

**CPC****COOPERATIVE PATENT CLASSIFICATION****B23K****SOLDERING OR UNSOLDERING ; WELDING ; CLADDING OR PLATING BY SOLDERING OR WELDING ; CUTTING BY APPLYING HEAT LOCALLY, e.g. FLAME CUTTING ; WORKING BY LASER BEAM**

( making metal-coated products by extruding metal [B21C 23/22](#) ; building up linings or coverings by casting [B22D 19/08](#) ; casting by dipping [B22D 23/04](#) ; manufacture of composite layers by sintering metal powder [B22F 7/00](#) ; arrangements on machine tools for copying or controlling [B23Q](#) ; covering metals or covering materials with metals, not otherwise provided for [C23C](#) ; burners [F23D](#) )

**NOTE**

This subclass covers also electric circuits specially adapted for the purposes covered by the title of the subclass.

In this subclass, the following term is used with the meaning indicated:  
"soldering" means uniting metals using solder and applying heat without melting either of the parts to be united

**WARNING**

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[B23K 35/04](#) - [B23K 35/20](#) covered by [B23K 35/0205](#) - [B23K 35/0294](#)  
[B23K 35/363](#) " [B23K 35/3601](#) - [B23K 35/3618](#)

**Guidance heading:** **Soldering, e.g. brazing, or unsoldering** ( essentially requiring the use of welding machines or welding equipment, see the relevant groups for the welding machines or welding equipment )

**B23K 1/00**

**Soldering, e.g. brazing, or unsoldering** ( [B23K 3/00](#) takes precedence; characterised only by the use of special materials or media [B23K 35/00](#) ; dip or wave soldering in the manufacture of printed circuits [H05K 3/34](#) )

- B23K 1/0002 . { Soldering by means of dipping in a fused salt bath }
- B23K 1/0004 . { Resistance soldering }
- B23K 1/0006 . { Exothermic brazing }
- B23K 1/0008 . { specially adapted for particular articles or work }
- B23K 1/001 .. { Sealing small holes in metal containers, e.g. tins }
- B23K 1/0012 .. { Brazing heat exchangers }
- B23K 1/0014 .. { Brazing of honeycomb sandwich structures }
- B23K 1/0016 .. { Brazing of electronic components }
- B23K 1/0018 .. { Brazing of turbine parts }

- B23K 1/002 . Soldering by means of induction heating
- B23K 1/005 . Soldering by means of radiant energy
- B23K 1/0053 .. { soldering by means of I.R. }
- B23K 1/0056 .. { soldering by means of beams, e.g. lasers, E.B. }
- B23K 1/008 . Soldering within a furnace ( [B23K 1/012](#) takes precedence )
- B23K 1/012 . Soldering with the use of hot gas
- B23K 1/015 .. Vapour-condensation soldering
- B23K 1/018 . Unsoldering ; Removal of melted solder or other residues
- B23K 1/06 . making use of vibrations, e.g. supersonic vibrations
- B23K 1/08 . Soldering by means of dipping in molten solder
- B23K 1/085 .. { Wave soldering }
- B23K 2001/12 . specially adapted for particular articles or work
- B23K 1/14 . specially adapted for soldering seams ( making tubes involving operations other than soldering [B21C](#) )
- B23K 1/16 .. longitudinal seams, e.g. of shells
- B23K 1/18 .. circumferential seams, e.g. of shells
- B23K 1/19 . taking account of the properties of the materials to be soldered
- B23K 1/20 . Preliminary treatment of work or areas to be soldered, e.g. in respect of a galvanic coating ( preparation of surfaces in particular ways, see the relevant classes for the treatments or the materials treated, e.g. [C04B](#) , [C23C](#) )
- B23K 1/203 .. { Fluxing, i.e. applying flux onto surfaces }
- B23K 1/206 .. { Cleaning }
- B23K 3/00** **Tools, devices, or special appurtenances for soldering, e.g. brazing, or unsoldering, not specially adapted for particular methods ( materials used for soldering [B23K 35/00](#) )**
- B23K 3/02 . Soldering irons ; Bits
- B23K 3/021 .. { Flame-heated soldering irons }
- B23K 3/022 ... { using a gaseous fuel }
- B23K 3/023 ... { using a liquid fuel }
- B23K 3/024 ... { using a solid fuel }
- B23K 3/025 .. { Bits or tips }
- B23K 3/026 ... { Removable soldering bits }
- B23K 3/027 .. { Holders for soldering irons }
- B23K 3/028 .. { Devices for cleaning soldering iron tips ( [B23K 3/027](#) takes precedence ) }
- B23K 3/029 .. { Solder or residue removing devices }

- B23K 3/03 .. electrically heated
- B23K 3/0307 ... { with current flow through the workpiece }
- B23K 3/0315 ... { Quick-heating soldering irons having the tip-material forming part of the electric circuit ( [B23K 3/0323](#) takes precedence ) }
- B23K 3/0323 ... { Battery-powered soldering irons }
- B23K 3/033 ... { comprising means for controlling or selecting the temperature or power }
- B23K 3/0338 ... { Constructional features of electric soldering irons }
- B23K 3/0346 .... { Handles }
- B23K 3/0353 .... { Heating elements or heating element housings }
- B23K 3/0361 .... { Couplings between the handle and the heating element housing }
- B23K 3/0369 .... { Couplings between the heating element housing and the bit or tip }
- B23K 3/0376 ... { comprising carbon heating elements or electrodes ( [B23K 3/0384](#) and [B23K 3/0392](#) take precedence ) }
- B23K 3/0384 ... { the heat being generated by an arc }
- B23K 3/0392 ... { the heat being generated by contact resistance }
  
- B23K 3/04 . Heating appliances ( soldering lamps or blowpipes [F23D](#) ; electric heating in general [H05B](#) )
- B23K 3/043 .. { Flame-heated appliances }
- B23K 3/047 .. electric
- B23K 3/0471 ... { using resistance rod or bar, e.g. carbon silica }
- B23K 3/0473 ... { using Joule effect at the place of contact between a rod and the soldering tip }
- B23K 3/0475 ... { using induction effects, e.g. Kelvin or skin effects }
- B23K 3/0476 ... { Soldering pliers }
- B23K 3/0478 ... { comprising means for controlling or selecting the temperature or power }
- B23K 3/053 ... using resistance wires
  
- B23K 3/06 . Solder feeding devices ; Solder melting pans
- B23K 3/0607 .. { Solder feeding devices }
- B23K 3/0615 ... { forming part of a soldering iron }
- B23K 3/0623 ... { for shaped solder piece feeding, e.g. preforms, bumps, balls, pellets, droplets }
- B23K 3/063 ... { for wire feeding }
- B23K 3/0638 ... { for viscous material feeding, e.g. solder paste feeding ( [B23K 3/0623](#) takes precedence ) }
- B23K 3/0646 .. { Solder baths }
- B23K 3/0653 ... { with wave generating means, e.g. nozzles, jets, fountains }
- B23K 3/0661 ... { Oscillating baths }
- B23K 3/0669 ... { with dipping means }
- B23K 3/0676 .... { Conveyers therefor }
- B23K 3/0684 .... { with means for oscillating the workpiece }
- B23K 3/0692 ... { with intermediary means for bringing solder on workpiece, e.g. rollers }
  
- B23K 3/08 . Auxiliary devices therefor ( cleaning pipes or tubes or systems of pipes or tubes, e.g. before soldering, [B08B 9/02](#) )

- B23K 3/082 . . { Flux dispensers; Apparatus for applying flux }
- B23K 3/085 . . { Cooling, heat sink or heat shielding means }
- B23K 3/087 . . { Soldering or brazing jigs, fixtures or clamping means }

**Guidance heading: Flame welding or cutting**

**B23K 5/00 Gas flame welding**

- B23K 5/003 . { the welding zone being shielded against the influence of the surrounding atmosphere ( [selection of media B23K 35/38](#) ) }
- B23K 5/006 . { specially adapted for particular articles or work }
- B23K 5/02 . Seam welding ( [making tubes involving operations other than welding B21C](#) )
- B23K 5/023 . . { of horizontal seams in assembling vertical plates a welding unit being adapted to travel along the upper horizontal edge of the plates }
- B23K 5/026 . . { of non-horizontal seams in assembling non-horizontal plates }
- B23K 5/04 . . using additional profiled strips or the like of welding metal along seam edges
- B23K 5/06 . . Welding longitudinal seams
- B23K 5/08 . . Welding circumferential seams
- B23K 5/083 . . . { Welding three-dimensional seams }
- B23K 5/086 . . . . { helicoidal seams }
- B23K 5/10 . Welding workpieces essentially comprising layers of different metals, e.g. plated workpieces
- B23K 5/12 . taking account of the properties of the material to be welded
- B23K 5/14 . . of non-ferrous metals ( [B23K 5/16 takes precedence](#) )
- B23K 5/16 . . of different metals
- B23K 5/18 . for purposes other than joining parts, e.g. built-up welding
- B23K 5/20 . making use of vibrations, e.g. supersonic vibrations
- B23K 2005/207 . specially adapted for particular articles or work
- B23K 5/213 . Preliminary treatment
- B23K 5/22 . Auxiliary equipment, e.g. backings, guides
- B23K 5/24 . . Arrangements for supporting torches ( [not restricted to flame welding B23K 37/02](#) )

