

# Universal Decimal Classification —

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UDC 621.3 Electrical engineering

UDC 025.45:621.3

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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 a concise edition, such as 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[621.3], which supersedes the 1975 edition, includes modifications authorized in *Extensions and Corrections to the UDC* up to and including Series 13, No. 1, dated August 1987. 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.

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 116, 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 621.3 is classed information about electrical engineering, including electronics, and the fundamental applications of electrical engineering. Particular applications of electrical engineering are classed under various other sections (see related subjects below). The theoretical aspects of electricity, magnetism and electromagnetism and their measurement are found under 537.

## Related subjects

- 51 Mathematics
- 52 Astronomy. Astrophysics. Space research. Geodesy
- 531.7 Measurement of geometrical and mechanical quantities. Instruments. Methods. Units
- 532 Fluid mechanics in general. Mechanics of liquids (hydromechanics)
- 533.9 Plasma physics
- 534 Vibrations. Acoustics
- 535 Optics
- 536 Heat. Thermodynamics
- 537 Electricity. Magnetism. Electromagnetism
- 539 Physical nature of matter
- 541.13 Electrochemistry
- 543.25 Electroanalysis. Electrolytic and electrometric methods
- 546 Inorganic chemistry
- 548.73 X-ray analysis (Roentgen radiography) of crystals. X-ray investigation of properties. X-ray structure — Crystallography
- 548.74 Investigations with electron beams. Investigations with cathode rays — Crystallography
- 550.3 Geophysics
- 551.5 Meteorology
- 615.84 Electrotherapy. Radiotherapy. Electrotherapeutics
- 620.1 Materials testing. Defects of materials. Protection of materials
- 621.039 Applied nuclear science. Atomic energy and atomic industry. Nuclear engineering in general
- 621.221 Sources and utilization of hydraulic energy. Hydraulic power plants in general
- 621.791 Welding and allied techniques
- 624 Civil structural engineering in general. Substructures. Earthworks. Foundations. Tunnelling. Bridge building. Superstructures

- 625 Civil engineering of land transport. Railway engineering, highway engineering
- 628.9 Lighting. Illumination engineering
- 629 Transport vehicle engineering
- 64 Housekeeping. Home economics. Domestic science
- 654 Telecommunication and telecontrol (organization, services)
- 656 Transport and postal services. Traffic organization and control
- 66 Chemical technology. Chemical and related industries
- 669 Metallurgy
- 677.73 Electricity cables. High — tension wires. Submarine cables. Hollow cables
- 678 Industries based on macromolecular materials. Rubber industry. Plastics industry
- 681 Precision mechanisms and instruments
- 681.3 Data processing equipment
- 681.84 Sound recording and reproduction
- 696.6 Electrical installations. Electric wiring systems. Electrician's trade — Building

## 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 or 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 .01/.09 special auxiliary subdivisions listed at 621.3 are applicable throughout the schedule. They may be applied to any subdivision of 621.3 where the result forms a meaningful combination, e.g.

621.3.032.12 Filling gases and vapours

621.326.7 Lamps with metallic filaments

621.326.7.032.12 Filling gases for lamps with metallic filaments

The – 1/ – 9 special auxiliary subdivisions listed at the beginning of UDC 62 and referred to at 621.3 are also applicable to this section.

## Typographic presentation

Small type is used for cancelled numbers of text.

The arrow → 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

## 621.3 Electrical Engineering

## Special auxiliary subdivisions

## 621.3-1/-9 CHARACTERISTICS OF ELECTRICAL MACHINERY ETC.

621.3-1/-9  $\cong$  62-1/-9

*These special -1/-9 auxiliary subdivisions should be used only for concepts not adequately designated by the special .01/.09 auxiliary subdivisions or by the direct decimal divisions*

## 621.3.01/.09 SPECIAL AUXILIARY SUBDIVISIONS FOR ELECTRICAL ENGINEERING.

*These special .01/.09 auxiliary subdivisions should be used only for concepts not adequately designated by the direct decimal divisions.*

## 621.3.01 GENERAL STUDIES. THEORY. DEFINITIONS. CONCEPTS

## 621.3.011 PRINCIPAL FORMULAE. ELECTRIC AND DIELECTRIC QUANTITIES

## .1 General formulae

## .2 Impedance. Reactance. Resistance. Conductance

.21 Impedance. Admittance

.212 Negative impedance. Negative admittance

.22 Resistance. Conductance

.222 Negative resistance. Negative conductance

.23 Reactance. Susceptance

## .3 Inductance

.31 Self-inductance

.32 Mutual inductance

.33 Stray inductance

## .4 Capacitance

.5 Dielectric constants

.6 Time constants

.7 Fundamental properties of active or passive networks. Network theory, analysis and synthesis. Fundamental formulae, quantities and properties

.71 Analysis of linear networks  
→621.3.011.73 Synthesis of linear networks

.711 Transfer functions

.712 Equivalent circuits  
→621.3.012.8 Equivalent circuits

.713 Mesh equations

.714 Nodal point equations

.715 Network transformation by frequency transformation

.716 Stability investigations

.719 Other methods of analysis

*Further particulars may be denoted by colon combination, e.g.*

621.3.011.719:512.643 Analysis using matrices

:681.3 Computer-aided analysis

.72 Analysis of non-linear networks

621.3.011.72  $\cong$  621.3.011.71

.73 Synthesis of linear networks

621.3.011.73 (cont'd) →621.3.011.75 Topology of networks

.731 Synthesis of linear networks by calculation, e.g. method of Zobel

.732 Synthesis of passive lumped-element networks in terms of elementary networks

.1 Networks with only one kind of element (R, L or C)

.12 Resistive networks

*For resistance* → 621.3.011.22

*For type of resistance* → 621.3.028

*For resistors* → 621.316.8

.14 Capacitive networks

*For capacitance* → 621.3.011.4

*For capacitors* → 621.319.4

.16 Inductive networks

*For inductance* → 621.3.011.3

.161 Self-inductive networks

*For inductor coils* → 621.318.4

.162 Mutually inductive networks

.2 Networks with two kinds of element

.22 LC networks

.24 RC networks

.26 RL networks

.3 With three kinds of element. RLC networks

.733 Synthesis of active linear networks

.739 Other methods of synthesis

.74 Synthesis of non-linear networks

621.3.011.74  $\cong$  621.3.011.73

.75 Topology of networks

.751 Elementary networks

.2 L-sections

.4 T-sections

.6 TT-sections

.752 Assembled networks

621.3.011.752  $\cong$  621.372.542.2

## 621.3.012 DIAGRAMS AND CHARACTERISTICS. PERFORMANCE CURVES

## .1 Vector diagrams

.11 Circle diagrams

.12 Polar diagrams

.3 Plotting of curves and nomograms

.4 Open-circuit characteristics

.5 Short-circuit characteristics

.6 External or dynamic characteristics

.7 Other characteristics

.8 Equivalent circuits

→621.3.011.712 Equivalent circuits

## 621.3.013 MAGNETIC PHENOMENA. FIELDS. EXCITATION, RECIPROCAL INTERFERENCE

## .1 Flux. Saturation

.2 Main fields. Primary fields

.22 Stationary fields

.23 Rotating fields

.24 Oscillating, pulsating fields

.3 Auxiliary fields. Secondary fields

621.3.013.3  $\cong$  621.3.013.2

|             |                                                                                |              |                                                                        |
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| 621.3.013.4 | <b>Commutation fields. Armature reaction. Effect of displacing the brushes</b> | 621.3.015.33 | Impulse voltages                                                       |
| .5          | <b>Leakage. Lines of leakage. Fields in the slot</b>                           | .333         | Intentional impulse voltages                                           |
| .6          | <b>Reciprocal interference between wiring and machine</b>                      | .334         | Unintentional impulse voltages                                         |
| .62         | Resonance effects. Self-excitation of a.c. machines                            | .34          | Voltages of travelling waves and surges                                |
| .7          | <b>Reciprocal interference between fields (conductors and wiring)</b>          | .38          | Overvoltages                                                           |
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| .72         | Capacitive interference between power and communication lines                  |              | <i>For resonance effects between wiring and machine → 621.3.013.62</i> |
| .79         | Other kinds of reciprocal interference effects                                 | .5           | <b>Discharge voltage. Disruptive breakdown voltage</b>                 |
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| .12         | Skin effect. Current displacement                                              | .53          | Discharge in boundary layer                                            |
| .13         | Proximity effect                                                               | .532         | Corona. Glow                                                           |
| .14         | Currents in discharge paths                                                    | .533         | Surface discharge. Lichtenberg figures                                 |
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| .144        | Effect of temperature on current                                               |              | Sparking at brushes                                                    |
| .145        | Current limitation by space charge                                             | .55          | Internal discharge inception voltage                                   |
| .2          | <b>Current reversal. Commutation</b>                                           | 621.3.016    | TORQUE. POWER. LOAD                                                    |
| .3          | <b>Overcurrents. Surge currents</b>                                            | .1           | <b>Torque</b>                                                          |
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| .31         | Arcs                                                                           | .22          | Output power                                                           |
|             | <i>For electric discharges → 537.52</i>                                        | .23          | Input power                                                            |
|             | →621.317.333.4 Location of insulation faults                                   | .24          | Active power                                                           |
| .32         | Mechanical effects                                                             | .25          | Reactive power                                                         |
| .33         | Surge-currents (impulse currents)                                              | .26          | Apparent power                                                         |
| .332        | Current peaks                                                                  | .3           | <b>Load</b>                                                            |
| .333        | Intentional current peaks                                                      | .31          | Distribution of the load                                               |
| .334        | Unintentional current peaks                                                    | .312         | Symmetrical loading                                                    |
| .36         | Thermal effects                                                                | .313         | Asymmetrical loading                                                   |
| .38         | Overcurrents                                                                   | .32          | Parallel operation of machines                                         |
| .4          | <b>Eddy currents</b>                                                           |              | →621.3.062 Methods of connection. Switching methods                    |
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| .6          | <b>Other losses</b>                                                      | .32           | Mechanical safety factor                                                   |
| .7          | <b>Heating. Thermal effects. Cooling</b>                                 | .33           | Thermal safety factor                                                      |
|             | →62-71 Cooling devices and arrangements                                  | .34           | Electrical safety factor                                                   |
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| .1          | <b>Phase. Phase difference. Power-factor</b>                             | 621.3.024     | DIRECT CURRENT (D.C.)                                                      |
| .12         | Phase shift. Phase rotation. Phase angle                                 |               | 621.3.024.1/.2 each $\cong$ 621.3.026.4                                    |
| .14         | Power factor                                                             | .1            | <b>Constant d.c.</b>                                                       |
| .141        | Lagging current power factor                                             | .2            | <b>Pulsating d.c.</b>                                                      |
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| .144        | Reactive current (in quadrature with the voltage)                        | .1            | <b>Single-phase a.c.</b>                                                   |
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| .3          | <b>Harmonics</b>                                                         | .3            | <b>Three-phase a.c.</b>                                                    |
| .32         | Current harmonics                                                        | .4            | <b>Other polyphase a.c.</b>                                                |
| .33         | Voltage harmonics                                                        | 621.3.026     | POWER                                                                      |
| .4          | <b>Frequency. Slip</b>                                                   | .4            | <b>True power in watts</b>                                                 |
| .41         | Frequency                                                                | .42           | Less than $10^{-9}$                                                        |
| .411        | Natural frequency                                                        |               | 621.3.026.42 $\cong$ 621.3.026.43                                          |
| .42         | Frequency bands                                                          | .43           | $10^{-9}$ to $< 1$                                                         |
| .422        | Narrow bands                                                             | .431          | $10^{-9}$ to $< 10^{-8}$                                                   |
| .424        | Wide bands                                                               | .432          | $10^{-8}$ to $< 10^{-7}$                                                   |
| .46         | Slip frequency. Slip                                                     | .433          | $10^{-7}$ to $< 10^{-6}$                                                   |
| .5          | <b>Synchronism. Asynchronism</b>                                         | .434          | $10^{-6}$ to $< 10^{-5}$                                                   |
| .51         | Synchronism                                                              | .435          | $10^{-5}$ to $< 10^{-4}$                                                   |
| .52         | Falling out of step                                                      | .436          | $10^{-4}$ to $< 10^{-3}$                                                   |
| .53         | Asynchronism                                                             | .437          | $10^{-3}$ to $< 10^{-2}$                                                   |
| .6          | <b>Mechanical oscillations. Hunting</b>                                  | .438          | $10^{-2}$ to $< 10^{-1}$                                                   |
| .7          | <b>Wave form. Distortion</b>                                             | .439          | $10^{-1}$ to $< 1$                                                         |
| .72         | Sinusoidal waves                                                         | .44           | 1 to $< 10^9$                                                              |
| .73         | Flat waves                                                               | .441          | 1 to $< 10$                                                                |
| .74         | Peaky waves                                                              | .442          | 10 to $< 10^2$                                                             |
| .75         | Waves of special form                                                    | .443          | $10^2$ to $< 10^3$                                                         |
| .751        | Saw-tooth waves                                                          | .444          | $10^3$ to $< 10^4$                                                         |
| .752        | Rectangular waves                                                        | .445          | $10^4$ to $< 10^5$                                                         |
| .753        | Step waves                                                               | .446          | $10^5$ to $< 10^6$                                                         |
| .756        | Pulse waveforms                                                          | .447          | $10^6$ to $< 10^7$                                                         |
| .78         | Distortion                                                               | .448          | $10^7$ to $< 10^8$                                                         |
| .782        | Linear distortion                                                        | .449          | $10^8$ to $< 10^9$                                                         |
| .2          | Attenuation distortion                                                   | .45           | $10^9$ and greater                                                         |
| .3          | Phase distortion                                                         |               | 621.3.026.45 $\cong$ 621.3.026.44                                          |
| .4          | Time-delay distortion                                                    | 621.3.026.5   | <b>Reactive volt-amperes</b>                                               |
| .5          | Amplitude distortion                                                     |               |                                                                            |

|                    |                                                                                                                                                   |        |                                                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------|
|                    | 621.3.026.5 $\cong$ 621.3.026.4                                                                                                                   |        | <i>Short waves 621.3.029.55</i>                                                                                                   |
| .6                 | <b>Apparent volt-amperes</b>                                                                                                                      | .3     | <b>Audio frequencies</b>                                                                                                          |
|                    | 621.3.026.6 $\cong$ 621.3.026.4                                                                                                                   | .33    | Video frequencies                                                                                                                 |
| 621.3.027          | TYPE OF VOLTAGE                                                                                                                                   | .4/.79 | Frequency and wavelength ranges                                                                                                   |
|                    | <i>The numbers 621.3.027.21/.88 below may be further subdivided by adding the actual numerical voltage value (omitting any final zeros), e.g.</i> | .4     | <b>Frequencies from 0 to &lt; 30 kHz. Wavelengths &gt; 10 000 m (myriametric waves)</b>                                           |
|                    | 621.3.027.224 4 V                                                                                                                                 | .42    | 0 to < 100 Hz; $\infty$ to > $3 \times 10$ m                                                                                      |
|                    | .246 60 V                                                                                                                                         | .422   | 0 to < 1 Hz; $\infty$ to $3 \times 10^8$ m                                                                                        |
|                    | .247.2 72 V                                                                                                                                       | .424   | 1 to < 10 Hz; $3 \times 10^8$ to > $3 \times 10^7$ m                                                                              |
|                    | .262.2 220 V                                                                                                                                      | .426   | 10 to < 100 Hz; $3 \times 10^7$ to > $3 \times 10^6$ m                                                                            |
| .2                 | <b>Low voltage</b>                                                                                                                                | .1     | 10 to < 20 Hz; $3 \times 10^7$ to > $1.5 \times 10^7$ m                                                                           |
| .21                | Very low (< 1 V)                                                                                                                                  | .2     | 20 to < 30 Hz; $1.5 \times 10^7$ to > $1 \times 10^7$ m                                                                           |
| .212               | < $10^{-9}$ V                                                                                                                                     | .3     | 30 to < 40 Hz; $1 \times 10^7$ to > $7.5 \times 10^6$ m                                                                           |
|                    | 621.3.027.212 $\cong$ 621.3.026.42                                                                                                                | .4     | 40 to < 50 Hz; $7.5 \times 10^6$ to > $6 \times 10^6$ m                                                                           |
| .213               | $10^{-9}$ to < 1 V                                                                                                                                | .5     | 50 to < 60 Hz; $6 \times 10^6$ to > $5 \times 10^6$ m                                                                             |
|                    | 621.3.027.213 $\cong$ 621.3.026.43                                                                                                                | .6     | 60 to < 70 Hz; $5 \times 10^6$ to > $4.29 \times 10^6$ m                                                                          |
| .22                | 1 to < 10 V                                                                                                                                       | .7     | 70 to < 80 Hz; $4.29 \times 10^6$ to > $3.75 \times 10^6$ m                                                                       |
| .23                | 10 to < 50 V                                                                                                                                      | .8     | 80 to < 90 Hz; $3.75 \times 10^6$ to > $3.33 \times 10^6$ m                                                                       |
| .24                | 50 to < 100 V                                                                                                                                     | .9     | 90 to < 100 Hz; $3.33 \times 10^6$ to > $3 \times 10^6$ m                                                                         |
| .25                | Low voltage and high current                                                                                                                      | .45    | 100 to < 30 000 Hz; $3 \times 10^6$ to > $1 \times 10^4$ m                                                                        |
| .26                | Low voltage > 100 V                                                                                                                               | .5     | <b>Frequencies from 30 kHz to &lt; 30 000 kHz. Wavelengths from 10 000 m to greater than 10 m</b>                                 |
| 621.3.027.3        | <b>High voltage in general</b>                                                                                                                    | .51    | 30 to < 300 kHz; $1 \times 10^4$ to > $1 \times 10^3$ m. kilometric waves                                                         |
| .4/.7              | Up to < 100 kV                                                                                                                                    | .53    | 300 to < 3 000 kHz; $1 \times 10^3$ to > $1 \times 10^2$ m. Hectometric waves                                                     |
|                    | <i>The exact voltages may be denoted by adding the actual numerical voltage to 621.3.027.4/.7, omitting the final zeros, e.g.</i>                 | .55    | 3 000 to < 30 000 kHz; $1 \times 10^2$ to > $1 \times 10^1$ m. Decametric waves                                                   |
|                    | 621.3.027.75 50 kV                                                                                                                                | .6     | <b>Frequencies from 30 MHz to &lt; 3 THz. Wavelengths from <math>1 \times 10^1</math> to &gt; <math>1 \times 10^{-4}</math> m</b> |
| .4                 | < 1 kV                                                                                                                                            | .62    | 30 to < 300 MHz; $1 \times 10^1$ to > 1 m. Metric waves                                                                           |
| .5                 | 1 to < 10 kV                                                                                                                                      | .63    | 300 to < 3 000 MHz; 1 to > $1 \times 10^{-1}$ m. Decimetric waves                                                                 |
| .6                 | 10 kV and over                                                                                                                                    | .64    | 3 to < 30 GHz; $1 \times 10^{-1}$ to > $1 \times 10^{-2}$ m. Centimetric waves                                                    |
| .7                 | <b>Very high voltage in general. High voltage &lt; 100 kV</b>                                                                                     | .65    | 30 to < 300 GHz; $1 \times 10^{-2}$ to > $1 \times 10^{-3}$ m. Millimetric waves                                                  |
| .8                 | 100 kV and over                                                                                                                                   | .66    | 300 to < 3 000 GHz; $1 \times 10^{-3}$ to $1 \times 10^{-4}$ m. Decimillimetric waves                                             |
| .81/.88            | 100 to < 900 kV                                                                                                                                   | .7     | <b>Frequencies of 3 THz and above. Wavelengths of <math>1 \times 10^{-4}</math> m and below</b>                                   |
|                    | <i>Subdivide according to kilovoltage, e.g.</i>                                                                                                   | .71    | 3 to < 30 THz; $1 \times 10^{-4}$ to $1 \times 10^{-5}$ m                                                                         |
|                    | 621.3.027.815 150 kV                                                                                                                              | .72    | 30 to < 300 THz; $1 \times 10^{-5}$ to > $1 \times 10^{-6}$ m                                                                     |
| .89                | 900 kV and over                                                                                                                                   | .73    | 300 to < 3 000 THz; $1 \times 10^{-6}$ to > $1 \times 10^{-7}$ m                                                                  |
| 621.3.028          | RESISTANCE                                                                                                                                        | .74    | 3 000 to < 30 000 THz; $1 \times 10^{-7}$ to > $1 \times 10^{-8}$ m                                                               |
| .2                 | <b>Low resistance. High conductivity</b>                                                                                                          | .75    | $3 \times 10^4$ to < $3 \times 10^5$ THz; $1 \times 10^{-8}$ to > $1 \times 10^{-9}$ m                                            |
| .22                | Non-inductive resistance                                                                                                                          | .76    | $3 \times 10^5$ to < $3 \times 10^6$ THz; $1 \times 10^{-9}$ to > $1 \times 10^{-10}$ m                                           |
| .23                | Non-capacitive resistance                                                                                                                         | .77    | $3 \times 10^6$ to < $3 \times 10^7$ THz; $1 \times 10^{-10}$ to > $1 \times 10^{-11}$ m                                          |
| .24                | Non-inductive and non-capacitive resistance                                                                                                       | .78    | $3 \times 10^7$ to < $3 \times 10^8$ THz; $1 \times 10^{-11}$ to > $1 \times 10^{-12}$ m                                          |
| .3                 | <b>High resistance. Low conductivity</b>                                                                                                          | .79    | $3 \times 10^8$ THz and higher frequencies; $1 \times 10^{-12}$ m and lower wavelengths                                           |
| .32                | Non-inductive resistance                                                                                                                          |        |                                                                                                                                   |
| .33                | Non-capacitive resistance                                                                                                                         |        |                                                                                                                                   |
| .34                | Non-inductive and non-capacitive resistance                                                                                                       |        |                                                                                                                                   |
| .4                 | <b>High-frequency resistance</b>                                                                                                                  |        |                                                                                                                                   |
| 621.3.029          | TYPES OF OSCILLATION. FREQUENCY AND WAVELENGTH RANGES                                                                                             |        |                                                                                                                                   |
|                    | <i>If desired, the verbal equivalents of certain frequency and wavelength ranges may be classified as follows:</i>                                |        |                                                                                                                                   |
|                    | <i>Low frequency 621.3.029.4</i>                                                                                                                  |        |                                                                                                                                   |
|                    | <i>High frequency 621.3.029.5</i>                                                                                                                 |        |                                                                                                                                   |
|                    | <i>Long waves 621.3.029.51</i>                                                                                                                    |        |                                                                                                                                   |
| 621.3.029 (cont'd) | <i>Medium waves 621.3.029.53</i>                                                                                                                  |        |                                                                                                                                   |

