TALAT Lecture 4206

Qualification

6 pages, 5 figures

Basic Level

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Objectives:

- Rules of EN 287-2 and EN 288-4
- Pay attention to health and safety

Prerequisites:

- Knowledge of standards

Date of Issue: 1994

4206 Qualification

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4206.01 Welding Personnel Qualification (EN 287-2)

The production of high-quality welded aluminium products requires not only the correct welding and testing tools, shop equipment as well as the right welding materials, but significantly also well trained, certified personnel. Applying the European CEN Standard EN 287-2 „Examination of Welders, Pt. 2: Aluminium and Aluminium Alloys“ warrants a minimum capability of the welder in his job performance. The standard applies to inert gas welding (MIG and TIG) of aluminium for the semi-finished product forms: rolled, forged/extruded and cast.

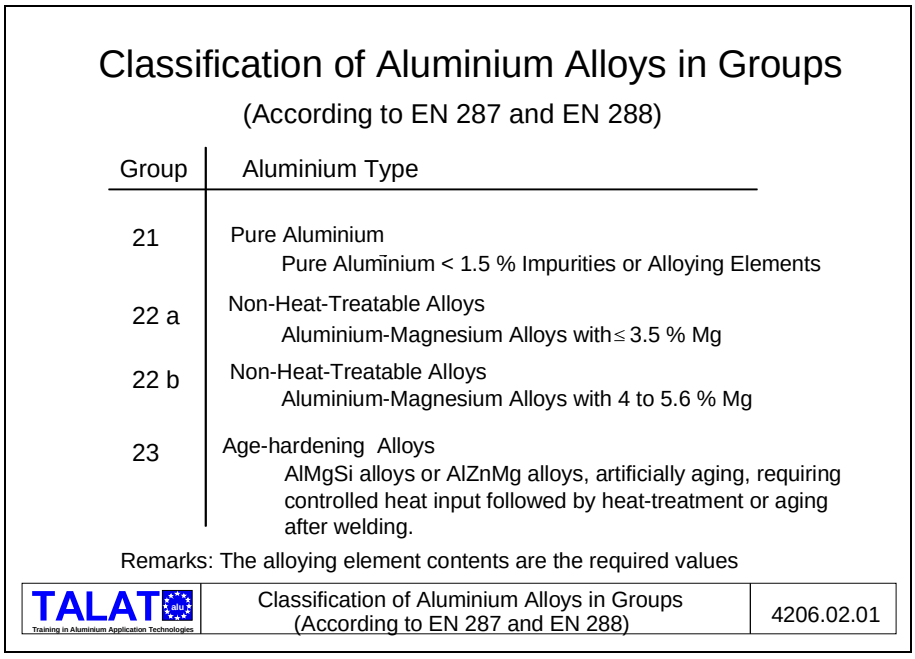
Three materials groups are discerned: W21 for unalloyed aluminium, W22 for non-agehardening alloys and W23 for agehardening alloys. Depending on the material mix of the subject test piece the extent of validity may cover several of the materials groups. Similar considerations apply to the welding gun position when welding sheet or tube products. The geometry and dimensions of the test pieces are similar to those required in EN 288. The conditions for welding the test pieces reflect those of the production floor. As a rule the certificate granted to the welder after passing the examination is valid for 2 years. It is recommended that the preparation for the welders examination is conducted systematically. This can be achieved e.g. by the attendance of welding courses performed according to the rules of EWF (European Welding Federation).

4206.02 Welding Process Qualification

- Classification of aluminium alloys in groups (according to EN 287 and EN 288)
- Specimens for testing the aluminium welding process

Classification of Aluminium Alloys in Groups (according to EN 287 and EN 288)

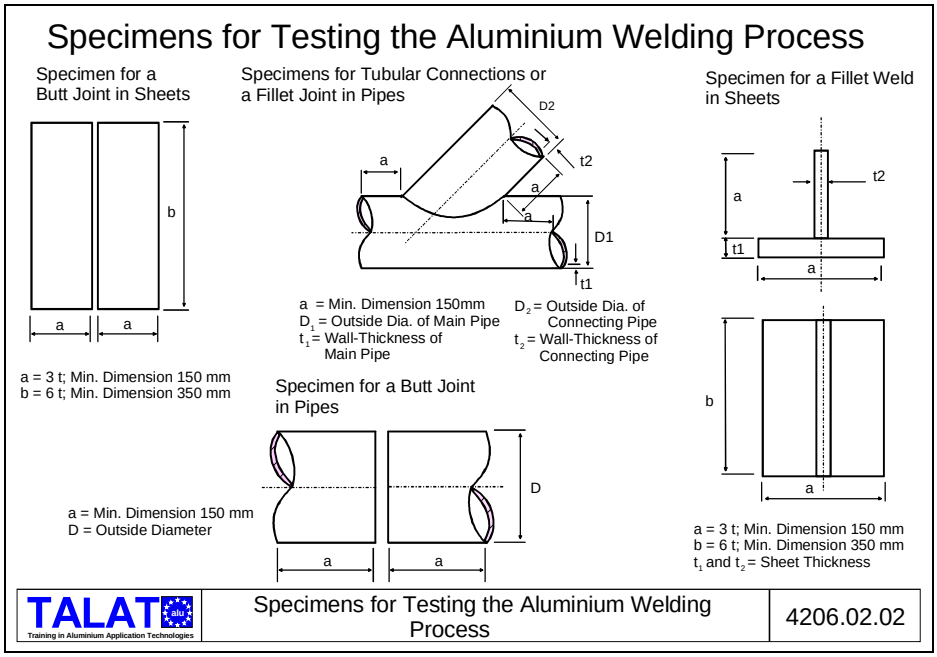
The large number of common aluminium alloys available with very varying welding characteristics are classified in groups, thus making the material testing easier.
Guidelines also exist for classifying the composite joints under such groups.



