

QUALICOAT SPECIFICATIONS

25th Edition

**Appendix A – Specifications for
QUALICOAT 3.0**

Reference: QCT-VOL.1-25.0

Approved by: TC & EC

Valid from: 2025-01-01

Author: QUALICOAT

No. Pages: 8

QUALICOAT

Inspired by architecture, trusted by professionals

1. QCT 3.0 Testing

a) Sampling

Three different extruded profiles shall be selected, and test samples shall be prepared as described below. For each sample, three test pieces shall be prepared in a testing laboratory approved for QCT 3.0.

Samples taken from the production before coating process (bare aluminium)

- a. The samples obtained from the extruded profiles shall be cut to the appropriate size for the corrosion cell.
- b. The surfaces of the samples shall be treated with organic solvents (acetone, ethyl alcohol, etc.) to eliminate the remains of oils, coolants, aluminium chips, etc. deposited on the surface during the cutting process.
- c. The surface chosen for performing the tests shall be flat.

Samples taken from the production after coating process (coated aluminium)

- a. The samples obtained from the extruded profiles shall be cut to the appropriate size for the corrosion cell.
- b. The surfaces of the samples shall be treated with organic solvents (acetone, ethyl alcohol, etc.) to eliminate the remains of oils, coolants, aluminium chips, etc. deposited on the surface during the cutting process.
- c. The surface chosen for performing the tests shall be flat.
- d. The coating layer shall be removed with an appropriate product.
- e. The conversion layer shall be removed with an appropriate product.

2. Tests methods and requirements

a) Optical Emission Spectroscopy (OES)

Test Method

This test is based on the EN 14726:2019 standard¹.

The test shall be performed on three different samples.

¹ For project-based approvals. Only one sample per alloy is required.

The sample for analysis is prepared mechanically and its thickness shall must be at least 1 mm.

Requirements

For Aluminium QUALICOAT 3.0 grade, the weights (%) of alloying elements for 6060 and 6063 alloys are as follows (acc. EN 573-3):

Table 1 - Alloy 6060 composition

Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
0.30-0.60	0.10-0.30	≤ 0.10	≤ 0.10	0.35-0.60	≤ 0.05	≤ 0.15	≤ 0.10

Table 2 - Alloy 6063 composition

Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti
0.20-0.60	≤ 0.35	≤ 0.10	≤ 0.10	0.45-0.90	≤ 0.10	≤ 0.10	≤ 0.10

Final Assessment

Table 3 - Final assessment of the OES test

Ratio	Value	Assessment
Fe/Si	<0.55	Satisfactory
Mg/Si	0.80 - 1.30	Satisfactory
Weight of alloying elements*	Within the limits	Satisfactory

* The QCT recommendation for Cu weight (%) is a maximum of 0.03. Nevertheless, it will be possible to use EN AW 6060 and EN AW 6063 alloys with a copper content higher than 0.03, provided that the copper content is balanced.

b) Anodic Cyclic Polarization (ACP)

Test Method

This is based on the ASTM G102 - 89(2015) e1 and ASTM G69 standards.

The test shall be performed on three different samples¹.

The surface for the test will be 1 cm². To achieve this surface, portholes or electrochemical masks can be used.

Once the sample is prepared, it shall be submerged in the cell solution for a period of 0.5-1 hour to achieve electrochemical stabilization.

¹ For project-based approvals. Only one sample per alloy is required.

Requirements

For alloys 6060 and 6063 with **Aluminium QUALICOAT 3.0 grade**, the requirements and parameters of the ACP test are indicated in the following table:

Surface to be tested	1 cm ²
Potential scan limits	- 0.1v (start) / 0.1v (stop)
Counter electrode material	Platinum (Pt)
Counter electrode area	3 cm (approximately)
Distance from test area	1-4 mm
Concentration of the cell solution NaCl	3,5%
Concentration of the reference electrode solution KCl	3,0 M
Stabilization time	0,5-1 hour
Test temperature	23 ± 2 °C
Electrical insulation	The equipment shall be inside into a Faraday box connected to ground.
Scan rate	10 mV/min
Parameter to be determined	Corrosion Potential (E _{corr})

Final assessment

For aluminium alloys 6060 and 6063 (Aluminium QUALICOAT 3.0 grade), the corrosion potential values of extruded profiles are shown in the following table:

Table 4 - Final assessment of the ACP test

Parameter	Value (V)	Assessment
Ecorr	AW 6060: ≥ -0.744 V	Satisfactory
	AW 6063: ≥ -0.774 V	Satisfactory

c) Metallographic study for aluminium QUALICOAT 3.0 grade

Test Method

This is based on the ASTM-E112-2010 (only to determine the grain size).

