

## **TALAT Lecture 4205**

# **Testing Methods for Welded Joints**

5 pages, 3 figures

Basic Level

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### **Objectives:**

- to give information about the relevant non-destructive and destructive testing methods for aluminium welded joints

### **Prerequisites:**

- background in production welding and quality assurance

**Date of Issue: 1994**

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# 4205 Testing Methods for Welded Joints

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## 4205.01 Non-Destructive Testing of Welded Aluminium Joints

- ◆ NDT methods for aluminium welds
- ◆ Example of an X-Ray Catalogue

### NDT Methods for Aluminium Welds

The quality of welds in welded joints can be tested using testing standards specific for aluminium or by using methods adapted from testing methods for steels. The magnaflux test (magnetic particle test) cannot be used for testing the non-magnetic aluminium (**Figure 4205.01.01**).

<h3>Non-Destructive Testing of Welded Aluminium Joints</h3>		
<ul style="list-style-type: none"><li>• Visual Inspection</li><li>• Dimensional Testing</li><li>• Dye Penetration Inspection Method</li><li>• Ultrasonic Testing</li><li>• Radiographic Examination</li></ul>		
	NDT Methods for Welded Aluminium Joints	4205.01.01

The types of testings heads used for the ultrasonic testing of steel can also be used to test aluminium welds; only the wave entry angle is somewhat smaller for aluminium.

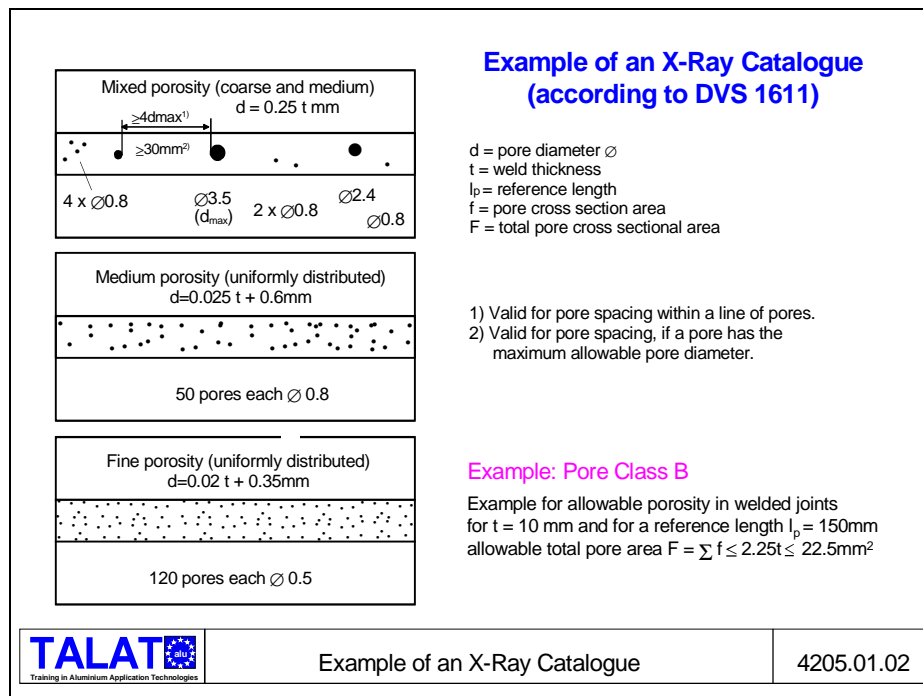
The different absorption capacities of the aluminium alloys influence the quality of the results obtained using the radiographic examination.

Both testing methods can be used to determine the presence of cracks, fusion defects, inclusions and pores.

When using the radiographic method for testing thin-walled aluminium parts, it must be remembered that the allowed weld thickness (weld root reinforcement including part thickness) is much thicker than the part itself, thus causing larger blacking differences on the radiograph film. This can make the evaluation more difficult.

## Example of an X-Ray Catalogue

X-ray catalogues based on experience are available for certain fields of application and are of great help in evaluating the radiographic films when weld seams with internal discontinuities have to be classified in certain evaluation groups or have to fulfil certain requirements. **Figure 4205.01.02** shows an example taken from the evaluation catalogue DVS 1611 relevant for the field of application of railway wagon construction. This comparative chart makes a quick evaluation by comparison possible, without having to actually measure and count the pores present.



## 4205.02 Destructive Testing of Aluminium Welded Joints

- List of test methods

### List of Test Methods

The destructive test methods are analogous to those used for steel. Metallographic tests and mechanical testing methods are employed (**Figure 4205.02.01**).

The material, testing loads, punch diameter, distance between supports, etchant etc. are chosen to conform to the physico-chemical properties of the material

## Destructive Testing of Aluminium Welded Joints

Bending Test (3-point, over root/cover pass, longitudinal/transverse to weld seam)

Tensile test

Fatigue test

Notch impact test

Creep rupture test

Crack propagation test

Corrosion test

Hardness test

Metallographic examination of structure (macro, micro, SEM)

Chemical analysis



Destructive Testing of Aluminium Welded Joints

4205.02.01

### 4205.03 Literature/References

- Aluminium-Taschenbuch, 14. Auflage, 1984, Aluminium-Verlag, Düsseldorf
- Welding Kaiser Aluminium, Kaiser Aluminium & Chemical Sales Inc., Kaiser Center, Oakland, California, 1978
- Beurteilung von Durchstrahlungsaufnahmen im Schienenfahrzeugbau - Schmelzschweißverbindungen an Aluminium und Aluminiumlegierungen. Merkblatt DVS 1611, Deutscher Verlag für Schweißtechnik, Düsseldorf

CEN-Standards on destructive and non-destructive testing of aluminium weldments are in preparation. Inquire about new issues via your national standards organisation.

### 4204.04 List of Figures

Figure No.	Figure Title (Overhead)
4205.01.01	NDT Methods for Welded Aluminium Joints
4205.01.02	Example of an X-Ray Catalogue
4205.02.01	Destructive Testing of Aluminium Welded Joints