Base Load Power Hub (BLPH)

WELDING PROCEDURE SPECIFICATION (WPS) AND QUALIFICATION (PQR) RECORDS

Document Number: 1723001756-WEL-PRO-00013

Document Class: 2

Rev.	Date	Description	Prepared	Reviewed	Approved
04	24/07/2024	Accepted for contruction (AFC)	A.Sandonà	M.Carminati	N.Tosto
03	12/03/2024	Accepted for contruction (AFC)	A.Sandonà	M.Carminati	N.Tosto
02	08/03/2024	Accepted for contruction (AFC)	A.Sandonà	M.Carminati	N.Tosto
01	02/02/2024	Issue for Review (IFR)	A.Sandonà	M.Carminati	N.Tosto
00	21/11/2023	Issue for Review (IFR)	A.Sandonà	M.Carminati	N.Tosto

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Revision / Change Log

Rev.	Description
00	Issue for Review (IFR)
01	Issue for Review (IFR)
02	Accepted for construction (AFC)
03	Accepted for construction (AFC)
04	Accepted for construction (AFC)

HOLDS LIST

No.	Description
1	
2	
3	
4	

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Subscribed Capital: € 14.560.000 - Paid-up Capital: € 11.600.000
Website: http://www.brembanarolle.com - VAT No. IT07348970158 - C.F. 00226780161

PURCHASER DATA		MANUFACTURER DATA	
CLIENT: Cliente:	Rosetti Marino	**JOB No.:** Commessa No.:	23096
PLANT: Impianto:	Crosswind Hollande Kust Noord Wind Park Project	**DWG. No.:** Disegno No.:	23096-01-EGA1
P.O.: Ordine:	1723001756 123A90A	**SERIAL No.:** No. di serie:	23096-01÷06-SNA
ITEM: Sigla:	V25001 A/F H2 Storage Vessel	**DOC. N. B&R:** DOC. N. Client: DOC. N. User:	23096-01-TWB1

APPLICABLE CODE:

ASME SECT. IX 2021 Edition
ASME SECT. VIII Div.2 2021 Edition
PED 2014/68/EU

APPLICABLE STANDARDS / SPECIFICATIONS:

Datasheet 123A90-DDL-MAC-DS-50027

WELDING BOOK - Quaderno di saldatura

- Zone reserved for approval stamps -

REV.	DATE-Data	DESCRIPTION - Descrizione	ISSUED BY Preparato da A. Sandonà	CHECKED BY Controllato da M. Carminati	VERIFIED BY Verificato da N. Tosto
4	24.07.2024	Added WPS W09 and PQR 63/17 for nameplate support	A.S.	M.C.	N.T.
3	12.03.2024	Revised as per customer comments	A.S.	M.C.	N.T.
2	08.03.2024	Revised as per customer comments	A.S.	M.C.	N.T.
1	02.02.2024	Revised as per customer comments	A.S.	M.C.	N.T.
0	20.11.2023	Issued for approval	A.S.	M.C.	N.T.

WELDING PROCEDURES SUMMARY LIST
ELENCO PROCEDURE DI SALDATURA

Purchaser:	**Rosetti Marino**
Item No.:	**V25001 A/F**
Serial No.:	**23096-01÷06-SNA**
B&R Job No.:	**23096**

Joint Giunto	WPS Spec.	Rev.	PQR PQR	PROCESS/ES Processo/i	Joint description Descrizione giunto	Materials Materiali	Type tipo	thk.mm sp.mm	CVN CVN	PWHT PWHT	Rmks. Note
C1-C6	W08	0	51/15	GTAW SMAW SAW	Head circumferential weld	SA 516 Gr.60 to SA 516 Gr.60	U	44	Yes	Yes	
C2÷C5	W01	0	51/15	GTAW SMAW SAW	Shell circumferential weld	SA 516 Gr.60 to SA 516 Gr.60	X	44	Yes	Yes	
L1÷L5	W01	0	51/15	GTAW SMAW SAW	Shell longitudinal weld	SA 516 Gr.60 to SA 516 Gr.60	X	44	Yes	Yes	
M1-M2	W02	0	51/15	GTAW SMAW SAW	Nozzle to head weld	SA 516 Gr.60 to SA 350 LF2	½ V	40	Yes	Yes	
N1-N3-N5	W03	0	51/15	GTAW SMAW	Nozzle to shell weld	SA 516 Gr.60 to SA 350 LF2	½ V	44	Yes	Yes	
N2-N4	W03	0	51/15	GTAW SMAW	Nozzle to shell weld	SA 516 Gr.60 to SA 350 LF2	½ V	44	Yes	Yes	
K1-K2	W03	0	51/15	GTAW SMAW	Nozzle to shell weld	SA 516 Gr.60 to SA 350 LF2	½ V	44	Yes	Yes	
LL/1÷LL/4	W06	0	51/15	GTAW SMAW SAW	Typical liftiing lug pad weld	SA 516 Gr.60 to SA 516 Gr.60	Fillet	All	N.A.	Yes	
R1÷R6	W06	0	51/15	GTAW SMAW SAW	Typical internal rung weld	SA 516 Gr.60 to SA 516 Gr.60	Fillet	All	N.A.	Yes	
F1/1-L **F1/1-R**	W05	0	51/15	GTAW SMAW	Typical liftiing lug on M1 flat cover weld	SA 516 Gr.60 to SA 350 LF2	K+Fillet / ½ V+Fillet	All ≤18	No	Yes	
F1/2-L **F1/2-R**	W05	0	51/15	GTAW SMAW	Typical liftiing lug on M2 flat cover weld	SA 516 Gr.60 to SA 350 LF2	K+Fillet / ½ V+Fillet	All ≤18	No	Yes	
F2/1-T **F2/1-B**	W04	0	51/15	GTAW SMAW	Typical hinge lug for flat cover on M1 nozzle	SA 516 Gr.60 to SA 350 LF2	K+Fillet / ½ V+Fillet	All >18	Yes	Yes	
F2/2-T **F2/2-B**	W04	0	51/15	GTAW SMAW	Typical hinge lug for flat cover on M2 nozzle	SA 516 Gr.60 to SA 350 LF2	K+Fillet / ½ V+Fillet	All >18	Yes	Yes	
H/1-H/2	W06	0	51/15	GTAW SMAW SAW	Typical handle on flat cover	SA 516 Gr.60 to SA 350 LF2	Fillet	All	N.A.	Yes	
NP	W09	0	63/17	GTAW	Name plate support weld	SA 516 Gr.60 to SA 240 316L	Fillet	All	N.A.	Yes	
F3/1-F3/2	W06	0	51/15	GTAW SMAW SAW	Typical fillet weld	SA 516 Gr.60 to SA 516 Gr.60	Fillet	All	N.A.	Yes	
F4	W07	0	24/17	FCAW	Typical no pressure parts fillet weld	SA 516 Gr.60 to SA 516 Gr.60	Fillet	All	N.A.	Yes	
WR	WR	0	51/15	SMAW SAW	Typical for Welding Repair	SA 516 Gr.60 / SA 350 LF2 / W.M. P.No.4	Sketch	N.A.	N.A.	Yes	

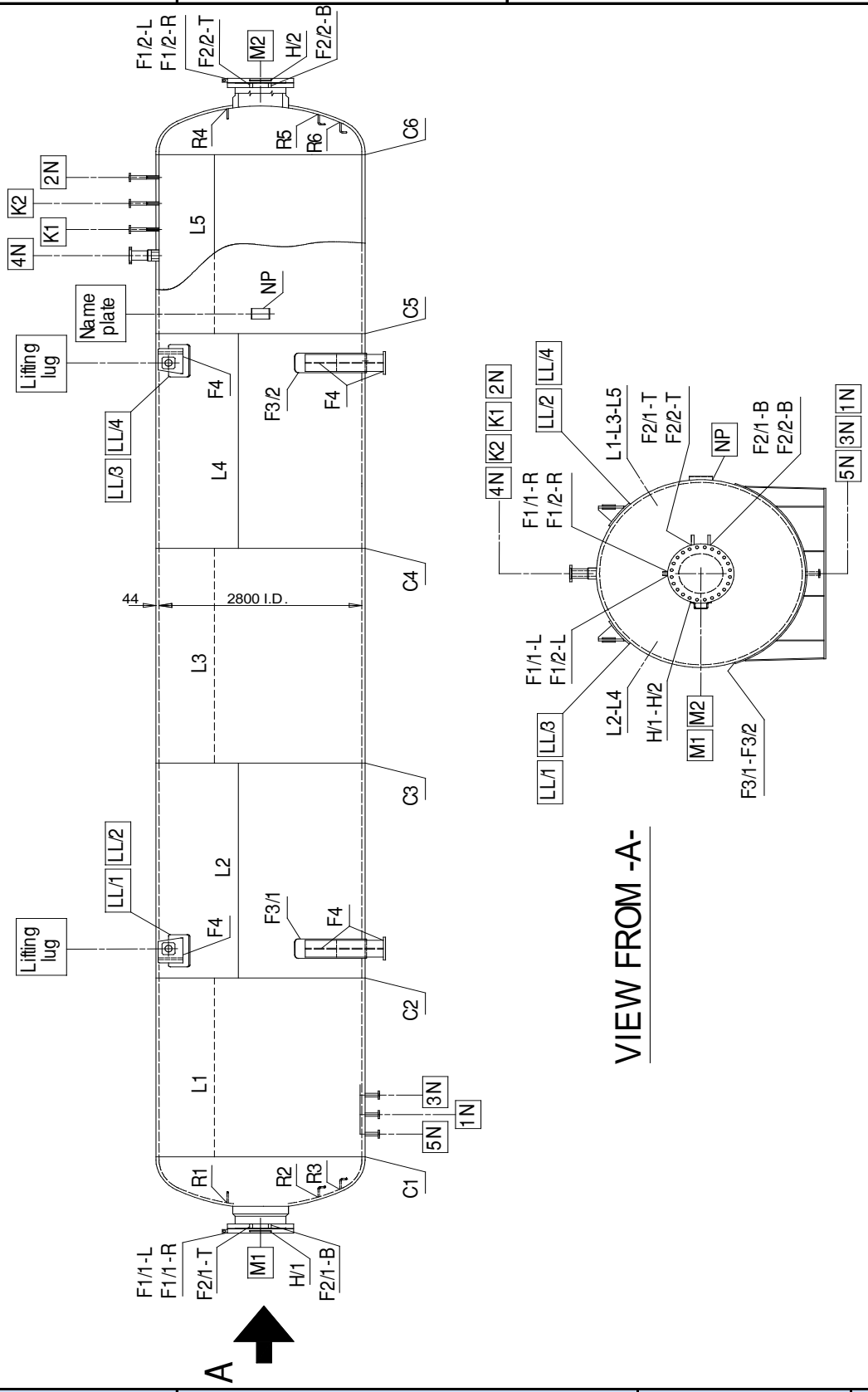
Remarks:

ISSUED BY - Preparato da:	**APPROVED BY** - Approvato da:	**DATE** - Data:	**REV.**- Rev.:
A. SANDONÀ	**N. TOSTO**	**24.07.2024**	**3**
A. SANDONÀ	**N. TOSTO**	**12.03.2024**	**2**
A. SANDONÀ	**N. TOSTO**	**08.03.2024**	**1**
A. SANDONÀ	**N. TOSTO**	**20.11.2023**	**0**

WELDING MAP 1 of 1

Mappa delle Saldature 1 of 1

Purchaser:	**Rosetti Marino**
Item No.:	**V25001 A/F**
Serial No.:	**23096-01÷06-SNA**
B&R Job No.:	**23096**



ISSUED BY - Preparato da:	**APPROVED BY** - Approvato da:	**DATE** - Data:	**REV.**-Rev.:
A. SANDONÀ	**N. TOSTO**	**12.03.2024**	**2**
A. SANDONÀ	**N. TOSTO**	**08.03.2024**	**1**
A. SANDONÀ	**N. TOSTO**	**20.11.2023**	**0**

REMARKS SHEET

FOGLIO NOTE

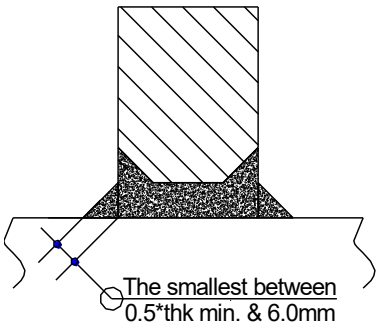
Purchaser:	Rosetti Marino
Item No.:	V25001 A/F
Serial No.:	23096-01÷06-SNA
B&R Job No.:	23096

Fit-up misallignment tolerances:

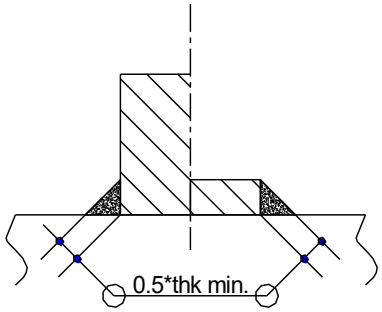
SI Units

Section Thickness, mm	Joint Categories A	Joint Categories B, C, & D
Up to 13, incl.	$\frac{1}{4}t$	$\frac{1}{4}t$
Over 13 to 19, incl.	3 mm	$\frac{1}{4}t$
Over 19 to 38, incl.	3 mm	5 mm
Over 38 to 51, incl.	3 mm	$\frac{1}{8}t$
Over 51	Lesser of $\frac{1}{16}t$ or 10 mm	Lesser of $\frac{1}{8}t$ or 19 mm

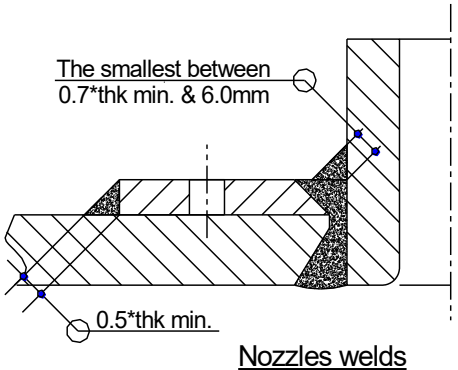
Typical weld throat dimensions (if not otherwise quoted on construction drawings):



Corner joints - full penetration



Fillet welds



Nozzles welds

WELDING PRODUCTION TEST PLATES - Talloni di produzione

Not required / Non richiesti - Exempt from impact test as per ASME VIII Div.2 - Part.3 - Figure 3.8 /3.8M

MINIMUM DESIGN METAL TEMPERATURE - Temperatura minima di progetto

-29 °C

REMARKS - Note

1) Weld bevels and edges shall be free from dirt, oils, paint and other foreign materials for at least 25 mm around.

2) All slag, loose, dirt, scale, weld spattern, oils, paint and other foreign material shall be removed before welds visual inspection.

3) In case of repairs occurs before or after PWHT, repairs activities shall follow what detailed in B&R procedure nominated "121 WR_Procedure for repairing of welds" attached to this document.

ISSUED BY - Preparato da:	APPROVED BY - Approvato da:	DATE - Data:	REV.-Rev.:
A. SANDONÀ	N. TOSTO	02.02.2024	1
A. SANDONÀ	N. TOSTO	20.11.2023	0

Welding Procedure Specification (WPS)

ASME Boiler and Pressure Vessel Code Section IX QW-200.1

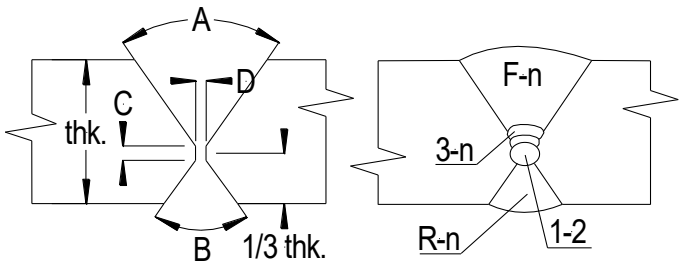
Job:	23096	WPS:	W01
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	20.11.2023

Welding Process:	GTAW	SMAW	SAW	
Type:	MANUAL	MANUAL	MACHINE	

Supporting PQR: 51/15

JOINTS (QW-402)

Design: X | Backing: GTAW No, other Yes | Material: Base + Weld metal



Dimensions:

A:	40° ± 5°
B:	50° ± 5°
C:	1 ÷ 2 mm
D:	3 ÷ 5 mm
E:	-
R:	-
Thk.:	See summary sheet

Retainers: No (QW-402.11)

Tack weld: According to process GTAW or SMAW of present WPS

Weld Bevel Code: ASC36

BASE METAL (QW-403)

Material Spec.; Type or Grade:	SA 516 Gr.60			
to Material Spec.; Type or Grade:	SA 516 Gr.60			
P-No.:	1	Gr. No.:	1	to P-No.: 1 Gr. No.: 1
Base Metal Groove T Limits (mm):	16 ÷ 200	Fillet (mm):	All	
Pipe Ø Range Groove (mm):	All	Fillet (mm):	All	
Other:	t pass ≤ 13 mm (QW-403.9)	T Limits (QW-403.6):	Yes	
Other:	No			

FILLER METAL (QW-404)

Process (es):	GTAW	SMAW	SAW	
SFA Specification:	5.18	5.1	5.17	
AWS Classification:	ER70S-3	E7018-1 H4	EH12K	
Filler metal F-No.:	6	4	6	
Weld Metal A-No.:	1	1	1	
Size (mm):	2.4	4 - 5	4	
Product Form:	Solid Wire	N.A.	Solid Wire	
Trade Name:	EML5	Tenax 35S	OK Autrod 12.32	
Supplier:	Bohler	Oerlikon	ESAB	
Flux Trade Name:	N.A.	N.A.	OK Flux 10.62	
Flux Type:	N.A.	N.A.	Neutral/Non Alloying	
Supplier:	N.A.	N.A.	ESAB	
Wire/Flux Class.:	N.A.	N.A.	F7P8-EH12K	
Consumable Ins.:	No	N.A.	N.A.	
Supplemental:	No	N.A.	No	
Recrushed slag:	N.A.	N.A.	No	
Max. weld metal thk.:	8	200	200	
Other:				

POSITION (QW-405)

Process:	GTAW	SMAW	SAW	
Position of Groove:	1G	1G	1G	
Position of Fillet:	N.A.	N.A.	N.A.	
Welding Progression:	N.A.	N.A.	N.A.	
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	250	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/
Other:	No			
Cooling under Insulation:	No			

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:			
Trailing:			
Other:	No		

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW	SMAW	SAW
Current Type:	DC	DC	DC
Pulsing Current:	No	N.A.	N.A.
Polarity:	EN	EP	EP
Tung. El. Type:	EWTh-2	N.A.	N.A.
Tung. El. Ø:	2.4	N.A.	N.A.
Transfer Mode:	N.A.	N.A.	N.A.
Other:	No		

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	10
Initial Cleaning:	Machining
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	N.A.
Oscillation:	No
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	Single
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	25 ÷ 30
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual and Machine
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1-2	GTAW	ER70S-3	2.4	DCEN	110 ÷ 150	10 ÷ 14	060 ÷ 090	/	/	733 ÷ 2100
3-n	SMAW	E7018-1 H4	4	DCEP	150 ÷ 190	24 ÷ 27	180 ÷ 220	/	/	982 ÷ 1710
	SMAW	E7018-1 H4	5	DCEP	180 ÷ 220	24 ÷ 27	190 ÷ 240	/	/	1080 ÷ 1876
F-n/R-n	SAW	EH 12K	4	DCEP	500 ÷ 535	28 ÷ 31	510 ÷ 540	/	/	1556 ÷ 1951

REMARKS:

Issued by:
A. Sandonà
Welding Department

Approved by:
N. Tosto
Welding Department Manager

Welding Procedure Specification (WPS)

ASME Boiler and Pressure Vessel Code Section IX QW-200.1

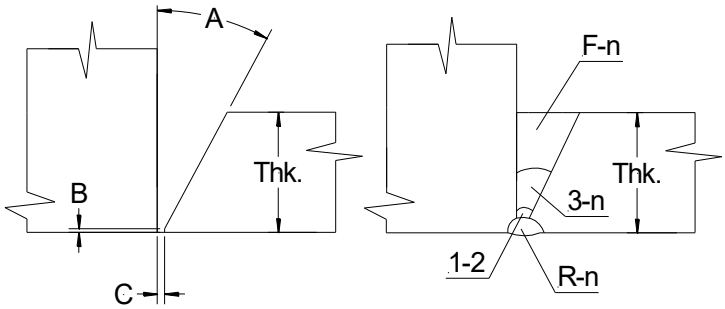
Job:	23096	WPS:	W02
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	20.11.2023

Welding Process:	GTAW	SMAW	SAW	
Type:	MANUAL	MANUAL	MACHINE	

Supporting PQR: 51/15

JOINTS (QW-402)

Design: ½ V | Backing: 1st layer No, other Yes | Material: Weld metal



Dimensions:

A:	25° +5/-0°
B:	0 ÷ 1 mm
C:	3 ÷ 5 mm
D:	See remarks sheet
E:	-
F:	-
R:	-
Thk.:	See summary

Retainers: No (QW-402.11)

Tack weld: According to process GTAW or SMAW of present WPS

Weld Bevel Code: ASC29

BASE METAL (QW-403)

Material Spec.; Type or Grade: SA 516 Gr.60

to Material Spec.; Type or Grade: SA 350 LF2

P-No.: 1 Gr. No.: 1 to P-No.: 1 Gr. No.: 2

Base Metal Groove T Limits (mm): 16 ÷ 200 Fillet (mm): All

Pipe Ø Range Groove (mm): All Fillet (mm): All

Other: t pass ≤ 13 mm (QW-403.9) T Limits (QW-403.6): Yes

Other: No

FILLER METAL (QW-404)

Process (es):	GTAW	SMAW	SAW	
SFA Specification:	5.18	5.1	5.17	
AWS Classification:	ER70S-3	E7018-1 H4	EH12K	
Filler metal F-No.:	6	4	6	
Weld Metal A-No.:	1	1	1	
Size (mm):	2.4	4 - 5	4	
Product Form:	Solid Wire	N.A.	Solid Wire	
Trade Name:	EML5	Tenax 35S	OK Autrod 12.32	
Supplier:	Bohler	Oerlikon	ESAB	
Flux Trade Name:	N.A.	N.A.	OK Flux 10.62	
Flux Type:	N.A.	N.A.	Neutral/Non Alloying	
Supplier:	N.A.	N.A.	ESAB	
Wire/Flux Class.:	N.A.	N.A.	F7P8-EH12K	
Consumable Ins.:	No	N.A.	N.A.	
Supplemental:	No	N.A.	No	
Recrushed slag:	N.A.	N.A.	No	
Max. weld metal thk.:	8	200	200	
Other:				

POSITION (QW-405)

Process:	GTAW	SMAW	SAW	
Position of Groove:	1G	1G	1G	
Position of Fillet:	N.A.	N.A.	N.A.	
Welding Progression:	N.A.	N.A.	N.A.	
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	250	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other: No

Cooling under Insulation: No

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:			
Trailing:			

Other: No

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW	SMAW	SAW
Current Type:	DC	DC	DC
Pulsing Current:	No	N.A.	N.A.
Polarity:	EN	EP	EP
Tung. El. Type:	EWTh-2	N.A.	N.A.
Tung. El. Ø:	2.4	N.A.	N.A.
Transfer Mode:	N.A.	N.A.	N.A.

Other: No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	10
Initial Cleaning:	Machining
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	Grinding to sound metal
Oscillation:	No
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	Single
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	25 ÷ 30
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual and Machine
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1-2	GTAW	ER70S-3	2.4	DCEN	110 ÷ 150	10 ÷ 14	060 ÷ 090	/	/	733 ÷ 2100
3-n	SMAW	E7018-1 H4	4	DCEP	150 ÷ 190	24 ÷ 27	180 ÷ 220	/	/	982 ÷ 1710
	SMAW	E7018-1 H4	5	DCEP	180 ÷ 220	24 ÷ 27	190 ÷ 240	/	/	1080 ÷ 1876
F-n/R-n	SAW	EH 12K	4	DCEP	500 ÷ 535	28 ÷ 31	510 ÷ 540	/	/	1556 ÷ 1951

REMARKS:

1) Back gouging shall be performed only if necessary after NDE

Issued by:
A. Sandonà
Welding Department

Approved by:
N. Tosto
Welding Department Manager

Welding Procedure Specification (WPS)

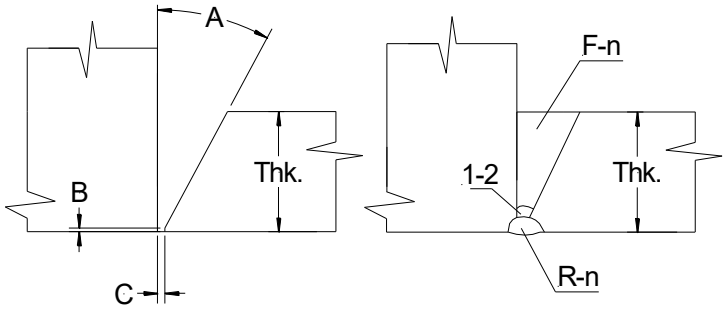
ASME Boiler and Pressure Vessel Code Section IX QW-200.1

Job:	23096	WPS:	W03
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	20.11.2023

Welding Process:	GTAW	SMAW			Supporting PQR: 51/15
Type:	MANUAL	MANUAL			

JOINTS (QW-402)

Design: ½ V | Backing: 1st layer No, other Yes | Material: Weld metal



Dimensions:

A:	25° +5/-0°
B:	0 ÷ 1 mm
C:	3 ÷ 5 mm
D:	See remarks sheet
E:	-
F:	-
R:	-
Thk.:	See summary

Retainers: No (QW-402.11)

Tack weld: According to process GTAW or SMAW of present WPS

Weld Bevel Code: ASC29

BASE METAL (QW-403)

Material Spec.; Type or Grade: SA 516 Gr.60

to Material Spec.; Type or Grade: SA 350 LF2

P-No.: 1 Gr. No.: 1 to P-No.: 1 Gr. No.: 2

Base Metal Groove T Limits (mm): 16 ÷ 200 Fillet (mm): All

Pipe Ø Range Groove (mm): All Fillet (mm): All

Other: t pass ≤ 13 mm (QW-403.9) T Limits (QW-403.6): Yes

Other: No

FILLER METAL (QW-404)

Process (es):	GTAW	SMAW		
SFA Specification:	5.18	5.1		
AWS Classification:	ER70S-3	E7018-1 H4		
Filler metal F-No.:	6	4		
Weld Metal A-No.:	1	1		
Size (mm):	2.4	4 - 5		
Product Form:	Solid Wire	N.A.		
Trade Name:	EML5	Tenax 35S		
Supplier:	Bohler	Oerlikon		
Flux Trade Name:	N.A.	N.A.		
Flux Type:	N.A.	N.A.		
Supplier:	N.A.	N.A.		
Wire/Flux Class.:	N.A.	N.A.		
Consumable Ins.:	No	N.A.		
Supplemental:	No	N.A.		
Recrushed slag:	N.A.	N.A.		
Max. weld metal thk.:	8	200		
Other:				

POSITION (QW-405)

Process:	GTAW	SMAW		
Position of Groove:	1G	1G		
Position of Fillet:	N.A.	N.A.		
Welding Progression:	N.A.	N.A.		
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	250	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other: No

Cooling under Insulation: No

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:			
Trailing:			

Other: No

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW	SMAW		
Current Type:	DC	DC		
Pulsing Current:	No	N.A.		
Polarity:	EN	EP		
Tung. El. Type:	EWTh-2	N.A.		
Tung. El. Ø:	2.4	N.A.		
Transfer Mode:	N.A.	N.A.		

Other: No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	10
Initial Cleaning:	Grinding / Brushing
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	Grinding to sound metal
Oscillation:	N.A.
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	N.A.
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	N.A.
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1-2	GTAW	ER70S-3	2.4	DCEN	110 ÷ 150	10 ÷ 14	060 ÷ 090	/	/	733 ÷ 2100
F-n/R-n	SMAW	E7018-1 H4	4	DCEP	150 ÷ 190	24 ÷ 27	180 ÷ 220	/	/	982 ÷ 1710
	SMAW	E7018-1 H4	5	DCEP	180 ÷ 220	24 ÷ 27	190 ÷ 240	/	/	1080 ÷ 1876

REMARKS:

1) Back gouging shall be performed only if necessary after NDE

Issued by:
A. Sandonà
Welding Department

Approved by:
N. Tosto
Welding Department Manager

Welding Procedure Specification (WPS)

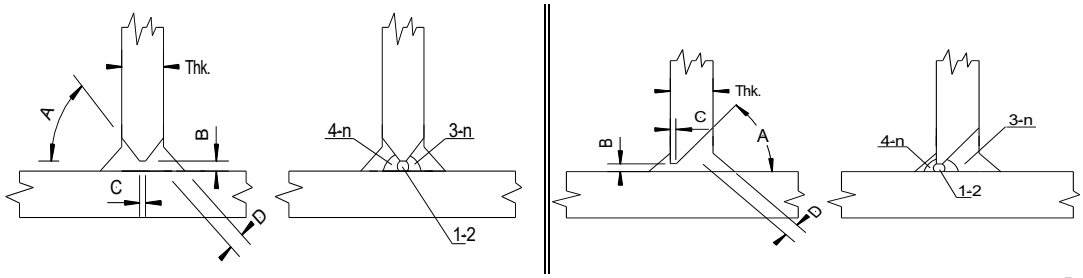
ASME Boiler and Pressure Vessel Code Section IX QW-200.1

Job:	23096	WPS:	W04
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	20.11.2023

Welding Process:	GTAW	SMAW			Supporting PQR: 51/15
Type:	MANUAL	MANUAL			

JOINTS (QW-402)

Design: K+Fillet / ½ V+Fillet — Backing: GTAW No, other Yes — Material: Weld metal



Dimensions:

A:	50° ± 10°
B:	2 ÷ 4 mm
C:	0 ÷ 1 mm
D:	See remarks sheet
E:	-
F:	-
R:	-
Thk.:	See summary

Retainers: No (QW-402.11)

Tack weld: According to processes GTAW or SMAW of present WPS — Weld Bevel Code: BSC21 - BSC20

BASE METAL (QW-403)

Material Spec.; Type or Grade: SA 516 Gr.60

to Material Spec.; Type or Grade: SA 350 LF2

P-No.: 1 Gr. No.: 1 to P-No.: 1 Gr. No.: 2

Base Metal Groove T Limits (mm): 16 ÷ 200 — Fillet (mm): All

Pipe Ø Range Groove (mm): All — Fillet (mm): All

Other: t pass ≤ 13 mm (QW-403.9) — T Limits (QW-403.6): Yes

Other: No

FILLER METAL (QW-404)

Process (es):	GTAW	SMAW		
SFA Specification:	5.18	5.1		
AWS Classification:	ER70S-3	E7018-1 H4		
Filler metal F-No.:	6	4		
Weld Metal A-No.:	1	1		
Size (mm):	2.4	3.2 - 4 - 5		
Product Form:	Solid Wire	N.A.		
Trade Name:	EML5	Tenax 35S		
Supplier:	Bohler	Oerlikon		
Flux Trade Name:	N.A.	N.A.		
Flux Type:	N.A.	N.A.		
Supplier:	N.A.	N.A.		
Wire/Flux Class.:	N.A.	N.A.		
Consumable Ins.:	No	N.A.		
Supplemental:	No	N.A.		
Recrushed slag:	N.A.	N.A.		
Max. weld metal thk.:	8	200		
Other:				

POSITION (QW-405)

Process:	GTAW	SMAW		
Position of Groove:	1G / 2G	1G / 2G		
Position of Fillet:	N.A.	N.A.		
Welding Progression:	N.A.	N.A.		
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	200	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other: No

Cooling under Insulation: No

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:			
Trailing:			

Other: No

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW	SMAW		
Current Type:	DC	DC		
Pulsing Current:	No	N.A.		
Polarity:	EN	EP		
Tung. El. Type:	EWTh-2	N.A.		
Tung. El. Ø:	2.4	N.A.		
Transfer Mode:	N.A.	N.A.		

Other: No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	10
Initial Cleaning:	Grinding / Brushing
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	N.A.
Oscillation:	N.A.
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	N.A.
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	N.A.
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1-2	GTAW	ER70S-3	2.4	DCEN	110 ÷ 150	10 ÷ 14	060 ÷ 090	/	/	733 ÷ 2100
3-n/4-n	SMAW	E7018-1 H4	3.2	DCEP	110 ÷ 140	23 ÷ 26	180 ÷ 200	/	/	759 ÷ 1213
	SMAW	E7018-1 H4	4	DCEP	150 ÷ 190	24 ÷ 27	180 ÷ 220	/	/	982 ÷ 1710
	SMAW	E7018-1 H4	5	DCEP	180 ÷ 220	24 ÷ 27	190 ÷ 240	/	/	1080 ÷ 1876

REMARKS:

Issued by:

A. Sandonà

Welding Department

Approved by:

N. Tosto

Welding Department Manager

Welding Procedure Specification (WPS)

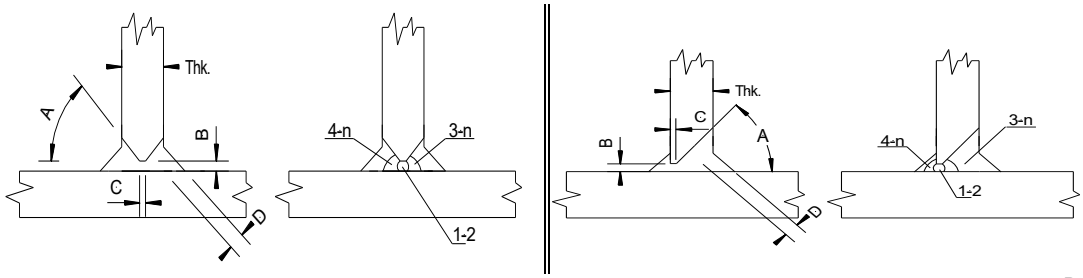
ASME Boiler and Pressure Vessel Code Section IX QW-200.1

Job:	23096	WPS:	W05
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	20.11.2023

Welding Process:	GTAW	SMAW			Supporting PQR: 51/15
Type:	MANUAL	MANUAL			

JOINTS (QW-402)

Design: K+Fillet / ½ V+Fillet — Backing: GTAW No, other Yes — Material: Weld metal



Dimensions:

A:	50° ± 10°
B:	2 ÷ 4 mm
C:	0 ÷ 1 mm
D:	See remarks sheet
E:	-
F:	-
R:	-
Thk.:	See summary

Retainers: No (QW-402.11)

Tack weld: According to processes GTAW or SMAW of present WPS — Weld Bevel Code: BSC21 - BSC20

BASE METAL (QW-403)

Material Spec.; Type or Grade: SA 516 Gr.60

to Material Spec.; Type or Grade: SA 516 Gr.60 - SA 350 LF2

P-No.: 1 Gr. No.: 1 to P-No.: 1 Gr. No.: 1 / 2

Base Metal Groove T Limits (mm): 5 ÷ 200 Fillet (mm): All

Pipe Ø Range Groove (mm): All Fillet (mm): All

Other: t pass ≤ 13 mm (QW-403.9) T Limits (QW-403.6): No

Other: No

FILLER METAL (QW-404)

Process (es):	GTAW	SMAW		
SFA Specification:	5.18	5.1		
AWS Classification:	ER70S-3	E7018-1 H4		
Filler metal F-No.:	6	4		
Weld Metal A-No.:	1	1		
Size (mm):	2.4	3.2 - 4 - 5		
Product Form:	Solid Wire	N.A.		
Trade Name:	EML5	Tenax 35S		
Supplier:	Bohler	Oerlikon		
Flux Trade Name:	N.A.	N.A.		
Flux Type:	N.A.	N.A.		
Supplier:	N.A.	N.A.		
Wire/Flux Class.:	N.A.	N.A.		
Consumable Ins.:	No	N.A.		
Supplemental:	No	N.A.		
Recrushed slag:	N.A.	N.A.		
Max. weld metal thk.:	8	200		
Other:				

POSITION (QW-405)

Process:	GTAW	SMAW		
Position of Groove:	1G / 2G	1G / 2G		
Position of Fillet:	N.A.	N.A.		
Welding Progression:	N.A.	N.A.		
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	200	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other: No

Cooling under Insulation: No

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:			
Trailing:			

Other: No

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW	SMAW		
Current Type:	DC	DC		
Pulsing Current:	No	N.A.		
Polarity:	EN	EP		
Tung. El. Type:	EWTh-2	N.A.		
Tung. El. Ø:	2.4	N.A.		
Transfer Mode:	N.A.	N.A.		

Other: No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	10
Initial Cleaning:	Grinding / Brushing
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	N.A.
Oscillation:	N.A.
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	N.A.
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	N.A.
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1-2	GTAW	ER70S-3	2.4	DCEN	110 ÷ 150	10 ÷ 14	060 ÷ 090	/	/	733 ÷ 2100
3-n/4-n	SMAW	E7018-1 H4	3.2	DCEP	110 ÷ 140	23 ÷ 26	180 ÷ 200	/	/	759 ÷ 1213
	SMAW	E7018-1 H4	4	DCEP	150 ÷ 190	24 ÷ 27	180 ÷ 220	/	/	982 ÷ 1710
	SMAW	E7018-1 H4	5	DCEP	180 ÷ 220	24 ÷ 27	190 ÷ 240	/	/	1080 ÷ 1876

REMARKS:

Issued by:

A. Sandonà

Welding Department

Approved by:

N. Tosto

Welding Department Manager

Welding Procedure Specification (WPS)

ASME Boiler and Pressure Vessel Code Section IX QW-200.1

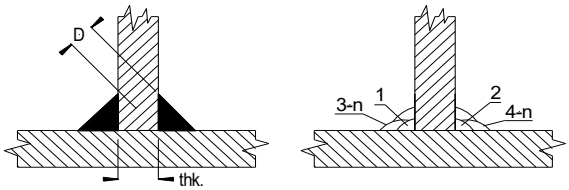
Job:	23096	WPS:	W06
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	20.11.2023

Welding Process:	GTAW	SMAW	SAW	
Type:	MANUAL	MANUAL	MACHINE	

Supporting PQR: 51/15

JOINTS (QW-402)

Design: Fillet | Backing: Yes | Material: Base metal



Dimensions:

A:	-
B:	-
C:	-
D:	See remarks sheet
E:	-
F:	-
R:	-
Thk.:	See summary

Retainers: No (QW-402.11)

Tack weld: According to GTAW or SMAW processes of present WPS

Weld Bevel Code: BSC22 - BCS23

BASE METAL (QW-403)

Material Spec.; Type or Grade:	SA 516 Gr.60		
to Material Spec.; Type or Grade:	SA 516 Gr.60 - SA 350 LF2		
P-No.: 1	Gr. No.: 1	to P-No.: 1	Gr. No.: 1 / 2
Base Metal Groove T Limits (mm):	N.A.	Fillet (mm):	All
Pipe Ø Range Groove (mm):	All	Fillet (mm):	All
Other:	t pass ≤ 13 mm (QW-403.9)	T Limits (QW-403.6):	N.A.
Other:	No		

FILLER METAL (QW-404)

Process (es):	GTAW	SMAW	SAW	
SFA Specification:	5.18	5.1	5.17	
AWS Classification:	ER70S-3	E7018-1 H4	EH12K	
Filler metal F-No.:	6	4	6	
Weld Metal A-No.:	1	1	1	
Size (mm):	2.4	4 - 5	4	
Product Form:	Solid Wire	N.A.	Solid Wire	
Trade Name:	EML5	Tenax 35S	OK Autrod 12.32	
Supplier:	Bohler	Oerlikon	ESAB	
Flux Trade Name:	N.A.	N.A.	OK Flux 10.62	
Flux Type:	N.A.	N.A.	Neutral/Non Alloying	
Supplier:	N.A.	N.A.	ESAB	
Wire/Flux Class.:	N.A.	N.A.	F7P8-EH12K	
Consumable Ins.:	No	N.A.	N.A.	
Supplemental:	No	N.A.	No	
Recrushed slag:	N.A.	N.A.	No	
Max. weld metal thk.:	8	200	200	
Other:				

POSITION (QW-405)

Process:	GTAW	SMAW	SAW	
Position of Groove:	N.A.	N.A.	N.A.	
Position of Fillet:	1F / 2F	1F / 2F	1F / 2F	
Welding Progression:	N.A.	N.A.	N.A.	
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	200	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other: No

Cooling under Insulation: No

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:			
Trailing:			

Other: No

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW	SMAW	SAW
Current Type:	DC	DC	DC
Pulsing Current:	No	N.A.	N.A.
Polarity:	EN	EP	EP
Tung. El. Type:	EWTh-2	N.A.	N.A.
Tung. El. Ø:	2.4	N.A.	N.A.
Transfer Mode:	N.A.	N.A.	N.A.

Other: No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	10
Initial Cleaning:	Machining
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	N.A.
Oscillation:	No
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	Single
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	25 ÷ 30
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual and Machine
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1 / 4-n	GTAW	ER70S-3	2.4	DCEN	110 ÷ 150	10 ÷ 14	060 ÷ 090	/	/	733 ÷ 2100
	SMAW	E7018-1 H4	4	DCEP	150 ÷ 190	24 ÷ 27	180 ÷ 220	/	/	982 ÷ 1710
	SMAW	E7018-1 H4	5	DCEP	180 ÷ 220	24 ÷ 27	190 ÷ 240	/	/	1080 ÷ 1876
	SAW	EH 12K	4	DCEP	500 ÷ 535	28 ÷ 31	510 ÷ 540	/	/	1556 ÷ 1951

REMARKS:

Issued by:
A. Sandonà
Welding Department

Approved by:
N. Tosto
Welding Department Manager

Welding Procedure Specification (WPS)

ASME Boiler and Pressure Vessel Code Section IX QW-200.1

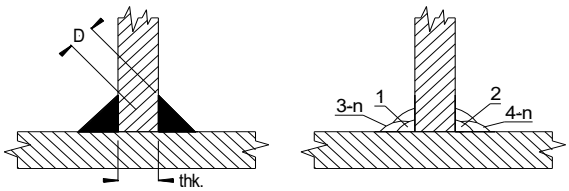
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Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	20.11.2023

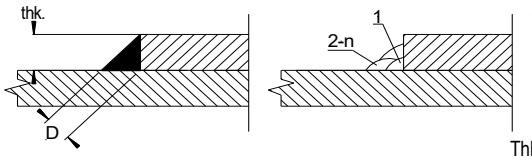
Welding Process: FCAW
Type: SEMI-AUTOMATIC

Supporting PQR: 24/17

JOINTS (QW-402)

Design: Fillet | Backing: Yes | Material: Base metal





Dimensions:

A:	-
B:	-
C:	-
D:	See remarks sheet
E:	-
F:	-
R:	-
Thk.:	See summary

Tack weld: According to FCAW process of present WPS

Retainers: No (QW-402.11)
Weld Bevel Code: BSC22 - BCS23

BASE METAL (QW-403)

Material Spec.; Type or Grade: SA 516 Gr.60
to Material Spec.; Type or Grade: SA 516 Gr.60

P-No.: 1 Gr. No.: 1 to P-No.: 1 Gr. No.: 1

Base Metal Groove T Limits (mm): N.A. Fillet (mm): All
Pipe Ø Range Groove (mm): All Fillet (mm): All
Other: t pass ≤ 13 mm (QW-403.9) T Limits (QW-403.6): N.A.
Other: No

FILLER METAL (QW-404)

Process (es):	FCAW			
SFA Specification:	5.20			
AWS Classification:	E70T-1			
Filler metal F-No.:	6			
Weld Metal A-No.:	1			
Size (mm):	1.2			
Product Form:	Flux cored wire			
Trade Name:	Fluxofil 14HD			
Supplier:	Oerlikon			
Flux Trade Name:	N.A.			
Flux Type:	N.A.			
Supplier:	N.A.			
Wire/Flux Class.:	N.A.			
Consumable Ins.:	N.A.			
Supplemental:	N.A.			
Recrushed slag:	N.A.			
Max. weld metal thk.:	200			
Other:				

POSITION (QW-405)

Process:	FCAW			
Position of Groove:	N.A.			
Position of Fillet:	1F / 2F			
Welding Progression:	N.A.			
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner (note 1)	Tempilstick	/
Maintaining:	No	/	/	/
Interpass ≤:	200	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/
Other:	No			
Cooling under Insulation:	No			

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	FCAW		
Shielding:	Ar + CO2	82 / 18	18 ÷ 20
Process:			
Shielding:	/		
Backing:			
Trailing:			
Other:	No		

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	FCAW			
Current Type:	DC			
Pulsing Current:	N.A.			
Polarity:	EP			
Tung. El. Type:	N.A.			
Tung. El. Ø:	N.A.			
Transfer Mode:	Spray			
Other:	No			

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	16
Initial Cleaning:	Grinding / Brushing
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	N.A.
Oscillation:	N.A.
Single/Multi pass/side:	Multi pass
Single/Multi Electrode:	N.A.
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	N.A.
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Semi-automatic
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1 / 4-n	FCAW	E70T-1	1.2	DCEP	180 ÷ 230	23 ÷ 26	190 ÷ 230	/	/	1080 ÷ 1888

REMARKS:

Issued by:
A. Sandonà
Welding Department

Approved by:
N. Tosto
Welding Department Manager

Welding Procedure Specification (WPS)

ASME Boiler and Pressure Vessel Code Section IX QW-200.1

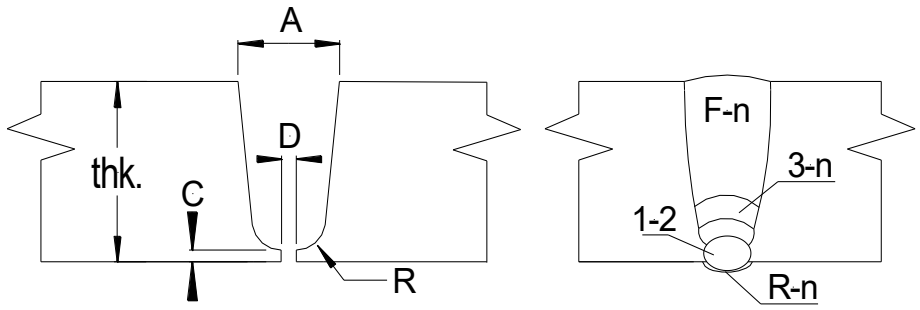
Job:	23096	WPS:	W08
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	08.03.2024

Welding Process:	GTAW	SMAW	SAW	
Type:	MANUAL	MANUAL	MACHINE	

Supporting PQR: 51/15

JOINTS (QW-402)

Design: U | Backing: GTAW No, other Yes | Material: Base + Weld metal



Dimensions:

A:	30 ± 1 mm
B:	
C:	1 ÷ 1,5 mm
D:	3 ÷ 5 mm
E:	-
R:	10 mm
Thk.:	See summary sheet

Retainers: No (QW-402.11)

Tack weld: According to process GTAW or SMAW of present WPS

Weld Bevel Code: ASC34

BASE METAL (QW-403)

Material Spec.; Type or Grade: SA 516 Gr.60

to Material Spec.; Type or Grade: SA 516 Gr.60

P-No.: 1 Gr. No.: 1 to P-No.: 1 Gr. No.: 1

Base Metal Groove T Limits (mm): 16 ÷ 200 Fillet (mm): All

Pipe Ø Range Groove (mm): All Fillet (mm): All

Other: t pass ≤ 13 mm (QW-403.9) T Limits (QW-403.6): Yes

Other: No

FILLER METAL (QW-404)

Process (es):	GTAW	SMAW	SAW	
SFA Specification:	5.18	5.1	5.17	
AWS Classification:	ER70S-3	E7018-1 H4	EH12K	
Filler metal F-No.:	6	4	6	
Weld Metal A-No.:	1	1	1	
Size (mm):	2.4	4 - 5	4	
Product Form:	Solid Wire	N.A.	Solid Wire	
Trade Name:	EML5	Tenax 35S	OK Autrod 12.32	
Supplier:	Bohler	Oerlikon	ESAB	
Flux Trade Name:	N.A.	N.A.	OK Flux 10.62	
Flux Type:	N.A.	N.A.	Neutral/Non Alloying	
Supplier:	N.A.	N.A.	ESAB	
Wire/Flux Class.:	N.A.	N.A.	F7P8-EH12K	
Consumable Ins.:	No	N.A.	N.A.	
Supplemental:	No	N.A.	No	
Recrushed slag:	N.A.	N.A.	No	
Max. weld metal thk.:	8	200	200	
Other:				

POSITION (QW-405)

Process:	GTAW	SMAW	SAW	
Position of Groove:	1G	1G	1G	
Position of Fillet:	N.A.	N.A.	N.A.	
Welding Progression:	N.A.	N.A.	N.A.	
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	250	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other: No

Cooling under Insulation: No

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:			
Trailing:			

Other: No

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW	SMAW	SAW
Current Type:	DC	DC	DC
Pulsing Current:	No	N.A.	N.A.
Polarity:	EN	EP	EP
Tung. El. Type:	EWTh-2	N.A.	N.A.
Tung. El. Ø:	2.4	N.A.	N.A.
Transfer Mode:	N.A.	N.A.	N.A.

