FSW-Tech

Friction Stir Welding European Qualifications

CU4 – Dodatočné spracovanie

FSW Operátor

Co-funded by the
Erasmus+ Programme
of the European Union

4. Dodatočné spracovanie

4.1. Unclamping precautions

4.2. Visual inspections

4.3. Imperfections/defects

4.4. Causes of imperfections/defects

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4. Post Processing

- Other important steps of the Friction Stir Welding process comes after the weld has been performed, with all the post process operations that are carried out.

- This include operations ranging from the unclamping to the basic quality assurance steps that should be performed.

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4.1 Unclamping precautions

- In order to prevent the injuries of personnel in application of welding equipment, due caution and keeping of the safety precautions is necessary.

- Therefore, it is inevitable to keep the following safety precautions :

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4.1 Unclamping precautions

- The welding equipment can be operated by a competent operator only, who was instructed about the safety and health protection at work (SHPW) and trained for work with the given equipment.
- Each equipment operator must be properly dressed (using the protective working means).
- Prior to welding proper the operator must make sure whether all clamping nuts in the tool holder are properly tightened and the clamping mechanism of welded material must be also thoroughly checked.
- All redundant materials on the working table (hammer, screw driver, wrenches, rags), impairing the welding process, must be removed.

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4.1 Unclamping precautions

- The operator can by no means leave the welding equipment during performing the welding operation.
- The manipulation with welding tool and welded material immediately after welding completion must be avoided – owing to the risk of burnings.
- At the end of welding (working shift), the operator is obliged to switch off the mains switch of welding equipment.

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4.2 Visual inspection

- Visual inspection of welded joint quality is necessary during entire period of welding process.
- The clamping of welded material and welding tool must be visually inspected prior to start of welding process.
- In the case of improper visual inspection prior to and during the welding process, different imperfections/defects may occur

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4.3 Imperfections / defects

- The most frequent surface defects which may be observed by a naked eye include excessive material – flash, surface groove along the welding line (see cap. 3.2.1) and the worn-down welding tool.

- The most frequent internal defects which cannot be observed by a naked eyed include unstirred root – kissing bond, subsurface voids and the cracks.

- These defects may be observed just on the specimens prepared for the metallography

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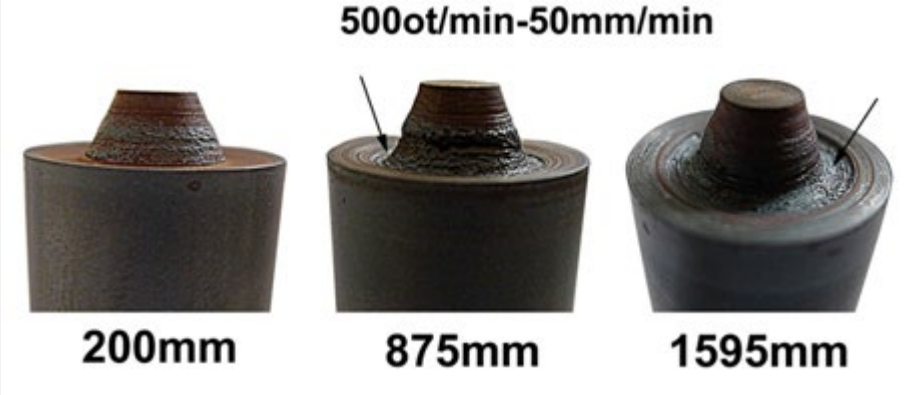
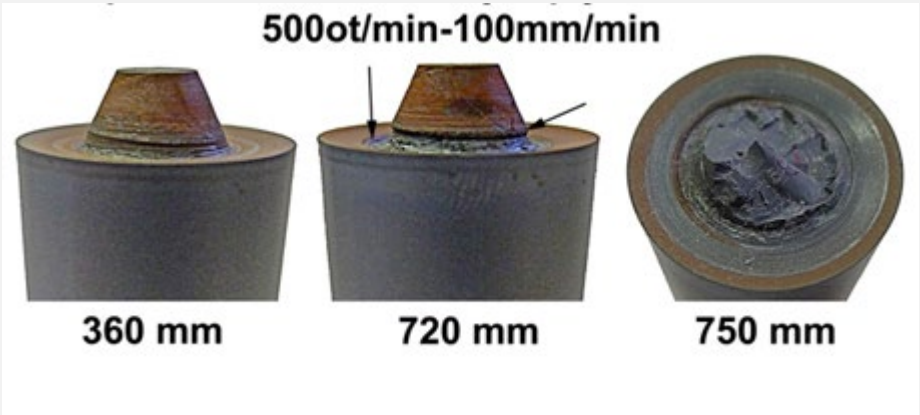
4.3 Imperfections / defects





