FRICTION STIR WELDING TOOLS FOR VERTICAL MILLS

Friction Stir Welding
Catalog 2026



Solid-state joining of aluminium on the mill you already have

Designed by MEISTERFABRIK, Skövde, Sweden · Made in Sweden and Germany

FS1

FLAGSHIP · AVAILABLE NOW

3 sizes · 12.7 mm shank · H13

MEISTERFABRIK

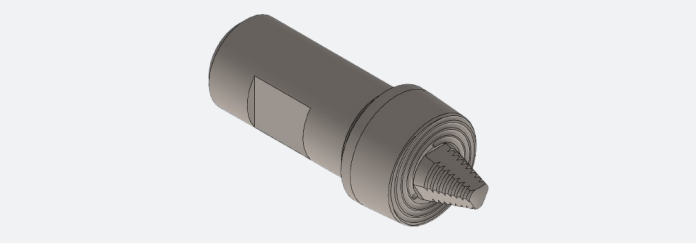
Catalog 2026 · Assortment and application
For buyers and resellers

FSW tool portfolio

MEISTERFABRIK friction stir welding tools bring solid-state joining of aluminium alloys to ordinary vertical milling machines. The tool fits ER32, ER25 or similar collets, C5 and R8 collets, or an end mill holder; no dedicated FSW machine is needed.

- Solid-state joining of aluminium alloys, no melting of the base material
- No shielding gas and no filler material
- Low distortion
- For manual or CNC vertical mills and VMCs, no internal cooling required

FS1 is available in three sizes.



FS1 AVAILABLE

First choice for friction stir welding aluminium on ordinary manual or CNC vertical mills and VMCs. Annealed AISI H13 tool steel (200 HB), 12.7 mm (1/2") shank for ER32, ER25 or similar collets, C5 and R8 collets, or an end mill holder. Three sizes.

Ordering code key

Every MEISTERFABRIK FSW tool has one ordering code that describes the tool itself: series, shoulder Ø, pin Ø, pin length, and steel grade with hardness. Read the code from left to right.

Example: FS1 Size 2

FS1 – **120** – **033** – **050** – **H13HB200**

1. **Series**
   FS1
2. **Shoulder Ø**
   Tenths of a mm
   3 digits
   120 = 12.0 mm
3. **Pin Ø**
   Tenths of a mm
   3 digits
   033 = 3.3 mm
4. **Pin length**
   Tenths of a mm
   3 digits
   050 = 5.0 mm
5. **Steel and hardness**
   Steel grade + "HB" +
   Brinell hardness
   H13HB200 = H13, 200 HB

Reading the dimensions

Fields 2 to 4 are in tenths of a millimetre, padded with leading zeros to three digits. Shoulder Ø 15.0 mm reads **150**; pin length 7.5 mm reads **075**.

Placeholders

Fields not yet defined are shown as XXX, ??? or XXXHB000. Codes marked this way are provisional and change when the value is set.

Code overview

FS1 · dimensions as encoded in the code

Ordering code	SKU	Tool	Shoulder Ø (mm)	Pin Ø (mm)	Pin length (mm)	Steel	HB	Status
FS1-100-033-025-H13HB200	MF1019	FS1 Size 1	10.0	3.3	2.5	H13	200	AVAILABLE
FS1-120-033-050-H13HB200	MF1003	FS1 Size 2	12.0	3.3	5.0	H13	200	AVAILABLE
FS1-150-033-075-H13HB200	MF1020	FS1 Size 3	15.0	3.3	7.5	H13	200	AVAILABLE

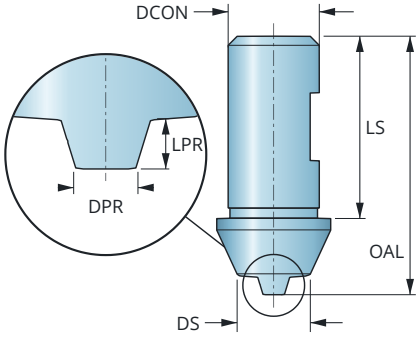
[1] Pin Ø measured at the small end of the pin.

