

ECLA EUROPEAN 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 [B21C23/22](#); building up linings or coverings by casting [B22D19/08](#); casting by dipping [B22D23/04](#); manufacture of composite layers by sintering metal powder [B22F7/00](#); arrangements on machine tools for copying or controlling B23Q; covering metals or covering materials with metals, not otherwise provided for C23C; burners F23D)

[N: **WARNING**

[C0812] The following IPC groups are not used in the internal ECLA classification scheme. Subject matter covered by these groups is classified in the following ECLA groups:

[B23K35/04](#) - [B23K35/20](#) covered by [B23K35/02B](#) - [B23K35/02E6](#)
[B23K35/363](#) " [B23K35/36B](#) - [B23K35/36D6](#)
]

Notes

[C9603]

1. This subclass covers also electric circuits specially adapted for the purposes covered by the title of the subclass.
2. 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

Guide 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)

B23K1/00

Soldering, e.g. brazing, or unsoldering ([B23K3/00](#) takes precedence; characterised only by the use of special materials or media [B23K35/00](#); dip or wave soldering in the manufacture of printed circuits [H05K3/34](#))

B23K1/00L

. [N: Soldering by means of dipping in a fused salt bath]

B23K1/00M

. [N: Resistance soldering]

B23K1/00Q

. [N: Exothermic brazing]

B23K1/00S

. [N: specially adapted for particular articles or work]

B23K1/00S2

. . [N: Sealing small holes in metal containers, e.g. tins]

B23K1/00S4

. . [N: Brazing heat exchangers]

B23K1/00S6

. . [N: Brazing of honeycomb sandwich structures]

- B23K1/00S8 . . [N: Brazing of electronic components] [N0305]
- B23K1/00S10 . . [N: Brazing of turbine parts] [N0305]
- B23K1/002 . Soldering by means of induction heating
- B23K1/005 . Soldering by means of radiant energy
- B23K1/005L . . [N: soldering by means of I.R.]
- B23K1/005R . . [N: soldering by means of beams, e.g. lasers, E.B.]
- B23K1/008 . Soldering within a furnace ([B23K1/012](#) takes precedence)
- B23K1/012 . Soldering with the use of hot gas
- B23K1/015 . . Vapour-condensation soldering
- B23K1/018 . Unsoldering; Removal of melted solder or other residues
- B23K1/06 . making use of vibrations, e.g. supersonic vibrations
- B23K1/08 . Soldering by means of dipping in molten solder
- B23K1/08B . . [N: Wave soldering]
- B23K1/14 . specially adapted for soldering seams ([making tubes involving operations other than soldering B21C](#))
- B23K1/16 . . longitudinal seams, e.g. of shells
- B23K1/18 . . circumferential seams, e.g. of shells
- B23K1/19 . taking account of the properties of the materials to be soldered
- B23K1/20 . 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](#))
- B23K1/20B . . [N: Fluxing, i.e. applying flux onto surfaces]
- B23K1/20C . . [N: Cleaning]
- B23K3/00** **Tools, devices, or special appurtenances for soldering, e.g. brazing, or unsoldering, not specially adapted for particular methods ([materials used for soldering B23K35/00](#))**
- B23K3/02 . Soldering irons; Bits
- B23K3/02C . . [N: Flame-heated soldering irons]
- B23K3/02C2 . . . [N: using a gaseous fuel]
- B23K3/02C4 . . . [N: using a liquid fuel]
- B23K3/02C6 . . . [N: using a solid fuel]
- B23K3/02D . . [N: Bits or tips]
- B23K3/02D2 . . . [N: Removable soldering bits] [N1204]
- B23K3/02G . . [N: Holders for soldering irons]
- B23K3/02H . . [N: Devices for cleaning soldering iron tips ([B23K3/02G](#) takes precedence)]
- B23K3/02K . . [N: Solder or residue removing devices]

- B23K3/03 . . electrically heated
- B23K3/03B . . . [N: with current flow through the workpiece]
- B23K3/03D . . . [N: Quick-heating soldering irons having the tip-material forming part of the electric circuit ([B23K3/03F](#) takes precedence)]
- B23K3/03F . . . [N: Battery-powered soldering irons]
- B23K3/03H . . . [N: comprising means for controlling or selecting the temperature or power]
- B23K3/03J . . . [N: Constructional features of electric soldering irons]
- B23K3/03J2 [N: Handles]
- B23K3/03J4 [N: Heating elements or heating element housings]
- B23K3/03J6 [N: Couplings between the handle and the heating element housing]
- B23K3/03J8 [N: Couplings between the heating element housing and the bit or tip]
- B23K3/03K . . . [N: comprising carbon heating elements or electrodes ([B23K3/03L](#) and [B23K3/03N](#) take precedence)]
- B23K3/03L . . . [N: the heat being generated by an arc]
- B23K3/03N . . . [N: the heat being generated by contact resistance]

- B23K3/04 . Heating appliances (soldering lamps or blowpipes [F23D](#); electric heating in general [H05B](#))
- B23K3/04D . . [N: Flame-heated appliances]
- B23K3/047 . . electric
- B23K3/047B . . . [N: using resistance rod or bar, e.g. carbon silica]
- B23K3/047D . . . [N: using Joule effect at the place of contact between a rod and the soldering tip]
- B23K3/047F . . . [N: using induction effects, e.g. Kelvin or skin effects]
- B23K3/047H . . . [N: Soldering pliers]
- B23K3/047J . . . [N: comprising means for controlling or selecting the temperature or power]
- B23K3/053 . . . using resistance wires

- B23K3/06 . Solder feeding devices; Solder melting pans
- B23K3/06B . . [N: Solder feeding devices]
- B23K3/06B2 . . . [N: forming part of a soldering iron]
- B23K3/06B4 . . . [N: for shaped solder piece feeding, e.g. preforms, bumps, balls, pellets, droplets] [N0506]
- B23K3/06B6 . . . [N: for wire feeding] [N0506]
- B23K3/06B8 . . . [N: for viscous material feeding, e.g. solder paste feeding ([B23K3/06B4](#) takes precedence)] [N0506]
- B23K3/06D . . [N: Solder baths]
- B23K3/06D2 . . . [N: with wave generating means, e.g. nozzles, jets, fountains]
- B23K3/06D4 . . . [N: Oscillating baths]
- B23K3/06D6 . . . [N: with dipping means]
- B23K3/06D6B [N: Conveyers therefor]
- B23K3/06D6D [N: with means for oscillating the workpiece]
- B23K3/06D8 . . . [N: with intermediary means for bringing solder on workpiece, e.g. rollers]

- B23K3/08 . Auxiliary devices therefor (cleaning pipes or tubes or systems of pipes or tubes, e.g. before soldering, [B08B9/02](#))

- B23K3/08B . . [N: Flux dispensers; Apparatus for applying flux]
- B23K3/08D . . [N: Cooling, heat sink or heat shielding means]
- B23K3/08F . . [N: Soldering or brazing jigs, fixtures or clamping means]

Guide heading: **Flame welding or cutting**

B23K5/00 **Gas flame welding**

- B23K5/00B . [N: the welding zone being shielded against the influence of the surrounding atmosphere (selection of media [B23K35/38](#))]
- B23K5/00S . [N: specially adapted for particular articles or work]
- B23K5/02 . Seam welding (making tubes involving operations other than welding [B21C](#))
- B23K5/02C . . [N: of horizontal seams in assembling vertical plates a welding unit being adapted to travel along the upper horizontal edge of the plates]
- B23K5/02D . . [N: of non-horizontal seams in assembling non-horizontal plates]
- B23K5/04 . . using additional profiled strips or the like of welding metal along seam edges
- B23K5/06 . . Welding longitudinal seams
- B23K5/08 . . Welding circumferential seams
- B23K5/08B . . . [N: Welding three-dimensional seams]
- B23K5/08B2 [N: helicoidal seams]
- B23K5/10 . Welding workpieces essentially comprising layers of different metals, e.g. plated workpieces
- B23K5/12 . taking account of the properties of the material to be welded
- B23K5/14 . . of non-ferrous metals ([B23K5/16](#) takes precedence)
- B23K5/16 . . of different metals
- B23K5/18 . for purposes other than joining parts, e.g. built-up welding
- B23K5/20 . making use of vibrations, e.g. supersonic vibrations
- B23K5/213 . Preliminary treatment
- B23K5/22 . Auxiliary equipment, e.g. backings, guides
- B23K5/24 . . Arrangements for supporting torches (not restricted to flame welding [B23K37/02](#))