orn-down welding tool Si3N4

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4.3. Imperfections / defects

Kissing bond

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4.3. Imperfections / defects

Sub surface voids Al alloys

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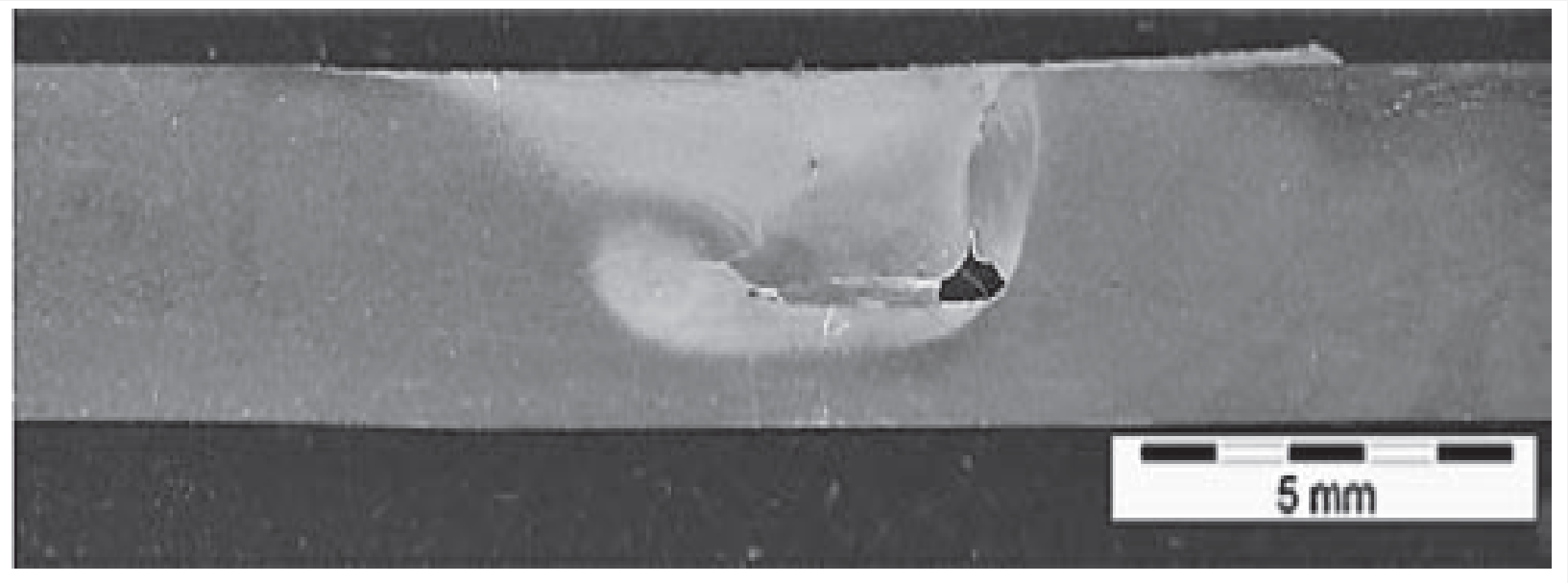
4.3 Imperfections /defects