The test shall be performed on three different samples¹.

The metallographic study shall be carried out in two phases: initially on a polished surface of the profile, and then on an etching surface with acid solutions.

Metallographic sample preparation

Polishing can be achieved by using different methods/procedures. The choice of procedure depends on each laboratory. A typical example of the process would be as follows (each laboratory may use the one it deems most appropriate):

1. Sample preparation by cutting.
2. Dipping the sample in both hot and cold mounting resin (acrylic resins, diallylphthalate resin, etc.)
3. Grinding with sandpaper abrasive sheets (silicon carbide P-180, 240, 360, 400, 600, 800, 1000, and 1200 grit.
4. Polishing: using aluminium oxide powder $1\mu\text{m}$ - $0,3\mu\text{m}$, diamond polishing paste ($0.25\mu\text{m}$), etc.
5. Remove the alumina from the surface using ammonia solution.
6. Clean the aluminium surface with ethyl alcohol.
7. Chemical attack using hydrofluoric acid 0.5% in weight. (Only for Part 2).

¹ For project-based approvals. Only one sample per alloy is required.

PART 1. Metallographic study of extruded surface of the samples

The surface of the extruded aluminium profile will be analysed. The extruded surface will have no defects or external inclusions.

Part 1.1 Without polishing process

TEST: Metallography study		
STANDARD/PROCEDURE: QUALICOAT Specifications		
OPERATOR:		
CODIFICATION	DEFECT ON SURFACE	RESULT
		NUMERICAL VALUE (**)
xxxx-yy-zz	Die lines	
	Strikes	
	Tearing	
	Dark bands	
	Blistering	
	Pick-up	
TOTAL		
FINAL ASSESSMENT A(*) - (limit value: ≥ 11)		
(*): FINAL ASSESSMENT TOTAL 6-10: UNSATISFACTORY TOTAL ≥ 11 : SATISFACTORY		(**) NUMERICAL VALUE: 1= PRESENT AND CRITICAL 2= PRESENT BUT NOT CRITICAL 3= NOT PRESENT

