

Engineering Procedure

SAEP-1106

29 October, 2003

Welding Test Supplement S06
for GTAW, Aluminum with Backing

Document Responsibility: Inspection Department

Saudi Aramco DeskTop Standards

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1 Scope

This welder performance qualification Test Supplement shall govern the testing of welders with the Gas Tungsten Arc Welding (GTAW) process, welding progression vertical up, for welding aluminum and aluminum alloy pipe (limited application - refer to the restrictions in paragraph 3.9).

2 Applicable Documents

The requirements contained in the following document apply to the extent specified in this procedure.

2.1 Saudi Aramco Reference(s)

Saudi Aramco Engineering Procedure

[SAEP-321](#)

*Performance Qualification Testing and
Certification of Saudi Aramco Welders*

2.2 Industry Code(s) and Standard(s)

American Society of Mechanical Engineers

ASME SEC IX

*Qualification Standard for Welding and Brazing
Procedures, Welders, Brazers, and Welding
and Brazing Operators*

3 Instructions

Conduct the Performance qualification testing of welders following the requirements of [SAEP-321](#) as supplemented by the subsequent instructions.

3.1 Applications

Piping	Yes*
Pipelines	No
Pressure Vessels	No
Tanks	No
Structural	Yes*

* See restrictions in paragraph 3.9

3.7 Testing and Inspection Requirements

Time Limit of Test	Two (2) hours maximum
Radiography	100% (ASME QW-191)
Guided-Bend Test	2F and 2R (ASME QW-163)
Visual Inspection	See paragraph 6.1.3 of SAEP-321

3.8 Qualification Limits

Material Form	Plate or pipe
Joint Type	Groove welds with backing and fillet welds
Base Material	Aluminum and aluminum alloys (P21, P22, P23, P25) to each other
Process	GTAW
Filler Metal	ERXXXX, (A5.10)
Gas Backing	Not required
Base Metal Thickness	0.474" maximum
Diameter Range	2.5" NPS and greater
Positions	All
Vertical Progression	Uphill

3.9 Restrictions

Piping and Structural - Welding from one side is only permitted when aluminum backing material is used.

Revision Summary

29 October, 2003	Minor revision to convert the text statements into a form layout (ASME SEC IX format). Revised the "Next Planned Update".
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WELDING PROCEDURE SPECIFICATION (WPS)

WPS S06

Rev. 0

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Procedure Qualification Record (PQR): <u>None</u>	Welding Process: <u>GTAW, manual</u>
Scope: <u>For welder qualification only</u>	Prior Qualification Requirements: <u>None</u>

BASE MATERIAL (QW-403)	POST WELD HEAT TREATMENT (QW-407)																
Test coupon type: <u>Pipe</u> Material Spec, type or Grade: <u>Aluminum, 4043 or Equivalent</u> Diameter of test coupon: <u>4" NPS</u> Thickness of test coupon: <u>0.237"</u> To Material spec. type or grade: <u>Aluminum</u> Tack Welds: <u>Four (4) made by the welder and incorporated into the root pass</u>	Temperature: <u>None</u> Time: _____ Other: _____																
FILLER METALS (QW-404)	GAS (QW-408)																
Weld Metal Analysis Number: <u>NA</u> Filler Metal F No.: <u>F-23</u> AWS specification: <u>A 5.10</u> AWS Classification: <u>ER 4043</u> Electrode: <u>EWP 3.2mm</u>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th><th style="text-align: center;">Gas</th><th style="text-align: center;">Composite</th><th style="text-align: center;">Flow (CFH)</th></tr> </thead> <tbody> <tr> <td style="text-align: center;">Shielding</td><td style="text-align: center;">Argon</td><td></td><td style="text-align: center;">10-20</td></tr> <tr> <td style="text-align: center;">Backing</td><td style="text-align: center;">None</td><td></td><td></td></tr> <tr> <td style="text-align: center;">Trailing</td><td></td><td></td><td></td></tr> </tbody> </table>		Gas	Composite	Flow (CFH)	Shielding	Argon		10-20	Backing	None			Trailing			
	Gas	Composite	Flow (CFH)														
Shielding	Argon		10-20														
Backing	None																
Trailing																	
POSITION (QW-405)	TECHNIQUE																
Position of Groove: <u>6G</u> Weld Progression: <u>Uphill</u>	String or weave: <u>Stringer or Weave</u> Oscillation: _____ Multiple or Single pass per side: <u>Multiple</u> Single or multiple electrode: <u>Single</u> Other: _____																
PREHEAT (QW 406)																	
Preheat Temperature: <u>10°C</u> Interpass temperature: <u>150°C</u> Other: _____																	

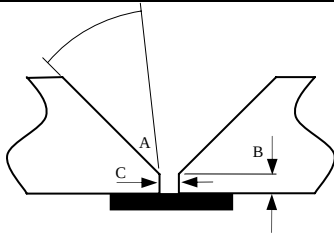


WELDING PROCEDURE SPECIFICATION (WPS)

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Joint Design: Single Vee

A = $30^{\circ} \pm 2.5^{\circ}$

B = None

C = $6.4 \pm 1.6\text{mm} \pm 0.8\text{mm}$

(Aluminum backing strip)

WELD LAYER	PROCESS	FILLER METAL		CURRENT		VOLTAGE	TRAVEL SPEED (cm/min)
		Class	Dia. (mm)	Polarity	Amps.		
Root	GTAW	ER4043	3.2	AC	100-180	15-20	3.8-8.9
Hot	GTAW	ER4043	3.2	AC	100-180	15-20	3.8-10.2
Fill	GTAW	ER4043	3.2	AC	100-180	15-20	3.8-14
Cap	GTAW	ER4043	3.2	AC	100-180	15-20	5.0-15.2