



*Costruzioni Industriali Cividac Spa*  
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# MANUFACTURER'S DATA BOOK

Customer : TURBODEN  
P.O. No. : 10PU-000265-PR  
C.I.C Job No. : 2010/005/T  
Item No. : T10 HR  
Serial No. : 4320

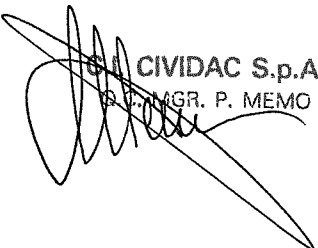
C.I. CIVIDAC S.p.A.  
C.I. MEMO



# MANUFACTURER'S DATA BOOK INDEX

CIC Job. no.	2010 / 005 / T	P.O. no.	10PU-000265-PR
ITEM	T10 HR	SERVICE	CONDENSATOR - REGENERATOR
S.N.	4320	DRAWING no.	6725-2010

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CIVIDAC S.p.A.  
MGR. P. MEMO



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# SECTION

# A

**FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS**  
 (Alternative Form for Single Chamber, Completely Shop or Field Fabricated Vessels Only)  
 As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

**COSTRUZIONI INDUSTRIALI CIVIDAC S.P.A., Via Borgo Cattanei, 35, San Biagio di Callalta Treviso 31048**

1. Manufactured and certified by \_\_\_\_\_  
(Name and address of Manufacturer)

2. Manufactured for **TURBODEN S.r.l. - Via Cernaia 10 - Brescia - Italy**  
(Name and address of Purchaser)

3. Location of installation **TG-TRANSGAS, ROSETOWN COMPRESSOR STATION, NE 21-30-14W3, ROSETOWN, SASKATCHEWAN, 2S0L 2V0 - CANADA**  
(Name and address)

4. Type **HORIZONTAL** **4320** **OH1085.3(\*)** **6725-2010 REV. 1** **647** **2010**  
(Horizontal or vertical, tank) (Manufacturer's serial number) (CRN) (Drawing number) (National Board number) (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the **ASME BOILER AND PRESSURE VESSEL CODE**. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1  
**ED. 2007**  
 to **2009b** **N.A.** **NO**  
[Addenda (date)] (Code Case numbers) [Special service per UG-120(d)]

6. Shell **SA 333 Gr. 6** **8.56/9.52** **1.6** **O.D. 114.3/141.3** **SEE DWG.**  
(Material spec. number, grade) [Nominal thickness (mm)] [Corr. allow. (mm)] [Inner diameter (mm)] [Length (overall) (mm)]

7. Seams **SEAMLESS** **NONE** **100** **NONE** **NO** **TYPE 1** **NONE** **0.7** **SEE DWG.**  
[Long. (welded, dbl., singl., lap, butt)] [R.T. (spot or full)] (Eff., %) (H.T. temp. °C) (Time, hr) [Girth (welded, dbl., singl., lap, butt)] [R.T. (spot or full)] (Eff., %) (No. of courses)

8. Heads: (a) Material **N.A.** (b) Material **N.A.**  
(Spec. no., grade) (Spec. no., grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	<b>N.A.</b>									
(b)	<b>N.A.</b>									

If removable, bolts used (describe other fastenings) **N.A.**  
(Material spec. number, grade, size, number)

9. MAWP **1900** **100** kPa g at max. temp. **300** **300** °C.  
(Internal) (External) (Internal) (External)

Min. design metal temp. **-9** °C at **1900** kPa g. Hydro., ~~pneu.~~ or ~~comb.~~ test pressure **24.7** Bar (g).  
 Proof test **N.A.**

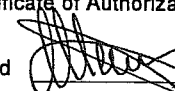
10. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain)	Number	Diameter or Size	Type	Material	Nominal Thickness	Reinforcement Material	How Attached	Location
<b>N.A.</b>								

11. Supports: Skirt **NO** Lugs **NO** Legs **N.A.** Other **N.A.** Attached **N.A.**  
(Yes or no) (Number) (Number) (Describe) (Where and how)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: **N.A.**  
(Name of part, item number, Manufacturer's name and identifying stamp)

**(\*) APPLICABLE FOR N°2 INTERNAL FINNED COILS POS. 800, MANUFACTURER: EUROCOIL S.p.A., DWG:DG62.4 Rev. 4**

CERTIFICATE OF SHOP / FIELD COMPLIANCE	
We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. "U" Certificate of Authorization Number <b>26,200</b> expires <b>27 February, 2013</b> .	
Date <b>25 JUNE 2010</b> Co.name <b>COSTRUZIONI INDUSTRIALI CIVIDAC S.P.A.</b> Signed 	<b>C.I. CIVIDAC S.p.A.</b> Q.C. MGR. P. MEMO <small>(Representative)</small>
CERTIFICATE OF SHOP/FIELD INSPECTION	
Vessel constructed by <b>COSTRUZIONI INDUSTRIALI CIVIDAC S.P.A.</b> at <b>San Biagio di Callalta, Treviso, Italy</b>	
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of <b>NEBRASKA</b> and employed by <b>ARISE INCORPORATED</b>	
have inspected the component described in this Manufacturer's Data Report on <b>25 JUNE 2010</b> , and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.	
Date <b>25 JUNE 2010</b> Signed <b>Mr. UMBERTO BREDA</b> Commissions <b>NB 13616A, NE 10249</b>	<small>(Authorized Inspector) [National Board (incl. endorsements), State, Province, and number]</small>



**FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS**  
**As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1**

1. Manufactured and certified by COSTRUZIONI INDUSTRIALI CIVIDAC S.P.A, Via Borgo Cattanei,35,San Biagio di Callalta Treviso 31048  
 (Name and address of Manufacturer)  
 2. Manufactured for TURBODEN S.r.l. - Via Cernaia 10 - Brescia - Italy  
 (Name and address of Purchaser)  
 3. Location of installation TG-TRANS GAS, ROSETOWN COMPRESSOR STATION, NE 21-30-14W3, ROSETOWN,SASKATCHEWAN,2S0L 2V0 - CANADA  
 (Name and address)

4. Type HORIZONTAL HEAT EXCHANGER 4320  
 (Horizontal, vertical, or sphere) (Tank, separator, jkt. vessel, heat exch., etc.) (Manufacturer's serial number)  
OH1085.3 (\*) 6725-2010 REV. 1 647 2010  
 (CRN) (Drawing number) (National Board number) (Year built)

5. ASME Code, Section VIII, Div.1 ED.2007 ADD.2009b - NO  
 [Edition and Addenda (date)] (Code Case number) [Special service per UG-120(d)]

Items 6-11 incl. to be completed for single wall vessels, jackets of jacketed vessels, shell of heat exchangers, or chamber of multichamber vessels.  
 6. Shell: (a) Number of course(s) 3 (1) (b) Overall length 3830 mm

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter	Length	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	I.D.2370 mm	2000 mm	SA516 GR 70	15mm	1.6mm	1	SPOT	0.85	1	SPOT	0.85	N.A.	N.A.
1	I.D.2370 mm	1830 mm	SA516 GR 70	15mm	1.6mm	1	SPOT	0.85	1	SPOT	0.85	N.A.	N.A.
1	I.D. 1070	200 mm	SA516 GR 70	15mm	1.6mm	1	SPOT	0.85	1	SPOT	0.85	N.A.	N.A.

7. Heads: (a) SA516 GR 70 (b) SA516 GR 70  
 (Material spec. number, grade or type) (H.T. - time and temp.) (Material spec. number, grade or type) (H.T. - time and temp.)

	Location (Top, Bottom, Ends)	Thickness mm		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
(a)	END	22	1.6	N.A.	N.A.	2:1	N.A.	N.A.	N.A.	N.A.	YES	1	SPOT	0.85
(b)	CONE	16	1.6	N.A.	N.A.	N.A.	60°	N.A.	N.A.	N.A.	YES	1	SPOT	0.85

If removable, bolts used (describe other fastening) N.A.  
 (Material spec. number, grade, size, number)

8. Type of jacket N.A. Jacket closure N.A.  
 (Describe as ogee and weld, bar, etc.)

If bar, give dimensions N.A. If bolted, describe or sketch.  
 9. MAWP 600 100 KPa at max. temp. 340 340 °C Min. design metal temp. -9 °C at 600 KPa.  
 (Internal) (External) (Internal) (External)

10. Impact test NO, AS PER UCS 66(a)(c) at test temperature of N.A. °C.  
 [Indicate yes or no and the component(s) impact tested]

11. Hydro., ~~preu.~~ or ~~comb.~~ test pressure 7.8 Bar Proof test N.A.

Items 12 and 13 to be completed for tube sections.

12. Tubesheet SA 266 GR. 2 1070 mm 80 mm 1.6 mm WELDED  
 [Stationary (material spec. no.)] [Diameter (subject to press.)] (Nominal thickness) (Corr. allow.) [Attachment (welded or bolted)]  
N.A. N.A. N.A. N.A. N.A.  
 [Floating (material spec. no.)] (Diameter) (Nominal thickness) (Corr. allow.) (Attachment)  
 13. Tubes SA 210 GR. A1 15.87 mm 2.11 mm 560 U  
 (Material spec. no., grade or type) (O.D.) (Nominal thickness) (Number) [Type (straight or U)]

Items 14-18 incl. to be completed for inner chambers or jacketed vessels or channels of heat exchangers.

14. Shell: (a) No. of course(s) 1 (b) Overall length 337 mm

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter	Length	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	I.D. 1070 mm	337 mm	SA516 GR 70	15 mm	1.6mm	1	SPOT	0.85	1	SPOT	0.85	N.A.	N.A.

15. Heads: (a) SA266 GR. 2 (b) N.A.  
 (Material spec. number, grade or type) (H.T. - time and temp.) (Material spec. number, grade or type) (H.T. - time and temp.)

	Location (Top, Bottom, Ends)	Thickness mm		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
(a)	END	86	1.6	N.A.	N.A.	N.A.	N.A.	N.A.	1106 mm	N.A.	N.A.	N.A.	N.A.	N.A.
(b)														

If removable, bolts used (describe other fastening) SA 193 B7 / SA194 2H, Ø 7/8" x 215, N° 40  
 (Material spec. number, grade, size, number)

**FORM U-1 (Back)**

16. MAWP 1600 N.A. KPa at max. temp. 150 N.A. °C Min. design metal temp. -29 °C at 1600 KPa.  
 (Internal) (External) (Internal) (External)

17. Impact test YES, POS. 350, 421 and 502 at test temperature of -29 °C.  
 [Indicate yes or no and the component(s) impact tested]

18. Hydro., ~~pneu., or comb.~~ test pressure 20.8 Bar Proof test N.A.

19. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Flange Type	Material		Nozzle Thickness		Reinforcement Material	How Attached		Location (Insp. Open.)
				Nozzle	Flange	Nom.mm	Corr.mm		Nozzle	Flange	
S1 FINNED COIL INLET	1	4" 300#	WN RF	SA333GR6	SA105	8.56	1.6	SA516 GR70	UW16.1(d)	(2)	N.A.
S2 FINNED COIL OUT.	1	5" 300#	WN RF	SA333GR6	SA105	8.56	1.6	SA516 GR70	UW16.1(d)	(2)	N.A.
S3 SAFETY DEVICE	1	3" 300#	WN RF	SA333GR6	SA105	9.52	1.6	N.A.	UW16.1(d)	(2)	N.A.
S4 VACUUM PUMP	1	1" 150#	WN RF	SA333GR6	SA105	4.55	1.6	N.A.	UW16.1(d)	(2)	N.A.
S5 MANHOLE	1	24" 150#	WN RF	SA516GR70	SA105	25	1.6	SA516 GR70	UW16.1(d)	(2)	N.A.
S6 SILICONE OIL OUTLET	1	12" 300#	LJ RF	SA333GR6	SA105	12.7	1.6	SA516 GR70	UW16.1(d)	(2)	N.A.
S7 LEVEL GAUGE	1	1" 150#	WN RF	SA333GR6	SA105	4.55	1.6	N.A.	UW16.1(d)	(2)	N.A.

20. Supports: Skirt NO Lugs NO Legs NO Others SADDLES Attached WELDED TO SHELL  
 (Yes or no) (Number) (Number) (Describe) (Where and how)

21. Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report (list the name of part, item number, Manufacturer's name and identifying number):

EXPANSION JOINT POS. 231, by INOFLEX S.r.l., SERIAL NUMBER 47290/1

22. Remarks -SEE FORM U1A (SUPPLEMENTARY SHEET FOR FINNED COIL SIDE).

(1) -SEE FORM U4 (SUPPLEMENTARY SHEET ).

(2) TABLE UW 12, JOINT CATEGORY B, RT SPOT.

(\*) APPLICABLE FOR N°2 INTERNAL FINNED COILS POS. 800, MANUFACTURER: EUROCOIL S.p.A., DWG:DG62.4 Rev. 4

**CERTIFICATE OF SHOP COMPLIANCE**

We certify that the statements in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1.

U Certificate of Authorization Number 26,200 Expires 27 February, 2013

Date 25 JUNE 2010 Name COSTRUZIONI INDUSTRIALI CIVIDAC S.P.A. Signed \_\_\_\_\_

(Manufacturer)

(Representative)

C.I. CIVIDAC S.p.A.  
G.C. MGR. P. MEMO

**CERTIFICATE OF SHOP INSPECTION**

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of NEBRASKA and employed by ARISE INCORPORATED of OHIO have inspected the pressure vessel described in this Manufacturer's Data Report on 25 JUNE 2010, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 25 JUNE 2010 Signed Mr. UMBERTO BREDIA Commissions NB 13616A, NE 10249

(Authorized Inspector)

(National Board (incl. endorsements), State, Province, and number)

**CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE**

We certify that the statements in this report are correct and that the field assembly construction of all parts of this vessel conforms with the requirements of ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. U Certificate of Authorization Number \_\_\_\_\_ Expires \_\_\_\_\_

Date \_\_\_\_\_ Name \_\_\_\_\_ / \_\_\_\_\_ Signed \_\_\_\_\_

(Assembler)

(Representative)

**CERTIFICATE OF FIELD ASSEMBLY INSPECTION**

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of \_\_\_\_\_ and employed by \_\_\_\_\_ of \_\_\_\_\_, have compared the statements in this Manufacturer's Data Report with the described pressure vessel and state that parts referred to as data items \_\_\_\_\_, not included in the certificate of shop inspection, have been inspected by me and to the best of my knowledge and belief, the Manufacturer has constructed and assembled this pressure vessel in accordance with the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of \_\_\_\_\_. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date \_\_\_\_\_ Signed \_\_\_\_\_ Commissions \_\_\_\_\_

(Authorized Inspector)

(National Board (incl. endorsements), State, Province, and number)

**FORM U-4 MANUFACTURER'S DATA REPORT SUPPLEMENTARY SHEET**  
**As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1**

1. Manufactured and certified by COSTRUZIONI INDUSTRIALI CIVIDAC S.P.A, Via Borgo Cattanei,35,San Biagio di Callalta Treviso 31048  
(Name and address of Manufacturer)

2. Manufactured for TURBODEN S.r.l. - Via Cernaia 10 - Brescia - Italy  
(Name and address of Purchaser)

3. Location of Installation TG-TRANSGAS, ROSETOWN COMPRESSOR STATION, NE 21-30-14W3, ROSETOWN,SASKATCHEWAN,2S0L 2V0 - CANADA  
(Name and address)

4. Type: HORIZONTAL EXCHANGER 4320  
(Horiz. , Vert. , or sphere) (Tank, separator, heat exh. , etc.) (Mfg's serial No.)

OH1085.3 6725-2010 REV. 1 647 2010  
(CRN) (Drawing No.) (Nat'l. Bd. No.) (Year built)

Data Report

Item Number

Remarks

19. Nozzles, Inspection and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Flange Type	Material	Nom. Thick. mm	Reinforcement Material	How Attached	Location (Insp. Open.)
S10 DRAIN	1	1/2" NPT	ANSI B1.20.1	SA333 GR. 6	4.55	N.A.	UW 16.1 (d)	N.A.
S12 VENT	1	1/2" NPT	ANSI B1.20.1	SA106 GR. B	4.78	N.A.	UW 16.1 (d)	N.A.
S13 INSTRUMENT	1	1/2" 150#	WN-RF	SA106 GR. B	4.78	N.A.	UW 16.1 (d)	N.A.
S14 INSTRUMENT	2	3" 150#	BL-RF	SA333 GR. 6	2.77	N.A.	(2)	N.A.
S15 BY-PASS INLET	1	6" 300#	WN-RF	SA420 WPL 6	10.97	N.A.	UW 16.1 (d)	N.A.
S16 INSTRUMENT	1	1/2" 150#	WN-RF	SA106 GR. B	4.78	N.A.	UW 16.1 (d)	N.A.
S18 INSTRUMENT	1	1/2" 150#	WN-RF	SA333 GR. 6	2.77	N.A.	(2)	N.A.
S19 VENT	1	1/2" NPT	ANSI B1.20.1	SA333 GR. 6	2.77	N.A.	(2)	N.A.
S20 IN. FOR TURBINE	1	SPEC.	SPEC.	SA 516 GR. 70	30	N.A.	UW 16.1 (d)	N.A.
T1 WATER INLET	1	8" 150#	WN-RF	SA333 GR. 6	12.7	N.A.	UW 16.1 (d)	N.A.
T2 WATER OUTLET	1	8" 150#	WN-RF	SA333 GR. 6	12.7	N.A.	UW 16.1 (d)	N.A.
T3 VENT	1	1/2" NPT	ANSI B1.20.1	SA420 WPL 6	4.78	N.A.	UW 16.1 (a)	N.A.
T4 DRAIN	1	1/2" NPT	ANSI B1.20.1	SA420 WPL 6	4.78	N.A.	UW 16.1 (a)	N.A.
T6 SERVICE	1	1" 150#	WN-RF	SA333 GR. 6	4.55	N.A.	UW 16.1 (d)	N.A.
T7 SERVICE	1	1" 150#	WN-RF	SA333 GR. 6	4.55	N.A.	UW 16.1 (d)	N.A.

- TABLE UW12,JOINT CATEGORY B , RT SPOT

- SAFETY VALVE LOCATED ON PIPING USER'S RESPONSABILITY.


Certificate of Authorization: Type U No. 26,200 Expires 27 FEBRUARY 20, 13

Date 25 JUNE 2010 Name COSTRUZIONI INDUSTRIALI CIVIDAC S.P.A. Signed [Signature] C.I. CIVIDAC S.p.A.  
(Manufacturer) (Representative)

Date 25 JUNE 2010 Name Mr. UMBERTO BREDA Commission NB 13616A , NE 10249  
(Authorized Inspector) (Nat'l Board incl. endorsement, State, Province and No.)



**FORM U-2 (Back)**

15. Heads : (a)  (Material spec.number, grade or type) (H.T. -- time and temp.) (b)  (Material spec.number, grade or type) (H.T. -- time and temp.)

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
(a)														
(b)														

If removable, bolts used (describe other fastening)  (Material spec. number, grade, size, number)

16. MAWP  (Internal)  (External) at max. temp.  (Internal)  (External) Min. design metal temp.  at

17. Impact test  [Indicate yes or no and the component(s) impact tested] at test temperature of

18. Hydro., pneu., or comb. test pressure  Proof test

19. Nozzles, inspection and safety valve openings :

Purpose (Inlet, Outlet, Drain, etc.)	No	Diameter or Size	Flange Type	Material		Nozzle Thickness		Reinforcement Material	How Attached		Location (Insp. Open.)
				Nozzle	Flange	Nom.	Corr.		Nozzle	Flange	

20. Identification of part(s) :

Name of Part	Quantity	Line No.	Mfr's. Identification No.	Mfr's Drawing No.	CRN	National Board No.	Year Built

21. Supports : Skirt  (Yes or no) Lugs  (Number) Legs  (Number) Others  (Describe) Attached  (Where and how)

22. Remarks : Bellows ( Item T10HR ) in SA 240 Tp 321 with 8 corrugations and 2 plies thk 1 mm. Bellows attached by fillet welds in accordance with APP.26 fig. 26.2 to number two shell courses in SA 516 Gr. 70.  
 - Impact test exempted per UHA 51 (d) (e) (f), UCS-66 and UG-20 (f)  
 - Lateral movement : 0.196" Lateral spring rate : 54494.90 lb/in  
 - Cycled required : > 1000 E = 1 for bellows E = 0.7 for carbon steel  
 - Internal hydrostatic test to be performed by client.  
 - HT : No on bellows  
 - Expansion bellows designed and constructed in accordance with APP. 26 by Inoflex

CERTIFICATE OF SHOP/FIELD COMPLIANCE			
We certify that the statements in this report are correct and that all details of material, construction, and workmanship of this pressure vessel part conform to the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1.			
U Certificate of Authorization Number	<b>28,858</b>	Expires	<b>MARCH , 12 2011</b>
Date	<b>May 12, 2010</b>	Name	<b>INOFLEX s.r.l. (Manufacturer)</b>
		Signed	<b>V. Sphardt (Representative)</b>

CERTIFICATE OF SHOP/FIELD INSPECTION			
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of <b>VIRGINIA</b> and employed by <b>L.R. INSURANCE INC.</b> of <b>DELAWARE</b> have inspected the pressure vessel part described in this Manufacturer's Data Report on <b>May 12, 2010</b> and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel part in accordance with ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel part described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.			
Date	<b>May 12, 2010</b>	Signed	<b>G. Agozzino (Authorized Inspector)</b>
		Commissions	<b>NB. 10719 - "A" VA 639</b> [National Board (incl. endorsements), State, Province and number]



Ministry of  
Corrections, Public  
Safety and Policing

Licensing and Inspections

Boiler & Pressure Vessel Safety  
330 - 1855 Victoria Avenue  
Regina, SK S4P 3T2

## REGISTRATION APPROVAL

SASK TOLL FREE: 1-866-530-8595  
or PHONE: (306) 787-1443

FAX : (306) 787-9273

Wednesday, June 23, 2010  
Eurocoils S.p.A.  
Via del Glicine 21  
Bovolone  
Verona, Italy

ATTENTION : Fresno Giovannoni

Our File : 8225 [ 0 F

With reference to your submission respecting the registration of the item below, for legal use in the province, please note we have surveyed, approved and registered this design as noted.

<b>MANUFACTURER :</b> Eurocoils S.p.A.	
<b>CATALOG OR DRAWING :</b> DG62.4 Rev. 4	
<b>ITEM :</b> Finned Block Heat Exchanger	<b>CRN :</b> OH1085.3

We wish to point out that every fitting must be constructed strictly in accordance with the registered design.

Fitting registrations are required to be resubmitted for validation after ten (10) years from the registration date in accordance with CSA B51, Clause 4.2.1. The date of expiry for this registration is June 23, 2020.

Sincerely,

Shane Kleisinger  
Codes and Standards Compliance

REMARKS:

PRESSIONE Pressure	DI PROGETTO Design	PS bar.g	6/F.V.	19/-1 F.V.	-	
	DI ESERCIZIO Operating	IN/OUT bar.g	<6	<19	-	
	PROVA IDRAULICA (POS. ORIZZ.) Hydraulic Test (Horiz. Pos.)	PT bar.g	14	30.5	-	
	PROVA IDRAULICA (POS. VERTIC.) Hydraulic Test (Vertic. Pos.)	PT bar.g	-	-	-	
	PROVA PNEUMATICA Pneumatic test	PT bar.g	-	30.5	-	
MANIP Manip	PT bar.g	-	-	-	-	
TEMPERATURE Temperature	DI PROGETTO (NOTA 10) Design	Min/Max Min/Max	TS °C	-10/340	-10/300	-
	DI ESERCIZIO Operating	IN/OUT In/Out	°C	-10/300	-10/300	-
	MONIT Mgmt	°C	-	-	-	-
SOVRASPESORE DI CORROSIONE Corrosion Allowance		mm	0	0	-	
EFFIC. DEI GIUNTI Joint efficiency	FASCIAIE Shell	0.85	1	DOVE APPLICABILE	-	
	FONDI Heads	1	N.A.	-	-	
CATEGORIA DI COSTRUZIONE Construction Category			2/2b	3	-	
FLUIDI Fluids	NATURA Nature		Olio silconico	Olio silconico	-	
	STATO FISICO Physical state		VAPORI	LIQUIDO	-	
	PESO SPECIFICO Specific weight	kg/dm <sup>3</sup>	-	-	-	
GRUPPO DEL FLUIDO PED 97/23 CE Fluid Group PED 97/23 CE			1	1	-	
CAPACITA' DELLE CAMERE Box capacity		Lt.	-	260	-	
CATEGORIA PED 97/23 CE Category PED 97/23 CE			-	IV	-	
MODULO APPLICABILE PED 97/23 CE Applicable module PED 97/23 CE			-	B+F	-	
CATEGORIA - MODULO APPARECCHIATURA Category - Module unit			IV - B+F		-	
NUMERO PASSAGGI Number of passes			1	N.A.	-	
TALLONI DI SALDATURA Weld test pieces	FASCIAIE Shell	-	NO	-	-	
	FONDI Heads	-	NO	-	-	
TRATTAMENTO TERMICO DOPO SALDATURA Postweld heat treatment			NO	NO	-	
SPESSORE DI COIBENTAZIONE Insulation thk.		mm	-	NO	-	
CARICHI DEL SISMA Seismic loads			ASSENTI (N.A.)		-	
CARICHI DEL VENTO Wind loads			ASSENTI (N.A.)		-	
CARICHI LOCALIZZATI Local loads			ASSENTI (N.A.)		-	
ANNO DI COSTRUZIONE Year built	TIPO TEMA Tema type		SUPER. DI SCAMBIO Surface for exch.	DESTINAZIONE Location		
-	N.A.		- m <sup>2</sup>	-		

TIMBRE E FIRMA DEL COSTRUTTORE  
Manufacturer stamp and signature

DRN. **DM10.86.3**

File. **B.225**

REVISIONI

Date. **June 24/2010**

FINITURA SUPERFICI ESTERNE  
External Finishing Surfaces

Design Survey Office

FINITURA SUPERFICI INTERNE  
Internal Finishing Surfaces

A VUOTO Location	TOLLERANZE SUGLI SPESSORI THK. tolerance	
~2250 Kg.		
PIENO H <sub>2</sub> O Full of water	LAMIERE Plate	Carbon steel Stainless steel
~2510 Kg.		SECONDO EN 10028-1 or ASME VIII Div. "UG-16"
FASCIO TUBERO Tube bundle	TUBI Pipe	Carbon steel Stainless steel
- Kg.		-12.5 % -12.5 %
IN ESERCIZIO Operating	OVALIZZAZIONE Ovalization	0.5 %
- Kg.		

5					
4	MODIFICATA NORMA DI PROGETTO E POSIZ. BOCCOLA 25	22.01.10	M.P.	M.S.	F.G.
3	MODIFICATI DATI DI PROGETTO LATO TUBI	05.03.07	M.P.	M.S.	F.G.
2	UNIFORMATI I MATERIALI E GLI SPESSORI DEI TUBI COLLETTORI	05.09.06	M.P.	M.S.	F.G.
1	ALLUNGATO COLLETTORE DI 200mm COME DA RICHIESTA CLIENTE	30-06-05	A.H.	G.F.	L.B.
0	EMESSO PER APPROVAZIONE	15-03-05	A.H.	G.F.	L.B.
No. Is.	REVISIONI Revision	DATA Date	DISEGN. Drawn	CONTROLL. Checked	APPROVATO Approvate

CONSTRUTTORE - Manufacturer : **Eurocoil**

CLIENTE - Client : **TURBODEN T800**

DESCRIZIONE - Description : **BATTERIA REFRIGERANTE**

N. FABBRICA - Serial n. : -

COMMESSA - Job : -

SCALA - Scale : 1:12.5

No. PEZZI - No. Pieces : -

SIGLA - Item : 25 22N W01 61 32 16 1700 122C

DISEGNO - Drawing : **DG62.4**

RICAVATO DA - From : -

PROPRIETA' DEL PROGETTO RISERVATA AI TERMINI DI LEGGE  
Design ownership reserved as prescribed by the law

REV. **0 1 2 3 4**

ED SAFETY SYSTEMS

ED FOR EROSTON,

SURE

ORMAL

11/96".

SITIONEDS

ANG RRY IN TICU.

ES AND BODY

PART.

LEANED.

CONTROLLO ULTRASONICO EXAMINATION NOTE NOTES

ATION

Rev. 10/1

Co. STB No.0186/05 Eurocoil

FORMATO A1



*Costruzioni Industriali Cividac Spa*  
*S. Biagio di Callalta – Treviso – Italy*  
Tel. 0039.0422.895090 – Fax 0039.0422.895121 – Email [info@cividac.com](mailto:info@cividac.com)

# SECTION

# B



CORROSION ALLOWANCE INT./ EXI.					
FLUIDO FLUID	NATURA FLUID NATURE		SILICONE OIL	WATER	SILICONE OIL
	STATO FISICO FLUID PHYSICAL STATE		LIQUID / VAP.	LIQUID	LIQUID
	PESO SPECIFICO FLUID SPECIFIC GRAVITY	kg/m <sup>3</sup>	0.83 vap. 750 liq.	~1000	~700
OVALIZZAZIONE MASSIMA OUT OF ROUNDNESS		%	≤1	≤1	≤1
SUPERFICIE DI SCAMBIO HEAT EXCHANGE SURFACE		m <sup>2</sup>	/	780	/
Nr. PASSAGGI NUMBER OF PASSES			1	2	/
COEFF. SISMICO I/S/Z (ASCE 7/88) COEFF. SEISMIC I/S/Z (ASCE 7/88)			1.25 / 1.2 / 0.375		
MODULO DI EFFICENZA SALDATURE WELDED JOINTS EFFICIENCY			0.85	0.85	0.7
CONTROLLO RADIOGRAFICO RADIOGRAPHY TEST	FONDO IN 1 PEZZO HEAD IN 1 PIECE		/	/	/
	MANTELLO (NOTA 12) SHELL (NOTE 12)		10% + 100% (*) (* )INCROCI-CROSSING WELD	10% + 100% (*) (* )INCROCI-CROSSING WELD	10%
TRATTAMENTO TERMICO DOPO SALDATURA POST WELD HEAT TREATMENT			NO-NONE	NO-NONE	NO-NONE
TALLONE DI PRODUZIONE WELDING TEST COUPON			NO	NO	NO
CAPACITA' CAPACITY		L	20200	850	750
PESO TOTALE TOTAL WEIGHT	A VUOTO EMPTY	kg	18200		
	PIENO D'ACQUA FULL OF WATER	kg	40000		

**U-STAMP**

ARISE  
Reviewed by  
ASME AI - U. BREDA  
13616 A 13/04/2010

C.I. CIVIDAC S.p.A.  
C.I. INCR. P. MEMO

13/04/2010

IMPIANTO DI DESTINAZIONE: SASKATCHEWAN - CANADA  
PLANT LOCATION

CLIENTE: TURBODEN  
CUSTOMER

N° DI FABBRICA: 4320  
SERIAL NUMBER

N.B. : 647

1	MODIFICATO DOVE INDICATO CON MODIFIED WHERE INDICATED WITH	①	PANIGHEL	13-04-2010	DONADI	13-04-2010	Corcella	13-04-2010
0	EMESSO PER APPROVAZIONE ISSUED FOR APPROVAL		PANIGHEL	02-03-2010	DONADI	02-03-2010		02-03-2010
N° No°	MODIFICHE DESCRIPTION		PREPARATO PREPARED	DATA DATE	CD CHECKED	DATA DATE	APPROVATO APPROVED	DATA DATE

TITOLO SERVICE **RIGENERATORE/CONDENSATORE - ITEM : IMPIANTO TURBODEN 10 HR ASSIEME**  
**REGENERATOR/CONDENSER - ITEM: PLANT TURBODEN 10 HR ASSEMBLY**

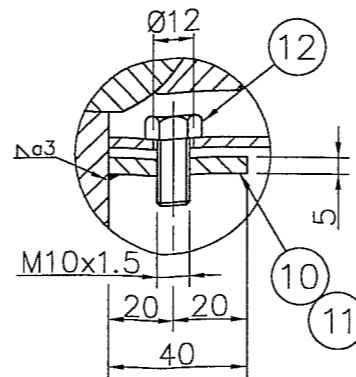
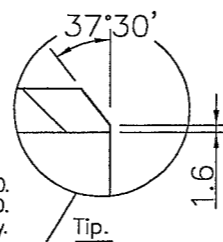
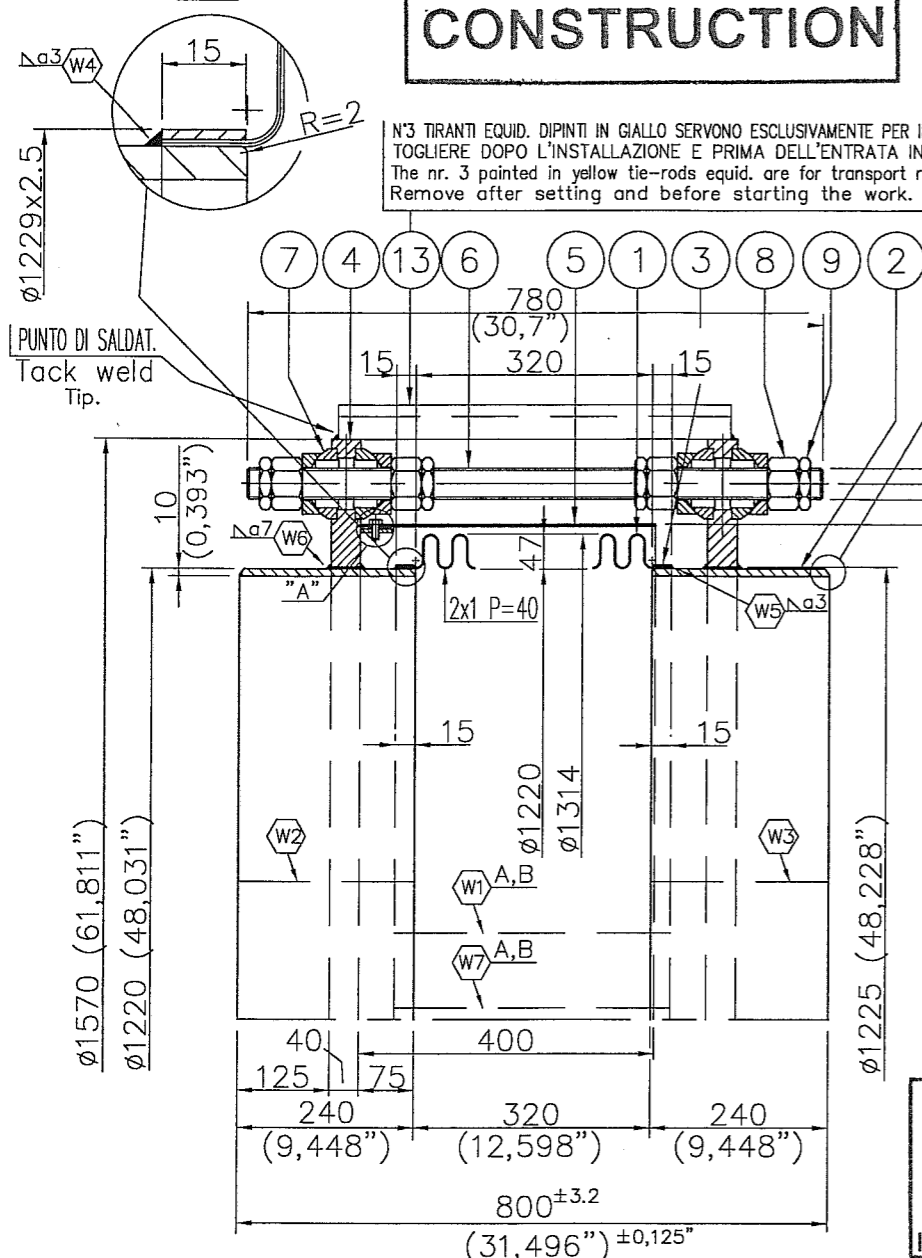
DATA DATE	02-03-2010	 COSTRUZIONI INDUSTRIALI <b>CIVIDAC</b> S. p. A. 31048 SAN BIAGIO DI CALLALTA - TREVISO ( ITALY ) LOCALITA' CAVRIE' TEL. 0422/895090 FAX 0422/895121 e-mail : info@cividac.com	 CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001:2008	CLIENTE CUSTOMER	TURBODEN			
SCALA SCALE	1:30			COMM. JOB.	2010/005/T			
DISEGN. DRAFTSMAN	PANIGHEL			REV.	0	1		
CONTR. CHECKED	DONADI			DIS. Nr. DWG. Nr.	6725-2010			

Il presente disegno e' di proprieta' della C.I.CIVIDAC S.p.A., e non puo' essere mostrato ad altri ne in originali ne in copia, se non con nostra autorizzazione scritta.  
The C.I.CIVIDAC S.p.A. is the exclusive owner of this drawing which can not be shown to others either in original or in copy without our written authorization.

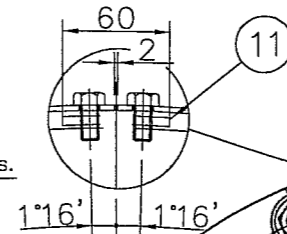
DETTAGLIO MONTAGGIO SOFFIETTO (Tip.)  
Bellows installation detail (Tip.)

# ASME CONSTRUCTION

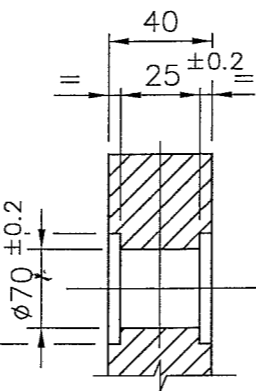
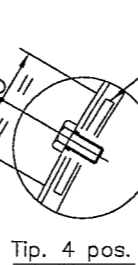
N°3 TIRANTI EQUID. DIPINTI IN GIALLO SERVONO ESCLUSIVAMENTE PER IL TRASPORTO. TOGLIERE DOPO L'INSTALLAZIONE E PRIMA DELL'ENTRATA IN ESERCIZIO. The nr. 3 painted in yellow tie-rods equid. are for transport reasons only. Remove after setting and before starting the work.



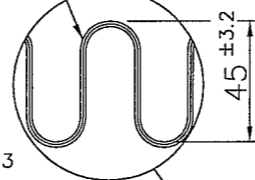
Tip. 2 pos.



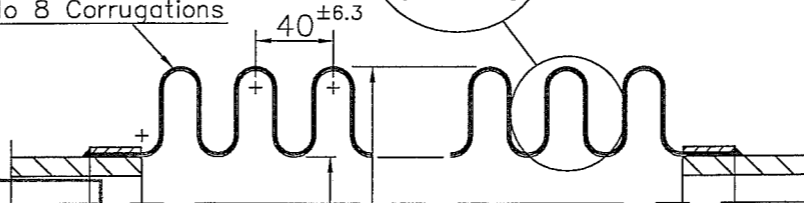
IL COMPENSATORE NON E' VERNICIATO  
The expansion joint is not painted



No 2 Plies thk 1 mm



No 8 Corrugations



DETTAGLIO SOFFIETTO  
Bellows detail

ASME VIII Div. 1 STAMP U  
ED. 2007 add. 2009

**AS BUILT**  
INOFLEX QA Mer. *[Signature]*

(\*) - Required by USER

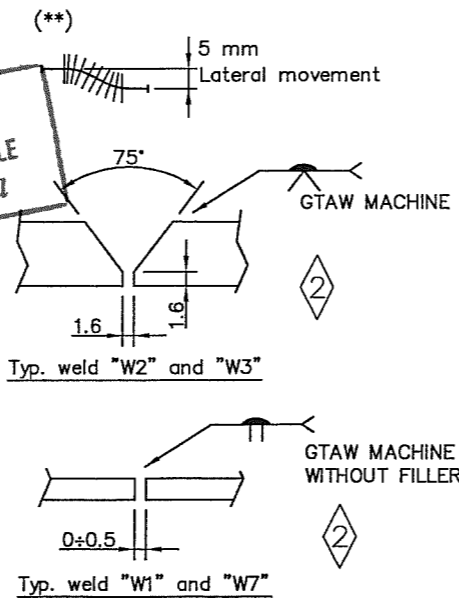
DN	Ø1200	serial n.	47290/001	year	2010	INOFLEX
max. press.	6/FV	bar	test press.	11.3	bar	temp. max.
Item		travel X	mm	travel Y	mm	travel Z
		travel X	mm	travel Y	mm	travel Z
		travel X	mm	travel Y	mm	travel Z

(DI COSTRUZIONE, FORNITURA E MONTAGGIO)  
(Of construction, furnishing and installing)

LR INSURANCE, INC.  
G. Aguzzino - Authorized Inspector  
Witnessed Reviewed

**INOFLEX s.r.l.**  
COPIA CONFORME ALL'ORIGINALE  
True copy to the original

NOTES:  
E=1 BELLOWS - E= 0,7 CARBON STEEL  
E=1 BELLOWS - E= 0,7 CARBON STEEL  
CORROSION CARBON STEEL: 1,6 mm (0,062")  
HYDROTEST PERFORMED BY CLIENT  
MAWP: 6 bar at 340 °C  
MDMT= -9 °C at 6 bar  
IMPACT TEST: EXEMPTED PER UHA 51-UCS 66 UG-20(f)  
HT ON BELLOWS: NO



PROGETTO Design	6/FV bar (87,02/FV psi)
MASSIMA Max.	6/FV bar (87,02/FV psi)
PROVA Test	11.3 bar (163,88 psi) (*)
PROGETTO Design	340 °C (644 F)
MASSIMA Max.	340 °C (644 F)
TEMP. MIN. M D M T	-9 °C (15,8 F) (2)
ASSIALE Axial	-
LATERALE Lateral	5 mm (0,196") (**)
ANGOLARE Angular	-
FLUIDO Fluid	OLIO SILICONICO/Silic. oil
PEZZI N° Pieces no.	1
SIGLA item	-
CICLI Cycles	≥ 1000
COLLAUDO Test	PCQ-47290

POS.	DIS. N° Dwg no.	DENOMINAZIONE Denomination	PEZZI N° Pieces no.	MATERIALE Material	NOTE Notes	LAV.
14		TARGA DI IDENTIFICAZIONE/Identif. plate	1	S/S 304		I
13		PROFILATO/Beam 25 x 25 x 3 L= 530	3	S 235 JR		I
12		VITE T.E./Screw M10x1.5 UNI 5725	8	SA 193 GR. B8		I
11		PIATTO/Plate 40x5 L= 60	2	S 235 JR		I
10		PIATTO/Plate 40x5 L= 60	4	S 235 JR		I
9		DADI ESAG./Exag. nut EN-4035-CAT.B M42x3	32	6S	GALVANIZ.	E
8		DADI ESAG./Exag. nut EN-4033-TIPO 2 CAT. B M42x3	32	SA 194 GR 2H	GALVANIZ.	E
7		SCODELLA SFERICA/Spherical cup TIPO/Type 42	32	CF 35 S Mn Pb 10	GALVANIZ.	I
6		FILETTATO/Stud bolt M 42x3 L= 780	8	SA 193 GR B7	GALVANIZ.	E
5		PROTEZIONE/Cover Ø 1340 x 3 L= 400	1	S 235 JR	IN DUE META/Two half	I
4		PIASTRA/Plate Ø 1570 SP= 40	2	SA 516 GR. 70		EI
3		ANELLO/Ring Ø 1225 x 2.5 L= 15	2	SA 240 TP 321	SV. 3840	I
2		MANICOTTI/Pipe Ø 1220 x 10 L= 240	2	SA 516 GR. 70		E
1	FS-47290-1	SOFFIETTO/Bellows Ø 1314 L= 350	1	SA 240 TP 321	ONDE/Corrug. N° 8	EI

REV. Rev.	DESCRIZIONE Description	DISEGNATO Drawn by	VERIFICATO Verified	APPROVATO Approved	DATA Date	COMMESSA Job
0	EMISSIONE		OS	FE	17-03-10	47290
1	MODIF. IN ACCORDO MAIL TO/TH DEL 01-04-2010 Modified according to mail TO/TH of 01-04-2010		OS	FE	06-04-10	
2	MODIFICATO DOVE/Modified where (2)		OS	FE	20-04-10	
3			-	-		SOSTITUITO DA N° This dwg. superseded by
4			-	-		SOSTITUISCE IL N° This dwg. supersedes

DIMENSIONI IN mm  
Dimensions in mm

TITOLO Title  
**COMPENSATORE LATERALE SFERICO**  
Spherical lateral expansion joint  
TIPO/Type SUW DN-1200

SCALA Scale

IL SEGUENTE DISEGNO E' PROTETTO A TERMINI DI LEGGE.  
This drawing is protected according to the law.

CLIENTE Customer  
**TURBODEN S.r.l.**



*Costruzioni Industriali Cividac Spa*  
*S. Biagio di Callalta – Treviso – Italy*

*Tel. 0039.0422.895090 – Fax 0039.0422.895121 – Email [info@cividac.com](mailto:info@cividac.com)*



# SECTION

# C



**Headquarters & workshop:**  
 Via Borgo Cattanei, 35  
 Località Cavriè  
 31048 San Biagio di Callalta  
 Treviso – ITALY

Tel. +39-0422-895090  
 Fax. +39-0422-895121  
 info@cividac.com

DOCUMENT No.	<b>CAL/2010/005</b>	REV.	FOGLIO	DI
		0	C	162
		REV.	SHEET	OF

DOCUMENT TITLE : **CALCULATION SHEET**

EQUIPMENT NAME : **CONDENSER / REGENERATOR**

EQUIPMENT TAG No : **TURBODEN 10 HR**

EQUIP. SERIAL No. : **4360**

CIVIDAC CV No. : **2010 / 002 / PR**

CIVIDAC JOB No. : **2010 / 005 / T**

DWG. NO. NUMBER : **10PU-000265-PR**

CLIENT: : **TURBODEN**

**ARISE**  
 Reviewed by  
 ASME AT 11. BREDA  
 13/03/2010 13816 A

REV.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
0	31/03/2010	FIRST ISSUE	PTR	LD	<i>Fonella</i>

**MANUFACTURER' S DESIGN REPORT**  
**AS PER ASME SECT. VIII - DIV. 1 - 2007 ED.+2009b Addenda**

**REGENERATOR/CONDENSER DWG 6725-2010**

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**DESIGN DATA**

	SHELL SID	TUBE SIDE	FINNED COIL
DESIGN PRESSURE (MAWP)	600 KPa g.	1600 KPa g.	1900/F.V. KPa g.
EXTERNAL DESIGN PRESSURE	F.V.	----	600/F.V. KPa g.
HYDROSTATIC TEST PRESSURE	780 KPa g.	2080 KPa g.	2470 KPa g.
DESIGN TEMPERATURE	340°C(1)	150°C(1)	300°C
CORROSION ALLOWANCE	1.6 mm	1.6 mm	1.6 mm
WELD JOINT EFFICIENCY	0.85	0.85	0.7
RADIOGRAPHY TEST	10%	10%	10%
POST WELD HEAT TREATMENT	NONE	NONE	NONE

NOTES:

- (1) DESIGN TEMPERATURE OF TUBESHEET = 265°C
- (2) FINISHED OPENING NOT LARGER THAN 60 mm ON AND FINISHED OPENING NOT LARGER THAN 89 mm DO NOT REQUIRE REINF. CALCULATION. SEE UG.36(c) (3) (a)
- (3) MAWP IS ASSUMED AS THE DESIGNE PRESSURE EVEN IF THE PROGRAM SHOW THE CALCULATION OF THE MAWP.

**ALLOWABLE STRESSES OF MATERIAL: SHELL SIDE**

	MATERIAL	St psig AT 20°C	Sd psig At340°C	RATIO S20°C/S340°C
SHELL	SA 516 Gr.70	138	129.6	1.064
HEAD	SA 516 Gr.70	138	129.6	1.064
FORGING	SA 266 Gr.2	138	123.2	1.120
PIPES	SA 336 Gr.6	118	117.4	1.005
TUBES	SA 210 Gr.1	118	117.4	1.005
BOLTING	SA 193 Gr.B7	172	172	1

**MIN.RATIO St(20°C) / Sd(340°C) = 1**

**HYDRAULIC TEST PRESSURE AT TOP OF VESSEL: (UG-99b)**

**= 1.3 x DP x (S20°C/S340°C) = 1.3 x 600 x 1 = 780 KPa = 0.78 MPa**

**MAP AND MAWP RECAPITULATION-INTERNAL PRESSURE (SHELL SIDE)**

	MAP new and cold	MAWP hot and corr
	MPa	MPa
HEAD POS.201	2.174	1.891
REINF.NOZZLE S20 POS.230	0.699	0.607
REINF.NOZZLE S3	1.043	0.914
REINF.NOZZLE S15	0.994	0.872
CYLINDR.SHELL POS.101-102	1.474	1.236
REINF.NOZZLE S1	1.474	1.236
REINF.NOZZLE S2	1.474	1.236
REINF.NOZZLE S6	1.263	1.084
CONICAL HEAD POS.301	0.788	0.666
REINF.NOZZLE S5	0.691	0.606
CYLINDR.SHELL POS.302	3.234	2.710
CYLINDR.SHELL POS.230	2.168	1.700
FLANGE POS.232	1.216	0.910
TUBESHEET POS.350	2.711	1.808
TUBES POS.351	24.650	19.581

**MAWP hot and corr. = 0.606 MPa LIMITED BY NOZZLE S5**

**MAP new and cold = 0.691 MPa LIMITED BY NOZZLE S5**



**MAP AND MAWP RECAPITULATION-EXTERNAL PRESSURE (SHELL SIDE)**

	MAP new and cold	MAWP hot and corr
	MPa	MPa
HEAD POS.201	0.916	0.565
REINF.NOZZLE POS.230	0.916	0.565
REINF.NOZZLE S3	0.916	0.565
REINF.NOZZLE S15	0.916	0.565
CYLINDR.SHELL POS.101-102	0.235	0.152
REINF.NOZZLE S1	0.178	0.152
REINF.NOZZLE S2	0.178	0.152
REINF.NOZZLE S6	0.235	0.152
CONICAL HEAD POS.301	0.330	0.203
REINF.NOZZLE S5	0.330	0.203
CYLINDR.SHELL POS.302	1.743	1.001
CYLINDR.SHELL POS.230	1.041	0.558

**MAWP hot and corr. = 0.178 MPa LIMITED BY NOZZLES S1-S2**

**MAP new and cold = 0.152 MPa LIMITED BY SHELL POS.101-102**

**ALLOWABLE STRESSES OF MATERIAL:TUBE SIDE**

	MATERIAL	St psig AT 20°C	Sd psig At150°C	RATIO S20°C/S150°C
SHELL	SA 516 Gr.70	138	138	1
FORGING	SA 266 Gr.2	138	138	1
PIPES	SA 336 Gr.6	118	118	1
TUBES	SA 210 Gr.1	118	117.4	1.005
BOLTING	SA 193 Gr.B7	172	172	1

**MIN.RATIO St(20°C) / Sd(150°C) = 1**

**HYDRAULIC TEST PRESSURE AT TOP OF VESSEL: (UG-99b)**

**= 1.3 x DP x (S20°C/S150°C) = 1.3 x 1600 x 1 = 2080 KPa = 2.08 MPa**

**MAP AND MAWP RECAPITULATION-INTERNAL PRESSURE (TUBE SIDE)**

	MAP new and cold	MAWP hot and corr
	MPa	MPa
CHANNEL BARREL POS.420	3.234	2.886
REINF.NOZZLE T1	2.155	1.853
REINF.NOZZLE T2	2.155	1.853
CHANNEL FLANGE POS.421	1.668	1.668
CHANNEL COVER POS.502	2.127	2.121
TUBESHEET POS.350	2.606	1.875
TUBES POS.351	35.112	34.934

**MAWP hot and corr. = 1.668 MPa LIMITED BY FLANGE POS.421**

**MAP new and cold = 1.668 MPa LIMITED BY FLANGE POS.421**

**ALLOWABLE STRESSES OF MATERIAL:FINNED COIL**

	MATERIAL	St psig AT 20°C	Sd psig At300°C	RATIO S20°C/S300°C
PIPES/ELBOW	SA 336 Gr.6/420 WPL6	118	118	1
FLANGES	SA 105	138	129	1.069

MIN.RATIO St(20°C) / Sd(300°C) = 1

HYDRAULIC TEST PRESSURE : (UG-99b)

= 1.3 x DP x (S20°C/S300°C) = 1.3 x 1900 x 1 = 2470 KPa = 2.47 MPa

**MAP AND MAWP RECAPITULATION-INTERNAL PRESSURE**

	MAP new and cold MPa	MAWP hot and corr MPa
PIPES	11.298	4.337
FLANGE-300#	5.110	3.980

MAWP hot and corr. = 3.980 MPa LIMITED BY FLANGE 300#

MAP new and cold = 5.110 MPa LIMITED BY FLANGE 300#

**MAP AND MAWP RECAPITULATION-EXTERNAL PRESSURE**

	MAP new and cold MPa	MAWP hot and corr MPa
PIPES	6.525	0.767

MAWP hot and corr. = 0.767 MPa

MAP new and cold = 6.525 MPa

**Table 2-1.1 Pressure-Temperature Ratings for Group 1.1 Materials**

Nominal Designation	Forgings	Castings	Plates
C-Si	A 105 (1)	A 216 Gr. WCB (1)	A 515 Gr. 70 (1)
C-Mn-Si	A 350 Gr. LF2 (1)		A 516 Gr. 70 (1), (2)
C-Mn-Si-V	A 350 Gr. LF6 Cl. (4)		
3½ Ni	A 350 Gr. LF3		A 537 Cl. 1 (3)

Working Pressure by Classes, bar							
Class	150	300	400	600	900	1500	2500
Temp., °C							
-29 to 38	19.6	51.1	68.1	102.1	153.2	255.3	425.5
50	19.2	50.1	66.8	100.2	150.4	250.6	417.7
100	17.7	46.6	62.1	93.2	139.8	233.0	388.3
150	15.8	45.1	60.1	90.2	135.2	225.4	375.6
200	13.8	43.8	58.4	87.6	131.4	219.0	365.0
250	12.1	41.9	55.9	83.9	125.8	209.7	349.5
300	10.2	39.8	53.1	79.6	119.5	199.1	331.8
325	9.3	38.7	51.6	77.4	116.1	193.6	322.6
350	8.4	37.6	50.1	75.1	112.7	187.8	313.0
375	7.4	36.4	48.5	72.7	109.1	181.8	303.1
400	6.5	34.7	46.3	69.4	104.2	173.6	289.3
425	5.5	28.8	38.4	57.5	86.3	143.8	239.7
450	4.6	23.0	30.7	46.0	69.0	115.0	191.7
475	3.7	17.4	23.2	34.9	52.3	87.2	145.3
500	2.8	11.8	15.7	23.5	35.3	58.8	97.9
538	1.4	5.9	7.9	11.8	17.7	29.5	49.2

**NOTES:**

- (1) Upon prolonged exposure to temperatures above 425°C, the carbide phase of steel may be converted to graphite. Permissible but not recommended for prolonged use above 425°C.
- (2) Not to be used over 455°C.
- (3) Not to be used over 370°C.
- (4) Not to be used over 260°C.

**SHELL SIDE**

DESIGN PRESSURE = 0.60 Mpa = 6.0 Bar  
 DESIGN TEMPERATURE 340°C  
 DESIGN TEMPERATURE 300°C  
 FLANGE RATING 300 ; MATERIAL A 105

AT 20°C WORKING PRESSURE = 51.1 Bar = 5.11 Mpa

AT 340°C WORKING PRESSURE = 37.5 Bar = 3.75 Mpa > OF 0.60 Mpa OK

AT 300°C WORKING PRESSURE = 39.8 Bar = 3.98 Mpa > OF 0.60 Mpa OK

**TUBE SIDE**

DESIGN PRESSURE = 1.60 Mpa = 16.0 Bar  
 DESIGN TEMPERATURE 150°C  
 FLANGE RATING 300 ; MATERIAL A 105

AT 20°C WORKING PRESSURE = 51.1 Bar = 5.11 Mpa > OF 1.60 Mpa OK

AT 150°C WORKING PRESSURE = 39.8 Bar = 3.98 Mpa > OF 1.60 Mpa OK

**FINNED COIL**

DESIGN PRESSURE = 1.90 Mpa = 19.0 Bar  
 DESIGN TEMPERATURE 300°C  
 FLANGE RATING 300 ; MATERIAL A 105

AT 20°C WORKING PRESSURE = 51.1 Bar = 5.11 Mpa

AT 300°C WORKING PRESSURE = 39.8 Bar = 3.98 Mpa > OF 1.90 Mpa OK



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 EXTERNAL PRESSURE OF ELLIPTICAL (2:1) HEAD POS.:201  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 33

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 80) SA 516 Gr.70

\* ALLOW. STRESSES: -----

	MPa / Psi		
	S = 129.600 / 18796.9		
External Pressure	Pe= 0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph= 0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht= 0.000 MPa	=	0.0 Psi
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa	=	15.0 Psi
Head outside diameter	Do= 2414.00 mm	=	95.04 Inch
Equiv. outside spherical radius	Ro= 2172.60 mm	=	85.54 Inch
Elastic Modulus	E = 173618 MPa	=	25181234 Psi
Adopted thickness	t = 22.00 mm	=	0.866 Inch
Corrosion Allowance	c = 1.60 mm	=	0.063 Inch
Wall undertolerance	c' = 0.00 mm	=	0.000 Inch
tmin = 1.67*P*(D+2c+2c')/(2*S-0.2*P)+c+c'	= 3.180 mm	=	0.1252 Inch
Ro/(t-c-c'-c')	= 106.500		
A = 0.125/(Ro/(t-c-c'))	= 0.00117371		
B (Fig.G-CS-2 )	= 60.1709 MPa	=	8727.1 Psi
Pa1= 0.0625*E/(Ro/(t-c-c'-c')) <sup>2</sup>	= 0.9567 MPa	=	138.8 Psi
Pa2= B/(Ro/(t-c-c'-c'))	= 0.5650 MPa	=	81.9 Psi
Pa = min (Pa1,Pa2)	= 0.5650 MPa	=	81.9 Psi
Min. thickness for external pressure tr+c+c' =	8.305 mm	=	0.3270 Inch
Max allowable working pressure (New & Cold)	= 0.916 MPa	=	132.9 Psi
Max allowable working pressure (Hot & Corr)	= 0.565 MPa	=	81.9 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
ELLIPTICAL HEAD POS.:201  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

INTERNAL PRESSURE  
Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 22.00 mm = 0.866 Inch  
Unadjusted MDMT from table UCS-66 = -38.1 C = -36.6 F  
Tr = 6.07 mm = 0.239 Inch  
Tn = Thk. -Corrosion - Wall undertolerance= 20.40 mm = 0.803 Inch  
Coincident ratio = 0.253  
ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

EXTERNAL PRESSURE  
Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 22.00 mm = 0.866 Inch  
Unadjusted MDMT from table UCS-66 = -38.1 C = -36.6 F  
Tr = 6.20 mm = 0.244 Inch  
Tn = Thk. -Corrosion - Wall undertolerance= 20.40 mm = 0.803 Inch  
Coincident ratio = 0.259  
ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE S20 POS.230  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37  
 \* TYPE OF HEAD: Ellipsoidal \* LOCATION OF OPENING: knuckle

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80) SA 516 Gr.70				
* NOZZLE MATERIAL (Record Nr 80) SA 516 Gr.70				
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	129.6000 MPa	=	18796.9 Psi
(at room temperature)	Sn0=	138.0000 MPa	=	20015.2 Psi
Pressure	P0=	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.025 MPa	=	3.6 Psi
Calculation pressure	P=(P0+ Ph)=	0.600 MPa	=	87.0 Psi
Head Internal diameter	D =	2370.00 mm	=	93.31 Inch
Inside Crown Radius	L =	2135.88 mm	=	84.09 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		= 1260.00 mm	=	49.606 Inch
Nozzle Thickness	tn =	30.00 mm	=	1.181 Inch
Nozzle Wall Tolerance	c1 =	0.00 mm	=	0.000 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis	N =	405.00 mm	=	15.945 Inch
Angular coordinate		= 180.00 deg		
Opening size	d =	1235.00 mm	=	48.622 Inch
* NET THICKNESSES:"				
t' = t -c -c'		= 20.40 mm	=	0.803 Inch
tr = P*(D+2c+2c')/(2*S-0.2*P)		= 5.50 mm	=	0.216 Inch
tn' = tn -c2 -c1		= 28.40 mm	=	1.118 Inch
trn = P*Rn/(Sn-0.6*P)		= 2.79 mm	=	0.110 Inch
Horiz. limit to nozzle O.D.	Lo =	130.00 mm	=	5.118 Inch
Vertic. limit to shell O.D.	ho =	40.00 mm	=	1.575 Inch
→ Leg of fillet weld (nozzle to wall)		= 9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = d*tr+2*tn'*tr*(1-Sn/S)		= 6787.6 mm2	=	10.521 Sq.in
(sh.) A1=2Lo(t'-tr)+2*tn'*(t'-tr)*Sn/S		= 4721.6 mm2	=	7.318 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S		= 2048.6 mm2	=	3.175 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)		= 81.0 mm2	=	0.126 Sq.in
(weld) A42 * Sp/S		= 0.0 mm2	=	0.000 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5		= 6851.1 mm2	=	10.619 Sq.in



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 REINFORCEMENT OF OPENING UNDER INT. PRESSURE S20 POS.230  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 30.00 mm = 1.181 Inch  
 Unadjusted MDMT from table UCS-66 = -31.1 C = -24.0 F  
 Tr = 2.62 mm = 0.103 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance = 28.40 mm = 1.118 Inch  
 Coincident ratio = 0.092  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 9.93 mm = 0.391 Inch  
 Min thickness under int. pressure + c (E=1) = 7.10 mm = 0.279 Inch  
 Min thickness according to UG 45 = 7.10 mm = 0.279 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 0.699 MPa = 101.4 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.607 MPa = 88.1 Psi

HYDRAULIC TEST PRESSURE -Nozzle= $1.3 \cdot P_i \cdot S_n0 / S_n$  = 0.831 MPa = 120.5 Psi  
 BASIS FOR CALC.TEST PRESSURE  $P_b = MAWP(N\&C) + P_h$  = 0.699 MPa = 101.4 Psi  
 MAX. ALL. HYDR.TEST PRESSURE-Nozzle =  $1.3 \cdot P_b - P_{ht}$  = 0.884 MPa = 128.2 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 EXTERNAL PRESSURE OF NOZZLE S20 POS.230  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 28

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 80) SA 516 Gr.70

\* ALLOW. STRESSES: -----

	MPa / Psi			
	S = 129.600 / 18796.9			
External Pressure	Pe= 0.103 MPa	=	15.0 Psi	
Overpressure due to static head	Ph= 0.000 MPa	=	0.0 Psi	
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa	=	15.0 Psi	
Outside diameter	Do= 1260.00 mm	=	49.61 Inch	
Elastic Modulus	E = 173618 MPa	=	25181234 Psi	
Axial length between reinforcements	L = 350.00 mm	=	13.78 Inch	
Adopted thickness	t = 30.00 mm	=	1.181 Inch	
Corrosion Allowance	c = 1.60 mm	=	0.063 Inch	
Wall undertolerance	c' = 0.00 mm	=	0.000 Inch	
L/Do	= 0.278			
Do/(t-c-c')	= 44.366			
A (Fig.G-UG-28)	= 0.02076869			
B (Fig.G-CS-2 )	= 96.2928 MPa	=	13966.1 Psi	
Pa = 4*B/3/(Do/(t-c-c'))	= 2.8939 MPa	=	419.7 Psi	
Min. thickness for external pressure tr+c+c'	= 4.065 mm	=	0.1600 Inch	

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE S20 POS.230  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37  
 \* TYPE OF HEAD: Ellipsoidal \* LOCATION OF OPENING: knuckle

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* HEAD MATERIAL (Record Nr 80) SA 516 Gr.70

\* NOZZLE MATERIAL (Record Nr 80) SA 516 Gr.70

\* SHELL ALLOWABLE STRESS S = 129.6000 MPa = 18796.9 Psi

\* NOZZLE ALLOWABLE STRESS Sn= 129.6000 MPa = 18796.9 Psi  
 (at room temperature) Sn0= 138.0000 MPa = 20015.2 Psi

Pressure P0= 0.103 MPa = 15.0 Psi

Overpressure due to static head Ph= 0.000 MPa = 0.0 Psi

Overpressure due to static head (test) Pht= 0.000 MPa = 0.0 Psi

Calculation pressure P=(P0+ Ph)= 0.103 MPa = 15.0 Psi

Head Internal diameter D = 2370.00 mm = 93.31 Inch

Inside Crown Radius L = 2135.88 mm = 84.09 Inch

Corrosion allowance c = 1.60 mm = 0.063 Inch

Head Thickness t = 22.00 mm = 0.866 Inch

Pad Thickness tp = 0.00 mm = 0.000 Inch

Pad Width lp = 0.00 mm = 0.000 Inch

Nozzle Outside Diameter = 1260.00 mm = 49.606 Inch

Nozzle Thickness tn = 30.00 mm = 1.181 Inch

Nozzle Wall Tolerance c1 = 0.00 mm = 0.000 Inch

Nozzle Corrosion c2 = 1.60 mm = 0.063 Inch

Type of connection: SET-IN

Nzl.position: AXIAL: elongation from axis N = 405.00 mm = 15.945 Inch  
 Angular coordinate = 180.00 deg

Opening size d = 1235.00 mm = 48.622 Inch

\* NET THICKNESSES:"

t' = t -c -c' = 20.40 mm = 0.803 Inch

tr = From external pressure calc. -c-c' = 6.70 mm = 0.264 Inch

tn' = tn -c2 -c1 = 28.40 mm = 1.118 Inch

trn = From external pressure calc. -c2-c1 = 2.46 mm = 0.097 Inch

Horiz. limit to nozzle O.D. Lo = 130.00 mm = 5.118 Inch

Vertic. limit to shell O.D. ho = 40.00 mm = 1.575 Inch

Leg of fillet weld (nozzle to wall) = 9.00 mm = 0.354 Inch

\* REINFORCING AREAS:

(set-in) Areq = (d\*tr+2\*tn'\*tr\*(1-Sn/S))/2 = 4140.3 mm2 = 6.418 Sq.in

(sh.) A1=2Lo(t'-tr)+2\*tn'\*(t'-tr)\*Sn/S = 4338.6 mm2 = 6.725 Sq.in

(nozzle) A2 = 2\*ho\*(tn'-trn)\*Sn/S = 2074.8 mm2 = 3.216 Sq.in

(weld) A41 \* Min(Sn/S, Sp/S) = 81.0 mm2 = 0.126 Sq.in

(weld) A42 \* Sp/S = 0.0 mm2 = 0.000 Sq.in

\* TOTAL REINF. AREA Ao = A1+A2+A4()+A5 = 6494.4 mm2 = 10.066 Sq.in

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REINFORCEMENT OF OPENING UNDER EXT. PRESSURE S20 POS.230  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 30.00 mm = 1.181 Inch  
Unadjusted MDMT from table UCS-66 = -31.1 C = -24.0 F  
Tr = 2.32 mm = 0.092 Inch  
Tn = Thk. -Corrosion - Wall undertolerance = 28.40 mm = 1.118 Inch  
Coincident ratio = 0.082  
ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 9.93 mm = 0.391 Inch  
Min thickness under ext. pressure + c (E=1) = 1.85 mm = 0.073 Inch  
Min thickness according to UG 45 = 1.85 mm = 0.073 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 0.916 MPa = 132.9 Psi  
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.565 MPa = 81.9 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S3 DN.5"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37  
 \* TYPE OF HEAD: Ellipsoidal \* LOCATION OF OPENING: knuckle

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn =	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0 =	118.0000 MPa	= 17114.5 Psi
Pressure	P0 =	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph =	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht =	0.025 MPa	=	3.6 Psi
Calculation pressure	P = (P0 + Ph) =	0.600 MPa	=	87.0 Psi
Head Internal diameter	D =	2370.00 mm	=	93.31 Inch
Inside Crown Radius	L =	2133.00 mm	=	83.98 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		=	141.30 mm	= 5.563 Inch
Nozzle Thickness	tn =	9.52 mm	=	0.375 Inch
Nozzle Wall Tolerance	c1 =	1.19 mm	=	0.047 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis	N =	1072.00 mm	=	42.205 Inch
	Angular coordinate	=	111.00 deg	
Opening size	d =	187.50 mm	=	7.382 Inch
* NET THICKNESSES:"				
t' = t - c - c'	=	22.00 mm	=	0.866 Inch
tr = P*(D+2c+2c')/(2*S-0.2*P)	=	5.49 mm	=	0.216 Inch
tn' = tn - c2 - c1	=	6.73 mm	=	0.265 Inch
trn = P*Rn/(Sn-0.6*P)	=	0.33 mm	=	0.013 Inch
Horiz. limit to nozzle O.D.	Lo =	30.00 mm	=	1.181 Inch
Vertic. limit to shell O.D.	ho =	16.82 mm	=	0.662 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = d*tr+2*tn'*tr*(1-Sn/S)	=	1036.1 mm2	=	1.606 Sq.in
(sh.) A1 = 2Lo*(t'-tr)+2*tn'*(t'-tr)*Sn/S	=	1192.0 mm2	=	1.848 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	195.2 mm2	=	0.302 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	1460.5 mm2	=	2.264 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S3 DN.5"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 9.52 mm = 0.375 Inch  
 Unadjusted MDMT from table UCS-66 = -47.9 C = -54.2 F  
 Tr = 0.33 mm = 0.013 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance = 6.73 mm = 0.265 Inch  
 Coincident ratio = 0.048  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 7.33 mm = 0.289 Inch  
 Min thickness under int. pressure + c (E=1) = 5.49 mm = 0.216 Inch  
 Min thickness according to UG 45 = 5.49 mm = 0.216 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 1.043 MPa = 151.3 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.914 MPa = 132.6 Psi

HYDRAULIC TEST PRESSURE -Nozzle= $1.3 \cdot P_i \cdot S_n0 / S_n$  = 0.784 MPa = 113.7 Psi  
 BASIS FOR CALC.TEST PRESSURE  $P_b = MAWP(N\&C) + P_h$  = 1.043 MPa = 151.3 Psi  
 MAX. ALL. HYDR.TEST PRESSURE-Nozzle =  $1.3 \cdot P_b - P_{ht}$  = 1.332 MPa = 193.1 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 EXTERNAL PRESSURE OF NOZZLE POS.:S3 DN.5"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 28

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 39) SA 333 Gr.6 smls.

\* ALLOW. STRESSES: -----

	MPa / Psi		
	S = 117.400 / 17027.5		
External Pressure	Pe= 0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph= 0.000 MPa	=	0.0 Psi
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa	=	15.0 Psi
Outside diameter	Do= 141.30 mm	=	5.56 Inch
Elastic Modulus	E = 173618 MPa	=	25181234 Psi
Axial length between reinforcements	L = 800.00 mm	=	31.50 Inch
Adopted thickness	t = 9.52 mm	=	0.375 Inch
Corrosion Allowance	c = 1.60 mm	=	0.063 Inch
Wall undertolerance	c' = 1.19 mm	=	0.047 Inch
L/Do	=		5.662
Do/(t-c-c')	=		20.996
A (Fig.G-UG-28)	=		0.00273208
B (Fig.G-CS-2 )	=	71.7296 MPa	= 10403.5 Psi
Pa = 4*B/3/(Do/(t-c-c'))	=	4.5552 MPa	= 660.7 Psi
Min. thickness for external pressure tr+c+c'	=	3.755 mm	= 0.1478 Inch





Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S3 DN.5"  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE  
Curve of fig UCS66 = C-Material Normalized  
Governing thickness = 9.52 mm = 0.375 Inch  
Unadjusted MDMT from table UCS-66 = -47.9 C = -54.2 F  
Tr = 0.90 mm = 0.036 Inch  
Tn = Thk. -Corrosion - Wall undertolerance = 6.73 mm = 0.265 Inch  
Coincident ratio = 0.134  
ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 7.33 mm = 0.289 Inch  
Min thickness under ext. pressure + c (E=1) = 7.88 mm = 0.310 Inch  
Min thickness according to UG 45 = 7.33 mm = 0.289 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 0.916 MPa = 132.9 Psi  
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.565 MPa = 81.9 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S15 DN.6"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

\* TYPE OF HEAD: Ellipsoidal \* LOCATION OF OPENING: knuckle

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* HEAD MATERIAL (Record Nr 80) SA 516 Gr.70

\* NOZZLE MATERIAL (Record Nr 39) SA 333 Gr.6 smls.

\* SHELL ALLOWABLE STRESS S = 129.6000 MPa = 18796.9 Psi

\* NOZZLE ALLOWABLE STRESS Sn = 117.4000 MPa = 17027.5 Psi  
 (at room temperature) Sn0 = 118.0000 MPa = 17114.5 Psi

Pressure P0 = 0.600 MPa = 87.0 Psi

Overpressure due to static head Ph = 0.000 MPa = 0.0 Psi

Overpressure due to static head (test) Pht = 0.025 MPa = 3.6 Psi

Calculation pressure P = (P0 + Ph) = 0.600 MPa = 87.0 Psi

Head Internal diameter D = 2370.00 mm = 93.31 Inch

Inside Crown Radius L = 2133.00 mm = 83.98 Inch

Corrosion allowance c = 0.00 mm = 0.000 Inch

Head Thickness t = 22.00 mm = 0.866 Inch

Pad Thickness tp = 0.00 mm = 0.000 Inch

Pad Width Lp = 0.00 mm = 0.000 Inch

Nozzle Outside Diameter = 168.30 mm = 6.626 Inch

Nozzle Thickness tn = 10.97 mm = 0.432 Inch

Nozzle Wall Tolerance c1 = 1.37 mm = 0.054 Inch

Nozzle Corrosion c2 = 1.60 mm = 0.063 Inch

Type of connection: SET-IN

Nzl.position: AXIAL: elongation from axis N = 1000.00 mm = 39.370 Inch  
 Angular coordinate = 306.00 deg

Opening size d = 182.00 mm = 7.165 Inch

\* NET THICKNESSES:"

t' = t - c - c' = 22.00 mm = 0.866 Inch

tr =  $P \cdot (D + 2c + 2c') / (2 \cdot S - 0.2 \cdot P)$  = 5.49 mm = 0.216 Inch

tn' = tn - c2 - c1 = 8.00 mm = 0.315 Inch

trn =  $P \cdot Rn / (Sn - 0.6 \cdot P)$  = 0.39 mm = 0.015 Inch

Horiz. limit to nozzle O.D. Lo = 30.00 mm = 1.181 Inch

Vertic. limit to shell O.D. ho = 20.00 mm = 0.787 Inch

Leg of fillet weld (nozzle to wall) = 9.00 mm = 0.354 Inch

\* REINFORCING AREAS:

(set-in) Areq =  $d \cdot tr + 2 \cdot tn' \cdot tr \cdot (1 - Sn/S)$  = 1007.2 mm<sup>2</sup> = 1.561 Sq.in

(sh.) A1 =  $2 \cdot Lo \cdot (t' - tr) + 2 \cdot tn' \cdot (t' - tr) \cdot Sn/S$  = 1230.0 mm<sup>2</sup> = 1.906 Sq.in

(nozzle) A2 =  $2 \cdot ho \cdot (tn' - trn) \cdot Sn/S$  = 275.7 mm<sup>2</sup> = 0.427 Sq.in

(weld) A41 =  $\text{Min}(Sn/S, Sp/S)$  = 73.4 mm<sup>2</sup> = 0.114 Sq.in

(weld) A42 =  $Sp/S$  = 0.0 mm<sup>2</sup> = 0.000 Sq.in

\* TOTAL REINF. AREA Ao = A1 + A2 + A41 + A42 = 1579.1 mm<sup>2</sup> = 2.448 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S15 DN.6"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66	=	C-Material Normalized		
Governing thickness	=	10.97 mm	=	0.432 Inch
Unadjusted MDMT from table UCS-66	=	-40.6 C	=	-41.2 F
Tr =	=	0.39 mm	=	0.015 Inch
Tn = Thk. -Corrosion - Wall undertolerance	=	8.00 mm	=	0.315 Inch
Coincident ratio	=	0.049		
ADJUSTED MDMT from fig UCS66.1	=	-105.0 C	=	-157.0 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c	=	7.82 mm	=	0.308 Inch
Min thickness under int. pressure + c (E=1)	=	5.49 mm	=	0.216 Inch
Min thickness according to UG 45	=	5.49 mm	=	0.216 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	0.994 MPa	=	144.2 Psi
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	0.872 MPa	=	126.5 Psi

HYDRAULIC TEST PRESSURE -Nozzle=1.3*Pi*Sn0/Sn	=	0.784 MPa	=	113.7 Psi
BASIS FOR CALC.TEST PRESSURE Pb = MAWP(N&C)+Ph	=	0.994 MPa	=	144.2 Psi
MAX. ALL. HYDR.TEST PRESSURE-Nozzle = 1.3*Pb-Pht	=	1.268 MPa	=	183.8 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 EXTERNAL PRESSURE OF NOZZLE POS.:S15 DN.6"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 28

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 39) SA 333 Gr.6 smls.