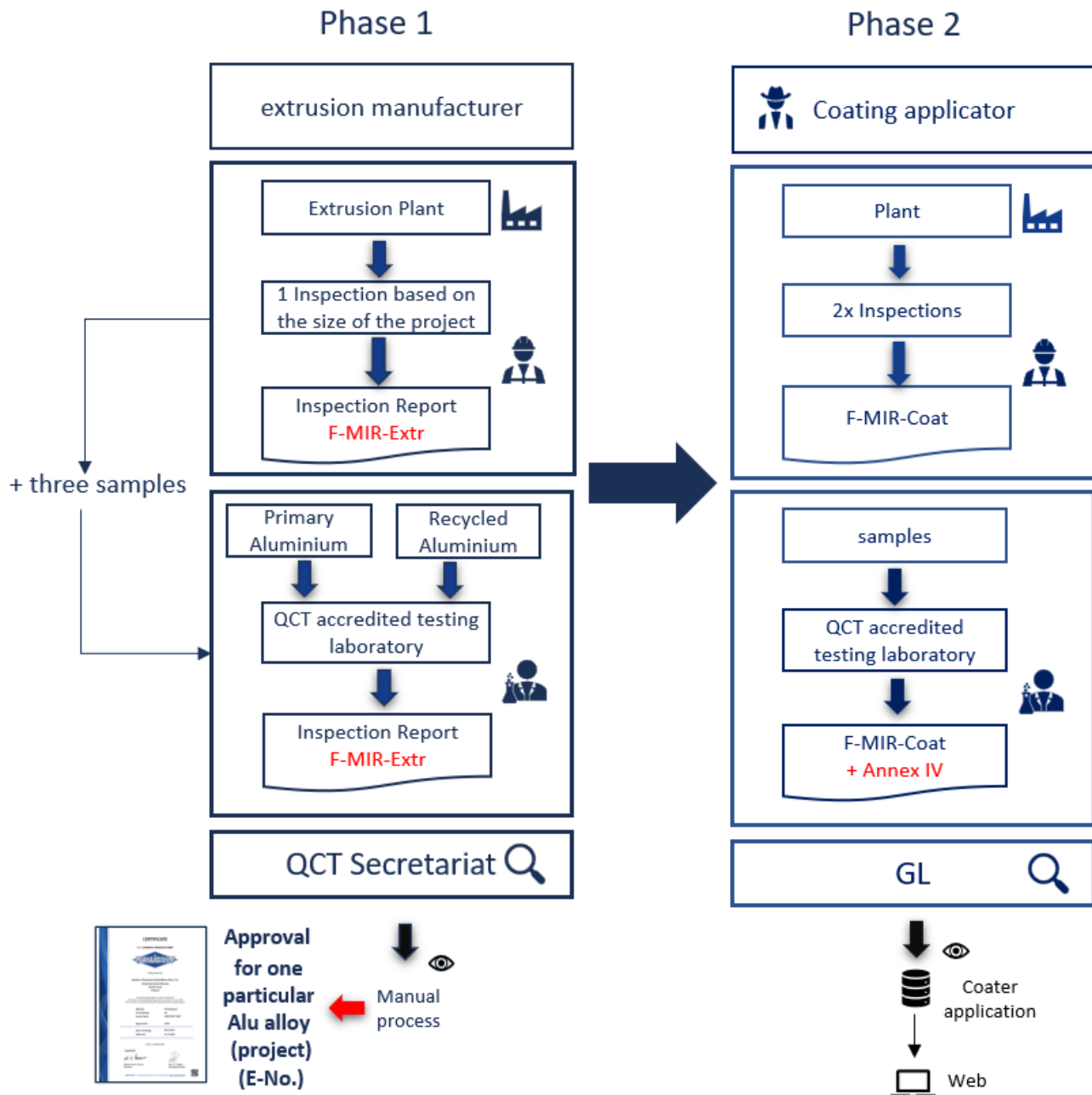
Part 1.2 With polishing process

TEST: Metallography study		
STANDARD/PROCEDURE: QUALICOAT Specifications		
OPERATOR:		
CODIFICATION	DEFECT ON SURFACE	RESULT
		NUMERICAL VALUE (**)
xxxx-yy-zz	Inclusions	
	Overpressure extrusion	
	Slag	
	Oxides	
TOTAL		
FINAL ASSESSMENT B (*) - (limit value: ≥ 8)		
(*): FINAL ASSESSMENT: TOTAL 4-7: UNSATISFACTORY TOTAL ≥ 8 : SATISFACTORY		(**) NUMERICAL VALUE: 1= PRESENT AND CRITICAL 2= PRESENT BUT NOT CRITICAL 3= NOT PRESENT

PART 2. Metallographic study on polishing samples with chemical etching

TEST: Metallography study		
STANDARD/PROCEDURE: QUALICOAT Specifications		
OPERATOR:		
CODIFICATION	DEFECT ON SURFACE	RESULT
		NUMERICAL VALUE (**)
xxxx-yy-zz	Secondary recrystallization	
	Determination of grade (Grain size ≥ 5)	
	Precipitates compounds	
	Inclusion present in the grain	
	Inclusion present in the grain boundary	
TOTAL		
FINAL ASSESSMENT C (*) - (limit value: ≥ 11)		
(*): FINAL ASSESSMENT: TOTAL 5-10: UNSATISFACTORY TOTAL ≥ 11 : SATISFACTORY		(**) NUMERICAL VALUE: 1= PRESENT AND CRITICAL 2= PRESENT BUT NOT CRITICAL 3= NOT PRESENT

3. Project-based Implementation



F-MIR Coat - Annex IV:

- The inspector shall ask the coater applicators if they are involved in the QCT 3.0 Project.
- The inspector shall verify if the material from the extruder has passed the QCT 3.0 tests (E-No.)
- The inspector shall take three samples after the coating and send them to one of the three involved testing laboratories (Decotec, IFO DE or Qualital) for performing the three QCT 3.0 tests.
- For the first year, QCT will pay for the AASS and FFC tests to collect data for a study (report to TC).