

I Plant and equipment for joining, surfacing and cutting processes

1 Plant and equipment, including automation, mechanization and industrial robots, for welding of metal, ceramic and composite materials

300	butt seam welding with rotary transformer
320	butt seam welding with sliding contacts
170	capacitor discharge welding
150	cold pressure welding
40	diffusion welding
60	electron beam welding
50	electrogas welding
70	electroslag welding
160	enclosed resistance fusion welding
310	explosive welding
350	firecracker welding
100	flux cored arc welding
10	flash welding
280	friction welding
110	gas pressure welding
120	gas welding
140	induction welding
180	laser welding
210	light beam welding
330	magnetically impelled arc butt (MIAB) welding
220	magnetic pulse welding
190	manual metal arc welding
240	micro welding
230	MIG-MAG (GMA) welding
221	multiple-wire welding
80	narrow gap welding
250	plasma/TIG welding
260	plasma welding
30	projection welding
200	pulsed arc welding
270	resistance butt welding
380	resistance spot welding
370	roll butt seam welding
290	seam welding
20	stud welding
360	submerged arc welding
331	tandem welding
130	thermit welding
390	TIG (GTA) welding
90	tubular wire welding
340	ultrasonic welding

2 Plant and equipment, including automation, mechanization and industrial robots, for weld surfacing and cladding

400	electroslag surfacing
440	explosive and roll cladding
430	friction surfacing
450	gas shielded arc surfacing
410	laser surfacing
420	plasma surfacing
460	submerged arc surfacing

3 Plant and equipment, including automation, mechanization and industrial robots, for brazing and soldering

540	arc brazing
560	bath, wave and drag brazing and soldering
520	bit soldering, block brazing, roller tinning
490	debrazing, desoldering
620	dip brazing and soldering
480	electron beam brazing and soldering
500	flame brazing and soldering
590	friction brazing
580	furnace brazing and soldering
500	high temperature brazing
640	hot gas soldering
511	induction soldering
530	laser brazing and soldering

550	light beam brazing and soldering
570	microbrazing and soldering
660	reflow soldering
650	resistance brazing and soldering
600	salt bath brazing and soldering
471	strap brazing
470	surfacing by brazing and soldering
630	ultrasonic brazing and soldering
610	wave soldering

4 Plant and equipment, including automation, mechanization and industrial robots, for thermal spraying and other coating processes

4.1 Thermal spraying processes

700	arc spraying
690	capacitor discharge spraying
670	flame and detonation spraying
680	induction spraying
720	molten metal spraying
710	plasma spraying

4.2 Other coating methods

730	aluminizing
740	anodizing
750	CVD (chemical vapour deposition)
830	dip coating
760	electrolytic oxidation
770	enameling
790	flame cleaning and phosphatizing
810	metallizing
780	painting, varnishing
800	plastic coating
820	PVD (physical vapour deposition)
840	tin, zinc, nickel, copper and chromium plating

5 Plant and equipment, including automation, mechanization and industrial robots, for thermal cutting and erosion

930	air arc gouging
940	arc-oxygen cutting
910	carbon arc cutting
850	oxy-fuel gas cutting
860	oxygen lancing
950	flame and fusion cutting with metal or mineral powder
900	flame cleaning
880	flame gouging
870	flame scarfing
920	laser beam cutting and drilling, electron beam lancing
970	plasma cutting
960	plasma scarfing
890	spark erosion and chemical machining
980	water jet cutting, water abrasive jet cutting

6 Plant and equipment, including automation, mechanization and industrial robots, for welding of plastics

990	extrusion welding
1030	friction welding of plastics
1000	heated tool welding
1010	high frequency welding of plastics
1060	hot gas welding of plastics
1020	light beam welding of plastics
1040	ultrasonic welding of plastics
1050	vibration welding of plastics

7 Plant and equipment, including automation, mechanization and industrial robots, for adhesive bonding for metallic and non-metallic materials