\* ALLOW. STRESSES: -----

	MPa / Psi			
S =	117.400 / 17027.5			
External Pressure	Pe= 0.103 MPa	=	15.0 Psi	
Overpressure due to static head	Ph= 0.000 MPa	=	0.0 Psi	
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa	=	15.0 Psi	
Outside diameter	Do= 168.30 mm	=	6.63 Inch	
Elastic Modulus	E = 173618 MPa	=	25181234 Psi	
Axial length between reinforcements	L = 305.00 mm	=	12.01 Inch	
Adopted thickness	t = 10.97 mm	=	0.432 Inch	
Corrosion Allowance	c = 1.60 mm	=	0.063 Inch	
Wall undertolerance	c' = 1.37 mm	=	0.054 Inch	
L/Do	=	1.812		
Do/(t-c-c')	=	21.037		
A (Fig.G-UG-28)	=	0.00737983		
B (Fig.G-CS-2 )	=	83.4707 MPa	=	12106.4 Psi
Pa = 4*B/3/(Do/(t-c-c'))	=	5.2903 MPa	=	767.3 Psi
Min. thickness for external pressure tr+c+c'	=	3.675 mm	=	0.1447 Inch

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S15 DN.6"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37  
 \* TYPE OF HEAD: Ellipsoidal \* LOCATION OF OPENING: knuckle

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80) SA 516 Gr.70				
* NOZZLE MATERIAL (Record Nr 39) SA 333 Gr.6 smls.				
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
(at room temperature)	Sn0=	118.0000 MPa	=	17114.5 Psi
Pressure	P0=	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.103 MPa	=	15.0 Psi
Head Internal diameter	D =	2370.00 mm	=	93.31 Inch
Inside Crown Radius	L =	2133.00 mm	=	83.98 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter	=	168.30 mm	=	6.626 Inch
Nozzle Thickness	tn =	10.97 mm	=	0.432 Inch
Nozzle Wall Tolerance	c1 =	1.37 mm	=	0.054 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis	N =	1000.00 mm	=	39.370 Inch
Angular coordinate	=	306.00 deg		
Opening size	d =	182.00 mm	=	7.165 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	22.00 mm	=	0.866 Inch
tr = From external pressure calc. -c-c'	=	8.30 mm	=	0.327 Inch
tn' = tn -c2 -c1	=	8.00 mm	=	0.315 Inch
trn = From external pressure calc. -c2-c1	=	0.70 mm	=	0.028 Inch
Horiz. limit to nozzle O.D.	Lo =	30.00 mm	=	1.181 Inch
Vertic. limit to shell O.D.	ho =	20.00 mm	=	0.787 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in)Areq = (d*tr+2*tn'*tr*(1-Sn/S))/2	=	762.0 mm2	=	1.181 Sq.in
(sh.) A1=2Lo(t'-tr)+2*tn'*(t'-tr)*Sn/S	=	1020.2 mm2	=	1.581 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	264.3 mm2	=	0.410 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	1357.9 mm2	=	2.105 Sq.in

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REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S15 DN.6"  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66	=	C-Material Normalized		
Governing thickness	=	10.97 mm	=	0.432 Inch
Unadjusted MDMT from table UCS-66	=	-40.6 C	=	-41.2 F
Tr =	=	0.66 mm	=	0.026 Inch
Tn = Thk. -Corrosion - Wall undertolerance	=	8.00 mm	=	0.315 Inch
Coincident ratio	=	0.083		
ADJUSTED MDMT from fig UCS66.1	=	-105.0 C	=	-157.0 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c	=	7.82 mm	=	0.308 Inch
Min thickness under ext. pressure + c (E=1)	=	7.88 mm	=	0.310 Inch
Min thickness according to UG 45	=	7.82 mm	=	0.308 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	0.916 MPa	=	132.9 Psi
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	0.565 MPa	=	81.9 Psi

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 REINFORCEMENT OF OPENING UNDER INT. PRESSURE S20 POS.230  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.600 MPa	=	87.0 Psi
Inside Crown Radius	L =	2120.00 mm	=	83.46 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		1260.00 mm	=	49.606 Inch
Nozzle Thickness	tn =	30.00 mm	=	1.181 Inch
Nozzle Wall Tolerance	cl =	0.00 mm	=	0.000 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis	N =	405.00 mm	=	15.945 Inch
Angular coordinate		180.00 deg		
Opening size (from combined output sheet)	d=	1219.33 mm	=	48.005 Inch
* NET THICKNESSES:"				
t' = t -c -c'		22.00 mm	=	0.866 Inch
tr = P*(L+c+c')/(2*S-0.2*P)		4.91 mm	=	0.193 Inch
tn' = tn -c2 -c1		28.40 mm	=	1.118 Inch
trn = P*Rn/(Sn-0.6*P)		2.79 mm	=	0.110 Inch
Horiz. limit to nozzle O.D.	Lo =	130.00 mm	=	5.118 Inch
Vertic. limit to shell O.D.	ho =	40.00 mm	=	1.575 Inch
Leg of fillet weld (nozzle to wall)		9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = d*tr+2*tn'*tr*(1-Sn/S)		5986.5 mm2	=	9.279 Sq.in
(sh.) A1=Lo(t'-tr)+2*tn'*(t'-tr)*Sn/S		3247.2 mm2	=	5.033 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S		2177.2 mm2	=	3.375 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)		81.0 mm2	=	0.126 Sq.in
(weld) A42 * Sp/S		0.0 mm2	=	0.000 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S3 DN.5"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn =	117.4000 MPa	=	17027.5 Psi
Pressure	P0 =	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph =	0.000 MPa	=	0.0 Psi
Calculation pressure	P = (P0 + Ph) =	0.600 MPa	=	87.0 Psi
Inside Crown Radius	L =	2120.00 mm	=	83.46 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		141.30 mm	=	5.563 Inch
Nozzle Thickness	tn =	9.52 mm	=	0.375 Inch
Nozzle Wall Tolerance	c1 =	1.19 mm	=	0.047 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis	N =	1072.00 mm	=	42.205 Inch
Angular coordinate		111.00 deg		
Opening size (from combined output sheet)	d =	144.52 mm	=	5.690 Inch
* NET THICKNESSES:"				
t' = t - c - c'		22.00 mm	=	0.866 Inch
tr = P*(L+c+c')/(2*S-0.2*P)		4.91 mm	=	0.193 Inch
tn' = tn - c2 - c1		6.73 mm	=	0.265 Inch
trn = P*Rn/(Sn-0.6*P)		0.32 mm	=	0.013 Inch
Horiz. limit to nozzle O.D.	Lo =	30.00 mm	=	1.181 Inch
Vertic. limit to shell O.D.	ho =	20.82 mm	=	0.820 Inch
Leg of fillet weld (nozzle to wall)		9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = d*tr+2*tn'*tr*(1-Sn/S)		717.2 mm2	=	1.112 Sq.in
(sh.) A1 = Lo*(t'-tr)+2*tn'*(t'-tr)*Sn/S		770.6 mm2	=	1.194 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S		302.2 mm2	=	0.468 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)		73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S		0.0 mm2	=	0.000 Sq.in



Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE S20 POS.230-S3 DN.5"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

Angular coordinate of Nozzle 1		g1 =	180.00	Deg
Angular coordinate of Nozzle 2		g2 =	111.00	Deg
Elongation from axis Nozzle 1	Z1 =	405.00 mm	=	15.945 Inch
Elongation from axis Nozzle 2	Z2 =	1072.00 mm	=	42.205 Inch
Distance from center Nozzle 1/ Nozzle 2	Lc =	1042.22 mm	=	41.032 Inch
For Nozzle 1 (between openings)	a1 =	639.69 mm	=	25.184 Inch
(outside openings)	a1' =	638.87 mm	=	25.152 Inch
Opening size	d =	1219.33 mm	=	48.005 Inch
For Nozzle 2 (between openings)	a2 =	79.10 mm	=	3.114 Inch
(outside openings)	a2' =	80.64 mm	=	3.175 Inch
Opening size	d =	144.52 mm	=	5.690 Inch
Lenght between OD of Nozzles	Lsh = Lc-a1-a2=	323.43 mm	=	12.734 Inch
A1' = Lsh*(t-tr)		=	5527.6 mm2	= 8.568 Sq.in

\* REINFORCING AREAS:

Areq = Areaq(1) + Areaq(2)	=	6703.8 mm2	=	10.391 Sq.in
(shell) A1 = A1(1) + A1(2) + A1'	=	9545.3 mm2	=	14.795 Sq.in
(Corner) A7 = A7(1) + A7(2)	=	0.0 mm2	=	0.000 Sq.in
(nozzle) A2 = A2(1) + A2(2)	=	2479.4 mm2	=	3.843 Sq.in
(nozzle) A3 = A3(1) + A3(2)	=	0.0 mm2	=	0.000 Sq.in
(weld) A41 = A41(1) + A41(2)	=	154.4 mm2	=	0.239 Sq.in
(weld) A42 = A42(1) + A42(2)	=	0.0 mm2	=	0.000 Sq.in
(weld) A43 = A43(1) + A43(2)	=	0.0 mm2	=	0.000 Sq.in
(pad) A5 = A5(1) + A5(2) + A5'	=	0.0 mm2	=	0.000 Sq.in
A5' = Lp(1)'*tp(1)Sp(1)/S + Lp(2)'*tp(2)Sp(2)/S	=	0.0 mm2	=	0.000 Sq.in
Lp(1)' = Lo (output calculation of Nozzle 1)	=	0.0 mm	=	0.000 Inch
Lp(2)' = Lo (output calculation of Nozzle 2)	=	0.0 mm	=	0.000 Inch

\* TOTAL REINF. AREA Ao = A1+A2+A4()+A5 = 12179.1 mm2 = 18.878 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE S20 POS.230  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn =	129.6000 MPa	=	18796.9 Psi
Pressure	P0 =	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph =	0.000 MPa	=	0.0 Psi
Calculation pressure	P = (P0 + Ph) =	0.103 MPa	=	15.0 Psi
Inside Crown Radius	L =	2120.00 mm	=	83.46 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		1260.00 mm	=	49.606 Inch
Nozzle Thickness	tn =	30.00 mm	=	1.181 Inch
Nozzle Wall Tolerance	cl =	0.00 mm	=	0.000 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis N		405.00 mm	=	15.945 Inch
Angular coordinate		180.00 deg		
Opening size (from combined output sheet)	d =	1219.33 mm	=	48.005 Inch
* NET THICKNESSES:"				
t' = t - c - c'		22.00 mm	=	0.866 Inch
tr = From external pressure calc. -c-c'		6.64 mm	=	0.262 Inch
tn' = tn - c2 - c1		28.40 mm	=	1.118 Inch
trn = From external pressure calc. -c2-c1		2.55 mm	=	0.101 Inch
Horiz. limit to nozzle O.D.	Lo =	130.00 mm	=	5.118 Inch
Vertic. limit to shell O.D.	ho =	40.00 mm	=	1.575 Inch
Leg of fillet weld (nozzle to wall)		9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = (d*tr+2*tn'*tr*(1-Sn/S))/2		4051.2 mm2	=	6.279 Sq.in
(sh.) A1=Lo(t'-tr)+2*tn'*(t'-tr)*Sn/S		2917.4 mm2	=	4.522 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S		2195.6 mm2	=	3.403 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)		81.0 mm2	=	0.126 Sq.in
(weld) A42 * Sp/S		0.0 mm2	=	0.000 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S3 DN.5"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
Pressure	P0=	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.103 MPa	=	15.0 Psi
Inside Crown Radius	L =	2120.00 mm	=	83.46 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter	=	141.30 mm	=	5.563 Inch
Nozzle Thickness	tn =	9.52 mm	=	0.375 Inch
Nozzle Wall Tolerance	c1 =	1.19 mm	=	0.047 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis	N =	1072.00 mm	=	42.205 Inch
Angular coordinate	=	111.00 deg		
Opening size (from combined output sheet)	d=	144.52 mm	=	5.690 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	22.00 mm	=	0.866 Inch
tr = From external pressure calc. -c-c'	=	6.64 mm	=	0.262 Inch
tn' = tn -c2 -c1	=	6.73 mm	=	0.265 Inch
trn = From external pressure calc. -c2-c1	=	1.10 mm	=	0.043 Inch
Horiz. limit to nozzle O.D.	Lo =	30.00 mm	=	1.181 Inch
Vertic. limit to shell O.D.	ho =	20.82 mm	=	0.820 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in)Areq = (d*tr+2*tn'*tr*(1-Sn/S))/2	=	485.4 mm2	=	0.752 Sq.in
(sh.) A1=Lo(t'-tr)+2*tn'*(t'-tr)*Sn/S	=	692.4 mm2	=	1.073 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	272.6 mm2	=	0.423 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE S20 POS.230-S3 DN.5"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

Angular coordinate of Nozzle 1		g1 =	180.00	Deg
Angular coordinate of Nozzle 2		g2 =	111.00	Deg
Elongation from axis Nozzle 1	Z1 =	405.00 mm	=	15.945 Inch
Elongation from axis Nozzle 2	Z2 =	1072.00 mm	=	42.205 Inch
Distance from center Nozzle 1/ Nozzle 2	Lc =	1042.22 mm	=	41.032 Inch
For Nozzle 1 (between openings)	a1 =	639.69 mm	=	25.184 Inch
(outside openings)	a1' =	638.87 mm	=	25.152 Inch
	Opening size d =	1219.33 mm	=	48.005 Inch
For Nozzle 2 (between openings)	a2 =	79.10 mm	=	3.114 Inch
(outside openings)	a2' =	80.64 mm	=	3.175 Inch
	Opening size d =	144.52 mm	=	5.690 Inch
Lenght between OD of Nozzles	Lsh = Lc-a1-a2=	323.43 mm	=	12.734 Inch
A1' = Lsh*(t-tr)		=	4966.3 mm2	= 7.698 Sq.in

\* REINFORCING AREAS:

Areq = Areaq(1) + Areaq(2)	=	4536.6 mm2	=	7.032 Sq.in
(shell) A1 = A1(1) + A1(2) + A1'	=	8576.1 mm2	=	13.293 Sq.in
(Corner) A7 = A7(1) + A7(2)	=	0.0 mm2	=	0.000 Sq.in
(nozzle) A2 = A2(1) + A2(2)	=	2468.2 mm2	=	3.826 Sq.in
(nozzle) A3 = A3(1) + A3(2)	=	0.0 mm2	=	0.000 Sq.in
(weld) A41 = A41(1) + A41(2)	=	154.4 mm2	=	0.239 Sq.in
(weld) A42 = A42(1) + A42(2)	=	0.0 mm2	=	0.000 Sq.in
(weld) A43 = A43(1) + A43(2)	=	0.0 mm2	=	0.000 Sq.in
(pad) A5 = A5(1) + A5(2) + A5'	=	0.0 mm2	=	0.000 Sq.in
A5' = Lp(1)'*tp(1)Sp(1)/S+Lp(2)'*tp(2)Sp(2)/S	=	0.0 mm2	=	0.000 Sq.in
Lp(1)' = Lo (output calculation of Nozzle 1)	=	0.0 mm	=	0.000 Inch
Lp(2)' = Lo (output calculation of Nozzle 2)	=	0.0 mm	=	0.000 Inch

\* TOTAL REINF. AREA Ao = A1+A2+A4()+A5 = 11198.7 mm2 = 17.358 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE S20 POS.230  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.600 MPa	=	87.0 Psi
Inside Crown Radius	L =	2120.00 mm	=	83.46 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter	=	1260.00 mm	=	49.606 Inch
Nozzle Thickness	tn =	30.00 mm	=	1.181 Inch
Nozzle Wall Tolerance	cl =	0.00 mm	=	0.000 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis	N =	405.00 mm	=	15.945 Inch
Angular coordinate	=	180.00 deg		
Opening size (from combined output sheet)	d=	1233.71 mm	=	48.571 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	22.00 mm	=	0.866 Inch
tr = P*(L+c+c')/(2*S-0.2*P)	=	4.91 mm	=	0.193 Inch
tn' = tn -c2 -c1	=	28.40 mm	=	1.118 Inch
trn = P*Rn/(Sn-0.6*P)	=	2.79 mm	=	0.110 Inch
Horiz. limit to nozzle O.D.	Lo =	130.00 mm	=	5.118 Inch
Vertic. limit to shell O.D.	ho =	40.00 mm	=	1.575 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = d*tr+2*tn'*tr*(1-Sn/S)	=	6057.1 mm2	=	9.389 Sq.in
(sh.) A1=Lo(t'-tr)+2*tn'*(t'-tr)*Sn/S	=	3247.2 mm2	=	5.033 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	2177.2 mm2	=	3.375 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	81.0 mm2	=	0.126 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S15 DN.6"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings  
 \* TYPE OF HEAD: Spherical

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F  
 \* HEAD MATERIAL (Record Nr 80) SA 516 Gr.70  
 \* NOZZLE MATERIAL (Record Nr 39) SA 333 Gr.6 smls.  
 \* SHELL ALLOWABLE STRESS S = 129.6000 MPa = 18796.9 Psi  
 \* NOZZLE ALLOWABLE STRESS Sn = 117.4000 MPa = 17027.5 Psi

Pressure PO = 0.600 MPa = 87.0 Psi  
 Overpressure due to static head Ph = 0.000 MPa = 0.0 Psi  
 Calculation pressure P=(PO+ Ph) = 0.600 MPa = 87.0 Psi  
 Inside Crown Radius L = 2120.00 mm = 83.46 Inch  
 Corrosion allowance c = 0.00 mm = 0.000 Inch  
 Head Thickness t = 22.00 mm = 0.866 Inch  
 Pad Thickness tp = 0.00 mm = 0.000 Inch  
 Pad Width Lp = 0.00 mm = 0.000 Inch  
 Nozzle Outside Diameter = 168.30 mm = 6.626 Inch  
 Nozzle Thickness tn = 10.97 mm = 0.432 Inch  
 Nozzle Wall Tolerance cl = 1.37 mm = 0.054 Inch  
 Type of connection: SET-IN  
 Nzl.position: AXIAL: elongation from axis N = 1000.00 mm = 39.370 Inch  
 Angular coordinate = 306.00 deg  
 Opening size (from combined output sheet) d = 170.86 mm = 6.727 Inch  
 \* NET THICKNESSES:"  
 t' = t -c -c' = 22.00 mm = 0.866 Inch  
 tr = P\*(L+c+c')/(2\*S-0.2\*P) = 4.91 mm = 0.193 Inch  
 tn' = tn -c2 -c1 = 8.00 mm = 0.315 Inch  
 trn = P\*Rn/(Sn-0.6\*P) = 0.38 mm = 0.015 Inch  
 Horiz. limit to nozzle O.D. Lo = 30.00 mm = 1.181 Inch  
 Vertic. limit to shell O.D. ho = 24.00 mm = 0.945 Inch  
 Leg of fillet weld (nozzle to wall) = 9.00 mm = 0.354 Inch

\* REINFORCING AREAS:

(set-in) Areq = d\*tr+2\*tn'\*tr\*(1-Sn/S) = 847.7 mm2 = 1.314 Sq.in  
 (sh.) A1=Lo(t'-tr)+2\*tn'\*(t'-tr)\*Sn/S = 810.0 mm2 = 1.255 Sq.in  
 (nozzle) A2 = 2\*ho\*(tn'-trn)\*Sn/S = 400.8 mm2 = 0.621 Sq.in  
 (weld) A41 \* Min(Sn/S, Sp/S) = 73.4 mm2 = 0.114 Sq.in  
 (weld) A42 \* Sp/S = 0.0 mm2 = 0.000 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE S20 POS.230-S15 DN.6"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

Angular coordinate of Nozzle 1		g1 =	180.00	Deg
Angular coordinate of Nozzle 2		g2 =	306.00	Deg
Elongation from axis Nozzle 1	Z1 =	405.00 mm	=	15.945 Inch
Elongation from axis Nozzle 2	Z2 =	1000.00 mm	=	39.370 Inch
Distance from center Nozzle 1/ Nozzle 2	Lc =	1318.78 mm	=	51.921 Inch
For Nozzle 1 (between openings)	a1 =	632.32 mm	=	24.894 Inch
(outside openings)	a1' =	661.79 mm	=	26.055 Inch
Opening size	d =	1233.71 mm	=	48.571 Inch
For Nozzle 2 (between openings)	a2 =	93.36 mm	=	3.676 Inch
(outside openings)	a2' =	95.47 mm	=	3.759 Inch
Opening size	d =	170.86 mm	=	6.727 Inch
Lenght between OD of Nozzles	Lsh = Lc-a1-a2 =	593.10 mm	=	23.350 Inch
A1' = Lsh*(t-tr)			=	10136.2 mm2 = 15.711 Sq.in

\* REINFORCING AREAS:

Areaq = Areaq(1) + Areaq(2)	=	6904.9 mm2	=	10.703 Sq.in
(shell) A1 = A1(1) + A1(2) + A1'	=	14193.4 mm2	=	22.000 Sq.in
(Corner) A7 = A7(1) + A7(2)	=	0.0 mm2	=	0.000 Sq.in
(nozzle) A2 = A2(1) + A2(2)	=	2578.0 mm2	=	3.996 Sq.in
(nozzle) A3 = A3(1) + A3(2)	=	0.0 mm2	=	0.000 Sq.in
(weld) A41 = A41(1) + A41(2)	=	154.4 mm2	=	0.239 Sq.in
(weld) A42 = A42(1) + A42(2)	=	0.0 mm2	=	0.000 Sq.in
(weld) A43 = A43(1) + A43(2)	=	0.0 mm2	=	0.000 Sq.in
(pad) A5 = A5(1) + A5(2) + A5'	=	0.0 mm2	=	0.000 Sq.in
A5' = Lp(1)*tp(1)Sp(1)/S + Lp(2)*tp(2)Sp(2)/S	=	0.0 mm2	=	0.000 Sq.in
Lp(1)' = Lo (output calculation of Nozzle 1)	=	0.0 mm	=	0.000 Inch
Lp(2)' = Lo (output calculation of Nozzle 2)	=	0.0 mm	=	0.000 Inch

\* TOTAL REINF. AREA Ao = A1+A2+A4()+A5 = 16925.7 mm2 = 26.235 Sq.in

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE S20 POS.230  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn =	129.6000 MPa	=	18796.9 Psi
Pressure	P0 =	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph =	0.000 MPa	=	0.0 Psi
Calculation pressure	P = (P0 + Ph) =	0.103 MPa	=	15.0 Psi
Inside Crown Radius	L =	2120.00 mm	=	83.46 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		1260.00 mm	=	49.606 Inch
Nozzle Thickness	tn =	30.00 mm	=	1.181 Inch
Nozzle Wall Tolerance	c1 =	0.00 mm	=	0.000 Inch
Type of connection:		SET-IN		
Nzl.position: AXIAL: elongation from axis	N =	405.00 mm	=	15.945 Inch
Angular coordinate		180.00 deg		
Opening size (from combined output sheet)	d =	1233.71 mm	=	48.571 Inch
* NET THICKNESSES:"				
t' = t - c - c'		22.00 mm	=	0.866 Inch
tr = From external pressure calc. -c-c'		6.64 mm	=	0.262 Inch
tn' = tn - c2 - c1		28.40 mm	=	1.118 Inch
trn = From external pressure calc. -c2-c1		2.57 mm	=	0.101 Inch
Horiz. limit to nozzle O.D.	Lo =	130.00 mm	=	5.118 Inch
Vertic. limit to shell O.D.	ho =	40.00 mm	=	1.575 Inch
Leg of fillet weld (nozzle to wall)		9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = (d*tr+2*tn'*tr*(1-Sn/S))/2	=	4099.0 mm2	=	6.353 Sq.in
(sh.) A1=Lo(t'-tr)+2*tn'*(t'-tr)*Sn/S	=	2917.4 mm2	=	4.522 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	2194.0 mm2	=	3.401 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	81.0 mm2	=	0.126 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in



Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S15 DN.6"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* HEAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn =	117.4000 MPa	=	17027.5 Psi
Pressure	P0 =	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph =	0.000 MPa	=	0.0 Psi
Calculation pressure	P = (P0 + Ph) =	0.103 MPa	=	15.0 Psi
Inside Crown Radius	L =	2120.00 mm	=	83.46 Inch
Corrosion allowance	c =	0.00 mm	=	0.000 Inch
Head Thickness	t =	22.00 mm	=	0.866 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		168.30 mm	=	6.626 Inch
Nozzle Thickness	tn =	10.97 mm	=	0.432 Inch
Nozzle Wall Tolerance	c1 =	1.37 mm	=	0.054 Inch
Type of connection:	SET-IN			
Nzl.position: AXIAL: elongation from axis	N =	1000.00 mm	=	39.370 Inch
Angular coordinate	=	306.00 deg		
Opening size (from combined output sheet)	d =	170.86 mm	=	6.727 Inch
* NET THICKNESSES:"				
t' = t - c - c'	=	22.00 mm	=	0.866 Inch
tr = From external pressure calc. -c-c'	=	6.64 mm	=	0.262 Inch
tn' = tn - c2 - c1	=	8.00 mm	=	0.315 Inch
trn = From external pressure calc. -c2-c1	=	0.80 mm	=	0.032 Inch
Horiz. limit to nozzle O.D.	Lo =	30.00 mm	=	1.181 Inch
Vertic. limit to shell O.D.	ho =	24.00 mm	=	0.945 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = (d*tr+2*tn'*tr*(1-Sn/S))/2	=	573.7 mm2	=	0.889 Sq.in
(sh.) A1=Lo(t'-tr)+2*tn'*(t'-tr)*Sn/S	=	727.7 mm2	=	1.128 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	382.4 mm2	=	0.593 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE S20 POS.230-S15 DN.6"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

Angular coordinate of Nozzle 1		g1 =	180.00	Deg
Angular coordinate of Nozzle 2		g2 =	306.00	Deg
Elongation from axis Nozzle 1	Z1 =	405.00 mm	=	15.945 Inch
Elongation from axis Nozzle 2	Z2 =	1000.00 mm	=	39.370 Inch
Distance from center Nozzle 1/ Nozzle 2	Lc =	1318.78 mm	=	51.921 Inch
For Nozzle 1 (between openings)	a1 =	632.32 mm	=	24.894 Inch
(outside openings)	a1' =	661.79 mm	=	26.055 Inch
	Opening size d =	1233.71 mm	=	48.571 Inch
For Nozzle 2 (between openings)	a2 =	93.36 mm	=	3.676 Inch
(outside openings)	a2' =	95.47 mm	=	3.759 Inch
	Opening size d =	170.86 mm	=	6.727 Inch
Length between OD of Nozzles	Lsh = Lc - a1 - a2 =	593.10 mm	=	23.350 Inch
A1' = Lsh*(t-tr)		=	9107.0 mm2	= 14.116 Sq.in

\* REINFORCING AREAS:

Areq = Areaq(1) + Areaq(2)	=	4672.7 mm2	=	7.243 Sq.in
(shell) A1 = A1(1) + A1(2) + A1'	=	12752.2 mm2	=	19.766 Sq.in
(Corner) A7 = A7(1) + A7(2)	=	0.0 mm2	=	0.000 Sq.in
(nozzle) A2 = A2(1) + A2(2)	=	2576.4 mm2	=	3.993 Sq.in
(nozzle) A3 = A3(1) + A3(2)	=	0.0 mm2	=	0.000 Sq.in
(weld) A41 = A41(1) + A41(2)	=	154.4 mm2	=	0.239 Sq.in
(weld) A42 = A42(1) + A42(2)	=	0.0 mm2	=	0.000 Sq.in
(weld) A43 = A43(1) + A43(2)	=	0.0 mm2	=	0.000 Sq.in
(pad) A5 = A5(1) + A5(2) + A5'	=	0.0 mm2	=	0.000 Sq.in
A5' = Lp(1)'*tp(1)Sp(1)/S + Lp(2)'*tp(2)Sp(2)/S	=	0.0 mm2	=	0.000 Sq.in
Lp(1)' = Lo (output calculation of Nozzle 1)	=	0.0 mm	=	0.000 Inch
Lp(2)' = Lo (output calculation of Nozzle 2)	=	0.0 mm	=	0.000 Inch

\* TOTAL REINF. AREA Ao = A1+A2+A4()+A5 = 15483.0 mm2 = 23.999 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S3 DN.5"-S15 DN.6"  
 ASME VIII-1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

Angular coordinate of Nozzle 1		g1 =	111.00	Deg
Angular coordinate of Nozzle 2		g2 =	306.00	Deg
Elongation from axis Nozzle 1	Z1 =	1072.00 mm	=	42.205 Inch
Elongation from axis Nozzle 2	Z2 =	1000.00 mm	=	39.370 Inch
Distance from center Nozzle 1/ Nozzle 2	Lc =	2143.97 mm	=	84.408 Inch
For Nozzle 1 (between openings)	a1 =	80.60 mm	=	3.173 Inch
(outside openings)	a1' =	82.40 mm	=	3.244 Inch
(Limit of reinforcement) Lo(1)	=	65.96 mm	=	2.597 Inch
Opening size	d =	147.46 mm	=	5.806 Inch
For Nozzle 2 (between openings)	a2 =	93.93 mm	=	3.698 Inch
(outside openings)	a2' =	96.14 mm	=	3.785 Inch
(Limit of reinforcement) Lo(2)	=	76.94 mm	=	3.029 Inch
Opening size	d =	171.97 mm	=	6.771 Inch
Length between OD of Nozzles	Lsh = Lc-a1-a2 =	1969.44 mm	=	77.537 Inch

Check of multiple openings not required:  $Lsh > (lo(1)+lo(2))$

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 CYLINDRICAL SHELL POS.:101-102  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 27

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* DESIGN TEMPERATURE                T = 340.0 C    = 644.0 F
* MATERIAL: SHELL (Record Nr 80) SA 516 Gr.70
* ALLOW. STRESSES: ----- Shell -----
                                MPa / Psi
                                S = 129.600 / 18796.9
                                (At room temperature) Sa= 138.000 / 20015.2
Internal Pressure                 Pi= 0.600 MPa = 87.0 Psi
Overpressure due to static head   Ph= 0.000 MPa = 0.0 Psi
Overpressure due to static head (Test) Pht= 0.025 MPa = 3.6 Psi
Calculation pressure              P=(Pi+ Ph)= 0.600 MPa = 87.0 Psi
Internal diameter                 D = 2*R = 2370.00 mm = 93.31 Inch
Joint efficiency                  E = 0.85
Corrosion allowance               c = 1.60 mm = 0.0630 Inch
Wall undertolerance               c' = 0.00 mm = 0.0000 Inch

tr+c+c' = P*(R+c+c')/(S*E-0.6*P)+c+c' = 8.08 mm = 0.318 Inch

Adopted thickness                 t = 15.00 mm = 0.5906 Inch

* MAXIMUM ALLOWABLE WORKING PRESSURES
New & cold                        = 1.474 MPa = 213.7 Psi
Hot & corroded                    = 1.236 MPa = 179.2 Psi

* HYDRAULIC TEST PRESSURE -Shell = 1.3*Pi*Sa/S = 0.831 MPa = 120.5 Psi
* BASIS FOR CALC.TEST PRESSURE   Pb=MAWP(N&C)+Ph= 1.474 MPa = 213.7 Psi
* MAX. ALL.HYDR.TEST PRESSURE-Shell =1.3*Pb-Pht = 1.891 MPa = 274.2 Psi
* ELONGATION (valid for construction from plate only)=50*t/(R+t/2)= 0.63 %

CHECK UNDER EXTERNAL PRESSURE (UG 28)
External Pressure                 Pe= 0.103 MPa = 15.0 Psi
Overpressure due to static head   Ph= 0.000 MPa = 0.0 Psi
Overpressure due to static head (test) Pht= 0.000 MPa = 0.0 Psi
Calculation pressure              P=(Pe+ Ph)= 0.103 MPa = 15.0 Psi
Outside diameter                 Do= 2400.00 mm = 94.49 Inch
Elastic Modulus                  E = 173618 MPa = 25181234 Psi
Axial length between reinforcements L = 5300.00 mm = 208.66 Inch
Adopted thickness                 t = 15.00 mm = 0.591 Inch
Corrosion Allowance               c = 1.60 mm = 0.063 Inch
Wall undertolerance               c' = 0.00 mm = 0.000 Inch

L/Do                              = 2.208
Do/(t-c-c')                       = 179.104
A (Fig.G-UG-28)                   = 0.00024129
B (Fig.G-CS-2 )                   = 20.3725 MPa = 2954.8 Psi
Pa = 4*B/3/(Do/(t-c-c'))          = 0.1517 MPa = 22.0 Psi
Min. thickness for external pressure tr+c+c' = 13.085 mm = 0.5152 Inch

Max allowable working pressure (New & Cold) = 0.235 MPa = 34.1 Psi
Max allowable working pressure (Hot & Corr) = 0.152 MPa = 22.0 Psi
    
