WELDING PROCEDURE QUALIFICATION RECORD (WPQR)

LEVEL 2

N. 18VE0048POA\3

Manufacturer **ITAQUA Srl - Trieste (TS)**

WPQR No. **05\2018** Dated **20/07/2018**

Manufacturer's welding procedure (WPS) No. **001-005-2018 ; 002-005-2018** Dated **13/03/2018**

RANGE OF QUALIFICATION

Welding process **136** Type **Partly mechanized**

Joint type **Plates and Pipes and build-up BW ssmb-bs/FW**

Single/Multiple pass **Multiple** (**Impact properties apply**)

Parent material group(s) **1-1** ISO/TR 15608; ISO/TR20172; ISO/TR 20173; ISO/TR20174 with a specified minimum yield strength ≤ 355 Mpa

Parent material thickness (mm) Butt Joint = **3 to 24** Fillet Joint t_1 **= 3 to 24** t_2 **= 3 to 24**

Throat thickness (mm) **No restriction**

Weld deposit thickness (mm) **3 to 24**

Outside pipe diameter (mm) **Over 150 PA - PB - PC ; over 500 all other qualified positions***

Filler metal make **Flux-cored wire KISWEL ITALIA K-71TLF** Nr. of wires for process 12: **None**

Flux make **N.A.** Flux Designation: **N.A.**

Filler metal designation **Flux-cored wire EN ISO 17632-A : T 42 2 P C 1 H5**

Shielding gas (ISO 14175) **C1** Backing gas (ISO 14175) **N.A.**

Type of welding current **DCEP** **Heat Input** Kj/cm **PF = max 36,4 ; PC = min 3,6**

Welding position **All, vertical down excluded** Transfer Mode **Spray, Pulse, Globular transfer**

Preheat min. (°C) +15 (if ISO/TR 17671-2 requirements are fulfilled) Interpass temp. Max. (°C) -

Interpass temp. Max. (°C) +250°C Postheat min. (°C) - Time (minutes) -

Post weld heat treatment / Ageing **None** Time (minutes) -

Other information **(*) Over 500 mm, when Rina Rules apply.**

Welder's/Operator's name **Cosic Juro** Stamp No. **CJ**

Welding test conducted by **ITAQUA Srl - Trieste (TS)**

Mechanical test conducted by **CTR Srl - Limena (PD)** Laboratory test No. **181587\3 and 181587\4**

At presence of RINA Surveyor **P. Danesin**

We confirm that statements in this record are correct and that the test welds were prepared, welded and tested and have fulfilled the requirements in accordance with **UNI EN ISO 15614-1: 2017** Standard.
Requirements of **RINA Rules for the Classification of Ships** are also met.

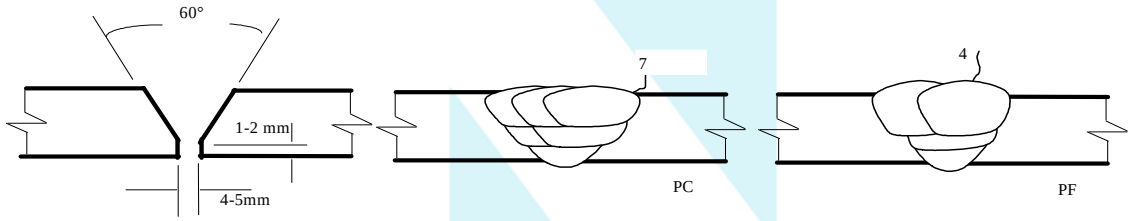
Issued at: Genova on 20 July 2018

RINA Services S.p.A.

Certificate No. 18VE0048POA\3

RECORD OF WELD TEST

JOINT DETAILS AND WELDING SEQUENCES PLATE TO PLATE SINGLE-V BUTT JOINT; ONE SIDE WELDING WITH BACKING									
Pass No.	Process	Filler metal diam. (mm)	Amps	Volt	Type of Current/ Polarity	Travel speed (cm/min)	Heat input (kJ/cm)	Metal Transfer mode	Other
WELDING POSITION: PC									
1	**136**	1,2	190	25,5	**DCEP**	16,3	14,3	**Spray Arc**	-
2	**136**	1,2	190	27,5	**DCEP**	25,0	10,0	**Spray Arc**	-
3	**136**	1,2	190	27,5	**DCEP**	36,9	6,8	**Spray Arc**	-
4	**136**	1,2	200	28,5	**DCEP**	33,3	8,2	**Spray Arc**	-
5	**136**	1,2	200	27,5	**DCEP**	34,2	7,7	**Spray Arc**	-
6	**136**	1,2	200	27,5	**DCEP**	55,0	4,8	**Spray Arc**	-
7	**136**	1,2	200	27,5	**DCEP**	48,0	5,5	**Spray Arc**	-
WELDING POSITION: PF									
1	**136**	1,2	190	26,5	**DCEP**	8,3	29,1	**Spray Arc**	-
2	**136**	1,2	180	26,5	**DCEP**	11,7	19,6	**Spray Arc**	-
3	**136**	1,2	170	25,5	**DCEP**	19,1	10,9	**Spray Arc**	-
4	**136**	1,2	170	25,5	**DCEP**	20,0	10,4	**Spray Arc**	-



