

# Universal Decimal Classification —

English full edition —  
FID publication no. 483 —

UDC 620 — Materials testing —  
Commercial materials —  
Power stations —  
Economics of energy

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Information and Documentation Standards Policy Committee (DOT/-) to Technical Committee DOT/3, upon which the following bodies were represented:

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- British Library Bibliographic Services
- British Steel Industry
- Chemical Industries Association
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- Standing Conference of National and University Libraries
- Textile Research Council (Hatra)
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The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Institute of Environmental Science and Technology
- Institute of Marine Engineers
- Institute of Refrigeration
- Institution of Mining and Metallurgy
- Society of Motor Manufacturers and Traders Limited
- Welding Institute

This British Standard, having been prepared under the direction of the Information and Documentation Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 31 May 1990

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First published 19 April 1973  
First revision May 1990

The following BSI reference relates to the work on this standard:  
Committee reference DOT/3

ISBN 0 580 18182 0

## Amendments issued since publication

| Amd. No. | Date of issue | Comments |
|----------|---------------|----------|
|          |               |          |
|          |               |          |
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## Foreword

The English version of the Universal Decimal Classification (UDC) is being prepared and published as BS 1000 by the British Standards Institution (BSI) at the original joint request of the British Society for International Bibliography (BSIB) and the Association of Special Libraries and Information Bureaux (ASLIB), now amalgamated as Aslib. It has the approval of the Lake Placid Education Foundation, New York, proprietors of the Dewey Decimal Classification, from which the UDC derives. The English full edition of the UDC is authorized by the International Federation for Information and Documentation (FID), PO Box 90402, 2509 LK The Hague, Netherlands.

This section is part of the English full edition. It should be used in conjunction with the English text of the International Medium Edition, BS 1000M, which refers to many other subjects of interest not listed in this schedule, and provides a conspectus of the whole scheme, together with an introduction to its use. For further practical information about the principles, application and utilization of the scheme, users should refer to BS 1000C.

This edition of BS 1000 [620], which supersedes the 1973 edition, includes modifications authorized in *Extensions and Corrections to the UDC* (FID publication no. 248) up to and including Series 13, No 2, dated July 1988. Subsequent issues of *Extensions and Corrections to the UDC* should be consulted to keep the schedule up to date. British Standards related to this part of BS 1000 are listed on the inside back cover.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 28, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## Scope

Under 620.1 is classed information about the testing of materials, including sampling, methods of test and equipment, investigation of the structure of materials, material defects, corrosion, erosion, etc.

Physical and chemical properties of materials, however, are classed in 53 and 54. Testing of specific materials may be denoted by colon combination with the appropriate number.

Under 620.2 is classed information about commercial materials or goods, especially dangerous goods.

Under 620.4 is classed information about power stations in general (not specific kinds of power production) and under 620.9 information about the economics of energy and energy sources.

## Related subjects

|             |                                                                            |
|-------------|----------------------------------------------------------------------------|
| 351.753     | Supervision of weapons, munitions, explosives — Public administration      |
| 351.773     | Public health inspection. Inspection of foodstuffs — Public administration |
| 519.24      | Special statistical applications and models                                |
| 53.08       | General principles and theory of measurement — Physics                     |
| 531         | General mechanics. Mechanics of solid and rigid bodies                     |
| 532         | Fluid mechanics in general                                                 |
| 533         | Mechanics of gases. Aerodynamics. Plasma physics                           |
| 534         | Vibrations. Acoustics                                                      |
| 535         | Optics                                                                     |
| 536         | Heat. Thermodynamics                                                       |
| 537         | Electricity. Magnetism. Electromagnetism                                   |
| 539         | Physical nature of matter                                                  |
| 54          | Chemistry. Mineralogical sciences                                          |
| 552         | Petrology. Petrography                                                     |
| 553         | Economic geology. Mineral deposits                                         |
| 57          | Biological sciences in general                                             |
| 58          | Botany                                                                     |
| 59          | Zoology                                                                    |
| 614         | Public health and hygiene. Accident prevention                             |
| 615         | Pharmaceutics. Therapeutics. Toxicology                                    |
| 616         | Pathology                                                                  |
| 62 – 1/ – 9 | Characteristics of machines                                                |
| 621.039     | Applied nuclear science                                                    |
| 621.3       | Electrical engineering                                                     |
| 621.6       | Fluids handling, storage and distribution plant and technique              |
| 621.7       | Plastic or chipless working, forming and treatment of materials            |

|        |                                                    |
|--------|----------------------------------------------------|
| 623    | Military engineering                               |
| 624    | Civil and structural engineering                   |
| 627.8  | Hydraulic power plant works                        |
| 632    | Plant damage, diseases and pests. Plant protection |
| 636    | Animal husbandry and breeding                      |
| 648    | Washing. Laundry. Cleaning                         |
| 656    | Transport and postal services                      |
| 658.26 | Energy sources — Business management               |
| 658.5  | Production engineering and planning                |
| 66     | Chemical technology. Chemical industry             |
| 674    | Timber and woodworking industry                    |

## Auxiliary signs and subdivisions

Full information about the common and special auxiliary signs and subdivisions (often abbreviated to “common and special auxiliaries”) will be found in BS 1000M and BS 1000C.

