

QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)

Welding Procedure Specification No.: WE 001 Date: 02-04-84 Supporting PQR No.: 185+21

Revision No.: 02

Date: 15-09-93

Welding Process (es) : SMAW

Type (s) : MANUAL

JOINTS (QW 402)

Joint Design : As per manufacturing drawing (groove / fillet)

Backing (Yes) : for double side and backing strip groove welds

(No) : for single side groove welds

Backing Material (Type) : Base metal / Weld metal

Metal : Yes

Non-Fusing Metal : No

Retainer : No

BASE METALS (QW – 403)

P. No. : 1 Group No. : 1&2 TO P. No.: 1 Group No.: 1&2

OR

Specification type & grade : --- to Specification type & grade : ---

OR

Chemical Analysis & Mechanical Properties : --- to Chemical Analysis & Mechanical Properties : ----

Thickness Range :

Base Metal : Groove: 4.8 mm to 200 mm Fillet : all sizes

Pipe Dia. Range : Groove: all dia Fillet : : all sizes

Other : Root spacing for backing strip joints : 8 - 10 mm

For others : 2 ± 1 mm

Filler Metals (QW – 404)

Spec. No. (SFA)	5.1
AWS NO (CLASS)	E-7018
F. No.	4
A. No.	1
Size of Filler Metals	Dia 2.5; 3.15; 4.0; 5.0; 6.3 mm
Deposited Weld Metal	
Thickness Range: Groove:	200 mm Max.
Fillet :	ALL
Electrode Flux (Class)	Basic
Consumable Insert	No
Max. Bead Thickness	5 mm

Rev 02 : Changes in non essential variables

POSITIONS (QW-405) Position(s) : ALL POSITIONS Welding Progression : UP for Vertical Down --- Position (s) Fillet : ALL				POSTWELD HEAT TREATMENT (QW-407) Temperature Range : 600 – 650°C Time Range : As per UCS 56			
PREHEAT (QW-406) Preheat Temp Min : 18 ° C UPTO 31 mm 100° C FROM 31 – 100 mm 150° C ABOVE 100 mm Interpass Temp Max : 350 ° C Preheat Maintenance : Nil				GAS (QW-408) NOT APPLICABLE			
ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC : <u>DIRECT CURRENT</u> Polarity : <u>ELECTRODE POSITIVE</u> Amps [Range] : <u>60 to 300 A</u> Volts Range : <u>22-26 V</u>							
TECHNIQUE (QW-410) String or Weave Bead : <u>string and weave (max 3D)</u> Initial and Interpass Cleaning : <u>chipping ; brushing ; grinding</u> Method of Back Gouging: <u>by air arc gouging / grinding</u> Multiple or Single Pass : <u>multiple pass / single pass</u> Multiple or Single Electrodes : <u>single electrode</u> Peening : <u>not allowed</u> Clean weld area to remove oil, rust, grease, etc. prior to welding.							
Weld Layer (s)	Process	Filler Metal		Current		Other	
		Class	Dia mm	Type Polar	Amp Range		
Root and subsequent layers	SMAW	E - 7018	2.5	DC +	60-90	STRING & WEAVE (MAX 3 x Electrode Dia)	
	SMAW	E - 7018	3.15	DC +	90-140		
	SMAW	E - 7018	4.0	DC +	140-180		
	SMAW	E - 7018	5.0	DC +	180-240		
	SMAW	E - 7018	6.3	DC +	240-300		



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Ramachandrapuram, Hyderabad – 502 032.

QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)Welding Procedure Specification No.: WE 003 Date: 02-04-84 Supporting PQR No.: 209Revision No.: 03Date: 14-08-2004Welding Process (es) : GTAW + SMAWType (s) : MANUAL**JOINTS (QW 402)**Joint Design: As per manufacturing drawing (groove / fillet)Backing (Yes) : for double side welds and backing strip joints(No) : for single side weldsBacking Material (Type) : Base metal / Weld metalMetal: YesNon-Fusing Metal: NoRetainer: No**BASE METALS (QW – 403)**

P. No. : 1 Group No. : 1&2 TO P. No.: 1 Group No.: 1&2

OR

Specification type & grade: --- to Specification type & grade: ---

OR

Chemical Analysis & Mechanical Properties: --- to Chemical Analysis & Mechanical Properties: ----