```

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
CYLINDRICAL SHELL POS.:101-102  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

INTERNAL PRESSURE  
Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 15.00 mm = 0.591 Inch  
Unadjusted MDMT from table UCS-66 = -45.1 C = -49.2 F  
Tr = 6.09 mm = 0.240 Inch  
Tn = Thk. -Corrosion - Wall undertolerance= 13.40 mm = 0.528 Inch  
Coincident ratio = 0.386  
ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

EXTERNAL PRESSURE  
Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 15.00 mm = 0.591 Inch  
Unadjusted MDMT from table UCS-66 = -45.1 C = -49.2 F  
Tr = 10.77 mm = 0.424 Inch  
Tn = Thk. -Corrosion - Wall undertolerance= 13.40 mm = 0.528 Inch  
Coincident ratio = 0.683  
ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S1 DN.4"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0=	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.020 MPa	=	2.9 Psi
Calculation pressure	P=(P0+ Ph)=	0.600 MPa	=	87.0 Psi
Shell Internal diameter	D =	2*R = 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	40.00 mm	=	1.575 Inch
Nozzle Outside Diameter		114.30 mm	=	4.500 Inch
Nozzle Thickness	tn =	8.56 mm	=	0.337 Inch
Nozzle Wall Tolerance	c1 =	1.07 mm	=	0.042 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	332.00 mm	=	13.071 Inch
Angular coordinate	=	102.86 deg		
Angle nozzle axis/normal to wall (Positive if counterclockwise)=				0.00 deg
Nzl.position: NOT RADIAL F=1, distance nzl/shell axes L =				265.5 mm
Rm = R+tr/2+c+c'	teta=acs((L+Rn)/Rm)-acs((L-Rn)/Rm) =			5.1 deg
Opening size d=2*Rm*sqr(1-(cos(teta/2))^2) =		105.18 mm	=	4.141 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = P*(R+c+c')/(S-0.6*P)	=	5.51 mm	=	0.217 Inch
tn' = tn -c2 -c1	=	5.89 mm	=	0.232 Inch
trn = P*Rn/(Sn-0.6*P)	=	0.26 mm	=	0.010 Inch
Horiz. limit to nozzle O.D.	Lo =	46.55 mm	=	1.833 Inch
Vertic. limit to shell O.D.	ho =	29.72 mm	=	1.170 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in)Areq = d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	585.5 mm2	=	0.908 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	818.8 mm2	=	1.269 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	303.0 mm2	=	0.470 Sq.in
(weld) A41 * Min(Sn/S,Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	88.1 mm2	=	0.137 Sq.in
(pad) A5 =2*Lp*tp*Sp/S	=	1200.0 mm2	=	1.860 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	2483.3 mm2	=	3.849 Sq.in
(Load carrying paths calculation not necessary since A1>=A)				

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.: S1 DN.4"  
ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	1.474 MPa	=	213.7	Psi
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	1.236 MPa	=	179.2	Psi
HYDRAULIC TEST PRESSURE -Nozzle= $1.3 \cdot P_i \cdot S_n0 / S_n$	=	0.784 MPa	=	113.7	Psi
BASIS FOR CALC.TEST PRESSURE $P_b = MAWP(N\&C) + P_h$	=	1.474 MPa	=	213.7	Psi
MAX. ALL. HYDR.TEST PRESSURE-Nozzle = $1.3 \cdot P_b - P_{ht}$	=	1.896 MPa	=	274.9	Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S1 DN.4"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0=	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.020 MPa	=	2.9 Psi
Calculation pressure	P=(P0+ Ph)=	0.600 MPa	=	87.0 Psi
Shell Internal diameter	D =	2*R = 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	40.00 mm	=	1.575 Inch
Nozzle Outside Diameter	=	114.30 mm	=	4.500 Inch
Nozzle Thickness	tn =	8.56 mm	=	0.337 Inch
Nozzle Wall Tolerance	c1 =	1.07 mm	=	0.042 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	332.00 mm	=	13.071 Inch
Angular coordinate	=	102.86 deg		
Nozzle position:	RADIAL (F=1)			
Opening size	d = 2*Rn =	102.52 mm	=	4.036 Inch
* NET THICKNESSES:"				
t' =	t -c -c'	=	13.40 mm	= 0.528 Inch
tr =	P*(R+c+c')/(S-0.6*P)	=	5.51 mm	= 0.217 Inch
tn' =	tn -c2 -c1	=	5.89 mm	= 0.232 Inch
trn =	P*Rn/(Sn-0.6*P)	=	0.26 mm	= 0.010 Inch
Horiz. limit to nozzle O.D.	Lo =	45.37 mm	=	1.786 Inch
Vertic. limit to shell O.D.	ho =	29.72 mm	=	1.170 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in)Areq =	d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	570.9 mm2	= 0.885 Sq.in
(sh.) A1=	2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	800.3 mm2	= 1.240 Sq.in
(nozzle) A2 =	2*ho*(tn'-trn)*Sn/S	=	303.0 mm2	= 0.470 Sq.in
(weld) A41 * Min(Sn/S,Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	78.6 mm2	=	0.122 Sq.in
(pad) A5 =	2*Lp*tp*Sp/S	=	1200.0 mm2	= 1.860 Sq.in
* TOTAL REINF. AREA Ao =	A1+A2+A4()+A5	=	2455.2 mm2	= 3.806 Sq.in
(Load carrying paths calculation not necessary since A1>=A)				



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 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S1 DN.4"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE  
 Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 8.56 mm = 0.337 Inch  
 Unadjusted MDMT from table UCS-66 = -48.0 C = -54.4 F  
 Tr = 0.26 mm = 0.010 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance = 5.89 mm = 0.232 Inch  
 Coincident ratio = 0.044  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

PAD  
 Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 15.00 mm = 0.591 Inch  
 Unadjusted MDMT from table UCS-66 = -45.1 C = -49.2 F  
 Coincident ratio = 0.386  
 ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 6.87 mm = 0.270 Inch  
 Min thickness under int. pressure + c (E=1) = 7.11 mm = 0.280 Inch  
 Min thickness according to UG 45 = 6.87 mm = 0.270 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 1.474 MPa = 213.7 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 1.236 MPa = 179.2 Psi

HYDRAULIC TEST PRESSURE -Nozzle=  $1.3 \cdot P_i \cdot S_n0 / S_n$  = 0.784 MPa = 113.7 Psi  
 BASIS FOR CALC.TEST PRESSURE  $P_b = MAWP(N\&C) + P_h$  = 1.474 MPa = 213.7 Psi  
 MAX. ALL. HYDR.TEST PRESSURE-Nozzle =  $1.3 \cdot P_b - P_{ht}$  = 1.896 MPa = 274.9 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 EXTERNAL PRESSURE OF NOZZLE POS.:S1 DN.4"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 28

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 39) SA 333 Gr.6 smls.

\* ALLOW. STRESSES: -----

	MPa / Psi		
S =	117.400 / 17027.5		
External Pressure	Pe= 0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph= 0.000 MPa	=	0.0 Psi
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa	=	15.0 Psi
Outside diameter	Do= 114.30 mm	=	4.50 Inch
Elastic Modulus	E = 173618 MPa	=	25181234 Psi
Axial length between reinforcements	L = 240.00 mm	=	9.45 Inch
Adopted thickness	t = 8.56 mm	=	0.337 Inch
Corrosion Allowance	c = 1.60 mm	=	0.063 Inch
Wall undertolerance	c' = 1.07 mm	=	0.042 Inch
L/Do	=	2.100	
Do/(t-c-c')	=	19.406	
A (Fig.G-UG-28)	=	0.00704792	
B (Fig.G-CS-2 )	=	82.9075 MPa	= 12024.7 Psi
Pa = 4*B/3/(Do/(t-c-c'))	=	5.6964 MPa	= 826.2 Psi
Min. thickness for external pressure tr+c+c'	=	3.175 mm	= 0.1250 Inch

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S1 DN.4"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0=	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.103 MPa	=	15.0 Psi
Shell Internal diameter	D =	2*R = 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	40.00 mm	=	1.575 Inch
Nozzle Outside Diameter	=	114.30 mm	=	4.500 Inch
Nozzle Thickness	tn =	8.56 mm	=	0.337 Inch
Nozzle Wall Tolerance	c1 =	1.07 mm	=	0.042 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	332.00 mm	=	13.071 Inch
Angular coordinate	=	102.86 deg		
Angle nozzle axis/normal to wall (Positive if counterclockwise)=				0.00 deg
Nzl.position: NOT RADIAL F=1, distance nzl/shell axes L =		265.5 mm		
Rm = R+tr/2+c+c' teta=acs((L+Rn)/Rm)-acs((L-Rn)/Rm) =		5.1 deg		
Opening size d=2*Rm*sqr(1-(cos(teta/2))^2) =		105.17 mm	=	4.140 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = From external pressure calc. -c-c' =		11.48 mm	=	0.452 Inch
tn' = tn -c2 -c1 =		5.89 mm	=	0.232 Inch
trn = From external pressure calc.-c2-c1 =		0.50 mm	=	0.020 Inch
Horiz. limit to nozzle O.D.	Lo =	46.54 mm	=	1.832 Inch
Vertic. limit to shell O.D.	ho =	29.72 mm	=	1.170 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in)Areq =(d*F*tr+2*F*tn'*tr*(1-Sn/S))/2=		610.3 mm2	=	0.946 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S =		198.7 mm2	=	0.308 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S =		290.0 mm2	=	0.449 Sq.in
(weld) A41 * Min(Sn/S,Sp/S) =		73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S =		88.0 mm2	=	0.136 Sq.in
(pad) A5 =2*Lp*tp*Sp/S =		1200.0 mm2	=	1.860 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5 =		1850.1 mm2	=	2.868 Sq.in

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.:S1 DN.4"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

*	POSSIBLE PATHS OF FAILURE				*			
-----	B+D	-----	A+C+D	-----	C+D	-----	D	-----
Leg of fillet weld (nozzle to pad)	a =	9.00 mm	=	0.354	Inch			
Leg of fillet weld (shell to pad)	b =	10.00 mm	=	0.394	Inch			
W = (A-2*Lo*(t-F*tr))*S	=			12587	Lb			
W11 = (A2+A5+A41+A42)*S	=			48114	Lb			
W33 = (A2+A5+A41+A42+2*tn*t*Sn/S)*S	=			52280	Lb			
SB = PI/2*dm*tn*0.7*Sn	=			18530	Lb			
SC = PI/2*OD*t*0.74*S	=			46988	Lb			
SD = PI/2*(OD+2*L)*b*0.49*S	=			43572	Lb			
	* SB + SD	>	min (W,W11)	*				
	* SC + SD	>	min (W,W33)	*				
MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	0.235 MPa	=	34.1	Psi			
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	0.152 MPa	=	22.0	Psi			

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S1 DN.4"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn =	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0 =	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp =	129.6000 MPa	=	18796.9 Psi
Pressure	P0 =	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph =	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht =	0.000 MPa	=	0.0 Psi
Calculation pressure	P = (P0 + Ph) =	0.103 MPa	=	15.0 Psi
Shell Internal diameter	D = 2*R	= 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	40.00 mm	=	1.575 Inch
Nozzle Outside Diameter	=	114.30 mm	=	4.500 Inch
Nozzle Thickness	tn =	8.56 mm	=	0.337 Inch
Nozzle Wall Tolerance	c1 =	1.07 mm	=	0.042 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	332.00 mm	=	13.071 Inch
Angular coordinate	=	102.86 deg		
Nozzle position:	RADIAL (F=1)			
Opening size	d = 2*Rn =	102.52 mm	=	4.036 Inch
* NET THICKNESSES:"				
t'	= t - c - c'	=	13.40 mm	= 0.528 Inch
tr	= From external pressure calc. -c-c'	=	11.48 mm	= 0.452 Inch
tn'	= tn - c2 - c1	=	5.89 mm	= 0.232 Inch
trn	= From external pressure calc. -c2-c1	=	0.50 mm	= 0.020 Inch
Horiz. limit to nozzle O.D.	Lo =	45.37 mm	=	1.786 Inch
Vertic. limit to shell O.D.	ho =	29.72 mm	=	1.170 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in) Areq	= (d*F*tr + 2*F*tn'*tr*(1-Sn/S))/2 =	595.1 mm2	=	0.922 Sq.in
(sh.) A1	= 2*Lo*(t'-F*tr) + 2*tn'*(t'-F*tr)*Sn/S =	194.2 mm2	=	0.301 Sq.in
(nozzle) A2	= 2*ho*(tn'-trn)*Sn/S =	290.0 mm2	=	0.449 Sq.in
(weld) A41	= Min(Sn/S, Sp/S) =	73.4 mm2	=	0.114 Sq.in
(weld) A42	= Sp/S =	78.6 mm2	=	0.122 Sq.in
(pad) A5	= 2*Lp*tp*Sp/S =	1200.0 mm2	=	1.860 Sq.in
* TOTAL REINF. AREA Ao	= A1+A2+A4()+A5 =	1836.1 mm2	=	2.846 Sq.in

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.:S1 DN.4"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* POSSIBLE PATHS OF FAILURE *			
----- B+D -----	A+C+D	C+D	----- D -----
Leg of fillet weld (nozzle to pad)	a =	9.00 mm	= 0.354 Inch
Leg of fillet weld (shell to pad)	b =	10.00 mm	= 0.394 Inch
W = (A-2*Lo*(t-F*tr))*S	=		12275 Lb
W11 = (A2+A5+A41+A42)*S	=		47838 Lb
W33 = (A2+A5+A41+A42+2*tn*t*Sn/S)*S	=		52005 Lb
SB = PI/2*dm*tn*0.7*Sn	=		18530 Lb
SC = PI/2*OD*t*0.74*S	=		46988 Lb
SD = PI/2*(OD+2*L)*b*0.49*S	=		43572 Lb
	* SB + SD	>	min (W,W11) *
	* SC + SD	>	min (W,W33) *

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S1 DN.4"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 8.56 mm = 0.337 Inch  
 Unadjusted MDMT from table UCS-66 = -48.0 C = -54.4 F  
 Tr = 0.47 mm = 0.019 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance = 5.89 mm = 0.232 Inch  
 Coincident ratio = 0.081  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

PAD

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 15.00 mm = 0.591 Inch  
 Unadjusted MDMT from table UCS-66 = -45.1 C = -49.2 F  
 Coincident ratio = 0.683  
 ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 6.87 mm = 0.270 Inch  
 Min thickness under ext. pressure + c (E=1) = 3.10 mm = 0.122 Inch  
 Min thickness according to UG 45 = 3.10 mm = 0.122 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 0.178 MPa = 25.7 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.152 MPa = 22.0 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S2 DN.4"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0=	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.015 MPa	=	2.2 Psi
Calculation pressure	P=(P0+ Ph)=	0.600 MPa	=	87.0 Psi
Shell Internal diameter	D =	2*R = 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	40.00 mm	=	1.575 Inch
Nozzle Outside Diameter	=	114.30 mm	=	4.500 Inch
Nozzle Thickness	tn =	8.56 mm	=	0.337 Inch
Nozzle Wall Tolerance	c1 =	1.07 mm	=	0.042 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	332.00 mm	=	13.071 Inch
Angular coordinate	=	70.12 deg		
Angle nozzle axis/normal to wall (Positive if counterclockwise)=			=	0.00 deg
Nzl.position: NOT RADIAL F=1, distance nzl/shell axes L =		405.5 mm		
Rm = R+tr/2+c+c' teta=acs((L+Rn)/Rm)-acs((L-Rn)/Rm) =			=	5.3 deg
Opening size d=2*Rm*sqr(1-(cos(teta/2))^2) =		109.07 mm	=	4.294 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = P*(R+c+c')/(S-0.6*P)	=	5.51 mm	=	0.217 Inch
tn' = tn -c2 -c1	=	5.89 mm	=	0.232 Inch
trn = P*Rn/(Sn-0.6*P)	=	0.26 mm	=	0.010 Inch
Horiz. limit to nozzle O.D.	Lo =	48.27 mm	=	1.900 Inch
Vertic. limit to shell O.D.	ho =	29.72 mm	=	1.170 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in)Areq = d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	607.0 mm2	=	0.941 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	846.0 mm2	=	1.311 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	303.0 mm2	=	0.470 Sq.in
(weld) A41 * Min(Sn/S,Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	97.0 mm2	=	0.150 Sq.in
(pad) A5 =2*Lp*tp*Sp/S	=	1200.0 mm2	=	1.860 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	2519.4 mm2	=	3.905 Sq.in
(Load carrying paths calculation not necessary since A1>=A)				



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REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.:S2 DN.4"  
ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	1.474 MPa =	213.7 Psi
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	1.236 MPa =	179.2 Psi
HYDRAULIC TEST PRESSURE -Nozzle= $1.3 \cdot P_i \cdot S_n0 / S_n$	=	0.784 MPa =	113.7 Psi
BASIS FOR CALC.TEST PRESSURE $P_b = MAWP(N\&C) + P_h$	=	1.474 MPa =	213.7 Psi
MAX. ALL. HYDR.TEST PRESSURE-Nozzle = $1.3 \cdot P_b - P_{ht}$	=	1.901 MPa =	275.7 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S2 DN.4"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn =	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0 =	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp =	129.6000 MPa	=	18796.9 Psi
Pressure	P0 =	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph =	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht =	0.015 MPa	=	2.2 Psi
Calculation pressure	P = (P0 + Ph) =	0.600 MPa	=	87.0 Psi
Shell Internal diameter	D = 2*R	= 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	40.00 mm	=	1.575 Inch
Nozzle Outside Diameter	=	114.30 mm	=	4.500 Inch
Nozzle Thickness	tn =	8.56 mm	=	0.337 Inch
Nozzle Wall Tolerance	c1 =	1.07 mm	=	0.042 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	332.00 mm	=	13.071 Inch
Angular coordinate	=	70.12 deg		
Nozzle position:	RADIAL (F=1)			
Opening size	d = 2*Rn =	102.52 mm	=	4.036 Inch
* NET THICKNESSES:"				
t'	= t - c - c'	=	13.40 mm	= 0.528 Inch
tr	= P*(R+c+c')/(S-0.6*P)	=	5.51 mm	= 0.217 Inch
tn'	= tn - c2 - c1	=	5.89 mm	= 0.232 Inch
trn	= P*Rn/(Sn-0.6*P)	=	0.26 mm	= 0.010 Inch
Horiz. limit to nozzle O.D.	Lo =	45.37 mm	=	1.786 Inch
Vertic. limit to shell O.D.	ho =	29.72 mm	=	1.170 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in) Areq	= d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	570.9 mm2	= 0.885 Sq.in
(sh.) A1	= 2Lo*(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	800.3 mm2	= 1.240 Sq.in
(nozzle) A2	= 2*ho*(tn'-trn)*Sn/S	=	303.0 mm2	= 0.470 Sq.in
(weld) A41	= Min(Sn/S, Sp/S)	=	73.4 mm2	= 0.114 Sq.in
(weld) A42	= Sp/S	=	78.6 mm2	= 0.122 Sq.in
(pad) A5	= 2*Lp*tp*Sp/S	=	1200.0 mm2	= 1.860 Sq.in
* TOTAL REINF. AREA Ao	= A1+A2+A4()+A5	=	2455.2 mm2	= 3.806 Sq.in
(Load carrying paths calculation not necessary since A1>=A)				

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 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S2 DN.4"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 8.56 mm = 0.337 Inch  
 Unadjusted MDMT from table UCS-66 = -48.0 C = -54.4 F  
 Tr = 0.26 mm = 0.010 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance = 5.89 mm = 0.232 Inch  
 Coincident ratio = 0.044  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

PAD

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 15.00 mm = 0.591 Inch  
 Unadjusted MDMT from table UCS-66 = -45.1 C = -49.2 F  
 Coincident ratio = 0.386  
 ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 6.87 mm = 0.270 Inch  
 Min thickness under int. pressure + c (E=1) = 7.11 mm = 0.280 Inch  
 Min thickness according to UG 45 = 6.87 mm = 0.270 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 1.474 MPa = 213.7 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 1.236 MPa = 179.2 Psi

HYDRAULIC TEST PRESSURE -Nozzle=  $1.3 \cdot P_i \cdot S_n0 / S_n$  = 0.784 MPa = 113.7 Psi  
 BASIS FOR CALC.TEST PRESSURE  $P_b = MAWP(N\&C) + P_h$  = 1.474 MPa = 213.7 Psi  
 MAX. ALL. HYDR.TEST PRESSURE-Nozzle =  $1.3 \cdot P_b - P_{ht}$  = 1.901 MPa = 275.7 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 EXTERNAL PRESSURE OF NOZZLE POS.:S2 DN.4"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 28

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 39) SA 333 Gr.6 smls.

\* ALLOW. STRESSES: -----

	MPa / Psi		
S =	117.400 / 17027.5		
External Pressure	Pe= 0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph= 0.000 MPa	=	0.0 Psi
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa	=	15.0 Psi
Outside diameter	Do= 114.30 mm	=	4.50 Inch
Elastic Modulus	E = 173618 MPa	=	25181234 Psi
Axial length between reinforcements	L = 240.00 mm	=	9.45 Inch
Adopted thickness	t = 8.56 mm	=	0.337 Inch
Corrosion Allowance	c = 1.60 mm	=	0.063 Inch
Wall undertolerance	c' = 1.07 mm	=	0.042 Inch
L/Do	=	2.100	
Do/(t-c-c')	=	19.406	
A (Fig.G-UG-28)	=	0.00704792	
B (Fig.G-CS-2 )	=	82.9075 MPa	= 12024.7 Psi
Pa = 4*B/3/(Do/(t-c-c'))	=	5.6964 MPa	= 826.2 Psi
Min. thickness for external pressure tr+c+c'	=	3.175 mm	= 0.1250 Inch

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S2 DN.4"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0=	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.103 MPa	=	15.0 Psi
Shell Internal diameter	D = 2*R	= 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	40.00 mm	=	1.575 Inch
Nozzle Outside Diameter	=	114.30 mm	=	4.500 Inch
Nozzle Thickness	tn =	8.56 mm	=	0.337 Inch
Nozzle Wall Tolerance	c1 =	1.07 mm	=	0.042 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	332.00 mm	=	13.071 Inch
Angular coordinate	=	70.12 deg		
Angle nozzle axis/normal to wall (Positive if counterclockwise)=			=	0.00 deg
Nzl.position: NOT RADIAL F=1, distance nzl/shell axes L =		405.5 mm		
Rm = R+tr/2+c+c' teta=acs((L+Rn)/Rm)-acs((L-Rn)/Rm)			=	5.2 deg
Opening size d=2*Rm*sqr(1-(cos(teta/2))^2)		109.03 mm	=	4.293 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = From external pressure calc. -c-c'	=	11.48 mm	=	0.452 Inch
tn' = tn -c2 -c1	=	5.89 mm	=	0.232 Inch
trn = From external pressure calc.-c2-c1	=	0.50 mm	=	0.020 Inch
Horiz. limit to nozzle O.D.	Lo =	48.25 mm	=	1.900 Inch
Vertic. limit to shell O.D.	ho =	29.72 mm	=	1.170 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in) Areq = (d*F*tr+2*F*tn'*tr*(1-Sn/S))/2=		632.5 mm2	=	0.980 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	205.2 mm2	=	0.318 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	290.0 mm2	=	0.449 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	96.9 mm2	=	0.150 Sq.in
(pad) A5 =2*Lp*tp*Sp/S	=	1200.0 mm2	=	1.860 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	1865.6 mm2	=	2.892 Sq.in

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.:S2 DN.4"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

*	POSSIBLE PATHS OF FAILURE				*			
-----	B+D	-----	A+C+D	-----	C+D	-----	D	-----
Leg of fillet weld (nozzle to pad)	a =	9.00 mm	=	0.354	Inch			
Leg of fillet weld (shell to pad)	b =	10.00 mm	=	0.394	Inch			
W = (A-2*Lo*(t-F*tr))*S	=			13043	Lb			
W11 = (A2+A5+A41+A42)*S	=			48374	Lb			
W33 = (A2+A5+A41+A42+2*tn*t*Sn/S)*S	=			52540	Lb			
SB = PI/2*dm*tn*0.7*Sn	=			18530	Lb			
SC = PI/2*OD*t*0.74*S	=			46988	Lb			
SD = PI/2*(OD+2*L)*b*0.49*S	=			43572	Lb			
	* SB + SD	>	min (W,W11)	*				
	* SC + SD	>	min (W,W33)	*				
MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	0.235 MPa	=	34.1	Psi			
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	0.152 MPa	=	22.0	Psi			

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S2 DN.4"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0=	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.103 MPa	=	15.0 Psi
Shell Internal diameter	D =	2*R = 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	40.00 mm	=	1.575 Inch
Nozzle Outside Diameter	=	114.30 mm	=	4.500 Inch
Nozzle Thickness	tn =	8.56 mm	=	0.337 Inch
Nozzle Wall Tolerance	c1 =	1.07 mm	=	0.042 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	332.00 mm	=	13.071 Inch
Angular coordinate	=	70.12 deg		
Nozzle position:	RADIAL (F=1)			
Opening size	d = 2*Rn =	102.52 mm	=	4.036 Inch
* NET THICKNESSES:"				
t' =	t -c -c'	=	13.40 mm	= 0.528 Inch
tr =	From external pressure calc. -c-c'	=	11.48 mm	= 0.452 Inch
tn' =	tn -c2 -c1	=	5.89 mm	= 0.232 Inch
trn =	From external pressure calc.-c2-c1	=	0.50 mm	= 0.020 Inch
Horiz. limit to nozzle O.D.	Lo =	45.37 mm	=	1.786 Inch
Vertic. limit to shell O.D.	ho =	29.72 mm	=	1.170 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in) Areq =	(d*F*tr+2*F*tn'*tr*(1-Sn/S))/2=	595.1 mm2	=	0.922 Sq.in
(sh.) A1=	2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	= 194.2 mm2	=	0.301 Sq.in
(nozzle) A2 =	2*ho*(tn'-trn)*Sn/S	= 290.0 mm2	=	0.449 Sq.in
(weld) A41 *	Min(Sn/S,Sp/S)	= 73.4 mm2	=	0.114 Sq.in
(weld) A42 *	Sp/S	= 78.6 mm2	=	0.122 Sq.in
(pad) A5 =	2*Lp*tp*Sp/S	= 1200.0 mm2	=	1.860 Sq.in
* TOTAL REINF. AREA Ao =	A1+A2+A4()+A5	= 1836.1 mm2	=	2.846 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.:S2 DN.4"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* POSSIBLE PATHS OF FAILURE *			
----- B+D -----	A+C+D	C+D	D -----
Leg of fillet weld (nozzle to pad)	a =	9.00 mm	= 0.354 Inch
Leg of fillet weld (shell to pad)	b =	10.00 mm	= 0.394 Inch
W = (A-2*Lo*(t-F*tr))*S	=		12275 Lb
W11 = (A2+A5+A41+A42)*S	=		47838 Lb
W33 = (A2+A5+A41+A42+2*tn*t*Sn/S)*S	=		52005 Lb
SB = PI/2*dm*tn*0.7*Sn	=		18530 Lb
SC = PI/2*OD*t*0.74*S	=		46988 Lb
SD = PI/2*(OD+2*L)*b*0.49*S	=		43572 Lb
	* SB + SD	>	min (W,W11) *
	* SC + SD	>	min (W,W33) *



Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S2 DN.4"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 8.56 mm = 0.337 Inch  
 Unadjusted MDMT from table UCS-66 = -48.0 C = -54.4 F  
 Tr = 0.47 mm = 0.019 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance = 5.89 mm = 0.232 Inch  
 Coincident ratio = 0.081  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

PAD

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 15.00 mm = 0.591 Inch  
 Unadjusted MDMT from table UCS-66 = -45.1 C = -49.2 F  
 Coincident ratio = 0.683  
 ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 6.87 mm = 0.270 Inch  
 Min thickness under ext. pressure + c (E=1) = 3.13 mm = 0.123 Inch  
 Min thickness according to UG 45 = 3.13 mm = 0.123 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 0.178 MPa = 25.7 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.152 MPa = 22.0 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S6 DN.12"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
	(at room temperature)	Sn0=	118.0000 MPa	= 17114.5 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.025 MPa	=	3.6 Psi
Calculation pressure	P=(P0+ Ph)=	0.600 MPa	=	87.0 Psi
Shell Internal diameter	D = 2*R	= 2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	55.00 mm	=	2.165 Inch
Nozzle Outside Diameter	=	323.80 mm	=	12.748 Inch
Nozzle Thickness	tn =	12.70 mm	=	0.500 Inch
Nozzle Wall Tolerance	c1 =	1.58 mm	=	0.062 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	580.00 mm	=	22.835 Inch
Angular coordinate	=	180.00 deg		
Nozzle position:	RADIAL (F=1)			
Opening size	d = 2*Rn =	304.76 mm	=	11.998 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = P*(R+c+c')/(S-0.6*P)	=	5.51 mm	=	0.217 Inch
tn' = tn -c2 -c1	=	9.52 mm	=	0.375 Inch
trn = P*Rn/(Sn-0.6*P)	=	0.78 mm	=	0.031 Inch
Horiz. limit to nozzle O.D.	Lo =	100.00 mm	=	3.937 Inch
Vertic. limit to shell O.D.	ho =	33.50 mm	=	1.319 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in) Areq = d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	1688.7 mm2	=	2.618 Sq.in
(sh.) A1=2Lo*(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	1714.3 mm2	=	2.657 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	530.4 mm2	=	0.822 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	100.0 mm2	=	0.155 Sq.in
(pad) A5 =2*Lp*tp*Sp/S	=	1650.0 mm2	=	2.557 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	4068.1 mm2	=	6.306 Sq.in
(Load carrying paths calculation not necessary since A1>=A)				

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S6 DN.12"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT) -----

NOZZLE

Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 12.70 mm = 0.500 Inch  
 Unadjusted MDMT from table UCS-66 = -37.0 C = -34.6 F  
 Tr = 0.78 mm = 0.031 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance= 9.52 mm = 0.375 Inch  
 Coincident ratio = 0.082  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

PAD

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 15.00 mm = 0.591 Inch  
 Unadjusted MDMT from table UCS-66 = -45.1 C = -49.2 F  
 Coincident ratio = 0.386  
 ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 9.93 mm = 0.391 Inch  
 Min thickness under int. pressure + c (E=1) = 7.11 mm = 0.280 Inch  
 Min thickness according to UG 45 = 7.11 mm = 0.280 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 1.263 MPa = 183.2 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 1.084 MPa = 157.3 Psi

HYDRAULIC TEST PRESSURE -Nozzle=  $1.3 \cdot P_i \cdot S_n0 / S_n$  = 0.784 MPa = 113.7 Psi  
 BASIS FOR CALC.TEST PRESSURE  $P_b = MAWP(N\&C) + P_h$  = 1.263 MPa = 183.2 Psi  
 MAX. ALL. HYDR.TEST PRESSURE-Nozzle =  $1.3 \cdot P_b - P_{ht}$  = 1.617 MPa = 234.6 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 EXTERNAL PRESSURE OF NOZZLE POS.:S6 DN.12"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 28

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 39) SA 333 Gr.6 smls.

\* ALLOW. STRESSES: -----

	MPa / Psi		
S =	117.400 / 17027.5		
External Pressure	Pe= 0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph= 0.000 MPa	=	0.0 Psi
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa	=	15.0 Psi
Outside diameter	Do= 323.80 mm	=	12.75 Inch
Elastic Modulus	E = 173618 MPa	=	25181234 Psi
Axial length between reinforcements	L = 200.00 mm	=	7.87 Inch
Adopted thickness	t = 12.70 mm	=	0.500 Inch
Corrosion Allowance	c = 1.60 mm	=	0.063 Inch
Wall undertolerance	c' = 1.58 mm	=	0.062 Inch
L/Do	=	0.618	
Do/(t-c-c')	=	34.013	
A (Fig.G-UG-28)	=	0.01193340	
B (Fig.G-CS-2 )	=	89.4014 MPa	= 12966.6 Psi
Pa = 4*B/3/(Do/(t-c-c'))	=	3.5046 MPa	= 508.3 Psi
Min. thickness for external pressure tr+c+c'	=	4.065 mm	= 0.1600 Inch

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S6 DN.12"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* PAD MATERIAL (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	117.4000 MPa	=	17027.5 Psi
(at room temperature)	Sn0=	118.0000 MPa	=	17114.5 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.103 MPa	=	15.0 Psi
Shell Internal diameter	D = 2*R =	2370.0 mm	=	93.31 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	15.00 mm	=	0.591 Inch
Pad Width	Lp =	55.00 mm	=	2.165 Inch
Nozzle Outside Diameter	=	323.80 mm	=	12.748 Inch
Nozzle Thickness	tn =	12.70 mm	=	0.500 Inch
Nozzle Wall Tolerance	c1 =	1.58 mm	=	0.062 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	580.00 mm	=	22.835 Inch
Angular coordinate	=	180.00 deg		
Nozzle position:	RADIAL (F=1)			
Opening size	d = 2*Rn =	304.76 mm	=	11.998 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = From external pressure calc. -c-c'	=	11.48 mm	=	0.452 Inch
tn' = tn -c2 -c1	=	9.52 mm	=	0.375 Inch
trn = From external pressure calc.-c2-c1	=	0.88 mm	=	0.035 Inch
Horiz. limit to nozzle O.D.	Lo =	100.00 mm	=	3.937 Inch
Vertic. limit to shell O.D.	ho =	33.50 mm	=	1.319 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	10.00 mm	=	0.394 Inch
* REINFORCING AREAS:				
(set-in) Areq = (d*F*tr+2*F*tn'*tr*(1-Sn/S))/2=	=	1760.4 mm2	=	2.729 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	416.0 mm2	=	0.645 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	524.1 mm2	=	0.812 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	73.4 mm2	=	0.114 Sq.in
(weld) A42 * Sp/S	=	100.0 mm2	=	0.155 Sq.in
(pad) A5 =2*Lp*tp*Sp/S	=	1650.0 mm2	=	2.557 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	2763.5 mm2	=	4.283 Sq.in

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.:S6 DN.12"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* POSSIBLE PATHS OF FAILURE *			
----- B+D -----	A+C+D	C+D	D -----
Leg of fillet weld (nozzle to pad)	a =	9.00 mm	= 0.354 Inch
Leg of fillet weld (shell to pad)	b =	10.00 mm	= 0.394 Inch
W = (A-2*Lo*(t-F*tr))*S	=		40130 Lb
W11 = (A2+A5+A41+A42)*S	=		68394 Lb
W33 = (A2+A5+A41+A42+2*tn*t*Sn/S)*S	=		75128 Lb
SB = PI/2*dm*tn*0.7*Sn	=		86827 Lb
SC = PI/2*OD*t*0.74*S	=		133112 Lb
SD = PI/2*(OD+2*L)*b*0.49*S	=		97280 Lb
	* SB + SD	>	min (W,W11) *
	* SC + SD	>	min (W,W33) *

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S6 DN.12"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 12.70 mm = 0.500 Inch  
 Unadjusted MDMT from table UCS-66 = -37.0 C = -34.6 F  
 Tr = 0.82 mm = 0.032 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance = 9.52 mm = 0.375 Inch  
 Coincident ratio = 0.087  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

PAD

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 15.00 mm = 0.591 Inch  
 Unadjusted MDMT from table UCS-66 = -45.1 C = -49.2 F  
 Coincident ratio = 0.683  
 ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 9.93 mm = 0.391 Inch  
 Min thickness under ext. pressure + c (E=1) = 3.13 mm = 0.123 Inch  
 Min thickness according to UG 45 = 3.13 mm = 0.123 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 0.235 MPa = 34.1 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.152 MPa = 22.0 Psi





Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 EXTERNAL PRESSURE OF CONICAL HEAD POS.:301  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 33

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 80) SA 516 Gr.70

\* ALLOW. STRESSES: -----

	MPa / Psi		
S =	129.600 / 18796.9		
External Pressure	Pe= 0.103 MPa =	15.0 Psi	
Overpressure due to static head	Ph= 0.000 MPa =	0.0 Psi	
Overpressure due to static head (test)	Pht= 0.000 MPa =	0.0 Psi	
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa =	15.0 Psi	
Outside diameter at large end	DL= 2400.00 mm =	94.49 Inch	
Outside diameter at small end	Ds= 1100.00 mm =	43.31 Inch	
One-half the apex angle	∅ = 60.00 °		
Elastic Modulus	E = 173618 MPa =	25181234 Psi	
	r1= 206.00 mm =	8.11 Inch	
	r2= 90.00 mm =	3.54 Inch	
	DSs= 1102.00 mm =	43.38 Inch	
	DLs= 2402.00 mm =	94.56 Inch	
	Lc= 664.00 mm =	26.14 Inch	
	DL= 3496.00 mm =	137.63 Inch	
	DS= 1192.00 mm =	46.93 Inch	
Design length $Le=(r1+r2*DSs/DLs) \sin \alpha + Lc/2*(DL+Ds)/DLs =$	Le = 864.06 mm =	34.02 Inch	
Design length	Le = 864.06 mm =	34.02 Inch	
Adopted thickness	t = 16.00 mm =	0.630 Inch	
Corrosion Allowance	c = 1.60 mm =	0.063 Inch	
Wall undertolerance	c' = 0.00 mm =	0.000 Inch	
Effective thickness $te=(t-c-c')*\cos\epsilon$	= 7.20 mm =	0.283 Inch	
Le/DL	= 0.360		
DL/te	= 333.333		
A (Fig.G-UG-28)	= 0.00063641		
B (Fig.G-CS-2 )	= 50.7534 MPa =	7361.2 Psi	
Pa = 4*B/3/(DL/te)	= 0.2030 MPa =	29.4 Psi	
Min. thickness for external pressure $tr+c+c'$	= 12.370 mm =	0.4870 Inch	

----- JUNCTION AT THE LARGE END (f1= 0.000 N/mm) -----  
 P/SsE1 ratio = 0.00094  
 ∅ angle (from table 1.8.1) ∅= 2.35 °  
 Radius at large end RL = 1200.00 mm = 47.244 Inch  
 P\*RL/2 (in compression) = -62.04 N/mm= -354 lb/in  
 $ArL=(PRL/2+f1)RL/S(1-1/4(PRL-QL)/QL)\epsilon/\cos\epsilon)tg(\epsilon)=$  1159.1 mm<sup>2</sup> = 1.80 Sq.in  
 $AeL=.55*SQR(2*RL*ts)+(ts+tc/\cos\epsilon)=$  4162.3 mm<sup>2</sup> = 6.45 Sq.in  
 \* STIFFENING RING NOT NECESSARY (area O.K.)

----- JUNCTION AT THE SMALL END (f2= 0.000 N/mm) -----  
 Radius at small end Rs = 550.00 mm = 21.654 Inch  
 P\*Rs/2 (in compression) = -28.43 N/mm= -162 lb/in  
 $Ars = (P*Rs/2+f2)*Rs/S/E1*tg(\epsilon)=$  245.9 mm<sup>2</sup> = 0.38 Sq.in  
 $Aes = .55*SQR(2*Rs*ts)*((ts-t)+(tc-tr)/\cos(\epsilon))=$  988.9 mm<sup>2</sup> = 1.53 Sq.in  
 \* STIFFENING RING NOT NECESSARY (area O.K.)

Max allowable working pressure (New & Cold) = 0.330 MPa = 47.9 Psi  
 Max allowable working pressure (Hot & Corr) = 0.203 MPa = 29.4 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
CONICAL SHELL POS.:301  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

INTERNAL PRESSURE  
Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 16.00 mm = 0.630 Inch  
Unadjusted MDMT from table UCS-66 = -43.9 C = -47.1 F  
Tr = 12.18 mm = 0.479 Inch  
Tn = Thk. -Corrosion - Wall undertolerance= 14.40 mm = 0.567 Inch  
Coincident ratio = 0.719  
ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

EXTERNAL PRESSURE  
Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 16.00 mm = 0.630 Inch  
Unadjusted MDMT from table UCS-66 = -43.9 C = -47.1 F  
Tr = 10.13 mm = 0.399 Inch  
Tn = Thk. -Corrosion - Wall undertolerance= 14.40 mm = 0.567 Inch  
Coincident ratio = 0.598  
ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S5 DN.24"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) -UG 36/37

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL : (Record Nr 80) SA 516 Gr.70				
* NOZZLE MATERIAL : (Record Nr 80) SA 516 Gr.70				
* PAD MATERIAL : (Record Nr 80) SA 516 Gr.70				
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	129.6000 MPa	=	18796.9 Psi
(at room temperature)	Sn0=	138.0000 MPa	=	20015.2 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.600 MPa	=	87.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.000 MPa	=	0.0 Psi
Calculation pressure	P=(P0+ Ph)=	0.600 MPa	=	87.0 Psi
Cone internal diameter at nozzle location	D =	2732.77 mm	=	107.59 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Shell Thickness	t =	16.00 mm	=	0.630 Inch
Pad Thickness	tp =	20.00 mm	=	0.787 Inch
Pad Width	Lp =	160.00 mm	=	6.299 Inch
Nozzle Outside Diameter	=	630.00 mm	=	24.803 Inch
Nozzle Thickness	tn =	25.00 mm	=	0.984 Inch
Nozzle Wall Tolerance	c1 =	0.00 mm	=	0.000 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	480.00 mm	=	18.898 Inch
Angular coordinate	=	0.00 deg		
Nzl.position: NOT RADIAL F=1, angle nzl/shell axes on plane	=	30.0 deg		
Opening size	d = 2*Rn/cos(teta)	=	673.42 mm	= 26.513 Inch
* NET THICKNESSES:"				
t' = t - c -c'	=	14.40 mm	=	0.567 Inch
tr = P*(R+c+c') / (cos(Alf)) / (S-0.6*P)	=	12.70 mm	=	0.500 Inch
tn' = tn -c- c1	=	23.40 mm	=	0.921 Inch
trn = P*Rn / (Sn-0.6*P)	=	1.35 mm	=	0.053 Inch
Horiz. limit to nozzle O.D.	Lo =	160.00 mm	=	6.299 Inch
Vertic. limit to shell O.D.	ho =	36.00 mm	=	1.417 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	11.00 mm	=	0.433 Inch
* REINFORCING AREAS:				
(set-in) Areq = d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	8553.7 mm2	=	13.258 Sq.in
(sh.) A1=2Lo*(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	622.9 mm2	=	0.965 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	1587.3 mm2	=	2.460 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	81.0 mm2	=	0.126 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in
(pad) A5 =2*Lo*tp*Sp/S	=	6400.0 mm2	=	9.920 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	8691.2 mm2	=	13.471 Sq.in

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 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.:S5 DN.24"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) -UG 36/37

		* POSSIBLE PATHS OF FAILURE *			
		----- B+D ----- A+C+D ----- C+D ----- D -----			
Leg of fillet weld (nozzle to pad)	a =	9.00 mm	=	0.354	Inch
Leg of fillet weld (shell to pad)	b =	11.00 mm	=	0.433	Inch
W	= (A-2*Lo*(t-F*tr))*S	=		233381	Lb
W11	= (A2+A5+A41+A42)*S	=		235073	Lb
W33	= (A2+A5+A41+A42+2*tn*t*Sn/S)*S	=		254708	Lb
SB	= PI/2*dm*tn*0.7*Sn	=		454732	Lb
SC	= PI/2*OD*t*0.74*S	=		307237	Lb
SD	= PI/2*(OD+2*L)*b*0.49*S	=		234343	Lb
	* SB + SD	>	min (W,W11)	*	
	* SC + SD	>	min (W,W33)	*	

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 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.S5 DN.24"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 25.00 mm = 0.984 Inch  
 Unadjusted MDMT from table UCS-66 = -35.2 C = -31.4 F  
 Tr = 1.27 mm = 0.050 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance= 23.40 mm = 0.921 Inch  
 Coincident ratio = 0.054  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

PAD

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 20.00 mm = 0.787 Inch  
 Unadjusted MDMT from table UCS-66 = -39.8 C = -39.6 F  
 Coincident ratio = 0.719  
 ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 9.93 mm = 0.391 Inch  
 Min thickness under int. pressure + c (E=1) = 14.30 mm = 0.563 Inch  
 Min thickness according to UG 45 = 9.93 mm = 0.391 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 0.6916 MPa = 100.3 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.6061 MPa = 87.9 Psi

HYDRAULIC TEST PRESSURE -Nozzle =  $1.3 \cdot P_i \cdot S_n0 / S_n$  = 0.831 MPa = 120.5 Psi  
 BASIS FOR CALC.TEST PRESSURE  $P_b = MAWP(N\&C) + P_h$  = 0.692 MPa = 100.3 Psi  
 MAX. ALL. HYDR.TEST PRESSURE-Nozzle =  $1.3 \cdot P_b - P_{ht}$  = 0.899 MPa = 130.4 Psi

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 EXTERNAL PRESSURE OF NOZZLE POS.:S5 DN.24"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - UG 28

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL: (Record Nr 80) SA 516 Gr.70

\* ALLOW. STRESSES: -----

	MPa / Psi			
	S = 129.600 / 18796.9			
External Pressure	Pe= 0.103 MPa	=	15.0 Psi	
Overpressure due to static head	Ph= 0.000 MPa	=	0.0 Psi	
Calculation pressure	P=(Pe+ Ph)= 0.103 MPa	=	15.0 Psi	
Outside diameter	Do= 630.00 mm	=	24.80 Inch	
Elastic Modulus	E = 173618 MPa	=	25181234 Psi	
Axial length between reinforcements	L = 450.00 mm	=	17.72 Inch	
Adopted thickness	t = 25.00 mm	=	0.984 Inch	
Corrosion Allowance	c = 1.60 mm	=	0.063 Inch	
Wall undertolerance	c' = 0.00 mm	=	0.000 Inch	
L/Do	= 0.714			
Do/(t-c-c')	= 26.923			
A (Fig.G-UG-28)	= 0.01456622			
B (Fig.G-CS-2 )	= 91.9029 MPa	=	13329.4 Psi	
Pa = 4*B/3/(Do/(t-c-c'))	= 4.5514 MPa	=	660.1 Psi	
Min. thickness for external pressure tr+c+c'	= 3.405 mm	=	0.1341 Inch	

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S5 DN.24"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) -UG 36/37

* DESIGN TEMPERATURE	T =	340.0 C	=	644.0 F
* SHELL MATERIAL : (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL : (Record Nr 80)	SA 516 Gr.70			
* PAD MATERIAL : (Record Nr 80)	SA 516 Gr.70			
* SHELL ALLOWABLE STRESS	S =	129.6000 MPa	=	18796.9 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	129.6000 MPa	=	18796.9 Psi
(at room temperature)	Sn0=	138.0000 MPa	=	20015.2 Psi
* PAD ALLOWABLE STRESS	Sp=	129.6000 MPa	=	18796.9 Psi
Pressure	P0=	0.103 MPa	=	15.0 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.000 MPa	=	0.0 Psi
Calculation pressure	F=(P0+ Ph)=	0.103 MPa	=	15.0 Psi
Cone internal diameter at nozzle location	D =	2732.77 mm	=	107.59 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Shell Thickness	t =	16.00 mm	=	0.630 Inch
Pad Thickness	tp =	20.00 mm	=	0.787 Inch
Pad Width	Lp =	160.00 mm	=	6.299 Inch
Nozzle Outside Diameter	=	630.00 mm	=	24.803 Inch
Nozzle Thickness	tn =	25.00 mm	=	0.984 Inch
Nozzle Wall Tolerance	c1 =	0.00 mm	=	0.000 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	480.00 mm	=	18.898 Inch
Angular coordinate	=	0.00 deg		
Nzl.position: NOT RADIAL F=1, angle nzl/shell axes on plane	=	30.0 deg		
Opening size d = 2*Rn/cos(teta)	=	673.42 mm	=	26.513 Inch
* NET THICKNESSES:"				
t' = t - c - c'	=	14.40 mm	=	0.567 Inch
tr = From external pressure calc. -c-c'	=	10.77 mm	=	0.424 Inch
tn' = tn -c- c1	=	23.40 mm	=	0.921 Inch
trn = From external pressure calc. -c-c1	=	1.80 mm	=	0.071 Inch
Horiz. limit to nozzle O.D.	Lo =	160.00 mm	=	6.299 Inch
Vertic. limit to shell O.D.	ho =	36.00 mm	=	1.417 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
Leg of fillet weld (pad to wall)	=	11.00 mm	=	0.433 Inch
* REINFORCING AREAS:				
(set-in) Areq = (d*F*tr+2*F*tn'*tr*(1-Sn/S))/2=		3626.4 mm2	=	5.621 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	1331.5 mm2	=	2.064 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	1554.8 mm2	=	2.410 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	81.0 mm2	=	0.126 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in
(pad) A5 =2*Lo*tp*Sp/S	=	6400.0 mm2	=	9.920 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	9367.3 mm2	=	14.519 Sq.in

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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.:S5 DN.24"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) -UG 36/37

* POSSIBLE PATHS OF FAILURE *	
----- B+D -----	A+C+D ----- C+D ----- D -----
Leg of fillet weld (nozzle to pad)	a = 9.00 mm = 0.354 Inch
Leg of fillet weld (shell to pad)	b = 11.00 mm = 0.433 Inch
W = (A-2*Lo*(t-F*tr))*S	= 71812 Lb
W11 = (A2+A5+A41+A42)*S	= 234127 Lb
W33 = (A2+A5+A41+A42+2*tn*t*Sn/S)*S	= 253761 Lb
SB = PI/2*dm*tn*0.7*Sn	= 454732 Lb
SC = PI/2*OD*t*0.74*S	= 307237 Lb
SD = PI/2*(OD+2*L)*b*0.49*S	= 234343 Lb
* SB + SD	> min (W,W11) *
* SC + SD	> min (W,W33) *



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 REINFORCEMENT OF OPENING UNDER EXT. PRESSURE POS.S5 DN.24"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 25.00 mm = 0.984 Inch  
 Unadjusted MDMT from table UCS-66 = -35.2 C = -31.4 F  
 Tr = 1.69 mm = 0.067 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance= 23.40 mm = 0.921 Inch  
 Coincident ratio = 0.072  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

PAD

Curve of fig UCS66 = D-Material Normalized  
 Governing thickness = 20.00 mm = 0.787 Inch  
 Unadjusted MDMT from table UCS-66 = -39.8 C = -39.6 F  
 Coincident ratio = 0.598  
 ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 9.93 mm = 0.391 Inch  
 Min thickness under ext. pressure + c (E=1) = 3.38 mm = 0.133 Inch  
 Min thickness according to UG 45 = 3.38 mm = 0.133 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 0.3304 MPa = 47.9 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 0.2030 MPa = 29.4 Psi



Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
CYLINDRICAL SHELL POS.:302  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

INTERNAL PRESSURE

Curve of fig UCS66	=	D-Material Normalized		
Governing thickness	=	15.00 mm	=	0.591 Inch
Unadjusted MDMT from table UCS-66	=	-45.1 C	=	-49.2 F
Tr =	=	2.75 mm	=	0.108 Inch
Tn = Thk. -Corrosion - Wall undertolerance=	=	13.40 mm	=	0.528 Inch
Coincident ratio	=	0.175		
ADJUSTED MDMT from fig UCS66.1	=	-105.0 C	=	-157.0 F

EXTERNAL PRESSURE

Curve of fig UCS66	=	D-Material Normalized		
Governing thickness	=	15.00 mm	=	0.591 Inch
Unadjusted MDMT from table UCS-66	=	-45.1 C	=	-49.2 F
Tr =	=	3.98 mm	=	0.157 Inch
Tn = Thk. -Corrosion - Wall undertolerance=	=	13.40 mm	=	0.528 Inch
Coincident ratio	=	0.253		
ADJUSTED MDMT from fig UCS66.1	=	-105.0 C	=	-157.0 F



Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
CYLINDRICAL SHELL POS.:230  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

INTERNAL PRESSURE  
Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 10.00 mm = 0.394 Inch  
Unadjusted MDMT from table UCS-66 = -48.0 C = -54.4 F  
Tr = 2.75 mm = 0.108 Inch  
Tn = Thk. -Corrosion - Wall undertolerance= 8.40 mm = 0.331 Inch  
Coincident ratio = 0.279  
ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

EXTERNAL PRESSURE  
Curve of fig UCS66 = D-Material Normalized  
Governing thickness = 10.00 mm = 0.394 Inch  
Unadjusted MDMT from table UCS-66 = -48.0 C = -54.4 F  
Tr = 3.71 mm = 0.146 Inch  
Tn = Thk. -Corrosion - Wall undertolerance= 8.40 mm = 0.331 Inch  
Coincident ratio = 0.376  
ADJUSTED MDMT from fig UCS66.1 = -48.0 C = -54.4 F

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 WELDING NECK FLANGE POS.:232  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - Appendix 2

\* DESIGN TEMPERATURE T = 340.0 C = 644.0 F

\* MATERIAL:

FLANGE (Record Nr 75) SA 266 Gr.2  
 SHELL (Record Nr 80) SA 516 Gr.70  
 BOLTING (Record Nr 86) SA 193 B7 ; <=64 mm  
 GASKET 5 -Spirally wound-stainl./monel

\* ALLOW. STRESSES: -----Flange-----Hub-----Bolting-----  
 MPa / Psi MPa / Psi MPa / Psi  
 DESIGN Sf =123.200 / 17868.7 Sh =184.800 / 26803.0 Sb =172.000 / 24946.5  
 SEATING Sfa=138.000 / 20015.2 Sha=207.000 / 30022.9 Sba=172.000 / 24946.5

\* GASKET PARAMETERS: m = 3.00 y= 10008 Psi N=15.0 mm w= 0.00 mm

Design pressure Pd= 0.600 MPa = 87.0 Psi  
 Overpressure due to static head Ph= 0.000 MPa = 0.0 Psi  
 Overpressure due to static head (test) Pht= 0.025 MPa = 3.6 Psi  
 Calculation pressure P=(Pd+Ph)= 0.600 MPa = 87.0 Psi  
 Corrosion allowance c = 1.60 mm = 0.063 inch  
 Flange outside diameter A = 1360.00 mm = 53.543 inch  
 Bolt circle C = 1300.00 mm = 51.181 inch  
 Mean gasket diameter G = 1245.00 mm = 49.016 inch  
 Flange inside diameter (uncorroded) B = 1200.00 mm = 47.244 inch  
 Hub at large end (uncorroded) g1= 20.00 mm = 0.787 inch  
 Shell thickness (uncorroded) g0= 10.00 mm = 0.394 inch  
 Flange thickness t = 75.00 mm = 2.953 inch  
 Hub length h = 30.00 mm = 1.181 inch  
 Bolt number and type n = 56 3/4 '' (Ansi)  
 Area of one bolt ab= 194.84 mm2 = 0.302 Sq.in

----- CALCULATED GASKET DIMENSIONS -----  
 bo = N/2 = 7.500 mm = 0.295 inch  
 b = 2.5\*SQR(bo) (bo > 6) = 6.847 mm = 0.270 inch  
 Effective gskt.diameter Ge = G+N-2\*b = 1246.31 mm = 49.067 inch

----- CHECK OF BOLTING AREA (actual area: Ab = 16.91 Sq.in) -----  
 Wm1 >= .785\*Ge<sup>2</sup>\*P + 2\*b\*3.14\*Ge\*m\*P = 186153.611 lb  
 Wm2 >= 3.14\*Ge\*b\*y = 415612.653 lb  
 Am1 = Wm1/Sb = 7.46 Sq.in  
 Am2 = Wm2/Sba = 16.66 Sq.in  
 Ab(max.for gasket crash)=6.28\*y\*G\*N/Sa = 72.92 Sq.in

----- FLANGE LOADS, LEVER ARMS AND MOMENTS -----  
 cF = MAX(SQR(PI\*C/n/(2\*dB+6\*t/(m+0.5))),1) = 1.000  
 HD = .785\*(B+2\*c)<sup>2</sup>\*P = 153289.0 lb hD=R+0.5\*(g1-c) = 1.54 inch  
 HT = .785\*Ge<sup>2</sup>\*P - HD = 11180.5 lb hT=(R+g1-c+hG)/2= 1.48 inch  
 HG = Wm1 - HT - HD = 21684.1 lb hG=(C-Ge)/2 = 1.06 inch  
 DESIGN: M0 = 276051.9 lb\*inch M=M0\*cF/(B+2\*c) = 5828 lb  
 W = (Am+Ab)\*Sba\*0.5 = 418754.3 lb hG=(C-Ge)/2 = 1.06 inch  
 BOLTING-UP: M0 = 442602.4 lb\*inch M=M0\*cF/(B+2\*c) = 9344 lb

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WELDING NECK FLANGE POS.232

ASME VIII div.1 / -Ed.2007+A09 (Metric units)

- Appendix 2

----- FLANGE CONSTANTS -----

$K = A / (B + 2 \cdot c)$	=	1.130
$U = (K^2 \cdot (1 + 8.55246 \cdot \text{LGT}(K) - 1) / 1.36136 / (K^2 - 1) / (K - 1)$	=	17.439
$T = (K^2 \cdot (1 + 8.55246 \cdot \text{LGT}(K) - 1) / (1.0472 + 1.9448 \cdot K^2) / (K - 1)$	=	1.866
$Y = (0.66845 + 5.71690 \cdot K^2 \cdot \text{LGT}(K) / (K^2 - 1)) / (K - 1)$	=	15.870
$Z = (K^2 + 1) / (K^2 - 1)$	=	8.204
$(g_1 - c) / (g_0 - c)$	=	2.190
$h / \text{SQR}((B + 2 \cdot c) (g_0 - c))$	=	0.298
$f =$ (figure 2-7.6)	=	2.509
$F =$ (figure 2-7.2)	=	0.870
$V =$ (figure 2-7.3)	=	0.288
$e = F / \text{SQR}((B + 2 \cdot c) (g_0 - c))$	=	0.220
$d = U / V \cdot \text{SQR}((B + 2 \cdot c) (g_0 - c)) \cdot (g_0 - c)^2$	=	26.216
$L = (t \cdot e + 1) / T + t^3 / d$	=	1.866

----- FLANGE STRESSES--(design / bolting-up) -----

	MPa	Psi	/	MPa	Psi
$SH = f \cdot M / L / (g_1 - c)^2$	= 102.957	14932.7	/	165.074	23942.0
$SR = (1.33 \cdot t \cdot e + 1) \cdot M / L / t^2$	= 4.602	667.4	/	7.378	1070.1
$ST = Y \cdot M / t^2 - Z \cdot SR$	= 35.381	5131.5	/	56.727	8227.5
$0.5 \cdot (SH + SR)$	= 53.779	7800.0	/	86.226	12506.1
$0.5 \cdot (SH + ST)$	= 69.169	10032.1	/	110.900	16084.8

----- FLANGE RIGIDITY--(design / bolting-up) -----

$E =$	= 179000.0	25961803	/	201233.3	29186480
$kI =$		0.3	/		0.3
$h_0 = \text{sqr}(B \cdot g_0)$		3.958	/		3.958
$J = 52.14 \cdot M_0 \cdot V / (L \cdot E \cdot g_0^2 \cdot h_0 \cdot KI) =$		0.65897	/		0.93981

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 WELDING NECK FLANGE POS.232  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - Appendix 2

MAX.ALLOWABLE WORKING PRESSURE:	(New&Cold)MPa/Psi	(Hot&Corr)MPa/Psi
FLANGE	= 1.2160 / 176.4	0.9105 / 132.1
BOLTS	= 1.3598 / 197.2	1.3598 / 197.2

HYDRAULIC TEST PRESSURE :

Hub	= 1.3*Pd*Sha/Sh	= 0.874 MPa	126.7 Psi
Flange	= 1.3*Pd*Sfa/Sf	= 0.874 MPa	126.7 Psi
Bolts	= 1.3*Pd*Sba/Sb	= 0.780 MPa	113.1 Psi
Min. test pressure		= 0.780 MPa	113.1 Psi

BASIS FOR CALCULATED TEST PRESSURE

Hub	Pb1 =MAWP(New&Cold)+Ph	= 1.216 MPa	176.4 Psi
Flange	Pb2 =MAWP(New&Cold)+Ph	= 1.216 MPa	176.4 Psi
Bolt	Pb3 =MAWP(New&Cold)+Ph	= 1.360 MPa	197.2 Psi
MAX.ALL. TEST PRESSURE	=Min(Pb1, Pb2, Pb3)*1.3-Pht	= 1.556 MPa	225.6 Psi

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT) -----

FLANGE

Curve of fig UCS66	= B		
Governing thickness	=	10.00 mm	= 0.394 Inch
Unadjusted MDMT from table UCS-66	=	-27.7 C	= -17.9 F
MAWP (at design temperature)	=	0.910 MPa	= 132.1 Psi
MAP (at MDMT)	=	1.024 MPa	= 148.5 Psi
Ratio MAWP/MAP	=	0.890	
ADJUSTED MDMT from fig UCS66.1	=	-34.2 C	= -29.6 F

BOLTING

MDMT	=	-48.0 C	= -54.4 F
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Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.T1 DN.8"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

* DESIGN TEMPERATURE	T =	150.0 C	=	302.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* SHELL ALLOWABLE STRESS	S =	138.0000 MPa	=	20015.2 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	118.0000 MPa	=	17114.5 Psi
(at room temperature)	Sn0=	118.0000 MPa	=	17114.5 Psi
Pressure	P0=	1.600 MPa	=	232.1 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.012 MPa	=	1.7 Psi
Calculation pressure	P=(P0+ Ph)=	1.600 MPa	=	232.1 Psi
Shell Internal diameter	D = 2*R =	1070.0 mm	=	42.13 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter	=	219.10 mm	=	8.626 Inch
Nozzle Thickness	tn =	12.70 mm	=	0.500 Inch
Nozzle Wall Tolerance	cl =	1.58 mm	=	0.062 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	165.00 mm	=	6.496 Inch
Angular coordinate	=	117.44 deg		
Angle nozzle axis/normal to wall (Positive if counterclockwise)=			=	-28.28 deg
Nzl.position: NOT RADIAL F=0.5, distance nzl/shell axes L =		250.0 mm		
Rm = R+tr/2+c+c'      teta=acs((L+Rn)/Rm)-acs((L-Rn)/Rm) =			=	24.3 deg
Opening size d=2*Rm*sqr(1-(cos(teta/2))^2) =		227.18 mm	=	8.944 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = P*(R+c+c')/(S-0.6*P)	=	6.26 mm	=	0.247 Inch
tn' = tn -c2 -c1	=	9.52 mm	=	0.375 Inch
trn = P*Rn/(Sn-0.6*P)	=	1.37 mm	=	0.054 Inch
Horiz. limit to nozzle O.D.	Lo =	80.00 mm	=	3.150 Inch
Vertic. limit to shell O.D.	ho =	23.80 mm	=	0.937 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in)Areq = d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	720.3 mm2	=	1.116 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	1810.0 mm2	=	2.805 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	331.8 mm2	=	0.514 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	69.3 mm2	=	0.107 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	2211.0 mm2	=	3.427 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.:T1 DN.8"  
ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	3.234 MPa	=	469.1	Psi
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	2.886 MPa	=	418.6	Psi
HYDRAULIC TEST PRESSURE -Nozzle= $1.3 \cdot P_i \cdot S_n0 / S_n$	=	2.080 MPa	=	301.7	Psi
BASIS FOR CALC.TEST PRESSURE $P_b = MAWP(N\&C) + P_h$	=	3.234 MPa	=	469.1	Psi
MAX. ALL. HYDR.TEST PRESSURE-Nozzle = $1.3 \cdot P_b - P_{ht}$	=	4.193 MPa	=	608.1	Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.T1 DN.8"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* DESIGN TEMPERATURE	T =	150.0 C	=	302.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* SHELL ALLOWABLE STRESS	S =	138.0000 MPa	=	20015.2 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	118.0000 MPa	=	17114.5 Psi
(at room temperature)	Sn0=	118.0000 MPa	=	17114.5 Psi
Pressure	P0=	1.600 MPa	=	232.1 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	PhT=	0.012 MPa	=	1.7 Psi
Calculation pressure	P=(P0+ Ph)=	1.600 MPa	=	232.1 Psi
Shell Internal diameter	D = 2*R	= 1070.0 mm	=	42.13 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter	=	219.10 mm	=	8.626 Inch
Nozzle Thickness	tn =	12.70 mm	=	0.500 Inch
Nozzle Wall Tolerance	c1 =	1.58 mm	=	0.062 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	165.00 mm	=	6.496 Inch
Angular coordinate	=	117.44 deg		
Nozzle position:	RADIAL (F=1)			
Opening size	d = 2*Rn =	200.06 mm	=	7.876 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = P*(R+c+c')/(S-0.6*P)	=	6.26 mm	=	0.247 Inch
tn' = tn -c2 -c1	=	9.52 mm	=	0.375 Inch
trn = P*Rn/(Sn-0.6*P)	=	1.37 mm	=	0.054 Inch
Horiz. limit to nozzle O.D.	Lo =	80.00 mm	=	3.150 Inch
Vertic. limit to shell O.D.	ho =	23.80 mm	=	0.937 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in)Areq = d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	1270.7 mm2	=	1.970 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	1257.8 mm2	=	1.950 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	331.8 mm2	=	0.514 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	69.3 mm2	=	0.107 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	1658.8 mm2	=	2.571 Sq.in

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 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.T1 DN.8"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE  
 Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 12.70 mm = 0.500 Inch  
 Unadjusted MDMT from table UCS-66 = -37.0 C = -34.6 F  
 Tr = 1.37 mm = 0.054 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance= 9.52 mm = 0.375 Inch  
 Coincident ratio = 0.144  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

\* CHECK ACCORDING TO UG 45  
 Check according to UG45 OK!  
 Min thickness of standard wall pipe + c = 8.76 mm = 0.345 Inch  
 Min thickness under int. pressure + c (E=1) = 7.86 mm = 0.310 Inch  
 Min thickness according to UG 45 = 7.86 mm = 0.310 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 2.155 MPa = 312.5 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 1.853 MPa = 268.8 Psi

HYDRAULIC TEST PRESSURE -Nozzle=  $1.3 \cdot P_i \cdot S_n0 / S_n$  = 2.080 MPa = 301.7 Psi  
 BASIS FOR CALC.TEST PRESSURE  $P_b = MAWP(N\&C) + P_h$  = 2.155 MPa = 312.5 Psi  
 MAX. ALL. HYDR.TEST PRESSURE-Nozzle =  $1.3 \cdot P_b - P_{ht}$  = 2.789 MPa = 404.5 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.T2 DN.8"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

* DESIGN TEMPERATURE	T =	150.0 C	=	302.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* SHELL ALLOWABLE STRESS	S =	138.0000 MPa	=	20015.2 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	118.0000 MPa	=	17114.5 Psi
	(at room temperature)	Sn0=	118.0000 MPa	= 17114.5 Psi
Pressure	P0=	1.600 MPa	=	232.1 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.012 MPa	=	1.7 Psi
Calculation pressure	P=(P0+ Ph)=	1.600 MPa	=	232.1 Psi
Shell Internal diameter	D =	2*R = 1070.0 mm	=	42.13 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		= 219.10 mm	=	8.626 Inch
Nozzle Thickness	tn =	12.70 mm	=	0.500 Inch
Nozzle Wall Tolerance	c1 =	1.58 mm	=	0.062 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	165.00 mm	=	6.496 Inch
Angular coordinate	=	62.56 deg		
Angle nozzle axis/normal to wall (Positive if counterclockwise)=			=	28.28 deg
Nzl.position: NOT RADIAL F=0.5, distance nzl/shell axes L =		250.0 mm		
Rm = R+tr/2+c+c'      teta=acs((L+Rn)/Rm)-acs((L-Rn)/Rm) =			=	24.3 deg
Opening size d=2*Rm*sqr(1-(cos(teta/2))^2) =		227.18 mm	=	8.944 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = P*(R+c+c')/(S-0.6*P)	=	6.26 mm	=	0.247 Inch
tn' = tn -c2 -c1	=	9.52 mm	=	0.375 Inch
trn = P*Rn/(Sn-0.6*P)	=	1.37 mm	=	0.054 Inch
Horiz. limit to nozzle O.D.	Lo =	80.00 mm	=	3.150 Inch
Vertic. limit to shell O.D.	ho =	23.80 mm	=	0.937 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in)Areq = d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	720.3 mm2	=	1.116 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	1810.0 mm2	=	2.805 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	331.8 mm2	=	0.514 Sq.in
(weld) A41 * Min(Sn/S,Sp/S)	=	69.3 mm2	=	0.107 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	2211.0 mm2	=	3.427 Sq.in

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.:T2 DN.8"  
ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Transv.plane

MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	3.234 MPa	=	469.1	Psi
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	2.886 MPa	=	418.6	Psi
HYDRAULIC TEST PRESSURE -Nozzle= $1.3 \cdot P_i \cdot S_n0 / S_n$	=	2.080 MPa	=	301.7	Psi
BASIS FOR CALC.TEST PRESSURE $P_b = \text{MAWP (N\&C)} + P_h$	=	3.234 MPa	=	469.1	Psi
MAX. ALL. HYDR.TEST PRESSURE-Nozzle = $1.3 \cdot P_b - P_{ht}$	=	4.193 MPa	=	608.1	Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.T2 DN.8"  
 ASME VIII div.1/ -Ed.2007+A09 (Metric units) - UG 36/37

* DESIGN TEMPERATURE	T =	150.0 C	=	302.0 F
* SHELL MATERIAL (Record Nr 80)	SA 516 Gr.70			
* NOZZLE MATERIAL (Record Nr 39)	SA 333 Gr.6	smls.		
* SHELL ALLOWABLE STRESS	S =	138.0000 MPa	=	20015.2 Psi
* NOZZLE ALLOWABLE STRESS	Sn=	118.0000 MPa	=	17114.5 Psi
(at room temperature)	Sn0=	118.0000 MPa	=	17114.5 Psi
Pressure	P0=	1.600 MPa	=	232.1 Psi
Overpressure due to static head	Ph=	0.000 MPa	=	0.0 Psi
Overpressure due to static head (test)	Pht=	0.012 MPa	=	1.7 Psi
Calculation pressure	P=(P0+ Ph)=	1.600 MPa	=	232.1 Psi
Shell Internal diameter	D = 2*R	1070.0 mm	=	42.13 Inch
Corrosion allowance	c =	1.60 mm	=	0.063 Inch
Wall undertolerance	c' =	0.00 mm	=	0.0000 Inch
Shell Thickness	t =	15.00 mm	=	0.591 Inch
Pad Thickness	tp =	0.00 mm	=	0.000 Inch
Pad Width	Lp =	0.00 mm	=	0.000 Inch
Nozzle Outside Diameter		219.10 mm	=	8.626 Inch
Nozzle Thickness	tn =	12.70 mm	=	0.500 Inch
Nozzle Wall Tolerance	c1 =	1.58 mm	=	0.062 Inch
Nozzle Corrosion	c2 =	1.60 mm	=	0.063 Inch
Type of connection:	SET-IN			
Distance from rif.point	=	165.00 mm	=	6.496 Inch
Angular coordinate	=	62.56 deg		
Nozzle position:	RADIAL (F=1)			
Opening size	d = 2*Rn =	200.06 mm	=	7.876 Inch
* NET THICKNESSES:"				
t' = t -c -c'	=	13.40 mm	=	0.528 Inch
tr = P*(R+c+c')/(S-0.6*P)	=	6.26 mm	=	0.247 Inch
tn' = tn -c2 -c1	=	9.52 mm	=	0.375 Inch
trn = P*Rn/(Sn-0.6*P)	=	1.37 mm	=	0.054 Inch
Horiz. limit to nozzle O.D.	Lo =	80.00 mm	=	3.150 Inch
Vertic. limit to shell O.D.	ho =	23.80 mm	=	0.937 Inch
Leg of fillet weld (nozzle to wall)	=	9.00 mm	=	0.354 Inch
* REINFORCING AREAS:				
(set-in) Areq = d*F*tr+2*F*tn'*tr*(1-Sn/S)	=	1270.7 mm2	=	1.970 Sq.in
(sh.) A1=2Lo(t'-F*tr)+2*tn'*(t'-F*tr)*Sn/S	=	1257.8 mm2	=	1.950 Sq.in
(nozzle) A2 = 2*ho*(tn'-trn)*Sn/S	=	331.8 mm2	=	0.514 Sq.in
(weld) A41 * Min(Sn/S, Sp/S)	=	69.3 mm2	=	0.107 Sq.in
(weld) A42 * Sp/S	=	0.0 mm2	=	0.000 Sq.in
* TOTAL REINF. AREA Ao = A1+A2+A4()+A5	=	1658.8 mm2	=	2.571 Sq.in



Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING UNDER INT. PRESSURE POS.T2 DN.8"  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

NOZZLE  
 Curve of fig UCS66 = C-Material Normalized  
 Governing thickness = 12.70 mm = 0.500 Inch  
 Unadjusted MDMT from table UCS-66 = -37.0 C = -34.6 F  
 Tr = 1.37 mm = 0.054 Inch  
 Tn = Thk. -Corrosion - Wall undertolerance= 9.52 mm = 0.375 Inch  
 Coincident ratio = 0.144  
 ADJUSTED MDMT from fig UCS66.1 = -105.0 C = -157.0 F

\* CHECK ACCORDING TO UG 45

Check according to UG45 OK!

Min thickness of standard wall pipe + c = 8.76 mm = 0.345 Inch  
 Min thickness under int. pressure + c (E=1) = 7.86 mm = 0.310 Inch  
 Min thickness according to UG 45 = 7.86 mm = 0.310 Inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold) = 2.155 MPa = 312.5 Psi  
 MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr) = 1.853 MPa = 268.8 Psi

HYDRAULIC TEST PRESSURE -Nozzle=  $1.3 \cdot P_i \cdot S_n0/S_n$  = 2.080 MPa = 301.7 Psi  
 BASIS FOR CALC.TEST PRESSURE  $P_b = MAWP(N\&C) + P_h$  = 2.155 MPa = 312.5 Psi  
 MAX. ALL. HYDR.TEST PRESSURE-Nozzle =  $1.3 \cdot P_b - P_{ht}$  = 2.789 MPa = 404.5 Psi

Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
 REINFORCEMENT OF OPENING POS.T1 DN.8"-T2 DN.8"  
 ASME VIII.1/ -Ed.2007+A09 (Metric units) -UG36/37-Mult.Openings

Angular distance between Nozzles		g =	54.88	Deg
Distance from rif.point Nozzle 1	Z1 =	165.00 mm	=	6.496 Inch
Distance from rif.point Nozzle 2	Z2 =	165.00 mm	=	6.496 Inch
$Lc = \text{sqr}(((g*\text{pi}/180)(D+s)/2)^2+(Z2-Z1)^2)$		520.40 mm	=	20.488 Inch
For Nozzle 1 (between openings)	a1 =	118.08 mm	=	4.649 Inch
(outside openings)	a1' =	133.95 mm	=	5.273 Inch
(Limit of reinforcement) Lo(1)=		103.44 mm	=	4.072 Inch
Opening size	d =	229.45 mm	=	9.034 Inch
For Nozzle 2 (between openings)	a2 =	133.95 mm	=	5.273 Inch
(outside openings)	a2' =	118.08 mm	=	4.649 Inch
(Limit of reinforcement) Lo(2)=		103.44 mm	=	4.072 Inch
Opening size	d =	229.45 mm	=	9.034 Inch
Angle Beta between two openings			=	90.00 Deg
Lenght between OD of Nozzles Lsh = Lc-a1-a2=		268.38 mm	=	10.566 Inch

Check of multiple openings not required:Lsh > (lo(1)+lo(2))

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 WELDING NECK FLANGE POS.:421  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - Appendix 2

\* DESIGN TEMPERATURE T = 150.0 C = 302.0 F

\* MATERIAL:

FLANGE (Record Nr 75) SA 266 Gr.2  
 SHELL (Record Nr 80) SA 516 Gr.70  
 BOLTING (Record Nr 86) SA 193 B7 ; <=64 mm  
 GASKET -1 -GRAFITE CON ANIMA IN 316

\* ALLOW. STRESSES: -----Flange-----Hub-----Bolting-----  
 MPa / Psi MPa / Psi MPa / Psi  
 DESIGN Sf =138.000 / 20015.2 Sh =207.000 / 30022.9 Sb =172.000 / 24946.5  
 SEATING Sfa=138.000 / 20015.2 Sha=207.000 / 30022.9 Sba=172.000 / 24946.5

\* GASKET PARAMETERS: m = 2.00 y= 2466 Psi N=30.0 mm w= 0.00 mm

Design pressure Pd= 1.600 MPa = 232.1 Psi  
 Overpressure due to static head Ph= 0.000 MPa = 0.0 Psi  
 Overpressure due to static head (test) Pht= 0.012 MPa = 1.7 Psi  
 Calculation pressure P=(Pd+Ph)= 1.600 MPa = 232.1 Psi  
 Corrosion allowance c = 1.60 mm = 0.063 inch  
 Flange outside diameter A = 1220.00 mm = 48.031 inch  
 Bolt circle C = 1171.00 mm = 46.102 inch  
 Mean gasket diameter G = 1106.00 mm = 43.543 inch  
 Flange inside diameter (uncorroded) B = 1070.00 mm = 42.126 inch  
 Hub at large end (uncorroded) g1= 18.00 mm = 0.709 inch  
 Shell thickness (uncorroded) g0= 15.00 mm = 0.591 inch  
 Flange thickness t = 75.00 mm = 2.953 inch  
 Hub length h = 30.00 mm = 1.181 inch  
 Bolt number and type n = 40 7/8 '' (Ansi)  
 Area of one bolt ab= 270.32 mm2 = 0.419 Sq.in

----- CALCULATED GASKET DIMENSIONS -----  
 bo = N/2 = 15.000 mm = 0.591 inch  
 b = 2.5\*SQR(bo) (bo > 6) = 9.682 mm = 0.381 inch  
 Effective gskt.diameter Ge = G+N-2\*b = 1116.63 mm = 43.962 inch

----- CHECK OF BOLTING AREA (actual area: Ab = 16.76 Sq.in) -----  
 Wm1 >= .785\*Ge<sup>2</sup>\*P + 2\*b\*3.14\*Ge\*m\*P = 400913.082 lb  
 Wm2 >= 3.14\*Ge\*b\*y = 129744.766 lb  
 Am1 = Wm1/Sb = 16.07 Sq.in  
 Am2 = Wm2/Sba = 5.20 Sq.in  
 Ab(max.for gasket crash)=6.28\*y\*G\*N/Sa = 31.92 Sq.in

----- FLANGE LOADS, LEVER ARMS AND MOMENTS -----  
 cF = MAX(SQR(PI\*C/n/(2\*dB+6\*t/(m+0.5))),1) = 1.000  
 HD = .785\*(B+2\*c)<sup>2</sup>\*P = 325211.1 lb hD=R+0.5\*(g1-c) = 1.60 inch  
 HT = .785\*Ge<sup>2</sup>\*P - HD = 26856.9 lb hT=(R+g1-c+hG)/2= 1.50 inch  
 HG = Wm1 - HT - HD = 48845.1 lb hG=(C-Ge)/2 = 1.07 inch  
 DESIGN: M0 = 613602.0 lb\*inch M=M0\*cF/(B+2\*c) = 14522 lb  
 W = (Am+Ab)\*Sba\*0.5 = 409508.5 lb hG=(C-Ge)/2 = 1.07 inch  
 BOLTING-UP: M0 = 438246.0 lb\*inch M=M0\*cF/(B+2\*c) = 10372 lb

Software by SANT'AMBROGIO S.I. srl - Milano, Italy - ASM/ 17.00  
 WELDING NECK FLANGE POS.421

ASME VIII div.1 / -Ed.2007+A09 (Metric units)

- Appendix 2

----- FLANGE CONSTANTS -----

$K = A / (B + 2 \cdot c)$	=	1.137
$U = (K^2 \cdot (1 + 8.55246 \cdot \text{LGT}(K) - 1) / 1.36136 / (K^2 - 1) / (K - 1)$	=	16.676
$T = (K^2 \cdot (1 + 8.55246 \cdot \text{LGT}(K) - 1) / (1.0472 + 1.9448 \cdot K^2) / (K - 1)$	=	1.864
$Y = (0.66845 + 5.71690 \cdot K^2 \cdot \text{LGT}(K) / (K^2 - 1)) / (K - 1)$	=	15.175
$Z = (K^2 + 1) / (K^2 - 1)$	=	7.843
$(g1 - c) / (g0 - c)$	=	1.224
$h / \text{SQR}((B + 2 \cdot c) \cdot (g0 - c))$	=	0.250
$f =$ (figure 2-7.6)	=	1.000
$F =$ (figure 2-7.2)	=	0.895
$V =$ (figure 2-7.3)	=	0.456
$e = F / \text{SQR}((B + 2 \cdot c) \cdot (g0 - c))$	=	0.190
$d = U / V \cdot \text{SQR}((B + 2 \cdot c) \cdot (g0 - c)) \cdot (g0 - c)^2$	=	48.043
$L = (t \cdot e + 1) / T + t^3 / d$	=	1.373

----- FLANGE STRESSES--(design / bolting-up) -----

	MPa	Psi	/	MPa	Psi
$SH = f \cdot M / L / (g1 - c)^2$	= 174.938	25372.7	/	124.944	18121.7
$SR = (1.33 \cdot t \cdot e + 1) \cdot M / L / t^2$	= 14.595	2116.9	/	10.424	1511.9
$ST = Y \cdot M / t^2 - Z \cdot SR$	= 59.812	8675.1	/	42.719	6195.9
$0.5 \cdot (SH + SR)$	= 94.767	13744.8	/	67.684	9816.8
$0.5 \cdot (SH + ST)$	= 117.375	17023.9	/	83.832	12158.8

----- FLANGE RIGIDITY--(design / bolting-up) -----

$E =$	= 194000.0	28137371	/	201233.3	29186480
$kI =$		0.3	/	0.3	
$h0 = \text{sqr}(B \cdot g0)$		4.721	/	4.721	
$J = 52.14 \cdot M0 \cdot V / (L \cdot E \cdot g0^2 \cdot h0 \cdot KI) =$		0.95824	/	0.65979	

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 WELDING NECK FLANGE POS.421  
 ASME VIII div.1 / -Ed.2007+A09 (Metric units) - Appendix 2

MAX.ALLOWABLE WORKING PRESSURE:	(New&Cold)MPa/Psi	(Hot&Corr)MPa/Psi
FLANGE	= 2.0056 / 290.9	1.6697 / 242.2
BOLTS	= 1.6686 / 242.0	1.6686 / 242.0

HYDRAULIC TEST PRESSURE :

Hub	= 1.3*Pd*Sha/Sh	= 2.080 MPa	301.7 Psi
Flange	= 1.3*Pd*Sfa/Sf	= 2.080 MPa	301.7 Psi
Bolts	= 1.3*Pd*Sba/Sb	= 2.080 MPa	301.7 Psi
Min. test pressure		= 2.080 MPa	301.7 Psi

BASIS FOR CALCULATED TEST PRESSURE

Hub	Pb1 =MAWP (New&Cold)+Ph	= 2.006 MPa	290.9 Psi
Flange	Pb2 =MAWP (New&Cold)+Ph	= 2.006 MPa	290.9 Psi
Bolt	Pb3 =MAWP (New&Cold)+Ph	= 1.669 MPa	242.0 Psi
MAX.ALL. TEST PRESSURE	=Min (Pb1, Pb2, Pb3)*1.3-Pht	= 2.157 MPa	312.9 Psi

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----  
 FLANGE

Governing thickness	= 15.00 mm	= 0.591	Inch
Curve of fig UCS66	= B		
MDMT (UG-20(f))	= -28.9 C	= -20.0	F

a) Completed vessel shall hydrostatically tested per UG-99(b) or (c) 27-4  
 b) The thermal or mechanical shock loadings are not a controlling design requirement (See UG-22)  
 c) Cyclical loading is not a controlling design requirement (See UG-22)

BOLTING  
 MDMT = -48.0 C = -54.4 F

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BOLTED FLAT COVER POS.:502

ASME VIII div.1 /-Ed.2007+A09 (Metric units)

-UG-34/TEMA RCB-9.21

\* DESIGN TEMPERATURE T = 150.0 C = 302.0 F

\* MATERIAL:

COVER (Record Nr 75) SA 266 Gr.2  
 BOLTING (Record Nr 86) -SA 193 B7 ; <=64 mm

\* ALLOW. STRESSES: -----Cover-----Bolting-----

	MPa / Psi	MPa / Psi
DESIGN	138.000 / 20015.2	172.000 / 24946.5
SEATING	138.000 / 20015.2	172.000 / 24946.5

Design pressure	Pd=	1.600 MPa =	232.1 Psi
Overpressure due to static head	Ph=	0.000 MPa =	0.0 Psi
Overpressure due to static head (test)	Pht=	0.012 MPa =	1.7 Psi
Calculation pressure	P=(Pd+Ph)=	1.600 MPa =	232.1 Psi
Bolt load at design conditions	Wm1	=	400913.1 lb
Bolt load at bolting-up	W	=	409508.5 lb
Gasket load reaction diameter	G	= 1116.63 mm =	43.962 inch
Bolt circle	G+2*hg	= 1171.00 mm =	46.102 inch
Nominal channel inside diameter	ND	= 1070.00 mm =	42.126 inch
Bolt area	AB	= 10812.8 mm <sup>2</sup> =	16.760 Sq.in
Elastic modulus	E	= 193687 MPa =	28092000 Psi
Corrosion allowance	c1=	1.60 mm =	0.063 inch
Gasket groove	c2=	5.00 mm =	0.197 inch
c = max(c1,c2)	=	5.00 mm =	0.197 inch
Adopted thickness (Center)	T	= 86.00 mm =	3.386 inch
Adopted thickness (Periphery)	T'	= 72.00 mm =	2.835 inch
Factor C (Fig. Ug-34)	C	=	0.3

----- OPERATING CONDITIONS -----

t = G*SQR(CP/S+1.9*Wm1*hg/S/G^3)+c	=	75.25 mm =	2.962 inch
t' = G*SQR(1.9*Wm1*hg/S/G^3)	=	24.45 mm =	0.963 inch

----- BOLTING-UP CONDITIONS -----

t = G*SQR(1.9*W*hg/So/G^3)+c	=	29.71 mm =	1.170 inch
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----- MINIMUM THICKNESS ACCORDING TO TEMA RCB-9.21 -----

Channel deflection	Y = ND/800 =	1.34 mm =	0.053 inch
T=(G/E/Y*(.0435*G^3*P+.5*SB*AB*hg))^-.33+c	=	85.76 mm =	3.376 inch

MAX. ALLOWABLE WORKING PRESSURE (New & Cold)	=	2.127 MPa =	308.5 Psi
MAX. ALLOWABLE WORKING PRESSURE (Hot & Corr)	=	2.127 MPa =	308.5 Psi

HYDRAULIC TEST PRESSURE = 1.3*Pd*Sa/S	=	2.080 MPa =	301.7 Psi
BASIS FOR CALC.TEST PRESSURE Pb=MAWP(N&C)+Ph	=	2.127 MPa =	308.5 Psi
MAX. ALL. HYDR.TEST PRESSURE-Shell =1.3*Pb-Pht	=	2.753 MPa =	399.4 Psi

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BOLTED FLAT COVER POS.:502  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

Governing thickness = 21.50 mm = 0.846 Inch  
Curve of fig UCS66 = B  
MDMT (UG-20(f)) = -28.9 C = -20.0 F  
a) Completed vessel shall hydrostatically tested per UG-99(b) or (c) 27-4  
b) The thermal or mechanical shock loadings are not a controlling design  
requirement (See UG-22)  
c) Cyclical loading is not a controlling design requirement (See UG-22)

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"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units)

- UHX-12

Integral shellside and tubeside

\* MATERIALS:

TUBESHEET (Record Nr 75) SA 266 Gr.2  
 Tubesheet design temperature Tp = 280.00 °C = 536.00 °F  
 Allowable stress, design condition S = 131.800 MPa= 19116.0 Psi  
 Allowable stress at room temperature S20 = 138.000 MPa= 20015.2 Psi  
 Modulus of elasticity, design condition E = 185000 MPa=26832030 Psi  
 Modulus of elasticity, atmospheric condition Ei = 201233 MPa=29186480 Psi

TUBES (Record Nr 129) -SA 210 Gr.A1  
 Tube design temperature Tt = 340.00 °C = 644.00 °F  
 Allowable stress, design condition StT = 117.400 MPa= 17027.5 Psi  
 Modulus of elasticity, design condition EtT = 180200 MPa=26135847 Psi  
 Modulus of elasticity, atmospheric condition EtTi = 202272 MPa=29337159 Psi

CHANNEL (Record Nr 80) SA 516 Gr.70  
 Channel design temperature Tc = 150.00 °C = 302.00 °F  
 Allowable stress, design condition Sc = 138.000 MPa= 20015.2 Psi  
 Modulus of elasticity, design condition Ec = 195000 MPa=28282410 Psi  
 Poisson's ratio vc = 0.300

SHELL (Record Nr 80) SA 516 Gr.70  
 Shell design temperature Ts = 340.00 °C = 644.00 °F  
 Allowable stress, design condition Ss = 129.600 MPa= 18796.9 Psi  
 Modulus of elasticity, design condition Es = 180200 MPa=26135847 Psi  
 Poisson's ratio vs = 0.300

TUBESIDE VACUUM : No  
 SHELLSIDE VACUUM :  
 Shellside design pressure Psv = -0.100 MPa= -14.70 Psi  
 Tubeside design pressure Ps' = 0.600 MPa= 87.0 Psi  
 Shellside static head, design condition Pt' = 1.600 MPa= 232.1 Psi  
 Tubeside static head, design condition Ps'' = 0.000 MPa= 0.0 Psi  
 Shellside calculation pressure Pt'' = 0.000 MPa= 0.0 Psi  
 Tubeside calculation pressure Ps = Ps'+Ps'' = 0.600 MPa= 87.0 Psi  
 Shellside calculation pressure Pt = Pt'+Pt'' = 1.600 MPa= 232.1 Psi



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"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units)

- UHX-12

Channel thickness	tc = 15.00	mm =	0.591	Inch
Channel corrosion allowance	Corc = 1.600	mm =	0.063	Inch
Channel thickness tolerance	Tolc = 0.000	mm =	0.000	Inch
Cylindrical channel				
Channel inside diameter	Dc =1070.00	mm =	42.126	Inch
Channel course length	lc = 337.00	mm =	13.27	Inch
Min. channel course length for calc. as integral	= 228.04	mm =	8.98	Inch
Shell thickness	ts = 15.00	mm =	0.591	Inch
Shell corrosion allowance	Cors = 1.600	mm =	0.063	Inch
Shell thickness tolerance	Tols = 0.000	mm =	0.000	Inch
Shell inside diameter	Ds =1070.00	mm =	42.126	Inch
Shell course length	ls = 200.00	mm =	7.87	Inch
Min. shell course length for calc. as integral	= 228.04	mm =	8.98	Inch
Tubesheet thickness	h = 80.00	mm =	3.150	Inch
Tubesheet corrosion allowance on tubeside	Ct = 1.60	mm =	0.063	Inch
Tubesheet corrosion allowance on shellside	Cs = 1.60	mm =	0.063	Inch
Diameter of perforated tubesheet area	DO =1051.43	mm =	41.395	Inch
Total area of untubed lanes	AL = 565910	mm <sup>2</sup> =	877	Inch <sup>2</sup>
Outside diameter of tubesheet	A =1100.00	mm =	43.307	Inch
Tube side pass partition groove depth	hg = 0.00	mm =	0.000	Inch
Depth of welded tube groove	hw = 1.50	mm =	0.059	Inch
Expanded length of tube in tubesheet	ltx = 65.00	mm =	2.559	Inch
Nominal outside diameter of tube	dt = 15.87	mm =	0.625	Inch
Triangular tube pitch	p = 20.00	mm =	0.787	Inch
Nominal tube wall thickness	tt = 2.11	mm =	0.083	Inch

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"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units)

- UHX-12

$h'g = \max((hg-ct); hw)$	$h'g = 1.50 \text{ mm} = 0.059 \text{ Inch}$
$\mu = (p-dt)/p$	$\mu = 0.206$
$\rho = (ltx)/(h-Ct-Cs)$	$\rho = 0.846$
$d^* = \max((dt-2 \cdot tt \cdot (EtT/E) \cdot (StT/S) \cdot \rho); (dt-2 \cdot tt))$	$d^* = 12.771 \text{ mm} = 0.503 \text{ Inch}$
$p^* = \frac{\check{S}(1-4 \cdot U1/(\check{a} \cdot D0))}{p}$	$p^* = 21.0454 \text{ mm} = 0.829 \text{ Inch}$
$\mu^* = (p^*-d^*)/p^*$	$\mu^* = 0.393$
$\alpha 0 =$	$\alpha 0 = -0.0029$
$\alpha 1 =$	$\alpha 1 = 0.2126$
$\alpha 2 =$	$\alpha 2 = 3.9906$
$\alpha 3 =$	$\alpha 3 = -6.1730$
$\alpha 4 =$	$\alpha 4 = 3.4307$
$\beta 0 =$	$\beta 0 = 0.9966$
$\beta 1 =$	$\beta 1 = -4.1978$
$\beta 2 =$	$\beta 2 = 9.0478$
$\beta 3 =$	$\beta 3 = -7.9955$
$\beta 4 =$	$\beta 4 = 2.2398$
$E^*/E = \alpha 0 + \alpha 1 \cdot \mu^* + \alpha 2 \cdot \mu^{*2} + \alpha 3 \cdot \mu^{*3} + \alpha 4 \cdot \mu^{*4}$	$E^*/E = 0.404355$
$v^* = \beta 0 + \beta 1 \cdot \mu^* + \beta 2 \cdot \mu^{*2} + \beta 3 \cdot \mu^{*3} + \beta 4 \cdot \mu^{*4}$	$v^* = 0.312363$

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"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units)

- UHX-12

\* Shellside pressure only

$$\begin{aligned} \rho_s &= (D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols}) / D_0 & \rho_s &= 1.0207 \\ \rho_c &= (D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc}) / D_0 & \rho_c &= 1.0207 \\ Mts &= (D_0^2 / 16) \cdot ((\rho_s - 1) \cdot (\rho_s^2 + 1) \cdot P_s - (\rho_c - 1) \cdot (\rho_c^2 + 1) \cdot P_t) & &= 1753 \text{ N} = 394 \text{ lb} \end{aligned}$$

$$\beta_s = \frac{\sqrt{12 \cdot (1 - \nu_s^2)}}{\sqrt{((D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols}) + (t_s - C_{ors} - T_{ols})) \cdot (t_s - C_{ors} - T_{ols})}} =$$

$$\beta_s = 0.015 \text{ 1/mm} = 0.3826 \text{ 1/in}$$

$$K_s = \beta_s \cdot \frac{E_s \cdot (t_s - C_{ors} - T_{ols})^3}{6 \cdot (1 - \nu_s^2)} =$$

$$K_s = 1196313 \text{ N} = 268942 \text{ lb}$$

$$\check{s}_s = \frac{6 \cdot (D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols})}{(h - ct - cs)} \cdot K_s \cdot (1 + (h - ct - cs) \cdot \beta_s + \frac{(h - ct - cs)^2 \cdot \beta_s^2}{2}) =$$

$$\check{s}_s = 48063 \text{ MPa} = 6970978 \text{ Psi}$$

$$f_s = \frac{(D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols})^2}{4 E_s \cdot (t_s - c_{ors} - t_{ols})} \cdot \frac{\nu_s}{2} \cdot (1 - \frac{\nu_s}{2}) =$$

$$f_s = 0.101 \text{ mm}^3/\text{N} = 0.00003 \text{ in}^3/\text{lb}$$

$$j_s = \rho_s \cdot k_s \cdot \beta_s \cdot f_s \cdot (1 + h \cdot \beta_s) \cdot \sqrt{12 \cdot (1 - \nu_c^2)} =$$

$$j_s = 4021.8 \text{ mm}^2 = 6.234 \text{ In}^2$$

$$\beta_c = \frac{\sqrt{12 \cdot (1 - \nu_c^2)}}{\sqrt{((D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc}) + (t_c - C_{orc} - T_{olc})) \cdot (t_c - C_{orc} - T_{olc})}} =$$

$$\beta_c = 0.015 \text{ 1/mm} = 0.3826 \text{ 1/in}$$

$$K_c = \beta_c \cdot \frac{E_c \cdot (t_c - C_{orc} - T_{olc})^3}{6 \cdot (1 - \nu_c^2)} =$$

$$K_c = 1294568 \text{ N} = 291030 \text{ lb}$$

$$\check{s}_c = \frac{6 \cdot (D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc})}{(h - ct - cs)} \cdot K_c \cdot (1 + (h - ct - cs) \cdot \beta_c + \frac{(h - ct - cs)^2 \cdot \beta_c^2}{2}) =$$

$$\check{s}_c = 52011 \text{ MPa} = 7543511 \text{ Psi}$$

$$f_c = \frac{(D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc})^2}{4 E_c \cdot (t_c - c_{orc} - t_{olc})} \cdot \frac{\nu_c}{2} \cdot (1 - \frac{\nu_c}{2}) =$$

$$f_c = 0.094 \text{ mm}^3/\text{N} = 0.00003 \text{ in}^3/\text{lb}$$

$$j_c = \rho_c \cdot k_c \cdot \beta_c \cdot f_c \cdot (1 + h \cdot \beta_c) =$$

$$j_c = 4021.8 \text{ mm}^2 = 6.234 \text{ In}^2$$

$$K = A / D_0 = 1.046$$

$$F = ((1 - \nu^*) / E^*) \cdot (\check{s}_s + \check{s}_c + E \cdot \ln(K)) = 0.997$$

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 "U" TUBE TUBESHEET CALCULATION position :350  
 According to ASME VIII div 1 Ed.2007+A09 (Metric units) - UHX-12

$$M^* = M_{ts} + j_c \cdot P_t - j_s \cdot P_s \quad M^* = -660 \text{ N} = -148 \text{ lb}$$

$$M_p = \frac{M^* - (D_0^2/32) \cdot F \cdot (P_s - P_t)}{1 + F} \quad M_p = -10678 \text{ N} = -2400 \text{ lb}$$

$$M_0 = M_p + (D_0^2/64) \cdot (3 + \nu^*) \cdot (P_s - P_t) \quad M_0 = 23652 \text{ N} = 5317 \text{ lb}$$

$$M = \max(|M_p|; |M_0|) \quad M = 23652 \text{ N} = 5317 \text{ lb}$$

Tubesheet bending stress  
 $\sigma = \frac{6 \cdot M}{\mu \cdot (h - h'g - C_s - C_t)^2}$

$$\sigma = \frac{6 \cdot M}{\mu \cdot (h - h'g - C_s - C_t)^2} \quad \sigma = 63.659 \text{ MPa} = 9232.9 \text{ Psi}$$

Tubesheet shear stress

$$\tau = \frac{(1/(4 \cdot \mu)) \cdot (D_0/(h - C_t - C_s)) \cdot |P_s - P_t|}{(D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols})^2} \quad \tau = 9.945 \text{ MPa} = 1442.4 \text{ Psi}$$

$$\sigma_{sm} = \frac{4 \cdot (t_s - C_{ors} - T_{ols}) \cdot (D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols} + t_s - C_{ors} - T_{ols})}{6 \cdot M} \cdot P_s = 11.865 \text{ MPa} = 1720.9 \text{ Psi}$$

$$\sigma_{sb} = \frac{6 \cdot k_s}{(t_s - C_{ors} - T_{ols})^2} \cdot (\beta_s \cdot f_s \cdot P_s + 6 \cdot \frac{1 - \nu^*}{E^*} \cdot \frac{D_0}{(h - C_t - C_s)^3} \cdot (1 + \frac{(h - C_t - C_s) \cdot \beta_s}{2} \cdot \frac{D_0^2}{32}) \cdot (M_p + (P_s - P_t)))$$

$$\sigma_{sb} = 117.811 \text{ MPa} = 17087.1 \text{ Psi}$$

Total stress in shell at tubesheet junction

$$\sigma_s = |\sigma_{sm}| + |\sigma_{sb}| \quad \sigma_s = 129.677 \text{ MPa} = 18808.0 \text{ Psi}$$

$$\sigma_{cm} = \frac{4 \cdot (t_c - C_{orc} - T_{olc}) \cdot (D_c + 2 \cdot C_{orc} + 2 \cdot T_{olc} + t_c - C_{orc} - T_{olc})}{6 \cdot k_c} \cdot P_t = 0.000 \text{ MPa} = 0.0 \text{ Psi}$$

$$\sigma_{cb} = \frac{6 \cdot k_c}{(t_c - C_{orc} - T_{olc})^2} \cdot (\beta_c \cdot f_c \cdot P_t - 6 \cdot \frac{1 - \nu^*}{E^*} \cdot \frac{D_0}{(h - C_t - C_s)^3} \cdot (1 + \frac{(h - C_t - C_s) \cdot \beta_c}{2} \cdot \frac{D_0^2}{32}) \cdot (M_p + (P_s - P_t)))$$

$$\sigma_{cb} = -87.855 \text{ MPa} = -12742.3 \text{ Psi}$$

$$\sigma_c = |\sigma_{cm}| + |\sigma_{cb}| \quad \sigma_c = 87.855 \text{ MPa} = 12742.3 \text{ Psi}$$

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"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units)

- UHX-12

Tubesheet considered as simply supported as per UHX-12.6

$$\rho_s = (D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols}) / D_0$$

$$\rho_s = 1.0207$$

$$\rho_c = (D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc}) / D_0$$

$$\rho_c = 1.0207$$

$$M_{ts} = (D_0^2 / 16) \cdot ((\rho_s - 1) \cdot (\rho_s^2 + 1) \cdot P_s - (\rho_c - 1) \cdot (\rho_c^2 + 1) \cdot P_t) = 1753 \text{ N} = 394 \text{ lb}$$

$$\beta_s =$$

$$\beta_s = 0 \text{ 1/mm} = 0 \text{ 1/in}$$

$$K_s =$$

$$K_s = 0 \text{ N} = 0 \text{ lb}$$

$$\check{s}_s =$$

$$\check{s}_s = 0 \text{ MPa} = 0 \text{ Psi}$$

$$\epsilon_s =$$

$$\epsilon_s = 0 \text{ mm}^3/\text{N} = 0 \text{ in}^3/\text{lb}$$

$$j_s = \rho_s \cdot k_s \cdot \beta_s \cdot \epsilon_s \cdot (1 + h \cdot \beta_s)$$

$$j_s = 0.0 \text{ mm}^2 = 0.000 \text{ In}^2$$

$$\beta_c =$$

$$\beta_c = 0 \text{ 1/mm} = 0 \text{ 1/in}$$

$$K_c =$$

$$K_c = 0 \text{ N} = 0 \text{ lb}$$

$$\check{s}_c =$$

$$\check{s}_c = 0 \text{ MPa} = 0 \text{ Psi}$$

$$\epsilon_c =$$

$$\epsilon_c = 0 \text{ mm}^3/\text{N} = 0 \text{ in}^3/\text{lb}$$

$$j_c = \rho_c \cdot k_c \cdot \beta_c \cdot \epsilon_c \cdot (1 + h \cdot \beta_c)$$

$$j_c = 0.0 \text{ mm}^2 = 0.000 \text{ In}^2$$

$$K = A / D_0$$

$$K = 1.046$$

$$F = ((1 - \nu^*) / E^*) \cdot (\check{s}_s + \check{s}_c + E \cdot \ln(K))$$

$$F = 0.077$$

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"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units) - UHX-12

$$M^* = M_{ts} + j_c \cdot P_t - j_s \cdot P_s \qquad M^* = 1753 \text{ N} = 394 \text{ lb}$$

$$M_p = \frac{M^* - (D_0^2/32) \cdot F \cdot (P_s - P_t)}{1 + F} \qquad M_p = 149 \text{ N} = 34 \text{ lb}$$

$$M_0 = M_p + (D_0^2/64) \cdot (3 + \nu^*) \cdot (P_s - P_t) \qquad M_0 = 34479 \text{ N} = 7751 \text{ lb}$$

$$M = |M_0| \qquad M = 34479 \text{ N} = 7751 \text{ lb}$$

Tubesheet bending stress

$$f = \frac{6 \cdot M}{\mu^* \cdot (h - h'g - C_s - C_t)^2} \qquad \text{,, 2.S} \qquad f = 92.800 \text{ MPa} = 13459.5 \text{ Psi}$$

Software by SANT'AMBROGIO S.I. srl - Milano, Italy-ASME VIII div 1 Rev.17.00

"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units)

- UHX-12

\* Tubeside pressure + shellside vacuum

Psv=		Psv = -0.100 MPa= -14.70 Psi
$\rho_s = (D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols}) / D_0$		$\rho_s = 1.0207$
$\rho_c = (D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc}) / D_0$		$\rho_c = 1.0207$
$M_{ts} = (D_0^2 / 16) \cdot ((\rho_s - 1) \cdot (\rho_s^2 + 1) \cdot P_s - (\rho_c - 1) \cdot (\rho_c^2 + 1) \cdot P_t)$		$= -4975 \text{ N} = -1118 \text{ lb}$
$\sqrt[3]{12 \cdot (1 - v_s^2)}$		
$\beta_s = \frac{\sqrt[3]{((D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols}) + (t_s - C_{ors} - T_{ols})) \cdot (t_s - C_{ors} - T_{ols})}}{E_s \cdot (t_s - C_{ors} - T_{ols})^3}$		$\beta_s = 0.015 \text{ 1/mm} = 0.3826 \text{ 1/in}$
$K_s = \beta_s \cdot \frac{6 \cdot (1 - v_s^2)}{6 \cdot (D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols})}$		$K_s = 1196313 \text{ N} = 268942 \text{ lb}$
$\check{s}_s = \frac{6 \cdot (D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols})}{(h - ct - cs)} \cdot K_s \cdot (1 + (h - ct - cs) \cdot \beta_s + \frac{(h - ct - cs)^2 \cdot \beta_s^2}{2})$		$\check{s}_s = 48063 \text{ MPa} = 6970978 \text{ Psi}$
$\epsilon_s = \frac{(D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols})^2}{4 E_s \cdot (t_s - c_{ors} - t_{ols})} \cdot \frac{v_s}{2} \cdot (1 - \frac{v_s}{2})$		$\epsilon_s = 0.101 \text{ mm}^3/\text{N} = 0.00003 \text{ in}^3/\text{lb}$
$j_s = \rho_s \cdot k_s \cdot \beta_s \cdot \epsilon_s \cdot (1 + h \cdot \beta_s) \cdot \sqrt[3]{12 \cdot (1 - v_c^2)}$		$j_s = 4021.8 \text{ mm}^2 = 6.234 \text{ In}^2$
$\beta_c = \frac{\sqrt[3]{((D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc}) + (t_c - C_{orc} - T_{olc})) \cdot (t_c - C_{orc} - T_{olc})}}{E_c \cdot (t_c - C_{orc} - T_{olc})^3}$		
$K_c = \beta_c \cdot \frac{6 \cdot (1 - v_c^2)}{6 \cdot (D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc})}$		$K_c = 1294568 \text{ N} = 291030 \text{ lb}$
$\check{s}_c = \frac{6 \cdot (D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc})}{(h - ct - cs)} \cdot K_c \cdot (1 + (h - ct - cs) \cdot \beta_c + \frac{(h - ct - cs)^2 \cdot \beta_c^2}{2})$		$\check{s}_c = 52011 \text{ MPa} = 7543511 \text{ Psi}$
$\epsilon_c = \frac{(D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc})^2}{4 E_c \cdot (t_c - c_{orc} - t_{olc})} \cdot \frac{v_c}{2} \cdot (1 - \frac{v_c}{2})$		$\epsilon_c = 0.094 \text{ mm}^3/\text{N} = 0.00003 \text{ in}^3/\text{lb}$
$j_c = \rho_c \cdot k_c \cdot \beta_c \cdot \epsilon_c \cdot (1 + h \cdot \beta_c)$		$j_c = 4021.8 \text{ mm}^2 = 6.234 \text{ In}^2$
$K = A / D_0$		$K = 1.046$
$F = ((1 - v^*) / E^*) \cdot (\check{s}_s + \check{s}_c + E \cdot \ln(K))$		$F = 0.997$

Software by SANT'AMBROGIO S.I. srl - Milano, Italy-ASME VIII div 1 Rev.17.00  
 "U" TUBE TUBESHEET CALCULATION position :350  
 According to ASME VIII div 1 Ed.2007+A09 (Metric units) - UHX-12

$$M^* = M_{ts} + i_c \cdot P_t - i_s \cdot P_s \quad M^* = 1875 \text{ N} = 421 \text{ lb}$$

$$M_p = \frac{M^* - (D_0^2/32) \cdot F \cdot (P_s - P_t)}{1+F} \quad M_p = 30307 \text{ N} = 6813 \text{ lb}$$

$$M_0 = M_p + (D_0^2/64) \cdot (3+\nu^*) \cdot (P_s - P_t) \quad M_0 = -67132 \text{ N} = -15092 \text{ lb}$$

$$M = \max(|M_p|; |M_0|) \quad M = 67132 \text{ N} = 15092 \text{ lb}$$

Tubesheet bending stress

$$f' = \frac{6 \cdot M}{\mu^* \cdot (h - h'g - C_s - C_t)^2} \quad \text{,, } 2 \cdot S \quad f' = 180.684 \text{ MPa} = 26206.1 \text{ Psi}$$

Tubesheet shear stress

$$s' = \frac{(1/(4 \cdot \mu)) \cdot (D_0/(h - C_t - C_s)) \cdot |P_s - P_t|}{(D_s + 2 \cdot C_{ors} + 2 \cdot T_{ols})^2} \quad \text{,, } 0.8 \cdot S \quad s' = 28.226 \text{ MPa} = 4093.9 \text{ Psi}$$

$$s'_{sm} = \frac{4 \cdot (t_s - C_{orc} - T_{ols}) \cdot (D_s + 2 \cdot C_{orc} + 2 \cdot T_{ols} + t_s - C_{orc} - T_{ols})}{6 \cdot M} \cdot P_s =$$

$$s'_{sm} = -2.037 \text{ MPa} = -295.4 \text{ Psi}$$

$$s'_{sb} = \frac{6 \cdot k_s}{(t_s - C_{orc} - T_{ols})^2} \cdot (\beta_s \cdot f_s \cdot P_s + 6 \cdot \frac{1-\nu^*}{E^*} \cdot \frac{D_0}{(h - C_t - C_s)^3} \cdot (1 + \frac{(h - C_t - C_s) \cdot \beta_s}{2} \cdot \frac{D_0^2}{32}) \cdot (M_p + (P_s - P_t)))$$

$$s'_{sb} = -236.723 \text{ MPa} = -34333.9 \text{ Psi}$$

Total stress in shell at tubesheet junction

$$s' = |s'_{sm}| + |s'_{sb}| \quad \text{,, } SPSS \quad s' = 238.760 \text{ MPa} = 34629.3 \text{ Psi}$$

$$s'_{cm} = \frac{4 \cdot (t_c - C_{orc} - T_{olc}) \cdot (D_c + 2 \cdot C_{orc} + 2 \cdot T_{olc} + t_c - C_{orc} - T_{olc})}{6 \cdot k_c} \cdot P_t =$$

$$s'_{cm} = 31.641 \text{ MPa} = 4589.1 \text{ Psi}$$

$$s'_{cb} = \frac{6 \cdot k_c}{(t_c - C_{orc} - T_{olc})^2} \cdot (\beta_c \cdot f_c \cdot P_t - 6 \cdot \frac{1-\nu^*}{E^*} \cdot \frac{D_0}{(h - C_t - C_s)^3} \cdot (1 + \frac{(h - C_t - C_s) \cdot \beta_c}{2} \cdot \frac{D_0^2}{32}) \cdot (M_p + (P_s - P_t)))$$

$$s'_{cb} = 347.027 \text{ MPa} = 50332.0 \text{ Psi}$$

$$s'_{c} = |s'_{cm}| + |s'_{cb}| \quad \text{,, } SPSC \quad s'_{c} = 378.667 \text{ MPa} = 54921.2 \text{ Psi}$$



Software by SANT'AMBROGIO S.I. srl - Milano, Italy-ASME VIII div 1 Rev.17.00

"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units)

- UHX-12

Tubesheet considered as simply supported as per UHX-12.6

$$\rho_s = (D_s + 2 \cdot C_{ors} + 2 \cdot t_{ols}) / D_0$$

$$\rho_s = 1.0207$$

$$\rho_c = (D_c + 2 \cdot C_{orc} + 2 \cdot t_{olc}) / D_0$$

$$\rho_c = 1.0207$$

$$M_{ts} = (D_0^2 / 16) \cdot ((\rho_s - 1) \cdot (\rho_s^2 + 1) \cdot P_s - (\rho_c - 1) \cdot (\rho_c^2 + 1) \cdot P_t) = -4975 \text{ N} = -1118 \text{ lb}$$

$$\beta_s =$$

$$\beta_s = 0 \text{ 1/mm} = 0 \text{ 1/in}$$

$$K_s =$$

$$K_s = 0 \text{ N} = 0 \text{ lb}$$

$$\check{s}_s =$$

$$\check{s}_s = 0 \text{ MPa} = 0 \text{ Psi}$$

$$\xi_s =$$

$$\xi_s = 0 \text{ mm}^3/\text{N} = 0 \text{ in}^3/\text{lb}$$

$$j_s = \rho_s \cdot k_s \cdot \beta_s \cdot \xi_s \cdot (1 + h \cdot \beta_s)$$

$$j_s = 0.0 \text{ mm}^2 = 0.000 \text{ In}^2$$

$$\beta_c =$$

$$\beta_c = 0 \text{ 1/mm} = 0 \text{ 1/in}$$

$$K_c =$$

$$K_c = 0 \text{ N} = 0 \text{ lb}$$

$$\check{s}_c =$$

$$\check{s}_c = 0 \text{ MPa} = 0 \text{ Psi}$$

$$\xi_c =$$

$$\xi_c = 0 \text{ mm}^3/\text{N} = 0 \text{ in}^3/\text{lb}$$

$$j_c = \rho_c \cdot k_c \cdot \beta_c \cdot \xi_c \cdot (1 + h \cdot \beta_c)$$

$$j_c = 0.0 \text{ mm}^2 = 0.000 \text{ In}^2$$

$$K = A / D_0$$

$$K = 1.046$$

$$F = ((1 - \nu^*) / E^*) \cdot (\check{s}_s + \check{s}_c + E \cdot \ln(K))$$

$$F = 0.077$$

Software by SANT'AMBROGIO S.I. srl - Milano, Italy-ASME VIII div 1 Rev.17.00  
 "U" TUBE TUBESHEET CALCULATION position :350  
 According to ASME VIII div 1 Ed.2007+A09 (Metric units) - UHX-12

$$M^* = M_{ts} + j_c \cdot P_t - j_s \cdot P_s \qquad M^* = -4975 \text{ N} = -1118 \text{ lb}$$

$$M_p = \frac{M^* - (D_0^2/32) \cdot F \cdot (P_s - P_t)}{1 + F} \qquad M_p = -424 \text{ N} = -95 \text{ lb}$$

$$M_0 = M_p + (D_0^2/64) \cdot (3 + \nu^*) \cdot (P_s - P_t) \qquad M_0 = -97863 \text{ N} = -22000 \text{ lb}$$

$$M = |M_0| \qquad M = 97863 \text{ N} = 22000 \text{ lb}$$

Tubesheet bending stress

$$s = \frac{6 \cdot M}{\mu^* \cdot (h - h'g - C_s - C_t)^2} \qquad \text{,, 2.S} \qquad s = 263.396 \text{ MPa} = 38202.4 \text{ Psi}$$

Software by SANT'AMBROGIO S.I. srl - Milano, Italy-ASME VIII div 1 Rev.17.00

"U" TUBE TUBESHEET CALCULATION position :350

According to ASME VIII div 1 Ed.2007+A09 (Metric units)

- UHX-12

MAX.ALLOWABLE WORKING PRESSURE:		(New&Cold)MPa/Psi	(Hot&Corr)MPa/Psi
SHELL SIDE	=	2.711 / 393.2	1.808 / 262.2
TUBE SIDE	=	2.606 / 378.0	1.975 / 286.4

HYDRAULIC TEST PRESSURE :		SHELL SIDE (MPa/Psi)	TUBE SIDE (MPa/Psi)
Tubesheet	(With design pressure) =	0.817 / 118.5	2.178 / 315.9

BASIS FOR CALCULATED TEST PRESSURE

Pb=MAWP(New&Cold)+PHydr,design	=	2.711 / 393.2	2.606 / 378.0
static head, (test)	PHydr,test=	0.025 / 3.6	0.012 / 1.7
MAX.ALL.TEST PRESSURE =Pb*1.3-PHydr,test=		3.499 / 507.5	3.376 / 489.6

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ASME VIII div.1 / Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

TUBE SIDE

Governing thickness = 20.00 mm = 0.787 Inch  
Curve of fig UCS66 = B  
MDMT (UG-20(f)) = -28.9 C = -20.0 F  
a) Completed vessel shall hydrostatically tested per UG-99(b) or (c) 27-4  
b) The thermal or mechanical shock loadings are not a controlling design requirement (See UG-22)  
c) Cyclical loading is not a controlling design requirement (See UG-22)

SHELL SIDE

Governing thickness = 20.00 mm = 0.787 Inch  
Curve of fig UCS66 = B  
MDMT (UG-20(f)) = -28.9 C = -20.0 F  
a) Completed vessel shall hydrostatically tested per UG-99(b) or (c) 27-4  
b) The thermal or mechanical shock loadings are not a controlling design requirement (See UG-22)  
c) Cyclical loading is not a controlling design requirement (See UG-22)



Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
CYLINDRICAL SHELL POS.:351  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

INTERNAL PRESSURE

Curve of fig UCS66	= B		
Governing thickness	=	2.11 mm	= 0.083 Inch
Unadjusted MDMT from table UCS-66	=	-29.0 C	= -20.2 F
Tr =	=	0.08 mm	= 0.003 Inch
Tn = Thk. -Corrosion - Wall undertolerance=	=	2.11 mm	= 0.083 Inch
Coincident ratio	=	0.040	
ADJUSTED MDMT from fig UCS66.1	=	-105.0 C	= -157.0 F

EXTERNAL PRESSURE

Curve of fig UCS66	= B		
Governing thickness	=	2.11 mm	= 0.083 Inch
Unadjusted MDMT from table UCS-66	=	-29.0 C	= -20.2 F
Tr =	=	0.19 mm	= 0.008 Inch
Tn = Thk. -Corrosion - Wall undertolerance=	=	2.11 mm	= 0.083 Inch
Coincident ratio	=	0.092	
ADJUSTED MDMT from fig UCS66.1	=	-105.0 C	= -157.0 F



Software by SANT'AMBROGIO S.I. srl - Milano, Italy -ASM/ 17.00  
CYLINDRICAL SHELL POS.:INT.PIPE NOZZLES S1-S2  
ASME VIII div.1 / -Ed.2007+A09 (Metric units)

----- MINIMUM DESIGN METAL TEMPERATURE (MDMT)-----

INTERNAL PRESSURE

Curve of fig UCS66	=	C-Material Normalized		
Governing thickness	=	6.02 mm	=	0.237 Inch
Unadjusted MDMT from table UCS-66	=	-48.0 C	=	-54.4 F
Tr =	=	0.94 mm	=	0.037 Inch
Tn = Thk. -Corrosion - Wall undertolerance=	=	2.07 mm	=	0.081 Inch
Coincident ratio	=	0.456		
ADJUSTED MDMT from fig UCS66.1	=	-48.0 C	=	-54.4 F

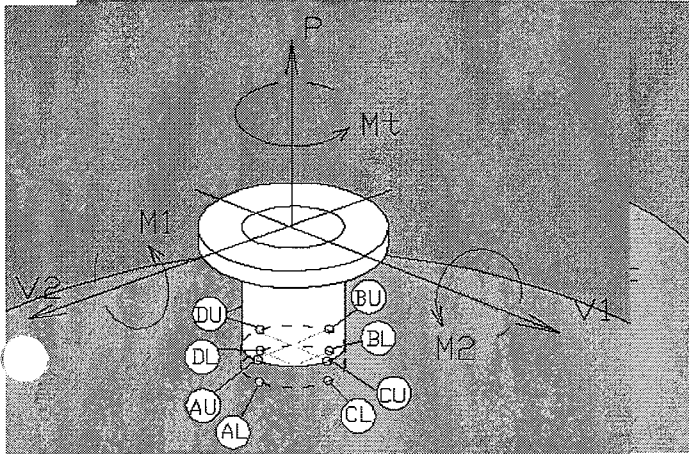
EXTERNAL PRESSURE

Curve of fig UCS66	=	C-Material Normalized		
Governing thickness	=	6.02 mm	=	0.237 Inch
Unadjusted MDMT from table UCS-66	=	-48.0 C	=	-54.4 F
Tr =	=	2.67 mm	=	0.105 Inch
Tn = Thk. -Corrosion - Wall undertolerance=	=	2.07 mm	=	0.081 Inch
Coincident ratio	=	1.292		
ADJUSTED MDMT from fig UCS66.1	=	-48.0 C	=	-54.4 F



**NOZZLE ON HEAD**

**NOZZLE ON SHELL**



Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -

DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S20 Di=1200

===== (WRC Bulletin n. 107 / 297) =====

Head inside crown radius	Di/2= R =	2136.00 mm
Head thickness	S =	22.00 mm
Head thickness undertolerance	tolh =	0.00 mm
Nozzle outside diameter	do =	1230.00 mm
Nozzle thickness (0 = rigid plug)	SN =	30.00 mm
Nozzle thickness undertolerance	tolN =	0.00 mm
Head corrosion allowance	cor =	1.60 mm
Nozzle corrosion allowance	ct =	1.60 mm
Internal pressure, with static head	p =	0.600 MPa
Dist.facing / head surface h= 205.0	a=h+T/2 =	216.0 mm
Bend. moment around X M1= 25000	M'=M1-a*V1 =	-7535000 Nmm
Bend. moment around Y M2= 25000	M''=M2+a*V2 =	7585000 Nmm
Torsional moment	MT =	2500 Nmm
Shear load along X	V2 =	35000 N
Shear load along Y	V1 =	35000 N
Axial tensile load	P =	35000 N
Average head radius (head+pad thickness)	Rm' =	2147.80 mm
Corroded head+pad thickness	T' =	20.40 mm
Stress due to pressure, according to ASME VIII Div. 1, compensated opening		
(R+cor+tolh)*p		
Stress due to pressure	=	$\frac{(R+cor+tolh)*p}{2*(S-cor-tolh)} + 0.1*p = 31.495 \text{ MPa}$
Stress due to pressure - nozzle	=	12.693 MPa
Head allowable stress for general membrane stress	=	129.600 MPa
Head allowable stress for local membrane stress	=	194.400 MPa
Head allowable stress for combined stress	=	388.800 MPa
Nozzle allowable stress for general membrane stress	=	129.600 MPa
Nozzle allowable stress for local membrane stress	=	194.400 MPa
Nozzle allowable stress for combined stress	=	388.800 MPa
Nozzle cross section	A =	107208.14 mm <sup>2</sup>
Nozzle section modulus	S =	31479298.09 mm <sup>3</sup>

Sign convention for loads and moments as in WRC 297 (not as in WRC 107)

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -  
 DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S20 Di=1200

===== (WRC Bulletin n. 107 / 297) =====

VALUES FROM THE GRAPHS (WRC 107) FOR NOZZLES

U= 2.200	T/t= 0.72	rm/t= 21.15	Nx*T/P	(Pic. SP) =	0.005
U= 2.200	T/t= 0.72	rm/t= 21.15	Mx/P	(Pic. SP) =	0.016
U= 2.200	T/t= 0.72	rm/t= 21.15	Nx*T*Sqr(Rm*T)/M1	(Pic. SM) =	0.005
U= 2.200	T/t= 0.72	rm/t= 21.15	Mx*Sqr(Rm*T)/M1	(Pic. SM) =	0.015
U= 2.200	T/t= 0.72	rm/t= 21.15	Nx*T*Sqr(Rm*T)/M2	(Pic. SM) =	0.005
U= 2.200	T/t= 0.72	rm/t= 21.15	Mx*Sqr(Rm*T)/M2	(Pic. SM) =	0.015
U= 2.200	T/t= 0.72	rm/t= 21.15	Ny*T/P	(Pic. SP) =	0.057
U= 2.200	T/t= 0.72	rm/t= 21.15	My/P	(Pic. SP) =	0.004
U= 2.200	T/t= 0.72	rm/t= 21.15	Ny*T*Sqr(Rm*T)/M1	(Pic. SM) =	0.048
U= 2.200	T/t= 0.72	rm/t= 21.15	My*Sqr(Rm*T)/M1	(Pic. SM) =	0.007
U= 2.200	T/t= 0.72	rm/t= 21.15	Ny*T*Sqr(Rm*T)/M2	(Pic. SM) =	0.048
U= 2.200	T/t= 0.72	rm/t= 21.15	My*Sqr(Rm*T)/M2	(Pic. SM) =	0.007

STRESSES IN THE HEAD AT NOZZLE CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fm <sub>x</sub> (p)	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
fb <sub>x</sub> (p)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fm <sub>x</sub> (P)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
fb <sub>x</sub> (P)	8.0	-8.0	8.0	-8.0	8.0	-8.0	8.0	-8.0
fm <sub>x</sub> (M1)	0.0	0.0	0.0	0.0	-0.4	-0.4	0.4	0.4
fb <sub>x</sub> (M1)	0.0	0.0	0.0	0.0	-7.5	7.5	7.5	-7.5
fm <sub>x</sub> (M2)	-0.4	-0.4	0.4	0.4	0.0	0.0	0.0	0.0
fb <sub>x</sub> (M2)	-7.6	7.6	7.6	-7.6	0.0	0.0	0.0	0.0
fm <sub>x</sub>	31.5	31.5	32.3	32.3	31.5	31.5	32.3	32.3
fm <sub>x</sub> +fb <sub>x</sub>	31.9	31.1	48.0	16.7	32.0	31.0	47.9	16.8
fm <sub>y</sub> (p)	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
fb <sub>y</sub> (p)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fm <sub>y</sub> (P)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
fb <sub>y</sub> (P)	2.2	-2.2	2.2	-2.2	2.2	-2.2	2.2	-2.2
fm <sub>y</sub> (M1)	0.0	0.0	0.0	0.0	-4.2	-4.2	4.2	4.2
fb <sub>y</sub> (M1)	0.0	0.0	0.0	0.0	-3.4	3.4	3.4	-3.4
fm <sub>y</sub> (M2)	-4.2	-4.2	4.2	4.2	0.0	0.0	0.0	0.0
fb <sub>y</sub> (M2)	-3.4	3.4	3.4	-3.4	0.0	0.0	0.0	0.0
fm <sub>y</sub>	32.1	32.1	40.5	40.5	32.1	32.1	40.5	40.5
fm <sub>y</sub> +fb <sub>y</sub>	30.9	33.3	46.1	34.9	30.9	33.3	46.1	34.9
t <sub>xy</sub> (V1)	0.0	0.0	0.0	0.0	-0.9	-0.9	0.9	0.9
t <sub>xy</sub> (V2)	0.9	0.9	-0.9	-0.9	0.0	0.0	0.0	0.0
t <sub>xy</sub> (MT)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t <sub>xy</sub>	0.9	0.9	-0.9	-0.9	-0.9	-0.9	0.9	0.9
fm	32.7	32.7	40.6	40.6	32.7	32.7	40.6	40.6
fm + fb	32.4	33.6	48.3	34.9	32.5	33.6	48.3	34.9

Maximum local membrane stress(fm)= 40.6 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 48.3 MPa Allowable stress= 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -  
 DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S20 Di=1200

===== (WRC Bulletin n. 107 / 297) =====

STRESSES IN THE NOZZLE AT HEAD CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7
fmt (P) =	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
fmt (M1) =	0.0	0.0	0.0	0.0	-4.2	-4.2	4.2	4.2
fmt (M2) =	-4.2	-4.2	4.2	4.2	0.0	0.0	0.0	0.0
fmt =	21.7	21.7	13.3	13.3	13.3	13.3	21.7	21.7
fmt+fmt =	21.7	21.7	13.3	13.3	13.3	13.3	21.7	21.7
fm (p) =	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
fb (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fm (P) =	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
fb (P) =	3.5	-3.5	3.5	-3.5	3.5	-3.5	3.5	-3.5
fm (M1) =	0.0	0.0	0.0	0.0	-0.2	-0.2	0.2	0.2
fb (M1) =	0.0	0.0	0.0	0.0	-3.2	3.2	3.2	-3.2
fm (M2) =	-0.2	-0.2	0.2	0.2	0.0	0.0	0.0	0.0
fb (M2) =	-3.3	3.3	3.3	-3.3	0.0	0.0	0.0	0.0
fm =	6.9	6.9	6.9	6.9	6.4	6.4	6.9	6.9
fm+fb =	13.7	0.2	7.1	6.7	6.7	6.2	13.6	0.2
txt (V1) =	0.0	0.0	0.0	0.0	-0.6	-0.6	0.6	0.6
txt (V2) =	0.6	0.6	-0.6	-0.6	0.0	0.0	0.0	0.0
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	0.6	0.6	-0.6	-0.6	-0.6	-0.6	0.6	0.6

fm	21.7	21.7	13.3	13.3	13.4	13.4	21.7	21.7
fm + fb	21.7	21.7	13.3	13.3	13.4	13.4	21.7	21.7

Maximum local membrane stress(fm)= 21.7 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 21.7 MPa Allowable stress= 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -  
 DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S3 DN.5"

===== (WRC Bulletin n. 107 / 297) =====

Head inside crown radius	Di/2= R =	2136.00 mm
Head thickness	S =	22.00 mm
Head thickness undertolerance	tolh =	0.00 mm
Nozzle outside diameter	do =	141.30 mm
Nozzle thickness (0 = rigid plug)	SN =	9.52 mm
Nozzle thickness undertolerance	tolN =	1.19 mm
Head corrosion allowance	cor =	1.60 mm
Nozzle corrosion allowance	ct =	1.60 mm
Internal pressure, with static head	p =	0.600 MPa
Dist.facing / head surface h= 800.0	a=h+T/2 =	811.0 mm
Bend. moment around X M1= 3200	M'=M1-a*V1 =	-3240800 Nmm
Bend. moment around Y M2= 3200	M''=M2+a*V2 =	3247200 Nmm
Torsional moment	MT =	3200 Nmm
Shear load along X	V2 =	4000 N
Shear load along Y	V1 =	4000 N
Axial tensile load	P =	4000 N
Average head radius (head+pad thickness)	Rm' =	2147.80 mm
Corroded head+pad thickness	T' =	20.40 mm
Stress due to pressure, according to ASME VIII Div. 1, compensated opening		
	(R+cor+tolh)*p	
Stress due to pressure	= ----- +0.1*p =	31.495 MPa
	2*(S-cor-tolh)	
Stress due to pressure - nozzle	=	5.999 MPa
Head allowable stress for general membrane stress	=	129.600 MPa
Head allowable stress for local membrane stress	=	194.400 MPa
Head allowable stress for combined stress	=	388.800 MPa
Nozzle allowable stress for general membrane stress	=	117.400 MPa
Nozzle allowable stress for local membrane stress	=	153.140 MPa
Nozzle allowable stress for combined stress	=	353.400 MPa
Nozzle cross section	A =	2845.20 mm <sup>2</sup>
Nozzle section modulus	S =	91388.60 mm <sup>3</sup>

Sign convention for loads and moments as in WRC 297 (not as in WRC 107)

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -  
 DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S3 DN.5"

===== (WRC Bulletin n. 107 / 297) =====  
 VALUES FROM THE GRAPHS (WRC 107) FOR NOZZLES

U= 0.338	T/t= 3.03	rm/t= 10.00	Nx*T/P	(Pic. SP) = 0.064
U= 0.338	T/t= 3.03	rm/t= 10.00	Mx/P	(Pic. SP) = 0.040
U= 0.338	T/t= 3.03	rm/t= 10.00	Nx*T*Sqr(Rm*T)/M1	(Pic. SM) = 0.179
U= 0.338	T/t= 3.03	rm/t= 10.00	Mx*Sqr(Rm*T)/M1	(Pic. SM) = 0.121
U= 0.338	T/t= 3.03	rm/t= 10.00	Nx*T*Sqr(Rm*T)/M2	(Pic. SM) = 0.179
U= 0.338	T/t= 3.03	rm/t= 10.00	Mx*Sqr(Rm*T)/M2	(Pic. SM) = 0.121
U= 0.338	T/t= 3.03	rm/t= 10.00	Ny*T/P	(Pic. SP) = 0.295
U= 0.338	T/t= 3.03	rm/t= 10.00	My/P	(Pic. SP) = 0.103
U= 0.338	T/t= 3.03	rm/t= 10.00	Ny*T*Sqr(Rm*T)/M1	(Pic. SM) = 0.195
U= 0.338	T/t= 3.03	rm/t= 10.00	My*Sqr(Rm*T)/M1	(Pic. SM) = 0.371
U= 0.338	T/t= 3.03	rm/t= 10.00	Ny*T*Sqr(Rm*T)/M2	(Pic. SM) = 0.195
U= 0.338	T/t= 3.03	rm/t= 10.00	My*Sqr(Rm*T)/M2	(Pic. SM) = 0.371

STRESSES IN THE HEAD AT NOZZLE CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL--
fmx (p) =	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
fbx (P) =	2.3	-2.3	2.3	-2.3	2.3	-2.3	2.3	-2.3
fmx (M1) =	0.0	0.0	0.0	0.0	-6.6	-6.6	6.6	6.6
fbx (M1) =	0.0	0.0	0.0	0.0	-27.0	27.0	27.0	-27.0
fmx (M2) =	-6.7	-6.7	6.7	6.7	0.0	0.0	0.0	0.0
fbx (M2) =	-27.0	27.0	27.0	-27.0	0.0	0.0	0.0	0.0
fmx	= 25.5	25.5	38.8	38.8	25.5	25.5	38.8	38.8
fmx+fbx	= 0.7	50.2	68.1	9.4	0.8	50.2	68.0	9.5
fmy (p) =	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
fby (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmy (P) =	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
fby (P) =	6.0	-6.0	6.0	-6.0	6.0	-6.0	6.0	-6.0
fmy (M1) =	0.0	0.0	0.0	0.0	-7.2	-7.2	7.2	7.2
fby (M1) =	0.0	0.0	0.0	0.0	-82.9	82.9	82.9	-82.9
fmy (M2) =	-7.3	-7.3	7.3	7.3	0.0	0.0	0.0	0.0
fby (M2) =	-83.1	83.1	83.1	-83.1	0.0	0.0	0.0	0.0
fmy	= 27.1	27.1	41.6	41.6	27.1	27.1	41.6	41.6
fmy+fby	= -50.0	104.2	130.6	-47.5	-49.9	104.0	130.4	-47.3
txy (V1) =	0.0	0.0	0.0	0.0	-0.9	-0.9	0.9	0.9
txy (V2) =	0.9	0.9	-0.9	-0.9	0.0	0.0	0.0	0.0
txy (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txy	= 0.9	0.9	-0.9	-0.9	-0.9	-0.9	0.9	0.9
-----								
fm	= 27.5	27.5	41.8	41.8	27.5	27.5	41.8	41.8
fm + fb	= 50.8	104.2	130.6	56.9	50.7	104.1	130.5	56.8

Maximum local membrane stress(fm)= 41.8 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 130.6 MPa Allowable stress= 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -  
 DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S3 DN.5"

===== (WRC Bulletin n. 107 / 297) =====

STRESSES IN THE NOZZLE AT HEAD CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
fmt (P) =	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
fmt (M1) =	0.0	0.0	0.0	0.0	-7.2	-7.2	7.2	7.2
fmt (M2) =	-7.3	-7.3	7.3	7.3	0.0	0.0	0.0	0.0
fmt =	16.1	16.1	1.6	1.6	1.6	1.6	16.1	16.1
fmt+fbt =	16.1	16.1	1.6	1.6	1.6	1.6	16.1	16.1
fmx (p) =	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
fbx (P) =	4.1	-4.1	4.1	-4.1	4.1	-4.1	4.1	-4.1
fmx (M1) =	0.0	0.0	0.0	0.0	-35.5	-35.5	35.5	35.5
fbx (M1) =	0.0	0.0	0.0	0.0	-64.8	64.8	64.8	-64.8
fmx (M2) =	-35.5	-35.5	35.5	35.5	0.0	0.0	0.0	0.0
fbx (M2) =	-65.0	65.0	65.0	-65.0	0.0	0.0	0.0	0.0
fmx =	39.9	39.9	39.9	39.9	-31.1	-31.1	39.9	39.9
fmx+fbx =	109.0	-29.1	-21.0	100.8	-91.8	29.7	108.8	-29.0
txt (V1) =	0.0	0.0	0.0	0.0	-2.7	-2.7	2.7	2.7
txt (V2) =	2.7	2.7	-2.7	-2.7	0.0	0.0	0.0	0.0
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	2.7	2.7	-2.7	-2.7	-2.7	-2.7	2.7	2.7
-----								
fm =	40.2	40.2	40.1	40.1	33.1	33.1	40.2	40.2
fm + fb =	109.1	45.5	23.2	100.9	93.6	30.0	108.9	45.4

Maximum local membrane stress(fm)= 40.2 MPa Allowable stress= 153.1 MPa  
 Maximum combined stress(fm+fb) = 109.1 MPa Allowable stress= 353.4 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -  
 DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S15 DN.6"  
 ===== (WRC Bulletin n. 107 / 297) =====

Head inside crown radius	Di/2= R =	2136.00 mm
Head thickness	S =	22.00 mm
Head thickness undertolerance	tolh =	0.00 mm
Nozzle outside diameter	do =	168.30 mm
Nozzle thickness (0 = rigid plug)	SN =	10.97 mm
Nozzle thickness undertolerance	tolN =	1.37 mm
Head corrosion allowance	cor =	1.60 mm
Nozzle corrosion allowance	ct =	1.60 mm
Internal pressure, with static head	p =	0.600 MPa
Dist.facing / head surface h= 340.0	a=h+T/2 =	351.0 mm
Bend. moment around X M1= 3400	M'=M1-a*V1 =	-1611200 Nmm
Bend. moment around Y M2= 3400	M''=M2+a*V2 =	1618000 Nmm
Torsional moment	MT =	3400 Nmm
Shear load along X	V2 =	4600 N
Shear load along Y	V1 =	4600 N
Axial tensile load	P =	4600 N
Average head radius (head+pad thickness)	Rm' =	2147.80 mm
Corroded head+pad thickness	T' =	20.40 mm
Stress due to pressure, according to ASME VIII Div. 1, compensated opening (R+cor+tolh)*p		
Stress due to pressure	= $\frac{(R+cor+tolh)*p}{2*(S-cor-tolh)} + 0.1*p$	= 31.495 MPa
Stress due to pressure - nozzle	=	6.011 MPa
Head allowable stress for general membrane stress	=	129.600 MPa
Head allowable stress for local membrane stress	=	194.400 MPa
Head allowable stress for combined stress	=	388.800 MPa
Nozzle allowable stress for general membrane stress	=	117.400 MPa
Nozzle allowable stress for local membrane stress	=	153.140 MPa
Nozzle allowable stress for combined stress	=	353.400 MPa
Nozzle cross section	A =	4028.77 mm <sup>2</sup>
Nozzle section modulus	S =	154161.63 mm <sup>3</sup>

Sign convention for loads and moments as in WRC 297 (not as in WRC 107)



Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -  
 DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S15 DN.6"

===== (WRC Bulletin n. 107 / 297) =====  
 VALUES FROM THE GRAPHS (WRC 107) FOR NOZZLES

U= 0.402	T/t= 2.55	rm/t= 10.02	Nx*T/P	(Pic. SP) = 0.063
U= 0.402	T/t= 2.55	rm/t= 10.02	Mx/P	(Pic. SP) = 0.046
U= 0.402	T/t= 2.55	rm/t= 10.02	Nx*T*Sqr(Rm*T)/M1	(Pic. SM) = 0.161
U= 0.402	T/t= 2.55	rm/t= 10.02	Mx*Sqr(Rm*T)/M1	(Pic. SM) = 0.128
U= 0.402	T/t= 2.55	rm/t= 10.02	Nx*T*Sqr(Rm*T)/M2	(Pic. SM) = 0.161
U= 0.402	T/t= 2.55	rm/t= 10.02	Mx*Sqr(Rm*T)/M2	(Pic. SM) = 0.128
U= 0.402	T/t= 2.55	rm/t= 10.02	Ny*T/P	(Pic. SP) = 0.260
U= 0.402	T/t= 2.55	rm/t= 10.02	My/P	(Pic. SP) = 0.078
U= 0.402	T/t= 2.55	rm/t= 10.02	Ny*T*Sqr(Rm*T)/M1	(Pic. SM) = 0.203
U= 0.402	T/t= 2.55	rm/t= 10.02	My*Sqr(Rm*T)/M1	(Pic. SM) = 0.257
U= 0.402	T/t= 2.55	rm/t= 10.02	Ny*T*Sqr(Rm*T)/M2	(Pic. SM) = 0.203
U= 0.402	T/t= 2.55	rm/t= 10.02	My*Sqr(Rm*T)/M2	(Pic. SM) = 0.257

STRESSES IN THE HEAD AT NOZZLE CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmx (p) =	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
fbx (P) =	3.1	-3.1	3.1	-3.1	3.1	-3.1	3.1	-3.1
fmx (M1) =	0.0	0.0	0.0	0.0	-3.0	-3.0	3.0	3.0
fbx (M1) =	0.0	0.0	0.0	0.0	-14.2	14.2	14.2	-14.2
fmx (M2) =	-3.0	-3.0	3.0	3.0	0.0	0.0	0.0	0.0
fbx (M2) =	-14.3	14.3	14.3	-14.3	0.0	0.0	0.0	0.0
fmx	29.2	29.2	35.2	35.2	29.2	29.2	35.2	35.2
fmx+fbx	18.0	40.4	52.5	17.8	18.0	40.4	52.5	17.9
fmy (p) =	31.5	31.5	31.5	31.5	31.5	31.5	31.5	31.5
fby (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmy (P) =	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
fby (P) =	5.2	-5.2	5.2	-5.2	5.2	-5.2	5.2	-5.2
fmy (M1) =	0.0	0.0	0.0	0.0	-3.7	-3.7	3.7	3.7
fby (M1) =	0.0	0.0	0.0	0.0	-28.5	28.5	28.5	-28.5
fmy (M2) =	-3.8	-3.8	3.8	3.8	0.0	0.0	0.0	0.0
fby (M2) =	-28.6	28.6	28.6	-28.6	0.0	0.0	0.0	0.0
fmy	30.6	30.6	38.1	38.1	30.6	30.6	38.1	38.1
fmy+fby	7.2	54.0	71.9	4.4	7.3	53.9	71.7	4.5
txy (V1) =	0.0	0.0	0.0	0.0	-0.9	-0.9	0.9	0.9
txy (V2) =	0.9	0.9	-0.9	-0.9	0.0	0.0	0.0	0.0
txy (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txy	0.9	0.9	-0.8	-0.8	-0.8	-0.8	0.9	0.9
fm	31.0	31.0	38.4	38.4	31.0	31.0	38.3	38.3
fm + fb	18.0	54.1	71.9	17.9	18.1	54.0	71.8	17.9

Maximum local membrane stress(fm)= 38.4 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 71.9 MPa Allowable stress= 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carfon Rev.3.07 -  
 DISHED HEAD-CONCENTRATED LOADS ON NOZZLE:S15 DN.6"

===== (WRC Bulletin n. 107 / 297) =====

STRESSES IN THE NOZZLE AT HEAD CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
fmt (P) =	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
fmt (M1) =	0.0	0.0	0.0	0.0	-3.7	-3.7	3.7	3.7
fmt (M2) =	-3.8	-3.8	3.8	3.8	0.0	0.0	0.0	0.0
fmt =	12.6	12.6	5.1	5.1	5.1	5.1	12.6	12.6
fmt+fbt =	12.6	12.6	5.1	5.1	5.1	5.1	12.6	12.6
fm <sub>x</sub> (p) =	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
fb <sub>x</sub> (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fm <sub>x</sub> (P) =	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
fb <sub>x</sub> (P) =	6.2	-6.2	6.2	-6.2	6.2	-6.2	6.2	-6.2
fm <sub>x</sub> (M1) =	0.0	0.0	0.0	0.0	-10.5	-10.5	10.5	10.5
fb <sub>x</sub> (M1) =	0.0	0.0	0.0	0.0	-34.4	34.4	34.4	-34.4
fm <sub>x</sub> (M2) =	-10.5	-10.5	10.5	10.5	0.0	0.0	0.0	0.0
fb <sub>x</sub> (M2) =	-34.6	34.6	34.6	-34.6	0.0	0.0	0.0	0.0
fm <sub>x</sub> =	14.6	14.6	14.6	14.6	-6.3	-6.3	14.6	14.6
fm <sub>x</sub> +fb <sub>x</sub> =	55.4	-26.1	-13.7	43.0	-34.5	21.9	55.2	-26.0
txt (V1) =	0.0	0.0	0.0	0.0	-2.2	-2.2	2.2	2.2
txt (V2) =	2.2	2.2	-2.2	-2.2	0.0	0.0	0.0	0.0
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	2.2	2.2	-2.2	-2.2	-2.2	-2.2	2.2	2.2
-----								
fm =	16.0	16.0	15.1	15.1	12.2	12.2	16.0	16.0
fm + fb =	55.5	39.0	19.3	43.1	39.9	22.2	55.3	38.9

Maximum local membrane stress(fm)= 16.0 MPa Allowable stress= 153.1 MPa  
 Maximum combined stress(fm+fb) = 55.5 MPa Allowable stress= 353.4 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -

CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S1 DN.4 "

===== (WRC Bulletin n. 297 / 107) =====

Shell inside diameter	Di =	2370.00 mm
Shell thickness	S =	15.00 mm
Shell thickness undertolerance	tolS =	0.00 mm
Nozzle outside diameter	do =	116.44 mm
Nozzle thickness (0 = RIGID PLUG)	SN =	8.56 mm
Nozzle thickness undertolerance	tolN =	1.07 mm
Reinforcing pad thickness minus wall undertolerance	SP =	15.00 mm
Reinforcing pad width	W =	40.00 mm
Shell corrosion allowance	cor =	1.60 mm
Nozzle corrosion allowance	corN =	1.60 mm
Internal pressure, with static head	p =	0.600 MPa
Distance facing / shell axis h=	1396.0 mm	a =h - Rm = 195.2 mm
Circumferential moment MC=	3200 Nmm	Mc=MC-a*VC = -777600 Nmm
Longitudinal moment ML=	3200 Nmm	Ml=ML+a*VL = 784000 Nmm
Torsional moment	MT =	3200 Nmm
Transverse shear load	VC =	4000 N
Longitudinal shear load	VL =	4000 N
Axial tensile load	P =	4000 N
Average shell radius (shell+pad thickness)	Rm' =	1200.80 mm
Average shell radius (shell thickness)	Rm =	1193.30 mm
Corroded shell thickness (Shell+pad thickness)	T' =	28.40 mm
Corroded shell thickness (shell thickness)	T =	13.40 mm
Stress due to pressure, according to ASME VIII Div.1, compensated opening (Di+2*cor+2*tolS)*p		
Circ. stress due to pressure =	----- +0.6*p =	53.491 MPa
	2*(S-cor-tolS)	
Circumferential pressure stress - pad edge	=	53.491 MPa
Circumferential pressure stress - nozzle	=	5.631 MPa
Shell allowable stress for general membrane stress	=	129.600 MPa
Shell allowable stress for local membrane stress	=	194.400 MPa
Shell allowable stress for combined stress	=	388.800 MPa
Nozzle allowable stress for general membrane stress	=	117.400 MPa
Nozzle allowable stress for local membrane stress	=	176.100 MPa
Nozzle allowable stress for combined stress	=	352.200 MPa
Pad allowable stress for general membrane stress	=	0.000 MPa
Nozzle cross section	A =	2045.61 mm <sup>2</sup>
Nozzle section modulus	S =	53828.21 mm <sup>3</sup>

Sign convention for loads and moments as in WRC 297 (not as in WRC 107)

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S1 DN.4"

===== (WRC Bulletin n. 297 / 107) =====

VALUES FROM THE GRAPHS (WRC 297) - NOZZLE CONNECTION

lambda= 0.446	T/t= 4.822	d/t= 19.769	Mr/P	(Pic.3-7)	= 0.0827
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nr*T/P	(Pic.8-12)	= 0.1135
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mteta/P	(Pic.13-17)	= 0.1980
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nteta*T/P	(Pic.20-22)	= 0.3179
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mr*d/Mc	(Pic.23-26)	= 0.1065
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nr*T*d/Mc	(Pic.27-31)	= 0.1240
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mteta*d/Mc	(Pic.32-35)	= 0.2871
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nteta*T*d/Mc	(Pic.36-40)	= 0.0389
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mr*d/ML	(Pic.41-44)	= 0.1047
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nr*T*d/ML	(Pic.45-49)	= 0.1239
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mteta*d/ML	(Pic.50-53)	= 0.2650
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nteta*T*d/ML	(Pic.54-58)	= 0.1387

STRESSES IN THE SHELL AT NOZZLE CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p)	= 53.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5
fbt (p)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P)	= 1.6	1.6	1.6	1.6	0.6	0.6	0.6	0.6
fbt (P)	= 5.9	-5.9	5.9	-5.9	2.5	-2.5	2.5	-2.5
fmt (MC)	= 0.0	0.0	0.0	0.0	-1.0	-1.0	1.0	1.0
fbt (MC)	= 0.0	0.0	0.0	0.0	-5.3	5.3	5.3	-5.3
fmt (ML)	= -1.2	-1.2	1.2	1.2	0.0	0.0	0.0	0.0
fbt (ML)	= -13.3	13.3	13.3	-13.3	0.0	0.0	0.0	0.0
fmt	= 53.9	53.9	56.2	56.2	53.0	53.0	55.1	55.1
fmt+fbt	= 46.5	61.3	75.4	37.1	50.2	55.9	62.8	47.3
fm <sub>x</sub> (p)	= 26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7
fb <sub>x</sub> (p)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fm <sub>x</sub> (P)	= 0.6	0.6	0.6	0.6	1.6	1.6	1.6	1.6
fb <sub>x</sub> (P)	= 2.5	-2.5	2.5	-2.5	5.9	-5.9	5.9	-5.9
fm <sub>x</sub> (MC)	= 0.0	0.0	0.0	0.0	-0.3	-0.3	0.3	0.3
fb <sub>x</sub> (MC)	= 0.0	0.0	0.0	0.0	-14.3	14.3	14.3	-14.3
fm <sub>x</sub> (ML)	= -1.0	-1.0	1.0	1.0	0.0	0.0	0.0	0.0
fb <sub>x</sub> (ML)	= -5.2	5.2	5.2	-5.2	0.0	0.0	0.0	0.0
fm <sub>x</sub>	= 26.3	26.3	28.3	28.3	28.0	28.0	28.6	28.6
fm <sub>x</sub> +fb <sub>x</sub>	= 23.5	29.1	36.0	20.6	19.6	36.4	48.8	8.5
txt (VC)	= 0.8	0.8	-0.8	-0.8	0.0	0.0	0.0	0.0
txt (VL)	= 0.0	0.0	0.0	0.0	-0.8	-0.8	0.8	0.8
txt (MT)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt	= 0.8	0.8	-0.8	-0.8	-0.8	-0.8	0.8	0.8

fm	= 53.9	53.9	56.2	56.2	53.0	53.0	55.1	55.1
fm + fb	= 46.6	61.3	75.4	37.1	50.2	55.9	62.9	47.3

Maximum local membrane stress(fm)= 56.2 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 75.4 MPa Allowable stress= 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S1 DN.4"

===== (WRC Bulletin n. 297 / 107) =====

VALUES FROM THE GRAPHS (WRC 107) - PAD EDGE

Beta= 0.0720	Gamma=	89.05	Nt*Rm/P - circ.	(Pic. 3C) =	13.1366
Beta= 0.0720	Gamma=	89.05	Nt*Rm/P - long.	(Pic. 4C) =	14.8064
Beta= 0.0720	Gamma=	89.05	Mt/P - circ.	(Pic. 1C) =	0.1214
Beta= 0.0720	Gamma=	89.05	Mt/P - long.	(Pic.2C-1) =	0.0832
Beta= 0.0720	Gamma=	89.05	Nt*Beta*Rm^2/MC	(Pic. 3A) =	2.6274
Beta= 0.0720	Gamma=	89.05	Mt*Beta*Rm/MC	(Pic. 1A) =	0.0927
Beta= 0.0720	Gamma=	89.05	Nt*Beta*Rm^2/ML	(Pic. 3B) =	9.2164
Beta= 0.0720	Gamma=	89.05	Mt*Beta*Rm/ML	(Pic. 1B) =	0.0439
Beta= 0.0720	Gamma=	89.05	Nx*Rm/P - circ.	(Pic. 4C) =	14.8064
Beta= 0.0720	Gamma=	89.05	Nx*Rm/P - long.	(Pic. 3C) =	13.1366
Beta= 0.0720	Gamma=	89.05	Mx/P - circ.	(Pic. 2C) =	0.0832
Beta= 0.0720	Gamma=	89.05	Mx/P - long.	(Pic.1C-1) =	0.1214
Beta= 0.0720	Gamma=	89.05	Nx*Beta*Rm^2/MC	Pic. 4A) =	3.8739
Beta= 0.0720	Gamma=	89.05	Mx*Beta*Rm/MC	Pic. 2A) =	0.0525
Beta= 0.0720	Gamma=	89.05	Nx*Beta*Rm^2/ML	Pic. 4B) =	2.6690
Beta= 0.0720	Gamma=	89.05	Mx*Beta*Rm/ML	Pic. 2B) =	0.0697

STRESSES IN THE SHELL AT PAD EDGE (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	53.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5
fbt (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P) =	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3
fbt (P) =	11.1	-11.1	11.1	-11.1	16.2	-16.2	16.2	-16.2
fmt (MC) =	0.0	0.0	0.0	0.0	-1.5	-1.5	1.5	1.5
fbt (MC) =	0.0	0.0	0.0	0.0	-28.0	28.0	28.0	-28.0
fmt (ML) =	-5.3	-5.3	5.3	5.3	0.0	0.0	0.0	0.0
fbt (ML) =	-13.4	13.4	13.4	-13.4	0.0	0.0	0.0	0.0
fmt	51.9	51.9	62.5	62.5	55.3	55.3	58.3	58.3
fmt+fbt	49.7	54.2	87.0	38.0	43.5	67.1	102.5	14.0
fmx (p) =	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
fbx (P) =	16.2	-16.2	16.2	-16.2	11.1	-11.1	11.1	-11.1
fmx (MC) =	0.0	0.0	0.0	0.0	-2.2	-2.2	2.2	2.2
fbx (MC) =	0.0	0.0	0.0	0.0	-15.9	15.9	15.9	-15.9
fmx (ML) =	-1.5	-1.5	1.5	1.5	0.0	0.0	0.0	0.0
fbx (ML) =	-21.2	21.2	21.2	-21.2	0.0	0.0	0.0	0.0
fmx	28.5	28.5	31.6	31.6	28.3	28.3	32.6	32.6
fmx+fbx	23.5	33.5	69.0	-5.9	23.5	33.0	59.6	5.7
txt (VC) =	1.0	1.0	-1.0	-1.0	0.0	0.0	0.0	0.0
txt (VL) =	0.0	0.0	0.0	0.0	-1.0	-1.0	1.0	1.0
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt	1.0	1.0	-1.0	-1.0	-1.0	-1.0	1.0	1.0

fm	=	52.0	52.0	62.5	62.5	55.3	55.3	58.3	58.3
fm + fb	=	49.7	54.2	87.0	43.9	43.5	67.1	102.5	14.1

Maximum local membrane stress(fm)= 62.5 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 102.5 MPa Allowable stress= 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S1 DN.4"

===== (WRC Bulletin n. 297 / 107) =====

STRESSES IN THE NOZZLE AT SHELL CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
fmt (P) =	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
fmt (MC) =	0.0	0.0	0.0	0.0	-0.3	-0.3	0.3	0.3
fmt (ML) =	-1.2	-1.2	1.2	1.2	0.0	0.0	0.0	0.0
fmt =	6.0	6.0	8.4	8.4	6.9	6.9	7.5	7.5
fmt+fmt =	6.0	6.0	8.4	8.4	6.9	6.9	7.5	7.5
fm (p) =	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
fb (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fm (P) =	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
fb (P) =	18.0	-18.0	18.0	-18.0	18.0	-18.0	18.0	-18.0
fm (MC) =	0.0	0.0	0.0	0.0	-14.4	-14.4	14.4	14.4
fb (MC) =	0.0	0.0	0.0	0.0	-51.4	51.4	51.4	-51.4
fm (ML) =	-14.6	-14.6	14.6	14.6	0.0	0.0	0.0	0.0
fb (ML) =	-49.8	49.8	49.8	-49.8	0.0	0.0	0.0	0.0
fm =	-9.8	-9.8	19.3	19.3	-9.7	-9.7	19.2	19.2
fm+fb =	-41.6	22.1	87.1	-48.4	-43.1	23.8	88.6	-50.2
txt (VC) =	3.7	3.7	-3.7	-3.7	0.0	0.0	0.0	0.0
txt (VL) =	0.0	0.0	0.0	0.0	-3.7	-3.7	3.7	3.7
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	3.7	3.7	-3.7	-3.7	-3.7	-3.7	3.7	3.7
fm =	17.5	17.5	20.5	20.5	18.1	18.1	20.3	20.3
fm + fb =	48.3	22.9	87.3	57.3	50.6	24.6	88.8	58.2

Maximum local membrane stress(fm)= 20.5 MPa Allowable stress= 176.1 MPa  
 Maximum combined stress(fm+fb) = 88.8 MPa Allowable stress= 352.2 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S2 DN.4"

===== (WRC Bulletin n. 297 / 107) =====

Shell inside diameter	Di =	2370.00 mm
Shell thickness	S =	15.00 mm
Shell thickness undertolerance	tolS =	0.00 mm
Nozzle outside diameter	do =	116.44 mm
Nozzle thickness (0 = RIGID PLUG)	SN =	8.56 mm
Nozzle thickness undertolerance	tolN =	1.07 mm
Reinforcing pad thickness minus wall undertolerance	SP =	15.00 mm
Reinforcing pad width	W =	40.00 mm
Shell corrosion allowance	cor =	1.60 mm
Nozzle corrosion allowance	corN =	1.60 mm
Internal pressure, with static head	p =	0.600 MPa
Distance facing / shell axis h= 1396.0 mm	a =h - Rm =	195.2 mm
Circumferential moment MC= 3200 Nmm	Mc=MC-a*VC =	-777600 Nmm
Longitudinal moment ML= 3200 Nmm	Ml=ML+a*VL =	784000 Nmm
Torsional moment	MT =	3200 Nmm
Transverse shear load	VC =	4000 N
Longitudinal shear load	VL =	4000 N
Axial tensile load	P =	4000 N
Average shell radius (shell+pad thickness)	Rm' =	1200.80 mm
Average shell radius (shell thickness)	Rm =	1193.30 mm
Corroded shell thickness (Shell+pad thickness)	T' =	28.40 mm
Corroded shell thickness (shell thickness)	T =	13.40 mm
Stress due to pressure, according to ASME VIII Div.1, compensated opening $(Di+2*cor+2*tolS)*p$		
Circ. stress due to pressure =	----- +0.6*p =	53.491 MPa
	$2*(S-cor-tolS)$	
Circumferential pressure stress - pad edge	=	53.491 MPa
Circumferential pressure stress - nozzle	=	5.631 MPa
Shell allowable stress for general membrane stress	=	129.600 MPa
Shell allowable stress for local membrane stress	=	194.400 MPa
Shell allowable stress for combined stress	=	388.800 MPa
Nozzle allowable stress for general membrane stress	=	117.400 MPa
Nozzle allowable stress for local membrane stress	=	176.100 MPa
Nozzle allowable stress for combined stress	=	352.200 MPa
Pad allowable stress for general membrane stress	=	0.000 MPa
Nozzle cross section	A =	2045.61 mm <sup>2</sup>
Nozzle section modulus	S =	53828.21 mm <sup>3</sup>

Sign convention for loads and moments as in WRC 297 (not as in WRC 107)

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S2 DN.4"

===== (WRC Bulletin n. 297 / 107) =====  
 VALUES FROM THE GRAPHS (WRC 297) - NOZZLE CONNECTION

lambda= 0.446	T/t= 4.822	d/t= 19.769	Mr/P	(Pic.3-7)	= 0.0827
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nr*T/P	(Pic.8-12)	= 0.1135
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mteta/P	(Pic.13-17)	= 0.1980
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nteta*T/P	(Pic.20-22)	= 0.3179
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mr*d/Mc	(Pic.23-26)	= 0.1065
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nr*T*d/Mc	(Pic.27-31)	= 0.1240
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mteta*d/Mc	(Pic.32-35)	= 0.2871
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nteta*T*d/Mc	(Pic.36-40)	= 0.0389
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mr*d/ML	(Pic.41-44)	= 0.1047
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nr*T*d/ML	(Pic.45-49)	= 0.1239
lambda= 0.446	T/t= 4.822	d/t= 19.769	Mteta*d/ML	(Pic.50-53)	= 0.2650
lambda= 0.446	T/t= 4.822	d/t= 19.769	Nteta*T*d/ML	(Pic.54-58)	= 0.1387

STRESSES IN THE SHELL AT NOZZLE CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	53.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5
fbt (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P) =	1.6	1.6	1.6	1.6	0.6	0.6	0.6	0.6
fbt (P) =	5.9	-5.9	5.9	-5.9	2.5	-2.5	2.5	-2.5
fmt (MC) =	0.0	0.0	0.0	0.0	-1.0	-1.0	1.0	1.0
fbt (MC) =	0.0	0.0	0.0	0.0	-5.3	5.3	5.3	-5.3
fmt (ML) =	-1.2	-1.2	1.2	1.2	0.0	0.0	0.0	0.0
fbt (ML) =	-13.3	13.3	13.3	-13.3	0.0	0.0	0.0	0.0
fmt	53.9	53.9	56.2	56.2	53.0	53.0	55.1	55.1
fmt+fbt	46.5	61.3	75.4	37.1	50.2	55.9	62.8	47.3
fmx (p) =	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	0.6	0.6	0.6	0.6	1.6	1.6	1.6	1.6
fbx (P) =	2.5	-2.5	2.5	-2.5	5.9	-5.9	5.9	-5.9
fmx (MC) =	0.0	0.0	0.0	0.0	-0.3	-0.3	0.3	0.3
fbx (MC) =	0.0	0.0	0.0	0.0	-14.3	14.3	14.3	-14.3
fmx (ML) =	-1.0	-1.0	1.0	1.0	0.0	0.0	0.0	0.0
fbx (ML) =	-5.2	5.2	5.2	-5.2	0.0	0.0	0.0	0.0
fmx	26.3	26.3	28.3	28.3	28.0	28.0	28.6	28.6
fmx+fbx	23.5	29.1	36.0	20.6	19.6	36.4	48.8	8.5
txt (VC) =	0.8	0.8	-0.8	-0.8	0.0	0.0	0.0	0.0
txt (VL) =	0.0	0.0	0.0	0.0	-0.8	-0.8	0.8	0.8
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt	0.8	0.8	-0.8	-0.8	-0.8	-0.8	0.8	0.8
-----								
fm	53.9	53.9	56.2	56.2	53.0	53.0	55.1	55.1
fm + fb	46.6	61.3	75.4	37.1	50.2	55.9	62.9	47.3

Maximum local membrane stress(fm)= 56.2 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 75.4 MPa Allowable stress= 388.8 MPa



Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S2 DN.4"

===== (WRC Bulletin n. 297 / 107) =====

VALUES FROM THE GRAPHS (WRC 107) - PAD EDGE

Beta= 0.0720	Gamma=	89.05	Nt*Rm/P - circ.	(Pic. 3C) =	13.1366
Beta= 0.0720	Gamma=	89.05	Nt*Rm/P - long.	(Pic. 4C) =	14.8064
Beta= 0.0720	Gamma=	89.05	Mt/P - circ.	(Pic. 1C) =	0.1214
Beta= 0.0720	Gamma=	89.05	Mt/P - long.	(Pic.2C-1) =	0.0832
Beta= 0.0720	Gamma=	89.05	Nt*Beta*Rm^2/MC	(Pic. 3A) =	2.6274
Beta= 0.0720	Gamma=	89.05	Mt*Beta*Rm/MC	(Pic. 1A) =	0.0927
Beta= 0.0720	Gamma=	89.05	Nt*Beta*Rm^2/ML	(Pic. 3B) =	9.2164
Beta= 0.0720	Gamma=	89.05	Mt*Beta*Rm/ML	(Pic. 1B) =	0.0439
Beta= 0.0720	Gamma=	89.05	Nx*Rm/P - circ.	(Pic. 4C) =	14.8064
Beta= 0.0720	Gamma=	89.05	Nx*Rm/P - long.	(Pic. 3C) =	13.1366
Beta= 0.0720	Gamma=	89.05	Mx/P - circ.	(Pic. 2C) =	0.0832
Beta= 0.0720	Gamma=	89.05	Mx/P - long.	(Pic.1C-1) =	0.1214
Beta= 0.0720	Gamma=	89.05	Nx*Beta*Rm^2/MC	Pic. 4A) =	3.8739
Beta= 0.0720	Gamma=	89.05	Mx*Beta*Rm/MC	Pic. 2A) =	0.0525
Beta= 0.0720	Gamma=	89.05	Nx*Beta*Rm^2/ML	Pic. 4B) =	2.6690
Beta= 0.0720	Gamma=	89.05	Mx*Beta*Rm/ML	Pic. 2B) =	0.0697

STRESSES IN THE SHELL AT PAD EDGE (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL--
fmt (p) =	53.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5
fbt (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P) =	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3
fbt (P) =	11.1	-11.1	11.1	-11.1	16.2	-16.2	16.2	-16.2
fmt (MC) =	0.0	0.0	0.0	0.0	-1.5	-1.5	1.5	1.5
fbt (MC) =	0.0	0.0	0.0	0.0	-28.0	28.0	28.0	-28.0
fmt (ML) =	-5.3	-5.3	5.3	5.3	0.0	0.0	0.0	0.0
fbt (ML) =	-13.4	13.4	13.4	-13.4	0.0	0.0	0.0	0.0
fmt =	51.9	51.9	62.5	62.5	55.3	55.3	58.3	58.3
fmt+fbt =	49.7	54.2	87.0	38.0	43.5	67.1	102.5	14.0
fmx (p) =	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
fbx (P) =	16.2	-16.2	16.2	-16.2	11.1	-11.1	11.1	-11.1
fmx (MC) =	0.0	0.0	0.0	0.0	-2.2	-2.2	2.2	2.2
fbx (MC) =	0.0	0.0	0.0	0.0	-15.9	15.9	15.9	-15.9
fmx (ML) =	-1.5	-1.5	1.5	1.5	0.0	0.0	0.0	0.0
fbx (ML) =	-21.2	21.2	21.2	-21.2	0.0	0.0	0.0	0.0
fmx =	28.5	28.5	31.6	31.6	28.3	28.3	32.6	32.6
fmx+fbx =	23.5	33.5	69.0	-5.9	23.5	33.0	59.6	5.7
txt (VC) =	1.0	1.0	-1.0	-1.0	0.0	0.0	0.0	0.0
txt (VL) =	0.0	0.0	0.0	0.0	-1.0	-1.0	1.0	1.0
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	1.0	1.0	-1.0	-1.0	-1.0	-1.0	1.0	1.0

fm =	52.0	52.0	62.5	62.5	55.3	55.3	58.3	58.3
fm + fb =	49.7	54.2	87.0	43.9	43.5	67.1	102.5	14.1

Maximum local membrane stress(fm)= 62.5 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 102.5 MPa Allowable stress= 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S2 DN.4"

===== (WRC Bulletin n. 297 / 107) =====

STRESSES IN THE NOZZLE AT SHELL CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
fmt (P) =	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
fmt (MC) =	0.0	0.0	0.0	0.0	-0.3	-0.3	0.3	0.3
fmt (ML) =	-1.2	-1.2	1.2	1.2	0.0	0.0	0.0	0.0
fmt =	6.0	6.0	8.4	8.4	6.9	6.9	7.5	7.5
fmt+fbt =	6.0	6.0	8.4	8.4	6.9	6.9	7.5	7.5
fmx (p) =	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
fbx (P) =	18.0	-18.0	18.0	-18.0	18.0	-18.0	18.0	-18.0
fmx (MC) =	0.0	0.0	0.0	0.0	-14.4	-14.4	14.4	14.4
fbx (MC) =	0.0	0.0	0.0	0.0	-51.4	51.4	51.4	-51.4
fmx (ML) =	-14.6	-14.6	14.6	14.6	0.0	0.0	0.0	0.0
fbx (ML) =	-49.8	49.8	49.8	-49.8	0.0	0.0	0.0	0.0
fmx =	-9.8	-9.8	19.3	19.3	-9.7	-9.7	19.2	19.2
fmx+fbx =	-41.6	22.1	87.1	-48.4	-43.1	23.8	88.6	-50.2
txt (VC) =	3.7	3.7	-3.7	-3.7	0.0	0.0	0.0	0.0
txt (VL) =	0.0	0.0	0.0	0.0	-3.7	-3.7	3.7	3.7
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	3.7	3.7	-3.7	-3.7	-3.7	-3.7	3.7	3.7
fm =	17.5	17.5	20.5	20.5	18.1	18.1	20.3	20.3
fm + fb =	48.3	22.9	87.3	57.3	50.6	24.6	88.8	58.2

Maximum local membrane stress(fm)= 20.5 MPa Allowable stress= 176.1 MPa  
 Maximum combined stress(fm+fb) = 88.8 MPa Allowable stress= 352.2 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S6 DN.12"

===== (WRC Bulletin n. 297 / 107) =====

Shell inside diameter	Di =	2370.00 mm
Shell thickness	S =	15.00 mm
Shell thickness undertolerance	tolS =	0.00 mm
Nozzle outside diameter	do =	323.80 mm
Nozzle thickness (0 = RIGID PLUG)	SN =	12.70 mm
Nozzle thickness undertolerance	tolN =	1.58 mm
Reinforcing pad thickness minus wall undertolerance	SP =	15.00 mm
Reinforcing pad width	W =	55.00 mm
Shell corrosion allowance	cor =	1.60 mm
Nozzle corrosion allowance	corN =	1.60 mm
Internal pressure, with static head	p =	0.600 MPa
Distance facing / shell axis h= 1360.0 mm	a =h - Rm =	159.2 mm
Circumferential moment MC= 12500 Nmm	Mc=MC-a*VC =	-1579500 Nmm
Longitudinal moment ML= 12500 Nmm	Ml=ML+a*VL =	1604500 Nmm
Torsional moment	MT =	12500 Nmm
Transverse shear load	VC =	10000 N
Longitudinal shear load	VL =	10000 N
Axial tensile load	P =	10000 N
Average shell radius (shell+pad thickness)	Rm' =	1200.80 mm
Average shell radius (shell thickness)	Rm =	1193.30 mm
Corroded shell thickness (Shell+pad thickness)	T' =	28.40 mm
Corroded shell thickness (shell thickness)	T =	13.40 mm
Stress due to pressure, according to ASME VIII Div.1, compensated opening (Di+2*cor+2*tolS)*p		
Circ. stress due to pressure = ----- +0.6*p =		53.491 MPa
2*(S-cor-tolS)		
Circumferential pressure stress - pad edge	=	53.491 MPa
Circumferential pressure stress - nozzle	=	9.904 MPa
Shell allowable stress for general membrane stress	=	129.600 MPa
Shell allowable stress for local membrane stress	=	194.400 MPa
Shell allowable stress for combined stress	=	388.800 MPa
Nozzle allowable stress for general membrane stress	=	117.400 MPa
Nozzle allowable stress for local membrane stress	=	176.100 MPa
Nozzle allowable stress for combined stress	=	352.200 MPa
Pad allowable stress for general membrane stress	=	0.000 MPa
Nozzle cross section	A =	9399.47 mm <sup>2</sup>
Nozzle section modulus	S =	717460.78 mm <sup>3</sup>

Sign convention for loads and moments as in WRC 297 (not as in WRC 107)

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S6 DN.12"

===== (WRC Bulletin n. 297 / 107) =====

VALUES FROM THE GRAPHS (WRC 297) - NOZZLE CONNECTION

lambda= 1.240	T/t= 2.983	d/t= 34.013	Mr/P	(Pic.3-7)	= 0.0821
lambda= 1.240	T/t= 2.983	d/t= 34.013	Nr*T/P	(Pic.8-12)	= 0.0659
lambda= 1.240	T/t= 2.983	d/t= 34.013	Mteta/P	(Pic.13-17)	= 0.0756
lambda= 1.240	T/t= 2.983	d/t= 34.013	Nteta*T/P	(Pic.20-22)	= 0.2073
lambda= 1.240	T/t= 2.983	d/t= 34.013	Mr*d/Mc	(Pic.23-26)	= 0.1533
lambda= 1.240	T/t= 2.983	d/t= 34.013	Nr*T*d/Mc	(Pic.27-31)	= 0.1083
lambda= 1.240	T/t= 2.983	d/t= 34.013	Mteta*d/Mc	(Pic.32-35)	= 0.1694
lambda= 1.240	T/t= 2.983	d/t= 34.013	Nteta*T*d/Mc	(Pic.36-40)	= 0.1684
lambda= 1.240	T/t= 2.983	d/t= 34.013	Mr*d/ML	(Pic.41-44)	= 0.1138
lambda= 1.240	T/t= 2.983	d/t= 34.013	Nr*T*d/ML	(Pic.45-49)	= 0.0835
lambda= 1.240	T/t= 2.983	d/t= 34.013	Mteta*d/ML	(Pic.50-53)	= 0.1096
lambda= 1.240	T/t= 2.983	d/t= 34.013	Nteta*T*d/ML	(Pic.54-58)	= 0.3109

STRESSES IN THE SHELL AT NOZZLE CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p)	= 53.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5
fmt (P)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (MC)	= 0.0	0.0	0.0	0.0	-0.7	-0.7	0.7	0.7
fmt (ML)	= -1.9	-1.9	1.9	1.9	0.0	0.0	0.0	0.0
fmt	= 54.2	54.2	58.0	58.0	53.7	53.7	55.0	55.0
fmt+fmt	= 55.7	52.6	67.6	48.3	54.2	53.1	66.6	43.3
fmt (p)	= 26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7
fmt (P)	= 0.8	0.8	0.8	0.8	2.6	2.6	2.6	2.6
fmt (MC)	= 0.0	0.0	0.0	0.0	-1.0	-1.0	1.0	1.0
fmt (ML)	= -0.5	-0.5	0.5	0.5	0.0	0.0	0.0	0.0
fmt	= 27.0	27.0	28.1	28.1	28.3	28.3	30.3	30.3
fmt+fmt	= 29.0	25.1	38.4	17.8	27.8	28.8	42.1	18.6
fmt (p)	= 0.7	0.7	-0.7	-0.7	0.0	0.0	0.0	0.0
fmt (P)	= 0.0	0.0	0.0	0.0	-0.7	-0.7	0.7	0.7
fmt (MC)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (ML)	= 0.7	0.7	-0.7	-0.7	-0.7	-0.7	0.7	0.7
fmt	= 54.2	54.2	58.0	58.0	53.7	53.7	55.0	55.0
fmt + fb	= 55.8	52.6	67.7	48.3	54.2	53.1	66.7	43.3

Maximum local membrane stress(fm)= 58.0 MPa Allowable stress= 194.4 MPa  
 Maximum combined stress(fm+fb) = 67.7 MPa Allowable stress= 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S6 DN.12"

===== (WRC Bulletin n. 297 / 107) =====

VALUES FROM THE GRAPHS (WRC 107) - PAD EDGE

Beta= 0.1590	Gamma=	89.05	Nt*Rm/P - circ.	(Pic. 3C) =	6.7379
Beta= 0.1590	Gamma=	89.05	Nt*Rm/P - long.	(Pic. 4C) =	11.5404
Beta= 0.1590	Gamma=	89.05	Mt/P - circ.	(Pic. 1C) =	0.0586
Beta= 0.1590	Gamma=	89.05	Mt/P - long.	(Pic.2C-1) =	0.0301
Beta= 0.1590	Gamma=	89.05	Nt*Beta*Rm^2/MC	(Pic. 3A) =	3.4186
Beta= 0.1590	Gamma=	89.05	Mt*Beta*Rm/MC	(Pic. 1A) =	0.0695
Beta= 0.1590	Gamma=	89.05	Nt*Beta*Rm^2/ML	(Pic. 3B) =	8.3877
Beta= 0.1590	Gamma=	89.05	Mt*Beta*Rm/ML	(Pic. 1B) =	0.0208
Beta= 0.1590	Gamma=	89.05	Nx*Rm/P - circ.	(Pic. 4C) =	11.5404
Beta= 0.1590	Gamma=	89.05	Nx*Rm/P - long.	(Pic. 3C) =	6.7379
Beta= 0.1590	Gamma=	89.05	Mx/P - circ.	(Pic. 2C) =	0.0301
Beta= 0.1590	Gamma=	89.05	Mx/P - long.	(Pic.1C-1) =	0.0586
Beta= 0.1590	Gamma=	89.05	Nx*Beta*Rm^2/MC	Pic. 4A) =	7.1728
Beta= 0.1590	Gamma=	89.05	Mx*Beta*Rm/MC	Pic. 2A) =	0.0323
Beta= 0.1590	Gamma=	89.05	Nx*Beta*Rm^2/ML	Pic. 4B) =	3.4869
Beta= 0.1590	Gamma=	89.05	Mx*Beta*Rm/ML	Pic. 2B) =	0.0279

STRESSES IN THE SHELL AT PAD EDGE (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	53.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5
fbt (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P) =	7.2	7.2	7.2	7.2	4.2	4.2	4.2	4.2
fbt (P) =	10.0	-10.0	10.0	-10.0	19.6	-19.6	19.6	-19.6
fmt (MC) =	0.0	0.0	0.0	0.0	-1.8	-1.8	1.8	1.8
fbt (MC) =	0.0	0.0	0.0	0.0	-19.3	19.3	19.3	-19.3
fmt (ML) =	-4.4	-4.4	4.4	4.4	0.0	0.0	0.0	0.0
fbt (ML) =	-5.9	5.9	5.9	-5.9	0.0	0.0	0.0	0.0
fmt =	56.3	56.3	65.1	65.1	55.9	55.9	59.5	59.5
fmt+fbt =	60.4	52.1	81.1	49.2	56.2	55.7	98.4	20.6
fm <sub>x</sub> (p) =	26.7	26.7	26.7	26.7	26.7	26.7	26.7	26.7
fb <sub>x</sub> (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fm <sub>x</sub> (P) =	4.2	4.2	4.2	4.2	7.2	7.2	7.2	7.2
fb <sub>x</sub> (P) =	19.6	-19.6	19.6	-19.6	10.0	-10.0	10.0	-10.0
fm <sub>x</sub> (MC) =	0.0	0.0	0.0	0.0	-3.7	-3.7	3.7	3.7
fb <sub>x</sub> (MC) =	0.0	0.0	0.0	0.0	-9.0	9.0	9.0	-9.0
fm <sub>x</sub> (ML) =	-1.8	-1.8	1.8	1.8	0.0	0.0	0.0	0.0
fb <sub>x</sub> (ML) =	-7.9	7.9	7.9	-7.9	0.0	0.0	0.0	0.0
fm <sub>x</sub> =	29.1	29.1	32.8	32.8	30.2	30.2	37.7	37.7
fm <sub>x</sub> +fb <sub>x</sub> =	40.8	17.4	60.3	5.3	31.3	29.2	56.7	18.7
txt (VC) =	1.1	1.1	-1.1	-1.1	0.0	0.0	0.0	0.0
txt (VL) =	0.0	0.0	0.0	0.0	-1.1	-1.1	1.1	1.1
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	1.1	1.1	-1.1	-1.1	-1.1	-1.1	1.1	1.1

fm	=	56.3	56.3	65.2	65.2	56.0	56.0	59.5	59.5
fm + fb	=	60.5	52.1	81.1	49.2	56.2	55.7	98.4	21.1

Maximum local membrane stress (fm) = 65.2 MPa Allowable stress = 194.4 MPa  
 Maximum combined stress (fm+fb) = 98.4 MPa Allowable stress = 388.8 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :S6 DN.12"

===== (WRC Bulletin n. 297 / 107) =====

STRESSES IN THE NOZZLE AT SHELL CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9
fmt (P) =	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
fmt (MC) =	0.0	0.0	0.0	0.0	-1.0	-1.0	1.0	1.0
fmt (ML) =	-1.9	-1.9	1.9	1.9	0.0	0.0	0.0	0.0
fmt =	10.6	10.6	14.4	14.4	11.5	11.5	13.5	13.5
fmt+fbt =	10.6	10.6	14.4	14.4	11.5	11.5	13.5	13.5
fmx (p) =	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
fbx (P) =	32.5	-32.5	32.5	-32.5	32.5	-32.5	32.5	-32.5
fmx (MC) =	0.0	0.0	0.0	0.0	-2.2	-2.2	2.2	2.2
fbx (MC) =	0.0	0.0	0.0	0.0	-32.0	32.0	32.0	-32.0
fmx (ML) =	-2.2	-2.2	2.2	2.2	0.0	0.0	0.0	0.0
fbx (ML) =	-23.6	23.6	23.6	-23.6	0.0	0.0	0.0	0.0
fmx =	3.8	3.8	8.3	8.3	3.8	3.8	8.2	8.2
fmx+fbx =	12.7	-5.1	64.4	-47.9	4.3	3.3	72.8	-56.3
txt (VC) =	2.1	2.1	-2.1	-2.1	0.0	0.0	0.0	0.0
txt (VL) =	0.0	0.0	0.0	0.0	-2.1	-2.1	2.1	2.1
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	2.1	2.1	-2.1	-2.1	-2.1	-2.1	2.1	2.1
-----								
fm =	11.1	11.1	15.0	15.0	12.0	12.0	14.2	14.2
fm + fb =	13.9	16.2	64.5	62.4	12.0	11.9	72.9	70.0

Maximum local membrane stress(fm)= 15.0 MPa Allowable stress= 176.1 MPa  
 Maximum combined stress(fm+fb) = 72.9 MPa Allowable stress= 352.2 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Carcil Rev.3.1 -  
 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :T1-T2 DN.8"

===== (WRC Bulletin n. 297 / 107) =====

Shell inside diameter	Di =	1070.00 mm
Shell thickness	S =	15.00 mm
Shell thickness undertolerance	tolS =	0.00 mm
Nozzle outside diameter	do =	222.26 mm
Nozzle thickness (0 = RIGID PLUG)	SN =	12.70 mm
Nozzle thickness undertolerance	tolN =	1.58 mm
Shell corrosion allowance	cor =	1.60 mm
Nozzle corrosion allowance	corN =	1.60 mm
Internal pressure,with static head	p =	1.600 MPa
Distance facing / shell axis h= 800.0 mm	a =h - Rm =	256.7 mm
Circumferential moment MC= 6900 Nmm	Mc=MC-a*VC =	-1944020 Nmm
Longitudinal moment ML= 6900 Nmm	Ml=ML+a*VL =	1957820 Nmm
Torsional moment	MT =	6900 Nmm
Transverse shear load	VC =	7600 N
Longitudinal shear load	VL =	7600 N
Axial tensile load	P =	7600 N
Average shell radius (shell+pad thickness)	Rm' =	543.30 mm
Corroded shell thickness (Shell+pad thickness)	T' =	13.40 mm
Stress due to pressure, according to ASME VIII Div.1, compensated opening (Di+2*cor+2*tolS)*p		
Circ. stress due to pressure = ----- +0.6*p =		65.032 MPa
2*(S-cor-tolS)		
Circumferential pressure stress - nozzle	=	17.877 MPa
Shell allowable stress for general membrane stress	=	138.000 MPa
Shell allowable stress for local membrane stress	=	207.000 MPa
Shell allowable stress for combined stress	=	414.000 MPa
Nozzle allowable stress for general membrane stress	=	118.000 MPa
Nozzle allowable stress for local membrane stress	=	177.000 MPa
Nozzle allowable stress for combined stress	=	354.000 MPa
Nozzle cross section	A =	6362.61 mm <sup>2</sup>
Nozzle section modulus	S =	324549.86 mm <sup>3</sup>

Sign convention for loads and moments as in WRC 297 (not as in WRC 107)

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 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :T1-T2 DN.8"

===== (WRC Bulletin n. 297 / 107) =====

VALUES FROM THE GRAPHS (WRC 297) - NOZZLE CONNECTION

lambda= 1.842	T/t= 1.408	d/t= 23.347	Mr/P	(Pic.3-7)	= 0.1120
lambda= 1.842	T/t= 1.408	d/t= 23.347	Nr*T/P	(Pic.8-12)	= 0.0615
lambda= 1.842	T/t= 1.408	d/t= 23.347	Mteta/P	(Pic.13-17)	= 0.0457
lambda= 1.842	T/t= 1.408	d/t= 23.347	Nteta*T/P	(Pic.20-22)	= 0.1329
lambda= 1.842	T/t= 1.408	d/t= 23.347	Mr*d/Mc	(Pic.23-26)	= 0.2236
lambda= 1.842	T/t= 1.408	d/t= 23.347	Nr*T*d/Mc	(Pic.27-31)	= 0.1061
lambda= 1.842	T/t= 1.408	d/t= 23.347	Mteta*d/Mc	(Pic.32-35)	= 0.1106
lambda= 1.842	T/t= 1.408	d/t= 23.347	Nteta*T*d/Mc	(Pic.36-40)	= 0.1215
lambda= 1.842	T/t= 1.408	d/t= 23.347	Mr*d/ML	(Pic.41-44)	= 0.1169
lambda= 1.842	T/t= 1.408	d/t= 23.347	Nr*T*d/ML	(Pic.45-49)	= 0.0668
lambda= 1.842	T/t= 1.408	d/t= 23.347	Mteta*d/ML	(Pic.50-53)	= 0.0499
lambda= 1.842	T/t= 1.408	d/t= 23.347	Nteta*T*d/ML	(Pic.54-58)	= 0.2037

STRESSES IN THE SHELL AT NOZZLE CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p)	= 65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
fmt (P)	= 5.6	5.6	5.6	5.6	2.6	2.6	2.6	2.6
fmt (MC)	= 0.0	0.0	0.0	0.0	-5.2	-5.2	5.2	5.2
fmt (ML)	= -10.0	-10.0	10.0	10.0	0.0	0.0	0.0	0.0
fmt	= 60.7	60.7	80.6	80.6	62.5	62.5	72.8	72.8
fmt+fmt	= 57.6	63.8	106.9	54.4	25.5	99.4	166.6	-21.0
fmt (p)	= 32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5
fmt (P)	= 2.6	2.6	2.6	2.6	5.6	5.6	5.6	5.6
fmt (MC)	= 0.0	0.0	0.0	0.0	-5.9	-5.9	5.9	5.9
fmt (ML)	= -3.3	-3.3	3.3	3.3	0.0	0.0	0.0	0.0
fmt	= 31.8	31.8	38.4	38.4	32.2	32.2	44.1	44.1
fmt+fmt	= 25.9	37.8	101.2	-24.4	11.5	52.9	88.0	0.1
fmt (VC)	= 1.6	1.6	-1.6	-1.6	0.0	0.0	0.0	0.0
fmt (VL)	= 0.0	0.0	0.0	0.0	-1.6	-1.6	1.6	1.6
fmt (MT)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt	= 1.6	1.6	-1.6	-1.6	-1.6	-1.6	1.6	1.6
fm	= 60.8	60.8	80.7	80.7	62.5	62.5	72.9	72.9
fm + fb	= 57.7	63.9	107.4	78.9	25.7	99.4	166.6	21.4

Maximum local membrane stress(fm)= 80.7 MPa Allowable stress= 207.0 MPa  
 Maximum combined stress(fm+fb) = 166.6 MPa Allowable stress= 414.0 MPa



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 CYLINDRICAL SHELL-CONCENTRATED LOADS ON NOZZLE :T1-T2 DN.8"

===== (WRC Bulletin n. 297 / 107) =====

STRESSES IN THE NOZZLE AT SHELL CONNECTION (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p) =	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9
fmt (P) =	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
fmt (MC) =	0.0	0.0	0.0	0.0	-5.9	-5.9	5.9	5.9
fmt (ML) =	-10.0	-10.0	10.0	10.0	0.0	0.0	0.0	0.0
fmt =	13.5	13.5	33.5	33.5	17.6	17.6	29.4	29.4
fmt+fbt =	13.5	13.5	33.5	33.5	17.6	17.6	29.4	29.4
fmx (p) =	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
fbx (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P) =	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
fbx (P) =	40.9	-40.9	40.9	-40.9	40.9	-40.9	40.9	-40.9
fmx (MC) =	0.0	0.0	0.0	0.0	-6.0	-6.0	6.0	6.0
fbx (MC) =	0.0	0.0	0.0	0.0	-98.8	98.8	98.8	-98.8
fmx (ML) =	-6.0	-6.0	6.0	6.0	0.0	0.0	0.0	0.0
fbx (ML) =	-48.7	48.7	48.7	-48.7	0.0	0.0	0.0	0.0
fmx =	4.1	4.1	16.2	16.2	4.1	4.1	16.1	16.1
fmx+fbx =	-3.7	11.9	105.7	-73.4	-53.8	62.0	155.8	-123.5
txt (VC) =	2.3	2.3	-2.3	-2.3	0.0	0.0	0.0	0.0
txt (VL) =	0.0	0.0	0.0	0.0	-2.3	-2.3	2.3	2.3
txt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt =	2.3	2.3	-2.3	-2.3	-2.3	-2.3	2.3	2.3
-----								
fm =	14.0	14.0	33.8	33.8	18.0	18.0	29.8	29.8
fm + fb =	17.8	15.1	105.8	107.0	71.5	62.2	155.8	153.0

Maximum local membrane stress(fm)= 33.8 MPa Allowable stress= 177.0 MPa  
 Maximum combined stress(fm+fb) = 155.8 MPa Allowable stress= 354.0 MPa

**SEISMIC CODE**

Method of seismic analysis:

**ASCE 7-88**

Seismic Zone:			2
Seismic Zone Coefficient (Table 21):	Z =	0,375	
Importance Factor:	I =	1,250	
Force Factor:	K =	2,000	
Soil profile:	S2=		
Soil Coefficient	S =	1,200	

**Period of vibration calculation**

The fundamental period of vibration of the vessel under proper weight, is calculated using the Rayleigh method of approximation by numerical integration of the following formulae

$$T = 2 \times 3,14 \times \left( \frac{\sum w_i \times y_i^2}{g \times \sum w_i \times y_i} \right)^{0,5} \quad \text{sec}$$

where:

w <sub>i</sub> = Weight of each section	N	187400
y <sub>i</sub> = Horizontal displacement at the top of section	m	0
g = Gravity acceleration	m/s <sup>2</sup>	9,80665

**Design data**

W <sub>o</sub> = 187400	N	Weight Operating condition
W <sub>e</sub> = 178550	N	Weight Erection condition
T = 0	sec	Vessel period of vibration
h = 1,309	m	Gravity center from base

**Seismic shear at bottom: Operating**

$$V_o = Z * I * K * CS * W_o = \quad 24596 \quad \text{N} \quad CS= \quad 0,14$$

**Seismic shear at bottom: Erection**

$$V_e = Z * I * K * CS * W_e = \quad 23435 \quad \text{N} \quad CS= \quad 0,14$$

**Bending moment at bottom: Operating**

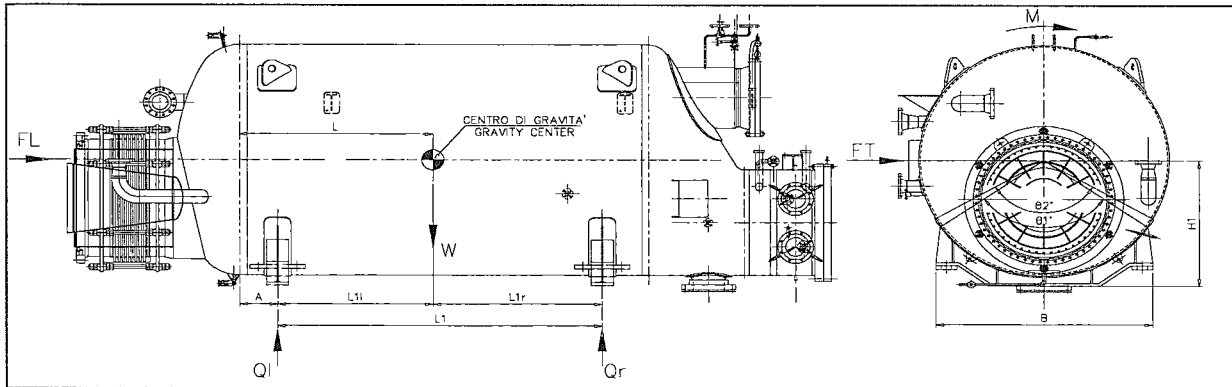
$$M_o = V_o * h = \quad 32196 \quad \text{N-m}$$

**Bending moment at bottom: Erection**

$$M_e = V_e * h = \quad 30676 \quad \text{N-m}$$

**SADDLE CALCULATION**

Saddles reaction due the vessel weight



$W_o = 187400$  N Weight Operating condition  
 $W_{ot} = 392400$  N Weight Test condition

$L = 1850$  mm  $H1 = 1309$  mm  
 $A = 364$  mm  $\theta_1 = 110^\circ$   
 $L1 = 3100$  mm  $\theta_2 = 120^\circ$   
 $L1l = 1486$  mm  
 $L1r = 1614$  mm

**Operating**

$Q_r = W_o * L1l / L1 = 89831$  N  
 $Q_l = W_o * L1r / L1 = 97569$  N

**Test**

$Q_r = W_{ot} * L1l / L1 = 188099$  N  
 $Q_l = W_{ot} * L1r / L1 = 204301$  N

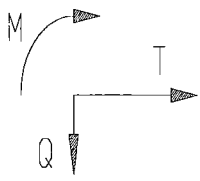
**Longitudinal force (operating)**

$FL = 24596$  N

**Transversal force (operating)**

$FT=0,5*FL= 12298$  N

LOADS AT SADDLES

	CARICHI ALLE SELLE LOADS AT SADDLES	IN EREZIONE ERECTION	IN PROVA IDR. HYDROTEST	IN ESERCIZIO OPERATING
		CARICO VERTICALE VERTICAL LOAD      daN	17855	39240
	TAGLIO SHEAR                  daN	2345	-	2460
M - (daN.m) T - (daN) Q - (daN)	MOMENTO MOMENT              daNm	3070	-	3220

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 HORIZONTAL VESSEL ON SADDLES - PD 5500:2003 (Modified for seisme)