**B23K 7/00 Cutting, scarfing, or desurfacing by applying flames { ( [thermal deburring B23D 79/005](#) ) }**

- B23K 7/001 . { for profiling plate edges or for cutting grooves }
- B23K 7/002 . { Machines, apparatus, or equipment for cutting plane workpieces, e.g. plates }

- B23K 7/003 . . { Machines, apparatus, or equipment for cutting long articles, e.g. cast stands, plates, in parts of predetermined length }
- B23K 7/004 . . { Seam tracking }
- B23K 7/005 . { Machines, apparatus, or equipment specially adapted for cutting curved workpieces, e.g. tubes }
- B23K 7/006 . . { for tubes }
- B23K 7/007 . . . { for obtaining tube intersection profiles }
- B23K 7/008 . { Preliminary treatment }
- B23K 7/06 . Machines, apparatus, or equipment specially designed for scarfing or desurfacing
- B23K 7/08 . by applying additional compounds or means favouring the cutting, scarfing, or desurfacing procedure
- B23K 7/10 . Auxiliary devices, e.g. for guiding or supporting the torch ( [guiding means applicable to other metal-working machines B23Q](#) )
- B23K 7/102 . . { for controlling the spacial relationship between the workpieces and the gas torch }
- B23K 7/105 . . { specially adapted for particular geometric forms }
- B23K 7/107 . . . { for cutting circles }

**Guidance heading: Electric welding or cutting**

- B23K 9/00** **Arc welding or cutting** ( [electro-slag welding B23K 25/00](#) ; welding transformers [H01F](#) ; welding generators [H02K](#) )
- B23K 9/0008 . { Welding without shielding means against the influence of the surrounding atmosphere }
  - B23K 9/0017 . . { using more than one electrode }
  - B23K 9/0026 . { specially adapted for particular articles or work }
  - B23K 9/0035 . . { of thin articles }
  - B23K 9/0043 . . { Locally welding a thin plate to a thick piece ( [spot arc welding B23K 9/007](#) ) }
  - B23K 9/0052 . . { Welding of pipe panels }
  - B23K 9/0061 . { Underwater arc welding }
  - B23K 9/007 . Spot arc welding
  - B23K 9/013 . Arc cutting, gouging, scarfing or desurfacing
  - B23K 9/0135 . . { Arc saw cutting }
  - B23K 9/02 . Seam welding ; Backing means ; Inserts
  - B23K 9/0203 . . { Inserts }
  - B23K 9/0206 . . { of horizontal seams in assembling vertical plates, a welding unit being adapted to travel along the upper horizontal edge of the plates }

- B23K 9/0209 .. { of non-horizontal seams in assembling non-horizontal plates }
- B23K 9/0213 .. { Narrow gap welding }
- B23K 9/0216 .. { Seam profiling, e.g. weaving, multilayer }
- B23K 9/022 .. Welding by making use of electrode vibrations
- B23K 9/025 .. for rectilinear seams
  - B23K 9/0253 ... { for the longitudinal seam of tubes }
  - B23K 9/0256 ... { for welding ribs on plates }
- B23K 9/028 .. for curved planar seams
  - B23K 9/0282 ... { for welding tube sections }
  - B23K 9/0284 .... { with an electrode working inside the tube }
  - B23K 9/0286 .... { with an electrode moving around the fixed tube during the welding operation }
- B23K 9/0288 ... { for welding of tubes to tube plates }
- B23K 9/032 .. for three-dimensional seams
  - B23K 9/0325 ... { helicoidal seams }
- B23K 9/035 .. with backing means disposed under the seam
  - B23K 9/0352 ... { the backing means being movable during the welding operation }
  - B23K 9/0354 ... { the backing means being expandable }
  - B23K 9/0356 ... { the backing means being a tape or strip }
  - B23K 9/0358 ... { the backing means being a ring or sleeve }
- B23K 9/038 .. using moulding means ( [not restricted to arc welding B23K 37/06](#) )
  
- B23K 9/04 . Welding for other purposes than joining, e.g. built-up welding
- B23K 9/042 .. { Built-up welding on planar surfaces }
- B23K 9/044 .. { Built-up welding on three-dimensional surfaces }
- B23K 9/046 ... { on surfaces of revolution }
- B23K 9/048 .... { on cylindrical surfaces }
  
- B23K 9/06 . Arrangements or circuits for starting the arc, e.g. by generating ignition voltage, or for stabilising the arc
- B23K 9/067 .. Starting the arc
  - B23K 9/0671 ... { by means of brief contacts between the electrodes }
  - B23K 9/0672 ... { without direct contact between electrodes }
  - B23K 9/0673 .... { Ionisation of the arc gap by means of a tension with a step front ( [pulses or high frequency tensions](#) ) }
  - B23K 9/0675 .... { Ionization of the arc gap by means of radiation or particle bombardment }
  - B23K 9/0676 .... { Ionization of the arc gap by means of heating }
  - B23K 9/0677 .... { Ionization of the arc gap by means of a contact piece disposed between the electrodes }
  - B23K 9/0678 .... { Ionization of the arc gap by means of an auxiliary arc }
- B23K 9/073 .. Stabilising the arc
  - B23K 9/0731 ... { Stabilising of the arc tension }
  - B23K 9/0732 ... { Stabilising of the arc current }
  - B23K 9/0734 ... { Stabilising of the arc power }

- B23K 9/0735 . . . { Stabilising of the arc length }
- B23K 9/0737 . . . { Stabilising of the arc position }
- B23K 9/0738 . . . { Stabilising of the arc by automatic re-ignition means }
  
- B23K 9/08 . Arrangements or circuits for magnetic control of the arc { stabilising of the arc position by magnetic means [B23K 9/0737](#) }
  
- B23K 9/09 . Arrangements or circuits for arc welding with pulsed current or voltage
- B23K 9/091 . . { characterised by the circuits }
- B23K 9/092 . . . { characterised by the shape of the pulses produced }
- B23K 9/093 . . . { the frequency of the pulses produced being modulatable }
  
- B23K 9/095 . Monitoring or automatic control of welding parameters
- B23K 9/0953 . . { using computing means }
- B23K 9/0956 . . { using sensing means, e.g. optical }
  
- B23K 9/10 . Other electric circuits therefor ; Protective circuits ; Remote controls
- B23K 9/1006 . . { Power supply }
- B23K 9/1012 . . . { characterised by parts of the process }
- B23K 9/1018 . . . . { Improvements of the cos (phi) of arc welding installations }
- B23K 9/1025 . . . . { Means for suppressing or reducing DC components in AC arc welding installations }
- B23K 9/1031 . . . . { Reduction of the arc voltage beneath the arc striking value, e.g. to zero voltage, during non-welding periods }
- B23K 9/1037 . . . . { Means preventing crater forming at the extremity of the seam }
- B23K 9/1043 . . . { characterised by the electric circuit ( [B23K 9/1012](#) takes precedence ) }
- B23K 9/105 . . . . { by using discharge tubes or mechanical contactors ( [B23K 9/1068](#) takes precedence ) }
- B23K 9/1056 . . . . { by using digital means ( [B23K 9/1068](#) takes precedence ) }
- B23K 9/1062 . . . . . { with computing means }
- B23K 9/1068 . . . . { Electric circuits for the supply of power to two or more arcs from a single source }
  
- B23K 9/1075 . . . { Parallel power supply, i.e. multiple power supplies or multiple inverters supplying a single arc or welding current }
- B23K 9/1081 . . { Arc welding by means of accumulated energy }
- B23K 9/1087 . . { Arc welding using remote control }
- B23K 9/1093 . . { Consumable electrode or filler wire preheat circuits }
  