Macrostructure welding joints - voids of AlSi12

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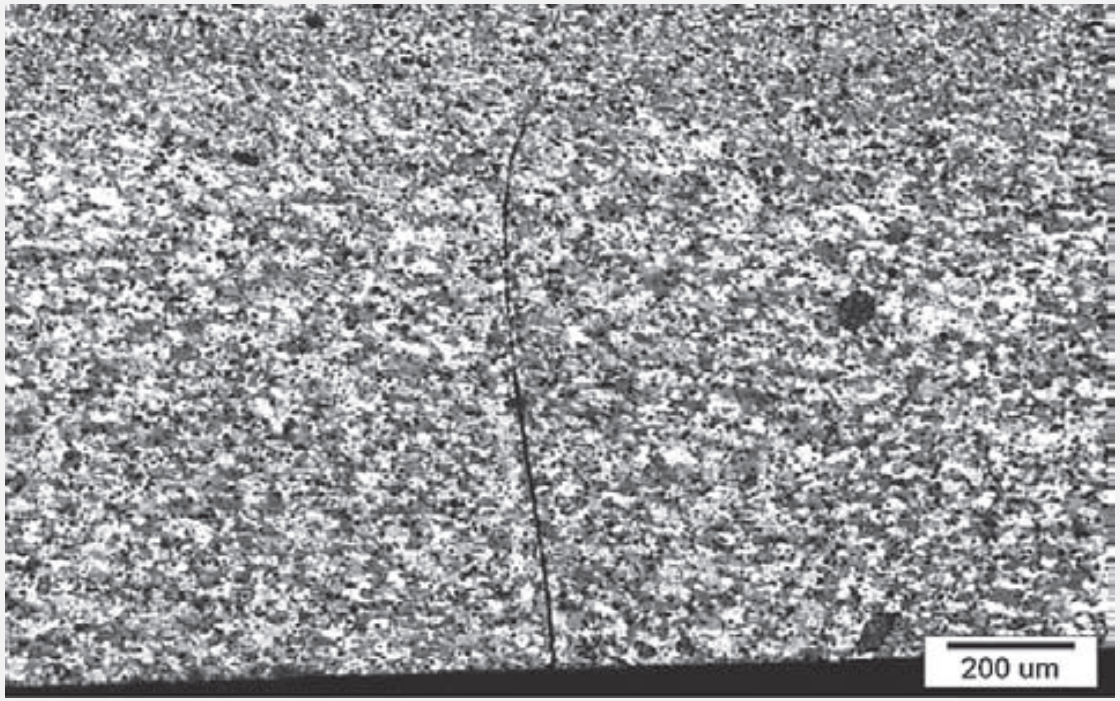
4.3 Imperfections / defects



Macrostructure welding joints Al alloy 5083 - cracks

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4.4 Cause of imperfections/defects

- Imperfections/defects may occur during the entire welding process, At the onset of welding process, at the first tool penetration into welded material.

- If this imperfection would occur, it is inevitable to inspect the clamping mechanism of welded plates.

- Another way how to solve this issue consists in reduced speed of welding tool immersion.