B23K7/00 **Cutting, scarfing, or desurfacing by applying flames** [N: (thermal deburring [B23D79/00B](#))]

- B23K7/00C . [N: for profiling plate edges or for cutting grooves]
- B23K7/00D . [N: Machines, apparatus, or equipment for cutting plane workpieces, e.g. plates]
- B23K7/00D2 . . [N: Machines, apparatus, or equipment for cutting long articles, e.g. cast stands, plates, in parts of predetermined length]

- B23K7/00D4 . . [N: Seam tracking]
- B23K7/00F . [N: Machines, apparatus, or equipment specially adapted for cutting curved workpieces, e.g. tubes]
- B23K7/00F2 . . [N: for tubes]
- B23K7/00F2P . . . [N: for obtaining tube intersection profiles]
- B23K7/00P . [N: Preliminary treatment]
- B23K7/06 . Machines, apparatus, or equipment specially designed for scarfing or desurfacing
- B23K7/08 . by applying additional compounds or means favouring the cutting, scarfing, or desurfacing procedure
- B23K7/10 . Auxiliary devices, e.g. for guiding or supporting the torch (guiding means applicable to other metal-working machines [B23Q](#))
- B23K7/10B . . [N: for controlling the spacial relationship between the workpieces and the gas torch]
- B23K7/10G . . [N: specially adapted for particular geometric forms]
- B23K7/10G2 . . . [N: for cutting circles]

Guide heading: **Electric welding or cutting**

B23K9/00 **Arc welding or cutting** (electro-slag welding [B23K25/00](#); welding transformers [H01F](#); welding generators [H02K](#))

- B23K9/00B . [N: Welding without shielding means against the influence of the surrounding atmosphere]
- B23K9/00B4 . . [N: using more than one electrode]
- B23K9/00D . [N: specially adapted for particular articles or work]
- B23K9/00D2 . . [N: of thin articles]
- B23K9/00D4 . . [N: Locally welding a thin plate to a thick piece (spot arc welding [B23K9/007](#))]
- B23K9/00D6 . . [N: Welding of pipe panels]
- B23K9/00R . [N: Underwater arc welding]
- B23K9/007 . Spot arc welding
- B23K9/013 . Arc cutting, gouging, scarfing or desurfacing
- B23K9/013S . . [N: Arc saw cutting]
- B23K9/02 . Seam welding; Backing means; Inserts
- B23K9/02A . . [N: Inserts]
- B23K9/02E . . [N: of horizontal seams in assembling vertical plates, a welding unit being adapted to travel along the upper horizontal edge of the plates]
- B23K9/02F . . [N: of non-horizontal seams in assembling non-horizontal plates]
- B23K9/02N . . [N: Narrow gap welding]

- B23K9/02P . . [N: Seam profiling, e.g. weaving, multilayer]
- B23K9/022 . . Welding by making use of electrode vibrations
- B23K9/025 . . for rectilinear seams
- B23K9/025B . . . [N: for the longitudinal seam of tubes]
- B23K9/025D . . . [N: for welding ribs on plates]
- B23K9/028 . . for curved planar seams
- B23K9/028B . . . [N: for welding tube sections]
- B23K9/028B2 [N: with an electrode working inside the tube]
- B23K9/028B4 [N: with an electrode moving around the fixed tube during the welding operation]
- B23K9/028D . . . [N: for welding of tubes to tube plates]
- B23K9/032 . . for three-dimensional seams
- B23K9/032B . . . [N: helicoidal seams]
- B23K9/035 . . with backing means disposed under the seam
- B23K9/035B . . . [N: the backing means being movable during the welding operation]
- B23K9/035D . . . [N: the backing means being expandable]
- B23K9/035F . . . [N: the backing means being a tape or strip]
- B23K9/035H . . . [N: the backing means being a ring or sleeve]
- B23K9/038 . . using moulding means (not restricted to arc welding [B23K37/06](#))

- B23K9/04 . . Welding for other purposes than joining, e.g. built-up welding
- B23K9/04C . . [N: Built-up welding on planar surfaces]
- B23K9/04D . . [N: Built-up welding on three-dimensional surfaces]
- B23K9/04D2 . . . [N: on surfaces of revolution]
- B23K9/04D2C [N: on cylindrical surfaces]

- B23K9/06 . . Arrangements or circuits for starting the arc, e.g. by generating ignition voltage, or for stabilising the arc
- B23K9/067 . . Starting the arc
- B23K9/067B . . . [N: by means of brief contacts between the electrodes]
- B23K9/067D . . . [N: without direct contact between electrodes]
- B23K9/067D2 [N: Ionisation of the arc gap by means of a tension with a step front (pulses or high frequency tensions)]
- B23K9/067D4 [N: Ionization of the arc gap by means of radiation or particle bombardment]
- B23K9/067D6 [N: Ionization of the arc gap by means of heating]
- B23K9/067D8 [N: Ionization of the arc gap by means of a contact piece disposed between the electrodes]
- B23K9/067D10 [N: Ionization of the arc gap by means of an auxiliary arc]
- B23K9/073 . . Stabilising the arc
- B23K9/073B . . . [N: Stabilising of the arc tension]
- B23K9/073D . . . [N: Stabilising of the arc current]
- B23K9/073E . . . [N: Stabilising of the arc power]
- B23K9/073F . . . [N: Stabilising of the arc length]
- B23K9/073G . . . [N: Stabilising of the arc position]

- B23K9/073H . . . [N: Stabilising of the arc by automatic re-ignition means]
- B23K9/08 . Arrangements or circuits for magnetic control of the arc [N: stabilising of the arc position by magnetic means [B23K9/073G](#)]
- B23K9/09 . Arrangements or circuits for arc welding with pulsed current or voltage
- B23K9/09B2 . . [N: characterised by the circuits] [N9603]
- B23K9/09B2B . . . [N: characterised by the shape of the pulses produced] [N9603]
- B23K9/09B2D . . . [N: the frequency of the pulses produced being modulatable] [N9603]
- B23K9/095 . Monitoring or automatic control of welding parameters
- B23K9/095B . . [N: using computing means] [N9509]
- B23K9/095D . . [N: using sensing means, e.g. optical] [N9509]
- B23K9/10 . Other electric circuits therefor; Protective circuits; Remote controls
- B23K9/10A . . [N: Power supply]
- B23K9/10A1 . . . [N: characterised by parts of the process]
- B23K9/10A1A [N: Improvements of the cos (phi) of arc welding installations]
- B23K9/10A1B [N: Means for suppressing or reducing DC components in AC arc welding installations]
- B23K9/10A1C [N: Reduction of the arc voltage beneath the arc striking value, e.g. to zero voltage, during non-welding periods]
- B23K9/10A1D [N: Means preventing crater forming at the extremity of the seam]
- B23K9/10A3 . . . [N: characterised by the electric circuit ([B23K9/10A1](#) takes precedence)]
- B23K9/10A3A [N: by using discharge tubes or mechanical contactors ([B23K9/10A3C](#) takes precedence)]
- B23K9/10A3B [N: by using digital means ([B23K9/10A3C](#) takes precedence)]
- B23K9/10A3B1 [N: with computing means]
- B23K9/10A3C [N: Electric circuits for the supply of power to two or more arcs from a single source]
- B23K9/10A5 . . . [N: Parallel power supply, i.e. multiple power supplies or multiple inverters supplying a single arc or welding current] [N1204]
- B23K9/10N . . [N: Arc welding by means of accumulated energy]
- B23K9/10Q . . [N: Arc welding using remote control]
- B23K9/10S . . [N: Consumable electrode or filler wire preheat circuits]
- B23K9/12 . Automatic feeding or moving of electrodes or work for spot or seam welding or cutting
- B23K9/12C . . [N: Devices for the automatic supply of at least two electrodes one after the other]
- B23K9/12E . . [N: Devices for guiding electrodes, e.g. guide tubes]
- B23K9/12E2 . . . [N: Serving also as contacting devices supplying welding current to an electrode]
- B23K9/12F . . [N: Circuits or methods for feeding welding wire]
- B23K9/12F2 . . . [N: Feeding of electrodes (for stabilising arc [B23K9/073](#))]
- B23K9/12S . . [N: Controlling the spatial relationship between the work and the gas torch (between wire tip and piece [B23K9/073](#))]
- B23K9/127 . . Means for tracking lines during arc welding or cutting (copying in general [B23Q35/00](#))