- B23K 9/12 . Automatic feeding or moving of electrodes or work for spot or seam welding or cutting
- B23K 9/121 . . { Devices for the automatic supply of at least two electrodes one after the other }
- B23K 9/122 . . { Devices for guiding electrodes, e.g. guide tubes }
- B23K 9/123 . . . { Serving also as contacting devices supplying welding current to an electrode }
- B23K 9/124 . . { Circuits or methods for feeding welding wire }
- B23K 9/125 . . . { Feeding of electrodes ( for stabilising arc [B23K 9/073](#) ) }
- B23K 9/126 . . { Controlling the spatial relationship between the work and the gas torch (



- between wire tip and piece [B23K 9/073](#) ) }
- B23K 9/127 .. Means for tracking lines during arc welding or cutting ( copying in general [B23Q 35/00](#) )
- B23K 9/1272 ... { Geometry oriented, e.g. beam optical trading }
- B23K 9/1274 .... { Using non-contact, optical means, e.g. laser means }
- B23K 9/1276 .... { Using non-contact, electric or magnetic means, e.g. inductive means }
- B23K 9/1278 .... { Using mechanical means }
- B23K 9/133 .. Means for feeding electrodes, e.g. drums, rolls, motors
- B23K 9/1333 ... { Dereeling means }
- B23K 9/1336 ... { Driving means }
- B23K 9/14 . making use of insulated electrodes
- B23K 9/142 .. { Drag welding, the arc length being determined by an insulated layer between the welding electrode and the welding spot or seam }
- B23K 9/145 ... { the insulated welding electrode being laid along the seam }
- B23K 9/147 ... { the insulated welding electrode resting with one extremity on the workpiece }
- B23K 9/16 . making use of shielding gas { selection of media [B23K 35/38](#) }
- B23K 9/162 .. { making use of a stationary fluid }
- B23K 9/164 .. { making use of a moving fluid }
- B23K 9/167 .. and of a non-consumable electrode
- B23K 9/1675 ... { making use of several electrodes }
- B23K 9/173 .. and of a consumable electrode
- B23K 9/1735 ... { making use of several electrodes }
- B23K 9/18 . Submerged-arc welding
- B23K 9/182 .. { making use of a non-consumable electrode }
- B23K 9/184 ... { making use of several electrodes }
- B23K 9/186 .. { making use of a consumable electrodes }
- B23K 9/188 ... { making use of several electrodes }
- B23K 9/20 . Stud welding
- B23K 9/201 .. { of the extremity of a small piece on a great or large basis }
- B23K 9/202 ... { by means of portable equipment, e.g. stud welding gun }
- B23K 9/203 .. { of cooling fins }
- B23K 9/205 .. { Means for determining, controlling or regulating the arc interval }
- B23K 9/206 .. { with automatic stud supply }
- B23K 9/207 .. { Features related to studs ( welding studs per se [B23K 35/0288](#) ) }
- B23K 9/208 ... { Ferrules, e.g. for confining molten material }
- B23K 9/22 . Percussion welding
- B23K 9/23 . taking account of the properties of the materials to be welded
- B23K 9/232 .. { of different metals }
- B23K 9/235 . Preliminary treatment



- B23K 9/24 . Features related to electrodes ( [form or composition of electrodes B23K 35/00](#) )
- B23K 9/26 .. Accessories for electrodes, e.g. ignition tips
- B23K 9/28 .. Supporting devices for electrodes ( [not restricted to arc welding or cutting B23K 37/02](#) )
- B23K 9/282 ... { Electrode holders not supplying shielding means to the electrode }
- B23K 9/285 ... { Cooled electrode holders }
- B23K 9/287 ... { Supporting devices for electrode holders ( [not restricted to arc welding B23K 37/02](#) ) }
- B23K 9/29 ... Supporting devices adapted for making use of shielding means
- B23K 9/291 .... { the shielding means being a gas }
- B23K 9/293 ..... { using consumable electrode-rod }
- B23K 9/295 ..... { using consumable electrode-wire }
- B23K 9/296 ..... { using non-consumable electrodes }
- B23K 9/298 .... { the shielding means being a powder }
- B23K 9/30 ... Vibrating holders for electrodes ( [B23K 9/022 takes precedence](#) )
- B23K 9/32 . Accessories ( [earthing connections H01R](#) )
- B23K 9/321 .. { Protecting means ( [protecting means in general F16P 1/06](#) ) }
- B23K 9/322 ... { Head protecting means ( [masks, shields or hoods for weldersp A61F 9/06](#) ) }
- B23K 9/323 .. { Combined coupling means, e.g. gas, electricity, water or the like ( [electrical only H01R](#) ) }
- B23K 9/324 .. { Devices for supplying or evacuating a shielding or a welding powder, e.g. a magnetic powder }
- B23K 9/325 .. { Devices for supplying or evacuating shielding gas }
- B23K 9/326 ... { Purge gas rings, i.e. devices for supplying or evacuating shielding gas inside of hollow or tubular articles, e.g. pipes, vessels }
- B23K 9/327 .. { Means for transporting supplies ( [carriages in general B23K 37/02](#) ) }
- B23K 9/328 .. { Cleaning of weld torches, i.e. removing weld-spatter; Preventing weld-spatter, e.g. applying anti-adhesives }

## **B23K 10/00 Welding or cutting by means of a plasma**

- B23K 10/003 . { Scarfing, desurfacing or deburring ( [by applying flames B23K 7/06](#) ) }
- B23K 10/006 . { Control circuits therefor ( [circuits for plasma torches H05H 1/36](#) ) }
- B23K 10/02 . Plasma welding
- B23K 10/022 .. { Spot welding }
- B23K 10/025 .. { by making use of electrode vibrations }
- B23K 10/027 .. { Welding for purposes other than joining, e.g. build-up welding }

## **B23K 11/00 Resistance welding ; Severing by resistance heating**

- B23K 11/0006 . { the welding zone being shielded against the influence of the surrounding atmosphere ( [selection of media B23K 35/38](#) ) }

- B23K 11/0013 . { welding for reasons other than joining, e.g. build up welding }
- B23K 11/002 . { specially adapted for particular articles or work }
- B23K 11/0026 .. { Welding of thin articles }
- B23K 11/0033 .. { Welding locally a thin plate to a large piece }
- B23K 11/004 .. { Welding of a small piece to a great or broad piece }
- B23K 11/0046 ... { the extremity of a small piece being welded to a base, e.g. cooling studs or fins to tubes or plates }
- B23K 11/0053 .... { Stud welding, i.e. resistive ( with an arc [B23K 9/20](#) ) }
- B23K 11/006 .... { Welding a tip to a base, e.g. pen point nibs }
- B23K 11/0066 ... { Riveting }
- B23K 11/0073 .. { Butt welding of long articles advanced axially }
- B23K 11/008 .. { Manufacturing of metallic grids or mats by spot welding }
- B23K 11/0086 ... { Grids or mats used in concrete structures ( [B23K 11/11](#) takes precedence ) }
- B23K 11/0093 .. { Welding of honeycomb sandwich structures ( brazing of honeycomb sandwich structure [B23K 1/0014](#) ) }
- B23K 11/02 . Pressure butt welding
- B23K 11/04 . Flash butt welding
- B23K 11/043 .. { characterised by the electric circuits used therewith }
- B23K 11/046 .. { Apparatus therefor }
- B23K 11/06 . using roller electrodes
- B23K 11/061 .. { for welding rectilinear seams }
- B23K 11/062 ... { for welding longitudinal seams of tubes }
- B23K 11/063 .... { Lap welding }
- B23K 11/065 .. { for welding curved planar seams }
- B23K 11/066 ... { of tube sections }
- B23K 11/067 .. { for welding three-dimensional seams }
- B23K 11/068 ... { of helicoidal seams }
- B23K 11/08 . Seam welding not restricted to one of the preceding sub-groups
- B23K 11/082 .. { of three-dimensional seams }
- B23K 11/084 ... { of helicoidal seams }
- B23K 11/087 .. for rectilinear seams
- B23K 11/0873 ... { of the longitudinal seam of tubes }
- B23K 11/0876 .... { Lap welding }
- B23K 11/093 .. for curved planar seams
- B23K 11/0935 ... { of tube sections }
- B23K 11/10 . Spot welding ; Stitch welding
- B23K 11/105 .. { Stitch welding }
- B23K 11/11 .. Spot welding