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| 621.3.03  | <b>SPECIAL POWER SUPPLIES. PARTS OF LAMPS, DISCHARGE TUBES, ELECTRONIC APPARATUS, ELECTROCHEMICAL APPARATUS AND FURNACES. SPECIAL FEATURES OF ELECTRICAL OSCILLATION TECHNIQUE</b> | 621.3.032.262 | Electrode systems for enlarged images, e.g. for electron microscopes                                             |
|           |                                                                                                                                                                                    | .2            | Electrostatic systems                                                                                            |
|           |                                                                                                                                                                                    | .3            | Electromagnetic systems                                                                                          |
|           |                                                                                                                                                                                    | .4            | Combined electrostatic and electromagnetic systems                                                               |
| 621.3.031 | POWER SUPPLY FOR SPECIAL PURPOSES                                                                                                                                                  | .263          | Electrode systems for reduced scale images, e.g. for television tubes                                            |
|           | <i>For power supply → 621.311.4</i>                                                                                                                                                |               | 621.3.032.263 $\cong$ 621.3.032.262                                                                              |
| .8        | Emergency power supply                                                                                                                                                             | .264          | Electrode systems for generating parallel electron streams, e.g. for klystrons                                   |
|           | →621.311.8 Emergency power supply                                                                                                                                                  | .265          | Electrode systems for deflecting electron streams, e.g. for cathode-ray tubes                                    |
| 621.3.032 | INDIVIDUAL PARTS OF ELECTRIC LAMPS, DISCHARGE TUBES. ELECTRONIC DEVICES UTILIZING SOLID-STATE EFFECTS. SEMICONDUCTOR DEVICES                                                       |               | 621.3.032.265 $\cong$ 621.3.032.262                                                                              |
|           | <i>The material of which a part is made may be denoted by colon combination, e.g.</i>                                                                                              | .266          | Electrode systems for generating circular and spiral-shaped electron streams, e.g. for magnetrons and cyclotrons |
|           | 621.3.032.23:546.78 Tungsten anti-cathodes                                                                                                                                         | .2            | Systems for energy absorption                                                                                    |
| .1        | <b>Vacuum systems. Filling gases. Getters</b>                                                                                                                                      | .3            | Systems for energy delivery                                                                                      |
| .11       | Vacuum systems                                                                                                                                                                     | .267          | Electrode systems for separating particles with a different charge, e.g. for ion traps                           |
|           | For vacuum production → 621.52                                                                                                                                                     | .269          | Other electrode systems                                                                                          |
| .12       | Filling gases and vapours                                                                                                                                                          | .1            | Electron and ion guns                                                                                            |
|           | <i>Individual gases may be denoted by colon combination, e.g.</i>                                                                                                                  | .2            | Beam-control systems                                                                                             |
|           | 621.3.032.12:546.295 Xenon filling                                                                                                                                                 | .27           | Electrodes for semiconductor devices                                                                             |
| .14       | Getters                                                                                                                                                                            | .271          | Bases                                                                                                            |
| .2        | <b>Electrodes. Internal screens and diaphragms</b>                                                                                                                                 | .272          | Collectors                                                                                                       |
|           | <i>For ignition electrodes, starting devices → 621.3.032.43</i>                                                                                                                    | .273          | Emitters                                                                                                         |
| .21       | Cathodes                                                                                                                                                                           | .3            | <b>Light-emitting elements. Luminescent substances. Luminescent screens</b>                                      |
| .212      | Cold cathodes                                                                                                                                                                      | .32           | Light-emitting elements. Filaments                                                                               |
| .2        | Without activator                                                                                                                                                                  | .321          | Straight filaments                                                                                               |
| .3        | With activator                                                                                                                                                                     | .2            | Single-crystal structure filaments                                                                               |
| .213      | Heated cathodes                                                                                                                                                                    | .3            | Long-crystal structure filaments                                                                                 |
| .1        | Directly heated cathodes                                                                                                                                                           | .4            | Spiral-crystal structure filaments                                                                               |
| .12       | Without activator                                                                                                                                                                  | .5            | Ribbon filaments                                                                                                 |
| .13       | With activator                                                                                                                                                                     | .322          | Single coil filaments                                                                                            |
| .2        | Indirectly heated cathodes                                                                                                                                                         |               | 621.3.032.322 $\cong$ 621.3.032.321                                                                              |
| .22       | Without activator                                                                                                                                                                  | .323          | Double coil filaments                                                                                            |
| .23       | With activator                                                                                                                                                                     |               | 621.032.323 $\cong$ 621.3.032.321                                                                                |
| .6        | Cathode construction                                                                                                                                                               | .324          | Multiple coil filaments                                                                                          |
| .62       | Heaters                                                                                                                                                                            |               | 621.3.032.324 $\cong$ 621.3.032.321                                                                              |
| .63       | Emission layers                                                                                                                                                                    | .329          | Other light-emitting elements                                                                                    |
| .64       | Intermediate layers                                                                                                                                                                | .35           | Luminescent substances                                                                                           |
|           | <i>Materials may be denoted by colon combination</i>                                                                                                                               |               | <i>Materials may be denoted by colon combination, e.g.</i>                                                       |
| .214      | Gas cathodes                                                                                                                                                                       |               | 621.3.032.35:546.47'221 Zinc sulphide                                                                            |
| .215      | Liquid cathodes                                                                                                                                                                    | .36           | Luminescent screens                                                                                              |
| .217      | Photocathodes. Secondary emission cathodes                                                                                                                                         | .362          | With no persistence                                                                                              |
| .2        | Photocathodes                                                                                                                                                                      | .364          | With medium persistence                                                                                          |
| .3        | Secondary emission cathodes                                                                                                                                                        | .366          | With long persistence                                                                                            |
| .22       | Anodes                                                                                                                                                                             | .4            | <b>Regulating devices. Igniting devices. Heating. Cooling</b>                                                    |
| .23       | Anti-cathodes                                                                                                                                                                      | .42           | Temperature control devices                                                                                      |
| .24       | Grids                                                                                                                                                                              | .43           | Ignition electrodes. Starting devices                                                                            |
| .25       | Internal screens and diaphragms other than electron-optical systems                                                                                                                | .434          | External starting devices. Starters. Start control devices                                                       |
| .26       | Electron-optical and ion-optical systems                                                                                                                                           | .435          | Internal starting devices                                                                                        |
|           |                                                                                                                                                                                    | .2            | Arc-discharge devices                                                                                            |
|           |                                                                                                                                                                                    | .3            | Devices based on heating effect of current, e.g. heater coils, bimetallic strips                                 |
|           |                                                                                                                                                                                    | .4            | Devices with auxiliary electrode for instantaneous ignition                                                      |

|                 |                                                         |                      |                                                                                                                                                       |
|-----------------|---------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 621.3.032.435.5 | Devices with built-in starters                          | 621.3.032.8 (cont'd) | →621.316.58 Holders                                                                                                                                   |
| .439            | Other starting devices                                  | .81                  | Screw caps                                                                                                                                            |
| .45             | Devices to smooth out variations in light intensity     | .82                  | Pin caps. Bayonet caps                                                                                                                                |
| .46             | Regulation of vacuum                                    | .83                  | Caps for fluorescent tubes                                                                                                                            |
| .5              | <b>Frame parts including supporting wires</b>           | .84                  | Caps for special lamps, e.g. for tubular lamps, show window lamps, bipost lamps                                                                       |
| .51             | Glass parts                                             | .85                  | Electron tube bases                                                                                                                                   |
| .53             | Glass-metal parts (seals)                               | .9                   | <b>Manufacture of lamps and tubes</b>                                                                                                                 |
| .531            | Current supply wires                                    | .91                  | Stem manufacture                                                                                                                                      |
| .532            | Current supply wire seals                               | .912                 | Flare                                                                                                                                                 |
| .533            | Disc seals                                              | .913                 | Cutting the glass rods and tubes                                                                                                                      |
| .534            | Hollow cylinder seals                                   | .914                 | Application of current supply leads                                                                                                                   |
| .539            | Other glass-to-metal seals. Butt seals                  | .918                 | Seal making                                                                                                                                           |
| .54             | Metal parts (supporting wires, grid supports etc.)      | .92                  | Frame manufacture (also mounting)                                                                                                                     |
| .55             | Cermet (ceramal) junctions                              | .922                 | Filament manufacture and shaping                                                                                                                      |
| .59             | Other frame parts                                       | .925                 | Inserting the wire supports                                                                                                                           |
| .7              | <b>Bulbs. Cylinders. Envelopes</b>                      | .927                 | Luminous element fitting                                                                                                                              |
|                 | <i>Materials may be denoted by auxiliary table I(k)</i> | .928                 | Applying the getters                                                                                                                                  |
| .71             | Metal envelopes                                         | .93                  | Sealing-in                                                                                                                                            |
| .72             | <i>[cancelled] → 621.3.032.7-03</i>                     | .94                  | Evacuating and degassing. Getter operation                                                                                                            |
| .73             | <i>[cancelled] → 621.3.032.7-03</i>                     | .96                  | Filling with gases and/or applying fluorescent material. Introducing discharge media                                                                  |
| .735            | <i>[cancelled] → 621.3.032.7-03</i>                     | .97                  | Capping                                                                                                                                               |
| .74             | <i>[cancelled] → 621.3.032.7-03</i>                     | .98                  | Finishing                                                                                                                                             |
| .75             | Envelopes according to surface treatment                | 621.3.035            | <b>INDIVIDUAL PARTS OF EQUIPMENT IN THE ELECTROCHEMICAL INDUSTRY</b>                                                                                  |
| .752            | Clear glass envelopes                                   |                      | <i>The material of which a part is made may be denoted by colon combination</i>                                                                       |
| .4              | With lenses                                             | .1                   | <b>Inactive external and internal parts. Receptacles. Vessels. Tanks. Dishes etc.</b>                                                                 |
| .5              | With inset windows                                      | .15                  | External parts                                                                                                                                        |
| .52             | With silicon windows                                    | .151                 | Containers. Jackets                                                                                                                                   |
| .53             | With sapphire windows                                   | .152                 | Equipment for carriage and suspension                                                                                                                 |
| .59             | With set-in windows made of other materials             | .153                 | Supporting components                                                                                                                                 |
| .753            | Etched and mirrored envelopes                           | .154                 | Lids. Closures. Caps                                                                                                                                  |
| .2              | Externally etched (entirely or partly)                  | .155                 | Degassing equipment                                                                                                                                   |
| .3              | Internally etched (entirely or partly)                  | .156                 | Seals, e.g. compounds, adhesives, impregnants                                                                                                         |
| .4              | Externally mirrored (entirely or partly)                | .18                  | Internal parts                                                                                                                                        |
| .5              | Internally mirrored (entirely or partly)                | .181                 | Separators. Diaphragms. Envelopes                                                                                                                     |
| .754            | Opalized envelopes                                      | .2                   | Single diaphragms. Separators                                                                                                                         |
| .755            | Coated envelopes                                        | .22                  | Diaphragms of fibrous materials                                                                                                                       |
|                 | <i>For mirrored envelopes → 621.3.032.753.4/.5</i>      | .3                   | Porous pots                                                                                                                                           |
| .2              | External conductive coating                             | .4                   | Bags. Envelopes                                                                                                                                       |
| .3              | Internal conductive coating                             | .182                 | Distance pieces. Supporting equipment                                                                                                                 |
| .4              | External non-conductive coating                         | .1                   | Grid supports                                                                                                                                         |
| .5              | Internal non-conductive coating                         | .2                   | Solid supports                                                                                                                                        |
| .6              | Envelopes with interferential coating                   | .3                   | Supports made of gauze, wire or similar materials                                                                                                     |
| .756            | Clad envelopes                                          | .4                   | Porous holders                                                                                                                                        |
| .2              | Double layer envelopes                                  | .7                   | Other forms of support                                                                                                                                |
| .3              | With glass sleeves                                      | .8                   | Devices for mounting the electrodes                                                                                                                   |
| .4              | With metal sleeves                                      | .183                 | Protectors (layers or wrappings)                                                                                                                      |
| .757            | Envelopes with luminescent coating                      | .2                   | <b>Electrodes. Plates. Grids. Frames. Wire supports. Electrolytes for sources for the direct conversion of chemical energy into electrical energy</b> |
| .758            | Lacquered envelopes                                     | .21                  | Aggregates. Pastes. Various mixtures                                                                                                                  |
| .76             | Shape of envelope                                       |                      |                                                                                                                                                       |
| .762            | Standard bulbs                                          |                      |                                                                                                                                                       |
| .763            | Tubular shape for all types of lamp                     |                      |                                                                                                                                                       |
| .764            | Candle shape                                            |                      |                                                                                                                                                       |
| .765            | Drop and pear shape                                     |                      |                                                                                                                                                       |
| .769            | Other shapes                                            |                      |                                                                                                                                                       |
| .78             | Double-wall envelopes                                   |                      |                                                                                                                                                       |
| .8              | <b>Lamp caps. Tube bases</b>                            |                      |                                                                                                                                                       |

|              |                                                                                                                                                                                    |                  |                                                                                                                                                                                                                                                                                                                                                              |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 621.3.035.22 | Electrodes. Plates. Grids. Frames. Wire supports. Electrolytes for primary and secondary sources of electrical energy<br><i>For electrolytes → 621.3.035.4</i>                     | 621.3.035.221.45 | Electrodes for fuel cells                                                                                                                                                                                                                                                                                                                                    |
| .221         | Composition of electrodes, depolarizers, electrolytes                                                                                                                              | .6               | Electrolytes for galvanic cells (voltaic cells)<br><i>For electrolytes → 621.3.035.4. The state or form of electrolyte may be denoted by the - 4 special auxiliaries, e.g.</i><br>621.3.035.221.6-404.1 Of low viscosity<br>.2 Of high viscosity<br>.8 In gel, foam form<br>.9 In paste form                                                                 |
| .14          | Positive electrodes. Anodes                                                                                                                                                        | .62              | Acids                                                                                                                                                                                                                                                                                                                                                        |
| .15          | Negative electrodes. Cathodes                                                                                                                                                      | .621             | Sulphuric acid                                                                                                                                                                                                                                                                                                                                               |
| .2           | Metallic electrodes. Hydrogen electrodes<br><i>Electrode metals may be denoted either by using the subdivisions below or by colon combination with the subdivision of 669.21.8</i> | .626             | Organic acids                                                                                                                                                                                                                                                                                                                                                |
| .22          | Electrodes based on zinc                                                                                                                                                           | .63              | Alkaline electrolytes                                                                                                                                                                                                                                                                                                                                        |
| .23          | Electrodes based on lead                                                                                                                                                           | .631             | Sodium hydroxide                                                                                                                                                                                                                                                                                                                                             |
| .24          | Electrodes based on nickel/iron                                                                                                                                                    | .632             | Potassium hydroxide                                                                                                                                                                                                                                                                                                                                          |
| .28          | Electrodes based on other metals                                                                                                                                                   | .64              | Salts                                                                                                                                                                                                                                                                                                                                                        |
| .281         | Electrodes based on cadmium                                                                                                                                                        | .642             | Halides                                                                                                                                                                                                                                                                                                                                                      |
| .282         | Electrodes based on magnesium/aluminium                                                                                                                                            | .2               | Chlorides                                                                                                                                                                                                                                                                                                                                                    |
| .283         | Electrodes based on silver                                                                                                                                                         | .3               | Bromides                                                                                                                                                                                                                                                                                                                                                     |
| .289         | Electrode based on remaining metals, e.g. indium, calcium<br><i>Metals may be denoted by colon combination with the subdivisions of 669.21.8</i>                                   | .643             | Oxygen-containing salts                                                                                                                                                                                                                                                                                                                                      |
| .29          | Electrodes based on hydrogen                                                                                                                                                       | .2               | Sulphates                                                                                                                                                                                                                                                                                                                                                    |
| .3           | Other active electrodes, active materials or depolarizers                                                                                                                          | .3               | Zincates                                                                                                                                                                                                                                                                                                                                                     |
| .32          | Oxides. Hydroxides                                                                                                                                                                 | .644             | Organic salts                                                                                                                                                                                                                                                                                                                                                |
| .321         | Of manganese                                                                                                                                                                       | .67              | Special electrolytes for fuel cells                                                                                                                                                                                                                                                                                                                          |
| .322         | Of lead                                                                                                                                                                            | .7               | Additions to active masses or electrolytes<br><i>The composition may be denoted by colon combination</i>                                                                                                                                                                                                                                                     |
| .323         | Of cadmium                                                                                                                                                                         | .72              | Inhibitors in general<br><i>For inhibitors → 621.3.035.462</i>                                                                                                                                                                                                                                                                                               |
| .324         | Of mercury                                                                                                                                                                         | .722             | Mercury. Mercury compounds                                                                                                                                                                                                                                                                                                                                   |
| .325         | Of silver                                                                                                                                                                          | .725             | Halides                                                                                                                                                                                                                                                                                                                                                      |
| .328         | Of other metals                                                                                                                                                                    | .726             | Chromates. Dichromates                                                                                                                                                                                                                                                                                                                                       |
| .1           | Of nickel                                                                                                                                                                          | .727             | Organic inhibitors                                                                                                                                                                                                                                                                                                                                           |
| .2           | Of iron                                                                                                                                                                            | .73              | Materials for promoting conductivity<br><i>For materials for promoting conductivity in general → 621.3.035.463</i>                                                                                                                                                                                                                                           |
| .329         | Combinations of other oxides and hydroxides<br><i>The oxides or hydroxides may be denoted by colon combination with the subdivisions of 546</i>                                    | .731             | Carbon (other than graphite)                                                                                                                                                                                                                                                                                                                                 |
| .329.1       | [cancel] → 621.3.035.221.328                                                                                                                                                       | .732             | Graphite                                                                                                                                                                                                                                                                                                                                                     |
| .329.2       | [cancel] → 621.3.035.221.7:669.25                                                                                                                                                  | .733             | Metal powder                                                                                                                                                                                                                                                                                                                                                 |
| .33          | Halides                                                                                                                                                                            | .74              | Electrically neutral materials                                                                                                                                                                                                                                                                                                                               |
| .331         | Chlorides                                                                                                                                                                          | .741             | Gelatinizing agents                                                                                                                                                                                                                                                                                                                                          |
| .332         | Bromides                                                                                                                                                                           | .742             | Gas-absorbing agents                                                                                                                                                                                                                                                                                                                                         |
| .34          | Oxygen-containing salts                                                                                                                                                            | .743             | Material reacting with gases                                                                                                                                                                                                                                                                                                                                 |
| .341         | Sulphates                                                                                                                                                                          | .744             | Moisture-absorbing agents                                                                                                                                                                                                                                                                                                                                    |
| .342         | Chromates. Dichromates                                                                                                                                                             | .2               | Hygroscopic materials                                                                                                                                                                                                                                                                                                                                        |
| .349         | Other oxygen-containing salts<br><i>The salts may be denoted by colon combination with the subdivisions of 546</i>                                                                 | .745             | Expanders, e.g. barium sulphate                                                                                                                                                                                                                                                                                                                              |
| .35          | Gaseous depolarizers                                                                                                                                                               | .746             | Fillers                                                                                                                                                                                                                                                                                                                                                      |
| .351         | Oxygen/air, possibly combined with an activator such as activated carbon                                                                                                           | .223             | Manufacture and construction of active parts, e.g. pasted electrodes and conductive supports.<br><i>The state or form may be denoted by the -4 special auxiliaries or by colon combination with the subdivision of 669-1, e.g.</i><br>621.3.035.223-405.8 Porous<br>-408.7 Smooth<br>-408.8 Rough<br>:669-135 Pressed<br>:669-138.8 Sintered<br>:669-14 Cast |
| .352         | Chlorine                                                                                                                                                                           | .2               | Carriers                                                                                                                                                                                                                                                                                                                                                     |
| .353         | Bromine vapour                                                                                                                                                                     | .21              | Metallic carriers                                                                                                                                                                                                                                                                                                                                            |
| .39          | Other depolarizers                                                                                                                                                                 |                  |                                                                                                                                                                                                                                                                                                                                                              |
| .392         | Organic depolarizers                                                                                                                                                               |                  |                                                                                                                                                                                                                                                                                                                                                              |
| .4           | Electrodes of neutral materials                                                                                                                                                    |                  |                                                                                                                                                                                                                                                                                                                                                              |
| .42          | Carbon (other than graphite)                                                                                                                                                       |                  |                                                                                                                                                                                                                                                                                                                                                              |
| .43          | Graphite                                                                                                                                                                           |                  |                                                                                                                                                                                                                                                                                                                                                              |
| .44          | Conductive plastics electrodes                                                                                                                                                     |                  |                                                                                                                                                                                                                                                                                                                                                              |

|                  |                                                                                          |              |                                                                                                           |
|------------------|------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------|
| 621.3.035.223.22 | Non-metallic carriers                                                                    | 621.3.035.31 | Single diaphragms                                                                                         |
| .23              | Sacks. Tubes. Bobbins                                                                    | .32          | Separators                                                                                                |
| .24              | Inserts                                                                                  | .33          | Porous pots. Bags                                                                                         |
| .25              | Grid plates                                                                              | .35          | Diaphragms prepared by chemical processes                                                                 |
| .251             | Frame plates                                                                             | .4           | <b>Electrolytes. Baths</b>                                                                                |
| .256             | Damage to plates or electrodes                                                           |              | <i>For electrolytes for primary or secondary galvanic cells → 621.3.035.221.6</i>                         |
| .257             | Formation of blisters on plates or electrodes                                            | .42          | Single electrolytes                                                                                       |
| .258             | Warping of plates or electrodes                                                          | .43          | Double electrolytes. Multiple electrolytes                                                                |
| .259             | Fall-out of active mass                                                                  | .44          | Composition of electrolytic baths                                                                         |
| .26              | Textile strips or threads, metallized or not                                             | .441         | Neutral                                                                                                   |
| .3               | Pasted electrodes                                                                        | .442         | Acidic                                                                                                    |
| .4               | Conductive terminals                                                                     | .443         | Alkaline                                                                                                  |
|                  | →621.3.035.5 Terminals. Lugs. Connections. Busbars                                       | .444         | Baths with complex compounds                                                                              |
| .41              | Poles. Tabs. Metallic conductors. Flags                                                  | .447         | Baths with organic compounds                                                                              |
| .42              | Contacts                                                                                 | .449         | Other baths                                                                                               |
| .421             | Caps                                                                                     | .45          | Melts                                                                                                     |
| .422             | Electrode connecting rods                                                                | .452         | Oxide melts                                                                                               |
| .423             | Strips rendered conductive                                                               | .453         | Silicate melts                                                                                            |
| .5               | Active components for fuel cells                                                         | .454         | Sulphide melts                                                                                            |
| .6               | Form, type and arrangement of the components in the cell                                 | .455         | Halide melts                                                                                              |
| .62              | Plane (parallel)                                                                         | .46          | Additions to baths                                                                                        |
| .621             | Discs. Plates                                                                            | .462         | Inhibitors                                                                                                |
| .622             | Cups                                                                                     |              | <i>For inhibitors for primary or secondary galvanic cells → 621.3.035.221.72</i>                          |
| .63              | Cylindrical (concentric)                                                                 | .463         | Materials for promoting conductivity                                                                      |
| .631             | Beakers                                                                                  |              | <i>For materials for promoting conductivity in primary or secondary galvanic cells → 621.3.035.221.73</i> |
| .632             | Rods                                                                                     | .47          | Pastes. Additions to solidify the electrolyte. Expanders                                                  |
| .633             | Spiral (rolled)                                                                          |              | <i>For the use of these materials in primary or secondary galvanic cells → 621.3.035.221.74</i>           |
| .64              | Zigzag                                                                                   | .48          | Regeneration of the electrolyte                                                                           |
| .65              | Special types of electrode                                                               |              | <i>For regeneration of primary cells and fuel cells → 621.354.325/.326</i>                                |
| .652             | Multiple electrodes                                                                      | .5           | <b>Terminals. Lugs. Connections. Busbars</b>                                                              |
| .653             | Bipolar electrodes                                                                       |              | <i>For the use of these items in primary or secondary galvanic cells → 621.3.035.223.4</i>                |
| .654             | Duplex electrodes                                                                        | .54          | Terminals, etc. for the anodes                                                                            |
| .655             | Auxiliary electrodes                                                                     | .56          | Terminals etc. for the cathodes                                                                           |
| .66              | Position of the electrolyte with reference to the electrodes                             | .6           | <b>Feed, stirring, drying, regulation, circulation of electrolytes</b>                                    |
| .662             | Electrolyte in contact with the electrodes                                               | .61          | Feeding. Feed apparatus                                                                                   |
| .1               | Absorbed in the electrodes (and/or separators)                                           | .62          | Circulation. Apparatus for the circulation of liquids. Movement of the electrolyte                        |
| .663             | Electrolyte not in contact with the electrodes                                           |              | → 621.354.22 Equipment for the circulation of electrolyte                                                 |
| .1               | In sealed reservoir                                                                      | .63          | Drying. Removal of gas                                                                                    |
| .664             | Electrolyte separated from the solvent                                                   | .65          | Circulation-regulating                                                                                    |
| .7               | Form of battery and arrangement of component cells                                       | .67          | Heating. Temperature regulators                                                                           |
| .72              | Assembly of cells into units                                                             | .677         | Heating by means of an alternating current passed through the electrolyte                                 |
| .721             | Cells side by side                                                                       | .7           | <b>Arrangements for filling</b>                                                                           |
| .1               | Quincunx                                                                                 | .8           | <b>Arrangements for emptying</b>                                                                          |
| .2               | Honeycomb arrangement                                                                    |              | <i>For filling and draining equipment for cells and batteries → 621.354.2</i>                             |
| .722             | Cells one above the other                                                                | .82          | Separators                                                                                                |
| .723             | Cells fitting into each other                                                            | .822         | Tubular separators                                                                                        |
| .724             | Zigzag cells                                                                             | .824         | Plate separators                                                                                          |
| .725             | Cells in spiral form (rolled)                                                            |              |                                                                                                           |
| .726             | Concentric cells                                                                         |              |                                                                                                           |
| .28              | Deterioration of electrodes. Buckling. Formation of air bubbles                          |              |                                                                                                           |
|                  | <i>For deterioration in primary or secondary galvanic cells → 621.3.035.223.256/.259</i> |              |                                                                                                           |
| .3               | <b>Diaphragms. Envelopes. Separators. Porous pots. Bags</b>                              |              |                                                                                                           |