FS1

Aluminium alloys

N01 N10

Standard assortment · Annealed AISI H13 tool steel, 200 HB · straight shank · no internal cooling



Parameter	Definition
WDMX	Maximum weld depth (aluminium)
DS	Shoulder diameter (concave shoulder)
DPR	Pin diameter, at the small end
LPR	Pin length
DCON	Connection (shank) diameter
LS	Shank length
OAL	Overall length
HB	Brinell hardness

FS1 Size 1 shown, to scale from the STEP model

Ordering code	SKU	Size	Steel	HB	**WDMX** (mm) Max. weld depth	**DS** (mm) Shoulder Ø	**DPR** (mm) Pin Ø	**LPR** (mm) Pin length	**DCON** (mm) Shank Ø	**LS** (mm) Shank length	**OAL** (mm) Overall length
FS1-100-033-025-H13HB200	MF1019	Size 1	H13	200	3	10.0	3.3	2.5	12.7	25.4	36.0
FS1-120-033-050-H13HB200	MF1003	Size 2	H13	200	6	12.0	3.3	5.0	12.7	25.4	36.0
FS1-150-033-075-H13HB200	MF1020	Size 3	H13	200	8	15.0	3.3	7.5	12.7	25.4	36.0

Inch values (converted from mm)

Ordering code	SKU	Size	Steel	HB	**WDMX** (in) Max. weld depth	**DS** (in) Shoulder Ø	**DPR** (in) Pin Ø	**LPR** (in) Pin length	**DCON** (in) Shank Ø	**LS** (in) Shank length	**OAL** (in) Overall length
FS1-100-033-025-H13HB200	MF1019	Size 1	H13	200	0.118	0.394	0.130	0.098	0.500	1.000	1.417
FS1-120-033-050-H13HB200	MF1003	Size 2	H13	200	0.236	0.472	0.130	0.197	0.500	1.000	1.417
FS1-150-033-075-H13HB200	MF1020	Size 3	H13	200	0.315	0.591	0.130	0.295	0.500	1.000	1.417

WDMX = maximum weld depth in aluminium, from the product listing. Pin and shoulder dimensions from the FS1 product drawings. Shank 12.7 mm (1/2") for ER32, ER25 or similar collets, C5 and R8 collets, or an end mill holder; always install with the shank shoulder seated against the collet or holder face.

[1] Pin Ø measured at the small end of the pin.

Which size?

Weld depth in aluminium	Choose	Ordering code	SKU
up to 3 mm	FS1 Size 1	**FS1-100-033-025-H13HB200**	MF1019
up to 6 mm	FS1 Size 2	**FS1-120-033-050-H13HB200**	MF1003
up to 8 mm	FS1 Size 3	**FS1-150-033-075-H13HB200**	MF1020

Packaging and logistics

Pack size	1 tool per tube, Ø25 × 50 mm
Weight per tool	0.1 kg
HS code	8468.80
Lead time	4–7 days for tools in stock 8–10 weeks for made-to-order

Machine requirements

FS1 is made for the vertical mills found in ordinary workshops: manual or CNC knee mills, vertical mills and VMCs. Check that the machine meets these minimums before ordering.

Minimum machine specification

N01 N10

FS1 · all sizes

Requirement	Minimum	Notes
Spindle power	2 hp (about 1.5 kW)	
Spindle speed	2,000 RPM	
Spindle torque	25 Nm (18.4 ft-lb) at the spindle	
Machine class	Knee mill in the class of a Bridgeport Series 1, or stiffer	Reference machine
Rigidity	Solid knee or bed mill recommended	Detailed spec to follow
Tool holding	ER32, ER25 or similar collets, C5 and R8 collets, or an end mill holder for a 12.7 mm (1/2") shank	Shank shoulder seated against the collet or
Machine type	Manual or CNC vertical mill, VMC	
Coolant	Not required; FS1 has no internal cooling	

Suitable

- Manual knee mills in the Bridgeport Series 1 class or stiffer
- CNC vertical mills
- Vertical machining centres (VMCs)