```

=====
Calculation report for Item          : REGENERATOR/CONDENSE
* INPUT DATA
Internal design pressure             p =           0.60      MPa
Design temperature                   T =          340.00      C.
Shell and heads material description : SA 516 GR.70
Allowable stress                     f =          129.600    N/mm2
Elastic modulus                     E =          180200    N/mm2
Distance between tangent lines      L =          3910.00    mm
Shell ID (uncorroded)               2*(r+c) =        2370.00    mm
Corrosion allowance                 c =             1.60    mm
Shell thickness (uncorroded)        e + c =          15.00    mm
Head outside height                 h =          615.00    mm
Head thickness (uncorroded)        e'+c =          22.00    mm
Distance saddle/head TL             A =          364.00    mm
Saddle longitudinal dimension       b1 =          210.00    mm
Saddle transversal dimension        b =          1965.96    mm
Saddle angle                        Teta =           110    deg.
Saddle reaction (weight)           W1 =          97569.0    N
Saddle reaction (vert. seismic)    W2 =             0.0    N
Seismic longitudinal force          R =          24596.0    N
Seismic transverse force            S =          12298.0    N
Height of vessel axis              h' =          1309.0    mm
Stiffening rings on saddles:      NO STIFFENING
Saddle attachment:                WELDED
                                  A.3.5.1 Fig. A.2 is considered

* MISCELLANEOUS DATA
Stress coeff.(1.2 with seismic)    s' =           1.20
Yield point/f ratio (3.6.1.1)      s =           1.40
K=.605*e*E/f/s/r                   =             6.7854
Delta (from fig. A.2)              =             0.4885
e'/D = e'/2/(r+e')                 =             0.0084
h/D = h/2/(r+e')                   =             0.2548
p/f = (from fig. 3.5-2)            =             0.0173

* ALLOWABLE STRESSES
Longitudinal tensile                s'*f =          155.520    N/mm2
Longitudinal compressive            delta*s*f =          88.629    N/mm2
Shear min(0.8*f, 0.06*e*E/r)       =             103.680    N/mm2
Tangential 1.25*f-p/(p'/f)         =             127.280    N/mm2
Circumferential tensile            1.25*f =          162.000    N/mm2
Circumf.compressive                delta*s*f =          88.629    N/mm2

* FACTORS & CONSTANTS
C3 (Figure G.3.3-4)                 =             0.1110
C2 (Figure G.3.3-4)                 =             1.2097
C1 (Figure G.3.3-3)                 =             0.2345
K1 (Table G.3.3-1)                  =             1.0000
K2 (Table G.3.3-1)                  =             1.0000
K3 (Table G.3.3-2)                  =             1.0753
K4 (Table G.3.3-2)                  =             0.4453
K5 (Table G.3.3-4)                  =             0.0802
K6 (Table G.3.3-3)                  =             0.0154
K6' (VBR 11, PAGE 36/37)           =             0.0580
K7' (VBR 11, PAGE 36/37)           =             0.2308
    
```

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 HORIZONTAL VESSEL ON SADDLES - PD 5500:2003 (Modified for seisme)

```

=====
* LONGITUDINAL STRESSES - longitudinal seismic load
W0=Ms/(L-2*A) = 10118.2 N
W1'=W0+W1+W2 (mod. W1) = 107687.2 N
Ms = R * h' = 32196164 Nmm
M3=(W1+W2)*(C1*L-A) = 53945596 Nmm
M4=(1-A/L+C3*r/A-C2)*(W1+W2)*A/C2 = 1731103 Nmm
M3' = M3 + Ms/2 (mod. M3) = 70043678 Nmm
M4' = M4 + Ms (mod. M4) = 33927267 Nmm
Shell -long.stress at center (G.3.3-5) f1 = 25.138 N/mm2
Shell +long.stress at center (G.3.3-6) f2 = 27.994 N/mm2
Shell (G.3.3-5) with p=0 f1o = 1.428 N/mm2
Shell -long.stress at saddle (G.3.3-7) f3 = 25.747 N/mm2
Shell +long.stress at saddle (G.3.3-8) f4 = 27.384 N/mm2
Shell (G.3.3-7) with p=0 f3o = 0.819 N/mm2
* LONGITUDINAL STRESSES - transverse seismic or load
M3''= S*A/2-S*L/8 (additional M3) = -3772412 Nmm
M3' = SQR (M3^2 + M3''^2) (mod. M3) = 54077338 Nmm
M4''= S*A^2/2/L (additional M4) = 208368 Nmm
f3',f4'=M4''/PI/r^2/e (addit.f3,f4) = 0.004 N/mm2
Shell -long.stress at center (G.3.3-5) f1 = 25.653 N/mm2
Shell +long.stress at center (G.3.3-6) f2 = 27.478 N/mm2
Shell (G.3.3-5) with p=0 f1o = 0.912 N/mm2
Shell-long.str. at saddle f3(G.3.3-7)+f3' = 26.533 N/mm2
Shell+long.str. at saddle f4(G.3.3-8)+f4' = 26.598 N/mm2
Shell f3(G.3.3-7)+f3' with p=0 f3o = 0.033 N/mm2
* TANGENTIAL STRESS AT SADDLE - longitudinal seismic load
W1'= W0+W1+W2 (mod. W1) = 107687.2 N
Shell shear stress at saddle (G.3.3-10) q = 7.283 N/mm2
Head shear stress at saddle (G.3.3-11) qe = 1.981 N/mm2
* TANGENTIAL STRESS AT SADDLE - transverse seismic load
W1''=SQR((W1+W2)^2+(S/2)^2) (mod. W1) = 97762.6 N
Shell shear stress at saddle (G.3.3-10) q = 6.612 N/mm2
Head shear stress at saddle (G.3.3-11) qe = 1.798 N/mm2
* CIRCUMFERENTIAL STRESSES - longitudinal seismic or wind load
W1'= W0+W1+W2 (mod. W1) = 107687.2 N
Shell circ.stress at saddle (G.3.3-17) f5 = -1.873 N/mm2
Shell circ.stress at saddle(G.3.3-18/19)f6 = -39.549 N/mm2
* CIRCUMFERENTIAL STRESSES - transverse seismic load
f6'=-12*K6'*S*r/2/L/e^2 (additional f6) = -7.233 N/mm2
Shell circ.stress at saddle (G.3.3-17) f5 = -1.873 N/mm2
Shell circ.str. at sadl.f6(G.3.3-18/19)+f6' = -46.782 N/mm2
    
```

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 HORIZONTAL VESSEL ON SADDLES - PD 5500:2003 (TEST)

```

=====
Calculation report for Item      : REGENERATOR/CONDENSE
* INPUT DATA
Internal design pressure          p =          0.78      MPa
Design temperature                T =          20.00      C.
Shell and heads material description : SA 516 GR.70
Allowable stress                  f =        138.000      N/mm2
Elastic modulus                   E =        202350      N/mm2
Distance between tangent lines    L =        3910.00      mm
Shell ID (uncorroded)             2*(r+c) =       2370.00      mm
Corrosion allowance               c =           0.00      mm
Shell thickness (uncorroded)      e + c =         15.00      mm
Head outside height               h =         615.00      mm
Head thickness (uncorroded)      e'+ c =         22.00      mm
Distance saddle/head TL          A =         364.00      mm
Saddle longitudinal dimension     b1 =         210.00      mm
Saddle transversal dimension     b =        1965.96      mm
Saddle angle                      Teta =          110      deg.
Saddle reaction (weight)         W1 =       204301.0      N
Saddle reaction (vert. seismic)  W2 =           0.0      N
Wind/Seismic longitudinal force   R =           0.0      N
Wind/Seismic transverse force    S =           0.0      N
Height of vessel axis            h' =        1309.0      mm
Stiffening rings on saddles:     NO STIFFENING
Saddle attachment:               WELDED
                                  A.3.5.1 Fig. A.2 is considered
* MISCELLANEOUS DATA
Stress coeff.(1.2 with seismic)  s' =          1.00
Yield point/f ratio (3.6.1.1)    s =          1.40
K=.605*e*E/f/s/r                  =          8.0209
Delta (from fig. A.2)            =          0.5001
e'/D = e'/2/(r+e')              =          0.0091
h/D = h/2/(r+e')                =          0.2548
p/f = (from fig. 3.5-2)          =          0.0189
* ALLOWABLE STRESSES
Longitudinal tensile              s'*f =        138.000      N/mm2
Longitudinal compressive          delta*s*f =     96.625      N/mm2
Shear      min(0.8*f, 0.06*e*E/r) =        110.400      N/mm2
Tangential 1.25*f-p/(p'/f)       =        130.951      N/mm2
Circumferential tensile          1.25*f =        172.500      N/mm2
Circumf.compressive              delta*s*f =     96.625      N/mm2
* FACTORS & CONSTANTS
C3      (Figure G.3.3-4)          =          0.1107
C2      (Figure G.3.3-4)          =          1.2097
C1      (Figure G.3.3-3)          =          0.2344
K1      (Table G.3.3-1)           =          1.0000
K2      (Table G.3.3-1)           =          1.0000
K3      (Table G.3.3-2)           =          1.0753
K4      (Table G.3.3-2)           =          0.4453
K5      (Table G.3.3-4)           =          0.0802
K6      (Table G.3.3-3)           =          0.0154
K6'     (VBR 11, PAGE 36/37)      =          0.0580
K7'     (VBR 11, PAGE 36/37)      =          0.2308
    
```

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 HORIZONTAL VESSEL ON SADDLES - PD 5500:2003 (TEST)

```

=====
* LONGITUDINAL STRESSES -
W0=Ms/(L-2*A) = 0.0 N
W1'=W0+W1+W2 (mod. W1) = 204301.0 N
Ms = R * h' = 0 N/mm
M3=(W1+W2)*(C1*L-A) = 112875439 Nmm
M4=(1-A/L+C3*r/A-C2)*(W1+W2)*A/C2 = 3542830 Nmm
M3' = M3 + Ms/2 (mod. M3) = 112875439 Nmm
M4' = M4 + Ms (mod. M4) = 3542830 Nmm
Shell -long.stress at center (G.3.3-5) f1 = 29.262 N/mm2
Shell +long.stress at center (G.3.3-6) f2 = 32.674 N/mm2
Shell (G.3.3-5) with p=0 f1o = 1.706 N/mm2
Shell -long.stress at saddle (G.3.3-7) f3 = 30.914 N/mm2
Shell +long.stress at saddle (G.3.3-8) f4 = 31.022 N/mm2
Shell (G.3.3-7) with p=0 f3o = 0.054 N/mm2
* LONGITUDINAL STRESSES -
M3''= S*A/2-S*L/8 (additional M3) = 0 Nmm
M3' = SQR (M3^2 + M3''^2) (mod. M3) = 112875439 Nmm
M4''= S*A^2/2/L (additional M4) = 0 Nmm
f3',f4'=M4''/PI/r^2/e (addit.f3,f4) = 0.000 N/mm2
Shell -long.stress at center (G.3.3-5) f1 = 29.262 N/mm2
Shell +long.stress at center (G.3.3-6) f2 = 32.674 N/mm2
Shell (G.3.3-5) with p=0 f1o = 1.706 N/mm2
Shell-long.str. at saddle f3(G.3.3-7)+f3' = 30.914 N/mm2
Shell+long.str. at saddle f4(G.3.3-8)+f4' = 31.022 N/mm2
Shell f3(G.3.3-7)+f3' with p=0 f3o = 0.054 N/mm2
* TANGENTIAL STRESS AT SADDLE -
W1'= W0+W1+W2 (mod. W1) = 204301.0 N
Shell shear stress at saddle (G.3.3-10) q = 12.360 N/mm2
Head shear stress at saddle (G.3.3-11) qe = 3.490 N/mm2
* TANGENTIAL STRESS AT SADDLE -
W1''=SQR((W1+W2)^2+(S/2)^2) (mod. W1) = 204301.0 N
Shell shear stress at saddle (G.3.3-10) q = 12.360 N/mm2
Head shear stress at saddle (G.3.3-11) qe = 3.490 N/mm2
* CIRCUMFERENTIAL STRESSES -
W1'= W0+W1+W2 (mod. W1) = 204301.0 N
Shell circ.stress at saddle (G.3.3-17) f5 = -3.033 N/mm2
Shell circ.stress at saddle(G.3.3-18/19)f6 = -60.425 N/mm2
* CIRCUMFERENTIAL STRESSES -
f6''=-12*K6'*S*r/2/L/e^2 (additional f6) = 0.000 N/mm2
Shell circ.stress at saddle (G.3.3-17) f5 = -3.033 N/mm2
Shell circ.str. at sadl.f6(G.3.3-18/19)+f6' = -60.425 N/mm2
    
