WELDING PROCEDURE QUALIFICATION RECORD (WPQR)

LEVEL 2

N. 17VE01465PO1\A

Manufacturer **ISOL.ME.CAR Srl - Monfalcone (GO)**

WPQR No. **01\17P** Dated **20/12/2017**

Manufacturer's welding procedure (WPS) No. **01\17P** Dated **10/10/2017**

RANGE OF QUALIFICATION

Welding process	**135**	Type	**Partly mechanized**
Joint type	**Plates and Pipes and build-up FW**		
Single/Multiple pass	**Single**	**(Impact properties not applied)**	
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 = **N.A.**	Fillet Joint t_1 = **3 to 12**	t_2 = **3 to 12**
Throat thickness (mm)	**3,45 to 6,9**		
Weld deposit thickness (mm)	**N.A.**		
Outside pipe diameter (mm)	**≥30(*)**		
Filler metal make	**SAPIO SG2**	Nr. of wires for process 12: **None**	
Flux make	**N.A.**	Flux Designation: **N.A.**	
Filler metal designation	**Solid wire EN ISO 14341-A : G 42 4 M21 3Si1**		
Shielding gas (ISO 14175)	**M24 with CO2% min. 5,6 max. 8,4**	Backing gas (ISO 14175) **N.A.**	
Type of welding current	**DCEP**	**Heat Input** Kj/cm **Min 6,2**	
Welding position	**All, vertical down excluded**	Transfer Mode **Spray, Pulse, Globular transfer**	
Preheat min. (°C)	20 (if ISO/TR 17671-2 requirements are fulfilled)	Interpass temp. Max. (°C) -	
Interpass temp. Max. (°C)	-	Postheat min. (°C) -	Time (minutes) -
Post weld heat treatment / Ageing	-	Time (minutes) -	
Other information	**(*) Diameter limited to max. 120 mm , when Rina Rules apply**		

Welder's/Operator's name	**Pacor Joseph Paul**	Stamp No.	**PJ**
Welding test conducted by	**ISOL.ME.CAR Srl - Monfalcone (GO)**		
Mechanical test conducted by	**METAL SERVICES Srl - Ronchi dei Legionari (GO)**	Laboratory test No.	**17.863**
At presence of RINA Surveyor	**F. Sedran**		

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.

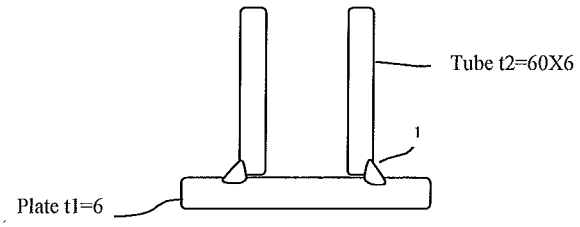
Issued at: Genova on 20 December 2017

RINA Services S.p.A.

Certificate No. 17VE01465PO1\A

RECORD OF WELD TEST

JOINT DETAILS AND WELDING SEQUENCES PLATE TO TUBE FILLET WELD IN SINGLE PASS									
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
1	**135**	1,0	250	24	**DCEP**	35	8,2	**Spray Arc**	-



PARENT MATERIAL

Material specification	**EN 10025-2 to EN 10210-1**
Type or grade	**S355J2+N to S355J2H**
Group(s)/Subgroup(s) No. (ISO/TR 15608; ISO/TR20172; ISO/TR 20173; ISO/TR20174)	t_1 = **1.2** ; t_2 = **1.2**
Thickness (mm)	t_1 = **6** ; t_2 = **6** Throat thickness (mm) **4,6**
Diameter (mm)	
Branch connection angle	
Other	

WELDING CONSUMABLES

Process	**135-S**
Trade name(s)	**SAPIO SG2**
Specification	**EN 14341-A**
Classification / designation	**G 42 4 M21 3Si1**
Size (mm)	**1,0**
Deposited metal thickness	
Groove	
Throat	**4,6 mm**
Flux trade name	**N.A.**
Consumable insert	**N.A.**
Other	-

GAS	Gas	Mixture	Flow rate (l/min.)
Shielding		**Ar 90,5% + CO_2 7% + O_2 2,5%**	**12**
Trailing			
Backing			

POSITION

Welding position **PB**

Other -

PREHEAT			**POSTWELD HEAT TREATMENT**		
Preheat temperature	**20°C**		Temperature	**None**	Time -
Interpass temperature	**N.A.**		Method	-	
Postheat temperature	-	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 - Welding mode Pulse □ Non pulse □

