KÖCO
KÖSTER & CO


STUD WELDING


IMPRESSIVE TECHNOLOGY

The Advantages of KÖCO-Stud Welding

KÖCO stud welding is a safe high-performance fastening technology offering the user an enormous potential for cost reduction.

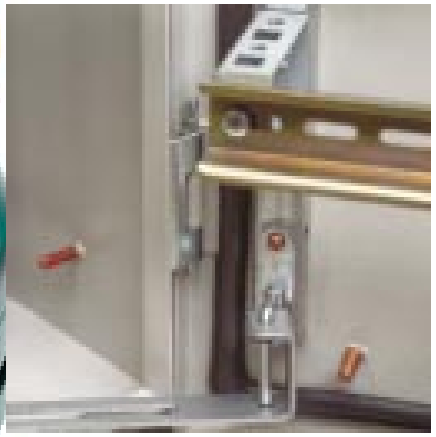
With KÖCO stud welding technology threaded and unthreaded studs, shear connectors, refractory anchors, etc. with diameters ranging from 2 to 25 mm, are joined to metal sheets, pipes, profiles, etc. by instantaneous cross-sectional welding.

Some costly and time-consuming operations, such as drilling, threading, screwing or manual welding, are no longer necessary.

The advantages of KÖCO stud welding technology are obvious:

- A high degree of safety, thanks to cross-sectional joints
- High productivity through extremely short welding time
- Options for various combinations of materials
- Distortion reduced to a minimum through low thermal stress
- Very little or no damage to the reverse side
- Hollow parts remain leakproof
- Access to parts from one side only is sufficient
- Easy to operate for personnel trained on the job
- Conform to international standards: EN ISO 14555 and EN ISO 13918
- Shear connectors officially approved: Approval (Zulassung) No. Z-21.5-280
- Innovative stud welding equipment and welding studs from in-house production

The Users of KÖCO-Stud Welding



KÖCO stud welding technology is suitable for applications in

- **Composite structures of steel and concrete** (bridge building, high rise buildings, industrial building, multi-storey car parks, prefabricated structures, foundation work and tunnelling, hydraulic steel work)
- **Steel construction** (mounting of facades, pillars, rails)
- **Shipbuilding** (assembly devices, insulations, cable tracks and fastening of equipment, anti-skid flooring on ramps, production of manhole rings, etc.)
- **Construction of containers and machinery** (boilers, chemical laboratory equipment, tanks, ventilation and air conditioning technology, switchboards, billboards, food industry, domestic appliances)
- **Vehicle construction** (fastening of cables and leads, decorative borders, earthing studs, linings, etc.)
- **Refractory industry** (fastening of fire-proof concrete, ceramic linings, fibre mats in kilns, boilers, waste incinerators, etc.)
- **Production and processing of raw materials** (anti-wear studs, spikes, mounting of hard facings)

The Technology of Stud Welding


1


2


3


4

In drawn arc stud welding, an arc is drawn between a stud and a workpiece, melting some of the metal on both parts. At the end of welding time the stud is plunged into the weld pool, the welding current is switched off and the weld pool solidifies.

Depending on the application, the following processes are available:

Drawn arc stud welding

with the following variants:

- stud welding with ceramic ferrule 1
- stud welding with shielding gas 2
- short-cycle stud welding with or without shielding gas 3

Stud welding with tip ignition

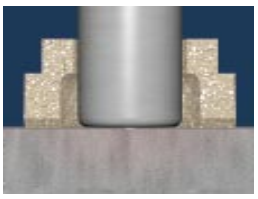
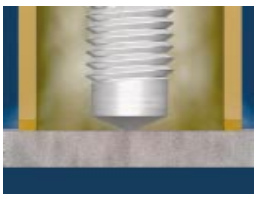
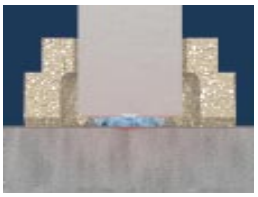
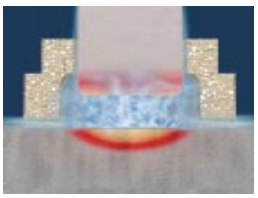
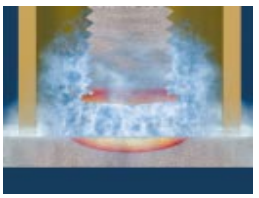
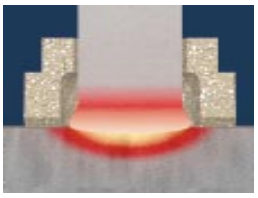
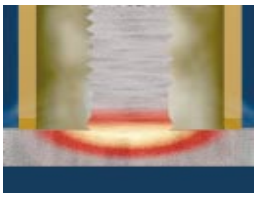
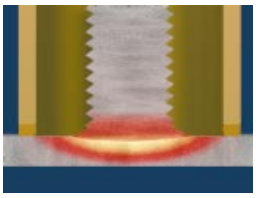
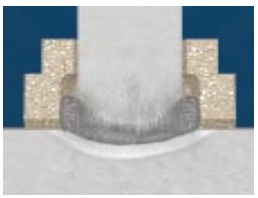
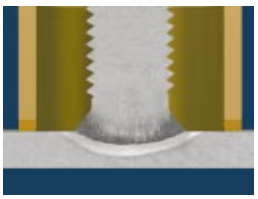
The following variants are available:

