



WELDING PROCEDURE QUALIFICATION TEST

According to (code, standard)

DNV Rules for Ships & DNV-OS-C401

Manufacturer's welding procedure No. **PQR-EzyFit-048**

Manufacturer EzyFit Hydraulics Pty Ltd Place and date Adelaide, 2011-09-13
 Purchaser's spec. No. N.A. Project N.A.
 Requirements beyond code/standard None

Joint preparation and welding sequence (Sketch).
 State rolling direction, if applicable
 Bevel Angle: **60°** Root Gap: **0mm**
 Root Landing: **2mm**

BASE MATERIAL SPECIFICATION AND GROUPING
UNS S32750 (pipe) to UNS S32750/A182 F53 (forging)

Grade	C, %	C eq %	Grade	C, %	C eq %

If applicable, the following C eq based on ladle analysis is to be calculated:

$$C_{eq} = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu+Ni}{15} \%$$

Welding process(es) **GTAW** Welding position **1G** Single-/double sided welding **Single**

WELDING CONSUMABLES:

Index	Consumable(s), trade name	Code designation
A	Sandvik 25.10.4L	AWS ER2594
B	--	--
C	--	--

WELDING PARAMETERS

Pass No.	Index	Diam. mm	Gas composition	Gas L/min	Current polarity	Amps	Volts	Travel speed mm/min	Wire feed mm/min	Heat input kJ/mm
1-3		1.6	Argon/2% N2	15	DC-	226-250	13-14	117-140	-	1.58max
4-12		2.4	(as above)	15	DC-	250	14	132-212	-	1.59max
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Other information (weaving, backing, groove preparation, gouging, grinding, etc.):
Back purge: Argon/2% N2 +/-15lpm

SPECIAL REQUIREMENTS: Preheat min. **40°C** Interpass max **127°C** PWHT --°C Time -- Hr(s)
 Heating/cooling rate -- Baking of electrodes -- Others --
 WELDING CARRIED OUT BY Dane Kelly TEST PIECE MARKED **DK**
 EXTENT OF APPROVAL: Base material(s) **S32750 /A182 F53** Positions: **1G**
 Plate /wall thickness **6.5 - 26 mm** Diam. **(125 and above) mm** Other limitations **Castings excluded**
(All NDT, mechanical and metallurgical testing carried out by Adelaide Inspections Services - Job No. M11021)

We certify that the statements in this record are correct and that the test weld was prepared, welded and heat treated in accordance with the specified Code/Standard and/or purchaser's requirements.

Manufacturer's signature and stamp: **10 CHEVIOT ROAD SALISBURY SOUTH AUSTRALIA 5106 PH: 08 - 8281 0955 FAX: 08 - 8281 1698 ABN 71 060 465 385**

DNV's survey station and surveyor's signature: **M.Henriques/G.Kittel**

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his/her loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million. In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.