```



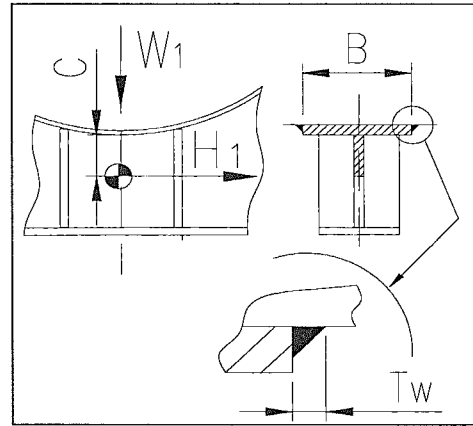
**SUPPORT SADDLE VERIFICATION (seismic operating case)**

**- Stress on cross area al lower |**

Per PD 5500 2006 G.3.3.2.6

	$K_9$
$\theta_1$	0,259

$W_1 =$	107.687	N	Max
$t_1 =$	15	mm	We
$t_2 =$	15	mm	We
$B =$	260	mm	We
$C =$	64	mm	Res
$S_m =$	138,00	Mpa	Allo



$S_a = S_m / 1,5 =$	92,00
$C_{max} = R / 3 =$	395,0
$A_1 = C * t_1 =$	960
$A_2 = B * t_2 =$	3.900
$H_1 = W_1 * K_9 =$	27.891

$S = H_1 / (A_1 + A_2) =$  **5,74 Mpa** < **92,00 Mpa**

**- Wear plate to shell weld joint**

$t_w =$	10	mm	Weld joint size
$\theta_2 =$	120	°	Wear plate contact angle
$E =$	0,7		Weld joint efficiency
$R_o =$	1.200	mm	Vessel outer radius

$T_w = 0,4 * S_a =$	36,80	Mpa	Weld shear allowable stress
$t = T_w * 0,7 =$	7	mm	Weld joint resisting size
$A_{w1} = 2 * (R_o * \pi * \theta_2 / 180) * t =$	35.186	mm <sup>2</sup>	Weld joint area
$A_{w2} = 2 * B * t =$	3.640	mm <sup>2</sup>	Weld joint area

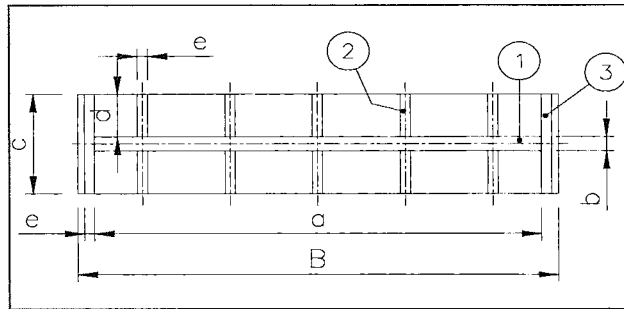
**Shear stress on weld**

$T = 3/2 * H_1 / ((A_{w1} + A_{w2}) * E) =$  **1,54 Mpa** < **36,80 Mpa**

**COMPRESSIVE STRESS VERIFICATION**

**- Saddle base section area properties**

a =	1.997	mm	Web width
b =	15	mm	Web thickness
c =	210	mm	External ribs width
d =	97,5	mm	Internal ribs width
e =	15	mm	Rib thickness
n <sub>2</sub> =	0	mm	External ribs number
n <sub>3</sub> =	8	mm	Internal ribs number



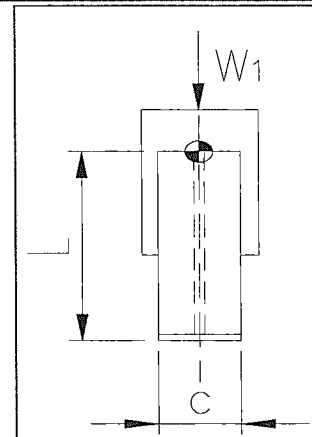
Item	X width	Y height	A mm <sup>2</sup>	h mm	h <sup>2</sup> mm <sup>2</sup>	A*h <sup>2</sup> mm <sup>4</sup>	I mm <sup>4</sup>	I + A*h <sup>2</sup> mm <sup>4</sup>
1	1997	15	29.955				5,6E+05	5,62E+05
3	0	210	0				0,0E+00	0,00E+00
2	15	97,5	11.700	56	3.164	3,70E+07	9,3E+06	4,63E+07

A <sub>tot</sub> =	41.655	mm <sup>2</sup>	Total are
I <sub>tot</sub> =	4,68E+07	mm <sup>4</sup>	Total Ine
E =	180.200	Mpa	Modulus
W <sub>1</sub> =	107.687	N	Max verti
L =	612	mm	Max sadi
c =	210	mm	Base pla

$W_{cr} = (\pi^2 * E * I_{tot}) / (4 * L^2) = 555965$   
 $S_{cr} = W_{cr} / A_{tot} = 1334,6$

**- Maximum compressive stress**

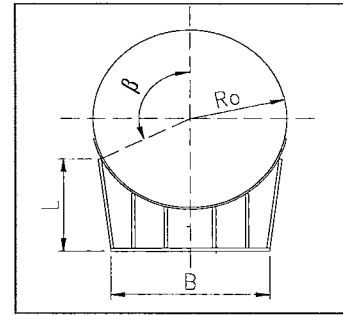
$S_c = W_i / A_{tot} =$



**SADDLE VERIFICATION acc. to (BEDNAR "PRESSURE VESSEL DESIGN HAND-BOOK chap. 6 ")**

S = 138,00 Mpa 20015 Psi  
 t = 15 mm 0,591 in  
 β = 125 ° 2,182 rad  
 R<sub>o</sub> = 1.200 mm 47,244 in  
 W<sub>1</sub> = 107.687 24209 Lb

Web allowable  
 Web thickness  
 see sketch  
 Vessel outer r  
 Maximum load



**- Allowable saddle height ( english units )**

$P_{\pi} = W_1/R_o*(1+\cos\beta)/(\pi-\beta +\sin\beta*\cos\beta) =$  **445,85 Lb/in**

$L_{max} = t*(0,289^2 * S /P_{\pi} * ( S * t- P_{\pi} )^{0,5} =$  **121,9517 in**      **3098 mm**  
**3098 mm**      **> L = 612 mm**

**- Base plate thickness**

B = 2.080 mm Base plate length  
 c = 210 mm Base plate width  
 t = 30 mm Base plate thickness

$t_{min} = ( W_1 * c / (1,2 * S * B ) )^{0,5} =$  **8,10 mm**      **< 30 mm**

**- Bearing stress**

$S_{bear} = W_1/ ( c \times B ) =$  **0,25 Mpa**      **< 5 Mpa**

**- Minimum number of stiffeners**

$N = B_1 / 24+1 =$  **4**      Including also lateral stiffeners  
**5**      Assumed

**- Shear stress in anchor boltinf, one end slotted**

Thermal expansion base shear =  $W_1 * m =$  **107.687 \* 0,45 = 48459 N**  
 Corroded root area for a 2" bolt  $A =$  **15,6748 cm<sup>2</sup>**      **N° 4 per saddle)**  
 Bolt shear stress =  $W_1*m/(A*N^{\circ}) =$  **7,73 Mpa**  
 Anchor bolt stress is acceptable **< 172 Mpa**

**SUPPORT SADDLE VERIFICATION (test case)**

**- Stress on cross area al lower |**

Per PD 5500 2006 G.3.3.2.6

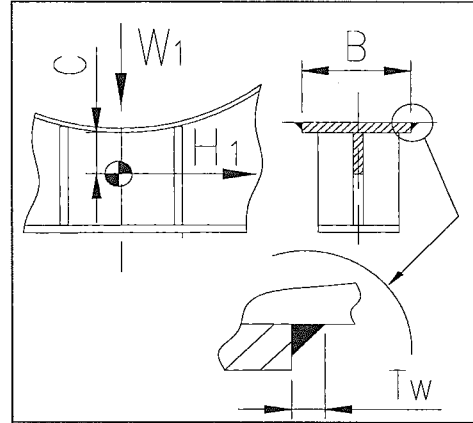
	$K_g$
$\theta_1$	0,259

$W_1 =$	392.400	N	Max
$t_1 =$	15	mm	We
$t_2 =$	15	mm	We
$B =$	260	mm	We
$C =$	64	mm	Res
$S_m =$	138,00	Mpa	Allo

$S_a = S_m / 1,5 =$	92,00
$C_{max} = R / 3 =$	395,0
$A_1 = C * t_1 =$	960
$A_2 = B * t_2 =$	3.900
$H_1 = W_1 * K_g =$	101.632

$S = H_1 / (A_1 + A_2) =$

**20,91 Mpa < 92,00 Mpa**



**- Wear plate to shell weld joint**

$t_w =$	10	mm	Weld joint size
$\theta_2 =$	120	°	Wear plate contact angle
$E =$	0,7		Weld joint efficiency
$R_o =$	1.200	mm	Vessel outer radius

$T_w = 0,4 * S_a =$	36,80	Mpa	Weld shear allowable stress
$t = T_w * 0,7 =$	7	mm	Weld joint resisting size
$A_{w1} = 2 * (R_o * \pi * \theta_2 / 180) * t =$	35.186	mm <sup>2</sup>	Weld joint area
$A_{w2} = 2 * B * t =$	3.640	mm <sup>2</sup>	Weld joint area

**Shear stress on weld**

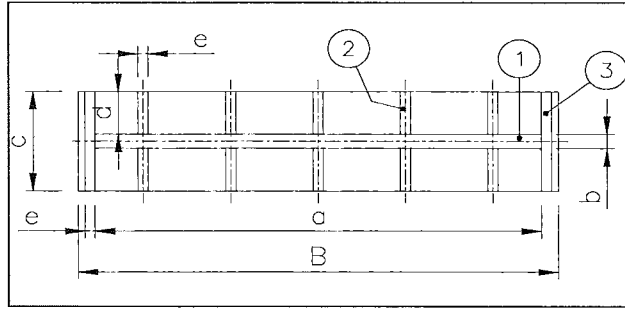
$T = 3/2 * H_1 / ((A_{w1} + A_{w2}) * E) =$

**5,61 Mpa < 36,80 Mpa**

**COMPRESSIVE STRESS VERIFICATION**

**- Saddle base section area properties**

a =	1.997	mm	Web width
b =	15	mm	Web thickness
c =	210	mm	External ribs width
d =	97,5	mm	Internal ribs width
e =	15	mm	Rib thickness
n <sub>2</sub> =	0	mm	External ribs number
n <sub>3</sub> =	8	mm	Internal ribs number



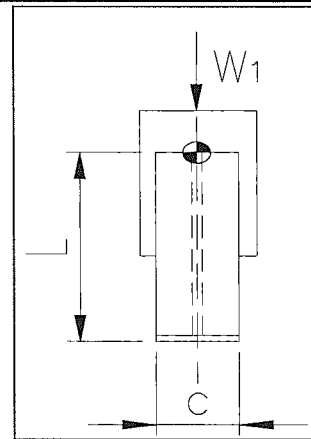
Item	X width	Y height	A mm <sup>2</sup>	h mm	h <sup>2</sup> mm <sup>2</sup>	A*h <sup>2</sup> mm <sup>4</sup>	I mm <sup>4</sup>	I + A*h <sup>2</sup> mm <sup>4</sup>
1	1997	15	29.955				5,6E+05	5,62E+05
3	0	210	0				0,0E+00	0,00E+00
2	15	97,5	11.700	56	3.164	3,70E+07	9,3E+06	4,63E+07

A <sub>tot</sub> =	41.655	mm <sup>2</sup>	Total are
I <sub>tot</sub> =	4,68E+07	mm <sup>4</sup>	Total Ine
E =	202.350	Mpa	Modulus
W <sub>1</sub> =	392.400	N	Max verti
L =	612	mm	Max sadi
c =	210	mm	Base pla

$W_{cr} = (\pi^2 * E * I_{tot}) / (4 * L^2) = 6243036$   
 $S_{cr} = W_{cr} / A_{tot} = 1498,7$

**- Maximum compressive stress**

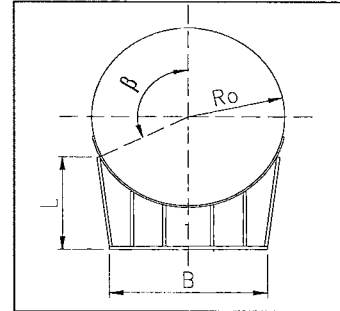
$S_c = W_i / A_{tot} =$



**SADDLE VERIFICATION acc. to (BEDNAR "PRESSURE VESSEL DESIGN HAND-BOOK chap. 6 ")**

S = 138,00 Mpa 20015 Psi  
 t = 15 mm 0,591 in  
 $\beta = 125^\circ$  2,182 rad  
 R<sub>o</sub> = 1.200 mm 47,244 in  
 W<sub>1</sub> = 392.400 88214 Lb

Web allowable  
 Web thickness  
 see sketch  
 Vessel outer r  
 Maximum load



**- Allowable saddle height ( english units )**

$P\pi = W_1/R_o * (1 + \cos\beta) / (\pi - \beta + \sin\beta * \cos\beta) =$  **1624,64 Lb/in**

$L_{max} = t * (0,289^2 * S / P\pi * (S * t - P\pi))^{0,5} =$  60,48485 in 1536 mm  
**> L = 612 mm**

**- Base plate thickness**

B = 2.080 mm Base plate length  
 c = 210 mm Base plate width  
 t = 30 mm Base plate thickness

$t_{min} = (W_1 * c / (1,2 * S * B))^{0,5} =$  **15,47 mm < 30 mm**

**- Bearing stress**

$S_{bear} = W_1 / (c * B) =$  **0,90 Mpa < 5 Mpa**

**- Minimum number of stiffeners**

$N = B_1 / 24 + 1 =$  **4** Including also lateral stiffeners  
**5** Assumed

**- Shear stress in anchor bolt inf, one end slotted**

Thermal expansion base shear =  $W_1 * m =$  392.400 \* 0,45 = 176580 N

Corroded root area for a 2" bolt  $A =$  15,6748 cm<sup>2</sup> N° 4 per saddle)

Bolt shear stress =  $W_1 * m / (A * N^\circ) =$  **28,16 Mpa**

Anchor bolt stress is acceptable < **172 Mpa**

**TOP LIFTING LUG POS. 113-114**

MATERIAL : SA 516 Gr.70

Yield stren.  $S_y = 262,00$  Mpa

$\sigma_{all} = S_y * 0,85 = 222,70$  Mpa

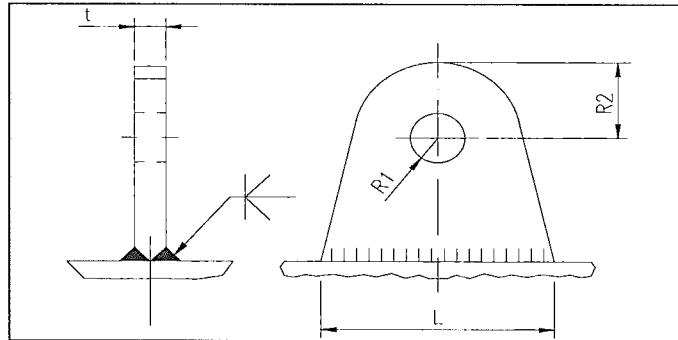
$\tau_{all} = \sigma_{all} * 0,8 = 178,16$  Mpa

$R_1 = 35$  mm

$R_2 = 90$  mm

$t = 30$  mm

$L = 300$  mm



$P = 178550$  N Weight of vessel  
 $K_d = 1,2$  Impact factor  
 $n = 4$  Number of lug Angle of inclination  $45^\circ$   
 $N = (P * K_d / 4) * 1,41 = 75527$  N

**SECTION " A-A "**

$A_a = t * (R_2 - R_1) = 1.650$  mm<sup>2</sup> Area of section "A-A"

**SHEAR STRESS**

$\tau = 1,5 * N / A_a = 68,66$  Mpa <  $\tau_{all} = 178,16$  Mpa

**SECTION " B-B "**

$A_b = t * (R_2 - R_1) = 1.650$  mm<sup>2</sup> Area of section "B-B"

$T = N / 2 = 37.763$  N Normal load acting on section "B-B"

**NORMAL STRESS**

$\sigma = T / A_b = 22,89$  Mpa <  $\sigma_{all} = 222,70$  Mpa

**SECTION " C-C "**

$A_c = t * L = 9.000$  mm<sup>2</sup> Area of section "C-C"

**NORMAL STRESS**

$\sigma = N / A_c = 8,39$  Mpa <  $\sigma_{all} = 222,70$  Mpa

**Bs= BEARING STRESS**

ds= PIN DIAMETER 65 mm

$Bs = N / (ds * t) = 38,73$  Mpa <  $\sigma_{all} = 222,70$  Mpa

**STRESS ON SHELL DURING LIFTING**

During lifting the following loads shall be indiced on the shell wall:

$Pr = -75527$  N radial load  
 $VL = -75.527$  N longit. shear  
 $ML = VL * l = -13972$  Nm longit. moment

The local stress on shell have been verified in accordance to WRC 107 considering the vessell at room temperature.

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Retcil Rev.3.00 -  
 SHELL - CONCENTRATED LOADS ON RECTANGULAR ATTACHMENT: 113-114  
 ===== (WRC Bulletin n. 107) =====

Shell Internal Diameter	=	2370.00	mm
Shell Thickness	=	15.00	mm
Circumferential Attachment Width	2c1 =	30.00	mm
Longitudinal Attachment Width	2c2 =	300.00	mm
Reinforcing Plate Thickness	=	20.00	mm
Reinforcing Plate Width	=	370.00	mm
Corrosion Allowance	=	0.00	mm
Internal Pressure	p =	0.00	MPa
Dist.Facing / Shell axis h= 1320.0	a =h - Rm =	117.5	mm
Circumferential Moment MC= 0	Mc=MC-a*VC=	0	Nmm
Longitudinal Moment ML= -13972	Ml=ML+a*VL=	-8888395	Nmm
Torsional Moment	MT =	0	Nmm
Transverse Shear Load	VC =	0	N
Longitudinal Shear Force	VL =	-75527	N
Axial Tensile Load	P =	-75527	N
Average Shell Radius (shell+pad thickness)	Rm' =	1202.50	mm
Average Shell Radius (shell thickness)	Rm =	1192.50	mm
Corroded Shell+pad thickness	T' =	35.00	mm
Corroded Shell Thickness	T =	15.00	mm
Circumfer. Pressure Stress (attachm. locat.)	=	0.000	MPa
Circumfer. Pressure Stress (pad edge)	=	0.000	MPa
Shell allowable stress for general membrane stress	=	138.0	MPa
Shell allowable stress for local membrane stress	=	207.0	MPa
Shell allowable stress for combined stress	=	414.0	MPa



Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Retcil Rev.3.00 -  
 SHELL - CONCENTRATED LOADS ON RECTANGULAR ATTACHMENT: 113-114  
 ===== (WRC Bulletin n. 107) =====

GAMMA(for K-C)= 34.36 Beta1= 0.012 Beta2= 0.125 Beta1/Beta2=0.250 S= 0.00

VALUES FROM THE GRAPHS AT ATTACHMENT EDGE

Beta= 0.058	K = 1.480	Gamma= 34.36	Nt*Rm/P - circ.	(Pic. 3C) =	5.458
Beta= 0.047	K = 1.200	Gamma= 34.36	Nt*Rm/P - long.	(Pic. 4C) =	6.425
Beta= 0.035	K = 0.880	Gamma= 34.36	Mt/P - circ.	(Pic.1C-1) =	0.233
Beta= 0.049	K = 1.250	Gamma= 34.36	Mt/P - long.	(Pic. 2C) =	0.157
Beta= 0.027	Cc = 0.237	Gamma= 34.36	Cc*Nt*Beta*Rm^2/MC	(Pic. 3A) =	0.036
Beta= 0.034	Kc = 1.261	Gamma= 34.36	Mt*Beta*Rm/MC	(Pic. 1A) =	0.108
Beta= 0.058	CL = 0.764	Gamma= 34.36	CL*Nt*Beta*Rm^2/ML	(Pic. 3B) =	1.463
Beta= 0.098	KL = 1.695	Gamma= 34.36	Mt*Beta*Rm/ML	(Pic. 1B) =	0.047
Beta= 0.047	K = 1.200	Gamma= 34.36	Nx*Rm/P - circ.	(Pic. 4C) =	6.381
Beta= 0.058	K = 1.480	Gamma= 34.36	Nx*Rm/P - long.	(Pic. 3C) =	5.582
Beta= 0.049	K = 1.250	Gamma= 34.36	Mx/P - circ.	(Pic.2C-1) =	0.188
Beta= 0.035	K = 0.880	Gamma= 34.36	Mx/P - long.	(Pic. 1C) =	0.197
Beta= 0.027	CC = 0.469	Gamma= 34.36	Cc*Nx*Beta*Rm^2/MC	(Pic. 4A) =	0.104
Beta= 0.045	Kc = 1.686	Gamma= 34.36	Mx*Beta*Rm/MC	(Pic. 2A) =	0.062
Beta= 0.058	CL = 0.358	Gamma= 34.36	CL*Nx*Beta*Rm^2/ML	(Pic. 4B) =	0.193
Beta= 0.069	KL = 1.184	Gamma= 34.36	Mx*Beta*Rm/ML	(Pic. 2B) =	0.090

STRESSES IN THE SHELL AT ATTACHMENT (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fbt (p)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P)	-11.5	-11.5	-11.5	-11.5	-9.8	-9.8	-9.8	-9.8
fbt (P)	-58.2	58.2	-58.2	58.2	-86.2	86.2	-86.2	86.2
fmt (MC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fbt (MC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (ML)	4.4	4.4	-4.4	-4.4	0.0	0.0	0.0	0.0
fbt (ML)	17.3	-17.3	-17.3	17.3	0.0	0.0	0.0	0.0
fmt	-7.1	-7.1	-16.0	-16.0	-9.8	-9.8	-9.8	-9.8
fmt+fbt	-48.0	33.8	-91.4	59.5	-96.0	76.4	-96.0	76.4
fmx (p)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fbx (p)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (P)	-10.0	-10.0	-10.0	-10.0	-11.4	-11.4	-11.4	-11.4
fbx (P)	-73.1	73.1	-73.1	73.1	-69.5	69.5	-69.5	69.5
fmx (MC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fbx (MC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmx (ML)	0.6	0.6	-0.6	-0.6	0.0	0.0	0.0	0.0
fbx (ML)	47.6	-47.6	-47.6	47.6	0.0	0.0	0.0	0.0
fmx	-9.4	-9.4	-10.6	-10.6	-11.4	-11.4	-11.4	-11.4
fmx+fbx	-34.9	16.0	-131.2	110.0	-81.0	58.0	-81.0	58.0
txt (VC)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt (VL)	0.0	0.0	0.0	0.0	3.6	3.6	-3.6	-3.6
txt (MT)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt	0.0	0.0	0.0	0.0	3.6	3.6	-3.6	-3.6

-----  
 fm = 9.4 9.4 16.0 16.0 14.3 14.3 14.3 14.3  
 fm + fb = 48.0 33.8 131.2 110.0 96.8 77.1 96.8 77.1  
 Maximum local membrane stress(fm)= 16.0 MPa Allowable stress= 207.0 MPa  
 Maximum combined stress(fm+fb) = 131.2 MPa Allowable stress= 414.0 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Retcil Rev.3.00 -  
 SHELL - CONCENTRATED LOADS ON RECTANGULAR ATTACHMENT: 113-114

===== (WRC Bulletin n. 107) =====

GAMMA(for K-C)= 79.50 Beta1= 0.323 Beta2= 0.436 Beta1/Beta2=0.740 S= 0.00

VALUES FROM THE GRAPHS AT PAD EDGE

Beta= 0.438	K = 1.480	Gamma= 79.50	Nt*Rm/P - circ.	(Pic. 3C) =	1.370
Beta= 0.401	K = 1.200	Gamma= 79.50	Nt*Rm/P - long.	(Pic. 4C) =	4.988
Beta= 0.360	K = 0.880	Gamma= 79.50	Mt/P - circ.	(Pic.1C-1) =	0.022
Beta= 0.408	K = 1.250	Gamma= 79.50	Mt/P - long.	(Pic. 2C) =	0.003
Beta= 0.357	Cc = 0.705	Gamma= 79.50	Cc*Nt*Beta*Rm^2/MC	(Pic. 3A) =	1.214
Beta= 0.382	Kc = 1.069	Gamma= 79.50	Mt*Beta*Rm/MC	(Pic. 1A) =	0.056
Beta= 0.394	CL = 0.918	Gamma= 79.50	CL*Nt*Beta*Rm^2/ML	(Pic. 3B) =	2.608
Beta= 0.402	KL = 1.018	Gamma= 79.50	Mt*Beta*Rm/ML	(Pic. 1B) =	0.006
Beta= 0.401	K = 1.200	Gamma= 79.50	Nx*Rm/P - circ.	(Pic. 4C) =	4.459
Beta= 0.438	K = 1.480	Gamma= 79.50	Nx*Rm/P - long.	(Pic. 3C) =	1.594
Beta= 0.408	K = 1.250	Gamma= 79.50	Mx/P - circ.	(Pic.2C-1) =	0.006
Beta= 0.360	K = 0.880	Gamma= 79.50	Mx/P - long.	(Pic. 1C) =	0.013
Beta= 0.357	CC = 0.850	Gamma= 79.50	Cc*Nx*Beta*Rm^2/MC	(Pic. 4A) =	6.105
Beta= 0.419	Kc = 1.175	Gamma= 79.50	Mx*Beta*Rm/MC	(Pic. 2A) =	0.021
Beta= 0.394	CL = 0.800	Gamma= 79.50	CL*Nx*Beta*Rm^2/ML	(Pic. 4B) =	1.269
Beta= 0.409	KL = 1.037	Gamma= 79.50	Mx*Beta*Rm/ML	(Pic. 2B) =	0.014

STRESSES IN THE SHELL AT PAD EDGE (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL--
fmt (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P) =	-21.1	-21.1	-21.1	-21.1	-5.8	-5.8	-5.8	-5.8
fmt (MC) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (ML) =	2.8	2.8	-2.8	-2.8	0.0	0.0	0.0	0.0
fmt =	-18.3	-18.3	-23.8	-23.8	-5.8	-5.8	-5.8	-5.8
fmt+fmt =	-22.0	-14.6	-33.8	-13.8	-50.2	38.7	-50.2	38.7
fmt (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P) =	-6.7	-6.7	-6.7	-6.7	-18.8	-18.8	-18.8	-18.8
fmt (MC) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (ML) =	1.3	1.3	-1.3	-1.3	0.0	0.0	0.0	0.0
fmt =	-5.4	-5.4	-8.1	-8.1	-18.8	-18.8	-18.8	-18.8
fmt+fmt =	-24.8	14.1	-40.8	24.7	-30.8	-6.9	-30.8	-6.9
fmt (VC) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (VL) =	0.0	0.0	0.0	0.0	2.4	2.4	-2.4	-2.4
fmt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt =	0.0	0.0	0.0	0.0	2.4	2.4	-2.4	-2.4

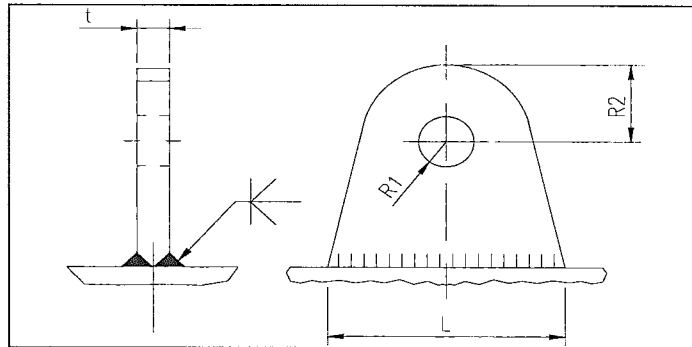
fm = 18.3 18.3 23.8 23.8 19.3 19.3 19.3 19.3  
 fm + fb = 24.8 28.7 40.8 38.5 50.5 45.8 50.5 45.8  
 Maximum local membrane stress(fm)= 23.8 MPa Allowable stress= 207.0 MPa  
 Maximum combined stress(fm+fb) = 50.5 MPa Allowable stress= 414.0 MPa

**LIFTING LUG POS.337-338**

MATERIAL : SA 516 Gr.70

Yield stren.  $S_y = 262,0$  Mpa  
 $\sigma_{all} = S_y * 0,85 = 222,7$  Mpa  
 $\tau_{all} = \sigma_{all} * 0,8 = 178,2$  Mpa

$R_1 = 15$  mm  
 $R_2 = 30$  mm  
 $t = 20$  mm  
 $L = 100$  mm



$P = 50000$  N Weight of vessel  
 $K_d = 1,2$  Impact factor  
 $n = 2$  Number of lug  
 $N = (P * K_d / 2) = 30000$  N Angle of inclination 45°

**SECTION " A-A "**

$A_a = t * (R_2 - R_1) = 300$  mm<sup>2</sup> Area of section "A-A"

**SHEAR STRESS**

$\tau = 1,5 * N / A_a = 150,00$  Mpa <  $\tau_{all} = 178,16$  Mpa

**SECTION " B-B "**

$A_b = t * (R_2 - R_1) = 300$  mm<sup>2</sup> Area of section "B-B"  
 $T = N / 2 = 15.000$  N Normal load acting on section "B-B"

**NORMAL STRESS**

$\sigma = T / A_b = 50,00$  Mpa <  $\sigma_{all} = 222,70$  Mpa

**SECTION " C-C "**

$A_c = t * L = 2.000$  mm<sup>2</sup> Area of section "C-C"

**NORMAL STRESS**

$\sigma = N / A_c = 15,00$  Mpa <  $\sigma_{all} = 222,70$  Mpa

**Bs= BEARING STRESS**

ds= PIN DIAMETER 25 mm

$Bs = N / (ds * t) = 60,00$  Mpa <  $\sigma_{all} = 222,70$  Mpa

**STRESS ON SHELL DURING LIFTING**

During lifting the following loads shall be indiced on the shell wall:

$Pr = -30000$  N radial load  
 $VL = -30.000$  N longit. shear  
 $ML = VL * l = -5550$  Nm longit. moment

The local stress on shell have been verified in accordance to WRC 107 considering the vessell at room temperature.

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Retcil Rev.3.00 -  
 SHELL - CONCENTRATED LOADS ON RECTANGULAR ATTACHMENT: 337-338  
 ===== (WRC Bulletin n. 107) =====

Shell Internal Diameter	=	2370.00 mm
Shell Thickness	=	15.00 mm
Circumferential Attachment Width	2c1 =	20.00 mm
Longitudinal Attachment Width	2c2 =	100.00 mm
Reinforcing Plate Thickness	=	10.00 mm
Reinforcing Plate Width	=	150.00 mm
Corrosion Allowance	=	0.00 mm
Internal Pressure	p =	0.00 MPa
Dist.Facing / Shell axis h= 1250.0	a =h - Rm =	52.5 mm
Circumferential Moment MC= 0	Mc=MC-a*VC=	0 Nmm
Longitudinal Moment ML= -5550	Ml=ML+a*VL=	-1580550 Nmm
Torsional Moment	MT =	0 Nmm
Transverse Shear Load	VC =	0 N
Longitudinal Shear Force	VL =	-30000 N
Axial Tensile Load	P =	-30000 N
Average Shell Radius (shell+pad thickness)	Rm' =	1197.50 mm
Average Shell Radius (shell thickness)	Rm =	1192.50 mm
Corroded Shell+pad thickness	T' =	25.00 mm
Corroded Shell Thickness	T =	15.00 mm
Circumfer. Pressure Stress (attachm. locat.)	=	0.000 MPa
Circumfer. Pressure Stress (pad edge)	=	0.000 MPa
Shell allowable stress for general membrane stress	=	138.0 MPa
Shell allowable stress for local membrane stress	=	207.0 MPa
Shell allowable stress for combined stress	=	414.0 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Retcil Rev.3.00 -  
 SHELL - CONCENTRATED LOADS ON RECTANGULAR ATTACHMENT: 337-338  
 ===== (WRC Bulletin n. 107) =====

GAMMA(for K-C)= 47.90 Beta1= 0.008 Beta2= 0.042 Beta1/Beta2=0.250 S= 0.00

VALUES FROM THE GRAPHS AT ATTACHMENT EDGE

Beta= 0.028	K = 1.480	Gamma= 47.90	Nt*Rm/P - circ.	(Pic. 3C) =	8.961
Beta= 0.022	K = 1.200	Gamma= 47.90	Nt*Rm/P - long.	(Pic. 4C) =	9.300
Beta= 0.016	K = 0.880	Gamma= 47.90	Mt/P - circ.	(Pic.1C-1) =	0.295
Beta= 0.023	K = 1.250	Gamma= 47.90	Mt/P - long.	(Pic. 2C) =	0.210
Beta= 0.014	Cc = 0.213	Gamma= 47.90	Cc*Nt*Beta*Rm^2/MC	(Pic. 3A) =	0.024
Beta= 0.018	Kc = 1.242	Gamma= 47.90	Mt*Beta*Rm/MC	(Pic. 1A) =	0.109
Beta= 0.024	CL = 0.769	Gamma= 47.90	CL*Nt*Beta*Rm^2/ML	(Pic. 3B) =	0.910
Beta= 0.040	KL = 1.655	Gamma= 47.90	Mt*Beta*Rm/ML	(Pic. 1B) =	0.061
Beta= 0.022	K = 1.200	Gamma= 47.90	Nx*Rm/P - circ.	(Pic. 4C) =	9.235
Beta= 0.028	K = 1.480	Gamma= 47.90	Nx*Rm/P - long.	(Pic. 3C) =	9.082
Beta= 0.023	K = 1.250	Gamma= 47.90	Mx/P - circ.	(Pic.2C-1) =	0.240
Beta= 0.016	K = 0.880	Gamma= 47.90	Mx/P - long.	(Pic. 1C) =	0.258
Beta= 0.014	CC = 0.461	Gamma= 47.90	Cc*Nx*Beta*Rm^2/MC	(Pic. 4A) =	0.047
Beta= 0.023	Kc = 1.627	Gamma= 47.90	Mx*Beta*Rm/MC	(Pic. 2A) =	0.064
Beta= 0.024	CL = 0.333	Gamma= 47.90	CL*Nx*Beta*Rm^2/ML	(Pic. 4B) =	0.098
Beta= 0.028	KL = 1.163	Gamma= 47.90	Mx*Beta*Rm/ML	(Pic. 2B) =	0.105

STRESSES IN THE SHELL AT ATTACHMENT (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL--
fmt (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P) =	-9.3	-9.3	-9.3	-9.3	-9.0	-9.0	-9.0	-9.0
fmt (MC) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (ML) =	1.6	1.6	-1.6	-1.6	0.0	0.0	0.0	0.0
fmt (MT) =	-7.7	-7.7	-11.0	-11.0	-9.0	-9.0	-9.0	-9.0
fmt+fmt =	-49.1	33.8	-90.6	68.7	-94.0	76.0	-94.0	76.0
fmt (p) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P) =	-9.1	-9.1	-9.1	-9.1	-9.3	-9.3	-9.3	-9.3
fmt (MC) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (ML) =	0.2	0.2	-0.2	-0.2	0.0	0.0	0.0	0.0
fmt (MT) =	47.0	-47.0	-47.0	47.0	0.0	0.0	0.0	0.0
fmt =	-8.9	-8.9	-9.3	-9.3	-9.3	-9.3	-9.3	-9.3
fmt+fmt =	-36.1	18.2	-130.5	111.9	-78.4	59.8	-78.4	59.8
fmt (VC) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (VL) =	0.0	0.0	0.0	0.0	6.0	6.0	-6.0	-6.0
fmt (MT) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt =	0.0	0.0	0.0	0.0	6.0	6.0	-6.0	-6.0

-----  
 fm = 8.9 8.9 11.0 11.0 15.1 15.1 15.1 15.1  
 fm + fb = 49.1 33.8 130.5 111.9 96.0 78.0 96.0 78.0  
 Maximum local membrane stress(fm)= 15.1 MPa Allowable stress= 207.0 MPa  
 Maximum combined stress(fm+fb) = 130.5 MPa Allowable stress= 414.0 MPa

Software by SANT'AMBROGIO S.I. srl - Milano, Italy: Retcil Rev.3.00 -  
 SHELL - CONCENTRATED LOADS ON RECTANGULAR ATTACHMENT: 337-338

===== (WRC Bulletin n. 107) =====

GAMMA(for K-C)= 79.50 Beta1= 0.134 Beta2= 0.168 Beta1/Beta2=0.800 S= 0.00

VALUES FROM THE GRAPHS AT PAD EDGE

Beta= 0.169	K = 1.480	Gamma= 79.50	Nt*Rm/P - circ.	(Pic. 3C) = 5.924
Beta= 0.158	K = 1.200	Gamma= 79.50	Nt*Rm/P - long.	(Pic. 4C) = 10.642
Beta= 0.145	K = 0.880	Gamma= 79.50	Mt/P - circ.	(Pic.1C-1) = 0.069
Beta= 0.160	K = 1.250	Gamma= 79.50	Mt/P - long.	(Pic. 2C) = 0.032
Beta= 0.145	Cc = 0.746	Gamma= 79.50	Cc*Nt*Beta*Rm^2/MC	(Pic. 3A) = 2.326
Beta= 0.155	Kc = 1.073	Gamma= 79.50	Mt*Beta*Rm/MC	(Pic. 1A) = 0.073
Beta= 0.156	CL = 0.910	Gamma= 79.50	CL*Nt*Beta*Rm^2/ML	(Pic. 3B) = 7.201
Beta= 0.157	KL = 1.008	Gamma= 79.50	Mt*Beta*Rm/ML	(Pic. 1B) = 0.023
Beta= 0.158	K = 1.200	Gamma= 79.50	Nx*Rm/P - circ.	(Pic. 4C) = 10.275
Beta= 0.169	K = 1.480	Gamma= 79.50	Nx*Rm/P - long.	(Pic. 3C) = 6.429
Beta= 0.160	K = 1.250	Gamma= 79.50	Mx/P - circ.	(Pic.2C-1) = 0.038
Beta= 0.145	K = 0.880	Gamma= 79.50	Mx/P - long.	(Pic. 1C) = 0.062
Beta= 0.145	CC = 0.870	Gamma= 79.50	Cc*Nx*Beta*Rm^2/MC	(Pic. 4A) = 5.145
Beta= 0.167	Kc = 1.156	Gamma= 79.50	Mx*Beta*Rm/MC	(Pic. 2A) = 0.033
Beta= 0.156	CL = 0.824	Gamma= 79.50	CL*Nx*Beta*Rm^2/ML	(Pic. 4B) = 2.636
Beta= 0.162	KL = 1.040	Gamma= 79.50	Mx*Beta*Rm/ML	(Pic. 2B) = 0.030

STRESSES IN THE SHELL AT PAD EDGE (MPa)

	AU	AL	BU	BL	CU	CL	DU	DL
fmt (p)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P)	= -17.8	-17.8	-17.8	-17.8	-9.9	-9.9	-9.9	-9.9
fmt (MC)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (ML)	= 3.4	3.4	-3.4	-3.4	0.0	0.0	0.0	0.0
fmt	= -14.4	-14.4	-21.3	-21.3	-9.9	-9.9	-9.9	-9.9
fmt+fmt	= -35.2	6.4	-52.4	9.9	-65.3	45.4	-65.3	45.4
fmt (p)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (P)	= -10.8	-10.8	-10.8	-10.8	-17.2	-17.2	-17.2	-17.2
fmt (MC)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fmt (ML)	= 1.3	1.3	-1.3	-1.3	0.0	0.0	0.0	0.0
fmt	= -9.5	-9.5	-12.0	-12.0	-17.2	-17.2	-17.2	-17.2
fmt+fmt	= -52.8	33.7	-68.5	44.4	-47.3	12.9	-47.3	12.9
txt (VC)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt (VL)	= 0.0	0.0	0.0	0.0	2.5	2.5	-2.5	-2.5
txt (MT)	= 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
txt	= 0.0	0.0	0.0	0.0	2.5	2.5	-2.5	-2.5

fm	= 14.4	14.4	21.3	21.3	18.0	18.0	18.0	18.0
fm + fb	= 52.8	33.7	68.5	44.4	65.6	45.6	65.6	45.6
Maximum local membrane stress(fm)=			21.3 MPa		Allowable stress=		207.0 MPa	
Maximum combined stress(fm+fb) =			68.5 MPa		Allowable stress=		414.0 MPa	



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# SECTION

# D



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DOCUMENT No.	<b>ITP / 2010 / 005</b>	REV.	FOGLIO	DI
		0	1	12
		REV	SHEET	OF

DOCUMENT TITLE: **INSPECTION AND TESTING PLAN**  
 EQUIPMENT NAME: **CONDENSATOR-RIGENERATOR**  
 EQUIPMENT TAG No.: **TURBODEN T10**  
 EQUIPMENT SERIAL No.: **4320**  
 CIVIDAC CV No.: **2010 / 002 / PR**  
 CIVIDAC JOB No.: **2010 / 005 / T**  
 TURBODEN P.O. No.: **10PU-000265-PR**

**ARISE**  
 Reviewed by  
 ASME AI - U BREDA  
 13615 A 03/APR/2010

0	30-03-2010	SIMONETTO	MAZZOCATO	MEMO	ISSUE FOR CONSTRUCTION
Rev. No	Date	Prepared by	Checked by	Approved by	Description





**FABRICATION AND INSPECTION PLAN - ITP/2010/005**  
**PIANO DI FABBRICAZIONE E ISPEZIONE**

Sheet Foglio	2	of di	12
Revision Revisione	0		

Job No. Commessa n°	2010 / 005 / T	Item Sigla	TURBODEN 10	Order No. Ordine n°	10PU-000265-PR	Serial No. N° di fabbrica	4320
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**LEGEND FOR THE FABRICATION AND INSPECTION**  
**LEGENDA PER PIANO DI FABBRICAZIONE E ISPEZIONE**

- |   |  |
|---|--|
| <p>X = HOLD POINT (C.I. CIVIDAC S.p.A.)<br/> H = HOLD POINT (by AUTHORISED INSPECTOR, by CLIENT or by TURBODEN)<br/> W = WITNESS POINT (CIVIDAC S.p.A. SHALL INFORM THE PERSON WHO ESTABLISHED THIS POINT IN WRITING AT LEAST 5 DAYS IN ADVANCE OF INCOMING WITNESS POINT (AND RECONFIRMATION SHALL BE 5 DAYS IN ADVANCE) AND WORK MAY PROCEED WITHOUT THE PRESENCE OF THE PERSON WHO ESTABLISHED THE POINT.<br/> R = DOCUMENT REVIEW</p> <p>S = SURVEILLANCE<br/> A = APPROVAL / ACCEPTANCE OF DOCUMENTS<br/> C = CERTIFICATION REQUIRED<br/> VT = VISUAL INSPECTION<br/> DT = DIMENSIONAL CHECK<br/> RT = RADIOGRAPHIC EXAMINATION<br/> UT = ULTRASONIC EXAMINATION<br/> PT = DYE PENETRANT EXAMINATION<br/> MT = MAGNETIC PARTICLE EXAMINATION<br/> LT = LEAKAGE TEST<br/> PMI = ALLOY VERIFICATION<br/> HB = HARDNESS TEST<br/> LAB = LABORATORY TEST</p> | <p>MTR = MATERIAL TEST REPORT<br/> SPECS = APPLICABLE CONTRACT SPECIFICATION<br/> DWG = C.I. CIVIDAC S.p.A. FABRICATION DRAWING (6725-2010)<br/> WB = WELDING BOOK (WB/2010/005)<br/> WM = WELDS AND NDE MAP (WM/2010/005)<br/> NDE = NON DESTRUCTIVE EXAMINATION (NDE/2010/005) PROC.<br/> CAL = CALCULATION SHEET (CAL/2010/005/T)<br/> HY = HYDROSTATIC TEST PROCEDURE (HT304 rev.2)<br/> A.I = ASME AUTHORIZED INSPECTOR</p> |
|---|--|

DOCUMENT		APPLICABLE REVISION				
6725-2010	FABRICATION DRAWING	0	1			
CAL/2010/005	CALCULATION SHEET	0				
NDE/2010/005	NDE OPERATIVE INSTRUCTION	0				
WM/2010/005	WELD AND NDE MAP	0				
WB/2010/005	WELDING BOOK	0				

- 1) APPLICABLE EDITION OF ASME CODES: EDITION 2007 + Addenda 2009b
- 2) ALL NDE PROCEDURES ARE IN REV. 0









# FABRICATION AND INSPECTION PLAN - ITP/2010/005

## PIANO DI FABBRICAZIONE E ISPEZIONE

Sheet 6 of 12  
Foglio di  
Revision 0  
Revisione

Job No. 2010 / 005 / T      Item Sigla TURBODEN 10      Order No. Ordine n° 10PU-000265-PR      Serial No. N° di fabbrica 4320

SECT D	NOZZLE WELDS (AS WELDED COND.) ACTIVITY	Type of Inspect.	Reference	C.I. CIVIDAC		TURBODEN		CLIENT		A.I.		Remarks or N.C.R. No.
				Sign/Date		Sign/Date		Sign/Date		Sign/Date	C	
1	Item identification	VT	DWG.	X	<i>Scant</i>							
2	Cutting – Beveling	VT	DWG. ASME VIII-1 UG-93	X	<i>27/04/2010</i>							
<u>NOZZLE S5: LONGITUD. WELD S5L</u>												
3	Rolling to cylinder	VT	DWG	X	<i>Scant</i>							
4	Alignment and fit-up and root gap check	VT-DT	WB, DWG. ASME VIII-1 UW-33	X	<i>13/04/2010</i>				W	<i>15/04/2010</i>		
5	Welding surveillance	VT	WB, WM ASME VIII-1 UG-90	X	<i>Scant 15/04/2010</i>							
6	Back gouging	PT FULL	PROC. NDE	X	<i>16/04/2010</i>				R	<i>25/04/2010</i>	C	
7	Re-rolling / calibration of cylinder	VT-DT	ASME VIII-1 DWG.	X	<i>Scant</i>							
8	Completed weld	VT	DWG, ASME V ASME VIII-1 UW-35	X	<i>13/04/2010</i>				W	<i>28/04/2010</i>		
9	Completed weld	RT FULL	ASME VIII-1 UW-51 & Appendix 4, PROC. NDE	X	<i>14/06/2010</i>				R	<i>25/06/2010</i>	C	
<u>PIPING SEAMS: PIPE-ELBOW-FLANGE</u>												
10	Alignment and fit-up	VT-DT	WB, DWG. ASME VIII-1 UW-33	X	<i>Scant 28/04/2010</i>				W	<i>28/04/2010</i>		
11	Butt welding	VT	ASME V Art. 9 ASME VIII-1 UW-35 WB, DWG	X	<i>Scant 28/04/2010</i>							
12	Completed girth welds	RT SPOT	PROC. NDE ASME VIII-1 UW-52 & Appendix 4	X	<i>14/06/2010</i>	W			R	<i>25/06/2010</i>	C	Øi >150 mm ONLY
13	Completed girth welds	MT SPOT	PROC. NDE ASME VIII-1 Appendix.6	X	<i>15/06/2010</i>	W			R	<i>25/06/2010</i>	C	
<u>ATTACHMENT SEAMS: nozzles to shell</u>												
14	Lay out - Cutting holes - Beveling	VT-DT	DWG.	X	<i>Scant 06/05/2010</i>	S						
15	Fit-up	VT-DT	WB, DWG. ASME VIII-1 UW-31	X	<i>Scant 06/05/2010</i>	S			W	<i>07/05/2010</i>		
16	Attachment welding	VT	ASME V Art. 9 WB, DWG	X	<i>Scant 08/05/2010</i>	W						
17	Back gouging	PT FULL	PROC. NDE ASME VIII-1 Appendix.8	X	<i>Scant 08/05/2010</i>	W			R	<i>25/06/2010</i>	C	
18	Completed welds	VT	ASME V Art. 9 ASME VIII-1 UW-36, 37	X	<i>Scant 08/05/2010</i>				W	<i>Scant</i>		
19	Completed welds	MT SPOT	PROC. NDE ASME VIII-1 Appendix.6	X	<i>Scant 15/06/2010</i>				R	<i>Scant</i>	C	











# FABRICATION AND INSPECTION PLAN - ITP/2010/005

## PIANO DI FABBRICAZIONE E ISPEZIONE

Sheet 10 of 12  
Foglio di di  
Revision 0  
Revisone

Job No. 2010 / 005 / T      Item Sigla TURBODEN 10      Order No. 10PU-000265-PR      Serial No. 4320  
Commissa n°      Ordine n°      N° di fabbrica

Position	ALIGNMENT AND FIT-UP			WELDING SURVEILLANCE			BACK GOUGING			COMPLETE WELD (VISUAL)		
	CIVIDAC	CONTRACTOR	A.I.	CIVIDAC	CONTRACTOR	A.I.	CIVIDAC	CONTRACTOR	A.I.	CIVIDAC	CONTRACTOR	A.I.
	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE	DATE SIGNATURE
L1			13/04/2010									28/04/2010
L2	13/04/2010		 13616	14/04/2010			14/04/2010			15/04/2010		 13616 A
L3			13/04/2010									28/04/2010
L4	13/04/2010		 13616	13/04/2010			14/04/2010			14/04/2010		 13616 A
L5	 13/04/2010		13/04/2010	 14/04/2010			 14/04/2010			 14/04/2010		28/04/2010
L6	 13/04/2010			 14/04/2010			 14/04/2010			 14/04/2010		
L7	 13/04/2010			 15/04/2010			 16/04/2010			 15/04/2010		
S5 L	 13/04/2010		13/04/2010	 15/04/2010			 16/04/2010			 13/04/2010		13616 A
C1	 24/05/2010			 24/05/2010			/			 24/05/2010		23/06/2010
C2	 24/05/2010			 25/05/2010			/			 25/05/2010		13616 A
C3	 03/06/2010		3/06/2010	 04/06/2010			 04/06/2010			 04/06/2010		25/06/2010
C4	 07/05/2010		7/05/2010	 08/05/2010			 08/05/2010			 08/05/2010		14/05/2010
C5	 07/05/2010		7/05/2010	 10/05/2010			 10/05/2010			 10/05/2010		
C6	 07/05/2010		7/05/2010	 08/05/2010			 08/05/2010			 08/05/2010		13616 A
C7	 10/06/2010			 11/06/2010			/			 11/06/2010		25/06/2010



# FABRICATION AND INSPECTION PLAN - ITP/2010/005

## PIANO DI FABBRICAZIONE E ISPEZIONE

Sheet 11 of 12  
Foglio di  
Revision 0  
Revisione

Job No. 2010 / 005 / T      Item Sigla TURBODEN 10      Order No. 10PU-000265-PR      Serial No. 4320  
Commissa n°      Ordine n°      N° di fabbrica

C8	<del>03/06/2010</del>		<del>04/06/2010</del>				<del>07/06/2010</del>		
C9	<del>25/05/2010</del>		<del>25/05/2010</del>			<del>26/05/2010</del>	<del>27/05/2010</del>		
D1	<del>17/05/2010</del>		<del>19/05/2010</del>			<del>20/05/2010</del>	<del>21/05/2010</del>		
S1	<del>24/05/2010</del>		<del>24/05/2010</del>			<del>24/05/2010</del>	<del>25/05/2010</del>		
S2	<del>24/05/2010</del>		<del>24/05/2010</del>			<del>24/05/2010</del>	<del>25/05/2010</del>		
S3	<del>10/05/2010</del>		<del>10/05/2010</del>			<del>11/05/2010</del>	<del>11/05/2010</del>		
S4	<del>03/06/2010</del>		<del>07/06/2010</del>			<del>07/06/2010</del>	<del>07/06/2010</del>		
S5	<del>06/05/2010</del>		<del>08/05/2010</del>			<del>08/05/2010</del>	<del>08/05/2010</del>		
S6	<del>18/05/2010</del>		<del>18/05/2010</del>			<del>19/05/2010</del>	<del>20/05/2010</del>		
S7	<del>21/05/2010</del>		<del>21/05/2010</del>			<del>21/05/2010</del>	<del>21/05/2010</del>		
S10	<del>14/05/2010</del>		<del>15/05/2010</del>			<del>15/05/2010</del>	<del>17/05/2010</del>		
S12	<del>14/05/2010</del>		<del>15/05/2010</del>			<del>15/05/2010</del>	<del>17/05/2010</del>		
S13-S14 S18-S19	<del>24/05/2010</del>		<del>25/05/2010</del>			<del>25/05/2010</del>	<del>25/05/2010</del>		
S15	<del>10/05/2010</del>		<del>10/05/2010</del>			<del>10/05/2010</del>	<del>12/05/2010</del>		
S16	<del>24/05/2010</del>		<del>24/05/2010</del>			<del>24/05/2010</del>	<del>24/05/2010</del>		
T1	<del>28/05/2010</del>		<del>31/05/2010</del>			<del>31/05/2010</del>	<del>04/06/2010</del>		



# FABRICATION AND INSPECTION PLAN - ITP/2010/005

## PIANO DI FABBRICAZIONE E ISPEZIONE

Sheet Foglio 12 of di 12  
Revision Revisione 0

Job No. Comessa n° 2010 / 005 / T    Item Sigla TURBODEN 10    Order No. Ordine n° 10PU-000265-PR    Serial No. N° di fabbrica 4320

T2	<del>Int</del> 28/05/2010			<del>Int</del> 31/05/2010			<del>Int</del> 31/05/2010			<del>Int</del> 01/06/2010		3/06/2010
T3	<del>Int</del> 08/06/2010			<del>Int</del> 08/06/2010			<del>Int</del> 08/06/2010			<del>Int</del> 09/06/2010		15/06/2010
T4	<del>Int</del> 08/06/2010			<del>Int</del> 08/06/2010			<del>Int</del> 08/06/2010			<del>Int</del> 09/06/2010		
T6	<del>Int</del> 08/06/2010			<del>Int</del> 08/06/2010			<del>Int</del> 09/06/2010			<del>Int</del> 09/06/2010		
T7	<del>Int</del> 08/06/2010			<del>Int</del> 08/06/2010			<del>Int</del> 09/06/2010			<del>Int</del> 09/06/2010		13/16



**Headquarters & workshop:**

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www.cividac.com

DOCUMENT  
No.

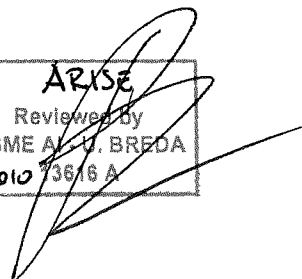
**WM/2010/005**

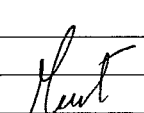
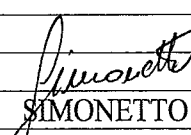
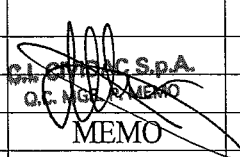
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0	1	6
REV	SHEET	OF

DOCUMENT TITLE: **WELDS AND NDE MAP**

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EQUIPMENT TAG No.: TURBODEN T10 HR  
EQUIPMENT SERIAL No.: 4320  
CIVIDAC CV No.: 2010 / 002 / PR  
CIVIDAC JOB No.: 2010 / 005 / T  
TURBODEN P.O. No.: 10PU-000265-PR

ARISE  
Reviewed By  
ASME AUTH. BREDA  
13/APR/2010 13616 A



					
0	30-03-2010	MAZZOCATO	SIMONETTO	MEMO	ISSUE FOR CONSTRUCTION
Rev. No	Date	Prepared by	Checked by	Approved by	Description

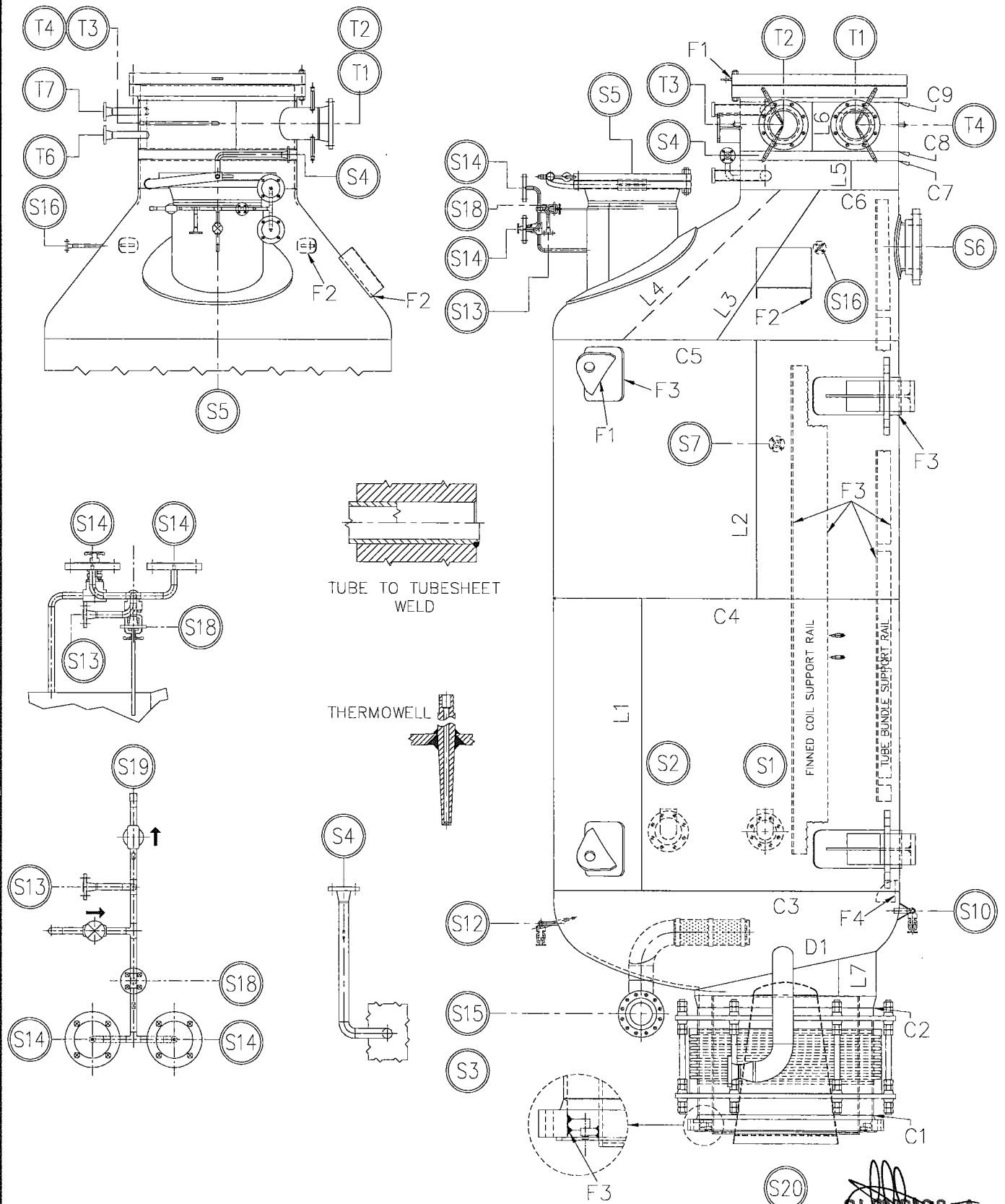
JOB NO.  
COMM. N° 2010/005/T

ORDER No.  
ORDINE N° 10PU-  
000265-PR

ITEM NO. TURBODEN  
SIGLA T10

SERIAL NO. 4320  
N° FABBR.

DRAWING No. 6725-2010  
DISEGNO N°



**C.I. CIVIDAC S.p.A.**  
Q. L. M. G. R. MEMO



# WELDS AND NDE MAP

Doc. No. WM / 2010 / 005

SHEET FOGLIO 3

REVISION No. REVISIONE N° 0

JOB NO. COMM. N° 2010/005/T


ORDER No. ORDINE N° 10PU-000265-PR

ITEM NO. SIGLA TURBODEN T10

SERIAL NO. N° FABBR. 4320

DRAWING No. DISEGNO N° 6725-2010

WELD No.	W.P.S. No.	P.Q.R. No.	WELDER No.	Non Destructive Examination Reports Number to be incorporated in free rooms			
				MT / PT	UT	RT	HB
L1	0005.01	2508	3S	/	/	4320/RT	/
L2	0005.01	2508	3S	/	/	4320/RT	/
L3	0005.01A	2535	6S	/	/	4320/RT	/
L4	0005.01A	2535	6S	/	/	4320/RT	/
L5	0005.01	2508	17S	/	/	4320/RT	/
L6	0005.01	2508	17S	/	/	4320/RT	/
L7	0005.01	2508	6S	/	/	4320/RT	/
C1	0005.01	2508	6S	/	/	4320/RT	/
C2	0005.01	2508	6S	/	/	4320/RT	/
C3	0005.02	2507 2508	6S	/	/	4320/RT	/
C4	0005.01	2508	22S	/	/	4320/RT	/
C5	0005.01	2508	22S	/	/	4320/RT	/
C6	0005.01	2508	6S	/	/	4320/RT	/
C7	0005.03	2507 3012	4S	/	4320/UT	/	/
C8	0005.03	2507 3012	4S	/	4320/UT	/	/
C9	0005.01	2508	6S	/	/	4320/RT	/
D1	0005.07	2507	18S	4320/MT	/	/	/
S1 C	0005.04	2507	18S	4320/MT	/	/	/
S1 N	0005.08	2507	18S	4320/MT	/	/	/


 CIVIDAC S.p.A.  
 MGR. P. MEMO



# WELDS AND NDE MAP

Doc. No. WM / 2010 / 005

SHEET FOGLIO 4

REVISION No. REVISIONE N° 0

JOB NO. COMM. N° 2010/005/T

ORDER No. 10PU-000265-PR  
ORDINE N°

ITEM NO. TURBODEN  
SIGLA T10

SERIAL NO. 4320  
N° FABBR.

DRAWING No. 6725-2010  
DISEGNO N°

WELD No.	W.P.S. No.	P.Q.R. No.	WELDER No.	Non Destructive Examination Reports Number to be incorporated in free rooms			
				MT / PT	UT	RT	HB
S2 C	0005.04	2507	18S	4320/MT	/	/	/
S2 N	0005.08	2507	18S	4320/MT	/	/	/
S3 C	0005.04	2507	23S	4320/MT	/	/	/
S3 N	0005.07	2507	18S	4320/MT	/	/	/
S4 C	0005.05	3023	23S	4320/MT	/	/	/
S4 N	0005.07	2507	18S	4320/MT	/	/	/
S5 L	0005.01	2508	17S	/	/	4320/RT	/
S5 C	0005.15	2507 2508	6S	/	/	4320/RT	/
S5 N	0005.08	2507	18S	4320/MT	/	/	/
S6 C	0005.16	2507	23S	4320/MT	/	4320/RT	/
S6 N	0005.08	2507	18S	4320/MT	/	/	/
S7 C	0005.05	3023	23S	4320/MT	/	/	/
S7 N	0005.07	2507	18S	4320/MT	/	/	/
S10 C	0005.05	3023	4S	4320/MT	/	/	/
S10 N	0005.07	2507	4S	4320/MT	/	/	/
S10 Valve to pipe	0005.14	3023	4S	4320/MT	/	/	/
S12 C	0005.05	3023	4S	4320/MT	/	/	/
S12 N	0005.07	2507	4S	4320/MT	/	/	/
S12 Valve to pipe	0005.14	3023	4S	4320/MT	/	/	/

C.I. CIVIDAC S.p.A.  
MGR. P. MEMO



# WELDS AND NDE MAP

Doc. No. WM / 2010 / 005

SHEET FOGLIO 5

REVISION No. REVISIONE N° 0

JOB NO. COMM. N° 2010/005/T	ORDER No. ORDINE N°	10PU- 000265-PR	ITEM NO. SIGLA	TURBODEN T10	SERIAL NO. N° FABBR. 4320	DRAWING No. DISEGNO N° 6725-2010
--------------------------------	------------------------	--------------------	-------------------	-----------------	------------------------------	-------------------------------------

WELD No.	W.P.S. No.	P.Q.R. No.	WELDER No.	Non Destructive Examination Reports Number to be incorporated in free rooms			
				MT / PT	UT	RT	HB
S13 S14 C S18	0005.05	3023	4S	4320/MT	/	/	/
S13-S14 S18 Valve to pipe	0005.14	3023	4S	4320/MT	/	/	/
S13 S14 N S18	0005.07	2507	4S	4320/MT	/	/	/
S14 Pipe to blind flange	0005.06	3023	4S	4320/MT	/	/	/
S15 C	0005.04	2507	23S	4320/MT	/	/	/
S15 N	0005.07	2507	18S	4320/MT	/	/	/
S16 C	0005.05	3023	4S	4320/MT	/	/	/
S16 N	0005.07	2507	4S	4320/MT	/	/	/
S19 Valve to pipe	0005.14	3023	4S	4320/MT	/	/	/
T1 C	0005.04	2507	23S	4320/MT	/	4320/RT	/
T1 N	0005.07	2507	18S	4320/MT	/	/	/
T2 C	0005.04	2507	23S	4320/MT	/	4320/RT	/
T2 N	0005.07	2507	18S	4320/MT	/	/	/
T3 C	0005.05	3023	4S	4320/MT	/	/	/
T3 N	0005.06	3023	4S	4320/MT	/	/	/
T4 C	0005.05	3023	4S	4320/MT	/	/	/
T4 N	0005.06	3023	4S	4320/MT	/	/	/
T6 C	0005.05	3023	4S	4320/MT	/	/	/
T6 N	0005.07	2507	4S	4320/MT	/	/	/







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 www.cividac.com

DOCUMENT  
No.

**WB/2010/005**

REV.	FOGLIO	DI
0	1	53
REV	SHEET	OF

DOCUMENT TITLE: **WELDING BOOK (WPS-PQR)**  
 EQUIPMENT NAME: **CONDENSATOR-REGENERATOR**  
 EQUIPMENT TAG No.: **TURBODEN T10 HR**  
 EQUIPMENT SERIAL No.: **4320**  
 CIVIDAC CV No.: **2010 / 002 / PR**  
 CIVIDAC JOB No.: **2010 / 005 / T**  
 TURBODEN P.O. No.: **10PU-000265-PR**

*ARISE*  
 Reviewed by  
 ASME AI / U. BREDA  
 13/APR/2010 11:16 A

		<i>Ma</i>	<i>Simonetto</i>	<i>ARISE</i>	
0	30-03-2010	MAZZOCATO	SIMONETTO	MEMO	ISSUE FOR CONSTRUCTION
Rev. No	Date	Prepared by	Checked by	Approved by	Description

JOB NO.  
COMM. N° 2010/005/T

ORDER No.  
ORDINE N° 10PU-  
000265-PR

ITEM NO. TURBODEN  
SIGLA T10

SERIAL NO.  
N° FABBR. 4320

DRAWING No.  
DISEGNO N° 6725-2010

**INDEX**

**DESCRIPTION**

**PAGE**

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6

WPS No. 0005.02

8

WPS No. 0005.03

10

WPS No. 0005.04

12

WPS No. 0005.05

14

WPS No. 0005.06

16

WPS No. 0005.07

18

WPS No. 0005.08

20

WPS No. 0005.09

22

WPS No. 0005.10

24

WPS No. 0005.11

26

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28

WPS No. 0005.13

30

WPS No. 0005.14

32

WPS No. 0005.15

34

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36

PQR No. 1023

38

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40

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42

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44

PQR No. 3012

46

PQR No. 3018

48

PQR No. 3023

50

PQR No. 6053

52

**TOTAL 53**



# WELDING BOOK

Doc. No. WB/2010/005

SHEET FOGGIO 3

REVISION No. 0  
REVISIONE N°

JOB NO. 2010/005/T  
COMM. N°

ORDER No. 10PU-  
ORDINE N° 000265-PR

ITEM NO. TURBODEN  
SIGLA T10

SERIAL NO. 4320  
N° FABBR.

DRAWING No. 6725-2010  
DISEGNO N°

## LIST OF W.P.S. AND P.Q.R.

WPS No.	No. of sheets	Rev.	WELDING PROCESS	APPLICABILITY	P.Q.R.
0005.01	2	0	SAW	LONG. & CIRCUM. SHELL WELDS; EXPANSION BELLOW PIPE AND CONE TO SHELL (SMALL SIDE) CIRCUM. WELDS; MANHOLE LONG. WELD	2508
0005.01A	2	0	SAW	LONGITUDINAL CONE WELDS	2535
0005.02	2	0	SMAW SAW	CIRCUMFERENTIAL SHELL WELDS (CLOSURE)	2507 2508
0005.03	2	0	GTAW SMAW	SHELL TO TUBESHEET WELD	2507 3012
0005.04	2	0	GTAW SMAW	PIPE TO FLANGE CIRCUMF. WELD	2507
0005.05	2	0	GTAW	PIPE TO FLANGE / PIPE / ELBOW CIRCUMFERENTIAL WELD	3023
0005.06	2	0	GTAW	PIPE TO BLIND FLANGE / SHELL WELD	3023
0005.07	2	0	GTAW SMAW	SET-IN NOZZLE TO SHELL / HEAD WELDS WITHOUT REINFORCING PAD	2507
0005.08	2	0	GTAW SMAW	SET-IN NOZZLE TO SHELL / HEAD WELDS WITH REINFORCING PAD	2507
0005.09	2	0	GTAW	TUBE TO TUBESHEET WELD	1032
0005.10	2	0	SMAW	CS FILLET WELD (F1)	2507
0005.11	2	0	SMAW	CS FILLET WELD (F2)	2507
0005.12	2	0	GMAW	CS FILLET WELD (F3)	3018
0005.13	2	0	SMAW	Carbon Steel / Stainless Steel FILLET WELD (F4)	6053
0005.14	2	0	GTAW	VALVE TO PIPE WELD	3023
0005.15	2	0	GTAW SMAW SAW	MANHOLE CIRCUMFERENTIAL WELDS	2507 2508
0005.16	2	0	GTAW SMAW	PIPE TO RING WELD (NOZZLE S6)	2507



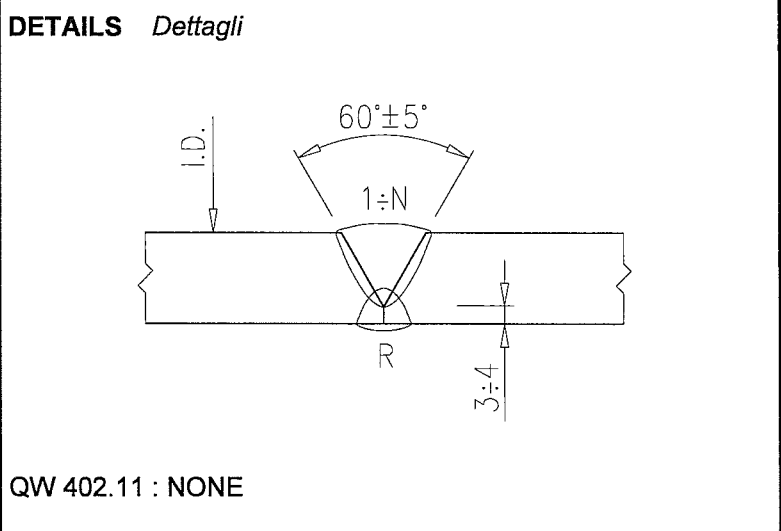
**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.01  
Spec. N° REV. 0  
DATE 30.03.2010  
Data  
PQR No. 2508  
Qual. No.

WELDING PROCESS: **SAW** TYPE: **MACHINE**  
Procedimento di saldatura: **SAW** Tipo: **MACHINE**  
Sheet 1 of 2  
Foglio di

**JOINTS (QW402) Giunti**  
JOINT DESIGN SEE SKETCH  
Disegno giunto  
BACKING YES  NOT   
Sostegno si no  
BACK. MAT BASE METAL  
Mat. Sostegno  
 METAL  NON FUSING METAL  
Metallo Metallo non fusibile  
 NONMETALLIC  OTHER  
Non metallico Altro



**BASE METALS (QW403) Materiali base**  
P No. 1 Group No. 2  
to  
P No. 1 Group No. 2  
Or  
Spec. \_\_\_\_\_ Spec. \_\_\_\_\_  
Or  
Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
Gamma spessori  
BASE MATERIAL 15 ÷ 30 mm  
Materiale base  
PIPE DIA. RANGE : Plate  
Gamma diametro tubi  
OTHER NONE  
Altro  
QW 403.13 N.A.  
QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
PROCESS GTAW SMAW SAW FCAW  
Processo  
SFA 5.17M  
AWS EM 12 K  
F No. 6  
A No. 1  
Size O.D. 4 mm  
Diametro  
THK Range MAX 64 mm  
Gamma Spessori  
ELECTRODE-FLUX (Class) F7A6-EM 12K  
Filo-flusso (Classificazione)  
FLUX TRADE NAME LINCOLN 8500  
Marca commerciale flusso  
CONSUMABLE INSERT N.A.  
Inserto fusibile  
OTHER WIRE: LINCOLN L61 – NEUTRAL FLUX  
Altro

**POSITION (QW405) Posizione**  
POSITION OF GROOVE FLAT  
Posizione cianfrino  
WELDING PROGRESSION N.A.  
Progressione di saldatura  
POSITION OF FILLET N.A.  
Posizione saldatura angolo  
QW405.3 : N.A.

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
GTAW : QW404.22,33,50 N.A.; QW404.14 N.A.  
SAW : QW404.10,24,27,36 NO  
SMAW : QW404.7 N.A.  
FCAW/GMAW : QW404.24,27,32 N.A.

SIGNATURE / DATE  
Firma / Data  
C.I. CIVIDAG S.p.A.  
Q.C. MGR. P. DE VITO  
Rev. 0

SIGNATURE / DATE  
Firma / Data  
Rev. 1





**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

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Spec. N° REV. 0  
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Data  
PQR No. 2535  
Qual. No.

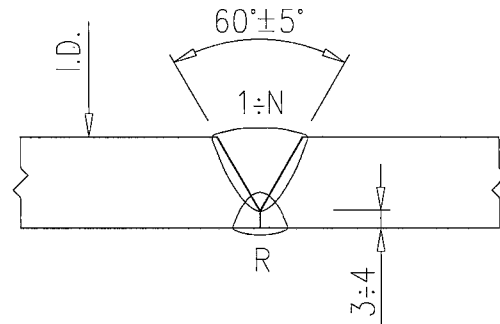
WELDING PROCESS: SAW  
Procedimento di saldatura:

TYPE: MACHINE  
Tipo:

Sheet 1 of 2  
Foglio di

**JOINTS (QW402) Giunti**  
JOINT DESIGN SEE SKETCH  
Disegno giunto  
BACKING YES  NOT   
Sostegno si no  
BACK. MAT BASE METAL  
Mat. Sostegno  
 METAL Metallo  NON FUSING METAL Metallo non fusibile  
 NONMETALLIC Non metallico  OTHER Altro

**DETAILS Dettagli**



QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**  
P No. 1 Group No. 2  
to  
P No. 1 Group No. 2  
Or  
Spec. Spec.  
Or  
Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
Gamma spessori  
BASE MATERIAL 16 mm  
Materiale base  
PIPE DIA. RANGE : N.A.  
Gamma diametro tubi  
OTHER NONE  
Altro  
QW 403.13 N.A.  
QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
PROCESS GTAW SMAW SAW FCAW  
Processo  
SFA 5.17  
AWS EH 12 K  
F No. 6  
A No. 1  
Size O.D. 4 mm  
Diametro  
THK Range MAX 46 mm  
Gamma Spessori  
ELECTRODE-FLUX (Class) F7P8-EH 12K  
Filo-flusso (Classificazione)  
FLUX TRADE NAME LINCOLN P240  
Marca commerciale flusso  
CONSUMABLE INSERT N.A.  
Inserto fusibile  
OTHER WIRE: LINCOLN LNS 133 U NEUTRAL FLUX  
Altro

**POSITION (QW405) Posizione**  
POSITION OF GROOVE FLAT  
Posizione cianfrino  
WELDING PROGRESSION N.A.  
Progressione di saldatura  
POSITION OF FILLET N.A.  
Posizione saldatura angolo  
QW405.3 : N.A.

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
GTAW : QW404.22,33,50 N.A.; QW404.14 N.A.  
SAW : QW404.10,24,27,36 NO  
SMAW : QW404.7 N.A.  
FCAW/GMAW : QW404.24,27,32 N.A.

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Rev. 1







**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

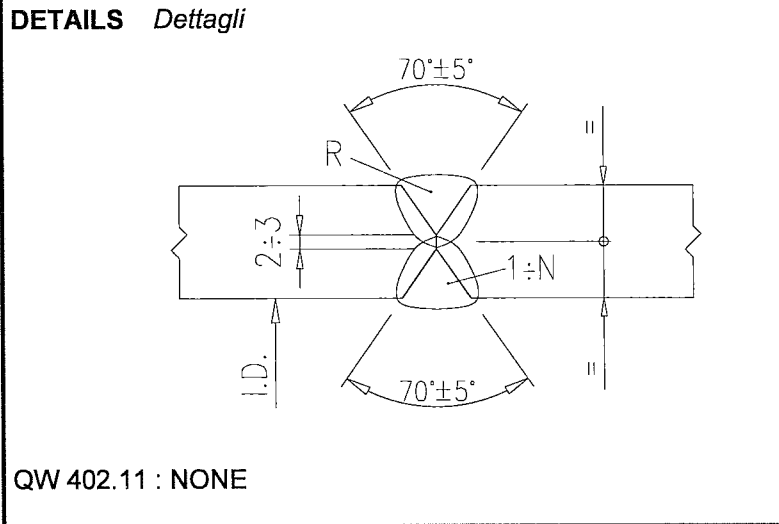
WPS No. 0005.02  
Spec. N° REV. 0  
DATE 30.03.2010  
Data  
PQR No. 2507  
Qual. No. 2508

WELDING PROCESS: **SMAW + SAW**  
Procedimento di saldatura:

TYPE: **MANUAL + MACHINE**  
Tipo:

Sheet 1 of 2  
Foglio di

**JOINTS (QW402) Giunti**  
JOINT DESIGN SEE SKETCH  
Disegno giunto  
BACKING YES  NOT   
Sostegno sì no  
BACK. MAT BASE METAL  
Mat. Sostegno  
 METAL Metallo  NON FUSING METAL Metallo non fusibile  
 NONMETALLIC Non metallico  OTHER Altro



**BASE METALS (QW403) Materiali base**  
P No. 1 Group No. 2  
to  
P No. 1 Group No. 2  
Or  
Spec.                      Spec.                       
Or  
Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
Gamma spessori  
BASE MATERIAL 15 mm  
Materiale base  
PIPE DIA. RANGE : N.A.  
Gamma diametro tubi  
OTHER NONE  
Altro  
QW 403.13 N.A.  
QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**

PROCESS	GTAW	SMAW	SAW	FCAW
PROCESSO				
SFA		5.1	5.17M	
AWS		E7018.1	EM 12 K	
F No.		4	6	
A No.		1	1	
Size O.D.		3.25-4-5mm	4 mm	
Diametro				
THK Range		MAX 58 mm	MAX 64 mm	
Gamma Spessori				
ELECTRODE-FLUX (Class)		F7A6-EM 12K		
Filo-flusso (Classificazione)				
FLUX TRADE NAME		LINCOLN 8500		
Marca commerciale flusso				
CONSUMABLE INSERT		N.A.		
Inserto fusibile				
OTHER	SMAW: ETC PH35S			
Altro	SAW: WIRE LINCOLN L61 - NEUTRAL FLUX			
THK OF PASSES NO GREATER THAN 13 mm (QW403.9)				
GTAW	:QW404.22,33,50 N.A.; QW404.14 N.A.			
SAW	:QW404.10,24,27,36 NO			
SMAW	:QW404.7 NO			
FCAW/GMAW	:QW404.24,27,32 N.A.			

**POSITION (QW405) Posizione**  
POSITION OF GROOVE FLAT  
Posizione cianfrino  
WELDING PROGRESSION N.A.  
Progressione di saldatura  
POSITION OF FILLET N.A.  
Posizione saldatura angolo  
QW405.3 : N.A.

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**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.02  
Spec. N°. REV. 0  
DATE 30.03.2010  
PQR No. 2507  
Qual. No. 2508

WELDING PROCESS: **SMAW + SAW** TYPE: **MANUAL + MACHINE**  
Procedimento di saldatura: **SMAW + SAW** Tipo: **MANUAL + MACHINE**  
Sheet 2 of 2  
Foglio di

<b>PREHEAT (QW406)</b> Preriscaldamento		<b>POSTWELD HEAT TREATMENT (QW 407)</b> Trattamento termico dopo saldatura	
PREHEAT TEMP. MIN. °C	15	HOLDING TEMP. RANGE °C	N.A.
Temp. di preriscaldamento min. °C		Temperatura di permanenza	
INTERPASS TEMP. MAX. °C	180	HOLDING TIME RANGE	N.A.
Temp. interpass max. °C		Tempo di permanenza	
PREHEAT MAINTENACE	N.A.	HEATING/COOLING RATE	N.A.
Mantenimento del preriscaldamento		Velocità di riscaldamento/Raffreddamento	

**GAS (QW408) Gas**

	GAS (ES)	%	FLOW RATE Portata
SHIELDING Protezione torcia	N.A.		
TRAILING Protezione	N.A.		
BACKING Supporto	N.A.		

**ELECTRICAL CHARACTERISTICS (QW 409) Caratteristiche elettriche**

TUNGSTEN ELECTRODE TYPE N.A. SIZE N.A.  
Elettrodo al tungsteno tipo Dimensione

MODE OF METAL TRANSFER FOR GMAW / FCAW: SPRAY ARC  SHORT ARC  GLOBULAR ARC   
Modo di fusione del metallo d'apporto

ELECTRODE WIRE SPEED RANGE mm/1' N.A.  
Gamma velocità del filo

**TECHNIQUE (QW410) Tecnica operativa**

STRING BEAD  WEAVE BEAD  ORIFICE OR GAS CUP SIZE: N.A. OSCILLATION NONE  
Passata stretta Passata oscillata Dim. orif. o portagas Oscillazione

METHOD OF BACK GOUGING GRINDING / ARC AIR MULTIPLE ELECTRODES   
Metodo di ripresa Elettrodi multipli

INITIAL AND INTERPASS CLEANING GRINDING AND/OR BRUSHING SINGLE ELECTRODE   
Pulizia iniziale e tra le passate Elettrodo singolo

MULTI - PASS  SINGLE - PASS  CONTACT TUBE TO WORK DISTANCE: 15-20 mm  
Passate multiple Passate singole Distanza guidafile al pezzo

PEENING NONE OTHER: GTAW PULSED QW409.3: N.A. QW410.11,15,64: NO  
Martellatura Altro

Layers Passate	Process Proced.	Class Materiali D'apporto	Dia. Dia. mm	Polarity Polarità	Curr. Corr.	Amper Range Amper	Volt Range Volt	Travel Speed mm / 1'	Heat input Apporto termico J / mm
1-N	SMAW	E7018.1	3.25	REVERSE	DC	120÷140	25÷26	160÷170	1059÷1365
1-N	SMAW	E7018.1	4	REVERSE	DC	170÷180	26÷27	180÷190	1396÷1620
1-N	SMAW	E7018.1	5	REVERSE	DC	190÷200	27÷28	200÷210	1466÷1680
R	SAW	EM12K	4	REVERSE	DC	480-530	27-28	500-520	1495÷1781



**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.03  
 Spec. N°. REV. 0  
 DATE 30.03.2010  
*Data*  
 PQR No. 2507  
 Qual. No. 3012

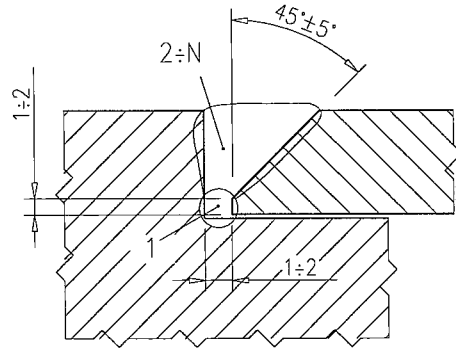
**WELDING PROCESS:** GTAW+SMAW  
*Procedimento di saldatura:*

**TYPE:** MANUAL  
*Tipo:*

**Sheet** 1 **of** 2  
*Foglio di*

**JOINTS (QW402) Giunti**  
 JOINT DESIGN SEE SKETCH  
*Disegno giunto*  
 BACKING YES  NOT   
*Sostegno si no*  
 BACK. MAT BASE METAL FOR GTAW  
*Mat. Sostegno WELD METAL FOR SMAW*  
 METAL  NON FUSING METAL  
*Metallo Metallo non fusibile*  
 NONMETALLIC  OTHER  
*Non metallico Altro*

**DETAILS Dettagli**



QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**  
 P No. 1 Group No. 1 or 2  
 to  
 P No. 1 Group No. 1 or 2  
 Or  
 Spec. \_\_\_\_\_ Spec. \_\_\_\_\_  
 Or  
 Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
*Gamma spessori*  
 BASE MATERIAL 15+80 mm  
*Materiale base*  
 PIPE DIA. RANGE : N.A.  
*Gamma diametro tubi*  
 OTHER NONE  
*Altro*  
 QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
 PROCESS GTAW SMAW SAW FCAW  
*Processo*  
 SFA 5.18 5.1  
 AWS ER70S6 E7018.1  
 F No. 6 4  
 A No. 1 1  
 Size O.D. 2.4 mm 3.25-4-5mm  
*Diametro*  
 THK Range MAX 6 mm MAX 200 mm  
*Gamma Spessori*  
 ELECTRODE-FLUX (Class) N.A.  
*Filo-flusso (Classificazione)*  
 FLUX TRADE NAME N.A.  
*Marca commerciale flusso*  
 CONSUMABLE INSERT N.A.  
*Inserto fusibile*  
 OTHER GTAW: SOLID WIRE OERLIKON CARBOROD 1  
*Altro SMAW: ETC PH35S*

**POSITION (QW405) Posizione**  
 POSITION OF GROOVE FLAT  
*Posizione cianfrino*  
 WELDING PROGRESSION N.A.  
*Progressione di saldatura*  
 POSITION OF FILLET N.A.  
*Posizione saldatura angolo*  
 QW405.3 : N.A.

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
 GTAW : QW404.22,33,50 NO; QW404.14 YES  
 SAW : QW404.10,24,27,36 N.A.  
 SMAW : QW404.7 NO  
 FCAW/GMAW : QW404.24,27,32 N.A.

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*Firma / Data*  
  
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*Firma / Data*  
 Rev. 1



**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. **0005.03**  
 Spec. N° **REV. 0**  
 DATE **30.03.2010**  
 Data  
 PQR No. **2507**  
 Qual. No. **3012**

**WELDING PROCESS:** GTAW+SMAW      **TYPE:** MANUAL  
*Procedimento di saldatura:*      *Tipo:*

<b>PREHEAT (QW406)</b> <i>Preriscaldamento</i>	<b>POSTWELD HEAT TREATMENT (QW 407)</b> <i>Trattamento termico dopo saldatura</i>
PREHEAT TEMP. MIN. °C      15 <i>Temp. di preriscaldamento min. °C</i>	HOLDING TEMP. RANGE °C      N.A. <i>Temperatura di permanenza</i>
INTERPASS TEMP. MAX. °C      180 <i>Temp. interpass max. °C</i>	HOLDING TIME RANGE      N.A. <i>Tempo di permanenza</i>
PREHEAT MAINTENANCE      N.A. <i>Mantenimento del preriscaldamento</i>	HEATING/COOLING RATE      N.A. <i>Velocità di riscaldamento/Raffreddamento</i>

**GAS (QW408) Gas**

	<b>GAS (ES)</b>	<b>%</b>	<b>FLOW RATE Portata</b>
SHIELDING <i>Protezione torcia</i>	AWS SFA 5.32 SG-A	ARGON PURITY 99.997	10 – 12 Lit. / 1'
TRAILING <i>Protezione</i>	N.A.		
BACKING <i>Supporto</i>	N.A.		

**ELECTRICAL CHARACTERISTICS (QW 409) Caratteristiche elettriche**

TUNGSTEN ELECTRODE TYPE      AWS SFA 5.12 EWh-2      SIZE      2.4 mm  
*Elettrodo al tungsteno tipo*      *Dimensione*

MODE OF METAL TRANSFER FOR GMAW / FCAW :    SPRAY ARC     SHORT ARC     GLOBULAR ARC   
*Modo di fusione del metallo d'apporto*

ELECTRODE WIRE SPEED RANGE mm/1'      N.A.  
*Gamma velocità del filo*

**TECHNIQUE (QW410) Tecnica operativa**

STRING BEAD     WEAVE BEAD     ORIFICE OR GAS CUP SIZE:      3/8"      OSCILLATION NONE  
*Passata stretta*      *Passata oscillata*      *Dim. orif. o portagas*      *Oscillazione*

METHOD OF BACK GOUGING      N.A.      MULTIPLE ELECTRODES   
*Metodo di ripresa*      *Elettrodi multipli*

INITIAL AND INTERPASS CLEANING      GRINDING AND/OR BRUSHING      SINGLE ELECTRODE   
*Pulizia iniziale e tra le passate*      *Elettrodo singolo*

MULTI – PASS  FOR SMAW    SINGLE – PASS  FOR GTAW    CONTACT TUBE TO WORK DISTANCE:      N.A.  
*Passate multiple*      *Passate singole*      *Distanza guidafile al pezzo*

PEENING NONE      OTHER: GTAW PULSED QW409.3: NO      QW410.11,15,64: NO  
*Martellatura*      *Altro*

Layers <i>Passate</i>	Process <i>Proced.</i>	Class Materiali <i>D'apporto</i>	Dia. Dia. mm	Polarity <i>Polarità</i>	Curr. Curr.	Amper Range Amper	Volt Range Volt	Travel Speed mm / 1'	Heat input <i>Apporto termico</i> J / mm
1 <sup>ST</sup>	GTAW	ER70S6	2.4	STRAIGHT	DC	90÷100	14÷15	80÷90	840÷1125
2-N	SMAW	E7018.1	3.25	REVERSE	DC	120÷140	25÷26	160÷170	1059÷1365
2-N	SMAW	E7018.1	4	REVERSE	DC	170÷180	26÷27	180÷190	1396÷1620
2-N	SMAW	E7018.1	5	REVERSE	DC	190÷200	27÷28	200÷210	1466÷1680



**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.04  
 Spec. N°. REV. 0  
 DATE 30.03.2010  
 Data  
 PQR No. 2507  
 Qual. No.

WELDING PROCESS: GTAW+SMAW  
 Procedimento di saldatura:

TYPE: MANUAL  
 Tipo:

Sheet 1 of 2  
 Foglio di

**JOINTS (QW402) Giunti**

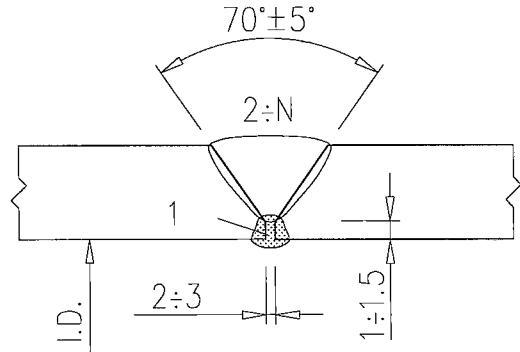
JOINT DESIGN SEE SKETCH  
 Disegno giunto

BACKING YES  NOT   
 Sostegno si no FOR GTAW

BACK. MAT WELD METAL FOR SMAW ONLY  
 Mat. Sostegno

- METAL Metallo  
 NON FUSING METAL Metallo non fusibile  
 NONMETALLIC Non metallico  
 OTHER Altro

**DETAILS Dettagli**



QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**

P No. 1 Group No. 1 or 2  
 to  
 P No. 1 Group No. 1 or 2  
 Or  
 Spec. Spec.  
 Or  
 Chem. An. N.A. Chem. An. N.A.

**THICKNESS RANGE :**  
 Gamma spessori

BASE MATERIAL 6.02÷12.7 mm  
 Materiale base

PIPE DIA. RANGE : 114.3÷219.1 mm  
 Gamma diametro tubi

OTHER NONE  
 Altro

QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**

PROCESS	GTAW	SMAW	SAW	FCAW
SFA	5.18	5.1		
AWS	ER70S6	E7018.1		
F No.	6	4		
A No.	1	1		
Size O.D.	2.4 mm	3.25-4-5mm		

Processo  
 Diametro

THK Range MAX 6 mm MAX 58 mm  
 Gamma Spessori

ELECTRODE-FLUX (Class) N.A.  
 Filo-flusso (Classificazione)

FLUX TRADE NAME N.A.  
 Marca commerciale flusso

CONSUMABLE INSERT N.A.  
 Inserto fusibile

OTHER GTAW: SOLID WIRE OERLIKON CARBOROD 1  
 Altro SMAW: ETC PH35S

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)

GTAW :QW404.22,33,50 NO; QW404.14 YES  
 SAW :QW404.10,24,27,36 N.A.  
 SMAW :QW404.7 NO  
 FCAW/GMAW :QW404.24,27,32 N.A.

**POSITION (QW405) Posizione**

POSITION OF GROOVE FLAT  
 Posizione cianfrino

WELDING PROGRESSION N.A.  
 Progressione di saldatura

POSITION OF FILLET N.A.  
 Posizione saldatura angolo

QW405.3 : N.A

SIGNATURE / DATE  
 Firma / Data

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**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. **0005.04**  
 Spec. N° **REV. 0**  
 DATE **30.03.2010**  
 Data  
 PQR No. **2507**  
 Qual. No.

Sheet **2** of **2**  
 Foglio **2** di **2**

**WELDING PROCESS:** GTAW+SMAW  
*Procedimento di saldatura:*

**TYPE:** MANUAL  
*Tipo:*

**PREHEAT (QW406)**  
*Preriscaldamento*  
 PREHEAT TEMP. MIN. °C 15  
*Temp. di preriscaldamento min. °C*  
 INTERPASS TEMP. MAX. °C 180  
*Temp. interpass max. °C*  
 PREHEAT MAINTENACE N.A.  
*Mantenimento del preriscaldamento*

**POSTWELD HEAT TREATMENT (QW 407)**  
*Trattamento termico dopo saldatura*  
 HOLDING TEMP. RANGE °C N.A.  
*Temperatura di permanenza*  
 HOLDING TIME RANGE N.A.  
*Tempo di permanenza*  
 HEATING/COOLING RATE N.A.  
*Velocità di riscaldamento/Raffreddamento*

**GAS (QW408) Gas**

	GAS (ES)	%	FLOW RATE Portata
SHIELDING <i>Protezione torcia</i>	AWS SFA 5.32 SG-A	ARGON PURITY 99.997	10 – 12 Lit. / 1'
TRAILING <i>Protezione</i>	N.A.		
BACKING <i>Supporto</i>	N.A.		

**ELECTRICAL CHARACTERISTICS (QW 409) Caratteristiche elettriche**

TUNGSTEN ELECTRODE TYPE AWS SFA 5.12 EWTh-2 SIZE 2.4 mm  
*Elettrodo al tungsteno tipo Dimensione*

MODE OF METAL TRANSFER FOR GMAW / FCAW : SPRAY ARC  SHORT ARC  GLOBULAR ARC   
*Modo di fusione del metallo d'apporto*

ELECTRODE WIRE SPEED RANGE mm/1' N.A.  
*Gamma velocità del filo*

**TECHNIQUE (QW410) Tecnica operativa**

STRING BEAD  WEAVE BEAD  ORIFICE OR GAS CUP SIZE: 3/8" OSCILLATION NONE  
*Passata stretta Passata oscillata Dim. orif. o portagas Oscillazione*

METHOD OF BACK GOUGING N.A. MULTIPLE ELECTRODES   
*Metodo di ripresa Elettrodi multipli*

INITIAL AND INTERPASS CLEANING GRINDING AND/OR BRUSHING SINGLE ELECTRODE   
*Pulizia iniziale e tra le passate Elettrodo singolo*

MULTI – PASS  FOR SMAW SINGLE – PASS  FOR GTAW CONTACT TUBE TO WORK DISTANCE: N.A.  
*Passate multiple Passate singole Distanza guidafile al pezzo*

PEENING NONE OTHER: GTAW PULSED QW409.3: NO QW410.11,15,64: NO  
*Martellatura Altro*

Layers <i>Passate</i>	Process <i>Proced.</i>	Class Materials <i>D'apporto</i>	Dia. Dia. mm	Polarity <i>Polarità</i>	Curr. Curr.	Amper Range Amper	Volt Range Volt	Travel Speed mm / 1'	Heat input <i>Apporto termico</i> J / mm
1 <sup>ST</sup>	GTAW	ER70S6	2.4	STRAIGHT	DC	90-100	14-15	90-100	756-1000
2-N	SMAW	E7018.1	3.25	REVERSE	DC	120÷140	25÷26	160÷170	1059÷1365
2-N	SMAW	E7018.1	4	REVERSE	DC	170÷180	26÷27	180÷190	1396÷1620
2-N	SMAW	E7018.1	5	REVERSE	DC	190÷200	27÷28	200÷210	1466÷1680



**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

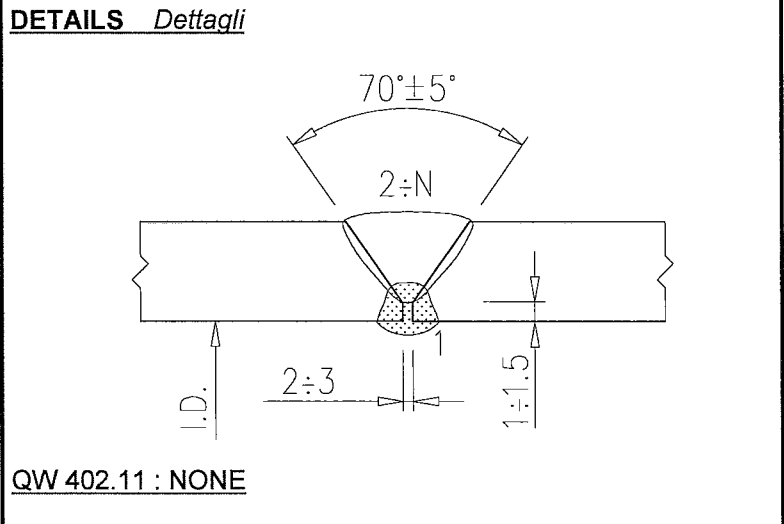
According to ASME Code Section IX (QW-200.1)

WPS No. 0005.05  
 Spec. N° REV. 0  
 DATE 30.03.2010  
 Data  
 PQR No. 3023  
 Qual. No.

WELDING PROCESS: **GTAW** TYPE: **MANUAL**  
*Procedimento di saldatura:* Tipo:

Sheet 1 of 2  
 Foglio di

**JOINTS (QW402) Giunti**  
 JOINT DESIGN SEE SKETCH  
*Disegno giunto*  
 BACKING YES  NOT   
*Sostegno si no*  
 BACK. MAT NONE  
*Mat. Sostegno*  
 METAL  NON FUSING METAL  
*Metallo Metallo non fusibile*  
 NONMETALLIC  OTHER  
*Non metallico Altro*



**BASE METALS (QW403) Materiali base**  
 P No. 1 Group No. 1 or 2  
 to  
 P No. 1 Group No. 1 or 2  
 Or  
 Spec.                      Spec.                       
 Or  
 Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
*Gamma spessori*  
 BASE MATERIAL 2.77÷4.55 mm  
*Materiale base*  
 PIPE DIA. RANGE : 21.3÷33.4 mm  
*Gamma diametro tubi*  
 OTHER NONE  
*Altro*  
 QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
 PROCESS GTAW SMAW SAW FCAW  
*Processo*  
 SFA 5.18  
 AWS ER70S6  
 F No. 6  
 A No. 1  
 Size O.D. 2.4 mm  
*Diametro*  
 THK Range MAX 7.82 mm  
*Gamma Spessori*  
 ELECTRODE-FLUX (Class) N.A.  
*Filo-flusso (Classificazione)*  
 FLUX TRADE NAME N.A.  
*Marca commerciale flusso*  
 CONSUMABLE INSERT N.A.  
*Inserto fusibile*  
 OTHER SOLID WIRE OERLIKON CARBOROD 1  
*Altro*

**POSITION (QW405) Posizione**  
 POSITION OF GROOVE FLAT  
*Posizione cianfrino*  
 WELDING PROGRESSION N.A.  
*Progressione di saldatura*  
 POSITION OF FILLET N.A.  
*Posizione saldatura angolo*  
 QW405.3 : N.A.

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
 GTAW :QW404.22,33,50 NO; QW404.14 YES  
 SAW :QW404.10,24,27,36 N.A  
 SMAW :QW404.7 N.A  
 FCAW/GMAW :QW404.24,27,32 N.A.

SIGNATURE / DATE Firma / Data  
 C.I. CIVIDAG S.p.A.  
 Q.C. MGR.                       
 Rev. 0  
 SIGNATURE / DATE Firma / Data  
 Rev. 1







**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.06  
 Spec. N°. REV. 0  
 DATE 30.03.2010  
 Data  
 PQR No. 3023  
 Qual. No. 2507

**WELDING PROCESS:** GTAW + SMAW  
*Procedimento di saldatura:*

**TYPE:** MANUAL  
*Tipo:*

**Sheet** 1 **of** 2  
*Foglio* di

**JOINTS (QW402) Giunti**

JOINT DESIGN SEE SKETCH

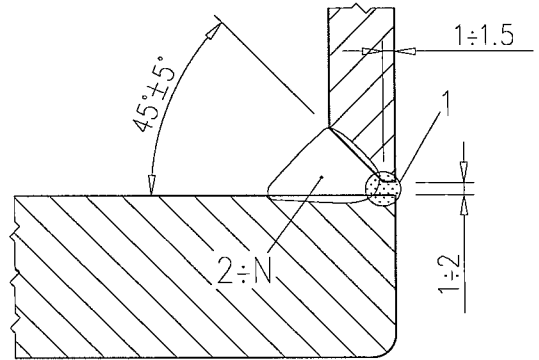
*Disegno giunto*

BACKING YES  NOT   
*Sostegno si no*

BACK. MAT NONE  
*Mat. Sostegno*

- METAL  NON FUSING METAL  
*Metallo Metallo non fusibile*
- NONMETALLIC  OTHER  
*Non metallico Altro*

**DETAILS** *Dettagli*



QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**

P No. 1 Group No. 1 or 2  
 to  
 P No. 1 Group No. 1 or 2  
 Or  
 Spec. \_\_\_\_\_ Spec. \_\_\_\_\_  
 Or  
 Chem. An. N.A. Chem. An. N.A.

**THICKNESS RANGE :**  
*Gamma spessori*

BASE MATERIAL 2.77÷16 mm  
*Materiale base*

PIPE DIA. RANGE : 21.3 mm  
*Gamma diametro tubi*

OTHER NONE  
*Altro*

QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**

PROCESS	GTAW	SMAW	SAW	FCAW
<i>Processo</i>				
SFA	5.18	5.1		
AWS	ER70S6	E7018.1		
F No.	6	4		
A No.	1	1		
Size O.D.	2.4 mm	3.25-4.5 mm		
<i>Diametro</i>				

THK Range MAX 7.82mm MAX 58 mm  
*Gamma Spessori*

ELECTRODE-FLUX (Class) N.A.  
*Filo-flusso (Classificazione)*

FLUX TRADE NAME N.A.  
*Marca commerciale flusso*

CONSUMABLE INSERT N.A.  
*Inserito fusibile*

OTHER GTAW: SOLID WIRE OERLIKON CARBOROD 1  
*Altro SMAW: ETC PH35S*

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)

GTAW : QW404.22,33,50 NO; QW404.14 YES  
 SAW : QW404.10,24,27,36 N.A.  
 SMAW : QW404.7 NO  
 FCAW/GMAW : QW404.24,27,32 N.A.

**POSITION (QW405) Posizione**

POSITION OF GROOVE FLAT  
*Posizione cianfrino*

WELDING PROGRESSION N.A.  
*Progressione di saldatura*

POSITION OF FILLET HORIZONTAL  
*Posizione saldatura angolo*

QW405.3 : N.A

SIGNATURE / DATE  
*Firma / Data*

*C.I. CIVIDAC S.p.A.*  
 Q.C. WELDING MEMO

Rev. 0

SIGNATURE / DATE  
*Firma / Data*

Rev. 1





**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.07  
 Spec. N° REV. 0  
 DATE 30.03.2010  
 Data  
 PQR No. 2507  
 Qual. No.

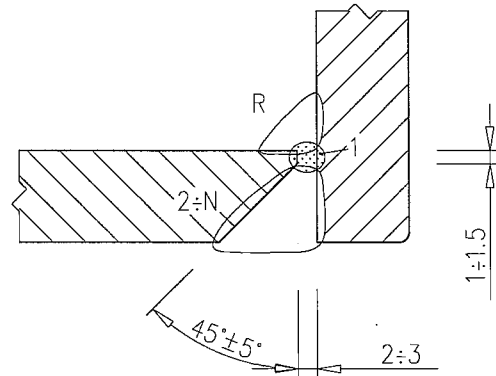
WELDING PROCESS: GTAW+SMAW  
*Procedimento di saldatura:*

TYPE: MANUAL  
*Tipo:*

Sheet 1 of 2  
*Foglio di*

**JOINTS (QW402) Giunti**  
 JOINT DESIGN SEE SKETCH  
*Disegno giunto*  
 BACKING YES  NOT   
*Sostegno si no FOR GTAW*  
 BACK. MAT WELD METAL FOR SMAW ONLY  
*Mat. Sostegno*  
 METAL  NON FUSING METAL  
*Metallo Metallo non fusibile*  
 NONMETALLIC  OTHER  
*Non metallico Altro*

**DETAILS Dettagli**



QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**  
 P No. 1 Group No. 1 or 2  
 to P No. 1 Group No. 1 or 2  
 Or  
 Spec. Spec.  
 Or  
 Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
*Gamma spessori*  
 BASE MATERIAL 15±22 mm  
*Materiale base*  
 PIPE DIA. RANGE : 21.3±219.1 mm  
*Gamma diametro tubi*  
 OTHER NONE  
*Altro*  
 QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
 PROCESS GTAW SMAW SAW FCAW  
*Processo*  
 SFA 5.18 5.1  
 AWS ER70S6 E7018.1  
 F No. 6 4  
 A No. 1 1  
 Size O.D. 2.4 mm 3.25-4.5mm  
*Diametro*  
 THK Range MAX 6 mm MAX 58 mm  
*Gamma Spessori*  
 ELECTRODE-FLUX (Class) N.A.  
*Filo-flusso (Classificazione)*  
 FLUX TRADE NAME N.A.  
*Marca commerciale flusso*  
 CONSUMABLE INSERT N.A.  
*Inserto fusibile*  
 OTHER GTAW: SOLID WIRE OERLIKON CARBOROD 1  
*Altro SMAW: ETC PH35S*  
 THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
 GTAW :QW404.22,33,50 NO; QW404.14 YES  
 SAW :QW404.10,24,27,36 N.A.  
 SMAW :QW404.7 NO  
 FCAW/GMAW :QW404.24,27,32 N.A.

**POSITION (QW405) Posizione**  
 POSITION OF GROOVE FLAT  
*Posizione cianfrino*  
 WELDING PROGRESSION N.A.  
*Progressione di saldatura*  
 POSITION OF FILLET HORIZONTAL  
*Posizione saldatura angolo*  
 QW405.3 : N.A.

SIGNATURE / DATE  
*Firma / Data*  
 C.I. CIVIDAC S.p.A.  
 Q.C. MGR. MEMO  
 Rev. 0  
 SIGNATURE / DATE  
*Firma / Data*  
 Rev. 1



**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. **0005.07**  
 Spec. N°. **REV. 0**  
 DATE **30.03.2010**  
 Data  
 PQR No. **2507**  
 Qual. No.

**WELDING PROCESS:** GTAW+SMAW **TYPE:** MANUAL  
*Procedimento di saldatura:* *Tipo:*

<b>PREHEAT (QW406)</b> <i>Preriscaldamento</i>	<b>POSTWELD HEAT TREATMENT (QW 407)</b> <i>Trattamento termico dopo saldatura</i>
PREHEAT TEMP. MIN. °C <u>15</u> <i>Temp. di preriscaldamento min. °C</i>	HOLDING TEMP. RANGE °C <u>N.A.</u> <i>Temperatura di permanenza</i>
INTERPASS TEMP. MAX. °C <u>180</u> <i>Temp. interpass max. °C</i>	HOLDING TIME RANGE <u>N.A.</u> <i>Tempo di permanenza</i>
PREHEAT MAINTENACE <u>N.A.</u> <i>Mantenimento del preriscaldamento</i>	HEATING/COOLING RATE <u>N.A.</u> <i>Velocità di riscaldamento/Raffreddamento</i>

**GAS (QW408) Gas**

	<b>GAS (ES)</b>	<b>%</b>	<b>FLOW RATE Portata</b>
SHIELDING <i>Protezione torcia</i>	<u>AWS SFA 5.32 SG-A</u>	<u>ARGON PURITY 99.997</u>	<u>10 – 12 Lit. / 1'</u>
TRAILING <i>Protezione</i>	<u>N.A.</u>		
BACKING <i>Supporto</i>	<u>N.A.</u>		

**ELECTRICAL CHARACTERISTICS (QW 409) Caratteristiche elettriche**

TUNGSTEN ELECTRODE TYPE AWS SFA 5.12 EWh-2 SIZE 2.4 mm  
*Elettrodo al tungsteno tipo* *Dimensione*

MODE OF METAL TRANSFER FOR GMAW / FCAW :  SPRAY ARC  SHORT ARC  GLOBULAR ARC   
*Modo di fusione del metallo d'apporto*

ELECTRODE WIRE SPEED RANGE mm/1' N.A.  
*Gamma velocità del filo*

**TECHNIQUE (QW410) Tecnica operativa**

STRING BEAD  WEAVE BEAD  ORIFICE OR GAS CUP SIZE: 3/8" OSCILLATION NONE  
*Passata stretta* *Passata oscillata* *Dim. orif. o portagas* *Oscillazione*

METHOD OF BACK GOUGING GRINDING / ARC AIR MULTIPLE ELECTRODES   
*Metodo di ripresa* *Elettrodi multipli*

INITIAL AND INTERPASS CLEANING GRINDING AND/OR BRUSHING SINGLE ELECTRODE   
*Pulizia iniziale e tra le passate* *Elettrodo singolo*

MULTI – PASS  FOR SMAW SINGLE – PASS  FOR GTAW CONTACT TUBE TO WORK DISTANCE: N.A.  
*Passate multiple* *Passate singole* *Distanza guidafile al pezzo*

PEENING NONE OTHER: GTAW PULSED QW409.3: NO QW410.11,15,64: NO  
*Martellatura* *Altro*

Layers <i>Passate</i>	Process <i>Proced.</i>	Class Materiali <i>D'apporto</i>	Dia. Dia. mm	Polarity <i>Polarità</i>	Curr. Corr.	Amper Range Amper	Volt Range Volt	Travel Speed mm / 1'	Heat input <i>Apporto termico</i> J / mm
1 <sup>ST</sup>	GTAW	ER70S6	2.4	STRAIGHT	DC	90-100	14-15	90-100	756-1000
2-N	SMAW	E7018.1	3.25	REVERSE	DC	120÷140	25÷26	160÷170	1059÷1365
2-N; R	SMAW	E7018.1	4	REVERSE	DC	170÷180	26÷27	180÷190	1396÷1620
2-N; R	SMAW	E7018.1	5	REVERSE	DC	190÷200	27÷28	200÷210	1466÷1680



**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. **0005.08**  
 Spec. N° **REV. 0**  
 DATE **30.03.2010**  
 Data  
 PQR No. **2507**  
 Qual. No.

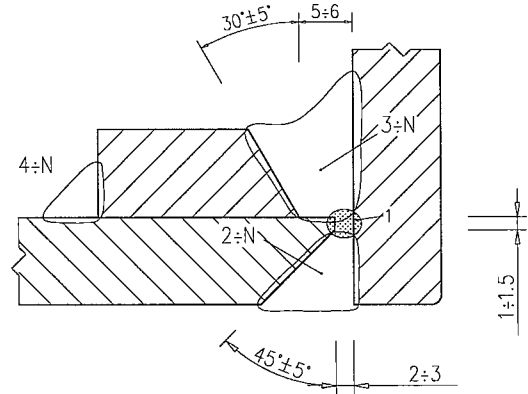
Sheet **1** of **2**  
 Foglio **1** di **2**

WELDING PROCESS: **GTAW+SMAW**  
 Procedimento di saldatura:

TYPE: **MANUAL**  
 Tipo:

**JOINTS (QW402) Giunti**  
 JOINT DESIGN SEE SKETCH  
 Disegno giunto  
 BACKING YES  NOT   
 Sostegno si no FOR GTAW  
 BACK. MAT WELD METAL FOR SMAW ONLY  
 Mat. Sostegno  
 METAL  NON FUSING METAL  
 Metallo Metallo non fusibile  
 NONMETALLIC  OTHER  
 Non metallico Altro

**DETAILS Dettagli**



QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**  
 P No. 1 Group No. 1 or 2  
 to  
 P No. 1 Group No. 1 or 2  
 Or  
 Spec. \_\_\_\_\_ Spec. \_\_\_\_\_  
 Or  
 Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
 Gamma spessori  
 BASE MATERIAL 15÷22 mm  
 Materiale base  
 PIPE DIA. RANGE : 21.3÷219.1 mm  
 Gamma diametro tubi  
 OTHER NONE  
 Altro  
 QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
 PROCESS GTAW SMAW SAW FCAW  
 Processo  
 SFA 5.18 5.1  
 AWS ER70S6 E7018.1  
 F No. 6 4  
 A No. 1 1  
 Size O.D. 2.4 mm 3.25-4-5mm  
 Diametro  
 THK Range MAX 6 mm MAX 58 mm  
 Gamma Spessori  
 ELECTRODE-FLUX (Class) N.A.  
 Filo-flusso (Classificazione)  
 FLUX TRADE NAME N.A.  
 Marca commerciale flusso  
 CONSUMABLE INSERT N.A.  
 Inserto fusibile  
 OTHER GTAW: SOLID WIRE OERLIKON CARBOROD 1  
 Altro SMAW: ETC PH35S  
 THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
 GTAW :QW404.22,33,50 NO; QW404.14 YES  
 SAW :QW404.10,24,27,36 N.A.  
 SMAW :QW404.7 NO  
 FCAW/GMAW :QW404.24,27,32 N.A.

**POSITION (QW405) Posizione**  
 POSITION OF GROOVE FLAT  
 Posizione cianfrino  
 WELDING PROGRESSION N.A.  
 Progressione di saldatura  
 POSITION OF FILLET HORIZONTAL  
 Posizione saldatura angolo  
 QW405.3 : N.A.

SIGNATURE / DATE  
 Firma / Data  
 C.I. CIVIDAC S.p.A.  
 Q.C. MORI MEMO  
 Rev. 0

SIGNATURE / DATE  
 Firma / Data  
 Rev. 1



**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.08  
 Spec. N° REV. 0  
 DATE 30.03.2010  
 Data  
 PQR No. 2507  
 Qual. No.

WELDING PROCESS: GTAW+SMAW TYPE: MANUAL  
*Procedimento di saldatura:* Tipo:

<b>PREHEAT (QW406)</b> <i>Preriscaldamento</i>	<b>POSTWELD HEAT TREATMENT (QW 407)</b> <i>Trattamento termico dopo saldatura</i>
PREHEAT TEMP. MIN. °C 15 <i>Temp. di preriscaldamento min. °C</i>	HOLDING TEMP. RANGE °C N.A. <i>Temperatura di permanenza</i>
INTERPASS TEMP. MAX. °C 180 <i>Temp. interpass max. °C</i>	HOLDING TIME RANGE N.A. <i>Tempo di permanenza</i>
PREHEAT MAINTENACE N.A. <i>Mantenimento del preriscaldamento</i>	HEATING/COOLING RATE N.A. <i>Velocità di riscaldamento/Raffreddamento</i>

**GAS (QW408) Gas**

	<b>GAS (ES)</b>	<b>%</b>	<b>FLOW RATE Portata</b>
SHIELDING <i>Protezione torcia</i>	AWS SFA 5.32 SG-A	ARGON PURITY 99.997	10 – 12 Lit. / 1'
TRAILING <i>Protezione</i>	N.A.		
BACKING <i>Supporto</i>	N.A.		

**ELECTRICAL CHARACTERISTICS (QW 409) Caratteristiche elettriche**

TUNGSTEN ELECTRODE TYPE AWS SFA 5.12 EWTh-2 SIZE 2.4 mm  
*Elettrodo al tungsteno tipo Dimensione*

MODE OF METAL TRANSFER FOR GMAW / FCAW : SPRAY ARC  SHORT ARC  GLOBULAR ARC   
*Modo di fusione del metallo d'apporto*

ELECTRODE WIRE SPEED RANGE mm/1' N.A.  
*Gamma velocità del filo*

**TECHNIQUE (QW410) Tecnica operativa**

STRING BEAD  WEAVE BEAD  ORIFICE OR GAS CUP SIZE: 3/8" OSCILLATION NONE  
*Passata stretta Passata oscillata Dim. orif. o portagas Oscillazione*

METHOD OF BACK GOUGING GRINDING / ARC AIR MULTIPLE ELECTRODES   
*Metodo di ripresa Elettrodi multipli*

INITIAL AND INTERPASS CLEANING GRINDING AND/OR BRUSHING SINGLE ELECTRODE   
*Pulizia iniziale e tra le passate Elettrodo singolo*

MULTI – PASS  FOR SMAW SINGLE – PASS  FOR GTAW CONTACT TUBE TO WORK DISTANCE: N.A.  