- B23K9/127G . . . [N: Geometry oriented, e.g. beam optical trading]
- B23K9/127G2 [N: Using non-contact, optical means, e.g. laser means] [N9603]
- B23K9/127G4 [N: Using non-contact, electric or magnetic means, e.g. inductive means] [N9603]
- B23K9/127G6 [N: Using mechanical means] [N9603]
- B23K9/133 . . Means for feeding electrodes, e.g. drums, rolls, motors
- B23K9/133B . . . [N: Dereeling means] [N9608]
- B23K9/133D . . . [N: Driving means] [N9608]

- B23K9/14 . . making use of insulated electrodes
- B23K9/14D . . [N: Drag welding, the arc length being determined by an insulated layer between the welding electrode and the welding spot or seam]
- B23K9/14D2 . . . [N: the insulated welding electrode being laid along the seam]
- B23K9/14D3 . . . [N: the insulated welding electrode resting with one extremity on the workpiece]

- B23K9/16 . . making use of shielding gas [N: selection of media [B23K35/38](#)]
- B23K9/16B . . [N: making use of a stationary fluid]
- B23K9/16C . . [N: making use of a moving fluid]
- B23K9/167 . . and of a non-consumable electrode
- B23K9/167M . . . [N: making use of several electrodes]
- B23K9/173 . . and of a consumable electrode
- B23K9/173M . . . [N: making use of several electrodes]

- B23K9/18 . . Submerged-arc welding
- B23K9/18C . . [N: making use of a non-consumable electrode]
- B23K9/18C4 . . . [N: making use of several electrodes]
- B23K9/18D . . [N: making use of a consumable electrodes]
- B23K9/18D4 . . . [N: making use of several electrodes]

- B23K9/20 . . Stud welding
- B23K9/20B . . [N: of the extremity of a small piece on a great or large basis]
- B23K9/20B2 . . . [N: by means of portable equipment, e.g. stud welding gun]
- B23K9/20C . . [N: of cooling fins]
- B23K9/20D . . [N: Means for determining, controlling or regulating the arc interval]
- B23K9/20E . . [N: with automatic stud supply]
- B23K9/20F . . [N: Features related to studs (**welding studs per se** [B23K35/02E4](#))]
- B23K9/20F2 . . . [N: Ferrules, e.g. for confining molten material]

- B23K9/22 . . Percussion welding

- B23K9/23 . . taking account of the properties of the materials to be welded
- B23K9/23B . . [N: of different metals]

- B23K9/235 . . Preliminary treatment

- B23K9/24 . . Features related to electrodes (**form or composition of electrodes** [B23K35/00](#))

- B23K9/26 . . Accessories for electrodes, e.g. ignition tips
- B23K9/28 . . Supporting devices for electrodes (not restricted to arc welding or cutting [B23K37/02](#))
- B23K9/28B . . . [N: Electrode holders not supplying shielding means to the electrode]
- B23K9/28D . . . [N: Cooled electrode holders]
- B23K9/28H . . . [N: Supporting devices for electrode holders (not restricted to arc welding [B23K37/02](#))]
- B23K9/29 . . . Supporting devices adapted for making use of shielding means
- B23K9/29G [N: the shielding means being a gas]
- B23K9/29G2 [N: using consumable electrode-rod]
- B23K9/29G4 [N: using consumable electrode-wire]
- B23K9/29G6 [N: using non-consumable electrodes]
- B23K9/29P [N: the shielding means being a powder]
- B23K9/30 . . . Vibrating holders for electrodes ([B23K9/022](#) takes precedence)

- B23K9/32 . Accessories (earthing connections [H01R](#))
- B23K9/32B . . [N: Protecting means (protecting means in general [F16P1/06](#))] [N0806]
- B23K9/32B2 . . . [N: Head protecting means (masks, shields or hoods for weldersp [A61F9/06](#))] [N0806]
- B23K9/32C . . [N: Combined coupling means, e.g. gas, electricity, water or the like (electrical only [H01R](#))]
- B23K9/32F . . [N: Devices for supplying or evacuating a shielding or a welding powder, e.g. a magnetic powder]
- B23K9/32G . . [N: Devices for supplying or evacuating shielding gas]
- B23K9/32G2 . . . [N: Purge gas rings, i.e. devices for supplying or evacuating shielding gas inside of hollow or tubular articles, e.g. pipes, vessels] [N1204]
- B23K9/32H . . [N: Means for transporting supplies (carriages in general [B23K37/02](#))] [N0806]
- B23K9/32K . . [N: Cleaning of weld torches, i.e. removing weld-spatter; Preventing weld-spatter, e.g. applying anti-adhesives] [N1204]

B23K10/00 Welding or cutting by means of a plasma

- B23K10/00B . [N: Scarfing, desurfacing or deburring (by applying flames [B23K7/06](#))]
- B23K10/00D . [N: Control circuits therefor (circuits for plasma torches [H05H1/36](#))]
- B23K10/02 . Plasma welding
- B23K10/02D . . [N: Spot welding]
- B23K10/02F . . [N: by making use of electrode vibrations]
- B23K10/02H . . [N: Welding for purposes other than joining, e.g. build-up welding]

B23K11/00 Resistance welding; Severing by resistance heating

- B23K11/00B . [N: the welding zone being shielded against the influence of the surrounding atmosphere (selection of media [B23K35/38](#))]
- B23K11/00D . [N: welding for reasons other than joining, e.g. build up welding]

- B23K11/00F . [N: specially adapted for particular articles or work]
- B23K11/00F2 . . [N: Welding of thin articles]
- B23K11/00F4 . . [N: Welding locally a thin plate to a large piece]
- B23K11/00F6 . . [N: Welding of a small piece to a great or broad piece]
- B23K11/00F6B . . . [N: the extremity of a small piece being welded to a base, e.g. cooling studs or fins to tubes or plates]
- B23K11/00F6B2 [N: Stud welding, i.e. resistive (with an arc [B23K9/20](#))]
- B23K11/00F6B4 [N: Welding a tip to a base, e.g. pen point nibs]
- B23K11/00F6D . . . [N: Riveting]
- B23K11/00F8 . . [N: Butt welding of long articles advanced axially]
- B23K11/00F10 . . [N: Manufacturing of metallic grids or mats by spot welding]
- B23K11/00F10B . . . [N: Grids or mats used in concrete structures ([B23K11/11](#) takes precedence) [N9707]
- B23K11/00F14 . . [N: Welding of honeycomb sandwich structures (brazing of honeycomb sandwich structure [B23K1/00S6](#))]

- B23K11/02 . Pressure butt welding

- B23K11/04 . Flash butt welding
- B23K11/04B . . [N: characterised by the electric circuits used therewith] [N9902]
- B23K11/04D . . [N: Apparatus therefor] [N9902]

- B23K11/06 . using roller electrodes
- B23K11/06B . . [N: for welding rectilinear seams]
- B23K11/06B2 . . . [N: for welding longitudinal seams of tubes]
- B23K11/06B2B [N: Lap welding]
- B23K11/06C . . [N: for welding curved planar seams]
- B23K11/06C2 . . . [N: of tube sections]
- B23K11/06D . . [N: for welding three-dimensional seams]
- B23K11/06D2 . . . [N: of helicoidal seams]

- B23K11/08 . Seam welding not restricted to one of the preceding sub-groups
- B23K11/08D . . [N: of three-dimensional seams]
- B23K11/08D2 . . . [N: of helicoidal seams]
- B23K11/087 . . for rectilinear seams
- B23K11/087B . . . [N: of the longitudinal seam of tubes]
- B23K11/087B2 [N: Lap welding]
- B23K11/093 . . for curved planar seams
- B23K11/093T . . . [N: of tube sections]

- B23K11/10 . Spot welding; Stitch welding
- B23K11/10C . . [N: Stitch welding]
- B23K11/11 . . Spot welding
- B23K11/11B . . . [N: by means of two electrodes placed opposite one another on both sides of the welded parts]