**Colon sign of relation.** For the classification of information for the public, as in abstracts and bibliographies, maximum use of colon combination rather than of common and special auxiliaries is recommended. The use of the colon sign of relation is preferable for multiple entry systems, as it will help prevent the concealment of information. This usually results in longer notation, however, and for information for more restricted use the application of auxiliaries, where available, may be simpler and more convenient provided that there is an adequate alphabetical subject index.

**Common auxiliaries.** The common auxiliaries of language = . . . , form (0 . . . ), place (1/9), race and nationality (= . . . ), time “. . . ”, point of view .00 . . . , materials – 03 . . . and persons – 05 . . . are applicable throughout the UDC. However, they should be used mainly to express concepts not otherwise provided for in the schedules.

**Special auxiliaries.** The .0 special auxiliaries listed under 620.1 and 620.193 are applicable to the numbers concerned. They may be detached and applied to any subdivision of the number at which they are listed, e.g.

|              |                                                                |
|--------------|----------------------------------------------------------------|
| 620.1.05     | Testing machines and apparatus                                 |
| 620.178.5    | Testing for resistance to the effects of vibration             |
| 620.178.5.05 | Machines and apparatus. Vibrators. Oscillating, shaking tables |

The – 2/ – 9 special auxiliaries listed under 62 are applicable throughout the schedule. They may be applied to any subdivision of 620 where the result forms a meaningful combination.

### **Typographic presentation**

Small type is used for cancelled numbers or text. The arrow  $\rightarrow$  means either “see” or “see also” according to the context. The symbol  $\cong$  “subdivide as” means that the number preceding it may be subdivided in the same way as, and with meanings analogous to the subdivisions of, the number which follows it.

## SCHEDULE

**620 Materials testing. Commercial materials.  
Power stations. Economics of energy****620.1 Materials testing. Defects of materials.  
Protection of materials**

|                                       |                                                                                                         |         |                                                                                                                           |
|---------------------------------------|---------------------------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Special auxiliary subdivisions</b> |                                                                                                         | 620.115 | APPARATUS FOR THE PREPARATION OF SPECIMENS, TEST PIECES. SHAPE OF SPECIMENS. MEASUREMENTS. GAUGE LENGTHS                  |
| 620.1.05                              | TESTING MACHINES AND APPARATUS                                                                          |         |                                                                                                                           |
| .051                                  | <b>Universal testing machines</b>                                                                       |         |                                                                                                                           |
| .052                                  | <b>Load capabilities and characteristics of testing machines</b>                                        | .2      | <b>Sampling apparatus</b>                                                                                                 |
| .1                                    | Maximum capacity                                                                                        | .21     | Sampling apparatus for solid materials                                                                                    |
| .2                                    | Calibration graphs                                                                                      | .22     | Sampling apparatus for liquid materials                                                                                   |
| .3                                    | Influence of characteristic stiffness, elasticity of testing machines                                   | .23     | Sampling apparatus for gaseous materials                                                                                  |
| .4                                    | Characteristics of testing machines                                                                     | .5      | <b>Apparatus and machines for production of specimens</b>                                                                 |
| .5                                    | Generation, transmission and measurement of power in testing machines                                   | .8      | <b>Shape of specimens. Measurements of specimens. Gauge lengths</b>                                                       |
| .058                                  | <b>Fixing and holding devices. Grips, clamps, chucks, jigs, shackles</b>                                | .82     | Round test pieces. Normal and proportional test pieces, with or without notch                                             |
|                                       | →62-229.3 Workpiece holders. Fastening devices — Engineering technology in general                      | .83     | Flat test pieces. Normal and proportional test pieces                                                                     |
| .2                                    | For test pieces of circular cross-section                                                               | .84     | Prismatic specimens with or without notch                                                                                 |
| .22                                   | With or without head                                                                                    | .842    | Shape of notches. Sharp notches. Round, radiused notches. Other notch shapes                                              |
| .23                                   | With screw thread                                                                                       | .85     | Other specimen shapes, e.g. cubes                                                                                         |
