



RINA



SGQ N° 002 A SSI N° 001 G  
SGA N° 002 D DAP N° 001 H  
PRD N° 002 B PRS N° 066 C  
SCR N° 003 F LAB N° 0832

Signatory of EA, IAF and ILAC  
Mutual Recognition Agreements

WELDING PROCEDURE QUALIFICATION RECORD (WPQR)

N. 11MI00272PO1/A

Manufacturer NUOVA OLEODINAMICA BONVICINI SRL GRUMELLO CREMONESE (CR)

WPQR No. 01/11 Dated

Manufacturer's welding procedure (WPS) No. 01/11 Dated 02/08/2011

RANGE OF APPROVAL

Welding process 136 Type Partly mechanized  
Joint type P/T and branch connections with angle over 60° BW ssmb-bs/FW  
Single/Multiple pass Multiple  
Parent material group(s) 1-1 ISO/TR 15608  
with a specified minimum yield strength ≤ 355 MPa  
Parent material thickness (mm) Butt Joint = 15 to 60 Fillet Joint t<sub>1</sub> = 5 and over t<sub>2</sub> = 5 and over  
Throat thickness (mm) No restriction  
Weld deposit thickness (mm) 15 to 60  
Outside diameter (mm) 109,55 and over  
Filler metal type Metal-cored wire ISO17632-A: T 46 4 M M 1 H5  
Shielding gas (ISO 14175) M21 with max. CO<sub>2</sub> % = 22 Backing gas (ISO 14175) None  
Type of welding current DCEP Heat input kJ/cm 7,8 to 15,8  
Welding position PA - PB  
Preheat min. (°C) 50 Interpass temp. Max. (°C) 200  
Post weld heat treatment / Ageing None  
Other information -

Welders name Da Canal Giovanni Stamp No. DG  
Welding test conducted by NUOVA OLEODINAMICA BONVICINI SRL  
Non destructive test conducted by CRC - RIPALTA CR. (CR) Laboratory test No. 79850/7184 dated 01/09/2011  
Mechanical test conducted by EXOVA SRL - CREMA (CR) Laboratory test No. 163210 dated 14/09/2011  
At presence of RINA Surveyor C. Migliavacca

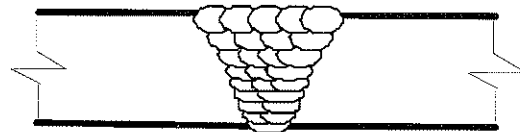
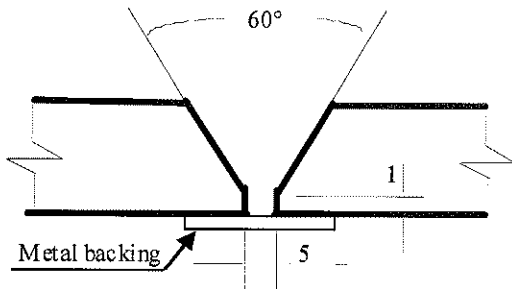
We certify that statements in this certificate are correct and that the test welds were prepared, welded and tested in accordance with the requirements of UNI EN ISO 15614-1: 2008 Standard

Issued at: Genova

on 5 October 2011

RINA Services S.p.A.

JOINT DETAILS AND WELDING SEQUENCES								
SINGLE-V BUTT JOINT; ONE SIDE WELDING WITH METAL BACKING								
Pass No.	Process	Filler metal diam. (mm)	Filler metal classification	Amps	Volt	Travel speed (cm/min)	Heat input (kJ/cm)	Other
1	136	1,2	ISO17632-A: T 46 4 M M 1 H5	205	29	25	11,4	-
2	136	1,2		210	31	29	10,8	-
3	136	1,2		220	31	29	11,3	-
4, 5	136	1,2		225	32	29	11,9	-
6, 7	136	1,2		230	32	28	12,6	-
8 to 10	136	1,2		230	32	28	12,6	-
11 to 13	136	1,2		225	30	28	11,6	-
14 to 17	136	1,2		220	30	28	11,3	-
18 to 21	136	1,2		210	29	28	10,4	-
22 to 26	136	1,2		210	29	28	10,4	-



**PARENT MATERIAL**

Material specification	EN10210		
Type or grade	S355J2H		
Group(s)/Subgroup(s) No. (ISO/TR 15608)	1.2		
Thickness (mm)	30	Throat thickness (mm)	N.A.
Diameter (mm)	219,1		
Backing material	Carbon steel		
Other	-		

**WELDING CONSUMABLES**

Process	136	
Trade name(s)	SAF FRO STEELCORED M10	
Specification	ISO17632-A	
Classification / designation	T 46 4 M M 1 H5	
Size (mm)	1,2	
Deposited metal thickness		
Groove	30 mm	
Throat	N.A.	
Flux trade name	N.A.	
Consumable insert	N.A.	
Other	-	



<b>GAS</b>			
	Gas	Mixture	Flow rate (l/min.)
Shielding	-	80% Ar + 20% CO2	10
Trailing	N.A.	-	-
Backing	N.A.	-	-