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| 621.3.035.826 | Wire netting separators                                                                                                         | 621.3.036.744 | Charging by cages                                                               |
| .828          | Cleaning of separators                                                                                                          | .8            | Emptying, discharging devices                                                   |
| .9            | <b>Other devices. Installation.</b>                                                                                             | .9            | Other accessories                                                               |
|               | <b>Supervisory measures</b>                                                                                                     |               |                                                                                 |
|               | →621.354 Methods and equipment for commissioning and servicing of cells and batteries for generation and storage of electricity | 621.3.037     | <b>SPECIAL FEATURES OF ELECTRICAL OSCILLATION TECHNIQUE</b>                     |
|               | 621.355.1 Installation.                                                                                                         | .3            | <b>Type and representation of information</b>                                   |
|               | Maintenance-cells, batteries                                                                                                    | .33           | Analogue representation                                                         |
| 621.3.036     | <b>TRANSMISSION OF HEAT. INDIVIDUAL PARTS OF ELECTRIC FURNACES AND HEATING APPARATUS. ACCESSORIES</b>                           | .37           | Digital representation                                                          |
| .2            | <b>Transmission of heat from the heating element to the material to be heated</b>                                               | .372          | Numeric systems                                                                 |
| .21           | Mainly by conduction                                                                                                            | .2            | Binary systems                                                                  |
| .212          | Direct conduction                                                                                                               | .22           | Purely binary systems                                                           |
| .213          | Indirect conduction                                                                                                             | .23           | Reflected binary systems. Gray code                                             |
| .25           | Mainly by radiation                                                                                                             | .3            | Ternary systems                                                                 |
| .252          | Direct radiation                                                                                                                | .5            | Decimal systems                                                                 |
| .253          | Indirect radiation                                                                                                              | .52           | Purely decimal systems                                                          |
| .27           | Mainly by convection                                                                                                            | .523          | Pulse number or pulse counting (7 pulses for digit 7)                           |
| .272          | Natural convection                                                                                                              | .524          | Pulse time or pulse position (pulse on 7th wire for digit 7)                    |
| .273          | Forced convection                                                                                                               | .53           | Binary coded decimal systems                                                    |
| .282          | By radiation and forced convection                                                                                              | .54           | Excess 3 code systems                                                           |
| .29           | Other methods of heat transmission                                                                                              | .55           | Bi-quinary systems. Qui-binary systems                                          |
| .5            | <b>Casing. Containers. Boilers. Coverings</b>                                                                                   | .56           | 2 out of 5 code                                                                 |
| .51           | Envelopes                                                                                                                       | .59           | Other decimal systems                                                           |
| .52           | Furnace receptacles. Hearths                                                                                                    | .7            | Mixed base, e.g. Sterling systems, residue systems                              |
| .522          | Depth of hearth. Depth of bath                                                                                                  | .9            | Other numeric systems                                                           |
| .524          | Removable hearth                                                                                                                | .375          | Alphabetic and alphanumeric systems                                             |
| .525          | Rotary hearth                                                                                                                   | .2            | Purely decimal systems with extra bits (IBM and Bull-code)                      |
| .53           | Lining                                                                                                                          | .3            | Coded decimal systems with extra bits (Univac)                                  |
| .538          | Lining stability                                                                                                                | .4            | 5, 6, 7 or 8 unit (bit) codes (punched tape codes; teletype codes)              |
| .54           | Closing devices                                                                                                                 | .9            | Other alphabetic and alphanumeric systems                                       |
| .56           | Devices for removing and eliminating gases produced                                                                             | .7            | Electrical pulse storage devices (stores)                                       |
| .6            | <b>Electrodes. Heating elements</b>                                                                                             | .71           | Characteristic properties                                                       |
| .61           | Electrodes                                                                                                                      | .711          | Storage capacity                                                                |
| .62           | Supply of current to the electrodes                                                                                             | .713          | Speed. Access time                                                              |
| .63           | Fixing of the electrodes                                                                                                        | .73           | Components                                                                      |
| .64           | Protective devices for electrodes                                                                                               | .732          | Information carriers. Storage media                                             |
| .65           | Regulating devices for electrodes                                                                                               | .733          | Writing, reading, regenerating and erasing devices                              |
| .66           | Heating elements                                                                                                                | .2            | Writing devices                                                                 |
| .662          | Exposed incandescent bodies                                                                                                     | .3            | Reading devices                                                                 |
| .2            | Wires                                                                                                                           | .4            | Regenerating devices. Circulation registers                                     |
| .3            | Strips                                                                                                                          | .5            | Erasing (or resetting) devices                                                  |
| .4            | Bars                                                                                                                            | .737          | Address selectors                                                               |
| .9            | Other types of exposed incandescent bodies                                                                                      | .2            | Spatial selectors                                                               |
| .663          | Sheathed-wire elements                                                                                                          | .22           | With selective movement of the read and/or write device to the selected address |
| .669          | Other heating elements                                                                                                          | .24           | With selective switching of the desired read and/or write device                |
|               | →535.247 Objective photometry                                                                                                   | .3            | Temporal selectors                                                              |
|               | 536.532 Thermoelectric generators, e.g. thermocouples                                                                           | .75           | Systems with several storage devices                                            |
| .7            | <b>Charging of the furnace</b>                                                                                                  | .752          | Transfer of individual numbers or words between stores                          |
| .71           | Charging by hand                                                                                                                | .753          | Transfer of groups of numbers or words between stores (block transfer)          |
| .74           | Charging mechanically                                                                                                           |               |                                                                                 |
| .741          | Charging through channels                                                                                                       |               |                                                                                 |
| .742          | Charging by crane                                                                                                               |               |                                                                                 |
| .743          | Charging by vessels with lid                                                                                                    |               |                                                                                 |

|           |                                                                                                                                                                                                               |             |                                                                                                                                                               |
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| 621.3.038 | SPECIAL FEATURES, PARTS ETC. OF ELECTRONIC EQUIPMENT                                                                                                                                                          | 621.3.042.1 | <b>Cores</b>                                                                                                                                                  |
| .6        | <b>Special features and parts of equipment for the production of active rays and corpuscular beams</b><br><i>The subdivisions given below are applicable to the subdivisions of 621.384.6</i>                 | .12         | Active cross-section. Shape of the cores and pole pieces. Yokes                                                                                               |
| .61       | Features and parts specific to particle accelerators                                                                                                                                                          | .13         | Massive cores, poles etc.<br><i>Material details may be denoted by the -03 common auxiliaries and by colon combination with the subdivisions of 621.318.1</i> |
| .612      | Particle sources                                                                                                                                                                                              | .14         | Cores of wire or laminated iron                                                                                                                               |
| .613      | Particle injectors. Inflectors                                                                                                                                                                                | .142        | Cores of wire                                                                                                                                                 |
| .614      | Radio-frequency accelerating systems. Accelerating electrodes<br><i>Specific components, e.g. waveguides, klystrons, may be denoted by colon combination</i>                                                  | .143        | Cores of laminated iron                                                                                                                                       |
| .615      | Beam-guiding, beam-focusing and beam correcting devices<br><i>Specific devices may be denoted by colon combination e.g.</i><br>621.3.038.615:621.318.3<br>Electromagnetics<br>:621.319 Electrostatic machines | .2          | Cores of wound sheet strips                                                                                                                                   |
| .616      | Beam-observing and beam-monitoring devices<br>→621.384.668 Beam-monitoring devices outside the accelerator                                                                                                    | .3          | Cores of piled up sheets                                                                                                                                      |
| .617      | Beam-extracting devices. Deflectors                                                                                                                                                                           | .4          | Cores of radially stacked plane or curved sheets                                                                                                              |
| .62       | Accelerators according to the particles accelerated<br>→539.12 Elementary and simple particles                                                                                                                | .15         | Iron powder cores with insulating binding material                                                                                                            |
| .624      | Electron accelerators                                                                                                                                                                                         | .2          | <b>Laminations. Assemblies of sheets</b>                                                                                                                      |
| .625      | Proton accelerators                                                                                                                                                                                           | .3          | <b>Slots. Slot wedges</b>                                                                                                                                     |
| .628      | Accelerators for other specified particles, e.g. deuterons, heavy ions                                                                                                                                        | .4          | <b>Air gap</b>                                                                                                                                                |
| .8        | <b>Features and parts of masers and lasers</b>                                                                                                                                                                | .5          | <b>Arrangement of iron parts. Arrangement of the parts with and without iron</b>                                                                              |
| .82       | Active parts according to material                                                                                                                                                                            | .52         | Inner core. Machines with inside poles. Core-type transformers                                                                                                |
| .823      | Gases                                                                                                                                                                                                         | .53         | Outer core. Machines with external poles. Shell-type transformers                                                                                             |
| .824      | Liquids                                                                                                                                                                                                       | .7          | <b>Components using magnetic leakage, e.g. magnetic shunts</b>                                                                                                |
| .825      | Solids                                                                                                                                                                                                        | 621.3.043   | <b>ARMATURES</b>                                                                                                                                              |
| .2        | Non-metallic crystals                                                                                                                                                                                         | .1          | General. Armature stampings                                                                                                                                   |
| .3        | Glass                                                                                                                                                                                                         | .2          | Fixed. Stator                                                                                                                                                 |
| .5        | Metals. Semiconductors                                                                                                                                                                                        | .3          | Rotor                                                                                                                                                         |
| .7        | Plastics                                                                                                                                                                                                      | 621.3.044   | <b>FIELD MAGNET SYSTEMS</b>                                                                                                                                   |
| .84       | Excitation devices                                                                                                                                                                                            | .2          | <b>Stationary magnet systems. Stator field</b>                                                                                                                |
| 621.3.04  | <b>COMPONENTS, INSULATION, CONNECTION AND WINDINGS OF ELECTRICAL MACHINES, TRANSFORMERS AND APPARATUS</b>                                                                                                     | .3          | <b>Rotating magnet systems. Rotor field</b>                                                                                                                   |
| 621.3.041 | GENERAL. PRINCIPAL DIMENSIONS. SIZE. WEIGHT                                                                                                                                                                   | .5          | <b>Various forms</b>                                                                                                                                          |
| .1        | <b>Principal dimensions</b>                                                                                                                                                                                   | .52         | With non-salient poles                                                                                                                                        |
| .3        | <b>Size. Weight</b>                                                                                                                                                                                           | .53         | With salient poles. Attachment of salient poles                                                                                                               |
| .33       | Of iron parts                                                                                                                                                                                                 | .6          | <b>Poles</b>                                                                                                                                                  |
| .34       | Of conductor material (e.g. copper, aluminium)                                                                                                                                                                | .61         | Principal poles                                                                                                                                               |
| 621.3.042 | MAGNETIC CIRCUIT<br><i>For magnetic materials → 621.318.1</i>                                                                                                                                                 | .62         | Auxiliary poles                                                                                                                                               |
|           |                                                                                                                                                                                                               | .64         | Pole shoes                                                                                                                                                    |
|           |                                                                                                                                                                                                               | 621.3.045   | <b>WINDINGS</b>                                                                                                                                               |
|           |                                                                                                                                                                                                               | .1          | <b>General. Various forms of windings</b>                                                                                                                     |
|           |                                                                                                                                                                                                               | .12         | Wire windings                                                                                                                                                 |
|           |                                                                                                                                                                                                               | .13         | Bar windings                                                                                                                                                  |
|           |                                                                                                                                                                                                               | .15         | Disc windings                                                                                                                                                 |
|           |                                                                                                                                                                                                               | .16         | Cylindrical windings                                                                                                                                          |
|           |                                                                                                                                                                                                               | .162        | Foil windings                                                                                                                                                 |
|           |                                                                                                                                                                                                               | .18         | Connections between parts of windings                                                                                                                         |
|           |                                                                                                                                                                                                               | .2          | <b>Windings for direct current in general</b>                                                                                                                 |
|           |                                                                                                                                                                                                               | .21         | Armature windings for direct current                                                                                                                          |
|           |                                                                                                                                                                                                               | .22         | Lap windings                                                                                                                                                  |
|           |                                                                                                                                                                                                               | .23         | Wave windings                                                                                                                                                 |
|           |                                                                                                                                                                                                               | .24         | Open windings                                                                                                                                                 |
|           |                                                                                                                                                                                                               | .29         | Various windings not specified above                                                                                                                          |
|           |                                                                                                                                                                                                               | .3          | <b>Field windings for direct current</b>                                                                                                                      |

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| 621.3.045.31 | Windings for series field excitation                                                     | 621.3.049.62 | Output                                                                                                                                                                                                                     |
| .32          | Windings for shunt field excitation                                                      | .63          | Tappings. Junctions                                                                                                                                                                                                        |
| .33          | Windings for compound field excitation                                                   | .633         | Centre, mid-point tappings                                                                                                                                                                                                 |
| .34          | Special windings. Compensation windings                                                  | .67          | Measuring points                                                                                                                                                                                                           |
| .37          | Windings for auxiliary poles                                                             | .7           | <b>Mechanical construction. Structural materials and components</b>                                                                                                                                                        |
| .5           | <b>Windings for alternating current</b>                                                  |              | <i>Further particulars may be denoted by the -7 special auxiliaries, e.g.</i>                                                                                                                                              |
| .51          | Single-phase windings                                                                    |              | 621.3.049.7-772.4 Plug-in units                                                                                                                                                                                            |
| .52          | Two-phase windings                                                                       | .73          | Wiring                                                                                                                                                                                                                     |
| .53          | Three-phase windings                                                                     | .75          | Printed circuits                                                                                                                                                                                                           |
| .532         | Three-phase star windings                                                                | .76          | Miniaturization and subminiaturization techniques. Circuits with discrete devices and components. Micromodules. Cordwood modules                                                                                           |
| .533         | Three-phase delta windings                                                               |              |                                                                                                                                                                                                                            |
| .54          | Polyphase windings                                                                       | .77          | Microelectronics. Integrated circuits                                                                                                                                                                                      |
| .55          | Interspersed windings                                                                    |              | <i>The scale of integration may be denoted by adding "12" 114 (analogous to 621.3.049.771.12/.14) to 621.3.049.77 and its subdivisions, e.g. 621.3.049.774.3'14 Large scale integration of bipolar monolithic circuits</i> |
| .56          | Short-circuited (squirrel-cage) windings                                                 | .771         | Integrated circuits according to the scale of integration                                                                                                                                                                  |
| .57          | Slip-ring windings                                                                       | .12          | Medium-scale integration                                                                                                                                                                                                   |
| .58          | Multi-pole windings                                                                      | .14          | Large-scale integration                                                                                                                                                                                                    |
| .59          | Windings for alternating current not specified above                                     | .772         | Integrated circuits formed on a non-conducting substrate                                                                                                                                                                   |
| .6           | <b>Coil windings</b>                                                                     | .1           | Thick-film integrated circuits                                                                                                                                                                                             |
| .7           | <b>Damper windings</b>                                                                   | .2           | Thin-film integrated circuits                                                                                                                                                                                              |
| .8           | <b>Fixing of windings</b>                                                                | .774         | Semiconductor integrated circuits. Solid circuits. Monolithic circuits                                                                                                                                                     |
| 621.3.046    | WINDING SUPPORTS. SPOOLS                                                                 | .2           | Unipolar monolithic integrated circuits (MOS)                                                                                                                                                                              |
| 621.3.047    | CURRENT COLLECTION DEVICES                                                               | .774.3       | Bipolar monolithic integrated circuits                                                                                                                                                                                     |
| .2           | <b>Commutators</b>                                                                       | .776         | Hybrid integrated circuits (assemblies comprising two or more of the types of circuit given in 621.3.049.76/.774)                                                                                                          |
| .24          | Commutator bars                                                                          | .2           | Combinations of integrated circuits and discrete devices                                                                                                                                                                   |
| .3           | <b>Slip-rings</b>                                                                        | .21          | Based on thick-film circuits                                                                                                                                                                                               |
| .4           | <b>Brushes</b>                                                                           | .22          | Based on thin-film circuits                                                                                                                                                                                                |
| .42          | Metal brushes, e.g. copper                                                               | .4           | Combinations of more than one type of integrated circuit                                                                                                                                                                   |
| .43          | Carbon brushes                                                                           | .41          | Based on thick-film circuits                                                                                                                                                                                               |
| .44          | Copper-containing carbon brushes                                                         | .42          | Based on thin-film circuits                                                                                                                                                                                                |
| .45          | Special brushes                                                                          | .422         | Compatible thin-film on semiconductor monolithic substrate                                                                                                                                                                 |
| .5           | <b>Brush holders</b>                                                                     | .43          | Multiple chip approach. Combination of metal oxide semiconductor and bipolar monolithic integrated circuits                                                                                                                |
| .52          | For fixed brushes                                                                        | .779         | Other microelectronic circuits                                                                                                                                                                                             |
| .53          | Brush rocker                                                                             | 621.3.05     | <b>TRANSMISSION. CHOICE OF TRANSMISSION SYSTEM</b>                                                                                                                                                                         |
| .6           | <b>Details of brushes and brush holders</b>                                              |              | <i>These 621.3.05 special auxiliaries are particularly applicable to 621.315, but 621.3.051/.052 are applicable also to 621.316.1</i>                                                                                      |
| .62          | Brush-shifting devices                                                                   | 621.3.051    | <b>POWER TRANSMISSION IN GENERAL</b>                                                                                                                                                                                       |
| .63          | Device for short-circuiting the armature                                                 |              | <i>The type of current may be denoted by the .024/.025 special auxiliaries, e.g.</i>                                                                                                                                       |
| .64          | Brush-lifting devices                                                                    |              | 621.3.051.024 Direct current transmission                                                                                                                                                                                  |
| .69          | Other devices                                                                            | .2           | <b>Principal lines</b>                                                                                                                                                                                                     |
| 621.3.048    | INSULATION OF MACHINES AND APPARATUS                                                     |              |                                                                                                                                                                                                                            |
|              | →621.315.61 Insulating materials. Dielectric materials                                   |              |                                                                                                                                                                                                                            |
|              | <i>The material of which the insulation is made may be denoted by colon combination.</i> |              |                                                                                                                                                                                                                            |
| .1           | Insulation of current-carrying parts                                                     |              |                                                                                                                                                                                                                            |
| .2           | Insulation of parts in the magnetic circuit                                              |              |                                                                                                                                                                                                                            |
| .3           | Insulation of other parts                                                                |              |                                                                                                                                                                                                                            |
| .8           | Insulation according to state of insulator                                               |              |                                                                                                                                                                                                                            |
| .81          | Solid insulation                                                                         |              |                                                                                                                                                                                                                            |
| .82          | Liquid insulation                                                                        |              |                                                                                                                                                                                                                            |
| .822         | Conservators. Expansion vessels. Gas cushions                                            |              |                                                                                                                                                                                                                            |
| .83          | Gaseous insulators                                                                       |              |                                                                                                                                                                                                                            |
| 621.3.049    | CONSTRUCTION OF THE ELECTRIC CIRCUIT                                                     |              |                                                                                                                                                                                                                            |
| .6           | <b>Designated points of the electric circuit</b>                                         |              |                                                                                                                                                                                                                            |
| .61          | Input                                                                                    |              |                                                                                                                                                                                                                            |

