DET NORSKE VERITAS

Ref.: 831-13-006

WELDING PROCEDURE QUALIFICATION TEST

According to (code, standard)

DNV - OS - C401

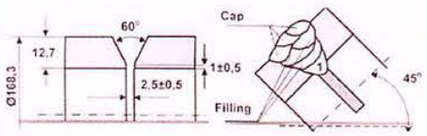
Manufacturer's welding procedure No.
WPS 111/136 -001

Manufacturer UAB "Gridins Group LT" Place and date Klaipeda, Lithuania 2013-07-31

Purchaser's spec. No. --- Project ---

Requirements beyond code/standard ---

Joint preparation and welding sequence (Sketch).
State rolling direction, if applicable



BASE MATERIAL SPECIFICATION AND GROUPING

Group 3.1 acc. to EN15608:2005; ø168.3x12.7 mm

Grade	C, %	C eq
S460G6	0.09	0.36

Grade	C, %	C eq
S460G6	0.09	0.36

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

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

Welding process(es) 111/136 Welding position H-L045 Single-/double sided welding ss nb

WELDING CONSUMABLES:

Index	Consumable(s), trade name	Code designation
A	ESAB FILARC 88S 2.5x350mm 1/4 VP	E50 6 Mn1Ni B 12 H5 acc. ISO2560-A
B	ELGACORE DWA 55L 1.2 mm	T46 6 1.5Ni P M 1 H5 acc. ISO17632-A
C	Argon 80%+CO2 20%	M21 acc. ISSO 14175:2008(E)

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	A	2.5	---	---	DC (+)	70	21	52.6	---	1.34
2	B+C	1.2	M21	8-10	DC (+)	175	23	173	5700	1.10
3-4	B+C	1.2	M21	8-10	DC (+)	191	22.7	246	6000	0.85
5	B+C	1.2	M21	8-10	DC (+)	182	22.9	203	6000	1.00
6	B+C	1.2	M21	8-10	DC (+)	178	22.9	218	5800	0.90
n	B+C	1.2	M21	8-10	DC (+)	185	22.9	302	5800	0.70

Other information (weaving, backing, groove preparation, gouging, grinding, etc.):
Root run done with 111 process covers 3 mm of pipe thickness

SPECIAL REQUIREMENTS: Preheat min. 20°C Interpass max 250°C PWHT N/A°C Time N/A Hr(s)

Heating/cooling rate N/A Baking of electrodes N/A Others N/A

WELDING CARRIED OUT BY S. Izmailov TEST PIECE MARKED WPS 111/136-001

EXTENT OF APPROVAL: Base material(s) See note 1 Positions: All except for J-L045

Plate /wall thickness 6.3 to 25.4 mm Diam. ≥84 mm Other limitations Note1: 3-3;3-2;3-1;2-2; 2-1;1-1.

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 Genadij Šamov

DNV's survey station and surveyor's signature DNV Klaipeda Dmitrijus Kvedaras

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.

Ref.: 831-13-006

NON-DESTRUCTIVE TESTING

1. Radiographic testing

Procedure ref. LVS RT 5.4-01:2008 Acceptance criteria LST EN ISO 5817:2007 Result Accepted

Film type Stucturix D5PI Screens Pb 0.027 IQI W10

KV 160 mAmin. 4.5 Sensitivity 0.16% Density 2.6

2. Ultrasonic examination

Procedure ref. --- Acceptance criteria --- Result ---

3. Other examination Type: Magnetic Particle Inspection

Procedure ref. LVS-M 5.4-04:2010 Acceptance criteria EN ISO 23278:2010 Result Accepted

Place and date Klaipeda, Lithuania 2013-08-06 Reveiwed by Dmitrijus Kvedaras

Laboratory signature and stamp

MECHANICAL TESTING (According to EN 4136; EN 5173; EN 9016; EN 1321; EN 6507-1)

1. Tensile tests Specified R_{eH} 450 Specified Rm 570-720

Test No.	Dim (mm)	Area (mm²)	Yield load (kN)	ReH (N/mm²)	U.T. load (kN)	Rm (N/mm²)	A, % on	Remarks
135-1	---	---	---	---	---	578	---	Nil
135-2	---	---	---	---	---	573	---	Nil
	---	---	---	---	---		---	
	---	---	---	---	---		---	

2. Bend tests Specified 180 degr. Former diameter 50 mm

Type and dimensions	Results	Type and dimensions	Results
135-3 Face bend	No defects		
135-4 Face bend	No defects		
135-6 Root bend	No defects		
135-7 Root bend	No defects		

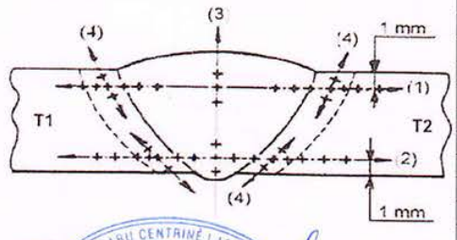
3. Impact tests Type: V-notch Size: 10 x 10 mm Requirement: Minimum 46J

Notch Location/Direction	Temp. °C	Values, J 1	2	3	Average J	Remarks
135-7-1 Weld Metal	-50	94	97	104	98	Nil
135-7-2 Fusion Line	-50	50	70	105	75	Nil
135-7-3 HAZ + 2 mm	-50	214	252	257	241	Nil
135-7- 4 HAZ + 5 mm	-50	242	243	211	232	Nil

4. Macro examination Accepted

5. Hardness test Specified type if test:: HV 10

Sketch showing indentations



Point	Hardness	Point	Hardness
Metal (T1), (1)	224,218,228	Weld, (2)	236,245,254
HAZ (T1), (1)	236,248,234	Weld(3), (2)	238,244,242
HAZ(4)(T1),(1)	240,239,244	HAZ (T2), (2)	256,245,249
Weld, (1)	219,211,234	Metal (T2), (2)	224,228,226
Weld(3), (1)	236,218,225		
HAZ (T2),(1)	236,239,241		
HAZ(4)(T2), (1)	239,237,241		
Metal (T2), (1)	224,237,241		
Metal (T1), (2)	214,208,206		
HAZ (T1), (2)	254,256,246		
HAZ (4)(T1),(2)	241,264,243		

6. Other tests Type and results: Visual examination acc. to EN 17637 - Accepted

Place Klaipeda, Lithuania Date 2013-08-06 Witnessed by Dmitrijus Kvedaras

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 Klaipeda, Lithuania Date 2013-08-16

Surveyor Dmitrijus Kvedaras