Other: No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	10
Initial Cleaning:	Machining
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	N.A.
Oscillation:	No
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	Single
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	25 ÷ 30
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual and Machine
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1-2	GTAW	ER70S-3	2.4	DCEN	110 ÷ 150	10 ÷ 14	060 ÷ 090	/	/	733 ÷ 2100
3-n/R-n	SMAW	E7018-1 H4	4	DCEP	150 ÷ 190	24 ÷ 27	180 ÷ 220	/	/	982 ÷ 1710
	SMAW	E7018-1 H4	5	DCEP	180 ÷ 220	24 ÷ 27	190 ÷ 240	/	/	1080 ÷ 1876
F-n	SAW	EH 12K	4	DCEP	500 ÷ 535	28 ÷ 31	510 ÷ 540	/	/	1556 ÷ 1951

REMARKS:

1) Back gouging and R-n passes shall be performed only if necessary after NDE

Issued by:
A. Sandonà
Welding Department

Approved by:
N. Tosto
Welding Department Manager

Welding Procedure Specification (WPS)

ASME Boiler and Pressure Vessel Code Section IX QW-200.1

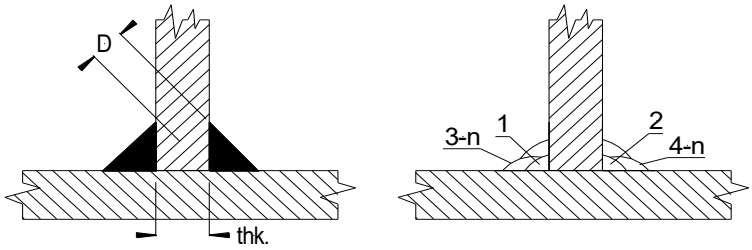
Job:	23096	WPS:	W09
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	24.07.2024

Welding Process: GTAW
Type: MANUAL

Supporting PQR: 63/17

JOINTS (QW-402)

Design: Fillet | Backing: Yes | Material: Base metal



Dimensions:

A:	-
B:	-
C:	-
D:	See remarks sheet
E:	-
F:	-
R:	-
Thk.:	See summary

Retainers: No (QW-402.11)

Tack weld: According to GTAW process of present WPS

Weld Bevel Code: BSC22

BASE METAL (QW-403)

Material Spec.; Type or Grade:	SA 516 Gr.60				
to Material Spec.; Type or Grade:	SA 240 316L				
P-No.:	1	Gr. No.:	1	to P-No.:	8	Gr. No.:	1
Base Metal Groove T Limits (mm):	N.A.		Fillet (mm):	All	
Pipe Ø Range Groove (mm):	All		Fillet (mm):	All	
Other:	t pass ≤ 13 mm (QW-403.9)		T Limits (QW-403.6):	N.A.	
Other:	No				

FILLER METAL (QW-404)

Process (es):	GTAW			
SFA Specification:	5.9			
AWS Classification:	ER309L			
Filler metal F-No.:	6			
Weld Metal A-No.:	8			
Size (mm):	2.4			
Product Form:	Solid Wire			
Trade Name:	Thermanit 25/14 (*)			
Supplier:	Bohler			
Flux Trade Name:	N.A.			
Flux Type:	N.A.			
Supplier:	N.A.			
Wire/Flux Class.:	N.A.			
Consumable Ins.:	No			
Supplemental:	No			
Recrushed slag:	N.A.			
Max. weld metal thk.:	20			
Other:	* Or other brand name welding consumable with the same AWS designation			

POSITION (QW-405)

Process:	GTAW			
Position of Groove:	N.A.			
Position of Fillet:	2F			
Welding Progression:	N.A.			
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	175	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other: No

Cooling under Insulation: No

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:	/		
Trailing:			

Other: No

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW			
Current Type:	DC			
Pulsing Current:	No			
Polarity:	EN			
Tung. El. Type:	EWTh-2			
Tung. El. Ø:	2.4			
Transfer Mode:	N.A.			

Other: No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	10
Initial Cleaning:	Grinding / Brushing
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	N.A.
Oscillation:	N.A.
Single/Multi pass/side:	Multi pass
Single/Multi Electrode:	N.A.
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	N.A.
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1-4-n	GTAW	ER309L	2.4	DCEN	120 ÷ 160	12 ÷ 14	060 ÷ 090	/	/	960 ÷ 2240

REMARKS:

Issued by:
A. Sandonà
Welding Department

Approved by:
N. Tosto
Welding Department Manager

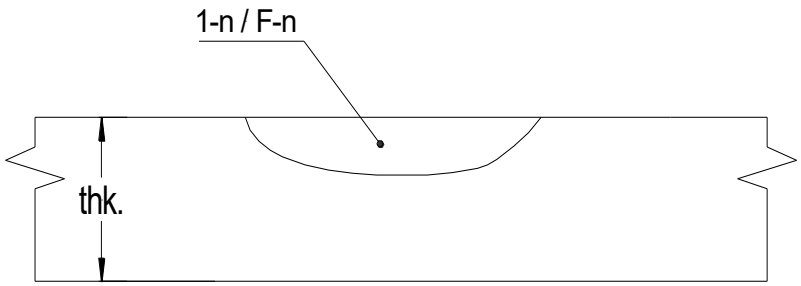
Welding Procedure Specification (WPS)

ASME Boiler and Pressure Vessel Code Section IX QW-200.1

Job:	23096	WPS:	WR
Item:	V25001 A/F	Rev.:	0
S.N.:	23096-01÷06-SNA	Date:	08.03.2024

Welding Process:	SMAW	SAW			Supporting PQR: 51/15
Type:	MANUAL	MACHINE			

JOINTS (QW-402) Design: Sketch Backing: Yes Material: Base + Weld metal



The excavation shall be prepared with smooth profile by grinding taking care to avoid perpendicular wall

Tack weld: N.A.

Retainers: No (QW-402.11)

Weld Bevel Code: Sketch

BASE METAL (QW-403)

Material Spec.; Type or Grade: SA 516 Gr.60 - SA 350 LF2 - Weld metal P.No.4

to Material Spec.; Type or Grade: -

P-No.: 1 Gr. No.: 1 to P-No.: - Gr. No.: -

Base Metal Groove T Limits (mm): N.A. Fillet (mm): All

Pipe Ø Range Groove (mm): All Fillet (mm): All

Other: t pass ≤ 13 mm (QW-403.9) T Limits (QW-403.6): N.A.

Other: No

FILLER METAL (QW-404)

Process (es):	SMAW	SAW		
SFA Specification:	5.1	5.17		
AWS Classification:	E7018-1 H4	EH12K		
Filler metal F-No.:	4	6		
Weld Metal A-No.:	1	1		
Size (mm):	4 - 5	4		
Product Form:	N.A.	Solid Wire		
Trade Name:	Tenax 35S	OK Autrod 12.32		
Supplier:	Oerlikon	ESAB		
Flux Trade Name:	N.A.	OK Flux 10.62		
Flux Type:	N.A.	Neutral/Non Alloying		
Supplier:	N.A.	ESAB		
Wire/Flux Class.:	N.A.	F7P8-EH12K		
Consumable Ins.:	N.A.	N.A.		
Supplemental:	N.A.	No		
Recrushed slag:	N.A.	No		
Max. weld metal thk.:	200	200		

Other:

POSITION (QW-405)

Process:	SMAW	SAW		
Position of Groove:	1G	1G		
Position of Fillet:	N.A.	N.A.		
Welding Progression:	N.A.	N.A.		

Other: No

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	50	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	250	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other: No

Cooling under Insulation: No

POST WELD HEAT TREATMENT (QW-407)

Method:	Gas Furnace	
Control:	Thermocouples	
Temperature Range:	610 ±10°C	°C
Time Range:	3	Hours
Heating/Cooling Rate:	≤60 / ≤60	°C/h
Temperature Limits:	No (QW-407.4)	
Other:	No	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:			
Shielding:	/	/	/
Process:			
Shielding:	/		
Backing:			
Trailing:			

Other: No

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	SMAW	SAW		
Current Type:	DC	DC		
Pulsing Current:	N.A.	N.A.		
Polarity:	EP	EP		
Tung. El. Type:	N.A.	N.A.		
Tung. El. Ø:	N.A.	N.A.		
Transfer Mode:	N.A.	N.A.		

Other: No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	N.A.
Initial Cleaning:	Grinding
Interpass Cleaning:	Grinding
Method of Back Gouge:	N.A.
Oscillation:	No
Single/Multi pass/side:	Multi pass
Single/Multi Electrode:	Single
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	N.A.
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual and Machine
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL ≥ (mm)	Wire Feed Speed (mm/min.)	Min./Max. Heat Input (J/mm)
1-n/F-n	SMAW	E7018-1 H4	4	DCEP	150 ÷ 190	24 ÷ 27	180 ÷ 220	/	/	982 ÷ 1710
	SMAW	E7018-1 H4	5	DCEP	180 ÷ 220	24 ÷ 27	190 ÷ 240	/	/	1080 ÷ 1876
	SAW	EH 12K	4	DCEP	500 ÷ 535	28 ÷ 31	510 ÷ 540	/	/	1556 ÷ 1951

REMARKS:

1) After completion of excavation, PT or MT examination shall be performed before start of welding activities

Issued by:
A. Sandonà
Welding Department

Approved by:
N. Tosto
Welding Department Manager

BREMBANA&ROLLE

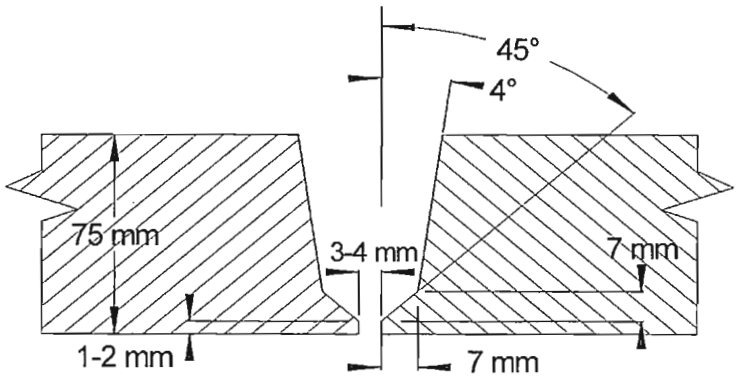
PROCEDURE QUALIFICATION RECORD (PQR)

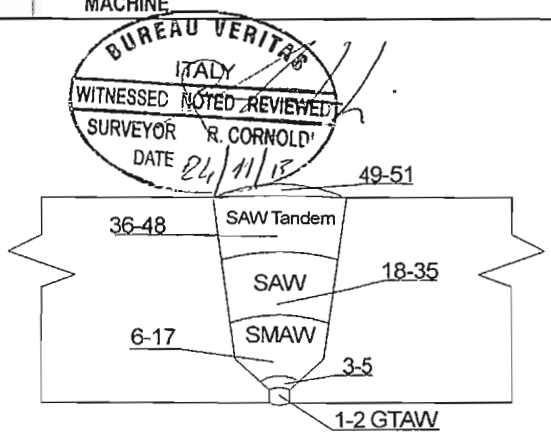
(QW-200.2)

(Section IX of ASME Boiler and Pressure Vessel Code)

Procedure Qualification Record No.:	51/15			Date:	24.11.15	Company:	Brembana & Rolle S.p.A.
Welding Process (es):	1) GTAW	2) SMAW	3) SAW-SAW Tandem			WPS No.:	W51/15
Types (Manual,Automatic,Semi-Auto.):	MANUAL	MANUAL	MACHINE				

JOINT (QW-402)





BASE METAL (QW-403)

Material Spec.; Type or Grade:	SA 516 Gr. 60 ①
to Material Spec.; Type or Grade:	SA 765 Gr. 2 ②

P-No.: 1 GR.No: 1 to P-No: 1 GR.No: 2

Thickness of Test Coupon (mm):	75
Diameter of Test Coupon (mm):	N.A.
Other:	① Normalized
	② Normalized and Tempered

FILLER METAL (QW-404)

Process (es):	GTAW	SMAW	SAW - SAW Tandem
SFA Specification:	5.18	5.1	5.17
AWS Classification:	ER70S-3	E7018-1 H4	EH12K
Filler metal F-No.:	6	4	6
Weld Metal A-No.:	1	1	/
Size (mm):	3	4 - 5	4
Product Form:	Solid wire	N.A.	Solid wire
Trade Name:	Bohler EML 5	PH 35S	OK Autrod 12.32
Supplier:	Bohler	Oerlikon	Esab
Flux Trade Name:	N.A.	N.A.	OK Flux 10.62
Flux Type:	N.A.	N.A.	Non alloying
Supplier:	N.A.	N.A.	Esab
Wire/Flux Class.:	N.A.	N.A.	F7P8-EH12K
Consumable Ins.:	No	N.A.	No
Supplemental:	N.A.	N.A.	No
Recrushed slag:	N.A.	N.A.	No
Weld Metal Thk.:	4	21	50 (*)
Other:	* 25 mm SAW - 25 mm SAW Tandem		

POSITION (QW-405)

Position of Groove:	1G
Weld Progression:	N.A.
Other:	No

PREHEAT (QW-406)

Preheat Temper. (°C):	99
Interpass Temper. (°C):	253
Other:	No

POSTWELD HEAT TREATMENT (QW-407)

Temperature (°C):	620 ± 10
Time:	Min. 4 hours - Max. 16 hours
Other:	Heating/Cooling rate 60 ÷ 70°C/h
	QW-407.4: N.A.

GAS (QW-408)

	Gas(es)	Percent Composition (Mixture)	Flow Rate (l/m)
Process:	GTAW		
Shielding:	Argon 99.99	/	10 ÷ 12
Trailing:	No	N.A.	N.A.
Backing:	No	N.A.	N.A.
Other:	No		

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW	SMAW	SAW
Type of Current:	DC	DC	*
Pulsing Current:	No	N.A.	N.A.
Polarity:	Negative	Positive	Positive/N.A.*
Tungsten Electrode Type:	EWTh2	N.A.	N.A.
Tungsten Electr.Size(mm):	2.4	N.A.	N.A.
Transfer Mode:	N.A.	N.A.	N.A.
Other:	* DC for SAW - DC/AC for SAW Tandem		

TECHNIQUE (QW-410)

String/weave beads:	String - Weave for GTAW
Orifice,cup size(mm):	10
Initial cleaning:	Machining - Brushing
Interpass cleaning:	Grinding - Brushing
Method of back gouge:	No
Oscillation:	No
Multi/Single pass/side:	Multipass
Single/Multi Electrode:	Single - Multiple for SAW tandem
Electrode spacing (mm):	20 mm
Electrode Stick out (mm):	25 ÷ 38
Closed or out of chamber:	N.A.
Manual or automatic:	Manual - Machine
Supplemental device:	N.A.
Other:	No

TABLE OF PARAMETERS (QW-409 ; QW-410)

Pass	Process	Ampere	Volt	Travel Speed (mm/min.)	Heat Input (*) (J/mm)	Filler metal Trade Name	Size (mm)	Flux Trade Name	Heat/Batch No.
1	GTAW	139 ÷ 153	15.5 ÷ 16.5	60 ÷ 88	2330	EML 5	3	N.A.	783420
2	GTAW	164 ÷ 169	15 ÷ 16	71 ÷ 77	2107	EML 5	3	N.A.	
3-5	SMAW	150 ÷ 160	23 ÷ 25.5	165 ÷ 290	1255	PH 35S	4	N.A.	344281002
6-17	SMAW	205 ÷ 212	23.25 ÷ 25.25	150 ÷ 255	1968	PH 35S	5	N.A.	371507302
18-35	SAW	536 ÷ 545	28.5 ÷ 30.5	500 ÷ 540	1984	OK Autrod 12.32	4	OK Flux 10.62	Wire: PV533474204 Flux: PNP19512
36-48	SAW Tandem	529 ÷ 533	28 ÷ 29.5	740	1275		4		
	SAW Tandem	538 ÷ 545	31 ÷ 33	740	1456		4		
49-51	SAW	539 ÷ 543	28.5 ÷ 30	540 ÷ 550	1797		4		

* Above Heat input values are the maximum recorded per layer (see attached welding monitoring)

BREMBANA&ROLLE

PROCEDURE QUALIFICATION RECORD (PQR)

(QW-200.2)

(Section IX of ASME Boiler and Pressure Vessel Code)

Procedure Qualification Record No.: 51/15 Date: 24.11.15 Company: Brembana & Rolle S.p.A.

TENSILE TEST (QW-150)

Specimen No.; Type and Figure No.	Width (mm)	Thickness (mm)	Area (mm2)	Ultimate Total Load (N)	Ultimate Unit Stress (N/mm2)	Type of Failure & Location

For mechanical tests see report: 15/2367RP01

	Diameter (mm)	Gage Length (mm)	Area (mm2)	U.T.L. (N)	U.T.S. (N/mm2)	U.Y.L. (N)	U.Y.S. (N/mm2)	Elongation (%)

GUIDED BEND TEST (QW-160)

Type and Figure No.	Result	Type and Figure No.	Result

For mechanical tests see report: 15/2367RP01

TOUGHNESS TEST (QW-170)

Specimen No. & Notch Location	Specimen Size (mm)	Test Temperature (°C)	Impact Values (Joule)	Lateral Expansion (% shear)	Lateral Expansion (mm)	Drop Weight Break (Yes or No)

For mechanical tests see report: 15/2367RP01

Comments:

FILLET WELD TEST (QW-180)

Result - Satisfactory: Yes ____ No ____ Penetration into Parent Metal: Yes ____ No ____

Macro - Result:

OTHER TESTS

Visual Examination: Satisfactory (PQR 51/15 VT)

R.T. Examination: Satisfactory

P.T. Examination: Satisfactory (PQR 51/15 PT)

M.T. Examination: No

Micro Examination: No

Deposit Analysis:

C	Mn	Si	P	S	Cr	Ni	Mo

Fe	Cu	Nb+Ta

Macro Examination: SATISFACTORY

Hardness Test (Hv10): Base Metal: / Weld Metal: / Haz: See report: 15/2367RP01

Other: No

Welder's Name: Capelli Gilberto - Grasso Stefano - Belligerante Rosario

Stamp No.: S09 - S02 - S04

Test conducted by: Brembana & Rolle S.p.A. Welding Engineer

Quality Control s.r.l. Laboratory

Bureau Veritas Inspector

Laboratory Test No.: 15/2367RP01

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLD' DATE 24/11/15

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of ASME Code Section IX

Prepared by	Checked and Certified by	Date	
S.Mangano 24/11/15	N.Tosto 24/11/15	24.11.15	Sheet 2 of 2

BREMBANA&ROLLE

ADDENDA to Procedure Qualification Record

Procedure Qualification Record No.: 51/15 Date: 20.03.17 Company: Brembana & Rolle S.p.A.

TENSILE TEST (QW-150)

Specimen No.; Type and Figure No.	Width (mm)	Thickness (mm)	Area (mm2)	Ultimate Total Load (N)	Ultimate Unit Stress (N/mm2)	Type of Failure & Location

	Diameter (mm)	Gage Length (mm)	Area (mm2)	U.T.L. (N)	U.T.S. (N/mm2)	U.Y.L. (N)	U.Y.S. (N/mm2)	Elongation (%)

GUIDED BEND TEST (QW-160)

Type and Figure No.	Result	Type and Figure No.	Result

TOUGHNESS TEST (QW-170)

Specimen No. & Notch Location	Specimen Size (mm)	Test Temperature (°C)	Impact Values (Joule)	Lateral Expansion (% shear)	Lateral Expansion (mm)	Drop Weight Break (Yes or No)

For mechanical tests see reports: 17/0586RP01 - 17/0586RP02

Comments:

FILLET WELD TEST (QW-180)

Result - Satisfactory: Yes ____ No ____ Penetration into Parent Metal: Yes ____ No ____

Macro-Result:

OTHER TESTS

Visual Examination: Satisfactory

R.T. Examination: No

P.T. Examination: No

M.T. Examination: No

Micro Examination: No

Deposit Analysis:

C	Mn	Si	P	S	Cr	Ni	Mo

Fe	Cu	Nb+Ta

Macro Examination: No

Hardness Test (Hv10): Base Metal: / Weld Metal: No / Haz:

Other: No

Welder's Name: Jopseph Joy - Pribescu Constantin

Stamp No.: S11 - S20

Test conducted by: Brembana & Rolle S.p.A. Welding Engineer
Quality Control s.r.l. Laboratory
Third Party Inspector

Laboratory Test No.: 15/0586RP01 - 15/0586RP02

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☐ Witnessed ☐ Monitored ☐ Reviewed
Alessandro Salvatore Monastra
Milan Office
20/03/17

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of ASME Code Section IX

Prepared by	Checked and Certified by	Date	
S.Mangano 21/3/17	M.Esposito	20.03.17	Sheet 1 of 1

BREMBANA&ROLLE

VISUAL EXAMINATION REPORT

REPORT No.

PQR 51/15 VT

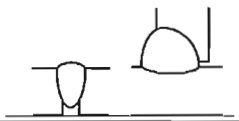
PURCHASER DATA		MANUFACTURER DATA	
PURCHASER		JOB No.	===
PLANT		DWG. No.	===
P.O.		PROCEDURE No.	BCI-007-VT
ITEM		SERIAL No.	===

APPLICABLE CODE:

ASME IX QW-194
ASME VIII Div. 2

APPLICABLE STANDARD/SPECIFICATION:

SP 1173

Nr.	Type of imperfection		Acceptance criteria	Test result conform:
1	Cracks	...	Not permitted	☑
2	Incomplete fusion	...	Not permitted	☑
3	Exposed inclusions	...	Not permitted when occurring at the surface	☑
4	Porosity	...	Not permitted	☑
5	Lack of penetration		Not permitted	☑
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐

BREMBANA & ROLLE S.p.A.

OPERATOR / EVALUATOR LEV. II SNT-TC-1A

BREMBANA&ROLLE S.p.A. P. FACHERIS QUALITY CONTROL DEPT. 09 OTT 2015

☐ F.CEFIS ☒ P.FACHERIS

09 OTT 2015

BREMBANA & ROLLE S.p.A. D.BOTTI QUALITY CONTROL DEPT.

D.BOTTI - Q.C.M.

INSPECTION AGENCY

09 OTT 2015

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLD DATE 05/10/15

BREMBANA&ROLLE

DYE PENETRANT TEST REPORT

REPORT No. **PQR 51/15 PT**

PURCHASER DATA		MANUFACTURER DATA	
PURCHASER		JOB No.	
PLANT		DWG. No.	
P.O.		PROCEDURE No.	BCI-002-PT
ITEM		SERIAL No.	

APPLICABLE CODE:

ASME IX – QW 195
ASME VIII Div. 2

APPLICABLE STANDARD/SPECIFICATION:

SP 1173

P.T. examination performed at 100 % on:

- Specimen 51/15

MATERIAL: SA 765 Gr. 2 – SA 516 Gr. 70 **THICKNESS:** 75 mm

P.T. Time:	BEFORE				AFTER		
	P.W.H.T.	■	HYDROTEST	☐	P.W.H.T.	☐	HYDROTEST ☐
Surface:	condition :	As welded	■	Ground ☐		Machined	☐
	cleaning :	Solvent	☐	Brushing ■		Shotblasting	☐
Type:	Water Washable Visible ■		Post Emulsifying None ☐		Solvent Removable None ☐		
Penetrant:	Colour Contrast CGM RED W	Emulsifier None	Solvent None	Developer	Non Acqueous Wet CGM ROTRIVEL U		
Application:	PENETRANT : Paint Brush ☐		Spray ■	Penetration time : 10 minutes			
	EMULSIFIER : Dipping ☐			Emulsification time N.A.			
Excess penetrant removal:	Water spray (3.5 barg max) ■		cloths ☐	absorber paper ☐			
Drying after excess penetrant removal :	Compressed air (3.5 barg max) ■		cloths ■				
Developer application :	Spraying		Developping time: 10 minutes Interpretation : 30 minutes				
Viewing condition:	Artificial light (1000 Lx min.) ■		Black light (1000 µW/cm² min) ☐				
Post examination cleaning:	Water rinse ■		Cloths ■				
TEST RESULT:	SATISFACTORY, NO REPORTABLE INDICATIONS FOUND						

BREMBANA & ROLLE S.p.A.

OPERATOR / EVALUATOR LEV. II SNT-TC-1A

09 OTT 2015

☒ F.CEFIS ☐ P.FACHERIS

09 OTT 2015

BREMBANA&ROLLE S.P.A. D.BOTTI QUALITY CONTROL DEPT.

D.BOTTI - Q.C.M. -

INSPECTION AGENCY

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R.CORNOLD'
DATE 05/10/15

Form PT Rev. 0 Date 23/06/99

QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI SU MATERIALI METALLICI E GIUNTI DI SALDATURA

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www.qualitycontrolsrl.it - e-mail: info@qualitycontrolgroup.com
Iscr. Reg. Imp. BG 12004 - C.C.I.A.A. BG 166333 - Cod. Fisc. e P.IVA 00663350163 - Cap. Soc. €101.490,00

RAPPORTO DI PROVA N. *Test Report N.*	15/2367RP01	DATA *Date*	24/11/2015	Foglio *Page*	1	di *of*	14

CLIENTE *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) — **SAGGIO N.** *Test No.* 51/15

ORDINE *Order*	01/04/000484 dated 15/10/2015	**DISTINTA PROVE** *List of tests*	151/15 dated 19/10/2015	**MATERIALE RICEVUTO IL** *Material received on*	19/10/2015

OGGETTO *Object*
Welding Procedure Qualification Record: 51/15
Plate Thk. 75 mm - Preliminary WPS: W51/15 - Job: 4098
Welding Process: GTAW+SMAW manual + SAW-SAW Tandem Machine Pos. 1G
Welder: CAPELLI GILBERTO (Stamp: S09) - BELLIGERANTE ROSARIO (Stamp: S04)
GRASSO STEFANO (Stamp: S02)
Coupon with PWHT MIN (Chart No. 295A/15 dated 22/10/2015)
Coupon with PWHT MAX (Chart No. 299A/15 dated 26/10/2015)

MATERIALE *Material* ASME SA516 gr.60 / ASME SA765 gr.2

COLATA *Heat* 61003 616857001 / 9084-14 14-0505

PRODUTTORE *Supplier* ARCELOR MITTAL / FORGE MONCHIERI — **CERT. N.** *Cert. No.* 2015-104345 / 14/08449/CM — **DEL** *dated* 19/02/2015 / 20/03/2014

NORME DI COLLAUDO *Test Specification* ASME IX 2013 Ed. + ASME VIII Div.1 2013 Ed. + SP 1173

ENTE DI COLLAUDO *Surveyors* BUREAU VERITAS + MAN DIESEL & TURBO + CONPACKSYS

Prove *Tests*	Pagina *Sheet*	Data Prova *Date of test*	Metodo di prova *Test method*	Apparecchiatura *Equipment*	Note *Note*
☑ Radiografia / *Radiographic*	2	20-23/10/15	ASME V art.2	See report	*Conform*
☑ Trattamento termico MIN / *Min H.T.*	3	22/10/15	IL 08.00.02	See report	---
☑ Trazione / *Tensile*	4	24/11/15	ASTM A370-14/QW151	QC 355	*Conform*
☑ Pieghe / *Bend*	4	24/11/15	QW 161.1	QC 355	*Conform*
☑ Resilienze / *Impact*	5	24/11/15	UG-84	QC 376	*Conform*
☑ Macrografia / *Macrograph*	6	14/10/15	ASTM E340-00	QC 401	*Conform*
☑ Durezze / *Hardness*	7-8	14/10/15	ASTM E384-11	QC 370	---
☑ Trattamento termico MAX / *MAX H.T.*	9	26/10/15	IL 08.00.02	See report	---
☑ Trazione / *Tensile*	10	24/11/15	ASTM A370-14/QW151	QC 355	*Conform*
☑ Pieghe / *Bend*	10	24/11/15	QW 161.1	QC 355	*Conform*
☑ Resilienze / *Impact*	11	24/11/15	UG-84	QC 376	*Conform*
☑ Macrografia / *Macrograph*	12	14/10/15	ASTM E340-00	QC 401	*Conform*
☑ Durezze / *Hardness*	13-14	14/10/15	ASTM E384-11	QC 370	---

Se non diversamente specificato, per l'accettabilità fanno fede le norme di collaudo e le norme relative al materiale
Unless otherwise specified, for the acceptability are valid test specifications and material standards

SI CERTIFICANO I RISULTATI OTTENUTI. TALI RISULTATI SONO RIFERITI ESCLUSIVAMENTE AI PROVINI TESTATI.
We certify the obtained results. These tests results refer only to examined samples.

ENTE DI COLLAUDO *Surveyor*
BUREAU VERITAS ITALY — WITNESSED NOTED REVIEWED — SURVEYOR R CORNOLDI — DATE 24/11/15

Ing. A.E. Popken I.W.E.

Digitaal ondertekend door Ing. A.E. Popken I.W.E.
DN: cn=Ing. A.E. Popken I.W.E., o=Welding, ou=Welding Department, emailaa.popken@supercrossl.nl, c=NL
Datum: 2016.02.17 17:07:46 +01'00'

BREMBANA & ROLLE S.p.A. WELDING DEPT. - S. MARCO — REVIEWED — WITNESSED — 24 NOV 2015

QUALITY CONTROL S.r.l.
ANGELO PENDEGGIA

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
SU MATERIALI METALLICI E GIUNTI DI SALDATURA

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Iscr. Reg. Imp. BG 12004 - C.C.I.A.A. BG 166333 - Cod. Fisc. e P.IVA 00663350163 - Cap. Soc. €101.490,00

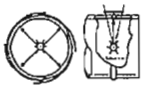
CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) **SAGGIO N.** / *Test No.* 51/15

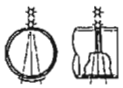
ESAME RADIOGRAFICO
RADIOGRAPHIC TEST

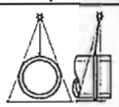
Norma di riferimento / *Reference standard*	ASME V art.2 - Ed. 2013		
Criterio di accettabilità / *Acceptance criteria*	ASME IX QW 191.1 - Ed.2013	Stadio di lavorazione / *Working step*	AS WELDED

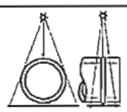
TECNICA DI ESPOSIZIONE / *Exposure technique*


☒


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☐

PARAMETRI DEL TEST / *Test parameters*

Spess. nominale di parete (mm) / *Nominal single wall thickness*	75	Spessore rinf. di sald. (mm) / *Welding reinforcement thickness*	2	Numero di esposizioni / *Exposure number*	1
Distanza fuoco-oggetto (mm) / *Source to object distance*	840	Distanza oggetto film (mm) / *Object to film distance*	79	Nr. Films per cassetta / *Film for each holder*	1
Costruttore della sorgente / *Source manufacturer*	SEIFERT	Tipo di sorgente / *Source type*	RX	Identificazione / *Source identification*	SA151
Attività (Ci) / *Activity*	---	Energia della radiazione (KV) / *Radiation Energy*	420	Intens. radiazione (mA) / *Radiation intensity*	10
Tempo di esposizione (minuti) / *Exposure time*	5'	Macchia focale (mm) / *Focal spot size*	3	Penombra / *UG*	0,28
Tipo di penetrametro / *Penetrameter type*	1C ASTM	Posizione del penetrametro / *Penetrameter location*	SOURCE	Filo/Foro richiesto / *Required wire/hole*	W11
Produttore film / *Film manufacturer*	KODAK	Tipo di film / *Film type*	T-200	Dimensioni (cm) / *Film size*	15x40

Tecnica di esposizione / *Exposure technique*	☒ Parete sing. / *Single wall*	☐ Parete dop. / *Double wall*		Tecnica di lettura / *Viewing technique*	☒ Parete sing. / *Single wall*	☐ Parete dop. / *Double wall*	
Tipo schermi intensificatori / *Intensifying screen type*	☒ Pb	☐ Cu		Spessore schermi (mm) / *Screen thickness*	Ant.	Post.	
Trattamento del film / *Film treatment*	☒ Automatico / *Automatic*	☐ Manuale / *Manual*					

LEGENDA

C	Conforme / Conforming	R	Non conforme / Not conforming	RRX	Ripetere esposizione / Exposure to be repeated
D*	Densità misurata / Measured density	S*	Filo/Foro rilevato / Wire/Hole detected	G*	Giudizio / Evaluation

VALUTAZIONE / *EVALUATION*

Tallone / *Coupon*	Tratto / *Area*	Discontinuità / *Discontinuity*	D*	S*	G*	Tallone / *Coupon*	Tratto / *Area*	Discontinuità / *Discontinuity*	D*	S*	G*
51/15-1	1 - 2	------	2,8	11	C	51/15-2	1 - 2	------	2,8	11	C
	2 - 3	------	2,8	11	C		2 - 3	------	2,8	11	C
	3 - 4	------	2,8	11	C		3 - 4	------	2,8	11	C

CLASSIFICAZIONE DELLE DISCONTINUITÀ
DISCONTINUITY CLASSIFICATION

101	Cricca longitudinale / *Longitudinal crack*	2014	Porosità allineate / *Linear Porosity*	304	Inclusioni metalliche / *Metallic inclusion*	504	Eccesso di penetrazione / *Excessive penetration*
102	Cricca trasversale / *Transversal crack*	2015 2016	Cavità allungate e tarli / *Elongated cavities and wormholes*	C 401	Mancanza di fusione / *Lack of fusion*	601	Colpo d'arco / *Stray arc*
104	Cricca di cratere / *Crater crack*	202	Cavità di ritiro / Shrinkage cavity	D 402	Mancanza di penetrazione / *Lack of penetration*	602	Spruzzi / *Spatter*
2011 2012	Porosità / *Porosity and gas pores*	2024	Crateri di ritiro / *Crater pipe*	5011 5012	Incisione cont. e interm. / *Undercut continues and intermit.*	SCR	Difetto schermo / *Screen defect*
2013	Gruppi di porosità / *Clustered Porosity*	301 302	Inclusioni di scoria o flusso / *Slag or flux inclusion*	515	Insellamento / *Root concavity*	F	Difetto film / *Film defect*

ENTE DI COLLAUDO / *Surveyor*

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLDI DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☒ REVIEWED ☒ WITNESSED 24 NOV 2015

CIMINO EMILIO
Liv. 2 - EN 473 / ISO 9712
II° Liv. SNT-TC-1A
RT - PT - MT - UT - VT

QUALITY CONTROL S.r.l.
MEDOLAGO (BG)
ANGELO PANDOLFI

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.
LABORATORIO DI PROVE E CONTROLLI
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CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) | **SAGGIO N.** / *Test No.* 51/15

TRATTAMENTO TERMICO
HEAT TREATMENT

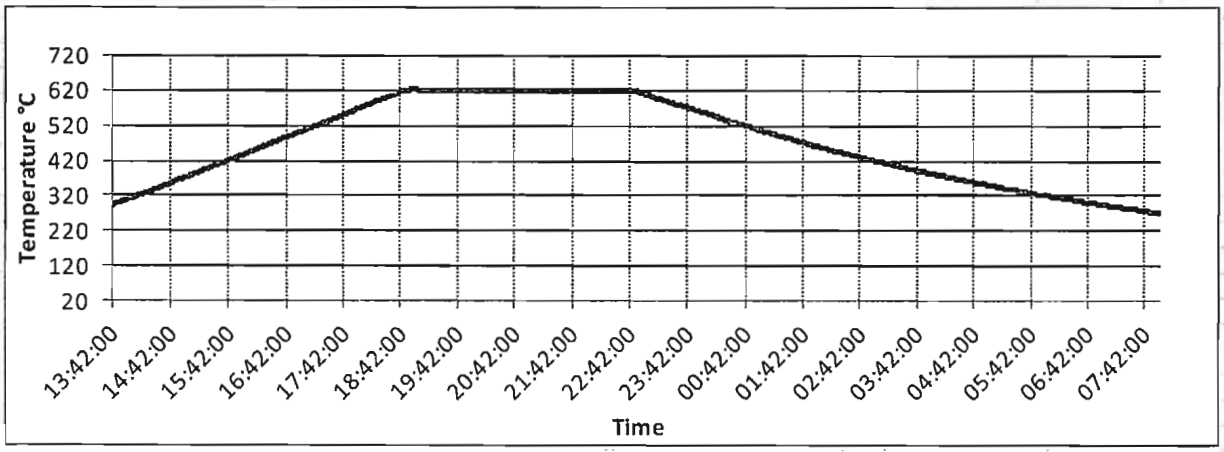
DIAGRAMMA N. / *CHART N.* 295A/15 **DEL** / *DATED* 22/10/2015

PRESCRIZIONI CLIENTE
CLIENT PARAMETRES

Tipo di Trattamento / *Heat treatment type*	Distensione / *Stress rilieving*
Specifica Tecnica / *Technical Specification*	Richiesta cliente / *Customer required*
Raffreddamento / *Cooling*	Aria calma / *Still air*

Parametri
Parametres

	RICHIESTI / *Required*		RILEVATI / *Recorded*	
Temp. Iniziale / *Start Temp.*	<300	°C	292	°C
Riscaldo / *Heating rate*	50÷80	≤ °C/h	65	°C/h
Temperatura / *Temperature*	620 ±10	°C	620	°C
Permanenza / *Holding time*	4,00	h	4,00	h
Raffreddamento / *Cooling rate*	50÷80	≤ °C/h	63	°C/h
Temp. Finale / *Final Tem.*	<300	°C	270	°C



Forno Elettrico n. / *Electrical Furnace n.* 223

Il diagramma originale è presso l'archivio della Quality Control S.r.l.
The original chart is in the Quality Control S.r.l. files

N.2 termocoppie tipo K posizionate sul saggio
N.2 type K thermocouples placed on the specimen

Si certifica che il trattamento termico risulta in accordo con la specifica summenzionata
We certify that the heat treatment is according to the named specification

ENTE DI COLLAUDO / *Surveyor*

BUREAU VERITAS ITALY
~~WITNESSED~~ ~~NOTED~~ REVIEWED
SURVEYOR R. CORNOLDI
DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☒ REVIEWED ☐ ~~WITNESSED~~
24 NOV 2015 ANGELO PEDEGGIA

QUALITY CONTROL S.r.l. MEDOLAGO (BG)

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
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RAPPORTO DI PROVA N. / *Test Report N.* 15/2367RP01 **DATA** / *Date* 24/11/2015 **Foglio** / *Page* 4 **di** / *of* 14

CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) **SAGGIO N.** / *Test No.* 51/15

PROVE DOPO TRATTAMENTO TERMICO MINIMO

TEST AFTER MIN P.W.H.T.

PROVA DI TRAZIONE

TENSILE TEST

SAGGIO *Test* N.		DIMENSIONI *Size* mm	AREA *Section* mm²	SENSO *Direction*	Lo mm	CARICO TOTALE A ROTTURA *Total load at break* ------ N	ROTTURA *Tensile Strength* ≥ 415 N/mm²	ALLUNG. *Elong.* ≥ --- %	STRIZ. *Reduct.* ≥ --- %	TEMP. °C
51/15 Top	1	40,0x19,0	760,0	T	----	376200	495	----	----	+23
51/15 Bottom	2	40,0x19,0	760,0	T	----	380760	501	----	----	+23
51/15 Top	3	40,0x19,0	760,0	T	----	374680	493	----	----	+23
51/15 Bottom	4	39,9x19,0	758,1	T	----	376780	497	----	----	+23

ROTTE FUORI SALDATURA - FRATTURA DUTTILE Lato gr.60
BROKEN OUT OF WELDING - DUCTILE FRACTURE gr.60 SIDE

PROVA DI PIEGA

BEND TEST

SAGGIO *Test* N.		SENSO *Direction*	ANGOLO *Angle*	MANDRINO *Former*	POSIZIONE *Position*	ALLUNG. *Elong.*	RISULTATO *Result*	NOTE *Notes*
51/15	1	T	180	Ø 4T	SIDE	---	SATISFACTORY	Top
51/15	2	T	180	Ø 4T	SIDE	---	SATISFACTORY	Top
51/15	3	T	180	Ø 4T	SIDE	---	SATISFACTORY	Top
51/15	4	T	180	Ø 4T	SIDE	---	SATISFACTORY	Top
51/15	1	T	180	Ø 4T	SIDE	---	SATISFACTORY	Bottom
51/15	2	T	180	Ø 4T	SIDE	---	SATISFACTORY	Bottom
51/15	3	T	180	Ø 4T	SIDE	---	SATISFACTORY	Bottom
51/15	4	T	180	Ø 4T	SIDE	---	SATISFACTORY	Bottom

ENTE DI COLLAUDO / *Surveyor*

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLDI DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☐ REVIEWED ☒ WITNESSED
24 NOV 2015

QUALITY CONTROL S.r.l.
ANGELO PENDEGGIA

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
SU MATERIALI METALLICI E GIUNTI DI SALDATURA

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CLIENTE / Customer BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) **SAGGIO N.** / Test No. 51/15

PROVE DI RESILIENZA

IMPACT TEST

SAGGIO Test N.	SENSO Direction	POSIZIONE Position	TIPO Type	TEMP. °C	DIMENS. Size Mm	VALORI Values ≥ 18 J			MEDIA Average ≥ 27 J	ESPANSIONE LATERALE Lateral Expantion ≥0,38 mm			AREA DUTTILE Shear Area For info		
						1	2	3		1	2	3	1	2	3
51/15	T	W.M. Top 1,5 mm below surface (SAW Tandem)	KV	-46	10x10	138	125	140	134,3	2,03	2,02	2,32	65	65	65
						4	5	6		4	5	6	4	5	6
51/15	T	W.M. Between ½ ÷ ¼ (SAW)	KV	-46	10x10	142	146	125	137,7	2,11	2,32	2,08	65	65	60
						7	8	9		7	8	9	7	8	9
51/15	T	W.M. ¾ Thk (SMAW)	KV	-46	10x10	109	57	37	67,7	1,88	0,91	0,61	60	40	20
						10	11	12		10	11	12	10	11	12
51/15	T	W.M. Bottom (GTAW)	KV	-46	10x10	56	18	76	50,3	0,92	0,38	1,27	40	20	55
						1	2	3		1	2	3	1	2	3
51/15	T	H.A.Z. gr.60 Top 1,5 mm below surface (SAW Tandem)	KV	-46	10x10	221	296	263	260,0	2,52	2,41	2,50	85	90	90
						4	5	6		4	5	6	4	5	6
51/15	T	H.A.Z. gr.60 Between ½ ÷ ¼ (SAW)	KV	-46	10x10	129	42	18	63,0	2,00	0,75	0,39	60	30	20
						7	8	9		7	8	9	7	8	9
51/15	T	H.A.Z. gr.60 ¾ Thk (SMAW)	KV	-46	10x10	28	28	26	27,3	0,46	0,38	0,40	20	20	20
						10	11	12		10	11	12	10	11	12
51/15	T	H.A.Z. gr.60 Bottom (GTAW)	KV	-46	10x10	28	147	152	109,0	0,38	2,12	2,32	20	65	65
						1	2	3		1	2	3	1	2	3
51/15	T	H.A.Z. gr.2 Top 1,5 mm below surface (SAW Tandem)	KV	-46	10x10	220	172	165	185,7	2,25	2,31	2,24	85	75	70
						4	5	6		4	5	6	4	5	6
51/15	T	H.A.Z. gr.2 Between ½ ÷ ¼ (SAW)	KV	-46	10x10	152	110	142	134,7	2,07	1,72	2,11	70	60	65
						7	8	9		7	8	9	7	8	9
51/15	T	H.A.Z. gr.2 ¾ Thk (SMAW)	KV	-46	10x10	176	152	126	151,3	2,24	2,14	1,90	75	70	60
						10	11	12		10	11	12	10	11	12
51/15	T	H.A.Z. gr.2 Bottom (GTAW)	KV	-46	10x10	28	27	36	30,3	0,51	0,46	0,62	20	20	20

ENTE DI COLLAUDO / Surveyor

BUREAU VERITAS ITALY
WITNESSED ~~NOTED~~ ~~REVIEWED~~
SURVEYOR R. CORNOLDI
DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☐ REVIEWED ☒ WITNESSED
24 NOV 2015

QUALITY CONTROL S.r.l.
ANGELO PENDEGGIA

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

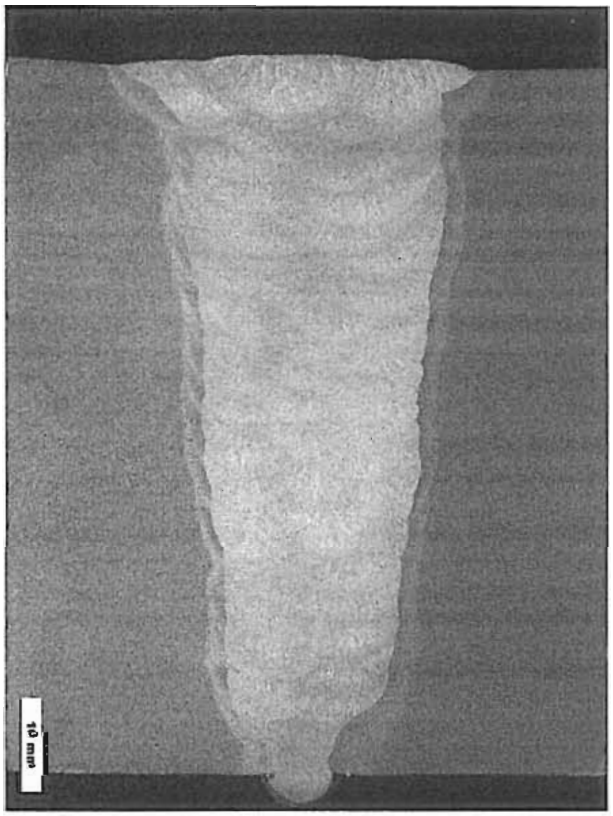
QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
SU MATERIALI METALLICI E GIUNTI DI SALDATURA

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CLIENTE / **Customer** BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) | **SAGGIO N.** / *Test No.* 51/15

ESAME MACROGRAFICO
MACROGRAPHIC EXAMINATION



Attacco: Nital 10%
Etching:

RISULTATO
RESULT

L'esame visivo a 10X di ingrandimento non ha evidenziato difetti o anomalie metallurgiche. Assenza di cricche e mancanze di fusione
The visual examination at 10X magnification has shown no defects or abnormal metallurgical features. Absence of cracks and lack of fusion.

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☒ REVIEWED ☐ WITNESSED
24 NOV 2015

ENTE DI COLLAUDO / **Surveyor**

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE 24 NOV 2015

Metallurgical Laboratory
ERMANNO ANNIBALE
Level II Sector LP
Reg. CICPND n. 285

QUALITY CONTROL S.r.l. MEDOLAGO (BG)
ANGELO PENDEGG...

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QUALITY CONTROL S.r.l.