<b>POSITION</b>	
Welding position	PA
Other	-

<b>PREHEAT</b>		<b>POSTWELD HEAT TREATMENT</b>	
Preheat temperature	50°C	Temperature	None
Interpass temperature	Max 200°C	Time	-
Other	-	Other	-

<b>ELECTRICAL CHARACTERISTICS</b>			
Current	DCEP		
Ampere (range)	See table	Volts (Range)	See table
Mode of metal transfer	Spray arc		
Tungsten electrode size and type	N.A.		
Other	-		

<b>TECHNIQUE</b>	
Travel speed (range)	See table
String or weave bead	String
Oscillation (*)	-
Method of groove/edge preparation	Machining/Grinding
Interpass cleaning	Grinding/Brushing
Method of back gouging	N.A.
Orifice or gas cup size	18mm
Stand off distance (*)	-
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 <sup>2</sup> )	Total load (N)	R <sub>m</sub> (N/mm <sup>2</sup> )	Fracture location
TT1	25,0	27,2	680	374680	551	Base metal
TT2	25,0	27,4	685	376065	549	Base metal

BEND TEST		
Type	No.	Result
SIDE TRANSVERSE	4 OFF	Acceptable

IMPACT TEST				
Full size specimens (10 x 10 x 55mm)				
Spec No.	Notch location	Notch type	Test Temp. (°C)	Impact values (J)
VWT <sub>0/2</sub>	WELD	ISO-V	-20	105 - 94 - 93
VHT <sub>1/2</sub>	H.A.Z.	ISO-V	-20	156 - 198 - 182

HARDNESS TEST		
Location	Type/load	Maximum value
Parent metal(s)	HV10	187
H.A.Z.(s)	HV10	311
Weld metal	HV10	226

**OTHER TEST**

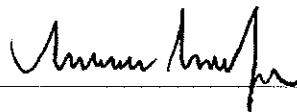
MACROGRAPHIC EXAMINATION      **Acceptable**  
 MICROGRAPHIC EXAMINATION      **Not required**

**NON DESTRUCTIVE EXAMINATION**

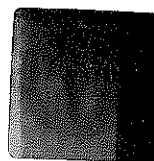
VISUAL EXAMINATION                      **Acceptable**  
 RADIOGRAPHIC EXAMINATION              **Acceptable**  
 PENETRANT TEST                              **Not required**  
 MAGNETIC PARTICLE                          **Acceptable**  
 ULTRASONIC TEST                              **Not required**

Issued at: Genova

on 5 October 2011



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SGQ N° 002 A SSI N° 001 G  
SGA N° 002 D DAP N° 001 H  
PRD N° 002 B PRS N° 065 C  
SCR N° 003 F LAB N° 0832

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Mutual Recognition Agreements

WELDING PROCEDURE QUALIFICATION RECORD (WPQR)

N. 11MI00272PO2/A

Manufacturer NUOVA OLEODINAMICA BONVICINI SRL GRUMELLO CREMONESE (CR)

WPQR No. 02/11 Dated

Manufacturer's welding procedure (WPS) No. 02/11 Dated 02/08/2011

RANGE OF APPROVAL

Welding process 141 + 136 Type Manual (141); Partly mechanized (136)  
Joint type P/T and branch connections with angle over 60° BW ssnb-ssmb-bs/FW (141)  
P/T and branch connections with angle over 60° BW ssmb-bs/FW (136)  
Single/Multiple pass Multiple  
Parent material group(s) 1-1 ISO/TR 15608  
with a specified minimum yield strength ≤ 355 MPa  
Parent material thickness (mm) Butt Joint = 3 to 16 Fillet Joint t<sub>1</sub> = 4 to 9,6 t<sub>2</sub> = 4 to 9,6  
Throat thickness (mm) No restriction  
Weld deposit thickness (mm) 1,6 to 4,6 (141) 3 to 11,4 (136)  
Outside diameter (mm) 30,15 and over  
Filler metal type Solid rod EN1668: W 42 4 W2Si; Metal-cored wire ISO17632-A: T 46 4 M M 1 H5  
Shielding gas (ISO 14175) I1 (141); M21 with max. CO<sub>2</sub> % = 22 (136) Backing gas (ISO 14175) None  
Type of welding current DCEN (141); DCEP (136) Heat input kJ/cm 2,1 to 3,5 (141); 2,9 to 4,8 (136)  
Welding position PA - PB  
Preheat min. (°C) 15 Interpass temp. Max. (°C) 250  
Post weld heat treatment / Ageing None  
Other information -

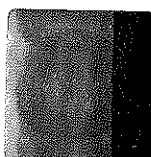
Welders name Da Canal Giovanni Stamp No. DG  
Welding test conducted by NUOVA OLEODINAMICA BONVICINI SRL  
Non destructive test conducted by CRC - RIPALTA CR. (CR) Laboratory test No. 79851/7185 dated 01/09/2011  
Mechanical test conducted by EXOVA SRL - CREMA (CR) Lab. test No. 163209 dated 14/09/2011; 163404 dated 21/09/2011  
At presence of RINA Surveyor C. Migliavacca