- B23K11/12 . . . making use of vibrations
- B23K11/14 . . . Projection welding
- B23K11/16 . . . taking account of the properties of the material to be welded
- B23K11/16C . . . [N: Welding of coated materials]
- B23K11/16C2 [N: of galvanized or tinned materials]
- B23K11/18 . . . of non-ferrous metals ([B23K11/20](#) takes precedence)
- B23K11/18B [N: of aluminium or aluminium alloys]
- B23K11/20 . . . of different metals
- B23K11/22 . . . Severing by resistance heating
- B23K11/24 . . . Electric supply or control circuits therefor
- B23K11/24A [N: Electric supplies ([B23K11/24B](#) takes precedence)]
- B23K11/24A2 [N: Multiple welding installations fed by one source]
- B23K11/24A3 [N: using a stepping counter in synchronism with the welding pulses (electromagnetic counters [G06M](#))]
- B23K11/24A4 [N: for flash welding]
- B23K11/24B [N: Electric supplies using discharge tubes]
- B23K11/25 . . . Monitoring devices
- B23K11/25B [N: using analog means]
- B23K11/25C [N: using digital means]
- B23K11/25C2 [N: the measured parameter being a displacement or a position]
- B23K11/25C4 [N: the measured parameter being a force ([B23K11/25C2](#) takes precedence)]
- B23K11/25C6 [N: the measured parameter being the inter-electrode electrical resistance]
- B23K11/25C8 [N: the measured parameter being an electrical current]
- B23K11/25C10 [N: the measured parameter being a voltage]
- B23K11/26 . . . Storage discharge welding
- B23K11/28 . . . Portable welding equipment
- B23K11/30 . . . Features relating to electrodes (form or composition of electrodes [B23K35/00](#))
- B23K11/30B [N: Pressure electrodes]
- B23K11/30B2 [N: Cooled pressure electrodes]
- B23K11/30C [N: Slide or drag electrodes]
- B23K11/30D [N: Roller electrodes]
- B23K11/30D2 [N: Cooled roller electrodes]
- B23K11/30E [N: Cooled electrodes ([B23K11/30B2](#), [B23K11/30D2](#) take precedence)]
- B23K11/30F [N: Electrode maintenance, e.g. cleaning, grinding]
- B23K11/30G [N: Devices for exchanging or removing electrodes or electrode tips]
- B23K11/30P [N: 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]

- B23K11/30Q . . [N: Wire electrodes]
- B23K11/31 . . Electrode holders [N: and actuating devices therefor] (not restricted to resistance welding or severing by resistance heating [B23K37/02](#))
- B23K11/31A . . . [N: the actuating device comprising an electric motor] [N1204]
- B23K11/31B . . . [N: for several electrodes]
- B23K11/31D . . . [N: Spot welding guns, e.g. mounted on robots]
- B23K11/31D2 [N: with one electrode moving on a linear path]
- B23K11/31E . . . [N: Equalizing; Balancing devices for electrode holders] [N1204]
- B23K11/31H . . . [N: Supporting devices for electrode holders]

- B23K11/34 . Preliminary treatment

- B23K11/36 . Auxiliary equipment ([B23K11/31](#) takes precedence)
- B23K11/36P . . [N: Contact means for supplying welding current to the electrodes]
- B23K11/36P3 . . . [N: Clamping contacts]
- B23K11/36P4 . . . [N: Sliding contacts]
- B23K11/36P5 . . . [N: Liquid contacts, e.g. mercury contacts]

- B23K13/00** **Welding by high-frequency current heating**

- B23K13/01 . by induction heating
- B23K13/01B . . [N: Butt welding]
- B23K13/02 . . Seam welding
- B23K13/02B . . . [N: for tubes]

- B23K13/04 . by conduction heating [N: ([B23K13/02](#) takes precedence)]
- B23K13/04S . . [N: Seam welding]
- B23K13/04S2 . . . [N: for tubes]

- B23K13/06 . characterised by the shielding of the welding zone against influence of the surrounding atmosphere (selection of media [B23K35/38](#))

- B23K13/08 . Electric supply or control circuits therefor

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

B23K15/00 **Electron-beam welding or cutting** (electron- or ion- beam tubes [H01J37/00](#))

- B23K15/00G . [N: specially adapted for particular articles]
- B23K15/00H . [N: Positioning or observing workpieces, e.g. with respect to the impact; Aligning, aiming or focusing electronbeams]
- B23K15/00L . [N: Devices involving relative movement between electronbeam and workpiece]
- B23K15/00N . [N: Auxiliary equipment]

- B23K15/00P . [N: Preliminary treatment]
- B23K15/00T . [N: Tandem beams or torches, i.e. working simultaneously with several beams or torches] [N1204]
- B23K15/00W . [N: Welding]
- B23K15/00W2 . . [N: Seam welding]
- B23K15/00W2B . . . [N: of rectilinear seams]
- B23K15/00W2F . . . [N: with backing means disposed under the seams]
- B23K15/00W2H . . . [N: with interposition of particular material to facilitate connecting the parts, e.g. using a filler]
- B23K15/00W4 . . [N: Spot welding]
- B23K15/00W6 . . [N: welding for purposes other than joining, e.g. built-up welding]
- B23K15/00W8 . . [N: characterised by the properties of the materials to be welded]
- B23K15/02 . Control circuits therefor
- B23K15/04 . for welding annular seams
- B23K15/06 . within a vacuum chamber ([B23K15/04](#) takes precedence)
- B23K15/08 . Removing material, e.g. by cutting, by hole drilling
- B23K15/08B . . [N: Boring]
- B23K15/10 . Non-vacuum electron beam-welding or cutting
- B23K17/00** use of the energy of nuclear particles in welding or related techniques
- B23K20/00** Non-electric welding by applying impact or other pressure, with or without the application of heat, e.g. cladding or plating
- B23K20/00B . [N: by extrusion or drawing]
- B23K20/00D . [N: specially adapted for particular articles or work ([B23K20/12M](#) takes precedence)]
- B23K20/00D2 . . [N: Wire welding]
- B23K20/00D2B . . . [N: Capillary welding]
- B23K20/00D2B2 [N: Ball bonding]
- B23K20/00F . [N: pressure combined with radiant energy]
- B23K20/02 . by means of a press; [N: Diffusion bonding ([B23K20/00B](#), [B23K20/04](#) take precedence)] [C1002]
- B23K20/02B . . [N: Isostatic pressure welding]
- B23K20/02D . . [N: Thermo-compression bonding]
- B23K20/02D2 . . . [N: Bonding tips therefor]
- B23K20/02D4 . . . [N: with diffusion of soldering material] [N1204]

- B23K20/02F . . [N: Butt welding]
- B23K20/04 . by means of a rolling mill
- B23K20/06 . by means of high energy impulses, e.g. magnetic energy
- B23K20/08 . . Explosive welding
- B23K20/08B . . . [N: for tubes, e.g. plugging]
- B23K20/10 . making use of vibrations, e.g. ultrasonic welding
- B23K20/10B . . [N: using a roller]
- B23K20/10D . . [N: Features related to sonotrodes]
- B23K20/12 . the heat being generated by friction; Friction welding
- B23K20/12B . . [N: using translation movement]
- B23K20/12C . . [N: Control circuits therefor]
- B23K20/12D . . [N: for other purposes than joining, e.g. built-up welding]
- B23K20/12E . . [N: using a non-consumable tool, e.g. friction stir welding] [N9811]
- B23K20/12E1 . . . [N: Particular aspects of welding with a non-consumable tool] [N0410]
- [N: **WARNING** [N0410]
This group only contains recent documents which are in the process of being reclassified into groups [B23K20/12E2](#) to [B23K20/12E8](#)]
- B23K20/12E2 . . . [N: Controlling or monitoring the welding process] [N0407]
- [N: **WARNING** [N0410]
This group and its subgroups are incomplete. For recent documents see also [B23K20/12E1](#)]
- B23K20/12E2B [N: with temperature control during joining] [N0407]
- B23K20/12E2E [N: at the beginning or at the end of a weld] [N1204]
- B23K20/12E6 . . . [N: characterised by the apparatus] [N0407]
- [N: **WARNING** [N0410]
This group and its subgroups are incomplete. For recent documents see also [B23K20/12E1](#)]
- B23K20/12E6B [N: Rotary tool drive mechanism] [N0407]
- B23K20/12E6D [N: Tools therefor, e.g. characterised by the shape of the probe] [N0407]
- B23K20/12E6F [N: Workpiece support, i.e. backing or clamping] [N0407]
- B23K20/12E8 . . . [N: Non-butt welded joints, e.g. overlap-joints, T-joints or spot welds] [N0407]
- [N: **WARNING** [N0410]
This group is incomplete. For recent documents see also [B23K20/12E1](#)]
- B23K20/12E10 . . . [N: friction stir welding involving a mechanical connection (forged connections B21K25/00B; riveted connections B21J15/02F)] [N1204]
- B23K20/12E12 . . . [N: involving metallurgical change] [N1204]
- B23K20/12E14 . . . [N: making use of additional material] [N1204]