Thickness Range :Base Metal : Groove: 4.8 mm to 24 mm Fillet : all sizesPipe Dia. Range : Groove: all dia Fillet : : all sizesOther : Root spacing for backing strip joints : 8 - 10 mmFor others : 2 ± 1 mmQW403.13 : Not applicable**Filler Metals (QW – 404)**

	GTAW	SMAW
Spec. No. (SFA)	<i>5.18</i>	<i>5.1</i>
AWS NO (CLASS)	<i>ER 70S2</i>	<i>E 7018</i>
F. No.	<i>6</i>	<i>4</i>
A. No.	<i>1</i>	<i>1</i>
Size of Filler Metals	<i>Dia 2.4 mm</i>	<i>Dia 3.15, 4.0, 5.0</i>
Deposited Weld Metal		
Thickness Range:	<i>4 mm Max.</i>	<i>20 mm Max.</i>
Groove:	<i>All sizes</i>	<i>All sizes</i>
Fillet:		
Electrode Flux (Class)	<i>NA</i>	<i>Basic</i>
Consumable Insert	<i>No</i>	<i>No</i>
Max. Bead Thickness	<i>3 mm</i>	<i>5 mm</i>

WPS: WE 003

Feller

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QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)Welding Procedure Specification No.: WE 004 Date: 01-08-84 Supporting PQR No.: 21 +213Revision No.: 02Date: 15.09.1993Welding Process (es) : GTAW + SMAWType (s) : MANUAL**JOINTS (QW 402)**Joint Design : As per manufacturing drawing (groove / fillet)Backing (Yes) : for double side welds and backing strip joints(No) : for single side weldsBacking Material (Type) : Base metal / Weld metalMetal : YesNon-Fusing Metal : NoRetainer : No**BASE METALS (QW – 403)**

P. No. : 1 Group No.: 1&2 TO P. No.: 1 Group No.: 1&2

OR

Specification type & grade : --- to Specification type & grade : ---

OR

Chemical Analysis & Mechanical Properties : --- to Chemical Analysis & Mechanical Properties : ----

Thickness Range :Base Metal : Groove: 1.6 mm to 38 mm Fillet : all sizesPipe Dia. Range : Groove: all dia Fillet : : all sizesOther : Root spacing for backing strip joints : 8 - 10 mmFor others : 2 ± 1 mm403.13 : not applicable**Filler Metals (QW – 404)**

	GTAW	SMAW
Spec. No. (SFA)	5.18	5.1
AWS NO (CLASS)	ER 70SG	E 7018
F. No.	6	4
A. No.	1	1
Size of Filler Metals	Dia 2.4 mm	Dia 3.15, 4.0, 5.0
Deposited Weld Metal		
Thickness Range: Groove: Fillet :	4 mm Max. All sizes	38 mm Max. All sizes
Electrode Flux (Class)	NA	Basic
Consumable Insert	No	No
Max. Bead Thickness	3 mm	5 mm

POSITIONS (QW-405) Position(s) : ALL POSITIONS Welding Progression : UP for Vertical Down --- Position (s) Fillet : ALL				POSTWELD HEAT TREATMENT (QW-407) Temperature Range : <u>600-650° C</u> Time Range : <i>As per UCS 56 of ASME secVIII division 1</i>			
PREHEAT (QW-406) Preheat Temp Min : 10 ° C upto 31 mm 							

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QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)

Welding Procedure Specification No.: WE 046 Date: 30-12-86 Supporting PQR No.: 517

Revision No.: 04

Date: 27.05.2010

Welding Process (es) : SMAW

Type (s) : MANUAL

JOINTS (QW 402)

Joint Design : As per manufacturing drawing (groove / fillet)

Root Spacing : Backing strip joints : 6 - 10 mm

For others : 1-3 mm

Backing (Yes) : for double side and backing strip joints

(No) : for single side joints

Backing Material (Type) : Base metal / Weld metal

Metal : Yes

Non-Fusing Metal : No

Retainer : No

BASE METALS (QW – 403)

P. No. : 8 Group No. : 1&2 TO P. No.: 1 Group No.: 1&2

OR

Specification type & grade or UNS Number: --- to Specification type & grade or UNS Number: ----

OR

Chemical Analysis & Mechanical Properties : --- to Chemical Analysis & Mechanical Properties : ----

Thickness Range :

Base Metal : Groove: 5.0 mm to 50 mm Fillet : all sizes

Maximum Pass thickness : ≤ 13mm

Other : ---

Filler Metals (QW – 404)