| .24                                   | With conical end                                                                                        | .88     | Application of gauge lengths, measuring marks                                                                             |
| .3                                    | For flat, strip test pieces                                                                             | 620.118 | STORAGE, PRESERVATION OF SPECIMENS                                                                                        |
| .4                                    | For solid polygonal, prismatic test pieces                                                              | 620.16  | <b>TEST OF SUITABILITY FOR SERVICE</b>                                                                                    |
| .5                                    | For test pieces of other shapes                                                                         | 620.162 | TECHNOLOGICAL TESTS SIMULATING CONDITIONS TO WHICH THE SPECIMEN WILL BE SUBMITTED IN SERVICE                              |
| 620.1.08                              | GENERAL PRINCIPLES AND THEORY OF MEASUREMENT AND THE DESIGN OF MEASURING APPARATUS. MEASUREMENT METHODS | .2      | Drawing tests. Stamping and pressing tests. Erichsen tests                                                                |
|                                       | 620.1.08 ≅ 53.08                                                                                        | .3      | Twisting test. Torsion tests                                                                                              |
| <b>Principal divisions</b>            |                                                                                                         | .4      | Capacity for withstanding external or internal pressure. Pressure tests with water or gases                               |
| 620.11                                | <b>PRELIMINARY EXAMINATION OF MATERIALS AND RAW MATERIALS. SAMPLING. TEST PIECES</b>                    | 620.163 | TECHNOLOGICAL TESTS NOT PRODUCING NUMERICAL VALUES. TESTING OF REGULARITY AND UNIFORMITY OF PRODUCTS, E.G. TEXTILE FIBRES |
| 620.111                               | PRELIMINARY EXAMINATION                                                                                 |         | →620.179 Non-destructive testing                                                                                          |
| .1                                    | Visual examination: examination with the naked eye, with magnifying glass                               | .1      | Pouring tests. Casting tests. Consistency. Spreadability Fluidity                                                         |
| .2                                    | Visual examination of inaccessible surfaces (e.g. of cavities) using an endoscope. Endoscopy            | .2      | Forging tests                                                                                                             |
| .3                                    | Acoustic testing. Testing by sound                                                                      | .22     | Flattening tests. Compression tests. Piercing tests. Drifting tests                                                       |
| 620.113                               | BASIS OF SAMPLING. ERRORS IN SELECTION. SAMPLING PROCESSES                                              | .24     | Flanging, bead tests. Working tests on heated plate or sheet (Hammering test)                                             |
| .2                                    | Basis of sampling                                                                                       | .3      | Weldability testing                                                                                                       |
|                                       | →519.24 Special statistical applications and models — Mathematics                                       | .31     | →620.177 Folding and bend tests                                                                                           |
| .3                                    | Errors in selection                                                                                     |         | Weld ductility tests (bend tests of surface-deposited bead), e.g. Komerell test                                           |
| .4                                    | Sampling processes                                                                                      |         | →539.564 Sensitivity to cleavage fracture. Susceptibility to cleavage fracture — Physics                                  |
| .41                                   | Sampling processes for solid materials                                                                  |         | 620.177 Folding and bend tests                                                                                            |
| .412                                  | Sampling processes for longitudinal samples. Sampling processes for cross-sections                      | .32     | Hot breaking test. Quench bend test                                                                                       |
| .42                                   | Sampling processes for liquid materials                                                                 | .33     | Notch bend tests. To-and-fro, reverse bending tests. Winding tests                                                        |
| .43                                   | Sampling processes for gaseous materials                                                                | .4      | Grinding tests. Drum strength tests                                                                                       |
|                                       |                                                                                                         | .45     | Crushing, fragmentation tests                                                                                             |
|                                       |                                                                                                         | .6      | Hardenability testing. Spark tests                                                                                        |