- B23K20/12H . . [N: Portable friction welding machines]
- B23K20/12M . . [N: specially adapted for particular articles or workpieces]
- B23K20/12M2 . . . [N: Welding studs] [N1204]

- B23K20/14 . Preventing or minimising gas access, or using protective gases or vacuum during welding (formed by material interposed between workpieces [B23K20/18](#))

- B23K20/16 . with interposition of special material to facilitate connection of the parts, e.g. material for absorbing or producing gas
- B23K20/16T . . [N: involving an exothermic reaction of the interposed material] [N1204]

- B23K20/18 . Zonal welding by interposing weld-preventing substances between zones not to be welded

- B23K20/20 . Special methods allowing subsequent separation, e.g. of metals of high quality from scrap material

- B23K20/22 . taking account of the properties of the materials to be welded
- B23K20/227 . . with ferrous layer
- B23K20/227A . . . [N: the other layer being aluminium]
- B23K20/233 . . without ferrous layer
- B23K20/233A . . . [N: one layer being aluminium, magnesium or beryllium]
- B23K20/233B . . . [N: both layers being aluminium]

- B23K20/24 . Preliminary treatment

- B23K20/26 . Auxiliary equipment

- B23K23/00** **Alumino-thermic welding**

- B23K25/00** **Slag welding, i.e. using a heated layer or mass of powder, slag, or the like in contact with the material to be joined ([B23K23/00](#) takes precedence; submerged-arc welding [B23K9/18](#))**

- B23K25/00B . [N: Welding for purposes other than joining, e.g. built-up welding]

- B23K26/00** **Working by laser beam, e.g. welding, cutting, boring (lasers per se [H01S3/00](#); [N: laser assisted deposition [C23C](#); laser inspection or alignment [G01B](#); laser sintering of metallic powder [B22F3/105](#), of plastics [B29C67/00](#), of glass [C03B19/06](#), of ceramics [C04B35/64](#); applying identification marks by laser [B41M5/24](#)]) [C1201]**

- B23K26/00B . [N: Trimming, tuning]

- B23K26/00F . [N: taking account of the properties of the material involved ([B23K26/20](#), [B23K26/36](#) take precedence)] [M1201]
- B23K26/00F1 . . [N: Metallic material] [N1201]
- B23K26/00F1B . . . [N: Non-ferrous metals or alloys] [N1201]
- B23K26/00F1B3 [N: Refractory metals] [N1201]

- B23K26/00F1B4 [N: Light metals] [N1201]
- B23K26/00F6 . . [N: Non-metallic material (laser surface treatment of glass not in the form of fibres or filaments [C03C23/00B8](#), of glass in the form of fibres or filaments [C03C25/62B8](#))] [N1201]
- B23K26/00F6B [N: Organic material] [N1201]
- B23K26/00F6B2 [N: Material from living organisms, e.g. skin (surgical instruments, devices or methods for applying laser energy to the body [A61B18/20](#); dental laser [A61C1/00L](#); eye surgery using laser [A61F9/008](#))] [N1201]
- B23K26/00F6B8 [N: Fabrics] [N1201]
- B23K26/00F6B9 [N: Paper] [N1201]
- B23K26/00F6B10 [N: Plastics] [N1201]
- B23K26/00F6D [N: Inorganic material] [N1201]
- B23K26/00F6D2 [N: Semiconductor material, e.g. Si or Ge based] [N1201]
- B23K26/00F6D12 [N: Ceramics] [N1201]
- B23K26/00F14 . . [N: Composite material, e.g. fibre reinforced, sandwich steel plate] [N1201]
- B23K26/00F15 . . [N: Surface-treated material, e.g. plated, painted] [N1201]

- B23K26/00G . . [N: Working by transmitting the laser beam within the workpiece] [N1201]
- B23K26/00G3 . . [N: by modifying or reforming the material inside the workpiece, e.g. for producing break initiation cracks] [N1201]
- B23K26/00G5 . . [N: by creating voids inside the workpiece, e.g. for forming flow passages or flow patterns] [N1201]
- B23K26/00G7 . . [N: 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] [N1201]

- B23K26/00J . . [N: for surface treatment (for changing the physical structure of ferrous metals or alloys [C21D](#), of non-ferrous metals or alloys [C22F](#); for alloying [C23C](#); annealing crystalline material [C30B33/02](#); laser treatment of semiconductors [H01L](#))] [N0701] [C1201]
- B23K26/00J1 . . [N: Laser shock processing (modifying the physical properties of ferrous metals by laser shock processing [C21D10/00L](#))] [N0812] [C1201]
- B23K26/00J2 . . [N: Modifying rugosity] [N0701]
- B23K26/00J2C [N: Diminishing rugosity, e.g. grinding; Polishing; Smoothing] [N0701]
- B23K26/00J2E [N: Increasing rugosity, e.g. roughening] [N0701]
- B23K26/00J6 . . [N: by melting (laser re-melting of metals by wave energy [C22B9/22](#); laser melting of glass [C03C](#); laser melting for crystal growth [C30B](#))] [N1201]
- B23K26/00J7 . . [N: Texturing] [N0701]
- B23K26/00J8 . . [N: by providing a line or line pattern, e.g. a dotted break initiation line] [N1201]

- B23K26/00K . . [N: using a non-absorbing, e.g. transparent, reflective or refractive, layer on the workpiece (using a mask on the workpiece [B23K26/06C7B](#))] [N1201]

- B23K26/00M . . [N: combined with mechanical machining or metal-working covered by other subclasses than B23K (combined with an electric arc [B23K26/14F1](#); combined welding or cutting procedures or apparatus [B23K28/02](#)); Heating a metal workpiece by laser during machining [B23P25/00B1](#)] [N1201]

- B23K26/00T . . [N: Portable laser equipment, e.g. hand-held laser apparatus (Surgical laser

instruments A61B18/20, Dental Lasers A61C1/00L, Hand-held laser dental apparatus for curing resins A61C19/00D1)] [N0701]

- B23K26/02 . Positioning or observing the workpiece, e.g. with respect to the point of impact; Aligning, aiming or focusing the laser beam
- B23K26/02C . . [N: Aligning, aiming or focussing the laser beam by pressing on the workpiece, e.g. pressing roller foot] [N0505]
- B23K26/02D . . [N: Aligning the laser beam ([B23K26/02C](#) takes precedence; automatically aligning the laser beam [B23K26/04A](#))] [N1203]
- B23K26/03 . . Observing, [N: e.g. monitoring,] the workpiece [N: (protective devices for the eye, carried on the body or in the hand [A61F9/02](#), [A61F9/04](#))] [N0102] [M1201]
- B23K26/03B . . . [N: using optical means] [N1108]
- B23K26/03D . . . [N: Observing temperature of the workpiece] [N1108]
- B23K26/03F . . . [N: Observing magnetic field related to the workpiece] [N1108]
- B23K26/03H . . . [N: Observing speed of the workpiece] [N1108]
- B23K26/04 . . Automatically aligning, aiming or focusing the laser beam, e.g. using the back-scattered light
- B23K26/04A . . . [N: Automatically aligning the laser beam] [N0812] [M1108]
- B23K26/04A4 [N: along the beam path, i.e. alignment of laser beam axis relative to laser beam apparatus] [N1108]
- B23K26/04B . . . [N: for tracking lines during welding or cutting, e.g. seam tracking] [N1108]
- B23K26/04C . . . [N: Automatically focusing the laser beam] [N0812] [M1108]
- B23K26/04C2 [N: by controlling the distance between laser head and workpiece] [N1108]
- B23K26/06 . . Shaping the laser beam, e.g. by masks or multi-focusing (optical elements, systems, or apparatus, in general G02B [N: beam shaping for applications of laser not covered in this group H01S3/00F]) [C0701]
- B23K26/06A . . . [N: by a combination of beams] [N0107] [C1002]
- B23K26/06A2 [N: in the same heat affected zone [HAZ] ([B23K26/06A4](#), [B23K26/06A6](#) take precedence)] [N1002]
- B23K26/06A4 [N: having a common axis ([B23K26/06A6](#) takes precedence)] [N1002]
- B23K26/06A4B [N: and with spots spaced along the common axis] [N1002]
- B23K26/06A6 [N: with spots located on opposed surfaces of the workpiece] [N1002]
- B23K26/06B . . . [N: Energy control of the laser beam (temporal shaping of laser beam [H01S3/00F1](#))] [N0701]
- B23K26/06B4 [N: Pulse shaping] [N0701]
- B23K26/06B4B [N: using ultrashort pulses, i.e. pulses of 1ns or less] [N0701]
- B23K26/06C . . . [N: by means of optical elements] [N1108]
- B23K26/06C1 [N: comprising mirrors] [N1108]
- B23K26/06C3 [N: comprising lenses] [N1108]
- B23K26/06C5 [N: comprising prisms] [N1108]
- B23K26/06C7 [N: comprising a mask (for lithography G03F)] [N1108]
- B23K26/06C7B [N: disposed on the workpiece] [N1108]
- B23K26/06H . . . [N: by beam condensation on the workpiece, e.g. for focusing] [N1108]
- B23K26/067 . . . Dividing the beam into multiple beams, e.g. multifocusing [N0102] [M1108]
- B23K26/067A [N: into independently operating sub-beams, e.g. beam multiplexing to