*Passate multiple Passate singole Distanza guidafile al pezzo*

PEENING NONE OTHER: GTAW PULSED QW409.3: NO QW410.11,15,64: NO  
*Martellatura Altro*

Layers <i>Passate</i>	Process <i>Proced.</i>	Class Materiali <i>D'apporto</i>	Dia. Dia. mm	Polarity Polarità	Curr. Curr.	Amper Range Amper	Volt Range Volt	Travel Speed mm / 1'	Heat input Apporto termico J / mm
1 <sup>ST</sup>	GTAW	ER70S6	2.4	STRAIGHT	DC	90-100	14-15	90-100	756-1000
2+N	SMAW	E7018.1	3.25	REVERSE	DC	120+140	25+26	160+170	1059+1365
2+N	SMAW	E7018.1	4	REVERSE	DC	170+180	26+27	180+190	1396+1620
2+N	SMAW	E7018.1	5	REVERSE	DC	190+200	27+28	200+210	1466+1680
3+N; 4+N	SMAW	E7018.1	4	REVERSE	DC	170+180	26+27	180+190	1396+1620
3+N; 4+N	SMAW	E7018.1	5	REVERSE	DC	190+200	27+28	200+210	1466+1680



**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

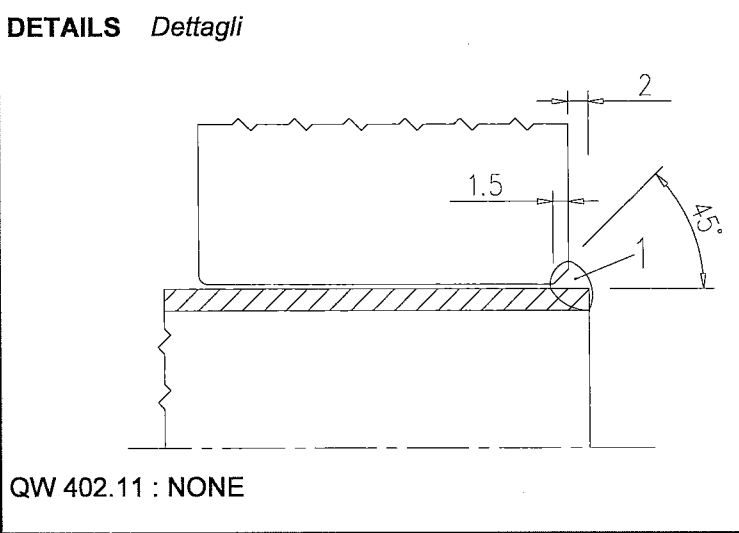
WPS No. **0005.09**  
Spec. N° **REV. 0**  
DATE **30.03.2010**  
Data  
PQR No. **1032**  
Qual. No.

**WELDING PROCESS:** GTAW  
Procedimento di saldatura:

**TYPE:** AUTOMATIC  
Tipo:

**Sheet** 1 **of** 2  
**Foglio** di

**JOINTS (QW402) Giunti**  
JOINT DESIGN SEE SKETCH  
Disegno giunto  
BACKING YES  NOT   
Sostegno si no  
BACK. MAT BASE METAL  
Mat. Sostegno  
 METAL Metallo  NON FUSING METAL Metallo non fusibile  
 NONMETALLIC Non metallico  OTHER Altro



**BASE METALS (QW403) Materiali base**  
P No. 1 Group No. 1  
to  
P No. 1 Group No. 2  
Or  
Spec.                      Spec.                       
Or  
Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
Gamma spessori  
BASE MATERIAL 2.11 / 80 mm  
Materiale base  
PIPE DIA. RANGE : 15.87 mm  
Gamma diametro tubi  
OTHER NONE  
Altro  
QW 403.13 N.A.  
QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
PROCESS GTAW SMAW SAW FCAW  
Processo  
SFA 5.18  
AWS ER 70 S6  
F No. 1  
A No. 6  
Size O.D. 0.8  
Diametro  
THK Range                       
Gamma Spessori  
ELECTRODE-FLUX (Class)                      N.A.  
Filo-flusso (Classificazione)  
FLUX TRADE NAME                      N.A.  
Marca commerciale flusso  
CONSUMABLE INSERT                      N.A.  
Inserito fusibile  
OTHER ETC SG2  
Altro

**POSITION (QW405) Posizione**  
POSITION OF GROOVE TUBESHEET VERTICAL  
Posizione cianfrino  
WELDING PROGRESSION N.A.  
Progressione di saldatura  
POSITION OF FILLET N.A.  
Posizione saldatura angolo  
QW405.3 : N.A.

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
GTAW :QW404.22,33,50 NO; QW404.14 YES  
SAW :QW404.10,24,27,36 N.A.  
SMAW :QW404.7 N.A.  
FCAW/GMAW :QW404.24,27,32 N.A.

SIGNATURE / DATE  
Firma / Data  
C.I. CIVIDAC S.p.A.  
G.S. MEMO  
Rev. 0

SIGNATURE / DATE  
Firma / Data  
Rev. 1







**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

WPS No. **0005.10**  
Spec. N° **REV. 0**  
DATE **30.03.2010**  
Data  
PQR No. **2507**  
Qual. No.

Sheet **1** of **2**  
Foglio **di**

WELDING PROCESS: **SMAW**  
Procedimento di saldatura:

TYPE: **MANUAL**  
Tipo:

**JOINTS (QW402) Giunti**

JOINT DESIGN SEE SKETCH

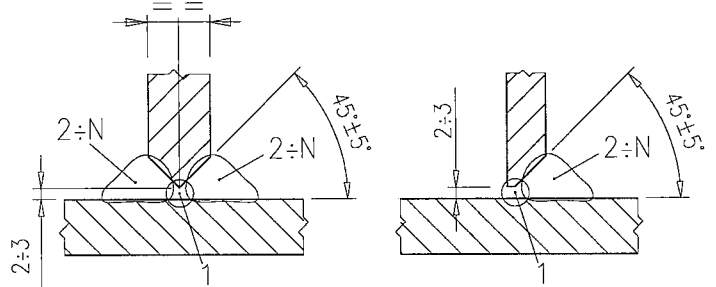
Disegno giunto

BACKING YES  NOT   
Sostegno *si* *no*

BACK. MAT NONE  
Mat. Sostegno

- METAL  NON FUSING METAL  
*Metallo* *Metallo non fusibile*
- NONMETALLIC  OTHER  
*Non metallico* *Altro*

**DETAILS Dettagli**



QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**

P No. 1 Group No. 2  
to  
P No. 1 Group No. 2  
Or  
Spec. \_\_\_\_\_ Spec. \_\_\_\_\_  
Or  
Chem. An. N.A. Chem. An. N.A.

**THICKNESS RANGE :**  
Gamma spessori

BASE MATERIAL 5÷30 mm  
Materiale base

PIPE DIA. RANGE : N.A.  
Gamma diametro tubi

OTHER NONE  
Altro

QW 403.13 N.A.  
QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**

PROCESS GTAW SMAW SAW FCAW  
Processo

SFA 5.1  
AWS E7018.1  
F No. 4  
A No. 1  
Size O.D. 3.25-4-5mm  
Diametro

THK Range MAX 58 mm  
Gamma Spessori

ELECTRODE-FLUX (Class) N.A.  
Filo-flusso (Classificazione)

FLUX TRADE NAME N.A.  
Marca commerciale flusso

CONSUMABLE INSERT N.A.  
Inserto fusibile

OTHER SMAW: ETC PH35S  
Altro

**POSITION (QW405) Posizione**

POSITION OF GROOVE FLAT  
Posizione cianfrino

WELDING PROGRESSION N.A.  
Progressione di saldatura

POSITION OF FILLET HORIZONTAL  
Posizione saldatura angolo

QW405.3 : N.A

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)

GTAW : QW404.22,33,50 N.A.; QW404.14 N.A.  
SAW : QW404.10,24,27,36 N.A.  
SMAW : QW404.7 NO  
FCAW/GMAW : QW404.24,27,32 N.A.

SIGNATURE / DATE  
Firma / Data

*[Signature]*  
C.I. CIVIDAC S.p.A.  
C.I. MGR. P. MEMO

Rev. 0

SIGNATURE / DATE  
Firma / Data

Rev. 1





**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.11  
Spec. N°. REV. 0  
DATE 30.03.2010  
Data  
PQR No. 2507  
Qual. No.

WELDING PROCESS: SMAW TYPE: MANUAL  
Procedimento di saldatura: Tip: Sheet 1 of 2  
Foglio di

**JOINTS (QW402) Giunti**  
JOINT DESIGN SEE SKETCH  
Disegno giunto  
BACKING YES  NOT   
Sostegno si no  
BACK. MAT BASE METAL  
Mat. Sostegno  
 METAL Metallo  
 NON FUSING METAL Metallo non fusibile  
 NONMETALLIC Non metallico  
 OTHER Altro

**DETAILS Dettagli**  
  
QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**  
P No. 1 Group No. 2  
to  
P No. 1 Group No. 2  
Or  
Spec. Spec.  
Or  
Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
Gamma spessori  
BASE MATERIAL 5+30 mm  
Materiale base  
PIPE DIA. RANGE : N.A.  
Gamma diametro tubi  
OTHER NONE  
Altro  
QW 403.13 N.A.  
QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
PROCESS GTAW SMAW SAW FCAW  
Processo  
SFA 5.1  
AWS E7018.1  
F No. 4  
A No. 1  
Size O.D. 3.25-4-5mm  
Diametro  
THK Range MAX 58 mm  
Gamma Spessori  
ELECTRODE-FLUX (Class) N.A.  
Filo-flusso (Classificazione)  
FLUX TRADE NAME N.A.  
Marca commerciale flusso  
CONSUMABLE INSERT N.A.  
Inserto fusibile  
OTHER SMAW: ETC PH35S  
Altro

**POSITION (QW405) Posizione**  
POSITION OF GROOVE N.A.  
Posizione cianfrino  
WELDING PROGRESSION N.A.  
Progressione di saldatura  
POSITION OF FILLET HORIZONTAL  
Posizione saldatura angolo  
QW405.3 : N.A.

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
GTAW :QW404.22,33,50 N.A.; QW404.14 N.A.  
SAW :QW404.10,24,27,36 N.A.  
SMAW :QW404.7 NO  
FCAW/GMAW :QW404.24,27,32 N.A.

SIGNATURE / DATE Firma / Data  
C.I. CIVIDAC S.p.A.  
Q.C. ING. P. MEMO  
Rev. 0  
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Rev. 1





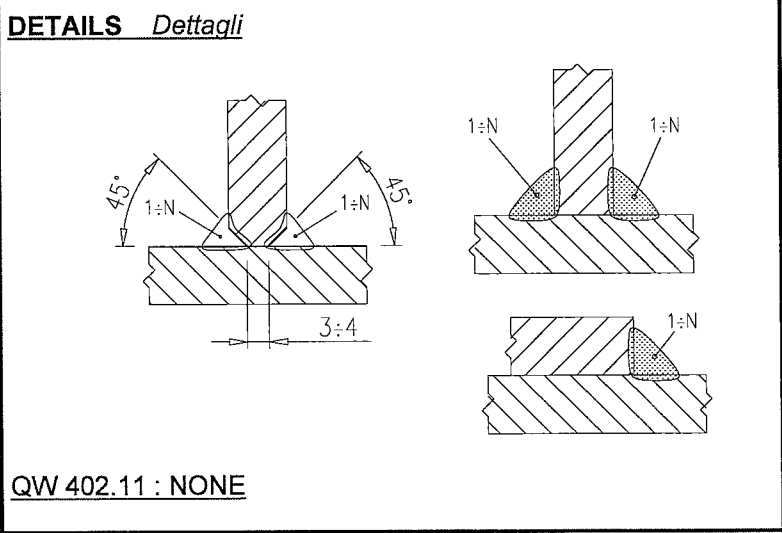
**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. **0005.12**  
 Spec. N° **REV. 0**  
 DATE **30.03.2010**  
 Data  
 PQR No. **3018**  
 Qual. No.

WELDING PROCESS: **GMAW** TYPE: **SEMI-AUTOMATIC** Sheet **1** of **2**  
*Procedimento di saldatura:* Tipo: Foglio **1** di **2**

**JOINTS (QW402) Giunti**  
 JOINT DESIGN SEE SKETCH  
*Disegno giunto*  
 BACKING YES  NOT   
*Sostegno Si no*  
 BACK. MAT BASE METAL  
*Mat. Sostegno*  
 METAL  NON FUSING METAL  
*Metallo Metallo non fusibile*  
 NONMETALLIC  OTHER  
*Non metallico Altro*



**BASE METALS (QW403) Materiali base**  
 P No. 1 Group No. 2  
 to  
 P No. 1 Group No. 2  
 Or  
 Spec. \_\_\_\_\_ Spec. \_\_\_\_\_  
 Or  
 Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
*Gamma spessori*  
 BASE MATERIAL 5+30 mm  
*Materiale base*  
 PIPE DIA. RANGE : N.A.  
*Gamma diametro tubi*  
 OTHER NONE  
*Altro*  
 QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
 PROCESS GTAW SMAW SAW GMAW  
*Processo*  
 SFA \_\_\_\_\_  
 AWS \_\_\_\_\_  
 F No. \_\_\_\_\_  
 A No. \_\_\_\_\_  
 Size O.D. \_\_\_\_\_  
*Diametro*  
 THK Range \_\_\_\_\_  
*Gamma Spessori*  
 ELECTRODE-FLUX (Class) \_\_\_\_\_  
*Filo-flusso (Classificazione)*  
 FLUX TRADE NAME \_\_\_\_\_  
*Marca commerciale flusso*  
 CONSUMABLE INSERT \_\_\_\_\_  
*Inserito fusibile*  
 OTHER GMAW: SOLID WIRE SAF-FRO FILCORD C  
*Altro*

**POSITION (QW405) Posizione**  
 POSITION OF GROOVE N.A.  
*Posizione cianfrino*  
 WELDING PROGRESSION N.A.  
*Progressione di saldatura*  
 POSITION OF FILLET HORIZONTAL  
*Posizione saldatura angolo*  
 QW405.3 : N.A

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
 GTAW : QW404.22,33,50 N.A.; QW404.14 N.A.  
 SAW : QW404.10,24,27,36 N.A.  
 SMAW : QW404.7 N.A.  
 FCAW/GMAW : QW404.24,27,32 NO

SIGNATURE / DATE \_\_\_\_\_  
*Firma / Data*  
 C.I. CIVIDAC S.p.A.  
 Q.C. MGR P. MEMO  
 Rev. 0

SIGNATURE / DATE \_\_\_\_\_  
*Firma / Data*  
 Rev. 1





**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

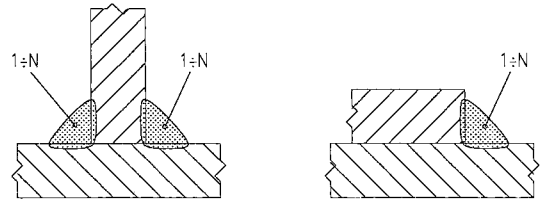
WPS No. 0005.13  
Spec. N°. REV. 0  
DATE 30.03.2010  
Data  
PQR No. 6053  
Qual. No.

Sheet 1 of 2  
Foglio di

WELDING PROCESS: GTAW  
Procedimento di saldatura:

TYPE: MANUAL  
Tipo:

**JOINTS (QW402) Giunti**  
JOINT DESIGN SEE SKETCH  
Disegno giunto  
BACKING YES  NOT   
Sostegno si no  
BACK. MAT BASE METAL  
Mat. Sostegno  
 METAL Metallo  NON FUSING METAL Metallo non fusibile  
 NONMETALLIC Non metallico  OTHER Altro

**DETAILS Dettagli**  
  
QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**  
P No. 8 Group No. 1  
to P No. 1 Group No. 2  
Or Spec. Spec.  
Or Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
Gamma spessori  
BASE MATERIAL 2 mm  
Materiale base  
PIPE DIA. RANGE : N.A.  
Gamma diametro tubi  
OTHER NONE  
Altro  
QW 403.13 N.A.  
QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**  
PROCESS GTAW SMAW SAW FCAW  
Processo  
SFA 5.9  
AWS ER309MoL  
F No. 6  
A No. 8  
Size O.D. 2.4 mm  
Diametro  
THK Range MAX 6 mm  
Gamma Spessori  
ELECTRODE-FLUX (Class) N.A.  
Filo-flusso (Classificazione)  
FLUX TRADE NAME N.A.  
Marca commerciale flusso  
CONSUMABLE INSERT N.A.  
Inserto fusibile  
OTHER GTAW: AVESTA 309 MoL  
Altro

**POSITION (QW405) Posizione**  
POSITION OF GROOVE N.A.  
Posizione cianfrino  
WELDING PROGRESSION N.A.  
Progressione di saldatura  
POSITION OF FILLET HORIZONTAL  
Posizione saldatura angolo  
QW405.3 : N.A.

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)  
GTAW :QW404.22,33,50 NO; QW404.14 YES  
SAW :QW404.10,24,27,36 N.A.  
SMAW :QW404.7 N.A.  
FCAW/GMAW :QW404.24,27,32 N.A.

SIGNATURE / DATE  
Firma / Data  
C.I. CIVIDAC S.p.A.  
O.C. MONT. R. MEMO  
Rev. 0

SIGNATURE / DATE  
Firma / Data  
Rev. 1







**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.14  
 Spec. N°. REV. 0  
 DATE 30.03.2010  
 Data  
 PQR No. 3023  
 Qual. No.

WELDING PROCESS: GTAW      TYPE: MANUAL  
*Procedimento di saldatura:*      *Tipo:*

Sheet 1 of 2  
*Foglio di*

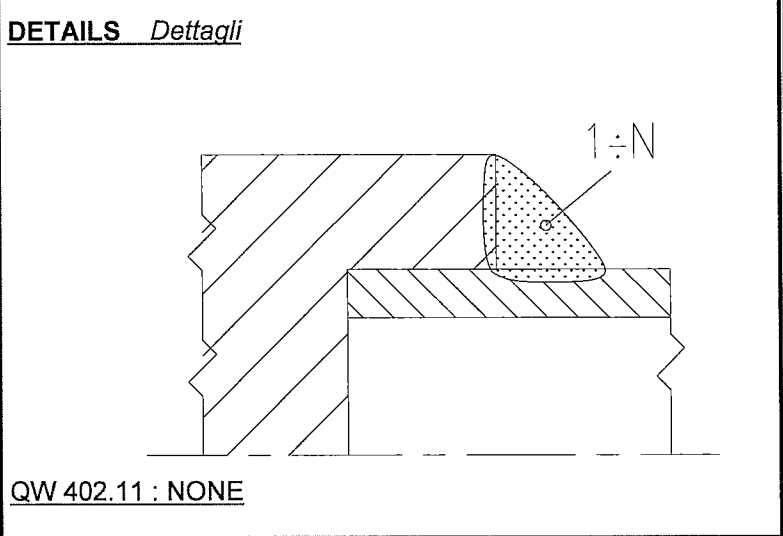
**JOINTS (QW402) Giunti**  
 JOINT DESIGN SEE SKETCH  
*Disegno giunto*

BACKING YES  NOT   
*Sostegno si no*

BACK. MAT BASE METAL  
*Mat. Sostegno*

METAL  NON FUSING METAL  
*Metallo Metallo non fusibile*

NONMETALLIC  OTHER  
*Non metallico Altro*



**BASE METALS (QW403) Materiali base**

P No. 1 Group No. 1 or 2  
 to  
 P No. 1 Group No. 1 or 2  
 Or  
 Spec. \_\_\_\_\_ Spec. \_\_\_\_\_  
 Or  
 Chem. An. N.A. Chem. An. N.A.

**THICKNESS RANGE :**  
*Gamma spessori*

BASE MATERIAL 2.77 mm  
*Materiale base*

PIPE DIA. RANGE : 21.3 mm  
*Gamma diametro tubi*

OTHER NONE  
*Altro*

QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**

PROCESS GTAW SMAW SAW FCAW  
*Processo*

SFA 5.18  
 AWS ER70S6  
 F No. 6  
 A No. 1  
 Size O.D. 2.4 mm  
*Diametro*

THK Range MAX 7.82 mm  
*Gamma Spessori*

ELECTRODE-FLUX (Class) N.A.  
*Filo-flusso (Classificazione)*

FLUX TRADE NAME N.A.  
*Marca commerciale flusso*

CONSUMABLE INSERT N.A.  
*Inserito fusibile*

OTHER SOLID WIRE OERLIKON CARBOROD 1  
*Altro*

**POSITION (QW405) Posizione**

POSITION OF GROOVE FLAT  
*Posizione cianfrino*

WELDING PROGRESSION N.A.  
*Progressione di saldatura*

POSITION OF FILLET HORIZONTAL  
*Posizione saldatura angolo*

QW405.3 : N.A

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)

GTAW : QW404.22,33,50 NO; QW404.14 YES  
 SAW : QW404.10,24,27,36 N.A.  
 SMAW : QW404.7 N.A.  
 FCAW/GMAW : QW404.24,27,32 N.A.

SIGNATURE / DATE  
*Firma / Data*

*G.I. CIVIDAC S.p.A.*  
*G.C. ING. FLUMINO*

Rev. 0

SIGNATURE / DATE  
*Firma / Data*

Rev. 1





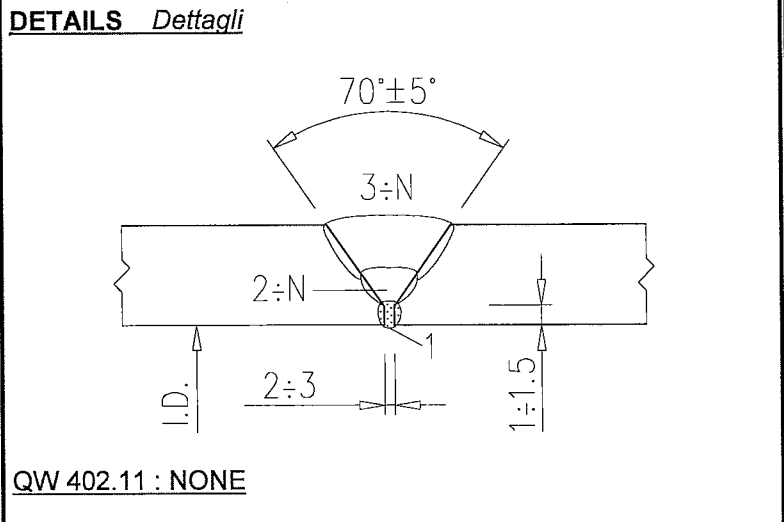
**WELDING PROCEDURE SPECIFICATION**  
*SPECIFICA PROCEDIMENTO DI SALDATURA*

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.15  
 Spec. N°. REV. 0  
 DATE 30.03.2010  
 Data  
 PQR No. 2507  
 Qual. No. 2508

WELDING PROCESS: GTAW + SMAW + SAW TYPE: MANUAL + MACHINE  
 Procedimento di saldatura: Tipo: MACHINE  
 Sheet 1 of 2  
 Foglio di

**JOINTS (QW402) Giunti**  
 JOINT DESIGN SEE SKETCH  
 Disegno giunto  
 BACKING YES  NOT   
 Sostegno si no FOR GTAW  
 BACK. MAT WELD METAL FOR SMAW/SAW  
 Mat. Sostegno  
 METAL Metallo  NON FUSING METAL Metallo non fusibile  
 NONMETALLIC Non metallico  OTHER Altro



**BASE METALS (QW403) Materiali base**  
 P No. 1 Group No. 2  
 to P No. 1 Group No. 2  
 Or  
 Spec. Spec.  
 Or  
 Chem. An. N.A. Chem. An. N.A.  
**THICKNESS RANGE :**  
 Gamma spessori  
 BASE MATERIAL 10÷12.7 mm  
 Materiale base  
 PIPE DIA. RANGE : 630 and plate.  
 Gamma diametro tubi  
 OTHER NONE  
 Altro  
 QW 403.13 N.A.  
 QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**

PROCESS	GTAW	SMAW	SAW	FCAW
Processo				
SFA	5.18	5.1	5.17M	
AWS	ER70S6	E7018.1	EM 12 K	
F No.	6	4	6	
A No.	1	1	1	
Size O.D.	2.4 mm	3.25-4mm	3.2 mm	
Diametro				
THK Range	MAX 6 mm	MAX 58 mm	MAX 64 mm	
Gamma spessori				
ELECTRODE-FLUX (Class)	F7A6-EM 12K			
Filo-flusso (Classificazione)				
FLUX TRADE NAME	LINCOLN 8500			
Marca commerciale flusso				
CONSUMABLE INSERT	N.A.			
Inserto fusibile				
OTHER	GTAW: SOLID WIRE CARBOROD 1 - SMAW: ETC PH35S			
Altro	SAW: WIRE LINCOLN L61 - NEUTRAL FLUX			
THK OF PASSES NO GREATER THAN 13 mm (QW403.9)				
GTAW	:QW404.22,33,50 NO; QW404.14 YES			
SAW	:QW404.10,24,27,36 NO			
SMAW	:QW404.7 NO			
FCAW/GMAW	:QW404.24,27,32 N.A.			

**POSITION (QW405) Posizione**  
 POSITION OF GROOVE FLAT  
 Posizione cianfrino  
 WELDING PROGRESSION N.A.  
 Progressione di saldatura  
 POSITION OF FILLET N.A.  
 Posizione saldatura angolo  
 QW405.3 : N.A

SIGNATURE / DATE  
 Firma / Data  
 C.I. CIVIDAC S.p.A.  
 O.S. MGR. P. MEMO  
 Rev. 0

SIGNATURE / DATE  
 Firma / Data  
 Rev. 1



**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.15  
Spec. N°. REV. 0  
DATE 30.03.2010  
Data  
PQR No. 2507  
Qual. No. 2508

Sheet 2 of 2  
Foglio di

WELDING PROCESS: GTAW + SMAW + SAW  
Procedimento di saldatura:

TYPE: MANUAL + MACHINE  
Tipo:

**PREHEAT (QW406)**  
Preriscaldamento  
PREHEAT TEMP. MIN. °C 15  
Temp. di preriscaldamento min. °C  
INTERPASS TEMP. MAX. °C 180  
Temp. interpass max. °C  
PREHEAT MAINTENANCE N.A.  
Mantenimento del preriscaldamento

**POSTWELD HEAT TREATMENT (QW 407)**  
Trattamento termico dopo saldatura  
HOLDING TEMP. RANGE °C N.A.  
Temperatura di permanenza  
HOLDING TIME RANGE N.A.  
Tempo di permanenza  
HEATING/COOLING RATE N.A.  
Velocità di riscaldamento/Raffreddamento

**GAS (QW408) Gas**

	GAS (ES)	%	FLOW RATE Portata
SHIELDING Protezione torcia	AWS SFA 5.32 SG-A	ARGON PURITY 99.997	10 - 12 Lit. / 1'
TRAILING Protezione	N.A.		
BACKING Supporto	N.A.		

**ELECTRICAL CHARACTERISTICS (QW 409) Caratteristiche elettriche**

TUNGSTEN ELECTRODE TYPE AWS SFA 5.12 EWTh-2 SIZE 2.4 mm  
Elettrodo al tungsteno tipo Dimensione

MODE OF METAL TRANSFER FOR GMAW / FCAW : SPRAY ARC  SHORT ARC  GLOBULAR ARC   
Modo di fusione del metallo d'apporto

ELECTRODE WIRE SPEED RANGE mm/1' N.A.  
Gamma velocità del filo

**TECHNIQUE (QW410) Tecnica operativa**

STRING BEAD  WEAVE BEAD  ORIFICE OR GAS CUP SIZE: 3/8" OSCILLATION NONE  
Passata stretta Passata oscillata Dim. orif. o portagás Oscillazione

METHOD OF BACK GOUGING N.A. MULTIPLE ELECTRODES   
Metodo di ripresa Elettrodi multipli

INITIAL AND INTERPASS CLEANING GRINDING AND/OR BRUSHING SINGLE ELECTRODE   
Pulizia iniziale e tra le passate Elettrodo singolo

MULTI - PASS  FOR SMAW-SAW SINGLE - PASS  FOR GTAW CONTACT TUBE TO WORK DISTANCE: 15-20 mm  
Passate multiple Passate singole Distanza guidafile al pezzo

PEENING NONE OTHER: GTAW PULSED QW409.3: NO QW410.11,15,64: NO  
Martellatura Altro

Layers Passate	Process Proced.	Class Materiali D'apporto	Dia. Dia. mm	Polarity Polarità	Curr. Curr.	Amper Range Amper	Volt Range Volt	Travel Speed mm / 1'	Heat input Apporto termico J / mm
1 <sup>ST</sup>	GTAW	ER70S6	2.4	STRAIGHT	DC	90÷100	14÷15	80÷90	840÷1125
2-N	SMAW	E7018.1	3.25	REVERSE	DC	120÷140	25÷26	160÷170	1059÷1365
2-N	SMAW	E7018.1	4	REVERSE	DC	170÷180	26÷27	180÷190	1396÷1620
3-N	SAW	EM12K	4	REVERSE	DC	480-530	27-28	500-520	1495÷1781



**WELDING PROCEDURE SPECIFICATION**  
SPECIFICA PROCEDIMENTO DI SALDATURA

According to ASME Code Section IX (QW-200.1)

WPS No. 0005.16  
Spec. N° REV. 0

DATE 30.03.2010  
Data

PQR No. 2507  
Qual. No.

Sheet 1 of 2  
Foglio di

WELDING PROCESS: SMAW  
Procedimento di saldatura:

TYPE: MANUAL  
Tipo:

**JOINTS (QW402) Giunti**

JOINT DESIGN SEE SKETCH

Disegno giunto

BACKING YES  NOT   
Sostegno Si no

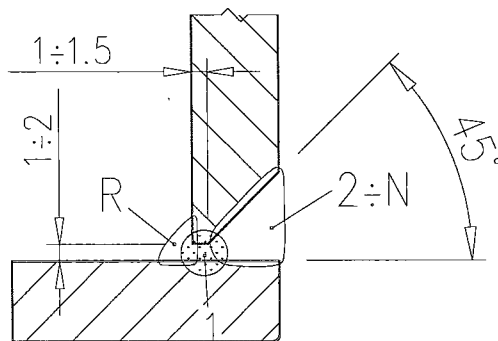
BACK. MAT NONE

Mat. Sostegno

METAL  NON FUSING METAL  
Metallo Metallo non fusibile

NONMETALLIC  OTHER  
Non metallico Altro

**DETAILS Dettagli**



QW 402.11 : NONE

**BASE METALS (QW403) Materiali base**

P No. 1 Group No. 1 or 2

P No. 1 Group No. 1 or 2

Or Spec. Spec.

Chem. An. N.A. Chem. An. N.A.

**THICKNESS RANGE :**

Gamma spessori

BASE MATERIAL 12.7 mm

Materiale base

PIPE DIA. RANGE : 323.8 mm

Gamma diametro tubi

OTHER NONE

Altro

QW 403.13 N.A.

QW 403.10 N.A. for FCAW only

**FILLER METAL (QW404) Materiale D'apporto**

PROCESS GTAW SMAW SAW FCAW

Processo

SFA 5.1

AWS E7018.1

F No. 4

A No. 1

Size O.D. 3.25-4-5mm

Diametro

THK Range MAX 58 mm

Gamma Spessori

ELECTRODE-FLUX (Class) N.A.

Filo-flusso (Classificazione)

FLUX TRADE NAME N.A.

Marca commerciale flusso

CONSUMABLE INSERT N.A.

Inserto fusibile

OTHER SMAW: ETC PH35S

Altro

**POSITION (QW405) Posizione**

POSITION OF GROOVE FLAT

Posizione cianfrino

WELDING PROGRESSION N.A.

Progressione di saldatura

POSITION OF FILLET HORIZONTAL

Posizione saldatura angolo

QW405.3 : N.A

THK OF PASSES NO GREATER THAN 13 mm (QW403.9)

GTAW :QW404.22,33,50 N.A.; QW404.14 N.A.

SAW :QW404.10,24,27,36 N.A.

SMAW :QW404.7 NO

FCAW/GMAW :QW404.24,27,32 N.A.

SIGNATURE / DATE

Firma / Data

*C.I. CIVIDAC S.p.A.*  
*Q.C. MGR. A. MAMO*

Rev. 0

SIGNATURE / DATE

Firma / Data

Rev. 1



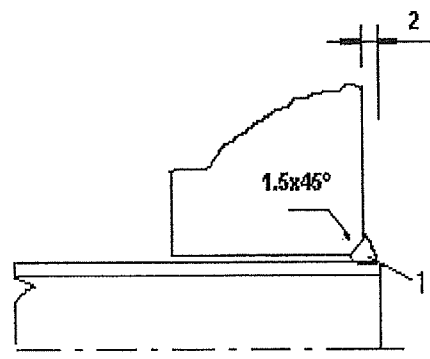
**QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)**

(See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)

Record Actual Conditions Used to Weld Test Coupon.

Company Name <b>C.I. CIVIDAC S.P.A.</b>	Date <b>07/05/2004</b>
Procedure Qualification Record No. <b>1032</b>	
WPS No. <b>1032/1</b>	
Welding Process (es) <b>GTAW</b>	
Types (Manual, Automatic, Semi-Auto.) <b>AUTOMATIC</b>	

**JOINTS (QW-402)**



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

<p><b>BASE METALS (QW-403)</b></p> <p>Material Spec. <b>SA 516 + SA 210</b></p> <p>Type or Grade <b>70 + A1</b></p> <p>P-No. <b>1</b> to P-No. <b>1</b></p> <p>Thickness of test Coupon <b>PLATE 20 / TUBE 2.11 mm</b></p> <p>Diameter of Test Coupon <b>TUBE Ø15.87</b></p> <p>Other _____</p>	<p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Temperature <b>NONE</b></p> <p>Time _____</p> <p>Other _____</p>																
<p><b>FILLER METALS (QW-404)</b></p> <p>SFA Specification <b>5. 18</b></p> <p>AWS Classification <b>ER 70 S6</b></p> <p>Filler Metal F-No. <b>1</b></p> <p>Weld Metal Analysis A-No. <b>6</b></p> <p>Size of Filler Metal <b>mm Ø0.8</b></p> <p>Other _____</p> <p>Weld Metal Thickness _____</p>	<p><b>GAS ( QW-408)</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Gas(es)</th> <th>Percent Composition (Mixture)</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td>ARGON 99.9%</td> <td>N.A.</td> <td>15/16 Lt/1'</td> </tr> <tr> <td>Trailing</td> <td>N.A.</td> <td>N.A.</td> <td>N.A.</td> </tr> <tr> <td>Backing</td> <td>N.A.</td> <td>N.A.</td> <td>N.A.</td> </tr> </tbody> </table> <p>PRE FLOW: 2 SEC      POST FLOW: 4 SEC</p>		Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	ARGON 99.9%	N.A.	15/16 Lt/1'	Trailing	N.A.	N.A.	N.A.	Backing	N.A.	N.A.	N.A.
	Gas(es)	Percent Composition (Mixture)	Flow Rate														
Shielding	ARGON 99.9%	N.A.	15/16 Lt/1'														
Trailing	N.A.	N.A.	N.A.														
Backing	N.A.	N.A.	N.A.														
<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <b>TUBESHEET VERTICAL</b></p> <p>Weld Progression (Uphill, Downhill) <b>N.A.</b></p> <p>Other _____</p>	<p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current <b>DC</b></p> <p>Polarity <b>STRAIGHT</b></p> <p>Amps. <b>30/180 PULSED</b> Volts <b>/</b></p> <p>Tungsten Electrode Size <b>THORIATED Ø2 mm</b></p> <p>Other <b>GAS CUP SIZE : Ø8 mm</b></p>																
<p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp. <b>15°C</b></p> <p>Interpass Temp. <b>250°C</b></p> <p>Other <b>/</b></p>	<p><b>TECHNIQUE (QW-410)</b></p> <p>Travel Speed <b>45 mm/1'</b></p> <p>String or Weave Bead <b>STRING</b></p> <p>Oscillation <b>N.A.</b></p> <p>Multipass or Single Pass (per side) <b>SINGLE</b></p> <p>Single or Multiple Electrodes <b>SINGLE</b></p> <p>Other _____</p> <p><b>Time backgr./pulse 0.26/0.22 s;</b>(TEMPO CORR. BASE/PICCO)</p> <p><b>Wire speed 170 mm/1';</b> (VEL. FILO)</p> <p><b>Slope up/down 1/6 s;</b> (TEMPO SAL./DISC. CORR)</p>																

**Tensile Test (QW-150)**

Specimen No.	mm Width	mm Thickness	mm <sup>2</sup> Area	Ultimate Total Load N/mm <sup>2</sup>	Ultimate Unit Stress N/mm <sup>2</sup>	Type of Failure & Location
1032	Ø15.87	2.11	91.2	40250	441.3	BM, DUCTILE

**Guided-Bend Tests (QW-160)**

Type and Figure No.	Result

**Toughness Tests (QW-170)**

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break

**Fillet-Weld Test (QW-180)**

Result – Satisfactory: Yes N.A. No N.A. Penetration into Parent Metal: Yes N.A. No N.A.

Macro- Results NA

**Other Tests**

Type of Test VISUAL, N°2 TEAR TEST, RADIOGRAPHY, PT AND MACRO: RESULT SATISFACTORY

Deposit Analysis HARDNESS TEST HV10 : WM: (208/212); -(SIDE A516 70): HAZ(211/216); BM(150/153);

Other -(SIDE A213 A1): HAZ(201/208); BM(151/155);

**- WELD THROATS "a" > 0.9 t : SATISFACTORY.**

Welder's Name TREVISIOL GIUSEPPE Clock No. / Stamp No. 4S  
 Tests conducted by: Q.C.Mgr of C.I. CIVIDAC SPA and SGS Laboratory Test No. 8794 I.T.I. ASTORI

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 Section IX of the ASME Code.



Manufacturer

C.I. CIVIDAC S.p.A.  
MGR. P. MEMO

Date 07/05/2004

By

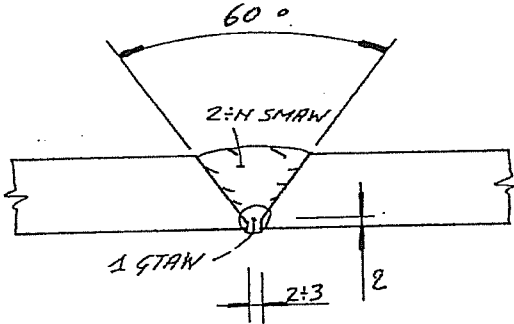
(Detail of record of tests are illustrative only and may be required to conform to the type and number of tests required by the Code.)



**QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)**  
 (See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)  
 Record Actual Conditions Used to Weld Test Coupon.

Company Name P. L. CIVIDAC  
 Procedure Qualification Record No. 2507 Date 02-11-1995  
 WPS No. 2507/1  
 Welding Process(es) GTAW + SMAW  
 Types (Manual, Automatic, Semi-Auto.) MANUAL

**JOINTS (QW-402)**



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

**BASE METALS (QW-403)**  
 Material Spec. ASTM / ASME  
 Type or Grade A / SA 516 - 70  
 P.No. 1 to P.No. 1  
 Thickness of Test Coupon 3.2 mm  
 Diameter of Test Coupon 1  
 Other QW 403.9: Thk of passes not greater than 1.3 mm.

**POSTWELD HEAT TREATMENT (QW-407)**  
 Temperature NONE  
 Time 1  
 Other 1

	Percent Composition		
	Gas(es)	(Mixture)	Flow Rate
Shielding	<u>ARGON</u>	<u>99.9%</u>	<u>11 l/h</u>
Trailing	<u>NONE</u>	<u>1</u>	<u>1</u>
Backing	<u>NONE</u>	<u>1</u>	<u>1</u>

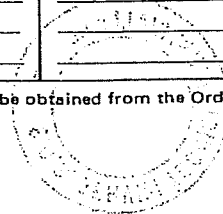
FILLER METALS (QW-404)	<u>GTAW</u>	<u>SMAW</u>
	SFA Specification	<u>5.18</u>
AWS Classification	<u>ER 70S6</u>	<u>E 7018-1</u>
Filler Metal F-No.	<u>6</u>	<u>4</u>
Weld Metal Analysis A-No.	<u>1</u>	<u>1</u>
Size of Filler Metal	<u>2.4 mm</u>	<u>3.25-4-5 mm</u>
Other	<u>QW-404.23: SOLID WIRE</u>	<u>QW-403.9: EACH LAYER ≤ 1/2"</u>
Weld Metal Thickness	<u>3 mm</u>	<u>2.9 mm</u>

**ELECTRICAL CHARACTERISTICS (QW-409)**  
 Current D.C.  
 Polarity (GTAW) STRAIGHT - SMAW (REVERSE)  
 Amps (GTAW) 100 - (SMAW) 120/200 Volts 1  
 Tungsten Electrode Size φ 2.38 mm - 2% THORIATED  
 Other 1

**POSITION (QW-405)**  
 Position of Groove 1G  
 Weld Progression (Uphill, Downhill) 1  
 Other 1

**TECHNIQUE (QW-410)**  
 Travel Speed 1  
 String or Weave Bead STRING  
 Oscillation 1  
 Multipass or Single Pass (per side) (GTAW) SINGLE - (SMAW) MULTIPLE  
 Single or Multiple Electrodes SINGLE  
 Other 1

**PREHEAT (QW-406)**  
 Preheat Temp. 30 °C  
 Interpass Temp. 130 °C  
 Other 1



Tensile Test (QW-150)

Specimen No.	mm Width	mm Thickness	mm <sup>2</sup> Area	Ultimate Total Load N	Ultimate Unit Stress N/mm <sup>2</sup>	Type of Failure & Location
2507.1	19.0	28.2	535.8	304.000	561.7	DUCTILE, OUT WELD
2507.2	18.5	28.8	532.8	304.000	570.6	
ALL WELD METAL	φ 10 mm - L <sub>0</sub> 50 mm		78.5	45.500	579.6	/
	YIELD STR. 74000 N - 509.5 N/mm <sup>2</sup> ; ELONG. 63.3 mm - 26.6 %.					/

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
- N° 4 SPECIMENS, SIDE BEND, QW-462.2	SATISFACTORY.

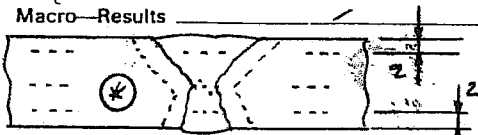
Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values J	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No-Break
1- ON THE WELD	CENTRE LINE	KV	-46°C	161-161	123			
2- CROSSING THE FUSION LINE SYMMETRICALLY		u	u	28-43	80			
3-	+2 mm	u	u	40-75	79			
4-	+5 mm	u	u	93-84	103			

Fillet-Weld Test (QW-180)

Result — Satisfactory: Yes  No  Penetration into Parent Metal: Yes  No

Macro-Results



Other Tests

(\*) Type of Test HARDNESS TEST (HV 10): B.M. (170<sup>2</sup>/176<sup>6</sup>) - H.A.Z. (218<sup>3</sup>/226<sup>7</sup>) - W.M. (206/216).

Deposit Analysis N.D. EXAMINATION: R.T. AND U.T. SATISFACTORY.

Other MACRO TEST: SATISFACTORY.

VISUAL EXAMINATION: SATISFACTORY.

Welder's Name VIALE GIOVANNI Clock No. \_\_\_\_\_ Stamp No. 115  
 Tests conducted by: SGS AND Q.C. MGR. OF C.I. CIVIDAC SpA Laboratory Test No. I.T. ASCORI 3338/3349-95/3.

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 Section IX of the ASME Code/BS 4870/LINI EN 288-3.

Manufacturer \_\_\_\_\_

Date 02/11/1995

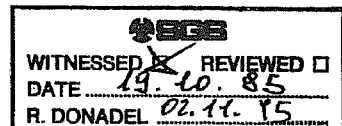
By \_\_\_\_\_

A. Rosanove  
Q.C. Mgr.

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)



WITNESSED   
 REVIEWED   
 Date: 12 JAN 99



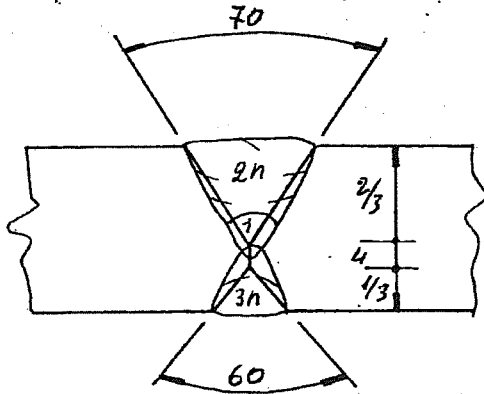
**QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)**

(See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)

Record Actual Conditions Used to Weld Test Coupon.

Company Name C. I. CIVIDAC SpA  
 Procedure Qualification Record No. 2508 Date 02-11-1995  
 WPS No. 2508/1  
 Welding Process(es) SAW  
 Types (Manual, Automatic, Semi-Auto.) MACHINE

**JOINTS (QW-402)**



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

<p><b>BASE METALS (QW-403)</b></p> <p>Material Spec. <u>ASTM / ASME</u>                  Type or Grade <u>A / SA 516-70</u>                  P-No. <u>1</u> to P-No. <u>1</u>                  Thickness of Test Coupon <u>32 mm</u>                  Diameter of Test Coupon <u>                    </u>                  Other <u>QW-403.9 : EACH LAYER SHALL BE</u>  <u>≤ 1/2 IN THK.</u></p>	<p><b>POSTWELD HEAT TREATMENT (QW-407)</b></p> <p>Temperature <u>NONE</u>                  Time <u>                    </u>                  Other <u>                    </u></p>																																			
<p><b>FILLER METALS (QW-404)</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;">SFA Specification</td> <td><u>5.17</u></td> </tr> <tr> <td>AWS Classification</td> <td><u>LINCOLN L61 EM 12 K</u></td> </tr> <tr> <td>Filler Metal F-No.</td> <td><u>6</u></td> </tr> <tr> <td>Weld Metal Analysis A-No.</td> <td><u>1</u></td> </tr> <tr> <td>Size of Filler Metal</td> <td><u>4 mm</u></td> </tr> <tr> <td>Other</td> <td><u>FLUX LINCOLN 8500</u> <u>(NEUTRAL)</u> <u>F7A6</u></td> </tr> <tr> <td>Weld Metal Thickness</td> <td><u>32 mm</u></td> </tr> <tr> <td colspan="2"><u>QW 404-20-24-27-36 : N.A.</u></td> </tr> </table>	SFA Specification	<u>5.17</u>	AWS Classification	<u>LINCOLN L61 EM 12 K</u>	Filler Metal F-No.	<u>6</u>	Weld Metal Analysis A-No.	<u>1</u>	Size of Filler Metal	<u>4 mm</u>	Other	<u>FLUX LINCOLN 8500</u> <u>(NEUTRAL)</u> <u>F7A6</u>	Weld Metal Thickness	<u>32 mm</u>	<u>QW 404-20-24-27-36 : N.A.</u>		<p><b>GAS (QW-408)</b></p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2"></th> <th colspan="3">Percent Composition</th> </tr> <tr> <th>Gas(es)</th> <th>(Mixture)</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td><u>NONE</u></td> <td><u>                    </u></td> <td><u>                    </u></td> </tr> <tr> <td>Trailing</td> <td><u>                    </u></td> <td><u>                    </u></td> <td><u>                    </u></td> </tr> <tr> <td>Backing</td> <td><u>                    </u></td> <td><u>                    </u></td> <td><u>                    </u></td> </tr> </tbody> </table>		Percent Composition			Gas(es)	(Mixture)	Flow Rate	Shielding	<u>NONE</u>	<u>                    </u>	<u>                    </u>	Trailing	<u>                    </u>	<u>                    </u>	<u>                    </u>	Backing	<u>                    </u>	<u>                    </u>	<u>                    </u>
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<p><b>POSITION (QW-405)</b></p> <p>Position of Groove <u>1G</u>                  Weld Progression (Uphill, Downhill) <u>                    </u>                  Other <u>                    </u></p>	<p><b>ELECTRICAL CHARACTERISTICS (QW-409)</b></p> <p>Current <u>D.C.</u>                  Polarity <u>REVERSE</u>                  Amps. <u>480/530</u> Volts <u>27/28</u>                  Tungsten Electrode Size <u>                    </u>                  Other <u>                    </u></p>																																			
<p><b>PREHEAT (QW-406)</b></p> <p>Preheat Temp. <u>30 °C</u>                  Interpass Temp. <u>130 °C</u>                  Other <u>                    </u></p>	<p><b>TECHNIQUE (QW-410)</b></p> <p>Travel Speed <u>50/52 cm/1'</u>                  String or Weave Bead <u>STRING</u>                  Oscillation <u>                    </u>                  Multipass or Single Pass (per side) <u>MULTIPASS</u>                  Single or Multiple Electrodes <u>SINGLE</u>                  Other <u>                    </u></p>																																			



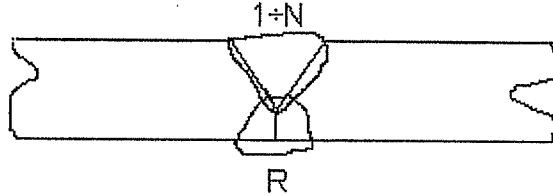
**QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)**

(See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)

Record Actual Conditions Used to Weld Test Coupon.

Company Name <b>C.I. CIVIDAC S.P.A.</b>	
Procedure Qualification Record No. <b>2535</b>	Date <b>24/04/2007</b>
WPS No. <b>2535/1</b>	
Welding Process (es) <b>SAW</b>	
Types (Manual, Automatic, Semi-Auto.) <b>MACHINE</b>	

**JOINTS (QW-402)**



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

<b>BASE METALS (QW-403)</b> Material Spec. <b>SA 516 + SA 516</b> Type or Grade <b>GR 70 + GR 70</b> P-No. <b>1.2</b> to P-No. <b>1.2</b> Thickness of test Coupon <b>23 mm</b> Diameter of Test Coupon <b>N.A.</b> Other _____		<b>POSTWELD HEAT TREATMENT (QW-407)</b> Temperature <b>920°C±10°C</b> Time <b>120 min.</b> Other _____																					
<b>FILLER METALS (QW-404)</b> SFA Specification <b>5.17</b> AWS Classification <b>EH 12K</b> Filler Metal F-No. <b>6</b> Weld Metal Analysis A-No. <b>1</b> Size of Filler Metal <b>mm</b> <b>Ø3.2</b> Other <b>FLUX: LINCOLN P240</b> <b>WIRE LINCOLN LNS 133</b> Weld Metal Thickness <b>23mm</b>		<b>GAS ( QW-408)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th align="center" colspan="3">Percent Composition</th> </tr> <tr> <th></th> <th align="center">Gas(es)</th> <th align="center">(Mixture)</th> <th align="center">Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td align="center">N.A.</td> <td align="center">N.A.</td> <td align="center">N.A.</td> </tr> <tr> <td>Trailing</td> <td align="center">N.A.</td> <td align="center">N.A.</td> <td align="center">N.A.</td> </tr> <tr> <td>Backing</td> <td align="center">N.A.</td> <td align="center">N.A.</td> <td align="center">N.A.</td> </tr> </tbody> </table>			Percent Composition				Gas(es)	(Mixture)	Flow Rate	Shielding	N.A.	N.A.	N.A.	Trailing	N.A.	N.A.	N.A.	Backing	N.A.	N.A.	N.A.
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Backing	N.A.	N.A.	N.A.																				
<b>POSITION (QW-405)</b> Position of Groove <b>1G (FLAT)</b> Weld Progression (Uphill, Downhill) <b>N.A.</b> Other _____		<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current <b>DC</b> Polarity <b>REVERSE</b> Amps. <b>380/420</b> Volts <b>29/31</b> Tungsten Electrode Size <b>N.A.</b> Other <b>HEAT INPUT:1271/1562 J/mm</b>																					
<b>PREHEAT (QW-406)</b> Preheat Temp. <b>15°C</b> Interpass Temp. <b>250°C</b> Other <b>/</b>		<b>TECHNIQUE (QW-410)</b> Travel Speed <b>500/520 mm/1'</b> String or Weave Bead <b>STRING</b> Oscillation <b>N.A.</b> Multipass or Single Pass (per side) <b>MULTIPLE</b> Single or Multiple Electrodes <b>SINGLE</b> Other <b>/</b>																					

Tensile Test (QW-150)

Specimen No.	mm Width	mm Thickness	mm <sup>2</sup> Area	Ultimate Total Load N/mm2	Ultimate Unit Stress N/mm2	Type of Failure & Location
2535	19.0	23.1	438.9	219100	499.2	B.M., DUCTILE
2535	19.0	22.8	433.2	219805	507.4	B.M., DUCTILE
2535 LONG.	/	Ø10	78.5	28735	513.3	A%27

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
N°2 FACE BEND QW 462.3(a)	SATISFACTORY
N°2 ROOT BEND QW 462.3(a)	SATISFACTORY

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values
2535	WM	KV	-46°C	52-41-58
2535	HAZ	KV	-46°C	76-84-71

SCHIZZO / PICTURE

Numero/Number	Posizione di identificazione/Position of indication	Durezza HV 10 / Hardness HV 10
1	Materiale base superiore/Parent metal surface	140 - 143 - 141
2	Zona term. alterata super./Heat affected zone top	149 - 153 - 165
3	Zona fusa superf./Weld metal top	160 - 161 - 163
4	Zona term. alterata super./Heat affected zone top	163 - 158 - 147
5	Materiale base superf./Parent metal surface	143 - 140 - 141
6	Materiale base centro/Parent metal centre	140 - 139 - 141
7	Zona term. alterata centro./Heat affected zone centre	146 - 153 - 157
8	Zona fusa centro./Weld metal centre	159 - 160 - 158
9	Zona term. alterata centro./Heat affected zone centre	154 - 149 - 146
10	Materiale base centro/Parent metal centre	139 - 140 - 140
11	Materiale base superf./Parent metal surface	143 - 143 - 142
12	Zona term. alterata superf./Heat affected zone bottom	146 - 156 - 161
13	Zona fusa superf./Weld metal bottom	163 - 160 - 161
14	Zona term. alterata superf./Heat affected zone bottom	169 - 161 - 147
15	Materiale base superf./Parent metal surface	141 - 143 - 141

Fillet-Weld Test (Q)

Result - Satisfactory: Yes N.A. No N.A. Penetration into Pa

Macro- Results N.A.

Other Tests

Type of Test VISUAL, RADIOGRAPHIC, MT AND MACRO: RESULT SATISFACTORY

Deposit-Analysis HARDNESS TEST HV10 :SATISFACTORY

Other \_\_\_\_\_

Welder's Name CAMARIN TIZIANO

Tests conducted by: Q.C.Mgr of C.I. CIVIDAC SPA and SGS

Clock No. /

Stamp No. 6S

Laboratory Test No. 11642/A I.T.I. ASTORI

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 Section IX of the ASME Code.



Manufacturer

C.I. CIVIDAC S.p.A.  
Q.C. MGR. P. MEMO

Date 24/04/2007

By \_\_\_\_\_

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)

QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)  
(See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)  
Record Actual Conditions Used to Weld Test Coupon.

Company Name C.I. CIVIDAC SpA  
Procedure Qualification Record No. 3012 Date 12/12/2002  
WPS No. 3012/1  
Welding Process(es) SMAW  
Types (Manual, Automatic, Semi-Auto.) MANUAL

**JOINTS (QW-402)**

Groove Design of Test Coupon  
(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

<b>BASE METALS (QW-403)</b> Material Spec. <u>SA 516 + SA 516</u> Type or Grade <u>GR 70 + GR 60</u> P-No. <u>1.2</u> to P-No. <u>1.1</u> Thickness of Test Coupon <u>50 mm</u> Diameter of Test Coupon <u>N.A.</u> Other <u>QW 403.B: Lhk of passes not greater than 13 mm.</u>		<b>POSTWELD HEAT TREATMENT (QW-407)</b> Temperature <u>NONE</u> Time <u>/</u> Other <u>/</u>																		
<b>FILLER METALS (QW-404)</b> SMAW SFA Specification <u>5.1</u> AWS Classification <u>E 7018.1</u> Filler Metal F-No. <u>4</u> Weld Metal Analysis A-No. <u>1</u> Size of Filler Metal <u>Ø 4-5 mm</u> Other <u>/</u> Weld Metal Thickness <u>2.9 mm</u>		<b>GAS (QW-408)</b> <table border="1"> <thead> <tr> <th></th> <th>Gas(es)</th> <th>Percent Composition (Mixture)</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td><u>N.A.</u></td> <td><u>N.A.</u></td> <td><u>N.A.</u></td> </tr> <tr> <td>Trailing</td> <td><u>/</u></td> <td><u>/</u></td> <td><u>/</u></td> </tr> <tr> <td>Backing</td> <td><u>/</u></td> <td><u>/</u></td> <td><u>/</u></td> </tr> </tbody> </table>				Gas(es)	Percent Composition (Mixture)	Flow Rate	Shielding	<u>N.A.</u>	<u>N.A.</u>	<u>N.A.</u>	Trailing	<u>/</u>	<u>/</u>	<u>/</u>	Backing	<u>/</u>	<u>/</u>	<u>/</u>
	Gas(es)	Percent Composition (Mixture)	Flow Rate																	
Shielding	<u>N.A.</u>	<u>N.A.</u>	<u>N.A.</u>																	
Trailing	<u>/</u>	<u>/</u>	<u>/</u>																	
Backing	<u>/</u>	<u>/</u>	<u>/</u>																	
<b>POSITION (QW-405)</b> Position of Groove <u>1G</u> Weld Progression (Uphill, Downhill) <u>N.A.</u> Other <u>N.A.</u>		<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current <u>DC</u> Polarity <u>REVERSE</u> Amps. <u>150/210</u> Volts <u>25/27</u> Tungsten Electrode Size <u>N.A.</u> Other <u>HEAT INPUT: Ø4 = 1500/1780 J/mm, Ø5 = 1768/2617 J/mm</u>																		
<b>PREHEAT (QW-406)</b> Preheat Temp. <u>20°C</u> Interpass Temp. <u>250°C</u> Other <u>/</u>		<b>TECHNIQUE (QW-410)</b> Travel Speed <u>130/150 mm/min</u> String or Weave Bead <u>STRING</u> Oscillation <u>N.A.</u> Multipass or Single Pass (per side) <u>MULTIPASS</u> Single or Multiple Electrodes <u>SINGLE</u> Other <u>/</u>																		

QW-483 (Back)

Tensile Test (QW-150)

PQR No. 3012

Specimen No.	Width	Thickness	Area	Ultimate Total Load N	Ultimate Unit Stress N/mm <sup>2</sup>	Type of Failure & Location
T 3012	19,9	25,9	515,4	283 000	549,1	BM-DUCTILE (*)
T 2012	18,8	26,0	488,8	268 000	548,3	BM-DUCTILE (*)
			(*) SIDE	SA 516-60		

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
N° 4 SIDE BEND QW 462. 2	SATISFACTORY

Toughness Tests (QW-170)

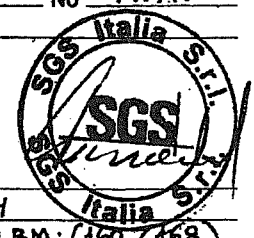
Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values J	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
T 3012	WM	KV	-46°C	29-31-40				
u	HAZ(SA516-70)	u	u	31-33-35				
u	HAZ(SA 516-60)	u	u	36-29-30				

Fillet-Weld Test (QW-180)

Result — Satisfactory: Yes N.A. No N.A. Penetration into Parent Metal: Yes N.A. No N.A.  
 Macro—Results N.A.

Other Tests

Type of Test MACRO TEST: RESULT SATISFACTORY  
VISUAL, RADIOGRAPHIC AND PENETRANT TEST SATISFACTORY  
 Other SMAW HARDNESS TEST WM:(189/205) - HAZ (SIDE A 516-70): (201/244) BM: (160/168)  
- HAZ (SIDE A 516-60): (202/245) BM: (155/163)



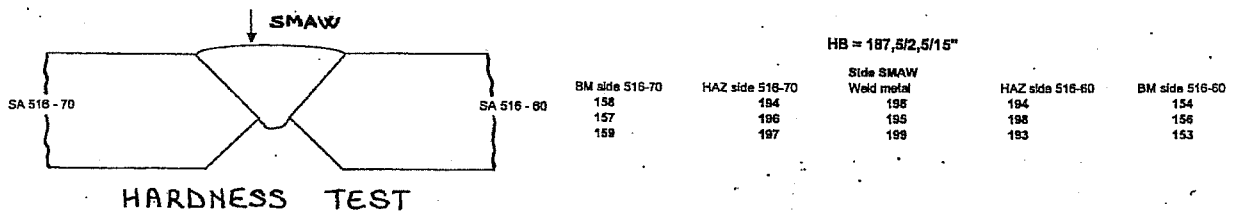
Welder's Name CAMARIN T. Clock No.   /  /   Stamp No. 68  
 Tests conducted by: C. CIVIDAC SpA AND SGS Laboratory Test No. ASTORI 7500/A 12/12/2002

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 Section IX of the ASME Code.

Manufacturer C. CIVIDAC S.p.A.

Date 12/12/2002 By   /  /  

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)

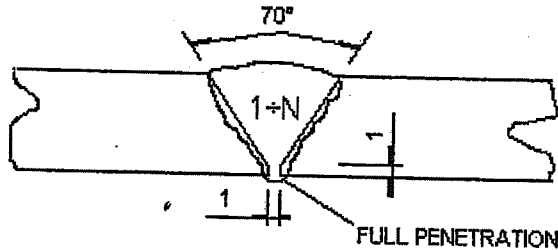




**QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)**  
 (See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)  
 Record Actual Conditions Used to Weld Test Coupon.

Company Name C.I. CIVIDAC S.P.A.  
 Procedure Qualification Record No. 3018 Date 08/03/2006  
 WPS No. 3018/1  
 Welding Process (es) GMAW  
 Types (Manual, Automatic, Semi-Auto.) SEMI-AUTOMATIC

**JOINTS (QW-402)**



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

<b>BASE METALS (QW-403)</b>		<b>POSTWELD HEAT TREATMENT (QW-407)</b>		
Material Spec.	<u>SA 516 + SA 516</u>	Temperature	<u>NONE</u>	
Type or Grade	<u>GR. 60 + GR. 70</u>	Time		
P-No.	<u>1.1</u> to P-No. <u>1.2</u>	Other		
Thickness of test Coupon	<u>20 mm</u>			
Diameter of Test Coupon				
Other	<u>QW403.9,13 N.A.</u>			
		<b>GAS (QW-408)</b>		
		Percent Composition		
		Gas(es)	(Mixture)	Flow Rate
		<u>ARGON/CO2</u>	<u>80/20%</u>	<u>18L/1'</u>
		Shielding		
		Trailing	<u>N.A.</u>	<u>N.A.</u>
		Backing	<u>N.A.</u>	<u>N.A.</u>
<b>FILLER METALS (QW-404)</b>		<b>ELECTRICAL CHARACTERISTICS (QW-409)</b>		
SFA Specification	<u>5.18</u>	Current	<u>DC</u>	
AWS Classification	<u>ER 70 S6</u>	Polarity	<u>REVERSE</u>	
Filler Metal F-No.	<u>6</u>	Amps.	<u>240/300</u>	Volts <u>28/30</u>
Weld Metal Analysis A-No.	<u>1</u>	Tungsten Electrode Size	<u>N.A.</u>	
Size of Filler Metal mm	<u>Ø 1.2</u>	Other	<u>HEAT IMPUT: 896/1350 J/mm;</u>	
Other	<u>QW404.24,27 N.A.</u>		<b>TRANSFER METAL MODE QW 409.2 :SPRAY ARC</b>	
Weld Metal Thickness	<u>20mm</u>			
<b>POSITION (QW-405)</b>		<b>TECHNIQUE (QW-410)</b>		
Position of Groove	<u>1G</u>	Travel Speed	<u>400/450 mm/1'</u>	
Weld Progression (Uphill, Downhill)	<u>N.A.</u>	String or Weave Bead	<u>STRING</u>	
Other		Oscillation	<u>N.A.</u>	
		Multipass or Single Pass (per side)	<u>MULTIPLE</u>	
		Single or Multiple Electrodes	<u>SINGLE</u>	
		Other	<u>WIRE SPEED 8/9 M/1'</u>	
<b>PREHEAT (QW-406)</b>			<u>CONTACT TUBE TO WORK DISTANCE 15+20 mm</u>	
Preheat Temp.	<u>15°C</u>		<u>ORFICE OR GAS CUP SIZE 16 mm</u>	
Interpass Temp.	<u>250°C</u>			
Other	<u>/</u>			

Tensile Test (QW-150)

Specimen No.	mm Width	mm Thickness	mm <sup>2</sup> Area	Ultimate Total Load N/mm2	Ultimate Unit Stress N/mm2	Type of Failure & Location
3018	19.0	22.0	418	212000	507.2	B.M. DUCTILE SIDE 516 GR60
3018	19.0	22.0	418	212500	508.4	B.M. DUCTILE SIDE 516 GR60

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
N°4 SIDE BEND (QW 462.2)	SATISFACTORY

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
2017	WM	KV	-30°C	93-86-91				
2017	HAZ SIDE 516 GR60	KV	-30°C	176-159-167				
2017	HAZ SIDE 516 GR70	KV	-30°C	55-58-49				

Fillet-Weld Test (QW-180)

Result - Satisfactory: Yes    N.A.    No    N.A.    Penetration into Parent Metal: Yes    N.A.    No    N.A.     
 Macro- Results    N.A.   

Other Tests

Type of Test VISUAL, RADIOGRAPHY, CT, MT AND MACRO: RESULT SATISFACTORY

Deposit Analysis HARDNESS TEST HV10 : WM: (198/205); -SIDE 516 GR70 HAZ(189/215); BM(163/169);

Other -SIDE 516 GR60 HAZ(184/214); BM(154/157);

Welder's Name SPRICIGO TIZIANO Clock No.    /    Stamp No. 7S  
 Tests conducted by: Q.C.Mgr of C.I. CIVIDAC SPA and SGS Laboratory Test No. 10514/B-10514/I L.T.L. ASTORI

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 Section IX of the ASME Code.

Manufacturer

C.I. CIVIDAC S.p.A.  
Q.C. MGR. P. MARIUCCI

Date 08/03/2006

By   

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)



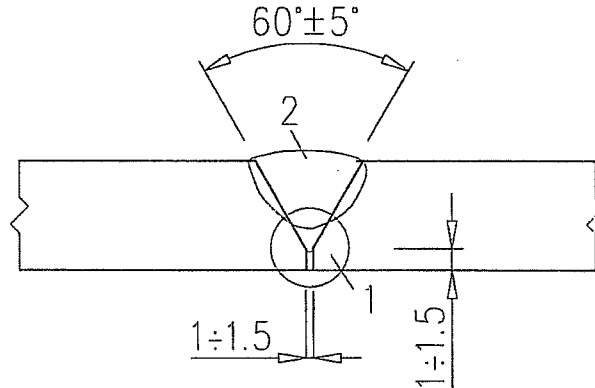
**QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)**

(See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)

Record Actual Conditions Used to Weld Test Coupon.

Company Name <b>C.I. CIVIDAC S.P.A.</b>	
Procedure Qualification Record No. <b>3023</b>	Date <b>27/02/2008</b>
WPS No. <b>3023/1</b>	
Welding Process (es) <b>GTAW</b>	
Types (Manual, Automatic, Semi-Auto.) <b>MANUAL</b>	

**JOINTS (QW-402)**



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

<b>BASE METALS (QW-403)</b>		<b>POSTWELD HEAT TREATMENT (QW-407)</b>	
Material Spec. <b>SA 333 + SA 333</b>		Temperature <b>N.A.</b>	
Type or Grade <b>GR 6 + GR 6</b>		Time <b>/</b>	
P-No. <b>1.2</b> to P-No. <b>1.2</b>		Other	
Thickness of test Coupon <b>3.91 mm</b>			
Diameter of Test Coupon <b>26.7 mm</b>			
Other			
		<b>GAS ( QW-408)</b>	
		Percent Composition	
		Gas(es)	(Mixture)
		Shielding	Flow Rate
		<b>ARGON</b>	<b>99.9%</b>
		Trailing	<b>10Lt/1'</b>
		<b>N.A.</b>	<b>N.A.</b>
		Backing	<b>N.A.</b>
		<b>N.A.</b>	<b>N.A.</b>
<b>FILLER METALS (QW-404)</b>		<b>ELECTRICAL CHARACTERISTICS (QW-409)</b>	
SFA Specification <b>5.18</b>		Current <b>DC</b>	
AWS Classification <b>ER70 S6</b>		Polarity <b>REVERSE</b>	
Filler Metal F-No. <b>6</b>		Amps. <b>100/120</b>	Volts <b>13/14</b>
Weld Metal Analysis A-No. <b>1</b>		Tungsten Electrode Size <b>Ø 2.38 mm</b>	
Size of Filler Metal <b>mm</b> <b>Ø2.4</b>		Other <b>HEAT IMPUT: 709/1008 J/mm;</b>	
Other			
Weld Metal Thickness <b>3.91 mm</b>			
<b>POSITION (QW-405)</b>		<b>TECHNIQUE (QW-410)</b>	
Position of Groove <b>6G</b>		Travel Speed <b>100/110 mm/1'</b>	
Weld Progression (Uphill, Downhill) <b>UPHILL</b>		String or Weave Bead <b>STRING</b>	
Other		Oscillation <b>N.A.</b>	
		Multipass or Single Pass (per side) <b>MULTIPLE</b>	
		Single or Multiple Electrodes <b>SINGLE</b>	
		Other <b>GTAW :NOT PULSET</b>	
<b>PREHEAT (QW-406)</b>		<b>GAS NOZZLE SIZE Ø3/8"</b>	
Preheat Temp. <b>15°C</b>		<b>QW 410.11,15 N.A.</b>	
Interpass Temp. <b>250°C</b>			
Other <b>/</b>			

Tensile Test (QW-150)

Specimen No.	mm Width	mm Thickness	mm <sup>2</sup> Area	Ultimate Total Load N/mm2	Ultimate Unit Stress N/mm2	Type of Failure & Location
3023	Ø26.7	3.7	262.6	149896	570.8	B.M., DUCTILE
3023	Ø26.7	3.7	262.6	151283	576.1	B.M., DUCTILE
3023 LONG. +20°C	/	Ø6	28.3	17941	634.0	A%30.5 Z%69.5 Rs 556 N/mm2
3023 LONG. +300°C	/	Ø6	28.3	17053	602.6	A%32 Z%70.5 Rs 504.7 N/mm2

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
Nº2 FACE BEND QW 462.3(a)	SATISFACTORY
Nº2 ROOT BEND QW 462.3(a)	SATISFACTORY

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
3023	WM (10x2.5)	KV	-46°C	27-28-26				
3023	HAZ(10x2.5)	KV	-46°C	30-32-33				

Fillet-Weld Test (QW-180)

Result - Satisfactory: Yes N.A. No N.A. Penetration into Parent Metal: Yes N.A. No N.A.

Macro- Results N.A.

Other Tests

Type of Test VISUAL,RADIOGRAPHYC,MT AND MACRO: RESULT SATISFACTORY

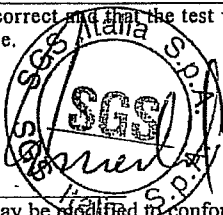
Deposit Analysis HARDNESS TEST HV10 :WM: (189/195); - HAZ(178/203); BM(169/174);

Other \_\_\_\_\_

Welder's Name TREVISIOL GIUSEPPE Clock No. / Stamp No. 4S

Tests conducted by: Q.C.Mgr of C.I. CIVIDAC SPA and SGS Laboratory Test No. 12488 I.T.I. ASTORI

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 Section IX of the ASME Code.



Manufacturer

C.I. CIVIDAC S.P.A.  
Q.C. MGR. P. MEMO

Date 27/02/2008

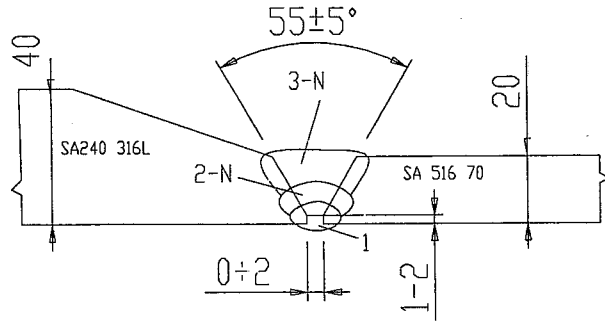
By \_\_\_\_\_

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)

**QW-483 SUGGESTED FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)**  
 (See QW-201.2, Section IX, ASME Boiler and Pressure Vessel Code)  
 Record Actual Conditions Used to Weld Test Coupon.

Company Name C.I. CIVIDAC S.P.A.  
 Procedure Qualification Record No. 6053 Date 07/03/2005  
 WPS No. 6053/1  
 Welding Process (es) GTAW + SMAW + SAW  
 Types (Manual, Automatic, Semi-Auto.) MANUAL+MACHINE

**JOINTS (QW-402)**



Groove Design of Test Coupon

(For combination qualifications, the deposited weld metal thickness shall be recorded for each filler metal or process used.)

<b>BASE METALS (QW-403)</b> Material Spec. <u>SA 240+SA516</u> Type or Grade <u>316L + GR70</u> P-No. <u>8/1</u> to P-No. <u>1/2</u> Thickness of test Coupon <u>40/20 mm</u> Diameter of Test Coupon <u>N.A.</u> Other _____				<b>POSTWELD HEAT TREATMENT (QW-407)</b> Temperature <u>NONE</u> Time <u>/</u> Other _____																																																							
<b>FILLER METALS (QW-404)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>GTAW</th> <th>SMAW</th> <th>SAW</th> </tr> </thead> <tbody> <tr> <td>SFA Specification</td> <td align="center">5.9</td> <td align="center">5.4</td> <td align="center">5.9</td> </tr> <tr> <td>AWS Classification</td> <td align="center">ER309MoL</td> <td align="center">E309MoL</td> <td align="center">ER309MoL</td> </tr> <tr> <td>Filler Metal F-No.</td> <td align="center">6</td> <td align="center">5</td> <td align="center">6</td> </tr> <tr> <td>Weld Metal Analysis A-No.</td> <td align="center">8</td> <td align="center">8</td> <td align="center">8</td> </tr> <tr> <td>Size of Filler Metal mm</td> <td align="center">Ø2.4</td> <td align="center">3.25/4</td> <td align="center">2.4</td> </tr> <tr> <td>Other</td> <td colspan="3"><u>FLUX AVESTA 801</u></td> </tr> <tr> <td>Weld Metal Thickness mm</td> <td align="center">3</td> <td align="center">5</td> <td align="center">12</td> </tr> </tbody> </table>					GTAW	SMAW	SAW	SFA Specification	5.9	5.4	5.9	AWS Classification	ER309MoL	E309MoL	ER309MoL	Filler Metal F-No.	6	5	6	Weld Metal Analysis A-No.	8	8	8	Size of Filler Metal mm	Ø2.4	3.25/4	2.4	Other	<u>FLUX AVESTA 801</u>			Weld Metal Thickness mm	3	5	12	<b>GAS (QW-408)</b> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th colspan="3">Percent Composition</th> </tr> <tr> <th></th> <th>Gas(es)</th> <th>(Mixture)</th> <th>Flow Rate</th> </tr> </thead> <tbody> <tr> <td>Shielding</td> <td align="center"><u>ARGON</u></td> <td align="center"><u>99.9%</u></td> <td align="center"><u>10/12Lt/1'</u></td> </tr> <tr> <td>Trailing</td> <td align="center"><u>N.A.</u></td> <td align="center"><u>N.A.</u></td> <td align="center"><u>N.A.</u></td> </tr> <tr> <td>Backing</td> <td align="center"><u>ARGON</u></td> <td align="center"><u>99.9%</u></td> <td align="center"><u>16/20Lt/1'</u></td> </tr> </tbody> </table>					Percent Composition				Gas(es)	(Mixture)	Flow Rate	Shielding	<u>ARGON</u>	<u>99.9%</u>	<u>10/12Lt/1'</u>	Trailing	<u>N.A.</u>	<u>N.A.</u>	<u>N.A.</u>	Backing	<u>ARGON</u>	<u>99.9%</u>	<u>16/20Lt/1'</u>
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<b>POSITION (QW-405)</b> Position of Groove <u>1G</u> Weld Progression (Uphill, Downhill) <u>N.A.</u> Other _____				<b>ELECTRICAL CHARACTERISTICS (QW-409)</b> Current <u>DC</u> Polarity <u>GTAW:STRAIGHT; SMAW:REVERSE;</u> Amps. <u>GTAW90/120;SMAW90/150</u> Volts <u>GTAW10/15;SMAW25/28</u> Tungsten Electrode Size <u>Ø 2.38 mm Th 2%</u> Other <u>SAW 300/350A 28-30V</u>																																																							
<b>PREHEAT (QW-406)</b> Preheat Temp. <u>20°C</u> Interpass Temp. <u>170°C</u> Other <u>/</u>				<b>TECHNIQUE (QW-410)</b> Travel Speed <u>GTAW:90/100;SMAW:150/180;SAW:450/550 mm/1'</u> String or Weave Bead <u>STRING</u> Oscillation <u>N.A.</u> Multipass or Single Pass (per side) <u>GTAW:SINGLE; SMAW MULTIPLE SAW: MULTIPLE</u> Single or Multiple Electrodes <u>SINGLE</u> Other <u>GTAW :NOT PULSED</u> GAS NOZZLE SIZE <u>Ø3/8"</u> QW <u>410.11,15 N.A.</u> SOLID METAL WIRE																																																							

Tensile Test (QW-150)

Specimen No.	mm Width	mm Thickness	mm <sup>2</sup> Area	Ultimate Total Load N/mm <sup>2</sup>	Ultimate Unit Stress N/mm <sup>2</sup>	Type of Failure & Location
6053	19.0	19.29	366.5	197177	538	B.M., DUCTILE (SIDE SA516 70)
6053	19.0	19.25	365.8	197532	540	B.M., DUCTILE (SIDE SA516 70)
WELD METAL 6053	/	Ø8.96	63.1	37166	589	Rp0.2%=428 N/mm <sup>2</sup> A=36.4%

Guided-Bend Tests (QW-160)

Type and Figure No.	Result
N°4 SIDE BEND QW 462.2	SATISFACTORY

Toughness Tests (QW-170)

Specimen No.	Notch Location	Notch Type	Test Temp.	Impact Values	Lateral Exp.		Drop Weight	
					% Shear	Mils	Break	No Break
6053	H.A.Z. (SIDE SA 240 316L)	KV(10x10)	-46°C	77-83-99				
6053	W.M.	KV(10x10)	-46°C	43-42-38				
6053	H.A.Z. (SIDE SA516 70)	KV(10x10)	-46°C	37-46-33				

Fillet-Weld Test (QW-180)

Result – Satisfactory: Yes N.A. No N.A. Penetration into Parent Metal: Yes N.A. No N.A.

Macro- Results N.A.

Other Tests

Type of Test VISUAL,RADIOGRAPHYC,PT,MICRO AND MACRO: RESULT SATISFACTORY

Deposit Analysis HARDNESS TEST HV10 :WM: (196/238); -(SIDE A240 316L): HAZ(186/219); BM(171/182);

Other -(SIDE A516 GR. 70):HAZ(179/195); BM(161/170);

Welder's Name TREVISIOL G. Clock No. / Stamp No. 4S

Tests conducted by: Q.C.Mgr of C.I. CIVIDAC SPA and SGS Laboratory Test No. 1243-2005 RTM BREDA

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 Section IX of the ASME Code.

Manufacturer C.I. CIVIDAC S.p.A.  
Q.C. Mgr. P. MAMO

Date 07/03/2005

By \_\_\_\_\_

(Detail of record of tests are illustrative only and may be modified to conform to the type and number of tests required by the Code.)

H. NAGORIN  
**SGS**  
[Signature]





**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name ANANI KOAMI Number 264 Stamp no. 3S  
 Welding process used SAW Type MACHINE  
 Identification of WPS followed by welder during welding of test coupon 184  
 Base material(s) welded SA 516-70 Thickness 16 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal,weld metal, welded from both sides, flux,etc)(QW-402)	N.A.	N.A.
ASME P-No (QW-403) 1	N.A.	N.A.
< X > Plate < > Pipe (enter diameter, if pipe)	N.A.	N.A.
Filler metal specification (SFA) 5.17	N.A.	N.A.
Filler metal F-No	N.A.	N.A.
Filler metal variety for GTAW, PAW (QW-404)	N.A.	N.A.
Consumable insert for GTAW or PAW	N.A.	N.A.
Weld deposit thickness for each welding process	N.A.	N.A.
Welding position (1G,5G, ect.)(QW-405)	N.A.	N.A.
Progression (uphill-downhill)	N.A.	N.A.
Backing gas for GTAW,PAW, or GMAW;fuel gas for OFW (QW-408)	N.A.	N.A.
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	N.A.	N.A.
Other: insert (QW404.22)	N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	DIRECT	DIRECT
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	NO	With and without
Welding position (1G,5G, ect.)	2F	F
Consumable insert	NO	With and without
Backing (metal, weld metal, welded from both sides, flux, ect.)	BASE METAL	WITH BACKING ONLY
Single / Multipass	MULTIPASS	SINGLE & MULTIPASS

**Guided Bend Test Results**

Guide Bend Tests Type <(N.A.)>QW-462.2 (Side) Result <N.A.>QW-462.3 (a) (Trans. R & F) type <N.A.>QW-462.3 (b) (Long, R & F) Results

MACRO TEST [ QW-462.4 ( b ) ]	SATISFACTORY		
FRACTURE TEST [ QW-462.4 ( c ) ]	SATISFACTORY		

Visual examination result (QW-302.4) Satisfactory

Radiographic test result (QW-304 and QW-305) N.A.

( For alternative qualification of groove welds by radiography)

Fillet Weld-Fracture test N.A. Lenght and percent of defects None in.

Macro test fusion OK Fillet leg size 16 in. x 18 in. Concavity/convexity / in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.

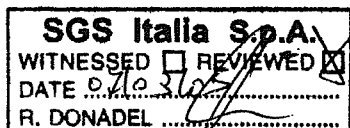
Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 264/2003

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

Organization C.I. CIVIDAC S.P.A.  
Q.C. MGR. A. ROSANOVA  
*Rosanova*

By \_\_\_\_\_

Date 27/06/2003







**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name TREVISIOL GIUSEPPE Number 21 Stamp no. 4S  
 Welding process used GTAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 84.TM.91  
 Base material(s) welded SA 106 GR. B Thickness 11 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal,weld metal, welded from both sides, flux,etc)(QW-402)	NONE	WITH & WITHOUT BACKING
ASME P-No (QW-403)	P1	P1+P11-P34-P4X and similar unassigned
< > Plate < X > Pipe (enter diameter, if pipe)	O.D. 2"	O.D. ≥ 1" and plates
Filler metal specification (SFA) 5.18	ER70S3	
Filler metal F-No	6	6
Filler metal variety for GTAW, PAW (QW-404)	Solid metal wire	Solid metal and metal cored
Consumable insert for GTAW or PAW	Without	Without
Weld deposit thickness for each welding process	3 mm	Max 6 mm
Welding position (1G,5G, ect.)(QW-405)	6G	ALL
Progression (uphill-downhill)	UPHILL	UPHILL
Backing gas for GTAW,PAW, or GMAW;fuel gas for OFW (QW-408)	NONE	WITH & WITHOUT
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	DC/STRAIGHT	DC/STRAIGHT
Other: insert (QW404.22)	NONE	WITHOUT

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	N.A.	N.A.
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	N.A.	N.A.
Welding position (1G,5G, ect.)	N.A.	N.A.
Consumable insert	N.A.	N.A.
Backing (metal, weld metal, welded from both sides, flux, ect.)	N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type <X>QW-462.2 (Side) Result < >QW-462.3 (a) (Trans. R & F) type < >QW-462.3 (b) (Long, R & F) Results

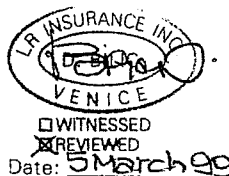
N°4 specimens,side bends: satisfactory			

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) None  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Lenght and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 1/92

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

Date 5/3/1999 Organization C.I. CIVIDAC S.p.A.  
 By Q.C. MGR. A. ROSATOVA







**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPO)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name TREVISIOL GIUSEPPE Number 29 Stamp no. 4S  
 Welding process used GTAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 83.TM.91  
 Base material(s) welded SA 312 Tp 304 Thickness 2.77 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Manual or Semiautomatic Variable for Each Process (QW 350)	Actual Values	Range Qualified
Backing (metal, weld metal, welded from both sides, flux, etc)(QW-402)	NONE	WITH & WITHOUT BACKING
ASME P-No (QW-403)	P8	P1+P11-P34-P4X and similar unassigned
< > Plate < X > Pipe (enter diameter, if pipe)	O.D. 1/2"	O.D. ≥ 1/2" and plates
Filler metal specification (SFA) 5.9	ER308L	
Filler metal F-No	6	6
Filler metal variety for GTAW, PAW (QW-404)	Solid metal wire	Solid metal and metal cored
Consumable insert for GTAW or PAW	Without	Without
Weld deposit thickness for each welding process	1.5 mm	Max 3 mm
Welding position (1G, 5G, ect.)(QW-405)	6G	ALL
Progression (uphill-downhill)	UPHILL	UPHILL
Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)	ARGON 99.9%	WITH
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	DC/STRAIGHT	DC/STRAIGHT
Other: insert (QW404.22)	NONE	WITHOUT

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Machine Welding Variables for the Process Used (QW-360)	Actual Values	Range Qualified
Direct-remote visual control	N.A.	N.A.
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	N.A.	N.A.
Welding position (1G, 5G, ect.)	N.A.	N.A.
Consumable insert	N.A.	N.A.
Backing (metal, weld metal, welded from both sides, flux, ect.)	N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type < N.A. > QW-462.2 (Side) Result < N.A. > QW-462.3 (a) (Trans. R & F) type < N.A. > QW-462.3 (b) (Long, R & F) Results

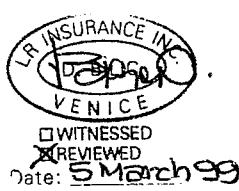
N.A.			

Visual examination result (QW-302.4) Satisfactory N° 2 specimens  
 Radiographic test result (QW-304 and QW-305) Satisfactory  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Length and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by / Laboratory test no. /  
 We certify that statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization C.I. CIVIDAC S.p.A.  
Q.C. MGR. A. ROSANOVA

Date 5/3/1999 By [Signature]





**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name TREVISIOL GIUSEPPE Number 167 Stamp no. 4S  
 Welding process used GTAW Type MACHINE  
 Identification of WPS followed by welder during welding of test coupon 1023-1  
 Base material(s) welded P355 NL2/SA334 GR-1 Thickness 45/Ø 19.05 x 2.11

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal, weld metal, welded from both sides, flux, etc)(QW-402)	N.A.	N.A.
ASME P-No (QW-403) 1	N.A.	N.A.
< X > Plate < > Pipe (enter diameter, if pipe)	N.A.	N.A.
Filler metal specification (SFA) 5.17	N.A.	N.A.
Filler metal F-No	N.A.	N.A.
Filler metal variety for GTAW, PAW (QW-404)	N.A.	N.A.
Consumable insert for GTAW or PAW	N.A.	N.A.
Weld deposit thickness for each welding process	N.A.	N.A.
Welding position (1G, 5G, ect.)(QW-405)	N.A.	N.A.
Progression (uphill-downhill)	N.A.	N.A.
Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)	N.A.	N.A.
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	N.A.	N.A.
Other: insert (QW404.22)	N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	DIRECT	DIRECT
Automatic voltage control (GTAW)	YES	YES
Automatic joint tracking	NO	NO
Welding position (1G, 5G, ect.)	TUBE SHEET VERTICAL	TUBE SHEET VERTICAL
Consumable insert	NO	WITH & WITHOUT
Backing (metal, weld metal, welded from both sides, flux, ect.)	BASE METAL	WITH BACKING ONLY
Single / Multipass	MULTIPASS	SINGLE & MULTIPASS

**Guided Bend Test Results**

Guide Bend Tests Type <>QW-462 (Side) Result <>QW-462.3 (a) (Trans. R & F) type <>QW-462.3 (b) (Long, R & F) Results

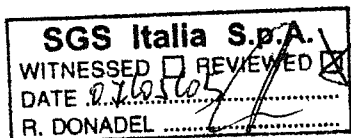
PENETRANT TEST	SATISFACTORY		
MACRO TEST	SATISFACTORY		
HARDNESS TEST	SATISFACTORY		

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) Satisfactory  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Length and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by I.T. ASTORI/C.I.C. S.p.A. Laboratory test no. ASTORI N° 6194/2001  
 We certify that statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

**C.I. CIVIDAC S.p.A.**  
 Organization Q.C. MGR. ROSANOVA  
 By

Date 07/03/2001





**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPO)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name CAMARIN TIZIANO Number 225 Stamp no. 6S  
 Welding process used SMAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 282  
 Base material(s) welded SA 516 GR. 70 Thickness 20 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

	NONE	WITH AND WITHOUT
Backing (metal, weld metal, welded from both sides, flux, etc.) (QW-402)	PI	P1-P11-P34-P4X and similar unassigned
ASME P-No (QW-403) 1	PLATE	PLATE and PIPE O.D. $\geq 2 \frac{7}{8}$ "
< X > Plate < > Pipe (enter diameter, if pipe)	E7018-1	
Filler metal specification (SFA) 5.1	4	1-4
Filler metal F-No	N.A.	N.A.
Filler metal variety for GTAW, PAW (QW-404)	N.A.	N.A.
Consumable insert for GTAW or PAW	20 mm	Max. to be welded
Weld deposit thickness for each welding process	1G	F
Welding position (1G, 5G, ect.) (QW-405)	N.A.	N.A.
Progression (uphill-downhill)	N.A.	N.A.
Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)	N.A.	N.A.
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	N.A.	N.A.
Other: insert (QW404.22)	N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	N.A.	N.A.
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	N.A.	N.A.
Welding position (1G, 5G, ect.)	N.A.	N.A.
Consumable insert	N.A.	N.A.
Backing (metal, weld metal, welded from both sides, flux, ect.)	N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type < N.A. > QW-462.2 (Side) Result < N.A. > QW-462.3 (a) (Trans. R & F) type < N.A. > QW-462.3 (b) (Long, R & F) Results

N.A.			

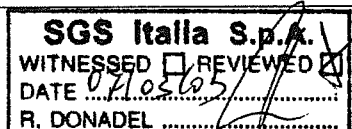
Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) Satisfactory  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Length and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 20/97

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

Organization C.I. CIVIDAC S.p.A.  
Q.C. MGR. A. ROSANOVA

Date 13/05/2002 By \_\_\_\_\_





**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name CAMARIN TIZIANO Number 44 Stamp no. 6S  
 Welding process used SAW Type MACHINE  
 Identification of WPS followed by welder during welding of test coupon 183  
 Base material(s) welded SA 516-70 Thickness 20 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal, weld metal, welded from both sides, flux, etc)(QW-402) \	N.A.	N.A.
ASME P-No (QW-403) <u>1</u>	N.A.	N.A.
< X > Plate < > Pipe (enter diameter, if pipe)	N.A.	N.A.
Filler metal specification (SFA) <u>5.17</u>	N.A.	N.A.
Filler metal F-No	N.A.	N.A.
Filler metal variety for GTAW, PAW (QW-404)	N.A.	N.A.
Consumable insert for GTAW or PAW	N.A.	N.A.
Weld deposit thickness for each welding process	N.A.	N.A.
Welding position (1G, 5G, ect.)(QW-405)	N.A.	N.A.
Progression (uphill-downhill)	N.A.	N.A.
Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)	N.A.	N.A.
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	N.A.	N.A.
Other: insert (QW404.22)	N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	DIRECT	DIRECT
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	NO	With and without
Welding position (1G, 5G, ect.)	1G	F
Consumable insert	NO	With and without
Backing (metal, weld metal, welded from both sides, flux, ect.)	BASE METAL	WITH BACKING ONLY
Single / Multipass	MULTIPASS	SINGLE & MULTIPASS

**Guided Bend Test Results**

Guide Bend Tests Type < X > QW-462.2 (Side) Result < > QW-462.3 (a) (Trans. R & F) type < > QW-462.3 (b) (Long, R & F) Results

Nº 2 Side band : good			
Nº 2 Side band : good			

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) Satisfactory  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Lenght and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 6/98  
 We certify that statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

**C.I. CIVIDAC S.p.A.**  
 Organization Q.C. MGR. A. ROSANOVA  
 By [Signature]

Date 12/03/1998

L.R. INSURANCE INC.  
  
 VENICE  
 WITNESSED  
 REVIEWED  
 Date: 12 March 99



**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name CAMARIN TIZIANO Number 233 Stamp no. 6S  
 Welding process used GTAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 83.TM.91  
 Base material(s) welded SA 312 Tp 304 Thickness 8 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal,weld metal, welded from both sides, flux,etc)(QW-402)  
 ASME P-No (QW-403) 8  
 < > Plate < X > Pipe (enter diameter, if pipe)  
 Filler metal specification (SFA) 5.9  
 Filler metal F-No  
 Filler metal variety for GTAW, PAW (QW-404)  
 Consumable insert for GTAW or PAW  
 Weld deposit thickness for each welding process  
 Welding position (1G,5G, ect.)(QW-405)  
 Progression (uphill-downhill)  
 Backing gas for GTAW,PAW, or GMAW;fuel gas for OFW (QW-408)  
 GMAW transfer mode (QW-409)  
 GTAW welding current type-polarity  
 Other: insert (QW404.22)

NONE	WITH & WITHOUT BACKING
P8	P1-P11-P34-P4X and similar unassigned
O.D. 2"	O.D. ≥ 1" and plates
ER308L	
6	6
Solid metal wire	Solid metal and metal cored
Without	Without
2 mm	Max 4 mm
1G	F
N.A.	N.A.
ARGON 99.9%	WITH
N.A.	N.A.
DC/STRAIGHT	DC/STRAIGHT
NONE	WITHOUT

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control  
 Automatic voltage control (GTAW)  
 Automatic joint tracking  
 Welding position (1G,5G, ect.)  
 Consumable insert  
 Backing (metal, weld metal, welded from both sides, flux, ect.)

N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type < >QW-462.2 (Side) Result <X>QW-462.3 (a) (Trans. R & F) type < >QW-462.3 (b) (Long, R & F) Results

N° 2 face-bend : satisfactory			
N° 2 root-bend : satisfactory			

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) SATISFACTORY  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Lenght and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. N.A. in. Concavity/convexity N.A. in.  
 x

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by Q.C. Mgr CIVIDAC S.p.A. Laboratory test no. 233/1-2002

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

Organization C.I. CIVIDAC S.p.A.  
Q.C. MGR. A. BOSANOVA

Date 10/06/2002

By [Signature]

**SGS Italia S.p.A.**  
 WITNESSED  REVIEWED   
 DATE 07/03/05  
 R. DONADEL



**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name SARTORI FABIO Number 267 Stamp no. 17S  
 Welding process used SAW Type MACHINE  
 Identification of WPS followed by welder during welding of test coupon 184  
 Base material(s) welded SA 516-70 Thickness 16 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal,weld metal, welded from both sides, flux,etc)(QW-402)	N.A.	N.A.
ASME P-No (QW-403) 1	N.A.	N.A.
< X > Plate < > Pipe (enter diameter, if pipe)	N.A.	N.A.
Filler metal specification (SFA) 5.17	N.A.	N.A.
Filler metal F-No	N.A.	N.A.
Filler metal variety for GTAW, PAW (QW-404)	N.A.	N.A.
Consumable insert for GTAW or PAW	N.A.	N.A.
Weld deposit thickness for each welding process	N.A.	N.A.
Welding position (1G,5G, ect.)(QW-405)	N.A.	N.A.
Progression (uphill-downhill)	N.A.	N.A.
Backing gas for GTAW,PAW, or GMAW;fuel gas for OFW (QW-408)	N.A.	N.A.
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	N.A.	N.A.
Other: insert (QW404.22)	N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	DIRECT	DIRECT
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	NO	With and without
Welding position (1G,5G, ect.)	2F	F - H
Consumable insert	NO	With and without
Backing (metal, weld metal, welded from both sides, flux, ect.)	BASE METAL	WITH BACKING ONLY
Single / Multipass	MULTIPASS	SINGLE & MULTIPASS

**Guided Bend Test Results**

Guide Bend Tests Type <(N.A.)>QW-462.2 (Side) Result <N.A.>QW-462.3 (a) (Trans. R & F) type <N.A.>QW-462.3 (b) (Long, R & F) Results

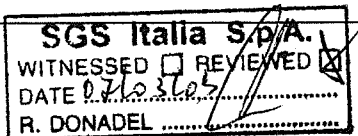
MACRO TEST [ QW-462.4 ( b ) ]	SATISFACTORY		
FRACTURE TEST [ QW-462.4 ( c ) ]	SATISFACTORY		

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) N.A.  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Length and percent of defects None in.  
 Macro test fusion OK Fillet leg size 16 in. x 18 in. Concavity/convexity / in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 267/2003  
 We certify that statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization C.I. CIVIDAC S.p.A.  
Q.C. MGR. A. ROSANOVA

Date 27/06/2003 By \_\_\_\_\_







**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name SARTORI FABIO Number 304 Stamp no. 17S  
 Welding process used GTAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 6053-1  
 Base material(s) welded SA516 70 / SA 240 316L Thickness 20(P.N.1) / 40(P.N.8) mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Actual Values	Range Qualified
NONE	WITH & WITHOUT
P1 / P8	P1+P11-P34,P4X and similar unassigned
Plate	Plate & Pipe O.D. $\geq 2 \frac{7}{8}$ "
ER 309 MoL	
6	6