- B23K 11/115 . . . { by means of two electrodes placed opposite one another on both sides of the welded parts }
- B23K 11/12 . . making use of vibrations
- B23K 11/14 . Projection welding
- B23K 11/16 . taking account of the properties of the material to be welded
- B23K 11/163 . . { Welding of coated materials }
- B23K 11/166 . . . { of galvanized or tinned materials }
- B23K 11/18 . . of non-ferrous metals ( [B23K 11/20](#) takes precedence )
- B23K 11/185 . . . { of aluminium or aluminium alloys }
- B23K 11/20 . . of different metals
- B23K 11/22 . Severing by resistance heating
- B23K 11/24 . Electric supply or control circuits therefor
- B23K 11/241 . . { Electric supplies ( [B23K 11/248](#) takes precedence ) }
- B23K 11/243 . . . { Multiple welding installations fed by one source }
- B23K 11/245 . . . { using a stepping counter in synchronism with the welding pulses ( [electromagnetic counters G06M](#) ) }
- B23K 11/246 . . . { for flash welding }
- B23K 11/248 . . { Electric supplies using discharge tubes }
- B23K 11/25 . . Monitoring devices
- B23K 11/251 . . . { using analog means }
- B23K 11/252 . . . { using digital means }
- B23K 11/253 . . . . { the measured parameter being a displacement or a position }
- B23K 11/255 . . . . { the measured parameter being a force ( [B23K 11/253](#) takes precedence ) }
- B23K 11/256 . . . . { the measured parameter being the inter-electrode electrical resistance }
- B23K 11/257 . . . . { the measured parameter being an electrical current }
- B23K 11/258 . . . . { the measured parameter being a voltage }
- B23K 11/26 . . Storage discharge welding
- B23K 11/28 . Portable welding equipment
- B23K 11/30 . Features relating to electrodes ( [form or composition of electrodes B23K 35/00](#) )
- B23K 11/3009 . . { Pressure electrodes }
- B23K 11/3018 . . . { Cooled pressure electrodes }
- B23K 11/3027 . . { Slide or drag electrodes }
- B23K 11/3036 . . { Roller electrodes }
- B23K 11/3045 . . . { Cooled roller electrodes }
- B23K 11/3054 . . { Cooled electrodes ( [B23K 11/3018](#) , [B23K 11/3045](#) take precedence ) }
- B23K 11/3063 . . { Electrode maintenance, e.g. cleaning, grinding }
- B23K 11/3072 . . { Devices for exchanging or removing electrodes or electrode tips }
- B23K 11/3081 . . { Electrodes with a seam contacting part shaped so as to correspond to the shape of the bond area, e.g. for making an annular bond without relative movement in the

- longitudinal direction of the seam between the electrode holder and the work }
- B23K 11/309 .. { Wire electrodes }
- B23K 11/31 .. Electrode holders { and actuating devices therefor } ( not restricted to resistance welding or severing by resistance heating [B23K 37/02](#) )
- B23K 11/311 ... { the actuating device comprising an electric motor }
- B23K 11/312 ... { for several electrodes }
- B23K 11/314 ... { Spot welding guns, e.g. mounted on robots }
- B23K 11/315 .... { with one electrode moving on a linear path }
- B23K 11/317 ... { Equalizing; Balancing devices for electrode holders }
- B23K 11/318 ... { Supporting devices for electrode holders }
- B23K 11/34 . Preliminary treatment
- B23K 11/36 . Auxiliary equipment ( [B23K 11/31](#) takes precedence )
- B23K 11/362 .. { Contact means for supplying welding current to the electrodes }
- B23K 11/364 ... { Clamping contacts }
- B23K 11/366 ... { Sliding contacts }
- B23K 11/368 ... { Liquid contacts, e.g. mercury contacts }

## **B23K 13/00      Welding by high-frequency current heating**

- B23K 13/01 . by induction heating
- B23K 13/015 .. { Butt welding }
- B23K 13/02 .. Seam welding
- B23K 13/025 ... { for tubes }
- B23K 13/04 . by conduction heating { ( [B23K 13/02](#) takes precedence ) }
- B23K 13/043 .. { Seam welding }
- B23K 13/046 ... { for tubes }
- B23K 13/06 . characterised by the shielding of the welding zone against influence of the surrounding atmosphere ( selection of media [B23K 35/38](#) )
- B23K 13/08 . Electric supply or control circuits therefor

## **Guidance heading: Other welding or cutting ; Working by laser beam**

### **B23K 15/00      Electron-beam welding or cutting ( electron- or ion- beam tubes [H01J 37/00](#) )**

- B23K 15/0006 . { specially adapted for particular articles }
- B23K 15/0013 . { Positioning or observing workpieces, e.g. with respect to the impact; Aligning, aiming or focusing electronbeams }
- B23K 15/002 . { Devices involving relative movement between electronbeam and workpiece }
- B23K 15/0026 . { Auxiliary equipment }

- B23K 15/0033 . { Preliminary treatment }
- B23K 15/004 . { Tandem beams or torches, i.e. working simultaneously with several beams or torches }
- B23K 15/0046 . { Welding }
- B23K 15/0053 .. { Seam welding }
- B23K 15/006 ... { of rectilinear seams }
- B23K 15/0066 ... { with backing means disposed under the seams }
- B23K 15/0073 ... { with interposition of particular material to facilitate connecting the parts, e.g. using a filler }
- B23K 15/008 .. { Spot welding }
- B23K 15/0086 .. { welding for purposes other than joining, e.g. built-up welding }
- B23K 15/0093 .. { characterised by the properties of the materials to be welded }
- B23K 15/02 . Control circuits therefor
- B23K 15/04 . for welding annular seams
- B23K 15/06 . within a vacuum chamber ( [B23K 15/04](#) takes precedence )
- B23K 15/08 . Removing material, e.g. by cutting, by hole drilling
- B23K 15/085 .. { Boring }
- B23K 15/10 . Non-vacuum electron beam-welding or cutting
- B23K 17/00 use of the energy of nuclear particles in welding or related techniques**
- B23K 20/00 Non-electric welding by applying impact or other pressure, with or without the application of heat, e.g. cladding or plating**
- B23K 20/001 . { by extrusion or drawing }
- B23K 20/002 . { specially adapted for particular articles or work ( [B23K 20/129](#) takes precedence ) }
- B23K 20/004 .. { Wire welding }
- B23K 20/005 ... { Capillary welding }
- B23K 20/007 .... { Ball bonding }
- B23K 20/008 . { pressure combined with radiant energy }
- B23K 20/02 . by means of a press; { Diffusion bonding ( [B23K 20/001](#) , [B23K 20/04](#) take precedence ) }
- B23K 20/021 .. { Isostatic pressure welding }
- B23K 20/023 .. { Thermo-compression bonding }
- B23K 20/025 ... { Bonding tips therefor }
- B23K 20/026 ... { with diffusion of soldering material }

- B23K 20/028 . . { Butt welding }
- B23K 20/04 . by means of a rolling mill
- B23K 20/06 . by means of high energy impulses, e.g. magnetic energy
- B23K 20/08 . . Explosive welding
- B23K 20/085 . . . { for tubes, e.g. plugging }
- B23K 20/10 . making use of vibrations, e.g. ultrasonic welding
- B23K 20/103 . . { using a roller }
- B23K 20/106 . . { Features related to sonotrodes }
- B23K 20/12 . the heat being generated by friction ; Friction welding
- B23K 20/1205 . . { using translation movement }
- B23K 20/121 . . { Control circuits therefor }
- B23K 20/1215 . . { for other purposes than joining, e.g. built-up welding }
- B23K 20/122 . . { using a non-consumable tool, e.g. friction stir welding }
- B23K 20/1225 . . . { Particular aspects of welding with a non-consumable tool }

**WARNING**

This group only contains recent documents which are in the process of being reclassified into groups [B23K 20/123](#) to [B23K 20/1265](#)

- B23K 20/123 . . . { Controlling or monitoring the welding process }

**WARNING**

This group and its subgroups are incomplete. For recent documents see also [B23K 20/1225](#)

- B23K 20/1235 . . . . { with temperature control during joining }
- B23K 20/124 . . . . { at the beginning or at the end of a weld }
- B23K 20/1245 . . . { characterised by the apparatus }

**WARNING**

This group and its subgroups are incomplete. For recent documents see also [B23K 20/1225](#)

- B23K 20/125 . . . . { Rotary tool drive mechanism }
- B23K 20/1255 . . . . { Tools therefor, e.g. characterised by the shape of the probe }
- B23K 20/126 . . . . { Workpiece support, i.e. backing or clamping }
- B23K 20/1265 . . . { Non-butt welded joints, e.g. overlap-joints, T-joints or spot welds }