We certify that statements in this certificate are correct and that the test welds were prepared, welded and tested in accordance with the requirements of UNI EN ISO 15614-1: 2008 Standard

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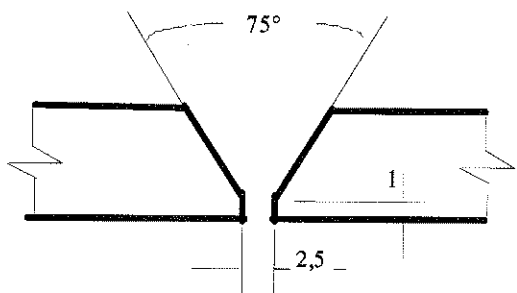
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**JOINT DETAILS AND WELDING SEQUENCES**

**SINGLE-V BUTT JOINT; ONE SIDE WELDING WITHOUT BACKING**

Pass No.	Process	Filler metal diam. (mm)	Filler metal classification	Amps	Volt	Travel speed (cm/min)	Heat input (kJ/cm)	Other
1	141	2,4	EN1668: W424W2Si	110	14	20	2,8	-
2	136	1,2	ISO17632-A: T 46 4 M M 1 H5	150	16	30	3,8	-
3	136	1,2		150	16	30	3,8	-
4	136	1,2		150	16	30	3,8	-



**PARENT MATERIAL**

Material specification	EN10210		
Type or grade	S355J2H (*)		
Group(s)/Subgroup(s) No. (ISO/TR 15608)	1.2		
Thickness (mm)	8	Throat thickness (mm)	N.A.
Diameter (mm)	60,3		
Branch connection angle	N.A.		
Other	* with impact test at -40°C (27J)		

**WELDING CONSUMABLES**

Process	141	136
Trade name(s)	ETC TIG SG1	SAF FRO STEELCORED M10
Specification	EN1668	ISO17632-A
Classification / designation	W 42 4 W2Si	T 46 4 M M 1 H5
Size (mm)	2,4	1,2
Deposited metal thickness		
Groove	2,3mm	5,7mm
Throat	N.A.	N.A.
Flux trade name	N.A.	N.A.
Consumable insert	None	N.A.
Other	-	-



<b>GAS</b>			
	Gas	Mixture	Flow rate (l/min.)
Shielding	Argon (141)	80% Ar + 20% CO2 (136)	7 (141); 10 (136)
Trailing	None	-	-
Backing	N.A.	-	-

<b>POSITION</b>	
Welding position	PA
Other	-

<b>PREHEAT</b>		<b>POSTWELD HEAT TREATMENT</b>	
Preheat temperature	15°C	Temperature	None
Interpass temperature	Max 250°C	Time	-
Other	-	Other	-

<b>ELECTRICAL CHARACTERISTICS</b>			
Current	DCEN (141); DCEP (136)		
Ampere (range)	See table	Volts (Range)	See table
Mode of metal transfer	Short arc (136)		
Tungsten electrode size and type	2,4mm; ISO6848 WTh10		
Other	-		

<b>TECHNIQUE</b>	
Travel speed (range)	See table
String or weave bead	String
Oscillation (*)	-
Method of groove/edge preparation	Machining/Grinding
Interpass cleaning	Grinding/Brushing
Method of back gouging	N.A.
Orifice or gas cup size	12mm (141); 18mm (136)
Stand off distance (*)	-
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 <sup>2</sup> )	Total load (N)	R <sub>m</sub> (N/mm <sup>2</sup> )	Fracture location
TT1	12,0	7,2	86,4	374680	579	Base metal
TT2	12,0	7,2	86,4	376065	566	Weld metal

BEND TEST		
Type	No.	Result
FACE TRANSVERSE	2 OFF	Acceptable
ROOT TRANSVERSE	2 OFF	Acceptable

IMPACT TEST				
Reduced size specimens (10 x 5 x 55mm) – test report n°163404 dated 21/09/2011				
Spec No.	Notch location	Notch type	Test Temp. (°C)	Impact values (J)
VWT <sub>0/2</sub>	WELD	ISO-V	-40	34 - 42 - 32
VHT <sub>1/2</sub>	H.A.Z.	ISO-V	-40	100 - 114 - 128

HARDNESS TEST		
Location	Type/load	Maximum value
Parent metal(s)	HV10	191
H.A.Z.(s)	HV10	217
Weld metal	HV10	214

**OTHER TEST**

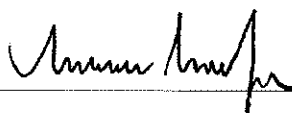
MACROGRAPHIC EXAMINATION      **Acceptable**  
 MICROGRAPHIC EXAMINATION      **Not required**