Check before ordering

- Spindle reaches 2,000 RPM with 25 Nm (18.4 ft-lb) available
- At least 2 hp (about 1.5 kW) spindle drive
- Solid knee or bed mill (rigidity spec to follow)

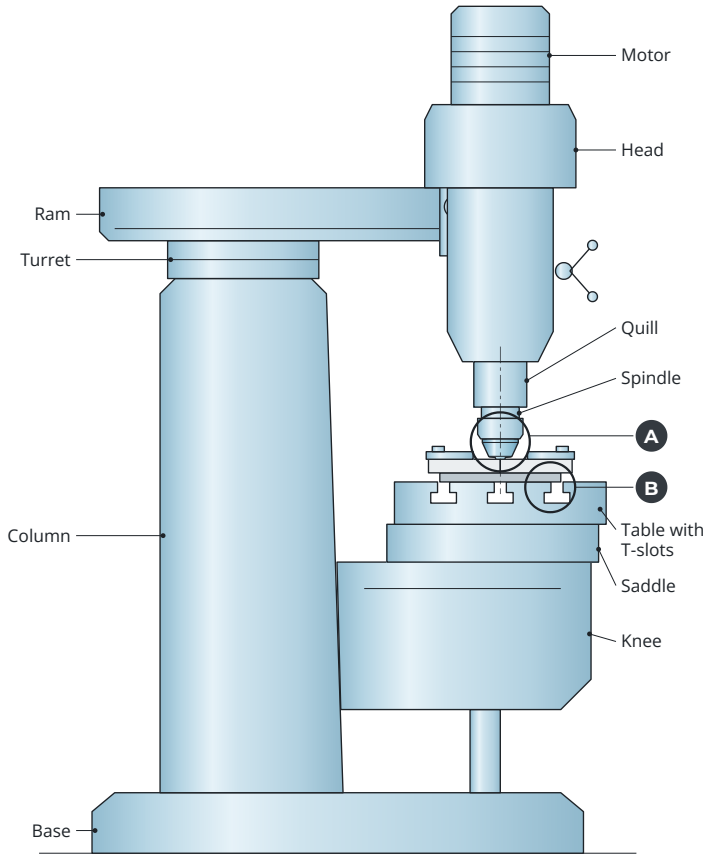


FS1.

Setup and use

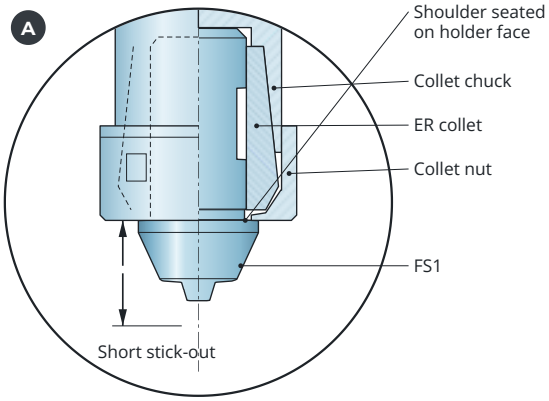
FS1 fits ER32, ER25 or similar collets, C5 and R8 collets, or an end mill holder on an ordinary manual knee mill or CNC VMC (minimum 2 hp, 2,000 RPM and 25 Nm (18.4 ft-lb), see page 5). No shielding gas, no filler and no coolant: the non-consumable tool, with its shoulder and threaded tapered pin, joins ISO N aluminium in the solid state.