**WARNING**

This group is incomplete. For recent documents see also [B23K 20/1225](#)

- B23K 20/127 . . . { friction stir welding involving a mechanical connection ( forged connections [B21K 25/005](#) ; riveted connections [B21J 15/027](#) ) }

- B23K 20/1275 . . . { involving metallurgical change }
- B23K 20/128 . . . { making use of additional material }
- B23K 20/1285 . . { Portable friction welding machines }
- B23K 20/129 . . { specially adapted for particular articles or workpieces }
- B23K 20/1295 . . . { Welding studs }
  
- B23K 20/14 . Preventing or minimising gas access, or using protective gases or vacuum during welding ( [formed by material interposed between workpieces B23K 20/18](#) )
  
- B23K 20/16 . with interposition of special material to facilitate connection of the parts, e.g. material for absorbing or producing gas
- B23K 20/165 . . { involving an exothermic reaction of the interposed material }
  
- B23K 20/18 . Zonal welding by interposing weld-preventing substances between zones not to be welded
  
- B23K 20/20 . Special methods allowing subsequent separation, e.g. of metals of high quality from scrap material
  
- B23K 20/22 . taking account of the properties of the materials to be welded
- B23K 20/227 . . with ferrous layer
- B23K 20/2275 . . . { the other layer being aluminium }
- B23K 20/233 . . without ferrous layer
- B23K 20/2333 . . . { one layer being aluminium, magnesium or beryllium }
- B23K 20/2336 . . . { both layers being aluminium }
  
- B23K 20/24 . Preliminary treatment
  
- B23K 20/26 . Auxiliary equipment
  
- B23K 23/00 Alumino-thermic welding**
  
- B23K 25/00 Slag welding, i.e. using a heated layer or mass of powder, slag, or the like in contact with the material to be joined ( [B23K 23/00](#) takes precedence; submerged-arc welding [B23K 9/18](#) )**
  
- B23K 25/005 . { Welding for purposes other than joining, e.g. built-up welding }
  
- B23K 26/00 Working by laser beam, e.g. welding, cutting, boring ( [lasers per se H01S 3/00](#) ; { laser assisted deposition [C23C](#) ; laser inspection or alignment [G01B](#) ; laser sintering of metallic powder [B22F 3/105](#) , of plastics [B29C 67/00](#) , of glass [C03B 19/06](#) , of ceramics [C04B 35/64](#) ; applying identification marks by laser [B41M 5/24](#) } )**
  
- B23K 26/0003 . { Trimming, tuning }
  
- B23K 26/0006 . { taking account of the properties of the material involved ( [B23K 26/20](#) , [B23K 26/36](#) take precedence ) }
  
- B23K 26/0009 . . { Metallic material }



B23K 26/0012	... { Non-ferrous metals or alloys }
B23K 26/0015	.... { Refractory metals }
B23K 26/0018	.... { Light metals }
B23K 26/0021	.. { Non-metallic material ( laser surface treatment of glass not in the form of fibres or filaments <a href="#">C03C 23/0025</a> , of glass in the form of fibres or filaments <a href="#">C03C 25/6233</a> ) }
B23K 26/0024	... { Organic material }
B23K 26/0027	.... { Material from living organisms, e.g. skin ( surgical instruments, devices or methods for applying laser energy to the body <a href="#">A61B 18/20</a> ; dental laser <a href="#">A61C 1/0046</a> ; eye surgery using laser <a href="#">A61F 9/008</a> ) }
B23K 26/003	.... { Fabrics }
B23K 26/0033	.... { Paper }
B23K 26/0036	.... { Plastics }
B23K 26/0039	... { Inorganic material }
B23K 26/0042	.... { Semiconductor material, e.g. Si or Ge based }
B23K 26/0045	.... { Ceramics }
B23K 26/0048	.. { Composite material, e.g. fibre reinforced, sandwich steel plate }
B23K 26/0051	.. { Surface-treated material, e.g. plated, painted }
B23K 26/0054	. { Working by transmitting the laser beam within the workpiece }
B23K 26/0057	.. { by modifying or reforming the material inside the workpiece, e.g. for producing break initiation cracks }
B23K 26/006	.. { by creating voids inside the workpiece, e.g. for forming flow passages or flow patterns }
B23K 26/0063	.. { the laser beam entering a face of the workpiece from which it is transmitted through the workpiece material to work on a face remote from the face where the laser beam entered the workpiece, e.g. for effecting removal, fusion splicing, modifying or reforming }
B23K 26/0066	. { for surface treatment ( for changing the physical structure of ferrous metals or alloys <a href="#">C21D</a> , of non-ferrous metals or alloys <a href="#">C22F</a> ; for alloying <a href="#">C23C</a> ; annealing crystalline material <a href="#">C30B 33/02</a> ; laser treatment of semiconductors <a href="#">H01L</a> ) }
B23K 26/0069	.. { Laser shock processing ( modifying the physical properties of ferrous metals by laser shock processing <a href="#">C21D 10/005</a> ) }
B23K 26/0072	.. { Modifying rugosity }
B23K 26/0075	... { Diminishing rugosity, e.g. grinding; Polishing; Smoothing }
B23K 26/0078	... { Increasing rugosity, e.g. roughening }
B23K 26/0081	.. { by melting ( laser re-melting of metals by wave energy <a href="#">C22B 9/22</a> ; laser melting of glass <a href="#">C03C</a> ; laser melting for crystal growth <a href="#">C30B</a> ) }
B23K 26/0084	.. { Texturing }
B23K 26/0087	.. { by providing a line or line pattern, e.g. a dotted break initiation line }
B23K 26/009	. { using a non-absorbing, e.g. transparent, reflective or refractive, layer on the workpiece ( using a mask on the workpiece <a href="#">B23K 26/0661</a> ) }
B23K 26/0093	. { combined with mechanical machining or metal-working covered by other subclasses than <a href="#">B23K</a> ( combined with an electric arc <a href="#">B23K 26/1429</a> ; combined welding or cutting procedures or apparatus <a href="#">B23K 28/02</a> ) ; Heating a metal workpiece by laser during machining <a href="#">B23P 25/006</a> }

- B23K 26/0096 . { Portable laser equipment, e.g. hand-held laser apparatus ( Surgical laser instruments [A61B 18/20](#) , Dental Lasers [A61C 1/0046](#) , Hand-held laser dental apparatus for curing resins [A61C 19/004](#) ) }
- B23K 26/02 . Positioning or observing the workpiece, e.g. with respect to the point of impact ; Aligning, aiming or focusing the laser beam
- B23K 26/023 .. { Aligning, aiming or focussing the laser beam by pressing on the workpiece, e.g. pressing roller foot }
- B23K 26/026 .. { Aligning the laser beam ( [B23K 26/023](#) takes precedence; automatically aligning the laser beam [B23K 26/041](#) ) }
- B23K 26/03 .. Observing, { e.g. monitoring, } the workpiece { ( protective devices for the eye, carried on the body or in the hand [A61F 9/02](#) , [A61F 9/04](#) ) }
- B23K 26/032 ... { using optical means }
- B23K 26/034 ... { Observing temperature of the workpiece }
- B23K 26/036 ... { Observing magnetic field related to the workpiece }
- B23K 26/038 ... { Observing speed of the workpiece }
- B23K 26/04 .. Automatically aligning, aiming or focusing the laser beam, e.g. using the back-scattered light
- B23K 26/041 ... { Automatically aligning the laser beam }
- B23K 26/043 .... { along the beam path, i.e. alignment of laser beam axis relative to laser beam apparatus }
- B23K 26/045 ... { for tracking lines during welding or cutting, e.g. seam tracking }
- B23K 26/046 ... { Automatically focusing the laser beam }
- B23K 26/048 .... { by controlling the distance between laser head and workpiece }
- B23K 26/06 .. Shaping the laser beam, e.g. by masks or multi-focusing ( optical elements, systems, or apparatus, in general [G02B](#) { beam shaping for applications of laser not covered in this group [H01S 3/005](#) } )
- B23K 26/0604 ... { by a combination of beams }
- B23K 26/0608 .... { in the same heat affected zone [HAZ] ( [B23K 26/0613](#) , [B23K 26/0621](#) take precedence ) }
- B23K 26/0613 .... { having a common axis ( [B23K 26/0621](#) takes precedence ) }
- B23K 26/0617 ..... { and with spots spaced along the common axis }
- B23K 26/0621 .... { with spots located on opposed surfaces of the workpiece }
- B23K 26/0626 ... { Energy control of the laser beam ( temporal shaping of laser beam [H01S 3/0057](#) ) }
- B23K 26/063 .... { Pulse shaping }
- B23K 26/0635 ..... { using ultrashort pulses, i.e. pulses of 1ns or less }
- B23K 26/0639 ... { by means of optical elements }
- B23K 26/0643 .... { comprising mirrors }
- B23K 26/0648 .... { comprising lenses }
- B23K 26/0652 .... { comprising prisms }
- B23K 26/0656 .... { comprising a mask ( for lithography [G03F](#) ) }
- B23K 26/0661 ..... { disposed on the workpiece }
- B23K 26/0665 ... { by beam condensation on the workpiece, e.g. for focusing }
- B23K 26/067 ... Dividing the beam into multiple beams, e.g. multifocusing