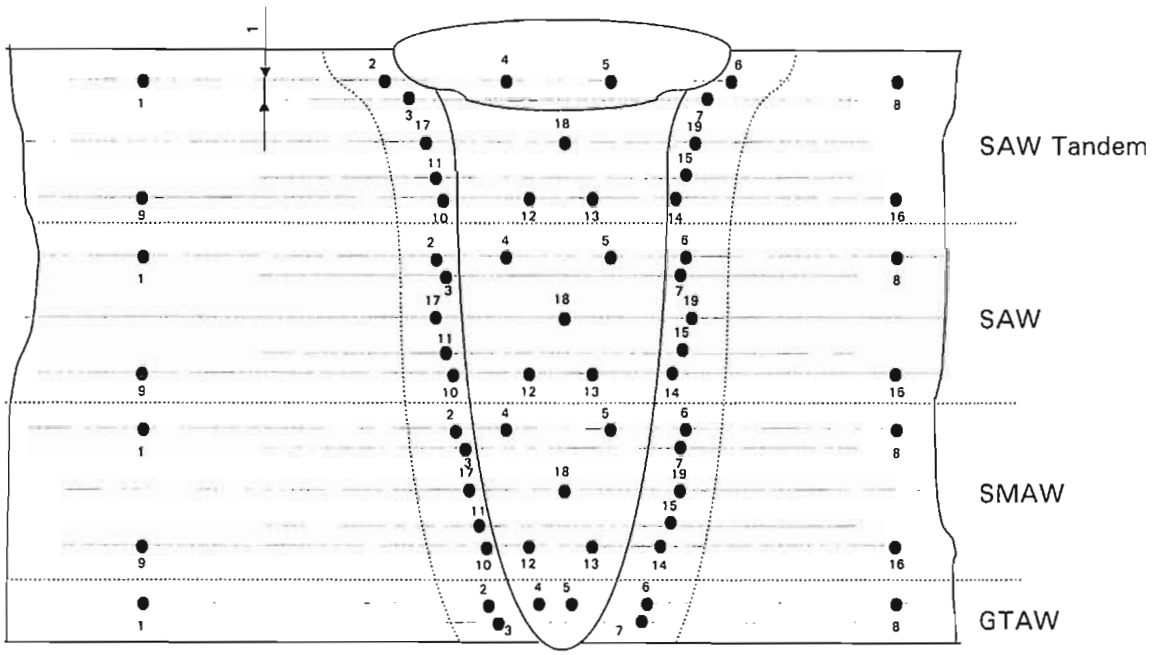
LABORATORIO DI PROVE E CONTROLLI
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CLIENTE / **Customer** BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) | **SAGGIO N.** / *Test No.* 51/15

PROVE DI DUREZZA TIPO HV_{10} (MAX 248) DOPO MIN PWHT

HARDNESS TEST TYPE HV_{10} (MAX 248) AFTER MIN PWHT



RISULTATO Pos. SAW tandem

RESULT

1 =	144	**2 =**	192	**3 =**	216	**4 =**	198	**5 =**	200
6 =	206	**7 =**	215	**8 =**	159	**9 =**	147	**10 =**	193
11 =	182	**12 =**	188	**13 =**	180	**14 =**	183	**15 =**	177
16 =	166	**17 =**	164	**18 =**	178	**19 =**	192		

RISULTATO Pos. SAW

RESULT

1 =	149	**2 =**	164	**3 =**	160	**4 =**	182	**5 =**	185
6 =	192	**7 =**	187	**8 =**	152	**9 =**	150	**10 =**	179
11 =	169	**12 =**	204	**13 =**	194	**14 =**	175	**15 =**	176
16 =	154	**17 =**	173	**18 =**	165	**19 =**	179		

ENTE DI COLLAUDO / **Surveyor**

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☒ REVIEWED ☐ WITNESSED
24 NOV 2015

Metallurgical Laboratory
PAVANNIBALE
Level II Sector LF
Reg. AICPND n. 285

QUALITY CONTROL S.r.l.
ANGELO PENDEGGIA

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
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CLIENTE / Customer BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) — **SAGGIO N.** / *Test No.* 51/15

RISULTATO Pos. SMAW

RESULT

1 =	133	**2** =	166	**3** =	173	**4** =	199	**5** =	192
6 =	190	**7** =	194	**8** =	153	**9** =	140	**10** =	169
11 =	181	**12** =	186	**13** =	178	**14** =	188	**15** =	186
16 =	151	**17** =	171	**18** =	190	**19** =	187		

RISULTATO Pos. GTAW

RESULT

1 =	151	**2** =	168	**3** =	177	**4** =	170	**5** =	177
6 =	178	**7** =	181	**8** =	161				

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☒ REVIEWED ☐ WITNESSED
24 NOV 2015

ENTE DI COLLAUDO / Surveyor
BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R CORNOLO'
DATE 24 NOV 2015

Metallurgical Laboratory
BRAVI ANNIBALE
Level II Sector LF
Reg. AICPND n. 285

QUALITY CONTROL S.r.l.
MEDOLAGO (BG)
ANGELO PEDERSOLI

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CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) — **SAGGIO N.** / *Test No.* 51/15

TRATTAMENTO TERMICO
HEAT TREATMENT

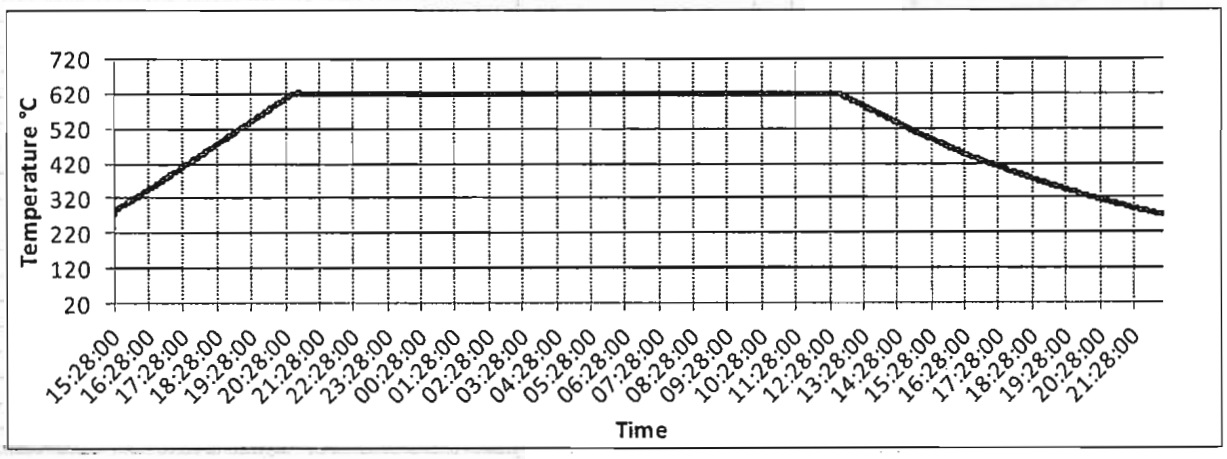
DIAGRAMMA N. / *CHART N.* 299A/15 — **DEL** / *DATED* 26/10/2015

PRESCRIZIONI CLIENTE
CLIENT PARAMETRES

Tipo di Trattamento / *Heat treatment type*	Distensione / *Stress rilieving*
Specifica Tecnica / *Technical Specification*	Richiesta cliente / *Customer required*
Raffreddamento / *Cooling*	Aria calma / *Still air*

Parametri
Parametres

	RICHIESTI / *Required*		RILEVATI / *Recorded*	
Temp. Iniziale / *Start Temp.*	<300	°C	274	°C
Riscaldo / *Heating rate*	50÷80	≤ °C/h	71	°C/h
Temperatura / *Temperature*	620 ±10	°C	620	°C
Permanenza / *Holding time*	16,00	h	16,00	h
Raffreddamento / *Cooling rate*	50÷80	≤ °C/h	69	°C/h
Temp. Finale / *Final Tem.*	<300	°C	270	°C



Forno Elettrico n. / *Electrical Furnace n.* 223

Il diagramma originale è presso l'archivio della Quality Control S.r.l.
The original chart is in the Quality Control S.r.l. files

N.2 termocoppie tipo K posizionate sul saggio
N.2 type K thermocouples placed on the specimen

Si certifica che il trattamento termico risulta in accordo con la specifica summenzionata
We certify that the heat treatment is according to the named specification

ENTE DI COLLAUDO / *Surveyor*

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLDI DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☒ REVIEWED ☐ WITNESSED
24 NOV 2015

QUALITY CONTROL S.r.l. MEDOLAGO (BG)
ANGELO [illegible]

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CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) | **SAGGIO N.** / *Test No.* 51/15

PROVE DOPO TRATTAMENTO TERMICO MASSIMO

TEST AFTER MAX P.W.H.T.

PROVA DI TRAZIONE

TENSILE TEST

SAGGIO *Test* N.		DIMENSIONI *Size* mm	AREA *Section* mm²	SENSO *Direction*	Lo mm	CARICO TOTALE A ROTTURA *Total load at break* ------ N	ROTTURA *Tensile Strength* ≥ 415 N/mm²	ALLUNG. *Elong.* ≥ --- %	STRIZ. *Reduct.* ≥ --- %	TEMP. °C
51/15 Top	1	40,0x19,0	760,0	T	----	357960	471	----	----	+23
51/15 Bottom	2	40,0x19,0	760,0	T	----	356440	469	----	----	+23
51/15 Top	3	39,9x19,0	758,1	T	----	366200	483	----	----	+23
51/15 Bottom	4	40,0x19,0	760,0	T	----	357200	470	----	----	+23

ROTTE FUORI SALDATURA - FRATTURA DUTTILE Lato gr.60
BROKEN OUT OF WELDING - DUCTILE FRACTURE gr.60 SIDE

PROVA DI PIEGA

BEND TEST

SAGGIO *Test* N.		SENSO *Direction*	ANGOLO *Angle*	MANDRINO *Former*	POSIZIONE *Position*	ALLUNG. *Elong.*	RISULTATO *Result*	NOTE *Notes*
51/15	1	T	180	Ø 4T	SIDE	---	SATISFACTORY	Top
51/15	2	T	180	Ø 4T	SIDE	---	SATISFACTORY	Top
51/15	3	T	180	Ø 4T	SIDE	---	SATISFACTORY	Top
51/15	4	T	180	Ø 4T	SIDE	---	SATISFACTORY	Top
51/15	1	T	180	Ø 4T	SIDE	---	SATISFACTORY	Bottom
51/15	2	T	180	Ø 4T	SIDE	---	SATISFACTORY	Bottom
51/15	3	T	180	Ø 4T	SIDE	---	SATISFACTORY	Bottom
51/15	4	T	180	Ø 4T	SIDE	---	SATISFACTORY	Bottom

ENTE DI COLLAUDO / *Surveyor*

BUREAU VERITAS ITALY
WITNESSED NOTES REVIEWED
SURVEYOR P. CORNOLDI
DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☐ REVIEWED ☒ WITNESSED
24 NOV 2015

QUALITY CONTROL S.r.l. MEDOLAGO (BG)
ANGELO PEDRONI

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QUALITY CONTROL S.r.l.

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CLIENTE / Customer BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) **SAGGIO N.** / Test No. 51/15

PROVE DI RESILIENZA

IMPACT TEST

SAGGIO *Test* N.	SENSO *Direction*	POSIZIONE *Position*	TIPO *Type*	TEMP. °C	DIMENS. *Size* Mm	VALORI *Values* ≥ 18 J			MEDIA *Average* ≥27 J	ESPANSIONE LATERALE *Lateral Expantion* ≥0,38 mm			AREA DUTTILE *Shear Area* For info		
						1	2	3		1	2	3	1	2	3
51/15	T	W.M. Top 1,5 mm below surface (SAW Tandem)	KV	-46	10x10	113	129	127	123,0	1,95	2,14	2,07	60	65	65
						4	5	6		4	5	6	4	5	6
51/15	T	W.M. Between ½ ÷ ¼ (SAW)	KV	-46	10x10	128	125	120	124,3	2,07	2,11	1,95	65	65	65
						7	8	9		7	8	9	7	8	9
51/15	T	W.M. ¾ Thk (SMAW)	KV	-46	10x10	138	28	132	99,3	2,12	0,50	2,21	65	20	65
						10	11	12		10	11	12	10	11	12
51/15	T	W.M. Bottom (GTAW)	KV	-46	10x10	87	20	27	44,7	1,51	0,38	0,45	55	20	20
						1	2	3		1	2	3	1	2	3
51/15	T	H.A.Z. gr.60 Top 1,5 mm below surface (SAW Tandem)	KV	-46	10x10	31	27	35	31,0	0,51	0,52	0,70	20	20	20
						4	5	6		4	5	6	4	5	6
51/15	T	H.A.Z. gr.60 Between ½ ÷ ¼ (SAW)	KV	-46	10x10	54	149	190	131,0	0,95	2,19	2,43	35	70	80
						7	8	9		7	8	9	7	8	9
51/15	T	H.A.Z. gr.60 ¾ Thk (SMAW)	KV	-46	10x10	38	18	27	31,0	0,66	0,44	0,44	20	20	20
						10	11	12		10	11	12	10	11	12
51/15	T	H.A.Z. gr.60 Bottom (GTAW)	KV	-46	10x5	157	157	168	160,7	2,53	2,39	2,58	70	70	70
						1	2	3		1	2	3	1	2	3
51/15	T	H.A.Z. gr.2 Top 1,5 mm below surface (SAW Tandem)	KV	-46	10x10	28	38	28	31,3	0,64	0,79	0,38	20	20	20
						4	5	6		4	5	6	4	5	6
51/15	T	H.A.Z. gr.2 Between ½ ÷ ¼ (SAW)	KV	-46	10x10	166	171	78	138,3	2,43	2,63	1,32	70	75	50
						7	8	9		7	8	9	7	8	9
51/15	T	H.A.Z. gr.2 ¾ Thk (SMAW)	KV	-46	10x10	166	187	166	173,0	2,55	2,49	2,47	70	75	70
						10	11	12		10	11	12	10	11	12
51/15	T	H.A.Z. gr.2 Bottom (GTAW)	KV	-46	10x5	159	184	169	170,7	2,57	2,75	2,73	70	80	75

ENTE DI COLLAUDO / Surveyor BUREAU VERITAS ITALY WITNESSED ~~NOTED~~ ~~REVIEWED~~ SURVEYOR R. CORNOLDI DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A. WELDING DEPT. - S. MARIANO ☐ REVIEWED ☒ WITNESSED 24 NOV 2015

QUALITY CONTROL S.r.l. MEDOLAGO (BG)

ANGELO PANDOLFO

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

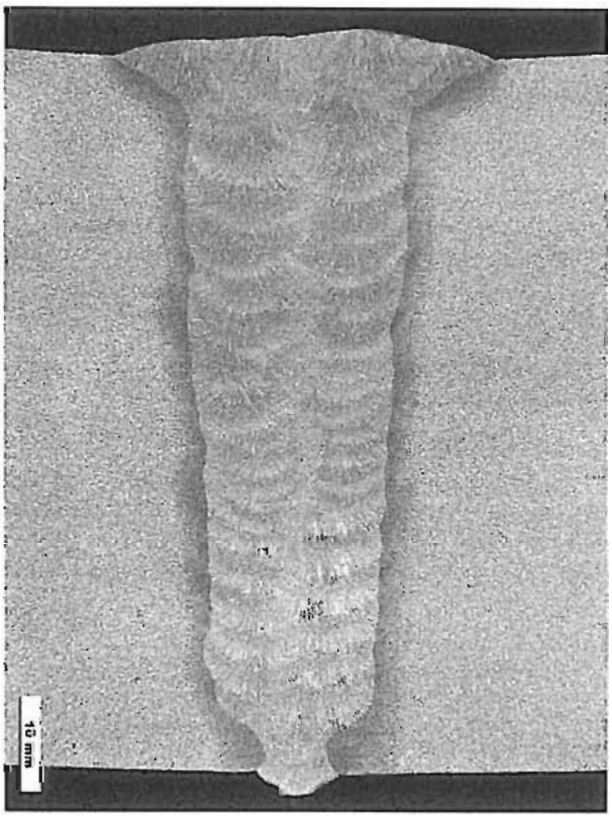
QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
SU MATERIALI METALLICI E GIUNTI DI SALDATURA

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CLIENTE / **Customer** BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) | **SAGGIO N.** / *Test No.* 51/15

ESAME MACROGRAFICO
MACROGRAPHIC EXAMINATION



Attacco: Nital 10%
Etching:

RISULTATO
RESULT

L'esame visivo a 10X di ingrandimento non ha evidenziato difetti o anomalie metallurgiche. Assenza di cricche e mancanze di fusione

The visual examination at 10X magnification has shown no defects or abnormal metallurgical features. Absence of cracks and lack of fusion.

ENTE DI COLLAUDO / **Surveyor**

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R.CORNOLDI
DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MARIANO
REVIEWED WITNESSED
24 NOV 2015

Metallurgical Laboratory
BRAVI ROMUALE
Level II Sector LF
Reg. CICPND n. 286

QUALITY CONTROL S.r.l. MEDOLAGO (BG)
ANGELO PERSEGATI

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

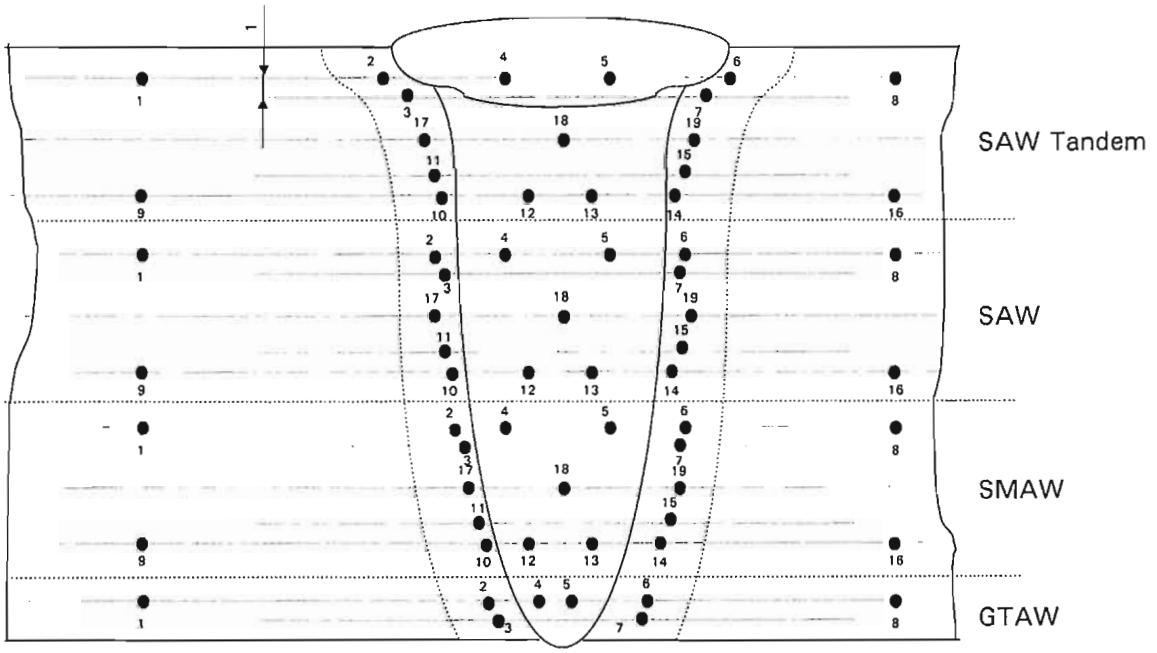
LABORATORIO DI PROVE E CONTROLLI
SU MATERIALI METALLICI E GIUNTI DI SALDATURA

24030 MEDOLAGO (BG) - Via Roma, 79 - Tel. 035/90.14.73 (n. 4 linee r.a.) - Fax 035/90.10.82
www.qualitycontrolsrl.it - e-mail: info@qualitycontrolgroup.com
Iscr. Reg. Imp. BG 12004 - C.C.I.A.A. BG 166333 - Cod. Fisc. e P.IVA 00663350163 - Cap. Soc. €101.490,00

CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) | **SAGGIO N.** / *Test No.* 51/15

PROVE DI DUREZZA TIPO HV_{10} (MAX 248) DOPO MAX PWHT

HARDNESS TEST TYPE HV_{10} (MAX 248) AFTER MAX PWHT



RISULTATO Pos. SAW tandem

RESULT

1 =	140	**2** =	176	**3** =	178	**4** =	179	**5** =	185
6 =	198	**7** =	198	**8** =	145	**9** =	142	**10** =	174
11 =	171	**12** =	178	**13** =	179	**14** =	179	**15** =	190
16 =	145	**17** =	162	**18** =	158	**19** =	170		

RISULTATO Pos. SAW

RESULT

1 =	143	**2** =	162	**3** =	166	**4** =	170	**5** =	179
6 =	181	**7** =	182	**8** =	144	**9** =	149	**10** =	176
11 =	176	**12** =	168	**13** =	175	**14** =	176	**15** =	185
16 =	145	**17** =	165	**18** =	157	**19** =	174		

ENTE DI COLLAUDO / *Surveyor*

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MARGANO
REVIEWED WITNESSED
24 NOV 2015

Metallurgical Laboratory
Level II Sector I.F.
Reg. CICPND n. 281

QUALITY CONTROL S.r.l.
MEDOLAGO (BG)
ANGELO PENDEGNA

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

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CLIENTE / Customer BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) — **SAGGIO N.** / *Test No.* 51/15

RISULTATO Pos. SMAW

RESULT

1 =	142	**2** =	169	**3** =	162	**4** =	183	**5** =	174
6 =	192	**7** =	203	**8** =	146	**9** =	142	**10** =	160
11 =	165	**12** =	174	**13** =	193	**14** =	185	**15** =	176
16 =	154	**17** =	180	**18** =	178	**19** =	182		

RISULTATO Pos. GTAW

RESULT

1 =	146	**2** =	163	**3** =	169	**4** =	169	**5** =	175
6 =	167	**7** =	164	**8** =	143				

ENTE DI COLLAUDO / Surveyor

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE 24 NOV 2015

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
REVIEWED WITNESSED
24 NOV 2015

Metallurgical Laboratory
ESAMI MINIMALE
Level II Welder LF
Reg. CICPND n. 246

QUALITY CONTROL S.r.l.
QUALITY CONTROL S.r.l. MEDOLAGO (BG)
ANGELO PENDEGGER

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
SU MATERIALI METALLICI E GIUNTI DI SALDATURA

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RAPPORTO DI PROVA N. *Test Report N.*	17/0586RP01	**DATA** *Date*	13/03/2017	**Foglio** *Page*	1	**di** *of*	2

CLIENTE *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) — **SAGGIO N.** *Test No.* 586.A

ORDINE *Order*	01/04/000185 dated 10/03/2017	**DISTINTA PROVE** *List of tests*	053/17	**MATERIALE RICEVUTO IL** *Material received on*	10/03/2017

OGGETTO *Object*

Welding Procedure Qualification Record: **51/15**

Plate Thk. 75 mm - Preliminary WPS: W51/15 - Job: 4129

Welding Process: GTAW+SMAW manual + SAW-SAW Tandem Machine Pos. 1G

Welders: JOSEPH JOY (Stamp: S11) - PRIBESCU CONSTANTIN (Stamp: S20)

Coupon 586.A with PWHT MIN (performed by client)

MATERIALE *Material*: ASME SA516 gr.60 / ASME SA765 gr.2

COLATA *Heat*: 61003 616857001 / 14E101854

PRODUTTORE *Supplier*: ARCELOR MITTAL / OFFICINE BINDA E GALPERTI — **CERT. N.** *Cert. No.*: 2015-104345 / 17594 — **DEL** *dated*: 19/02/2015 / 17/09/2015

NORME DI COLLAUDO *Test Specification*: ASME IX 2015 Ed. + ASME VIII Div.2 2015 Ed.

ENTE DI COLLAUDO *Surveyors*: Lloyds' Register

Prove *Tests*	Pagina *Sheet*	Data Prova *Date of test*	Metodo di prova *Test method*	Apparecchiatura *Equipment*	Note *Note*
☑ Resilienze / *Impact*	2	13/03/17	UG-84	QC 376	***Conform***
☐					
☐					
☐					
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☐					
☐					

Se non diversamente specificato, per l'accettabilità fanno fede le norme di collaudo e le norme relative al materiale
Unless otherwise specified, for the acceptability are valid test specifications and material standards

SI CERTIFICANO I RISULTATI OTTENUTI. TALI RISULTATI SONO RIFERITI ESCLUSIVAMENTE AI PROVINI TESTATI.
We certify the obtained results. These tests results refer only to examined samples.

ENTE DI COLLAUDO
Surveyor

Lloyd's Register Verification Limited
A member of the Lloyd's Register Group

Lloyd's Register

☒ Witnessed ☐ Monitored ☐ Reviewed

Alessandro Salvatore Monastra
13 March 2017
Milan Office

QUALITY CONTROL S.r.l.

Dott. Ing. ALESSANDRO DONADONI

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
SU MATERIALI METALLICI E GIUNTI DI SALDATURA

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RAPPORTO DI PROVA N. / *Test Report N.* 17/0586RP01 **DATA** / *Date* 13/03/2017 **Foglio** / *Page* 2 **di** / *of* 2

CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) **SAGGIO N.** / *Test No.* 586.A

PROVE DI RESILIENZA

IMPACT TEST

SAGGIO *Test* N.	SENSO *Direction*	POSIZIONE *Position*	TIPO *Type*	TEMP. °C	DIMENS. *Size* Mm	VALORI *Values* ≥ 27 J			MEDIA *Average* ≥ 27 J	ESPANSIONE LATERALE *Lateral Expantion* ≥0,38 mm			AREA DUTTILE *Shear Area* For info		
						1	2	3		1	2	3	1	2	3
586.A	T	W.M. Bottom (GTAW)	KV	-46	10x10	134	128	146	136,0	2,15	1,80	2,20	60	60	70
586.A	T	H.A.Z. gr.60 Between ½ ÷ ¼ (SAW)	KV	-46	10x10	279	303	291	291,0	2,45	2,50	2,48	90	90	85
586.A	T	H.A.Z. gr.60 Between ½ ÷ ¾ (SMAW)	KV	-46	10x10	182	263	217	220,7	2,09	2,45	2,25	75	90	80
586.A	T	H.A.Z. gr.60 Bottom (GTAW)	KV	-46	10x10	174	108	70	117,3	2,20	1,75	1,11	75	60	50
586.A	T	H.A.Z. gr.2 Between ½ ÷ ¼ (SAW)	KV	-46	10x10	96	158	91	115,0	1,50	2,17	1,48	55	70	55
586.A	T	H.A.Z. gr.2 Between ½ ÷ ¾ (SMAW)	KV	-46	10x10	231	314	250	265,0	2,35	2,41	2,27	85	90	85
586.A	T	H.A.Z. gr.2 Bottom (GTAW)	KV	-46	10x10	146	179	164	163,0	2,11	2,24	2,19	65	75	70

ENTE DI COLLAUDO / *Surveyor*

Lloyd's Register Verification Limited
A member of the Lloyd's Register Group
Lloyd's Register

[X] Witnessed [-] Monitored [-] Reviewed

Alessandro Salvatore Monastra
13 March 2017
Milan Office

LRV003.1.2013.12

QUALITY CONTROL S.r.l.

Dott. Ing. ALESSANDRO DONADONI

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio.

QUALITY CONTROL S.r.l.

LABORATORIO DI PROVE E CONTROLLI
SU MATERIALI METALLICI E GIUNTI DI SALDATURA

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RAPPORTO DI PROVA N. *Test Report N.*	17/0586RP02	DATA *Date*	20/03/2017	Foglio *Page*	1	di *of*	3

CLIENTE *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) — SAGGIO N. *Test No.* 586.B

ORDINE *Order*	01/04/000185 dated 10/03/2017	DISTINTA PROVE *List of tests*	053/17	MATERIALE RICEVUTO IL *Material received on*	10/03/2017

OGGETTO *Object*

Integrative test to Welding Procedure Qualification Record: **51/15**
Plate Thk. 75 mm - Preliminary WPS: W51/15 - Job: 4129
Welding Process: GTAW + SMAW manual + SAW-SAW Tandem Machine Pos. 1G
Welders: JOSEPH JOY (Stamp: S11) - PRIBESCU CONSTANTIN (Stamp: S20)
Coupon 586.B with PWHT MAX (Chart No.072A/17 dated 13 ÷ 15/03/2017)

MATERIALE *Material*: ASME SA516 gr.60 / ASME SA765 gr.2

COLATA *Heat*: 61003 616857001 / 14E101854

PRODUTTORE *Supplier*: ARCELOR MITTAL / OFFICINE BINDA E GALPERTI — **CERT. N.** *Cert. No.*: 2015-104345 / 17594 — **DEL** *dated*: 19/02/2015 / 17/09/2015

NORME DI COLLAUDO *Test Specification*: ASME IX 2015 Ed. + ASME VIII Div.2 2015 Ed.

ENTE DI COLLAUDO *Surveyors*: CLIENT INSPECTOR

Prove *Tests*	Pagina *Sheet*	Data Prova *Date of test*	Metodo di prova *Test method*	Apparecchiatura *Equipment*	Note *Note*
☑ Trattamento temico MAX / *MAX H.T.*	2	13 ÷ 15/03/17	IL 08.00.02	See report	---------
☑ Resilienze / *Impact*	3	20/03/17	UG-84	QC 376	***Conform***
☐					
☐					
☐					
☐					
☐					
☐					
☐					
☐					
☐					
☐					
☐					

Se non diversamente specificato, per l'accettabilità fanno fede le norme di collaudo e le norme relative al materiale
Unless otherwise specified, for the acceptability are valid test specifications and material standards

SI CERTIFICANO I RISULTATI OTTENUTI. TALI RISULTATI SONO RIFERITI ESCLUSIVAMENTE AI PROVINI TESTATI.
We certify the obtained results. These tests results refer only to examined samples.

ENTE DI COLLAUDO *Surveyor*
BREMBANA & ROLLE S.p.A.
WELDING DEPT. S. MARCIANO
☐ REVIEWED ☑ WITNESSED
21/3/17

ACES GLOBAL QUALITY SERVICES
☐ REVIEWED ☐ NOTED
☑ WITNESSED ☐ SPOT WITNESSED
NAME: FRANCOVIG F.
DATE: 21 MAR. 2017
SIGNATURE:

QUALITY CONTROL S.r.l.
Dott. Ing. ALESSANDRO DONADONI

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio

QUALITY CONTROL S.r.l.
LABORATORIO DI PROVE E CONTROLLI SU MATERIALI METALLICI E GIUNTI DI SALDATURA
24030 MEDOLAGO (BG) - Via Roma, 79 - Tel. 035/90.14.73 (n. 4 linee r.a.) - Fax 035/90.10.82
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CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) SAGGIO N. / *Test No.* 586.B

TRATTAMENTO TERMICO
HEAT TREATMENT

DIAGRAMMA N. / *CHART N.* 072A/17 DEL / *DATED* 13 ÷ 15/03/2017

PRESCRIZIONI CLIENTE
CLIENT PARAMETRES

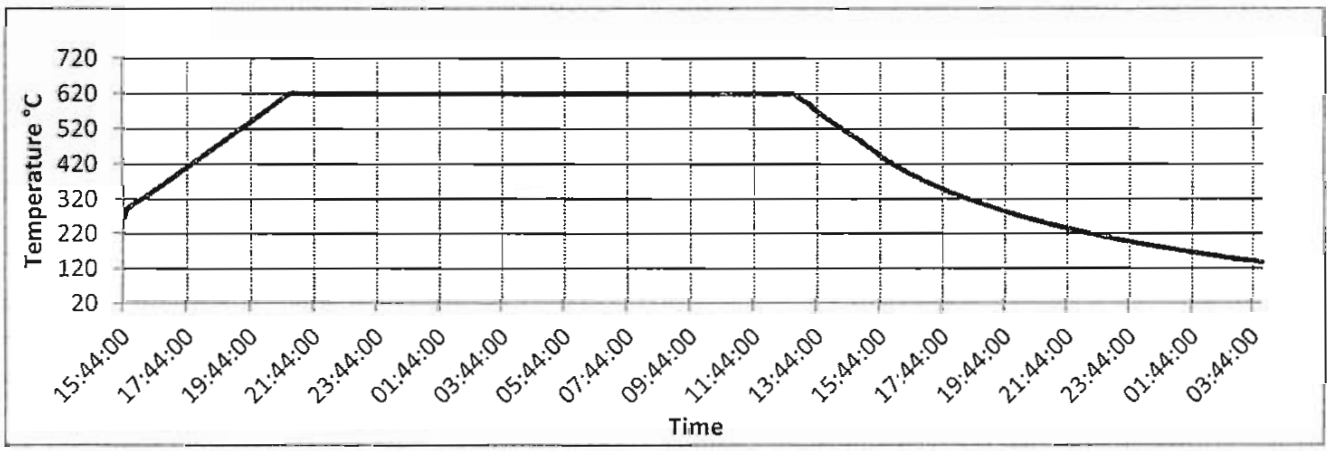
Tipo di Trattamento / *Heat treatment type*: Distensione / *Stress rilieving*

Specifica Tecnica / *Technical Specification*: Richiesta cliente / *Customer required*

Raffreddamento / *Cooling*: Aria calma / *Still air*

Parametri
Parametres

	RICHIESTI / *Required*		RILEVATI / *Recorded*	
Temp. Iniziale / *Start Temp.*	<300	°C	265	°C
Riscaldo / *Heating rate*	50 ÷ 80	≤°C/h	65	°C/h
Temperatura / *Temperature*	620±10	°C	620	°C
Permanenza / *Holding time*	16,00	h	16,00	h
Raffreddamento / *Cooling rate*	50 ÷ 80	≤°C/h	66	°C/h
Temp. Finale / *Final Tem.*	<300	°C	131	°C



Forno Elettrico n. / *Electrical Furnace n.* 221

Il diagramma originale è presso l'archivio della Quality Control S.r.l.
The original chart is in the Quality Control S.r.l. files

N.2 termocoppie tipo K posizionate sul saggio
N.2 type K thermocouples placed on the specimen

Si certifica che il trattamento termico risulta in accordo con la specifica summenzionata
We certify that the heat treatment is according to the named specification

ENTE DI COLLAUDO / *Surveyor*
BREMBANA & ROLLE S.p.A.
WELDING DEPT. S. MARIANO
☐ REVIEWED ☑ WITNESSED
20/3/2017

ACES GLOBAL QUALITY SERVICES
☑ REVIEWED ☐ NOTED
☐ WITNESSED ☐ SPOT WITNESSED
NAME: FRANCOVIG E.
DATE: 20 MAR. 2017
SIGNATURE:

QUALITY CONTROL S.r.l.
Dott. Ing. ALESSANDRO DONADONI

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio

QUALITY CONTROL S.r.l.
LABORATORIO DI PROVE E CONTROLLI SU MATERIALI METALLICI E GIUNTI DI SALDATURA
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RAPPORTO DI PROVA N. / *Test Report N.* 17/0586RP02 **DATA** / *Date* 20/03/2017 **Foglio** / *Page* 3 **di** / *of* 3

CLIENTE / *Customer* BREMBANA&ROLLE S.p.A. - VALBREMBO (BG) SAGGIO N. / *Test No.* 586.B

PROVE DOPO TRATTAMENTO TERMICO MASSIMO
TEST AFTER MAX P.W.H.T.

PROVE DI RESILIENZA
IMPACT TEST

SAGGIO *Test* N.	SENSO *Direction*	POSIZIONE *Position*	TIPO *Type*	TEMP. °C	DIMENS. *Size* Mm	VALORI *Values* ≥ 27 J			MEDIA *Average* ≥ 27 J	ESPANSIONE LATERALE *Lateral Expantion* ≥0,38 mm			AREA DUTTILE *Shear Area* For info		
						1	2	3		1	2	3	1	2	3
586.B	T	W.M. Bottom (GTAW)	KV	-46	10x10	159	148	168	158,3	2,31	2,21	2,40	70	70	75
586.B	T	H.A.Z. gr.60 Between ½ ÷ ¾ (SMAW)	KV	-46	10x10	151	200	178	176,3	2,36	2,60	2,40	70	80	75
586.B	T	H.A.Z. gr.2 Between ½ ÷ ¾ (SMAW)	KV	-46	10x10	235	119	312	222,0	2,44	1,61	2,47	85	65	90

ENTE DI COLLAUDO / *Surveyor*
BREMBANA & ROLLE S.p.A. WELDING DEPT. - S. MANGANO
☐ REVIEWED ☒ WITNESSED
20/3/2017

ACES GLOBAL QUALITY SERVICES
☐ REVIEWED ☐ NOTED
☑ WITNESSED ☐ SPOT WITNESSED
NAME: FRANCOVIG E.
DATE: 20 MAR. 2017
SIGNATURE:

QUALITY CONTROL S.r.l.
Dott. Ing. ALESSANDRO DONADONI

Il presente certificato non può essere riprodotto, salvo autorizzazione scritta del laboratorio

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 (Date) foglio 1 (Page) di 12 (of)

CERTIFICATO DI COLLAUDO \ CERTIFICATE MATERIAL TEST REPORT

CERTIFICAT DE RÉCEPTION \ ABNAHMEPR ÜFZEUGNIS

N. 14\08449\CM

CLIENTE / *Customer Client / Kunde*: **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung*: **000725 JOB M288**

DATA / *Date / Datum*: **20.03.2014**

COMMESSA / *Job. Nr. Réf. / Auftrag*: **14\120**

MATERIALE / *Material Nuance/ Werkstoff*: **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation*: **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

CODICE / *Code Kundenidentifikation*

Id Fm	POS Item	QTA Q.ty / Qte	DESCRIZIONE / Subject Object / Betreff	DISEGNO / Drawing Plan / Zeichnung	MATRICOLA / Serial Nr. Repère / Kenn-Nr.	PROVA / Test Essai / Test Nr.	COLATA / Heat Coulée / Schmelze
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

LISTA DEI CERTIFICATI / List of enclosed certificates

Pages	List of enclosed certificates	Report No.	
1	Certificato di Collaudo \ Certificate Material Test Report \ Certificat de Réception \ Abnahmepr üfzeugnis	14\08449\CM	1
2	Analisi Chimica \ Chemical Analysis \ Analyse Chimique \ Chem. Zusammensetzung	14\08449\CA	1
3	Trattamento Termico \ Heat Treatment \ Traitement Thermique \ Wärmebehandlung	14\08449\HTQ	1
4	Prova Meccanica di Trazione \ Mechanical Tensile Test \ Essai de Traction \ Zugfestigkeitsversuch	14\08449\TE	1
5	Prova Meccanica di Resilienza \ Mechanical Impact Test \ Essai de Résilience \ Kerbschlagbiegeversuch	14\08449\IM	1
6	Trattamento Termico Simulato Max\ Simulated Heat Treatment Max \ Traitement Thermique Simulé Max.\ Max. Simulierte Wärmebehandlung	14\08449\PWX	1
7	Trazione MAX SPWHT\ Tensile Test MAX SPWHT \ Essai de Traction MAX SPWHT \ Zugfestigkeitsversuch MAX SPWHT	14\08449\TEX	1
8	Resilienza MAX SPWHT \ Impact Test MAX SPWHT \ Essai de Résilience MAX SPWHT \ Kerbschlagbiegeversuch MAX SPWHT	14\08449\IMX	1
9	Durezza \ Hardness \ Essai de Dureté \ Härteprüfung	14\08449\HPF	1
10	Esame Magnetico \ Magnetic Test \ Côntrole Magnétoscopique \ Magnetpulverprüfung	14\08449\MT	1
11	Esame Ultrasonoro \ Ultrasonic Test \ Côntrole Ultrasons \ Ultrachallprüfung	14\08449\USF	1
12	Esame Dimensionale \ Dimensional and Visual check \ Contrôle Visuel et Dimensionnel \ Visuelle Prüfung und Maßkontr.	14\08449\DI	1

I controlli eseguiti sono conformi all'ordine e specifiche del materiale
The tests have been in conformance with the order and material specifications

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE 3/6/15

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
13 GIU 2014

Operatore *Operator*	Enti collaudatori *Inspection Authorities*	saipem spa QC INSPECTOR Sergio Ricci ☑ review ☐ witness date 21.05.'14 Snamprogetti Centre of Excellence	Responsabile controllo qualità *Quality Control Manager* FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 foglio 2 di 12
Date *Page* *of*

ANALISI CHIMICA \ CHEMICAL ANALYSIS
ANALYSE CHIMIQUE \ CHEM. ZUSAMMENSETZUNG

Inspection report according to EN10204 Ed.2004 3.2 N. **14\08449\CA** *of* *Page* 1 *of* 1

CLIENTE / *Customer Client / Kunde* **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung* **000725 JOB M288** DATA *Date / Datum* **20.03.2014**

COMMESSA / *Job. Nr. Réf. / Auftrag* **14\120**

MATERIALE / *Material Nuance/ Werkstoff* **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation* **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Heat Coulée / Schmelze*
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

COLATA	C	Mn	Si	P	S	Cr	Ni	Mo	Cu	V	Al	Ceq
Heat	%	%	%	%	%	%	%	%	%	%	%	%
Min		,6	,15									
Max	,22	1,35	,35	,02	,02	,4	,5	,1	,2	,05	,05	,43
	Ladle analysis				*Steelmaker : OLIFER-ACP S.P.A.*							
9084-14	,16	1,17	,22	,007	,0007	,11	,14	,05	,15	,002	,023	,4067
	Product analysis				*Performed by Forge Monchieri Spa*							
14-0505	,162	1,168	,221	,008	,0007	,107	,138	,049	,151	,003	,025	,4077

Acciaio elaborato al forno elettrico degassato sottovuoto calmato a grano fine .
Steel made by electric furnace process, vacuum degassed fully killed , fine grain practice .

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. SARNOLDI DATE 5/6/15

BREMBANA & ROLLE S.p.A. QCM - L. BENSONI REVIEWED / ACCEPTED 13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Svt Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*		Responsabile controllo qualità *Quality Control Manager*
		saipem spa QC INSPECTOR Sergio Ricci ☒ review ☐ witness date 21.05.14 Snamprogetti Centre of Excellence	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

OLIFER-ACP SPA
Soc. per Az. Unipersonale soggetta ad attività di direz. e coord. esercitata da "OLIFIN SPA" con sede in Odolo — BS- Via Marconi,4 cod.fisc e iscr. reg. impr. Bs: 00286190178
LOC. Motte Alte, 14 - 24050 CIVIDATE AL PIANO (BG)
Tel. +39 0363 97193-4 - Fax +39 0363 976665
P.I. 02477420168 C.F. e REG. IMPR. BG 00496820176
Capitale sociale i.v. Euro 10.000.000,00

CERTIFICATO DI COLLAUDO / MILL TEST CERTIFICATE

ACPL00269/2014 Data / Date **26/02/2014**

EN 10204 3.1

Azienda con sistema di gestione certificato da IGQ secondo ISO 9001 e da TUV secondo ISO 14001

ISO 9001 Quality Management System Certified by IGQ,ISO 14001 Environmental System Certified by TUV

Cliente / Customer

FORGE MONCHIERI S.P.A.

VIA INDUSTRIALE, 3

25040 CIVIDATE CAMUNO BS

Nostra conferma N° / Our confirmation no.

138/2014 del 28-01-2014

Ordine cliente n./Customer

2014/A2/00020 pos.1-2-3-4 del 27/01/14

Colata N. / Heat no.

9084-14

Stato fornitura materiale / State of supplies material

Norma Specifica / Standard	Acciaio / Steel grade	Scheda / Sheet	Dimensioni (mm) / Size (mm)
		CL430DF	

Acciaio prodotto con fusione in E.A.F. ed affinazione in L.F. - Trattamento sottovuoto - Materiale esente da radioattività e da saldature - Lo stato di fornitura del materiale è prodotto siderurgico primario

Steel is fully killed - produced by E.A.F. - Refined in L.F. - Vacuum Degassed - the employed material is free from ionizing radiation beyond the natural intrinsic radiation - No welding operation has been performed - Supply status is raw material -

Analisi chimica / Chemical composition %

C	Si	Mn	P	S	Ni	Cu	Cr	Mo	Al	Sn	H2	V	Ti	B	Nb	As	Ca
0,16	**0,22**	**1,17**	**0,007**	**0,0007**	**0,14**	**0,15**	**0,11**	**0,05**	**0,023**	**0,011**	**0,00012**	**0,002**	**0,002**	**0,0004**	**0,001**	**0,007**	**0,001**
Sb	Co	N	O2														
0,0031	**0,008**	**0,0062**	**0,0018**														

CuEq	Ceq	Cef	Jfact	xfact	Pcm
0,26	**0,41**	**0,090**	**250**	**14**	**0,25**

DUREZZA HARDNESS	INCLUSIONI NON METALLICHE NON METALLIC INCLUSION CHECK	GRANO AUSTENITICO GRAIN SIZE	TRATTAMENTO TERMICO HEAT TREATMENT		
(HB)			Raffreddamento in c. Controlled cooling	Ricotto Annealing	Spedito caldo Hot delivery
			–	–	–

ALTRE PROVE / OTHER TEST

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R CORNOLO DATE 9/6/15

Si dichiara che il materiale corrisponde alle specifiche concordate alla conferma dell'ordine/ We confirm that the productions correspond to the agreement made during order confirmation.