Spec. No. (SFA)	5.4
AWS NO (CLASS)	E309-15 & E309-16
F. No.	5
A. No.	8
Size of Filler Metals	Dia 2.5 to 5.0 mm
Filler Metal Product Form	Flux Coated Electrode
Supplemental Filler Metal	N.A
Deposited Weld Metal	
Thickness Range: Groove:	38 mm Max
Fillet :	ALL
Electrode Flux (Class)	Basic

Rev 04 : Clause 403.13 deleted

POSITIONS (QW-405) Position(s) : ALL POSITIONS Welding Progression : UP for Vertical Down --- Position (s) Fillet : ALL Other :				POSTWELD HEAT TREATMENT (QW-407) Temperature Range : Nil Time Range : Other :			
PREHEAT (QW-406) Preheat Temp Min : 10° C upto 31mm 							



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BHARAT HEAVY ELECTRICALS LIMITED Ramachandrapuram, Hyderabad – 502 032.	
QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)	
Welding Procedure Specification No.: <u>WE 301</u> Date: <u>09-09-77</u> Supporting PQR No.: <u>WE/RRC/23</u> Revision No.: <u>01</u> Date: <u>01-03-89</u> Welding Process (es) : <u>GTAW</u> Type (s) : <u>MANUAL</u>	
JOINTS (QW 402) Joint Design : <u>As per manufacturing drawing (groove / fillet)</u> Backing (Yes) : <u>for double side and backing strip joints</u> (No) : <u>for single side joints</u> Backing Material (Type) : <u>P1 for backing strip & weld metal for double side joints</u> Metal : <u>Yes</u> Non-Fusing Metal : <u>No</u> Retainer : <u>No</u>	
BASE METALS (QW – 403) P. No. : 1 Group No. : 1&2 TO P. No.: 1 Group No.: 1&2 OR Specification type & grade : ----- to Specification type & grade : ----- OR Chemical Analysis & Mechanical Properties : --- to Chemical Analysis & Mechanical Properties : ---- <u>Thickness Range :</u> Base Metal : Groove: <u>1.6 to 11.2 mm</u> Fillet : <u>all sizes</u> Pipe Dia. Range : Groove: <u>all dia</u> Fillet : : <u>all dia</u> Other : <u>Root spacing for backing strip joints : 8 - 10 mm</u> <u>For others : 2 ± 1 mm</u> <u>403.13 : not applicable</u>	
Filler Metals (QW – 404)	
Spec. No. (SFA)	<u>5.18</u>
AWS NO (CLASS)	<u>ER70SG /ER70S-2</u>
F. No.	<u>6</u>
A. No.	<u>1</u>
Size of Filler Metals	<u>Dia 2.4 mm</u>
Other	<u>Filler wire : TGS – 50 of KOBE STEEL (JAPAN)</u>
Deposited Weld Metal	
Thickness Range: Groove:	<u>11.2 mm Max.</u>
Fillet :	<u>---</u>
Electrode Flux (Class)	<u>---</u>
Consumable Insert	<u>No</u>
Max. Bead Thickness	<u>4 mm</u>

Rev 01 : Changes in non essential variables

POSITIONS (QW-405)				POSTWELD HEAT TREATMENT (QW-407)			
Position(s) : ALL POSITIONS Welding Progression : UP for Vertical Down --- Position (s) Fillet : ALL				Temperature Range : Nil Time Range : ---			
PREHEAT (QW-406)				GAS (QW-408)			
Preheat Temp Min : 10 ^o C Interpass Temp Max : 350 ° C Preheat Maintenance : Nil				Percent Composition : Gas(es) Mixture Flow Rate Shielding : Argon, 99.9% 6-10 LPM Trailing : No -- Backing : No --			
ELECTRICAL CHARACTERISTICS (QW-409)							
Current AC or DC : <u>DIRECT CURRENT</u> Polarity : <u>ELECTRODE NEGATIVE</u> Amps [Range] : <u>110 to 160 A</u> Volts Range : <u>14 – 20 V</u> Tungsten Electrode Size and Type : <u>Dia 2.4 mm, 2% Thoriated</u> Pulsing : <u>No</u>							
TECHNIQUE (QW-410)							
String or Weave Bead : <u>string</u> Orifice or Gas Cup Size : <u>9-11 mm ID</u> Initial and Interpass Cleaning : <u>chipping ; brushing ; grinding</u> Method of Back Gouging: <u>by grinding</u> Multiple or Single Pass : <u>multiple pass</u> Multiple or Single Electrodes : <u>single electrode</u> Peening : <u>no</u> Clean weld area to remove oil, rust, grease, etc. prior to welding.							
Weld Layer (s)	Process	Filler Metal		Current		Volt Range	Other
		Class	Dia mm	Type Polar	Amp Range		
1-n	GTAW	ER70S	2.4	DC -	110-160	14-20	String only