- B23K26/067B
 - provide laser beams for several stations] [N1002]
 - [N: into dependently operating sub-beams, e.g. an array of spots with fixed spatial relationship or for performing simultaneously identical operations] [N1002]
- B23K26/073
 - Shaping the laser spot [N0102] [M1108]
- B23K26/073B
 - [N: into a rectangular shape] [N0102] [M1108]
- B23K26/073D
 - [N: into an annular shape] [N0102] [M1108]
- B23K26/073F
 - [N: into an oval shape, e.g. elliptic shape] [N0506] [M1108]
- B23K26/073H
 - [N: into a linear shape] [N0506] [M1108]
- B23K26/08
 - Devices involving relative movement between laser beam and workpiece
- B23K26/08B
 - [N: Devices involving movement of the laser beam relative to the laser head, i.e. scanning devices] [N0610] [M1201]
- B23K26/08B2
 - [N: using multifaceted mirrors, e.g. polygonal mirror (scanning devices using multifaceted mirrors, in general [G02B26/12](#))] [N1201]
- B23K26/08D
 - [N: Devices involving rotation of the workpiece] [M1201]
- B23K26/08E
 - [N: Devices involving movement of the workpiece in at least one axial direction] [M1201]
- B23K26/08E2
 - [N: by using an endless conveyor belt] [M1201]
- B23K26/08E2B
 - [N: for moving elongated workpieces longitudinally, e.g. wire or strip material] [M1201]
- B23K26/08E4
 - [N: Devices involving movement of the workpiece in at least in two axial directions, e.g. in a plane] [M1201]
- B23K26/08E4B
 - [N: in at least in three axial directions] [N0610] [M1201]
- B23K26/08L
 - [N: Devices involving movement of the laser head in at least one axial direction] [M1201]
- B23K26/08L2
 - [N: in at least two axial directions] [N0611] [M1201]
- B23K26/08L2B
 - [N: in at least in three axial directions, e.g. manipulators, robots] [N0611] [M1201]
- B23K26/08L8
 - [N: Controlling the laser beam travel length] [N1203]
- B23K26/10
 - using a fixed support, [N: i.e. involving moving the laser beam]
- B23K26/10R
 - [N: the laser beam rotating around the fixed workpiece ([B23K26/28](#) takes precedence)] [C0812]
- B23K26/10R1
 - [N: inside the workpiece] [N0812]
- B23K26/12
 - in a special atmosphere, e.g. in an enclosure
- B23K26/12B
 - [N: in a liquid, e.g. underwater] [N9704]
- B23K26/12C
 - [N: in vacuum] [N1108]
- B23K26/12D
 - [N: in an atmosphere of particular gases] [N1108]
- B23K26/12D2
 - [N: of mixed gases] [N1108]
- B23K26/12E
 - [N: in an atmosphere of gases chemically reacting with the workpiece (chemical etching of glass [C03C15/00](#), [C03C25/68](#); chemical etching of metallic material [C23F1/00](#); etching of crystallised non-metallic material with defined structure in gas atmosphere [C30B33/12](#))] [N1108]
- B23K26/12F
 - [N: in an enclosure] [N1201]
- B23K26/12F2
 - [N: Laser beam path enclosures] [N1201]
- B23K26/14
 - using a flow, e.g. a jet of gas, in conjunction with the laser beam; [N: Nozzles therefor]

([B23K26/12](#) takes precedence)

- B23K26/14A . . [N: for the removal of by-products, e.g. by aspiration] [N1108]
- B23K26/14B . . [N: the flow containing particles, e.g. powder] [N9611]
- B23K26/14D . . [N: the flow containing a liquid] [N9611]
- B23K26/14F . . [N: the flow carrying an electric current] [N0003] [M1201]
- B23K26/14F1 . . . [N: the flow carrying an electric arc, e.g. laser arc hybrid welding] [N1201]
- B23K26/14H . . [N: involving specially adapted flow control means] [N1108]
- B23K26/14H2 . . . [N: for pressure control] [N1108]
- B23K26/14H4 . . . [N: for debit control] [N1108]
- B23K26/14H6 . . . [N: for directional control] [N1108]
- B23K26/14N . . [N: Nozzles; Features related to nozzles] [N0610] [M1108]
- B23K26/14N1 . . . [N: Supply to, or discharge from, nozzles of media, e.g. gas, powder, wire] [N0610] [M1108]
- B23K26/14N1E [N: Features outside the nozzle for feeding media towards the workpiece] [N0610] [M1108]
- B23K26/14N1T [N: Features inside the nozzle for feeding media through the nozzle] [N0610] [M1108]
- B23K26/14N2 . . . [N: Detachable nozzles, e.g. exchangeable or with breakaway lines] [N0610] [M1108]
- B23K26/14N3 . . . [N: Means for protecting nozzles, e.g. the tip surface ([by breakaway lines B23K26/14N2](#))] [N0610] [M1108]
- B23K26/14N4 . . . [N: Maintenance of nozzles] [N0610] [M1108]

- B23K26/16 . Removing of by-products, e.g. particles or vapours produced during treatment of a workpiece ([by a flow of gas B23K26/14](#)) [M1108]

- B23K26/18 . using absorbing layers on the material being worked, e.g. for marking or protecting purposes [N: ([observing devices provided with laser radiation protection devices B23K26/03](#); [using masks on the workpiece for shaping the laser beam B23K26/06C7B](#); [interposing material for facilitating bonding B23K26/20B](#); [laser anti-reflection devices, e.g. optical isolators H01S3/00F2](#))] [C1201]

- B23K26/20 . Bonding, e.g. welding ([soldering by means of radiant energy B23K1/005](#); [joining of preformed plastics parts by heating using laser beam B29C65/16](#)) [N0102] [M1108]
- B23K26/20B . . [N: with interposition of material for facilitating bonding (with interposition of adhesive being heated by laser C09J5/06; with interposition of solder B23K1/005R)] [N0701]
- B23K26/20D . . [N: Laser sealing] [N1201]
- B23K26/22 . . Spot welding [N0102]
- B23K26/24 . . Seam welding [N0102]
- B23K26/24A . . . [N: Fillet welding] [N0105]
- B23K26/24B . . . [N: Overlap welding] [N0202]
- B23K26/26 . . . of rectilinear seams [N0102]
- B23K26/26B [N: Longitudinal seams of tubes] [N0102]
- B23K26/28 . . . of curved planar seams [N0102]
- B23K26/28B [N: Tube sections] [N0102]
- B23K26/30 . . . of three-dimensional seams [N0102]

