

| Symbol           | Typ                 | Titel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>C</b>         | <b>Sektion</b>      | <b>CHEMISTRY; METALLURGY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>C21</b>       | <b>Untersektion</b> | <b>METALLURGY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>C21</b>       | <b>Klasse</b>       | <b>METALLURGY OF IRON</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>C21D</b>      | <b>Unterklasse</b>  | <b>MODIFYING THE PHYSICAL STRUCTURE OF FERROUS METALS; GENERAL DEVICES FOR HEAT TREATMENT OF FERROUS OR NON-FERROUS METALS OR ALLOYS; MAKING METAL MALLEABLE BY DECARBURISATION, TEMPERING, OR OTHER TREATMENTS (cementation by diffusion processes C23C; surface treatment of metallic material involving at least one process provided for in class C23 and at least one process covered by this subclass C23F 17/00; unidirectional solidification of eutectic materials or unidirectional demixing of eutectoid materials C30B)</b> |
| <b>C21D 1/00</b> | <b>Hauptgruppe</b>  | <b>General methods or devices for heat treatment, e.g. annealing, hardening, quenching or tempering [1, 2006.01]</b>                                                                                                                                                                                                                                                                                                                                                                                                                    |
| C21D 1/02        | 1-Punkt Untergruppe | . Hardening articles or materials formed by forging or rolling, with no further heating beyond that required for the formation [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                             |
| C21D 1/04        | 1-Punkt Untergruppe | . with simultaneous application of supersonic waves, magnetic or electric fields [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| C21D 1/06        | 1-Punkt Untergruppe | . Surface hardening [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| C21D 1/08        | 2-Punkt Untergruppe | . . with flames [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| C21D 1/09        | 2-Punkt Untergruppe | . . by direct application of electrical or wave energy; by particle radiation [3, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| C21D 1/10        | 3-Punkt Untergruppe | . . . by electric induction [1, 3, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| C21D 1/18        | 1-Punkt Untergruppe | . Hardening (C21D 1/02 takes precedence); Quenching with or without subsequent tempering (quenching devices C21D 1/62) [1, 3, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                  |
| C21D 1/19        | 2-Punkt Untergruppe | . . by interrupted quenching [3, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| C21D 1/20        | 3-Punkt Untergruppe | . . . Isothermal quenching, e.g. bainitic hardening [1, 3, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| C21D 1/22        | 3-Punkt Untergruppe | . . . Martempering [1, 3, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| C21D 1/25        | 2-Punkt Untergruppe | . . Hardening, combined with annealing between 300 °C and 600 °C, i.e. heat refining ("Vergüten") [3, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                          |
| C21D 1/26        | 1-Punkt Untergruppe | . Methods of annealing [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| C21D 1/28        | 2-Punkt Untergruppe | . . Normalising [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| C21D 1/30        | 2-Punkt Untergruppe | . . Stress-relieving [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| C21D 1/32        | 2-Punkt Untergruppe | . . Soft annealing, e.g. spheroidising [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| C21D 1/34        | 1-Punkt Untergruppe | . Methods of heating (C21D 1/06 takes precedence) [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| C21D 1/38        | 2-Punkt Untergruppe | . . Heating by cathodic discharges [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| C21D 1/40        | 2-Punkt Untergruppe | . . Direct resistance heating [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| C21D 1/42        | 2-Punkt Untergruppe | . . Induction heating [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| C21D 1/44        | 2-Punkt Untergruppe | . . in heat-treatment baths [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| C21D 1/46        | 3-Punkt Untergruppe | . . . Salt baths [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| C21D 1/48        | 3-Punkt Untergruppe | . . . Metal baths [1, 2006.01]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Symbol           | Typ                 | Titel                                                                                                                          |
|------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------|
| C21D 1/50        | 3-Punkt Untergruppe | . . . Oil baths [1, 2006.01]                                                                                                   |
| C21D 1/52        | 2-Punkt Untergruppe | . . with flames [1, 2006.01]                                                                                                   |
| C21D 1/53        | 2-Punkt Untergruppe | . . Heating in fluidised beds [3, 2006.01]                                                                                     |
| C21D 1/54        | 1-Punkt Untergruppe | . Determining when the hardening temperature has been reached by measurement of magnetic or electrical properties [1, 2006.01] |
| C21D 1/55        | 1-Punkt Untergruppe | . Hardenability tests, e.g. end-quench tests [3, 2006.01]                                                                      |
| C21D 1/56        | 1-Punkt Untergruppe | . characterised by the quenching agents [1, 2006.01]                                                                           |
| C21D 1/58        | 2-Punkt Untergruppe | . . Oils [1, 2006.01]                                                                                                          |
| C21D 1/60        | 2-Punkt Untergruppe | . . Aqueous agents [1, 2006.01]                                                                                                |
| C21D 1/607       | 2-Punkt Untergruppe | . . Molten salts [3, 2006.01]                                                                                                  |