- B23K 26/0673 . . . . { into independently operating sub-beams, e.g. beam multiplexing to provide laser beams for several stations }
- B23K 26/0676 . . . . { into dependently operating sub-beams, e.g. an array of spots with fixed spatial relationship or for performing simultaneously identical operations }
- B23K 26/073 . . . Shaping the laser spot
- B23K 26/0732 . . . . { into a rectangular shape }
- B23K 26/0734 . . . . { into an annular shape }
- B23K 26/0736 . . . . { into an oval shape, e.g. elliptic shape }
- B23K 26/0738 . . . . { into a linear shape }
  
- B23K 26/08 . . Devices involving relative movement between laser beam and workpiece
- B23K 26/0807 . . { Devices involving movement of the laser beam relative to the laser head, i.e. scanning devices }
- B23K 26/0815 . . . { using multifaceted mirrors, e.g. polygonal mirror ( scanning devices using multifaceted mirrors, in general [G02B 26/12](#) ) }
- B23K 26/0823 . . { Devices involving rotation of the workpiece }
- B23K 26/083 . . { Devices involving movement of the workpiece in at least one axial direction }
- B23K 26/0838 . . . { by using an endless conveyor belt }
- B23K 26/0846 . . . . { for moving elongated workpieces longitudinally, e.g. wire or strip material }
- B23K 26/0853 . . . { Devices involving movement of the workpiece in at least in two axial directions, e.g. in a plane }
- B23K 26/0861 . . . . { in at least in three axial directions }
- B23K 26/0869 . . { Devices involving movement of the laser head in at least one axial direction }
- B23K 26/0876 . . . { in at least two axial directions }
- B23K 26/0884 . . . . { in at least in three axial directions, e.g. manipulators, robots }
- B23K 26/0892 . . . { Controlling the laser beam travel length }
- B23K 26/10 . . using a fixed support, { i.e. involving moving the laser beam }
- B23K 26/103 . . . { the laser beam rotating around the fixed workpiece ( [B23K 26/28](#) takes precedence ) }
- B23K 26/106 . . . . { inside the workpiece }
  
- B23K 26/12 . . in a special atmosphere, e.g. in an enclosure
- B23K 26/121 . . { in a liquid, e.g. underwater }
- B23K 26/122 . . { in vacuum }
- B23K 26/123 . . { in an atmosphere of particular gases }
- B23K 26/125 . . . { of mixed gases }
- B23K 26/126 . . { in an atmosphere of gases chemically reacting with the workpiece ( chemical etching of glass [C03C 15/00](#) , [C03C 25/68](#) ; chemical etching of metallic material [C23F 1/00](#) ; etching of crystallised non-metallic material with defined structure in gas atmosphere [C30B 33/12](#) ) }
- B23K 26/127 . . { in an enclosure }
- B23K 26/128 . . . { Laser beam path enclosures }
  
- B23K 26/14 . . using a flow, e.g. a jet of gas, in conjunction with the laser beam; { Nozzles therefor } ( [B23K 26/12](#) takes precedence )
- B23K 26/1405 . . { for the removal of by-products, e.g. by aspiration }

- B23K 26/1411 .. { the flow containing particles, e.g. powder }
- B23K 26/1417 .. { the flow containing a liquid }
- B23K 26/1423 .. { the flow carrying an electric current }
- B23K 26/1429 ... { the flow carrying an electric arc, e.g. laser arc hybrid welding }
- B23K 26/1435 .. { involving specially adapted flow control means }
- B23K 26/1441 ... { for pressure control }
- B23K 26/1447 ... { for debit control }
- B23K 26/1452 ... { for directional control }
- B23K 26/1458 .. { Nozzles; Features related to nozzles }
- B23K 26/1464 ... { Supply to, or discharge from, nozzles of media, e.g. gas, powder, wire }
- B23K 26/147 ..... { Features outside the nozzle for feeding media towards the workpiece }
- B23K 26/1476 ..... { Features inside the nozzle for feeding media through the nozzle }
- B23K 26/1482 ... { Detachable nozzles, e.g. exchangeable or with breakaway lines }
- B23K 26/1488 ... { Means for protecting nozzles, e.g. the tip surface ( [by breakaway lines B23K 26/1482](#) ) }
- B23K 26/1494 ... { Maintenance of nozzles }
  
- B23K 26/16 . Removing of by-products, e.g. particles or vapours produced during treatment of a workpiece ( [by a flow of gas B23K 26/14](#) )
  
- B23K 26/18 . using absorbing layers on the material being worked, e.g. for marking or protecting purposes { ( [observing devices provided with laser radiation protection devices B23K 26/03](#) ; using masks on the workpiece for shaping the laser beam [B23K 26/0661](#) ; interposing material for facilitating bonding [B23K 26/203](#) ; laser anti-reflection devices, e.g. optical isolators [H01S 3/0064](#) ) }
  
- B23K 26/20 . Bonding, e.g. welding ( [soldering by means of radiant energy B23K 1/005](#) ; joining of preformed plastics parts by heating using laser beam [B29C 65/16](#) )
- B23K 26/203 .. { [with interposition of material for facilitating bonding \( with interposition of adhesive being heated by laser \[C09J 5/06\]\(#\) ; with interposition of solder \[B23K 1/0056\]\(#\) \)](#) }
- B23K 26/206 .. { [Laser sealing](#) }
- B23K 26/22 .. Spot welding
- B23K 26/24 .. Seam welding
- B23K 26/243 ... { [Fillet welding](#) }
- B23K 26/246 ... { [Overlap welding](#) }
- B23K 26/26 ... of rectilinear seams
- B23K 26/265 ..... { [Longitudinal seams of tubes](#) }
- B23K 26/28 ... of curved planar seams
- B23K 26/285 ..... { [Tube sections](#) }
- B23K 26/30 ... of three-dimensional seams
- B23K 26/305 ..... { [Helicoidal seams](#) }
- B23K 26/32 .. taking account of the properties of the material involved
- B23K 26/3206 ... { [Metallic material](#) }
- B23K 26/3213 ..... { [Non-ferrous metals or alloys](#) }
- B23K 26/322 ..... { [Refractory metals](#) }