Saipem SpA QC INSPECTOR Sergio Ricci review witness date 29.04.14 Sampogetti Centre of Excellence

COPY CONFORM TO ORIGINAL

Forgiatura monchieri Dario Brandini Quality Control Manager

SREMBANA & BOLIS S.p.A. QCM - LORENSONI REVIEWED / ACCEPTED 13 GIU 2014

Controllo Qualità / Quality control		Preparato controllo qualità/Prepared quality control	Verificato responsabile controllo qualità/ Verified quality control
Controllo superficiale Surface quality	Antimescolamento Grade check		
X	X	Alberto Sengermano	Alessandro D'Amico

forge monchieri

COMPANY CERTIFIED BY ASME
AS A MATERIAL ORGANIZATION
- CERTIFICATE NUMBER QSC-610 -

ISO 9001, ISO 14001, OHSAS 18001 BUREAU VERITAS Certification

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 foglio 3 di 12
Date *Page* *of*

TRATTAMENTO TERMICO \ HEAT TREATMENT
TRAITEMENT THERMIQUE \ WÄRMEBEHANDLUNG

Inspection report according to EN10204 Ed.2004 3.2 N. **14\08449\HTQ** *of* *Page* 1 *of* 1

CLIENTE / *Customer Client / Kunde* **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung* **000725 JOB M288** DATA *Date / Datum* **20.03.201**

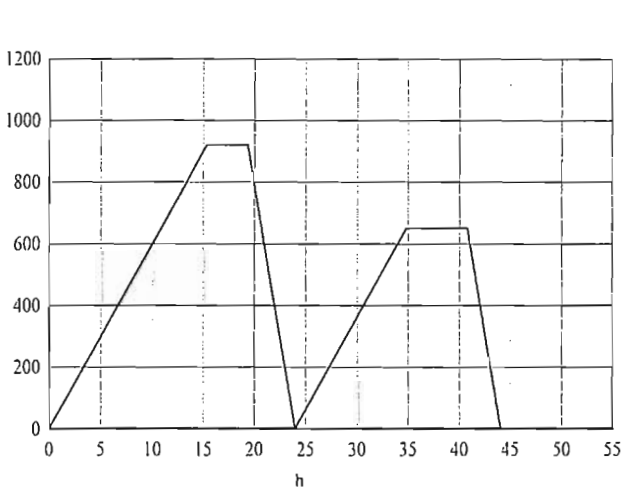
COMMESSA / *Joh. Nr. Réf. / Auftrag* **14\120**

MATERIALE / *Material Nuance/ Werkstoff* **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation* **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Hea* Coulée / Schmelz
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14



Trattamento Termico *Heat treatment*	Gradiente Salita *Heating rate*		Temperatura di Permanenza *Holding temperature*		Permanenza *Holding time*	Raffreddamneto *Cooling*	
Normalizzazione - Normalization	60,0 °C/h	108,0 °F/h	920 °C	1688 °F	4,0 h	Aria	Air
Rinvenimento - Tempering	60,0 °C/h	108,0 °F/h	650 °C	1202 °F	6,0 h	Aria	Air

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE 13/06/14

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Svt Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*		Responsabile controllo qualità *Quality Control Manager*
		saipem spa QC INSPECTOR Sergio Ricci [X] review [ ] witness date 21.05.14	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager
		Snamprogetti Centre of Excellence	

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 (Date) foglio 4 (Page) di 12 (of)

PROVA MECCANICA DI TRAZIONE \ MECHANICAL TENSILE
ESSAI DE TRACTION \ ZUGFESTIGKEITSVERSUCH

Inspection report according to EN10204 Ed.2004 3.2 N. **14\08449\TE** (of) (Page) 1 of 1

CLIENTE / *Customer Client / Kunde*: **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung*: **000725 JOB M288** DATA / *Date / Datum*: **20.03.2014**

COMMESSA / *Job. Nr. Réf. / Auftrag*: **14\120**

MATERIALE / *Material Nuance/ Werkstoff*: **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation*: **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Hea* Coulée / Schmelze
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

TRAZIONE - *Tensile*

Ø 12,5 mm.				Sec. 122,66 mm²			Lo 50,00 mm		
Tensile tests machines: Macchina di Trazione		ZWICK matricola 181845-08							
Prova *Test*	**Direzione** *Direction*	**Temp.** °C	**Temp.** °F	**Rp (0,02%)** MPa	**Rp (0,2%)** MPa	**Rp (1%)** MPa	**R** MPa	**A** %	**Z** %
		20	*68,00*		*>=250*		*485÷655*	*>=22*	*>=30*
14-0505	*Tangential ¼TxT*	*20*	*68,00*		*352,0*		*524,0*	*35,3*	*76,0*

Le prove meccaniche sono state eseguite in condizioni di fornitura
The mechanical tests have been performed in delivered condition

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLDI DATE 5/12/5

BREMBANA & ROLLE S.p.A. QCM - L. BONSONI REVIEWED / ACCEPTED 13 GIU 2014

X CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

☐ *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Svt Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*	Responsabile controllo qualità *Quality Control Manager*
	saipem spa QC INSPECTOR Sergio Ricci ☐ review ☒ witness date 21.05.14 Snamprogetti Centre of Excellence	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 *Date* foglio 5 *Page* di 12 *of*

PROVA MECCANICA DI RESILIENZA \ MECHANICAL IMPACT
ESSAI DE RÉSILIENCE \ KERBSCHLAGBIEGEVERSUCH

Inspection report according to EN10204 Ed.2004 3.2 N. **14\08449\IM** *of* *Page* 1 *of* 1

CLIENTE / *Customer Client / Kunde* **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung* **000725 JOB M288** DATA *Date / Datum* **20.03.2014**

COMMESSA / *Joh. Nr. Réf. / Auftrag* **14\120**

MATERIALE / *Material Nuance/ Werkstoff* **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation* **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

ASME VIII Div.2 Para AM-201.4(b)

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Hea* Coulée / Schmelze
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

RESILIENZA - *Impact*

Sezione Provino *Impact specimen Section* 10x10 mm L.55 mm

Impact tests machines: Macchina per Resilienza ZWICK ROELL mod. RKP450 matricola 189240/09

Prova *Test*	Direzione *Direction*	KV °C	KV °F	Esp Laterale *Lat Espansion*	Fratt.Duttile *Sheare Fracture*
		-45,00	-49,00		
		KV J		mm	%
		Average	>=20		
		Single	>=16		
			Average		
14-0505	Tangential ¼TxT	287,0	294,0	305,0	295,3

Le resilienze sono state eseguite in condizioni di fornitura
The impact tests have been performed in delivered condition

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLDI DATE 5/10/15

BREMBANA & ROLLE S.p.A. QCM - L. BENSONI REVIEWED / ACCEPTED 13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Svt Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*	Responsabile controllo qualità *Quality Control Manager*
	saipem spa QC INSPECTOR Sergio Ricci ☐ review ☒ witness date 21.05.14 Snamprogetti Centre of Excellence	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 (Date) foglio 6 (Page) di 12 (of)

TRATTAMENTO TERMICO SIMULATO MAX\ SIMULATED HEAT
TRAITEMENT THERMIQUE SIMULÉ MAX.\ MAX. SIMULIERTE

Inspection report according to EN10204 Ed.2004 3.2 — N. **14\08449\PWX** (of) — Page 1 of 1

CLIENTE / *Customer Client / Kunde*: **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung*: **000725 JOB M288** — DATA / *Date / Datum*: **20.03.201**

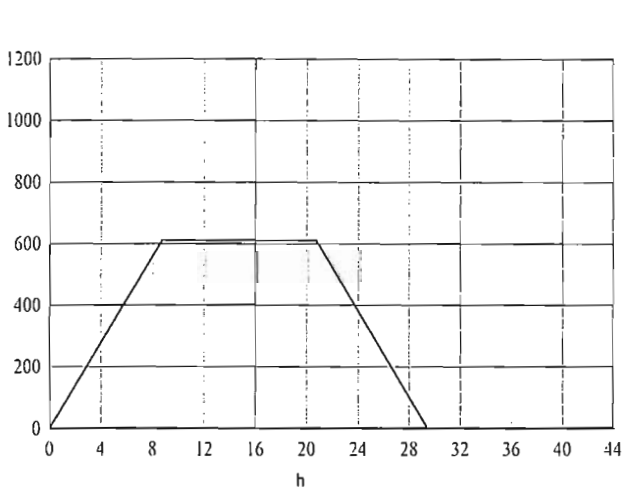
COMMESSA / *Job. Nr. Réf. / Auftrag*: **14\120**

MATERIALE / *Material Nuance/ Werkstoff*: **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation*: **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

CODICE / *Code Kundenidentifikation*

Id Fm	POS Item	QTA Q.ty / Qte	DESCRIZIONE / Subject Object / Betreff	DISEGNO / Drawing Plan / Zeichnung	MATRICOLA / Serial Nr. Repère / Kenn-Nr.	PROVA / Test Essai / Test Nr.	COLATA / He Coulée / Schmelz
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14



Trattamento Termico *Heat treatment*	Gradiente Salita *Heating rate*		Temperatura di Permanenza *Holding temperature*		Permanenza *Holding time*	Gradiente Discesa *Cooling rate*		Raffreddamneto *Cooling*	
SPWHT	70,0 °C/h	126,0 °F/h	610 °C	1130 °F	12,00 h	70,0 °C/h	126,0 °F/h	Forno	Furnace

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLDI DATE 5/10/5

BREMBANA & ROLLE S.p.A. QCM - L. BENSONI REVIEWED / ACCEPTED 13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Sw Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*		Responsabile controllo qualità *Quality Control Manager*
		saipem spa QC INSPECTOR Sergio Ricci ☒ review ☐ witness date 21/05/14 Snamprogetti Centre of Excellence	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 (Date) foglio 7 (Page) di 12 (of)

TRAZIONE MAX SPWHT\ TENSILE TEST MAX SPWHT

ESSAI DE TRACTION MAX SPWHT \ ZUGFESTIGKEITSVERSUCH MAX SPWHT

Inspection report according to EN10204 Ed.2004 3.2 N. **14\08449\TEX** (of) (Page) 1 of 1

CLIENTE / *Customer Client / Kunde* **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung* **000725 JOB M288** DATA / *Date / Datum* **20.03.201**

COMMESSA / *Job. Nr. Réf. / Auftrag* **14\120**

MATERIALE / *Material Nuance / Werkstoff* **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation* **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Hea* Coulée / Schmelz
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

TRAZIONE - *Tensile*

Ø 12,5 mm. Sec. 122,66 mm² Lo 50,00 mm

Tensile tests machines: Macchina di Trazione ZWICK matricola 181845-08

Prova *Test*	Direzione *Direction*	Temp. °C	Temp. °F	Rp (0,02%) MPa	Rp (0,2%) MPa	Rp (1%) MPa	R MPa	A %	Z %
		20	*68,00*		*>=250*		*485÷655*	*>=22*	*>=30*
14-0505	*Tangential ¼TxT*	*20*	*68,00*		*318,0*		*501,0*	*36,4*	*73,8*

Le prove meccaniche sono state eseguite dopo SPWHT
The mechanical test have been performed after SPWHT

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR C. CORNOLDI DATE 9/10/14

BREMBANA & ROLLE S.p.A. QCM - E. BENSONI REVIEWED / ACCEPTED 13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Svi Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*		Responsabile controllo qualità *Quality Control Manager*
		saipem spa QC INSPECTOR Sergio Ricci ☐ review ☒ witness date 21.05.14 Snamprogetti Centre of Excellence	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

forge monchieri

MAM FORGINGS MEMBER

COMPANY CERTIFIED BY ASME
AS A MATERIAL ORGANIZATION
- CERTIFICATE NUMBER QSC-610 -

ISO 9001, ISO 14001, OHSAS 18001
BUREAU VERITAS Certification

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 foglio 8 di 12
Date *Page* *of*

RESILIENZA MAX SPWHT \ IMPACT TEST MAX SPWHT

ESSAI DE RÉSILIENCE MAX SPWHT \ KERBSCHLAGBIEGEVERSUCH MAX SPWHT

Inspection report according to EN10204 Ed.2004 3.2 N. **14\08449\IMX** *of* *Page* 1 *of* 1

CLIENTE / *Customer Client / Kunde* **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung* **000725 JOB M288** DATA / *Date / Datum* **20.03.2014**

COMMESSA / *Job. Nr. Réf. / Auftrag* **14\120**

MATERIALE / *Material Nuance/ Werkstaff* **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation* **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

ASME VIII Div.2 Para AM-201.4(b)

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Heat* Coulée / Schmelze
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

RESILIENZA - *Impact*

Sezione Provino *Impact specimen Section*	10x10 mm L.55 mm
Impact tests machines: Macchina per Resilienza	ZWICK ROELL mod. RKP450 matricola 189240/09

Prova *Test*	Direzione *Direction*	KV °C	KV °F	Esp Laterale *Lat Espansion*	Fratt.Duttile *Sheare Fracture*
		-45,00	-49,00		
		J		mm	%
		Average	>=20		
		Single	>=16		

Average

14-0505	*Tangential ¼TxT*	*225,0*	*194,0*	*211,0*	*210,0*						

Le resilienze sono state eseguite dopo SPWHT
The impact tests have been performed after SPWHT

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE 31/10/15

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Svt Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*	Responsabile controllo qualità *Quality Control Manager*
	saipem spa QC INSPECTOR Sergio Ricci ☐ review ☒ witness date 21.05.'14 Snamprogetti Centre of Excellence	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 (Date) foglio 9 (Page) di 12 (of)

DUREZZA \ HARDNESS
ESSAI DE DURETÉ \ HÄRTEPRÜFUNG

Inspection report according to EN10204 Ed.2004 3.2 — N. **14\08449\HPF** (of) — Page 1 of 1

CLIENTE / *Customer Client / Kunde*: **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung*: **000725 JOB M288** — DATA / *Date / Datum*: **20.03.201**

COMMESSA / *Joh. Nr. Réf. / Auftrag*: **14\120**

MATERIALE / *Material Nuance/ Werkstoff*: **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation*: **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Hea* Coulée / Schmelz
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

APPARATO *Apparatus*	Durezza *Hardness*	**HB**	
SPINA	Richiesto *Required*	**<200**	
Identificazione *Identification*		Risultati Results	
	From	To	
Item 6A	162	164	

La prova di durezza è stata eseguita sui forgiati in condizione di fornitura
The hardness test has been performed on the forgings in delivered condition

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R. CORNOLD DATE 5/06/15

BREMBANA & ROLLE S.p.A. QCM - L. BENSONI REVIEWED / ACCEPTED 13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*
[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Svt Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*	saipem spa QC INSPECTOR Sergio Ricci ☐ review ☒ witness date 21.05.14 Snamprogetti Centre of Excellence	Responsabile controllo qualità *Quality Control Manager* FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

14\08449 rev. 00

Cividate Camuno, lì 21-MAG-2014 (Date) foglio 10 (Page) di 12 (of)

ESAME MAGNETICO \ MAGNETIC TEST
CÔNTROLE MAGNÉTOSCOPIQUE \ MAGNETPULVERPRÜFUNG

Inspection report according to EN10204 Ed.2004 3.2 — N. **14\08449\MT** (of) — Page 1 of 1

CLIENTE / *Customer Client / Kunde*: **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung*: **000725 JOB M288** — DATA / *Date / Datum*: **20.03.201**

COMMESSA / *Job. Nr. Réf. / Auftrag*: **14\120**

MATERIALE / *Material Nuance/ Werkstoff*: **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation*: **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

ASTM A-275

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Hea* Coulée / Schmelz
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

Condizioni Superficiali - *Surface condition*

X Machined to drawing

Pulitura - *Cleaning*

X Trielina - Tricloroetylene - Con Straccio - Cloth

Magnetizzazione - *Magnetization*

	Apparato - *Apparatus*	Distanza *Distance*	Corrente *Current*	Intesità *Intensity*	Magnetico *Magnetic*	Note *Note*
X	YOKE ES AC/DC	180 mm	AC	40 Gauss		

Metodo di Ispezione - *Inpection Method*

X	Controllo col. Nero Black color Contrast	Tipo *Type*	LK-35 CGM	Lampada a Luce Bianca White light lamp	
		Tipo *Type*			

L'esame è stato eseguito sul 100% della superficie. Nessuna indicazione rilevata.
The magnetoscopic examination has been carried out on 100% of surfaces . No indication has been detected

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R CORNOLDI DATE 5/16/14

BREMBANA & ROLLE S.p.A. QCM - L. BENSONI REVIEWED/ACCEPTED 13 GIU 2014

X CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

NON CONFORME ALLA SPECIFICA / *Not According to specif. Non Conf. Svt Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*		Responsabile controllo qualità *Quality Control Manager*
QUALITY CONTROL Salari Francesco II° LEVEL UT-MT-PT SNT-TC-1A-EN 473		saipem spa QC INSPECTOR Sergio Ricci ☐ review ☒ witness date 21.05.14 Snamprogetti Centre of Excellence	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 foglio 11 di 12
Date *Page* *of*

ESAME ULTRASONORO \ ULTRASONIC TEST
CÔNTROLE ULTRASONS \ ULTRACHALLPRÜFUNG

Inspection report according to EN10204 Ed.2004 3.2 N. **14\08449\USF** *of* *Page* 1 *of* 1

CLIENTE / *Customer Client / Kunde* **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung* **000725 JOB M288** DATA *Date / Datum* **20.03.2014**

COMMESSA / *Job. Nr. Réf. / Auftrag* **14\120**

MATERIALE / *Material Nuance/ Werkstoff* **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation* **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

ASME SA-388 - ASME VIII Div.2 Para AM-203.2

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Hea* Coulée / Schmelze
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

Condizioni Superficiali - *Surface Condition*

[X] Finito-Finish Machined

Accoppiante - *Couplage*

[X] Metilcellulosa - Methycellulose

Apparecchio - *Apparatus* USN 60 SW Mat.01V906

Calibrazione - *Calibration*

[X] ECO di Riferimento - Reference ECO

[X] Blocco V1 - Block V1

[X] Blocco V2 - Block V2

Maticola *Identification*	Tipo Sonda *Type*	Dimensioni *Dimension mm*	Frequenza *Frequency Mhz*	Angolo *Angle °*	Amplificaz. *Amplificat. dB*	Potenza *Damping*	Rilevato *Rilevato*	Note *Note*
57745-50210	B2S EN	Ø24	2,00	0,00				

L'esame è stato eseguito sul 100% del volume. Nessuna indicazione rilevata.
The ultrasonic examination has been carried out on 100% of volume . No indication has been detected

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R CORNOLDI
DATE 9/10/14

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Svt Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*		Responsabile controllo qualità *Quality Control Manager*
QUALITY CONTROL Salari Francesco II LEVEL UT-MT-PT SNT-TC-1A-EN 473		saipem spa QC INSPECTOR Sergio Rizzi ☐ review ☒ witness date 21.05.14 Snamprogetti Centre of Excellence	FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

forge monchieri

M&M FORGINGS MEMBER

COMPANY CERTIFIED BY ASME
AS A MATERIAL ORGANIZATION
- CERTIFICATE NUMBER QSC-610 -

ISO 9001, ISO 14001, OHSAS 18001 BUREAU VERITAS Certification

14\08449 rev. 00

Cividate Camuno, li 21-MAG-2014 foglio 12 di 12
Date *Page* *of*

ESAME DIMENSIONALE \ DIMENSIONAL AND VISUAL CHECK
CONTRÔLE VISUEL ET DIMENSIONNEL \ VISUELLE PRÜFUNG UND MAßKONTR.

Inspection report according to EN10204 Ed.2004 3.2 N. **14\08449\DI** *of* *Page* 1 *of* 1

CLIENTE / *Customer Client / Kunde* **BREMBANA & ROLLE S.p.A**

ORDINE / *Order Commande /Bestellung* **000725 JOB M288** DATA *Date / Datum* **20.03.2014**

COMMESSA / *Job. Nr. Réf. / Auftrag* **14\120**

MATERIALE / *Material Nuance/ Werkstoff* **SA765 M Gr.II**

SPECIFICHE / *Specif. Spécif. / Spezifikation* **ASME II Part A Ed.2004 Add. 2006 - ASME VIII Div.1 Ed.2004 Add. 2004 - 0288MRS202 Rev.2**

CODICE / *Code Kundenidentifikation*

Id *Fm*	POS *Item*	QTA *Q.ty / Qte*	DESCRIZIONE / *Subject Object / Betreff*	DISEGNO / *Drawing Plan / Zeichnung*	MATRICOLA / *Serial Nr. Repère / Kenn-Nr.*	PROVA / *Test Essai / Test Nr.*	COLATA / *Hea* Coulée / Schmelze
6A	11	1	TEST COUPON	150 x 125 x 700 mm		14-0505	9084-14

Dimensional and Visual Inspection

Il controllo visivo dimensionale eseguito sui pezzi in oggetto ha dato esito favorevole.
The visual and dimensionalcheck has been satisfactory carried out on the above mentioned pieces

Marcatura - *Marking*

Order / Order	000725 JOB M288
Materiale / Material	SA765 M Gr.II
Colata / Heat	9084-14
Prova / Test	14-0505
ID Fm	14\120\6A

Marcatura del "Fornitore" / *Forge master stamp*

Marchio dell'ispettore esterno / *Inspector stamp*

Forge Monchieri S.p.A. dichiara che il materiale è conforme con l' ordine e le specifiche applicabili .
Forge Monchieri S.p.A. declare that the material is conformity with P. order and applicable specification .

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R.CORNOLDI
DATE 13/10/15

BREMBANA & ROLLE S.p.A.
QCM - LABENSONI
REVIEWED / ACCEPTED
13 GIU 2014

[X] CONFORME ALLA SPECIFICA / *According to specif Conforme à Spécif / Gemäß spezifikation*

[ ] *NON CONFORME ALLA SPECIFICA / Not According to specif. Non Conf. Sw Spécif. / Nicht Gemäß spezifikation*

Operatore *Operator*	Enti collaudatori *Inspection Authorities*	saipem spa QC INSPECTOR Sergio Ricci ☐ review ☒ witness date 21.05.14 Snamprogetti Centre of Excellence	Responsabile controllo qualità *Quality Control Manager* FORGE MONCHIERI S.p.A. - Morandini Dario - Quality Control Manager

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 001 Sheet / Seite 014	ArcelorMittal

Client - Purchaser - Besteller	BREMBANA & ROLLE SPA
Référence client - Purchase order - Kaufauftrag	002974 Job4085/
Projet - Project - Projekt	STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504

#010 - PRODUITS LIVRES - DELIVERED PRODUCTS - GELIEFERTEN GEGENSTÄNDE

Nuance - Grade - Werkstoff	SA 516 Grade 60 + S5 (HIC)		Selon norme - According to - Entsprechend	ASME IIA ED. 2013 SA 516/M	
Epaisseur - Thickness - Dicke	94.00 mm	Largeur - Width - Breite	2,260 mm	Longueur - Length - Länge	5,600 mm

Spécification - Specification - Spezifikation

DOC 4085MRS102 REV.2
FROM 29/01/2015
ASME II A 2010 Ed.- ADD.2011
NO REPAIR BY WELDING

Material fulfills all requirements of
ASME VIII Div. 2 part 3 2010 Ed. 2011 Add.

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
TRUE COPY OF THE ORIGINAL

ACCEPTED FOR JOB 4085

Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferzustand: IDENTICAL WITH
Normalisation (920 °C - 1 min/mm) - Normalization - Normalisierung: ASME SA 516 Gr.60

Procédé d'élaboration - Melting process - Erschmelzungsart: 2010 ED. 2011pADD.
Electric-arc furnace - Vacuum degassed - Fully killed - Fine grain practice

Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflos nr.	Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflos nr.
01	616857001	61003	616857.1001 / 616857.4001	01	616858001	61003	616857.4001 / 616858.1001
01	616860001	61003	616857.4001 / 616860.1001	01	620378001	62763	620378.1001 / 620378.4001

Total - Total - Gesamtzahl 004

BUREAU VERITAS S.A.
ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE 5/10/15

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
06 MAR 2015

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungvorschriften entsprechen.

BUREAU VERITAS
INSPECTORS AT ANTWERP
paris 1828
INDUSTRY & FACILITIES

INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 002 Sheet / Seite 014	ArcelorMittal

Client - Purchaser - Besteller	BREMBANA & ROLLE SPA
Référence client - Purchase order - Kaufauftrag	002974 Job4085/
Projet - Project - Projekt	STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504

#020 - ANALYSE CHIMIQUE DE COULEE - LADLE CHEMICAL COMPOSITION - SCHMELZE CHEMISCHE ZUSAMMENSETZUNG

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
	%	%	%	%	%	%	%	%	%
Min.		0.850			0.150				
61003	0.175	1.199	0.0044	0.0004	0.377	0.040	0.046	0.071	0.010
62763	0.183	1.193	0.0032	0.0006	0.380	0.042	0.044	0.037	0.009
Max.	0.200	1.200	0.0100	0.0020	0.400	0.400	0.400	0.300	0.120
	Al	Nb	V	Ti	(01)	(02)	B	(03)	(04)
	%	%	%	%			%		
Min.	0.020								
61003	0.029	0.013	0.002	0.001	0.168	0.081	0.0001	0.397	0.015
62763	0.021	0.010	0.002	0.002	0.132	0.046	0.0001	0.397	0.012
Max.	100.000	0.020	0.030	0.030	1.000	0.320	0.0010	0.450	0.020
	(05)								
Min.									
61003	0.016								
62763	0.013								
Max.	0.150								

(01) F(104) = Cu+Ni+Cr+Mo
(02) F(143) = Cr+Mo
(03) Ceq = C+(Mn/6)+((Cu+Ni)/15)+((Cr+Mo+V)/5)
(04) F(106) = Nb+V
(05) F(107) = Nb+Ti+V

#030 - ANALYSES PRODUITS - PRODUCTS ANALYSIS - STÜCKANALYSEN

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
	%	%	%	%	%	%	%	%	%
Min.		0.850			0.150				
616857.4001	0.179	1.162	0.0053	0.0002	0.380	0.043	0.055	0.079	0.013
620378.4001	0.177	1.170	0.0038	0.0004	0.385	0.039	0.038	0.032	0.008
Max.	0.200	1.200	0.0100	0.0020	0.400	0.400	0.400	0.300	0.120
	Al	Nb	V	Ti	(01)	(02)	B	(03)	(04)
	%	%	%	%			%		
Min.	0.020								
616857.4001	0.027	0.012	0.002	0.004	0.190	0.092	0.0003	0.398	0.014
620378.4001	0.023	0.009	0.002	0.004	0.117	0.040	0.0004	0.386	0.010
Max.	100.000	0.020	0.030	0.030	1.000	0.320	0.0010	0.450	0.020
	(05)								
Min.									
616857.4001	0.018								
620378.4001	0.015								
Max.	0.150								

(01) F(104) = Cu+Ni+Cr+Mo
(02) F(143) = Cr+Mo
(03) Ceq = C+(Mn/6)+((Cu+Ni)/15)+((Cr+Mo+V)/5)
(04) F(106) = Nb+V
(05) F(107) = Nb+Ti+V

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLO
DATE

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
05 MAR 2015

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungvorschriften entsprechen.

BUREAU VERITAS INSPECTORS AT ANTWERP paris 1828 INDUSTRY & FACILITIES
INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 003 Sheet / Seite 014

ArcelorMittal

Client - Purchaser - Besteller	BREMBANA & ROLLE SPA
Référence client - Purchase order - Kaufauftrag	002974 Job4085/
Projet - Project - Projekt	STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504

#072 ESSAIS MECANIQUES - MECHANICAL TESTS - MECHANISCHE PRÜFUNGEN

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

								HB10 Ind	HB10 Ind	HB10 Ind	HB10 Aver								
Brinell HB Brinell HB - Brinell HB																				
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	Brinell	Brinell	Brinell	Brinell									
							Min	123	123	123	123									
							Max	200	200	200	200									
616857.1001	000	T3/4	PSS	20	°C			153	155	155	154									
616858.1001	000	T3/4	PSS	20	°C			153	155	153	154									
616860.1001	000	T3/4	PSS	20	°C			154	153	155	154									
620378.1001	000	T3/4	PSS	20	°C			158	156	158	157									

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

DURETE NACE MR0103 HRC < 22 NACE MR0103 - NACE MR0103																				
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac														
616857.1001	000	T3/4	PSS	20	°C															
616858.1001	000	T3/4	PSS	20	°C															
616860.1001	000	T3/4	PSS	20	°C															
620378.1001	000	T3/4	PSS	20	°C															

Test result HRC < 22
Test result HRC < 22
Test result HRC < 22
Test result HRC < 22

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R CORNOLDI DATE

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
06 MAR 2015

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungvorschriften entsprechen.

BUREAU VERITAS INSPECTORS AT ANTWERP paris 1828 INDUSTRY & FACILITIES

INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 004 Sheet / Seite 014	ArcelorMittal

Client - Purchaser - Besteller: BREMBANA & ROLLE SPA

Référence client - Purchase order - Kaufauftrag: 002974 Job4085/

Projet - Project - Projekt: STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis: Plate(s)

Commande / Poste - Internal order - Werksbestellung: 1062273 / 000010

Bordereau de livraison - Delivery note - Lieferungsdokument: 80271507 80271504

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

								HB10 Ind	HB10 Ind	HB10 Ind	HB10 Aver								
Brinell HB Brinell HB - Brinell HB																			
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	Brinell	Brinell	Brinell	Brinell								
							Min	123	123	123	123								
							Max	200	200	200	200								
616857.1001	001	T3/4	PSS	20	°C			152	156	155	154								
616858.1001	001	T3/4	PSS	20	°C			153	153	155	154								
616860.1001	001	T3/4	PSS	20	°C			151	153	153	152								
620378.1001	001	T3/4	PSS	20	°C			155	157	157	156								

DURETE SUR COUPON - HARDNESS ON SAMPLE - HÄRTE AUF COUPON

								HB10 Ind	HB10 Ind	HB10 Ind	HB10 Aver								
Brinell HB Brinell HB - Brinell HB																			
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	Brinell	Brinell	Brinell	Brinell								
							Min	123	123	123	123								
							Max	200	200	200	200								
616857.1001	002	T3/4	PSS	20	°C			147	149	149	148								
616858.1001	002	T3/4	PSS	20	°C			145	148	147	147								
616860.1001	002	T3/4	PSS	20	°C			148	147	147	147								
620378.1001	002	T3/4	PSS	20	°C			152	153	151	152								

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

								Rp 0,2%	Rm	A Lo=50									
Traction cylindrique Round tensile test - Zugversuch																			
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa	MPa	%									
							Min	220	415	25									
							Max		550										
616857.1001	000	T3/4	1/4ST	20	°C			341	498	60									
616858.1001	000	T3/4	1/4ST	20	°C			337	497	53									
616860.1001	000	T3/4	1/4ST	20	°C			348	497	62									
620378.1001	000	T3/4	1/4ST	20	°C			349	517	62									

BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R CORNOLDI DATE

BREMBANA & ROLLE S.p.A. QCM - L. BENSONI REVIEWED / ACCEPTED 06 MAR 2015

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungvorschriften entsprechen.

BUREAU VERITAS INSPECTORS AT ANTWERP paris 1828 INDUSTRY & FACILITIES

INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 005 Sheet / Seite 014	ArcelorMittal

Client - Purchaser - Besteller	BREMBANA & ROLLE SPA
Référence client - Purchase order - Kaufauftrag	002974 Job4085/
Projet - Project - Projekt	STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

Traction cylindrique Round tensile test - Zugversuch								Rp 0,2%	Rm	A Lo=50
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa	MPa	%
							Min	220	415	25
							Max		550	
616857.1001	001	T3/4	1/4ST	20	°C			335	494	62
616858.1001	001	T3/4	1/4ST	20	°C			330	488	54
616860.1001	001	T3/4	1/4ST	20	°C			337	489	61
620378.1001	001	T3/4	1/4ST	20	°C			343	503	59

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

Traction cylindrique Round tensile test - Zugversuch								Rp 0,2%	Rm	A Lo=50
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa	MPa	%
							Min	220	415	25
							Max		550	
616857.1001	002	T3/4	1/4ST	20	°C			324	478	56
616858.1001	002	T3/4	1/4ST	20	°C			322	471	52
616860.1001	002	T3/4	1/4ST	20	°C			327	473	57
620378.1001	002	T3/4	1/4ST	20	°C			332	488	56

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm KCV ASTM 10X10mm - KCV ASTM 10X10mm								Energ Ind	Energ Ind	Energ Ind	Energ Ave
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J
							Min	24	24	24	34
							Max				
616857.1001	000	T3/4	1/4ST	-4	°C			131	157	154	147
616858.1001	000	T3/4	1/4ST	-4	°C			135	175	162	157
616860.1001	000	T3/4	1/4ST	-4	°C			139	130	151	140
620378.1001	000	T3/4	1/4ST	-4	°C			161	132	166	153

BUREAU VERITAS
ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R CORNOLDI
DATE

BREMBANA & ROLLE S.p.A.
QCM - L. BONISONI
REVIEWED / ACCEPTED
06 MAR 2015

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungvorschriften entsprechen.

BUREAU VERITAS
INSPECTORS AT ANTWERP
paris 1828
INDUSTRY & FACILITIES
INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 006 Sheet / Seite 014	ArcelorMittal

Client - Purchaser - Besteller	BREMBANA & ROLLE SPA
Référence client - Purchase order - Kaufauftrag	002974 Job4085/
Projet - Project - Projekt	STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm KCV ASTM 10X10mm - KCV ASTM 10X10mm								Energ Ind	Energ Ind	Energ Ind	Energ Ave								
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J								
							Min	24	24	24	34								
							Max												
616857.1001	001	T3/4	1/4ST	-4	°C			129	151	145	142								
616858.1001	001	T3/4	1/4ST	-4	°C			132	154	141	142								
616860.1001	001	T3/4	1/4ST	-4	°C			130	134	151	138								
620378.1001	001	T3/4	1/4ST	-4	°C			134	124	139	132								

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm KCV ASTM 10X10mm - KCV ASTM 10X10mm								Energ Ind	Energ Ind	Energ Ind	Energ Ave								
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J								
							Min	24	24	24	34								
							Max												
616857.1001	002	T3/4	1/4ST	-4	°C			114	130	140	128								
616858.1001	002	T3/4	1/4ST	-4	°C			124	126	142	131								
616860.1001	002	T3/4	1/4ST	-4	°C			138	120	126	128								
620378.1001	002	T3/4	1/4ST	-4	°C			130	132	108	123								

Loc	3/4	Trois-Quart - 3/4 Width - 3/4 Breite
Loc	T	Tête - Top - Kopf
Epr. Epaisseur	1/4	Quart épaisseur - 1/4 Thickness - 1/4 Dicke
Epr. Epaisseur	P	Peau - Rolled Surface - Walzfläche
Epr. Face	S	Supérieure - Upper face - obere
Epr. Sens	S	Standard - Standard - Standard
Epr. Sens	T	Travers - Transverse - Quer
Etat	000	Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferustand
Etat	001	PWHT - PWHT (From 425 °C at 70 °C/h to 630 °C (-10/+10) (min: 4 h) - Down to 425 °C at 70 °C/h - 1 Cycle) - PWHT
Etat	002	PWHT - PWHT (From 425 °C at 70 °C/h to 630 °C (-10/+10) (min: 16 h) - Down to 425 °C at 70 °C/h - 1 Cycle) - PWHT
Epr.Ep./Face/Sens	1/4ST	Quart épaisseur - 1/4 Thickness - 1/4 Dicke / Supérieure - Upper face - obere / Travers - Transverse - Quer
Epr.Ep./Face/Sens	PSS	Peau - Rolled Surface - Walzfläche / Supérieure - Upper face - obere / Standard - Standard - Standard

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R CORNOLDI
DATE

BREMBANA & ROLLE S.p.A.
QCM - V. BENSONI
REVIEWED ACCEPTED
06 MAR 2015

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungvorschriften entsprechen.

BUREAU VERITAS INSPECTORS AT ANTWERP paris 1828 INDUSTRY & FACILITIES
INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 007 Sheet / Seite 014	ArcelorMittal
Client - Purchaser - Besteller	BREMBANA & ROLLE SPA		
Référence client - Purchase order - Kaufauftrag	002974 Job4085/		
Projet - Project - Projekt	STAR Aegean Refinery (ARP)		
Industeel Belgium Site : Rue de Châtelet 266 6030 Marchienne-au-Pont	ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012 ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012		
Produit - Product - Erzeugnis	Plate(s)		
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010		
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504		

#082 ESSAIS TECHNOLOGIQUES - TECHNOLOGICAL TESTS - TECHNOLOGISCHE PRÜFUNGEN

BUREAU VERITAS
ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R.CORNOLDI
DATE

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
06 MAR 2015

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BUREAU VERITAS
INSPECTORS AT ANTWERP
paris 1828
INDUSTRY & FACILITIES
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TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 008 Sheet / Seite 014	ArcelorMittal

Client - Purchaser - Besteller	BREMBANA & ROLLE SPA
Référence client - Purchase order - Kaufauftrag	002974 Job4085/
Projet - Project - Projekt	STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504

HIC - HIC - HIC

HIC NACE TM02-84 HIC NACE TM02-84 - HIC NACE TM02-84								T° solution	Initial H2S	Final H2S	Initial T°	Final T°	Initial pH	Final pH	pH solution	Nbr cracks	Longest crack		
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	°C	ppm	ppm	°C	°C				Nombre	mm		
							Min	22	2.000	2.000	22	22	2.700		2.600				
							Max	28			28	28	3.300	4.000	2.800				
616857.4001	001	T3/4	SSL	20	°C			23	2,451.000	2,678.000	23	25	2.980	3.810	2.670	0	0		
620378.4001	001	T3/4	SSL	20	°C			23	2,451.000	2,678.000	23	25	2.980	3.810	2.670	0	0		

Standard	NACE TM0284 ed.2011
Specimen surface preparation	320-grit polishing
Degreasing	Acetone + Check according to ASTM F21
Solution	A
Test result	Compliant with Standards

Size of Specimen - Dimensions de l'échantillon - Probengrösse					
Length - Longueur - Länge	Unit - Unité - Einheit	Width - Largeur - Breite	Unit - Unité - Einheit	Thickness - Epaisseur - Dicke	Unit - Unité - Einheit
100.00	mm	20.00	mm	30.00	mm
Total area - Surface de l'échantillon - Probenoberfläche			112.00	cm2	

Start of Test - Début de test - Testenbeginn	12/02/2015 12:30
End of Test - fin de test - Testenende	16/02/2015 12:30
Test duration in h Durée du test - Testendauer	96.00

N°	Location - Localisation - Lage	Picture - Image - Bild	Magnification - Grossissement - Vergrößerung
01	Top Surface	AN_0001062273_000010_616857001_001(1)	1X
02	Bottom Surface	AN_0001062273_000010_616857001_001(1)	1X
03	Microstructure	AN_0001062273_000010_616857001_001(2)	100X

Blisters whose dimensions are < 1,0 mm are not taken into account

	1st specimen					2nd specimen					3rd specimen					4th specimen					5th specimen				
Number	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diameter in mm	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

	1st specimen				2nd specimen				3rd specimen			
	S1.1	S1.2	S1.3	S1 Aver.	S2.1	S2.2	S2.3	S2 Aver.	S3.1	S3.2	S3.3	S3 Aver.
CLR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CTR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CSR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	4th specimen				5th specimen				Aver.	Max requirements		
	S4.1	S4.2	S4.3	Aver	S5.1	S5.2	S5.3	Aver		Per sect	Per spec	Aver.
CLR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		7.000	5.000
CTR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		2.000	1.500
CSR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.700	0.500

Standard	NACE TM0284 ed.2011
Specimen surface preparation	320-grit polishing
Degreasing	Acetone + Check according to ASTM F21
Solution	A
Test result	Compliant with Standards

ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
06 MAR 2015

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungvorschriften entsprechen.

BUREAU VERITAS
INSPECTORS AT ANTWERP
INDUSTRY & FACILITIES
paris 1828
INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 009 Sheet / Seite 014	ArcelorMittal

Client - Purchaser - Besteller	BREMBANA & ROLLE SPA
Référence client - Purchase order - Kaufauftrag	002974 Job4085/
Projet - Project - Projekt	STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504

Size of Specimen - Dimensions de l'échantillon - Probengrösse

Length - Longueur - Länge	Unit - Unité - Einheit	Width - Largeur - Breite	Unit - Unité - Einheit	Thickness - Epaisseur - Dicke	Unit - Unité - Einheit
100.00	mm	20.00	mm	30.00	mm
Total area - Surface de l'échantillon - Probenoberfläche			112.00	cm2	

Start of Test - Début de test - Testenbeginn	12/02/2015 12:30
End of Test - fin de test - Testenende	16/02/2015 12:30
Test duration in h Durée du test - Testendauer	96.00

N°	Location - Localisation - Lage	Picture - Image - Bild	Magnification - Grossissement - Vergrößerung
01	Top Surface	AN_0001062273_000010_620378001_001(1)	1X
02	Bottom Surface	AN_0001062273_000010_620378001_001(1)	1X
03	Microstructure	AN_0001062273_000010_620378001_001(2)	100X

Blisters whose dimensions are < 1,0 mm are not taken into account

	1st specimen					2nd specimen					3rd specimen					4th specimen					5th specimen				
Number	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diameter in mm	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

	1st specimen				2nd specimen				3rd specimen			
	S1.1	S1.2	S1.3	S1 Aver.	S2.1	S2.2	S2.3	S2 Aver.	S3.1	S3.2	S3.3	S3 Aver.
CLR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CTR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CSR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	4th specimen				5th specimen				Aver.	Max requirements		
	S4.1	S4.2	S4.3	Aver	S5.1	S5.2	S5.3	Aver		Per sect	Per spec	Aver.
CLR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		7.000	5.000
CTR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		2.000	1.500
CSR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.700	0.500

Loc	3/4	Trois-Quart - 3/4 Width - 3/4 Breite
Loc	T	Tête - Top - Kopf
Epr. Epaisseur	S	Standard - Standard - Standard
Epr. Face	S	Supérieure - Upper face - obere
Epr. Sens	L	Long - Longitudinal - Längs
Etat	001	PWHT - PWHT (From 425 °C at 70 °C/h to 630 °C (-10/+10) (min: 4 h) - Down to 425 °C at 70 °C/h - 1 Cycle) - PWHT
Epr.Ep./Face/Sens	SSL	Standard - Standard - Standard / Supérieure - Upper face - obere / Long - Longitudinal - Längs

BUREAU VERITAS ITALY
WITNESSED NOTED REVIEWED
SURVEYOR DR CORNOLDI
DATE

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED ACCEPTED
06 MAR 2015

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungsvorschriften entsprechen.

BUREAU VERITAS INSPECTORS AT ANTWERP paris 1828 INDUSTRY & FACILITIES
INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 010 Sheet / Seite 014	ArcelorMittal

Client - Purchaser - Besteller	BREMBANA & ROLLE SPA
Référence client - Purchase order - Kaufauftrag	002974 Job4085/
Projet - Project - Projekt	STAR Aegean Refinery (ARP)

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1062273 / 000010
Bordereau de livraison - Delivery note - Lieferungsdokument	80271507 80271504

#141 - CONTROLE US - ULTRASONIC EXAMINATION - ULTRACHALLPRÜFUNGSBESCHEINIGUNG

Norme applicable 1 - Applicable standard 1 -	ASTM A 578 C+S1 100% + overlaping 10%
Procédure applicable 1 - Applicable procedure 1 -	Procedure 1564
Résultat du contrôle - Examination result - Prüfergebnis	

Conforme aux spécifications précitées - Conforming to above specifications - Entspricht der vorgenannten vorschriften

BUREAU VERITAS
ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLDI
DATE

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
06 APR 2015

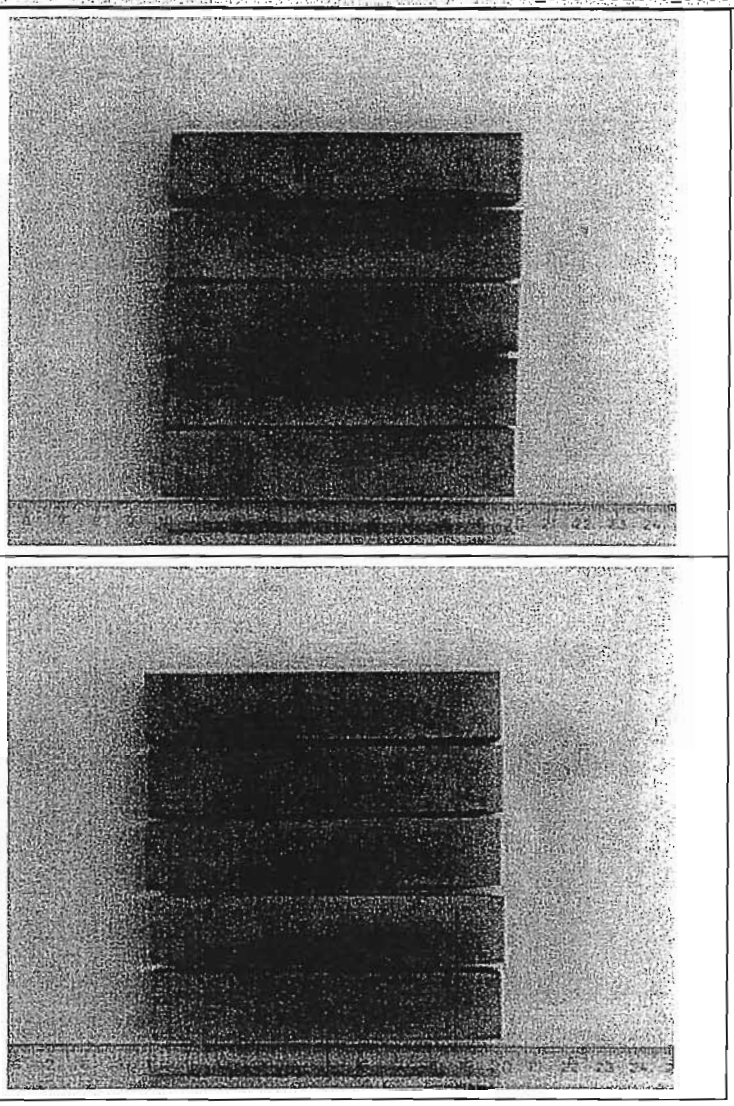
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BUREAU VERITAS
INSPECTORS AT ANTWERP
paris 1828
INDUSTRY & FACILITIES
INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 011 Sheet / Seite 014	ArcelorMittal
Client - Purchaser - Besteller	BREMBANA & ROLLE SPA		
Référence client - Purchase order - Kaufauftrag	002974 Job4085/		
Projet - Project - Projekt	STAR Aegean Refinery (ARP)		

ANNEXES - APPENDIX - ANLAGEN 616857001 AN_0001062273_000010_616857001_001



BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR DATE P. CORNOLDI

BREMBANA & ROLLE S.p.A. QCM - L. BENSONI REVIEWED & ACCEPTED 06 MAR 2015

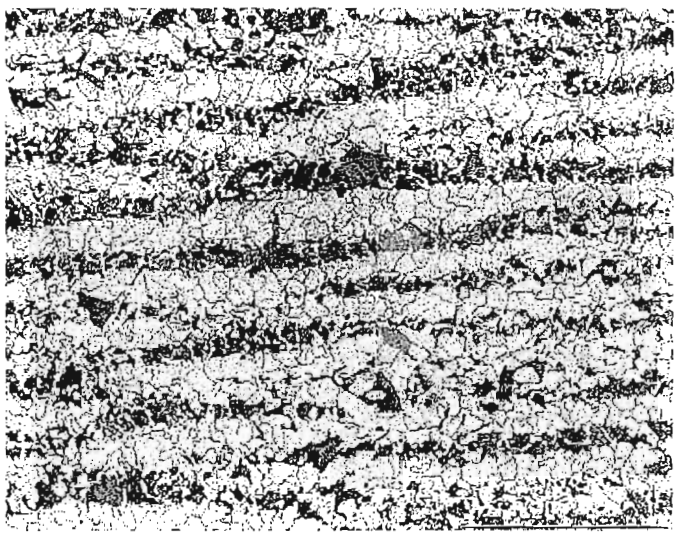
BUREAU VERITAS INSPECTORS AT ANTWERP paris 1828 INDUSTRY & FACILITIES

INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.2 / EN 10204:2004 Inspection Certificate 3.2 / EN 10204:2004 Prüfbescheinigung 3.2 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2015-104345 AVS 1514500	Page 012 Sheet / Seite 014	ArcelorMittal
Client - Purchaser - Besteller	BREMBANA & ROLLE SPA		
Référence client - Purchase order - Kaufauftrag	002974 Job4085/		
Projet - Project - Projekt	STAR Aegean Refinery (ARP)		

ANNEXES - APPENDIX - ANLAGEN 616857001 AN_0001062273_000010_616857001_001



BUREAU VERITAS ITALY WITNESSED NOTED REVIEWED SURVEYOR R CORNOLD DATE

BREMBANA & ROLLE S.p.A. QCM - L. BENSONI REVIEWED / ACCEPTED 06 MAR 2015

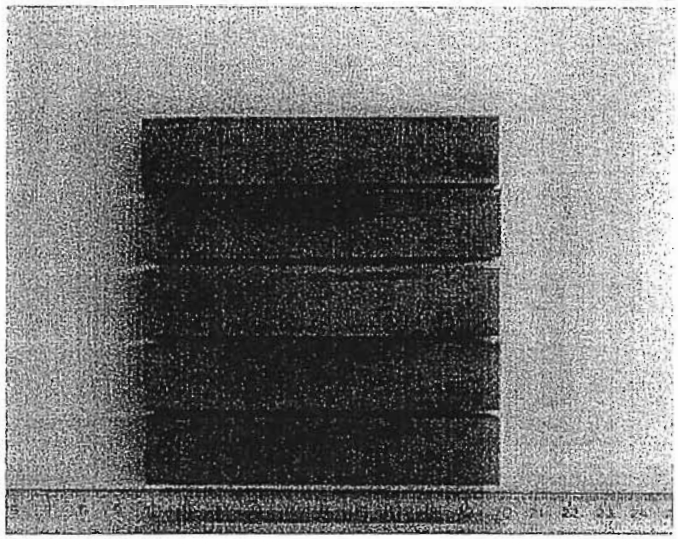
BUREAU VERITAS INSPECTORS AT ANTWERP paris 1828 INDUSTRY & FACILITIES

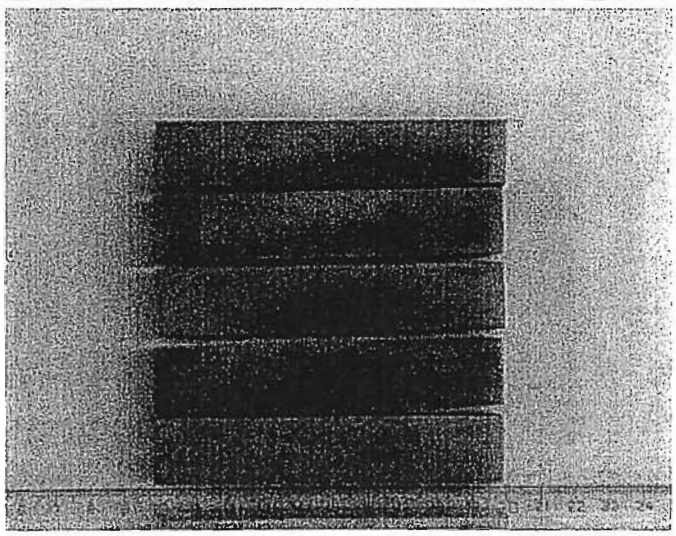
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19/02/2015
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Werksbeauftragte

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Client - Purchaser - Besteller	BREMBANA & ROLLE SPA		
Référence client - Purchase order - Kaufauftrag	002974 Job4085/		
Projet - Project - Projekt	STAR Aegean Refinery (ARP)		

ANNEXES - APPENDIX - ANLAGEN 620378001 AN_0001062273_000010_620378001_001





BUREAU VERITAS
ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R CORNOLDI
DATE

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED ACCEPTED
06 MAR 2015

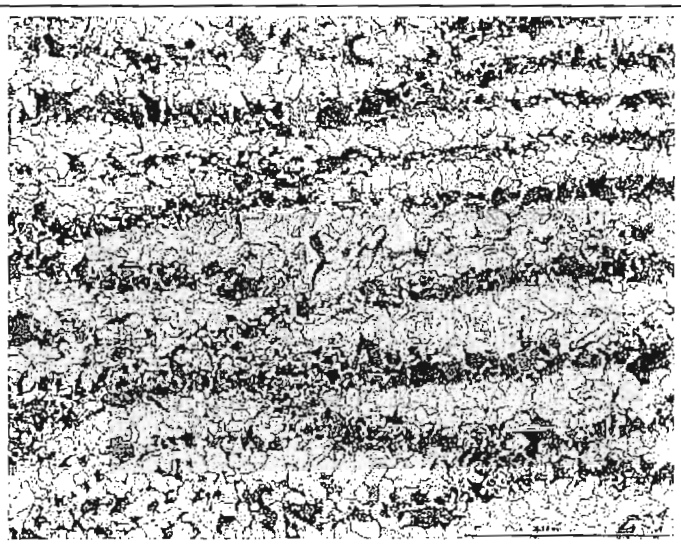
BUREAU VERITAS
INSPECTORS AT ANTWERP
INDUSTRY & FACILITIES
paris 1828

INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

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ANNEXES - APPENDIX - ANLAGEN 620378001 AN_0001062273_000010_620378001_001



BUREAU VERITAS
ITALY
WITNESSED NOTED REVIEWED
SURVEYOR R. CORNOLD'
DATE

BREMBANA & ROLLE S.p.A.
QCM - A. BENSONI
REVIEWED ACCEPTED
06 MAR 2015

BUREAU VERITAS
INSPECTORS AT ANTWERP
INDUSTRY & FACILITIES
paris 1828

INSPECTOR'S STAMP

TONI D'ANGELO
19/02/2015
Gestionnaire Commande
Mill inspector
Werksbeauftragte

voestalpine Böhler Welding

voestalpine Böhler Welding Italia S.p.A.

Via Palizzi, 90
I – 20157 MILANO MI
Tel. +39 02 39017.1
Fax +39 02 39017244

www.voestalpine.com/welding

Certificato di prova 3.1
Inspection certificate 3.1

secondo / as per : EN 10204
No. : No. : 2012-2014163563-900001-014
Rev. 0 Page / Page : 1 / 1

BREMBANA & ROLLE S.P.A.