| C21D 1/613       | 2-Punkt Untergruppe | . . Gases; Liquefied or solidified normally gaseous material [3, 2006.01]                                                      |
| C21D 1/62        | 1-Punkt Untergruppe | . Quenching devices [1, 2006.01]                                                                                               |
| C21D 1/63        | 2-Punkt Untergruppe | . . for bath quenching [3, 2006.01]                                                                                            |
| C21D 1/64        | 3-Punkt Untergruppe | . . . with circulating liquids [1, 3, 2006.01]                                                                                 |
| C21D 1/667       | 2-Punkt Untergruppe | . . for spray quenching [3, 2006.01]                                                                                           |
| C21D 1/673       | 2-Punkt Untergruppe | . . for die quenching [3, 2006.01]                                                                                             |
| C21D 1/68        | 1-Punkt Untergruppe | . Temporary coatings or embedding materials applied before or during heat treatment [1, 2006.01]                               |
| C21D 1/70        | 2-Punkt Untergruppe | . . while heating or quenching [1, 2006.01]                                                                                    |
| C21D 1/72        | 2-Punkt Untergruppe | . . during chemical change of surfaces [1, 2006.01]                                                                            |
| C21D 1/74        | 1-Punkt Untergruppe | . Methods of treatment in inert gas, controlled atmosphere, vacuum or pulverulent material [1, 2006.01]                        |
| C21D 1/76        | 2-Punkt Untergruppe | . . Adjusting the composition of the atmosphere [1, 2006.01]                                                                   |
| C21D 1/767       | 2-Punkt Untergruppe | . . with forced gas circulation; Reheating thereof [3, 2006.01]                                                                |
| C21D 1/773       | 2-Punkt Untergruppe | . . under reduced pressure or vacuum [3, 2006.01]                                                                              |
| C21D 1/78        | 1-Punkt Untergruppe | . Combined heat-treatments not provided for above [1, 2006.01]                                                                 |
| C21D 1/82        | 1-Punkt Untergruppe | . Descaling by thermal stresses (mechanically B21, B23; chemically C23; electrolytically C25F 1/00) [1, 2006.01]               |
| C21D 1/84        | 1-Punkt Untergruppe | . Controlled slow cooling (cooling-beds for metal rolling B21B 43/00) [3, 2006.01]                                             |
| <b>C21D 3/00</b> | <b>Hauptgruppe</b>  | <b>Diffusion processes for extraction of non-metals; Furnaces therefor (local protective coatings C21D 1/72) [1, 2006.01]</b>  |
| C21D 3/02        | 1-Punkt Untergruppe | . Extraction of non-metals [1, 2006.01]                                                                                        |
| C21D 3/04        | 2-Punkt Untergruppe | . . Decarburising [1, 2006.01]                                                                                                 |
| C21D 3/06        | 2-Punkt Untergruppe | . . Extraction of hydrogen [1, 2006.01]                                                                                        |
| C21D 3/08        | 2-Punkt Untergruppe | . . Extraction of nitrogen [1, 2006.01]                                                                                        |
| C21D 3/10        | 1-Punkt Untergruppe | . Furnaces therefor [1, 2006.01]                                                                                               |

| Symbol           | Typ                 | Titel                                                                                                                                                                                                                                                      |
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| <b>C21D 5/00</b> | <b>Hauptgruppe</b>  | <b>Heat treatment of cast-iron [1, 2006.01]</b>                                                                                                                                                                                                            |
| C21D 5/02        | 1-Punkt Untergruppe | . improving the malleability of grey cast-iron [1, 2006.01]                                                                                                                                                                                                |
| C21D 5/04        | 1-Punkt Untergruppe | . of white cast-iron [1, 2006.01]                                                                                                                                                                                                                          |
| C21D 5/06        | 2-Punkt Untergruppe | . . Malleabilising [1, 2006.01]                                                                                                                                                                                                                            |
| C21D 5/08        | 3-Punkt Untergruppe | . . . with oxidation of carbon [1, 2006.01]                                                                                                                                                                                                                |
| C21D 5/10        | 4-Punkt Untergruppe | . . . . in gaseous agents [1, 2006.01]                                                                                                                                                                                                                     |
| C21D 5/12        | 4-Punkt Untergruppe | . . . . in solid agents [1, 2006.01]                                                                                                                                                                                                                       |
| C21D 5/14        | 3-Punkt Untergruppe | . . . Graphitising [1, 2006.01]                                                                                                                                                                                                                            |