**NON DESTRUCTIVE EXAMINATION**

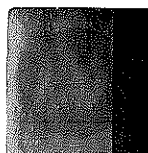
VISUAL EXAMINATION                      **Acceptable**  
 RADIOGRAPHIC EXAMINATION              **Acceptable**  
 PENETRANT TEST                              **Not required**  
 MAGNETIC PARTICLE                          **Acceptable**  
 ULTRASONIC TEST                              **Not required**

Issued at: Genova

on 5 October 2011



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SGQ N° 002 A SSI N° 001 G  
SGA N° 002 D DAP N° 001 H  
PRD N° 002 B PRS N° 066 C  
SCR N° 003 F LAB N° 0832

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WELDING PROCEDURE QUALIFICATION RECORD (WPQR)

N. 11MI00272PO3/A

Manufacturer NUOVA OLEODINAMICA BONVICINI SRL GRUMELLO CREMONESE (CR)

WPQR No. 03/11 Dated

Manufacturer's welding procedure (WPS) No. 03/11 Dated 02/08/2011

RANGE OF APPROVAL

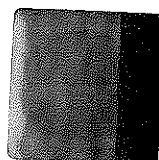
Welding process 136 Type Partly mechanized  
Joint type Set-on branch connections with angle over 60° BW ssnb-ssmb-bs/FW  
Single/Multiple pass Multiple  
Parent material group(s) 1-1 ISO/TR 15608  
with a specified minimum yield strength ≤ 355 MPa  
Parent material thickness (mm) Butt Joint t<sub>1</sub> = 3 to 10 t<sub>2</sub> = 15 to 60 Fillet Joint t<sub>1</sub> = 3 to 6 t<sub>2</sub> = 5 and over  
Throat thickness (mm) No restriction  
Weld deposit thickness (mm) 3 to 10  
Outside diameter (mm) 25,5 and over (branch); over 150 (main)  
Filler metal type Metal-cored wire ISO17632-A: T 46 4 M M 1 H5  
Shielding gas (ISO 14175) M21 with max. CO<sub>2</sub> % = 22 Backing gas (ISO 14175) None  
Type of welding current DCEP Heat input kJ/cm Min 3,2  
Welding position All, vertical down excluded  
Preheat min. (°C) 15 Interpass temp. Max. (°C) 200  
Post weld heat treatment / Ageing None  
Other information -

Welders name Da Canal Giovanni Stamp No. DG  
Welding test conducted by NUOVA OLEODINAMICA BONVICINI SRL  
Non destructive test conducted by CRC - RIPALTA CR. (CR) Laboratory test No. 79852/7186 dated 01/09/2011  
Mechanical test conducted by EXOVA SRL - CREMA (CR) Laboratory test No. 163212 dated 14/09/2011  
At presence of RINA Surveyor C. Migliavacca

We certify that statements in this certificate are correct and that the test welds were prepared, welded and tested in accordance with the requirements of UNI EN ISO 15614-1: 2008 Standard

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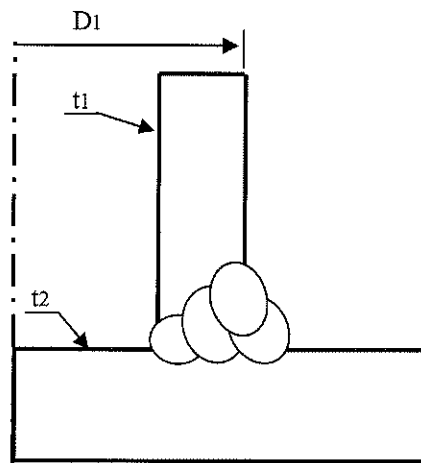
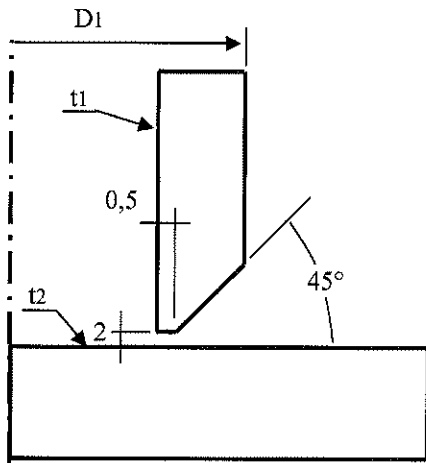
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**JOINT DETAILS AND WELDING SEQUENCES**

PIPE-TO-PIPE SET-ON BRANCH CONNECTION; ONE SIDE WELDING WITHOUT BACKING

Pass No.	Process	Filler metal diam. (mm)	Filler metal classification	Amps	Volt	Travel speed (cm/min)	Heat input (kJ/cm)	Other
1	136	1,2	ISO17632-A: T 46 4 M M 1 H5	145	19	30	4,4	-
2	136	1,2		150	18	30	4,3	-
3	136	1,2		170	18	30	4,9	-
4	136	1,2		170	18	30	4,9	-



**PARENT MATERIAL**

Material specification	t1: EN10210	t2: EN10025
Type or grade	t1: S355J2H	t2: S355J2H
Group(s)/Subgroup(s) No. (ISO/TR 15608)	1.2 to 1.2	
Thickness (mm)	t1 = 5; t2 = 30	Throat thickness (mm) N.A.
Diameter (mm)	D1 = 51	
Branch connection angle	90°	
Other	-	