|         |                                                                                                                                                                                                                                                                                                       |                  |                                                                                                                                                                                                 |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 620.164 | TESTS ACCORDING TO KIND OF SURFACE                                                                                                                                                                                                                                                                    | 620.171          | GENERAL QUESTIONS                                                                                                                                                                               |
| .1      | Testing of flat surfaces. Testing of sheets                                                                                                                                                                                                                                                           | .2               | <b>Testing processes</b>                                                                                                                                                                        |
| .2      | Testing of curved surfaces. Testing of tank plates                                                                                                                                                                                                                                                    | .3               | <b>Influence of external conditions</b>                                                                                                                                                         |
| .3      | Testing of cylindrical surfaces. Testing of tubes                                                                                                                                                                                                                                                     | .31              | Length and speed of test                                                                                                                                                                        |
| 620.165 | TESTING OF HOLLOW BODIES                                                                                                                                                                                                                                                                              | .311             | Length, duration of test                                                                                                                                                                        |
| .1      | Testing of open containers                                                                                                                                                                                                                                                                            | .2               | Short tests                                                                                                                                                                                     |
| .2      | Testing of closed containers                                                                                                                                                                                                                                                                          | .3               | Long tests                                                                                                                                                                                      |
| .29     | Tightness tests. Leakage tests. Seepage tests<br><i>Further particulars may be denoted by the special auxiliaries listed under 620.1, e.g. 620.165.29.05 Apparatus for tightness tests</i>                                                                                                            | .313             | Speed of test                                                                                                                                                                                   |
| .7      | Package testing (boxes, jars, cans etc)                                                                                                                                                                                                                                                               | .32              | Test temperature                                                                                                                                                                                |
| .71     | Testing in rotating drums                                                                                                                                                                                                                                                                             | .33              | Dryness. Dampness                                                                                                                                                                               |
| .72     | Drop tests. Fragility tests                                                                                                                                                                                                                                                                           | .34              | Influence of shape of specimen                                                                                                                                                                  |
| .79     | Other tests                                                                                                                                                                                                                                                                                           | .35              | Influence of gradual or staccato working                                                                                                                                                        |
| 620.166 | TESTING OF PROPERTIES DEPENDENT ON THE SHAPE, E.G. OF SPRINGS, HELICAL TUBES                                                                                                                                                                                                                          | .5               | <b>Photoelastic tests</b><br><i>Testing with polarized light may be denoted by colon combination with 535.51</i>                                                                                |
| 620.168 | TESTING OF SAMPLES OF COMPOSITE MATERIALS                                                                                                                                                                                                                                                             | 620.172          | <b>TENSILE TESTS UNDER STEADY OR GRADUALLY INCREASING LOAD</b><br><i>Observation and recording methods and apparatus may be denoted by the .087 special auxiliaries listed under 53</i>         |
| .2      | <b>Determination of number of constituents</b><br><i>Further particulars may be denoted by the special auxiliaries listed under 620.1, e.g. 620.168.2.05 Apparatus for determining number of constituents. Linen testers (thread counters) etc.</i>                                                   | 620.172.2        | <b>DETERMINATION OF TEST VALUES AND MATERIAL CHARACTERISTICS</b><br><i>Observation and recording methods and apparatus may be denoted by the .087 special auxiliaries listed under 53, e.g.</i> |
| .3      | <b>Testing of individual constituent characteristics of composite materials. Separation</b><br>→543 Analytical chemistry                                                                                                                                                                              | 620.172.2.087.4  | Recording of test values. Recording apparatus                                                                                                                                                   |
| .32     | Sieving. Screening                                                                                                                                                                                                                                                                                    | 620.172.2.087.45 | Recording of several variable values. Extensometers. Recording of stress-strain diagram. Recording of stress and elongation                                                                     |
| .33     | Separation processes based on differences of density                                                                                                                                                                                                                                                  | .21              | <b>Measurement of load and stress. Determination of deformation work</b>                                                                                                                        |
| .332    | Separation by precipitation                                                                                                                                                                                                                                                                           | .212             | With weights. With direct loading, dead load                                                                                                                                                    |
| .333    | Separation by weight difference                                                                                                                                                                                                                                                                       | .213             | With travelling weights and inclination balance, with lever reading                                                                                                                             |