B23K 26/3226	.....	{ Light metals }
B23K 26/3233	....	{ Dissimilar metal materials }
B23K 26/324	...	{ Non-metallic material ( joining glass to glass by fusing with laser <a href="#">C03B 23/20</a> , by processes other than by fusing using laser <a href="#">C03C 27/06</a> ; joining ceramics <a href="#">C04B 37/00</a> ) }
B23K 26/3246	....	{ Organic material ( devices or method using laser on the body <a href="#">A61B 18/20</a> ; dental laser <a href="#">A61C 1/0046</a> ; eye laser surgery <a href="#">A61F 9/008</a> ; Treatment of micro-organisms with electric or wave energy <a href="#">C12N 13/00</a> ) }
B23K 26/3253	.....	{ Fabrics }
B23K 26/326	.....	{ Paper }
B23K 26/3266	...	{ Inorganic material }
B23K 26/3273	....	{ Ceramics }
B23K 26/328	...	{ Composite material, e.g. fibre reinforced, sandwich steel plate }
B23K 26/3286	...	{ Surface-treated material, e.g. plated, painted }
B23K 26/3293	....	{ Coated material }
B23K 26/34	.	Welding for purposes other than joining, e.g. build-up welding { ( laser alloying or sintering <a href="#">C23C</a> ) }
B23K 26/345	..	{ Build-up welding }
B23K 26/36	.	Removing material { ( laser wire stripping <a href="#">H02G 1/128</a> ; cleaning by laser treatment <a href="#">B08B 7/0042</a> ) }
B23K 26/362	..	{ Mechanical trimming ( trimming of electric components <a href="#">B23K 26/0003</a> ) ; Deburring; Scarfing or desurfacing }
B23K 26/365	..	{ Laser etching, i.e. the material is removed superficially or partially through the workpiece by the laser beam ( laser etching for decorative purposes <a href="#">B44C 1/22</a> , laser etching for manufacturing printed circuit boards <a href="#">H05K 3/00</a> ) }
B23K 26/367	...	{ for making a groove or trench, e.g. scribing a break initiation groove }
B23K 26/38	..	by boring or cutting
B23K 26/381	...	{ Boring ( Via connections through an SC device substrate <a href="#">H01L 21/486</a> ) }
B23K 26/383	....	{ of specially shaped holes }
B23K 26/385	....	{ of blind holes ( Laser ablation of PCB substrate blind holes having a metal layer at the bottom <a href="#">H05K 3/0035</a> ) }
B23K 26/386	....	{ Trepanning }
B23K 26/388	....	{ of fluid openings, e.g. nozzles, jets ( Laser machining of inkjet nozzles <a href="#">B41J 2/1634</a> ) }
B23K 26/40	..	taking account of the properties of the material involved
B23K 26/4005	...	{ Metallic material }
B23K 26/401	....	{ Non-ferrous metals or alloys }
B23K 26/4015	....	{ Refractory metals }
B23K 26/402	....	{ Light metals }
B23K 26/4025	...	{ Non-metal material }
B23K 26/403	....	{ Organic material }
B23K 26/4035	.....	{ Material from living organisms, e.g. skin ( devices or method using laser on the body <a href="#">A61B 18/20</a> ; dental laser <a href="#">A61C 1/0046</a> ; eye laser surgery <a href="#">A61F 9/008</a> ; Treatment of micro-organisms with electric or wave energy <a href="#">C12N 13/00</a> ; Introduction of foreign genetic material into plant

- cells by physical or non-biological means [C12N 15/8206](#) ) }
- B23K 26/404 ..... { Leather ( clicking, perforating, or cutting leather [C14B 5/00](#) ) }
- B23K 26/4045 ..... { Wood or similar ( working or preserving wood or similar material [B27B](#) - [B27M](#) ) }
- B23K 26/405 ..... { Fibrous material }
- B23K 26/4055 ..... { Fabrics }
- B23K 26/406 ..... { Paper ( metallic paper [B23K 26/4005](#) ) }
- B23K 26/4065 ..... { Plastics }
- B23K 26/407 .... { Inorganic material }
- B23K 26/4075 ..... { Brittle material, e.g. semi-conductor wafers ( severing glass using laser [C03B 33/0222](#) , [C03B 33/091](#) ) }
- B23K 26/408 ..... { Ceramics }
- B23K 26/4085 ... { Composite material, e.g. fibre reinforced, sandwich steel plate }
- B23K 26/409 .... { Multi-layered material wherein at least one layer is non-metallic }
- B23K 26/4095 ... { Surface-treated material, e.g. plated, painted }
- B23K 26/42 . Preliminary treatment ; Auxiliary operations or equipment ( [B23K 26/16](#) takes precedence )
- B23K 26/421 .. { Preliminary treatment }
- B23K 26/422 .. { Auxiliary equipment }
- B23K 26/423 ... { Cooling arrangements ( by using a flow [B23K 26/14](#) ) }
- B23K 26/425 ... { Beam dispersers, e.g. beam wells }
- B23K 26/426 ... { Beam measuring device ( beam monitoring per se [G01J 1/4257](#) ) }
- B23K 26/427 ... { Protective screens ( goggles or eye-masks for welders carried on the body or in the hand [A61F 9/02](#) , [A61F 9/06](#) ) }
- B23K 26/428 ... { for monitoring laser beam transmission optics }
- B23K 28/00** **Welding or cutting not covered by any of the preceding groups, e.g. electrolytic welding**
- B23K 28/003 . { Welding in a furnace }
- B23K 28/006 . { Welding metals by means of an electrolyte ( working metal, e.g. cutting, by means of an electrolyte [B23H](#) ) }
- B23K 28/02 . Combined welding or cutting procedures or apparatus
- B23K 31/00** **Processes relevant to this subclass, specially adapted for particular articles or purposes, but not covered by only one of the preceding main groups ( making tubes or profiled bars involving operations other than soldering or welding [B21C 37/04](#) , [B21C 37/08](#) )**
- B23K 31/003 . { relating to controlling of welding distortion }
- B23K 31/006 . { relating to using of neural networks }
- B23K 31/02 . relating to soldering or welding ( dip or wave soldering in the manufacture of printed circuits [H05K 3/34](#) )

B23K 31/022	.. { Making profiled bars with soldered or welded seams }
B23K 31/025	.. { Connecting cutting edges or the like to tools; Attaching reinforcements to workpieces, e.g. wear-resisting zones to tableware }
B23K 31/027	.. { Making tubes with soldering or welding }
B23K 31/10	. relating to cutting or desurfacing
B23K 31/12	. relating to investigating the properties, e.g. the weldability, of materials
B23K 31/125	.. { Weld quality monitoring }
<b>B23K 33/00</b>	<b>Specially-profiled edge portions of workpieces for making soldering or welding connections ; Filling the seams formed thereby { ( <a href="#">B23K 11/14</a> takes precedence ) }</b>
B23K 33/002	. { Crimping or bending the workpieces at the joining area }
B23K 33/004	. { Filling of continuous seams }
B23K 33/006	.. { for cylindrical workpieces }
B23K 33/008	.. { for automotive applications }
<b>B23K 35/00</b>	<b>Rods, electrodes, materials, or media, for use in soldering, welding, or cutting</b>
B23K 35/001	. { Interlayers, transition pieces for metallurgical bonding of workpieces }
B23K 35/002	.. { at least one of the workpieces being of light metal }
B23K 35/004	.. { at least one of the workpieces being of a metal of the iron group }
B23K 35/005	.. { at least one of the workpieces being of a refractory metal }
B23K 35/007	.. { at least one of the workpieces being of copper or another noble metal }
B23K 2035/008	.. at least one of the workpieces being of silicium
B23K 35/02	. characterised by mechanical features, e.g. shape
B23K 35/0205	.. { Non-consumable electrodes; C-electrodes }
B23K 35/0211	.. { for use in cutting ( <a href="#">B23K 35/0205</a> takes precedence ) }
B23K 35/0216	... { Rods, electrodes, wires }
B23K 35/0222	.. { for use in soldering, brazing ( <a href="#">B23K 35/0205</a> takes precedence ) }
B23K 35/0227	... { Rods, wires ( <a href="#">B23K 35/0244</a> takes precedence ) }
B23K 35/0233	... { Sheets, foils ( <a href="#">B23K 35/0244</a> takes precedence ) }
B23K 35/0238	.... { layered }
B23K 35/0244	... { Powders, particles or spheres; Preforms made therefrom }
B23K 35/025	.... { Pastes, creams, slurries }
B23K 35/0255	.. { for use in welding ( <a href="#">B23K 35/0205</a> takes precedence ) }
B23K 35/0261	... { Rods, electrodes, wires }
B23K 35/0266	.... { flux-cored }
B23K 35/0272	.... { with more than one layer of coating or sheathing material }
B23K 35/0277	.... { of non-circular cross-section }
B23K 35/0283	.... { multi-cored; multiple }



- B23K 35/0288 ... { Welding studs }
- B23K 35/0294 ... { Consumable guides }
  
- B23K 35/22 . characterised by the composition or nature of the material
- B23K 35/222 .. { Non-consumable electrodes }
- B23K 35/224 .. { Anti-weld compositions; Braze stop-off compositions }
- B23K 35/226 .. { Non-corrosive coatings; Primers applied before welding }
- B23K 35/228 .. { Selection of materials for cutting }
- B23K 35/24 .. Selection of soldering or welding materials proper ( [B23K 35/34](#) takes precedence )
  