**WELDING CONSUMABLES**

Process	136
Trade name(s)	SAF FRO STEELCORED M10
Specification	ISO17632-A
Classification / designation	T 46 4 M M 1 H5
Size (mm)	1,2
Deposited metal thickness	
Groove	5mm
Throat	N.A.
Flux trade name	N.A.
Consumable insert	N.A.
Other	-



<b>GAS</b>			
	Gas	Mixture	Flow rate (l/min.)
Shielding	-	80% Ar + 20% CO2	10
Trailing	N.A.	-	-
Backing	N.A.	-	-

<b>POSITION</b>	
Welding position	PC
Other	-

<b>PREHEAT</b>		<b>POSTWELD HEAT TREATMENT</b>	
Preheat temperature	15°C	Temperature	None
Interpass temperature	Max 200°C	Time	-
Other	-	Other	-

<b>ELECTRICAL CHARACTERISTICS</b>			
Current	DCEP		
Ampere (range)	See table	Volts (Range)	See table
Mode of metal transfer	Short arc		
Tungsten electrode size and type	N.A.		
Other	-		

<b>TECHNIQUE</b>	
Travel speed (range)	See table
String or weave bead	String
Oscillation (*)	-
Method of groove/edge preparation	Machining/Grinding
Interpass cleaning	Grinding/Brushing
Method of back gouging	N.A.
Orifice or gas cup size	18mm
Stand off distance (*)	-
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	176
H.A.Z.(s)	HV10	284
Weld metal	HV10	236

**OTHER TEST**


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

**NON DESTRUCTIVE EXAMINATION**

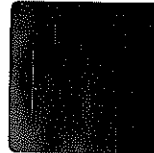
VISUAL EXAMINATION              **Acceptable**  
 RADIOGRAPHIC EXAMINATION      **Acceptable**  
 PENETRANT TEST                      **Not required**  
 MAGNETIC PARTICLE                  **Acceptable**  
 ULTRASONIC TEST                      **Not required**

Issued at: Genova

on 5 October 2011



RINA Services S.p.A.





RINA



SGQ N° 002 A SSI N° 001 G  
SGA N° 002 D DAP N° 001 H  
PRD N° 002 B PRS N° 066 C  
SCR N° 003 F LAB N° 0832

Signatory of EA, IAF and ILAC  
Mutual Recognition Agreements

WELDING PROCEDURE QUALIFICATION RECORD (WPQR)

N. 11MI00272PO4/A

Manufacturer NUOVA OLEODINAMICA BONVICINI SRL GRUMELLO CREMONESE (CR)

WPQR No. 04/11 Dated

Manufacturer's welding procedure (WPS) No. 04/11 Dated 02/08/2011

RANGE OF APPROVAL

Welding process 136 Type Partly mechanized  
Joint type P/T and branch connections with angle over 60° BW ssmb-bs/FW  
Single/Multiple pass Multiple  
Parent material group(s) 1-1 ISO/TR 15608  
with a specified minimum yield strength ≤ 355 MPa  
Parent material thickness (mm) Butt Joint = 50 to 200 Fillet Joint t<sub>1</sub> = 5 and over t<sub>2</sub> = 5 and over  
Throat thickness (mm) No restriction  
Weld deposit thickness (mm) 50 to 200  
Outside diameter (mm) Over 150  
Filler metal type Metal-cored wire ISO17632-A: T 46 4 M M 1 H5  
Shielding gas (ISO 14175) M21 with max. CO<sub>2</sub> % = 22 Backing gas (ISO 14175) None  
Type of welding current DCEP Heat input kJ/cm 2,2 to 9,5  
Welding position PA - PB  
Preheat min. (°C) 50 Interpass temp. Max. (°C) 250  
Post weld heat treatment / Ageing None  
Other information -

Welders name Da Canal Giovanni Stamp No. DG

Welding test conducted by NUOVA OLEODINAMICA BONVICINI SRL

Non destructive test conducted by CRC - RIPALTA CR. (CR) Laboratory test No. 21782/7192 dated 01/09/2011

Mechanical test conducted by EXOVA SRL - CREMA (CR) Laboratory test No. 163211 dated 14/09/2011

At presence of RINA Surveyor C. Migliavacca

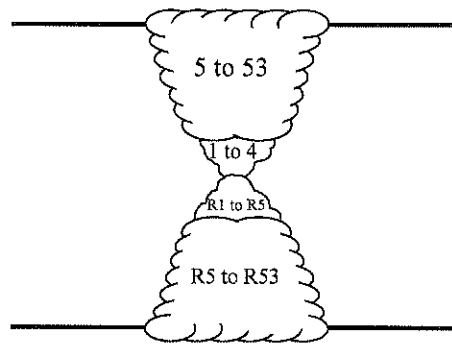
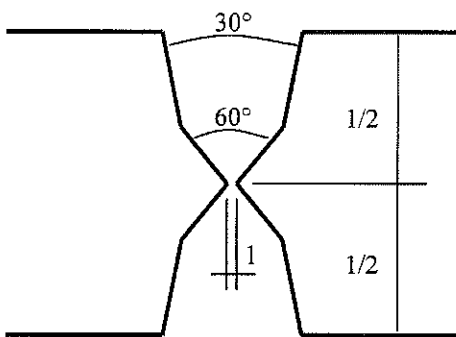
We certify that statements in this certificate are correct and that the test welds were prepared, welded and tested in accordance with the requirements of UNI EN ISO 15614-1: 2008 Standard

Issued at: Genova

on 5 October 2011

RINA Services S.p.A.