VIA VILLINO 1
24030 VALBREMBO
Italia

Ordine N°	PO no.	000739	del / of	30.05.2012
Ordine N°	Order no.	1014147959		
Bolla di consegna/Pos./Splitt.	Delivery note/pos./splitt	2014163563/000010/900001	del / of	01.06.2012

Oggetto test	Product	bacchetta/filo GTAW / GTAW rod/wire	
Denominazione commerciale	Trade name	**BOEHLER EML 5**	212838 10251
Classificazione norma	Standard designation	EN ISO 636-A: W 46 5 W2Si	2U04510W 0140
		AWS A5.18: ER70S-3	

Dimensione	Dimension	3,0 x 1000 mm
Colata - Lotto	Heat no.	783420
Quantità fornita	Quantity	50,0 KG

Composizione chimica in % del prodotto **Chemical composition in % of the product**

C	Si	Mn	P	S	Cr	Mo	Ni	V	Cu	Al				
0,11	0,54	1,14	0,012	0,006	0,04	< 0,01	0,01	< 0,01	0,01	< 0,01				

proprietà meccaniche **Mechanical properties** **EN 10204 - 2.2**

Prova di trazione — Tensile test

T	ReL / Rp 0,2 MPa	Rp 1,0 MPa	Rm MPa	A (Lo = 5d) %	Z %	WBH PWHT	Note Remarks
20°C	≥ 460		530 - 680	≥ 23			

Prova di resilienza — Impact test

T	Energia di impatto Impact energy KV / J	Medio Average KV / J	Espansione lat. Lateral expansion mm	Frattura cristalliina Shear fracture %	WBH PWHT	Note Remarks
-50°C	≥ 47					
20°C	≥ 130					

Questo certificate é stato emesso con sistema automatizzato e non richiede firma
This certificate was issued by DP-equipment and does not require signature.

Centro / Town: Milano
Data / Date: 04.06.2012

Q.A. representative / Authorized representative

Zuin

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MARIANO
CHECKED WITNESSED

08/06/2012

voestalpine
ONE STEP AHEAD.

AIR LIQUIDE WELDING FRANCE
13 Rue d'Epluches, Saint-Ouen l'Aumône
95315 Cergy Pontoise Cedex - France

Phone: +33134213333
Fax: +33134213130

OERLIKON

Certificato di Prodotto / Product Certificate

Certificato N°: / Certificate n°: ALW04142194-34

Ordine N°: / Order n°: 2953

Bolla N°: / Delivery Note n°: 47030

Cliente: / Customer:
BREMBANA & ROLLE SPA
VIA VILLINO, 1

24030 VALBREMBO
ITALY

Data: / Date: 22/12/2014

Quantità: / Quantity: 2800

UM: / Unit: N.

Designazione: / Trade name: 0010502016
ELECTRODE ETC PH 35S 4.00X0450XCBOX

Lotto N°: / Batch n°: 344281002

Classificazione: / Classification:
AWS A5.1: E7018-1 H4
EN ISO 2560-A: E 42 5 B 3 2 H5

Si confermano le proprietà sotto riportate per i consumabili di saldatura da noi forniti

We confirm following properties for the welding filler metals delivered by us

Analisi chimica del deposito: / Weld metal chemical analysis (%):

In accordo a / According to EN 10204-3.1

C	Mn	Si	Cr	Ni	Mo	S	P	Cu	Nb
0.069	1.326	0.474	0.028	0.082	0.003	0.0052	0.0152	0.06	0.0072

V
0.018

Proprietà meccaniche del deposito / Weld metal mechanical properties:

In accordo a / According to EN 10204-2.2

Trattamento Termico Heat treatment	Test temp. °C	Snervamento Yield Strength ReH [N/mm²]	Trazione Tensile Strength Rm [N/mm²]	Allungamento Elongation A [%]	Durezza Hardness HB	Resilienza - Impact strength (Charpy-V)		
						Temp: °C	Joule	Media Average
Come Saldato as Welded	20	490	541	29.5		-50		148

Note:

Remarks:

Questo certificato è stato stampato da computer e non necessita di firma

This certificate is printed by computer and needs no signature

Quality Departement - Due Carrare Plant

Munarin Riccardo

Emesso da - issued by: Fiaccadori Stefano

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☒ REVIEWED ☐ WITNESSED
13 GEN 2015

AIR LIQUIDE
WELDING

AIR LIQUIDE WELDING FRANCE
13, rue d'Epluches
Saint-Ouen L 'Aumône
95315 Cergy Pontoise Cedex
FRANCE

Phone: +33 1 342 13 333
Fax : +33 1 342 13 130
Internet : www.airliquidewelding.com

OERLIKON

Certificato / Product Certificate

Cliente: / Customer:	Certificato N. / Certificate n°:	Ordine N. / Order n°:	Documento di Trasporto / Delivery note:
BREMBANA & ROLLE SPA Italia	2110310380057801	00871	12543
	Data : / Date:	**Quantità / Quantity:**	**UM / UM:**
	09/04/15	10.065,00	N Numero

Designazione / Trade name: ETC PH 35S 5.00X450

Lotto N.: / Batch n°: 371507302

Classificazione: / Classification: EN ISO 2560-A - E 42 5 B 32 H5
AWS A5.1: E 7018-1 H4

Si certificano le caratteristiche di seguito riportate per i materiali d'apporto da noi forniti.
We confirm following properties for the welding filler metals delivered by us.

Analisi Chimica / Chemical analysis (%):

Certificato Tipo: EN 10 204-3.1 WELD METAL

C	Mn	Si	S	P	Cr	Ni	V	Cu	Nb
0.067	1.340	0.456	0.004	0.011	0.029	0.026	0.018	0.036	0.006

Mo									
0.005									

Proprietà Meccaniche: / Mechanical properties:

Certificato Tipo: EN 10 204-2.2 WELD METAL

Prova di Trazione in accordo a EN ISO 6892-1 Trazione					Resilienza in accordo a EN ISO 148-1 Resilienza		
Temperatura di Prova Test Temp. °C	Limite Elastico Yield strength $R_{p0,2}$ N/mm²	Resistenza a Rottura Tensile strength N/mm²	Allungamento Elongation %	Z %	Temperatura di Prova Test Temp. °C	Resilienza Impact strength Joule (Charpy-V)	Trattamento Termico Heat treatment
+20	490	541	30		-50	150	As Welded

09.04.2015

La Vostra Persona di riferimento : / Your Contact Person :
Quality Corporate Department
Airliquide Welding France
Tél. : 33/1 34 21 33 33
Fax : 33/1 34 21 31 30
ETC -Oerlikon
Tél. : 39/045 82 91 511
Fax : 39/045 82 91 500

Marian Domnescu
QA Manager – Buzau Plant

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BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
REVIEWED WITNESSED

15 APR 2015

AIR LIQUIDE WELDING

CERTIFICATO DI COLLAUDO/ INSPECTION CERTIFICATE

in accordo a/acc to EN 10204 - 3.1

Data/Date: 2015-08-20

Numero certificato/Cert no: EC23998477 rev. 0

Nostro ordine/Our order:	1135666	Vostro ordine/Your order:	N° 001764
Nostro riferimento/Our ref:	Web user - Movex CMP020 ITB	Vostro riferimento/Your ref:	
Codice Cliente/Cust no:	ITB01810	Vostro numero fax/Your fax	
Data ordine Cliente/Your date:	20150731	Vostra e-mail/Your e-mail:	

Indirizzo di fatturazione/Invoice address

ESAB SALDATURA SpA

.

VIA ROSA LUXEMBURG 49
20085 LOCATE DI TRIULZI (MI)
20085 ITALY
Italy

Destinatario del certificato/Cert receiver

Indirizzo di spedizione/Delivery address

BREMBANA & ROLLE S.P.A

.

VIA VILLINO 1
24030 VALBREMBO BG
Italy

PRODOTTO CONSEGNATO/DELIVERED PRODUCT

Marchio/Brand:	ESAB
Descrizione/Desc:	OK Autrod 12.32 4.0mm 30kg
Codice/Item no:	**1232402800**
Numero di lotto/Lot no:	**PV533474204**
Quantità/Quantity:	2490 KG

CLASSIFICAZIONE/CLASSIFICATIONS

SFA/AWS A5.17	EH12K
EN ISO 14171-A	S3Si

ANALISI CHIMICA/ CHEMICAL ANALYSIS

Wire/strip

Altro/Auxiliary:

C	0.13%
Si	0.31%
Mn	1.79%
P	0.015%
S	0.009%
Cr	0.03%
Ni	0.02%
Mo <	0.01%
Cu	0.04%

BREMBANA&ROLLE S.p.A.
WELDING DEPT. - M. ESPOSITO
☒ REVIEWED ☐ WITNESSED
01 SET 2015

COMMENTI/COMMENTS

Materiale fornito in accordo al Sistema Qualità conforme alla norma EN ISO 9001.
Questo certificato è stampato elettronicamente ed è valido senza firma.
Per ogni chiarimento, rivolgersi a:

ESAB Saldatura Spa, Via Rosa Luxemburg 49, I-20085 Locate Triulzi (MI), +39 02 97968.1

Product supplied under a QA Programme fulfilling the EN ISO 9001 standard.
This certificate is produced electronically and is valid without signature.
Please refer any queries to: (see above)

Validazione/Validation

Josef Moravek Quality Manager

CERTIFICATO DI COLLAUDO/ INSPECTION CERTIFICATE

in accordo a/acc to EN 10204 - 3.1

Data/Date: 2015-05-22

Numero certificato/Cert no: EC23891836 rev. 0

Nostro ordine/Our order:	1083070	Vostro ordine/Your order:	N° 001123
Nostro riferimento/Our ref:	Web user - Movex CMP020 ITB	Vostro riferimento/Your ref:	
Codice Cliente/Cust no:	ITB01810	Vostro numero fax/Your fax	
Data ordine Cliente/Your date:	20150513	Vostra e-mail/Your e-mail:	

Indirizzo di fatturazione/Invoice address

ESAB SALDATURA SpA

.

VIA ROSA LUXEMBURG 49
20085 LOCATE DI TRIULZI (MI)
20085 ITALY
Italy

Destinatario del certificato/Cert receiver

Indirizzo di spedizione/Delivery address

BREMBANA & ROLLE S.P.A

.

VIA VILLINO 1
24030 VALBREMBO BG
Italy

PRODOTTO CONSEGNATO/DELIVERED PRODUCT

Marchio/Brand:	ESAB
Descrizione/Desc:	OK Flux 10.62 25kg(55lb) BP
Codice/Item no:	**1062800000**
Numero di lotto/Lot no:	**PNP19512**
Quantità/Quantity:	3000 KG

ANALISI CHIMICA/ CHEMICAL ANALYSIS

Flux

Altro/Auxiliary:

CaF2	24%
SiO2+TiO2	14%
CaO+MgO	36%
Al2O3+MnO	20%

CLASSIFICAZIONE/CLASSIFICATIONS

EN ISO 14174	S A FB 1 55 AC H5
EN ISO 14174	S A FB 1 55 AC H4 only BlockPac/moisture-protection

BREMBANA & ROLLE S.p.A.
WELDING DEPT. - S. MANGANO
☒ REVIEWED ☐ WITNESSED
29 MAG 2015

COMMENTI/COMMENTS

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Validazione/Validation

Dariusz Kijowski Quality Assurance Manager

PROCEDURE QUALIFICATION RECORD (PQR)

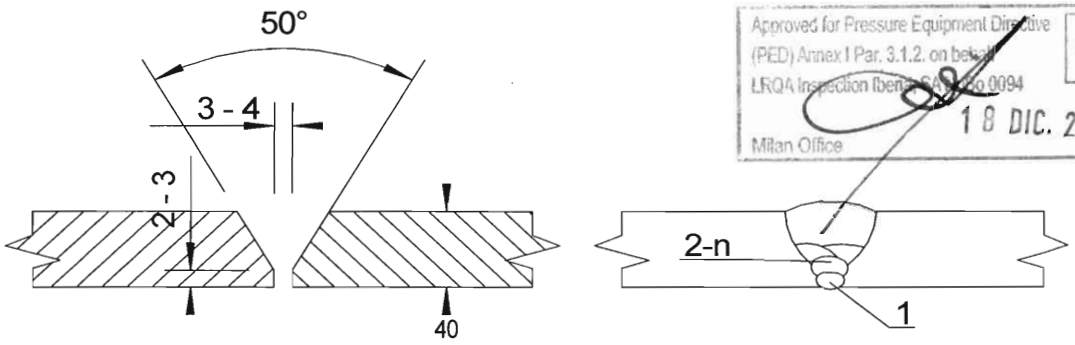
QW-200.2

ASME Boiler and Pressure Vessel Code Section IX

BREMBANA&ROLLE

PQR No.:	24/17					Company:	Brembana&Rolle S.p.A.
Welding Process:	1) GMAW	2) FCAW	3)	4)		WPS No.:	W24/17
Type:	SEMI-AUTOMATIC	SEMI-AUTOMATIC				Date:	19.02.2018

JOINTS (QW-402)



Approved for Pressure Equipment Directive (PED) Annex I Par. 3.1.2. on behalf of LRQA Inspection Ibena CA No 0094
LRQA
Milan Office
18 DIC. 2021

Tack weld: By clumps

Retainers: No (QW-402.11)

BASE METAL (QW-403)

Material Spec.; Type or Grade:	SA 516 Gr.70 (*)
to Material Spec.; Type or Grade:	SA 765 Gr.2 (**)

P-No.: 1 Gr. No.: 2 to P-No.: 1 Gr. No.: 2

Thickness of Test Coupon (mm):	40
Diameter of Test Coupon (mm):	/
Other:	t pass ≤ 13 mm (QW-403.9)
	*Normalized; **Quenched + Tempered

FILLER METAL (QW-404)

Process (es):	GMAW	FCAW		
SFA Specification:	5.18	5.20		
AWS Classification:	ER70S-6	E71T-1		
Filler metal F-No.:	6	6		
Weld Metal A-No.:	*	1		
Size (mm):	1.2	1.2		
Product Form:	Solid wire	Flux cored wire		
Trade Name:	Carbofil 1	Fluxofil 14HD		
Supplier:	Oerlikon	Oerlikon		
Flux Trade Name:	N.A.	N.A.		
Flux Type:	N.A.	N.A.		
Supplier:	N.A.	N.A.		
Wire/Flux Class.:	N.A.	N.A.		
Consumable Ins.:	N.A.	N.A.		
Supplemental:	N.A.	N.A.		
Recrushed slag:	N.A.	N.A.		
Weld metal thk. (mm):	3	37		
Other:	* see AWS reference			

POSITION (QW-405)

Process:	GMAW	FCAW		
Position of Groove:	3G	3G		
Position of Fillet:	N.A.	N.A.		
Welding Progression:	Downhill	Uphill		
Other:	No			

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	100	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	250	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other:	No
Cooling under Insulation:	No

POST WELD HEAT TREATMENT (QW-407)

Temperature Range:	610 ± 10	°C
Time Range:	min 2h; max 16h	Hours
Heating Rate:	56 ÷ 80	°C/h
Cooling Rate:	56 ÷ 80	°C/h
Other:	QW-407.4: N.A.	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GMAW		
Shielding:	Ar + CO2	82 / 18	18 ÷ 20
Process:	FCAW		
Shielding:	Ar + CO2	82 / 18	18 ÷ 20
Backing:			
Trailing:			
Other:			

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GMAW	FCAW
Current Type:	DC	DC
Pulsing Current:	No	N.A.
Polarity:	EP	EP
Tung. El. Type:	N.A.	N.A.
Tung. El. Ø:	N.A.	N.A.
Transfer Mode:	Short	Spray
Other:	No	

TECHNIQUE (QW-410)

String/Weave beads:	String and Weave
Orifice/Cup size (mm):	16
Initial Cleaning:	Machining
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	/
Oscillation:	No
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	N.A.
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	N.A.
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Semi-automatic
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL (mm)	Tungsten Electrode Ø (mm)	Min./Max. Heat Input (J/mm)
1	GMAW	ER70S-6	1.2	DCEP	165 ÷ 185	17 ÷ 20	120 ÷ 140	/	/	1202 ÷ 1850
2 - n	FCAW	E71T-1	1.2	DCEP	180 ÷ 220	23 ÷ 26	180 ÷ 230	/	/	1080 ÷ 1907

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office
31 GEN. 2018

BREMBANA&ROLLE

PROCEDURE QUALIFICATION RECORD (PQR)

QW-200.2

Section IX of ASME Boiler and Pressure Vessel Code

Procedure Qualification Record No.: 24/17 Date: 19.02.2018 Company: Brembana&Rolle S.p.A.

TENSILE TEST (QW-150)

Specimen No.; Type and Figure No.	Width (mm)	Thickness (mm)	Area (mm2)	Ultimate Total Load (N)	Ultimate Unit Stress (N/mm2)	Type of Failure & Location
0426-5 - QW-462.1(a)	19.06	40.52	772.31	390800	506	Broken out of weld - Ductile fracture
0426-6 - QW-462.1(a)	19.04	40.18	765.03	384900	503	Broken out of weld - Ductile fracture

	Diameter (mm)	Gage Length (mm)	Area (mm2)	U.T.L. (N)	U.T.S. (N/mm2)	U.Y.L. (N)	U.Y.S. (N/mm2)	Elongation (%)

GUIDED BEND TEST (QW-160)

Type and Figure No.	Result	Type and Figure No.	Result
0425-5 - QW-462.2	Satisfactory		
0425-6 - QW-462.2	Satisfactory		
0425-7 - QW-462.2	Satisfactory		
0425-8 - QW-462.2	Satisfactory		

TOUGHNESS TEST (QW-170)

Specimen No. & Notch Location	Specimen Size (mm)	Test Temperature (°C)	Impact Values (Joule)	Lateral Expansion (% shear)	Lateral Expansion (mm)	Drop Weight Break (Yes or No)
WM Top	10x10x55	-46	72.2 - 72.6 - 72.9	-	-	
WM ¾ Thk.	10x10x55	-46	37.4 - 40.2 - 65.7	-	-	
WM Bottom	10x10x55	-46	39.7 - 45 - 51.7	-	-	
HAZ Between ½ ÷ ¼ BOTTOM SA 765 side	10x10x55	-46	109 - 124.2 - 150.1	-	-	
HAZ Between ½ ÷ ¼ TOP SA 765 side	10x10x55	-46	32.9 - 39.2 - 37.5	-	-	
HAZ Bottom SA 765 side	10x10x55	-46	53.6 - 105.5 - 110.8	-	-	
HAZ Between ½ ÷ ¼ BOTTOM SA 516 side	10x10x55	-46	30.9 - 33.2 - 43.6	-	-	
HAZ Between ½ ÷ ¼ TOP SA 516 side	10x10x55	-46	133.4 - 170.1 - 196.3	-	-	
HAZ Bottom SA 516 side	10x10x55	-46	49.5 - 58.1 - 66.3	-	-	

Comments:

FILLET WELD TEST (QW-180)

Result - Satisfactory: Yes ____ No ____ Penetration into Parent Metal: Yes ____ No ____

Macro - Result:

OTHER TESTS

Visual Examination: Satisfactory (PQR 24/17 VT)

R.T. Examination: Satisfactory

P.T. Examination: Satisfactory (PQR 24/17 PT)

M.T. Examination: No

Micro Examination: No

Deposit Analysis:

C	Mn	Si	P	S	Cr	Ni	Mo

Fe	Cu	Nb+Ta

Macro Examination: Satisfactory

Hardness Test (Hv10):
- Base Metal: 147 - 153 (SA 765) / 133 - 142 (SA 516)
- Weld Metal: 162 - 246
- Haz: 145 - 232 (SA 765) / 133 - 245 (SA 516)

Other: No

Welder's Name: Kachi Abderrahim

Stamp No.: S32

Test conducted by: Brembana & Rolle S.p.A. Welding Engineer

Sigma Tre Lab

Third party Inspector

Laboratory Test No.: 2018/01/0400

Lloyd's Register Verification Limited
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Lloyd's Register
☒ Witnessed ☐ Monitored ☐ Reviewed
Alessandro Salvatore Monastra
Milan Office 31 GEN. 2018

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of ASME Code Section IX

Prepared by	Checked and Certified by	Date	
S.Mangano	N.Tosto	19.02.2018	Sheet 2 of 2

PROCEDURE QUALIFICATION RECORD (PQR) Integrative test

QW-200.2

Section IX of ASME Boiler and Pressure Vessel Code

Procedure Qualification Record No.: **24/17** Date: **03/07/2023** Company: **Brembana&Rolle S.p.A.**

TENSILE TEST (QW-150)

Specimen No.; Type and Figure No.	Width (mm)	Thickness (mm)	Area (mm2)	Ultimate Total Load (N)	Ultimate Unit Stress (N/mm2)	Type of Failure & Location

Diameter (mm)	Gage Length (mm)	Area (mm2)	U.T.L. (N)	U.T.S. (N/mm2)	U.Y.L. (N)	U.Y.S. (N/mm2)	Elongation (%)

GUIDED BEND TEST (QW-160)

Type and Figure No.	Result	Type and Figure No.	Result

TOUGHNESS TEST (QW-170)

Specimen No. & Notch Location	Specimen Size (mm)	Test Temperature (°C)	Impact Values (Joule)	Lateral Expansion (% shear)	Lateral Expansion (mm)	Drop Weight Break (Yes or No)

Comments:

FILLET WELD TEST (QW-180)

Result - Satisfactory: **Yes** **No** **Penetration into Parent Metal:** **Yes** **No**

Macro - Result:

OTHER TESTS

Visual Examination: /

R.T. Examination: /

P.T. Examination: /

M.T. Examination: /

Micro Examination: /

Deposit Analysis:

C	Mn	Si	P	S	Cr	Ni	Mo

Fe	Cu	Nb+Ta

Macro Examination: /

Hardness Test (Hv10):
- Base Metal: **171 - 178 (SA 765) / 170 - 178 (SA 516)**
- Weld Metal: **190 - 195**
- Haz: **180 - 191 (SA 765) / 170 - 194 (SA 516)**

Other: **No**

Welder's Name: **Jospeh joy**

Stamp No.: **S11**

Test conducted by: **Brembana & Rolle S.p.A. Welding Engineer**

Quality Control

Third party Inspector

Laboratory Test No.: **23/1016RP05**

BUREAU VERITAS ITALIA WELDING 14

IT FILE:

DATE:

WITNESSED ☐ REVIEW ☑

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of ASME Code Section IX

Prepared by	Checked and Certified by	Date	
M.Carminati	**N.Tosto**	**03/07/2023**	Sheet 3 of 3

BREMBANA&ROLLE

PROCEDURE QUALIFICATION RECORD (PQR) Integrative test

QW-200.2

Section IX of ASME Boiler and Pressure Vessel Code

Procedure Qualification Record No.: **24/17** Date: **12/09/2023** Company: **Brembana&Rolle S.p.A.**

TENSILE TEST (QW-150)

Specimen No.; Type and Figure No.	Width (mm)	Thickness (mm)	Area (mm2)	Ultimate Total Load (N)	Ultimate Unit Stress (N/mm2)	Type of Failure & Location

	Diameter (mm)	Gage Length (mm)	Area (mm2)	U.T.L. (N)	U.T.S. (N/mm2)	U.Y.L. (N)	U.Y.S. (N/mm2)	Elongation (%)
2121-B-005 (Max PWHT)	**12.56**	**50**	**123.9**	/	**569**	/	**474**	**73**

GUIDED BEND TEST (QW-160)

Type and Figure No.	Result	Type and Figure No.	Result

TOUGHNESS TEST (QW-170)

Specimen No. & Notch Location	Specimen Size (mm)	Test Temperature (°C)	Impact Values (Joule)	Lateral Expansion (% shear)	Lateral Expansion (mm)	Drop Weight Break (Yes or No)
2121-C-001 HAZ ½ T	**10x10x55**	**-46**	**151 - 157 - 187**	/	/	/
2121-D-001 WM ½ T	**10x10x55**	**-46**	**70 - 77- 77**	/	/	/

Comments:

FILLET WELD TEST (QW-180)

Result - Satisfactory: **Yes** ____ **No** ____ **Penetration into Parent Metal:** **Yes** ____ **No** ____

Macro - Result:

OTHER TESTS

Visual Examination: /

R.T. Examination: /

P.T. Examination: /

M.T. Examination: /

Micro Examination: /

Deposit Analysis:

C	Mn	Si	P	S	Cr	Ni	Mo
Fe	Cu	Nb+Ta					

Macro Examination: /

Hardness Test (Hv10): Base Metal: /; Weld Metal: /; Haz: /

Other: **No**

Welder's Name: **Bonzi Michele**

Stamp No.: **S15**

Test conducted by: **Brembana & Rolle S.p.A. Welding Engineer**
Quality Control
Third party Inspector

Laboratory Test No.: **2023080280**

BUREAU VERITAS ITALIA WELDING 14
IT FILE:
DATE:
WITNESSED REVIEW

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of ASME Code Section IX

Prepared by	Checked and Certified by	Date	
M.Carminati	**M.Costo**	**12/09/2023**	Sheet 3 of 3

BREMBANA&ROLLE

VISUAL EXAMINATION REPORT

REPORT No.

PQR 24/17VT

PURCHASER DATA		MANUFACTURER DATA	
PURCHASER		**JOB No.**	===
PLANT		**DWG. No.**	===
P.O.		**PROCEDURE No.**	BCI-007-VT
ITEM		**SERIAL No.**	===

APPLICABLE CODE:

ASME IX - ASME VIII Div. 1 UW-31

APPLICABLE STANDARD/SPECIFICATION:

Nr.	Type of imperfection		Acceptance criteria	Test result conform:
1	Cracks	...	Not permitted	☑
2	Crater cracks	...	Not permitted	☑
3	Exposed inclusions	...	Not permitted when occurring at the surface	☑
4	Porosity/Surface pores	...	Not permitted	☑
5	Incomplete/Lack of fusion	...	Not permitted	☑
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐

BREMBANA & ROLLE S.p.A.

OPERATOR / EVALUATOR LEV. II SNT-TC-1A

BREMBANA&ROLLE S.p.A.
P.FACHERIS
QUALITY CONTROL DEPT.
11 GEN 2018

☐ F.CEFIS ☒ P.FACHERIS

BREMBANA & ROLLE S.p.A.
M. ESPOSITO
Q. C. MANAGER
11 GEN 2018

M.ESPOSITO - Q.C.M.

INSPECTION AGENCY

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A member of the Lloyd's Register group
☑ Witnessed ☐ Monitored ☐ Reviewed
Alessandro Salvatore Monastra
Milan Office

BREMBANA&ROLLE

DYE PENETRANT TEST REPORT

REPORT No. **PQR 24/17 PT**

PURCHASER DATA	MANUFACTURER DATA
PURCHASER	**JOB No.**
PLANT	**DWG. No.**
P.O.	**PROCEDURE No.** BCI-002-PT
ITEM	**SERIAL No.**

APPLICABLE CODE:	**APPLICABLE STANDARD/SPECIFICATION:**
ASME IX – QW 195	

P.T. examination performed at 100 % on:

- Specimen 24/17

MATERIAL: SA 765 Gr.2 - SA 516 Gr. 70 **THICKNESS:** 40 mm

P.T. Time:	BEFORE: P.W.H.T. ■ HYDROTEST ☐	AFTER: P.W.H.T. ☐ TUBE EXPANSION ☐
Surface:	condition : As welded ■ Ground ☐ Machined ☐	
	cleaning : Solvent ☐ Brushing ■ Shotblasting ☐	
Type:	Water Washable Visible ■ Post Emulsifying None ☐ Solvent Removable None ☐	
Penetrant:	Colour Contrast CGM RED W Emulsifier None Solvent None Developer Non Acqueous Wet CGM ROTRIVEL U	
Application:	PENETRANT : Paint Brush ☐ Spray ■ Penetration time : 10 minutes	
	EMULSIFIER : Dipping ☐ Emulsification time N.A.	
Excess penetrant removal:	Water spray (3.5 bar max) ■ cloths ☐ absorber paper ☐	
Drying after excess penetrant removal :	Compressed air (3.5 bar max) ■ cloths ■	
Developer application :	Spraying	Developping time: 10 minutes Interpretation : 30 minutes
Viewing condition:	Artificial light (1000 Lx min.) ■ Black light (1000 µW/cm² min) ☐	
Post examination cleaning:	Water rinse ■ Cloths ■	
TEST RESULT:	SATISFACTORY, NO REPORTABLE INDICATIONS FOUND	

BREMBANA & ROLLE S.p.A.

OPERATOR / EVALUATOR LEV. II SNT-TC-1A

11 GEN 2018

☒ F.CEFIS ☐ P.FACHERIS

BREMBANA & ROLLE S.p.A.
M. ESPOSITO
Q. C. MANAGER
11 GEN 2018
M.ESPOSITO - Q.C.M.

INSPECTION AGENCY

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Alessandro Salvatore Monastra
Milan Office

Form PT Rev. 0 Date 23/06/'99

Rapporto di prova / Test Report **2018/01/0400**

Garbagnate M.ero 2018 January 31

Campionamento eseguito a cura del Cliente
Sampling performed by Customer

I Campioni sottoposti a prova sono conservati per 4 mesi
Tested samples are kept for 4months

Ordine Interno / Internal Order: 2018/0078

Materiale Ricevuto il / Material Received on: 2018 January 25

Prove Eseguite il / Test Performed on: 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

Via Villino, 1

24030 Valbrembo (BG)

Campione sottoposto a prova Tested Specimen	**Materiale dichiarato** Declared Material	**Specifiche applicate** Applied Specifications
Procedure qualification record No.24/17	**Base Metal:**	
Preliminary WPS: W24/17	**SA 516 Gr.70**	
Process: GMAW-FCAW Semi-Automatic	**SA 765 Gr.2**	**ASME IX - Ed. 2015 QW-153 QW-163**
Pos. : 3G		
WPS: W23/17		
Welder: Kachi Abderrahim Stamp: S32		
	Colata / Heat	**ASME VIII Div. 1 UW 51**
Thk.40 mm (SA 765 Gr.2)		
Thk.45 mm (SA 516 Gr.70)	**1SN427**	
Supplier:	**(SA 516 Gr.70)**	
Metinvest Cert. 305269 dtd 22/10/2013	**16791**	
Forgiatura Vienna Cert. 16012803 dtd 28/10/2016	**(SA 765 Gr.2)**	
Test Plan 008/18		

	Prove eseguite Performed Tests	**Metodo di prova** Test method	Accreditation Yes	Accreditation No	**Apparecchiature utilizzate** Used Equipments
➢	**Esame Radiografico** Radiographic Examination	**ASME V art.2**		X	**vedere pagina successiva** see following page
➢	**Trattamento Termico** Heat Treatment	-		X	**Furnace** Cod.FO-SALD1
➢	**Prova di Piega** Side Bend Test	**ASME IX-QW-161-15** **ASTM A370-17**	X X		**Testing Machine** Cod.TRAZ-200 **Termometer** Cod.TERM005 **Caliper** Cod.CAL675
➢	**Prova di Resilienza** Impact Test	**ASME IX -QW171-15** **ASTM E23-16b**	X X		**Testing Machine** Cod.CH-750 **Termometer** Cod.TERM007 **Caliper** Cod.CAL675
➢	**Esame Macrografico** Macrographic Examination	**ASTM E340-15**	X		**Macro camera** Cod.MACRO-1
➢	**Prova di Durezza** Hardness Test	**ASTM E92-16** **NACE MR0175, ISO 15156-2**	X		**Testing Machine** Cod.DU-KB

Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Pratola
SIGMATRE LAB srl

mb

BREMBANA & ROLLE S.p.A.
WELDING DEPT.
☐ REVIEWED ☐ WITNESSED

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☒ Witnessed ☐ Monitored ☐ Reviewed
Alessandro Salvatore Monastra
Milan Office 31 GEN 2018

Il presente rapporto riguarda esclusivamente i campioni testati e non può essere riprodotto parzialmente senza l'approvazione scritta del laboratorio di prova.
The present report covers exclusively the samples tested and it cannot be reproduced partially without written approval by the test laboratory

SigmaTre-LAB Srl - Via Fornace 31 - 23846 Garbagnate Monastero (Lecco) Tel. +39 031 87 94 25 - Fax +39 031 87 94 22 Mail sigmalab@sigmalab.it P.IVA 03615120130

Rapporto di prova 2018/01/0400
Test Report

Garbagnate M.ero 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

CONTROLLI NON DISTRUTTIVI - NOT DESTRUCTIVE TESTS
Esame Radiografico – Radiographic Examination

Posizione Position	Sensibilità Sensitivity	Valutazione Evaluation	Indicazioni Indications
008-17			
1-2	W8	C	Sd
2-3	W8	C	Sd
3-4	W8	C	Sd

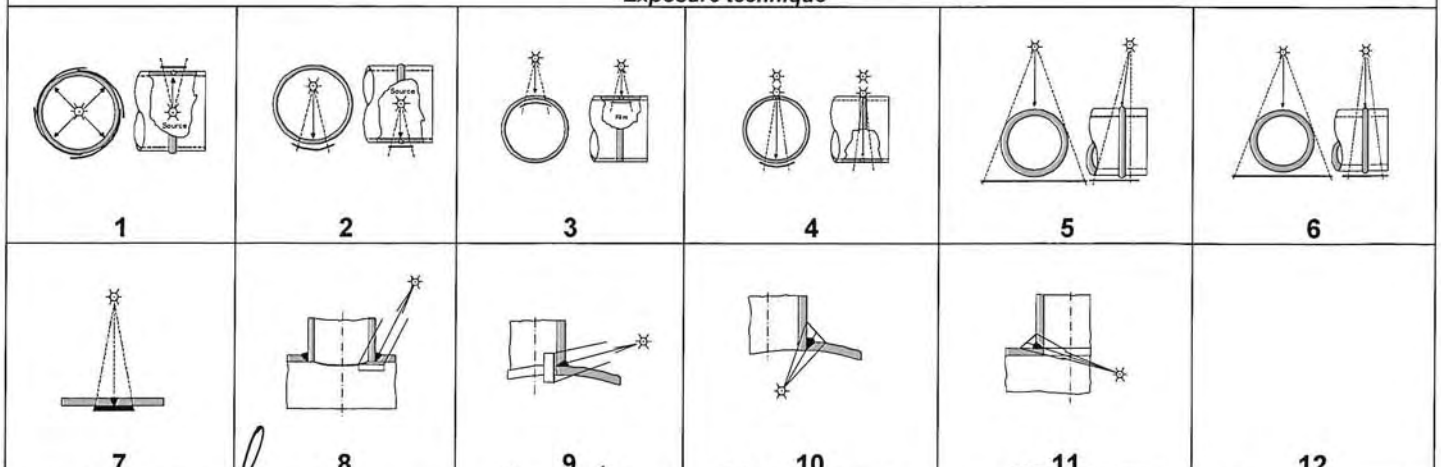
Legenda: Legend:		
2011	poro	Gas pore
2016	Tarlo	warm hole
2014	Pori allineati	Linear porosity
301	inclusione scoria	Slag inclusion
202	Cavità di ritiro	Shrinkage cavity
401	Mancanza di fusione	lack of fusion
502	Sovrametallo eccessivo	Excess weld metal
402	mancanza di penetrazione	incomplete penetration
4013	Mancanza di fusione al vertice	Lack of root fusion
515	insellamento	Root concavity
504	eccessi di penetrazione	excess penetration
100	cricca	crack
2015	Cavità allungata	Elongated cavity
5011	incisione marginale	undercut
304	inclusione metallica	Metallic inclusion
503	Convessità eccessiva	Excessive convexity
Sd	senza indicazioni	withoutdefects

TECNICHE DI ESPOSIZIONE
Exposure technique
No. 7

Apparecchiatura utilizzata	Used equipment
Apparecchio Equipment	SEIFERT
Modello Type	ERESCO 65MF3
Macchia focale Focus	3 mm
Tipo Pellicola Film Type	Agfa gevaert 15X40 D7
Penetrametro IQI Penetrameter IQI	1B ASTM
Schermi Screens	0.05 / 0.10 Pb
Distanza F/F mm Distance F/F mm	700 mm
Densità Density	**2.6÷2.9**
Intensità/mA Intensity/mA	3
Max Voltaggio kV Max Voltage kV	290
Durata Esposizione Exposition Time	2' 36"
Sp. materiale Thk.material	40÷45 mm

Note: C = Conform, NC = Not Conform W=Filo IQI
designazione delle imperfezioni /imperfection designation UNI EN ISO 6520-1
Acceptability as per ASME VII Div.1 UW-51

TECNICHE DI ESPOSIZIONE
Exposure technique



Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Fratola
SIGMATRE LAB srl
mb

SCIARRONE DOMENICO
Liv.2 - EN 473 / ISO 9712
II° Liv. SNT-TC-1A
RT - UT - PT - MT - VT

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☐ Witnessed ☐ Monitored ☑ Reviewed
Alessandro Salvatore Monastra
Milan Office

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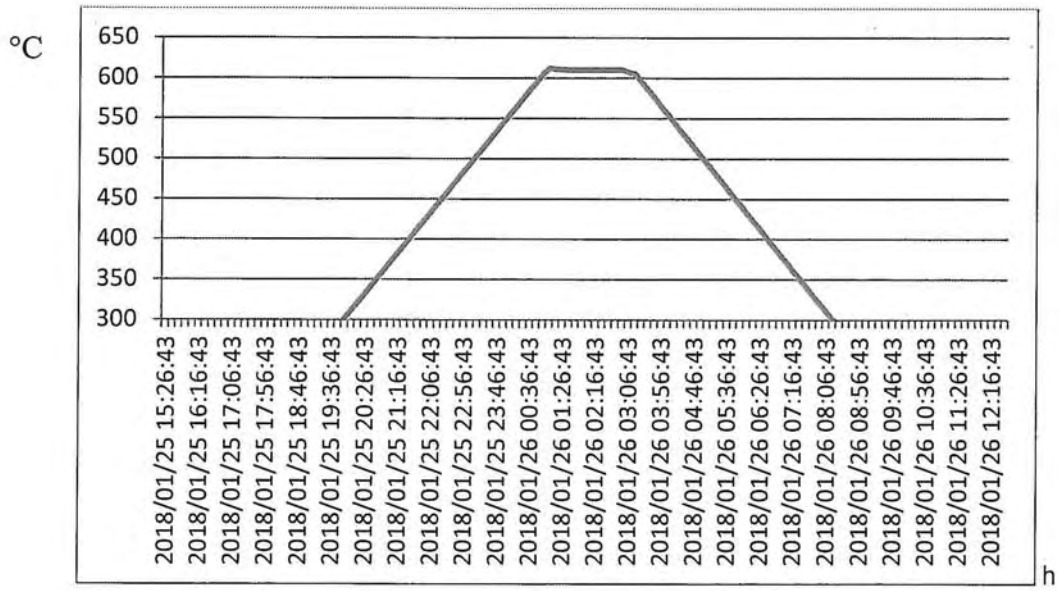
Rapporto di prova Test Report **2018/01/0400**

Garbagnate M.ero 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

PWHT at 610°C +/-10°C for 2 h - Heating and Cooling Rate 56÷80°C/h



Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Prato
SIGMATRE LAB srl

BREMBANA & ROLLE S.p.A.
WELDING
REVIEWED / WITNESSED

Lloyd's Register Verification Limited
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Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office

mb

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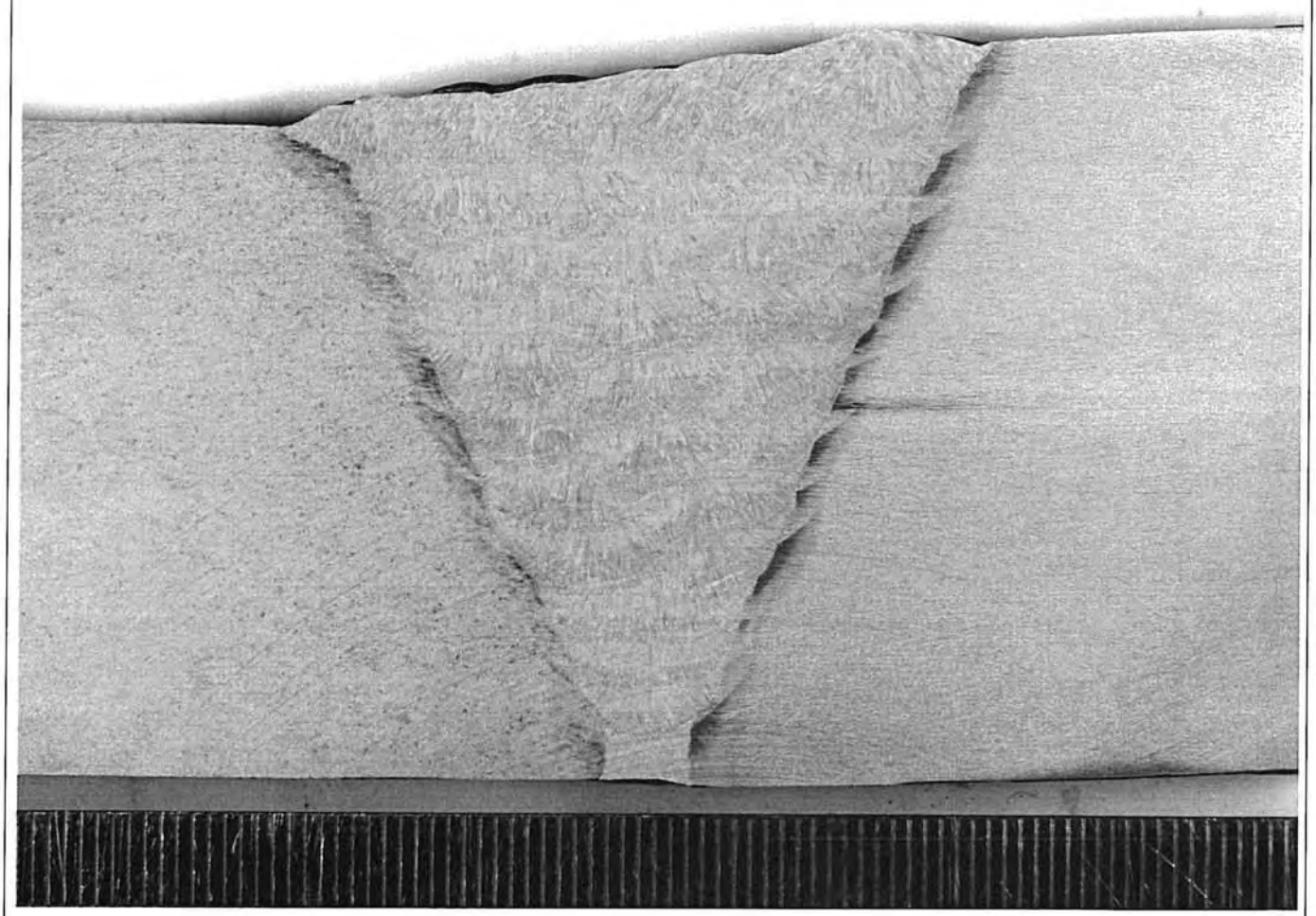
Rapporto di prova Test Report **2018/01/0400**

Garbagnate M.ero 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

ESAME MACROGRAFICO *MACROGRAPHIC EXAMINATION*	***Campione sottoposto a prova*** *Tested specimen* 425



Ingrandimento Magnification	≈ 2.2 x	**Attacco** Etching	Nital	**Figura N.** Picture Nr.	1

Assenza di Difetti -- Absence of defects

Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Pratola
SIGMATRE LAB srl

mb

BREMBANA & ROLLE S.p.A.
VIELLO INSPECTION
ESTABLISHMENT WITNESSED

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office

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Rapporto di prova 2018/01/0400
Test Report

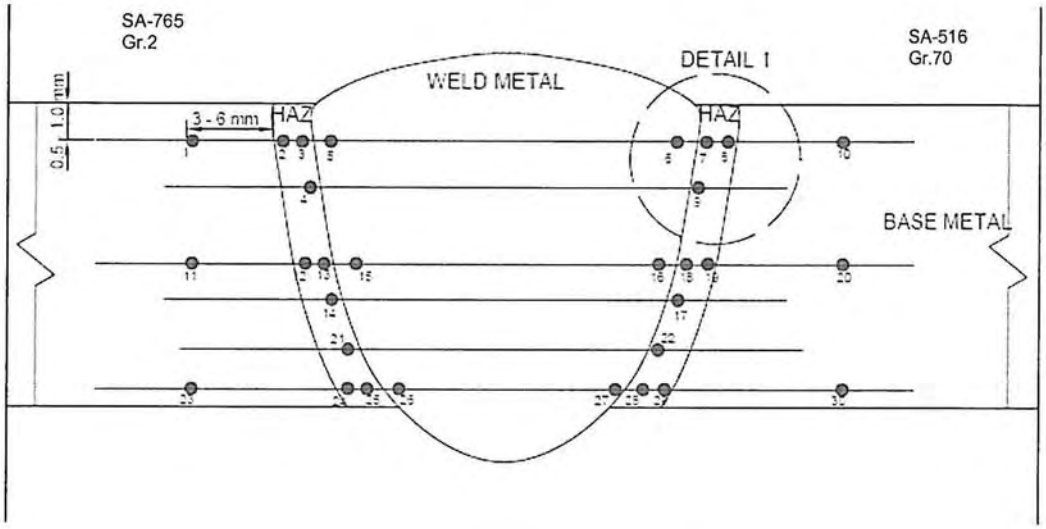
Garbagnate M.ero 2018 January 31

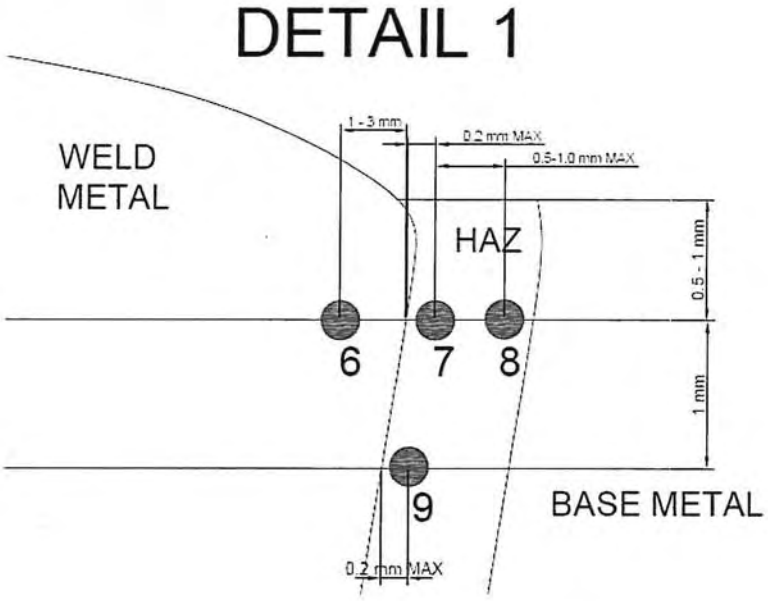
Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

PROVA DI DUREZZA HV10
HARDNESS TEST HV10

Campione sottoposto a prova 425
Tested specimen





Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Pratola
SIGMATRE LAB srl

mb

BREMBANA & ROLLE S.p.A.
WELDING TEST
WITNESSED

Lloyd's Register Verification Limited
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Alessandro Salvatore Monastra
Milan Office

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Rapporto di prova 2018/01/0400
Test Report

Garbagnate M.ero 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

HARDNESS TEST HV10 according to NACE MR0175 / ISO 15156-2/ AB-036386-001						
Position	Top Line		Middle line		Bottom Line	
	Pos.	HV 10	Pos.	HV 10	Pos.	HV 10
Base Metal	1	**150**	11	**147**	23	**153**
Heat Affected Zone	2	**161**	12	**149**	21	**145**
	3	**210**	13	**166**	24	**160**
	4	**232**	14	**209**	25	**176**
Weld Metal	5	**241**	15	**207**	26	**168**
	6	**246**	16	**221**	27	**162**
Heat Affected Zone	7	**245**	17	**242**	22	**133**
	8	**223**	18	**192**	28	**187**
	9	**161**	19	**154**	29	**165**
Base Metal	10	**133**	20	**142**	30	**140**

Note: Hardness Test maximum value: **max. 248 HV** (maximum value requested by Customer).
Condition: As Welded

Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Piatola
SIGMATRE LAB srl
mb

BREMBANA & ROLLE S.p.A.

