

# W26 Requirements for Welding Consumables for Aluminium Alloys

(July, 1999)  
(Rev.1 June 2005)

## 1. General

### 1.1 Scope

1.1.1 These requirements give the conditions of approval and inspection of welding consumables to be used for hull construction and marine structure aluminium alloys according to UR W 25. Where no special requirements are given herein, e.g. for the approval procedure or for the welding of test assemblies and testing, those of UR W 17 apply in analogous manner.

1.1.2 The welding consumables preferably to be used for the aluminium alloys concerned are divided into two categories as follows:

- **W** = wire electrode - and wire - gas combinations for metal-arc inert gas welding (MIG, 131 acc. to ISO 4063), tungsten inert gas arc welding (TIG, 141) or plasma arc welding (15)
- **R** = rod - gas combinations for tungsten inert gas arc welding (TIG, 141) or plasma arc welding (15)

### 1.2 Grading, Designation

1.2.1 The consumables concerned are graded as mentioned in Table 1, in accordance with the alloy type and strength level of the base materials used for the approval tests.

**Table 1 Consumable grades and base materials for the approval test**

Consumable quality grade (Symbol)	Base material for the tests	
	Alloy Designation	
	Numerical	Chem. symbol
RA/WA	<b>5754</b>	AlMg3
RB/WB	<b>5086</b>	AlMg4
RC/WC	<b>5083</b>	AlMg4.5Mn0,7
	<b>5383</b>	AlMg4.5Mn0.9
	<b>5456</b>	AlMg5
	<b>5059</b>	-
RD/WD	<b>6005A</b>	AlSiMg(A)
	<b>6061</b>	AlMg1SiCu
	<b>6082</b>	AlSi1MgMn
Note: Approval on higher strength AlMg base materials covers also the lower strength AlMg grades and their combination with AlSi grades		

1.2.2. Approval of a wire or a rod will be granted in conjunction with a specific shielding gas acc. to Table 2 or defined in terms of composition and purity of "special" gas to be designated with group sign "S". The composition of the shielding gas is to be reported. The approval of a wire or rod with any particular gas can be applied or transferred to any combination of the same wire or rod and any gas in the same numbered group as defined in Table 2, subject to the agreement of the Society.

Table 2 Compositional limits of shielding gases and mixtures to be used

Group	Gas composition (Vol. %) <sup>1)</sup>	
	Argon	Helium
I - 1	100	---
I - 2	---	100
I - 3	Rest	> 0 to 33
I - 4	Rest	> 33 to 66
I - 5	Rest	> 66 to 95
S	Special gas, composition to be specified, see 1.2.2	

<sup>1)</sup>Gases of other chemical composition (mixed gases) may be considered as „special gases“ and covered by a separate test.

### 1.3 Manufacture, testing and approval procedure

1.3.1 Manufacturer's plant, production methods and quality control measures shall be such as to ensure reasonable uniformity in manufacture, see also UR W 17.

1.3.2 Testing and approval procedure shall be in accordance with UR W 17, sections 2 and 3 and as required in UR W 17 for the individual categories (types) of welding consumables, shielding gases and their mixtures mentioned in 1.1.2 above.

## 2. Testing, required properties

### 2.1 Testing of the deposited weld metal

2.1.1 For the testing of the chemical composition of the deposited weld metal, a test piece according to Figure 1 shall be prepared. The size depends on the type of the welding consumable (and on the welding process) and shall give a sufficient amount of pure weld metal for chemical analysis. The base metal used shall be compatible with the weld metal in respect of chemical composition.

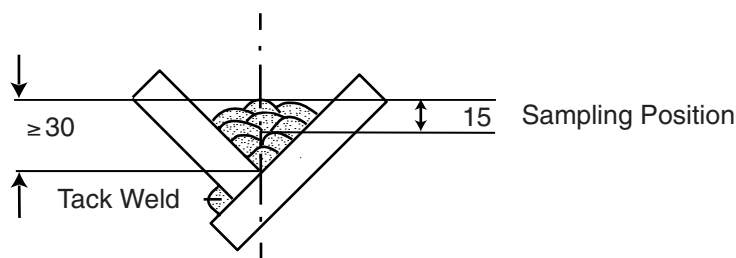


Figure 1 Deposited weld metal test assembly

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2.1.2 The chemical composition of the deposited weld metal shall be determined and certified in a manner analogous to that prescribed in UR W 17, section 6.2.3. The results of the analysis shall not exceed the limit values specified by the manufacturer.

