

**ELECTRICAL TRANSITION JOINTS
WITH HIGH THERMAL RESISTANCE
ALUMINIUM / TITANIUM / CARBON STEEL ETJ 2001**

Specification NC 606

Revision N° 1 of 10 February 2003

Date of revision	Number of revision	Written by	Checked by	Approved by	Remarks
2003-02-10	1	A. NOBILI	A. MION	A. DEMANGEOT	update
2001-12-04	0	A. NOBILI	A. MION	A. DEMANGEOT	

**Electrical Transition Joints with High Thermal Resistance
Aluminum / Titanium / Carbon steel ETJ 2001**

Specification NC 606 - Revision N° 1 of 10 February 20003

The dimensions in inches are for information only.

1 - SCOPE

This specification concerns anodic transition joints with high thermal resistance, used in aluminum electrolysis cells. These joints, called "ETJ 2001" are cut in aluminium / titanium / steel explosive bonded clad plates.

2 - FIELD OF APPLICATION

Field of application of this specification applies is limited to products with a steel 11.0 mm (0.44") thick, a Titanium interlayer 1.0 mm (0.04") thick and an Aluminium 12.0 mm (0.47") thick. This field of application can be extended for steel thicknesses between 10 and 18 mm (0.4" to 1") after agreement.

① 3 - COMPOSITION

- 3.1.** The cladding metal is commercially pure aluminium, quality 1050 A or equivalent, 12.0 mm (0.47") thick.
- 3.2.** The interlayer is pure titanium, ASTM B 265 Gr 1 or equivalent, 1.0 mm (0.04") thick.
- 3.3.** The backer metal is low carbon steel, 1008-type or equivalent. The carbon content is 0.10 % maximum. Nominal thickness is 11.0 mm (0.44").

4 – SUPPLY CONDITIONS

ETJ 2001 are not heat treated after explosive bonding. Surface finish is guaranteed with a roughness of 3.2 µm (140 RMS) maximum after grinding.

5 - TOLERANCES

5.1 – Thickness

Total tolerance : 22 ± 1.5 mm

The field of applications should be extended (cf. § 2), thickness tolerances will be reviewed.

5.2 – Length and Width

- 5.2.1. Tolerances for joints are ± 2 mm (0.08").
- 5.2.2. Tolerances for plates are $- 0 + 20$ mm (- 0" + 0.8").
- 5.2.3. Other tolerances can be applied after agreement.

5.2 – Flatness

The flatness shall be measured according to specification NF EN 10029, § 10.6, from the Aluminium side.

- 5.3.1. For widths greater than 150 mm (6"), the variation from a flat surface is not greater than 1 % of the width.
- 5.3.2. For widths up to 150 mm (6"), the variation from a flat surface is not greater than 1.5 mm (0.06").

6 - ULTRASONIC TESTING

All bonded plates shall be 100 % ultrasonically tested by a qualified staff. Gauging of the ultrasonic equipment is performed according to ASTM A 578 standard (the transducer has a diameter of 25 mm (1") or less). Test is carried out from the Aluminium side.

Complete loss of back reflection, accompanied by an echo indication from the plane of the interface, shall be interpreted as a non-bonded zone. This area, 40 mm (1.6") extended, is rejected.

When the plant provides plates, non-bonded zones (40 mm extended) are clearly identified on Aluminium face with paint.

7 - BOND QUALITY

The bond quality is measured with the tensile test, in as delivered conditions as well as after heat treatment at 500 °C during 24 hours. The test is carried out on samples described in Annex 1.

- ① Every 5 plates, 6 samples are taken, 3 will be heat treated. All 3 specimens are to break at minimum :
 - 120 MPa (17 000 Psi) as delivered
 - 80 MPa (11 000 Psi) after heat treatment at 500° C x 24 hours.