JOINT DETAILS AND WELDING SEQUENCES									
DOUBLE-V BUTT JOINT; TWO SIDE WELDING									
Pass No.	Process	Filler metal diam. (mm)	Filler metal classification	Amps	Volt	Travel speed (cm/min)	Heat input (kJ/cm)	Other	
1	136	1,2	ISO17632-A: T 46 4 M M 1 H5	170	18	50	2,9	-	
2	136	1,2		250	24	38	7,6	-	
3, 4	136	1,2		260	24	50	6,0	-	
Grinding to sound metal				-					
R1 to R5	136	1,2		240	24	40	6,9	-	
5 to 53	136	1,2		260	24	40	7,5	-	
R6 to R53	136	1,2		260	24	40	7,5	-	



PARENT MATERIAL			
Material specification	EN10025-2		
Type or grade	S355J2+N		
Group(s)/Subgroup(s) No. (ISO/TR 15608)	1.2		
Thickness (mm)	100	Throat thickness (mm)	N.A.
Diameter (mm)	N.A.		
Branch connection angle	N.A.		
Other	-		

WELDING CONSUMABLES			
Process	136		
Trade name(s)	SAF FRO STEELCORED M10		
Specification	ISO17632-A		
Classification / designation	T 46 4 M M 1 H5		
Size (mm)	1,2		
Deposited metal thickness			
Groove	100 mm		
Throat	N.A.		
Flux trade name	N.A.		
Consumable insert	N.A.		
Other	-		



<b>GAS</b>			
	Gas	Mixture	Flow rate (l/min.)
Shielding	-	80% Ar + 20% CO2	10
Trailing	N.A.	-	-
Backing	N.A.	-	-

<b>POSITION</b>	
Welding position	PA
Other	-

<b>PREHEAT</b>		<b>POSTWELD HEAT TREATMENT</b>	
Preheat temperature	50°C	Temperature	None
Interpass temperature	Max 250°C	Time	-
Other	-	Other	-

<b>ELECTRICAL CHARACTERISTICS</b>			
Current	DCEP		
Ampere (range)	See table	Volts (Range)	See table
Mode of metal transfer	Short arc (1st pass); spray arc (other passes)		
Tungsten electrode size and type	N.A.		
Other	-		

<b>TECHNIQUE</b>	
Travel speed (range)	See table
String or weave bead	String
Oscillation (*)	-
Method of groove/edge preparation	Machining/Grinding
Interpass cleaning	Grinding/Brushing
Method of back gouging	Grinding to sound metal
Orifice or gas cup size	18mm
Stand off distance (*)	-
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 <sup>2</sup> )	Total load (N)	R <sub>m</sub> (N/mm <sup>2</sup> )	Fracture location
TT1	25	51,80	1295	669515	517	Base metal
TT2	25	51,90	1297,5	664320	512	Base metal
TT3	25	51,90	1297,5	681188	525	Base metal
TT4	25	52,00	1300	681200	524	Base metal

BEND TEST		
Type	No.	Result
SIDE TRANSVERSE	4 OFF	Acceptable

IMPACT TEST				
Full size specimens (10 x 10 x 55mm)				
Spec No.	Notch location	Notch type	Test Temp. (°C)	Impact values (J)
VWT <sub>0/2</sub>	WELD	ISO-V	-20	61 - 69 - 65
VHT <sub>1/2</sub>	H.A.Z.	ISO-V	-20	98 - 90 - 108
VWT <sub>0/45</sub>	WELD	ISO-V	-20	74 - 72 - 71
VHT <sub>1/45</sub>	H.A.Z.	ISO-V	-20	167 - 180 - 179

HARDNESS TEST		
Location	Type/load	Maximum value
Parent metal(s)	HV10	171
H.A.Z.(s)	HV10	278
Weld metal	HV10	275

## OTHER TEST

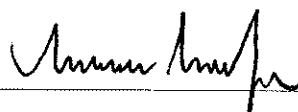
MACROGRAPHIC EXAMINATION      Acceptable  
 MICROGRAPHIC EXAMINATION      Not required

## NON DESTRUCTIVE EXAMINATION

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

Issued at: Genova

on 5 October 2011



RINA Services S.p.A.