Solid metal wire	Solid metal / cored
NONE	WITHOUT
3 mm	6 mm max.
1G	F
N.A.	N.A.
ARGON 99.9%	WITH
N.A.	N.A.
DC/ STRAIGHT	DC/ STRAIGHT
NONE	WITHOUT

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Actual Values	Range Qualified
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.

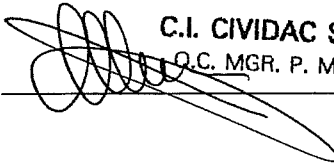
**Guided Bend Test Results**

Guide Bend Tests Type < X > QW-462.2 (Side) Result < > QW-462.3 (a) (Trans. R & F) type < > QW-462.3 (b) (Long, R & F) Results

N° 4 side-bend : satisfactory			

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) Satisfactory  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Length and percent of defects N.A. in.  
 Macro test fusion Satisfactory Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A. & SGS  
 Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. / SGS Laboratory test no. RTM 1243-2005  
 We certify that statements in this record are correct and that the test coupons were prepared , welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization  C.I. CIVIDAC S.p.A.  
Q.C. MGR. P. MEMO

Date 07/03/2005 By \_\_\_\_\_

<b>SGS Italia</b>
WITNESSED <input checked="" type="checkbox"/> REVIEWED <input type="checkbox"/>
DATE <u>12/05</u>
R. DONADEL



**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPO)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name BONESSO GIANNI Number 83 Stamp no. 18S  
 Welding process used SMAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 84.TM.94  
 Base material(s) welded SA 106 GR. B Thickness 22 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

	WELD METAL	WITH BACKING ONLY
Backing (metal, weld metal, welded from both sides, flux, etc)(QW-402)	P1	P1+P11-P34-P4X and similar unassigned
ASME P-No (QW-403) 1	O.D. 6"	O.D. $\geq 2 \frac{7}{8}$ " and plates
< > Plate < X > Pipe (enter diameter, if pipe)	E7018-1	
Filler metal specification (SFA) 5.1	4	1+4
Filler metal F-No	N.A.	N.A.
Filler metal variety for GTAW, PAW (QW-404)	N.A.	N.A.
Consumable insert for GTAW or PAW	22 mm	Max. to be welded
Weld deposit thickness for each welding process	6G	ALL
Welding position (1G,5G, ect.)(QW-405)	UPHILL	UPHILL
Progression (uphill-downhill)	N.A.	N.A.
Backing gas for GTAW,PAW, or GMAW;fuel gas for OFW (QW-408)	N.A.	N.A.
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	N.A.	N.A.
Other: insert (QW404.22)	N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	N.A.	N.A.
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	N.A.	N.A.
Welding position (1G,5G, ect.)	N.A.	N.A.
Consumable insert	N.A.	N.A.
Backing (metal, weld metal, welded from both sides, flux, ect.)	N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type < X > QW-462.2 (Side) Result < > QW-462.3 (a) (Trans. R & F) type < > QW-462.3 (b) (Long, R & F) Results

N° 2 side-bends : satisfactory			
N° 2 side-bends : satisfactory			

Visual examination result (QW-302.4) Satisfactory

Radiographic test result (QW-304 and QW-305) Good

( For alternative qualification of groove welds by radiography)

Fillet Weld-Fracture test N.A. Lenght and percent of defects N.A. in.

Macro test fusion Good Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.

Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 18/94

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

Organization C.I. CIVIDAC S.p.A.  
Q.C. MGR. A. ROSANOVA  
 By [Signature]

Date 12/03/1999



WITNESSED

REVIEWED

Date: 12 March 99



**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPO)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name BONESSO GIANNI Number 26 Stamp no. 18S  
 Welding process used GTAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 84.TM.91  
 Base material(s) welded SA 106 GR. B Thickness 11 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Manual or Semiautomatic Variable for Each Process (QW 350)	Actual Values	Range Qualified
Backing (metal, weld metal, welded from both sides, flux, etc)(QW-402)	NONE	WITH & WITHOUT BACKING
ASME P-No (QW-403)	P1	P1+P11-P34-P4X and similar unassigned
< > Plate < X > Pipe (enter diameter, if pipe)	O.D. 2"	O.D. ≥ 1" and plates
Filler metal specification (SFA) 5.18	ER70S3	
Filler metal F-No	6	6
Filler metal variety for GTAW, PAW (QW-404)	Solid metal wire	Solid metal and metal cored
Consumable insert for GTAW or PAW	Without	Without
Weld deposit thickness for each welding process	3 mm	Max 6 mm
Welding position (1G, 5G, ect.)(QW-405)	6G	ALL
Progression (uphill-downhill)	UPHILL	UPHILL
Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)	NONE	WITH & WITHOUT
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	DC/STRAIGHT	DC/STRAIGHT
Other: insert (QW404.22)	NONE	WITHOUT

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Machine Welding Variables for the Process Used (QW-360)	Actual Values	Range Qualified
Direct-remote visual control	N.A.	N.A.
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	N.A.	N.A.
Welding position (1G, 5G, ect.)	N.A.	N.A.
Consumable insert	N.A.	N.A.
Backing (metal, weld metal, welded from both sides, flux, ect.)	N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type <X>QW-462.2 (Side) Result < >QW-462.3 (a) (Trans. R & F) type < >QW-462.3 (b) (Long, R & F) Results

Nº4 specimens, side bends: satisfactory			

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) None  
 (For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Length and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 1/92  
 We certify that statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization C.I. CIVIDAC S.p.A.  
Q.C. MGR. A. ROSANOVA

Date 5/3/1999 By [Signature]

WITNESSED  
 REVIEWED  
 Date: 5 March 99



**QW-484 WELDER/WELDING OPERATOR PERFORMANCE  
QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name BONESSO GIANNI Number 270 Stamp no. 18S  
 Welding process used GMAW Type SEMIAUTOMATIC  
 Identification of WPS followed by welder during welding of test coupon 1034/1  
 Base material(s) welded SA-516 Gr. 70 Thickness 12 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

	NONE	WITH OR WITHOUT
Backing (metal, weld metal, welded from both sides, flux, etc.) (QW-402)	P-No 1.2	1+11, 34, 4X and similar unassigned
ASME P-No (QW-403) SA-516 Gr.70	Plate	Plate & Pipe OD > 2 7/8"
<> Plate < > Pipe (enter diameter, if pipe)	5.18 - ER 70 S6	
Filler metal specification (SFA)	6	6
Filler metal F-No	N.A.	N.A.
Filler metal variety for GTAW, PAW (QW-404)	N.A.	N.A.
Consumable insert for GTAW or PAW	12 mm	24 mm
Weld deposit thickness for each welding process	1G	F
Welding position (1G, 5G, ect.) (QW-405)	N.A.	N.A.
Progression (uphill-downhill)	Ar CO <sub>2</sub> - 80/20%	Ar CO <sub>2</sub> - 80/20%
Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)	Spray arc	all except SCA
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity		

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	N.A.	N.A.
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	N.A.	N.A.
Welding position (1G, 5G, ect.)	N.A.	N.A.
Consumable insert	N.A.	N.A.
Backing (metal, weld metal, welded from both sides, flux, ect.)	N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type < > QW-462-5 (d) (Side) Result < X > QW-462.3 (a) (Trans. R & F) type < > QW-462.3 (b) (Long, R & F) Results

N° 2 FACE BEND	SATISFACTORY		
N° 2 ROOT BEND	SATISFACTORY		

Visual examination result (QW-302.4) Satisfactory

Radiographic test result (QW-304 and QW-305) SATISFACTORY

( For alternative qualification of groove welds by radiography)

Fillet Weld-Fracture test N.A. Lenght and percent of defects N.A. in.

Macro test fusion Satisfactory Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C Mgr. C.I. CIVIDAC S.p.A. & SGS

Mechanical tests conducted by Q.C Mgr. C.I. CIVIDAC S.p.A. & SGS Laboratory test no. ASTORI 9131/A/B

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



Date 27/09/2004

Organization \_\_\_\_\_

By C.I. CIVIDAC S.p.A.  
Q.C. MGR. MEMO



**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPO)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name KERE ABOUBACAR Number 90 Stamp no. 20S  
 Welding process used SMAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 282  
 Base material(s) welded SA 516 GR. 70 Thickness 20 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal, weld metal, welded from both sides, flux, etc.) (QW-402)  
 ASME P-No (QW-403) 1  
 < X > Plate < > Pipe (enter diameter, if pipe)  
 Filler metal specification (SFA) 5.1  
 Filler metal F-No  
 Filler metal variety for GTAW, PAW (QW-404)  
 Consumable insert for GTAW or PAW  
 Weld deposit thickness for each welding process  
 Welding position (1G, 5G, ect.) (QW-405)  
 Progression (uphill-downhill)  
 Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)  
 GMAW transfer mode (QW-409)  
 GTAW welding current type-polarity  
 Other: insert (QW404.22)

NONE	WITH AND WITHOUT
P1	P1+P11-P34-P4X and similar unassigned
PLATE	PLATE and PIPE O.D. $\geq 2\ 7/8"$
E7018-1	
4	1:4
N.A.	N.A.
N.A.	N.A.
20 mm	Max. to be welded
1G	F
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control  
 Automatic voltage control (GTAW)  
 Automatic joint tracking  
 Welding position (1G, 5G, ect.)  
 Consumable insert  
 Backing (metal, weld metal, welded from both sides, flux, ect.)

N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type < N.A. > QW-462.2 (Side) Result < N.A. > QW-462.3 (a) (Trans. R & F) type < N.A. > QW-462.3 (b) (Long. R & F) Results

N.A.			

Visual examination result (QW-302.4) Satisfactory

Radiographic test result (QW-304 and QW-305) Satisfactory

( For alternative qualification of groove welds by radiography)

Fillet Weld-Fracture test N.A. Length and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.

Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 20/97

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

**C.I. CIVIDAC S.p.A.**  
 Organization Q.C. MGR. A. ROSANOVA

Date 12/03/1999

By [Signature]



WITNESSED  
 REVIEWED  
 Date: 12 March 99



**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name TOFFOLI CLAUDIO Number 94 Stamp no. 22S  
 Welding process used SAW Type MACHINE  
 Identification of WPS followed by welder during welding of test coupon 2502  
 Base material(s) welded SA 516 GR. 70 Thickness 20 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal, weld metal, welded from both sides, flux, etc.) (QW-402)	N.A.	N.A.
ASME P-No (QW-403) 1	N.A.	N.A.
< X > Plate < > Pipe (enter diameter, if pipe)	N.A.	N.A.
Filler metal specification (SFA) 5.17	N.A.	N.A.
Filler metal F-No	N.A.	N.A.
Filler metal variety for GTAW, PAW (QW-404)	N.A.	N.A.
Consumable insert for GTAW or PAW	N.A.	N.A.
Weld deposit thickness for each welding process	N.A.	N.A.
Welding position (1G, 5G, ect.) (QW-405)	N.A.	N.A.
Progression (uphill-downhill)	N.A.	N.A.
Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)	N.A.	N.A.
GMAW transfer mode (QW-409)	N.A.	N.A.
GTAW welding current type-polarity	N.A.	N.A.
Other: insert (QW404.22)	N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control	DIRECT	DIRECT
Automatic voltage control (GTAW)	N.A.	N.A.
Automatic joint tracking	NO	WITH & WITHOUT
Welding position (1G, 5G, ect.)	1G	F
Consumable insert	NO	WITH & WITHOUT
Backing (metal, weld metal, welded from both sides, flux, ect.)	BASE METAL	WITH BACKING ONLY

**Guided Bend Test Results**

Guide Bend Tests Type < X > QW-462.2 (Side) Result < > QW-462.3 (a) (Trans. R & F) type < > QW-462.3 (b) (Long, R & F) Results

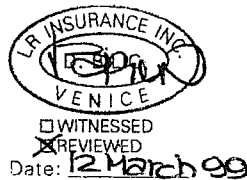
1P2 Side-bend : satisfactory			
1P2 Side-bend : satisfactory			

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) N.A.  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Length and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by C.T.R. Laboratory test no. 7100  
 We certify that statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization C.I. CIVIDAC S.p.A.  
Q.C. MGR. A. ROSANOVA  
 By [Signature]

Date 4/3/1999





**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name PERISSINOTTO MARIO Number 244 Stamp no. 23S  
 Welding process used GTAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 2507/1  
 Base material(s) welded SA 516-70 Thickness 12 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal, weld metal, welded from both sides, flux, etc.) (QW-402)  
 ASME P-No (QW-403) 1  
 <X> Plate < > Pipe (enter diameter, if pipe)  
 Filler metal specification (SFA) 5.18  
 Filler metal F-No  
 Filler metal variety for GTAW, PAW (QW-404)  
 Consumable insert for GTAW or PAW  
 Weld deposit thickness for each welding process  
 Welding position (1G, 5G, ect.) (QW-405)  
 Progression (uphill-downhill)  
 Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)  
 GMAW transfer mode (QW-409)  
 GTAW welding current type-polarity  
 Other: insert (QW404.22)

NONE	WITH & WITHOUT BACKING
P1	P1-P11-P34-P4X and similar unassigned
Plate	Plate and pipe O.D. $\geq 2\ 7/8"$
ER70S	
6	6
Solid metal wire	Solid metal and metal cored
Without	Without
3 mm	6 mm
1G	F
N.A.	N.A.
None	With and without
N.A.	N.A.
DC/STRAIGHT	DC/STRAIGHT
NONE	WITHOUT

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control  
 Automatic voltage control (GTAW)  
 Automatic joint tracking  
 Welding position (1G, 5G, ect.)  
 Consumable insert  
 Backing (metal, weld metal, welded from both sides, flux, ect.)

N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type <N.A.> QW-462.2 (Side) Result <N.A.> QW-462.3 (a) (Trans. R & F) type <N.A.> QW-462.3 (b) (Long, R & F) Results

N.A.			

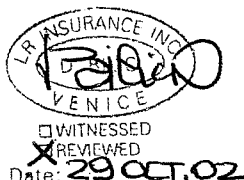
Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) Satisfactory  
 (For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Length and percent of defects N.A. in.  
 Macro test fusion N.A. Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by N.A. Laboratory test no. N.A.  
 We certify that statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

**C.I. CIVIDAC S.p.A.**  
**Q.C. MGR. A. ROSANOVA**

Organization \_\_\_\_\_  
 By *A. Rosanova*

Date 41/10/2002





**QW-484 WELDER/WELDING OPERATOR  
PERFORMANCE QUALIFICATION (WPQ)**  
(See QW-301, Section IX, ASME Boiler and Pressure Vessel Code)

Welder's name PERISSINOTTO MARIO Number 245 Stamp no. 23S  
 Welding process used SMAW Type MANUAL  
 Identification of WPS followed by welder during welding of test coupon 84.TM.94  
 Base material(s) welded SA 106 GR. B Thickness 22 mm

**Manual or Semiautomatic Variable for Each Process (QW 350) Actual Values Range Qualified**

Backing (metal, weld metal, welded from both sides, flux, etc.) (QW-402)  
 ASME P-No (QW-403) 1  
 < > Plate < X > Pipe (enter diameter, if pipe)  
 Filler metal specification (SFA) 5.1  
 Filler metal F-No  
 Filler metal variety for GTAW, PAW (QW-404)  
 Consumable insert for GTAW or PAW  
 Weld deposit thickness for each welding process  
 Welding position (1G, 5G, ect.) (QW-405)  
 Progression (uphill-downhill)  
 Backing gas for GTAW, PAW, or GMAW; fuel gas for OFW (QW-408)  
 GMAW transfer mode (QW-409)  
 GTAW welding current type-polarity  
 Other: insert (QW404.22)

WELD METAL	WITH BACKING ONLY
P1	P1-P11-P34-P4X and similar unassigned
O.D. 6"	O.D. ≥ 2 7/8" and plates
E7018-1	
4	1-4
N.A.	N.A.
N.A.	N.A.
22 mm	Max. to be welded
1G	F
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.

**Machine Welding Variables for the Process Used (QW-360) Actual Values Range Qualified**

Direct-remote visual control  
 Automatic voltage control (GTAW)  
 Automatic joint tracking  
 Welding position (1G, 5G, ect.)  
 Consumable insert  
 Backing (metal, weld metal, welded from both sides, flux, ect.)

N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.
N.A.	N.A.

**Guided Bend Test Results**

Guide Bend Tests Type < X > QW-462.2 (Side) Result < > QW-462.3 (a) (Trans. R & F) type < > QW-462.3 (b) (Long, R & F) Results

N° 2 side-bend : satisfactory			
N° 2 side-bend : satisfactory			

Visual examination result (QW-302.4) Satisfactory  
 Radiographic test result (QW-304 and QW-305) Good  
 ( For alternative qualification of groove welds by radiography)  
 Fillet Weld-Fracture test N.A. Lenght and percent of defects N.A. in.  
 Macro test fusion Good Fillet leg size N.A. in. x N.A. in. Concavity/convexity N.A. in.

Welding test conducted by Q.C. Mgr. CIVIDAC S.p.A.  
 Mechanical tests conducted by Q.C. Mgr. CIVIDAC S.p.A. Laboratory test no. 23/2002  
 We certify that statements in this record are correct and that the test coupons were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Organization C.I. CIVIDAC S.p.A.  
Q.C. MGR. A. ROSANOVA  
 By \_\_\_\_\_

Date 11/10/2002







*Costruzioni Industriali Cividac Spa*  
*S. Biagio di Callalta – Treviso – Italy*  
Tel. 0039.0422.895090 – Fax 0039.0422.895121 – Email [info@cividac.com](mailto:info@cividac.com)

# SECTION

# E



# REFERENCE SKETCH

## SCHEMA DI RIFERIMENTO

REPORT NO. **4320/RS**  
Certific. N°

SHEET **1** OF **1**  
Foglio di

JOB NO. **2010 / 005 / T**  
Comm. N°

ORDER NO. **10PU-000265-PR**  
Ordine N°

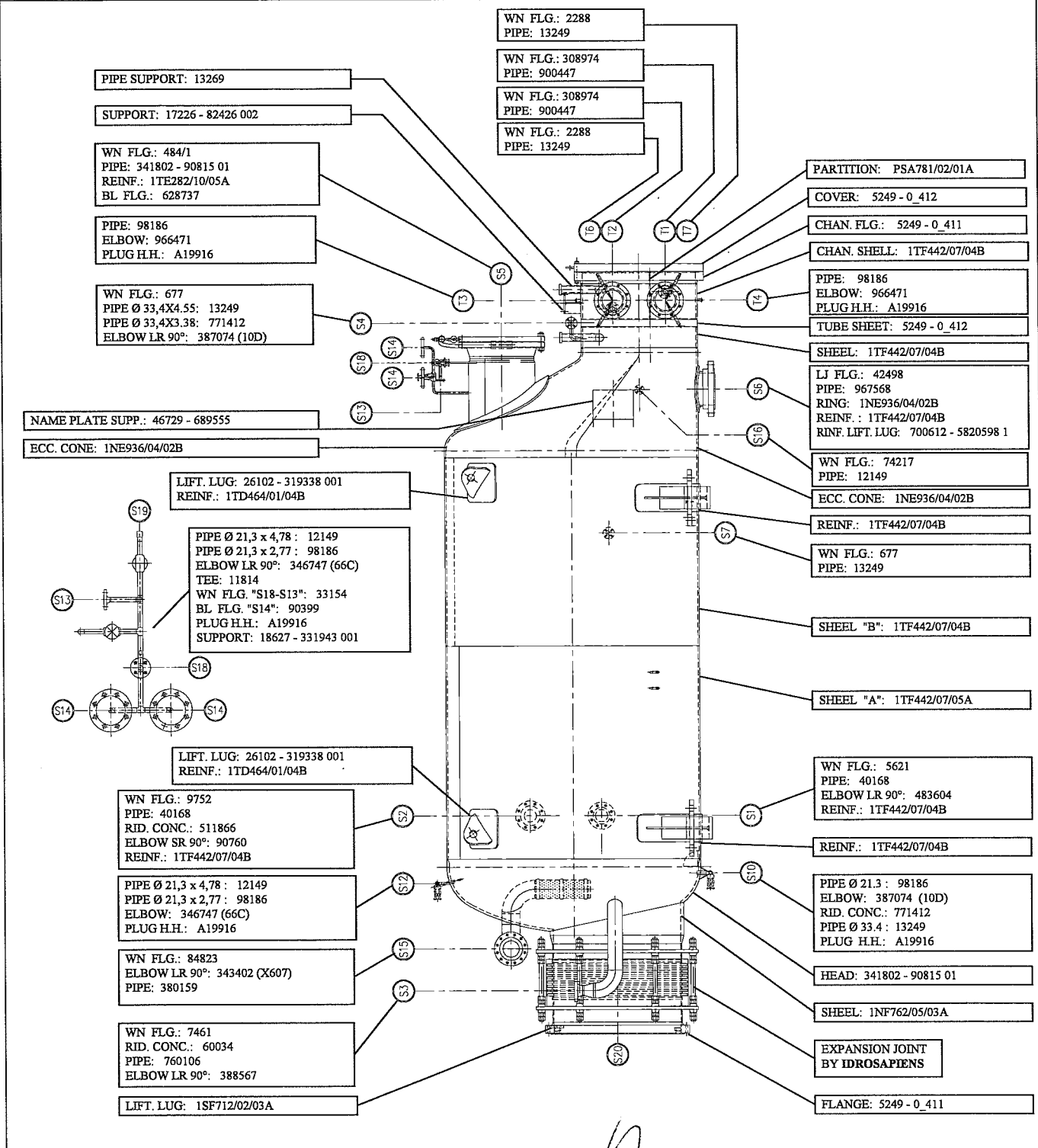
ITEM NO. **T10 HR**  
Sigla

SERIAL NO. **4320**  
N° fabbr.

DWG NO. **6725-2010**  
Disegno N°

INSPECTION PRG. **2010/005**  
Prg. Ispezione

REV. **00** STEP **A10**  
Rev. Fase



DATE  
Data

INSPECTOR SIGN.  
Firma ispettore

DATE  
Data

INSPECTOR SIGN.  
Firma ispettore  
*ARUSE*  
Reviewed by  
ASME AI J. BREDA  
13516 A 25/06/2010

DATE  
Data  
16/06/2010

Q. C. MANAGER SIGN.  
Firma Q. C. Manager  
*C. CIVIDAC S.p.A.*  
MEMO



# MILL REPORT SUMMARY

SHEET 1 OF 5  
Foglio di

<b>JOB NO.</b> Commessa N° <b>2010/005/T</b>	<b>ORDER NO.</b> Ordine N° <b>10PU-000265-PR</b>	<b>ITEM NO.</b> Sigla <b>T10 HR</b>	<b>SERIAL NO.</b> N° fabbr. <b>4320</b>	<b>DRAWING NO.</b> Disegno N° <b>6725-2010</b>
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Component	Dwg Item	Q.ty	Material	Dim. (Thk, etc)	Test No.	Heat No.	Supplier	Material Test Report no.	In. Ag
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SHELL "A"	101	1	SA 516 Gr. 70	15 Thk.	1TF422/07/05A	1TF442	METINVEST	195974	
SHELL "B"	102	1	SA 516 Gr. 70	15 Thk.	1TF442/07/04B	1TF442	METINVEST	195974	
WN-RF FLANGE S2	103	1	SA 105	NPS 5 300#	/	9752	BINDA & GALPERTI	6243	
PIPE S1 S2	104	2	SA 333 Gr. 6	Ø 114.3 x 8.56	/	40168	ARCELOR MITTAL	A 119/1	
REINFORCING S1 S2	105	2	SA 516 Gr. 70	15 Thk.	1TF442/07/04B	1TF442	METINVEST	195974	
CONC. REDUC. S2	106	1	SA 420 Gr. WPL6	NPS 5-4 Sch. 80	/	511866	IRC	3020	
ELBOW 90° LR S1	107	1	SA 420 Gr. WPL6	Ø 114.3 x 6.02	/	483604	ERNEFITTINGS	002893/08-EM	
ELBOW 90° SR S2	108	1	SA 420 Gr. WPL6	Ø 114.3 x 6.02	/	90760	IRC	3020	
WN-RF FLANGE S1	109	1	SA 105	NPS 4 300#	/	5621	BINDA & GALPERTI	6243	
WN-RF FLANGE S7	110	1	SA 105	NPS 1 150#	/	677	BINDA & GALPERTI	6243	
PIPE S7	111	1	SA 333 Gr. 6	Ø 33.4 x 4.55	/	13249	PIETRA	19848	
NAME PLATE SUPPORT	112	1	SA 516 Gr. 60	5 Thk.	689555	46729	SALZGITTER FLACHSTAHL	602027	
REINFORCING	113	4	SA 516 Gr. 70	20 Thk.	1TD464/01/04B	1TD464	METINVEST	169152	
LIFTING LUG	114	4	SA 516 Gr. 70	30 Thk.	319338 001	26102	VITKOVICE STEEL	8762/2008	
REINFORCING	115	2	SA 516 Gr. 60	10 Thk.	7SE981/04/02A	7SE981	METINVEST	190677	
TERMOWELL (Ø 24 x 275 )	118	2	SA 350 LF2	Ø 25	/	285/03	FIORI	1224	
ELL. HEAD (22 Thk. min. A.F.)	201	1	SA 516 Gr. 70	25 Thk.	90815-01	341802	DILLINGER HUTTE	351602-002	
WN-RF FLANGE S3	202	1	SA 105	NPS 3 300#	/	7461	BINDA & GALPERTI	6243	
PIPE S3	203	1	SA 333 Gr. 6	Ø 141.3 x 9.52	/	760106	TENARIS	07/04604	
ELBOW 90° LR S3	204	1	SA 420 Gr. WPL6	Ø 141.3 x 6.55	/	388567	ERNEFITTINGS	008492/10-SD	
CONC. REDUC. S3	205	1	SA 420 Gr. WPL6	NPS 5-3 Sch. 40	/	60034	IRC	3020	
ELBOW 90° LR S10	206	1	SA 420 Gr. WPL6	Ø 33.4 x 3.38	/	387074 (10D)	ERNEFITTINGS	044500/09-HG	
CONC. REDUC. S10	207	1	SA 420 Gr. WPL6	NPS 1 - 1/2 Sch. 40	/	771412	CENA	2.931.B1Ap	

<b>INSPECTOR</b>	<b>INSPECTOR</b>  Reviewed by ASME AI - U. BREDA 13678 A 25/06/2010	<b>C.I. CIVIDAC</b> 
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# MILL REPORT SUMMARY

SHEET 2 OF 5  
Foglio di

JOB NO. Commessa N°		ORDER NO. Ordine N°		ITEM NO. Sigla		SERIAL NO. N° fabbr.		DRAWING NO. Disegno N°		
2010/005/T		10PU-000265-PR		T10 HR		4320		6725-2010		
Component	Dwg Item	Q.ty	Material	Dim. (Thk, etc)	Test No.	Heat No.	Supplier	Material Test Report no.	In. Ag	
PIPE	S10	208	2	SA 333 Gr. 6	Ø 21.3 x 2.77	/	98186	PIETRA	13121	
PLATE	S10	209	2	SA 516 Gr. 60	5 Thk.	689555	46729	SALZGITTER FLACHSTAHL	602027	
PIPE	S10	210	2	SA 333 Gr. 6	Ø 33.4 x 4.55	/	13249	PIETRA	19848	
VALVE		211	1	SA 105	NPS ½	Valve's documentation ( Section G )				
PLUG FEM. H.H.	S10	212	1	SA 350 LF2	NPS ½ NPT 3000#	/	A19916	FIORI	950	
PIPE	S12	213	1	SA 106 Gr. B	Ø 21.3 x 4.78	/	12149	PIETRA	19460	
PIPE	S12	214	2	SA 333 Gr. 6	Ø 21.3 x 2.77	/	98186	PIETRA	13121	
ELBOW 90° LR	S12	215	1	SA 420 Gr. WPL6	Ø 21.3 x 2.77	/	346747 (66C)	ERNEFITTINGS	002784/10-SD	
VALVE		216	1	SA 105	NPS ½	Valve's documentation ( Section G )				
PLUG FEM. H.H.	S12	217	1	SA 350 LF2	NPS ½ NPT 3000#	/	A19916	FIORI	950	
TERMOWELL (Ø 24 x 275 )		218	2	SA 350 LF2	Ø 25	/	285/03	FIORI	1224	
LIFTING LUG		220	2	SA 516 Gr. 60	20 Thk.	1SF712/02/03A	1SF712	METINVEST	196989	
SHELL	S20	230	1	SA 516 Gr. 70	30 Thk.	1NF672/05/03A	1NF672	METINVEST	197527	
EXPANSION JOINT	S20	231	1	INOFLEX No. S/SU61309-2	Type SUW DN 1200	Inoflex's documentation ( Section A )				
FLANGE	S20	232	1	SA 266 Gr. 2	Øe 1360 Øi 1200 H= 113	0-411	5249	LA FORGIA DI BOLLATE	M 0341/10	
WN-RF FLANGE	S15	233	1	SA 105	NPS 6 300#	/	84823	BINDA & GALPERTI	6243	
PIPE	S15	234	1	SA 333 Gr. 6	Ø 168.3 x 10.97	/	380159	VOESTALPINE	Z48237	
ELBOW 90° LR	S15	235	2	SA 420 Gr. WPL6	Ø 168.3 x 10.97	/	343402 (X607)	INTERFIT	10-02679	
CONICAL HEAD		301	1	SA 516 Gr. 70	16 Thk.	1NE936/04/02B	1NE936	METINVEST	187601	
SHELL		302	1	SA 516 Gr. 70	15 Thk.	1TF442/07/04B	1TF442	METINVEST	195974	
WN-RF FLANGE	S5	303	1	SA 105	NPS 24 150#	/	484/1	BINDA & GALPERTI	6243	
PIPE	S5	304	1	SA 516 Gr. 70	25 Thk.	90815-01	341802	DILLINGER HUTTE	351602-002	

INSPECTOR	INSPECTOR <i>ARIST</i>	C.I. CIVIDAC
	Reviewed by ASME AI- U. XREDA 1561/A 25/06/2010	



# MILL REPORT SUMMARY

SHEET 3 OF 5  
Foglio di

<b>JOB NO.</b> Commessa N° <b>2010/005/T</b>	<b>ORDER NO.</b> Ordine N° <b>10PU-000265-PR</b>	<b>ITEM NO.</b> Sigla <b>T10 HR</b>	<b>SERIAL NO.</b> N° fabbr. <b>4320</b>	<b>DRAWING NO.</b> Disegno N° <b>6725-2010</b>
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Component	Dwg Item	Q.ty	Material	Dim. (Thk, etc)	Test No.	Heat No.	Supplier	Material Test Report no.	In. Ag
REINFORCING	S5	305	1	SA 516 Gr. 70	20 Thk.	1TE282/10/05A	1TE282	METINVEST	186031
BL-RF FLANGE	S5	306	1	SA 105	NPS 24 150#	/	628737	OFFICINE SANTAFEDE	500916
STUD BOLT	S5	308	20	SA 193 Gr. B7	Ø 1¼" x 190	/	AC5300	EMI	4179
HEX NUT	S5	309	40	SA 194 Gr. 2H	Ø 1¼" H=D	/	10364	EMI	4179
PIPE SUPPORT		311	1	SA 516 Gr. 70	10 Thk.	331943 001	18627	EVRAZ VITKOVICE	15451/2008
ROD (Ø 18)		315	1	SA 516 Gr. 70	20 Thk.	1TE282/10/05A	1TE282	METINVEST	186031
WN-RF FLANGE	S16	318	1	SA 105	NPS ½ 150#	/	74217	FERRARI	5.690/1
PIPE	S16	319	1	SA 106 Gr. B	Ø 21.3 x 4.78	/	12149	PIETRA	19460
PLUG FEM. H.H.	S19	320	1	SA 350 LF2	NPS ½ NPT 3000#	/	A19916	FIORI	950
PIPE	S13 S14 S18	321	1	SA 106 Gr. B	Ø 21.3 x 4.78	/	12149	PIETRA	19460
PIPE	S13 S14 S18	322	13	SA 333 Gr. 6	Ø 21.3 x 2.77	/	98186	PIETRA	13121
ELBOW 90° LR	S13 S14 S18	323	4	SA 420 Gr. WPL6	Ø 21.3 x 2.77	/	346747 (66C)	ERNEFITTINGS	002784/10-SD
TEE	S13 S14 S18	324	4	SA 420 Gr. WPL6	Ø 21.3 x 2.77	/	11814	O.M.R.	32198
WN-RF FLANGE	S13 S18	325	2	SA 105	NPS ½ 150#	/	33154	BINDA & GALPERTI	6243
BL-RF FLANGE	S14	326	2	SA 105	NPS 3 150#	/	90399	BINDA & GALPERTI	6243
VALVES	S19	327	2	SA 105	NPS ½	Valve's documentation ( Section G )			
SUPPORT	S13 S14 S18	328	2	SA 516 Gr. 70	10 Thk.	331943 001	18627	EVRAZ VITKOVICE	15451/2008
WN-RF FLANGE	S4	329	1	SA 105	NPS 1 150#	/	677	BINDA & GALPERTI	6243
PIPE	S4	330	1	SA 333 Gr. 6	Ø 33.4 x 4.55	/	13249	PIETRA	19848
PIPE	S4	331	2	SA 333 Gr. 6	Ø 33.4 x 3.38	/	771412	TENARIS	07/28491
ELBOW 90° LR	S4	332	2	SA 420 Gr. WPL6	Ø 33.4 x 3.38	/	387074 (10D)	ERNEFITTINGS	044500/09-HG
PLATE	S4	333	1	SA 516 Gr. 60	5 Thk.	689555	46729	SALZGITTER FLACHSTAHL	602027

INSPECTOR

INSPECTOR

*ARISE*  
Reviewed by  
ASME AI - U. BREDA  
13618 A 15/06/2010

C.I. CIVIDAC

C.I. CIVIDAC S.p.A.  
QC - MGR - MEMO



# MILL REPORT SUMMARY

SHEET 4 OF 5  
Foglio di

<b>JOB NO.</b> <i>Commessa N°</i> <b>2010/005/T</b>	<b>ORDER NO.</b> <i>Ordine N°</i> <b>10PU-000265-PR</b>	<b>ITEM NO.</b> <i>Sigla</i> <b>T10 HR</b>	<b>SERIAL NO.</b> <i>N° fabbr.</i> <b>4320</b>	<b>DRAWING NO.</b> <i>Disegno N°</i> <b>6725-2010</b>
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Component	Dwg Item	Q.ty	Material	Dim. (Thk, etc)	Test No.	Heat No.	Supplier	Material Test Report no.	In. Ag
NAME PLATE SUPPORT		334	1	SA 516 Gr. 60	5 Thk.	689555	46729	SALZGITTER FLACHSTAHL	602027
REINFORCING FOR LIF. LUG	S6	337	2	SA 516 Gr. 70	10 Thk.	5820598-1	700612	ARCELOR	88468-02
LIFTING LUG	S6	338	2	SA 516 Gr. 70	20 Thk.	1TD464/01/04B	1TD464	METINVEST	169152
PIPE		339	4	SA 106 Gr. B	Ø 73 x 5.16	/	13269	PIETRA	20302
TUBE SHEET		350	1	SA 266 Gr. 2	Øe 1100 H= 80	0-412	5249	LA FORGIA DI BOLLATE	M 0342/10
"U" TUBE		351	560	SA 210 Gr. A1	Ø 15.87 x 2.11	/	192727	RONCONI	7406
BAFFLE		352	1	SA 516 Gr. 60	12 Thk.	PSA781/02/01A	PSA781	TRAMETAL	139542
LJ FLANGE	S6	358	1	SA 105	NPS 12 300#	/	42498	BINDA & GALPERTI	6243
PIPE	S6	359	1	SA 333 Gr. 6	Ø 323.8 x 12.7	/	967568	TENARIS	06/27189
RING (12 Thk.)	S6	360	1	SA 516 Gr. 70	16 Thk.	1NE936/04/02B	1NE936	METINVEST	187601
REINFORCING	S6	361	1	SA 516 Gr. 70	15 Thk.	1TF442/07/04B	1TF442	METINVEST	195974
WN-RF FLANGE	T1 T2	401	2	SA 105	NPS 8 150#	/	308974	BINDA & GALPERTI	6243
PIPE	T1 T2	402	2	SA 333 Gr. 6	Ø 219.1 x 12.7	/	900447	TENARIS	10/01943
PIPE	T3 T4	403	2	SA 333 Gr. 6	Ø 21.3 x 2.77	/	98186	PIETRA	13121
ELBOW 90° LR	T3 T4	404	2	SA 420 Gr. WPL6	Ø 21.3 x 4.78	/	966471	IRC	3020
PLATE	T3 T4	405	2	SA 516 Gr. 60	5 Thk.	689555	46729	SALZGITTER FLACHSTAHL	602027
PLUG FEM. H.H.	T3 T4	406	2	SA 350 LF2	NPS ½ NPT 3000#	/	A19916	FIORI	950
TERMOWELL (Ø 24 x 275)		409	4	SA 350 LF2	Ø 25	/	285/03	FIORI	1224
REINFORCING		411	2	SA 516 Gr. 60	12 Thk.	82426 002	17226	VITKOVICE STEEL	32819/2006
REINFORCING		412	1	SA 516 Gr. 60	12 Thk.	82426 002	17226	VITKOVICE STEEL	32819/2006
CHANNEL COURSE		420	1	SA 516 Gr. 70	15 Thk.	1TF442/07/04B	1TF442	METINVEST	195974
CHANNEL FLANGE		421	1	SA 266 Gr. 2	Øe 1220 Øi 1070 H= 110	0-411	5249	LA FORGIA DI BOLLATE	M 0341/10

INSPECTOR	INSPECTOR <b>ARISE</b> Reviewed by ASME AI-1032 138/A 25/06/2010	C.I. CIVIDAC  C.I. CIVIDAC S.p.A. Q.C. INGR. MEMO
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# MILL REPORT SUMMARY

SHEET 5 OF 5  
Foglio di

<b>JOB NO.</b> Commessa N° <b>2010/005/T</b>	<b>ORDER NO.</b> Ordine N° <b>10PU-000265-PR</b>	<b>ITEM NO.</b> Sigla <b>T10 HR</b>	<b>SERIAL NO.</b> N° fabbr. <b>4320</b>	<b>DRAWING NO.</b> Disegno N° <b>6725-2010</b>
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Component	Dwg Item	Q.ty	Material	Dim. (Thk, etc)	Test No.	Heat No.	Supplier	Material Test Report no.	In. Ag
PARTITION	422	1	SA 516 Gr. 60	12 Thk.	PSA781/02/01A	PSA781	TRAMETAL	139542	
WN-RF FLANGE T6 T7	423	2	SA 105	NPS 1 150#	/	2288	BINDA & GALPERTI	6243	
PIPE T6 T7	424	2	SA 333 Gr. 6	Ø 33.4 x 4.55	/	13249	PIETRA	19848	
LIFTING LUG	501	1	SA 516 Gr. 60	12 Thk.	82426 002	17226	VITKOVICE STEEL	32819/2006	
CHANNEL COVER	502	1	SA 266 Gr. 2	Øe 1220 H= 86	0-412	5249	LA FORGIA DI BOLLATE	M 0342/10	
STUD BOLT	504	40	SA 193 Gr. B7	Ø ¾" x 215	/	AD0462	EMI	4179	
HEX. NUT	505	80	SA 194 Gr. 2H	Ø ¾" H=D	/	75583	EMI	4179	
SADDLE SUPPORT	601	2	SA 516 Gr. 70	15 Thk.	1TF442/07/04B	1TF442	METINVEST	195974	
CLOSING DISC	701	1	SA 516 Gr. 60	5 Thk.	689555	46729	SALZGITTER FLACHSTAHL	602027	
PLATE	721	1	SA 516 Gr. 60	5 Thk.	689555	46729	SALZGITTER FLACHSTAHL	602027	
SUPPORT PLATE	759	2	SA 516 Gr. 60	10 Thk.	7SE981/04/03A	7SE981	METINVEST	190677	
SUPPORT PLATE	762	1	SA 516 Gr. 60	10 Thk.	7SE981/04/03A	7SE981	METINVEST	190677	
SUPPORT PLATE	763	1	SA 516 Gr. 60	10 Thk.	7SE981/04/03A	7SE981	METINVEST	190677	
NAME PLATE SUPPORT	770	1	SA 516 Gr. 60	5 Thk.	682950	52109	SALZGITTER FLACHSTAHL	597734	
FLANGE	901	1	SA 516 Gr. 70	30 Thk.	3688046-1	779483	ARCELOR MITTAL	01547-02	
WELDING MATERIAL CERTIFICATE									
CERTIFICATE OF CONFORMITY									
SEVERAL									

<b>INSPECTOR</b>	<b>INSPECTOR ARSE</b> Reviewed by ASME AI-1, BFE DA 17516 / 25/04/2010	<b>C.I. CIVIDAC</b>  CIVIDAC S.p.A. O.E. MEMO
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SN4320 Pos. 103-109-110-202-233-303-325-326-329-401-423-

**OFFICINE BINDA & GALPERTI S.r.l.**  
 PRODUZIONE FLANGE - FORGIATI - GIUNTI ISOLANTI  
 MANUFACTURE OF FLANGES - FORGED - INSULATING JOINTS  
 23813 CORTENOVA (LC) Italy - Via Roma, 43  
 Tel. +39 (0)341.901.333 - Fax +39 (0)341.901.300  
 http://www.officinebindaegalperti.com  
 e-mail: obg@officinebindaegalperti.com



CERTIFICATO DI COLLAUDO /  
 TEST CERTIFICATE  
 EN 10204 3.1.  
 ISO 10474 3.1.B.  
 N. / NR. **6243**  
 DATA / DATE **27/04/2010**

D.D.T. N. / DELIVERY NOTE NR. **358**  
**861**  
 DATA / DATE  
**23/04/2010**

Spett. / Messrs  
**I.M.G. INTERNATIONAL di Rossetto Andrea**  
 Via Masero n. 57  
 - 10010 - SCARMAGNO ( TO )  
 rossetto.andrea@imginternational.it

Page 1 of 10

Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	00040	B16.5 150 BL 24" RF	2	A/SA105N ASME II ED. 07 ADD. 09
1066/10	00040	B16.5 150 BL 24" RF	3	A/SA105N ASME II ED. 07 ADD. 09

COLATA / HEAT	MATERIALE / MATERIAL	ACCIAIERIA / STEEL PLANT	T.T.												
00040	A/SA105N ASME II ED. 07 ADD. 09	RUBIERA	1												
ANALISI CHIMICHE - CHEMICAL ANALYSIS															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,16	1,11	0,22	0,008	0,009	0,15	0,24	0,14	0,013	0,03	0,41	0,025	0,002	0,004	0,002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS															
	Snervamento	Rottura	Allungamento	Strizione	Resilienza	Durezza									
	Yield point Rs N/mm <sup>2</sup>	Tensile stren. R N/mm <sup>2</sup>	Elongation A%	Reduct Area Z%	Impact Test J -10°C	Brinell hard HB									
Min	250	485	22	30		137									
X	331	558	29	60	109 - 92 - 112	153 - 155									
Max		655				197									
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 - PED 97/23/EC E EN 13445															

Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	00040	B16.5 150 BL 24" RF	1	A/SA105N ASME II ED. 07 ADD.09

COLATA / HEAT	MATERIALE / MATERIAL	ACCIAIERIA / STEEL PLANT	T.T.												
00040	A/SA105N ASME II ED. 07 ADD.09	RUBIERA	1												
ANALISI CHIMICHE - CHEMICAL ANALYSIS															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,16	1,11	0,22	0,008	0,009	0,15	0,24	0,14	0,013	0,03	0,41	0,025	0,002	0,004	0,002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS															
	Snervamento	Rottura	Allungamento	Strizione	Resilienza	Durezza									
	Yield point Rs N/mm <sup>2</sup>	Tensile stren. R N/mm <sup>2</sup>	Elongation A%	Reduct Area Z%	Impact Test J -10°C	Brinell hard HB									
Min	250	485	22	30		137									
X	331	558	29	60	109 - 92 - 112	153 - 155									
Max		655				197									
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A															

**C. DIVIAC S.p.A.**  
 C.C. MGBA - MEMO

a) <b>Trattamento termico / Heat treatment</b> 1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma. <i>Normalized at 920 °C / 1 h / 25 mm. and cooled in still air</i> 2) Solubilizzato / Solution Treated and quenched. 3) Bonificato / Quenched and tempered.	4) Normalizzato / Normalized and tempered. 5) _____ b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria. <i>Chemical analysis values are taken from base certificate.</i>	c) Controllo visivo e dimensionale soddisfacente. <i>Satisfactory visual and dimensional check.</i> d) Acciaio elaborato al forno elettrico e calmato. <i>Killed steel made by electric furnace.</i>	
TRADE MARK 	p. OFFICINE BINDA & GALPERTI S.r.l.	COLLAUDATO / INSPECTOR <b>Officina Binda &amp; Galperti s.r.l.</b> Quality Department	ENTE C. / INSPEC. AGENCY

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**IGQ**  
**TUV SUD**  
 APPROVED

**CERTIFICATO DI COLLAUDO / TEST CERTIFICATE**  
 EN 10204 3.1.  
 ISO 10474 3.1.B.  
 N. / NR. **6243**  
 DATA / DATE **27/04/2010**

D.D.T. N. / DELIVERY NOTE NR. **861**  
 DATA / DATE **23/04/2010**

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Ordine Order	Colata Heat	Descrizione Description	Q.tà Materiale Q.ty Material
1066/10	2288	B16.5 150 WN 1" RF S.XS Sp. 4,55	2 A/SA105N ASME II ED. 07 ADD.09 <b>P.423</b>

**COLATA / HEAT 2288**      **MATERIALE / MATERIAL A/SA105N ASME II ED. 07 ADD.09**      **ACCIAIERIA / STEEL PLANT OLIFER - ACP**      **T.T. 1**

**ANALISI CHIMICHE - CHEMICAL ANALYSIS**

	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,17	1,12	0,19	0,008	0,008	0,11	0,2	0,2	0,014	0,05	0,42	0,02		0,0005	0,0002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	

C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

**CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS**

	Snervamento Yield point Rs N/mmq	Rottura Tensile stren. R N/mmq	Allungamento Elongation A%	Strizione Reduct Area Z%	Resilienza Impact Test	Durezza Brinell hard HB
Min	250	485	22	30		137
X	331	568,5	30,5	62		153 - 155
Max		655				197

Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A

Ordine Order	Colata Heat	Descrizione Description	Q.tà Materiale Q.ty Material
1066/10	308974	B16.5 150 WN 8" RF S. 80 Sp. 12,7	2 A/SA105N ASME II ED. 07 ADD.09 <b>P.401</b>

**COLATA / HEAT 308974**      **MATERIALE / MATERIAL A/SA105N ASME II ED. 07 ADD.09**      **ACCIAIERIA / STEEL PLANT STEEL**      **T.T. 1**

**ANALISI CHIMICHE - CHEMICAL ANALYSIS**

	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,16	1,25	0,21	0,015	0,001	0,08	0,05	0,05		0,02	0,41	0,028		0,05	0,001
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	



C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

**CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS**

	Snervamento Yield point Rs N/mmq	Rottura Tensile stren. R N/mmq	Allungamento Elongation A%	Strizione Reduct Area Z%	Resilienza Impact Test	Durezza Brinell hard HB
Min	250	485	22	30		137
X	343	558	28	60		153 - 155
Max		655				197

Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A

**C. I. CIVISAC S.p.A.**  
 C.C. MEMO

<b>a) Trattamento termico / Heat treatment</b> 1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma. <i>Normalized at 920 °C / 1 h / 25 mm. and cooled in still air.</i> 2) Solubilizzato / Solution Treated and quenched. 3) Bonificato / Quenched and tempered.	<b>4) Normalizzato / Normalized and tempered.</b> 5) _____ b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria. <i>Chemical analysis values are taken from base certificate.</i>	<b>c) Controllo visivo e dimensionale soddisfacente.</b> <i>Satisfactory visual and dimensional check.</i> <b>d) Acciaio elaborato al forno elettrico e calmato.</b> <i>Killed steel made by electric furnace.</i>	
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**CERTIFICATO DI COLLAUDO / TEST CERTIFICATE**  
 EN 10204 3.1.  
 ISO 10474 3.1.B.  
 N. / NR. **6243**  
 DATA / DATE **27/04/2010**

D.D.T. N. / DELIVERY NOTE NR. **861**  
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Ordine Order	Colata Heat	Descrizione Description	Q.tà Materiale Q.ty Material
1066/10	33154	B16.5 150 WN 1/2" RF STD Sp. 2,77	2 A/SA105N ASME II ED. 07 ADD.09 <b>P.325</b>

COLATA / HEAT	MATERIALE / MATERIAL	ACCIAIERIA / STEEL PLANT	T.T.												
33154	A/SA105N ASME II ED. 07 ADD.09	CARONNO	1												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSIS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,175	0,7	0,25	0,014	0,017	0,11	0,16	0,07	0,009	0,01	0,33	0,015	0,01	0,001	
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq.CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	<b>Snervamento</b>	<b>Rottura</b>	<b>Allungamento</b>	<b>Strizione</b>	<b>Resilienza</b>	<b>Durezza</b>									
	Yield point Rs N/mmq	Tensile stren. R N/mmq	Elongation A%	Reduct Area Z%	Impact Test	Brinell hard HB									
Min	250	485	22	30		137									
X	326,7	489,8	31,8	60,3		145									
Max		655				197									
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A															

Ordine Order	Colata Heat	Descrizione Description	Q.tà Materiale Q.ty Material
1066/10	42460	UNI 2282/29 DN 200/219,1 PN 16 S.80 WN RF - Cod. 12,7	10 A/SA105 ASME II ED. 07 ADD. 09

COLATA / HEAT	MATERIALE / MATERIAL	ACCIAIERIA / STEEL PLANT	T.T.												
42460	A/SA105 ASME II ED. 07 ADD. 09	SAN ZENO ACCIAI	1												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSIS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,18	1,2	0,25	0,025	0,009	0,11	0,23	0,1	0,014	0,02	0,43	0,031	0,002	0,001	0,003
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq.CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	<b>Snervamento</b>	<b>Rottura</b>	<b>Allungamento</b>	<b>Strizione</b>	<b>Resilienza</b>	<b>Durezza</b>									
	Yield point Rs N/mmq	Tensile stren. R N/mmq	Elongation A%	Reduct Area Z%	Impact Test J -10°C	Brinell hard HB									
Min	250	485	22	30		137									
X	328	521	30	62	97 - 102 - 110	151 - 153									
Max		655				197									
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 - PED 97/23/EC E EN 13445															

C.I. CIVILAC S.p.A.  
 Q.C. / Q.S. / P. MEMO

a) <b>Trattamento termico / Heat treatment</b> 1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma. <i>Normalized at 920 °C / 1 h / 25 mm. and cooled in still air.</i> 2) Solubilizzato / Solution Treated and quenched. 3) Bonificato / Quenched and tempered.	4) Normalizzato / Normalized and tempered. 5) _____ b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria. <i>Chemical analysis values are taken from base certificate.</i>	c) Controllo visivo e dimensionale soddisfacente. <i>Satisfactory visual and dimensional check.</i> d) Acciaio elaborato al forno elettrico e calmato. <i>Killed steel made by electric furnace.</i>	
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 EN 10204 3.1.  
 ISO 10474 3.1.B.  
 N. / NR. **6243**  
 DATA / DATE **27/04/2010**

D.D.T. N. / DELIVERY NOTE NR. **861**  
 DATA / DATE **23/04/2010**

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Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	42498	B16.5 300 LJ 12" FF	1	A/SA105N ASME II ED. 07 ADD.09

COLATA / HEAT	MATERIALE / MATERIAL	ACCIAIERIA / STEEL PLANT	T.T.												
42498	A/SA105N ASME II ED. 07 ADD.09	DUFERDOFIN	1												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSIS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,18	1,18	0,24	0,017	0,006	0,12	0,19	0,08		0,02	0,42	0,033	0,002	0,002	0,001
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	Snervamento		Rottura		Allungamento		Strizione		Resilienza		Durezza				
	Yield point Rs N/mm <sup>2</sup>		Tensile stren. R N/mm <sup>2</sup>		Elongation A%		Reduct Area Z%		Impact Test		Brinell hard HB				
Min	250		485		22		30				137				
X	370		519		27,3		50,44				152 - 158				
Max			655								197				
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A															

Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	484/1	B16.5 150 WN 24" RF Thk. 15	2	A/SA105N ASME II ED. 07 ADD. 09
1066/10	484/1	B16.5 150 WN 24" RF Thk. 15	3	A/SA105N ASME II ED. 07 ADD. 09

COLATA / HEAT	MATERIALE / MATERIAL	ACCIAIERIA / STEEL PLANT	T.T.												
484/1	A/SA105N ASME II ED. 07 ADD. 09	ZELEZIARNE	1												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSIS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,18	0,83	0,22	0,011	0,012	0,2	0,19	0,08		0,01	0,38	0,023		0,004	0,001
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	Snervamento		Rottura		Allungamento		Strizione		Resilienza		Durezza				
	Yield point Rs N/mm <sup>2</sup>		Tensile stren. R N/mm <sup>2</sup>		Elongation A%		Reduct Area Z%		Impact Test J -10°C		Brinell hard HB				
Min	250		485		22		30				137				
X	330		518		27,5		56		85 - 94 - 110		148 - 150				
Max			655								197				
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 - PED 97/23/EC E EN 13445															

G.I. IMDAC S.p.A.  
 Q.C. INSPECTION MEMO

- |   |   |   |
|---|---|---|
| a) <b>Trattamento termico / Heat treatment</b><br>1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma.<br>Normalized at 920 °C / 1 h / 25 mm. and cooled in still air.<br>2) Solubilizzato / Solution Treated and quenched.<br>3) Bonificato / Quenched and tempered. | 4) <b>Normalizzato / Normalized and tempered.</b><br>5) _____<br>b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria.<br>Chemical analysis values are taken from base certificate. | c) <b>Controllo visivo e dimensionale soddisfacente.</b><br>Satisfactory visual and dimensional check.<br>d) <b>Acciaio elaborato al forno elettrico e calmato.</b><br>Killed steel made by electric furnace. |
|---|---|---|

TRADE MARK 	p. OFFICINE BINDA & GALPERTI S.r.l.	COLLAUDATORE / INSPECTOR  Binda & Galperti s.r.l. Quality Department	ENTE C. / INSPEC. AGENCY
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 SO 10474 3.1.B.  
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Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	484/1	B16.5 150 WN 24" RF Thk. 15	1	A/SA105N ASME II ED. 07 ADD.09 ← P. 303

5/1

**COLATA / HEAT 484/1**      **MATERIALE / MATERIAL A/SA105N ASME II ED. 07 ADD.09**      **ACCIAIERIA / STEEL PLANT ZELEZIARNE**      **T.T. 1**

**ANALISI CHIMICHE - CHEMICAL ANALYSIS**

	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,18	0,83	0,22	0,011	0,012	0,2	0,19	0,08		0,01	0,38	0,023		0,004	0,001
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	

C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

**CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS**

	Snervamento Yield point Rs N/mm <sup>2</sup>	Rottura Tensile stren. R N/mm <sup>2</sup>	Allungamento Elongation A%	Strizione Reduct Area Z%	Resilienza Impact Test	Durezza Brinell hard HB
Min	250	485	22	30		137
X	330	518	27,5	56		148 - 150
Max		655				197

Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A

Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	5621	B16.5 300 WN 4" RF S.XS Sp. 8,56	1	A/SA105N ASME II ED. 07 ADD.09 ← P. 109

5/1

**COLATA / HEAT 5621**      **MATERIALE / MATERIAL A/SA105N ASME II ED. 07 ADD.09**      **ACCIAIERIA / STEEL PLANT OLIFER - ACP**      **T.T. 1**

**ANALISI CHIMICHE - CHEMICAL ANALYSIS**

	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,167	1,14	0,213	0,008	0,008	0,14	0,15	0,14	0,007	0,05	0,41	0,02		0,001	0,001
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	

C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

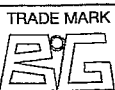
**CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS**

	Snervamento Yield point Rs N/mm <sup>2</sup>	Rottura Tensile stren. R N/mm <sup>2</sup>	Allungamento Elongation A%	Strizione Reduct Area Z%	Resilienza Impact Test	Durezza Brinell hard HB
Min	250	485	22	30		137
X	358	559	30	60,5		151 - 155
Max		655				197

Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A

*C.I. BINDA & GALPERTI S.p.A.*  
 Q.C. MGR / MEMO

- |  |  |   |
|--|--|---|
| a) <b>Trattamento termico / Heat treatment</b><br>1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma.<br><i>Normalized at 920 °C / 1 h / 25 mm. and cooled in still air.</i><br>2) Solubilizzato / Solution Treated and quenched.<br>3) Bonificato / Quenched and tempered. | 4) <b>Normalizzato / Normalized and tempered.</b><br>5) _____<br>b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria.<br><i>Chemical analysis values are taken from base certificate.</i> | c) <b>Controllo visivo e dimensionale soddisfacente.</b><br><i>Satisfactory visual and dimensional check.</i><br>d) <b>Acciaio elaborato al forno elettrico e calmato.</b><br><i>Killed steel made by electric furnace.</i> |
|--|--|---|



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**Binda & Galperti s.r.l.**  
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CERTIFICATO DI COLLAUDO /  
 TEST CERTIFICATE  
 EN 10204 3.1.  
 ISO 10474 3.1.B.

D.D.T. N. / DELIVERY NOTE NR.  
**861**

N. / NR. **6243**  
 DATA / DATE **27/04/2010**

DATA / DATE  
**23/04/2010**

Spett. / Messrs  
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 Via Masero n. 57  
 - 10010 - SCARMAGNO ( TO )  
 rossetto.andrea@imginternational.it

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Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	6408	UNI 2284/29 DN100 PN25/40 S.40 WN RF - Cod. 6,02	10	A/SA105 ASME II ED. 07 ADD. 09
1066/10	6408	UNI 2284/29 DN125 PN25/40 S.40 WN RF - Cod. 6,55	5	A/SA105 ASME II ED. 07 ADD. 09

**COLATA / HEAT 6408**      **MATERIALE / MATERIAL A/SA105 ASME II ED. 07 ADD. 09**      **ACCIAIERIA / STEEL PLANT OLIFER - ACP**      **T.T. 1**

**ANALISI CHIMICHE - CHEMICAL ANALYSYS**

	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,186	0,78	0,19	0,004	0,008	0,05	0,07	0,07	0,005	0,019	0,34	0,02		0,002	0,001
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	

C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

**CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS**

	Snervamento Yield point Rs N/mm <sup>2</sup>	Rottura Tensile stren. R N/mm <sup>2</sup>	Allungamento Elongation A%	Strizione Reduct Area Z%	Resilienza Impact Test J -10°C	Durezza Brinell hard HB
Min	250	485	22	30		137
X	326	495	28	63	75 - 82 - 88	145 - 148
Max		655				197

Test standard conforming to ASTM A370 - According to NACE MR 0175/03 - PED 97/23/EC E EN 13445

Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	6440	UNI 2282/29 DN15 PN10/16 S.40 WN RF - Cod. 2,77	15	A/SA105 ASME II ED. 07 ADD. 09
1066/10	6440	UNI 2282/29 DN 25 PN10/16 S.40 WN RF - Cod. 3,38	10	A/SA105 ASME II ED. 07 ADD. 09

**COLATA / HEAT 6440**      **MATERIALE / MATERIAL A/SA105 ASME II ED. 07 ADD. 09**      **ACCIAIERIA / STEEL PLANT OLIFER - ACP**      **T.T. 1**

**ANALISI CHIMICHE - CHEMICAL ANALYSYS**

	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,175	1,11	0,208	0,006	0,007	0,06	0,17	0,16	0,01	0,05	0,4	0,024		0,001	0,0002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	

C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

**CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS**

	Snervamento Yield point Rs N/mm <sup>2</sup>	Rottura Tensile stren. R N/mm <sup>2</sup>	Allungamento Elongation A%	Strizione Reduct Area Z%	Resilienza Impact Test J -10°C	Durezza Brinell hard HB
Min	250	485	22	30		137
X	363	558,5	30,5	59	98 - 88 - 82	150 - 153
Max		655				197

Test standard conforming to ASTM A370 - According to NACE MR 0175/03 - PED 97/23/EC E EN 13445

G.I. EMDAC S.p.A.  
 C.S. INTER. P. MEMO

- |  |   |   |
|--|---|---|
| a) <b>Trattamento termico / Heat treatment</b><br>1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma.<br><i>Normalized at 920 °C / 1 h / 25 mm. and cooled in still air.</i><br>2) Solubilizzato / Solution Treated and quenched.<br>3) Bonificato / Quenched and tempered. | 4) Normalizzato / Normalized and tempered.<br>5) _____<br>b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria.<br><i>Chemical analysis values are taken from base certificate.</i> | c) Controllo visivo e dimensionale soddisfacente.<br><i>Satisfactory visual and dimensional check.</i><br>d) Acciaio elaborato al forno elettrico e calmato.<br><i>Killed steel made by electric furnace.</i> |
|--|---|---|

TRADE MARK 	p. OFFICINE BINDA & GALPERTI S.r.l. 	COLLAUDATORE / INSPECTOR Binda & Galperti s.r.l. Quality Department	ENTE C. / INSPEC. AGENCY
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		N. / NR. <b>6243</b> DATA / DATE <b>27/04/2010</b>	DATA / DATE <b>23/04/2010</b>
Spett. / Messrs <b>I.M.G. INTERNATIONAL di Rossetto Andrea</b> Via Masero n. 57 - 10010 - SCARMAGNO ( TO ) rossetto.andrea@imginternational.it		<b>Page 7 of 10</b>	



Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	677	B16.5 150 WN 1" RF STD Sp. 3,38	5/T 1	A/SA105N ASME II ED. 07 ADD.09 <b>P. 329</b>
1066/10	677	B16.5 150 WN 1" RF S.XS Sp. 4,55	5/T 1	A/SA105N ASME II ED. 07 ADD.09 <b>P. 110</b>

<b>COLATA / HEAT</b> 677	<b>MATERIALE / MATERIAL</b> A/SA105N ASME II ED. 07 ADD.09	<b>ACCIAIERIA / STEEL PLANT</b> OLIFER - ACP	<b>T.T.</b> 1												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSYS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,177	1,15	0,224	0,008	0,005	0,12	0,16	0,12	0,013	0,05	0,42	0,02	0,002	0,001	0,002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	<b>Snervamento</b> Yield point Rs N/mm <sup>2</sup>	<b>Rottura</b> Tensile stren. R N/mm <sup>2</sup>	<b>Allungamento</b> Elongation A%	<b>Strizione</b> Reduct Area Z%	<b>Resilienza</b> Impact Test	<b>Durezza</b> Brinell hard HB									
Min	250	485	22	30		137									
X	331	528	32	60,5		151 - 153									
Max		655				197									
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A															

Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	7461	B16.5 300 WN 3" RF STD Sp. 5,49	5/T 1	A/SA105N ASME II ED. 07 ADD.09 <b>P. 202</b>

<b>COLATA / HEAT</b> 7461	<b>MATERIALE / MATERIAL</b> A/SA105N ASME II ED. 07 ADD.09	<b>ACCIAIERIA / STEEL PLANT</b> OLIFER - ACP	<b>T.T.</b> 1												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSYS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,164	1,14	0,237	0,007	0,006	0,07	0,19	0,15	0,012	0,05	0,4	0,03		0,001	0,0002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	<b>Snervamento</b> Yield point Rs N/mm <sup>2</sup>	<b>Rottura</b> Tensile stren. R N/mm <sup>2</sup>	<b>Allungamento</b> Elongation A%	<b>Strizione</b> Reduct Area Z%	<b>Resilienza</b> Impact Test	<b>Durezza</b> Brinell hard HB									
Min	250	485	22	30		137									
X	368	558	30	62		155 - 158									
Max		655				197									
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A															

  
**C.I. BINDA & GALPERTI S.p.A.**  
 D.C. N. P. MEMO

a) <b>Trattamento termico / Heat treatment</b> 1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma. Normalized at 920 °C / 1 h / 25 mm. and cooled in still air. 2) Solubilizzato / Solution Treated and quenched. 3) Bonificato / Quenched and tempered.	4) Normalizzato / Normalized and tempered. 5) _____ b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria. Chemical analysis values are taken from base certificate.	c) Controllo visivo e dimensionale soddisfacente. Satisfactory visual and dimensional check. d) Acciaio elaborato al forno elettrico e calmato. Killed steel made by electric furnace.	
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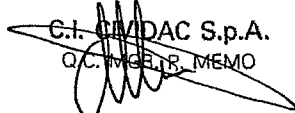
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		N. / NR. <b>6243</b> DATA / DATE <b>27/04/2010</b>	DATA / DATE <b>27/04/2010</b>
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Ordine Order	Colata Heat	Descrizione Description	Q.tà Materiale Q.ty Material
1066/10	83617	UNI 2284/29 DN150 PN25/40 S.80 WN RF - Cod. 10,97	5 A/SA105 ASME II ED. 07 ADD. 09

<b>COLATA / HEAT</b> 83617	<b>MATERIALE / MATERIAL</b> A/SA105 ASME II ED. 07 ADD. 09	<b>ACCIAIERIA / STEEL PLANT</b> RUBIERA	<b>T.T.</b> 1												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSIS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,205	0,72	0,27	0,008	0,004	0,18	0,07	0,05	0,007	0,02	0,37	0,024	0,003	0,002	0,002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	<b>Snervamento</b> Yield point Rs N/mm <sup>2</sup>	<b>Rottura</b> Tensile stren. R N/mm <sup>2</sup>	<b>Allungamento</b> Elongation A%	<b>Strizione</b> Reduct Area Z%	<b>Resilienza</b> Impact Test J -10°C	<b>Durezza</b> Brinell hard HB									
Min	250	485	22	30		137									
X	331	509,5	30,5	60	114 - 82 - 89	148 - 150									
Max		655				197									
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 - PED 97/23/EC E EN 13445															

Ordine Order	Colata Heat	Descrizione Description	Q.tà Materiale Q.ty Material
1066/10	84823	B16.5 300 WN 6" RF S.XS Sp. 10,97	1 A/SA105N ASME II ED. 07 ADD.09

<b>COLATA / HEAT</b> 84823	<b>MATERIALE / MATERIAL</b> A/SA105N ASME II ED. 07 ADD.09	<b>ACCIAIERIA / STEEL PLANT</b> RUBIERA	<b>T.T.</b> 1												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSIS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,16	1,16	0,3	0,01	0,004	0,18	0,1	0,13	0,008	0,03	0,41	0,03	0,002	0,02	0,001
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	<b>Snervamento</b> Yield point Rs N/mm <sup>2</sup>	<b>Rottura</b> Tensile stren. R N/mm <sup>2</sup>	<b>Allungamento</b> Elongation A%	<b>Strizione</b> Reduct Area Z%	<b>Resilienza</b> Impact Test	<b>Durezza</b> Brinell hard HB									
Min	250	485	22	30		137									
X	363	558	30	60		153 - 155									
Max		655				197									
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A															

  
 C.I. M. DAC S.p.A.  
 Q.C. INGEG. MEMO

a) <b>Trattamento termico / Heat treatment</b> 1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma. Normalized at 920 °C / 1 h / 25 mm. and cooled in still air. 2) Solubilizzato / Solution Treated and quenched. 3) Bonificato / Quenched and tempered.	4) Normalizzato / Normalized and tempered. 5) _____ b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria. Chemical analysis values are taken from base certificate.	c) Controllo visivo e dimensionale soddisfacente. Satisfactory visual and dimensional check. d) Acciaio elaborato al forno elettrico e calmato. Killed steel made by electric furnace.	
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 ISO 10474 3.1.B.  
 N. / NR. **6243**  
 DATA / DATE **27/04/2010**

D.D.T. N. / DELIVERY NOTE NR.  
**861**  
 DATA / DATE  
**23/04/2010**

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 - 10010 - SCARMAGNO (TO)  
 rossetto.andrea@imginternational.it

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Ordine Order	Colata Heat	Descrizione Description	Q.tà Materiale Q.ty Material
1066/10	90399	B16.5 150 BL 3" RF	2 A/SA105N ASME II ED. 07 ADD.09 <b>P.326</b>

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**COLATA / HEAT 90399**      **MATERIALE / MATERIAL A/SA105N ASME II ED. 07 ADD.09**      **ACCIAIERIA / STEEL PLANT RUBIERA**      **T.T. 1**

**ANALISI CHIMICHE - CHEMICAL ANALYSIS**

	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,195	0,67	0,25	0,008	0,013	0,14	0,22	0,18	0,011	0,05	0,37	0,026		0,002	0,003
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	

C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

**CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS**

	Snervamento Yield point Rs N/mm <sup>2</sup>	Rottura Tensile stren. R N/mm <sup>2</sup>	Allungamento Elongation A%	Strizione Reduct Area Z%	Resilienza Impact Test	Durezza Brinell hard HB
Min	250	485	22	30		137
X	298	510	30	60		148 - 150
Max		655				197

Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A

Ordine Order	Colata Heat	Descrizione Description	Q.tà Materiale Q.ty Material
1066/10	92681	UNI 6093/29 DN 80 PN 16 BL RF	10 A/SA105 ASME II ED. 07 ADD. 09

**COLATA / HEAT 92681**      **MATERIALE / MATERIAL A/SA105 ASME II ED. 07 ADD. 09**      **ACCIAIERIA / STEEL PLANT ACC. RUBIERA**      **T.T. 1**

**ANALISI CHIMICHE - CHEMICAL ANALYSIS**

	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,185	1,15	0,27	0,007	0,003	0,1	0,11	0,06	0,008	0,03	0,41	0,026	0,002	0,002	0,002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	

C.Eq:CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15

**CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS**

	Snervamento Yield point Rs N/mm <sup>2</sup>	Rottura Tensile stren. R N/mm <sup>2</sup>	Allungamento Elongation A%	Strizione Reduct Area Z%	Resilienza Impact Test J -10°C	Durezza Brinell hard HB
Min	250	485	22	30		137
X	348	550	28,5	60	88 - 97 - 92	153 - 155
Max		655				197

Test standard conforming to ASTM A370 - According to NACE MR 0175/03 - PED 97/23/EC E EN 13445

C.I. GMDAC S.p.A.  
 Q.C. MGR. CL. MEMO

- |  |   |   |
|--|---|---|
| a) <b>Trattamento termico / Heat treatment</b><br>1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma.<br><i>Normalized at 920 °C / 1 h / 25 mm. and cooled in still air.</i><br>2) Solubilizzato / Solution Treated and quenched.<br>3) Bonificato / Quenched and tempered. | 4) Normalizzato / Normalized and tempered.<br>5) _____<br>b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria.<br><i>Chemical analysis values are taken from base certificate.</i> | c) Controllo visivo e dimensionale soddisfacente.<br><i>Satisfactory visual and dimensional check.</i><br>d) Acciaio elaborato al forno elettrico e calmato.<br><i>Killed steel made by electric furnace.</i> |
|--|---|---|

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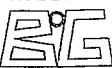

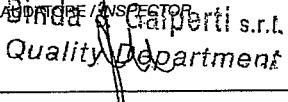
<b>OFFICINE BINDA &amp; GALPERTI S.r.l.</b> PRODUZIONE FLANGE - FORGIATI - GIUNTI ISOLANTI MANUFACTURE OF FLANGES - FORGED - INSULATING JOINTS 23813 CORTENOVA (LC) Italy - Via Roma, 43 Tel. +39 (0)341.901.333 - Fax +39 (0)341.901.300 http://www.officinebindaegalperti.com e-mail: obg@officinebindaegalperti.com	    APPROVED	<b>CERTIFICATO DI COLLAUDO / TEST CERTIFICATE</b> EN 10204 3.1. ISO 10474 3.1.B.	D.D.T. N. / DELIVERY NOTE NR. <b>861</b>
		N. / NR. <b>6243</b> DATA / DATE <b>27/04/2010</b>	DATA / DATE <b>23/04/2010</b>
Spett. / Messrs <b>I.M.G. INTERNATIONAL di Rossetto Andrea</b> Via Masero n. 57 - 10010 - SCARMAGNO ( TO ) rossetto.andrea@imginternational.it		<b>Page 10 of 10</b>	

Ordine Order	Colata Heat	Descrizione Description	Q.tà Q.ty	Materiale Material
1066/10	9752	B16.5 300 WN 5" RF S.XS Sp. 9,52	1	A/SA105N ASME II ED. 07 ADD.09

5/T P.103

COLATA / HEAT <b>9752</b>	MATERIALE / MATERIAL <b>A/SA105N ASME II ED. 07 ADD.09</b>	ACCIAIERIA / STEEL PLANT <b>OLIFER - ACP</b>	T.T. <b>1</b>												
<b>ANALISI CHIMICHE - CHEMICAL ANALYSIS</b>															
	C	Mn	Si	P	S	Cr	Cu	Ni	Sn	Mo	Ceq	Al	Ti	V	Nb
Min		0,6	0,15									0,015			
X	0,17	1,11	0,218	0,008	0,003	0,07	0,15	0,1	0,005	0,03	0,39	0,033	0,002	0,001	0,002
Max	0,22	1,35	0,3	0,035	0,04	0,3	0,4	0,4		0,12	0,43	0,05		0,05	
C.Eq.CE = C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15															
<b>CARATTERISTICHE MECCANICHE - MECHANICAL CHARACTERISTICS</b>															
	<b>Snervamento</b>		<b>Rottura</b>		<b>Allungamento</b>		<b>Strizione</b>		<b>Resilienza</b>		<b>Durezza</b>				
	Yield point Rs N/mm <sup>2</sup>		Tensile stren. R N/mm <sup>2</sup>		Elongation A%		Reduct Area Z%		Impact Test		Brinell hard HB				
Min	250		485		22		30				137				
X	368		548		30		60				151 - 153				
Max			655								197				
Test standard conforming to ASTM A370 - According to NACE MR 0175/03 and Your spec. Sheet F04A															

C.I. CIVIDAC S.p.A.  
Q.C. MESSALMEMO

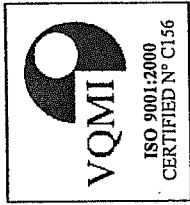
<b>a) Trattamento termico / Heat treatment</b> 1) Normalizzato a 920 °C / 1 h / 25 mm. e raffreddato in aria calma. Normalized at 920 °C / 1 h / 25 mm. and cooled in still air. 2) Solubilizzato / Solution Treated and quenched. 3) Bonificato / Quenched and tempered.	<b>4) Normalizzato / Normalized and tempered.</b> 5) _____ b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria. Chemical analysis values are taken from the certificate.	<b>c) Controllo visivo e dimensionale soddisfacente.</b> Satisfactory visual and dimensional check. <b>d) Acciaio elaborato al forno elettrico e calmato.</b> Killed steel made by electric furnace.
TRADE MARK 	p. OFFICINE BINDA & GALPERTI S.r.l. 	COLLAUDO / INSPECTOR Binda & Galperti s.r.l. Quality Department 
		ENTE C. / INSPEC. AGENCY





RACCORDIA SILDARE DI TESTA  
BUTT WELDING FITTINGS

INDUSTRIA RACCORDERIE CORTEMAGGIORE S.P.A.  
VIA FERMI, 7 - 29016 CORTEMAGGIORE - PC - ITALIA  
TELEFONO: (0039) 0523-839600  
FAX (0039) 0523-836132  
SEDE LEGALE: VIA MINGEGNERI, 7 - 26100 CREMONA  
Reg. Imp. CR 01224220192  
R.E.A. CR 152967  
EXPORT CR 011012  
P. IVA 01224220192  
CERT. DEPT. E-MAIL: germana.capra@ircspa.it  
CERT. DEPT. FAX : (0039) 0523-839415



ISO 9001:2000  
CERTIFIED N° C156

003333

Spett.le/Messrs  
C.I.CIVIDAC SPA

VIA BORGO CATTANEI,35-LOC.CAVRIE  
31048 S. BIAGIO DI CALLALTA TV

SM 4320 Ps. 106-404-108-205

## CERTIFICATO D'ISPEZIONE

Inspection certificate - Abnahmeprüfzeugnis - Certificat de réception - EN 10204 : 2004 3.1 - ASME B 16.9 - 2003

RIF. D.D.T. Numero 2884		Data 26/03/2010		Cliente - Customer C.I.CIVIDAC SPA		Ordine del Cliente - Customer's order Bestellung - Commande du Client 2010 163		Norma di collaudo - Test specification Abnahmenorme - Specification ASME SA 420 WPL6-Sept. II part A Ed.'07 + ADD.'08		CERT. N° 3020	Pag. 1																																																																																					
Posizione Item Stellung Poste	Trazione - Tension - Zugversuch - Traction			Durezza Hardness Härte - Dureté		Resilienza-Impact test Kerbschlagzähigkeit - Resilience KV		Temperatura Temp. °C		Ottento Result Ergebnis Obtenu Joules																																																																																						
	10	2	MPA	362,0	502,0	39,5	HB	-46	151	L	92 87 96																																																																																					
20	8	MPA	395,0	511,0	30,0	HB	-46	154	154	L	99 85 88																																																																																					
30	1	N	363,0	488,0	30,6	HB	-50	146	146	L	76 84 77																																																																																					
40	1	N	337,0	466,0	32,4	HB	-46	140	140	L	51 55 69																																																																																					
<p>Trattamento - Heat treatment NORMALIZING AT 920°C AND COOLING IN STILL AIR.-</p> <p>Note - Remarks - Anmerkung - Notes -VISUAL/DIMENSIONAL CHECK WITH SATISFACTORY RESULT -THE PRODUCTS COMPLY WITH ORDER REQUIREMENTS. -CHEMICAL ANALYSIS: If the value is not indicated It's held 0,00. - Started materials: SMLS PIPES ASTM A 333 GR. 6.-</p>																																																																																																
<p>Analisi chimica di colata - Ladie analysis - Schmelzanalyse - Analyse chimique de coulée - Check analysis</p> <table border="1"> <thead> <tr> <th>Posiz. Item Stellung Poste</th> <th>Colata Heat Schmelze Coulée N°</th> <th>C %</th> <th>Mn %</th> <th>Si %</th> <th>P %</th> <th>S %</th> <th>NI %</th> <th>Cr %</th> <th>Mo %</th> <th>Cu %</th> <th>V %</th> <th>Al %</th> <th>CE %</th> <th>Ti %</th> <th>N %</th> <th>Nb %</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>966471</td> <td>,110</td> <td>1,260</td> <td>,250</td> <td>,013</td> <td>,001</td> <td>,080</td> <td>,090</td> <td>,030</td> <td>,160</td> <td>,040</td> <td>,011</td> <td>,368</td> <td>,002</td> <td></td> <td>,001</td> </tr> <tr> <td>20</td> <td>90760</td> <td>,200</td> <td>1,060</td> <td>,240</td> <td>,010</td> <td>,007</td> <td>,090</td> <td>,050</td> <td>,030</td> <td>,190</td> <td>,004</td> <td>,011</td> <td>,412</td> <td>,003</td> <td></td> <td>,014</td> </tr> <tr> <td>30</td> <td>511866</td> <td>,130</td> <td>1,170</td> <td>,210</td> <td>,005</td> <td>,002</td> <td>,080</td> <td>,090</td> <td>,020</td> <td>,100</td> <td>,037</td> <td>,031</td> <td>,366</td> <td></td> <td></td> <td></td> </tr> <tr> <td>40</td> <td>60034</td> <td>,130</td> <td>,870</td> <td>,220</td> <td>,005</td> <td>,005</td> <td>,020</td> <td>,030</td> <td>,010</td> <td>,050</td> <td>,002</td> <td>,031</td> <td>,288</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Verified to ASME II° Part. A ed. 2007... + add 2009b &amp; found conforming.</p> <p>G.I. CIVIDAC S.P.A. D.C. MEMO</p>												Posiz. Item Stellung Poste	Colata Heat Schmelze Coulée N°	C %	Mn %	Si %	P %	S %	NI %	Cr %	Mo %	Cu %	V %	Al %	CE %	Ti %	N %	Nb %	10	966471	,110	1,260	,250	,013	,001	,080	,090	,030	,160	,040	,011	,368	,002		,001	20	90760	,200	1,060	,240	,010	,007	,090	,050	,030	,190	,004	,011	,412	,003		,014	30	511866	,130	1,170	,210	,005	,002	,080	,090	,020	,100	,037	,031	,366				40	60034	,130	,870	,220	,005	,005	,020	,030	,010	,050	,002	,031	,288			
Posiz. Item Stellung Poste	Colata Heat Schmelze Coulée N°	C %	Mn %	Si %	P %	S %	NI %	Cr %	Mo %	Cu %	V %	Al %	CE %	Ti %	N %	Nb %																																																																																
10	966471	,110	1,260	,250	,013	,001	,080	,090	,030	,160	,040	,011	,368	,002		,001																																																																																
20	90760	,200	1,060	,240	,010	,007	,090	,050	,030	,190	,004	,011	,412	,003		,014																																																																																
30	511866	,130	1,170	,210	,005	,002	,080	,090	,020	,100	,037	,031	,366																																																																																			
40	60034	,130	,870	,220	,005	,005	,020	,030	,010	,050	,002	,031	,288																																																																																			
<p>Inspector</p> <p>Quality Assistant <b>Germana Capra</b></p> <p>Data - Date 26/03/2010</p>																																																																																																
<p>LEGENDA / TRANSLATION: RC=CONCENTRIC REDUCER RE=ECCENTRIC REDUCER TEE=TEE CURVA=ELBOW FONDELLO=CAP GROCE=CROSS TUBO=PIPE</p>																																																																																																

SN 4320 Ps. 107



F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mt 12	Kg 12	Pz No.: 12
This document is reproduced by a computerized system and is conform to the original	Heat No.: 483604	Fps's job: OC0000555	Date: 29/03/2010
Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG00267		Item: 5

<b>erne fittings gmbh</b> A-6824 Schilfs Hauptstrasse 48 Austria/Europa Telefon +43/5224 501-0 Telefax +43/5224 501-990 Fax No. 12.100.004		<b>Abnahmeprüfzeugnis</b> <b>Inspection Certificate</b> <b>EN 10204 - 3.1</b>		Datum [date] 18/01/2008	
<b>erne fittings</b>		Ihre Bestellnummer [your order no.] OST0139		Augusnummer [certificate no.] 002893108-EM	
Ihre Artikelnummer [your item no.] Menge [quantity] 197		Ihre Artikelnummer [your item no.] Artikelbezeichnung [designation] LR-8p-S-WPL6-4"-STD		Unsere Auftrags.Nr. [our order no.] 97640-GJ-0390	
Kunde [customer] Fittings & Pipes Stainless Service SPA Pandini Valentina Viale Lidice 38/40/42 I-10095 Grugliasco (TO)		Hersteller [manufacturer] Voestalpine		Schmelze Nr. [heat no.] 483604	
Vormaterial [base material] Z48607		Rohzeugnisnr. [tube work's cert.no.]		Schmelze Nr. [heat no.] 483604	
Analyse [analysis] Index 1 2		Erschmelzungsart [melting process] Y		Dichtheitsprüfung [leakage test] Bar. 172	
C Si Mn P S Cr Mo Ni Cu V Nb Al B Ti N Sn Ceq CEQ J-Fact. 0.1843 0.2359 0.0213 0.0154 0.254 0.0039 0.0034 0.0030 0.0150 0.0143 0.0044 0.0008 0.0009 0.0013 0.0047 0.0017 0.33 202.51 0.154 0.016 0.016 0.003 0.003 0.009 0.016 0.014 0.001 0.002 0.029 0.00038 0.002 0.005 0.002 0.324 0.32 216.7		J-Faktor CEQ [CEQ] C + (Mn/8) + (Cr + Mo + V) / 5 + (Cu + Ni) / 16		Härteprüfung [hardness test] 155-157 HB	
Proben Nr. [test no.] 010908		Zugversuch [tensile test] Dehnung [elongation] % 25.8 Zugfestigkeit [tensile strength] N/mm² 535 PR-Lage [pos. of sample] 40 Temp. [temp] °C -50°C		Kerbschlagversuch [notched bar impact test] Form: Charpy-V notch Kerbschlagarbeit [impact values] J 30-40-40	
Kennzeichnung [marking] E05 Mat./483604/DN/wall		Kerbschlagversuch [notched bar impact test] Form: Charpy-V notch Kerbschlagarbeit [impact values] J 30-40-40		Wärmebehandlung [heat treatment] normalised temperature 920 °C Holding Time 30 min. Cooling in still air	
Besichtigung und Ausmessung [visual inspection and dimensional check] o.B./o.K.		Zugversuch [tensile test] Dehnung [elongation] % 25.8 Zugfestigkeit [tensile strength] N/mm² 535 PR-Lage [pos. of sample] 40 Temp. [temp] °C -50°C		Zusatzmarkierung [add. mark.]	
Bemerkungen [remarks] hot formed over mandrel Hardness test and stamping acc. to NACE MR-01-75. Stamped with round nosed tools. Hardness test, visual and dimensional test are checked on 10%.		Zugversuch [tensile test] Dehnung [elongation] % 25.8 Zugfestigkeit [tensile strength] N/mm² 535 PR-Lage [pos. of sample] 40 Temp. [temp] °C -50°C		Die gestellten Anforderungen wurden erfüllt [Manufacturing requirements are satisfied] Der Werksachverständige [the Works Inspector] 18/01/08 Ender Matthias	
Zertifiziert nach DGRL 97/23/EG Anhang I - Absatz 4.3 durch TÜV SÜddeutschland CE 0038, Zertifikat-Nr. DGR-0038-DIN-WH-104-01 [Certified acc. to PED 97/23/EC by TÜV SÜddeutschland CE 0038, certificate no. DGR-0038-DIN-WH-104-01]		Zugversuch [tensile test] Dehnung [elongation] % 25.8 Zugfestigkeit [tensile strength] N/mm² 535 PR-Lage [pos. of sample] 40 Temp. [temp] °C -50°C		Dieses Dokument wurde elektronisch erstellt und ist ohne Unterschrift gültig. [The certificate is issued by the computerized system and is valid without signature]	
La société Erne Fittings GmbH garantit que les produits, objet du présent certificat, respectent en leur totalité les spécifications suivantes: C ≤ 0,25 % S ≤ 0,05 %, P ≤ 0,05 %, R <sub>m</sub> ≤ 700 N/mm², R <sub>eL</sub> (A-2) ≥ 10500, A (%) (L = 5,65 (S) ≥ 15 %		Zugversuch [tensile test] Dehnung [elongation] % 25.8 Zugfestigkeit [tensile strength] N/mm² 535 PR-Lage [pos. of sample] 40 Temp. [temp] °C -50°C		Verifiziert zu ASME II <sup>o</sup> Part. A ed. 2007 + add. 2009b & found conforming.	

CTA THIS CERTIFICATE IS VALID FOR CCS  
 CUSTOMER CSR-INDU OVIDAC  
 PROJECT OVIDA 483604  
 P.O. no: 5  
 ITEM no: 5  
 PIPES no: 18/01/08  
 kg: 12  
 m: 5  
 CTAs  
 PED 97/23/EC by TÜV SÜddeutschland CE 0038, certificate no. DGR-0038-DIN-WH-104-01