If one specimen is lower , 2 other specimen shall be broken in the vicinity of the defective specimen. If the results of any of these retests are lower than the minimum , the mother plate is rejected. In case of non specific testing , if a plate is rejected , other test series shall be carried out on 2 other plates of the reception unit . If they are acceptable , the whole unit is accepted minus the defective plate. If not , each plate of the unit shall be tested individually.

8 – TEST REPORTS

Upon request in the order, following test reports can be provided :

- 8.1.** Certificate certifying that the bonded metal conforms to this specification (model 2.1 following EN 10204).
- 8.2.** Certificates of chemical composition of the materials used.
- 8.3.** Mechanical tests reports

9 – DIE STAMPING

A systematic die stamping of the mother plate number is carried out on the edge of each joint.

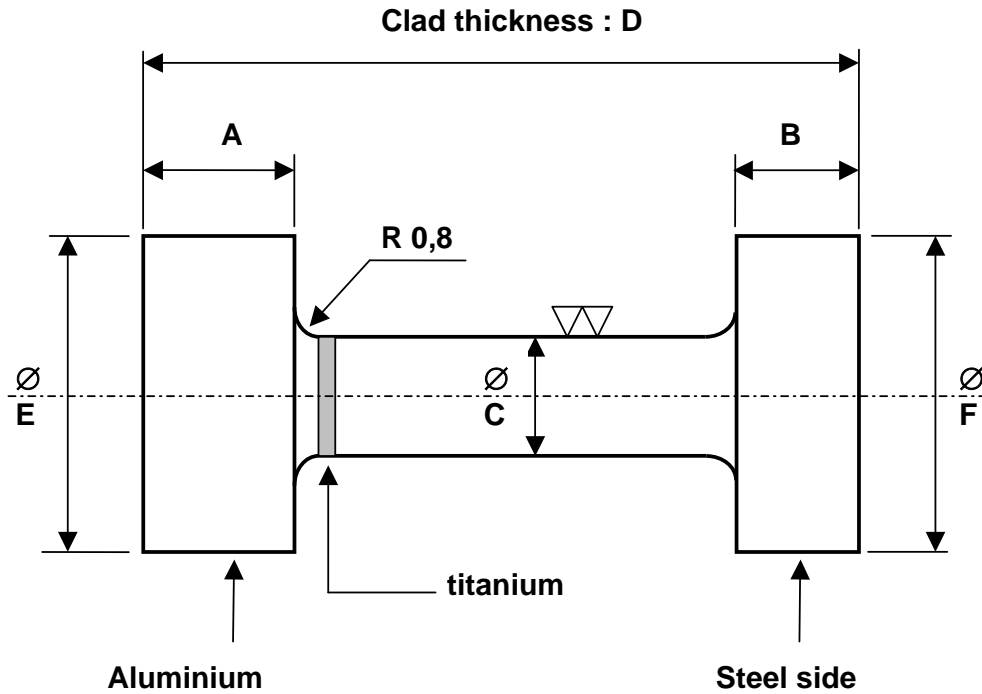
10 – PACKAGING

Overseas packaging are used with or without plastic covers. Dehydrator bags can be added in the last case upon request.

**NC 606 SPECIFICATION
ANNEX 1 - TENSILE TEST**

SPECIMEN FOR TENSILE TEST

Scale 2/1



	Dimensions in millimeters
A	7 + 0 / +1
B	4 - 0 / - 0.5
C	7.5 ± 0.1
D	Steel thickness + Titanium thickness + Aluminium thickness = 22.22 mm nominal
E	16 - 0 / -1
F	16 - 0 / -1

SAMPLING SPECIMEN PROCEDURE

Sampling : Choice of the plates to be tested (numbers ending with 0 or 5). The specimens (at least 6) come from a sample cut in an area shown to be sound for the Ultrasonic Testing.

Marking : The sample is hard stamped with the plate number from which it has been taken.

Cutting : The specimens are cut by sawing into lengths from the sound area, approximately 75 mm (3") from the edge of the parent plate and at least 40 mm (1.6") from any no-bonded metal area.