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BHARAT HEAVY ELECTRICALS LIMITED Ramachandrapuram, Hyderabad – 502 032.	
QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)	
Welding Procedure Specification No.: <u>WE 313</u> Date: <u>17-11-77</u> Supporting PQR No.: <u>79 & 79 IGC</u> Revision No.: <u>03</u> Date: <u>27.01.2006</u> Welding Process (es) : <u>GTAW</u> Type (s) : <u>MANUAL</u>	
JOINTS (QW 402) Joint Design : <u>As per manufacturing drawing (groove / fillet)</u> Backing (Yes) : <u>for double side and backing strip joints</u> (No) : <u>for single side joints</u> Backing Material (Type) : <u>Weld metal / base metal</u> Metal : <u>Yes</u> Non-Fusing Metal : <u>No</u> Retainer : <u>No</u>	
BASE METALS (QW – 403) P. No. : 8 Group No. : 1 TO P. No.: 8 Group No.: 1 OR Specification type & grade : ----- to Specification type & grade : ----- OR Chemical Analysis & Mechanical Properties : --- to Chemical Analysis & Mechanical Properties : ---- Thickness Range : Base Metal : Groove: <u>1.6 to 7.50 mm</u> Fillet : <u>all sizes</u> Pipe Dia. Range : Groove: <u>all dia</u> Fillet : : <u>all sizes</u> Other : <u>Root spacing : 2 ± 1 mm</u> <u>403.13 : not applicable</u>	
Filler Metals (QW – 404)	
Spec. No. (SFA)	5.9
AWS NO (CLASS)	ER 347
F. No.	6
A. No.	8
Size of Filler Metals	Dia 1.6 to 2.4 mm
Deposited Weld Metal	
Thickness Range: Groove:	7.50 mm Max.
Fillet :	ALL
Electrode Flux (Class)	NA
Consumable Insert	No
Max. Bead Thickness	3 mm

Rev. 3 : PDO DEP SP1173 requirements (PQR Added)

POSITIONS (QW-405)				POSTWELD HEAT TREATMENT (QW-407)																							
Position(s) : ALL POSITIONS Welding Progression : UP for Vertical Down --- Position (s) Fillet : ALL				Temperature Range : Nil Time Range : ---																							
PREHEAT (QW-406)				GAS (QW-408)																							
Preheat Temp Min : 18° C Interpass Temp Max : 200 ° C Preheat Maintenance : Nil				Percent Composition : Single Gas <table><tr><td></td><td>Gas(es)</td><td>Mixture</td><td>Flow Rate</td></tr><tr><td>Shielding :</td><td>Argon</td><td>--</td><td>6-10 LPM</td></tr><tr><td>Trailing :</td><td>No</td><td>--</td><td></td></tr><tr><td>Backing :</td><td>Argon</td><td>--</td><td>4-6 LPM</td></tr><tr><td>Closed Chamber :</td><td>No</td><td></td><td></td></tr></table>					Gas(es)	Mixture	Flow Rate	Shielding :	Argon	--	6-10 LPM	Trailing :	No	--		Backing :	Argon	--	4-6 LPM	Closed Chamber :	No		
	Gas(es)	Mixture	Flow Rate																								
Shielding :	Argon	--	6-10 LPM																								
Trailing :	No	--																									
Backing :	Argon	--	4-6 LPM																								
Closed Chamber :	No																										
ELECTRICAL CHARACTERISTICS (QW-409)																											
Current AC or DC : <u>DIRECT CURRENT</u> Polarity : <u>ELECTRODE NEGATIVE</u> Amps [Range] : <u>70 to 110 A</u> Volts Range : <u>11 – 20 V</u> Tungsten Electrode Size and Type : <u>Dia 2.4 mm, 2% Thoriated</u> Pulsing : <u>No</u>																											
TECHNIQUE (QW-410)																											
String or Weave Bead : <u>string</u> Orifice or Gas Cup Size : <u>9-11 mm ID</u> Initial and Interpass Cleaning : <u>chipping ; brushing ; grinding</u> (Use SS tools only) Method of Back Gouging: <u>by grinding</u> Multiple or Single Pass : <u>multiple pass</u> Multiple or Single Electrodes : <u>single electrode</u> Peening : <u>no</u> Clean weld area to remove oil, rust, grease, etc. prior to welding.																											
Weld Layer (s)	Process	Filler Metal		Current		Volt Range	Other																				
		Class	Dia mm	Type Polar	Amp Range																						
1	GTAW	ER 347	1.6	DC -	70-90	11-15	String ,,																				
2	GTAW	ER 347	2.4	DC -	80-110	14-20																					