Overview · knee mill in the Bridgeport Series 1 class



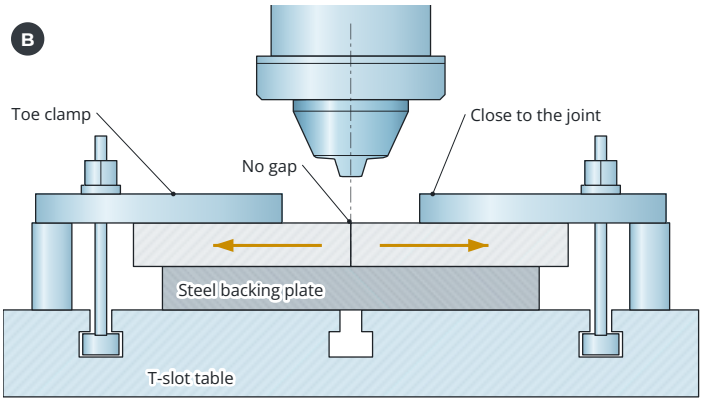
Schematic side view, not to scale. Callouts: A tool in the collet, B workpiece clamping.

1 Tool placement in the mill

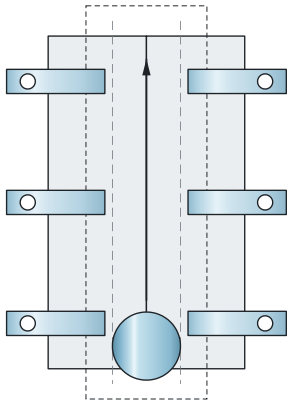


- Clean the shank, collet and nut. Use an ER32, ER25 or similar collet, a C5 or R8 collet, or an end mill holder for the 12.7 mm (1/2") shank.
- Always install with the shank shoulder seated against the collet or tool holder face (shank length LS 25.4 mm fully inside).
- Keep the stick-out short for rigidity: only neck, shoulder and pin below the nut.
- Tighten the nut to the collet maker's torque.

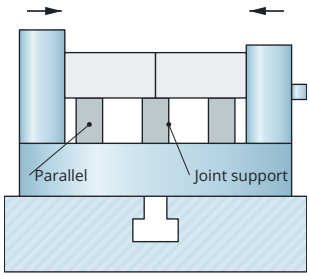
2 Workpiece setup



a Option 1: toe (strap) clamps on the table T-slots. With strap or toe clamps, a backing plate under the workpiece is preferred to protect the table. Plates butted tight with **no gap**; clamps on both sides, close to the joint but clear of the shoulder. Amber arrows: the weld forces push the plates apart.



b Top view: clamps along both sides of the joint, backing plate (hidden line) under its full length, shoulder path kept clear.

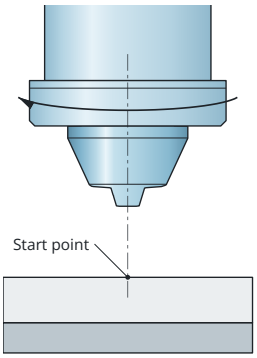


c Option 2: machinist vise. Plates butted tight. Support them on parallels at the sides **and** on a parallel or bar directly under the joint line. Keep the shoulder clear of the jaws.

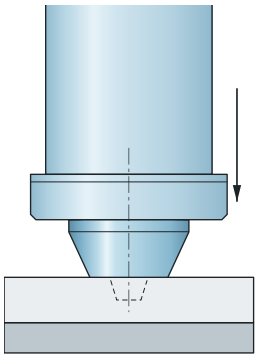
Setup and use

Weld sequence, tool tilt, joint designs and good practice · process values on page 8

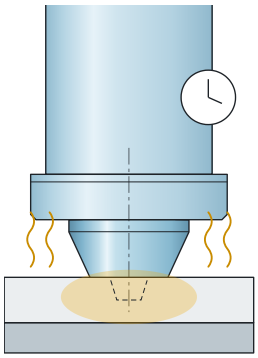
3 Weld sequence



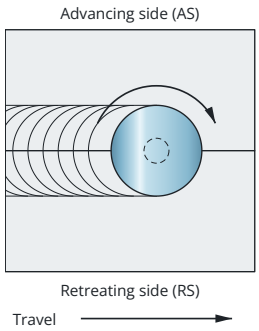
a Position over the start point and switch the spindle on, rotating clockwise (M3).