1067	adhesive applications
1080	adhesive bonding of glass and ceramics
1090	adhesive bonding of plastics
1100	adhesive bonding of leather and textiles
1110	adhesive bonding of metals
1066	bonding in construction and joining technology
1068	combination of adhesive bonding with other joining processes
1065	dosing devices
1070	inductive adhesive curing
1120	micro adhesive bonding
1069	structural bonding

8 Plant and equipment and joining elements, including automation, mechanization and industrial robots, for positive and non-positive joining

1130	flanging
1160	hanging, expanding, clamping, wedging, extending
1170	seaming
1210	joining by compression or squeezing
1180	joining by extrusion or drawing
1190	joining by forming
1200	joining by lockforming (lockseaming)
1220	joining by widening or tightening (rolling in of tubes, botting, beading)
1230	joining by winding
1280	joining elements (rivets, tubular rivets, tap rivets, pop rivets, blind rivet nuts, bolts, screws)
1260	pressure joining (press-fitting, shrink-fitting, expansion-fitting)
1250	riveting
1270	screwing
1240	stapeling (using by wirestaples)
1150	tamp joining
1140	wire netting, wire weaving

9 Plant and equipment, including automation, mechanization and industrial robots, for special applications

1330	orbital welding equipment
1320	production equipment and production lines
1350	repair welding and cutting
1340	stack cutting
1310	systems for feeding, positioning, tipping or conveying (e.g. nut feeding systems)
1300	torch cleaning, automatic torch cleaning systems
1360	underwater cutting
1370	underwater welding
1380	welding, brazing, soldering and thermal cutting and surfacing in space

II Plant and equipment for heat treatment and other production processes (excluding thermal joining, coating and cutting)

1 Plant and equipment, including automation, mechanization and industrial robots, for heat treatment

1400	diffusion annealing
1420	flame straightening
1430	flame heating
1410	flame stress relieving
1470	furnace heating

- 1440 hardening, tempering, annealing
- 1450 induction heating
- 1460 normalizing
- 1500 resistance heating
- 1490 soft annealing
- 1480 stress relief annealing

2 Plant and equipment, including automation, mechanization and industrial robots, for other production processes (excluding thermal joining, coating, cutting and heat treatment)

- 1600 bending, pipe bending
- 1720 blasting
- 1640 casting
- 1670 cold dressing
- 1710 cutting (e.g. plate shearing), slamping, nibbling
- 1610 drilling
- 1630 edge preparation (e.g. plate and pipe chamfering machines)
- 1700 grinding
- 1650 surface preparation and finishing
- 1660 polishing
- 1740 pumps
- 1601 rolling, upsetting, drawing
- 1680 sawing
- 1690 sintering and hot isostatic pressing
- 1620 turning, milling, planing
- 1730 vibratory stress relieving
- 1711 welding conditioning

III General productions equipment, systems for computer aided manufacture, data processing, manual and automatic control engineering, automation

- 1900 CAD-, CAM-, CAQ-, CIM- and CAP systems
- 1930 camera systems for monitoring design and production processes
- 1910 capture, checking and processing of process and production parameters
- 1960 computers and other hardware (mini and micro computers, PC's, main-frames, process computers, printers, plotters, processors, etc.)
- 1980 control engineering (pressure switches, solenoid and plasma valves, etc.)
- 1920 industrial plant
- 1970 mass production, flexible production facilities and welding lines
- 1941 optics for laser welding and/or cutting
- 1950 programs (software)
- 1940 seam tracking and welding head guidance systems

IV Plant for production of filler materials and consumables

- 2000 acetylene generators and filling stations
- 2030 brazing filler and solder production plants
- 2010 conveying systems
- 2020 gas manufacturing and liquefying plants
- 2050 welding electrode and flux cored wire production plants
- 2060 welding flux production plants
- 2040 welding wire production plants