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QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)

Welding Procedure Specification No.: WE 314 Date: 21-03-83 Supporting PQR No.: 79A

Revision No.: 02

Date: 14-08-04

Welding Process (es) : GTAW

Type (s) : MANUAL

JOINTS (QW 402)

Joint Design : As per manufacturing drawing (groove / fillet)

Backing (Yes) : for double side and backing strip joints

(No) : for single side joints

Backing Material (Type) : Weld metal / base metal

Metal : Yes

Non-Fusing Metal : No

Retainer : No

BASE METALS (QW – 403)

P. No. : 8 Group No. : 1 TO P. No.: 8 Group No.: 1

OR

Specification type & grade : ----- to Specification type & grade : -----

OR

Chemical Analysis & Mechanical Properties : --- to Chemical Analysis & Mechanical Properties : ----

Thickness Range :

Base Metal : Groove: 1.6 to 9.6 mm

Fillet : all sizes

Pipe Dia. Range : Groove: all dia

Fillet : : all sizes

Other : Root spacing for backing strip joints : 8 - 10 mm

For others : 2 ± 1 mm

403.13 : not applicable

Filler Metals (QW – 404)

Spec. No. (SFA)	5.9
AWS NO (CLASS)	ER 308L
F. No.	6
A. No.	8
Size of Filler Metals	Dia 1.6 to 2.4 mm
Deposited Weld Metal	
Thickness Range: Groove:	9.6 mm Max.
Fillet :	ALL
Electrode Flux (Class)	NA
Consumable Insert	No
Max. Bead Thickness	3 mm

Rev 02 : Changes in non essential variables

POSITIONS (QW-405)				POSTWELD HEAT TREATMENT (QW-407)			
Position(s) : ALL POSITIONS Welding Progression : UP for Vertical Down --- Position (s) Fillet : ALL				Temperature Range : Nil Time Range : ---			
PREHEAT (QW-406)				GAS (QW-408)			
Preheat Temp Min : 10° C Interpass Temp Max : 200 ° C Preheat Maintenance : Nil				Percent Composition : Single Gas			
				Gas(es)	Mixture	Flow Rate	
				Shielding :	Argon	--	6-10 LPM
				Trailing :	No	--	
				Backing :	Argon	--	4-6 LPM
				Closed Chamber : No			
ELECTRICAL CHARACTERISTICS (QW-409)							
Current AC or DC : <u>DIRECT CURRENT</u> Polarity : <u>ELECTRODE NEGATIVE</u> Amps [Range] : <u>70 to 100 A</u> Volts Range : <u>10 – 20 V</u> Tungsten Electrode Size and Type : <u>Dia 2.4 mm, 2% Thoriated</u> Pulsing : <u>No</u>							
TECHNIQUE (QW-410)							
String or Weave Bead : <u>string</u> Orifice or Gas Cup Size : <u>9-11 mm ID</u> Initial and Interpass Cleaning : <u>chipping ; brushing ; grinding</u> (USE STAINLESS STEEL TOOLS) Method of Back Gouging: <u>by grinding</u> Multiple or Single Pass : <u>multiple pass /single pass</u> Multiple or Single Electrodes : <u>single electrode</u> Peening : <u>no</u> Clean weld area to remove oil, rust, grease, etc. prior to welding.							
Weld Layer (s)	Process	Filler Metal		Current		Volt Range	Other
		Class	Dia mm	Type Polar	Amp Range		
Root/sub sequent	GTAW	ER308L	1.6	DC -	70-90	10-18	String ,,
	GTAW	ER308L	2.4	DC -	80-100	12-20	