- with gap 4
- with contact 4

Photo: Dietmar Strauß

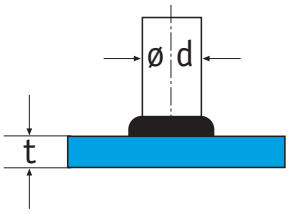
Drawn Arc

Stud Welding

	Stud welding with ceramic ferrule	Stud welding with shielding gas	Short-cycle stud welding with or without shielding gas
The stud is placed against the workpiece.			
The stud is lifted off, while current is flowing, thus creating an arc.			
The arc melts the surfaces of stud and workpiece.			
The stud is plunged into the weld pool.			
A cross-sectional joint is achieved.			

The Selection of the Process

Process	Stud welding with ceramic ferrule	Stud welding with shielding gas	Short-cycle stud welding	Stud welding with tip ignition
minimum sheet thickness t	1/4 d	1/8 d	1/8 d	1/10 d, min. 0,5 mm
maximum stud diameter d for welding from different positions	↓ 25 ← 16 ↑ 20	↓ 12 (16) ← 6 ↑ 8	↓ 12 ← 8 ↑ 10	↓ 8 ← 8 ↑ 8 (for aluminium 6 in all cases)
suitable surface conditions [1]	bright metal, rolling skin, primer suitable for welding, surface rust, thin layer of oil	bright metal, rolling skin, primer suitable for welding, surface rust, thin layer of oil, zinc coating	bright metal, rolling skin, surface rust, thin layer of oil, zinc coating	bright metal, thin layer of oil, galvanized (with a possible limit to the stud diameter)
unsuitable surface conditions [1]	hot-dip galvanising, loose layers of scaling, heavily corroded, protective coating	loose layers of scaling, heavily corroded, protective coating	loose layers of scaling, heavily corroded, coating with organic material	zinc coating of more than 15 µm, coating with organic material, coating with insulating material (e. g. anodised aluminium)
common applications	studs with more than 8 mm ø in steel and boiler construction, and shipbuilding, on surfaces only coarsely cleaned, deep penetration, suitable for field welding	studs from M 6 to M 12 in downhand position, especially with automatic feeding of studs	studs from 5 to 10 mm ø without shielding of the weld pool in case of average quality requirements for the shape of the weld collar. In case of high-grade requirements, shielding gas should be used.	for thin metal sheets, especially stainless steel and aluminium, and in case of high-grade requirements for an undamaged visible reverse side.



[1] Here, we can give only general hints without any commitment or warranty on our part. The conditions must be tested in each individual case. Basically, a higher degree of surface cleanliness is required for shorter welding times. The best results are always achieved on bright metal surfaces.

Common Stud/Workpiece Material Combinations in Drawn Arc Stud Welding

Stud material	Workpiece material: low-alloy steel with a minimum yield point of ≤ 460 N/mm²	Workpiece material: thermo-mechanically treated and annealed fine-grain steel with a minimum yield point > 460 N/mm²	Workpiece material: austenitic stainless steel and Duplex steel	Workpiece material: pure aluminium and non-hardenable aluminium alloys
low-alloy steel, e. g. S235, 4.8 (suitable for welding), 16Mo3	a	b	b[2)]	-
heat-resisting ferritic and austenitic steel, e. g. 1.4742, 1.4841	c	c	c	-
austenitic stainless steel, e. g. 1.4301, 1.4571	b/a[1)]	b	a	-
aluminium-magnesium alloys, e. g. AlMg3, AlMg5	-	-	-	b[3)]

1) up to 10 mm Ø and with shielding gas 2) only short-cycle drawn arc stud welding 3) for stud diameters up to 10 mm only

welding suitability keys:
-: unsuitable for welding, a: suitable for any application including force transfer, b: limited suitability for force transfer
c: generally suitable, limited suitability, for heat transfer only

Common Stud/Workpiece Material Combinations in Stud Welding with Tip Ignition

Stud material	Workpiece material: low-alloy steel fine-grain steel, annealed steel C ≤ 0,35 %	Workpiece material: low-alloy steel, fine-grain steel, annealed steel, C ≤ 0,35 %, zinc- or metal-coated, thickness of coating ≤ 15 µm	Workpiece material: austenitic stainless steel	Workpiece material: pure copper and unleaded copper alloys	Workpiece material: pure aluminium and non-hardenable aluminium alloys
low-alloy steel, e.g. S235, 4.8 (suitable for welding)	a	b	a	b	-
austenitic stainless steel e. g. 1.4301	a	b	a	b	-
brass (unleaded)	b	b	b	b	-
Al99,5	-	-	-	-	b
AlMg3	-	-	-	-	a

welding suitability keys:
-: unsuitable for welding, a: suitable for any application including force transfer, b: limited suitability for force transfer

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