Other -

TECHNIQUE

Travel speed (range) **See table**

String or weave bead **String** Maximum width of run

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

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

Interpass cleaning **N.A.**

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

Orifice or gas cup size **16 mm**

Distance contact tube/worpiece (*) **12-15 mm**

Multiple or single pass **Single**

Multiple or single electrodes **Single**

Torch angle (*) **None**

Other (*) for fully mechanized/robotic only

HARDNESS TEST		
Location	Type/load	Maximum value
Parent metal(s)	**HV10**	**171**
H.A.Z.(s)	**HV10**	**217**
Weld metal	**HV10**	**191**

OTHER TEST

MACROGRAPHIC EXAMINATION	**Acceptable**
MICROGRAPHIC EXAMINATION	**Not required**
FRACTURE TEST	**Acceptable**

NON DESTRUCTIVE EXAMINATION

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

Issued at: Genova on 20 December 2017

RINA Services S.p.A.

WELDING PROCEDURE QUALIFICATION RECORD (WPQR)

LEVEL 2

N. 17VE01465PO2\A

Manufacturer **ISOL.ME.CAR Srl - Monfalcone (GO)**

WPQR No. **02\17P** Dated **20/12/2017**

Manufacturer's welding procedure (WPS) No. **02\17P** Dated **10/10/2017**

RANGE OF QUALIFICATION

Welding process	**135**	Type	**Partly mechanized**
Joint type	**Plates and Pipes and build-up FW**		
Single/Multiple pass	**Multiple**	**(Impact properties not applied)**	
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 = **N.A.**	Fillet Joint t_1 = **5 and over(*)**	t_2 = **5 and over(*)**
Throat thickness (mm)	**No restriction**		
Weld deposit thickness (mm)	**N.A.**		
Outside pipe diameter (mm)	**Over 150 (PA-PB) ; over 500 (all other qualified positions)(**)**		
Filler metal make	**SAPIO SG2**	Nr. of wires for process 12: **None**	
Flux make	**N.A.**	Flux Designation: **N.A.**	
Filler metal designation	**Solid wire EN ISO 14341-A : G 42 4 M21 3Si1**		
Shielding gas (ISO 14175)	**M24 with CO2% min. 5,6 max. 8,4**	Backing gas (ISO 14175) **None**	
Type of welding current	**DCEP**	**Heat Input** Kj/cm **Min 3,7**	
Welding position	**All, vertical down excluded**	Transfer Mode	**Spray, Pulse, Globular transfer**
Preheat min. (°C)	20 (if ISO/TR 17671-2 requirements are fulfilled)	Interpass temp. Max. (°C) -	
Interpass temp. Max. (°C)	250	Postheat min. (°C) -	Time (minutes) -
Post weld heat treatment / Ageing -	Time (minutes) -		
Other information	**(*) Upper base material thickness limit to be considered 60 mm, when Rina Rules apply.**		
	(**) Over 500 mm, when Rina Rules apply.		
Welder's/Operator's name	**Pacor Joseph Paul**	Stamp No. **PJ**	
Welding test conducted by	**ISOL.ME.CAR Srl - Monfalcone (GO)**		
Mechanical test conducted by	**METAL SERVICES Srl - Ronchi dei Legionari (GO)**	Laboratory test No. **17.864**	
At presence of RINA Surveyor	**F. Sedran**		

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.

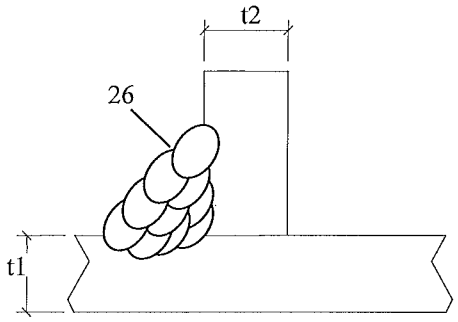
Issued at: Genova on 20 December 2017

RINA Services S.p.A.