# SPECIFICA DI SALDATURA (WPS) IN ACCORDO ALLA EN ISO 15609-1

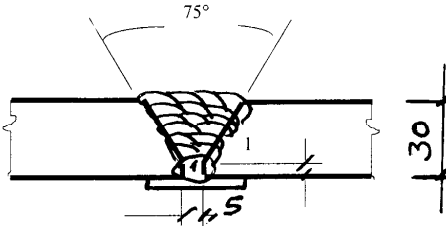
FABBRICANTE: NUOVA OLEODINAMICA BONVICINI srl

SPECIFICA DI SALDATURA No.: 01-11 DATA: 02-08-2011

PROCESSO DI SALDATURA: 136 TIPO: SEMIAUTOMATICO

WPAR DI RIFERIMENTO (se richiesto): \_\_\_\_\_ DATA: \_\_\_\_\_

### DETTAGLI DELLA PREPARAZIONE/SEQUENZA DI SALDATURA

	Pass.	Processo	Diam.	A	V	cm/min
	1	136	1,2	205	29	25
	2	136	1,2	210	31	29
	3	136	1,2	220	31	29
	4-n	136	1,2	220	30	28

#### GIUNTO

Tipo di giunto: <u>BUTT.WELD</u> Sostegno: <u>SI</u> Materiale sostegno: <u>MATAL BACKING</u>	Ripresa al rovescio: <u>NO</u> Preparazione e pulizia: <u>SMER. E SPAZZOLATURA</u> Altro: <u>NO</u>
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#### MATERIALE BASE

Designazione: <u>S355J2+H</u> con <u>S 355 J2+H</u>
Gruppo (CR ISO 15608): <u>1.2</u> con <u>1.2</u>
Spessore (mm): <u>30</u> con <u>30</u>
Diametro esterno (mm): <u>219</u> con <u>219</u>

#### POSIZIONE DI SALDATURA

Posizione: <u>PA</u>
Angolo del tronchetto: <u>N.A</u>
Altro: <u>N.A</u>

#### MATERIALE D'APPORTO

Processo: <u>136</u>
Nome commerciale: <u>SAF FRO STEELCORED M10</u>
Designazione: <u>EN 17632A</u> <u>T46 4M M1 H5</u>
Diametro (mm): <u>1,2</u>
Spessore depositato (mm): <u>32</u>
Altezza di gola (mm): <u>N.A.</u>

#### PARAMETRI ELETTRICI

Tipo di corrente/Polarità: <u>DCEP</u>
Corrente (A): <u>VEDI TABELLA</u>
Voltaggio (V): <u>VEDI TABELLA</u>
Modalità di trasferimento: <u>SPRAY ARC</u>
Altro: _____

#### GAS

Composizione: <u>80% AR +20% CO2 ISO 14175 M21</u>
Portata (l/min): <u>10 - 12</u>
Rovescio: <u>N.A.</u>
Portata (l/min): <u>N.A.</u>
Altro: <u>N.A.</u>

#### PRERISCALDO/INTERPASS/PWHT

Preriscaldamento (°C): <u>50</u>
Interpass (°C): <u>150 - 250</u>
Postriscaldamento (°C): <u>N.A.</u>
PWHT temperatura & tempo: <u>N.A.</u>
Mantenimento preriscaldamento: <u>N.A.</u>

#### ALTRE INFORMAZIONI

Diametro ugello (mm): <u>18</u> Tipo elettrodo tungsteno: <u>N.A.</u> Diam. elettrodo tungsteno (mm): <u>N.A.</u> Pass. Stretta o larga: <u>STRING</u>	*Oscillazione: <u>N.A.</u> *Distanza punta-pezzo (mm): <u>N.A.</u> *Angolo torcia: <u>N.A.</u> Velocità (cm/min): <u>N.A.</u>
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\*Solo per processi fully mechanized/robot.



FABBRICANTE



# SPECIFICA DI SALDATURA (WPS) IN ACCORDO ALLA EN ISO 15609-1

FABBRICANTE: NUOVA OLEODINAMICA BONVICINI srl

SPECIFICA DI SALDATURA No.: 03-11

DATA: 02-08-2011

PROCESSO DI SALDATURA: 136

TIPO: SEMIAUTOMATICO

WPAR DI RIFERIMENTO (se richiesto):

DATA:

### DETTAGLI DELLA PREPARAZIONE/SEQUENZA DI SALDATURA

	Pass.	Processo	Diam.	A	V	cm/min
	1	136	1,2	145	19	30
	2	136	1,2	150	18	30
	3	136	1,2	170	18	30
	4	136	1,2	170	18	30

### GIUNTO

Tipo di giunto: BUTT WELD

Ripresa al rovescio: NO

Sostegno: NO

Preparazione e pulizia: SMER. E SPAZZOLATURA

Materiale sostegno: NA

Altro: NO

### MATERIALE BASE

### POSIZIONE DI SALDATURA

Designazione: S355J2+H con S 355 J2+H

Posizione: PB

Gruppo (CR ISO 15608): 1.2 con 1.2

Angolo del tronchetto: N.A.