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office

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Rapporto di prova Test Report **2018/01/0400**

Garbagnate M.ero 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

Prova di Piega - Side Bend Test**

Identificazione Campione Sample identification	Posizione prova Test Position	Distanza tra i rulli Distance between rollers mm	Dimensioni Dimensions mm W x Thk	Mandrino / Angolo Mandrel/angle mm/°	Risultati Prova Test results < 1.6 mm
0425-5	Side/Tr	70.0	10.0 x 40.0	40/180	No indication
0425-6	Side/Tr	70.0	10.0 x 40.0	40/180	No indication
0425-7	Side/Tr	70.0	10.0 x 40.0	40/180	No indication
0425-8	Side/Tr	70.0	10.0 x 40.0	40/180	No indication

Prova di Resilienza - Impact Test**

Identificazione campione Sample identification	Posizione prova Test position	Dimensioni Dimensions mm	Intaglio Notch type	Temp. Temp. °C	Risultati prova Test results Joule			Media Average ≥27J*	Lateral expansion mm			Shear Fracture %		
0425-11	WM TOP	10x10x55	KV	-46	72.2	72.6	72.9	72.6	-	-	-	-	-	-
0425-12	WM ¾ Thk.	10x10x55	KV	-46	37.4	40.2	65.7	47.7	-	-	-	-	-	-
0425-13	WM BOTTOM	10x10x55	KV	-46	39.7	45.0	51.7	45.5	-	-	-	-	-	-
0425-14	HAZ ½ ÷¼ BOTTOM (SA-516 Gr.70)	10x10x55	KV	-46	30.9	33.2	43.6	35.9	-	-	-	-	-	-
0425-15	HAZ TOP ½ ÷¼ (SA-516 Gr.70)	10x10x55	KV	-46	133.4	170.1	196.3	166.6	-	-	-	-	-	-
0425-16	HAZ BOTTOM (SA-516 Gr.70)	10x10x55	KV	-46	49.5	58.1	66.3	57.9	-	-	-	-	-	-
0425-17	HAZ ½ ÷¼ BOTTOM (SA-765 Gr.2)	10x10x55	KV	-46	109.0	124.2	150.1	127.8	-	-	-	-	-	-
0425-18	HAZ TOP ½ ÷¼ (SA-765 Gr.2)	10x10x55	KV	-46	32.9	39.2	37.5	36.5	-	-	-	-	-	-
0425-19	HAZ BOTTOM (SA-765 Gr.2)	10x10x55	KV	-46	53.6	105.5	110.8	90.0	-	-	-	-	-	-

L	*Longitudinale*	*Longitudinal*
Tr	*Trasversale*	*Transversal*
Tang	*Tangenziale*	*Tangential*
W	*Larghezza*	*Width*
Thk	*Spessore*	*Thickness*
amb	*Temp.ambiente*	*RoomTemper.*

Note : *Minimum value requested by Customer
** Test Performed after PWTH at 610°C +/-10°C for 2 h - Heating and Cooling Rate 56÷80°C/h

Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Prabola
SIGMATRE LAB srl

mb

BREMBANA & ROLLE S.p.A.
WELDING PROCEDURE
REVIEWED & WITNESSED

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office

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SigmaTre-LAB Srl - Via Fornace 31 - 23846 Garbagnate Monastero (Lecco) Tel. +39 031 87 94 25 - Fax +39 031 87 94 22 Mail sigmalab@sigmalab.it P.IVA 03615120130

Rapporto di prova Test Report **2018/01/0401**

Garbagnate M.ero 2018 January 31

Campionamento eseguito a cura del Cliente
Sampling performed by Customer

I Campioni sottoposti a prova sono conservati per 4 mesi
Tested samples are kept for 4months

Ordine Interno / Internal Order: 2018/0078

Materiale Ricevuto il / Material Received on: 2018 January 25

Prove Eseguite il / Test Performed on: 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

Via Villino, 1

24030 Valbrembo (BG)

Campione sottoposto a prova Tested Specimen	**Materiale dichiarato** Declared Material	**Specifiche applicate** Applied Specifications
Procedure qualification record No.24/17	Base Metal:	
Preliminary WPS: W24/17	SA 516 Gr.70	
Process: GMAW-FCAW Semi-Automatic	SA 765 Gr.2	ASME IX - Ed. 2015, QW-153, QW-163
Pos. : 3G		
WPS: W23/17		
Welder: Kachi Abderrahim Stamp: S32		
	Colata / Heat	ASME VIII Div. 1 UW 51
Thk.40 mm (SA 765 Gr.2)		
Thk.45 mm (SA 516 Gr.70)	1SO902	
Supplier:	(SA 516 Gr.70)	
Metinvest Cert. 305269 dtd 22/10/2013	16791	
Forgiatura Vienna Cert. 16012803 dtd 28/10/2016	(SA 765 Gr.2)	
Test Plan 008/18		

Prove eseguite Performed Tests	**Metodo di prova** Test method	Accreditation Yes	Accreditation No	**Apparecchiature utilizzate** Used Equipments
➢ **Esame Radiografico** Radiographic Examination	**ASME V art.2**		X	**vedere pagina successiva** see following page
➢ **Trattamento Termico** Heat Treatment	-		X	**Furnace** Cod.FO-SALD1
➢ **Prova di Trazione** Tensile Test	**ASME IX -QW 150-15**	X		**Testing Machine**
	ASTM A370-17	X		Cod.TRAZ600
				Caliper Cod.CAL675
				Termometer Cod.TERM007

Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Prato
SIGMATRE LAB srl
mb

PROVA PER BREMBANA & ROLLE S.p.A.
WELDING PROCEDURE
DEVELOPMENT WITNESSED

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Alessandro Salvatore Mobastra
Milan Office
31 GEN 2018

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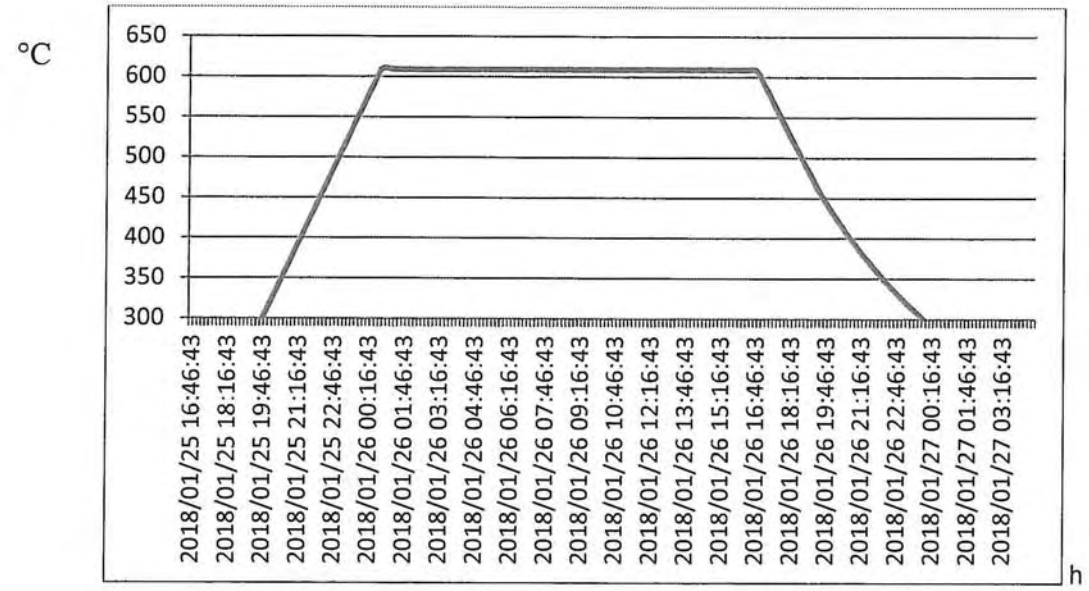
Rapporto di prova / Test Report **2018/01/0401**

Garbagnate M.ero 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

PWHT at 610°C +/-10°C for 16 h - Heating and Cooling Rate 56÷80°C/h



Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Prabla
SIGMATRE LAB srl

mb

BREMBANA & ROLLE S.p.A.
WELDING DEPT.
WITNESSED

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Milan Office

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Rapporto di prova Test Report **2018/01/0401**

Garbagnate M.ero 2018 January 31

Ditta/Messrs *Request by*

BREMBANA & ROLLE S.p.A.

Prova di Trazione - Tension Test*

Identificazione campione Sample identification	Posizione prova Test position	Dimensioni Dimensions Ø o WxThk mm	Sezione Area So mm²	Tratto utile Gage length Lo mm	Temp. Temp. °C	Carico Totale di rottura Total Charge of failure kN	Carico Rottura Tensile strength Rm MPa ≥485	Posizione di rottura Failure position	Tipo di frattura Fracture type
0426-5	Tr	19.06 x 40.52	772.31	-	amb	390.8	506	Base Material (SA-516 Gr.70)	Ductile
0426-6	Tr	19.04 x 40.18	765.03	--	amb	384.9	503	Base Material (SA-516 Gr.70)	Ductile

L	*Longitudinale*	*Longitudinal*
Tr	*Trasversale*	*Transversal*
Tang	*Tangenziale*	*Tangential*
W	*Larghezza*	*Width*
Thk	*Spessore*	*Thickness*
amb	*Temp.ambiente*	*RoomTemper.*

Note : Test performed after PWHT a at 610°C +/-10°C for 16 h - Heating and Cooling Rate 56÷80°C/h

Responsabile Tecnico Laboratorio
Laboratory Manager
Ing. G. Pratola
SIGMATRE LAB srl
mb

BREMBANA & ROLLE S.p.A.
WITNESSED

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RAPPORTO DI PROVA N. *Test Report No.*	**23/1016RP05**	**DATA** *Date*	**23/06/2023**	**CAMPIONE N.** *Sample No.*	**1016EN**	**PAGINA** *Page*	**1**	**DI** *of*	**2**

Laboratory of Medolago, Via Roma 79 - 24030 Medolago (BG) t. +39 035 901473 e-mail info@qualitycontrolgroup.com website www.qualitycontrolgroup.com

ORDINE / *Order* Letter
Data ordine / Order date 07/06/2023

RIFERIMENTO / *Reference* BG/23/071
Data riferimento / Reference date

DATA DI RICEZIONE *Reception date* 07/06/2023

CLIENTE / Customer

BREMBANA & ROLLE S.p.A.
via Villino 1
24030 Valbrembo (BG)

DATA DI ACCETTAZIONE *Acceptance date* 07/06/2023

OGGETTO *Subject* **Tallone di saldatura per test integrativi**
Coupon weld Test for integrative test

ELENCO DELLE PROVE / List of tests	**Metodo** / *Method*	**Saggio** / *Test*	**Pagina** / *Sheet*
Prova di durezza Vickers su giunti saldati / *Destructive tests on welds – Vickers hardness test*	UNI EN ISO 9015-1:2011	1016EN	2

L'accreditamento è legato esclusivamente alle prove incluse nell'elenco allegato al certificato n° 1384L disponibile sul sito web www.accredia.it. Le prove non accreditate da Accredia sono caratterizzate dall'asterisco (*) / *The accreditation is related solely to the tests included in the list annexed to the certificate n° 1384L available on the website www.accredia.it. The tests not accredited by Accredia are characterized by asterisk (*)*

Alessandro Donadoni
Vice Direttore Tecnico / Technical Deputy Manager

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Sampling is carried out by the customer and is not subject to accreditation; test results refer to the sample as received.
Il laboratorio è responsabile di ogni informazione riportata nel presente rapporto di prova ad eccezione delle informazioni fornite dal cliente rispetto alle quali declina ogni responsabilità /
The laboratory is responsible for any information reported in this report except for the information provided by the customer with the respect to which it disclaims any responsibility

CARATTERISTICHE DEL CAMPIONE DICHIARATE DAL CLIENTE / *features of sample declared by customer*						
	Descrizione *Description*	Dimensioni *Dimension*	Fornitore *Supplier*	Colata/Lotto *Heat/Lot*	Certificato *Certificate*	Date *Date*
Materiale base 1 *Parent material1*	ASME SA516 gr.70	Plate Thk. 40 mm	---	---	---	---
Materiale base 2 *Parent material 2*	ASME SA765 gr.2	Plate Thk. 40 mm	---	---	---	---
Metallo d'apporto *Filler Metal*	---	---	---	---	---	---
Tipo di giunto *Joint type*	BW	Processo di saldatura *Welding process*	GMAW-FCAW		Posizione di saldatura *Welding position*	---
pWPS n.	W24/17	Saldatore *Welder*	---		Stamp	S11
Altre caratteristiche *Other features*	Procedure Qualification Record P.Q.R. - integrative hardness test Job. 22177 Coupon test 1016EN after min PWHT performed by B. & R. Test according to: **Customer specification**					

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Tutte le prove riportate nelle pagine seguenti sono state eseguite presso il laboratorio di MEDOLAGO (BG)
All tests reported in the following pages were carried out at the laboratory of MEDOLAGO (BG)

BUREAU VERITAS ITALIA WELDING 14
IT FILE:
DATE:
WITNESSED ☐ REVIEW ☑

Ente di Collaudo / Surveyor

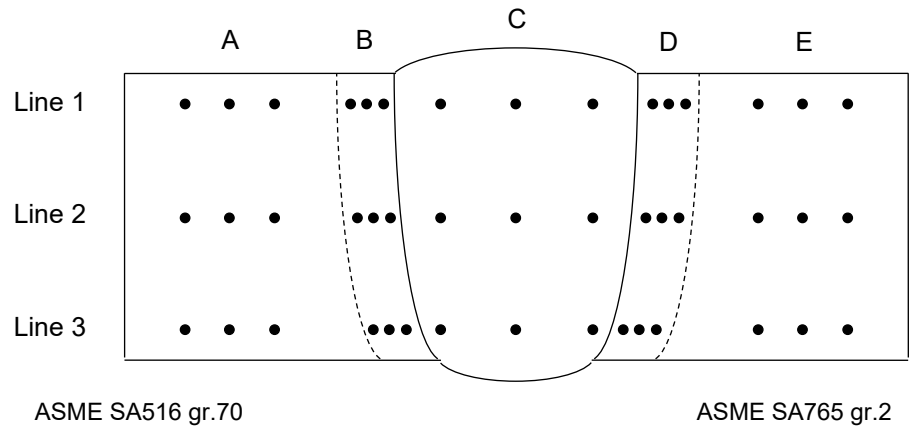
Ente di Collaudo / Surveyor

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PROVA DI DUREZZA VICKERS SU GIUNTI SALDATI – UNI EN ISO 9015-1: 2011

Weld joints Vickers hardness testing – UNI EN ISO 9015-1: 2011

SAGGIO *Test*	**1016EN**
TIPO DI DUREZZA *Hardness type*	HV10
VALORE RICHIESTO *Required value*	MAX 200 HV



Lo schema delle impronte di durezza la distanza tra le impronte è in accordo alla ISO 9015-1
The hardness indentation sketch and indentation distance are according to ISO 9015-1

RISULTATO

RESULT

Pos.	A (M.B.) *A (B.M.)*	B (Z.T.A.) *B (H.A.Z.)*	C (Z.F.) *C (W.M.)*	D (Z.T.A.) *D (H.A.Z.)*	E (M.B.) *E (B.M.)*
LINEA 1 ***LINE 1***	170-172-176	170-179-194	192-193-195	191-190-186	178-176-172
LINEA 2 ***LINE 2***	170-178-174	177-180-185	193-195-195	187-182-180	173-174-171
LINEA 3 ***LINE 3***	174-173-172	179-178-184	194-194-190	190-189-186	173-173-171

Norme di accettabilità: Customer specification
***Acceptability standards**: Customer specification*

Dichiarazione di conformità
la superficie esaminata risulta conforme ai requisiti previsti dalle norme di accettabilità summenzionate
Statement of conformity
The examined surface comply with the requirements of the acceptability standards mentioned above

Data inizio prova *Test start date*	23/06/2023	Data fine prova *Test end date*	23/06/2023	Tecnico qualificato *Qualified techinician*	MARIO PUCCI	Apparecchiatura *Equipment*	QC 371

07.01mod RP HM2I

***FINE RAPPORTO** / END REPORT*

BUREAU VERITAS ITALIA WELDING 14
IT FILE:
DATE:
WITNESSED ☐ REVIEW ☑

Ente di Collaudo / Surveyor

Ente di Collaudo / Surveyor

Rapporto di Prova
Test Report

2023080280

Garbagnate M.ro — 08 September 2023

Ditta / Messers

BREMBANA & ROLLE SPA

Indirizzo/Address
VIA VILLINO 1
VALBREMBO
24030
BG

Campionamento eseguito a cura del Cliente Sampling performed by Customer	
I Campioni sottoposti a prova sono conservati per 4 mesi Tested samples are kept for 4 months	
Prove Eseguite Presso Laboratorio SIGMATRELAB, salvo diversa indicazione Tests Performed on SIGMATRELAB Laboratory, if not othervised specified	
Ordine Interno: Internal Order:	202302121
Id Interno: Internal Id:	202302121-B,C, D
Materiale Ricevuto il: Material Received on:	9 August 2023
Prove Terminate il: Test Ended on:	08 September 2023
Condizioni di Prova: Test Condition:	Campione Testato Dopo MAX PWHT Sample Tested After MAX PWHT

Informazioni fornite dal cliente, per le quali il laboratorio non si assume responsabilità - Information provided by the customer, for which the laboratory assumes no responsibility

Campione Sottoposto a Prova
Tested Sample

Weld test coupon – Integrative test
PQR no. 24/17 – Job no. 23031
Welding process: GMAW+FCAW
Welder: Michele Bonzi – Stamp S15

Tracciabilità *Traceability*	BG/23/113 - JOB 23031 - TT MAX	[O] Ordine / Order	BG/23/113
		[C] *Consegna* / *Delivery*	1250 del 04/08/2023

Specifiche Applicate / Standard Materiale *Applied Specifications / Material Standard*	Materiale Dichiarato *Declared Material*	Colata *Heat*	Dettagli *Details*	Spec. #
ASME BPVC.II.A-2021 (PART A2)	SA-516/SA-516M - GRADE 70	-	Side A - Thk 40 mm	1
ASME BPVC.II.A-2021 (PART A2)	SA-765/SA-765M - SA765 Grade II	-	Side B - Thk 40 mm	2
ASME BPVC.IX-2021	-	-	-	3

Prove Eseguite *Performed Tests*	Metodo di Prova *Test Method*	Accreditamento *Accreditation* Si / Yes	No / No
Prove di trazione a temperatura ambiente *Tensile testing at room temperature*	*ASTM E8/E8M -22*	*X*	
Prove di resilienza *Impact test*	*ASME IX QW 170:2021*	*X*	

Vice Responsabile Tecnico Laboratorio
Vice Laboratory Manager
ING. VIVIANA CREPALDI

BREMBANA & ROLLE S.p.A.
WELDING APPROVED CARMINATI
REVIEWED WITNESSED

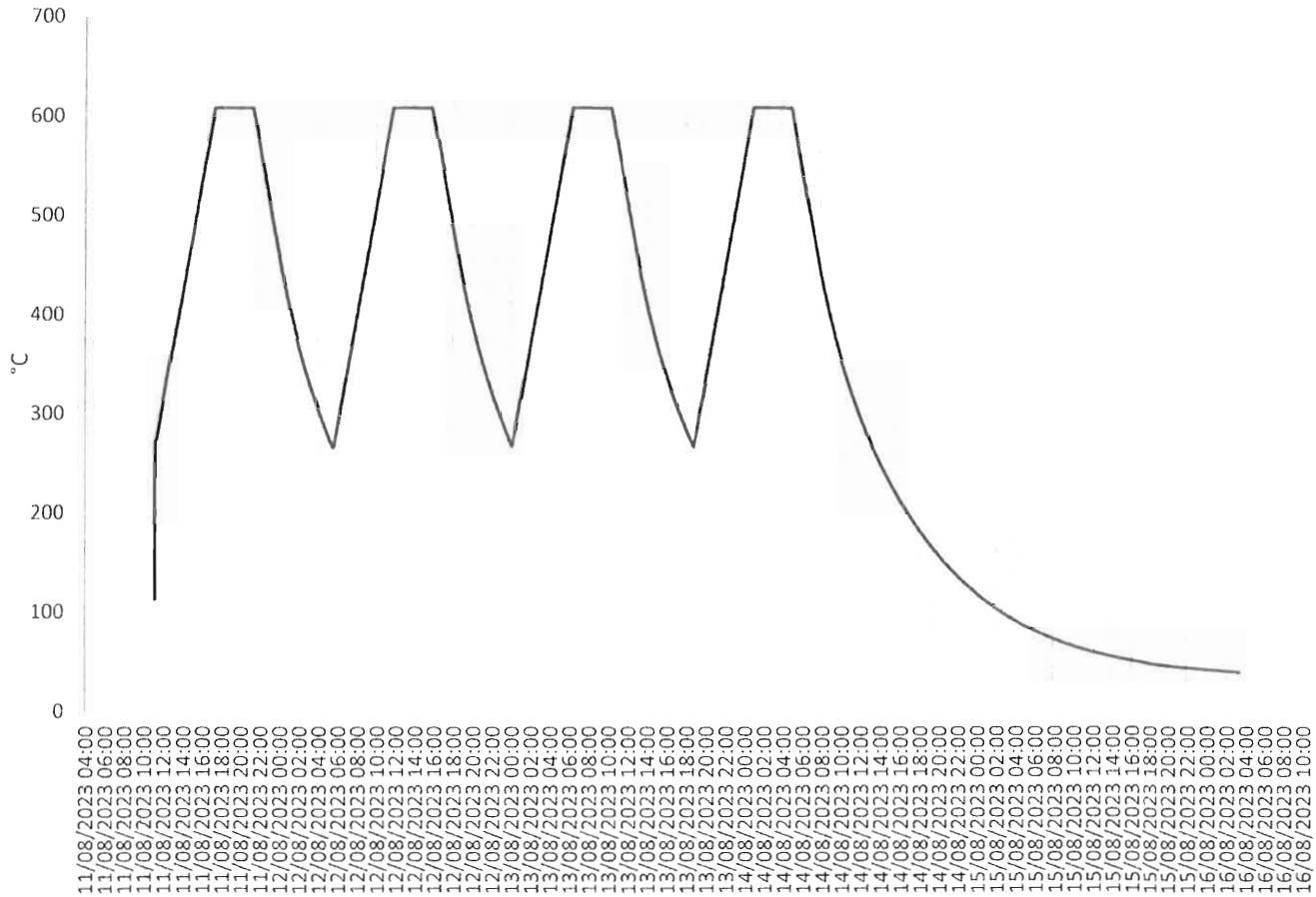
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If expressed a declaration of conformity the decisional rule taken by SIGMATRELAB is to issue the result without considering the uncertainty contribution. If it's expressed the coverage factor considered (k) and a level of confidence of (%).

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Rapporto di Prova Test Report	2023080280	Ditta / Messers
Garbagnate M.ro	08 September 2023	BREMBANA & ROLLE SPA

MAX PWHT: 610 +/-10°C for 4 hours for 4 cycles – Heating and cooling rate: 50÷60°C/h



Vice Responsabile Tecnico Laboratorio
Vice Laboratory Manager
ING. VIVIANA CREPALDI

BREMBANA & ROLLE S.p.A.
WELDING DEPT. M. CARMINATI
REVIEWED WITNESSED

BUREAU VERITAS ITALIA WELDING 14
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If expressed a declaration of conformity the decisionale rule taken by SIGMATRE LAB is to issue the result without considering the uncertainty contribution, if it is expressed the coverage factor considered is k = 2 and a level of confidence of 95%

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Rapporto di Prova
Test Report
Garbagnate M.ro

2023080280

08 September 2023

Ditta / Messers

BREMBANA & ROLLE SPA

Prove di trazione a temperatura ambiente - Tensile testing at room temperature
ASTM E8/E8M -22

Provino	Ori	Dimensioni	Sezione	Tratto Utile	Temp.	Snervamento	Carico Rottura	Allungamento	Strizione
Specimen	*Pos*	*Dimensions*	*Area*	*Gauge Length*	*Temp.*	*Yield Strength*	*Tensile Strength*	*Elongation*	*Reduction*
-	-	mm	mm^2	mm	°C	MPa	MPa	%	%
-	-	T x W - Ø	S_0	G	T	$YS_{0.2}$	S_u	E	Z
		Requirements from Specification # [O]				FOR INFO	FOR INFO	FOR INFO	FOR INFO
2121-B-005	LONG 1/2T	Ø 12.56	123.9	50	+22	474	569	35.0	73

Note:

Legenda e Dettagli – Legend and Details

Macchina di Prova *Testing Machine*		Orientamento Test Position	LONG	Longitudinale *Longitudinal*	TRAS	Trasversale *Transversal*	TANG	Tangenziale *Tangential*
X	TRAZ-250	Orientamento – Zona Rottura	BM	Metallo Base	WM	Saldatura	HAZ	Zona Termicamente alterata
-	-	Test Position – Fracture Location		*Base Metal*		*Weld Metal*		*Heat Affected Zone*
Sampling Sketch (solo se richiesto – only if required)		Orientamento	THK	Spessore	-	-	-	-
		Test Position		*Thickness*		-		-
-		Dimensioni	B	Spessore	W	Larghezza	Ø	Diametro
		Dimensions		*Thickness*		*Width*		*Diameter*

Prove di resilienza - Impact test
ASME IX QW 170:2021

Provino	Ori	Dimensioni	Intaglio	Temp.	Energia Assorbita				Espansione Laterale			Aspetto Frattura		
Specimen	*Pos*	*Dimensions*	*Notch*	*Temp.*	*Absorbed Energy*				*Lateral Expansion*			*Shear Fracture*		
-	-	mm	-	°C	J				mm			%		
-	-	B x W x L	KV	T	Valore Singolo *Single Value*			Media *Average*	Valore Singolo *Single Value*			Valore Singolo *Single Value*		
		Requirements from Specification # [O]			≥ 27			≥ 27	-			-		
2121-C-001	TRAS HAZ 1/2T	10 X 10 X 55	KV	-46	151	157	187	165	-	-	-	-	-	-
2121-D-001	TRAS WM 1/2T	10 X 10 X 55	KV	-46	70	77	77	75	-	-	-	-	-	-

Note:

Legenda e Dettagli – Legend and Details

Macchina di Prova - Testing Machine *CH-750 (KV8)*	Orientamento (Ori) *Test Position (Pos)*	LONG	Longitudinale *Longitudinal*	TRAS	Trasversale *Transversal*	TANG	Tangenziale *Tangential*
CH-750: Nominal Energy 750J, Stricker Radius 8 mm	Orientamento (Ori)	BM	Metallo Base	WM	Saldatura	HAZ	Zona Termicamente alterata
CH-450: Nominal Energy 450J, KV_2	*Test Position (Pos)*		*Base Metal*		*Weld Metal*		*Heat Affected Zone*
I valori superiori all'80% dell'energia nominale si devono	Orientamento (Ori)	THK	Spessore	-	-	-	-
considerare approssimativi.	*Test Position (Pos)*		*Thickness*		-		-
Absorbed energy values above 80% of the nominal energy	Dimensioni	B	Spessore	W	Larghezza	L	Lunghezza
are approximate.	*Dimensions*		*Thickness*		*Width*		*Length*

Fine del Rapporto di Prova – End of Test Report

Vice Responsabile Tecnico Laboratorio
Vice Laboratory Manager
ING. VIVIANA CREPALDI

BREMBANA & ROLLE S.p.A.
WELDING DEPT. M. CARMINATI
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Il presente rapporto riguarda esclusivamente i campioni testati, così come ricevuti e non può essere riprodotto parzialmente senza l'approvazione scritta del laboratorio di prova.
The present report covers exclusively the samples tested, as received, and it cannot be reproduced partially without written approval by the test laboratory.
Nel caso in cui sia espressa una dichiarazione di conformità in regola decisionale adottata da SIGMATRELAB e di presentare il risultato senza tenere conto del contributo dell'incertezza di misura, nel rispetto di tale espressa viene considerato un fattore di copertura k=2 e un livello di fiducia del 95%.
If expressed a declaration of conformity the decision rule taken by SIGMATRELAB is to assume the result without considering the uncertainty contribution. If this expression the coverage factor considered is k=2 and a level of confidence of 95%.

SigmaTre-LAB Srl – Via Fornace 31 – 23846 Garbagnate Monastero (Lecco) Tel. +39 031 87 94 25 Fax +39 031 87 94 22 Mail: info@sigmatrelab.it – P.IVA 03615120130

A02

CERTIFICATO DI CONTROLLO 3.1 / INSPECTION CERTIFICATE 3.1 - EN 10204:2004

A04/A05

METINVEST®

Metinvest Trametal spa

A01 Società per azioni con socio unico - soggetta a direzione e coordinamento di Metinvest B.V.
STABILIMENTO: 33058 S. GIORGIO DI NOGARO (UD) VIA E. FERMI, 44
TEL. 0431/629989 (RIC. AUT.) - FAX 0431/629985 (RIC. AUT.)
SEDE LEGALE: 16121 GENOVA - VIA XII OTTOBRE, 3 - 6° PIANO
Capitale sociale € 300.120.000,00 I.V. - R.E.A. Genova n. 437720
C.F., P. Iva e Iscr. Reg. Imp. Genova n. 05956630965

(A) PROCESSO DI ELABORAZIONE / STEELMAKING PROCESS: E = ELECTRIC ; BO = BASIC OXYGEN
(B) STATO DI FORNITURA / DELIVERY CONDITION: AR = GREZZO DI LAMINAZIONE / AS ROLLED ;
N° = LAMINAZIONE A TEMPERATURA CONTROLLATA / NORMALIZING ROLLING ;
N = NORMALIZZATO / NORMALIZED at 910°C, 1,5 min/mm ; ARIA CALMA / STILL AIR;
R = RICOTTO / ANNEALED;
N+R = NORMALIZZATO + RINVENUTO / NORMALIZED + ANNEALED
(C) TRATTAMENTO TERMICO DEL CAMPIONE / HEAT TREATMENT OF SAMPLE:
N = 910°C, 1,5 min/mm ; ARIA CALMA / STILL AIR
R = 650°C, 1,5 min/mm ; ARIA CALMA / STILL AIR
(D) Ceq_1 = C + Mn/6 ; Ceq_2 = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15 ;
Pcm = C + Si/30 + (Mn + Cu + Cr)/20 + Ni/50 + Mo/15 + V/10 + B*5
(1) POSIZIONE / LOCATION: 1 = TESTA / TOP ; 2 = PIEDE / BOTTOM
(2) POSIZIONE / LOCATION: C = CUORE / 1/2 THICKNESS ; P = PELLE / SURFACE ; D = 1/4 SPESSORE / THICKNESS
(3) DIREZIONE / DIRECTION: L = LONGITUDINALE / LONGITUDINAL ; T = TRASVERSALE / TRANSVERSE
(4) FORMA DEL PROVINO / SHAPE OF TEST PIECE: P = PRISMATICO / PRISMATIC ; C = CILINDRICO / CYLINDRICAL
(5) ESITO PROVA DI PIEGA / RESULT: OK = COMPLYING ; NO = NOT COMPLYING

A03 N° Certificato / Certificate no.	Z02 Data / Date
305269	22/10/2013
A08 N° Ordine Trametal / Works order	A07 N° Ordine cliente / Customer's order
31305663	4042/00232
DDT	del / date
BOL 31320616	21/10/2013
Pratica / File no.	
del / date	

A06 Cliente / Customer

BREMBANA & ROLLE SPA

VIA VILLINO, 1
24030 VALBREMBO
BG ITALIA

B01/B02/B03

Prodotto / Product	Lamiere / Hot rolled plates
Qualità / Steel grade	SA516GR70MT/LTV
Normativa / Specification	ASME

B06 Marcatura di prodotto / Marking of the product

LAMIERA/ORDINE/N° INFORNAMENTO/DIMENSIONI/QUALITÀ/MARCHIO DEL PRODUTTORE
PLATE/ORDER/INTERNAL N°/DIMENSIONS/STEEL GRADE/MANUFACTURER'S MARK

B07 ITEM	B07 LAMIERA PLATE	B07 N° INFORN. INTERNAL NUMBER	B09/B11 DIMENSIONI [mm] DIMENSIONS	B12 PESO TEORICO [t] THEORICAL WEIGHT	B07 LOTTO BATCH NO.	C70 PROCESSO ELAB. (A) STEELMAKING PROCESS	B04 STATO FORNITURA LAMIERA (B) DELIVERY CONDITION	C00 CAMPIONE SAMPLE	B05 TRATT. CAMPIONE (C) HEAT TREATMENT	C00 CAMPIONE PWHT SAMPLE	B05 PWHT BEGINNING TEMPERATURE °C TEMPERATURA INIZIO	HEATING RATE VELOCITA' RISCALDO C/h	TEMPERATURE TREATMENT °C TEMPERATURA TRATTAMENTO	HOLDING TIME PERMANENZA Min	COOLING RATE VELOCITA' RAFFREDDAMENTO °C/h	END TEMPERATURE °C TEMPERATURA FINE	N° CICLI / CYCLES	C00 CAMPIONE Q+T SAMPLE	B05 Q+T TEMPERATURE (Q) °C TEMPERATURA	HOLDING TIME (Q) Min PERMANENZA	COOLING RAFFREDDAMENTO	TEMPERATURE (T) °C TEMPERATURA	HOLDING TIME PERMANENZA (T) Min	COOLING RAFFREDDAMENTO
17 1	1SO9020403A	1039223	45.00X2500X4000	3,53	379314	BO	N	GM374																	
18 2	1NP3020905A	1039347	72.00X1500X4000	3,39	379358	BO	N	GM396																	

C71/C92 COMPOSIZIONE CHIMICA DI COLATA / HEAT CHEMICAL ANALYSIS

B07	C71	C72	C73	C74	C75	C76	C77	C78	C79	C80	C81	C82	C83	C84	C85	C86	C87	C88	C89	C90	C91
COLATA HEAT	C %	Mn %	Si %	P %	S %	Cu %	Ni %	Cr %	Mo %	Al %	V %	Nb %	Ti %	Sn %	Ca %	N %	B %	H %	Ceq1 % (D)	Ceq2 % (D)	Pcm % (D)
Ordine Min 1	0,00	0,00	0,00	0,000	0,000	0,000	0,000	0,000	0,00	0,000	0,000	0,000	0,000	0,000		0,0000	0,0000	0,0000	0,00	0,00	0,00
Ordine Max 1	0,21	0,00	0,00	0,000	0,000	0,000	0,000	0,000	0,00	0,000	0,000	0,050	0,000	0,000		0,0000	0,0000	0,0000	0,00	0,44	0,00
Ordine Min 2	0,00	0,00	0,00	0,000	0,000	0,000	0,000	0,000	0,00	0,000	0,000	0,000	0,000	0,000		0,0000	0,0000	0,0000	0,00	0,00	0,00
Ordine Max 2	0,21	0,00	0,00	0,000	0,000	0,000	0,000	0,000	0,00	0,000	0,000	0,050	0,000	0,000		0,0000	0,0000	0,0000	0,00	0,44	0,00
SA51670LTV Min 12.60 - 50.00		0,85	0,15																		
SA51670LTV Max 12.60 - 50.00	0,28	1,20	0,40	0,035	0,035																
SA51670LTV Min 50.10 - 100.00		0,85	0,15																		
SA51670LTV Max 50.10 - 100.00	0,30	1,20	0,40	0,035	0,035																
1NP302	0,16	1,44	0,24	0,012	0,003	0,030	0,020	0,030	0,00	0,037	0,000	0,023	0,000	0,000	0,0000	0,0060	0,0000	0,0004	0,40	0,41	0,24
1SO902	0,21	1,03	0,28	0,013	0,002	0,020	0,020	0,030	0,00	0,036	0,000	0,000	0,000	0,000	0,0000	0,0060	0,0000	0,0003	0,38	0,39	0,27

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Alessandro Salvatore Monastra
Milan Office 12/11/13

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
22 OTT. 2013

			PROVA DI TRAZIONE TENSILE TEST										PROVA DI RESILIENZA IMPACT TEST - CHARPY V-NOTCH TEST						PROVA DI PIEGA BEND TEST				PROVA DI DUREZZA HARDNESS TEST				PROVA DI STRIZIONE Z% TEST	
C00		C01	C01	C02	C03	C11	C12		C13	C14	C10		C41	C02	C03	C01	C42	C43	C02	C51	C52	C50	C01	C30	C31	C32	C53	C54
CAMPIONE SAMPLE	SPESSORE LAMIERA PLATE THICKNESS	POSIZIONE (1) LOCATION	POSIZIONE (2) LOCATION	DIREZIONE (3) ORIENTATION	TEMPERATURA [°C] TEST TEMPERATURE	ReH [Mpa] YIELD STRENGTH	Rm [Mpa] TENSILE STRENGTH	ReH/Rm	A2" ELONGATION	Rp 0,2 [Mpa] PROOF STRENGTH	FORMA PROVINO (4) SHAPE OF TEST PIECE		LARGHEZZA [mm] WIDTH	DIREZIONE (3) ORIENTATION	TEMPERATURA [°C] TEST TEMPERATURE	POSIZIONE (2) LOCATION	SINGOLI VALORI [J] INDIVIDUAL VALUES	MEDIA [J] MEAN VALUE	DIREZIONE (3) ORIENTATION	MANDRINO [mm] MANDREL	ANGOLO [°] ANGLE	ESITO (5) RESULT	POSIZIONE (2) LOCATION	METODO TEST METHOD	SINGOLI VALORI INDIVIDUAL VALUES	MEDIA MEAN VALUE	Z% SINGOLI VALORI Z% INDIVIDUAL VALUES	Z% VALORE MEDIO Z% MEAN VALUE
ORDINE Min 1					-20										-20		27	0										
ORDINE Min 2					-20										-20		27	0										
SA51670LTV Min 20.10 - 120.00					20		485		17,0																			
SA51670LTV Max 20.10 - 120.00					20		620		0,0																			
SA51670LTV Min 25.10 - 50.00														L	-40		20	0										
SA51670LTV Min 50.10 - 75.00														L	-35		20	0										
GM374	45,00	2	P	T	20		511		37,3	355	C		10,00	L	-20	P	160 168 112	147						HB	166 167 168	167		
GM396	72,00	2	P	T	20		520		35,7	368	C		10,00	L	-20	P	245 248 229	241						HB	170 168 171	170		

C10

ASME SA-370 FIG. 3 AND FIG. 10 (FIG. 11 a 10x10mm) - SAMPLE TAKEN AFTER PLATE HEAT TREATMENT

D02-D50 CONTROLLO ULTRASONORO / ULTRASONIC EXAMINATION

D02	D03	D04	D05	D06	D07
APPARECCHIATURA EQUIPMENT	N° SERIE SERIAL NO	CONDIZIONI SUPERFICIALI SURFACE CONDITIONS	ACCOPPIANTE COUPLANT	MODALITÀ OPERATIVE PROCEDURE	TARATURA CALIBRATION
GILARDONI RDG450	RDG450-450-140156TC	GREZZO DI LAMINAZIONE AS ROLLED	ACQUA WATER	IN ACCORDO ALLA SPECIFICA ACCORDING TO SPECIFICATION	IN ACCORDO ALLA SPECIFICA ACCORDING TO SPECIFICATION

B07 LAMIERA PLATE	D08 SONDE PROBE	D09 DIAMETRO DIAMETER MM	D10 FREQUENZA FREQUENCE MHZ	D11 ANGOLO Angle °	D12 NORMA DI RIFERIMENTO STANDARD SPECIFICATION	D13 CLASSE DI ACCETTABILITÀ ACCEPTANCE SPECIFICATIONS	D14 ESITO RESULT	D15 INDICAZIONI INDICATIONS	D16 RETICOLO RETICLE	D17 BORDI EDGES
1SO9020403A		mm 25	2,25 MHz	0	ASME-SA578/B + S1		OK	NO INDICATIONS FOUND	100%	
1NP3020905A		mm 25	2,25 MHz	0	ASME-SA578/B + S1		OK	NO INDICATIONS FOUND	100%	

D18 NOTE REMARKS	D19 ENTE ISPETTIVO INSPECTOR	D20 FIRMA SIGNATURE
		METINVEST TRAMETAL S.p.a. F. Andrian III Liv. EN 473

Z01

ITEM		TOLLERANZA DI SPESSORE TOLERANCE ON THICKNESS	TOLLERANZE DI LARGHEZZA TOLERANCE ON WIDTH	TOLLERANZE DI LUNGHEZZA TOLERANCE ON LENGTH	CONDIZIONI SUPERFICIALI SURFACE FINISH	PLANARITÀ FLATNESS
1		ASME SA20/SA20M - 0.30/0.80	-0+100 MM	-0+200 MM	ASME SA20/SA20M	ASME SA20/SA20M
2		ASME SA20/SA20M - 0.30/0.80	-0+100 MM	-0+200 MM	ASME SA20/SA20M	ASME SA20/SA20M

CERTIFICHIAMO che le lamiere elencate sono conformi alla prescrizione dell'ordine, che i controlli della marcatura, dell'aspetto superficiale e dimensionale hanno dato esito positivo.
WE CERTIFY that the above mentioned plates are consistent with the order prescriptions: marking, inspection and measurement without objection.

Z06

VACUUM DEGASSED

Z07	Z03 ENTE COLLAUDO / INSPECTION BODY	Z02
PRODUCED FROM CONTINOUS CAST SLAB AND HAVE A MINIMUN REDUCTION RATIO OF 3 TO 1. ACCORDING TO ASME II PART A ED. 2010+ADDENDA 2011. FULLY KILLED, FINE GRAIN STEEL. Value of Mn maximun in derogation permitted up to 1.50% Plates acc. to PED 97/23/EC	TIMBRO DELL'ISPETTORE STAMP OF THE INSPECTION REPRESENTATIVE	METINVEST TRAMETAL S.p.a. F. Andrian Lab. Test Resp.le

BREMBANA & MOLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
22 OTT. 2013

LABORATORIO CONTROLLO QUALITA'

ISPESL	Istituto Superiore Prevenzione e Sicurezza del Lavoro		
FS	Ferrovie dello Stato	BV	Bureau Veritas
LR	Lloyd's Register of Shipping	DNV	Det Norske Veritas
RINA	Registro Italiano Navale	MMI	Marina Militare Italiana
IIS	Istituto Italiano della Saldatura	TUV	Technischen Uberwachungs Vereine

Sigma Tre

TEST - RESEARCH - EXPEDITING

Rapporto di prova / Test Report: **2013/7996/A/PM**

Garbagnate M.ero — 2013 December 18

Ordine Interno / Internal Order: 2013/3120

Materiale Ricevuto il / Material Received on: 2013 December 06

Prove Eseguite il / Test Performed on: 2013 December 18

Ditta/Messrs — *Request by*

BREMBANA & ROLLE S.p.A.

Via Villino, 1

24030 VALBREMBO BG

Campione sottoposto a prova / Tested Specimen

Plate 4042-23
Test 1SO9020403A
Dimensions : Thk 45 mm

Materiale dichiarato / Material declared

ASME SA 516 Gr. 70

Specifiche di Prova / Test Specifications

ASME II Part A-2010 Ed. 2011 Add
ASME VIII Div.1-2010 Ed. 2011 Add
ASME SA 516

Job 4042 - test sheet 223/13

Colata / Heat

1SO902
1SO9020403A

Quando non specificato considerare valida l'ultima versione della norma citata
When not specified the last version of the mentioned standard is to be considered valid

Prova di Trazione - Tension Test

Identificazione campione Sample identification	Posizione prova Test position	Dimensioni Dimensions Ø o WxThk mm	Sezione Area So mm^2	Tratto utile Gage length Lo mm	Temperatura Temperature °C	Snervamento Yield strength Rp 0,2% MPa ≥260	Carico Rottura Tensile strength Rm MPa 485÷620	Allungamento Elongation A % ≥21	Strizione Reduction Z %
4042-23-MIN	Tr	12.49	122.52	50	amb	299	495	35.1	70.6

Prova di Resilienza - Impact Test

Identificazione campione Sample identification	Posizione prova Test position	Dimensioni Dimensions mm	Intaglio Notch type	Temp. Temp. °C	Risultati prova Test results Joule			Media Average ≥27
4042-23-MIN	Tr	10x10x55	KV	-20	108.1	146.6	155.9	136.9

Prova di Durezza - Hardness Test

Identificazione campione Sample identification	Tipo durezza Hardness type	Risultati prova Test results max 200
4042-23-MIN	HBW 10/3000	131-134-134

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Alessandro Salvatore Monastra
Milan Office

L	Longitudinale	Longitudinal
Tr	Trasversale	Transversal
W	Larghezza	Width
Thk	Spessore	Thickness

Note : Test performed after Heat Treatment MIN : 610±10 °C x 2.5 hours - Heating and cooling 80°C/h

CONFORM

Tecnico-Engineer G. Vigano'

cc SIGMATRE srl

INSPECTION
WITNESSED
REVIEWED
DATE 21/1/14
SIGNATURE

BREMBANA & ROLLE S.p.A.
QCM - L. BENSONI
REVIEWED / ACCEPTED
13 DEC. 2013

PM14-2012-05

Il presente rapporto riguarda esclusivamente i campioni testati e non può essere riprodotto parzialmente senza l' approvazione scritta del laboratorio di prova.
The present report covers exclusively the samples tested and it cannot be reproduced partially without written approval by the test laboratory

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Mail sigmatre@sigmatre.it
P.IVA 01516910138 - C.F. 05544130153
CCIAA Como 195838 - Trib. Como 17954

- Prove Meccaniche e Tecnologiche
- Analisi Chimiche e Prove Corrosione
- Esami Metallografici
- Controlli Non Distruttivi
- Corsi di Qualifica Personale e Saldatori

- Mechanical and Technological Tests
- Chemical Analysis and Corrosion tests
- Metallographic Examination
- Non Destructive Tests
- Training for Personnel and Welders Qualification

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Cod. Fisc. e P. Iva: 03007190154 - www.forgevienna.it

Trib. Milano n.169930-5000-30
Camera Commercio Milano 938573
N. posizione mecc. MI 055315
Cap. Soc. € 2.000.000,00 i.v.

Certificate N. **16012803** Sheet 1 of 5 Rev 00

Order N. 1610 rev 001 JOB 4131
Pos N. 006
Condition machined
Heat treatment Quenched and tempered

Customer
BREMBANA&ROLLE Srl
VIA VILLINO, 1 - (BG) - 24030 VALBRERMBO (BG) Italia

Material Description: N. 3 FORGING TEST COUPONS DIM. 700 x 150 x 159 mm - MK EXT 2 - ITEM 1-146-D

Test n.	Heat n.	Material Grade	Drawing n.
767	16791	SA 765 Gr.2	M.F.= 150*159*700

Mechanical Tests

Tensile test Ø mm 12.5 - Gage Length mm 50 Area mm² 122.6 -
Impact test Section mm 10x10 - Length mm 55 -

Specification Reference

Applicable Specification	Tensile Test: Direction Long. Transv. Tang.	Temp. °C	Yield Strength Rp 0,2 Mpa Min	Yield Strength Rp 0,2 Mpa Max	Modulus Elasticity E Mpa	Tensile Strength Rm Mpa Min.	Tensile Strength Rm Mpa Max	Elongation A% Min.	Reduct. of area Z% Min.	Impact Test: Temp. °C	Impact energy KV J Min	Impact energy KV J Average	Lateral Expansion mils Min.	Shear Area % Min.	Hardness Test HB 10/3000 Test piece Min.	Hardness Test HB 10/3000 Test piece Max	Note Test location
ASME SA765 GR II, 2015 Edition - B&R spec. 4131MRS201 rev. 0	Long.	20	250			485	655	22	30	-45	16	20				200	
	Long.									-36	20						

Tests n.	Test Results: Direction	Temp.	Yield Strength Rp 0,2 Mpa	Modulus Elasticity E Mpa	Tensile Strength Rm Mpa	Elongation A%	Reduct. of area Z%	Impact Test: Temp. °C	Impact energy KV J	Lateral Expansion mils	Shear Area %	Hardness Test HB 10/3000
767	Long 1/4TxT	20	329		523	31,8	65,3	-45	99-90-85	31,5-31,5-27,6	45-45-40	152÷153
767B	Long 1/4TxT							-36	110-126-100	35,4-39,4-35,4	45-45-45	150÷152
767A	Long 1/4TxT	20	308		505	33,2	66,1					

Lloyd's Register Verification Limited
Umberto Breda
Authorised Inspector - NZ No. 13615 ABN
☐ Witnessed ☑ Reviewed
Date: 5 APRIL '17
REVIEWED ALL PAGES

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☐ Witnessed ☐ Monitored ☑ Reviewed
Alessandro Salvatore Monastra
Milan Office

Notes: Inspection performed according to B&R doc. 4131MRS201 rev. 0 - ASME II Part A & D, ASME VIII Div. 2, 2015 Edition

Test n. 767 carried out in quenched and tempered condition - Test n. 767B carried out after min. PWHT at 620°C (required 620°C ± 10°C) fo
4h heating and cooling rates 50°C/h (required 40÷55°C/h) above 430°C
Test n. 767A carried out after max PWHT at 620°C (required 620°C ±10°C) for 12h heating and cooling rates 50°C/h (required 40÷55°C/h)
above 430°C

We certify that all requirements of the material specification and all special requirements of Part 3 para 3.2.6.1 and 3.3.1 of ASME VIII Div. 2, 2015 Edition, which are to be fulfilled have been complied with

LR Ref.: MLN1691403

Compiler Casé Antonella | Conforming ☒ | Non-Conforming ☐

Quality Control	*Date*	*Inspection Certificate*	*Inspection Authority*
Giudici Marco	28.10.2016	According to EN 10204 3.2	Lloyd's Register EMEA A member of the Lloyd's Register group ☑ Witnessed ☐ Monitored ☐ Reviewed Giuseppe Floriello Milan Office

1 1 NOV. 2016

forgiatura A.VIENNA di Antonio Vienna e C. S.a.s.
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Cod. Fisc. e P. Iva: 03007190154 - www.forgevienna.it

Trib. Milano n.169930-5000-30
Camera Commercio Milano 938573
N. posizione mecc. MI 055315
Cap. Soc. € 2.000.000,00 i.v.