Certificate No. 17VE01465PO2\A

RECORD OF WELD TEST

JOINT DETAILS AND WELDING SEQUENCES PLATE TO PLATE FILLET WELD IN MULTIPASS									
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
1	**135**	1,0	235	23,5	**DCEP**	48	5,5	**Spray Arc**	-
2	**135**	1,0	240	23,5	**DCEP**	55	4,9	**Spray Arc**	-
3-26	**135**	1,0	240	23,5	**DCEP**	55	4,9	**Spray Arc**	-



PARENT MATERIAL			
Material specification	**EN 10025-2**		
Type or grade	**S355J2+N**		
Group(s)/Subgroup(s) No. (ISO/TR 15608; ISO/TR20172; ISO/TR 20173; ISO/TR20174)			**1.2**
Thickness (mm)	**t_1 = 30 ; t_2 = 30**	Throat thickness (mm)	**N.A.**
Diameter (mm)	**None**		
Branch connection angle	**N.A.**		
Other	-		

WELDING CONSUMABLES	
Process	**135-S**
Trade name(s)	**SAPIO SG2**
Specification	**EN 14341-A**
Classification / designation	**G 42 4 M21 3Si1**
Size (mm)	**1,0**
Deposited metal thickness	
Groove	
Throat	**20,1 mm**
Flux trade name	**N.A.**
Consumable insert	**N.A.**
Other	-

GAS			
	Gas	Mixture	Flow rate (l/min.)
Shielding		**Ar 90,5% + CO_2 7% + O_2 2,5%**	**12**
Trailing			
Backing			

POSITION

Welding position **PB**

Other -

PREHEAT		**POSTWELD HEAT TREATMENT**	
Preheat temperature	**20°C**	Temperature	**None** Time -
Interpass temperature	**250°C**	Method	-
Postheat temperature	- 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 - Welding mode Pulse □ Non pulse □

Other -

TECHNIQUE

Travel speed (range) **See table**

String or weave bead **String** Maximum width of run

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 (*) **12-15 mm**

Multiple or single pass **Multiple**

Multiple or single electrodes **Single**

Torch angle (*) -

Other (*) for fully mechanized/robotic only

HARDNESS TEST		
Location	Type/load	Maximum value
Parent metal(s)	**HV10**	**174**
H.A.Z.(s)	**HV10**	**283**
Weld metal	**HV10**	**246**

OTHER TEST

MACROGRAPHIC EXAMINATION	**Acceptable**
MICROGRAPHIC EXAMINATION	**Not required**
FRACTURE TEST	**Acceptable**

NON DESTRUCTIVE EXAMINATION

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

Issued at: Genova on 20 December 2017

RINA Services S.p.A.

WELDING PROCEDURE QUALIFICATION RECORD (WPQR)

LEVEL 2

N. 17VE01465PO3\A

Manufacturer **ISOL.ME.CAR Srl - Monfalcone (GO)**

WPQR No. **03\17P** Dated **20/12/2017**

Manufacturer's welding procedure (WPS) No. **03\17P** Dated **10/10/2017**

RANGE OF QUALIFICATION

Welding process	**135**	Type	**Partly mechanized**
Joint type	**Plates and Pipes and build-up BW ssnb-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)	**Max 6 135-D**	**Max 18 135-S**	
Weld deposit thickness (mm)	**3 to 24**		
Outside pipe diameter (mm)	**Over 150 (PA-PB) ; over 500 (all other qualified positions)(*)**		
Filler metal make	**SAPIO SG2**	Nr. of wires for process 12: **None**	
Flux make	**N.A.**	Flux Designation: **N.A.**	
Filler metal designation	**Solid wire EN ISO 14341-A : G 42 4 M21 3Si1**		
Shielding gas (ISO 14175)	**M24 with CO2% min. 5,6 max. 8,4**	Backing gas (ISO 14175) **None**	
Type of welding current	**DCEP**	**Heat Input** Kj/cm **Min 3,6 ; Max 9,2**	
Welding position	**PA**	Transfer Mode **Short Arc ; Spray, Pulse, Globular transfer**	
Preheat min. (°C)	20 (if ISO/TR 17671-2 requirements are fulfilled)	Interpass temp. Max. (°C) -	
Interpass temp. Max. (°C)	250	Postheat min. (°C) -	Time (minutes) -
Post weld heat treatment / Ageing	-	Time (minutes) -	
Other information	**(*) Over 500 mm, when Rina Rules apply.**		

Welder's/Operator's name	**Pacor Joseph Paul**	Stamp No.	**PJ**
Welding test conducted by	**ISOL.ME.CAR Srl - Monfalcone (GO)**		
Mechanical test conducted by	**METAL SERVICES Srl - Ronchi dei Legionari (GO)**	Laboratory test No.	**17.865**
At presence of RINA Surveyor	**F. Sedran**		

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.