|              |                                                                                             |           |                                                                                        |
|--------------|---------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------|
| 621.3.051.24 | Ring mains. Coupled lines                                                                   | 621.3.062 | METHODS OF CONNECTION.                                                                 |
| .3           | <b>Secondary lines</b>                                                                      |           | SWITCHING METHODS                                                                      |
|              | →621.316.1 Distribution networks and installations in buildings, offices, factories         | .1        | Connection in parallel. Operation in parallel                                          |
|              |                                                                                             |           | <i>For load conditions → 621.3.016.32</i>                                              |
| 621.3.052    | CHOICE OF TRANSMISSION SYSTEM                                                               | .12       | Machines and apparatus of similar construction                                         |
|              | 621.3.052.2/.5 each $\cong$ 621.3.051                                                       | .13       | Machines and apparatus of different construction                                       |
| .2           | <b>Two-conductor system</b>                                                                 | .2        | Connection in series. Operation in series                                              |
| .3           | <b>Multiconductor system</b>                                                                | .3        | Mixed connection. Series-parallel connection                                           |
| .31          | Outer conductors                                                                            |           | <i>For series-parallel connection for regulation purposes → 621.3.076.52</i>           |
| .32          | Neutral                                                                                     | .4        | Cascade connection                                                                     |
| .33          | Neutral point                                                                               | .6        | Zigzag connection                                                                      |
| .332         | Not earthed                                                                                 | .8        | Switching over                                                                         |
| .333         | Earthed                                                                                     | .88       | Switching over to emergency power supply                                               |
| .4           | <b>Meshed network system</b>                                                                |           | →621.316.378 Emergency switchgear installations                                        |
| .5           | <b>Series transmission</b>                                                                  | .9        | Other connections                                                                      |
| .6           | Mixed transmission                                                                          | 621.3.064 | SWITCHING OPERATIONS. SWITCHING PHENOMENA. CIRCUIT-BREAKING IN GENERAL                 |
| .62          | Simultaneous use of direct and alternating current                                          |           | <i>The 621.3.064/.067 special auxiliaries are particularly applicable to 621.316.5</i> |
| .63          | Transmission of information over power lines                                                | .1        | <b>Short circuiting</b>                                                                |
| .7           | <b>Transmission of several frequencies over the same line</b>                               | .2        | <b>Circuit-breaking. Arc rupture</b>                                                   |
| .9           | <b>Other systems</b>                                                                        | .21       | Length of gap                                                                          |
|              | <i>For wired radio → 621.396.44</i>                                                         | .22       | High-speed circuit-breaking (reclosing)                                                |
| 621.3.053    | EARTHING                                                                                    | .23       | Delayed circuit-breaking                                                               |
| .1           | <b>General</b>                                                                              | .24       | Circuit-breaking in air, gases, vapours                                                |
| .2           | <b>Conducting lead to earth</b>                                                             | .241      | Circuit-breaking in air                                                                |
| .21          | Through resistor                                                                            | .242      | Circuit-breaking in gases                                                              |
| .22          | Through reactor                                                                             | .243      | Circuit-breaking in vapours                                                            |
| .23          | Through capacitor                                                                           | .25       | Circuit-breaking in oil or other liquids                                               |
| .24          | Solid earthing                                                                              | .26       | Circuit-breaking in vacuum                                                             |
| 621.3.054    | SPECIAL ARRANGEMENTS WITH REFERENCE TO THE INDUCTANCE AND CAPACITANCE OF TRANSMISSION LINES | .3        | <b>Breaking capacity</b>                                                               |
| .1           | Transposition of lines to diminish mutual inductance                                        | .31       | Influence of voltage. Recovery voltage. Restriking voltage                             |
| .2           | Krarup cable                                                                                | .32       | Influence of gap length                                                                |
| .3           | Pupin cable                                                                                 | .33       | Influence of the speed of break                                                        |
| .4           | Devices to balance capacitances                                                             | .34       | Influence of the dielectric medium                                                     |
| .41          | Transposition                                                                               | .4        | <b>Blowout and quenching of arc. Arrangements for spark quenching</b>                  |
| .42          | Compensating capacitors                                                                     | .42       | Arc-chute. Baffles                                                                     |
| 621.3.056    | MECHANICAL STRESSES AND STRAINS IN TRANSMISSION LINES                                       | .43       | Arcing contacts                                                                        |
| .1           | Sag                                                                                         | .44       | Blowout coils                                                                          |
| .2           | Deformations during erection of line                                                        | .45       | Pneumatic blowout. Gas blast                                                           |
| .3           | Deformations due to mechanical vibrations                                                   | .46       | Other methods of extinction. Use of inert gases. Use of a vacuum                       |
| .4           | Deformations due to wind pressure                                                           | 621.3.066 | DESIGN AND MECHANISM OF SWITCHES IN GENERAL                                            |
| .5           | Deformations due to ice, hoar-frost                                                         | .3        | <b>Generalities on design of switches</b>                                              |
| .7           | Deformations due to temperature changes                                                     | .31       | Single-pole switches                                                                   |
| 621.3.06     | <b>METHODS OF CONNECTION. SWITCHING. CIRCUIT-BREAKING</b>                                   | .32       | Two-pole switches                                                                      |
| 621.3.061    | DIAGRAMS OF CONNECTION. CIRCUIT DIAGRAMS                                                    | .33       | Three-pole switches                                                                    |
|              | <i>For switching diagrams → 621.316.31</i>                                                  | .34       | Multipole switches                                                                     |
|              |                                                                                             | .5        | <b>Mechanism of motion of switches</b>                                                 |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------|
| 621.3.066.6 | <b>Design of the current-carrying parts.<br/>Switch contact design</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 621.3.076.1 | <b>Regulation by compounding,<br/>compensation, buffer action</b>                                                        |
| 621.3.067   | CLOSING AND INTERLOCKING OF<br>SWITCHES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | .11         | Regulation by compounding                                                                                                |
| .1          | Mechanical closing and interlocking with a<br>mechanical device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .12         | Regulation by compensation                                                                                               |
| .2          | Mechanical closing and interlocking of<br>switches one with another or with other<br>electrical equipment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | .13         | Regulation by buffer action                                                                                              |
| .4          | Electrical closing and interlocking of<br>switches through a mechanical device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | .2          | <b>Regulation by variation of reluctance<br/>or permeability</b>                                                         |
| .5          | Electrical closing and interlocking of<br>switches with one another or with other<br>equipment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | .21         | Grooving of the poles                                                                                                    |
| .9          | Other forms of connection and interlocking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | .22         | Variable air gap                                                                                                         |
| 621.3.07    | <b>REGULATION</b><br><i>Regulation of electric machines etc. may<br/>be denoted by the .07 special auxiliaries,<br/>e.g.</i><br>621.313.12.072.2:621.311.161 Effect of<br>generator<br>voltage<br>regulation<br>on inter-<br>connected<br>network<br><br><i>However, for regulation in general →<br/>621.316.7 using the .076/.078 special<br/>auxiliaries for methods for which there is<br/>no main number, e.g.</i><br>621.316.722.076.7 Voltage regulation by<br>electronic devices<br><br><i>Control of motion, starting, braking,<br/>reversing etc. may be denoted by<br/>the -57/-59 special auxiliaries listed<br/>under 62, e.g.</i><br>621.313-57 Starting of electric machines | .23         | Use of materials differing in permeability                                                                               |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .24         | Insertion of iron parts in the magnetic<br>circuit. Magnetic short-circuiting                                            |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .25         | Regulation by magnetic saturation                                                                                        |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .3          | <b>Regulation by changing the number of<br/>the turns in or the connections of the<br/>exciting winding</b>              |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .31         | Regulation by change in the coil leads                                                                                   |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .32         | Regulation by disconnection of windings                                                                                  |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .33         | Regulation by short-circuiting of windings                                                                               |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .4          | <b>Regulation by changing the number of<br/>turns in or the connections of the<br/>armature winding</b>                  |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .41         | Regulation by change-over in the armature<br>coils                                                                       |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .42         | Regulation by disconnection of windings                                                                                  |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .43         | Regulation by short-circuiting of windings.<br>Use of two pairs of brushes. Use of auxiliary<br>brushes                  |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .44         | Regulation by change in the relative<br>position of field and armature winding.<br>Regulation by displacement of brushes |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .5          | <b>Regulation by special connections</b>                                                                                 |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .51         | Star-delta connections                                                                                                   |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .52         | Series-parallel connections<br><i>For series-parallel connection in general<br/>→ 621.3.062.3</i>                        |
| 621.3.072   | <b>REGULATION OF VARIOUS<br/>ELECTRICAL QUANTITIES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | .6          | <b>Regulation by using auxiliary circuits</b>                                                                            |
| .1          | Regulation of current                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | .61         | Shunt regulation                                                                                                         |
| .2          | Regulation of voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | .62         | Regulation by electrodynamic coupling with<br>other apparatus                                                            |
| .3          | Regulation of resistance, impedance,<br>inductance, capacitance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .63         | Regulation by magnetic coupling with other<br>apparatus                                                                  |
| .31         | Regulation of resistance, impedance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | .7          | <b>Regulation by electronic devices</b><br>→621.3.077.65 Regulation by<br>grid-controlled rectifiers                     |
| .32         | Regulation of inductance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 621.3.077   | <b>REGULATION BY SPECIAL APPARATUS</b>                                                                                   |
| .33         | Regulation of capacitance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | .1          | Regulation by rheostats                                                                                                  |
| .6          | Regulation of frequency                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | .14         | Regulation by periodic connection of<br>resistors into the circuit                                                       |
| .7          | Regulation of phase                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | .2          | Regulation by motors, servomotors                                                                                        |
| .8          | Regulation of power, load                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | .3          | Regulation by generators                                                                                                 |
| .85         | Load-balancing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | .4          | Regulation by transformers                                                                                               |
| .86         | Power in relation to load                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | .5          | Regulation by accumulators                                                                                               |
| .9          | Regulation of combined voltage, phase and<br>frequency. Synchronization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | .6          | Regulation by relays                                                                                                     |
| 621.3.073   | <b>REGULATION OF MAGNETIC<br/>QUANTITIES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | .62         | Electrodynamic                                                                                                           |
| .1          | Regulation of induction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | .63         | Electrostatic                                                                                                            |
| .2          | Regulation of polarity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | .64         | Valve                                                                                                                    |
| .3          | Regulation of premagnetization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | .65         | Grid-controlled rectifiers                                                                                               |
| .4          | Regulation of saturation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | .7          | Regulation by inductors, transducers                                                                                     |
| .9          | Regulation of other magnetic quantities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | .8          | Regulation by capacitors                                                                                                 |
| 621.3.076   | <b>METHODS OF REGULATION</b><br>→621.398 Telecontrol etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 621.3.078   | <b>AUTOMATIC REGULATION</b><br>Regulation to constant value or values                                                    |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .3          |                                                                                                                          |

|             |                                                                                                                                                                |                 |                                                                                     |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------|
| 621.3.078.4 | Regulation to a dependent variable                                                                                                                             | 621.3.082.731.3 | Actuation of contacts by the measured quantity                                      |
| 621.3.079   | ELECTRICAL REGULATION OF NON-ELECTRICAL QUANTITIES APART FROM MOTION                                                                                           | .74             | Electromagnetic and electrodynamic phenomena                                        |
|             | <i>For regulation and regulators of magnetic quantities → 621.316.73</i>                                                                                       | .742            | Dynamometric effects. Moving coils                                                  |
|             | <i>For temperature control in general → 662.927</i>                                                                                                            | .743            | Change in inductance                                                                |
|             |                                                                                                                                                                | .3              | Change in self-inductance                                                           |
|             |                                                                                                                                                                | .4              | Change in mutual inductance                                                         |
| 621.3.08    | GENERAL PRINCIPLES AND THEORIES OF MEASUREMENTS AND CONSTRUCTION OF MEASURING APPARATUS. MEASUREMENT METHODS                                                   | .744            | Inductive phenomena other than moving coils                                         |
|             | 621.3.08 $\cong$ 53.08                                                                                                                                         | .75             | Electrolytic and electrochemical phenomena                                          |
|             | <i>These 621.3.08 special auxiliaries, of which a selection is listed below, are particularly applicable to 621.317 For manufacture of instruments → 681.2</i> | .77             | Discharge phenomena                                                                 |
|             |                                                                                                                                                                | .78             | Magnetic phenomena                                                                  |
|             |                                                                                                                                                                | .781            | Magnetic needles                                                                    |
|             |                                                                                                                                                                | .782            | Change in reluctance due to the measured quantity                                   |
|             |                                                                                                                                                                | .8              | <b>Use of chemical phenomena</b>                                                    |
|             |                                                                                                                                                                | .9              | <b>Use of biological phenomena</b>                                                  |
| 621.3.081   | UNITS. CONSTANTS                                                                                                                                               | 621.3.083       | METHODS OF MEASUREMENT. INSTRUMENTS FROM THE POINT OF VIEW OF METHOD OF MEASUREMENT |
| .1          | Units in general                                                                                                                                               | .1              | Direct measurements                                                                 |
| .3          | Absolute units                                                                                                                                                 | .2              | Resonance methods                                                                   |
| .4          | Relative and practical units                                                                                                                                   | .3              | Ballistic methods                                                                   |
| .5          | Dimensions of units                                                                                                                                            | .4              | Null methods. Bridge methods                                                        |
| .6          | Constants                                                                                                                                                      | .5              | Compensation methods                                                                |
| .7          | Constants for specific substances                                                                                                                              | .6              | Differential methods                                                                |
| 621.3.082   | PRINCIPLES OF MEASUREMENT AND OF THE CONSTRUCTION OF INSTRUMENTS                                                                                               | .7              | Telemetry                                                                           |
| .1          | <b>Use of mechanical phenomena</b>                                                                                                                             | .71             | Intensity methods                                                                   |
| .12         | Weight. Static forces                                                                                                                                          | .72             | Impulse methods                                                                     |
| .13         | Dynamic phenomena                                                                                                                                              | .721            | Time methods                                                                        |
| .14         | Pendulums. Balance wheels                                                                                                                                      | .722            | Counting methods                                                                    |
| .15         | Centrifugal force                                                                                                                                              | .8              | Summation methods                                                                   |
| .16         | Gyroscopic devices                                                                                                                                             | .9              | Other methods                                                                       |
| .17         | Elasticity. Torsion                                                                                                                                            | .91             | Mixed methods                                                                       |
| .18         | Friction                                                                                                                                                       | .92             | Methods with intermittent indication                                                |
| .4          | <b>Use of acoustic phenomena</b>                                                                                                                               | .94             | Methods with continuous indication                                                  |
| .5          | <b>Use of optical phenomena</b>                                                                                                                                | .98             | Micromethods                                                                        |
| .52         | Photoelectric phenomena                                                                                                                                        | 621.3.084       | CONSTRUCTION OF INSTRUMENTS                                                         |
| .6          | <b>Use of thermal phenomena</b>                                                                                                                                | .2              | Receivers. Parts which come in contact with the phenomena measured                  |
| .61         | Thermodynamic changes. Hot wires                                                                                                                               | .8              | Storage, supply, transmission and discharge of matter or energy                     |
| .62         | Thermoelectric phenomena                                                                                                                                       | .822            | Feed, supply arrangements for liquids                                               |
| .63         | Calorimetric phenomena                                                                                                                                         | 621.3.085       | INDICATORS. SCALES ETC.                                                             |
| .64         | Variation of resistance due to heat changes                                                                                                                    | .1              | Braking, damping devices                                                            |
| .7          | <b>Use of electric and magnetic phenomena</b>                                                                                                                  | .2              | Zero. Zero adjustment. Adjusting devices                                            |
| .72         | Electrostatic phenomena (electrostatic force, capacitance)                                                                                                     | .3              | Indicating devices                                                                  |
| .722        | Change in capacitance due to the measured quantity                                                                                                             | .31             | Mechanical                                                                          |
| .4          | With measurement of capacitance by electrostatic methods                                                                                                       | .32             | Indicator elements. Fibres. Cross wires                                             |
| .5          | With measurement of capacitance by electrodynamic methods                                                                                                      | .33             | Optical devices for reading scales                                                  |
| .55         | Bridge methods                                                                                                                                                 | .34             | Indicating devices using a light beam                                               |
| .56         | Resonance methods                                                                                                                                              | .39             | Accessories                                                                         |
| .57         | Beat methods                                                                                                                                                   | .4              | Scales                                                                              |
| .73         | Electrokinetic, e.g. piezoelectric, phenomena                                                                                                                  | .49             | Illumination of scales                                                              |
| .731        | Change in resistance due to the measured quantity                                                                                                              | .5              | Pens                                                                                |
|             |                                                                                                                                                                | .6              | Casings (of instruments)                                                            |
|             |                                                                                                                                                                |                 | <i>For casings for other equipment → 62-758</i>                                     |

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| 621.3.087 | OBSERVATION. RECORDING<br>621.3.087 $\cong$ 53.087                                                                                                                                          |
| 621.3.088 | ERRORS. CORRECTION OF ERRORS<br>621.3.088 $\cong$ 53.088                                                                                                                                    |
| .089.6    | Calibration and testing of measuring instruments                                                                                                                                            |
| 621.3.09  | <b>TRANSMISSION PROPERTIES</b><br><i>For electromagnetic oscillations <math>\rightarrow</math> 537.86/.87</i><br><i>For theory of transmission lines <math>\rightarrow</math> 621.372.2</i> |
| 621.3.091 | ATTENUATION. GAIN                                                                                                                                                                           |
| .1        | Attenuation                                                                                                                                                                                 |
| .2        | Transmission gain                                                                                                                                                                           |
| .22       | Aerial gain                                                                                                                                                                                 |
| 621.3.092 | TRANSMISSION TIME. PROPAGATION VELOCITY. PATHS. DISTANCES AND ANGLES<br>$\rightarrow$ 621.3.018.12 Phase shift. Phase rotation. Phase angle                                                 |
| .2        | Propagation velocity                                                                                                                                                                        |
| .22       | Phase velocity                                                                                                                                                                              |
| .24       | Group velocity. Signal velocity                                                                                                                                                             |
| .3        | Paths                                                                                                                                                                                       |
| .4        | Distances                                                                                                                                                                                   |
| .5        | Angles                                                                                                                                                                                      |
| .52       | Elevation angle                                                                                                                                                                             |
| .53       | Incident angle                                                                                                                                                                              |
| .54       | Wave arrival angle                                                                                                                                                                          |
| 621.3.093 | FREQUENCY PHENOMENA                                                                                                                                                                         |
| .2        | Doppler effect<br>$\rightarrow$ 534.171 Acoustic Doppler effect<br>535.338.334 Optical Doppler effect                                                                                       |
| 621.3.095 | POLARIZATION. ENERGY DISTRIBUTION. FIELD STRENGTH. RADIATED POWER                                                                                                                           |
| .1        | <b>Polarization</b>                                                                                                                                                                         |
| .11       | Linear polarization                                                                                                                                                                         |
| .111      | Horizontal polarization                                                                                                                                                                     |
| .112      | Vertical polarization                                                                                                                                                                       |
| .12       | Elliptical polarization                                                                                                                                                                     |
| .13       | Circular polarization                                                                                                                                                                       |
| .14       | Non-polarized                                                                                                                                                                               |
| .2        | <b>Distribution of energy</b>                                                                                                                                                               |
| .21       | Spectral distribution of energy                                                                                                                                                             |
| .22       | Spatial distribution of energy                                                                                                                                                              |
| .221      | Omnidirectional distribution of energy (uniformly in all directions)                                                                                                                        |
| .222      | Directional distribution of energy (focusing or beaming)                                                                                                                                    |
| .1        | Horizontal                                                                                                                                                                                  |
| .2        | Vertical                                                                                                                                                                                    |
| .3        | Horizontal/vertical                                                                                                                                                                         |
| .4        | Fixed                                                                                                                                                                                       |
| .5        | Rotating                                                                                                                                                                                    |
| .3        | <b>Field strength</b>                                                                                                                                                                       |
| .4        | <b>Radiated power</b>                                                                                                                                                                       |

## Principal divisions

## 621.31 Generation, supply and control of electricity. Electrical machines and apparatus. Electrical measurement. Applied magnetism. Applied electrostatics

*Apparatus not essentially electrically operated is classed under the number for the apparatus using the -65 (electrical heating) or -83 (electrically driven) special auxiliaries, e.g.*

621.791.033-65 Electric soldering irons

631.352.93-83 Electrically driven lawn mowers

*Alternatively, colon combination may be used, e.g.*

621.791.033:621.365.4 Electric soldering irons

631.352.93:62-83 Electrically driven lawn mowers

### 621.311 POWER GENERATION AND SUPPLY. POWER STATIONS. GENERALITIES ON SUPPLY SYSTEMS, EQUIPMENT AND LAYOUT. COMPLETE ELECTRIFICATION SCHEMES.

*Further particulars may be denoted by common auxiliaries, e.g.*

621.311.001.57 Network tests, trials with models

### 621.311.1 SUPPLY NETWORKS FROM THE REGIONAL POINT OF VIEW. ELECTRIFICATION SCHEMES. REGIONAL NETWORKS. COMPLETE REGIONAL SCHEMES

*For distribution networks  $\rightarrow$  621.316.1*  
*Further particulars may be denoted by the common auxiliaries of place*

.11 Location of power stations and substations

*For types of substations  $\rightarrow$  621.311.4*

.12 Choice of type of current

.13 Choice of voltage

.14 Choice of type of machine

.15 Output of station

.151 Total installed capacity of installation.

Plant load factor

.152 Connected load

.153 Load. Load curve. Diversity factor. Maximum demand

.2 Load fluctuations and their compensations

.22 Peak load

.23 Minimum load

.154 Available power

.16 Utilization of residual electrical energy and of excess energy. Distribution of load. Coupling

.161 Of excess energy of the whole network. Network coupling. Interconnection

.162 Of excess energy of main power stations

.163 Of excess energy of private installations

.17 Design of power stations

|               |                                                                                                                     |           |                                                                                                                                                                                                                   |
|---------------|---------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 621.311.171   | Layout and space requirements of machines                                                                           | .2        | Substations with rectifiers working with contacts and liquid jets                                                                                                                                                 |
| .172          | Layout of switchgear                                                                                                | .4        | Substations with solid-state rectifiers                                                                                                                                                                           |
| .176          | Layout of equipment for control rooms                                                                               | .449      | Substations with other types of rectifier                                                                                                                                                                         |
| .177          | Layout of equipment for load dispatching                                                                            | .47       | Switching (sub) stations                                                                                                                                                                                          |
| .18           | House sets for power stations. Auxiliary machines and equipment in power stations                                   | .48       | Mixed substations                                                                                                                                                                                                 |
| .182          | House sets                                                                                                          | .49       | Other types of substation                                                                                                                                                                                         |
| .183          | Auxiliary machines and equipment                                                                                    | 621.311.6 | ARRANGEMENTS FOR THE SUPPLY OF POWER TO APPARATUS, ELECTRONIC DEVICES, ETC.                                                                                                                                       |
| 621.311.2     | POWER STATIONS ACCORDING TO THE TYPE OF PRIME MOVER. UTILIZATION OF NATURAL ELECTRIC AND MAGNETIC SOURCES OF ENERGY | .61       | Supply from independent sources (primary cells, accumulators)                                                                                                                                                     |
|               | <i>For hydraulic power plant → 627.8</i>                                                                            | .62       | Supply from electric mains                                                                                                                                                                                        |
|               | <i>The -18, -6 and -8 special auxiliaries are particularly applicable to this section</i>                           | .68       | Supply from independent sources and mains combined                                                                                                                                                                |
| .21           | Hydroelectric power stations                                                                                        | .69       | Other devices for power supply                                                                                                                                                                                    |
|               | →621.22 Water power. Hydraulic energy                                                                               | 621.311.8 | EMERGENCY POWER SUPPLIES                                                                                                                                                                                          |
| .22           | Power stations using steam                                                                                          | 621.313   | <b>ELECTRIC MACHINES. GENERATORS. MOTORS</b>                                                                                                                                                                      |
|               | →621.1 Steam power                                                                                                  |           | <i>For transformers, convertors and rectifiers → 621.314</i>                                                                                                                                                      |
| .23           | Power stations using other types of heat engine                                                                     |           | <i>For electrostatic machines → 621.319</i>                                                                                                                                                                       |
| .236          | Power stations using diesel engines                                                                                 |           | <i>For thermoelectric and thermomagnetic machines → 621.363</i>                                                                                                                                                   |
| .238          | Power stations using gas turbines                                                                                   |           | <i>For electronic generators → 621.373</i>                                                                                                                                                                        |
| .24           | Wind power stations                                                                                                 |           | <i>Individual parts of electric machines (field and armature systems, windings etc.) may be denoted by the .04 special auxiliaries</i>                                                                            |
| .25           | Power stations using other sources of energy                                                                        |           |                                                                                                                                                                                                                   |
|               | →621.039.577 Production of electric power — Nuclear technology                                                      |           | GENERATORS, MOTORS IN GENERAL                                                                                                                                                                                     |
| .26           | Power stations with several types of prime mover                                                                    | 621.313.1 | <i>Further particulars of machines used as generators, e.g. according to the type of prime mover, may be denoted by the -81/-88 special auxiliaries, e.g. 621.313.224-843.6 Diesel-driven compound generators</i> |
| .28           | [cancelled] → 621.311.2-182.3                                                                                       |           | <i>Machines used as motors, however, are denoted by the -89 special auxiliary, e.g. 621.313.222-89 Direct-current series motors</i>                                                                               |
| .29           | Utilization of natural electrical and magnetic sources of energy                                                    |           |                                                                                                                                                                                                                   |
| 621.311.4     | SUBSTATIONS. POWER PLANT                                                                                            |           |                                                                                                                                                                                                                   |
|               | <i>The purpose may be denoted by colon combination, e.g.</i>                                                        |           |                                                                                                                                                                                                                   |
|               | 621.311.4:621.316.1 Distribution substations                                                                        |           |                                                                                                                                                                                                                   |
|               | :621.33 Substations for electric traction                                                                           | .12       | Generators in general                                                                                                                                                                                             |
|               | :621.395.722 Power plant for telephone exchanges                                                                    |           | →621.313.8 Magnetoelectric generators                                                                                                                                                                             |
|               | <i>The voltage applied may be denoted by the .027 special auxiliaries, e.g.</i>                                     |           | →621.319.3 Electrostatic generators                                                                                                                                                                               |
|               | 621.311.4.027.55 5 kV substations                                                                                   | .126      | →621.319.5 Surge generators                                                                                                                                                                                       |
|               | <i>Further particulars may be denoted by the -5 or -7 special auxiliaries, e.g.</i>                                 | .13       | →621.373 h.f. generators and oscillators                                                                                                                                                                          |
|               | 621.311.4-519 Telecontrolled substations                                                                            | .14       | Exciters                                                                                                                                                                                                          |
|               | -52 Automatic substations                                                                                           | .15       | Motors in general                                                                                                                                                                                                 |
|               | -742 Outdoor substations                                                                                            | .17       | Universal motors. Motors for various kinds of current                                                                                                                                                             |
| .41           | Substations with accumulators                                                                                       | 621.313.2 | Flywheel machines in general                                                                                                                                                                                      |
| .42           | Substations with transformers                                                                                       |           | Machines for special purposes                                                                                                                                                                                     |
| .426          | Local substations. Transformer cubicles, houses                                                                     |           | DIRECT-CURRENT MACHINES                                                                                                                                                                                           |
| .43           | Substations with rotary units                                                                                       |           | <i>The type of regulation may be denoted by the .07 special auxiliaries, e.g.</i>                                                                                                                                 |
| .44           | Substations with static convertors. With rectifiers working with contacts and liquid jets                           | .22       | 621.313.2.077.3 Direct-current motors with regulation by means of generators, e.g. Ward Leonard circuits                                                                                                          |
| .442          | Substations with rectifiers                                                                                         |           | <b>Direct-current machines according to winding</b>                                                                                                                                                               |
| 621.311.442.1 | Substations with mercury-arc rectifiers                                                                             |           |                                                                                                                                                                                                                   |