- B23K26/30B [N: Helicoidal seams] [N0102]
- B23K26/32 . . taking account of the properties of the material involved [N0102]
- B23K26/32D [N: Metallic material] [N1201]
- B23K26/32D2 [N: Non-ferrous metals or alloys] [N1201]
- B23K26/32D2B [N: Refractory metals] [N1201]
- B23K26/32D2D [N: Light metals] [N1201]
- B23K26/32D5 [N: Dissimilar metal materials] [N1201]
- B23K26/32F [N: Non-metallic material (joining glass to glass by fusing with laser [C03B23/20](#), by processes other than by fusing using laser [C03C27/06](#); joining ceramics [C04B37/00](#))] [N1201]
- B23K26/32F7 [N: Organic material (devices or method using laser on the body [A61B18/20](#); dental laser [A61C1/00L](#); eye laser surgery [A61F9/008](#); Treatment of micro-organisms with electric or wave energy [C12N13/00](#))] [N1201]
- B23K26/32F7B [N: Fabrics] [N1201]
- B23K26/32F7D [N: Paper] [N1201]
- B23K26/32H [N: Inorganic material] [N1201]
- B23K26/32H12 [N: Ceramics] [N1203]
- B23K26/32J [N: Composite material, e.g. fibre reinforced, sandwich steel plate] [N1201]
- B23K26/32L [N: Surface-treated material, e.g. plated, painted] [N1201]
- B23K26/32L2 [N: Coated material] [N1201]

- B23K26/34 . . Welding for purposes other than joining, e.g. build-up welding [N: (laser alloying or sintering [C23C](#))] [N0102] [M1108]
- B23K26/34B [N: Build-up welding] [N1203]

- B23K26/36 . . Removing material [N: (laser wire stripping [H02G1/12D6](#); cleaning by laser treatment [B08B7/00S2](#))] [N0102] [[C0704](#)]
- B23K26/36B [N: Mechanical trimming (trimming of electric components [B23K26/00B](#)); Deburring; Scarfing or desurfacing] [N0704] [M1201]
- B23K26/36E [N: Laser etching, i.e. the material is removed superficially or partially through the workpiece by the laser beam (laser etching for decorative purposes [B44C1/22](#), laser etching for manufacturing printed circuit boards [H05K3/00](#))] [N1201]
- B23K26/36E2 [N: for making a groove or trench, e.g. scribing a break initiation groove] [N1201]
- B23K26/38 by boring or cutting [N0102]
- B23K26/38B [N: Boring (Via connections through an SC device substrate [H01L21/48C4E](#))] [N0102] [[C0610](#)]
- B23K26/38B2 [N: of specially shaped holes] [N0305]
- B23K26/38B4 [N: of blind holes (Laser ablation of PCB substrate blind holes having a metal layer at the bottom [H05K3/00K3L4B](#))] [N0305] [[C0611](#)]
- B23K26/38B6 [N: Trepanning] [N0305]
- B23K26/38B8 [N: of fluid openings, e.g. nozzles, jets (Laser machining of inkjet nozzles [B41J2/16M5L](#))] [N0610]

- B23K26/40 taking account of the properties of the material involved [N0102] [M1201]
- B23K26/40A [N: Metallic material] [N1201]
- B23K26/40A2 [N: Non-ferrous metals or alloys] [N1201]
- B23K26/40A3 [N: Refractory metals] [N1201]

- B23K26/40A4 [N: Light metals] [N1201]
- B23K26/40B [N: Non-metal material] [N0102] [C1201]
- B23K26/40B7 [N: Organic material] [N1201] [C1201]
- B23K26/40B7B [N: Material from living organisms, e.g. skin (devices or method using laser on the body [A61B18/20](#); dental laser [A61C1/00L](#); eye laser surgery [A61F9/008](#); Treatment of micro-organisms with electric or wave energy [C12N13/00](#); Introduction of foreign genetic material into plant cells by physical or non-biological means [C12N15/82A6](#))] [N1201]
- B23K26/40B7D [N: Leather (clicking, perforating, or cutting leather [C14B5/00](#))] [N1201]
- B23K26/40B7E [N: Wood or similar (working or preserving wood or similar material B27B - B27M)] [N1201]
- B23K26/40B7F [N: Fibrous material] [N1201]
- B23K26/40B7F8 [N: Fabrics] [N1201]
- B23K26/40B7F9 [N: Paper (metallic paper [B23K26/40A](#))] [N1201]
- B23K26/40B7H [N: Plastics] [N1201]
- B23K26/40B11 [N: Inorganic material] [N1201]
- B23K26/40B11B [N: Brittle material, e.g. semi-conductor wafers (severing glass using laser [C03B33/02L](#), [C03B33/09B](#))] [N1201]
- B23K26/40B11B12 [N: Ceramics] [N1201]
- B23K26/40J [N: Composite material, e.g. fibre reinforced, sandwich steel plate] [N1201]
- B23K26/40J2 [N: Multi-layered material wherein at least one layer is non-metallic] [N1201]
- B23K26/40L [N: Surface-treated material, e.g. plated, painted] [N1201]
- B23K26/42 Preliminary treatment; Auxiliary operations or equipment ([B23K26/16](#) takes precedence) [N0102]
- B23K26/42C [N: Preliminary treatment] [N0102]
- B23K26/42D [N: Auxiliary equipment] [N0102]
- B23K26/42D2 [N: Cooling arrangements (by using a flow [B23K26/14](#))] [N0105] [C0704]
- B23K26/42D4 [N: Beam dispersers, e.g. beam wells] [N0704]
- B23K26/42D6 [N: Beam measuring device (beam monitoring per se [G01J1/42L](#))] [N0704]
- B23K26/42D8 [N: Protective screens (goggles or eye-masks for welders carried on the body or in the hand [A61F9/02](#), [A61F9/06](#))] [N0704] [M1201]
- B23K26/42D10 [N: for monitoring laser beam transmission optics] [N1201]
- B23K28/00** **Welding or cutting not covered by any of the preceding groups, e.g. electrolytic welding**
- B23K28/00B [N: Welding in a furnace]
- B23K28/00D [N: Welding metals by means of an electrolyte (working metal, e.g. cutting, by means of an electrolyte [B23H](#))]
- B23K28/02 Combined welding or cutting procedures or apparatus
- B23K31/00** **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 [B21C37/04](#), [B21C37/08](#))**

- B23K31/00F . [N: relating to controlling of welding distortion] [N1204]
- B23K31/00N . [N: relating to using of neural networks] [N1204]
- B23K31/02 . relating to soldering or welding (dip or wave soldering in the manufacture of printed circuits [H05K3/34](#))
- B23K31/02B . . [N: Making profiled bars with soldered or welded seams]
- B23K31/02C . . [N: Connecting cutting edges or the like to tools; Attaching reinforcements to workpieces, e.g. wear-resisting zones to tableware]
- B23K31/02T . . [N: Making tubes with soldering or welding]
- B23K31/10 . relating to cutting or desurfacing
- B23K31/12 . relating to investigating the properties, e.g. the weldability, of materials
- B23K31/12Q . . [N: Weld quality monitoring] [N1204]

- B23K33/00** **Specialty-profiled edge portions of workpieces for making soldering or welding connections; Filling the seams formed thereby** [N: ([B23K11/14](#) takes precedence)]
- B23K33/00A . [N: Crimping or bending the workpieces at the joining area] [N1204]
- B23K33/00B . [N: Filling of continuous seams]
- B23K33/00B2 . . [N: for cylindrical workpieces] [N9706]
- B23K33/00B4 . . [N: for automotive applications] [N9706]

- B23K35/00** **Rods, electrodes, materials, or media, for use in soldering, welding, or cutting**
- B23K35/00B . [N: Interlayers, transition pieces for metallurgical bonding of workpieces]
- B23K35/00B2 . . [N: at least one of the workpieces being of light metal] [C9409]
- B23K35/00B4 . . [N: at least one of the workpieces being of a metal of the iron group] [C9409]
- B23K35/00B6 . . [N: at least one of the workpieces being of a refractory metal] [C9409]
- B23K35/00B8 . . [N: at least one of the workpieces being of copper or another noble metal] [C9409]