V Workshop and workplace equipment, safety equipment, health and safety

1 Workshop and workplace equipment, safety equipment

- 2160 at-source welding fume extraction systems (stationary, mobile)
- 2220 exhaust and ventilation systems
- 2120 heat recovery systems
- 2130 load turning devices
- 2270 other protective and safety devices (e.g. signs warning against possible hazards, fire extinguishers, fire blankets)
- 2183 protective screens
- 2200 protection devices against fires and explosions
- 2210 protection equipment against high energy radiation (e.g. X-rays, laser)
- 2180 safety device for industrial robots (e.g. door locking systems, control boards, visual supervision systems)
- 2100 slinging gear, cranes and elevators (crane systems, lifting forks and beams, slewing cranes, lifting magnets, electric chain hoists)
- 2150 soldering fume filters
- 2170 sound absorbing materials, sound-proof chambers
- 2211 stationary vacuum cleaners for industrial use
- 2260 tools
- 2140 transparent/opaque screens
- 2190 weld fume filters and filtration systems
- 2181 welding booths
- 2182 welding curtains
- 2230 work benches, workshop lockers
- 2240 workshop stools, aids to stability
- 2250 workshop trolleys, cylinder trolleys
- 2110 work tables (e.g. welding and cutting tables)

2 Health and safety (personal protective equipment)

- 2320 ear protection (wadding, ear plugs, ear muffs)
- 2310 first aid equipment, medicines
- 2330 laser protection
- 2360 other protective equipment
- 2340 protective clothing (helmets, aprons, garments, shoes, gloves)
- 2300 respiratory protection (filters-, insulating devices)
- 2350 welder's head screens and shields, protective goggles, eye protective filters

VI Accessories

1 General accessories

- 2570 assembly systems, assembling and positioning devices (clamps, roller blocks, line-up clamps) (see also 2670)
- 2590 chipping hammers and wire brushes
- 2670 clamping systems, clamping elements
- 2540 clamps (terminals, earthing, workpiece) and polarity testers
- 2430 controlled feeding devices (e.g. for adhesives, solders and powders)
- 2560 cooling systems
- 2680 drying cabinets (electrodes and fluxes), heated quivers, baking ovens
- 2500 electrode holders
- 2510 electrode grinding devices
- 2400 equalizing systems (e.g. for spot welding guns)
- 2620 filler, wire spools
- 2520 gas lighters
- 2530 globoidal drive

- 2610 hose press
- 2600 hoses, hose couplings, hose connections, hose package
- 2550 magnets for welding, magnetic handling equipment
- 2551 magnetic valves
- 2700 other accessories, pumps and other auxiliary equipment
- 2571 plasma valves
- 2460 pressure cylinders for pressure and resistance welding
- 2480 resistance welding electrodes
- 2581 robot holding bracket
- 2660 secondary cables for resistance welding
- 2580 spot welding guns
- 2671 steels-wire brushes and hand brushes for welds
- 2490 TIG (GTA) welding electrodes
- 2691 tool changing systems
- 2695 turntables and tilt-turn positioners
- 2420 torch and welding head manipulation systems
- 2411 torch-neck changing systems
- 2450 turnables and tilt-turn positioners, lift tables
- 2552 water-, oil-, air chillers
- 2410 weld backings and adhesive tapes (for one sided welding)
- 2630 welding flux feeding and recovery devices
- 2650 welding leads and connectors
- 2640 welding mirrors
- 2611 welding-sets, diesel or gasoline driven
- 2440 wire feeders
- 2431 wire-guide spiral
- 2690 workpiece handling systems (lift and shift systems, dial tables)
- 2470 workpiece storage equipment (belts, pallets, stores)

2 Gas supply accessories

- 2720 central switching, pressure regulating and safety units, gas mixing units and valves for supply pipe work (switching, pressure regulating and safety devices, valves, gas filters, gas flow and pressure meters)
- 2730 equipment for gas take-off stations (stop valves, pressure regulators, gas mixers, safety devices, take-off boards)
- 2710 gas sources/tanks with pipework and valves (storage tanks, tankers, containers, cylinder racks and batteries, individual cylinders)
- 2740 individual cylinders (pressure reducers and anti-flashback and backflow devices)
- 2750 special equipment and general accessories (automatic switching and pressure control systems, gas analyzers, pipe identification stickers, clamps etc.)