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|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 621.313.222 | With series excitation                                                                                                                                                                                                                                                     | 621.313.333.8 (cont'd) | 621.313.323.821 Synchronous linear motors with advancing movement                                                                                                                       |
| .223        | With shunt excitation                                                                                                                                                                                                                                                      |                        |                                                                                                                                                                                         |
| .1          | With self-excitation                                                                                                                                                                                                                                                       | .325                   | Synchronous capacitors. Phase advancers                                                                                                                                                 |
| .2          | With separate excitation                                                                                                                                                                                                                                                   | .33                    | <b>Asynchronous (induction) machines</b>                                                                                                                                                |
| .224        | With compound excitation. Compound machines                                                                                                                                                                                                                                | .332                   | Induction generators                                                                                                                                                                    |
| .225        | With open armature winding                                                                                                                                                                                                                                                 | .333                   | Asynchronous (induction) motors                                                                                                                                                         |
| .226        | With special forms of winding                                                                                                                                                                                                                                              | .1                     | With slip-rings                                                                                                                                                                         |
| .1          | Over-compounded                                                                                                                                                                                                                                                            | .2                     | With short-circuited (squirrel-cage) armature                                                                                                                                           |
| .2          | For lowering the voltage<br>→621.316.7 Regulation in general.<br>Regulators                                                                                                                                                                                                | .4                     | With multiple armature                                                                                                                                                                  |
| .23         | <b>Direct-current machines according to brush arrangement</b>                                                                                                                                                                                                              | .8                     | Asynchronous motors according to movements of the armature and the field<br>621.313.333.8 $\cong$ 621.313.28 e.g.<br>621.313.333.821 Asynchronous linear motors with advancing movement |
| .236        | With special brush arrangement                                                                                                                                                                                                                                             |                        |                                                                                                                                                                                         |
| .1          | Cross-field                                                                                                                                                                                                                                                                | .334                   | Synchronous induction motors                                                                                                                                                            |
| .2          | Metadyne                                                                                                                                                                                                                                                                   | .335                   | Phase advancers                                                                                                                                                                         |
| .3          | Other amplifier machines. Amplidyne                                                                                                                                                                                                                                        | .36                    | <b>Commutator machines</b>                                                                                                                                                              |
| .28         | <b>Direct-current machines according to movements of the armature and the field</b>                                                                                                                                                                                        | .361                   | With series characteristic                                                                                                                                                              |
| .281        | With rotary movement                                                                                                                                                                                                                                                       | .362                   | With shunt characteristic                                                                                                                                                               |
| .1          | With continuous, rotating movement                                                                                                                                                                                                                                         | .37                    | <b>Repulsion machines</b>                                                                                                                                                               |
| .2          | With oscillating (to and fro) rotating movement                                                                                                                                                                                                                            | .39                    | <b>Unipolar and other a.c. machines</b>                                                                                                                                                 |
| .3          | With undulatory, rotating movement                                                                                                                                                                                                                                         | .391                   | Homopolar, unipolar a.c. machines<br>→621.313.322 Synchronous generators                                                                                                                |
| .4          | With rotating, stepped movement                                                                                                                                                                                                                                            | .392                   | Without commutator. Hysteresis machines                                                                                                                                                 |
| .282        | With linear movement. Linear motors                                                                                                                                                                                                                                        | 621.313.5              | <b>GENERATORS AND MOTORS BASED ON THE INFLUENCE OF ELECTRIC OR MAGNETIC INDUCTION EFFECTS ON FLUID FLOW</b>                                                                             |
| .1          | With continuous, advancing movement                                                                                                                                                                                                                                        | .52                    | <b>Generators</b>                                                                                                                                                                       |
| .2          | With oscillating (to and fro) movement                                                                                                                                                                                                                                     | .522                   | Magnetohydrodynamic generators                                                                                                                                                          |
| .3          | With linear, stepped movement                                                                                                                                                                                                                                              | .2                     | Employing the Faraday effect                                                                                                                                                            |
| .283        | <i>[cancelled]</i><br>→621.313.281.2 With oscillating (to and fro) rotating movement<br>.3 With undulatory, rotating movement<br>.282.2 With oscillating (to and fro) movement                                                                                             | .21                    | Open cycle                                                                                                                                                                              |
| .289        | Other machines                                                                                                                                                                                                                                                             | .22                    | Closed cycle                                                                                                                                                                            |
| .29         | <b>Direct-current machines of special electrical construction</b>                                                                                                                                                                                                          | .3                     | Employing the Hall effect                                                                                                                                                               |
| .291        | Homopolar, unipolar machines                                                                                                                                                                                                                                               | .31                    | Open cycle                                                                                                                                                                              |
| .2          | With commutators                                                                                                                                                                                                                                                           | .32                    | Closed cycle                                                                                                                                                                            |
| .3          | With slip-rings                                                                                                                                                                                                                                                            | .523                   | Magnetoplasma dynamic generators<br>621.313.523 $\cong$ 621.313.522                                                                                                                     |
| .292        | Without commutator or slip-rings                                                                                                                                                                                                                                           | .524                   | Magnetogasdynamic generators<br>621.313.524 $\cong$ 621.313.522                                                                                                                         |
| 621.313.3   | <b>ALTERNATING-CURRENT MACHINES</b><br>→621.314.5 Motor-generators and convertors                                                                                                                                                                                          | .53                    | <b>Flow motors. Induction pumps. Electrodynamic jet propulsion systems</b>                                                                                                              |
| .32         | <b>Synchronous machines</b>                                                                                                                                                                                                                                                | .532                   | Flow motors using flowing liquids                                                                                                                                                       |
| .322        | Synchronous generators<br><i>The type of drive may be denoted by the -8 special auxiliaries, e.g.</i><br>621.313.322-81 Steam-driven, e.g. turbo-generators<br>-82 Hydraulically-driven, e.g. hydro-generators<br>-84 Driven by combustion engines, e.g. diesel generators | .533                   | Flow motors using flowing gases.<br>Electrogasdynamic jet propulsion systems                                                                                                            |
| .323        | Synchronous motors                                                                                                                                                                                                                                                         | .534                   | Flow motors using flowing plasmas.<br>Plasmadynamic jet propulsion systems                                                                                                              |
| .8          | Synchronous motors according to movements of the armature and the field<br>621.313.323.8 $\cong$ 621.313.28 e.g.                                                                                                                                                           | 621.313.8              | <b>MAGNETOELECTRIC MACHINES. PERMANENT MAGNET MACHINES</b>                                                                                                                              |
|             |                                                                                                                                                                                                                                                                            | .82                    | Design<br>→621.313.1 Generators, motors in general                                                                                                                                      |
|             |                                                                                                                                                                                                                                                                            | .821                   | Armature                                                                                                                                                                                |
|             |                                                                                                                                                                                                                                                                            | .822                   | Magnet. Iron                                                                                                                                                                            |
|             |                                                                                                                                                                                                                                                                            | .2                     | Horseshoe magnet                                                                                                                                                                        |
|             |                                                                                                                                                                                                                                                                            | .3                     | With multiple poles                                                                                                                                                                     |
|             |                                                                                                                                                                                                                                                                            | .5                     | Bell-shaped magnet                                                                                                                                                                      |
|             |                                                                                                                                                                                                                                                                            | .6                     | Rotating-sleeve inductor                                                                                                                                                                |

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| 621.313.823 | Machines according to the motion of the armature and the magnet                                                               | 621.314.214.5 | Transformers with variable magnetic circuit                                                               |
| .1          | Moving armature, fixed magnet                                                                                                 | .53           | Of which only parts without windings are displaced                                                        |
| .2          | Fixed armature, variable magnetic flux                                                                                        | .54           | Sliding-core transformers                                                                                 |
| .3          | Armature and magnet both moving                                                                                               | .55           | Of which only coils are displaced                                                                         |
| .5          | Oscillating motion                                                                                                            | .22           | <b>Transformers with ordinary closed ferromagnetic circuit</b>                                            |
| .824        | Flywheel magnetoelectric machines                                                                                             |               | <i>Further particulars may be denoted by special auxiliaries, e.g.</i>                                    |
| .84         | Magnetoelectric machines for special purposes                                                                                 |               | 621.314.22.08 Instrument transformers in general                                                          |
| 621.314     | <b>TRANSFORMATION. TRANSFORMERS. CONVERTORS. RECTIFIERS</b>                                                                   | .222          | Voltage transformers                                                                                      |
|             | <i>For electrical machines in general, including transformers and convertors → 621.313</i>                                    | .6            | 621.314.222 $\cong$ 621.314.21                                                                            |
|             | <i>Individual parts of magnetic equipment (magnetic circuit, windings etc.) may be denoted by the .04 special auxiliaries</i> | .68           | (Power-) voltage transformers                                                                             |
| 621.314.1   | <b>DIRECT-CURRENT (D.C./D.C.) TRANSFORMATION. DIRECT-CURRENT TRANSFORMERS</b>                                                 | .7            | Safety transformers                                                                                       |
| .11         | Motor generators, increasing and decreasing d.c. voltage                                                                      | .76           | Boosting transformers                                                                                     |
| .12         | Other methods of direct-current transformation (e.g. metadyne convertors) → 621.375.024 Direct-current amplifiers             | .766          | Booster regulating transformers                                                                           |
| .13         | Direct-current transformation using grid-modulated discharge tubes                                                            | .767          | For regulating in phase                                                                                   |
| 621.314.2   | <b>ALTERNATING-CURRENT (A.C./A.C.) TRANSFORMATION. ALTERNATING-CURRENT TRANSFORMERS, CONVERTORS ETC.</b>                      | .8            | For regulating in quadrature                                                                              |
| .21         | <b>Alternating-current transformers in general</b>                                                                            | .223          | Instrument-type voltage transformers                                                                      |
| .211        | With air insulating and cooling                                                                                               |               | Autotransformers                                                                                          |
| .212        | With oil insulating and cooling                                                                                               | .224          | 621.314.223 $\cong$ 621.314.21                                                                            |
|             | <i>Further particulars may be denoted by special auxiliaries e.g.</i>                                                         | .8            | Current transformers                                                                                      |
|             | 621.314.212.048.822 With expansion vessels                                                                                    | .225          | 621.314.224 $\cong$ 621.314.21                                                                            |
| .213        | With insulation and cooling by means other than air and oil                                                                   |               | Instrument-type current transformers                                                                      |
|             | <i>Further particulars may be denoted by the -71 special auxiliaries</i>                                                      | .228          | Ring transformers                                                                                         |
| .1          | By gases other than air                                                                                                       |               | 621.314.225 $\cong$ 621.314.21                                                                            |
| .3          | By liquids other than oil                                                                                                     | .1            | Transformers for special purposes                                                                         |
| .5          | By solid materials                                                                                                            | .2            | 621.314.228.1/.5 each $\cong$ 621.314.21                                                                  |
| .214        | Adjustable transformers, variable-ratio transformers in general                                                               | .3            | Alternating-current balancers (static balancers) for d.c. three-wire systems.                             |
|             | → 621.316.722 Voltage regulation and regulators                                                                               | .4            | Equalizing coils for d.c. three-wire systems                                                              |
| .2          | Induction regulators                                                                                                          | .5            | Alternating-current balancers to form an artificial neutral point. Neutral earthing compensation          |
| .3          | Transformers with variable turns ratio                                                                                        | .23           | Transformers for coupling neutral points. Interphase transformers. Interphase reactors                    |
| .32         | With off-circuit regulation                                                                                                   | .4            | Compensation transformers for rectifiers                                                                  |
| .322        | By tapping terminals                                                                                                          | .5            | Transformers as negative booster                                                                          |
| .323        | By tap-changing switch                                                                                                        | .232          | <b>Special transformers with closed ferromagnetic circuit. Transformers with air gap or with air core</b> |
| .33         | With on-load regulation                                                                                                       | .233          | 621.314.232/.236 each $\cong$ 621.314.21                                                                  |
| .332        | By tap-changing                                                                                                               | .235          | Ordinary transformers with air gap                                                                        |
| .333        | By a sliding or rolling contact moving over the windings                                                                      | .236          | Swinburne transformers. Hedgehog transformers                                                             |
|             |                                                                                                                               | .24           | Air-cored transformers                                                                                    |
|             |                                                                                                                               | .241          | Tesla transformers                                                                                        |
|             |                                                                                                                               | .242          | Transformers with closed special magnetic circuit                                                         |
|             |                                                                                                                               | .25           | <b>Phase transformation by means of rotating machinery. Dynamotors. Rotary transformers</b>               |
|             |                                                                                                                               | .252          | Transformation by motor generators                                                                        |
|             |                                                                                                                               | .254          | Transformation by other types of machine                                                                  |
|             |                                                                                                                               |               | <b>Phase convertors. Phase transformers</b>                                                               |
|             |                                                                                                                               |               | Phase convertors                                                                                          |
|             |                                                                                                                               |               | Phase transformers                                                                                        |
|             |                                                                                                                               |               | 621.314.254 $\cong$ 621.314.21                                                                            |

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| 621.314.254.6 | Scott-system transformers                                                                                                                                                                                                                                                                                                                                                                | 621.314.64 (cont'd) | <i>The .032 special auxiliaries are particularly applicable to 621.314.64/.67</i>                                                                                                                                                           |
| .8            | Polyphase rectifier transformers (mutator transformers)                                                                                                                                                                                                                                                                                                                                  |                     |                                                                                                                                                                                                                                             |
| .26           | <b>Frequency convertors. Frequency changers</b><br>→621.372.632 Frequency changers                                                                                                                                                                                                                                                                                                       | .65                 | <b>Metal-arc rectifiers. Mercury-arc rectifiers (low-pressure arcs)</b><br><i>For mercury pool-cathode discharge devices → 621.387.222</i>                                                                                                  |
| .261          | Electromechanical frequency convertors                                                                                                                                                                                                                                                                                                                                                   | .651                | Without grid                                                                                                                                                                                                                                |
| .262          | Electrochemical frequency convertors                                                                                                                                                                                                                                                                                                                                                     | .1                  | Glass-bulb                                                                                                                                                                                                                                  |
| .263          | Electromagnetic frequency convertors                                                                                                                                                                                                                                                                                                                                                     | .2                  | Metal-clad                                                                                                                                                                                                                                  |
| .27           | <b>Simultaneous phase and frequency changing using grid-controlled current convertors, e.g. mercury arc rectifiers, thyratrons</b><br><i>For metal-arc rectifiers with grid → 621.387.132.22 Hot-cathode thyratrons<br/>Further particulars may be denoted by colon combination e.g.<br/>621.314.27:621.314.65 The use of metal-arc rectifiers etc. for phase and frequency changing</i> | .652                | With grid, e.g. mutators                                                                                                                                                                                                                    |
|               |                                                                                                                                                                                                                                                                                                                                                                                          | .1                  | Glass-bulb                                                                                                                                                                                                                                  |
|               |                                                                                                                                                                                                                                                                                                                                                                                          | .2                  | Metal-clad                                                                                                                                                                                                                                  |
|               |                                                                                                                                                                                                                                                                                                                                                                                          | .653                | With control electrode. Ignitron rectifiers<br><i>For ignitron devices → 621.387.24</i>                                                                                                                                                     |
|               |                                                                                                                                                                                                                                                                                                                                                                                          | .66                 | <b>Arc rectifiers (atmospheric-pressure arc or high-pressure arc)</b>                                                                                                                                                                       |
|               |                                                                                                                                                                                                                                                                                                                                                                                          | .67                 | <b>Thermionic rectifiers. Glow-discharge rectifiers</b><br>→621.387.132.22 Hot-cathode thyratrons                                                                                                                                           |
|               |                                                                                                                                                                                                                                                                                                                                                                                          | .671                | Hot-cathode rectifiers<br><i>For hard vacuum thermionic diodes → 621.385.2</i>                                                                                                                                                              |
| 621.314.5     | CONVERSION OF ALTERNATING CURRENT INTO DIRECT CURRENT AND VICE VERSA. CONVERTORS. INVERTORS<br><i>For rectifiers → 621.314.6</i>                                                                                                                                                                                                                                                         | .672                | Glow discharge rectifiers<br><i>For thyratrons → 621.387.132.22, 621.387.33</i>                                                                                                                                                             |
| .52           | Motor generators                                                                                                                                                                                                                                                                                                                                                                         | .69                 | <b>Other rectifiers</b>                                                                                                                                                                                                                     |
| .521          | Motor generators with synchronous motors                                                                                                                                                                                                                                                                                                                                                 | .692                | Point-plate rectifiers                                                                                                                                                                                                                      |
| .522          | Motor generators with asynchronous motors                                                                                                                                                                                                                                                                                                                                                | 621.315             | <b>TRANSMISSION, DISTRIBUTION AND TELECOMMUNICATION LINES. CONDUCTORS. INSULATING MATERIALS AND WIRING ACCESSORIES. DESIGN, CONSTRUCTION AND ERECTION OF LINES</b><br>→621.311.4 Substations. Power plant                                   |
| .53           | Rotary convertors<br>621.314.53 ≅ 621.314.52                                                                                                                                                                                                                                                                                                                                             |                     | 621.316.1 Distribution networks and installations in buildings, offices, factories                                                                                                                                                          |
| .54           | Convertors in cascade                                                                                                                                                                                                                                                                                                                                                                    |                     | 621.316.9 Protection and protective devices. Fuses. Lightning protection. Earthing                                                                                                                                                          |
| .55           | Convertors with rotary brushes. Rotating commutators                                                                                                                                                                                                                                                                                                                                     |                     | 679.74 Manufacture of wires and cables for conducting electricity (conductors for power and signals)                                                                                                                                        |
| .57           | Transformation of direct current into alternating current by discharge apparatus                                                                                                                                                                                                                                                                                                         |                     | <i>Further particulars may be denoted by the .05 special auxiliaries, which are particularly applicable here e.g. 621.315.051.024 Direct-current transmission lines</i>                                                                     |
| .571          | Choppers                                                                                                                                                                                                                                                                                                                                                                                 |                     | <i>Transmission theory applied to transmission lines may be denoted by the .09 special auxiliaries</i>                                                                                                                                      |
| .572          | Invertors                                                                                                                                                                                                                                                                                                                                                                                |                     |                                                                                                                                                                                                                                             |
| .58           | Transformation of direct current into alternating current and vice versa by convertors                                                                                                                                                                                                                                                                                                   |                     |                                                                                                                                                                                                                                             |
| 621.314.6     | RECTIFICATION. RECTIFIERS AND RECTIFIER EQUIPMENT<br><i>Class here only the complete apparatus or plant; for devices themselves use appropriate main number, e.g. 621.382 Semiconductor devices; for substations with rectifiers use 621.311.442<br/>Individual parts may be denoted by the .03 or .04 special auxiliaries</i>                                                           | 621.315.1           | <b>BARE LINES. OVERHEAD LINES</b><br>→621.315.24 Aerial (service) cables<br>679.742 Manufacture of conductors according to function<br><i>Specific conductor materials may be denoted by colon combination with the subdivisions of 669</i> |
| .62           | <b>Mechanical rectifiers</b>                                                                                                                                                                                                                                                                                                                                                             | .14                 | Bare lines in general                                                                                                                                                                                                                       |
| .621          | Vibrating-type rectifiers                                                                                                                                                                                                                                                                                                                                                                | .145                | Stranded                                                                                                                                                                                                                                    |
| .622          | Rotating-type rectifiers                                                                                                                                                                                                                                                                                                                                                                 |                     |                                                                                                                                                                                                                                             |
| .623          | Mercury-jet-type rectifiers                                                                                                                                                                                                                                                                                                                                                              |                     |                                                                                                                                                                                                                                             |
| .626          | Contact rectifiers                                                                                                                                                                                                                                                                                                                                                                       |                     |                                                                                                                                                                                                                                             |
| .63           | <b>Dry rectifiers. Barrier-layer rectifiers</b>                                                                                                                                                                                                                                                                                                                                          |                     |                                                                                                                                                                                                                                             |
| .631          | Piezoelectric rectifiers                                                                                                                                                                                                                                                                                                                                                                 |                     |                                                                                                                                                                                                                                             |
| .632          | Rectifiers with crystal and metal contact                                                                                                                                                                                                                                                                                                                                                |                     |                                                                                                                                                                                                                                             |
| .2            | Cuprous oxide rectifiers                                                                                                                                                                                                                                                                                                                                                                 |                     |                                                                                                                                                                                                                                             |
| .634          | Selenium rectifiers                                                                                                                                                                                                                                                                                                                                                                      |                     |                                                                                                                                                                                                                                             |
| .64           | <b>Electrolytic rectifiers</b>                                                                                                                                                                                                                                                                                                                                                           |                     |                                                                                                                                                                                                                                             |