| .334    | Separation by removal or introduction of water                                                                                                                                                                                                                                                        | .214             | By measurement of hydraulic pressure                                                                                                                                                            |
| .7      | Atterberg analysis. Kopecky analysis                                                                                                                                                                                                                                                                  | .1               | Measurement by weighing machine (steelyard or scale beam, pendulum balance)                                                                                                                     |
| .72     | Atterberg analysis                                                                                                                                                                                                                                                                                    | .2               | Measurement by manometer                                                                                                                                                                        |
| .73     | Kopecky analysis                                                                                                                                                                                                                                                                                      | .215             | By elastic measurements                                                                                                                                                                         |
| .336    | Separation by centrifuging                                                                                                                                                                                                                                                                            | .1               | With dynamometer                                                                                                                                                                                |
| .34     | Filtration analysis                                                                                                                                                                                                                                                                                   | .2               | With standard test bar                                                                                                                                                                          |
| .35     | Separation by air currents, e.g. winnowing                                                                                                                                                                                                                                                            | .216             | With pressure cell                                                                                                                                                                              |
| .36     | Measurement of the size of small particles, e.g. by microscope                                                                                                                                                                                                                                        | .22              | <b>Determination of elongation, elastic limit, modulus of elasticity</b>                                                                                                                        |
| .37     | Magnetic or electrical measurements                                                                                                                                                                                                                                                                   | .222             | Determination of elongation. Determination of elongation at fracture                                                                                                                            |
| .372    | Magnetic                                                                                                                                                                                                                                                                                              | .224             | Determination of elastic limit, yield point, proportional limit                                                                                                                                 |
| .373    | Electrical                                                                                                                                                                                                                                                                                            | .1               | Determination of elastic limit                                                                                                                                                                  |
| .4      | <b>Determination of admixtures by non-chemical methods</b>                                                                                                                                                                                                                                            | .2               | Determination of yield point, stretching-strain limit                                                                                                                                           |
| .169.1  | <b>Endurance, durability tests in general</b>                                                                                                                                                                                                                                                         | .22              | Determination of lower yield point                                                                                                                                                              |
| .2      | <b>Accelerated tests</b><br>→620.199 Accelerated tests                                                                                                                                                                                                                                                | .24              | Determination of upper yield point                                                                                                                                                              |
| 620.17  | <b>MEASUREMENT OF MECHANICAL PROPERTIES OF MATERIALS. STRENGTH TESTS</b><br>→67.017 Physical and mechanical properties — Various industries, trades and crafts<br><i>Further particulars may be denoted by the special auxiliaries listed under 620.1, e.g. 620.17.051 Universal testing machines</i> | .3               | Determination of proportional limit                                                                                                                                                             |
|         |                                                                                                                                                                                                                                                                                                       | .4               | Determination of proof stress                                                                                                                                                                   |
|         |                                                                                                                                                                                                                                                                                                       | .225             | Determination of modulus of elasticity                                                                                                                                                          |
|         |                                                                                                                                                                                                                                                                                                       | .23              | <b>Determination of shrinkage, contraction, reduction of area, necking</b>                                                                                                                      |
|         |                                                                                                                                                                                                                                                                                                       | .24              | <b>Determination of breaking load, breaking strength, cross-section at failure. Phenomena of fracture</b>                                                                                       |
|         |                                                                                                                                                                                                                                                                                                       | .242             | Ultimate tensile stress. Maximum load strength                                                                                                                                                  |
|         |                                                                                                                                                                                                                                                                                                       | .244             | Reduction of area. Necking                                                                                                                                                                      |
|         |                                                                                                                                                                                                                                                                                                       | .246             | Appearance of fracture                                                                                                                                                                          |