VII Filler materials

1 Filler materials for welding and thermal cutting

1.1 Fillers and materials for welding and coating specific materials (classified by material groups)

- 2810 welding fillers for alloy cast steels
- 2800 welding fillers for high alloy steels
- 2830 welding fillers for non-ferrous metals and alloys
- 2870 welding fillers for other materials
- 2820 welding fillers for plastics
- 2850 welding fillers for unalloyed and low alloy cast steels
- 2840 welding fillers for unalloyed and low alloy steels
- 2860 welding fillers for wear and corrosion resisting deposits

1.2 Fillers and materials for welding, cutting and coating (classified by types)	3370 adhesives for metals	3910 gauges and weld gauges
2990 covered electrodes (manual metal arc welding)	3360 adhesives for plastics	3860 holography
3000 filler materials for laser welding	3320 all-purpose adhesives	4120 hydrogen determination
2910 flux cored wires and strips	3330 high-temperature adhesives	3940 manual and miscellaneous measuring devices for arc welding (current, voltage, wire-feed rate, gas-feed rate, welding speed and energy per unit length)
2940 gas welding rods	VIII Consumables other than filler materials	3930 mass, density, force, torque and pressure measurement
2960 gouging and thermal cutting electrodes	1 Gases	3990 measuring and monitoring devices for the electrode-penetration depth in resistance welding
2980 thermit welding materials	3460 carbon dioxide	3960 measuring devices for gases, fumes and dusts
2950 TIG (GTA) welding rods	3420 compressed air	3970 measuring devices for sound/noise
2920 tubular stick electrodes	3410 doping and test gas	3980 measuring devices for radiation
2970 underwater welding and cutting electrodes	3400 fuel gases (acetylen, butane, natural gas, methane)	3950 measuring devices for resistance welding (pulses, periods, current and voltage) and Rogovski belts
2930 welding fluxes	3470 gas mixtures	4000 metallography
2900 wire electrodes for gas metal-arc welding	3500 hydrogen	4010 microscopy
2890 wires and strips for micro welding	3440 hydrogen-nitrogen mixture	4150 miscellaneous measurement technology and measuring devices
2880 wires, strips and plates for submerged arc and electroslag welding	3450 inert gases (argon, neon, helium)	4100 monitoring devices for arc welding
2 Filler material for thermal spraying	3430 liquid gas	4110 monitoring devices for resistance welding
2.1 Filler materials for thermal spraying (classified by composition)	3490 nitrogen	4050 photoelasticity
3010 carbide powders	3480 oxygen	3840 photography and cinematography
3020 ceramic powders (metal oxides/nitrides)	2 Other consumables	3920 power measurement
3030 metal powders and wires	3760 abrasives	4130 resistance and insulation measurement
3040 powder mixtures	3660 anti-rust compounds	4040 sensor technology
3050 thermoplastics	3550 anti-spatter compounds	4030 specimen-preparation installations
2.2 Filler materials for thermal spraying classified by process and type of spray material)	3750 anti-spatter sprays	4051 spectrometers
3070 filler materials for arc spraying (wires)	3510 asbestos substitutes	3850 speed and rotational-speed measurement
3060 filler materials for flame spraying (wires, rods powders)	3580 auxiliary materials for thermit welding	4020 surface quality (cut-surface quality)
3090 filler materials for molten metal spraying	3570 brazing and soldering fluxes	4080 temperature measurement (optical, electrical, chemical and mechanical)