|             |                                                                                                  |                |                                                                                                                        |
|-------------|--------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------|
| 621.315.145 | →621.315.34 Insulated stranded conductors, flexible cord                                         | 621.315.213.14 | With more than three conductors                                                                                        |
| .146        | Hollow. Tubular                                                                                  | .2             | With segmental conductors, not stranded                                                                                |
|             | →621.315.216 Insulated tubular conductors                                                        | .23            | With three conductors                                                                                                  |
| .17         | Design, erection and maintenance of overhead lines                                               | .24            | With more than three conductors                                                                                        |
| .171        | Tensioning and suspending the conductors                                                         | .216           | Insulated tubular conductors                                                                                           |
| .172        | Fixing to insulators and supports                                                                |                | →679.7.023.337 (Methods for manufacture of hollow, tubed shaped (stranded wires, or twisted yarns)                     |
| .173        | Line crossings                                                                                   |                | 679.743.4 Mechanical protection (afforded by covering of cable)                                                        |
|             | →621.316.96 Protection against mechanical accidents                                              |                | <b>Armoured, sheathed cables.</b>                                                                                      |
| .174        | Reducing the mechanical stress on conductors                                                     | .22            | <b>Armouring. Sheathing</b>                                                                                            |
| .175        | Removal of hoar-frost and similar operations                                                     |                | 621.315.221/.229 each $\cong$ 621.315.21, e.g.                                                                         |
|             | →551.574.42 Solid (deposits). Rime. Hoar-frost. Glazed frost. Silver thaw etc. — Meteorology     |                | 621.315.222.31 Armoured cables with stranded conductors                                                                |
|             | 624.144.2 Damage caused by loading with hoar-frost, snow etc. — Civil and structural engineering |                | →679.743 Covering (including liquid and gaseous layers) of conductors, cores, and stranded cores according to function |
| .176        | Methods of suspending the conductors. Suspension wires                                           | .221           | Sheathing                                                                                                              |
|             | <i>For suspension of traction wires → 621.332.33</i>                                             |                | <i>Materials may be denoted by the -03 auxiliaries</i>                                                                 |
| .177        | <i>Other devices for erection and maintenance of lines</i>                                       | .5             | <i>[cancelled] → 621.315.221-034.4</i>                                                                                 |
|             |                                                                                                  | .7             | <i>[cancelled] → 621.315.221-034...</i>                                                                                |
|             |                                                                                                  | .8             | <i>[cancelled] → 621.315.221-036...</i>                                                                                |
| 621.315.2   | CABLES (INSULATED, SHEATHED AND ARMoured CONDUCTORS). UNDERGROUND AND SUBMARINE CABLES           | .222           | Mechanical protection. Armouring                                                                                       |
|             | <i>For materials of construction → 621.315.5/.6</i>                                              | .223           | Combined sheathing and armouring. Bedding                                                                              |
|             | <i>For insulated wires and flexible cords. Interior wiring → 621.315.3</i>                       | .5             | Combined lead sheathing and steel tape armouring                                                                       |
|             | <i>For design, erection and maintenance of overhead lines → 621.315.17</i>                       | .227           | Serving (outermost protective layer), e.g. of jute                                                                     |
|             | <i>For manufacture of wires and cables for conducting electricity → 679.74</i>                   | .229           | Other kinds of armouring and sheathing                                                                                 |
| .21         | <b>Cables according to type of insulation and structure</b>                                      | .23            | <b>Underground cables: arrangements, laying</b>                                                                        |
| .211        | According to type of insulation                                                                  | .232           | In ducts or troughs                                                                                                    |
|             | →679.74 Manufacture of wires and cables for conducting electricity                               | .233           | Trenches and tunnels for laying cables. Cable manholes                                                                 |
| .2          | Solid insulation                                                                                 | .235           | Cable laying                                                                                                           |
| .3          | Oil-filled insulation                                                                            | .24            | <b>Aerial (service) cables</b>                                                                                         |
| .4          | Gas-pressure insulation                                                                          | .242           | <i>[cancelled] → 621.315.24-219.521</i>                                                                                |
| .8          | Expansion insulation                                                                             | .243           | <i>[cancelled] → 621.315.24-112.3</i>                                                                                  |
| .9          | Other types of insulation                                                                        | .27            | <b>Floating cables</b>                                                                                                 |
| .212        | Concentric cable. Coaxial cable                                                                  | .28            | <b>Submarine and river cables: arrangements, laying, etc.</b>                                                          |
|             | →679.746 Manufacture of wires and cables according to field of application                       | .284           | Arrangements on board cable-laying ships                                                                               |
| .1          | With one conductor                                                                               | .285           | Laying cable in the water. Underwater work                                                                             |
| .2          | With two conductors                                                                              | .287           | Recovery of submarine cables                                                                                           |
| .3          | With three conductors                                                                            | .29            | <b>Accessories for laying and repair</b>                                                                               |
| .4          | With more than three conductors                                                                  | .292           | Cable drums. Cable winches. Sheaves                                                                                    |
| .213        | Non-concentric cables                                                                            |                |                                                                                                                        |
|             | →679.746 Manufacture of wires and cables according to field of application                       | 621.315.3      | INSULATED WIRES, FLEXIBLE CORDS. INTERIOR WIRING                                                                       |
| .1          | With stranded conductors                                                                         |                | →679.74 Manufacture of wires and cables for conducting electricity (conductors for power and signals)                  |
| .12         | With two conductors                                                                              | .32            | Insulated wires according to their particular application                                                              |
| .13         | With three conductors                                                                            |                | →621.365 Electric heating                                                                                              |

|                     |                                                                                                 |           |                                                                                                                                          |
|---------------------|-------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------|
| 621.315.32 (cont'd) | 679.745 Manufacture of wires and cables according to construction                               | 621.315.6 | INSULATING MATERIALS. INSULATORS. INSULATOR SUPPORTS. DISTRIBUTION AND TRANSMISSION LINE ACCESSORIES                                     |
| .322                | For use in high-temperature surroundings.                                                       |           | <i>For insulation co-ordination → 621.316.91.048</i>                                                                                     |
| .2                  | Heat-resistant wires                                                                            |           | →621.317.333 Insulating testing                                                                                                          |
| .3                  | Ignition wires                                                                                  | .61       | <b>Insulating materials (insulants). Dielectric materials</b>                                                                            |
| .3                  | Furnace leads. Oven leads etc.                                                                  |           | <i>Individual materials are preferably denoted by subdividing 621.315.611/.619 by colon combination with the number for the material</i> |
| .4                  | Soil-heating wires                                                                              |           | <i>The form of material may be denoted by the -4 special auxiliary subdivisions, e.g. 621.315.61-418 Insulating tape</i>                 |
| .323                | To resist effects of tropical climates                                                          | .611      | Solid insulating materials in general                                                                                                    |
| .324                | For use under conditions of severe mechanical stress                                            | .612      | Ceramic and similar materials. Porcelain. Glass. Vitreous enamel                                                                         |
| .325                | To resist chemical attack                                                                       | .2        | Porcelain                                                                                                                                |
| .328                | To meet other service conditions                                                                | .3        | Containing talc and steatite                                                                                                             |
|                     | <i>Further particulars may be denoted by colon combination with the subdivisions of 620.193</i> | .4        | Containing titanium dioxide                                                                                                              |
| .33                 | Insulated wires according to the material of covering                                           | .5        | Stoneware. Concrete                                                                                                                      |
|                     | 621.315.33 ≅ 621.315.61, e.g.                                                                   | .6        | Glass                                                                                                                                    |
|                     | 621.315.334.7 Textile-insulated, e.g. cotton-insulated                                          | .7        | Vitreous enamel                                                                                                                          |
|                     | .337.4 Lacquered. Enamelled                                                                     | .8        | Refractory oxides. Magnesium oxide, zirconium oxide and similar oxides as insulating materials                                           |
| .34                 | Insulated stranded conductors. Flexible cord (flex)                                             |           | →666.762 Refractory bodies and products according to composition                                                                         |
|                     | →621.315.145 Stranded bare lines                                                                | .613      | Natural mineral insulants                                                                                                                |
|                     | 621.315.2 Cables (sheathed etc.)                                                                | .1        | Mica. Mica products                                                                                                                      |
|                     | 679.746 Manufacture of wires and cables according to field of application                       | .2        | Asbestos. Asbestos products                                                                                                              |
| .342                | Flexible cord                                                                                   | .4        | Slate                                                                                                                                    |
| .346                | Litz wires                                                                                      | .5        | Marble                                                                                                                                   |
| .35                 | With protective metal sheathing                                                                 | .6        | Sulphur                                                                                                                                  |
| .36                 | Screened wires                                                                                  | .7        | Quartz, silica                                                                                                                           |
| .37                 | Fixing of insulated wires                                                                       | .9        | Other natural mineral insulating materials                                                                                               |
| .372                | Directly to the wall                                                                            | .614      | Textiles. Fibrous materials                                                                                                              |
| .374                | On insulating supports                                                                          | .1        | Vulcanized fibre                                                                                                                         |
| 621.315.5           | CONDUCTORS, SEMICONDUCTORS OF SPECIFIED MATERIALS                                               | .4        | Wood. Cork                                                                                                                               |
|                     | <i>Individual materials may be denoted by colon combination</i>                                 | .5        | Leather                                                                                                                                  |
| .55                 | Metal or metal alloy conductors                                                                 | .6        | Paper. Pressboard                                                                                                                        |
|                     | <i>Individual metals may be denoted by colon combination with the subdivisions of 669, e.g.</i> |           | <i>For fabricated structures of resin-bonded paper → 621.315.619</i>                                                                     |
|                     | 621.315.55:669.3-418 Copper strip conductors                                                    | .61       | Untreated papers                                                                                                                         |
| .551                | With high melting points. Resistance alloys, e.g. heating elements                              | .62       | Varnished papers                                                                                                                         |
| .552                | With low melting points. Fusible alloys                                                         | .63       | Metallized papers                                                                                                                        |
| .553                | With constant resistance                                                                        | .64       | Other treated papers, e.g. oil-impregnated, wax-impregnated                                                                              |
| .554                | Bimetallic conductors, e.g. in heat regulators, relays etc.                                     | .65       | Pressboard                                                                                                                               |
| .56                 | Carbon, e.g. graphite conductors                                                                | .7        | Textile fibres (cotton, silk etc.)                                                                                                       |
| .57                 | Other solid (non-metallic) conductors                                                           |           | <i>For fibres and fabric of inorganic substances (e.g. glass, asbestos) see under the other appropriate subdivisions</i>                 |
| .58                 | Liquid conductors                                                                               | .71       | Untreated textiles                                                                                                                       |
| .59                 | Conductors with very high resistance. Semiconductors                                            | .72       | Varnished textiles                                                                                                                       |
|                     | <i>For semiconductor devices → 621.382</i>                                                      | .73       | Other treated textiles e.g. bonded                                                                                                       |
| .592                | Electronic semiconductors                                                                       | .615      | Liquid insulants used in the liquid state                                                                                                |
| .2                  | Pure materials                                                                                  | .2        | Mineral oils. Transformer oils.                                                                                                          |
| .3                  | Alloyed materials                                                                               |           | Circuit-breaker oils                                                                                                                     |
| .4                  | Oxides. Mixtures of oxides                                                                      | .22       | Pure mineral oils                                                                                                                        |
| .9                  | Other compounds                                                                                 |           |                                                                                                                                          |

|                |                                                                   |             |                                                                                           |
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| 621.315.615.23 | Mixtures of mineral oils with other materials                     | 621.315.624 | Suspension insulators. String insulators                                                  |
| .9             | Carbon tetrachloride                                              | .4          | Cap and pin insulators                                                                    |
| .616           | Macromolecular insulants. Rubbers. Plastics. Synthetic materials  | .5          | Solid core insulators                                                                     |
| .1             | Soft (vulcanized) natural rubber                                  | .6          | Insulators for traction contact wires                                                     |
| .4             | Ebonite                                                           | .61         | Cap shape insulators                                                                      |
| .5             | Other natural rubbers                                             | .63         | Solid-core type insulators                                                                |
| .51            | Gutta-percha                                                      | .65         | Hewlett type insulators                                                                   |
| .52            | Balata                                                            | .67         | Diabolo insulators                                                                        |
| .7             | Artificial rubbers. Regenerated rubbers                           | .7          | Hewlett insulators                                                                        |
| .9             | Various plastic substances                                        | .8          | Special insulators, e.g. for use in polluted atmospheres (fog-type)                       |
| .92            | Cellulose derivatives                                             | .625        | Shackle insulators. Strain insulators                                                     |
| .95            | Natural resins                                                    |             | 621.315.625 $\cong$ 621.315.624                                                           |
| .96            | Synthetic resins                                                  | .626        | Bushings                                                                                  |
| .97            | Filling compounds                                                 | .1          | Bushing insulators                                                                        |
| .98            | Paraffins. Waxes                                                  | .2          | Lead-in conductors                                                                        |
| .617           | Dried liquid insulants                                            | .3          | Lead-in bushes                                                                            |
| .1             | Paints                                                            | .4          | Other devices for leading-in                                                              |
| .2             | Drying oils                                                       | .5          | Protection of bushings from rain etc.                                                     |
| .3             | Varnishes                                                         | .627        | Spool insulators. Devices for fixing to the wall                                          |
| .4             | Lacquers. Enamel substitutes                                      | .629        | Other types of insulator                                                                  |
| .5             | Compounds containing silicon, e.g. sodium silicate, silicones     | .65         | <b>Insulator supports. Fixing the insulators</b>                                          |
| .618           | Gaseous insulants                                                 | .652        | Insulator supports. Fixing the insulators to the supports                                 |
| .2             | Air                                                               | .653        | Non-insulating supports for line wires                                                    |
| .3             | Nitrogen                                                          | .654        | Fixing the supports to walls, masts etc.                                                  |
| .4             | Carbon dioxide                                                    | .66         | <b>Poles, masts, pylons, towers (for support of overhead line)</b>                        |
| .9             | Other gases                                                       |             | →624.97 Masts. Pylons. Towers — Civil and structural engineering                          |
| .619           | Insulators according to their structure (rolled, laminated, etc.) | .661        | Generalities. Spacing                                                                     |
| .3             | Compound insulants. Barriers                                      | .663        | For straight runs of line, e.g. poles, pylons                                             |
| .62            | <b>Insulators. Bushings</b>                                       |             | 621.315.663 $\cong$ 621.315.668                                                           |
| .622           | Insulators according to shape                                     | .664        | For changes of horizontal direction, for lateral rigidity, e.g. angle towers and supports |
| .1             | Single-cup insulators                                             |             | 621.315.664 $\cong$ 621.315.668                                                           |
| .2             | Double-cup insulators                                             | .665        | For longitudinal rigidity, e.g. anchor and dead-end towers, terminal poles                |
| .3             | Multiple-cup insulators                                           |             | 621.315.665 $\cong$ 621.315.668                                                           |
| .6             | Diabolo insulators                                                | .668        | According to the material used                                                            |
| .8             | Other shapes of insulator                                         | .1          | Of wood                                                                                   |
| .623           | Post-type, pedestal-type insulators. Pin-type insulators          | .2          | Of iron, steel                                                                            |
| .4             | Indoor types of insulator                                         | .3          | Of concrete                                                                               |
| .41            | Single (one-piece), plain or smooth insulators                    | .9          | Of other materials                                                                        |
| .42            | Single (one-piece), complex insulators e.g. ribbed                | .669        | According to their use                                                                    |
| .45            | Multiple (multi-piece), plain or smooth insulators                | .67         | <b>Protective enclosures. Conduits (wiring). Boxes. Fittings for insulated wires</b>      |
| .46            | Multiple (multi-piece), complex insulators e.g. ribbed            | .671        | Conduits. Pipes. Ducts                                                                    |
| .5             | Outdoor types of insulator                                        | .673        | Boxes. Distribution boxes. Ceiling roses                                                  |
| .51            | Single (one-piece) insulators, with screen                        |             | <i>For boxes and covers for switchgear and fuses</i> → 621.316.36                         |
| .55            | Multiple (multi-piece) insulators                                 | .1          | Distribution boxes                                                                        |
| .551           | Built up of post-type insulators                                  | .2          | Ceiling roses                                                                             |
| .552           | Built up of pin-type insulators                                   | .3          | Other accessories                                                                         |
| .553           | Built up of cap insulators                                        | .674        | Fixing of conduits, pipes, ducts. Conduit fittings                                        |
| .554           | Built up of solid-core insulators                                 | .68         | <b>Junctions. Splicing of electric wires and cables</b>                                   |
| .7             | Pin-type insulators                                               | .682        | Permanent joints and connections                                                          |
| .71            | Single bell insulators                                            |             |                                                                                           |
| .73            | Multiple bell insulators                                          |             |                                                                                           |
| .75            | Solid core insulators                                             |             |                                                                                           |
| .78            | Other pin-type insulators                                         |             |                                                                                           |

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                                                                                                                                                                                                              |
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| 621.315.683 | Junctions, connectors (rigid, articulated etc.)<br>→621.316.541 Plug-and-socket (switch) devices                                                                                                                                                                                                                                                                                                                                                           | 621.316.176 | Electrical installations in factories, mines, exhibitions etc.<br><i>Further particulars may be denoted by colon combination e.g.</i><br>621.316.176:622 In mines                                                            |
| .684        | Terminals. Soldering tags. Binding screws (non-permanent junctions)                                                                                                                                                                                                                                                                                                                                                                                        | .178        | Electrical installations for traffic and transport purposes<br>→621.33 Electric traction and locomotion<br><i>Further particulars may be denoted by colon combination, e.g.</i><br>621.316.178:628.971.6 For street lighting |
| .685        | Terminal boxes                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |                                                                                                                                                                                                                              |
| .687        | Cable junction details. Protective accessories etc.                                                                                                                                                                                                                                                                                                                                                                                                        |             |                                                                                                                                                                                                                              |
| .1          | Cable splicing. Cable jointing                                                                                                                                                                                                                                                                                                                                                                                                                             |             |                                                                                                                                                                                                                              |
| .2          | Junction boxes<br>621.315.687.22/.25 each $\cong$ 621.315.21                                                                                                                                                                                                                                                                                                                                                                                               |             |                                                                                                                                                                                                                              |
| .22         | Straight-through joints                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |                                                                                                                                                                                                                              |
| .23         | Tee joints                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 621.316.3   | SWITCHGEAR IN GENERAL. CONNECTIONS<br><i>The .061/.062 special auxiliaries are particularly applicable here</i>                                                                                                              |
| .24         | Soldered joints                                                                                                                                                                                                                                                                                                                                                                                                                                            |             |                                                                                                                                                                                                                              |
| .25         | Barrier joints                                                                                                                                                                                                                                                                                                                                                                                                                                             | .31         | <b>Switch and wiring diagrams. Layout of complete installations</b><br>→621.3.061 Circuit diagrams<br>744.423 Circuit diagrams (drawing)                                                                                     |
| .3          | Sealing ends. Sealing boxes                                                                                                                                                                                                                                                                                                                                                                                                                                | .311        | Indoor installations                                                                                                                                                                                                         |
| .4          | Cable sockets. Sweating thimbles                                                                                                                                                                                                                                                                                                                                                                                                                           | .312        | Outdoor installations                                                                                                                                                                                                        |
| .6          | Protecting boxes, glands                                                                                                                                                                                                                                                                                                                                                                                                                                   | .313        | Special installations for research and experiment, e.g. network analysers                                                                                                                                                    |
| 621.316     | <b>DISTRIBUTION AND CONTROL SWITCHGEAR. CIRCUIT-BREAKERS. REGULATION. PROTECTION</b><br><i>The .06 special auxiliaries are particularly applicable to 621.316.3/.5 and the .07 special auxiliaries to 621.316.7</i><br><i>For telecontrol use 621.398 combined by colon with the number of the application</i>                                                                                                                                             | .318        | Illuminated switching-diagrams etc.                                                                                                                                                                                          |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .34         | <b>Switchboards. Switchboard panels etc.</b>                                                                                                                                                                                 |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .342        | Construction. Mounting                                                                                                                                                                                                       |
| 621.316.1   | <b>DISTRIBUTION NETWORKS AND INSTALLATIONS IN BUILDINGS, OFFICES, FACTORIES ETC.</b><br><i>The .051/.052 special auxiliaries are particularly applicable here, "Distribution" being substituted for "Transmission" in the original text</i><br><i>For networks regarded from a regional point of view and systems comprising power stations, distribution lines, substations etc → 621.311</i><br><i>For electrical installations in buildings → 696.6</i> | .1          | Panels and platforms for switchboards. Pillars                                                                                                                                                                               |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .2          | Fixing and arrangement of the apparatus                                                                                                                                                                                      |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .344        | Distribution or control cubicles<br>621.316.344/.349 each $\cong$ 621.316.342                                                                                                                                                |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .345        | Control decks                                                                                                                                                                                                                |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .346        | Control posts. Columns                                                                                                                                                                                                       |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .347        | Control pedestals                                                                                                                                                                                                            |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .349        | Other types of switchboard                                                                                                                                                                                                   |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .35         | <b>Busbars. Busbar connections. Busbar systems</b>                                                                                                                                                                           |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .351        | Bare busbars on insulated supports.                                                                                                                                                                                          |
| .11         | Generalities. Methods of network calculation<br><i>For calculating boards (network analysers) → 621.316.313</i>                                                                                                                                                                                                                                                                                                                                            | .352        | Connections to the busbars. Branches                                                                                                                                                                                         |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | .36         | Completely insulated busbars. Connections to the busbars. Branches                                                                                                                                                           |
| .12         | Direct-current networks                                                                                                                                                                                                                                                                                                                                                                                                                                    |             | <b>Protective arrangements for electrical equipment. Boxes. Cases. Hoods. Covers etc.</b><br><i>For boxes and covers protecting installation wiring → 621.315.67 For boxes and covers to protect cables → 621.315.687</i>    |
| .13         | Alternating-current networks                                                                                                                                                                                                                                                                                                                                                                                                                               | .361        | Covers of wood or insulating materials                                                                                                                                                                                       |
| .14         | Mixed networks                                                                                                                                                                                                                                                                                                                                                                                                                                             | .362        | Metal covers. Metal cladding                                                                                                                                                                                                 |
| .15         | Area covered by networks. Power consumption in relation to the size of the network                                                                                                                                                                                                                                                                                                                                                                         | .363        | Covers of special construction. Interlocking                                                                                                                                                                                 |
| .17         | Electrical installations in buildings or on sites, in vehicles, for traffic and transport purposes                                                                                                                                                                                                                                                                                                                                                         | .364        | Systems of covers. Assembling of covers                                                                                                                                                                                      |
| .172        | Electrical installations in houses, shops, office buildings, hotels, schools, theatres, farms etc.                                                                                                                                                                                                                                                                                                                                                         | .37         | <b>Switchgear plant in general. General control platform</b>                                                                                                                                                                 |
| .174        | Electrical installations in vehicles<br>→629.1.066 Electrical installations in vehicles<br><i>Further particulars may be denoted by colon combination with the subdivisions of 629, e.g.</i><br>621.316.174:629.113 In motor vehicles:<br>:629.4 In railway vehicles                                                                                                                                                                                       | .378        | Emergency switchgear installations                                                                                                                                                                                           |
|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 621.316.5   | <b>CLOSING AND OPENING OF CIRCUITS. SWITCHES. ISOLATORS. CIRCUIT-BREAKERS. HOLDERS</b><br>→621.3.066.6 Design of the (switch) contacts<br>621.395.65 Telephone switching apparatus. Switchboards                             |

