

Engineering Procedure

SAEP-1109

29 October, 2003

Welding Test Supplement S09
for GTAW, Aluminum, Single Sided

Document Responsibility: Inspection Department

Saudi Aramco DeskTop Standards

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Previous Issue: 30 April, 2000 Next Planned Update: 1 November, 2008

Revised paragraphs are indicated in the right margin

Primary contact: Supervisor, ID/OID/IEU on 874-6604

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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.

2 Applicable Documents

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

2.1 Saudi Aramco References

Saudi Aramco Engineering Procedures

[SAEP-321](#)

*Performance Qualification Testing and
Certification of Saudi Aramco Welders*

[SAEP-1107](#)

*Welding Test Supplement S07 for GTAW,
Stainless Steel.*

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

|| 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 and without 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	Argon (2-5 CFH)
Base Metal Thickness	0.474" maximum
Diameter Range	2.5" NPS and greater
Positions	All
Vertical Progression	Uphill

3.9 Restrictions

None.

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".



WELDING PROCEDURE SPECIFICATION (WPS)

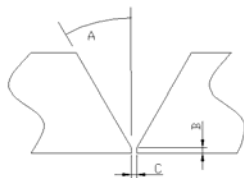
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Procedure Qualification Record (PQR): <u>None</u>	Welding Process: <u>GTAW, manual</u>
Scope: <u>For welder qualification only</u>	Prior Qualification Requirements: <u>S07</u>

BASE MATERIAL (QW-403) Test coupon type: <u>Pipe</u> Material Spec, type or Grade: <u>Aluminum, 4043</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>		POST WELD HEAT TREATMENT (QW-407) Temperature: <u>None</u> Time: _____ Other: _____																	
FILLER METALS (QW-404) Weld Metal Analysis Number: <u>NA</u> Filler Metal F No.: <u>F2.3</u> AWS specification: <u>A 5.10</u> AWS Classification: <u>ER4043</u> Electrode: <u>EWP (3.2mm)</u>		GAS (QW-408) <table border="1"> <thead> <tr> <th></th><th>Gas</th><th>Composite</th><th>Flow (CFH)</th></tr> </thead> <tbody> <tr> <td>Shielding</td><td>Argon</td><td></td><td>10-20</td></tr> <tr> <td>Backing</td><td>Argon</td><td></td><td>2-5</td></tr> <tr> <td>Trailing</td><td></td><td></td><td></td></tr> </tbody> </table>			Gas	Composite	Flow (CFH)	Shielding	Argon		10-20	Backing	Argon		2-5	Trailing			
	Gas	Composite	Flow (CFH)																
Shielding	Argon		10-20																
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Trailing																			
POSITION (QW-405) Position of Groove: <u>6G</u> Weld Progression: <u>Uphill</u>		TECHNIQUE 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>50°C</u> Interpass temperature: <u>315°C</u> Other: _____																			



Joint Design: Single Vee

A = 30° +/- 2.5°
B = 1.6mm +/- 0.8mm
C = 3.2mm +/- 0.8mm



WELDING PROCEDURE SPECIFICATION (WPS)

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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