- B23K35/02 . characterised by mechanical features, e.g. shape
- B23K35/02B . . [N: Non-consumable electrodes; C-electrodes]
- B23K35/02C . . [N: for use in cutting ([B23K35/02B](#) takes precedence)]
- B23K35/02C2 . . . [N: Rods, electrodes, wires]
- B23K35/02D . . [N: for use in soldering, brazing ([B23K35/02B](#) takes precedence)]
- B23K35/02D2 . . . [N: Rods, wires ([B23K35/02D5](#) takes precedence)]
- B23K35/02D3 . . . [N: Sheets, foils ([B23K35/02D5](#) takes precedence)]
- B23K35/02D3C [N: layered]
- B23K35/02D5 . . . [N: Powders, particles or spheres; Preforms made therefrom]
- B23K35/02D5P [N: Pastes, creams, slurries]
- B23K35/02E . . [N: for use in welding ([B23K35/02B](#) takes precedence)]
- B23K35/02E2 . . . [N: Rods, electrodes, wires]

B23K35/02E2B	. . . .	[N: flux-cored]
B23K35/02E2C	. . . .	[N: with more than one layer of coating or sheathing material]
B23K35/02E2D	. . . .	[N: of non-circular cross-section]
B23K35/02E2E	. . . .	[N: multi-cored; multiple]
B23K35/02E4	. . .	[N: Welding studs]
B23K35/02E6	. . .	[N: Consumable guides]
B23K35/22	. . . .	characterised by the composition or nature of the material
B23K35/22B	. . . .	[N: Non-consumable electrodes]
B23K35/22C	. . . .	[N: Anti-weld compositions; Braze stop-off compositions]
B23K35/22D	. . . .	[N: Non-corrosive coatings; Primers applied before welding]
B23K35/22E	. . . .	[N: Selection of materials for cutting]
B23K35/24	. . . .	Selection of soldering or welding materials proper (B23K35/34 takes precedence)
B23K35/26	. . . .	with the principal constituent melting at less than 400 degrees C
B23K35/26B	. . . .	[N: Sn as the principal constituent]
B23K35/26C	. . . .	[N: Bi as the principal constituent]
B23K35/26D	. . . .	[N: Cd as the principal constituent]
B23K35/26E	. . . .	[N: Pb as the principal constituent]
B23K35/28	. . . .	with the principal constituent melting at less than 950 degrees C
B23K35/28B	. . . .	[N: Zn as the principal constituent]
B23K35/28C	. . . .	[N: Mg as the principal constituent]
B23K35/28D	. . . .	[N: Al as the principal constituent]
B23K35/28D2	. . . .	[N: with Sn or Zn]
B23K35/30	. . . .	with the principal constituent melting at less than 1550 degrees C
B23K35/30B	. . . .	[N: Ag as the principal constituent]
B23K35/30C	. . . .	[N: Au as the principal constituent]
B23K35/30D	. . . .	[N: Cu as the principal constituent]
B23K35/30E	. . . .	[N: Mn as the principal constituent]
B23K35/30F	. . . .	[N: Ni as the principal constituent]
B23K35/30F2	. . . .	[N: with Cr as the next major constituent]
B23K35/30G	. . . .	[N: Co as the principal constituent]
B23K35/30H	. . . .	[N: Fe as the principal constituent]
B23K35/30H2	. . . .	[N: with C as next major constituent, e.g. cast iron]
B23K35/30H4	. . . .	[N: with Ni as next major constituent]
B23K35/30H6	. . . .	[N: with Mn as next major constituent]
B23K35/30H8	. . . .	[N: with Cr as next major constituent]
B23K35/30H8B	. . . .	[N: containing Ni or Mn]
B23K35/30H9	. . . .	[N: with other elements as next major constituents]
B23K35/32	. . . .	with the principal constituent melting at more than 1550 degrees C
B23K35/32B	. . . .	[N: a Pt-group metal as principal constituent]
B23K35/32C	. . . .	[N: Ti as the principal constituent]
B23K35/32K	. . . .	[N: comprising refractory compounds, e.g. carbides]

- B23K35/34 . . comprising compounds which yield metals when heated
- B23K35/36 . . Selection of non-metallic compositions, e.g. coatings, fluxes ([B23K35/34](#) 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 B23K35/24](#))
- B23K35/36B . . . [N: with anorganic compounds as principal constituents]
- B23K35/36B2 [N: Carbonates, basic oxides or hydroxides]
- B23K35/36B3 [N: Halide salts]
- B23K35/36B3F [N: Fluorides]
- B23K35/36B4 [N: Borates or B-oxides]
- B23K35/36B5 [N: Silica or silicates]
- B23K35/36B6 [N: Titania or titanates]
- B23K35/36B7 [N: Alumina or aluminates]
- B23K35/36B8 [N: Phosphates]
- B23K35/36D . . . [N: with organic compounds as principal constituents]
- B23K35/36D2 [N: Polymers, e.g. resins]
- B23K35/36D3 [N: N-compounds]
- B23K35/36D4 [N: Halogen compounds]
- B23K35/36D5 [N: B-compounds]
- B23K35/36D6 [N: Carboxylic acids or salts]
- B23K35/362 . . . Selection of compositions of fluxes ([B23K35/365](#), [B23K35/368](#) take precedence)
- B23K35/365 . . . Selection of non-metallic compositions of coating materials either alone or conjoint with selection of soldering or welding materials
- B23K35/368 . . . Selection of non-metallic compositions of core materials either alone or conjoint with selection of soldering or welding materials
- B23K35/38 . . Selection of media, e.g. special atmospheres for surrounding the working area
- B23K35/38B . . . [N: mainly containing noble gases or nitrogen]
- B23K35/38F . . . [N: for condensation soldering]
- B23K35/40 . Making wire or rods for soldering or welding ([processes involving a single technical art, see the relevant subclasses, e.g. B05D, B21C](#))
- B23K35/40B . . [N: Non-consumable electrodes; C-electrodes]
- B23K35/40D . . [N: Coated rods; Coated electrodes]
- B23K35/40F . . [N: Filled tubular wire or rods ([B23K35/40B](#) takes precedence)]

- B23K37/00** **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 A61F9/00 [N: i.e. A61F9/02]; applicable to metal-working machines other than soldering, welding, or flame-cutting machines B23Q; [N: laser protective screens B23K26/42D8;] protective shields for other welding methods F16P1/06) [C0704]**
- B23K37/00F . [N: Cooling means]
- B23K37/00S . [N: Safety devices]
- B23K37/02 . Carriages for supporting the welding or cutting element

- B23K37/02B . . [N: guided by hand]
- B23K37/02F . . [N: travelling on a guide member, e.g. rail, track]
- B23K37/02F2 . . . [N: the guide member being fixed to the workpiece]
- B23K37/02F2B [N: the guide member being a part of the workpiece]
- B23K37/02F4 . . . [N: the guide member being situated alongside the workpiece]
- B23K37/02F8 . . . [N: the guide member forming part of a portal]
- B23K37/02H . . [N: Attachments between the welding or cutting element and the carriage]
- B23K37/02K . . [N: Driving means]
- B23K37/02L . . [N: Steering means]
- B23K37/02M . . [N: Electric supply or control circuits therefor]
- B23K37/02P . . [N: magnetically attached to the workpiece]
- B23K37/02R . . [N: for making circular cuts or welds]
- B23K37/02S . . [N: for working on or in tubes ([B23K37/02F](#) takes precedence)]
- B23K37/02T . . [N: Carriages forming part of a welding unit]
- B23K37/02V . . [N: Carriages forming part of a cutting unit]
- B23K37/02Y . . [N: Transport carriages or vehicles]

- B23K37/04 . . for holding or positioning work
- B23K37/04A . . [N: for planar work]
- B23K37/04D . . [N: for spherical work]
- B23K37/04H . . [N: Fixtures for other work]
- B23K37/04H2 . . . [N: Clamps]
- B23K37/04H2J [N: Jigs]
- B23K37/04H4 . . . [N: Orientable fixtures ([B23K37/04T](#) takes precedence)]
- B23K37/04T . . [N: Welding tables]
- B23K37/047 . . moving work to adjust its position between soldering, welding or cutting steps ([B23K37/053](#) takes precedence)
- B23K37/053 . . aligning cylindrical work; Clamping devices therefor
- B23K37/053B . . . [N: internal pipe alignment clamps]
- B23K37/053E . . . [N: external pipe alignment clamps]
- B23K37/053F . . . [N: longitudinal pipe seam alignment clamps]
- B23K37/053H . . . [N: for maintaining flanges on tubes]
- B23K37/053R . . . [N: for rotating tubes, e.g. rollers]

- B23K37/06 . . for positioning the molten material, e.g. confining it to a desired area

- B23K37/08 . . for flash removal