PARENT MATERIAL

Material specification	**EN ISO 10025-2**
Type or grade	**S 355J2+N**
Group(s)/Subgroup(s) No. (ISO/TR 15608; ISO/TR20172; ISO/TR 20173; ISO/TR20174)	**1.2**
Thickness (mm)	**12 mm**
Throat thickness (mm)	**N.A.**
Diameter (mm)	**N.A.**
Branch connection angle	**N.A.**
Other	**Backing with ceramic**

WELDING CONSUMABLES

Process	**136**
Trade name(s)	**KISWELITALIA K-71LT**
Specification	**EN ISO 17632-A**
Classification / designation	**T 42 2 P C1 H5**
Size (mm)	**1,2**
Deposited metal thickness	
Groove	**12 mm**
Throat	**N.A.**
Flux trade name	**N.A.**
Consumable insert	**N.A.**
Other	**N.A.**

GAS			
	Gas	Mixture	Flow rate (l/min.)
Shielding	**CO_2 100%**		**17**
Trailing			
Backing			

POSITION

Welding position **PC + PF**

Other

PREHEAT				**POSTWELD HEAT TREATMENT**			
Preheat temperature	**+ 20°C**			Temperature	**None**	Time	-
Interpass temperature	**+250°C**			Method	-		
Postheat temperature	**None**	Time	-	Other	-		

ELECTRICAL CHARACTERISTICS

Current **DC EP**

Ampere (range) **See table** Volts (Range) **See table**

Mode of metal transfer **Spray Arc**

Tungsten electrode size and type **N.A.**

Pulse welding details **N.A.**

Plasmawelding details **N.A.**

Waveform controlled welding machine N.A. Waveform control mode **N.A.**

Power source LORCK S5XT Welding mode Pulse □ Non pulse ☑

Other -

TECHNIQUE

Travel speed (range) **See table**

String or weave bead **String and Weave (PF) ; String (PC)** Maximum width of run **None**

Oscillation (*) **None** (Amplitude/Frequency/Dwell time)

Method of groove/edge preparation **Machining/Grinding**

Interpass cleaning **Grinding/Brushing**

Method of back gouging **N.A.**

Orifice or gas cup size **16 mm**

Distance contact tube/worpiece (*) **15 – 20 mm**

Multiple or single pass **Multiple**

Multiple or single electrodes **Single**

Torch angle (*) **N.A.**

Other (*) for fully mechanized/robotic only

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TRANSVERSE TENSILE TEST						
Spec. (No.)	Width (mm)	Thickness (mm)	Area (mm^2)	Total load (N)	R_m. (N/mm^2)	Fracture location
5185-1	**25,04**	**11,56**	**289,5**	**-**	**532**	**Ductile failure out of weld**
5185-2	**25,02**	**11,53**	**288,5**	**-**	**529**	**Ductile failure out of weld**

BEND TEST			
Type	No.	Bend Angle	Result
SIDE TRANSVERSE SBB	**4 OFF**	**180°**	**Acceptable**

IMPACT TEST

Full-section 10x10

Spec No.	Notch location	Notch type	Test Temp. (°C)	Impact values (J)	Average (J)
VWT $_{0/1,5}$	**WELD**	**ISO-V**	**-20**	**42 – 54 - 41**	**46**
VHT $_{0/1,5}$	**LF**	**ISO-V**	**-20**	**35 – 88 - 47**	**57**
VHT $_{2/1,5}$	**LF+2**	**ISO-V**	**-20**	**86 – 136 - 76**	**99**

HARDNESS TEST		
Location	Type/load	Maximum value
Parent metal(s)	**HV10**	**158**
H.A.Z.(s)	**HV10**	**255**
Weld metal	**HV10**	**238**

all destructive test have been carried out on the test sample welded in PF, except for HV10 hardness carried out on the test sample welded in PC

OTHER TEST

MACROGRAPHIC EXAMINATION	**Acceptable PC and PF**
MICROGRAPHIC EXAMINATION	**Not required**

NON DESTRUCTIVE EXAMINATION

VISUAL EXAMINATION	**Acceptable PC and PF**
RADIOGRAPHIC EXAMINATION	**Acceptable PC and PF**
PENETRANT TEST	**Acceptable PC and PF**
MAGNETIC PARTICLE	**Not required**
ULTRASONIC TEST	**Not required**

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