- B23K 35/26 ... with the principal constituent melting at less than 400 degrees C
- B23K 35/262 .... { Sn as the principal constituent }
- B23K 35/264 .... { Bi as the principal constituent }
- B23K 35/266 .... { Cd as the principal constituent }
- B23K 35/268 .... { Pb as the principal constituent }
- B23K 35/28 ... with the principal constituent melting at less than 950 degrees C
- B23K 35/282 .... { Zn as the principal constituent }
- B23K 35/284 .... { Mg as the principal constituent }
- B23K 35/286 .... { Al as the principal constituent }
- B23K 35/288 ..... { with Sn or Zn }
- B23K 35/30 ... with the principal constituent melting at less than 1550 degrees C
- B23K 35/3006 .... { Ag as the principal constituent }
- B23K 35/3013 .... { Au as the principal constituent }
- B23K 35/302 .... { Cu as the principal constituent }
- B23K 35/3026 .... { Mn as the principal constituent }
- B23K 35/3033 .... { Ni as the principal constituent }
- B23K 35/304 ..... { with Cr as the next major constituent }
- B23K 35/3046 .... { Co as the principal constituent }
- B23K 35/3053 .... { Fe as the principal constituent }
- B23K 35/306 ..... { with C as next major constituent, e.g. cast iron }
- B23K 35/3066 ..... { with Ni as next major constituent }
- B23K 35/3073 ..... { with Mn as next major constituent }
- B23K 35/308 ..... { with Cr as next major constituent }
- B23K 35/3086 ..... { containing Ni or Mn }
- B23K 35/3093 ..... { with other elements as next major constituents }
- B23K 35/32 ... with the principal constituent melting at more than 1550 degrees C
- B23K 35/322 .... { a Pt-group metal as principal constituent }
- B23K 35/325 .... { Ti as the principal constituent }
- B23K 35/327 .... { comprising refractory compounds, e.g. carbides }
- B23K 35/34 .. comprising compounds which yield metals when heated
- B23K 35/36 .. Selection of non-metallic compositions, e.g. coatings, fluxes ( [B23K 35/34](#) takes precedence ) ; Selection of soldering or welding materials, conjoint with selection of non-metallic compositions, both selections being of interest ( [selection of soldering or welding materials proper B23K 35/24](#) )

- B23K 35/3601 ... { with inorganic compounds as principal constituents }
- B23K 35/3602 .... { Carbonates, basic oxides or hydroxides }
- B23K 35/3603 .... { Halide salts }
- B23K 35/3605 ..... { Fluorides }
- B23K 35/3606 .... { Borates or B-oxides }
- B23K 35/3607 .... { Silica or silicates }
- B23K 35/3608 .... { Titania or titanates }
- B23K 35/361 .... { Alumina or aluminates }
- B23K 35/3611 .... { Phosphates }
- B23K 35/3612 ... { with organic compounds as principal constituents }
- B23K 35/3613 .... { Polymers, e.g. resins }
- B23K 35/3615 .... { N-compounds }
- B23K 35/3616 .... { Halogen compounds }
- B23K 35/3617 .... { B-compounds }
- B23K 35/3618 .... { Carboxylic acids or salts }
- B23K 35/362 ... Selection of compositions of fluxes ( [B23K 35/365](#) , [B23K 35/368](#) take precedence )
- B23K 35/365 ... Selection of non-metallic compositions of coating materials either alone or conjoint with selection of soldering or welding materials
- B23K 35/368 ... Selection of non-metallic compositions of core materials either alone or conjoint with selection of soldering or welding materials
- B23K 35/38 .. Selection of media, e.g. special atmospheres for surrounding the working area
- B23K 35/383 ... { mainly containing noble gases or nitrogen }
- B23K 35/386 ... { for condensation soldering }
- B23K 35/40 . Making wire or rods for soldering or welding ( processes involving a single technical art, see the relevant subclasses, e.g. [B05D](#) , [B21C](#) )
- B23K 35/402 .. { Non-consumable electrodes; C-electrodes }
- B23K 35/404 .. { Coated rods; Coated electrodes }
- B23K 35/406 .. { Filled tubular wire or rods ( [B23K 35/402](#) takes precedence ) }
- B23K 2035/408 ... with welded longitudinal seam

**B23K 37/00** Auxiliary devices or processes, not specially adapted to a procedure covered by only one of the preceding main groups ( eye-shields for welders worn on the operator's body or carried in the hand [A61F 9/00](#) { i.e. [A61F 9/02](#) } ; applicable to metal-working machines other than soldering, welding, or flame-cutting machines [B23Q](#) ; { laser protective screens [B23K 26/427](#) ; } protective shields for other welding methods [F16P 1/06](#) )

- B23K 37/003 . { Cooling means }
- B23K 37/006 . { Safety devices }
- B23K 37/02 . Carriages for supporting the welding or cutting element
- B23K 37/0205 .. { guided by hand }
- B23K 37/0211 .. { travelling on a guide member, e.g. rail, track }

B23K 37/0217	... { the guide member being fixed to the workpiece }
B23K 37/0223	.... { the guide member being a part of the workpiece }
B23K 37/0229	... { the guide member being situated alongside the workpiece }
B23K 37/0235	... { the guide member forming part of a portal }
B23K 37/0241	.. { Attachments between the welding or cutting element and the carriage }
B23K 37/0247	.. { Driving means }
B23K 37/0252	.. { Steering means }
B23K 37/0258	.. { Electric supply or control circuits therefor }
B23K 37/0264	.. { magnetically attached to the workpiece }
B23K 37/027	.. { for making circular cuts or welds }
B23K 37/0276	.. { for working on or in tubes ( <a href="#">B23K 37/0211</a> takes precedence ) }
B23K 37/0282	.. { Carriages forming part of a welding unit }
B23K 37/0288	.. { Carriages forming part of a cutting unit }
B23K 37/0294	.. { Transport carriages or vehicles }
B23K 37/04	. for holding or positioning work
B23K 37/0408	.. { for planar work }
B23K 37/0417	.. { for spherical work }
B23K 37/0426	.. { Fixtures for other work }
B23K 37/0435	... { Clamps }
B23K 37/0443	.... { Jigs }
B23K 37/0452	... { Orientable fixtures ( <a href="#">B23K 37/0461</a> takes precedence ) }
B23K 37/0461	.. { Welding tables }
B23K 37/047	.. moving work to adjust its position between soldering, welding or cutting steps ( <a href="#">B23K 37/053</a> takes precedence )
B23K 37/053	.. aligning cylindrical work ; Clamping devices therefor
B23K 37/0531	... { internal pipe alignment clamps }
B23K 37/0533	... { external pipe alignment clamps }
B23K 37/0535	... { longitudinal pipe seam alignment clamps }
B23K 37/0536	... { for maintaining flanges on tubes }
B23K 37/0538	... { for rotating tubes, e.g. rollers }
B23K 37/06	. for positioning the molten material, e.g. confining it to a desired area
B23K 37/08	. for flash removal
<b>B23K 2201/00</b>	<b>Articles made by soldering, welding or cutting by applying heat locally</b>
B23K 2201/001	. Turbines
B23K 2201/002	. Drill-bits
B23K 2201/003	. Pistons
B23K 2201/005	. Camshafts

B23K 2201/006	. Vehicles
B23K 2201/007	. Marks, e.g. trade marks
B23K 2201/008	. Gears
B23K 2201/02	. Honeycomb structures
B23K 2201/04	. Tubular or hollow articles
B23K 2201/045	.. Hollow panels
B23K 2201/06	.. Tubes
B23K 2201/08	... finned or ribbed
B23K 2201/10	.. Pipe-lines
B23K 2201/12	.. Vessels
B23K 2201/125	... Cans
B23K 2201/14	.. Heat exchangers
B23K 2201/16	. Bands or sheets of indefinite length
B23K 2201/18	. Sheet panels
B23K 2201/185	.. Tailored blanks
B23K 2201/20	. Tools
B23K 2201/22	. Nets, wire fabrics or the like
B23K 2201/24	. Frameworks
B23K 2201/26	. Railway or like rails
B23K 2201/28	. Beams
B23K 2201/30	. Chains, hoops or rings
B23K 2201/32	. Wires
B23K 2201/34	. Coated articles
B23K 2201/36	. Electric or electronic devices
B23K 2201/38	.. Conductors
B23K 2201/40	.. Semiconductor devices
B23K 2201/42	.. Printed circuits
<b>B23K 2203/00</b>	<b>Materials to be soldered, welded or cut</b>
B23K 2203/02	. Iron or ferrous alloys
B23K 2203/04	.. Steel or steel alloys

B23K 2203/06	. .	Cast-iron alloys
B23K 2203/08	.	Non-ferrous metals or alloys
B23K 2203/10	. .	Aluminium or alloys thereof
B23K 2203/12	. .	Copper or alloys thereof
B23K 2203/14	. .	Titanium or alloys thereof
B23K 2203/16	.	Composite materials
B23K 2203/18	.	Dissimilar materials
B23K 2203/20	. .	Ferrous alloys and aluminium or alloys thereof
B23K 2203/22	. .	Ferrous alloys and copper or alloys thereof
B23K 2203/24	. .	Ferrous alloys and titanium or alloys thereof