For alloys and composite joints not considered in this classification, welding process tests have to be conducted (**Figure 4206.02.01**).

Specimens for Testing the Aluminium Welding Process

The welding process test is the proof that the welding company delivers for guaranteeing that sound welds have been produced using this process. These include all pretreatments and post-treatments (e.g., joint preparation, surface treatments, heat treatments). Thus it is possible to judge the interaction between welding technology, material and works conditions like personnel qualification, apparatus technology and other circumstances, using a uniform basis for comparison (**Figure 4206.02.02**).



The standard EN 288, part 4, "Requirements and recognition of welding processes for metallic materials", lays down the following specifications for butt and fillet joints:

- Form, dimensions and welding of specimens
- Test content, specimen length and sampling, testing method
- Scope of fabricator, material and welding process
- Report on recognition of process (WPR)

4206.03 Health and Safety

- Formation of ozone
- Short-Term Effects of ozone
- Ventilation and airing during welding of aluminium

Formation of Ozone

Ozone (O_3) is created during all arc welding processes carried out in the atmosphere. The photo-chemical process involved depends to a large extent on the intensity of the arc radiation. Composition of filler metal, amount of shielding gas and arc length also affect the formation of ozone. Less ozone is formed during TIG welding than during MIG welding (**Figure 4206.03.01**).

Formation of Ozone (O_3)

O_3 is an instable form of oxygen

- Formation by a photochemical reaction of oxygen under the influence of UV radiation
- During TIG welding much less O_3 formed than during TIG welding

The composition of the filler metal used during MIG welding of aluminium has a strong effect on the O_3 concentration

- Increasing the arc length and the amount of inert gas increases the O_3 formation
- During Plasma Arc Cutting, the amount of O_3 formed depends on the composition of the metal to be cut;
  Corrective measure: cutting under water.

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Short-Term Effects of Ozone

Depending on the duration and location, appropriate measures are required to remove or reduce the vapours, gases and dust produced. The regulations for the maximum work-place concentrations (threshold limit values) have to be adhered to.

During MIG welding, the high arc intensity and the continuously melting filler metal leads to higher levels of pollutants. Therefore, the requirements for removal of pollutants and their reduction are much higher for MIG welding than for TIG welding (**Figure 4206.03.02**).

Short - Term Effects of Ozone (O_3)

≥ 0.05	ppm	Threshold Limit for Odour
≥ 1.5	ppm	Irritation of Eyes and Mucous Membrans, Irritation of Upper Respiratory Tract
≥ 1	ppm	Headache and Illness Symptoms after 30 min.
≥ 1.5	ppm	Reduction of Lung Function after a few Hours (Occurrence Partly at Values above 0.8 ppm)
1.5 to 2	ppm	Worsening of Lung Functions, Illness Symptoms Sense of Taste Altered, Coughing, Extreme Weariness
5 to 9	ppm	Formation of Lung Oedema Possible

The Maximum Work-place Concentration (MAK Value) in Germany is set to:

0.1 ppm or 0.2 mg/m³

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Ventilation and Airing during Welding of Aluminium

Any health dangers due to ozone can be quite easily and safely eliminated by choosing the proper process parameters (e.g., amount of shielding gas, arc length) and by sufficient airing and ventilation. Keeping below the maximum work-place concentration of 0.1 ppm is no problem at all (**Figure 4206.03.03**).

Ventilation and Airing during Welding of Aluminium

	Short Term	Long Term
MIG-Welding		
Local	T	A
Non-Local	F	T
TIG and Plasma Arc Welding		
Local	F	T
Non-Local	F	F

F = Free of Natural Ventilation
T = Forced (Technical or Mechanical) Ventilation
A = Suction of Substances Harmful for Health at Location of Formation

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4206.04 Literature/References

-EN 287 Pt. 2: Prüfung von Schweißern, Schmelzschweißen.
Part 2: Aluminium and aluminium alloys

-EN 288-4 „Anforderungen und Anerkennung von Schweißverfahren für metallische Werkstoffe;
Part 4: Schweißverfahrensprüfungen für das Lichtbogenschweißen von Aluminium und seinen Legierungen

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