3080 filler materials for plasma spraying (powders)	3530 calcium carbide	4090 thermography
3 Filler materials for brazing and soldering	3610 ceramic powders	3820 throughput and flow-rate measurement
3.1 Solders (classified by composition)	3600 ceramic preforms	4140 time, event-number and frequency measurement
3100 lead-in solders	3720 chalk	2 Decives and processes testing technology
3130 other solders	3640 cleaning agents	2.1 Non-destructive testing
3110 solders for aluminium	3761 cutting and snagging wheels	4160 betatron and linear accelerators
3120 tin-lead solders with or without Cu, Ag, P additions	3710 cutting powders for concrete, cast iron and other materials	4170 leak testing
3.2 Brazing fillers (classified by composition)	3690 explosives	4180 radiographic testing
3140 aluminium brazing fillers	3590 heat protection equipment for welding work	4190 dye-penetration testing
3160 copper/brass brazing fillers	3541 impregnating compounds	4200 resources, automation and computer assistance for non-destructive testing
3150 gold containing brazing fillers	3540 leak-test-materials	4201 ultraviolet lamps
3170 nickel base brazing fillers	3700 lubricants	4210 laser-beam testing
3230 other brazing fillers	3680 marking paints	4220 magnetic testing
3180 palladium containing brazing fillers	3520 pickling pastes	4230 neutron-beam testing
3190 phosphorus containing brazing fillers	3670 oxygen and powder lances	4240 acoustic-emission analysis
3200 platinum containing brazing fillers	3560 paints and varnishes	4250 ultrasonic testing
3210 silver brazing fillers	3650 raw materials for electrode coatings	4260 eddy-current testing
3220 special brazing fillers (cobalt, titanium, zirconium base)	3630 solder masks and resists	4270 other non-destructive testing processes
3.3 Forms of solders and brazing fillers	3620 solvents	2.1 Destructive testing
3280 brazing and soldering pastes	3740 weld cleaning	4280 dynamic fracture testing (Battelle, drop-weight, double-torsion, explosion-bulge, Esso notched-bar bend impact, notched-bar tensile impact, Niblink and Robertson tests)
3300 brazing and soldering powders	3730 weld primers	4290 hardness testing
3260 brazing and soldering wires, rods and strips	3 Primers and bonding agents for adhesive technology	4300 resources, automation and computer assistance for destructive testing
3290 filler precoated plates	3770 bonding agents	4310 K'tric'he test and crack-opening displacement (COD) test
3250 flux coated rods	3780 primers	4320 corrosion testing
3240 flux cored rods	IX Measurement and testing technology (equipment and/or services)	4330 weldability testing (cold-cracking and hot-cracking testing and others)
3270 preforms and foils	1 Decives for measurement and sensor technology	4340 static fracture testing (longitudinal-weld bend, bursting, deep-notch, bend, notched-bar bend, notched-bar tensile and wide-plate tests)
3310 stranded rods	3880 calculation systems	4350 universal testing facilities
4 Adhesives	3870 calibration	
3340 adhesives ceramic/ceramic	3890 capacitance and inductance measurement	
3350 adhesives ceramic/metal	3800 chemical analysis	
	4060 coat-thickness, wall-thickness and crack-depth measurement	
	4070 current and voltage measurement	
	3810 elongation, path and angle measurement	
	3830 ferrite-content measuring devices	
	3900 force measuring systems	