Certificate N. **16012803** Sheet 2 of 5 Rev 00

Order N.: 1610 rev 001 JOB 4131
Pos N. 006
Condition machined
Heat treatment Quenched and tempered
Material Description : N. 3 FORGING TEST COUPONS DIM. 700 x 150 x 159 mm - MK EXT 2 - ITEM 1-146-D

Customer
BREMBANA&ROLLE Srl
VIA VILLINO, 1 - (BG) - 24030 VALBRERMBO (BG)
Italia

Test n.	Heat n.	Material Grade	Drawing n.
767	16791	SA 765 Gr.2	M.F.= 150*159*700

Chemical analysis

Specified Chemical Composition

Applicable Specification ASME SA 765/SA 765M Book 2015 + BREMBANA & ROLLE 4131MRS201 Rev. 0

	C%	Mn%	Si %	P%	S%	Cr%	Ni%	Mo%	Al%	Cu%	Sn%	V%	Ti%	Nppm	Nb%	B%	As%	Sb%	JF	XF	Co%	Ca%	CE%	Hppm
Min		0,600	0,150																					
Max	0,220	1,350	0,350	0,020	0,020	0,400	0,500	0,100	0,050	0,350		0,050												
Heat n.	**Ladle Analysis**																							
NUNKI STEEL 16791	0,181	1,175	0,234	0,0105	0,0006	0,19	0,13	0,04	0,028	0,15	0,008	0,006	0,003	101	0,002	0,0004	0,005	0,003	260,66	15,70		0,0002	0,443	1
	Melting process : E.A.F. + L.F. + V.D.																							
CHECK ANALYSIS 16791	0,194	1,19	0,25	0,01	0,001	0,203	0,144	0,062	0,033	0,17	0,01	0,005	0,002		0,002	0,0002	0,0056	0,0035	288,00	16,31		0,0001	0,467	
	Melting process:																							
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	Melting process:																							

Notes:

Compiler Casé Antonella

Conforming ☑ Non-Conforming ☐

Quality Control	*Date*	*Inspection Certificate*	*Inspection Authority*
Giudici Marco	28.10.2016	According to EN 10204 3.2	

BREMBANA & ROLLE S.p.A. CALUSCO D'ADDA (BG) - ITALY Q.C. INSPECTOR P. SACCAROLA 1 NOV. 2016

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Witnessed ☐ Monitored ☐ Reviewed ☑
Giuseppe Fiorello
Milan Office

forgiatura A.VIENNA
GIVA GROUP
forgiatura A.VIENNA di Antonio Vienna e C. S.a.s.
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Tel. +39 02 939 300 11 (5 linee r.a.) - Fax +39 02 939 019 32
Cod. Fisc. e P. Iva: 03007190154 - www.forgevienna.it

Trib. Milano n.169930-5000-30
Camera Commercio Milano 938573
N. posizione mecc. MI 055315
Cap. Soc. € 2.000.000,00 i.v.

Certificate N. **16012803** Sheet 3 of 5 Rev 00

Order N. 1610 rev 001 JOB 4131
Pos N. 006
Condition machined
Heat treatment Quenched and tempered

Customer
BREMBANA&ROLLE Srl
VIA VILLINO, 1 - (BG) - 24030
VALBRERMBO (BG)
Italia

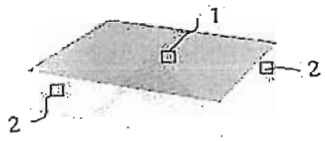
Material Description: N. 3 FORGING TEST COUPONS DIM. 700 x 150 x 159 mm - MK EXT 2 - ITEM 1-146-D

Test n.	Heat n.	Material Grade	Drawing n.
767	16791	SA 765 Gr.2	M.F.= 150*159*700

Ultrasonic Examination

Specification : B&R doc. 4131MRS201 rev. 0 ASME SA388 - ASME VIII div. 2, 2015 Edition, part 3 acceptance criteria according to para 3.3.4		Search Unit			Calibration Data				
		Used Probe	Frequency MHz	Dimension (mm)	Angle	Pos	Type and serial number	Calibration Sett (db)	Inspection Sett (db)
Surface Status:	machined	SEB4 EN	2	Ø 24	0°	1-2	Krautkramer SN 60714		
Coupling :	Cellulose								
Apparatus Type :	Krautkramer USN 58L mtr 433								
Apparatus Type :									
Calibration Method :	according to specification								
Reference Block :	Thickness of piece								
Test Results :	No indication found to declare								
100% ultrasonic examination performed according to specification with satisfactory result									

SKETCH



Notes: cable used type RG58 Lemo1-Lemo2

Compiler Casé Antonella

Conforming ☒ Non-Conforming ☐

Quality Control	***Date***	***Inspection Certificate***	***Inspection Authority***
Radice Simone NDT Level II SNT-TC - 1A and UNI EN ISO 9712	28.10.2016	According to EN 10204 3.2 FORGIATURA A. VIENNA ALZANO (BG) ITALY Q.C. INSPECTOR 11 NOV. 2016	Lloyd's Register EMEA A member of the Lloyd's Register group Witnessed ☐ Witnessed ☐ Reviewed Giuseppe Floriello Milan Office

forgiatura A.VIENNA di Antonio Vienna e C. S.a.s.
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Cod. Fisc. e P. Iva: 03007190154 - www.forgevienna.it

Trib. Milano n.169930-5000-30
Camera Commercio Milano 938573
N. posizione mecc. MI 055315
Cap. Soc. € 2.000.000,00 i.v.

Certificate N. **16012803** Sheet 4 of 5 Rev 00

Order N. 1610 rev 001 JOB 4131
Pos N. 006
Condition machined
Heat treatment Quenched and tempered

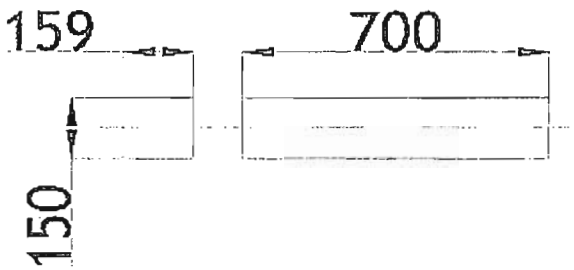
Customer
BREMBANA&ROLLE Srl
VIA VILLINO, 1 - (BG) - 24030 VALBRERMBO (BG) Italia

Material Description: N. 3 FORGING TEST COUPONS DIM. 700 x 150 x 159 mm - MK EXT 2 - ITEM 1-146-D

Test n.	Heat n.	Material Grade	Drawing n.
767	16791	SA 765 Gr.2	M.F.= 150*159*700

Dimensional Report

- T 767 -2 - H 16791 - SA765M-II-036 QT - MK EXT 2 - JOB 4131 - PO 001610/1 ITEM 006 - LR STAMP
- T 767 -3 - H 16791 - SA765M-II-036 QT - MK EXT 2 - JOB 4131 - PO 001610/1 ITEM 006 - LR STAMP
- T 767 -4 - H 16791 - SA765M-II-036 QT - MK EXT 2 - JOB 4131 - PO 001610/1 ITEM 006 - LR STAMP



Test n.	Point																							
						Ra µm																		
required mm	150	159	700			<6,3																		
	+2/-0	+2/-0	+10/+30																					
T 767 -2	151	160	730			1,96																		
T 767 -3	150,7	161	714			2																		
T 767 -4	151,5	160,6	730			2,05																		

Notes:

Compiler Casé Antonella

Conforming ☒ Non-Conforming ☐

Quality Control	*Date*	*Inspection Certificate*	*Inspection Authority*
Radice Simone	28.10.2016	According to EN 10204 3.2	Lloyd's Register EMEA A member of the Lloyd's Register group ☑ Witnessed ☐ Monitored ☐ Reviewed Giuseppe Floriello Milan Office

BREMBANA & ROLLE S.P.A. ALZANO (BG) ITALY Q.C. INSP. P. SACCAROLA DATE 11 NOV. 2016

forgiatura A.VIENNA di Antonio Vienna e C. S.a.s.
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Trib. Milano n.169930-5000-30
Camera Commercio Milano 938573
N. posizione mecc. MI 055315
Cap. Soc. € 2.000.000,00 i.v.

Certificate N. **16012803** Sheet 5 of 5 Rev 00

Order N. 1610 rev 001 JOB 4131

Pos N. 006

Condition machined

Heat treatment Quenched and tempered

Material Description: N. 3 FORGING TEST COUPONS DIM. 700 x 150 x 159 mm - MK EXT 2 - ITEM 1-146-D

Customer
BREMBANA&ROLLE Srl
VIA VILLINO, 1 - (BG) - 24030 VALBRERMBO (BG) Italia

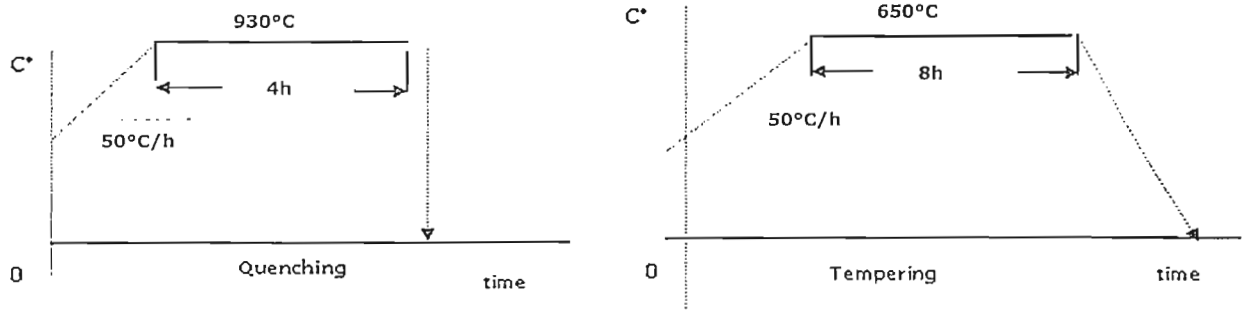
Test n.	Heat n.	Material Grade	Drawing n.
767	16791	SA 765 Gr.2	M.F.= 150*159*700

Heat Treatment

Furnace n. 8 — Specification : B&R doc. 431MRS201 rev. 0

Temperature Monitoring Method: Furnace set Termocouple

	REQUIRED	REQUIRED		
Heat Treatment Type	Quenching	Tempering		
Entry Furnace Temperature	20°C	20°C		
Heating Rate	<100°C/h	<80°C/h		
Holding Temperature	930°C	min. 650°C		
Holding Time	1min/mm thk	1h/inch thk		
Cooling Rate				
Exit Furnace				
Type cooling	water cooling	air cooling		
Heat Treatment Diagramm				



Notes:

Compiler Casé Antonella — Conforming ☒ Non-Conforming ☐

Quality Control	Date	Inspection Certificate	Inspection Authority
Giudici Marco	30.09.2016	According to EN 10204 3.2	Lloyd's Register EMEA A member of the Lloyd's Register group ☐ Witnessed ☐ Monitored ☑ Reviewed Giuseppe Floriello Milan Office

Air Liquide Welding France S.A.
25 Boulevard de la Paix
CS 30003 Cergy
95895 CERGY SAINT CHRISTOPHE
France
Telefono: +33 134213333
Fax: +33 134213130
Internet: www.airliquidewelding.com

Product Certificate

Cliente:	Certificato N°:	Ordine N°:	Bolla N°:
BREMBANA & ROLLE SPA VIA VILLINO, 1 24030 VALBREMBO (BG) Italy	30094503	002377	2227054
	Reference Number:	Quantità:	UM:
	W000282617	960.00	KG
Designazione:	CARBOFIL 1 1.2X0016XB300XP		Lotto N°: 3917104
Classificazione:	AWS- A 5.18: ER 70S-6 EN ISO 14341-A: G42 4 M21 3Si1 / G42 3 C1 3Si1 M21, C1		

Si confermano le proprietà sotto riportate per i consumabili di saldatura da noi forniti

Analisi chimica del deposito:
In accordo a EN 10 204-3.1 PRODUCT

C	Mn	Si	S	P	Cr	Ni	Mo	Al	Cu
0,073	1,420	0,816	0,014	0,008	0,026	0,012	0,002	0,001	0,078
V	Ti+Zr								
0,001	0,030								

Proprietà meccaniche del deposito:
In accordo a EN 10 204-2.2 WELD METAL

Tensile Test according to EN ISO 6892-1					Impact Strength Test according to EN ISO 148--1		
Test Temp. °C	Snervamento ReH N/mm²	Trazione Tensile N/mm²	Allungamento %	Z %	Test Temp. °C	Resilienza Joule(Charpy-V)	Trattamento Termico
20	506	595	30		-20 -40	117 72	AS WELDED

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office

BREMBANA & ROLLE S.p.A.

08 JAN 2018

Mattia Fusi
QA Manager - Storo
Data: 04/12/2017

AIR LIQUIDE WELDING FRANCE
25 Boulevard de la Paix
CS 30003 CERGY SAINT CHRISTOPHE
95895 CERGY PONTOISE CEDEX
FRANCE

Phone: +33 1 342 13 333
Fax : +33 1 342 13 130
Internet : www.airliquidewelding.com

Product Certificate

Customer:	Certificate No.:	Order No.:	Delivery Note:
BREMBANA & ROLLE SPA	2110310380023371	000631	9676
	Date:	**Quantity** Quantity:	**UM**
	13/03/17	160,00	KG Kilograms

Trade Name: FLUXOFIL 14HD 1.2X0016XB300

Batch No.: 421706033

Classification: EN ISO 17632-A:T463PM1H5
AWS A5.20:E71T1-MJH4

Gas: Mix: Ar/CO2

We confirm following properties for the welding filler metals delivered by us.

Chemical Analysis:

Certificate Type EN 10 204-3.1 WELD METAL

C	Mn	Si	P	S	Al	Cr	Ni	Mo	V
0.048	1.564	0.433	0.010	0.006	0.015	0.034	0.012	0.002	0.020

Cu	Nb	B	Ti						
0.076	0.010	0.0029	0.062						

Mechanical Properties:

Certificate Type EN 10 204-2.2 WELD METAL

Tensile Test according to EN ISO 6892-1					Impact Strength Test according to EN ISO 148-1		
Test Temp. °C	Yield Strength Rp0,2 N/mm²	Tensile Strength N/mm²	Elongation %	Z %	Test Temp. °C	Impact Strength Joule (Charpy-V)	heat Treatment
+20	530	600	25		-30	100	As Welded

06.04.2017

Your Contact Person :
Quality Corporate Department
Airliquide Welding France
Tél. : 33/1 34 21 33 33
Fax : 33/1 34 21 31 30
ETC -Oerlikon
Tél. : 39/045 82 91 511
Fax : 39/045 82 91 500

Bogdan Serban
QA Manager – Buzau Plant

This document has been issued by computer and needs no signature.

BREMBANA & ROLLE S.p.A.
WELDING DEPT - A. BANA
☑ REVIEWED ☐ WITNESSED
07 APR 2017

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☐ Witnessed ☐ Monitored ☑ Reviewed
Alessandro Salvatore Monastra
Milan Office 7/4/17

AIR LIQUIDE WELDING

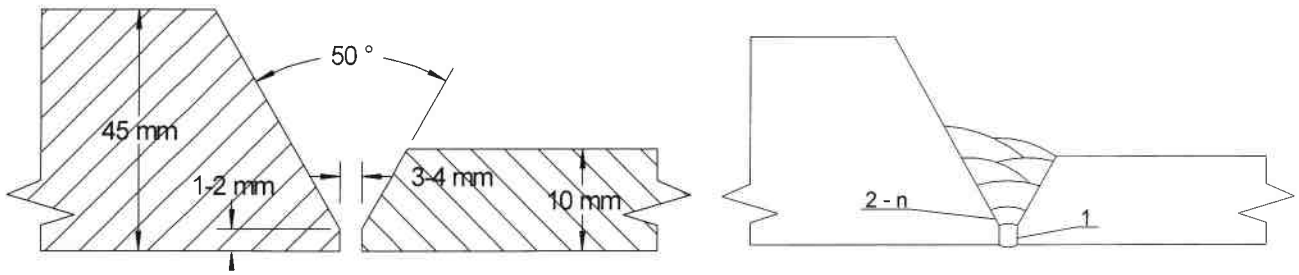
PROCEDURE QUALIFICATION RECORD (PQR)

QW-200.2

ASME Boiler and Pressure Vessel Code Section IX

PQR No.:	63/17				Company:	Brembana&Rolle S.p.A.
Welding Process:	1) GTAW	2)	3)	4)	WPS No.:	W63/17
Type:	MANUAL				Date:	08/03/2018

JOINTS (QW-402)



Tack weld: By clumps

Retainers: No (QW-402.11)

BASE METAL (QW-403)

Material Spec.; Type or Grade:	SA 516 Gr. 70 (*)
to Material Spec.; Type or Grade:	SA 240 TP304L

P-No.:	Gr. No.:	to	P-No.:	Gr. No.:
1	2		8	1

Thickness of Test Coupon (mm):	T1: 45 mm; T2: 10 mm
Diameter of Test Coupon (mm):	/
Other:	t pass ≤ 13 mm (QW-403.9)
	*Normalized

FILLER METAL (QW-404)

Process (es):	GTAW			
SFA Specification:	5.9			
AWS Classification:	ER309L			
Filler metal F-No.:	6			
Weld Metal A-No.:	8			
Size (mm):	2.4			
Product Form:	Solid wire			
Trade Name:	THERMANIT 25/14			
Supplier:	Bohler			
Flux Trade Name:	N.A.			
Flux Type:	N.A.			
Supplier:	N.A.			
Wire/Flux Class.:	N.A.			
Consumable Ins.:	No			
Supplemental:	No			
Recrushed slag:	N.A.			
Weld metal thk. (mm):	10			
Other:	No			

POSITION (QW-405)

Process:	GTAW
Position of Groove:	1G
Position of Fillet:	N.A.
Welding Progression:	N.A.
Other:	No

PREHEAT (QW-406)

	Temperature (°C)	Method	Control	Time (Hours)
Preheat ≥:	30	Gas Burner	Tempilstick	/
Maintaining:	Yes	Gas Burner	Tempilstick	/
Interpass ≤:	175	/	Tempilstick	/
Post-Heat (DHT) ≥:	No	/	/	/

Other:	No
Cooling under Insulation:	No

POST WELD HEAT TREATMENT (QW-407)

Temperature Range:	610 ±10	°C
Time Range:	Min 3 h; Max 10 h	Hours
Heating Rate:	56 ÷ 80	°C/h
Cooling Rate:	56 ÷ 80	°C/h
Other:	QW-407.4: N.A.	

GAS (QW-408)

	Gas(es)	Composition	Flow Rate (l/1')
Process:	GTAW		
Shielding:	Argon	99.997	10 ÷ 12
Process:			
Shielding:	/		
Backing:	Argon	99.997	8 ÷ 10
Trailing:			
Other:	Gas backing maintained up bead 6		

ELECTRICAL CHARACTERISTICS (QW-409)

Process:	GTAW
Current Type:	DC
Pulsing Current:	No
Polarity:	EN
Tung. El. Type:	EWLa-1
Tung. El. Ø:	2.4
Transfer Mode:	N.A.
Other:	No

TECHNIQUE (QW-410)

String/Weave beads:	String
Orifice/Cup size (mm):	N.A.
Initial Cleaning:	Machining
Interpass Cleaning:	Grinding / Brushing
Method of Back Gouge:	N.A.
Oscillation:	N.A.
Single/Multi pass/side:	Single and Multi pass
Single/Multi Electrode:	Single
Electrode Spacing (mm):	N.A.
Electrode Stick out (mm):	N.A.
Closed/Out of Chamber:	N.A.
Manual or Automatic:	Manual
Supplemental Device/s:	N.A.
Peening:	No
Other:	QW-410.64: No

TABLE OF PARAMETERS (QW-409; QW-410)

Pass	Process	AWS	Size (mm)	Current Polarity	Ampere range	Volt range	Travel Speed (mm/min.)	ROL (mm)	Tungsten Electrode Ø (mm)	Min./Max. Heat Input (J/mm)
1 - n	GTAW	ER309L	2.4	DCEN	120 ÷ 160	12 ÷ 14	060 ÷ 100	/	/	864 ÷ 2240

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☑ Witnessed ☐ Monitored ☐ Reviewed
Alessandro Salvatore Monastra
Milan Office
08 MAR. 2018

BREMBANA&ROLLE

PROCEDURE QUALIFICATION RECORD (PQR)

QW-200.2

Section IX of ASME Boiler and Pressure Vessel Code

Procedure Qualification Record No.: **63/17** Date: **08/03/2018** Company: **Brembana&Rolle S.p.A.**

TENSILE TEST (QW-150)

Specimen No.; Type and Figure No.	Width (mm)	Thickness (mm)	Area (mm2)	Ultimate Total Load (N)	Ultimate Unit Stress (N/mm2)	Type of Failure & Location
TENSILE TEST AFTER MIN PWHT						
1T - QW-462.1(a)	19.20	9.85	198.12	98750	522.1	Broken out of weld - Ductile fracture
2T - QW-462.1(a)	19.10	9.84	187.94	98000	521.4	Broken out of weld - Ductile fracture
1L - QW-462.1(a)	ø 6.35		31.66	20500	647.5	
TENSILE TEST AFTER MAX PWHT						
1T - QW-462.1(a)	19.10	9.84	187.94	96500	513.4	Broken out of weld - Ductile fracture
2T - QW-462.1(a)	19.20	9.84	188.92	97500	516.0	Broken out of weld - Ductile fracture
1L - QW-462.1(a)	ø 6.36		32.06	20000	623.8	

	Diameter (mm)	Gage Length (mm)	Area (mm2)	U.T.L. (N)	U.T.S. (N/mm2)	U.Y.L. (N)	U.Y.S. (N/mm2)	Elongation (%)

GUIDED BEND TEST (QW-160)

Type and Figure No.	Result	Type and Figure No.	Result
1st - QW-462.2	Satisfactory		
2nd - QW-462.2	Satisfactory		
3rd - QW-462.2	Satisfactory		
4th - QW-462.2	Satisfactory		

TOUGHNESS TEST (QW-170)

Specimen No. & Notch Location	Specimen Size (mm)	Test Temperature (°C)	Impact Values (Joule)	Lateral Expansion (% shear)	Lateral Expansion (mm)	Drop Weight Break (Yes or No)
TOUGHNESS TEST AFTER MIN PWHT						
WM	7.5x10x55	-55	68 - 54 - 53		1.47 - 1.16 - 1.27	
HAZ SA 516 SIDE	7.5x10x55	-55	91 - 109 - 70		1.03 - 1.18 - 0.83	
HAZ SA 516 SIDE + 2 mm	7.5x10x55	-55	82 - 102 - 88		1.77 - 2.13 - 1.95	
HAZ SA 516 SIDE + 5 mm	7.5x10x55	-55	130 - 138 - 104		2.25 - 2.30 - 1.95	
HAZ SA 240 SIDE	7.5x10x55	-55	115 - 112 - 112		1.63 - 1.53 - 1.36	
HAZ SA 240 SIDE + 2 mm	7.5x10x55	-55	114 - 118 - 102		1.40 - 1.30 - 1.40	
HAZ SA 240 SIDE + 5 mm	7.5x10x55	-55	148 - 159 - 152		1.77 - 1.81 - 1.81	
TOUGHNESS TEST AFTER MAX PWHT						
WM	7.5x10x55	-55	58 - 61 - 73		1.19 - 1.02 - 1.23	
HAZ SA 516 SIDE	7.5x10x55	-55	64 - 72 - 52		1.07 - 1.20 - 0.82	
HAZ SA 516 SIDE + 2 mm	7.5x10x55	-55	95 - 65 - 70		1.65 - 1.08 - 1.55	
HAZ SA 516 SIDE + 5 mm	7.5x10x55	-55	57 - 94 - 92		1.12 - 1.74 - 1.82	
HAZ SA 240 SIDE	7.5x10x55	-55	74 - 90 - 72		1.01 - 1.15 - 1.01	
HAZ SA 240 SIDE + 2 mm	7.5x10x55	-55	51 - 82 - 85		0.67 - 0.99 - 0.99	
HAZ SA 240 SIDE + 5 mm	7.5x10x55	-55	83 - 94 - 70		1.17 - 1.43 - 1.07	

Comments:

FILLET WELD TEST (QW-180)

Result - Satisfactory: Yes ____ No ____ **Penetration into Parent Metal:** Yes ____ No ____

Macro - Result:

OTHER TESTS

Visual Examination: **Satisfactory (PQR 63/17 VT)**

U.T. Examination: **No**

P.T. Examination: **Satisfactory (PQR 63/17 PT)**

M.T. Examination: **No**

Micro Examination: **Yes**

Deposit Analysis:

C	Mn	Si	P	S	Cr	Ni	Mo
0.024	1.86	0.33	0.015	0.006	23.2	12.6	0.07

Fe	Cu	Nb+Ta
/	0.06	/

Macro Examination: **Satisfactory**

Hardness Test (Hv10): Base Metal: / Weld Metal: **See Laboratory Report RPR36-9E1R0A18** / Haz:

Other: **No**

Welder's Name: **Gargantini Marco - Lapietra Astolfo**

Stamp No.: **S10 - S13**

Test conducted by: **Brembana & Rolle S.p.A. Welding Engineer**

Villa&Bonaldi - Exova

Third party Inspector

Laboratory Test No.: **16/18 - RPR36-9E1R0A18**

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office
08 MAR 2018

IT-160109A

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of ASME Code Section IX

Prepared by	Checked and Certified by	Date	
M.Carammati	N.Tosto	08/03/2018	Sheet 2 of 2

BREMBANA&ROLLE

DYE PENETRANT TEST REPORT

REPORT No. **PQR 63/17 PT**

PURCHASER DATA	MANUFACTURER DATA
PURCHASER	**JOB No.**
PLANT	**DWG. No.**
P.O.	**PROCEDURE No.** BCI-002-PT
ITEM	**SERIAL No.**

APPLICABLE CODE:	**APPLICABLE STANDARD/SPECIFICATION:**
ASME IX – QW 195	

P.T. examination performed at 100 % on:

- Specimen 63/17

MATERIAL: SA 516 Gr.70 – SA 240 TP304L **THICKNESS:** 45 - 10 mm

P.T. Time:	BEFORE P.W.H.T. ■ HYDROTEST ☐	AFTER P.W.H.T. ☐ TUBE EXPANSION ☐
Surface:	condition : As welded ■ Ground ☐ Machined ☐	
	cleaning : Solvent ☐ Brushing ■ Shotblasting ☐	
Type:	Water Washable Visible ■ Post Emulsifying None ☐ Solvent Removable None ☐	
Penetrant:	Colour Contrast CGM RED W Emulsifier None Solvent None Developer Non Acqueous Wet CGM ROTRIVEL U	
Application:	PENETRANT : Paint Brush ☐ Spray ■ Penetration time : 10 minutes EMULSIFIER : Dipping ☐ Emulsification time N.A.	
Excess penetrant removal:	Water spray (3.5 bar max) ■ cloths ☐ absorber paper ☐	
Drying after excess penetrant removal :	Compressed air (3.5 bar max) ■ cloths ■	
Developer application :	Spraying	Developping time: 10 minutes Interpretation : 30 minutes
Viewing condition:	Artificial light (1000 Lx min.) ■ Black light (1000 µW/cm² min) ☐	
Post examination cleaning:	Water rinse ■ Cloths ■	
TEST RESULT:	SATISFACTORY, NO REPORTABLE INDICATIONS FOUND	

BREMBANA & ROLLE S.p.A.

OPERATOR / EVALUATOR LEV. II SNT-TC-1A

03 GEN 2018

☒ F.CEFIS ☐ P.FACHERIS

BREMBANA & ROLLE S.p.A.
M. ESPOSITO
Q. C. MANAGER
03 GEN 2018
M.ESPOSITO - Q.C.M.

INSPECTION AGENCY

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Lloyd's Register
☒ Witnessed ☐ Monitored ☐ Reviewed
Alessandro Salvatore Monastra
Milan Office 03 GEN. 2018

Form PT Rev. 0 Date 23/06/99

BREMBANA&ROLLE

VISUAL EXAMINATION REPORT

REPORT No.

PQR 63/17 VT

PURCHASER DATA		MANUFACTURER DATA	
PURCHASER		JOB No.	===
PLANT		DWG. No.	===
P.O.		PROCEDURE No.	BCI-007-VT
ITEM		SERIAL No.	===

APPLICABLE CODE:

ASME IX - ASME VIII Div. 1 UW-31

APPLICABLE STANDARD/SPECIFICATION:

Nr.	Type of imperfection		Acceptance criteria	Test result conform:
1	Cracks	...	Not permitted	☑
2	Crater cracks	...	Not permitted	☑
3	Exposed inclusions	...	Not permitted when occurring at the surface	☑
4	Porosity/Surface pores	...	Not permitted	☑
5	Incomplete/Lack of fusion	...	Not permitted	☑
				☐
				☐
				☐
				☐
				☐
				☐
				☐
				☐

BREMBANA & ROLLE S.p.A.

OPERATOR / EVALUATOR LEV. II SNT-TC-1A

BREMBANA & ROLLE S.p.A. P. FACHERIS QUALITY CONTROL DEPT. 03 GEN 2013

☐ F.CEFIS ☐ P.FACHERIS

BREMBANA & ROLLE S.p.A. M. ESPOSITO Q. C. MANAGER 03 GEN 2013

M.ESPOSITO - Q.C.M.

INSPECTION AGENCY

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☑ Witnessed ☐ Monitored ☐ Reviewed
Alessandra Salvatore Monastra
Milan Office 03 GEN 2013

Officine Meccaniche
VILLA & BONALDI
RICENGO - Italy

Certificato prove meccaniche su tallone di saldatura
Coupon mechanical test certificate

N. 16/18 sheet 1 of 4

Data . Date 05/02/2018

Posizione Position	Distinta Schedule n.	Saggio n. Coupon n.	Spessore saggio Coupon Thickness	Materiale base Base material	Materiale d'apporto Filler metal	Procedimento di saldatura Welding Process	Trattamento termico Heat treatment
1	PQR 63/17	WPS 63/17	45+10mm	ASTM A / SA 516 Gr.70 (side A) + ASTM A / SA 240 TP304L (side B)	Rod: THERMANIT 25/14 (Voestalpine Bohler welding)	GTAW	610±10°C x 60 minutes (heating and cooling rate: max 70°C/h)

Posizione Position	Norme di prova Test code	Temperatura di prova °C Test temperature °C	Orientamento Orientation	Caratteristiche della provetta Specimen data: Dimensioni Sizes	Sezione Section	Lung. Lenght	Rottura Tensile strenght: Rich. Req.	Ottenuto Result: Totale Total	Ottenuto Result	Snervamento Yield Point: Rich. Req.	Ottenuto Result: Totale Total	Ottenuto Result	Allungamento Elongation: Rich. Req.	Ottenuto Result: Totale Total	Ottenuto Result	Piega Bend test: Later. Side Ø= 38,1 α 180°	Later. Side Ø= 38,1 α 180°	Resilienza Impact test: Provetta tipo Type specimen	Orientamento Orientation	Temperatura di prova °C Test temperature °C	Dimensione (mm) Dimension (mm)	C.S. W.M. Richiesto Required J	C.S. W.M. Ottenuto Result J	Z.T.A. H.A.Z. Richiesto Required J	Z.T.A. H.A.Z. Ottenuto Result J	Durezza Hardness: Richiesto Required	Ottenuto Result
				mm	mm²	mm	N/mm²	N	N/mm²	N/mm²	N	N/mm²	2" %		%													
1	ASME	+20	T	9,85 x 19,20	189,12	//	485 ÷ 620	98750	522,1	DUCTILE OUT OF WELD (side A)						1st OK	2nd OK	KV	T	-55	7,5 x 10 x 55	27 / 47 Av.	68-54-53 / 58,3 Av. (L.E. 1,47-1,16-1,27 - S.F. 70-60-60)			215 max (B.M. and H.A.Z. side A) - 245 max (W.M. - H.A.Z. and B.M. side B)	*
				9,84 x 19,10	187,94	//	485 ÷ 620	98000	521,4	DUCTILE OUT OF WELD (side A)						3rd OK	4th OK										
			L	Ø 6,35	31,66	50	515 min.	20500	647,5	205 min.	15400	486,4	40 min.	72,0	44,0												

Note: . Remarks: visual examination, dye penetrant examination and x-ray examination: satisfactory // Macrographic examination: satisfactory // Micrographic examination: satisfactory

*Hardness test HV10: B.M.(A) 156(min)-200(max) H.A.Z.(A) 156(min)-211(max) W.M. 190(min)-213(max) H.A.Z.(B) 196(min)-209(max) B.M.(B) 199(min)-208(max)

Chemical analisys: C 0,024% Cr 23,2% Ni 12,6% Mo 0,07% Mn 1,86% Si 0,33% P 0,015% S 0,006% Cu 0,06% // L.E.: lateral expansion (mm) - S.F.: shear fracture (%)

Ente di collaudo
Testing Agency

Ispettore
Inspector
TECHNIBANK & BOLLE S.p.A
WELDING DEPT
REVIEWED WITNESSED

Ispettore
Inspector
Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Witnessed Monitored Reviewed
Luca Rivaroli
Milan Office 05/02/18

Villa & Bonaldi - Ricengo

Data
Date
05/02/2018

\\SRVDC01:\Qualita\Excel\Talloni_Saldatura\PQR 63-17

Officine Meccaniche
VILLA & BONALDI
RICENGO - Italy

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N. 16/18 sheet 2 of 4

Data . Date 05/02/2018

Posizione Position	Distinta Schedule n.	Saggio n. Coupon n.	Spessore saggio Coupon Thickness	Materiale base Base material	Materiale d'apporto Filler metal	Procedimento di saldatura Welding Process	Trattamento termico Heat treatment
1	PQR 63/17	WPS 63/17	45+10mm	ASTM A / SA 516 Gr.70 (side A) + ASTM A / SA 240 TP304L (side B)	Rod: THERMANIT 25/14 (Voestalpine Bohler welding)	GTAW	610±10°C x 60 minutes (heating and cooling rate: max 70°C/h)

Posizione Position	Norme di prova Test code	Resilienza Impact test							Resilienza Impact test							Resilienza Impact test								Durezza Hardness	
		Provetta tipo Type specimen	Orientamento Orientation	Temperatura di prova °C Test temperature °C	Dimensione (mm) Dimension (mm)	Z.T.A. H.A.Z. Richiesto Required J	Ottenuto Result J	Z.T.A. H.A.Z. Richiesto Required J	Ottenuto Result J	Provetta tipo Type specimen	Orientamento Orientation	Temperatura di prova °C Test temperature °C	Dimensione (mm) Dimension (mm)	Z.T.A. (+2mm) H.A.Z. (+2mm) Richiesto Required J	Ottenuto Result J	Z.T.A. (+2mm) H.A.Z. (+2mm) Richiesto Required J	Ottenuto Result J	Provetta tipo Type specimen	Orientamento Orientation	Temperatura di prova °C Test temperature °C	Dimensione (mm) Dimension (mm)	Z.T.A. (+5mm) H.A.Z. (+5mm) Richiesto Required J	Ottenuto Result J	Z.T.A. (+5mm) H.A.Z. (+5mm) Richiesto Required J	Ottenuto Result J		Richiesto Required	Ottenuto Result
1	ASME	KV	T	-55	7,5 x 10 x 55	27 / 47 Av.	91-109-70 / 90,0 Av. (L.E. 1,03-1,18-0,83 - S.F. 85-100-70) - side A	27 / 47 Av.	115-112-112 / 113,0 Av. (L.E. 1,63-1,53-1,36 - S.F. 100-100-100) - side B	KV	T	-55	7,5 x 10 x 55	27 / 47 Av.	82-102-88 / 90,6 Av. (L.E. 1,77-2,13-1,95 - S.F. 100-100-100) - side A	27 / 47 Av.	114-118-102 / 111,3 Av. (L.E. 1,40-1,30-1,40 - S.F. 85-85-85) - side B	KV	T	-55	7,5 x 10 x 55	27 / 47 Av.	130-138-104 / 124,0 Av. (L.E. 2,25-2,30-1,95 - S.F. 100-100-100) - side A	27 / 47 Av.	148-159-152 / 153,0 Av. (L.E. 1,77-1,81-1,81 - S.F. 100-100-100) - side B		215 max (B.M. and H.A.Z. side A) - 245 max (W.M. - H.A.Z. and B.M. side B)	*

Note: . Remarks: Hardness test HB on top: B.M.(A) 127(min)-139(max) W.M. 168(min)-175(max) B.M.(B) 148(min)-154(max) // See Exova Test report n°RPR36-9E1R0A18

*Hardness test HB: B.M.(A) 143(min)-190(max) H.A.Z.(A) 149(min)-199(max) W.M. 179(min)-190(max) H.A.Z.(B) 180(min)-190(max) B.M.(B) 178(min)-196(max)

Hardness test HB on bottom: B.M.(A) 138(min)-143(max) W.M. 137(min)-169(max) B.M.(B) 129(min)-163(max) // Harndess test in accordance with W-ST-2006 Rev.2 and NACE MR0175 / ISO 15156-2

Ente di collaudo Testing Agency	Ispettore Inspector	Ispettore Inspector	Villa & Bonaldi - Ricengo	Data Date
	CREMONA & ROLLE S.p.A. WELDING DEPT REVIEWED WITNESSED	Lloyd's Register Verification Limited A member of the Lloyd's Register group Lloyd's Register Witnessed Monitored Reviewed Luca Rivaroli Milan Office 05/02/18	Off. Mecc. VILLA & BONALDI RICENGO (MI) QUALITY CONTROL DPT	05/02/2018

Officine Meccaniche
VILLA & BONALDI
RICENGO - Italy

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Coupon mechanical test certificate

N. 16/18 sheet 3 of 4

Data . Date 05/02/2018

Posizione Position	Distinta Schedule n.	Saggio n. Coupon n.	Spessore saggio Coupon Thickness	Materiale base Base material	Materiale d'apporto Filler metal	Procedimento di saldatura Welding Process	Trattamento termico Heat treatment
1	PQR 63/17	WPS 63/17	45+10mm	ASTM A / SA 516 Gr.70 (side A) + ASTM A / SA 240 TP304L (side B)	Rod: THERMANIT 25/14 (Voestalpine Bohler welding)	GTAW	610±10°C x 600 minutes (heating and cooling rate: max 70°C/h)

Posizione Position	Norme di prova Test code	Temperatura di prova °C Test temperature °C	Orientamento Orientation	Caratteristiche della provetta Specimen data: Dimensioni Sizes	Sezione Section	Lung. Lenght	Rottura Tensile strenght: Rich. Req.	Rottura: Ottenuto Result Totale Total	Rottura: Ottenuto Result	Snervamento Yield Point: Rich. Req.	Snervamento: Ottenuto Result Totale Total	Snervamento: Ottenuto Result	Allungamento Elongation: Rich. Req.	Allungamento: Ottenuto Result Totale Total	Allungamento: Ottenuto Result	Piega Bend test: Later. Side Ø= 38,1 α 180°	Piega: Later. Side Ø= 38,1 α 180°	Resilienza Impact test: Provetta tipo Type specimen	Orientamento Orientation	Temperatura di prova °C Test temperature °C	Dimensione (mm) Dimension (mm)	C.S. W.M. Richiesto Required J	C.S. W.M. Ottenuto Result J	Z.T.A. H.A.Z. Richiesto Required J	Z.T.A. H.A.Z. Ottenuto Result J	Durezza Hardness: Richiesto Required	Durezza Hardness: Ottenuto Result
				mm	mm^2	mm	N/mm^2	N	N/mm^2	N/mm^2	N	N/mm^2	2" %		%													
1	ASME	+20	T	9,84 x 19,10	187,94	//	485 ÷ 620	96500	513,4	DUCTILE OUT OF WELD (side A)						1st OK	2nd OK	KV	T	-55	7,5 x 10 x 55	27 / 47 Av.	58-61-73 / 64,0 Av. (L.E. 1,19-1,02-1,23 - S.F. 70-70-85)			215 max (B.M. and H.A.Z. side A) - 245 max (W.M. - H.A.Z. and B.M. side B)	*
				9,84 x 19,20	188,92	//	485 ÷ 620	97500	516,0	DUCTILE OUT OF WELD (side A)						3rd OK	4th OK										
			L	Ø 6,36	32,06	50	515 min.	20000	623,8	205 min.	13000	405,4	40 min.	70,6	41,2												

Note: . Remarks: visual examination, dye penetrant examination and x-ray examination: satisfactory

*Hardness test HV10: B.M.(A) 156(min)-179(max) H.A.Z.(A) 197(min)-212(max) W.M. 199(min)-207(max) H.A.Z.(B) 194(min)-208(max) B.M.(B) 192(min)-210(max)

Macrographic examination: satisfactory // Micrographic examination: satisfactory // L.E.: lateral expansion (mm) - S.F.: shear fracture (%)

Ente di collaudo Testing Agency	Ispettore Inspector	Ispettore Inspector	Villa & Bonaldi - Ricengo	Data Date
	REMBANG HOLLE S.p.A. WELDING DEPT. REVIEWED WITNESSED	Lloyd's Register Verification Limited A member of the Lloyd's Register group. Witnessed Monitored Reviewed. Luca Rivaroli Milan Office 05/02/18	Off. Mecc. VILLA & BONALDI RICENGO (Italy) QUALITY CONTROL DPT	05/02/2018

Officine Meccaniche
VILLA & BONALDI
RICENGO - Italy

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Coupon mechanical test certificate

N. 16/18 sheet 4 of 4

Data . Date 05/02/2018

Posizione Position	Distinta Schedule n.	Saggio n. Coupon n.	Spessore saggio Coupon Thickness	Materiale base Base material	Materiale d'apporto Filler metal	Procedimento di saldatura Welding Process	Trattamento termico Heat treatment
1	PQR 63/17	WPS 63/17	45+10mm	ASTM A / SA 516 Gr.70 (side A) + ASTM A / SA 240 TP304L (side B)	Rod: THERMANIT 25/14 (Voestalpine Bohler welding)	GTAW	610±10°C x 60 minutes (heating and cooling rate: max 70°C/h)

Posizione Position	Norme di prova Test code	Resilienza Impact test								Resilienza Impact test								Resilienza Impact test									Durezza Hardness	
		Provetta tipo Type specimen	Orientamento Orientation	Temperatura di prova °C Test temperature °C	Dimensione (mm) Dimension (mm)	Z.T.A. H.A.Z. Richiesto Required J	Ottenuto Result J	Z.T.A. H.A.Z. Richiesto Required J	Ottenuto Result J	Provetta tipo Type specimen	Orientamento Orientation	Temperatura di prova °C Test temperature °C	Dimensione (mm) Dimension (mm)	Z.T.A. (+2mm) H.A.Z. (+2mm) Richiesto Required J	Ottenuto Result J	Z.T.A. (+2mm) H.A.Z. (+2mm) Richiesto Required J	Ottenuto Result J	Provetta tipo Type specimen	Orientamento Orientation	Temperatura di prova °C Test temperature °C	Dimensione (mm) Dimension (mm)	Z.T.A. (+5mm) H.A.Z. (+5mm) Richiesto Required J	Ottenuto Result J	Z.T.A. (+5mm) H.A.Z. (+5mm) Richiesto Required J	Ottenuto Result J		Richiesto Required	Ottenuto Result
1	ASME	KV	T	-55	7,5 x 10 x 55	27 / 47 Av.	64-72-52 / 62,6 Av. (L.E. 1,07-1,20-0,82 - S.F. 70-85-70) - side A	27 / 47 Av.	74-90-72 / 78,6 Av. (L.E. 1,01-1,15-1,01 - S.F. 70-85-70) - side B	KV	T	-55	7,5 x 10 x 55	27 / 47 Av.	95-65-70 / 76,6 Av. (L.E. 1,65-1,08-1,55 - S.F. 85-60-70) - side A	27 / 47 Av.	51-82-85 / 72,6 Av. (L.E. 0,67-0,99-0,99 - S.F. 50-50-50) - side B	KV	T	-55	7,5 x 10 x 55	27 / 47 Av.	57-94-92 / 81,0 Av. (L.E. 1,12-1,74-1,82 - S.F. 50-70-70) - side A	27 / 47 Av.	83-94-70 / 82,3 Av. (L.E. 1,17-1,43-1,07 - S.F. 50-70-50) - side B		215 max (B.M. and H.A.Z. side A) - 245 max (W.M. - H.A.Z. and B.M. side B)	*

Note: . Remarks: Hardness test HB on top: B.M.(A) 151(min)-159(max) W.M. 136(min)-184(max) B.M.(B) 137(min)-157(max) // See Exova Test report n°RPR36-10E1R0A18

*Hardness test HB: B.M.(A) 149(min)-163(max) H.A.Z.(A) 187(min)-198(max) W.M. 179(min)-195(max) H.A.Z.(B) 183(min)-197(max) B.M.(B) 183(min)-200(max)

Hardness test HB on bottom: B.M.(A) 149(min)-187(max) W.M. 159(min)-175(max) B.M.(B) 130(min)-136(max) // Harndess test in accordance with W-ST-2006 Rev.2 and NACE MR0175 / ISO 15156-2

Ente di collaudo Testing Agency	Ispettore Inspector	Ispettore Inspector	Villa & Bonaldi - Ricengo	Data Date
		Lloyd's Register Verification Limited A member of the Lloyd's Register group. Witnessed ☐ Monitored ☐ Reviewed. Luca Rivaroli Milan Office 04/01/18		05/02/2018

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Test report: RPR36-9E1R0A18
Date 19/01/2018

Client
Cod. 95

Brembana&Rolle S.p.A.
Via Villino, 1
24030 Valbrembo (BG)

Your ref. :	Document :	Ddt n. 2018-DTE-0015	Date:	10/01/2018
Our ref. :	Report :	RPR36-9E1R0A18	Date:	19/01/2018
	Job :	ADC36-1E1R0A18 (64065)	Date:	15/01/2018

Remarks: PQR 63/17
FILLER METAL : THERMANIT 25/14 (Voestalpine Bohler Welding)
CLASS. FILLER METAL : SFA 5.9 - AWS ER 309L
WELDING PROCESS : GTAW

Project:

Doc. reference: ASME IX Ed.2017

Test standard: ASTM E340-15 - ASTM E92-17 - Doc. W-ST-2006 Rev.2 - ASTM E10-17 - ASTM E3-11(2017) - ASTM E1086-14 - ASME II-C ED.2017 (SFA5.9 - AWS ER 309L)

This Report (RPR) contains tests results on the following materials

Ref:	Identification	Material	Dn (mm)	Thk (mm)	Remarks
99A18 (149364)	PQR 63/17	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L			MIN PWHT - Thk 45+10mm

Report signatories and approval

☐ Third party ☐ Witness

☐ Third party ☐ Witness

☐ Third party ☐ Witness

Client

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☑ Witnessed ☐ Monitored ☐ Reviewed
Alessandro Salvatore Monastra
Milan Office 19 DEC 2018

Digitally signed by Cantoni Luca
EXOVA S.R.L. Crema (CR)

Issue approved

BREMBANA & ROLLE S.p.A.
WELDING DEPT.
REVIEWED ☐ WITNESSED

General conditions:
1. The Customer accepts general conditions and prices fixed by the laboratory to perform the tests.
2. Test results will be communicated only by means of test report except for different contractual agreement.
3. Tests sample will be destroyed 30 days after test except for different written Client request.
4. The spare will be destroyed 90 days after date of receipt for different written Client request.
5. The test results described in the following test report are referring only to the sample mentioned in it.
6. The date of material receivement is the same as the date of job opening. The date of testing is the same as the date of test report, except for different info.
7. The laboratory has examined the material sampled an supplied by the Client in compliance with standard request.
8. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.
9. Unless otherwise agreed, sales terms and conditions (MOD20-1E1R0) will be apply.

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Test report: RPR36-9E1R0A18
Date 19/01/2018

Test	Page	Technician
Macrographic examination	Pag. 3	**Cristian Piloni**
Micrographic examination	Pag. 4	**Marco Piloni**
Chemical analysis	Pag. 5	**Matteo Fais**
Hardness test	Pag. 6..8	**Cristian Piloni**

Technician signatories

Digitally signed by
Cristian Piloni
EXOVA S.R.L. Crema (CR)

Digitally signed by
Marco Piloni
EXOVA S.R.L. Crema (CR)

Digitally signed by
Matteo Fais
EXOVA S.R.L. Crema (CR)

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MACROGRAPHIC EXAMINATION

General infos

Test start - Test finish	23/01/2018 - 23/01/2018
MIF reference (Lab)	99A18 (149364)
Client reference	PQR 63/17
Identification of specimen (Lab)	364 MC 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM Full thk
Test standard	ASTM E340-15

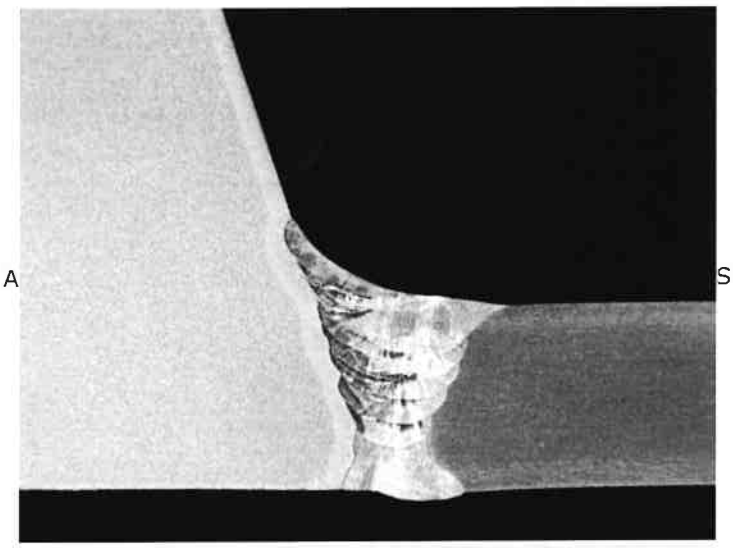
Equipments

(Inv.N°1961) PHOTOCAMERA

Test properties

Etching	Alcoholic hydrochloric acid solution with hydrogen peroxide + Nital 3%

Side A



Side B

Magnification: ~2.5X

Result

The macro examination, at 20x magnification, has shown complete fusion and absence of cracks.