Spessore (mm): 5 con 30

Altro: N.A.

Diametro esterno (mm): 60,3 con =

### MATERIALE D'APPORTO

### PARAMETRI ELETTRICI

Processo: 136

Tipo di corrente/Polarità: DCEP

Nome commerciale: SAF FRO STEELCORED M10

Corrente (A): VEDI TABELLA

Designazione: ISO 17632° : T46 4M M1 H5

Voltaggio (V): VEDI TABELLA

Diametro (mm): 1,2

Modalità di trasferimento:

Spessore depositato (mm): 8

Altro:

Altezza di gola (mm):

### GAS

### PRERISCALDO/INTERPASS/PWHT

Composizione: 80% AR+20%CO2 – ISO 14175 M21

Preriscaldamento (°C): 50

Portata (l/min): 8 - 12

Interpass (°C): 150 - 250

Rovescio: N.A.

Postriscaldamento (°C): N.A.

Portata (l/min): N.A.

PWHT temperatura & tempo: N.A.

Altro: N.A.

Mantenimento preriscaldamento: N.A.

### ALTRE INFORMAZIONI

Diametro ugello (mm): 18

\*Oscillazione: N.A.

Tipo elettrodo tungsteno: NA

\*Distanza punta-pezzo (mm): N.A.

Diam. elettrodo tungsteno (mm): 1,2

\*Angolo torcia: N.A.

Pass. Stretta o larga: STRING

Velocità (cm/min): N.A.

\*Solo per processi fully mechanized/robotic.

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# SPECIFICA DI SALDATURA (WPS) IN ACCORDO ALLA EN ISO 15609-1

FABBRICANTE: NUOVA OLEODINAMICA BONVICINI srl

SPECIFICA DI SALDATURA No.: 04-11 DATA: 02-08-2011

PROCESSO DI SALDATURA: 136 TIPO: SEMIAUTOMATICO

WPAR DI RIFERIMENTO (se richiesto): \_\_\_\_\_ DATA: \_\_\_\_\_

### DETTAGLI DELLA PREPARAZIONE/SEQUENZA DI SALDATURA

	Pass.	Processo	Diam.	A	V	cm/min
	1	136	1,2	170	18	50
	2	136	1,2	250	24	40
	3	136	1,2	240	24	35
	4-n	136	1,2	270	24	40

### GIUNTO

Tipo di giunto: <u>BUTT.WELD</u> Sostegno: <u>SI</u> Materiale sostegno: <u>MATAL BACKING</u>	Ripresa al rovescio: <u>SI</u> Preparazione e pulizia: <u>SMER. E SPAZZOLATURA</u> Altro: <u>NO</u>
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### MATERIALE BASE

Designazione: <u>S355J2+H</u> con <u>S 355 J2+H</u>
Gruppo (CR ISO 15608): <u>1.2</u> con <u>1.2</u>
Spessore (mm): <u>100</u> con <u>100</u>
Diametro esterno (mm): <u>=</u> con <u>=</u>

### POSIZIONE DI SALDATURA

Posizione: <u>PA</u>
Angolo del tronchetto: <u>N.A.</u>
Altro: <u>N.A.</u>

### MATERIALE D'APPORTO

Processo: <u>136</u>
Nome commerciale: <u>SAF FRO STEELCORED M10</u>
Designazione: <u>EN 17632A</u> <u>T46 4M M1 H5</u>
Diametro (mm): <u>1,2</u>
Spessore depositato (mm): <u>105</u>
Altezza di gola (mm): <u>N.A.</u>

### PARAMETRI ELETTRICI

Tipo di corrente/Polarità: <u>DCEP</u>
Corrente (A): <u>VEDI TABELLA</u>
Voltaggio (V): <u>VEDI TABELLA</u>
Modalità di trasferimento: _____
Altro: _____

### GAS

Composizione: <u>80% AR +20% CO2 ISO 14175 M21</u>
Portata (l/min): <u>10 - 12</u>
Rovescio: <u>N.A.</u>
Portata (l/min): <u>N.A.</u>
Altro: <u>N.A.</u>

### PRERISCALDO/INTERPASS/PWHT

Preriscaldamento (°C): <u>50</u>
Interpass (°C): <u>150 - 250</u>
Postriscaldamento (°C): <u>N.A.</u>
PWHT temperatura & tempo: <u>N.A.</u>
Mantenimento preriscaldamento: <u>N.A.</u>

### ALTRE INFORMAZIONI

Diametro ugello (mm): <u>18</u> Tipo elettrodo tungsteno: <u>N.A.</u> Diam. elettrodo tungsteno (mm): <u>N.A.</u> Pass. Stretta o larga: <u>STRING</u>	*Oscillazione: <u>N.A.</u> *Distanza punta-pezzo (mm): <u>N.A.</u> *Angolo torcia: <u>N.A.</u> Velocità (cm/min): <u>N.A.</u>
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\*Solo per processi fully mechanized/robotic



**RINA**

C. M. Lavacca

FABBRICANTE