NON-DESTRUCTIVE TESTING													
1. Radiographic testing													
Procedure ref. CSP 415			Acceptance criteria DNV Rules for Ships				Result Pass						
Film type (not stated)			Screens Pb 0.125mm				IQI ASTM 1A						
KV --		mAmin. --		Sensitivity 1.3%		Density 2.9-3.9							
2. Ultrasonic examination													
Procedure ref. --			Acceptance criteria --				Result --						
3. Other examination Type: Dye Penetrant Test													
Procedure ref. CSP 413			Acceptance criteria DNV Rules for Ships				Result Pass						
Place and date Adelaide, 2011-09-23: AIS					Witnessed by Adelaide Insp Services Job No.:M11021								
Laboratory signature and stamp													
MECHANICAL TESTING (According to DNV Rules for Ships)													
1. Tensile tests			Specified R_{eH}			Specified R_m :							
Test No.	Dim (mm)	Area (mm ²)	Yield load (kN)	R_{eH} (N/mm ²)	U.T. load (kN)	R_m (N/mm ²)	A, % on	Remarks					
T4309	(Transverse)					795		Break at forging side					
T4310	(Transverse)					795		Break at forging side					
T4234	(All Weld)			724		850	81	Pass					
T4235	(All Weld)			704		845	78	Pass					
2. Bend tests		Specified		180		degr.		Former diameter 40mm					
Type and dimensions			Results			Type and dimensions			Results				
4 x Side Bends			Pass			2 x Face Bends			Pass				
2 x Root Bends			Pass			--			--				
3. Impact tests Type: Charpy Size: 10 x 10mm Requirement: Minimum 27J													
Notch Location/Direction		Temp. °C		Values, J			Average J		Remarks				
				1	2	3							
S32750 HAZ+5mm		-50		105	147	158	136		Pass				
S32750 HAZ+2mm		-50		103	98	107	102		Pass				
Weld Metal		-50		224	214	220	219		Pass				
A182 F53 HAZ+2mm		-50		67	70	38	58		Pass				
A182 F53 HAZ+5mm		-50		115	120	120	118		Pass				
S32750 parent metal		-50		176	104	224	168		Pass				
A182 F53 parent metal		-50		83	72	81	78		Pass				
4. Macro examination x2 - Pass													
5. Hardness test Specified type if test: Vickers HV10													
Sketch showing indentations			Point	Hardness	Point	Hardness	Point	Hardness	Point	Hardness			
			T1		T2		T3						
			PM1	277 max	PM1	270 max	PM1	314 max					
			HAZ1	271 max	HAZ1	278 max	HAZ1	320 max					
			Weld	276 max	Weld	283 max	Weld	322 max					
			HAZ2	273 max	HAZ2	285 max	HAZ2	290 max					
			PM2	265 max	PM2	277 max	PM2	254 max					
				1 =	A182 F53								
	2 =	S32750											
6. Other tests Type and results: Ferritic Chloride Pitting Test (ASTM G-48 Method A) - Pass													
Place Adelaide			Date 2011-09-23			Received by DNV							
Laboratory signature and stamp													
We hereby certify that by virtue of the information given on page 1 of this form and the laboratory test results given above, this welding procedure meets the Code/Standard and/or purchaser's specification, and that within the limitations given in the Code/Standard and/or purchaser's specification by our signature is approved for welding on said product.					Place Melbourne		Date 2011-12-08						
					Surveyor		Michael Henriques						





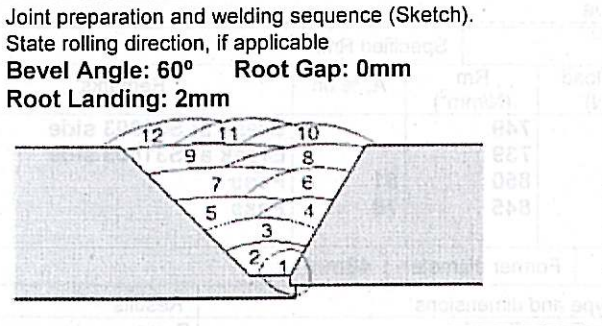
WELDING PROCEDURE QUALIFICATION TEST

According to (code, standard)

DNV Rules for Ships & DNV-OS-C401

Manufacturer's welding procedure No. **PQR-EzyFit-049**

Manufacturer EzyFit Hydraulics Pty Ltd Place and date Adelaide, 2011-09-13
 Purchaser's spec. No. N.A. Project N.A.
 Requirements beyond code/standard None



BASE MATERIAL SPECIFICATION AND GROUPING

UNS S32750 (pipe) to S31803 (ASTM A276)

Grade	C, %	C eq %	Grade	C, %	C eq %

If applicable, the following C eq based on ladle analysis is to be calculated:

$$C_{eq} = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5} + \frac{Cu+Ni}{15} \%$$

Welding process(es) **GTAW** Welding position **1G** Single-/double sided welding **Single**

WELDING CONSUMABLES:

Index	Consumable(s), trade name	Code designation
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B	--	--
C	--	--

WELDING PARAMETERS

Pass No.	Index	Diam. mm	Gas composition	Gas L/min	Current polarity	Amps	Volts	Travel speed mm/min	Wire feed mm/min	Heat input kJ/mm
1		1.6	Argon/2% N2	15	DC-	230	13	99	-	1.81
2-3		1.6	(as above)	15	DC-	250	14	124-137	-	1.69max
4-12		2.4	(as above)	15	DC-	250	14	133-195	-	1.58max

Other information (weaving, backing, groove preparation, gouging, grinding, etc.):
Back purge: Argon/2% N2 +/-15lpm

SPECIAL REQUIREMENTS: Preheat min. **40°C** Interpass max **122°C** PWHT --°C Time -- Hr(s)

Heating/cooling rate -- Baking of electrodes -- Others --

WELDING CARRIED OUT BY **Dane Kelly** TEST PIECE MARKED **DK**

EXTENT OF APPROVAL: Base material(s) **S32750 to S31803** Positions: **1G**

Plate /wall thickness **6.5 - 26 mm** Diam. **(125 and above) mm** Other limitations **Castings excluded**

(All NDT, mechanical and metallurgical testing carried out by Adelaide Inspections Services - Job No. M11021)

We certify that the statements in this record are correct and that the test weld was prepared, welded and heat treated in accordance with the specified Code/Standard and/or purchaser's requirements.