List of Products

- 4360 creep rupture and fatigue-endurance strength testing and vibration-fatigue testing installations
- 4370 tensile, pressure, torsion and bend testing
- 4380 miscellaneous and mechanical-technological tests

X Quality assurance, construction, consultancy (services)

- 4500 certification of welding personnel, quality management systems and products
- 4430 consultancy and planning of fabrication and application of materials, energy and processes
- 4450 design and analysis of welded structures
- 4410 determination and testing of products, joining processes and fabrication operations
- 4420 determination of weldability, sprayability, solderability, brazeability and/or cuttability
- 4440 factory qualification
- 4470 failure investigation and analysis
- 4490 maintenance, servicing, repair of equipment
- 4460 quality management systems
- 4480 supervision of welding and fabrication operations, on site and in-plant

XI Sub-contracting (services)

1 Sub-contracting—processing of specific materials

- 4600 aluminium
- 4830 brass
- 4790 carbon
- 4870 cardboard, paper
- 4750 cast iron
- 4940 cast steel
- 4780 ceramics
- 4660 cermets
- 4670 chromium
- 4620 coated and plated materials
- 4890 compression moulding compounds (polymers)
- 4630 concrete
- 4640 concrete reinforcing bars
- 4800 copper
- 4680 duplex-steels
- 4700 elastomers
- 4710 fiber reinforced materials
- 4720 fine grained structural steels
- 4610 free machining steels
- 4740 glass
- 4760 high alloy steels
- 4770 high temperature materials
- 4810 laminates
- 4650 lead, bismuth, cobalt, cadmium
- 4820 leather
- 4850 low alloy steels
- 4821 magnesium
- 5040 new materials (high strength, light weight constructions and superhard materials, nanomaterials, light and electricity conducting materials, magnetic materials, implant materials, etc.)
- 4840 nickel
- 4860 niobium, manganese
- 4900 pipe steels
- 4880 platinum, gold, silver
- 4910 rail steels
- 4730 refractory materials
- 4920 shipbuilding steels
- 4930 sintered materials
- 4950 superalloys (hot isostatic pressure)
- 4690 termosets
- 4960 thermoplastics

- 5020 tin, zinc
- 4970 titanium
- 4990 tool steels
- 5010 tungsten, tantalum, molybdenum
- 4980 unalloyed steels
- 5000 weathering steels
- 5030 zirconium, vanadium, beryllium

2 Sub-contracting—processing of specific semi-finished products

- 5202 brass pipes
- 5160 castings
- 5230 circular blanks
- 5201 copper pipes
- 5280 extruded products
- 5150 foils, thin strip
- 5260 forgings
- 5250 hoses (metal)
- 5220 pipes and flanges
- 5170 plastic films, strips, sheets
- 5180 plastic pipes, flanges and other plastic semi-finished products
- 5200 plastic products
- 5190 plastic tubes and sleeving
- 5240 rails
- 5110 reinforcing bars and mesh
- 5210 sections (girders)
- 5120 sheet, plate, checker plate, perforated plate
- 5270 sintered parts
- 5140 springs
- 5100 strip and wide strip
- 5130 wires

3 Sub-contracting—application of joining and other manufacturing processes

- 5420 adhesive bonding of metals
- 5410 adhesive bonding of plastics
- 5470 brazing and soldering
- 5370 electron, laser- and ion beam welding
- 5380 electroslag welding
- 5580 firecracker, electrogas and/or submerged arc welding
- 5340 flame cleaning
- 5350 flame cutting blanks
- 5300 flash welding
- 5531 friction stir welding
- 5520 friction welding
- 5390 gas pressure welding
- 5540 gas shielded arc welding
- 5400 gas welding
- 5610 heat treating and/or quenching and tempering
- 5450 laser welding and/or cutting
- 5550 magnetically impelled arc butt (MIAB) welding
- 5620 maintenance, servicing, repair
- 5460 manual metal arc welding
- 5480 metallizing, dip coating and anodizing
- 5490 metal spraying
- 5500 oxidized ceramic spraying
- 5320 pickling, sand blasting, polishing, deburring and/or grinding
- 5440 plastic spraying
- 5510 resistance spot and/or projection
- 5521 robot welding TIG/MIG/MAG
- 5590 scrapping
- 5530 seam welding
- 5360 spark erosion
- 5330 stud welding
- 5310 surfacing
- 5560 thermal cutting
- 5570 ultrasonic welding
- 5600 vibratory stress relieving
- 5430 welding of plastics

XII Organizations, education and training, research, information transfer, technical literature and regulations

- 5640 acceptance, approval, examination and supervisory organizations
- 5630 accreditation and certification organizations
- 5710 codes of practice, standardization, patents (incl. organizations)
- 5690 consultants, experts
- 5650 education, continuing education and examination of specialist personnel
- 5700 information services (literature and factual database searches, expert systems, certification, literature appraisal, state of the art and trend analyses)
- 5680 joining research and education
- 5660 supervisory bodies, chambers of trade, employers associations
- 5720 technical and scientific associations, industrial associations
- 5670 technical publishers, libraries (literature, codes of practice, educational films, software, CD-ROM and diskette services, audiovisual media)

XIII Services

- 5730 leasing of welding plant and welding equipment