|            |                                                                                                                                                 |            |                                                                                                                           |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------|
| 620.172.25 | <b>Tensile testing under particular conditions</b>                                                                                              | 620.174    | <b>BENDING STRENGTH TESTING WITH STATIC OR GRADUALLY INCREASING LOAD</b>                                                  |
|            | →620.171.3 Influence of external conditions                                                                                                     |            | →539.413 Resistance to flexion, bending Physics                                                                           |
| .251       | Tensile tests at various temperatures                                                                                                           |            | 620.177 Folding and bend tests                                                                                            |
| .1         | Tensile tests at low temperatures                                                                                                               | .12        | Bending tensile tests                                                                                                     |
| .12        | Determination of characteristic values<br>620.172.251.12 $\cong$ 620.172.251.22                                                                 | .13        | Bending compression tests                                                                                                 |
| .18        | Devices for cooling specimens. Freezing mixtures                                                                                                | .2         | Determination of test values and material characteristics<br>620.174.2 $\cong$ 620.172.2, e.g.                            |
| .2         | Tensile tests at high temperatures. Creep tests for metals (depending on time)                                                                  | 620.174.21 | Measurement of load, stress                                                                                               |
| .22        | Determination of characteristic values                                                                                                          | .22        | Determination of deflection, elastic limit, modulus of elasticity                                                         |
| .222       | Determination of hot yield point                                                                                                                | .24        | Determination of breaking load                                                                                            |
| .224       | Determination of hot tensile strength                                                                                                           | .25        | Bending strength tests under particular conditions                                                                        |
| .225       | Measurement of elongation when hot                                                                                                              |            |                                                                                                                           |
| .226       | Determination of creep strength depending on time                                                                                               |            |                                                                                                                           |
| .28        | Specimen heaters                                                                                                                                |            |                                                                                                                           |
| .282       | Furnaces                                                                                                                                        |            |                                                                                                                           |
|            | <i>Methods of heating may be denoted by the -6 special auxiliaries listed under 62</i>                                                          | 620.175    | <b>TORSIONAL STRENGTH TESTING WITH STATIC OR GRADUALLY INCREASING LOAD. TORSION TESTS. TWISTING TESTS. RIGIDITY TESTS</b> |
| .283       | Heating in gaseous atmosphere                                                                                                                   |            | Determination of test values and material characteristics<br>620.175.2 $\cong$ 620.172.2, e.g.                            |
| .284       | Liquid heating baths                                                                                                                            | 620.175.21 | Measurement of load, stress                                                                                               |
| .29        | Factors affecting testing                                                                                                                       | .22        | Determination of torsion, elastic limit, modulus of rigidity                                                              |
| .292       | Duration of heating of specimens<br>→620.171.31 Length and speed of test                                                                        | .24        | Determination of shear strength                                                                                           |
| .253       | Tensile testing by centrifugal force                                                                                                            | .25        | Torsional strength testing under particular conditions                                                                    |
| .254       | High speed tensile tests. Impact tensile tests<br>→620.178.72 Impact tearing tests. Dynamic tensile tests                                       | .251       | Tests at various temperatures<br>.2 Tests at high temperatures                                                            |
| 620.173    | <b>COMPRESSIVE STRENGTH TESTING WITH STATIC OR GRADUALLY INCREASING LOAD. COMPRESSION TESTS. PRESSURE TESTS. CRUSHING TESTS. BUCKLING TESTS</b> | .6         | Determination of number of twists                                                                                         |
| .2         | <b>Determination of test values and material characteristics</b>                                                                                | 620.176    | <b>SHEAR STRENGTH TESTING WITH STATIC OR GRADUALLY INCREASING LOAD. SHEAR TESTS. PUNCHING TESTS</b>                       |
|            | →620.171.3 Influence of external conditions                                                                                                     |            | Single and double shear tests. Shear resistance tests                                                                     |
|            | 620.173.21/.25 $\cong$ 620.172.21 /.25, e.g.                                                                                                    | .21        | Single shear tests                                                                                                        |
|            | 620.173.21 Measurement of load, stress                                                                                                          | .22        | Double shear tests                                                                                                        |
|            | .212 With weights                                                                                                                               | .24        | Determination of shear resistance                                                                                         |
|            | .213 With travelling weights and inclination balance                                                                                            | .245       | Tearing tests                                                                                                             |
|            | .214 By measurement of hydraulic pressure                                                                                                       | .25        | Shear strength test under particular conditions                                                                           |
|            | .22 Determination of shortening, compression, of crushing limit or yield point                                                                  | .251       | Shear strength tests at various temperatures<br>620.176.251 $\cong$ 620.172.251                                           |
|            | .23 Determination of bulging                                                                                                                    | .3         | Punching tests with gradual loading                                                                                       |
|            | .24 Determination of breaking load                                                                                                              | .5         | Stamping tests                                                                                                            |
|            | .25 Compression testing under particular conditions                                                                                             | 620.177    | <b>FOLDING AND BEND TESTS</b>                                                                                             |
|            | .251 Compression testing at various temperatures                                                                                                |            | →620.163.31 Weld ductility tests                                                                                          |
|            | .1 At low temperatures                                                                                                                          | 620.174    | Bending strength testing with static or gradually increasing load.                                                        |
|            | .2 At high temperatures                                                                                                                         | .2         | Folding in general. Folding, doubling, bendover tests. Seaming tests                                                      |
| .26        | Buckling tests. Crippling tests                                                                                                                 | .3         | Bending round a mandrel                                                                                                   |
| .262       | Determination of characteristic values<br>620.173.262 $\cong$ 620.172.2, e.g.                                                                   | .4         | Bending without mandrel                                                                                                   |
|            | 620.173.262.3 Degree of deformation in buckling tests                                                                                           | .6         | Flexibility, bendability testing. To-and-fro, reverse bend tests                                                          |

