

SPECIFICATION, MATERIALS, SPECIFICATION FOR ALUMINUM ALLOY EN AW-6082-T6/T651, ROLLED SHEETS AND PLATES, FOR PERMANENT SUBSEA USE UNDER CATHODIC PROTECTION, RESTRICTED APPROVED VENDORS, FOR LOAD BEARING PARTS

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Summary:

This specification covers the wrought products such as sheet, strip, plate made of EN AW-6082 aluminum alloy (Al Si1MgMn) in T6 or T651 heat treat condition, i.e. solution heat-treated and then artificially aged (T6) or solution heat treated, stress-relieved stretched and then artificially aged (T651).



This specification shall be used for parts exposed to seawater and cathodic protection, when mechanical load is applied on parts. This specification includes restriction on the approved suppliers for raw material.

NOTE

Materials Technology SME shall be consulted before selecting this specification.

1.0 Scope

This specification covers the wrought products such as sheet, strip, plate made of EN AW-6082 aluminum alloy (Al Si1MgMn) in T6 or T651 heat treat condition i.e. solution heat-treated and then artificially aged or solution heat treated, stress-relieved stretched and then artificially aged (T651) in accordance with EN 515.

Sheet, strip and plate products shall be manufactured through rolling process. Casting billets and blooms without forming processes shall not be selected by the supplier for the application.

This specification shall be used for parts exposed to seawater and cathodic protection, when mechanical load is applied, since it includes addition mechanical testing on short transverse orientation and half-thickness mechanical testing.

This specification includes restriction on the approved vendors for seawater exposure and cathodic protection for permanent application.

2.0 Additional TechnipFMC Requirements

2.1 Approved Vendors

The vendors listed below are mills that are approved for melting, casting, forming and heat treatment:

- Arconic
- Constellium



Melting, casting, rolling and heat treatment processes shall be performed in-house, at the suppliers listed in Section 2.1.

WARNING

It shall not be performed any special process listed herein at suppliers outside the list presented in Section 2.1.

3.0 Reference Specifications

Documents	Descriptions
EN 12258-1	Aluminium and Aluminium alloys - Terms and Definitions - Part 1: General terms

EN 13195	Aluminium and aluminium alloys – Specifications for wrought and cast products for marine applications (shipbuilding, marine and offshore)
EN14361	Aluminium and Aluminium alloys - Chemical analysis - Sampling from metal melts
ISO 6892-1	Metallic materials - Tensile testing . Part 1: Method of test at room temperature
EN 485-1	Aluminium and aluminium alloys - Sheet, strip and plate - Part 1: Technical condition for inspection and delivery
EN 485-2	Aluminium and aluminium alloys - Sheet, strip and plate - Part 2: Mechanical properties
EN 515	Aluminium and aluminium alloys - Wrought products - Temper designation
EN 573-3	Aluminium and aluminium alloys - Chemical composition and form of wrought products
EN 10204	Metallic products - Types of inspection documents

4.0 Chemical Composition

The chemical composition shall meet the requirements listed in Table 1.

The required chemistry was established in accordance with ISO EN 573-3.

Sampling for chemistry shall be carried out at time of the casting in accordance with EN 14361.

Table 1: Chemical composition

Element	Wt. Percentage (%)	
	Min.	Max.
Silicon (Si)	0.70	1.30
Iron (Fe)	-	0.50
Copper (Cu)	-	0.10
Manganese (Mn)	0.40	1.00
Magnesium (Mg)	0.60	1.20
Chromium (Cr)	-	0.25
Zinc (Zn)	-	0.20
Titanium (Ti)	-	0.10
Other: each (total)	-	0.05 (0.15)
Aluminium (Al)	Remainder	

5.0 Mechanical Properties

Mechanical properties shall be tested after completion of all heat treatment steps (including aging). Mechanical testing shall be per either EN ISO 6892-1.

5.1 Sheet, Strip and Plate

For sheet, strip and plate, the material shall be tested according to EN 485-1. Samples for mechanical testing shall be removed from the L-T orientation and shall meet the acceptance criteria per EN 485-2, as listed in Table 2.

Table 2: Mechanical requirements for sheet and plate as per EN 485-2

Specified thickness, [mm]		Tensile strength, R_m [MPa]	Yield strength, $R_{p0.2}$ [MPa]	Elongation, min. [%]		Bend radius ^a	Hardness, [HBW ^a]
from	up to	min.	min.	$A_{50\text{ mm}}$	A	90°	
3,0	6,0	310	260	10		4,5 t ^b	94
6,0	12,5	300	255	9		6,0 t ^b	91
12,5	60,0	295	240		8		89
60,0	100,0	295	240		7		89
100,0	150,0	275	240		6		84
150,0	175,0	275	230		4		83
175,0	350,0	260	220		2		
a For information only.							
b Appreciably smaller cold bend radii can be achieved immediately after quenching.							



NOTE

For specified thickness over 100 mm, in addition to the test coupons orientation mentioned in the ISO 485-1, S-T orientation shall be also tested and shall exhibit a minimum value of 207 MPa (30 ksi).



NOTE

For specified thickness over 100 mm, the longitudinal axis of the round L-T test species shall be located at a distance from one of the surfaces equal to one half of the thickness.

6.0 Heat Treatment

Wrought aluminum alloy products (sheet, strip, plate) shall be in T6 or T651 heat treat condition i.e. solution heat-treated and then artificially aged or solution heat treated, stress-relieved stretched and then artificially aged (T651) in accordance with EN 515.

7.0 Weld Repair

Weld repair of this material is not permitted.

8.0 Workmanship

Material shall be inspected in accordance with part report (DBI).

Material shall be free of injurious defects that are detrimental to the integrity of the final product, such as laps, scabs, cracks and exogenous inclusions.

9.0 Certification

Documentation that is in compliance with EN 10204 type 3.1 inspection certificates shall be provided with each shipment of material. This type of certificate requires the supplier to provide test results for all requirements listed in specifications that are attached to the part report.