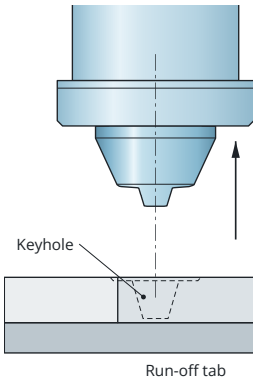
b Plunge: the pin enters until the shoulder contacts the surface, plus a slight shoulder plunge. Depth: page 8.



c Dwell: hold 0–3 s so the material under the shoulder heats up.

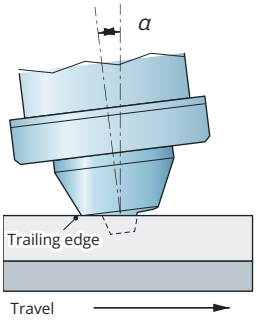


d Traverse along the joint at weld speed (page 8). AS: rotation and travel point the same way.



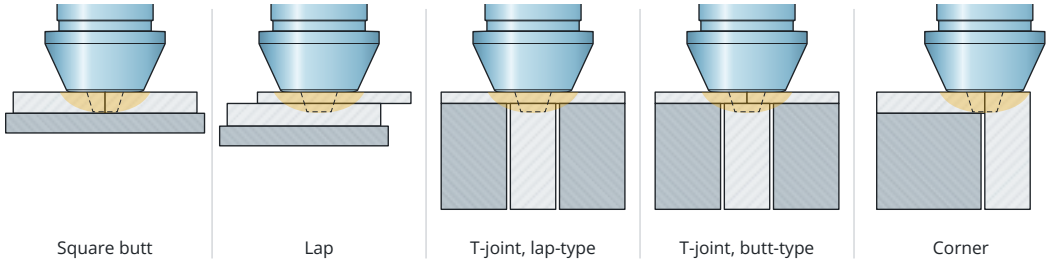
e Retract at the end. The pin leaves an exit hole (keyhole); run it off onto an optional tab.

4 Tool tilt



The tools are designed for 0° tilt. Optionally, a trailing tilt α of up to 5° can be used: the top of the tool leans back from the travel direction so the trailing edge of the shoulder is lower. Angle exaggerated in the drawing.

5 Standard joint designs



Cross-sections, schematic. Amber: stirred zone under the shoulder; dashed: pin.

6 Safety and good practice

Wear eye protection; keep hands and loose clothing clear of the rotating tool.

No coolant is needed: the tools weld dry and have no internal cooling.

Lock the machine axes that do not move during the weld.

The tool and the workpiece are hot during and after the weld: let them cool or use gloves.

Check the clamping before plunging: clamps tight, workpiece supported under the whole joint, shoulder clear of the clamps along the full path.

Start with a test piece of the same alloy and thickness, using the welding data on page 8 as the starting point.

Welding data recommendations

		Spindle speed and weld feed			Plunge and tool position				
Material	**FS1**	**n** (RPM)	v_f (mm/min)	v_f (in/min)	**Plunge feed** (mm/min (in/min))	**Plunge depth** (mm)	**Tilt** (°)	**Dwell** (s)	**Rotation**
N01	**Size 1**	2,050	400–800	15.7–31.5	55 (2.2)	2.8	0	0–3	CW (M3)
	Size 2	2,050	400–800	15.7–31.5	55 (2.2)	5.2	0	0–3	CW (M3)
	Size 3	2,050	400–800	15.7–31.5	55 (2.2)	7.8	0	0–3	CW (M3)
N10	**Size 1**	1,500	900	35.4	55 (2.2)	2.8	0	0–3	CW (M3)
	Size 2	1,500	900	35.4	55 (2.2)	5.2	0	0–3	CW (M3)
	Size 3	1,500	900	35.4	55 (2.2)	7.8	0	0–3	CW (M3)

Data based on tests in EN AW 6082. Rotation clockwise (M3). Tilt 0° (optionally a trailing tilt of up to 5°). Values are starting points; confirm on a test piece.

What our FSW tools offer



No shielding gas



No filler material



Low distortion



Minimum workpiece and machine preparation

No oxide removal or cleaning required



Less training required

Learn more about MEISTERFABRIK friction stir welding tools:
shop.meisterfabrik.se

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