|                    |                                                                                                                                                            |             |                                                                                                                                                                                            |
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| 621.316.5 (cont'd) | <i>The .064/.067 special auxiliaries are particularly applicable here</i>                                                                                  | 621.316.546 | Interruption and switches. Change-over switches with contacts in mercury or other conducting liquids                                                                                       |
| .52                | <b>Interruption (tremblers) in general</b><br><i>For interruption with mercury contacts → 621.316.546</i>                                                  | .1          | Mercury interruption                                                                                                                                                                       |
| .53                | <b>Contactors</b>                                                                                                                                          | .2          | Mercury jet interruption                                                                                                                                                                   |
| .54                | <b>Switching devices</b><br>→ 621.316.57 Circuit-breakers<br><i>Oil-break and air-break switches may be denoted by the .064.24/.25 special auxiliaries</i> | .3          | Mercury change-over switches                                                                                                                                                               |
| .541               | Plug-and-socket devices<br>→ 621.315.683 Connectors                                                                                                        | .549        | Other switches and change-over switches not specified above                                                                                                                                |
| .1                 | General                                                                                                                                                    | .56         | <b>Battery-regulating switches</b>                                                                                                                                                         |
| .11                | Sockets                                                                                                                                                    | .561        | Single battery switches                                                                                                                                                                    |
| .111               | Fixed sockets                                                                                                                                              | .562        | Double battery switches                                                                                                                                                                    |
| .112               | Movable sockets                                                                                                                                            | .564        | Charging switches                                                                                                                                                                          |
| .12                | Plugs                                                                                                                                                      | .567        | Automatic battery-regulating switches                                                                                                                                                      |
| .2                 | Plug contacts                                                                                                                                              | .57         | <b>Automatic interruption in general. Circuit-breakers</b><br><i>Further particulars may be denoted by the .064 special auxiliaries, e.g.</i>                                              |
| .3                 | Plug switches<br><i>For switches in general → 621.316.542</i>                                                                                              |             | 621.316.57.064.241 Air-break                                                                                                                                                               |
| .4                 | Plug change-over switches<br><i>For change-over switches in general → 621.316.543</i>                                                                      | .573        | .25 Oil-break                                                                                                                                                                              |
| .542               | Switches (according to type of mechanical action)<br>→ 621.316.545 Section switches (isolators)                                                            | .574        | .45 Air-blast                                                                                                                                                                              |
| .1                 | Lever switches                                                                                                                                             |             | Circuit-breakers with overcurrent releases                                                                                                                                                 |
| .11                | Knife switches                                                                                                                                             | .574        | Circuit-breakers with undercurrent releases                                                                                                                                                |
| .12                | Laminated-brush switches                                                                                                                                   | .575        | Circuit-breakers with overcurrent and power-reversal releases                                                                                                                              |
| .2                 | Rotary switches. Drum switches<br>→ 621.316.544.3 Packet rotary switches                                                                                   | .576        | Circuit-breakers with undervoltage no-close releases                                                                                                                                       |
| .22                | Switches with plane contact                                                                                                                                | .577        | Combination and other circuit-breakers                                                                                                                                                     |
| .23                | Switches with cylindrical contact (drum switches)                                                                                                          | .578        | Circuit-breakers actuated by some external means, independent of the closed circuit                                                                                                        |
| .3                 | Push-button switches                                                                                                                                       | .1          | Time switches<br>→ 681.118.5 Time control mechanisms                                                                                                                                       |
| .4                 | Cord switches                                                                                                                                              | .58         | <b>Holders</b><br>→ 621.3.032 Individual parts of electric lamps, discharge tubes etc.                                                                                                     |
| .6                 | Switches with rectilinear sliding action                                                                                                                   |             | 621.3.048 Insulation of machines and apparatus                                                                                                                                             |
| .7                 | Roller switches                                                                                                                                            |             | <i>Type of protection and protection against accidental contact with moving parts etc., may be denoted by the -213 and -783.3 special auxiliaries, respectively, listed under 62, e.g.</i> |
| .8                 | Horn switches                                                                                                                                              |             | 62-213.34 Gastight. Flameproof.                                                                                                                                                            |
| .9                 | Other forms                                                                                                                                                |             | Explosion-proof                                                                                                                                                                            |
| .543               | Change-over switches                                                                                                                                       |             | -783.3 Protection against accidental contact with moving parts                                                                                                                             |
| .1                 | Two-way switches. Reversing switches                                                                                                                       | .581        | Screw holders                                                                                                                                                                              |
| .2                 | Multiway switches                                                                                                                                          | .582        | Pin holders. Bayonet holders                                                                                                                                                               |
| .3                 | Step switches                                                                                                                                              | .583        | Holders for fluorescent tubes                                                                                                                                                              |
| .544               | Combination switches. Selectors                                                                                                                            | .584        | Holders for special lamps, e.g. for bipost lamps                                                                                                                                           |
| .1                 | Controllers in general<br><i>For series-parallel and star-delta regulators → 621.316.765</i><br><i>For electric traction control gear → 621.337.2</i>      | .585        | Electron tube holders                                                                                                                                                                      |
| .3                 | Packet rotary switches                                                                                                                                     | 621.316.7   | <b>REGULATION IN GENERAL. REGULATORS</b><br>→ 681.527 Electrical and magnetic automatic control systems                                                                                    |
| .4                 | Selector switches                                                                                                                                          |             | .53 Automatic control systems according to the physical variable controlled                                                                                                                |
| .9                 | Various combination switches not specified above                                                                                                           |             | <i>Electrical engineering aspects of regulation and electrical regulators as independent apparatus are classed here, e.g.</i>                                                              |
| .545               | Section switches. Isolators<br><i>For section fuses → 621.316.923.5</i>                                                                                    |             | 621.316.722 Voltage regulators                                                                                                                                                             |
| .1                 | One-way section switches                                                                                                                                   |             |                                                                                                                                                                                            |
| .2                 | Two-way section switches. Section reversers                                                                                                                |             |                                                                                                                                                                                            |
| .3                 | Earthing section                                                                                                                                           |             |                                                                                                                                                                                            |

|                    |                                                                                                                                                           |             |                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 621.316.7 (cont'd) | 621.316.727 Power-factor correction<br><i>Methods of regulation may be denoted by the .076/.078 special auxiliaries, e.g.</i>                             | 621.316.765 | Regulation involving distinctive connections                                                                                                                                                  |
|                    | 621.316.727.077.8 Power-factor correction by capacitors                                                                                                   | .1          | Star-delta connection. Star-delta controllers                                                                                                                                                 |
|                    | <i>Additionally, the particular type of equipment may be denoted by colon combination, e.g.</i>                                                           | .2          | Series-parallel controllers                                                                                                                                                                   |
|                    | 621.313.2:621.316.722.076.6 Voltage regulation of d.c. generators by auxiliary circuits                                                                   | .771        | Regulation by means of resistors<br>→621.316.8 Resistors                                                                                                                                      |
|                    |                                                                                                                                                           | .79         | <b>Electric regulation of non-electrical quantities other than motion</b><br><i>For regulation of magnetic quantities → 621.316.73</i><br><i>For temperature control in general → 662.927</i> |
| .71                | <b>Electric regulation and regulators of motion. Electric starting and braking</b><br><i>For controls for electric locomotives and vehicles → 621.337</i> | 621.316.8   | <b>RESISTORS. RHEOSTATS</b><br><i>The conducting or insulating material may be denoted by colon combination with the subdivisions of 621.315.5/.6</i>                                         |
| .717               | Electric starting in general. Starters                                                                                                                    | .82         | Variable resistors. Rheostats<br>→621.316.544.1 Controllers                                                                                                                                   |
| .718               | Control of motion                                                                                                                                         |             | 621.316.717 Electric starting. Starters                                                                                                                                                       |
| .1                 | Change of motion. Reversal                                                                                                                                | .824        | Adjusting devices                                                                                                                                                                             |
| .5                 | Speed regulators                                                                                                                                          | .825        | Variable resistors dependent on temperature. Thermistors                                                                                                                                      |
| .719               | Electric braking in general                                                                                                                               | .2          | Thermistors with positive temperature coefficient. Barretters                                                                                                                                 |
| .2                 | Electric brakes                                                                                                                                           | .4          | Thermistors with negative temperature coefficient                                                                                                                                             |
| .3                 | Regenerative braking                                                                                                                                      | .84         | Metallic resistors in general                                                                                                                                                                 |
| .72                | <b>Regulation of electrical quantities in general</b>                                                                                                     | .842        | Metal-wire resistors                                                                                                                                                                          |
| .721               | Current regulation. Current regulators                                                                                                                    | .843        | Metal-ribbon resistors                                                                                                                                                                        |
| .722               | Voltage regulation. Voltage regulators<br>→621.314.214 Adjustable and variable ratio transformers                                                         | .844        | Cast-iron grid resistors                                                                                                                                                                      |
|                    | 621.314.222.76 Booster regulating transformers                                                                                                            | .845        | Sheet-iron grid resistors                                                                                                                                                                     |
| .1                 | Regulators for maintaining constant voltage. Voltage stabilizers                                                                                          | .849        | Other metallic resistors, e.g. film resistors                                                                                                                                                 |
| .2                 | Regulators for increasing voltage. Boosters                                                                                                               | .86         | Non-metallic solid resistors, e.g. carbon                                                                                                                                                     |
| .3                 | Regulators for decreasing voltage. Negative boosters                                                                                                      | .87         | Liquid resistors                                                                                                                                                                              |
| .4                 | Regulators for dividing voltage. Voltage dividers                                                                                                         | .88         | Gas resistors                                                                                                                                                                                 |
| .9                 | Other voltage-regulating devices                                                                                                                          | .89         | Mixed and other types                                                                                                                                                                         |
| .723               | Impedance regulation                                                                                                                                      | 621.316.9   | <b>PROTECTION. PROTECTIVE DEVICES. FUSES. LIGHTNING PROTECTION. EARTHING</b>                                                                                                                  |
| .2                 | Resistance regulation. Impedance regulation                                                                                                               | .91         | <b>Protection against over-currents and over-voltages in general</b><br><i>Further particulars may be denoted by special auxiliaries, e.g.</i><br>621.316.91.048 Insulation co-ordination     |
| .3                 | Inductance regulation                                                                                                                                     | .92         | <b>Protection against over-currents and over-voltages of internal origin</b>                                                                                                                  |
| .4                 | Capacitance regulation                                                                                                                                    | .923        | Fuses                                                                                                                                                                                         |
| .726               | Frequency regulation. Frequency regulators                                                                                                                | .1          | Open fuses                                                                                                                                                                                    |
| .727               | Regulation of phase difference in general. Power factor correctors                                                                                        | .2          | Cartridge fuses                                                                                                                                                                               |
| .728               | Electric power regulation. Power regulators. Load regulators                                                                                              | .3          | Plug fuses                                                                                                                                                                                    |
| .729               | Synchronization. Synchronizers                                                                                                                            | .4          | Horn fuses                                                                                                                                                                                    |
| .73                | <b>Regulation and regulators of magnetic quantities</b>                                                                                                   | .5          | Section fuses. Isolating fuses                                                                                                                                                                |
| .731               | Regulation of magnetic induction. Induction regulators                                                                                                    | .6          | Multiple fuses                                                                                                                                                                                |
| .76                | <b>Regulators according to method of action</b>                                                                                                           | .7          | Miniature fuses                                                                                                                                                                               |
| .761.2             | Regulation by compensation. Compensators<br>→621.313.226.2 Machines for lowering the voltage                                                              | .9          | Other types of fuse                                                                                                                                                                           |
|                    |                                                                                                                                                           | .925        | Protection by relays. Selective protection<br>→621.318.5 Relays                                                                                                                               |
|                    |                                                                                                                                                           | .1          | Protection in general                                                                                                                                                                         |
|                    |                                                                                                                                                           | .2          | Protection by the Merz-Price system. Differential protection                                                                                                                                  |

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| 621.316.925.4 | Protection by relays acting on the circuit-breakers<br>→621.316.57 Circuit-breakers                                                                          | 621.316.974 (cont'd) | →621.3.013.71 Inductive interference between power and communication lines                                                                                                                              |
| .42           | Over-voltage relays                                                                                                                                          |                      | 621.3.054 Special arrangements with reference to the inductance and capacitance of transmission lines                                                                                                   |
| .43           | Over-current relays                                                                                                                                          |                      | 621.391.823 Interference due to electric power systems and apparatus (man-made interference)                                                                                                            |
| .44           | Thermal relays                                                                                                                                               |                      |                                                                                                                                                                                                         |
| .45           | Distance relays                                                                                                                                              |                      |                                                                                                                                                                                                         |
| .451          | Impedance relays                                                                                                                                             |                      |                                                                                                                                                                                                         |
| .452          | Reactance relays                                                                                                                                             |                      |                                                                                                                                                                                                         |
| .926          | Protective devices based on the heating of insulating or other material, e.g. heating of oil in transformers                                                 | .98                  | <b>Lightning conductors</b>                                                                                                                                                                             |
| .93           | <b>Protection against over-current or overvoltage of external origin. Surge protection. Lightning protection</b><br>→621.316.99 Earthing                     | .99                  | <b>Earthing</b><br><i>For earthing reactors → 621.316.935</i>                                                                                                                                           |
| .932          | Protection against flashover. Flasher-arc extinction                                                                                                         | .991                 | General. Connection of parts. Spacing                                                                                                                                                                   |
| .933          | Surge diverters. Arresters. Protective gaps                                                                                                                  | .992                 | Earth wire                                                                                                                                                                                              |
| .1            | Sphere gaps. Rod gaps                                                                                                                                        | .993                 | Earthing resistance. Resistance to earth                                                                                                                                                                |
| .2            | Horn gaps                                                                                                                                                    | .995                 | Earth electrodes (plates, rods etc)                                                                                                                                                                     |
| .3            | Roller, cylinder, disc, needle gaps                                                                                                                          | .996                 | Other apparatus and materials used                                                                                                                                                                      |
| .4            | Arresters using dielectrics                                                                                                                                  | .997                 | Earthing by means of a liquid or water jet                                                                                                                                                              |
| .5            | Liquid arresters<br><i>For electrolytic lightning arresters → 621.316.938</i>                                                                                | .998                 | Counterpoises<br><i>For aerial counterpoises → 621.396.679.2</i>                                                                                                                                        |
| .6            | Discharge tubes. Gas-filled protectors                                                                                                                       | .999                 | Other methods                                                                                                                                                                                           |
| .8            | Contact protectors                                                                                                                                           | 621.317              | <b>ELECTRICAL MEASUREMENT (METHODS AND APPARATUS)</b><br><i>Units of measurement, methods and construction details may be denoted by the .08 special auxiliaries</i>                                    |
| .9            | Other types                                                                                                                                                  |                      |                                                                                                                                                                                                         |
| .935          | Protective devices based on inductance. Current-limiting reactors. Line choking coils. Earthing reactors. Arc-suppression coils<br>→621.318.4 Inductor coils | 621.317.1            | PROCEDURE OF CARRYING OUT A GIVEN MEASUREMENT                                                                                                                                                           |
| .1            | Coils with iron core, e.g. Petersen coils                                                                                                                    | .18                  | Qualitative indication in general. Indicators in general                                                                                                                                                |
| .2            | Coils without iron core, with air core                                                                                                                       | 621.317.2            | EQUIPMENT FOR ELECTRICAL LABORATORIES. LABORATORIES FOR TESTING, CALIBRATION ETC<br><i>Further particulars may be denoted by colon combination, e.g. 621.317.2:621.315.2 Cable-testing laboratories</i> |
| .3            | Adjustable coils                                                                                                                                             |                      |                                                                                                                                                                                                         |
| .936          | Protective capacitors<br>→621.319.4 Capacitors                                                                                                               |                      |                                                                                                                                                                                                         |
| .937          | Combined protective devices, e.g. capacitors and coils                                                                                                       | 621.317.3            | MEASUREMENT OF ELECTRICAL QUANTITIES                                                                                                                                                                    |
| .938          | Protective devices based on the electrolytic action of the current. Electrolytic lightning arresters                                                         | .31                  | <b>Measurement of current, quantity of electricity</b><br><i>Further particulars may be denoted by special auxiliaries, e.g. 621.317.31.014.33 Measurement of impulse currents</i>                      |
| .94           | <b>Protection against transients of internal origin (harmonics, steep wave-fronts)</b>                                                                       |                      |                                                                                                                                                                                                         |
| .95           | <b>Protection against the combined effects of several electrical influences</b>                                                                              | .311                 | Direct current measurement                                                                                                                                                                              |
| .96           | <b>Protection against mechanical accidents</b>                                                                                                               | .312                 | Alternating current measurement<br><i>Frequency ranges may be denoted by the .029 special auxiliaries</i>                                                                                               |
| .962          | Protection against breakage of electric lines                                                                                                                | .313                 | High-frequency alternating current measurement                                                                                                                                                          |
| .963          | Protection against breakage of electric lines at crossings                                                                                                   | .318                 | Measurement of quantity of electricity. Charge measurement                                                                                                                                              |
| .969          | Protection against other mechanical accidents                                                                                                                | .32                  | <b>Measurement of electromotive force, potential, field strength, voltage</b>                                                                                                                           |
| .97           | <b>Protection against magnetic influences, mutual inductance and earth currents</b>                                                                          | .321                 | Measurement of electromotive force, potential, potential difference and voltage gradient. Measurement of d.c. potential                                                                                 |
| .972          | Protection against influence of the Earth's magnetic field                                                                                                   | .322                 | Measurement of a.c. potential<br><i>Frequency gauges may be denoted by the .029 special auxiliaries</i>                                                                                                 |
| .973          | Protection against earth current                                                                                                                             |                      |                                                                                                                                                                                                         |
| .974          | Protection against mutual inductance                                                                                                                         |                      |                                                                                                                                                                                                         |

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| 621.317.326 | Peak voltage measurement. Impulse voltage measurement                                                                          | .3          | Intermodulation measurement                                                                |
| .328        | Electromagnetic field strength measurement                                                                                     | 621.317.353 | Measurement of harmonics and modulation                                                    |
| .329        | Delineation of electric field or potential, e.g. with electrolytic trough                                                      | .1          | Distortion factor measurement                                                              |
| .33         | <b>Measurement of resistance, impedance, conductance and reactance</b>                                                         | .36         | <b>Measurement of frequency, wavelength</b>                                                |
| .331        | Direct-current resistance and conductance measurement                                                                          | .361        | Frequency measurement                                                                      |
| .332        | Impedance, reactance and resistance measurement (a.c.)                                                                         |             | <i>Frequency ranges may be denoted by the .029 special auxiliaries</i>                     |
|             | <i>Frequency ranges may be denoted by the .029 special auxiliaries</i>                                                         | .365        | Wavelength measurement                                                                     |
| .1          | Impedance measurement. Coupling factor                                                                                         | .37         | <b>Measurement of power factor and phase difference. Determination of phase sequence</b>   |
| .2          | Reactance measurement                                                                                                          | .372        | Power-factor                                                                               |
| .3          | Resistance measurement                                                                                                         | .373        | Phase difference. Phase angle                                                              |
| .6          | Measurement of alternating current resistance ratio (matching errors, image errors, reflection factor, attenuation distortion) | .374        | Loss angle                                                                                 |
| .333        | Insulation testing                                                                                                             | .375        | Phase sequence. Phase rotation                                                             |
| .4          | Location of faults                                                                                                             | .38         | <b>Measurement of power and energy</b>                                                     |
| .41         | During operation                                                                                                               | .382        | Active power measurement. Reactive volt-amperes measurement. Apparent power measurement    |
| .42         | Out of operation                                                                                                               |             | Energy losses. Power losses                                                                |
| .6          | Disruptive testing. Electric strength measurement. Measurement of resistance to tracking                                       | .384        | Energy consumption, e.g. two-wattmeter method                                              |
| .8          | Impulse testing                                                                                                                | .385        |                                                                                            |
| .82         | High-voltage impulse testing                                                                                                   | .39         | <b>Electrical measurement of non-electrical quantities</b>                                 |
| .83         | High-current impulse testing                                                                                                   |             | →536.53 Electrical thermometry methods                                                     |
| .334        | Measurement of inductance                                                                                                      |             | <i>Further particulars may be denoted by colon combination e.g.</i>                        |
| .2          | Self inductance measurement                                                                                                    |             | 621.317.39:531.7 Measurement of geometrical and mechanical quantities                      |
| .3          | Mutual inductance measurement                                                                                                  |             | :536 Measurement of heat, temperature etc.                                                 |
| .335        | Measurement of capacitance, permittivity                                                                                       | 621.317.4   | <b>MEASUREMENT OF MAGNETIC QUANTITIES. APPARATUS FOR MAGNETIC TESTING</b>                  |
| .2          | Capacitance measurement                                                                                                        |             | <i>For terrestrial magnetism → 537.67, 550.38</i>                                          |
| .3          | Permittivity measurement                                                                                                       | .41         | Permeability measurement. Susceptibility measurement                                       |
| .337        | Measurement of circuit quality. Q-factor measurement                                                                           | .411        | Permeability measurement                                                                   |
| .34         | <b>Measurement of transmission characteristics of networks and lines</b>                                                       | .2          | Initial                                                                                    |
| .341        | Line attenuation measurement. Level (attenuation and amplification in quadripoles)                                             | .3          | Maximum                                                                                    |
| .1          | Crosstalk attenuation measurement                                                                                              | .4          | Incremental                                                                                |
| .2          | Nyquist diagram                                                                                                                | .412        | Susceptibility measurement                                                                 |
| .3          | Mismatch loss. Reflection attenuation measurement                                                                              | .42         | Magnetic fields measurement. Magnetizing force measurement. Magnetic induction measurement |
| .342        | Transmission time                                                                                                              | .421        | Magnetic induction measurement. Saturation value                                           |
| .343        | Characteristic impedance measurement. Surge impedance measurement. Impedance matching                                          | .2          | In air                                                                                     |
| .2          | Characteristic impedance measurement. Surge impedance measurement                                                              | .3          | In iron                                                                                    |
| .3          | Impedance matching                                                                                                             | .422        | Remanence measurement. Coercivity measurement. Maximum energy product                      |
| .35         | <b>Wave-form analysis, recording. Harmonic content</b>                                                                         | .423        | Recoil effect                                                                              |
| .351        | Oscillographic methods of analysis                                                                                             | .43         | Magnetic losses measurement                                                                |
| .352        | Attenuation measurements in oscillatory circuits                                                                               | .431        | Hysteresis losses measurement                                                              |
|             | <i>For attenuation distortion → 621.317.332.6</i>                                                                              | .432        | Eddy-current losses measurement                                                            |
| .2          | Harmonic attenuation measurement                                                                                               | .44         | Apparatus for magnetic measurement                                                         |
|             |                                                                                                                                | .441        | Solenoids. Mutual inductors. Search coils                                                  |
|             |                                                                                                                                |             | →621.318.371 Electromagnets with poles in two parallel planes                              |

