





**STANDARD ELECTRICAL TRANSITION JOINTS
ALUMINIUM / CARBON STEEL
CATHODIC BICLADS**

Specification NC 601

Revision N° 2 of 15 March, 1999

Date of revision	Number of revision	Written by	Checked by	Approved by	Remarks
		 			
15.03.1999	2	A. DEMANGEOT C. RIOU	A. NOBILI	A. MION	

**STANDARD ELECTRICAL TRANSITION JOINTS
ALUMINIUM / LOW CARBON STEEL
CATHODIC BICLADS**

Specification NC 601 - Revision N° 2 of 15 March, 1999

The dimensions in inches are for information only

1 - SCOPE

This specification concerns standard electrical transition joints used in alumina electrolysis cells. These joints, called "BICLADS" are cut in aluminium/steel explosive bonded clad plates.

2 - FIELD OF APPLICATION

Field of application of this specification is limited to "BICLADS" with steel 38.1 mm (1.5") thick and Aluminium 12.7 mm (0.5") thick. This field of application can be extended for steel thickness between 18 and 100 mm. (0.7" to 4") after agreement.

3 - COMPOSITION

- 3.1. The cladding metal is commercially pure aluminium, quality 1050 or equivalent, 12.7 mm (0.5") thick.
- 3.2. The base metal is low carbon steel, 1008-type or equivalent. The carbon content is 0.10 % maximum. Nominal thickness is 38.1 mm (1.5").

4 – SUPPLY CONDITIONS

"BICLADS" are not heat treated after explosive bonding.

5 - TOLERANCES

5.1. **THICKNESS**

Total tolerance : 50 ± 1.5 mm

If the field of application has been extended (cf. § 2), thickness tolerances will be reviewed.

5.2. LENGTH AND WIDTH

5.2.1. Tolerances for BICLADS 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.

5.3. FLATNESS

The flatness shall be measured according to NF EN 10029 standard, § 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 - ULTRA-SONIC TESTING

All bonded plates shall be 100 % ultrasonically tested by a qualified staff. Gauging of the ultra-sonic 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 cause of rejection.

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 either with the tensile test or with the ram tensile test, chosen by the customer. Ram tensile test gives a more realistic value of the bond quality. Tests are carried out on 6 samples : 3 as delivered and 3 after heat treatment at 300 °C during 24 hours.

Without any precision, plant will choose the test.

Control is carried out on plates with a number ending with 0 or 5 (1 test for a lot of 5 plates).

Mechanical tests can be performed on each plate if the customer asked for it in the order.

- 7.1. Tensile test** : carried out on sample described in annex 1.
Minimal values : 80 MPa (11.600 psi) in the as-clad condition.
65 MPa (9.400 psi) on a sample held for 24 hours at 300°C.
- 7.2. Ram Tensile test** : carried out on samples described in annex 2.
Minimum values : 150 MPa (21700 psi) in the as-clad condition.
80 MPa (11600 psi) on a sample held for 24 hours at 300°C.

8 – TEST REPORTS

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

- 8.1.** Attestation 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

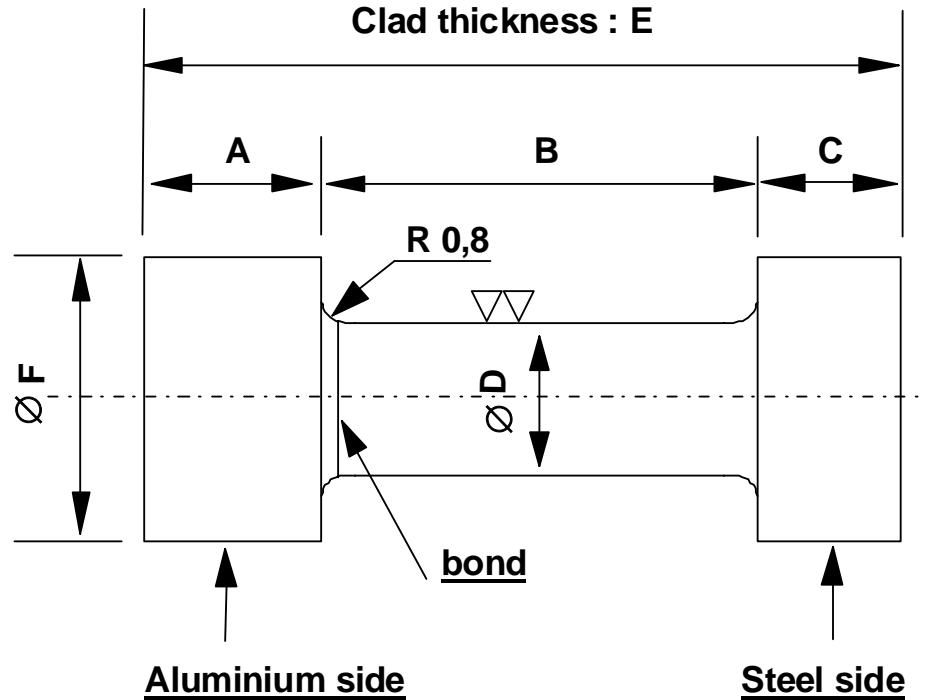
"Maritime" packaging are used with or without plastic covers. Dehydrator bags can be added in the last case.

Note : Joints are not oiled.

**NC 301 SPECIFICATION
ANNEX 1 - TENSILE TEST**

SPECIMEN FOR TENSILE TEST

Scale 2:1



	Dimensions in millimetres
A	12 – 1 + 0
B	≈ 28.8
C	10 – 1 + 0
D	10 ± 0.1
E	Steel thickness + Aluminium thickness = 50.8 mm nom.
F	20 – 1 + 0

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.

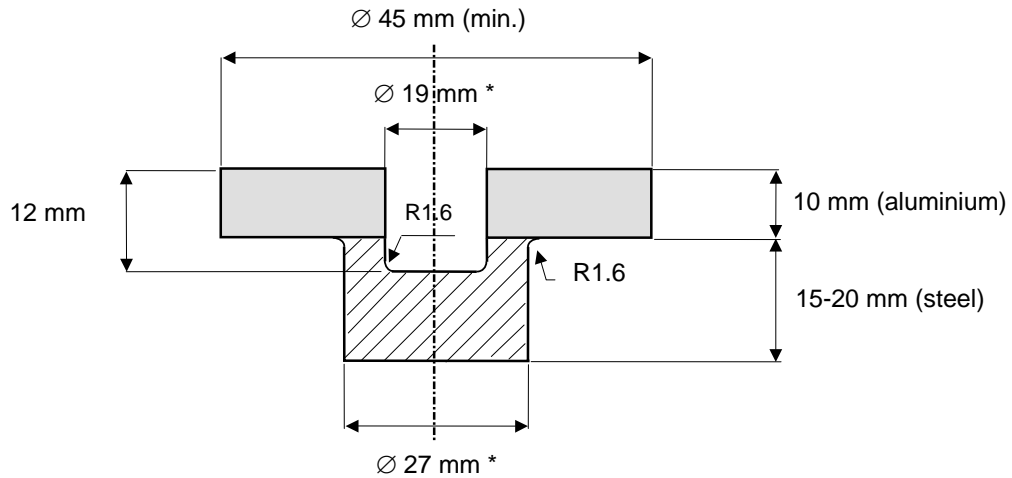
Marking :

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

Cut :

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.

**NC 601 SPECIFICATION
ANNEX 2 – RAM TENSILE TEST**



- Tolerances : $\pm 0.1 \text{ mm}$

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's number from which it has been taken.

Cut :

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.