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19 GEN 2018

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MICROGRAPHIC EXAMINATION

General infos

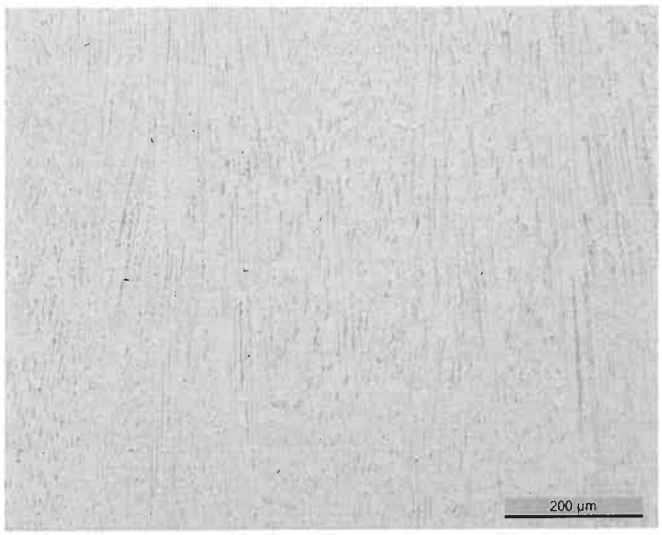
Test start - Test finish	18/01/2018 - 18/01/2018
MIF reference (Lab)	99A18 (149364)
Client reference	PQR 63/17
Identification of specimen (Lab)	364 MI 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM ½ thk
Test standard	ASTM E3-11(2017)

Equipments

(Inv.N°781) MICROSCOPE

Test properties

Etching	13b ASTM E407-07(2015)e1
Test magnification	100X



Result

Microstructure consists of dendritic fusion structure.

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Test report: RPR36-9E1R0A18
Date 19/01/2018

CHEMICAL ANALYSIS

General infos

Test start - Test finish	17/01/2018 - 17/01/2018
MIF reference (Lab)	99A18 (149364)
Client reference	PQR 63/17
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Test standard	ASTM E1086-14

Equipments

(Inv.N°979) QUANTOMETER

Ref.Lab.	T (°C)	Position	Element	Value	Required	Method	Note
364 EA 1.1	20	T WM ½ thk	C	0.024%	≤0.03%	OES	
364 EA 1.2	20	T WM ½ thk	Cr	23.2%	23.0%÷25.0%	OES	
364 EA 1.3	20	T WM ½ thk	Ni	12.6%	12.0%÷14.0%	OES	
364 EA 1.4	20	T WM ½ thk	Mo	0.07%	≤0.75%	OES	
364 EA 1.5	20	T WM ½ thk	Mn	1.86%	1.00%÷2.50%	OES	
364 EA 1.6	20	T WM ½ thk	Si	0.33%	0.30%÷0.65%	OES	
364 EA 1.7	20	T WM ½ thk	P	0.015%	≤0.03%	OES	
364 EA 1.8	20	T WM ½ thk	S	0.006%	≤0.03%	OES	
364 EA 1.9	20	T WM ½ thk	Cu	0.06%	≤0.75%	OES	

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Test report: RPR36-9E1R0A18
Date 19/01/2018

HARDNESS TEST

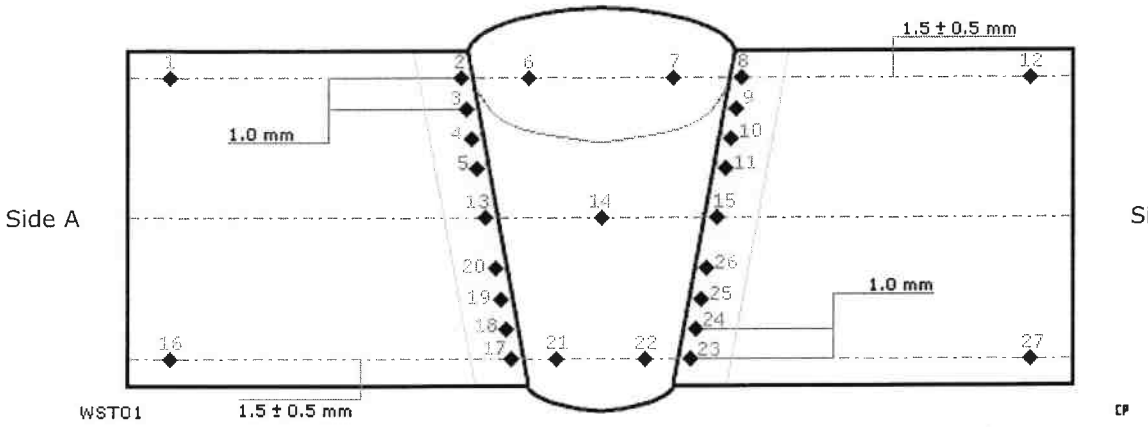
General infos

Test start - Test finish	23/01/2018 - 23/01/2018
MIF reference (Lab)	99A18 (149364)
Client reference	PQR 63/17
Identification of specimen (Lab)	364 MC 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM Full thk
Test standard	ASTM E92-17 + Doc. W-ST-2006 Rev.2

Equipments

(Inv.N°9) HARDNESS TESTING MACHINE

Results



Side A

Side B

Cap		½ thk		Root	
N°	Value HV10	N°	Value HV10	N°	Value HV10
1	**156.0**	13	**198.0**	16	**200.0**
2	**207.0**	14	**213.0**	17	**156.0**
3	**208.0**	15	**207.0**	18	**180.0**
4	**209.0**			19	**188.0**
5	**211.0**			20	**196.0**
6	**193.0**			21	**190.0**
7	**190.0**			22	**203.0**
8	**204.0**			23	**197.0**
9	**199.0**			24	**203.0**
10	**196.0**			25	**209.0**
11	**203.0**			26	**204.0**
12	**208.0**			27	**199.0**

Min	156.0
Max	213.0

Lloyd's Register Verification Limited
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Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office

Note

Required:
215 HV10 Side A
245 HV10 Max Side B
245 HV10 Max WM

Exova Srl
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W: www.exova.com

Test report: RPR36-9E1R0A18
Date 19/01/2018

HARDNESS TEST

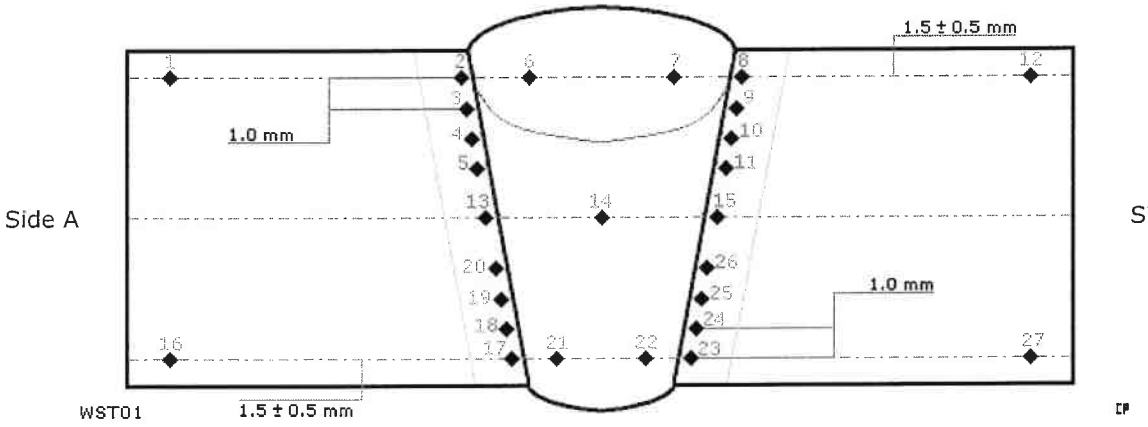
General infos

Test start - Test finish	23/01/2018 - 23/01/2018
MIF reference (Lab)	99A18 (149364)
Client reference	PQR 63/17
Identification of specimen (Lab)	364 MC 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM Full thk
Test standard	ASTM E10-17 + Doc. W-ST-2006 Rev.2

Equipments

(Inv.N°9) HARDNESS TESTING MACHINE

Results



Side A Side B

Cap

N°	Value HB
1	**143.0**
2	**194.0**
3	**196.0**
4	**199.0**
5	**187.0**
6	**186.0**
7	**179.0**
8	**185.0**
9	**180.0**
10	**183.0**
11	**184.0**
12	**196.0**

½ thk

N°	Value HB
13	**187.0**
14	**190.0**
15	**184.0**

Root

N°	Value HB
16	**190.0**
17	**149.0**
18	**176.0**
19	**173.0**
20	**184.0**
21	**186.0**
22	**180.0**
23	**183.0**
24	**190.0**
25	**188.0**
26	**185.0**
27	**178.0**

Min	143.0
Max	199.0

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Milan Office 19 SET 2018

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Test report: RPR36-9E1R0A18
Date 19/01/2018

HARDNESS TEST

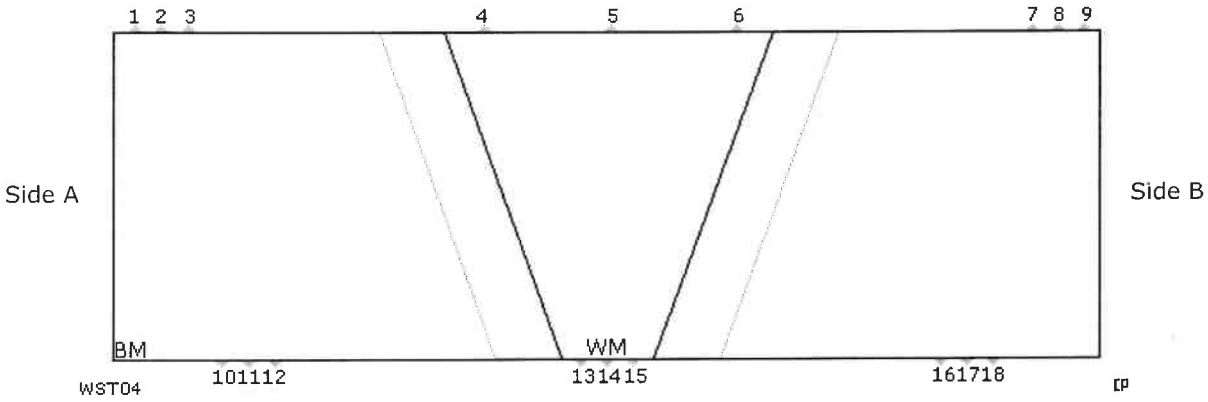
General Infos

Test start - Test finish	23/01/2018 - 23/01/2018
MIF reference (Lab)	99A18 (149364)
Client reference	PQR 63/17
Identification of specimen (Lab)	364 MC 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM Full thk
Test standard	ASTM E10-17 + Doc. W-ST-2006 Rev.2

Equipments

(Inv.N°9) HARDNESS TESTING MACHINE

Results



Ext surface		Int surface	
N°	Value HB	N°	Value HB
1	**136.0**	10	**143.0**
2	**139.0**	11	**140.0**
3	**127.0**	12	**138.0**
4	**168.0**	13	**137.0**
5	**175.0**	14	**159.0**
6	**173.0**	15	**169.0**
7	**154.0**	16	**163.0**
8	**149.0**	17	**138.0**
9	**148.0**	18	**129.0**
Min			127.0
Max			175.0

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Test report: RPR36-10E1R0A18
Date 19/01/2018

Client
Cod. 95

Brembana&Rolle S.p.A.
Via Villino, 1
24030 Valbrembo (BG)

Your ref. :	Document :	Ddt n. 2018-DTE-0015	Date:	10/01/2018
Our ref. :	Report :	RPR36-10E1R0A18	Date:	19/01/2018
	Job :	ADC36-1E1R0A18 (64065)	Date:	15/01/2018

Remarks: PQR 63/17
FILLER METAL : THERMANIT 25/14 (Voestalpine Bohler Welding)
CLASS. FILLER METAL : SFA 5.9 - AWS ER 309L
WELDING PROCESS : GTAW

Project:

Doc. reference: ASME IX Ed.2017

Test standard: ASTM E340-15 - ASTM E92-17 - Doc. W-ST-2006 Rev.2 - ASTM E10-17 - ASTM E3-11(2017)

This Report (RPR) contains tests results on the following materials

Ref:	Identification	Material	Dn (mm)	Thk (mm)	Remarks
100A18 (149365)	PQR 63/17	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L			MAX PWHT - Thk 45+10mm

Report signatories and approval

☐ Third party ☐ Witness

☐ Third party ☐ Witness

☐ Third party ☐ Witness

Client

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☑ Witnessed ☐ Monitored ☐ Reviewed
Alessandro Salvatore Monastra
Milan Office 19 DEC. 2018

Digitally signed by Cantoni Luca
EXOVA S.R.L. Crema (CR)

Issue approved

BREMBANA & ROLLE S.p.A.
WELDING DEPT.
☐ RECEIVED ☑ WITNESSED

General conditions:
1. The Customer accepts general conditions and prices fixed by the laboratory to perform the tests.
2. Test results will be communicated only by means of test report except for different contractual agreement.
3. Tests sample will be destroyed 30 days after test except for different written Client request.
4. The spare will be destroyed 90 days after date of receipt for different written Client request.
5. The test results described in the following test report are referring only to the sample mentioned in it.
6. The date of material receivement is the same as the date of job opening. The date of testing is the same as the date of test report, except for different info.
7. The laboratory has examined the material sampled an supplied by the Client in compliance with standard request.
8. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.
9. Unless otherwise agreed, sales terms and conditions (MOD20-1E1R0) will be apply.

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Test report: RPR36-10E1R0A18
Date 19/01/2018

Test	Page	Technician
Macrographic examination	Pag. 3	**Cristian Piloni**
Micrographic examination	Pag. 4	**Marco Piloni**
Hardness test	Pag. 5..7	**Cristian Piloni**

Technician signatories

Digitally signed by
Cristian Piloni
EXOVA S.R.L. Crema (CR)

Digitally signed by
Marco Piloni
EXOVA S.R.L. Crema (CR)

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MACROGRAPHIC EXAMINATION

General Infos

Test start - Test finish	23/01/2018 - 23/01/2018
MIF reference (Lab)	100A18 (149365)
Client reference	PQR 63/17
Identification of specimen (Lab)	365 MC 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM Full thk
Test standard	ASTM E340-15

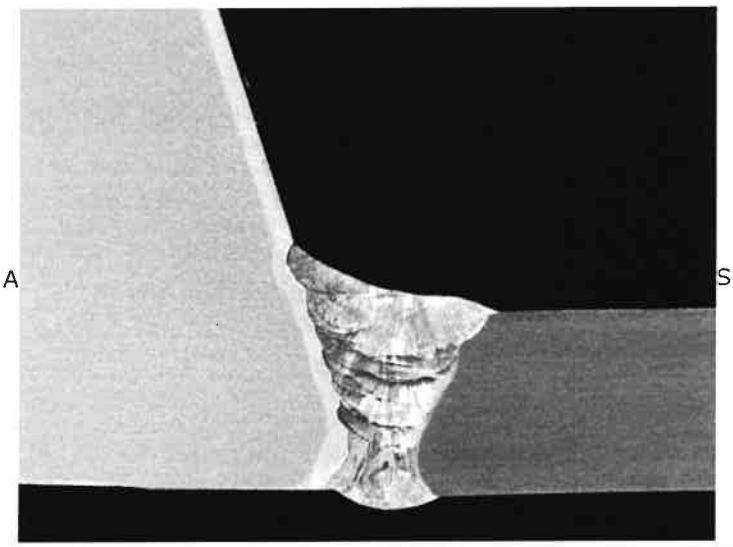
Equipments

(Inv.N°1961) PHOTOCAMERA

Test properties

Etching	Alcoholic hydrochloric acid solution with hydrogen peroxide + Nital 3%

Side A



Side B

Magnification: ~2.5X

Result

The macro examination, at 20x magnification, has shown complete fusion and absence of cracks.

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Witnessed Monitored Reviewed
Alessandro Salvatore Monastra
Milan Office

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MICROGRAPHIC EXAMINATION

General infos

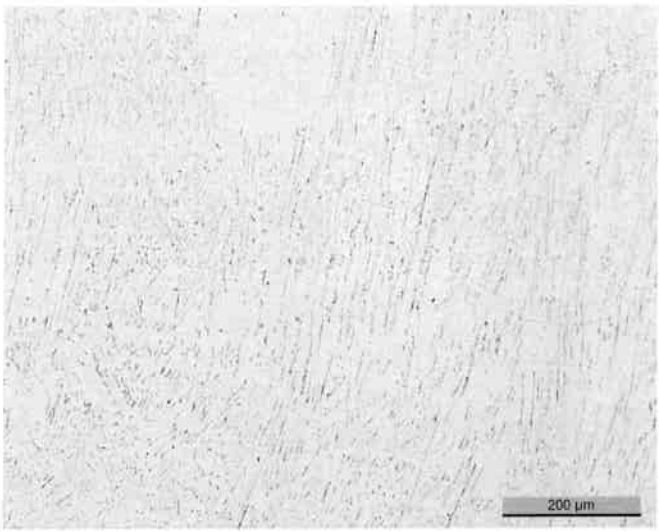
Test start - Test finish	18/01/2018 - 18/01/2018
MIF reference (Lab)	100A18 (149365)
Client reference	PQR 63/17
Identification of specimen (Lab)	365 MI 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM ½ thk
Test standard	ASTM E3-11(2017)

Equipments

(Inv.N°781) MICROSCOPE

Test properties

Etching	13b ASTM E407-07(2015)e1
Test magnification	100X



Result

Microstructure consists of dendritic fusion structure.

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Milan Office

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Test report: RPR36-10E1R0A18
Date 19/01/2018

HARDNESS TEST

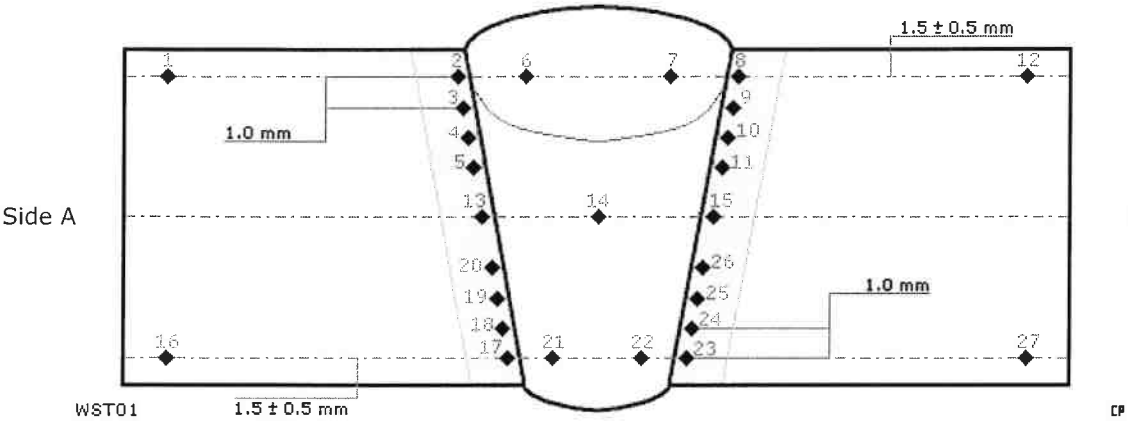
General infos

Test start - Test finish	23/01/2018 - 23/01/2018
MIF reference (Lab)	100A18 (149365)
Client reference	PQR 63/17
Identification of specimen (Lab)	365 MC 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM Full thk
Test standard	ASTM E92-17 + Doc. W-ST-2006 Rev.2

Equipments

(Inv.N°9) HARDNESS TESTING MACHINE

Results



Cap		½ thk		Root	
N°	Value HV10	N°	Value HV10	N°	Value HV10
1	**179.0**	13	**205.0**	16	**156.0**
2	**197.0**	14	**199.0**	17	**193.0**
3	**204.0**	15	**195.0**	18	**203.0**
4	**211.0**			19	**212.0**
5	**208.0**			20	**209.0**
6	**204.0**			21	**207.0**
7	**199.0**			22	**201.0**
8	**194.0**			23	**195.0**
9	**200.0**			24	**200.0**
10	**206.0**			25	**205.0**
11	**208.0**			26	**201.0**
12	**210.0**			27	**192.0**

Min	156.0
Max	212.0

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Alessandro Salvatore Monastra
Milan Office

Note

Required:
215 HV10 Side A
245 HV10 Max Side B
245 HV10 Max WM

Exova Srl
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Test report: RPR36-10E1R0A18
Date 19/01/2018

HARDNESS TEST

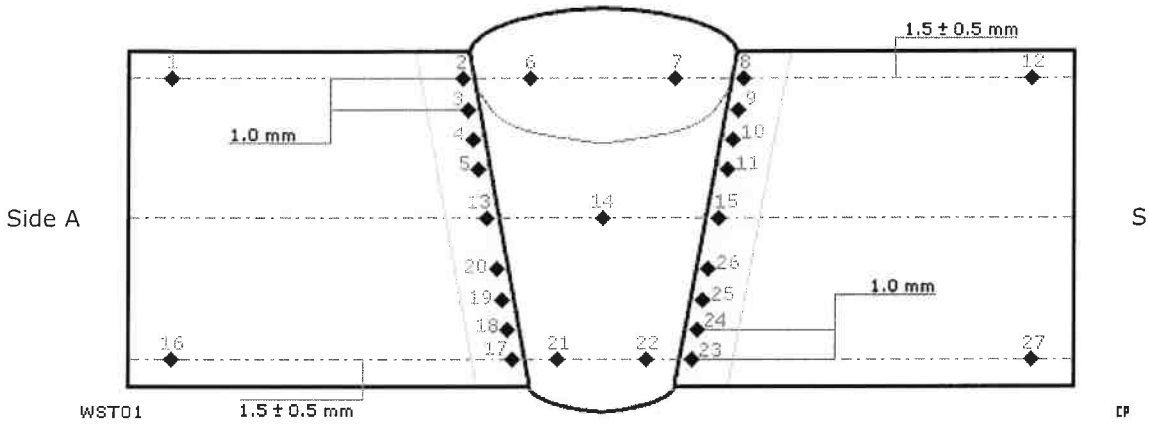
General infos

Test start - Test finish	23/01/2018 - 23/01/2018
MIF reference (Lab)	100A18 (149365)
Client reference	PQR 63/17
Identification of specimen (Lab)	365 MC 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM Full thk
Test standard	ASTM E10-17 + Doc. W-ST-2006 Rev.2

Equipments

(Inv.N°9) HARDNESS TESTING MACHINE

Results



Cap		½ thk		Root	
N°	Value HB	N°	Value HB	N°	Value HB
1	**163.0**	13	**197.0**	16	**149.0**
2	**189.0**	14	**193.0**	17	**187.0**
3	**190.0**	15	**190.0**	18	**195.0**
4	**198.0**			19	**193.0**
5	**195.0**			20	**187.0**
6	**191.0**			21	**179.0**
7	**184.0**			22	**195.0**
8	**183.0**			23	**187.0**
9	**189.0**			24	**193.0**
10	**188.0**			25	**197.0**
11	**196.0**			26	**196.0**
12	**200.0**			27	**183.0**

Min	149.0
Max	200.0

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Alessandro Salvatore Monastra
Milan Office 19 GEN 2018

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Test report: RPR36-10E1R0A18
Date 19/01/2018

HARDNESS TEST

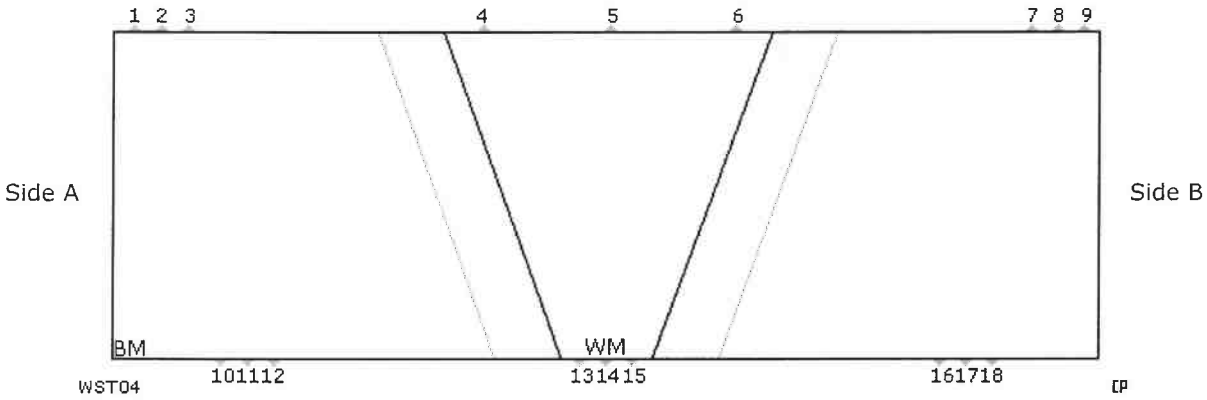
General infos

Test start - Test finish	23/01/2018 - 23/01/2018
MIF reference (Lab)	100A18 (149365)
Client reference	PQR 63/17
Identification of specimen (Lab)	365 MC 1
Material	Side A: ASTM A / SA 516 Gr.70 Side B: ASTM A / SA 240 TP304L
Position	T WM Full thk
Test standard	ASTM E10-17 + Doc. W-ST-2006 Rev.2

Equipments

(Inv.N°9) HARDNESS TESTING MACHINE

Results



Ext surface		Int surface	
N°	Value HB	N°	Value HB
1	**155.0**	10	**149.0**
2	**159.0**	11	**187.0**
3	**151.0**	12	**178.0**
4	**184.0**	13	**175.0**
5	**139.0**	14	**165.0**
6	**136.0**	15	**159.0**
7	**137.0**	16	**136.0**
8	**157.0**	17	**133.0**
9	**150.0**	18	**130.0**

Min	130.0
Max	187.0

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Alessandro Salvatore Monastra
Milan Office

voestalpine Böhler Welding Italia S.r.l.

voestalpine Böhler Welding Italia S.r.l.

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I – 20157 MILANO MI
Tel. +39 02 39017.1
Fax +39 02 39017244

www.voestalpine.com/welding

Certificato di prova 3.1
Inspection certificate 3.1

secondo / as per : EN 10204
No. : No. : 2017-2014502415-000030-014
Rev. 0 Page / Page : 1 / 1

VILLA & BONALDI S.p.A.
OFFICINE MECCANICHE
Via Soncino 19
26010 RICENGO
Italia

Ordine N°	PO no.	2017-ORD-0000095	del / of	26.01.2017
Ordine N°	Order no.	1014196674		
Bolla di consegna/Pos./Splitt.	Delivery note/pos./splitt	2014502415/000000/000030	del / of	02.02.2017

Oggetto test	Product	filo SAW / SAW wire electrode	
Denominazione commerciale	Trade name	**THERMANIT 25/14 E-309L**	208648
Classificazione norma	Standard designation	AWS A5.9: ER309L	79223
			1SE6A20S
		EN ISO 14343-A: 23 12 L	0140

Dimensione	Dimension	2,4 mm
Colata - Lotto	Heat no.	102454
Quantità fornita	Quantity	25,0 KG

Composizione chimica in % del prodotto **Chemical composition in % of the product**

C	Si	Mn	P	S	Cr	Mo	Ni	Cu						
0,01	0,6	1,8	0,014	0,007	23,8	0,03	13,0	0,06						

Questo certificate è stato emesso con sistema automatizzato e non richiede firma
This certificate was issued by DP-equipment and does not require signature.

Centro / Town: Milano
Data / Date: 01.03.2017

Q.A. representative / Authorized representative
Zuin

voestalpine
ONE STEP AHEAD.

21843

outokumpu
high performance stainless steel

CERTIFICATE –ZEUGNIS - CERTIFICAT

EN 10204-3.1
2256524-EN

Invoice No. / Rechnung Nr. / N° du certificat: 6610/1452670
Page / Seite / Page: 1/1

Business Unit / QCM: Avesta Works / Johan Nordström
Date Datum Date: 10-Jun-2014
Load, Ladung, Charge No: IT/IT4O-0224
Acknowledged ID, Bestätigung, Commande ID: 6610/411234

Your ref, Ihre Ref., Votre ref: 900332

Buyer, Besteller, Acheteur:
OUTOKUMPU SPA
VIA AGNELLO, 8
IT IT-20121, MILANO (MI)
ITALY

Consignee, Empfänger, Lieu de livraison:
OUTOKUMPU SPA

Requirements, Anforderungen, Exigences:
ASTM A 240M-13c
ASME SEC II PART A SA-240/SA-240M 2013
EN 10088-2:2005
AD 2000 W2, W10 & EN 10028-7
NACE MR0175/ISO 15156-3:2009
EN 10088-4:2009
NACE MR0103:2012
EN ISO 9444-2 / ASTM A480M

Mark of Manufacturer / Zeichen des Lieferwerkes / Signe de producteur	Process / Erschmelzungsart / Mode de fusion	Inspector's stamp / Zeichen des Sachverständigen / Poicon de l'expert	Grade, Werkstoff, Nuance
outokumpu	E+AOD	AJA	Outokumpu 18-8L TYPE 304 TYPE 304L 1.4301 1.4307

Product, Erzeugnisform, Produit: Stainless Steel Hot Rolled, Coil
finish 1D, cut edge

Line / Reihe / Ligne	Item / Position / Poste	Heat-Lot No / Schmelze-Lot Nr / Coulée n° - Lot No	Size / Abmessungen / Dimensions	Pieces / Stückzahl / Nombre	Quantity / Unit / Menge / Einheit / Quantité / Unité
1	3	E140876-702	10,00 X 1500 mm	1	11870 KG

Chemical composition – Chemische Zusammensetzung – Composition chimiques

	C	Si	Mn	P	S	Cr	Ni	Nb	Cu	Co	N
Heat	.023	.34	1.68	.027	.001	18.62	8.22	.013	.35	.078	.070

Radioactive contamination check acc. IAEA recommendations: Approved

Test results – Prüfergebnisse – Results dessais (1N/mm² = 1 MPa) F = Front – Anfan – Debut B = Back – Ende – Fin T = Transverse – Quer – Travers

Test Ref	Temp °C	RP 0.2 N/MM2	RP 1.0 N/MM2	RM N/MM2	A5 %	2" %	HB
Min	+20	230	260	520	45	40	
Max				700			201
F T	+20	315	364	624	54	56	183
B T		323	366	624	53	54	170

Material conforms to NACE MR0103 in supplied condition
Material conforms to NACE MR0175/ISO 15156 in supplied condition
Corrosion acc. ASTM A 262-E, EN ISO 3651-2A: Approved
Heat treatment / Solution annealed: Material temperature 1100 °C / Quenched (forced air + water)
Steel grade verification (PMI-spectroscopic): Approved
Marking, visual insp. and gauge measurement: Approved
Approved acc. AD 2000 Merkblatt W0 by TÜV NORD Systems with renounce of countersignment
Certified acc. Pressure Equipment Directive (97/23/EC) by TÜV CERT-Certification body
for pressure equipment of the TÜV NORD Systems; notified body, reg-no. 0045.

C 1.3030
CHECKED BY
V & B SHOP INSPECTOR
SIGNED _____ DATE 22-07-14

COPY CONFORMING TO THE ORIGINAL
OUTOKUMPU S.p.A.
NAME
SIGNATURE

Vs. Ord 2014-ORD-0000736
Ns. Bolla 941377
del 10/07/14

Outokumpu Stainless AB
Business Unit Special Coil
BOX 74, S-774 22 AVESTA
SWEDEN
Regoffice: Stockholm SWEDEN, Regno: 556001-8748
Telephone: + 46 (0)226 811 73
Fax: + 46 (0)226 816 46
V.A.T no: SE556001874801

This material is found to comply with order requirements

Joakim Johansson
Authorized Inspector

EN ISO 9001
EN ISO 14001
CE 0045 Certificate no.: 0045-CPD-0889

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
☐ Witnessed ☐ Monitored ☑ Reviewed
Luca Rivaroli
Milan Office 05/04/18

21843

CERTIFICAT DE RECEPTION 3.1 / EN 10204:2004 Inspection Certificate 3.1 / EN 10204:2004 Prüfbescheinigung 3.1 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2016-118721	Page 001 Sheet / Seite 004	ArcelorMittal

Client - Purchaser - Besteller	VILLA & BONALDI SRL
Référence client - Purchase order - Kaufauftrag	2016-ORD-0000579/ Rev.1
Projet - Project - Projekt TCO (TengizChevrOil) FGP (Future Gr	Repère poste - - 50

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1067331 / 000500
Bordereau de livraison - Delivery note - Lieferungsdokument	80296796

#010 - PRODUITS LIVRES - DELIVERED PRODUCTS - GELIEFERTEN GEGENSTÄNDE

Nuance - Grade - Werkstoff	SA 516 Grade 70 + S5	Selon norme - According to - Entsprechend	ASME IIA ED. 2015 SA 516/M		
Epaisseur - Thickness - Dicke	45.00 mm	Largeur - Width - Breite	1,200 mm	Longueur - Length - Länge	3,500 mm

Spécification - Specification - Spezifikation

14018MRS101 REV.1

.

Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferzustand

Normalisation (920 °C - 1 min/mm) - Normalization - Normalisierung

Procédé d'élaboration - Melting process - Erschmelzungsart

Electric-arc furnace - Vacuum degassed - Fully killed - Fine grain practice

Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflos nr.	Nbre Nbr Stz	N° produit Product Erzeugnis	N° de coulée Ladle nr. Schmelze nr.	N° de lot de contrôle Inspection lot nr. Prüflos nr.
01	748727001	82813	748727.1001 / 748732.4001				

Total - Total - Gesamtzahl 001

Nous certifions que les produits ci-dessus sont conformes aux prescriptions de la commande.
We hereby certify that the above mentioned products are complying with the order requirements.
Wir bestätigen hiermit, dass die obengenannten Erzeugnisse den Bestellungvorschriften entsprechen.

THIERRY VILLE
16/08/2016
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.1 / EN 10204:2004 Inspection Certificate 3.1 / EN 10204:2004 Prüfbescheinigung 3.1 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2016-118721	Page 002 Sheet / Seite 004

ArcelorMittal

Client - Purchaser - Besteller	VILLA & BONALDI SRL
Référence client - Purchase order - Kaufauftrag	2016-ORD-0000579/ Rev.1
Projet - Project - Projekt	TCO (TengizChevrOil) FGP (Future Gr Repère poste - - 50

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + MAQ REV 12 du 02/05/2012
ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1067331 / 000500
Bordereau de livraison - Delivery note - Lieferungsdokument	80296796

#020 - ANALYSE CHIMIQUE DE COULEE - LADLE CHEMICAL COMPOSITION - SCHMELZE CHEMISCHE ZUSAMMENSETZUNG

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
	%	%	%	%	%	%	%	%	%
Min.		0.850			0.150				
82813	0.186	1.192	0.0074	0.0006	0.314	0.061	0.170	0.117	0.028
Max.	0.230	1.200	0.0350	0.0350	0.400	0.400	0.400	0.300	0.120
	Al	Nb	V	Ti	(01)	(02)	B	(03)	
	%	%	%	%			%		
Min.	0.020								
82813	0.020	0.013	0.002	0.001	0.376	0.145	0.0001	0.430	
Max.	100.000	0.020	0.030	0.030	1.000	0.320	0.0010	0.430	

(01) F(104) = Cu+Ni+Cr+Mo
(02) F(143) = Cr+Mo
(03) Ceq = C+(Mn/6)+((Cu+Ni)/15)+((Cr+Mo+V)/5)

#030 - ANALYSES PRODUITS - PRODUCTS ANALYSIS - STÜCKANALYSEN

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
	%	%	%	%	%	%	%	%	%
Min.		0.790			0.130				
748732.4001	0.182	1.194	0.0077	0.0006	0.320	0.058	0.164	0.114	0.028
Max.	0.230	1.300	0.0350	0.0350	0.450	0.430	0.430	0.340	0.130
	Al	Nb	V	Ti	(01)	(02)	B	(03)	
	%	%	%	%			%		
Min.	0.020								
748732.4001	0.020	0.015	0.001	0.003	0.364	0.142	0.0003	0.424	
Max.	100.000	0.030	0.040	0.040	1.000	0.320	0.0015	0.430	

(01) F(104) = Cu+Ni+Cr+Mo
(02) F(143) = Cr+Mo
(03) Ceq = C+(Mn/6)+((Cu+Ni)/15)+((Cr+Mo+V)/5)

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THIERRY VILLE
16/08/2016
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.1 / EN 10204:2004 Inspection Certificate 3.1 / EN 10204:2004 Prüfbescheinigung 3.1 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2016-118721	Page 003 Sheet / Seite 004	ArcelorMittal

Client - Purchaser - Besteller	VILLA & BONALDI SRL
Référence client - Purchase order - Kaufauftrag	2016-ORD-0000579/ Rev.1
Projet - Project - Projekt TCO (TengizChevrOil) FGP (Future Gr	Repère poste - - 50

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Produit - Product - Erzeugnis	Plate(s)
Commande / Poste - Internal order - Werksbestellung	1067331 / 000500
Bordereau de livraison - Delivery note - Lieferungsdokument	80296796

#072 ESSAIS MECANIQUES - MECHANICAL TESTS - MECHANISCHE PRÜFUNGEN

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

Traction cylindrique Round tensile test - Zugversuch								Rp 0,2%	Rm	A Lo=50									
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa	MPa	%									
							Min	260	485	21									
							Max		620										
748727.1001	000	T3/4	1/4ST	20	°C			371	525	42									

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

Traction cylindrique Round tensile test - Zugversuch								Rp 0,2%	Rm	A Lo=50									
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa	MPa	%									
							Min	260	485	21									
							Max		620										
748727.1001	001	T3/4	1/4ST	20	°C			364	520	40									

TRACTION A L' AMBIANTE - ROOM TEMPERATURE TENSILE TEST - ZUGVERSUCH BEI RT

Traction cylindrique Round tensile test - Zugversuch								Rp 0,2%	Rm	A Lo=50									
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	MPa	MPa	%									
							Min	260	485	21									
							Max		620										
748727.1001	002	T3/4	1/4ST	20	°C			354	505	38									

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm KCV ASTM 10X10mm - KCV ASTM 10X10mm								Energ Ind	Energ Ind	Energ Ind	Energ Ave	LatEx Ind	LatEx Ind	LatEx Ind	LatEx Ave	%Sh.area Ind	%Sh.area Ind	%Sh.area Ind	%Sh.area Ave
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	Mils	Mils	Mils	Mils	%	%	%	%
							Min	27	27	27	34								
							Max												
748727.1001	000	T3/4	1/4SL	-46	°C			145	116	138	133	67	67	71	68	80	80	75	78.333

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm KCV ASTM 10X10mm - KCV ASTM 10X10mm								Energ Ind	Energ Ind	Energ Ind	Energ Ave	LatEx Ind	LatEx Ind	LatEx Ind	LatEx Ave	%Sh.area Ind	%Sh.area Ind	%Sh.area Ind	%Sh.area Ave
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	Mils	Mils	Mils	Mils	%	%	%	%
							Min	27	27	27	34								
							Max												
748727.1001	001	T3/4	1/4SL	-46	°C			144	104	126	125	67	67	67	67	75	80	80	78.333

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THIERRY VILLE
16/08/2016
Gestionnaire Commande
Mill inspector
Werksbeauftragte

CERTIFICAT DE RECEPTION 3.1 / EN 10204:2004 Inspection Certificate 3.1 / EN 10204:2004 Prüfbescheinigung 3.1 / EN 10204:2004	Numéro de document Rev 00 Document number Bescheinigungnummer 2016-118721	Page 004 Sheet / Seite 004	ArcelorMittal

Client - Purchaser - Besteller: VILLA & BONALDI SRL

Référence client - Purchase order - Kaufauftrag: 2016-ORD-0000579/ Rev.1

Projet - Project - Projekt: TCO (TengizChevrOil) FGP (Future Gr Repère poste - - 50

Industeel Belgium
Site : Rue de Châtelet 266 6030 Marchienne-au-Pont

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ISO 9001 (Cert.95587-2011, Valid 02/06/2017) + QAM REV 12 of 02/05/2012

Produit - Product - Erzeugnis: Plate(s)

Commande / Poste - Internal order - Werksbestellung: 1067331 / 000500

Bordereau de livraison - Delivery note - Lieferungsdokument: 80296796

RESILIENCE - TOUGHNESS - KERBSCHLAGZÄHIGKEIT

KCV ASTM 10X10mm KCV ASTM 10X10mm - KCV ASTM 10X10mm								Energ Ind	Energ Ind	Energ Ind	Energ Ave	LatEx Ind	LatEx Ind	LatEx Ind	LatEx Ave	%Sh.area Ind	%Sh.area Ind	%Sh.area Ind	%Sh.area Ave
N° lot QM	Etat	Loc	Epr.	T°	Uni	Mac	Uni	J	J	J	J	Mils	Mils	Mils	Mils	%	%	%	%
							Min	27	27	27	34								
							Max												
748727.1001	002	T3/4	1/4SL	-46	°C			114	87	134	112	67	55	67	63	80	80	80	80

Loc	3/4	Trois-Quart - 3/4 Width - 3/4 Breite
Loc	T	Tête - Top - Kopf
Epr. Epaisseur	1/4	Quart épaisseur - 1/4 Thickness - 1/4 Dicke
Epr. Face	S	Supérieure - Upper face - obere
Epr. Sens	L	Long - Longitudinal - Längs
Epr. Sens	T	Travers - Transverse - Quer
Etat	000	Etat thermique de livraison - Heat treatment state of delivery - Wärmebehandlung Lieferustand
Etat	001	PWHT - PWHT (From 425 °C at 60 °C/h to 620 °C (-10/+10) (min: 1 h) - Down to 425 °C at 60 °C/h - 1 Cycle) - PWHT
Etat	002	PWHT - PWHT (From 425 °C at 60 °C/h to 620 °C (-10/+10) (min: 9 h) - Down to 425 °C at 60 °C/h - 1 Cycle) - PWHT
Epr.Ep./Face/Sens	1/4SL	Quart épaisseur - 1/4 Thickness - 1/4 Dicke / Supérieure - Upper face - obere / Long - Longitudinal - Längs
Epr.Ep./Face/Sens	1/4ST	Quart épaisseur - 1/4 Thickness - 1/4 Dicke / Supérieure - Upper face - obere / Travers - Transverse - Quer

CHECKED BY
V & B SHOP INSPECTOR

Lloyd's Register Verification Limited
A member of the Lloyd's Register group
Witnessed Monitored Reviewed
Luca Rivaroli
Milan Office 05/01/17

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We hereby certify that the above mentioned products are complying with the order requirements.
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THIERRY VILLE
16/08/2016
Gestionnaire Commande
Mill inspector
Werksbeauftragte

B&R GROUP PROCEDURE

PROCEDURE SPECIFICATION FOR REPAIRING OF WELD

PR.N° 121 WR

REV.0

REFERENCE DOCUMENTS:
ASME BPV CODE Sections I, VIII div. 1, VIII div. 2 Ed.2021
ASME Power Piping B31.1 Ed.2020

LRQA Verification Limited
☐ Witnessed ☑ Reviewed
Gianluca Cestari
Authorized Inspector N.B. No. 16408
Milan Office 28/06/2022

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☐ Witnessed ☑ Reviewed
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Flavio Zanon
Authorized Inspector N.B. No. 13421
Milan Office 27-06-2022

A.I.

LRQA Verification Limited
☐ Witnessed ☑ Reviewed 2nd Accepted
Luca Rivaroli
Authorized Inspector N.B. No. 13097
Milan Office 27/06/22

REVIEW FOR COMPLIANCE WITH REFERENCE CODE / DOCUMENT REVISION		
Date	Code Edition	TP

Rev.	Date	Description	Issued by	Reviewed by	Approved by TP
0	27-01-2022	Issued for approval	M. Fiammingo	S.L Rigobon	N. Tosto

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	INDEX		INDICE
1.	SCOPE	1.	SCOPO
2.	MATERIAL	2.	MATERIALE
3.	EXAMINATION	3.	ESAME
4.	EVALUATION OF DEFECT	4.	VALUTAZIONE DEL DIFETTO
5.	REPAIRING	5.	RIPARAZIONE
6.	INSPECTION AND TESTING OF REPAIRS	6.	ISPEZIONE E COLLAUDO DOPO RIPARAZIONE

ABBREVIATIONS:
A.I. Authorized Inspector
P.W.H.T. Post-Weld Heat Treatment
N.D.E. Non-Destructive Examination

1. Scope	1. Scopo
This specification outlines the system used to repair defective welds (weld metal and heat affected zone). Defective welds may be repaired, provided acceptance by the A.I. is first obtained for the method and extent of repairs. The requirements of this procedure do not apply when the welded repairs are minor restoration of the weld surface.	Questa specifica delinea il sistema utilizzato per riparare le saldature difettose (metallo di saldatura e zona termicamente alterata). Le saldature difettose possono essere riparate, previa accettazione da parte dell'A.I. per il metodo e l'entità delle riparazioni. I requisiti di questa procedura non si applicano quando le riparazioni saldate sono un ripristino minore della superficie di saldatura.

2. Material	2. Materiale
The type of material shall be as specified on relevant drawings and specification.	Il tipo di materiale deve essere quello specificato nei disegni e nelle specifiche pertinenti.

3. Examination	3. Esame
3.1 The defect may be detected by means of visual examination, Liquid penetrant test, magnetic test, or ultrasonic test, hydrostatic/pneumatic test, as specified by applicable Code requirements..	3.1 Il difetto può essere rilevato mediante esame visiva, test con liquido penetrante, test magnetoscopico, o indagine ultrasonora, test idrostatico/pneumatico, come specificato dai requisiti del Codice applicabile.
3.2 Additional tests and investigations methods may be used, in order to detect the full extension of the defective area	3.2 Ulteriori metodi di prova e di indagine possono essere utilizzati al fine di accertare la piena estensione dell'area difettosa.

4. Evaluation of defect	4. Valutazione del difetto
4.1 The defect shall be evaluated as specified by applicable Code standards and User specifications.	4.1 Il difetto dovrà essere valutato come specificato dalle norme del Codice applicabili e dalle specifiche dell'Utilizzatore.

5. Repairing	5. Riparazione
All unacceptable defects shall be treated as follows: 5.1 The defective welds shall be removed by grinding, machining, or arcair process. The groove shall be re-welded by qualified welders, using matching consumables and according to a qualified welding procedure specification (to be submitted to the A.I. and User for their acceptance prior to start with any repairing activity). Before re-welding, the repairing area shall be re-examined by the N.D.E. required by the Code and User specifications, to verify the full removal of all defect.	Tutti i difetti inaccettabili devono essere trattati come segue: 5.1 L'area difettosa deve essere rimossa mediante molatura, lavorazione a macchina o di scriccatura con arcair. Se necessario, un deposito di saldatura deve essere applicato da saldatori qualificati, utilizzando materiali di consumo corrispondenti e secondo una specifica della procedura di saldatura qualificata (da presentare all'AI e all'Utilizzatore per la loro accettazione prima di iniziare qualsiasi attività di riparazione). Prima della saldatura, l'area di riparazione deve essere riesaminata con N.D.E. richiesto dal Codice e dalle Specifiche dell'Utilizzatore, per verificare la completa rimozione di ogni difetto.

5.2 Repairing of welds may be made after the final P.W.H.T. and before the final hydrostatic test, without additional P.W.H.T. only if permitted by Code / User specifications. Such repair shall be recorded on Data Report	5.2 La riparazione mediante saldatura può essere effettuata dopo il P.W.H.T. e prima della prova idrostatica finale, senza P.W.H.T. solo se consentito dal codice e dalle specifiche dell'utilizzatore. Tale riparazione dovrà essere registrata su Data Report.
5.3 Defective welds that cannot be satisfactorily repaired shall be rejected.	5.3 Le saldature difettose che non possono essere riparate in modo soddisfacente devono essere respinte.

6. Inspection and testing after repair	**6. Ispezione e collaudo dopo riparazione**
Repaired areas shall be re-inspected in accordance with applicable Code, and User specification. The report of these repairs shall be made available to the **A.I.** and User for their acceptance.	Le aree riparate devono essere nuovamente ispezionate in conformità con il Codice applicabile e le specifiche dell'utilizzatore. Il rapporto di tali riparazioni deve essere messo a disposizione dell'A.I. e dell'utilizzatore per loro accettazione.