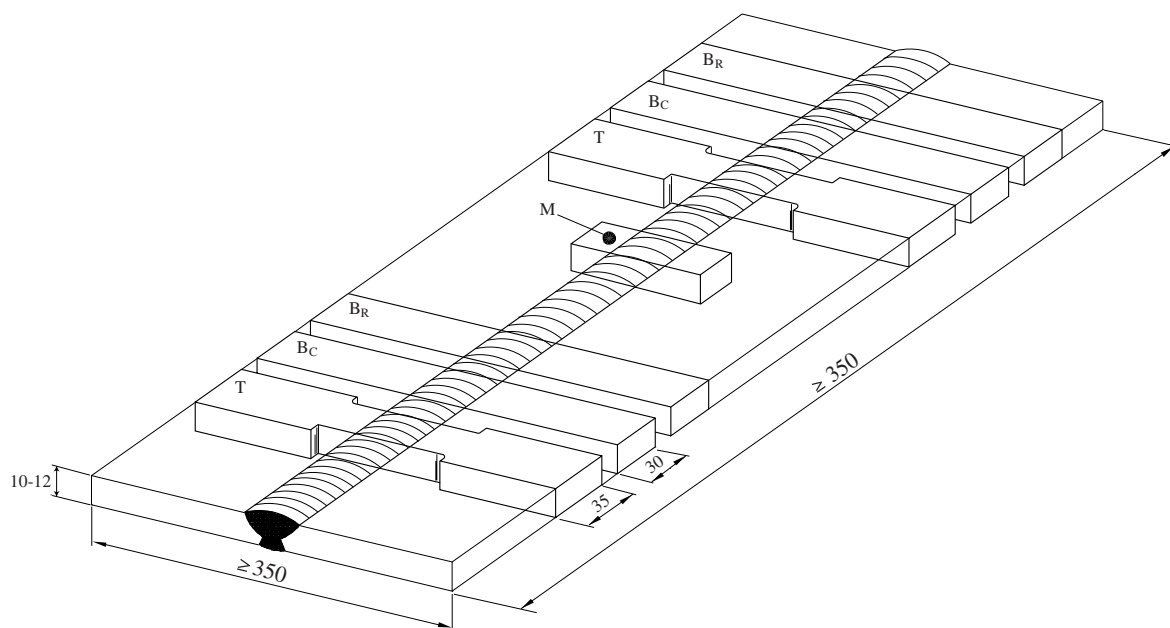
### 2.2 Testing of butt weld assemblies

2.2.1 The testing of the welded joints shall be performed on butt-weld test assemblies according to Figure 2 and Figure 3, made from materials as given in Table 1, in an analogous manner to UR W 17, sections 4.3, 6.2.5, 6.3.5 or 6.4.2 respectively.

2.2.2 Butt weld test assemblies according to Figure 2 with a thickness of 10 to 12 mm are to be prepared for each welding position (downhand, horizontal-vertical, vertical-upward and overhead) for which the consumable is recommended by the manufacturer; except that consumables satisfying the requirements for downhand and vertical-upward positions will be considered as also complying with the requirements for the horizontal-vertical position subject to the agreement of the Society.

2.2.3 Additionally one test assembly according to Figure 3 with a thickness of 20 to 25 mm is to be welded in the downhand position only.

T = Flat tensile test specimen  
 B<sub>C</sub> = Face bend test specimen  
 B<sub>R</sub> = Root bend test specimen  
 M = Macrographic section