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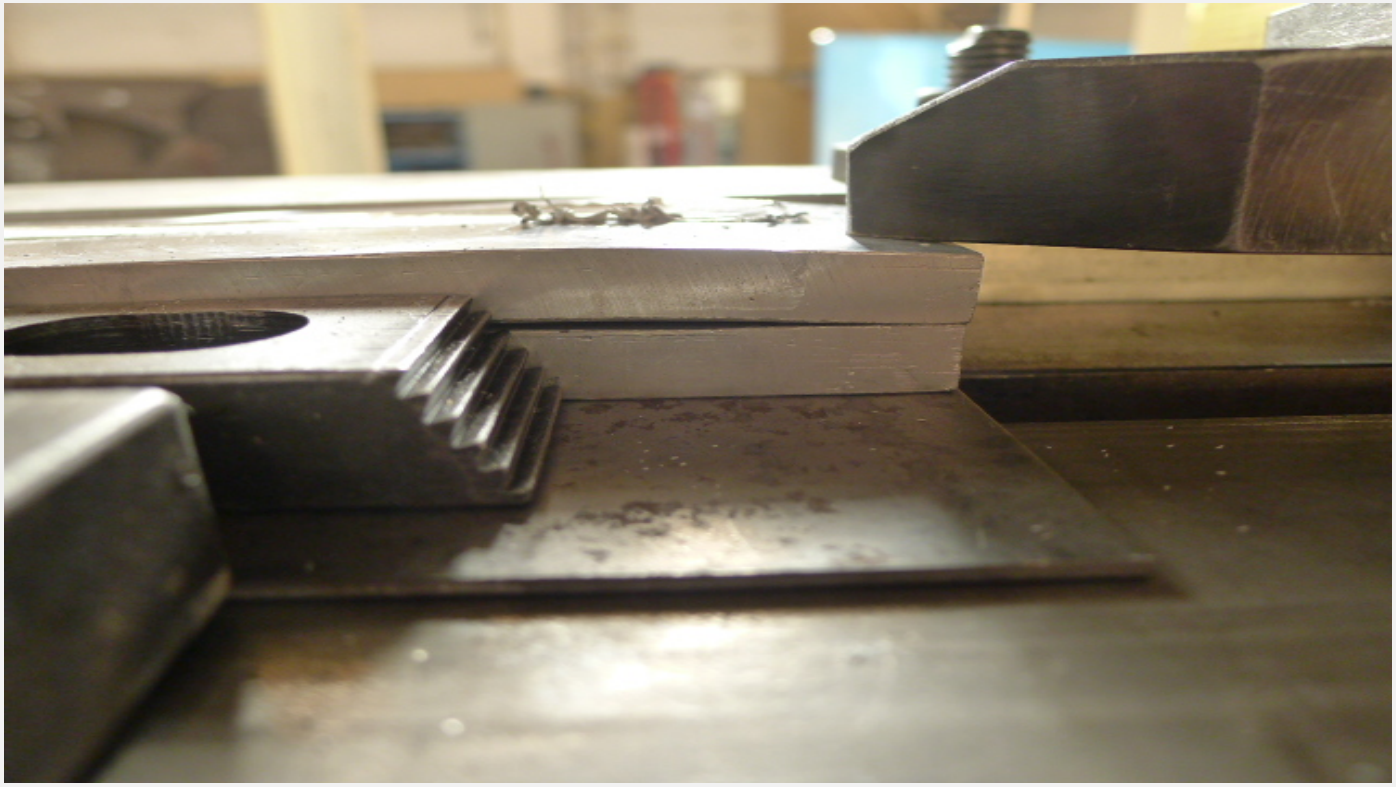

Welding materials pushed aside

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4.4 Cause of imperfections/defects

- An imprint from welding tool remains on the material welded at the end of welding process.
- This imperfection is solved by attaching the additional plate to welded materials, where the welding tool will pass and terminate at the end of welding operation.
- This additional plate is then removed (cut off) from the welded material.

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4.4 Cause of imperfections/defects

An imprint from welding tool

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4.4 Cause of imperfections/defects

- In the case of welding steel materials high temperatures occur, what may cause the sticking of material welded to the welding support (table 4-1).
- In order to prevent this issue a continuous layer of powder (for example the BN powder), preventing the adherence of welded plates is deposited on the welding support presents the most frequent examples of accidents (imperfections)

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4.4 Cause of imperfections/defects

Accidents examples

Accident	Cause	Preventive Action
Inappropriate tool material/ diameter for the operation	Insufficient clamping Life termination of welding tool	Proper tightening of clamping bolts Plan replacement of welding tool
Burned skin	Direct contact of human skin with hot material welded	Wearing the gloves, goggles and proper clothes
Welded material damage	Sticking of welded material to welding support (table)	Spraying of welding support (BN)
Damage to eyes / face	Metal chips can by released during welding with high revolutions	Use of goggles
Cutting	Un machined edges of material welded	Use of gloves

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Záver

- Dá sa teda konštatovať, že účinný výber parametrov zvárania eliminuje vznik uvedených chýb, čo prispieva k zlepšeniu mechanických vlastností zvarových spojov.

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