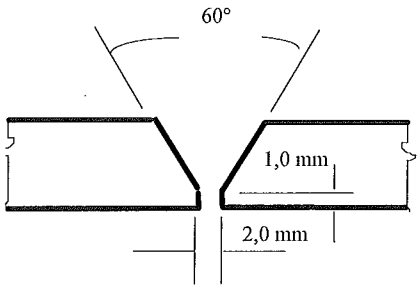
Issued at: Genova on 20 December 2017

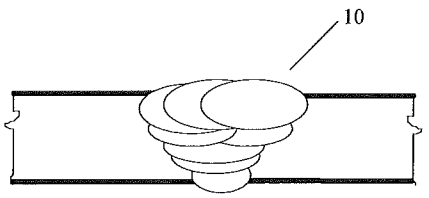
RINA Services S.p.A.

Certificate No. 17VE01465PO3\A

RECORD OF WELD TEST

JOINT DETAILS AND WELDING SEQUENCES PLATE TO PLATE SINGLE-V BUTT JOINT; ONE SIDE WELDING WITHOUT 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
1	**135**	1,0	150	20,0	**DCEP**	30	4,8	**Short Arc**	-
2	**135**	1,0	195	20,5	**DCEP**	26	7,4	**Spray Arc**	-
3-10	**135**	1,0	200	20,5	**DCEP**	40	4,9	**Spray Arc**	-





PARENT MATERIAL			
Material specification	**EN 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**	Throat thickness (mm)	**N.A.**
Diameter (mm)	**None**		
Branch connection angle	**N.A.**		
Other	-		

WELDING CONSUMABLES			
Process	**135-D**	**135-S**	
Trade name(s)	**SAPIO SG2**	**SAPIO SG2**	
Specification	**EN 14341-A**	**EN 14341-A**	
Classification / designation	**G 42 4 M21 3Si1**	**G 42 4 M21 3Si1**	
Size (mm)	**1,0**	**1,0**	
Deposited metal thickness			
Groove	**3 mm**	**9 mm**	
Throat			
Flux trade name	**N.A.**	**N.A.**	
Consumable insert	**N.A.**	**N.A**	
Other	.	-	

GAS			
	Gas	Mixture	Flow rate (l/min.)
Shielding		**Ar 90,5% + CO_2 7% + O_2 2,5%**	**12**
Trailing			
Backing			

POSITION

Welding position **PA**

Other -

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

ELECTRICAL CHARACTERISTICS

Current **DC EP**

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

Mode of metal transfer **Short arc (root pass only), spray arc (other passes)**

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 - Welding mode Pulse □ Non pulse □

Other -

TECHNIQUE

Travel speed (range) **See table**

String or weave bead **String and Weave** Maximum width of run

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 (*) **12 – 15 mm**

Multiple or single pass **Multiple**

Multiple or single electrodes **Single**

Torch angle (*)

Other (*) for fully mechanized/robotic only

TRANSVERSE TENSILE TEST						
Spec. (No.)	Width (mm)	Thickness (mm)	Area (mm^2)	Total load (N)	R_m. (N/mm^2)	Fracture location
2117	**25,0**	**10,2**	**255,0**	**138370**	**553**	**Ductile failure out of weld**
2117	**25,0**	**10,2**	**255,0**	**138087**	**552**	**Ductile failure out of weld**

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

IMPACT TEST

Full size specimens 10 x 10 mm

Spec No.	Notch location	Notch type	Test Temp. (°C)	Impact values (J)	Average (J)
VWT $_{0/1,5}$	**WELD**	**ISO-V**	**-20**	**76 – 55 - 51**	**61**
VHT $_{0/1,5}$	**FUSION LINE**	**ISO-V**	**-20**	**142 – 75 - 98**	**105**
VHT $_{2/1,5}$	**FUSION LINE +2**	**ISO-V**	**-20**	**32 – 53 - 88**	**58**

HARDNESS TEST		
Location	Type/load	Maximum value
Parent metal(s)	**HV10**	**181**
H.A.Z.(s)	**HV10**	**235**
Weld metal	**HV10**	**221**

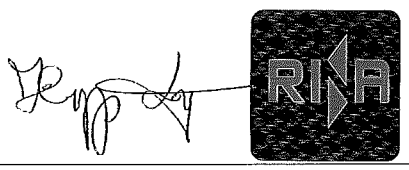
OTHER TEST

MACROGRAPHIC EXAMINATION	**Acceptable**
MICROGRAPHIC EXAMINATION	**Not required**

NON DESTRUCTIVE EXAMINATION

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

Issued at: Genova on 20 December 2017



RINA Services S.p.A.