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BHARAT HEAVY ELECTRICALS LIMITED Ramachandrapuram, Hyderabad – 502 032.	
QW – 482 WELDING PROCEDURE SPECIFICATION (WPS)	
Welding Procedure Specification No.: <u>WE 315</u> Date: <u>10-04-90</u> Supporting PQR No.: <u>82</u> Revision No.: 0 Date: -- Welding Process (es) : <u>GTAW</u> Type (s) : <u>MANUAL</u>	
JOINTS (QW 402) Joint Design : <u>As per manufacturing drawing (groove / fillet)</u> Backing (Yes) : <u>for double side and backing strip joints</u> (No) : <u>for single side joints</u> Backing Material (Type) : <u>Weld metal / base metal</u> Metal : <u>Yes</u> Non-Fusing Metal : <u>No</u> Retainer : <u>No</u>	
BASE METALS (QW – 403) P. No. : 8 Group No. : 1 TO P. No.: 1 Group No.: 1&2 OR Specification type & grade : ----- to Specification type & grade : ----- OR Chemical Analysis & Mechanical Properties : --- to Chemical Analysis & Mechanical Properties : ---- Thickness Range : Base Metal : Groove: <u>1.6 to 15 mm</u> Fillet : <u>all sizes</u> Pipe Dia. Range : Groove: <u>all dia</u> Fillet : : <u>all sizes</u> Other : <u>Root spacing for backing strip joints : 8 - 10 mm</u> <u>For others : 2 ± 1 mm</u> <u>403.13 : not applicable</u>	
Filler Metals (QW – 404)	
Spec. No. (SFA)	5.9
AWS NO (CLASS)	ER 309L
F. No.	6
A. No.	8
Size of Filler Metals	Dia 1.6 to 2.4 mm
Deposited Weld Metal	
Thickness Range: Groove:	15 mm Max.
Fillet :	15 mm
Electrode Flux (Class)	NA
Consumable Insert	No
Max. Bead Thickness	3 mm

POSITIONS (QW-405) Position(s) : ALL POSITIONS Welding Progression : UP for Vertical Down --- Position (s) Fillet : ALL				POSTWELD HEAT TREATMENT (QW-407) Temperature Range : Nil Time Range : ---																							
PREHEAT (QW-406) Preheat Temp Min : 10° C Interpass Temp Max : 200 ° C Preheat Maintenance : Nil				GAS (QW-408) Percent Composition : Single Gas <table><tr><td></td><td>Gas(es)</td><td>Mixture</td><td>Flow Rate</td></tr><tr><td>Shielding :</td><td>Argon</td><td>--</td><td>6-10 LPM</td></tr><tr><td>Trailing :</td><td>No</td><td>--</td><td></td></tr><tr><td>Backing :</td><td>Argon</td><td>--</td><td>4-6 LPM</td></tr><tr><td>Closed Chamber :</td><td>No</td><td></td><td></td></tr></table>					Gas(es)	Mixture	Flow Rate	Shielding :	Argon	--	6-10 LPM	Trailing :	No	--		Backing :	Argon	--	4-6 LPM	Closed Chamber :	No		
	Gas(es)	Mixture	Flow Rate																								
Shielding :	Argon	--	6-10 LPM																								
Trailing :	No	--																									
Backing :	Argon	--	4-6 LPM																								
Closed Chamber :	No																										
ELECTRICAL CHARACTERISTICS (QW-409) Current AC or DC : <u>DIRECT CURRENT</u> Polarity : <u>ELECTRODE NEGATIVE</u> Amps [Range] : <u>70 to 120 A</u> Volts Range : <u>12 – 20 V</u> Tungsten Electrode Size and Type : <u>Dia 2.4 mm, 2% Thoriated</u> Pulsing : <u>No</u>																											
TECHNIQUE (QW-410) String or Weave Bead : <u>string</u> Orifice or Gas Cup Size : <u>9-11 mm ID</u> Initial and Interpass Cleaning : <u>chipping ; brushing ; grinding</u> Method of Back Gouging: <u>by grinding</u> Multiple or Single Pass : <u>multiple pass /single pass</u> Multiple or Single Electrodes : <u>single electrode</u> Peening : <u>no</u> Clean weld area to remove oil, rust, grease, etc. prior to welding.																											
Weld Layer (s)	Process	Filler Metal		Current		Volt Range	Other																				
		Class	Dia mm	Type Polar	Amp Range																						
Root/sub sequent	GTAW	ER309L	1.6	DC -	70-90	12-18	String ,,																				
	GTAW	ER309L	2.4	DC -	80-100	12-20																					



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