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| .442        | Anchor rings. Closed magnetic circuits                                                                         | 621.317.73 | <b>Apparatus for measuring resistance, impedance, inductance, capacitance</b>                  |
| 621.317.443 | Magnetic force measurement. Magnetic balances                                                                  | .732       | Resistance boxes                                                                               |
| .444        | Magnetic needles. Magnetometers. Fluxmeters                                                                    | .733       | Bridge instruments                                                                             |
| .445        | Measurement of very small field strength. Flux-gate process                                                    |            | <i>The type of current may be denoted by the .02 special auxiliaries</i>                       |
| .45         | Direction indicators for lines of force. Polarity indicators                                                   |            | <i>Resistance, inductance, capacitance etc. may be denoted by the .011 special auxiliaries</i> |
| .49         | Magnetic measurement of non-magnetic properties                                                                | .2         | Single. Wheatstone bridges                                                                     |
|             | <i>For non-destructive magnetic testing → 620.179.14</i>                                                       | .3         | Double Universal. Kelvin bridges                                                               |
|             |                                                                                                                | .734       | Ohmmeters                                                                                      |
| 621.317.6   | DETERMINATION OF THE RELATION BETWEEN MEASURED QUANTITIES. CHARACTERISTICS. DIAGRAMS                           | .735       | Apparatus for testing insulation                                                               |
| .61         | Measurement of the relation between electrical quantities                                                      | .736       | Leakage indicators. Short-circuit indicators                                                   |
| .611        | Measurement of transformation ratio                                                                            | .737       | Circuit-quality meters (Q-meters)                                                              |
| .612        | No-load characteristic                                                                                         | .738       | Apparatus other than bridge instruments for measuring inductance, capacitance, permittivity    |
| .613        | Short-circuit characteristic                                                                                   |            | <b>Apparatus for measurement of transmission quantities</b>                                    |
| .614        | Load characteristic                                                                                            | .74        | Attenuation measuring apparatus.                                                               |
| .616        | Frequency characteristic                                                                                       | .741       | Amplification measuring apparatus                                                              |
| .619        | Other characteristics                                                                                          | .742       | Standing waves. Standing-wave indicators                                                       |
| .62         | Measurement of the relation between magnetic quantities. Plotting of hysteresis curves                         | .743       | Level measuring apparatus                                                                      |
|             |                                                                                                                | .744       | Parameters of coupled circuits, e.g. coupling factor                                           |
| .63         | Measurement of the relation between electric and magnetic quantities                                           | .75        | <b>Apparatus for examining wave-forms. Oscillographs</b>                                       |
| .66         | Measurement of efficiency                                                                                      | .752       | Contact apparatus                                                                              |
| 621.317.7   | ELECTRICAL MEASURING APPARATUS AND INSTRUMENTS                                                                 | .753       | Electrostatic and electromagnetic oscillographs                                                |
| .71         | <b>Apparatus for measurement of current intensity and quantity of electricity</b>                              | .755       | Cathode-ray oscillographs                                                                      |
| .711        | Current-direction indicators                                                                                   | .756       | Apparatus for measuring damping decrements                                                     |
| .712        | Electrodynamometers                                                                                            | .757       | Harmonic analysers. Distortion factor measurement                                              |
| .713        | Voltameters. Coulometers                                                                                       | .76        | <b>Apparatus for measuring frequency</b>                                                       |
| .714        | Ammeters                                                                                                       | .761       | Frequency meters                                                                               |
| .715        | Galvanometers                                                                                                  | .762       | Oscillation indicators                                                                         |
| .5          | Mirror galvanometers                                                                                           | .763       | Wavemeters                                                                                     |
| .716        | Ammeter shunts                                                                                                 | .77        | <b>Apparatus for phase measurement</b>                                                         |
| .72         | <b>Apparatus for measuring electromotive force, voltage, voltage gradient. Voltmeters</b>                      | .772       | Phase differences. Power-factor meters (measurement of $\cos\phi$ )                            |
| .722        | Electroscopes. Potential indicators. Voltage detectors. Polarity indicators                                    | .773       | Phase-sequence indicators                                                                      |
| .723        | Electrometers                                                                                                  | .774       | Synchrosopes                                                                                   |
| .724        | Klydonographs                                                                                                  |            | <i>For synchronisers → 621.316.729</i>                                                         |
| .725        | Voltmeters                                                                                                     | .78        | <b>Apparatus for measuring power, energy consumption etc</b>                                   |
| .726        | Crest, peak voltmeters                                                                                         | .782       | Load indicators                                                                                |
|             | <i>Apparatus using thermionic valves may be denoted by colon combination with the sub-divisions of 621.385</i> | .2         | Maximum load indicators                                                                        |
| .727        | Voltage matching apparatus                                                                                     | .783       | Volt-ampere meters                                                                             |
| .1          | Voltage dividers                                                                                               | .784       | Wattmeters                                                                                     |
| .2          | Potentiometers                                                                                                 | .785       | Watt-hour meters. Electricity supply meters                                                    |
| .3          | Shunt resistors                                                                                                |            | →621.317.786 Electrolytic meters                                                               |
| .728        | Spark gap voltmeters                                                                                           | .5         | 621.317.787 Ampere-hour meters (other than electrolytic meters). Time meters                   |
| .729        | Other apparatus for potential measurement                                                                      | .6         | Recording apparatus for a single tariff                                                        |
| .1          | Electrolytic trough                                                                                            | .7         | Recording apparatus for a multiple tariff                                                      |
| .2          | Probes                                                                                                         | .786       | Prepayment meters. Slot meters etc.                                                            |
| .3          | Dipoles. Measuring aerials                                                                                     | .787       | Electrolytic meters                                                                            |
|             |                                                                                                                |            | Ampere-hour meters (other than electrolytic meters). Time meters                               |

|               |                                                                                                                                                     |                      |                                                                                                     |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------|
| 621.317.787.1 | Ampere-hour meters                                                                                                                                  | 621.318.371 (cont'd) | <i>For solenoids for magnetic measurement<br/>→ 621.317.441</i>                                     |
| .2            | Time meters                                                                                                                                         |                      |                                                                                                     |
| .789          | Other apparatus for measuring power etc.                                                                                                            | .372                 | Electromagnets with poles in the same plane                                                         |
| .79           | <b>Other measuring apparatus</b>                                                                                                                    | .373                 | Electromagnets with poles in some other arrangement                                                 |
| .791          | Universal apparatus. Apparatus for measuring several quantities                                                                                     | .38                  | Electromagnets according to their intended use. Apparatus based upon the action of an electromagnet |
| .792          | Apparatus for investigations into atmospheric electricity                                                                                           |                      | <i>Further particulars may be denoted by colon combination, e.g.</i>                                |
| .794          | Apparatus for measuring radiant energy. Bolometers                                                                                                  |                      | 621.318.38:623.368 Magnetic mine detectors                                                          |
| .799          | Special test equipment not provided for elsewhere                                                                                                   |                      |                                                                                                     |
|               | <i>Further particulars may be denoted by colon combination e.g.</i>                                                                                 | 621.318.4            | INDUCTOR COILS                                                                                      |
|               | 621.317.799:621.396.62 Equipment for testing radio receivers                                                                                        | .43                  | →621.3.045 Windings                                                                                 |
| 621.318       | <b>APPLIED MAGNETISM. MAGNETIC MATERIALS AND APPARATUS. COILS. RELAYS</b>                                                                           | .433                 | Inductors. Choking coils. Reactors                                                                  |
|               | →534.852 Magnetic sound recording — Physics                                                                                                         | .434                 | Air-cored                                                                                           |
|               | 537.6/.8 Magnetism.                                                                                                                                 | .1                   | With core mainly of magnetic material                                                               |
|               | Electromagnetism — Physics                                                                                                                          | .2                   | With air gap                                                                                        |
|               | 62-83 Electrically driven machinery etc.                                                                                                            | .435                 | With core of other low-permeability materials                                                       |
|               | 681.84.083.8 Magnetic sound recording — Technical acoustics                                                                                         | .1                   | With core entirely of magnetic materials. Saturable reactors                                        |
|               | <i>Details of cores and windings may be denoted by the .042 and .045 special auxiliaries. Special materials may be denoted by colon combination</i> | .2                   | With a single winding. Anchor ring                                                                  |
| 621.318.1     | MAGNETIC MATERIALS IN GENERAL                                                                                                                       | .3                   | With one or more d.c. premagnetizing or control windings                                            |
|               | →537.622 Magnetic properties of materials                                                                                                           | .32                  | Transductors                                                                                        |
| .12           | Hard magnetic materials                                                                                                                             |                      | →621.375.3 Magnetic (transductor) amplifiers                                                        |
| .122          | Ferromagnetic materials                                                                                                                             | .321                 | Series transductors                                                                                 |
| .124          | Ferrimagnetic materials                                                                                                                             | .322                 | Series transductors without external self-excitation                                                |
| .13           | Soft magnetic materials                                                                                                                             | .33                  | Series transductors with external self-excitation                                                   |
| .132          | Ferromagnetic materials                                                                                                                             | .331                 | Parallel transductors                                                                               |
| .134          | Ferrimagnetic materials                                                                                                                             | .332                 | Parallel transductors without external self-excitation                                              |
| .14           | Paramagnetic materials                                                                                                                              | .34                  | Parallel transductors with external self-excitation                                                 |
|               | <i>The form of material may be denoted by the -4 special auxiliaries, e.g.</i>                                                                      | .44                  | Transductors with automatic self-excitation                                                         |
|               | 621.318.14-418 Tape of paramagnetic material                                                                                                        | 621.318.5            | Coil-winding machines                                                                               |
| 621.318.2     | PERMANENT MAGNETS                                                                                                                                   |                      | RELAYS                                                                                              |
| .23           | Construction                                                                                                                                        | .51                  | <i>For protection by relays → 621.316.925</i>                                                       |
| .24           | Magnetization. Devices for enhancing magnetization                                                                                                  | .53                  | <i>For control system relays → 681.584</i>                                                          |
| .25           | Demagnetization                                                                                                                                     | .56                  | Electrostatic relays                                                                                |
| .26           | Devices for avoiding loss of magnetic properties, e.g. keepers                                                                                      | .562                 | Electrolytic relays                                                                                 |
| 621.318.3     | ELECTROMAGNETS                                                                                                                                      | .2                   | Electromagnetic relays                                                                              |
| .34           | Magnetization methods                                                                                                                               | .3                   | Direct-current relays                                                                               |
| .35           | Heating. Devices for avoiding eddy currents etc.                                                                                                    | .5                   | Differential relays                                                                                 |
| .37           | Electromagnets according to the arrangement of the poles                                                                                            | .6                   | Polarized relays                                                                                    |
| .371          | Electromagnets with poles in two parallel planes. Solenoids                                                                                         | .7                   | Counting relays. Number display                                                                     |
|               |                                                                                                                                                     | .563                 | <i>For call-counters → 621.395.663</i>                                                              |
|               |                                                                                                                                                     |                      | Limiting relays                                                                                     |
|               |                                                                                                                                                     |                      | Timing relays                                                                                       |
|               |                                                                                                                                                     |                      | Alternating-current relays                                                                          |
|               |                                                                                                                                                     |                      | <i>The number of phases may be denoted by the .025 special auxiliaries</i>                          |
|               |                                                                                                                                                     | .2                   | Resonant relays                                                                                     |
|               |                                                                                                                                                     | .3                   | Non-resonant relays                                                                                 |
|               |                                                                                                                                                     | .4                   | Limiting relays                                                                                     |
|               |                                                                                                                                                     | .5                   | Timing relays                                                                                       |

|            |                                                                                      |
|------------|--------------------------------------------------------------------------------------|
| 621.318.57 | Electronic relays. Electronic switches                                               |
| .58        | Photoelectric relays                                                                 |
| 621.319    | <b>APPLIED ELECTROSTATICS</b>                                                        |
|            | →537.2 Static electricity.                                                           |
|            | Electrostatics — Physics                                                             |
| 621.319.1  | <b>APPLIED FERROELECTRICITY</b>                                                      |
| 621.319.2  | <b>ELECTRETS</b>                                                                     |
| 621.319.3  | <b>ELECTROSTATIC MACHINES.</b>                                                       |
|            | <b>ELECTROSTATIC GENERATORS</b>                                                      |
| .32        | Friction machines                                                                    |
| .33        | Influence machines                                                                   |
| .331       | Disc machines, e.g. Wimshurst machines                                               |
| .332       | Cylinder machines                                                                    |
| .339       | Other influence machines, e.g. van de Graaff generators                              |
| .34        | Machines with external feed (electric discharger)                                    |
| .35        | Other forms                                                                          |
| .37        | Parts of machines. Current collectors. Discs, etc.                                   |
| 621.319.4  | <b>CAPACITORS</b>                                                                    |
|            | <i>Dielectric materials may be denoted by colon combination e.g.</i>                 |
|            | 621.319.4:621.315.612 Capacitors with ceramic dielectric                             |
| .42        | Parts. Design                                                                        |
| .43        | Continuously variable capacitors                                                     |
| .44        | Capacitor-banks. Capacitors with stepwise regulation                                 |
| .45        | Electrolytic capacitors                                                              |
| .46        | Compressed gas capacitors                                                            |
| .47        | Vacuum capacitors                                                                    |
| .48        | Non-variable liquid capacitors                                                       |
| 621.319.5  | <b>OTHER ELECTROSTATIC APPARATUS.</b>                                                |
|            | <b>SURGE GENERATORS</b>                                                              |
| .51        | Spark gaps                                                                           |
|            | →621.317.728 Spark gap voltmeters                                                    |
|            | 621.373.32 Spark oscillators                                                         |
|            | <i>For spark gaps as protective devices → 621.316.933.1</i>                          |
| .52        | Direct voltage circuits                                                              |
| .522       | Greinacher circuits                                                                  |
| .523       | Cockcroft circuits                                                                   |
| .53        | Impulse circuits. Marx generators                                                    |
| .54        | Alternating voltage circuits for damped processes. Tesla circuits                    |
| .55        | Relaxation circuits                                                                  |
| 621.319.7  | <b>ELECTROSTATIC FIELDS. FIELD GENERATION. FIELD DISTRIBUTION</b>                    |
| .71        | Generation                                                                           |
| .72        | Regulation                                                                           |
|            | →621.316.99 Earthing                                                                 |
| .74        | Devices to avoid generation of undesired fields and charges. Electrostatic screening |

## 621.32 Electric light sources

|         |                                                                                               |
|---------|-----------------------------------------------------------------------------------------------|
|         | →628.9 Lighting. Illuminating engineering                                                     |
|         | <i>Parts and accessories of electric lamps may be denoted by the .032 special auxiliaries</i> |
|         | <i>The purpose for which the lamps are used may be denoted by colon combination, e.g.</i>     |
|         | 621.32:535.24 Lamps for photometry                                                            |
|         | :615.831 Physiotherapy lamps                                                                  |
|         | :771.2 Photographic studio lamps                                                              |
| 621.321 | <b>GENERALITIES. COMPARISON BETWEEN VARIOUS KINDS OF ELECTRIC LAMP</b>                        |
| 621.325 | <b>CARBON ARC LAMPS. ARC LAMPS WITH ONE CARBON AND ONE METAL ELECTRODE</b>                    |
|         | <i>For theory of arc discharges → 537.523.5</i>                                               |
| .1      | Production of the electric arc in general.                                                    |
| .12     | Arc lamps according to their construction                                                     |
| .122    | Carbon arc lamps without or in open jacket                                                    |
| .2      | Carbon arc lamps with two electrodes                                                          |
| .3      | Vertical arc                                                                                  |
| .5      | Horizontal arc, e.g. Jablochkoff candles                                                      |
| .9      | Oblique arc                                                                                   |
| .124    | Other arrangements                                                                            |
| .13     | Carbon arc lamps with more than two electrodes                                                |
| .17     | Enclosed carbon arc lamps                                                                     |
| .172    | Special types of carbon arc lamp including those for searchlights                             |
| .173    | With incandescent rod. Flame arcs                                                             |
| .2      | With electrode automatic feed                                                                 |
| .22     | Carbon arc lamps with pure carbon electrodes                                                  |
| .23     | Open-arc                                                                                      |
| .3      | Enclosed-arc                                                                                  |
| .32     | Carbon arc lamps with electrodes of specially prepared carbon                                 |
| .33     | Open-arc types, e.g. Beck arc lamps                                                           |
| .4      | Enclosed-arc types                                                                            |
|         | Arc lamps with one carbon and one metal electrode                                             |
| 621.326 | <b>INCANDESCENT LAMPS. FILAMENT LAMPS</b>                                                     |
| .1      | Carbon filament lamps                                                                         |
| .5      | Filament lamps with non-metallic light-emitting elements other than carbon                    |
| .53     | Nernst lamps                                                                                  |
| .59     | Lamps with other light-emitting elements, e.g. tantalum carbide                               |
| .7      | Lamps with metallic filaments                                                                 |
| .71     | Vacuum GLS lamps                                                                              |
| .72     | Gas-filled GLS lamps                                                                          |
| .73     | Lamps with concentrated filaments.                                                            |
| .732    | Spotlight lamps                                                                               |
| .74     | Lamps with built-in mirror                                                                    |
|         | Lamps with several caps, e.g. show window lamps                                               |

|            |                                                                                                                                                                                        |                  |                                                                        |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------------------------------------------------------|
| .75        | Small, miniature lamps                                                                                                                                                                 | 621.331 (cont'd) | <i>Further particulars may be denoted by common auxiliaries, e.g.</i>  |
| 621.326.76 | Lamps with variable illuminating power                                                                                                                                                 |                  | 621.331.001.2 Planning, preparatory work for electrification           |
| .761       | Lamps with several filaments                                                                                                                                                           |                  |                                                                        |
| .762       | Lamps with one filament built-up from various sections                                                                                                                                 | .3               | Choice of type of current for electric traction                        |
| .77        | Economy lamps. Low-consumption lamps                                                                                                                                                   | .4               | Choice of voltage for electric traction                                |
| .771       | Lamps with built-in resistor                                                                                                                                                           | .5               | Choice of machines for electric traction                               |
| .773       | Lamps with built-in capacitor                                                                                                                                                          |                  |                                                                        |
| .779       | Other types                                                                                                                                                                            | 621.332          | <b>SUPPLY LINES. DISTRIBUTION OF ENERGY</b>                            |
| .78        | Incandescent lamps with halogen-containing medium (tungsten halogen)                                                                                                                   |                  | <i>For transmission lines in general → 621.315</i>                     |
| .79        | Other incandescent lamps with metallic filaments                                                                                                                                       |                  | <i>For distribution networks in general → 621.316.1</i>                |
|            |                                                                                                                                                                                        |                  | <i>For protective devices → 621.316.9</i>                              |
| 621.327    | <b>GAS DISCHARGE LIGHT SOURCES</b>                                                                                                                                                     |                  |                                                                        |
| .2         | Electroluminescence sources                                                                                                                                                            | 621.332.2        | <b>SUPPLY AND RETURN LINES. TRACK RETURN LINES</b>                     |
| .4         | Glow discharge lamps                                                                                                                                                                   |                  | Feeders                                                                |
| .42        | With inert gas filling                                                                                                                                                                 | .21              | Special return lines                                                   |
| .422       | With neon gas filling                                                                                                                                                                  | .22              | Track-return lines                                                     |
| .43        | With gas and metal vapour filling                                                                                                                                                      | .23              | <i>Further particulars may be denoted by special auxiliaries, e.g.</i> |
| .5         | Arc discharge lamps                                                                                                                                                                    |                  | 621.332.23.014.6 Leakage current on track return lines                 |
| .52        | With inert gas filling                                                                                                                                                                 |                  |                                                                        |
| .523       | With xenon gas filling (xenon discharge lamps)                                                                                                                                         | .231             | General. Resistance etc.                                               |
| .1         | Low pressure lamps                                                                                                                                                                     | .232             | Rail connections. Rail bonds. Welding                                  |
| .2         | High pressure and extra-high pressure lamps                                                                                                                                            | .1               | Rail bonds                                                             |
| .22        | Long-arc lamps (tubular, of different shape)                                                                                                                                           | .2               | Transverse connections                                                 |
| .23        | Medium-arc lamps                                                                                                                                                                       | .3               | Fixing of the rail bonds and connections to the rails                  |
| .24        | Short-arc lamps (ball-type, cylindrical)                                                                                                                                               | .4               | Welding of the rails                                                   |
| .53        | With gas and metal vapour filling                                                                                                                                                      | .6               | Other methods of connection                                            |
| .532       | Sodium lamps                                                                                                                                                                           | .233             | Sectionalizing of the return circuit.                                  |
| .1         | Low pressure sodium lamps                                                                                                                                                              |                  | Insulation of rails from one another                                   |
| .2         | High pressure sodium lamps                                                                                                                                                             | .234             | Stray currents between the wheels and rails. Sparks. Arcs              |
| .534       | Mercury lamps                                                                                                                                                                          |                  |                                                                        |
| .1         | Low pressure mercury lamps                                                                                                                                                             | 621.332.3        | <b>OVERHEAD LINES. LINE SUSPENSION</b>                                 |
| .15        | Low pressure, mercury fluorescent lamps                                                                                                                                                | .31              | Contact wires. Trolley wires                                           |
| .2         | High pressure and extra-high pressure mercury lamps                                                                                                                                    | .313             | Double wires of the same polarity                                      |
| .25        | With phosphor (with chromaticity correction)                                                                                                                                           | .314             | Double wires of different polarity                                     |
| .3         | <i>[cancelled] → 621.327.534.2</i>                                                                                                                                                     | .315             | Use of more than two wires                                             |
| .539       | Lamps with other metal vapour filling                                                                                                                                                  | .32              | Construction and form of contact wires                                 |
| .54        | Halide lamps                                                                                                                                                                           | .322             | Contact wires for use with trolley collectors                          |
| .59        | Other arc-discharge lamps                                                                                                                                                              | .323             | Contact wires for use with bow collectors                              |
| .6         | Discharge lamps with luminous electrodes (no positive column)                                                                                                                          | .329             | Contact wires for use with other types of collector                    |
| .7         | Flash tubes (USA)                                                                                                                                                                      | .33              | Methods of suspension                                                  |
| .9         | Other gas-discharge light sources                                                                                                                                                      | .331             | Direct suspension without cross wires                                  |
| 621.328    | <b>COMPOUND LAMPS (BLENDED-LIGHT LAMPS)</b>                                                                                                                                            | .1               | For straight lines                                                     |
|            |                                                                                                                                                                                        | .2               | For use on curves                                                      |
|            |                                                                                                                                                                                        | .3               | With anchoring system                                                  |
|            |                                                                                                                                                                                        | .4               | Devices for automatic tensioning of the contact wires                  |
|            |                                                                                                                                                                                        | .5               | Special devices for railway stations                                   |
| 621.331    | <b>ELECTRIFICATION FOR TRACTION PURPOSES</b>                                                                                                                                           | .332             | Direct suspension from cross wires                                     |
|            | <i>The type of transport may be denoted by colon combination with the subdivisions of 625 or 629, the location being denoted by the common auxiliaries of place, if required, e.g.</i> | .333             | 621.332.332 ≅ 621.332.331                                              |
|            | 621.331:625.1 (494) Electrification of railways in Switzerland                                                                                                                         | .334             | Simple catenary (support cable and contact wire)                       |
|            |                                                                                                                                                                                        | .335             | 621.332.333 ≅ 621.332.331                                              |
|            |                                                                                                                                                                                        |                  | Compound catenary (support cable, auxiliary line and contact wire)     |
|            |                                                                                                                                                                                        |                  | Mixed (combined) systems of support                                    |