Manufacturer's signature and stamp

EZYFIT HYDRAULICS
SALISBURY SOUTH SA 5106
 PH: 08 8281 1698
 FAX: 08 8281 1698
 ABN 71 060 465 385

Handwritten signature

DNV's survey station and surveyor's signature

M. Henriques/G. Kittel



If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million. In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.

NON-DESTRUCTIVE TESTING												
1. Radiographic testing												
Procedure ref. CSP 415			Acceptance criteria DNV Rules for Ships				Result Pass					
Film type (not stated)			Screens Pb 0.125mm				IQI ASTM 1A					
KV --		mAmin. --		Sensitivity 1.3%		Density 2.9-3.9						
2. Ultrasonic examination												
Procedure ref. --			Acceptance criteria --				Result --					
3. Other examination Type: Dye Penetrant Test												
Procedure ref. CSP 413			Acceptance criteria DNV Rules for Ships				Result Pass					
Place and date Adelaide, 2011-09-23: AIS					Witnessed by Adelaide Insp Services Job No.:M11021							
Laboratory signature and stamp												
MECHANICAL TESTING (According to DNV Rules for Ships)												
1. Tensile tests			Specified R _{eH}			Specified R _m :						
Test No.	Dim (mm)	Area (mm ²)	Yield load (kN)	ReH (N/mm ²)	U.T. load (kN)	R _m (N/mm ²)	A, % on	Remarks				
T4311 (Transverse)						749		Break at S31803 side				
T4312 (Transverse)						739		Break at S31803 side				
T4234 (All Weld)				724		850	81	Pass				
T4235 (All Weld)				704		845	78	Pass				
2. Bend tests		Specified		180		degr.		Former diameter 40mm				
Type and dimensions			Results			Type and dimensions			Results			
4 x Side Bends			Pass			2 x Face Bends			Pass			
2 x Root Bends			Pass			--			--			
3. Impact tests Type: Charpy Size: 10 x 10mm Requirement: Minimum 27J												
Notch Location/Direction		Temp. °C		Values, J			Average J		Remarks			
				1	2	3						
S32750 HAZ+5mm		-50		162	155	164	160		Pass			
S32750 HAZ+2mm		-50		95	125	135	118		Pass			
Weld Metal		-50		210	197	194	200		Pass			
S31803 HAZ+2mm		-50		66	97	75	79		Pass			
S31803 HAZ+5mm		-50		108	92	176	125		Pass			
S32750 parent metal		-50		124	114	120	119		Pass			
S31803 parent metal		-50		111	95	82	96		Pass			
4. Macro examination x2 - Pass												
5. Hardness test Specified type if test: Vickers HV10												
Sketch showing indentations				Point	Hardness		Point	Hardness				
				T1			T2					
				PM1	247 max		PM1	247 max		PM1	242 max	
				HAZ1	263 max		HAZ1	257 max		HAZ1	273 max	
				Weld	280 max		Weld	283 max		Weld	321 max	
				HAZ2	281 max		HAZ2	290 max		HAZ2	321 max	
				PM2	286 max		PM2	281 max		PM2	317 max	
				1 =	S31803							
				2 =	S32750							
6. Other tests Type and results: Ferritic Chloride Pitting Test (ASTM G-48 Method A) - Pass												
Place Adelaide			Date 2011-09-23			Received by DNV						
Laboratory signature and stamp												
We hereby certify that by virtue of the information given on page 1 of this form and the laboratory test results given above, this welding procedure meets the Code/Standard and/or purchaser's specification, and that within the limitations given in the Code/Standard and/or purchaser's specification by our signature is approved for welding on said product.					Place Melbourne		Date 2011-12-08					
					Surveyor		Michael Henriques					