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| 620.178   | <b>HARDNESS TESTING. WEAR TESTING. BRITTLENESS TESTING</b><br>→620.163.4 Grinding tests. Drum strength tests                                                                                                                                                                                           | 620.178.152.34 | Pyramid indentation method                                                                                                                                                                                                                                                      |
| 620.178.1 | <b>HARDNESS TESTING. WEAR TESTING</b>                                                                                                                                                                                                                                                                  | .341           | Vickers diamond pyramid method                                                                                                                                                                                                                                                  |
| .12       | <b>Hardness testing by grinding</b>                                                                                                                                                                                                                                                                    | .2             | With loads over 3kp. Macro hardness testing                                                                                                                                                                                                                                     |
| .13       | <b>Hardness testing by planing or filing</b>                                                                                                                                                                                                                                                           | .3             | With loads of 0.2 to 3 kp. Small load hardness testing                                                                                                                                                                                                                          |
| .14       | <b>Scratch hardness testing</b>                                                                                                                                                                                                                                                                        | .4             | With loads of 0.2 kp. Micro hardness testing, e.g. single crystal tests                                                                                                                                                                                                         |
| .142      | Scratch tests with several bodies of known hardness (comparative determination)                                                                                                                                                                                                                        | .342           | Firth method (Hardometer)<br><i>Further particulars may be denoted by the special auxiliaries listed under 620.1, e.g. 620.178.152.342.05 Apparatus for Firth method</i>                                                                                                        |
| .143      | Scratch test with a single body of known hardness                                                                                                                                                                                                                                                      | .344           | Methods in which the indentation is magnified and projected. Projection microscope method<br><i>Further particulars may be denoted by the special auxiliaries listed under 620.1, e.g. 620.178.152.344.05 Apparatus for projection microscope method. Briviskop, Dia-Testor</i> |
| .2        | Shape, point angle and application of the scratching tool                                                                                                                                                                                                                                              | .346           | Knoop method                                                                                                                                                                                                                                                                    |
| .3        | Determination of scratch hardness. Hardness measurement                                                                                                                                                                                                                                                | .4             | Hardness testing with initial loading                                                                                                                                                                                                                                           |
| .32       | By determination of the pressure for a given width of scratch                                                                                                                                                                                                                                          | .42            | Rockwell hardness testing                                                                                                                                                                                                                                                       |
| .34       | By determination of the width of scratch for a given pressure                                                                                                                                                                                                                                          | .43            | Monotron hardness testing                                                                                                                                                                                                                                                       |
| .146      | Various influences                                                                                                                                                                                                                                                                                     | .5             | Pendulum hardness testing. Herbert method                                                                                                                                                                                                                                       |
| .2        | Influence of speed of scratching                                                                                                                                                                                                                                                                       | .51            | Generalities. Deformation by pendulum motion. Energy requirements. Determination of the hardness number                                                                                                                                                                         |
| .15       | <b>Measurement of hardness by impression with balls, cones, pyramids, cylinders, prisms</b>                                                                                                                                                                                                            | .512           | Deformation. Energy requirements                                                                                                                                                                                                                                                |
| .151      | Generalities. Indenter dimensions. Indenter shape. Indenter deformation                                                                                                                                                                                                                                | .513           | Determination of the hardness number                                                                                                                                                                                                                                            |
| .1        | Dimensions and condition of the specimen                                                                                                                                                                                                                                                               | .2             | By time test                                                                                                                                                                                                                                                                    |
| .2        | Shape, accuracy, surface condition, shaping, material of the indenter                                                                                                                                                                                                                                  | .3             | By scale test (angle test)                                                                                                                                                                                                                                                      |
| .22       | Shape of the indenter. Ball. Cone. Pyramid. Cylinder. Prism                                                                                                                                                                                                                                            | .52            | Testing process                                                                                                                                                                                                                                                                 |
| .23       | Accuracy of the indenter                                                                                                                                                                                                                                                                               | .55            | Varieties of pendulum hardness testing method                                                                                                                                                                                                                                   |
| .24       | Surface condition, deformation of the indenter                                                                                                                                                                                                                                                         | .153           | Impact hardness tests. Hardness testing by measurement of rebound<br><i>For grinding tests. Drum strength tests → 620.163.4</i>                                                                                                                                                 |
| .26       | Material of the indenter; steel, hard metal or alloy, diamond                                                                                                                                                                                                                                          | .2             | Impact hardness test                                                                                                                                                                                                                                                            |
| .3        | Magnitude and evenness of indenting pressure. Speed of loading and unloading. Duration of impressing                                                                                                                                                                                                   | .4             | Hardness testing by measurement of rebound<br><i>Further particulars may be denoted by the special auxiliaries listed under 620.1, e.g. 620.178.153.4.05 Apparatus for testing by rebound. Shore's scleroscope</i>                                                              |
| .4        | Measurement of the diameter, depth of impression. Accuracy of measurement. Shape of impression<br><i>Further particulars may be denoted by the special auxiliary subdivisions listed under 620.1, e.g. 620.178.151.4.08 Principles of measurement. Design of instruments for measuring indentation</i> | .154           | Special hardness testing methods                                                                                                                                                                                                                                                |
| .6        | Calculation of hardness values (maximum, minimum hardness.) Hardness number                                                                                                                                                                                                                            | .2             | By the flattening of conical specimens                                                                                                                                                                                                                                          |
| .152      | Impression methods                                                                                                                                                                                                                                                                                     | .3             | By impression with the cutting edge of a rectangular bar                                                                                                                                                                                                                        |
| .2        | Ball indentation tests                                                                                                                                                                                                                                                                                 | .4             | By pressing together two bodies of the same material                                                                                                                                                                                                                            |
| .22       | Brinell methods<br><i>Further particulars may be denoted by the special auxiliary subdivisions listed under 620.1, e.g. 620.178.152.22.05 Apparatus for Brinell testing. Brinell machines. Durometers</i>                                                                                              | .5             | Hardness testing at various temperatures<br>→620.178.156.2 (Influence of) temperature — Hardness testing                                                                                                                                                                        |
| .23       | Mayer method                                                                                                                                                                                                                                                                                           | .56            | Special arrangements, equipment etc                                                                                                                                                                                                                                             |
| .25       | Martens-Heyn method (with small loads)                                                                                                                                                                                                                                                                 | .58            | Defects                                                                                                                                                                                                                                                                         |
| .26       | Varieties of the ball indentation method                                                                                                                                                                                                                                                               | .582           | Caused by heating the specimen                                                                                                                                                                                                                                                  |
| .28       | Ball indentation procedure                                                                                                                                                                                                                                                                             | .583           | Caused by coldness of the indenter                                                                                                                                                                                                                                              |
| .3        | Cone and pyramid indentation tests                                                                                                                                                                                                                                                                     | .8             | Special methods of hardness testing based on physical phenomena<br>620.178.154.8 ≅ 53, e.g.<br>620.178.154.876 Magnetic methods                                                                                                                                                 |
| .32       | Cone indentation method, e.g. Ludwik's method                                                                                                                                                                                                                                                          | .9             | Other methods of hardness testing                                                                                                                                                                                                                                               |