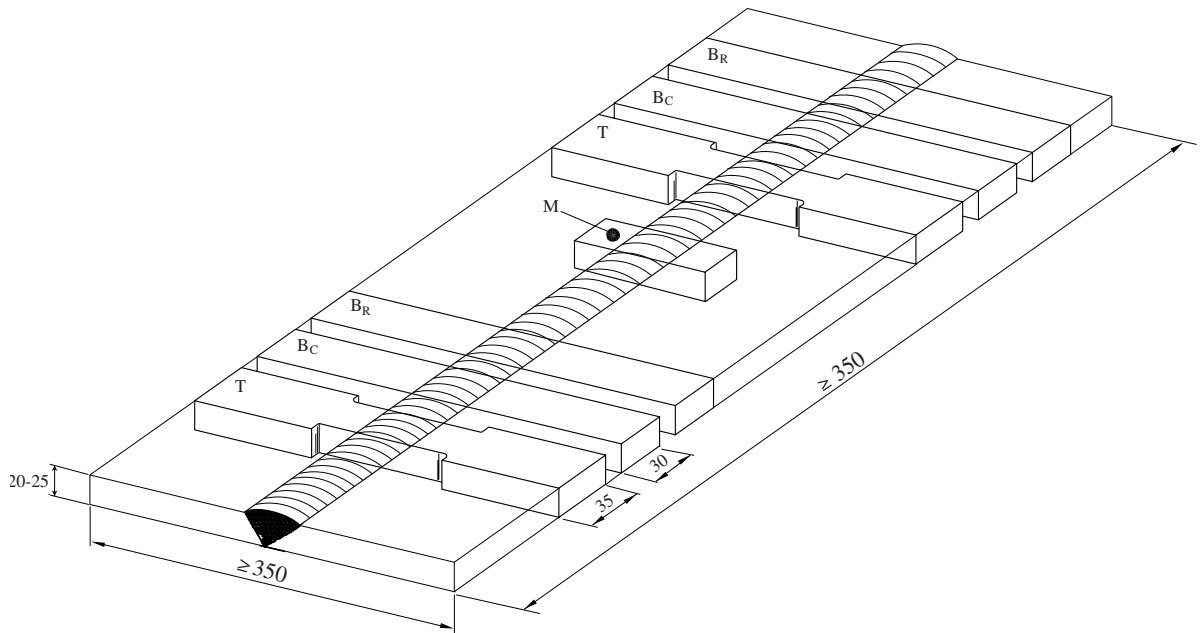


- Notes: 1) Edge preparation is to be single V or double V with 70° angle.  
 2) Back sealing runs are allowed in single V weld assemblies.  
 3) In case of double V assembly both sides shall be welded in the same welding position.

**Figure 2 Butt weld test assembly for positional welding**

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cont'd

T = Flat tensile test specimen  
B<sub>C</sub> = Face bend test specimen  
B<sub>R</sub> = Root bend test specimen  
M = Macrographic section



Notes:

- 1) Edge preparation is to be a single V with 70° angle.
- 2) Back sealing runs are allowed.

**Figure 3 Additional butt weld test assembly in downhand position**

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2.2.4 On completion of welding, assemblies must be allowed to cool naturally to ambient temperature. Welded test assemblies and test specimens must not be subjected to any heat treatment.

Grade D assemblies should be allowed to naturally ageing for a minimum period of 72 hours from the completion of welding before testing is carried out.

2.2.5 The test specimens shown in Figure 2 and Figure 3 and described in UR W 17 shall be taken from the butt weld test assemblies.

2.2.6 The mechanical properties must meet the requirements stated in Table 3. The provisions of UR W 17 apply in analogous manner to the performance of the tests, including the requirements regarding the annual repeat tests and retesting. The position of the fractures is to be stated in the report. The macrographic specimen shall be examined for imperfections such as lack of fusion, cavities, inclusions, pores or cracks.

**Table 3 Requirements for the transverse tensile and bend tests**

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Grade	Base material used for the test	Tensile strength $R_m$ [N/mm <sup>2</sup> ] min.	Former diameter	Bending angle <sup>1)</sup> [°] min.
RA/WA	5754	190	3t	180
RB/WB	5086	240	6t	
RC/WC	5083	275	6t	
	5383 or 5456	290	6t	
	5059	330	6t	
RD/WD	6061, 6005A or 6082	170	6t	

Note: <sup>1)</sup> During testing, the test specimen shall not reveal any one single flaw greater than 3 mm in any direction. Flaws appearing at the corners of a test specimen shall be ignored in the evaluation, unless there is evidence that they result from lack of fusion.

### 3. Annual repeat tests

3.1 The annual repeat tests shall entail the preparation and testing of the deposited weld metal test assembly as prescribed under 2.1.1 (Figure 1) and of the downhand butt weld test assembly according to 2.2.2 (Figure 2).

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