| C21D 5/16        | 4-Punkt Untergruppe | . . . . Packing agents [1, 2006.01]                                                                                                                                                                                                                        |
| <b>C21D 6/00</b> | <b>Hauptgruppe</b>  | <b>Heat treatment of ferrous alloys [2, 2006.01]</b>                                                                                                                                                                                                       |
| C21D 6/02        | 1-Punkt Untergruppe | . Hardening by precipitation [2, 2006.01]                                                                                                                                                                                                                  |
| C21D 6/04        | 1-Punkt Untergruppe | . Hardening by cooling below 0° C [2, 2006.01]                                                                                                                                                                                                             |
| <b>C21D 7/00</b> | <b>Hauptgruppe</b>  | <b>Modifying the physical properties of iron or steel by deformation (apparatus for mechanical working of metal B21, B23, B24) [1, 2006.01]</b>                                                                                                            |
| C21D 7/02        | 1-Punkt Untergruppe | . by cold working [1, 2006.01]                                                                                                                                                                                                                             |
| C21D 7/04        | 2-Punkt Untergruppe | . . of the surface [1, 2006.01]                                                                                                                                                                                                                            |
| C21D 7/06        | 3-Punkt Untergruppe | . . . by shot-peening or the like [1, 2006.01]                                                                                                                                                                                                             |
| C21D 7/08        | 3-Punkt Untergruppe | . . . by burnishing or the like [1, 2006.01]                                                                                                                                                                                                               |
| C21D 7/10        | 2-Punkt Untergruppe | . . of the whole cross-section, e.g. of concrete reinforcing bars [1, 2006.01]                                                                                                                                                                             |
| C21D 7/12        | 3-Punkt Untergruppe | . . . by expanding tubular bodies [1, 2006.01]                                                                                                                                                                                                             |
| C21D 7/13        | 1-Punkt Untergruppe | . by hot working [1, 2006.01]                                                                                                                                                                                                                              |
| <b>C21D 8/00</b> | <b>Hauptgruppe</b>  | <b>Modifying the physical properties by deformation combined with, or followed by, heat treatment (hardening articles or materials formed by forging or rolling with no further heating beyond that required for the formation C21D 1/02) [3, 2006.01]</b> |
| C21D 8/02        | 1-Punkt Untergruppe | . during manufacturing of plates or strips (C21D 8/12 takes precedence) [3, 2006.01]                                                                                                                                                                       |
| C21D 8/04        | 2-Punkt Untergruppe | . . to produce plates or strips for deep-drawing [3, 2006.01]                                                                                                                                                                                              |
| C21D 8/06        | 1-Punkt Untergruppe | . during manufacturing of rods or wires [3, 2006.01]                                                                                                                                                                                                       |
| C21D 8/08        | 2-Punkt Untergruppe | . . for concrete reinforcement [3, 2006.01]                                                                                                                                                                                                                |
| C21D 8/10        | 1-Punkt Untergruppe | . during manufacturing of tubular bodies [3, 2006.01]                                                                                                                                                                                                      |
| C21D 8/12        | 1-Punkt Untergruppe | . during manufacturing of articles with special electromagnetic properties [3, 2006.01]                                                                                                                                                                    |
| <b>C21D 9/00</b> | <b>Hauptgruppe</b>  | <b>Heat treatment, e.g. annealing, hardening, quenching or tempering, adapted for particular articles; Furnaces therefor [1, 2006.01]</b>                                                                                                                  |
| C21D 9/02        | 1-Punkt Untergruppe | . for springs [1, 2006.01]                                                                                                                                                                                                                                 |
| C21D 9/04        | 1-Punkt Untergruppe | . for rails [1, 2006.01]                                                                                                                                                                                                                                   |