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|-------------|-----------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 620.178.156 | Factors affecting hardness testing                                                                              | 620.178.325  | Alternating stress tests with various other applied alternating loads                                                                                                                                                        |
| .2          | Temperature                                                                                                     |              | Tests with tension-compression-torsion stresses                                                                                                                                                                              |
| .3          | Brittleness                                                                                                     | .2           | Tests with bending-torsion stresses                                                                                                                                                                                          |
| .4          | Elasticity                                                                                                      | .3           | <b>Repeated impact tests</b>                                                                                                                                                                                                 |
| .5          | Work                                                                                                            | .35          | Repeated impact tension-compression tests                                                                                                                                                                                    |
| .6          | Elasticity and work                                                                                             | .352         | Repeated impact bending tests                                                                                                                                                                                                |
| .16         | <b>Wear testing</b>                                                                                             | .353         | <b>Fatigue tests at low temperatures</b>                                                                                                                                                                                     |
| .162        | Wear testing by friction. Effect of lubricants and abrasive materials                                           | .37          | 620.178.37 $\cong$ 620.178.3                                                                                                                                                                                                 |
| .2          | Tests under rolling friction combined with slip, with or without lubrication                                    | .38          | <b>Fatigue tests at various temperatures</b>                                                                                                                                                                                 |
| .4          | Tests under sliding friction                                                                                    |              | 620.178.38 $\cong$ 620.178.3                                                                                                                                                                                                 |
| .42         | Tests with flat surfaces together, with or without lubrication                                                  | 620.178.4/.6 | TESTING UNDER VARIOUS KINDS OF STRESS                                                                                                                                                                                        |
| .43         | Tests with curved surfaces together, with or without lubrication                                                |              | <i>Here are classed only questions that cannot be assigned to any of the other subdivisions of 620.1</i>                                                                                                                     |
| .44         | Tests with thin disc and abrasive material                                                                      | .4           | Tests under various multiple kinds of stress, similar to those occurring in practical use, in service, e.g. friction testing of rubber with simultaneous stressing by pressure in oblique plane. Determination of weak spots |
| .45         | Tests with thin grinding disc of steel sheet                                                                    | .5           | Testing for failure of vibrating parts. Testing for resistance to the effects of vibration. Stroboscopic tests. Sonoscopic tests. Oscilloscopic tests                                                                        |
| .165        | Wear testing with air or steam sandblast                                                                        |              | →620.178.3 Strength testing with varying load                                                                                                                                                                                |
| .167        | Wear testing under shock                                                                                        |              | <i>Further particulars may be denoted by the special auxiliaries listed under 620.1, e.g.</i>                                                                                                                                |
| .169        | Other wear tests                                                                                                |              | 620.178.5.05 Apparatus for vibrational tests. Vibrators. Oscillating, shaking tables                                                                                                                                         |
| 620.178.2   | BRITTLENESS AND TOUGHNESS TESTING                                                                               |              |                                                                                                                                                                                                                              |
| .22         | Folding tests                                                                                                   |              |                                                                                                                                                                                                                              |
| .221        | After cold drawing                                                                                              |              |                                                                                                                                                                                                                              |
| .222        | After notching, scoring                                                                                         |              |                                                                                                                                                                                                                              |
| .23         | Punching tests                                                                                                  |              |                                                                                                                                                                                                                              |
| 620.178.3   | STRENGTH TESTING WITH VARYING LOAD. REPEATED IMPACT TESTS. REPEATED DYNAMIC STRESS TESTS. FATIGUE TESTS         |              |                                                                                                                                                                                                                              |
| .311        | <b>Generalities. Direction of stress. Effect of forces</b>                                                      | 620.178.53   | Shaking tests. Testing of assemblies for behaviour under vibration, jarring                                                                                                                                                  |
| .3          | Direction of stress. Magnitude and effect of forces. Strength of impact                                         |              | 620.178.53 $\cong$ 620.178.3                                                                                                                                                                                                 |
| .4          | Determination of material characteristics. Fatigue strength (under alternating stresses). Fatigue limit         | .6           | Testing under various kinds of stress similar to those occurring in processing, working of materials, e.g. testing for resistance to deformation                                                                             |
| .5          | Generation of vibrations: hydraulic, electrical, magnetic                                                       | 620.178.7    | STRENGTH TESTING WITH IMPACT, PERCUSSION LOAD. DROP TESTS. FALLING WEIGHT TESTS                                                                                                                                              |
| .6          | Damping capacity of material                                                                                    |              | <i>For impact tensile tests → 620.172.254</i>                                                                                                                                                                                |
| .62         | Internal damping                                                                                                | .72          | Impact tearing tests. Dynamic tensile tests                                                                                                                                                                                  |
| .64         | Hysteresis                                                                                                      |              | 620.178.72 $\cong$ 620.172                                                                                                                                                                                                   |
|             | →539.389.4 Hysteresis — Physics                                                                                 | .73          | Impact compression tests. Pressure tests with impact loading, e.g. explosion                                                                                                                                                 |
| .8          | Effect of experimental conditions                                                                               |              | 620.178.73 $\cong$ 620.173                                                                                                                                                                                                   |
| .81         | Effect of notching, surface treatment, preliminary handling of specimens                                        | .74          | Impact bending tests                                                                                                                                                                                                         |
| .82         | Effect of loading frequency. Number of impacts per unit of time. Rest periods. Resonant vibrations, covibration | .742         | Test, on unnotched specimens                                                                                                                                                                                                 |
| .84         | Effect of wetting                                                                                               |              | 620.178.742 $\cong$ 620.174.1                                                                                                                                                                                                |
| .86         | Other effects                                                                                                   | .746         | Tests on notched specimens. Notched-bar impact bending tests                                                                                                                                                                 |
| .868        | Effect of corrosion                                                                                             |              | Test with pendulum hammers                                                                                                                                                                                                   |
|             | →620.194.23 Corrosion fatigue                                                                                   | .22          | Charpy method                                                                                                                                                                                                                |
| .32         | <b>Kinds of repeated dynamic stress test. Kind of stress applied</b>                                            | .24          | Izod method                                                                                                                                                                                                                  |
| .322        | Pure bending, torsion, tension-compression stressing                                                            | .3           | Tests with rotating hammer. Guillery method                                                                                                                                                                                  |
| .1          | Alternating tensile stress tests                                                                                | .4           | Drop tests (for rails, axles, tyres etc.). Falling weight tests                                                                                                                                                              |
| .2          | Alternating tension-compression stress tests                                                                    | .75          | Impact torsion test                                                                                                                                                                                                          |
| .3          | Alternating bending stress tests                                                                                |              | 620.178.75 $\cong$ 620.175                                                                                                                                                                                                   |
| .4          | Alternating torsion stress tests                                                                                | .76          | Impact shearing and punching tests                                                                                                                                                                                           |
| .324        | Alternating stress tests with static pre-loading                                                                |              | 620.178.76 $\cong$ 620.176                                                                                                                                                                                                   |