| C21D 9/06        | 2-Punkt Untergruppe | . . with diminished tendency to become wavy [1, 2006.01]                                                                                                                                                                                                   |
| C21D 9/08        | 1-Punkt Untergruppe | . for tubular bodies or pipes [1, 2006.01]                                                                                                                                                                                                                 |

| Symbol     | Typ                 | Titel                                                                              |
|------------|---------------------|------------------------------------------------------------------------------------|
| C21D 9/10  | 2-Punkt Untergruppe | . . shotgun barrels [1, 2006.01]                                                   |
| C21D 9/12  | 2-Punkt Untergruppe | . . barrels for ordnance [1, 2006.01]                                              |
| C21D 9/14  | 2-Punkt Untergruppe | . . wear-resistant or pressure-resistant pipes [1, 2006.01]                        |
| C21D 9/16  | 1-Punkt Untergruppe | . for explosive shells [1, 2006.01]                                                |
| C21D 9/18  | 1-Punkt Untergruppe | . for knives, scythes, scissors, or like hand cutting tools [1, 2006.01]           |
| C21D 9/20  | 1-Punkt Untergruppe | . for blades for skates [1, 2006.01]                                               |
| C21D 9/22  | 1-Punkt Untergruppe | . for drills; for milling cutters; for machine cutting tools [1, 2006.01]          |
| C21D 9/24  | 1-Punkt Untergruppe | . for saw blades [1, 2006.01]                                                      |
| C21D 9/26  | 1-Punkt Untergruppe | . for needles; for teeth for card-clothing [1, 2006.01]                            |
| C21D 9/28  | 1-Punkt Untergruppe | . for plain shafts [1, 2006.01]                                                    |
| C21D 9/30  | 1-Punkt Untergruppe | . for crankshafts; for camshafts [1, 2006.01]                                      |
| C21D 9/32  | 1-Punkt Untergruppe | . for gear wheels, worm wheels, or the like [1, 2006.01]                           |
| C21D 9/34  | 1-Punkt Untergruppe | . for tyres; for rims [1, 2006.01]                                                 |
| C21D 9/36  | 1-Punkt Untergruppe | . for balls; for rollers [1, 2006.01]                                              |
| C21D 9/38  | 1-Punkt Untergruppe | . for roll bodies [1, 2006.01]                                                     |
| C21D 9/40  | 1-Punkt Untergruppe | . for rings; for bearing races [1, 2006.01]                                        |
| C21D 9/42  | 1-Punkt Untergruppe | . for armour plate [1, 2006.01]                                                    |
| C21D 9/44  | 1-Punkt Untergruppe | . for equipment for lining mine shafts, e.g. segments, rings or props [1, 2006.01] |
| C21D 9/46  | 1-Punkt Untergruppe | . for sheet metals [1, 2006.01]                                                    |
| C21D 9/48  | 2-Punkt Untergruppe | . . deep-drawing sheets [1, 2006.01]                                               |
| C21D 9/50  | 1-Punkt Untergruppe | . for welded joints [1, 2006.01]                                                   |
| C21D 9/52  | 1-Punkt Untergruppe | . for wires; for strips [1, 2006.01]                                               |
| C21D 9/54  | 2-Punkt Untergruppe | . . Furnaces for treating strips or wire [1, 2006.01]                              |
| C21D 9/56  | 3-Punkt Untergruppe | . . . Continuous furnaces for strip or wire [1, 2006.01]                           |
| C21D 9/567 | 4-Punkt Untergruppe | . . . . with heating in fluidised beds [3, 2006.01]                                |
| C21D 9/573 | 4-Punkt Untergruppe | . . . . with cooling [3, 2006.01]                                                  |
| C21D 9/58  | 4-Punkt Untergruppe | . . . . with heating by baths [1, 2006.01]                                         |
| C21D 9/60  | 4-Punkt Untergruppe | . . . . with induction heating [1, 2006.01]                                        |
| C21D 9/62  | 4-Punkt Untergruppe | . . . . with direct resistance heating [1, 2006.01]                                |
| C21D 9/63  | 4-Punkt Untergruppe | . . . . the strip being supported by a cushion of gas [3, 2006.01]                 |
| C21D 9/64  | 3-Punkt Untergruppe | . . . Patenting furnaces [1, 2006.01]                                              |
| C21D 9/66  | 3-Punkt Untergruppe | . . . Tower-type furnaces [1, 2006.01]                                             |

| Symbol            | Typ                 | Titel                                                                                                     |
|-------------------|---------------------|-----------------------------------------------------------------------------------------------------------|
| C21D 9/663        | 3-Punkt Untergruppe | . . . Bell-type furnaces [3, 2006.01]                                                                     |
| C21D 9/665        | 4-Punkt Untergruppe | . . . . inverted or side-facing [3, 2006.01]                                                              |
| C21D 9/667        | 4-Punkt Untergruppe | . . . . Multi-station furnaces [3, 2006.01]                                                               |
| C21D 9/67         | 5-Punkt Untergruppe | . . . . . adapted for treating the charge in vacuum or special atmosphere [3, 2006.01]                    |
| C21D 9/673        | 4-Punkt Untergruppe | . . . . Details, accessories, or equipment peculiar to bell-type furnaces [3, 2006.01]                    |
| C21D 9/675        | 4-Punkt Untergruppe | . . . . Arrangements of charging or discharging devices [3, 2006.01]                                      |
| C21D 9/677        | 4-Punkt Untergruppe | . . . . Arrangements of heating devices [3, 2006.01]                                                      |
| C21D 9/68         | 3-Punkt Untergruppe | . . . Furnace coilers; Hot coilers (cold coilers B21C 47/00) [1, 2006.01]                                 |
| C21D 9/70         | 1-Punkt Untergruppe | . Furnaces for ingots, i.e. soaking pits [1, 2006.01]                                                     |
| <b>C21D 10/00</b> | <b>Hauptgruppe</b>  | <b>Modifying the physical properties by methods other than heat treatment or deformation [3, 2006.01]</b> |
| <b>C21D 11/00</b> | <b>Hauptgruppe</b>  | <b>Process control or regulation for heat treatments [2, 2006.01]</b>                                     |