<b>PIETRA</b>	COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg: 20	M: 6	Pipes No.: 1
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 13249	Cta's job: VC0001529	Date: 11/09/2007
Customer: COSTRUZIONI INDUSTRIALI CINDAC SPA		P.O. No.: 2007/423	Item: 1	
<b>PIETRA</b> SOCIETÀ PER AZIONI 25125 Brescia - Via Orzinuovi, 2 telef.: 030 3540545 - fax 030 3540204 Internet: www.pietra-spa.com- e-mail: info@pietra-spa.com		<b>CERTIFICATO DI COLLAUDO</b> Inspection certificate - Abnahmeerzeugnis - Certificat de Réception EN 10204 3.1		Nr. 19848 Pag. 2

C 0,13 Mn 0,61 Si 0,21 P 0,008 S 0,008 Cr 0,04 Mo 0,01  
 Ni 0,05 Cu 0,11 Sn 0,008 V 000 Al 0,032

PROVA IDRAULICA ALLA PRESSIONE DI - Hydraulic test pressure 2500 psi 172 bar  
 CORRENTI INDOTTE Eddy current acc.to: ASTM E 309

ISPEZIONE E CONTROLLO DIMENSIONALE: POSITIVO

Results of inspection and dimensional control: positive

CERTIFICHIAMO CHE LA FORNITURA E' CONFORME AGLI ACCORDI DELL'ORDINE

We hereby certify that material complies with the terms of the order

I TUBI HANNO SUBITO UN TRATTAMENTO COMPLETO DI DEMAGNETIZZAZIONE

The tubes have been subjected to a complete demagnetization treatment

ACCIAIO PRODOTTO AL FORNO ELETTRICO COMPLETAMENTE CALMATO

Steel made by electric furnace, fully killed

CERTIFICATO ENTE COMPETENTE : IT-0035 IGQ 9105

Competent Body registration number:

DATA DI CONVALIDA - Issued on : 24.06.2004

DATA DI SCADENZA - Valid Until : 30.06.2007

La societa' PIETRA S.p.A. garantisce che i prodotti oggetto del presente

certificat respectent en leur totalite' les prescriptions de

l'article 15 de l'arrete ministeriel 24 Mars 1978 modifie' :

C<=0,25% P<=0,050% S<=0,050% R<=700 N/mm2 E<=0,9 x R

A% (Lo=5,65Vs0) min.16% en lon. R(A-2)>=10500 A% (Lo=5,65Vs0)

min. 14% en transv. RxA>=10500

*[Signature]*  
 C.I.C. S.p.A.  
 Q.C. M.C.P. MEMO

Verified to ASME II<sup>o</sup> Part. A  
 ed. 2007 + add. 2009b  
 & found conforming.

DATA  
 7.11.05

PIETRA S.p.A.

RESPONSABILE COLLAUDO  
 QUALITY INSPECTION MANAGER  
 F.Sabotti

Questo certificato è emesso da un sistema computerizzato ed è valido senza firma. Il certificato originale riporta il marchio "Pietra" di colore blu. Nel caso in cui il destinatario ne rilasci copia, deve attestarne a suo nome la conformità, assumendosi ogni responsabilità per usi illeciti o non consentiti dalla Pietra Spa. Alterazioni e/o falsificazioni saranno perseguite a termini di legge.

This certificate is issued by computerized system and it is valid without signature. Many trade marks "Pietra" are printed in blue on the original certificate. In case the consignee of the original certificate issues a copy of it, he must certify by his name the conformity to the original one. He takes upon himself the responsibility for any illegal or not allowed use. All alterations and/or falsifications will be prosecuted.



SN4320

Pos. 112-209-333-334 Pos. 701-721-405



Ein Unternehmen der Salzgitter Gruppe

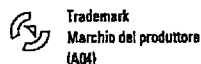
<b>Inspection certificate 3.1</b>		No./N° (A03)	602027
<b>Certificato Collaudo Materiali 3.1</b>		Page/Pag	1/2
<b>DIN EN 10204</b>		Date/Data	13.12.2005
(A02)			
No. (A07)	500276	11.10.2005	No. (A07)
Purchaser	Siderurgica Astico S.p.A.		Customer
Committente	I-36030 Fara Vicentino		Destinatario
(A06)			
Product	Hot rolled wide strip	Works order No.	0001035661
Prodotto	Nastro largo a caldo	N° d'ordine	
(B01)			
Steel grade and terms of delivery	Grade 60	Inspection	WS
Condizioni di materia e consegna	SA 516 / SA 20	Collaudo	
(B02-B03)			
	ASME SECTION II -Part A / Ed.99		
	145		

Material data / Dati del materiale (B01-B99)						
Item Pos.	Quantity Numera (B08)	Product No. N° prodotto (B07)	Heat No. N° Colata (B07)	Cond. of delivery Stato di fornitura (B04)	Thickness x Width Spessore x Largh. (B09-B11)	mm x mm
29	1	689551	52106	N	5,00 x 1800,0	
29	1	689555	46729	N	5,00 x 1800,0	
Σ	2	Weight Peso (B12)	40.840	kgs kg	N: normalized / normalizzato	
Dimensional check and visual examination of the surface condition: without objection						
Controllo delle dimensioni e controllo a vista della superficie: soddisfacente						

Ladle analysis / Analisi di colata (C70-C99)										
Heat No. N° Colata (B07)	C %	Si %	Mn %	P %	S %	N %	Al %	Cu %	Cr %	Ni %
	≤0,21	0,15-0,30	0,60-1,20	≤0,035	≤0,035			≤0,40	≤0,30	≤0,40
46729	0,08	0,21	1,13	0,012	0,009	0,004	0,039	0,11	0,06	0,06
52106	0,08	0,23	1,17	0,011	0,004	0,005	0,032	0,09	0,04	0,05
Heat No. N° Colata (B07)	Mo %	Nb %	Ti %	V %	C. eq (L) %					
	≤0,12	≤0,02		≤0,03						
46729	0,01	0,00	0,00	0,00	0,29					
52106	0,00	0,00	0,00	0,00						
Steelmaking process: Basic oxygen process										
Procedimento di elaborazione: Proc. ossigeno										
(C70)										

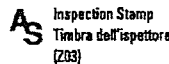
Verified to ASME II° Part. A  
 ed. 2002 + add. 2003b C.K. CIVIDAC S.p.A.  
 & found conforming. Q.C. NORA BUREMO

We hereby certify that the delivered material complies with the terms of the order.  
 Viene confermato, che la consegna corrisponde alle richieste delle condizioni di consegna.  
 (Z01)



Trademark  
 Marchio del produttore  
 (A04)

Salzgitter Flachstahl GmbH  
 Eisenhüttenstr. 99  
 D-38239 Salzgitter  
 (A01)



Inspection Stamp  
 Timbra dell'ispettore  
 (Z03)

Inspection Representative  
 Ferito officina  
 (Z02)

This certificate was prepared by a suitable data processing system and is valid without signature according to EN 10 204, section 5.  
 Questo certificato è stato rilasciato di un sistema di elaborazione dei dati adatto secondo EN 10 204, articolo 5, e valido anche senza firma.

Kratz



<b>Inspection certificate 3.1</b>		<b>Nu./N° (A03)</b>	<b>602027</b>
<b>Certificato Collaudo Materiali 3.1</b>		<b>Page/Pag</b>	<b>2/2</b>
<b>DIN EN 10204</b>		<b>Date/Data</b>	<b>13.12.2005</b>
<b>(A02)</b>			
<b>No. (A07)</b>	<b>500276</b>	<b>11.10.2005</b>	<b>No. (A07)</b> <b>500276</b>
<b>Purchaser</b>	<b>Siderurgica Astico S.p.A.</b>	<b>Customer</b>	<b>Siderurgica Astico S.p.A.</b>
<b>Committente</b>	<b>I-36030 Fara Vicentino</b>	<b>Destinatario</b>	<b>I-36030 Fara Vicentino</b>
<b>(A06)</b>			
<b>Product</b>	<b>Hot rolled wide strip</b>	<b>Works order No.</b>	<b>0001035661</b>
<b>Prodotto</b>	<b>Nastro largo a caldo</b>	<b>N° d'ordine</b>	<b>(A08)</b>
<b>(B01)</b>			
<b>Steel grade and terms of delivery</b>	<b>Grade 60</b>	<b>Inspection</b>	<b>WS</b>
<b>Condizioni di materia e consegna</b>	<b>SA 516 / SA 20</b>	<b>Collaudo</b>	<b>(A05)</b>
<b>(B02-B03)</b> <b>ASME SECTION II -Part A / Ed.99</b>			
<b>145</b>			


<b>Tensile test / Prova di trazione (C10-C29)</b>										
<b>Specimen No.</b> <b>N° di provetta</b> <b>(C00)</b>	<b>Heat No.</b> <b>N° Colata</b> <b>(B07)</b>	<b>Location</b> <b>Zona</b> <b>(C01)</b>	<b>Direct.</b> <b>Senso</b> <b>(C02)</b>	<b>Cond.</b> <b>Stato</b> <b>(B05)</b>	<b>Type</b> <b>Tipo</b> <b>(C10)</b>	<b>Yield strength</b> <b>Snervamento</b> <b>(C11)</b>	<b>Tensile strength</b> <b>Carico di rottura</b> <b>(C12)</b>	<b>Elongation</b> <b>Allungamento</b> <b>(C13)</b>		
		1) 2) 3)	4)	5)	6)	<b>Rp0,2</b> <b>N/mm<sup>2</sup></b> <b>≥ 220</b>	<b>Rm</b> <b>N/mm<sup>2</sup></b> <b>415 - 550</b>	<b>2 in</b> <b>%</b> <b>≥ 25</b>		
689551	52106	A4G	Q	N	P	358	472	40		
689555	46729	A4G	Q	N	P	377	487	36		

1) A: Lead end / Inizio  
2) 4: 1/4 Width / 1/4 Largh.  
3) 6: Thickness of product / Spessore di prodotto  
4) Q: transversal / trasversale  
5) N: normalized / normalizzato  
6) P: prismatic / prismatico

Verified to ASME II Part. A  
ed. 2007 + add. 2009 b  
& found conforming.

**C.I. CIMPAL S.p.A.**  
**Q.C. MGR. V. V. MO**

We hereby certify that the delivered material complies with the terms of the order.  
Viene confermato, che la consegna corrisponde alle richieste delle condizioni di consegna.  
(Z01)

 **Trademark**  
**Marchio del produttore**  
**(A04)**

**Salzgitter Flachstahl GmbH**  
**Eisenhüttenstr. 99**  
**D-38239 Salzgitter**  
**(A01)**

**AS** **Inspection Stamp**  
**Timbra dell'ispettore**  
**(Z03)**

**Inspection Representative**  
**Pecito officina**  
**(Z02)**

This certificate was prepared by a suitable data processing system and is valid without signature according to EN 10 204, section 5.  
Questo certificato è stato rilasciato da un sistema di elaborazione dei dati adatto secondo EN 10 204, articolo 5, e valido anche senza firma.

**Kratz**





**INSPEKČNÍ CERTIFIKÁT 3.1**  
 INSPECTION CERTIFICATE, ABNAHMEPRÜFZEUGNIS, CERTIFICAT DE RÉCEPTION

EN 10204:2004

A02



**EVRAZ VÍTKOVICE STEEL**

A01/ Číslo dokumentu, No. Nr.

Z02/ Datum, Date

Strana, Page, Seite

A01/ AD/ EVRAZ VÍTKOVICE STEEL, s.r.o.  
 Ostrava-Hulváky Stramberská 2871/47, PSČ 709 00  
 ČESKÁ REPUBLIKA

8762/2008

26.02.2008

1/1

A05/ Odběratel/zákazník, Customer/consignee, Besteller/Einkäufer, Acheteur/désignataire

A08/ Číslo zakázky/výrobce, Manufacturer's works order No., Werksauftragsnr., fñom. de la commande de l'usine productrice

163978/2008

**S.I.A.T. SPA**  
 VIA DEI CAVALLARI, 37  
 15077  
 PREDOSA (AL)  
 IT

A07/ Číslo objednávky/oběhatele, Purchaser's order No., Kundenbestellnr., Numéro de la commande du client

508657/014  
 1.12

A10/ Adyza č., Advice Note No., Avviso Nr., Avviso No.

612522

378036600138

21 195 kg

Hot rolled heavy plates in quality P355 NH per EN 10028/ASME SA 516 Gr.70/Gr.485 SA 20



EN ISO 9001:2000/ EN ISO 14001:2004  
 Certifikáty č. 04100344/000-01, 04 101 030144

Výrobca prohlašuje, že je certifikován podle bodu A3 Přílohy I Směrnicí 97/23/ES a podle AD-2000 Merkblatt WR od jmenovaného rádia TÜV NORD Reg.č. 0045. Certifikát jsou platné do prosince 2007. The Manufacturer declares that it is certified by the notified body TÜV NORD Reg No 0045 according to Article 4.3, Annex I of Directive 97/23 EC and section AD-2000 Merkblatt WR. Certificates are valid until December 2007. Die Hersteller erklärt, dass er bei von benanntem Rádium TÜV NORD Reg.Nr. 0045 nach Pic.4.3 Anhang I, Richtlinie 97/23 ES und nach AD-2000 Merkblatt WR zertifiziert. Zertifikate sind bis Dezember 2007 gültig.

spedizioni@statspa.it

B01/ Výrobek, Product, Erzeugnis, Produit, B08/ Počet ks, No. of pieces, Stückzahl, B09-B11/ Rozměry, Dimensions, Maße, B12/ Teor. hm., Th. mass, Th. Masse, Masse th.

30-2500-12000 mm

21 195 kg

3 plates

B02/ Označení oceli, Steel designation, Stahlbezeichnung, Désignation de l'acier

B04/ Stav výrobku při dodání, Product delivery condition, Lieferzustand des Erzeugnisses, Etat de livraison

P355NH N  
 ASME SA 516 Gr.70/Gr.485

B05/ Referenční zprac., Reference treatment of samples, Referenzbehandlung, Traitement de référence des échantillons

P355NH N  
 ASME SA 516 Gr.70/Gr.485

B03/ Dodací podmínky, Terms of Delivery, Lieferbedingungen, Conditions de livraison

EN 10028-3  
 EN 10029 B/N  
 EN 10163-2, B/2

B14/ Tvarba, Heat No., Schmelz Nr., No de la coulée	C70	B08/ Počet ks, No. of pieces, Stückzahl, No. de pièces	C00/ Identif. Identification, Identifizierung, Identification	C02/ Zkouška tahem, Tensile test, Zugversuchtest, Essai de traction										C03/ Zkouška nárazu, v ohybu (1), Impact test (1), Kerbschlagversuchtest (1), Essai de résilience (1)			
				C01	C02	C03	C10	C11	C12	C13	C11	C12	C13	C02	C03	C40	C41

26102	Y	1	124479	A T	20	P	ReH	A5	387	543	30.6	L	-40	KV	240	230	243	238	
						C	Rp0.2	A50	407	554	36.0	T	-20	KV	228	236	249	238	
1	124480	A T	20	P	ReH	A5	393	547	31.2	L	-40	KV	249	205	252	235	235	235	
																			C
1	124481	A T	20	P	ReH	A5	397	540	30.0	L	-40	KV	257	249	256	254	254	254	254

C71-C82/ Chemical composition

Heat	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	V	Ti	Al	N	Nb	CEV
26102	0.158	1.400	0.330	0.017	0.004	0.070	0.040	0.070	0.005	0.005	0.002	0.048	0.006	0.020	0.41

B07/ Identification of the product

Heat	Test	plates
26102	124479	319339 001
	124480	319337 001
	124481	319338 001

NORMALIZED: walking beam furnace-length 70m, temperature 900°C/dwell 17min.

"Steel killed"

"Material produced in agreement with P.E.D.97/23/EG"

ASME CODE EDITION 2007 SECTION II PART A SA 20

Verified to ASME II<sup>o</sup> Part. A  
 ed. 2007 + add. 2009b  
 & found conforming.

C.I. CERTIFICAZIONE S.p.A.  
 Q.C. MEMO

COPIA CONFORME ALL'ORIGINALE  
 STAT. SPA

Control of dimensions and results of surface inspection : without objection.  
 Masskontrolle un Oberflächenbesichtigung : ohne Beanstandung.  
 Contrôle de dimensions et contrôle visuel de surface : sans défauts.

B06/ Značení výrobku, Marking of the product, Kennzeichnung des Erzeugnisses, Marquage du produit:  
 Vývalek, Plech, Tavná, Jakost, Zkouška / Rolled product No., Plate No., Heat No., Quality, Test No. /  
 Walzstück, Blech, Schmelzen, Qualität, Probe

Z01/ Tímto prohlašujeme na svou výlučnou odpovědnost, že uvedené výrobky na něž se vztahuje toto prohlášení (sou ve shodě s předlohy, které jsou specifikovány kumul smlouvou a je na výrobky výhradně prohlášení o shodě podle zřídka č. 22/1997 Sb., o technických požadavcích na výrobky a o změně a doplnění některých zákonů, ve znění pozdějších předpisů a nálezů vlády č. 150/2002 Sb., Es wird hiermit auf ausschließliche Verantwortung erklärt, dass die hier angeführten Erzeugnisse auf die sich diese Erklärung bezieht, entsprechen den Im Kaufvertrag spezifizierten Vorschriften. Thereby we declare to our exclusive responsibility that the mentioned products to which this declaration is in accordance with regulations, which are specified by the contract. Nous déclarons à notre responsabilité exclusive que les produits mentionnés se réfèrent à cette déclaration sont conformes aux prescriptions spécifiées par le contrat d'achat.

A04/ Značka výrobce: Manufacturer's mark; Zeichen des Herstellers; Marque du producteur;



Inspector's Stamp:  
 Zeichen des Sachverständigen:  
 Poinçon de réception:



Z03/ Ověření platnosti 203/ Razítko zástupce kontroly



**EVRAZ VÍTKOVICE STEEL**

**Martin ŠTEBEL**  
 Independent authorized agent  
 unabhängiger berechtigter Vertreter  
 Независимый уполномоченный представитель


C01/ Umístění vzorku, Locus: A - Nava, Top, Kopf, Mte; Z - pata, Bottom, Fuss, pied  
 C02/ Směr zkoušebních vzorků: L - podélná, longitudinal, längs; T - příčná, transverse, quer, transversal  
 Z - vertikální, vertical, senkrecht  
 C03/ Zkoušební teplota, Test temperature, Prüftemperatur, Température d'essai  
 C10/ Tvar zkoušebního vzorku: P - prizmatický, prismatic, prismatisch, C - cylindrický, cylindrical, zylindrisch  
 C11/ Výramě nebo smluvní mez kluzu, Yield or proof strength, Stres oder Dehnngrenze, Limite d'élasticité  
 C12/ Mez pevnosti v tahu, Tensile strength, Zugfestigkeit, Résistance à la traction  
 C13/ Tážnost, Elongation after fracture, Bruchdehnung, Allongement après rupture  
 C04/ Tvar zkoušebního tělesa, C01/Síla zkoušebního tělesa, C02/Relativní hodnoty, C13/ Sbědní hodnota  
 C70/ Způsob výroby oceli, Steelmaking process, Stahherstellungverfahren, Mode d'élaboration de l'acier, BO=Y

Z00-F03

UP 89 NO



SN 4320 Pos. 118-218-409

G.Fiori International srl		INSPECTION CERTIFICATE DIN 50049/3.1 - EN 10204/3.1										CERTIFICATO DI COLLAUDO								
Sede 20021 OSPiate DI BOLLATE (MI) Via Ghisalba 11/3 Telefoni: +39 02 3506488 - 3502958 - 3504427 Fax: +39 02 38303824 http://www.fioriformiture.com E-mail: info@fioriformiture.com		TURBODEN SRL V.LE STAZIONE, 23 25122 BRESCIA Partita Iva 03591940170												N. 1224 Pag. 1		Del 25.07.2008				
HEAT COLATA		QUANTITY QUANTITA'		DESCRIPTION DESCRIZIONE										SIZE MISURA		YOUR P.O. VS. ORDINE		VISUAL & DIMENSIONAL VISIVO E DIMENSIONALE		
285/03 *285/03		326 250		BARRA A105 NORMALIZ L=6,5mt (13 BARRE) BARRA A350 LF2 CL.1 L=6,5mt (10 BARRE)										D.25mm D.25mm		PR/08PU-001221/0 PR/08PU-001221/0		SATISFACTORY SATISFACTORY		
HEAT COLATA		MATERIAL MATERIALE		C %	SI %	Mn %	S %	P %	Cr %	NI %	Mo %	TI %	Cu %	V %	Nb %	N %	Al %	Sn %	C.E. %	STEEL MILL ACCIAIERIA
285/03 *285/03		ASTM/ASME 105 A/SA 350 LF2 CL.1		0,170 0,170	0,190 0,190	0,940 0,940	0,014 0,014	0,017 0,017	0,250 0,250	0,130 0,130	0,064 0,064		0,260 0,260	0,001 0,001	0,001 0,001		0,023 0,023		0,416 0,416	ASA A08-3467 ASA A08-3582
HEAT COLATA		YIELD POINT Sneramento N/mm <sup>2</sup> >= 0,2%		TENSILE STRENGTH Rottura N/mm <sup>2</sup> >=		ELONGATION Allungamento % >=		REDUCTION OF AREA Contrazione % >=		HARDNESS Durezza Hb		IMPACT TEST - RESILIENZA Joule			FURNACE FORNO					
285/03 *285/03		322,00 322,00		511,00 511,00		28,90 28,90		59,80 59,80		157 159 157 159		° C			ELECTRIC FURNACE ELECTRIC FURNACE					
												1			2		3			
												-10 -46			48 32		55 45			
HEAT COLATA		MATERIAL IN ACCORDANCE TO MATERIALE IN ACCORDO A										HEAT TREATMENT TRATTAMENTO TERMICO		FURNACE FORNO						
285/03 *285/03		ASTM A105 - SA 105 ASME II PART.A ED.04 ADD.05 ASTM A350 - SA350 ASME II PART.A ED.04 ADD.05										NORMALIZED AT 920 C - COOLED IN STILL AIR 1H X 1" NORMALIZED AT 920 C - COOLED IN STILL AIR 1H X 1"		ELECTRIC FURNACE ELECTRIC FURNACE						
NOTE		<p>Verified to ASME II Part. A              G.F. Fiori S.p.A. ed. 2007... + add. 2009b            Q.C. MGR. MEMO &amp; found conforming.</p>										QUALITY CONTROL DEPARTMENT UFFICIO CONTROLLO QUALITA'		G. Fiori & C s.r.l.						
		It's in accordance with original certification issued by steel plant and relative analysis and test laboratory. Conforme al certificato originale rilasciato dall'acciaieria e relativo laboratorio di analisi e prove.																		

SN 4320 Pos. 201-304



<p>Erklärungen siehe Rückseite/Explications voir au verso/See reverse for explanations (www.dillinger.de/certificate)</p>		<p>A08/ Manufacturer's order/ A03 Certificate No.</p>		<p>Sheet</p>	
<p>A02 INSPECTION CERTIFICATE 3.1 AS PER EN 10204:2004 INSPECTION CERTIFICATE 3.1.B AS PER EN 10204:1991+A1:1995 + AS PER ISO 10474:1991 MATERIAL TEST REPORT (MTR)</p>		<p>A10 Advice of dispatch No./ Date of dispatch</p>		<p>351602-002 B01 Product HOT ROLLED PLATES</p>	
<p>A05 Established inspecting body DH</p>		<p>A07.1 No. 1.157 A07.2 No.</p>		<p>349051-04.01.10</p>	
<p>A06 Purchaser SIAT, PREDOSA</p>		<p>Final receiver SIAT, PREDOSA</p>		<p>013: REV. 1 AD2000-W1: 06 VDTUV-354-1</p>	
<p>B02/ Steel design. P355NH/SA516-70</p>		<p>B03 Any suppl. requirements DIN-EN10028-3:03/ASME-II-A:07+A09 ACIER CALME</p>		<p></p>	
<p><b>A01-A99 Further commercial information</b></p>					
<p>ITEM NO.: 04 THE WAIVER OF VERIFICATION OF YIELD STRENGTH AT ELEVATED TEMPERATURE IS MADE IN ACCORDANCE WITH AD2000W1 CLAUSE 3.3 RESP. 3.4 WITH THE APPROVAL OF TUEV-SAARLAND (LETTER OF CONFIRMATION 6022/08/0226 FROM 03.03.2008).</p>					
<p>ITEM NO.: 04 3.1-CERTIFICATE ACCORDING TABLE 3 NOTE 2 AND LETTER OF CONFIRMATION OF TUEV-SAARLAND 6022/04/0680 FROM 29.06.04.</p>					
<p><b>B01-B99 Description of the product</b></p>					
B14 Item No.	B08 Number of pieces	B09 Thickness	B10 Width	B11 Length	B12 Theoretical mass
04	1	25,00	x 3000	x 12000	7065
***	1				7065
<p>B03 Actual mass: 7151 KG</p>					
<p><b>B04 Product delivery condition</b></p>					
<p>ITEM NO.: 04 N: HT: 910 GR.C +20 -15 GR.C SOAKING TIME TO ATTAIN THE TARGET TEMPERATURE OVER THE WHOLE SECTION: 1-1,75 MIN/MM (25-45 MIN/INCH) COOLING IN STILL AIR</p>					
<p><b>B06 Marking of the product</b></p>					
<p>ITEM NO.: 04 STEEL DESIGNATION P355NH SA516 70MT HEAT NO. / TRADEMARK / ROLLED PLATE NO.-TEST NO. / INSPECTOR'S STAMP</p>					
<p>A01</p>					
<p>A04</p>		<p>Z01/Z02/Z03 We hereby certify, that the above mentioned materials have been delivered in accordance with the terms of order.</p>		<p>AG der Dillinger Hüttenwerke Postfach 1580, D-66748 Dillingen/Saar Inspection department</p>	
		<p>QM-System: Certification as per ISO 9001</p>		<p>Inspector's stamp Date 04.01.10</p>	
<p>Manufacturer's mark</p>		<p>DR. CH. DILLIG Test House Manager</p>		<p>PP 1</p>	

*Handwritten signature and stamp*  
C.I. QM/SA516-70  
Q.C. (MTR) P. NEMO



Erläuterungen siehe Rückseite/Explications voir au verso/See reverse for explanations (www.dillinger.de/certificate)

A02 INSPECTION CERTIFICATE 3.1 AS PER EN 10204:2004  
 INSPECTION CERTIFICATE 3.1.B AS PER EN 10204:1991+A1:1995 + AS PER ISO 10474:1991  
 MATERIAL TEST REPORT (MTR)

A10 Advice of dispatch No./  
 Date of dispatch  
 349051-04.01.10

A01 Manufacturer's order/  
 Certificate No.  
 351602-002

B01 Product  
 HOT ROLLED PLATES

Sheet  
 2/...

A05 Established inspecting body  
 DH

A06 Purchaser  
 SIAT, PREDOSA

A07 Final receiver  
 SIAT, PREDOSA

A07.1 No. 1.157  
 A07.2 No.

B02 Steel Design. P355NH/SA516-70  
 O13:REV.1

B03 Any suppl. requirements  
 DIN-EN10028-3:03/ASME-II-A:07+A09  
 AD2000-W1:06  
 VDTUV-354-1

**B07-B99 Further information about the product**

ITEM NO.: 04  
 THICKNESS REDUCTION RATIO >= 3,0 IS FULFILLED (CF. A/SA20 PAR. 5.3)

**C10-C29 Tensile test**

B14 Item No.	B07.2 Heat No.	B05 Rol./plate/ Test No.	B05 Reference (heat) treatment	C01 C02/ C03 C01		C12 C13	C14-C15
				MPA	%		
04	341802	90815	K4 Q RT	416	392	551	29

**C40-C49 Impact test**

B14 Item No.	B07.2 Heat No.	B07.1 Rol./plate/ Test No.	B05 Reference (heat) treatment	C01 C02/ C03 C01		C44 Testing method	C45 C46	C43 Mean value
				Temp. GRC	Temp. GRC			
04	341802	90815	K4 Q -20	0010	0072	0,031	750	257

**C70-C99 Chemical composition % - Heat analysis**

B07.2 Heat No.	C70 Y	C	SI	Mn	P	S	N	CU	MO	NI	CR	V	NB	TI	AL-T
341802	Y	0,135	0,384	1,45	0,014	0,0010	0,0072	0,183	0,031	0,377	0,031	0,002	0,017	0,003	0,032

**C94 Heat analysis Carbon equivalent / Alloying restrictions**

FO-02= 0,43 FO-52= 0,02 FO-54= 0,25 FO-78= 0,06

C.I. S.P.A.  
 Q.E. N.B.P. MEMO

SIAT

A04 Z01/Z02/Z03 We hereby certify, that the above mentioned materials have been delivered in accordance with the terms of order.

Manufacturer's mark

AG der Dillinger Hüttenwerke  
 Postfach 1480, D-66748 Dillingen/Saar  
 Inspection department


DR. CH. DILLG  
 Test House Manager

Date 04.01.10

Inspector's stamp



Erläuterungen siehe Rückseite/Explications voir au verso/See reverse for explanations (www.dillinger.de/certificate)

<p>A02 INSPECTION CERTIFICATE 3.1 AS PER EN 10204 : 2004</p> <p>INSPECTION CERTIFICATE 3.1.B AS PER EN 10204 : 1991+A1.1995 + AS PER ISO 10474:1991</p> <p>MATERIAL TEST REPORT (MTR)</p>	<p>A10 Advice of dispatch No./ Date of dispatch</p> <p>349051-04.01.10</p>	<p>A08/ Manufacturer's order/ A09 Certificate No.</p> <p>351602-002</p>	<p>Sheet</p> <p>3</p>
<p>A05 Established inspecting body</p> <p>DH</p>	<p>A06 Purchaser</p> <p>SIAT, PREDOSA</p>	<p>A07.1 No. 1.157</p> <p>A07.2 No.</p>	<p>B01 Product</p> <p>HOT ROLLED PLATES</p>
<p>B02/ Steel design.</p> <p>P355NH/SA516-70</p>	<p>Final receiver</p> <p>SIAT, PREDOSA</p>	<p>013:REV.1</p> <p>AD2000-WI:06</p> <p>VDTUV-354-1</p>	
<p>B03 Any suppl. requirements</p> <p>ACIER CALME</p>	<p>DIN-EN10028-3:03/ASME-II-A:07+A09</p>		
<p><b>C94 Carbon equivalent formula / Alloying restrictions</b></p> <p>FO-02 = C+ (MN/6) + (CR+MO+V) / 5 + (NI+CU) / 15</p> <p>FO-52 = V +NB+TI</p> <p>FO-54 = CU+MO+CR</p> <p>FO-55 = CU+MO+NI+CR</p> <p>FO-78 = CR+MO</p>			
<p><b>D01 Marking and identification, surface appearance, shape and dimensional properties</b></p> <p>ITEM NO.: 04</p> <p>RESULT OF MARKING, SURFACE, SHAPE AND DIMENSIONS: NO REMARKS</p> <p>SURFACE AS PER EN-10163-B2</p> <p>THICKNESS AS PER EN-10029-B</p> <p>LENGTH AND WIDTH AS PER EN-10029</p> <p>FLATNESS AS PER EN-10029-T4L</p>			
<p><b>Z01/Z02/Z03</b> We hereby certify, that the above mentioned materials have been delivered in accordance with the terms of order.</p> <p><b>QM-System: Certification as per ISO 9001</b></p>			
<p>A04</p>  <p>Manufacturer's mark</p>	<p>DR. CH. DILLG</p> <p>Test House Manager</p>	<p>AHB</p> <p>Inspector's stamp</p>	<p>A01</p> <p>AG der Dillinger Hüttenwerke</p> <p>Postfach 1580, D-66748 Dillingen/Saar</p> <p>Inspection department</p> <p>Date 04.01.10</p> <p>PP 1</p>

G. CH. DILLG S.p.A.  
O.C. VERT. MENO

G. CH. DILLG S.p.A.  
O.C. VERT. MENO







COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 294	Mt 9,68	Pipes No.: 1
This document is reproduced by a computerized system and is conform to the original	Heat No.: 760106	Cta's job: VC0001529	Date: 25/09/2007
Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: 2007/423		Item: 01

**INSPECTION CERTIFICATE**  
**CERTIFICAT DE INSPECTIE**  
**CONFORME A LA NORMA EN ISO 9001:2000**

Order No: 07/04604  
 Date: 09/02/2007  
 Mill order/Confirmarea comenzii Peval: 2250301/012  
 Shipping Note/Aviz de expeditie: 00001568 - 09/02/2007

Customer's order/Comanda client: VD/0326/06/LS/0019  
 Country/Tara: ITALIA  
 Town/City: 10095 GRUGLIASCO TO  
 Address/Adresa: VIALE LIDICE, 40  
 Product/Produs: SEAMLESS HOT FINISHED PIPES FOR LOW TEMPERATURE SERVICES WITH SUPPLEMENTARY REQUIREMENTS ACCORDING TO ASTM A 333, ASME SA 333 SEZ. II PARTE A AND TO 37387 STEEL GR 6 ASTM A 333 AND ASME SA 333 NORMALIZED INTERNALY BARE, EXTERNALLY VARNISHED BEVELLED AS PER ASME B.16.25  
 Dimensions/Dimensiuni: Lp. From 10000 Lp. To 11800 C.D. mm 141,300 W.T. mm 9,530

Heat/Sezon	Q. Num.	Test ok/Incarcare ok	kg/Kg	Mt/Mt	Pieces/Buc	Quantity/Quantitate	Fees/Fee	Lp/Lb
C7916	760106	Test ok/Incarcare ok	28,50	882	3	3	93,06"	194,4,4
C7917	760106	Test ok/Incarcare ok						
C8108	760106	Test ok/Incarcare ok						
C8109	760106	Test ok/Incarcare ok						

Q. 1: EACH PIPE/ELECARIE TRAVA...  
 2: THE UPPER END/ALA...  
 3: THE LOWER END/ALA...  
 E - 2: THE UPPER END/ALA...  
 3: THE LOWER END/ALA...

**CHEMICAL COMPOSITION/COMPONENZA CHIMICA**

	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	V	Ca	Fe
	%100	%100	%100	%100	%100	%100	%100	%100	%100	%100	%100	%100
Heat	Max 0,19	0,06	0,06	0,025	0,010							42
Sample	Min 0,19	0,10	0,25									
Test	Max 0,19	0,06	0,06	0,025	0,010							42
Heat	Min 0,19	0,25	0,06	0,010	0,010	0,021	0,008	0,10	0,01	0,01	0,01	38
Sample	Max 0,19	0,23	0,06	0,010	0,010	0,019	0,009	0,11	0,02	0,01	0,01	39
Test	Min 0,19	0,25	0,06	0,010	0,010	0,020	0,009	0,10	0,02	0,01	0,01	39

VERIFIED TO ASME 1<sup>st</sup> Part. A  
 ed. 2007 + add. 2007p  
 & found conforming.

**C.I. CIVIDAC S.p.A.**  
 Q.C. CONTROL MEMO

**MECHANICAL TESTS/PROVA DEI PARAMETRI MECCANICI**

U.M.	Set	Value/Valore
MPa	5	19,0

HYDRAULIC/PROVA IDROSTATICA

REMARKS/NOTE

NONDESTRUCTIVE TEST - ENL ACC. TO ASTM E 570; WITHOUT OBJECTIONS

HEAT TREATMENT: NORMALIZED

MATERIAL ACC. TO ASTM/ASME II PART. D TAB Y1/NACE MR 01-75+PED97/23/EC

HARDNESS HRC 22 MAX. ACCORDING TO NACE MR - 01 - 75

This certificate is issued on the basis of the inspection report...  
 The certificate is issued on the basis of the inspection report...  
 The certificate is issued on the basis of the inspection report...  
 The certificate is issued on the basis of the inspection report...  
 The certificate is issued on the basis of the inspection report...



COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 294	Mt 9,68	Pipes No.: 1
This document is reproduced by a computerized system and is conform to the original	Heat No.: 760106	Cta's job: VC0001529	Date: 25/09/2007
Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: 2007/423		Item: 01

INSPECTION CERTIFICATE  
 COMMERCIAL DE INSPECTION  
 (ONLY EN 0204 3 6 ISO 10474 3 LB  
 N.N. 07/04604 003/003  
 Date: 09/02/2007  
 Mill order/Comanda client: 2250301/012  
 Shipping Note/Aviz de expeditie: 00001568 - 09/02/2007.

Customer's order/Comanda client: VD/0326/06/LS/0019  
 Customer's order/Comanda client: ITALIA  
 Customer's order/Comanda client: 10095 GRUGLIASCO TO  
 Customer's order/Comanda client: COMMERCIALE TUBI ACCIAIO SPA  
 Town/City: 10095 GRUGLIASCO TO  
 Country/Zone: ITALIA  
 Job Number/Id. Comanda int: EX/104122/12  
 Shipping Note/Aviz de expeditie: 00001568 - 09/02/2007.

Product/Produs: SEAMLESS HOT FINISHED PIPES FOR LOW TEMPERATURE SERVICES (WITH SUPPLEMENTARY REQUIREMENTS) ACCORDING TO ASTM A 333, ASME SA 333 SEZ. II PARTE A AND TQ 3787 STEEL GR 6 ASTM A 333 AND ASME SA 333 NORMALIZED INTERNALLY BARE, EXTERNALLY VARNISHED BEVELLED AS PER ASME B 16.25  
 TUBI PT. TEMPERATI TUBI JOASE LAMINATE LA CALD (CU CERINTE SUPPLEMENTARE PATA DE NORMA) NORMA ASTM A 333, ASME SA 333 SEZ. II PARTE A AND TQ 3787 OTEL GR 6 ASTM A 333 AND ASME SA 333 NORMALIZATE LA CUIET EXTERIOR, INTERIOR NEPROTEJATE SANFRENATE CONFORM ASME B 16.25

Dimensions/Dimensiuni	Lg. From	Lg. To	O.D. mm	W.T. mm
	10000	11800	141,300	9,530

Quantity/Canitate	Process/Buc	MM/Inch	Kg/Kg	Feet/Foot	Lb/Lb-lb
3		28,50	882	93' 06"	1944,4

STANDARD EDITION/NORMA	EDUCIA	Year/Anul	Year/Anul	Revision/Revisia	Year/Anul
ASME A 333		2004	2004		
ASME SA 333		2004	2005		Add...

VISUAL AND DIMENSIONAL CONTROL HAS BEEN CARRIED OUT WITH SATISFACTORY RESULT  
 CONTROLUL VIZUAL DIMENSIONAL S-A REALIZAT CU REZULTATE SATISFACTOARE  
 STEEL IS FULLY KILLED AND PRODUCED BY ELECTRIC FURNACE TO A FINE GRAIN PRACTICE  
 OTELUL ESTE PRODUS IN CUPTOR ELECTRIC COMPLET CALMAT CONFORM UNEI PRACTICI DE OBTINERE A UNUI GRAUNTE FIN  
 THE PRODUCT SUPPLIED IS IN COMPLIANCE WITH THE REQUIREMENTS OF THE ORDER.  
 PRODUSUL LIVRAT ESTE IN CONFORMITATE CU CERINTELE COMENZII


	CHIEF OF QUALITY CERTIFICATION DT MANAGER CERTIFICARE CALITATE	QUALITY MANAGER MANAGER CONTROL CALITATE
	LIVIU DUMITRAS	LAZZIO MORENTI



Verified to ASME II Part. A  
 ed. 2007 + add. 2005b  
 & found conformable

*(Signature)*  
 CIVIDAC S.p.A.  
 Q.C. MANAGER

This certificate is issued by a computerized system and it is not valid if it is not signed electronically by the authorized personnel. The user is responsible for the validity of the data entered in the system. The user is responsible for the validity of the data entered in the system. The user is responsible for the validity of the data entered in the system.



	F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mt 36	Kg 36	Pz No.: 36
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 387074	Fps's job: OC0000555	Date: 29/03/2010
	Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG08267	Item: 01	

		<b>Abnahmeprüfzeugnis</b> Inspection Certificate EN 10204 - 3.1		Zeugnisnummer [certificate no.] 044500/09-HG		Datum [date] 11/12/2008	
erne fittings gmbh A-6824 Schilfs Hauptstrasse 4b Austria/Europe Telefon +43/5324 501-0 Telefax +43/5324 501-930		Ihre Bestellnummer [your order no.] OS 90105		Unsere Auftrags.Nr. [our order no.] 11594DGJ-0030			
Kunde [customer] Fittings & Pipes Stainless Service SPA		Ihre Artikelnummer [your item no.] Menge Artikelbezeichnung [designation] 273 elbows LR-90-S-WPLG-1"-STD		Schneize Nr [heat no.] 387074		Ident Nr. [ident no.] 10D	
Vormaterial Rohrzeugnistr. [tube work's cert.no.] V&M 50817Zb07		Hersteller [manufacturer] V&M		Dichttheitprüfung [leakage test] SEP 1925			
Analyse [analysis] Schmelze Nr. [heat no.]		1 = Schmelzeanalyse [heat analysis] 2 = Produktanalyse [product analysis] CEQ [CEQ]:		J-Faktor CEQ [CEQ]:		$(S + Mn) + (P + Sn) + 10000$ $C + (Mn/8) + (Cr + Mo + V) / 5 + (Cu + Ni) / 15$	
Index 1 2		C Si Mn P S Cr Mo Ni Cu V Nb Al B Ti N Ceq CEQ J-Fact. 0.12 0.18 0.16 0.015 0.001 0.04 0.01 0.02 0.02 <0.004 0.001 0.030 0.0071 0.25 0.109 0.166 0.661 0.01368 0.00182 0.073 0.018 0.036 0.033 0.001 0.001 0.038 0.00033 0.003 0.246 0.25					
Proben [test no.] 18-208		Zugversuch [tensile test] Dehngr. [yield str.] Rp0.2 Temp. +20 °C 472		Kerbschlagversuch [notched bar impact test] Form: ISO-V Kerbschlagarbeit [impact value] (J) 131-137 HB 27-28-28		Härteprüfung [hardness test] Wärmebehandlung [heat treatment] normalized temperature 920 °C Holding Time 30 min. Cooling in still air	
Kennzeichnung [marking] LOGO* 		Mat./10D/0N/wal		Zusatzmarkierung [add. mark.]			
Besichtigung und Ausmessung [visual inspection and dimensional check]		o.B./o.K.		1. Logo: <input checked="" type="checkbox"/> E or <input checked="" type="checkbox"/> G			
Bemerkungen [remarks] hot formed over mandrel		Verifiziert nach ASME 1 <sup>o</sup> Part. A ed. 2007 + add. 2009 b & found conforming.		Der Werkstoffhersteller 11/12/08 Grabherr: Harald 55-321 Dieses Dokument wurde elektronisch erstellt und ist ohne Unterschrift gültig. [The certificate is issued by the computerized system and is valid without signature.]			

Zertifiziert nach DGR 97/23/EG Anhang I - Absatz 4.3 durch TÜV SÜD Industrie Service, Benannte Stelle 0035, Zertifikat Nr.: 1292002MUG (Certificate No.: 1292002MUG)

La società Erne Fittings GmbH garantisce che i prodotti, objai du présent certificat respectent en leur totalité les spécifications suivantes:  
 C ≤ 0,25 % S ≤ 0,05 % R<sub>e</sub> ≤ 700 N/mm<sup>2</sup>, R<sub>m</sub> (A-2) ≥ 1050, A<sub>5</sub> (L = 5,65 / 5) ≥ 18 %

CTA'S	DATE
PIPES no: 36	kg:
PROJECT: CATA 387074	ITEM no: 01
P.O. no: 280164	CUSTOMER: OST NALL CIVDAG

THIS CERTIFICATE IS VALID FOR QCS

	F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mk 12	Kg 12	Pz No.: 12
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 771412	Fps's job: OC000555	Date: 29/03/2010
	Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG00267	Renc <i>M</i>	

### VIRGIOLO CENA & FIGLI s.p.a.

25124 BRESCIA - VIA OBERDAN, 28 - TEL. (030) 398561 (n. 5 linee) - FAX (030) 398646  
e-mail: info@cenafilings.com - www.cenafilings.com



Q S according to PED 97/23/EC  
Annex I, Sec. 4.3  
Cert. n. 160142



### CERTIFICATO DI COLLAUDO

Inspection Certificate  
Abnahmeprüfzeugnis EN 10204/3.1  
Certificat de Réception

Date - Date - Datum - Date 30/06/2009

N. 2.931.111Ag
PAGINA Sheet - Blatt - Page 1

Ordine - Order - Bestellung - Commande
OS 900054 del 28.5.09

Cliente - Customer - Besteller - Client

FITTINGS & PIPES  
STAINLESS SERVICE S.p.A.

*SM4320*  
*P.207*

Fattura - Invoice - Rechnung - Factura - DDT
2.931 del 30.06.2009

VIALE LIDICE N.38/40/42

10095 GROGLIASCO TO

Prodotto/Norma - Article/Specifications - Prüfgegenstand/Prüfgrundlagen/Anforderungen - Produit/Spécifications
Seamless concentric reducer / Riduzioni concentriche senza saldatura WPL6 ASTM/ASME A/SA-420-07-ASME B 16.9/D1-NACE MR0103

Trattamento termico - Heat Treatment - Wärmebehandlung - Traitement thermique
Normalized at 900°C Normalizzate a 900°C

Marchio del produttore - Brand of the manufacturer - Herstellerzeichen - Marque de fabricant

**CENA**

Marcatura - Marking - Kennzeichnung - Marquage
CENA D01xSp1-De2xSp2 (inch.) WPL6 - Heat Nr CENA D01xSp1-De2xSp2 (inch.) WPL6 - Nr.colata

Posizione dell'ispezione - Inspector's stamp - Stempel des Sachverständigen - Poinçon de l'expert



Materiale di partenza Acciaio/Acero (2) (3) - Raw material: Steel/Specification - Vormaterial: Werkstoff/Lieferbedingungen - Matière de départ: Acier/Specification
01 S ASTM/ASME SA-333 Gc. 6 NACE MR 01 75 FULLY KILLED - D.M. 24/11/1984

Partic. Inv. Pz Partic. N°	Quantità Misure Quantités	Descrizione della fornitura - Extent of material delivered - Umfang der Lieferung - Liste descriptive	Codice Heat Treatment Co.40 N°	Codice Certificate Abnahmeprüfzeugnis Certificat N°	Caratteristiche Dispositivi Verifiche Procedure
1	389	1" x 1/2" Std Vernic.	771412	07/28491	

CTA	THIS CERTIFICATE IS VALID FOR	QCS
CUSTOMER: <i>OST IND. U. CIVIDAC</i>		
P.O. no: <i>2010/164</i>	ITEM no: <i>11</i>	
PROJECT: <i>COLATA 411412</i>		
PIPES no: <i>10</i>	kg: _____	m: _____
CTA's JOB	DATE	

- Note - Remarques - Anmerkungen
- (1) "T" - Tube senza saldatura - Seamless pipe - Nahtlose Röhre - Tube sans soudure  
"W" - Tube saldato con saldatura a pressione 100% - Welded pipe with 100% pressure  
1 - 100% - Gewaldfrei Röhre mit 100% - Hochdruckverschweißung mit 100% - Tube soude avec 100% - soudure autogène 100%
- (2) I tubi sono stati sottoposti a prova di strarice - the pipes are tested by hydrotest - Die Röhren wurden mit Wasserdruck geprüft - Les tubes sont éprouvés
- Mediante prova idraulica - By hydraulic test - Durch Wasserversuch  
Per pressione idraulica - For hydraulic test - Für Druckversuch
- Mediante controllo N.B. secondo SEP 1923 - By magnetic control according to SEP 1923  
Durch magnetisierende Prüfung - SEP 1923  
Für event. de essant Foucault selon SEP 1923
- Il controllo è stato eseguito secondo le norme CEI 10000 - The inspection was carried out according to CEI 10000  
Das Prüfverfahren ist nach den Vorschriften der CEI 10000 ausgeführt worden  
Les contrôles ont été effectués conformément aux normes CEI 10000

Verified to ASME II<sup>o</sup> Part. A  
ed. 2007 + add. 2009b  
& found conforming.

*CL. CIVIDAC S.p.A.*  
*Q.C. MGR. MEMO*

Il Capo Controllo Quality Control Manager - Der Sachverständige La Responsable Contrôle Qualité	
<b>BUTTURINI RICCARDO</b>	
QUESTO CERTIFICATO È REDATTO CON L'AUSILIO INFORMATICO ED È VALIDO SENZA FIRMA.	

090630\_02931\_B1Ag





F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mt 12	Kg 12	Pz No.: 12
This document is reproduced by a computerized system and is conform to the original	Heat No.: 771412	Fps's job: OC000555	Date: 29/03/2010
Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG00267	Item:	

# VIRGILIO CENA & FIGLI S.p.A.

25124 BRESCIA - VIA OPERDAN, 38 - TEL. (030) 291561 (R. 5 linee) - FAX (030) 291646  
e-mail: info@cnafisngl.com - www.cnafisngl.com

Allegato Annex Anlage Anexo	alla pagina 1	Certificato - Certificate - Prüfzug - Certificate N. 2.911.BIAP
--------------------------------------	---------------	--

## Risultati delle prove - Test Results - Ergebnis der Prüfungen - Résultats des essais

Analisi chimica di colata % - Results of ladle analysis % - Ergebnis der Schmelzanalyse in % - Résultats d'analyse de coulée %													
Posizione - Item Position - Posti	Colata - Heat Schmelze - Coulée	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	V	Nb	Coq (1)
Posizione - Item Position - Posti	Requisito - Required Anforderungen - Demandé	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
1	771412	0,230	0,150	0,600	0,025	0,010	0,300	0,120	0,400	0,300	0,080	0,020	
		0,170	0,200	0,830	0,011	0,002	0,050	0,020	0,090	0,190	0,002	0,002	0,340 (2)=E

Processo di fabbricazione dell'acciaio - Steel making process - Erzeugungsort - Procédé d'élaboration de l'acier: [2]

(1) Carbon equivalent - Carbon äquivalent - Kohlenstoff-Gleichwertigkeit - Carbon equivalent  $C_{eq} = C + \frac{Mn}{6} + \frac{Cr}{5} + \frac{Ni}{6} + \frac{Cu}{12} + \frac{Nb}{10} + \frac{V}{6} + \frac{Si}{24}$   
(2) - Erzeugungsort - Erzeugungsort - Erzeugungsort - Erzeugungsort E = Forno elettrico - Electric furnace - Elektroherdverfahren - Four électrique

Prove meccaniche - Mechanical Tests - Mechanische Prüfungen - Essais mécaniques (3)											(3)	
Posizione - Item Position - Posti	Prova - Specimen Proben - Epreuve	Colata - Heat Schmelze - Coulée	Dim. delle prove - Dim. of specimen - Prüfmaßnahme - Dim. de l'éprouvette (4)	Stato di prova - Proof condition - Prüfzustand - État de l'éprouvette	Alleggero Elongation Dilation Allongement (5)	Durezza Hardness Härte Dureté (6)	Resistenza - Impact Test MartenChargé - Essai de résilience (4) (4)	IMPACT TEST		Note Remarks Bemerkung Remarques		
N°	N°	N°	mm	mm	N/mm <sup>2</sup>	N/mm <sup>2</sup>	%	HB	Min. J	Max. J	Temp. °C	TYPE AND SIZE OF SPECIMEN °C
1	0.5.5.5	771412	(3)-P	12,4x 4,1	342	485	30,5	140-160	30,0	30,0	31,0	P 10x2,5 -50 (4)=L

Verified to ASME II<sup>o</sup> Part. A  
ed. 2007 + add. 2009b  
& found conforming.

C.I. CENAC S.p.A.  
Q.C. MEMO

(1) P = Pulver - Coque - Vers des Pulver - Kohlenstaub, F = Bol electrico - Of electrico - Von den Elektroden - El electrico  
(2) L = Longitudinale - Longitudinal - Längs - Longitudinal, T = Transversale - Transversal - Quers - Querschnitt  
(3) 5646 - 2" - 4" - 5,65 TEF  
(4) Bol electrico - Of electrico - Von den Elektroden - Sur electrico  
(5) Tipo di prova - Specimen - Proben - Type d'éprouvette - A/D/VE  
(6) Temperatura di prova - Test temperature - Prüftemperatur - Temperature d'essai

Controllo visuale dimensionale dei pezzi speciali - Dimensional control of special parts - Sichtprüfung der Sonderstücke - Contrôle visuel des pièces spéciales  
Inspection et contrôle des dimensions des pièces spéciales - Sichtprüfung der Sonderstücke - Contrôle visuel des pièces spéciales

Il Capo Collaudatore  
Quality Control Manager - Der Sachverständige  
Le Responsable Contrôle Qualité  
BUTTURINI RICCARDO  
QUESTO CERTIFICATO È REDATTO CON L'AUSILIO  
INFORMATICO ED È VALIDO SENZA FIRMA.

	F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mt 12	Kg 12	Pz No.: 12
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 771412	Fps's job: OC000555	Date: 29/03/2010
	Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG00267	Name:	

# VIRGILIO CENA & FIGLI S.p.A.

25128 BRESCIA - VIA OBERDAN, 38 - TEL. (030) 208581 (PL 5 linee) - FAX (030) 268888  
e-mail: info@virgilio-cena.com - www.virgilio-cena.com



U.S. according to PED 97/23/EC  
Annex I, Sec. 4.1  
Cert. n. 160142



## CERTIFICATO DI COLLAUDO

Inspection Certificate  
Abnahmeprüfzeugnis EN 10204/3.1  
Certificat de Réception

Date - Data - Datum - Date 30/06/2009

N.	2.931. BIAP
PAGINA Sheet - Blatt - Page	2

Ordine - Order - Bestellung - Commande	OS 900054 del 28.5.09
--	-----------------------

Cliente - Customer - Besteller - Client

FITTINGS & PIPES  
STAINLESS SERVICE S.p.A.

Fattura - Invoice - Rechnung - Faktura	DDT
2.931 del 30/06/2009	

VIALE LIDICE N.38/40/42

10095 GROGLIASCO TO

Prodotto/Norme - Article/Specifications - Prüfgegenstand/Prüfbedingungen/Anforderungen - Produit/Spécifications
Seamless concentric reducer / Riduzioni concentriche senza saldatura WPL6 ASTM/ASME A/SA-420-07-ASME B 16.9/01-NACE MR0103

Trattamento termico - Heat Treatment - Wärmebehandlung - Traitement thermique
Normalized at 900°C Normalizzate a 900°C

Marca del produttore - Brand of the manufacturer - Hersteller/Marken - Marque du fabricant:

**CENA**

Marcatura - Marking - Kennzeichnung - Marquage
CENA De1xSp1-De2xSp2 (inch.) WPL6 - Heat Nr CENA De1xSp1-De2xSp2 (inch.) WPL6 - Nr. colata

Presso dell'ispettore - Inspector's stamp - Stempel des Sachverständigen - Patrice de l'expert.



Materiale di partenza: Acciaio/Norme (2) (3) - Raw material: Steel/Specification - Vormaterial: Werkstoff/Lieferbedingungen - Matière de départ: Acier/Specification
S ASTM/ASME SA-333 Gr. 6 NACE MR 01 75 FULLY KILLED - D.N. 24/11/1984

Descrizione della fornitura - Extent of material delivered - Umfang der Lieferung - Liste descriptive					
Partic. Item Partic. N°	Quantità Quantity Menge Quantité	Tipologia di prodotto Article - Gegenstand - Désignation du produit	Colore Heat Exchanger Color N°	Certificato Certificate Attestation/Certificat N°	Funzione Function Funktion Fonction
		La société VIRGILIO CENA & FIGLI S.p.A. garantit que tous les produits, objet du certificat susdit, respectent en leur totalité les spécifications de l'article 15 de l' Arrêté Ministériel du 24 mars 1978, c'est à dire: C < 0,025 - P < 0,05 - S < 0,05 Ra < 700 N/mm <sup>2</sup> , Rm (A-2) 10500 min., AK sur \15,6550 min. lat, E < 0,2R			
 E. CIVIDAC S.p.A. Q.C. MGR. E. MEMO			Verified to ASME II° Part. A ed. 2007 + add. 2009b & found conforming.		

(1) "R" = Tube senza saldatura - Seamless pipe - Nahtlose Röhre - Tube sans soudure  
 "W" = Tube addetto con sovrappressione massima 100% - Welded pipe with 100% pressure  
 "100%" = Geschweißte Röhre mit Überdruckspannung von 100% - Tube soudé avec coefficient de sécurité 100%  
 (2) I tubi sono stati sottoposti a prove di tenuta - The pipes are tested on tightness - Die Röhre sind auf Dichtheit geprüft - Les tubes sont éprouvés  
 - sottoposti a prova idraulica  
 - By hydraulic test  
 - Durch Wasserversuchversucht  
 - Par pression hydraulique  
 - sottoposti a prova di tenuta  
 - By Eddy current according to SEP 1125  
 - Durch Wirbelstromprüfung gemäß SEP 1125  
 - Par courants tourbillonnants selon SEP 1125  
 (3) I tubi sono stati sottoposti a prove di resistenza a trazione in accordo con le norme di riferimento - The requirements of standards analysis and mechanical characteristics are fulfilled as per process  
 - Die geschweißten Röhren wurden der charakteristischen Zugversuchprüfung nach EN 10204/3.1 BIAP  
 - Les soudures respectent les conditions de tenue de charge

**Il Capo Collaudo**  
 Quality Control Manager - Der Sachverständige  
 Le Responsable Contrôle Qualité  
**BUTTORINI RICCARDO**  
 QUESTO CERTIFICATO È REDATTO CON L'AUSILIO  
 INFORMATICO ED È VALIDO SENZA FIRMA.



F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mt 12	Kg 12	Pz No.: 12
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Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG00267	Herr:	

# VIRGILIO CENA & FIGLI S.p.A.

25124 BRESCIA - VIA OBERDAN, 38 - TEL. (030) 294561 (R. 5 linee) - FAX (030) 396448  
 E-mail: info@vcaf.it - www.vcaf.it

Allegato Anex Anlage Anexe	alla pagina 2	Certificato - Certificate - Prüfung - Certificat N. 2.931.BIAP
-------------------------------------	---------------	---

## Risultati delle prove - Test Results - Ergebnis der Prüfungen - Résultats des essais

Analisi chimica di colata - Results of ladle analysis % - Ergebnis der Schmelzanalyse in % - Résultats d'analyse de coulée %										
Procedi. Anal. Metall. Prova	Colata - Heat Schmelze - Coulee N°	C	Si	Mn	P	S				Coq (1)
	Richiesta Required Anforderungen Demandé	min								
	max									

Processo di fabbricazione dell'acciaio - Steel making process - Erhschmelzprozess - Procédé d'élaboration de l'acier

(1) Carbono equivalente - Carbon equivalent - Kohlenstoff-Gleichwertigkeit - Carbon equivalent  $Coq = C + \frac{Mn}{6} + \frac{Cr+Mo+V}{5}$   
 (2) T = Ossigeno basico - Basic oxygen - Basenstoffblowverfahren - Procédé à l'oxygène E = Forne elettrica - Electric furnace - Elektrosmelt-verfahren - Four électrique

Prove meccaniche - Mechanical Tests - Mechanische Prüfungen - Essais mécaniques (3)										
Posizio. e Item Position L'ITEM	Prova - Specimen Proben Epreuve	Colata Heat Schmelze Coulée N°	Din. di prova - Dim. of specimen - Probenabmessung - Dim. de l'éprouvette (4)		Allegamento Elegation Dübelung Ablongement (5)	Durezza Härden Härte Dureté (6)	Resistenza - Tensile Test Kerbschlagprobe - Essai de résistance		Note Remarks Bemerkung Remarques	
			Ø	L			(7)	(8)		
			mm	mm			N/mm <sup>2</sup>	J/cm <sup>2</sup>		
N°	N°	Richiesta - Required Anforderungen - Demandé	min	max			Media - Average Mittelwert - Moyens	Minimo - Minimum Minimum - Minimum		

Verified to ASME II<sup>o</sup> Part. A  
 ed. 2007 + add. 2009b  
 & found conforming.

*C.I. G. V. S. P. A.*  
*Q.C. M. S. P. MEMO*

(3) P = Estensione - Elongation - Strecken - Verformung - Si = Forne - Electric - Elektrosmelt - Four électrique  
 (4) L = Lunghezza - Length - Länge - Längelänge, T = Temperatura - Temperature - Grad - Temperatur  
 (5) Ø = Dia. - Dia. - Durchmesser - Durchmesser  
 (6) H =urezza - Hardness - Härte - Härte  
 (7) H = Resistenza - Tensile - Zugfestigkeit - Zugfestigkeit  
 (8) Tipo di prova - Specimen - Proben - Type d'éprouvette - KV-TYP  
 (9) Temperatura di prova - Test Temperature - Prüftemperatur - Temperature d'essai


R. Capa Collaudo  
 Quality Control Manager - Der Sachverständige  
 Le Responsable Contrôle Qualité

**BUTTURINI RICCARDO**

Controlle visive e dimensionali del pezzo spedito:  Sì / Gefügekontrolle und dimensionale Inspektion des Produkts:  Ja  
 Sichtprüfung und Messarbeiten der Formstücke:  Ja  
 Inspection et contrôle des dimensions des pièces:  Oui



CTA	THIS CERTIFICATE IS VALID FOR		QCS
CUSTOMER	COSTRUZIONI IND. CIVILDAC		
P.O. no:	2010/164	ITEM no:	02
PROJECT	COLATA 98186		
PIPES no:	4	Kg:	31
		m.:	24
CTA's JOB	VC 638	DATE	30/03/2010

 <b>PIETRA</b> SOCIETA PER AZIONI 25126 Enna - Via Crotone, 2 telefon: 090 3540540 - Fax 090 3540204 Internet: www.pietra-spa.com - E-mail: pietra@pietra-spa.com	<b>CERTIFICATO DI COLLAUDO</b> Inspection certificate - Attestato di collaudo - Certificat de réception EN 10204 3.1.B	Nr 19121 Pag. 2 30/03/10 AG
	CORRENTI INDOTTE Eddy current acc.to: ASTM E 309 ISPEZIONE E CONTROLLO DIMENSIONALE POSITIVO Results of inspection and dimensional control: positive CERTIFICHIAMO CHE LA FORNITURA E' CONFORME AGLI ACCORDI DELL'ORDINE We hereby certify that material complies with the terms of the order I TUBI HANNO SUBITO UN TRATTAMENTO COMPLETO DI DEMAGNETIZZAZIONE The tubes have been subjected to a complete demagnetization treatment ACCIENO TRATTATO AL FORNO ELETTRICO COMPLETAMENTE CALMATO Steel material electric furnace, fully killed La société PIETRA S.p.A. garantit que les produits objet du présent certificat respectent en leur totalité les prescriptions de l'article 15 de l'arrêté ministériel 24 Mars 1979 modifié : C<=0,25% P<=0,050% S<=0,050% R<=700 N/mm <sup>2</sup> E<=0,9 x R AX (L<=5,65VS <sub>o</sub> ) min.14% en lon. R(A-2)>=10300 AX(L<=5,65VS <sub>o</sub> ) min. 14% en transv. RxA>=10500	

CORRENTI INDOTTE Eddy current acc.to: ASTM E 309  
 ISPEZIONE E CONTROLLO DIMENSIONALE POSITIVO  
 Results of inspection and dimensional control: positive  
 CERTIFICHIAMO CHE LA FORNITURA E' CONFORME AGLI ACCORDI DELL'ORDINE  
 We hereby certify that material complies with the terms of the order  
 I TUBI HANNO SUBITO UN TRATTAMENTO COMPLETO DI DEMAGNETIZZAZIONE  
 The tubes have been subjected to a complete demagnetization treatment  
 ACCIENO TRATTATO AL FORNO ELETTRICO COMPLETAMENTE CALMATO  
 Steel material electric furnace, fully killed  
 La société PIETRA S.p.A. garantit que les produits objet du présent  
 certificat respectent en leur totalité les prescriptions de  
 l'article 15 de l'arrêté ministériel 24 Mars 1979 modifié :  
 C<=0,25% P<=0,050% S<=0,050% R<=700 N/mm<sup>2</sup> E<=0,9 x R  
 AX (L<=5,65VS<sub>o</sub>) min.14% en lon. R(A-2)>=10300 AX(L<=5,65VS<sub>o</sub>)  
 min. 14% en transv. RxA>=10500

Verified to ASME II<sup>o</sup> Part. B  
 ed. 2007 + add. 2009b  
 & found conforming.

C.I. CIVILDAC S.p.A.  
 Q.C. MGR-B MEMO

DATA	PIETRA S.p.A.	RESPONSABILE COLLAUDO
15.11.04		QUALITY INSPECTION MANAGER
		Andrea Zocchi

Questo certificato è generato da un sistema computerizzato ed è valido senza firma. Il certificato originale riporta il marchio "Pietra" di colore blu.  
 Nel caso in cui il destinatario ne chieda copia, deve attestare la sua correttezza, assumendone ogni responsabilità per cui l'iscrittore non è ritenuto  
 dalla Pietra S.p.A. Altrettanto vale in qualsiasi caso per quanto riguarda la responsabilità di legge.  
 This certificate is issued by computerized system and it is valid without signature. Only the original "Pietra" are printed in blue on the original certificate.  
 In case the customer of the original certificate issues a copy of it, he must certify by his name the conformity to the original one. He takes upon himself the  
 responsibility for any legal or administrative consequences. All alterations and/or falsifications will be prosecuted.



212  
SN 4320 Ps. 217-320-406

**G. Fiori & C s.r.l.**  
 Sede 20021 OSPiate DI BOLLATE (MI) Via Ghiesaliba 1/3  
 Telefoni: +39 02 3506468 - 3502958 - 3504427  
 Fax: +39 02 38303824  
 http://www.fiorifurniture.com  
 E-mail: info@fiorifurniture.com

INSPECTION CERTIFICATE DIN 50049/3.1 - EN 10204/3.1  
 CERTIFICATO DI COLLAUDO  
 N. 950  
 Pag. 1  
 Del.Note / D.d.t. 1423 08.06.2007

CONSTRUZIONI INDUSTRIAL CIVIDAC SPA  
 VIA BORGIO CATTANEO, 35  
 31048 S. BIAGIO DI CALLALTA TV  
 Partita Iva 01639460268

HEAT COLATA	QUANTITY QUANTITA'	DESCRIPTION DESCRIZIONE	SIZE MISURA	YOUR P.O. VS. ORDINE	VISUAL & DIMENSIONAL VISIVO E DIMENSIONALE	MATERIAL													IMPACT TEST			STEEL MILL ACCIAIERIA		
						C %	SI %	Mn %	S %	P %	Cr %	NI %	Mo %	TI %	Cu %	V %	Nb %	N %	AI %	Sn %	C.E. %		1	2
*9782 *A19916	1 6	FLANGE VN-RF 300 LF2 SP. 8,74 TONDO DIAM. 50 LF2 L= 6000	2" DN 50	2007/305 2007/305	SATISFACTORY SATISFACTORY	0,120	0,167	1,040	0,010	0,007	0,090	0,050	0,036	0,200	0,003	0,001	0,008	0,025	0,336	0,387	0,336	0,387	OLIFER/SF 154...	ASA A07-2840
*9782 *A19916						0,190	0,230	0,840	0,005	0,021	0,130	0,160	0,030	0,210	0,002	0,001								
HEAT COLATA						ELONGATION Allungamento		REDUCTION OF AREA Contrazione		HARDNESS Durezza Hb					°C									
*9782 *A19916						39,00	28,00	68,00	61,00	159 162	156 159													
HEAT COLATA						MATERIAL IN ACCORDANCE TO MATERIALE IN ACCORDO A													HEAT TREATMENT TRATTAMENTO TERMICO			FURNACE FORNO		
*9782 *A19916						ASTM A350 - SA350 ASME II PART. A ED.04 ADD.05 ASTM A350 - SA350 ASME II PART. A ED.04 ADD.05													NORMALIZED AT 920 C - COLLED IN STILL AIR 1H X 1" NORMALIZED AT 920 C - COLLED IN STILL AIR 1H X 1"			ELECTRIC FURNACE ELECTRIC FURNACE		

NOTE FULLY KILLED


QUALITY CONTROL DEPARTMENT  
 UFFICIO CONTROLLO QUALITA'


**G. Fiori & C s.r.l.**

Verified to ASME II Part. 7  
 G. Fiori & C s.p.a. ed. 2007 + add. 2009 b  
 G. Fiori & C s.r.l.

It's in accordance with original certification issued by steel plant and relative analysis and test laboratory.  
 Conforme al certificato originale rilasciato dall'acciaieria e relativo laboratorio di analisi e prove.



	F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mt 32	Kg 32	Pz.No.: 32
	This document is reproduced by a computerized system and it conforms to the original	Heat No.: 346747	Fps's job: OC0000555	Date: 29/03/2010
	Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG00267		Rev: 3

<b>Abnahmeprüfzeugnis</b> <b>Inspection Certificate</b> <b>EN 10204 - 3.1</b>		Zeugnisnummer [certificate no.] 002784/10-SD		Datum [date] 25/01/2010	
Ihre Bestellnummer [your order no.] OS 90105		Unsere Auftrags.Nr. [our order no.] 115940GJ-0020		Ident.Nr. [ident no.] 66C	
Ihre Artikelnummer [your item no.] Menge Artikelbezeichnung [designation] 300 elbows LR-90-S-WPLB-12"-STD		Schmelze Nr [heat no.] 346747		Anforderungen [requirements] ASME B16.9-2007 LR,WPLB,ASME Sect. II, part D table Y-1,ASTM A 420/A 420M-05,ASME SA-420M-Ed.04/A06,NACE MR0175/ISO15156-2:2003A.2,NACE MR0103-2007 2.1 and 4,MSB03-05,EN 10204/3.1 + BC,Manufacturers standard	
Hersteller [manufacturer] V&M		Dichtheitsprüfung [leakage test] SEP 1925		Form: Kerbschlagarbeit [Impact values] (J) 122-126 HB	
Schmelze Nr. [heat no.] 346747		J-Faktor CEG [CEQ]: (Si + Mn) * (P + Sn) * 10000 C + (Mn / 6) + (Cr + Mo + V) / 5 + (Cu + Ni) / 15		Härteprüfung [hardness test] Wärmebehandlung [heat treatment] normalized temperature 840 °C - 890 °C Holding Time 30 min. Cooling in still air	
Rohzeugnisnr. [tube work's cert.no.] 481362h07		1 = Schmelzeanalyse [heat analysis] 2 = Produktanalyse [product analysis]		Kerbschlagbegeversuch [notched bar impact test]	
Analyse [analysis] Index 1 2		Erweichungsart [melting process] Y C Si Mn P S Cr Ni Mo Nb Cu V Nb Ti N Ceq CEQ J-Fact.		Querschnitt [cross sec.] PR-Lage [pos. of sample] Temp. Dehnung [elongation] (AS %)	
Zugversuch [tensile test] Zugfestigkeit [tensile str.] Rm (MPa) 436		Dehnung [elongation] (AS %)		PR-Lage [pos. of sample] Temp. Dehnung [elongation] (AS %)	
Zugversuch [tensile test] Zugfestigkeit [tensile str.] Rp0.2 323		Dehnung [elongation] (AS %)		PR-Lage [pos. of sample] Temp. Dehnung [elongation] (AS %)	
Kennzeichnung [marking] LOGO: 		Mat.66CDN/wall		Zusatzmarkierung [add. mark.]	
Besichtigung und Ausmessung [visual inspection and dimensional check] e.B./o.K		"Logo: <input checked="" type="checkbox"/> E <input type="checkbox"/> or <input type="checkbox"/>		Die gelieferten Produkte entsprechen den Anforderungen der Bestellung (einschließlich Herstellung, Probenahme, Testen und Prüfen). (The supplied products comply with the requirements of the order (including manufacturing, sampling, testing and inspections).)	
Bemerkungen [remarks] hot formed over mandrel Hardness test and stamping acc. to NACE MR-01-75. Stamped with round nosed tools. Hardness test, visual and dimensional test are checked on 10%.		Zertifiziert nach DIN EN 10204 Teil 3.1 Certified acc. to PED 97/23/EG Annex I, Absatz 4.3 durch TÜV SÜD Industrie Service, Benannte Stelle 0036, Zertifikat Nr. 1292022MUC [Certified acc. to PED 97/23/EG Annex I, Paragraph 4.3 by TÜV SÜD Industrie Service, Notified Body 0036, Certificate No. 1292022MUC]		Der Werksachverständige [the Works Inspector] 25/01/10 Schweißsteck Daniel Nr. 822 Dieses Dokument wurde elektronisch erstellt und ist ohne Unterschrift gültig. (The certificate is issued by the computerized system and it is valid without signature.)	

CTA	THIS CERTIFICATE IS VALID FOR	QCS
CUSTOMER:	OSTR. INDU. CIVILAC	
R.O. no.:	2010/64	ITEM no.: 3
PROJECT:	OSTRA 3166547	
PIPES no.:	32	kg:
CTA's JOB	DATE	

Verified to ASME 1<sup>st</sup> Part. A  
 ed. 2007 + add. 2003b  
 & found conforming.

C.I. CIVILAC S.p.A.  
 O.C. M. MEMO














	COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 484	Mt 11,62	Pipes No.: 1
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 380159	Cta's job: VC0002142	Date: 12/12/2007
	Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: NR		Item: 07

2007/598-599-549 rev. 1

SN4320  
Pos 234

**voestalpine Tubulars GmbH & Co KG**

Alpinestrasse 17  
8652 Kindberg-Aumuehl  
T. +43/50304/23-0  
F. +43/50304/63-532  
www.voestalpine.com

Legal Structure: Limited Partnership  
Location: Kindberg/Austria,  
Company Registry Number 165400k  
Commercial Court of Leoben  
DPR 0592684, VAT Nr. ATU 43630406

General Partner: voestalpine Tubulars GmbH  
Legal Structure: Limited Liability Company  
Location: Linz, Company Registry Number 106933 f  
Commercial Court of Linz

**Abnahmeprüfzeugnis 3.1 / Nr./No. Z48237**

(gem. EN 10204 – ISO 10474)

**Inspection - Certificate**

(according to EN 10204 – ISO 10474)

Besteller: Purchaser:	COMMERCIALE TUBI ACCIAIO S.P.A. Viale Lidice 38/40/42 I-10095 GRUGLIASCO	ordina no. Bestell-Nr.: VD70448/VS0000104 Your order No.: 19.07.07
Hersteller: Manufacturer:	voestalpine Tubulars GmbH & Co KG	Auftrags-Nr.: 225737 Our works order No.:
Prüfgegenstand Object of tests:	NAHTLOSE STAHLROHRE/SEAMLESS STEEL TUBES	Versandanzelge: Dispatch advice No.: 2007-11-06

Anforderungen:  
Requirements:

Spec „RAQ-02-SA-333-GS Rev.3“  
ASTM A 333/A 333M-05 /ASME SA 333 ; ASTM A 999-04a/A 999/according  
ASME Boiler and Pressure Vessel Code, Section II, Part. A  
edition July 1, 2004 + addenda 2006, ANSI B 36.10,  
API Spec 5 L , forty third edition, 2004 (PSL 1)  
NACE MR0175-ISO 15156, edition 2004, NACE MR0103, edition 2005,  
ASME Section II Part D Table Y-1,  
EUROPEAN DIRECTIVE 97/23/EC – ANNEX 1

Erשמלזונגסארט:  
Melting process:

**Y**  
**BASIC**  
**OXYGEN**  
fully killed  
fine grain

voestalpine Tubulars runs a quality management system which has undergone  
a specific assessment for materials of pressure equipment and is certified by a  
competent body (TUEV).

Werkstoff: Material:	GRADE 6	Zeichen des Lieferwerkes: Marking of producer	<b>Va</b>
Kennzeichnung: Marking:	Schablone/Paint steciling: va A/SA 333 GRADE 6 6.625" 0.432" SCHED. 80 HOT FINISHED SEAMLESS LT -50F+ .Heat No.		
Ausführung: Condition:	both ends bevelled acc. to ANSI/ASME 16.25-86 FIG. 4 (37.5")		
Wärmebehandlung: Heat treatment:	Normalisiert/normalised: 880°C Haltezeit/holding time: 15 min.	Stempel des Sachverständigen: Stamp of inspector:	

**Umfang der Lieferung / Volume of delivery:**

Pos.-Nr.: Item No.: Poste n°	Stückzahl Number Of Nombre	kg	m	Abmessung Dimension Dimension	Schmelze Nr. Heat No. N° Coulée	Probe-Nr.: Test-No N° d' éprouvette
02	21	10362.00	241.16	168.3 x 10.97 mm	380159	109160

Verified to ASME II° Part. A  
ed. 2007 + add. 2009b  
& found conforming.

C.I. CIVIDAC S.p.A.  
Q.C. MGR. P. MENO

Kindberg, 08.11.07

Page 1 of 1


voestalpine Tubulars GmbH & Co KG  
Qualitätsstelle / Quality Department

**PIRCHEGGER**

Der Werksachverständige  
Works Inspector / L'Expert d'usine

**voestalpine**

ONE STEP AHEAD

	COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 484	Mt 11,62	Pipes No.: 1
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 380159	Cia's job: VC0002142	Date: 12/12/2007
	Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: NR		Item: 07

2007/598-599-549 rev. 1

## voestalpine Tubulars GmbH & Co KG

### Umfang der Lieferung

Volume of delivery

Schmelze	Los
Heat	Lot
380159	109160 - 01

### Ergebnis der Prüfung

test results

- 1 Visuelle Inspektion/ Visual Inspection:  
o.B./satisfactory
- 2 Dimensionskontrolle/ Dimensional Inspection: o.B./satisfactory
- 3 Wasserinnendruckversuch/Hydrostatic test:  
o.B./satisfactory 186 bar
- 4 Ringfaltversuch/Flattening test: o.B./satisfactory
- 5 Streifflussprüfung/Diverted flux:  
o.B./satisfactory ASTM E 570

No 4 8 2 3 7

Kindberg, 08.11.2007

Page 2 of 4

Verified to ASME II<sup>e</sup> Part. A  
ed. 2007 + add. 2009b  
& found conforming.

  
C.I. CIVIDAC S.p.A.  
Q.C. MGR. E. P. B.M.Q.

voestalpine Tubulars GmbH & Co KG  
Qualitätsstelle / Quality Department

**PIRCHEGGER**

Der Werkssachverständige  
Works Inspector / L'Expert d'usine

**voestalpine**

ONE STEP AHEAD



COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 484	Mt 11,62	Pipes No.: 1
This document is reproduced by a computerized system and is conform to the original	Heat No.: 380159	Cla's job: VC0002142	Date: 12/12/2007
Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: NR		Item: 07

2007/598-599-549 rev. 1

**voestalpine Tubulars GmbH & Co KG**

**Mechanische Prüfung Mechanical testing**

Los Lot No	Probenabm. Specimen mm	Streckgrenze Yield Strength Rp0.20 N/mm <sup>2</sup>	Zugfestigkeit Tensile Strength N/mm <sup>2</sup>	Dehnung % Elongation Lo= 2"
VON from: bis to:		240	415	30,0
109160 -- 01 N 1 Streifen	25,40 11,20 324	498		39,20
109160 -- 01 N 2 Streifen	25,40 10,80 358	510		35,70

ratio yield and tensile strength ( $\leq 0.85$ ) = 0.70%

**Härte Prüfung Hardness testing HRB max. 88.5**

Los Lot No	Einzelw. Hardness number	Mittelw. Mean hardness number	Streuung Variation
VON from: bis to:			
109160 -- 01 N 1	78,50	99,5	-
109160 -- 01 N 2	77,93	77,93	,80

**Kerbschlagarbeit Impact test results Charpy-V -50°C mind. 14 J (18 J) specimen 55 x 10 x 10 mm**

Los Lot No	Einzelw. Single	Mittelwerte Value
109160 -- 01 N 1	128 105	74 102
109160 -- 01 N 2	-	-

SHEAR-AREA 100%  
(UB)1.48 (UB)1.15 (UB)1.84

**No 48237**

Kindberg, 08.11.2007

Page 3 of 4

Verified to ASME II Part. A  
ed. 2007 + add. 2009b  
& found conforming.

*[Signature]*  
C.I. CIVIDAC S.p.A.  
G.C. MERLINO

voestalpine Tubulars GmbH & Co KG  
Qualitätsstelle / Quality Department

**PIRMEGER**


Der Werkssachverständige  
Works/Inspector / L'Expert d'usine

**voestalpine**

ONE STEP AHEAD.





	COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 484	Mt 11,62	Pipes No.: 1
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 380159	Cta's job: VC0002142	Date: 12/12/2007
	Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: NR		Item: 07

2007/598-599-549 rev. 1

Client: Commerciale Tubi Acciaio S.P.A.  
I-10095 GRUGLIASCO  
Commance du Client: VD70448/VS0000104 19/07/07  
Notre Confirmation: 225737  
Tubes 168.3 x 10.97mm

Spec „RAQ-02-SA-333-GS Rev.3“  
ASTM A 333/A 333M-05 /ASME SA 333 ; ASTM A 999-04a/A 999  
according ASME Boiler and Pressure Vessel Code, Section II, Part. A  
edition July 1, 2004 + addenda 2006, ANSI B 36.10,  
API Spec 5 L , forty third edition, 2004 (PSL 1)  
NACE MR0175-ISO 15156, edition 2004, NACE MR0103, edition 2005,  
ASME Section II Part D Table Y-1,  
EUROPEAN DIRECTIVE 97/23/EC – ANNEX 1

Piece encluse au certificat No. Z48237

## DECLARATION

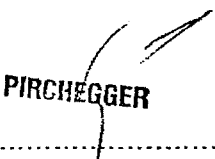
La Société voestalpine Tubulars GmbH & Co KG garantit que  
tous les produits, objet du Certificat susdit, respectent en leur  
totalité les Specifications de l'Article 15 de l'Arrêté Ministériel du  
24 Mars 1978 modifié:

C max. 0.25 % P max. 0.05 % S max. 0.05 %  
RM (N/mm<sup>2</sup>) max. 700 A (Lo=5.65√So) min. 16 % long Rm (A-2) min. 10500  
E max. 0.9 A (Lo=5.65√So) min. 14 % trans RA min. 10500

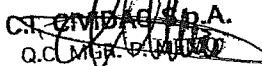
voestalpine Tubulars GmbH & Co KG  
Quality Department

Verified to ASME II<sup>o</sup> Part. A  
ed. 2007 + add. 2003b

& found conforming.

  
**PIRCHEGGER**

.....  
Works-Inspector

  
C.T. CIVIDAC S.p.A.  
Q.C. Mgr. P. MURRO

SN4320 Pos 235

	F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mt 24	Kg 24	Pz No.: 24
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	Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG00267		Item: (04)



La Courbe Vallourec  
ISO 9001/2000

Groupe Vallourec  
B.P 10132 59802 MAUBEUGE FRANCE  
Tél : 03.27.68.11.01  
Fax : 03.27.69.11.99

Raccords à Souder  
Bull Welding Fittings  
Schweißsformstücke

Client : FITTINGS & PIPES STAINLESS SERVICE  
Purchaser VIA BACCANELLO, 35  
Besteller TERNO D'ISOLA (BG)

N° de Cde Usine  
Mtl Ref 901434 005  
Works-Nr 1000511  
N° Certificat  
Certificate Nr  
Zeugnis Nr 10-02679

INSPECTION CERTIFICATE  
EN 10204 3.1

CTA THIS CERTIFICATE IS VALID FOR ACS  
 CUSTOMER BEST INDU. CUIDAC  
 PROJECT POLARTIA X 607  
 PIPES no: 14  
 DATE  
 M:

Cde Client N° : OS-0000106 - 290 00 283 - Your Order Nr Bestell-Nr		Spécifications : Specifications : Spezifikationen :	
Acier et Normes Steel and Standard Werkstoff und Norm		PED 97/23/EC Annex 1 par 4.3 Certificate No : 01 202 F/Q-02 0019 ASME SA 420 Section II - Part D - Table Y1	
Matériau de départ Raw Material / Werkstoff		Tubes sans soudure / Seamless Tube / Nahtlose Rohre Acier procédé Oxygène / Oxygen Steel / Sauerstoff Stahl Acier calmé / Killed Steel / beruhigter Stahl	
Etat de livraison Delivery Condition / Lieferzustand		Normalisés à 900° C / Normalised at 900° C / Normalisiertend 900° C	
Marquage Marking / Stempelung		Sur pièces en creux low stress Low stress hand stamp Kennzeichnung auf dem Flans durch kerbteils Einprägung	
Poste N° Item Nr Pos Nr		N° Certificat Matière Raw Material Rohzeugnis Nr	
Nombre Number Stückzahl		Code Marking Markierung	
Couleur N° Heat Nr Schmelze		Dimensions / Sizes / Abmessungen	
005	100	6720Sv09	X607
			343402
90° LONG RADIUS ELBOW 6° XS			

CARACTERISTIQUES CHIMIQUES - CHEMICAL ANALYSIS - SCHMELZENANALYSE														
Couleur N° Heat Nr Schmelze	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	V	Al	Sa	Ti	Nb
343402	0,200	0,150	0,600	0,025	0,020	0,300	0,080	0,300	0,300	0,020			0,040	0,020
	0,140	0,180	1,010	0,013	0,001	0,120	0,010	0,050	0,050	0,004	0,023	0,003	0,012	0,001

Carbone équivalent / Carbon equivalent / Kohlenstoffäquivalent (Max : 0.41)  
 $C_F = C + \frac{Mn}{6} = 0,308$        $L_F = C + \frac{Mn}{6} + \frac{Cr+V+Mo}{5} + \frac{Cu+Ni}{15} = 0,342$

CARACTERISTIQUES MECANIKES - MECHANICAL PROPERTIES - MECHANISCHE EIGENSCHAFTEN			
Essais de Traction / Tensile Tests / Zugversuch			Dureté
Limite Elastique Yield Point / Streckgrenze Re ≥ 285 MPa	Résistance Rupture Tensile strength / Zugfestigkeit 410 ≤ Rm ≤ 570 MPa	Allongement Elongation / Dehnung ε% A5 ≥ 30	Hardness test on fittings Hérog HB
288 MPa	453 MPa	ε% 43,8 %	139

Résilience / Impact Test / Kerbschlagarbeit					Date:	
Essai Test Versuch	Test 1	Test 2	Test 3	Moyenne : Unité Mean : Units Mittelwert : Einheit	Type : KV Specimen Muster	10 x 5 mm
09-01281	32	44	40	38,7 Joules	Température T°C	-50° Celsius
					Long / Long / Längs	
					LE RESPONSABLE QUALITE	

WE CERTIFY THAT THE DELIVERED PRODUCTS WERE MANUFACTURED, SAMPLED, TESTED AND INSPECTED IN ACCORDANCE WITH THE SPECIFICATION OF THE ORDER.

C.T. CUIDAC S.p.A.  
O.C. MEMO

Verified to ASME II° Part. A  
ed. 2007 + add. 2009b  
found conforming.

**CERTIFICAZIONE DI ISPEZIONE / INSPECTION CERTIFICATE / ABNAHMEPRUFZEUGNIS 3.1 EN 10204:2004**

<b>Clienti/Customer/Kunde/Client</b> SOCIETA' ITALIANA ACCIAI TUBI SPA		<b>Certificatore/Certificator/Abnahmeprüfzeugnis/Certificat d'essai</b> 187801 1-1 del 13/10/2009		<b>Bolla</b> 20913170		<b>Del</b> 12/10/2009	
<b>Lamiere/Plates/Bleche/foles</b> ASME SA516GR70HT/LTY		<b>1</b> N		<b>(1)</b> AR allo stato naturale / in as rolled condition / im Weitzustand / ohne Twist de laminage / N on laminatione a temperatura ambiente / With normalizing rolling / ohne Twist de laminage / N on laminatione / normalised / normalised / annealed / soft / soft / soft		<b>(4)</b> C-Quota/Code sample/Improbato/Costit Pe-Perforated surface/Witboortoppervlak De-Diverso/Different/Anders/Divers - 1/A Sp/Th Es-Estratto/Extract/Extrakt/Extrakt/Extrakt C-Contaminato/Contaminated/Contaminat Co-Contaminato/Contaminated/Contaminat	
<b>Ord.N</b> 20903974		<b>Vs</b> 1.116		<b>(3)</b> Direzione/Direction/Richtung/richt Test/Exam/Prüfung/Prüfung/Prüfung Sp-Spessore/Thickness/Dicke/Estesur		<b>(5)</b> C-Contaminato/Contaminated/Contaminat Co-Contaminato/Contaminated/Contaminat	
<b>ReH</b> Rm		<b>5%</b> Resilienza / /Immagctt		<b>Temp</b>		<b>Temp</b>	

C	Mn	Si	P	S	Cu	Ni	Cr	Mo	Al	V	Nb	Ti	N	B	C.Eq.

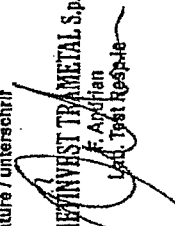
**Analisi Chimica di Colata / Chemical Analysis / Analyse chimique**

Colata / heat	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	Al	V	Nb	Ti	N	B	C.Eq.
1NE936	0,15	1,46	0,26	0,010	0,002	0,02	0,02	0,04	0,000	0,029	0,000	0,020	0,000	0,008	0,0000	0,404

**Analisi Chimica di Prodotto / Product Analysis / Analyse sur produit**

N° Lamiera/ Plate/Blecth/Tole	Lotto / lot	N° Prova N° Test Versuch/N° N° D'essai	Dimensioni/Size/ Grosse/Dimension (mm)	Trazione/Traction/Zugversuch/Traction			HB	Z-%	Piega Type Form	Resilienza/Impact test/Kerbschlagzähigkeit/Ressilience			Media Average Mittelwerte Moyenne				
				(2)	(4)	(6)				Temp °C	Temp °C	Temp °C		Rp 0,2% N/mm2	Rm N/mm2	A g° %	Rp 02 N/mm2
1NE936/04/02A	227350	J1400-2009	016x3000x12000	2	P	CC	+20	422,53	623,13	34,35	L	-46	P	142	146	137	141,667
1NE936/04/02B	227350	J1400-2009	016x3000x12000	2	P	CC	+20	422,53	623,13	34,35	L	-46	P	142	146	137	141,667

**Firma / signature / unterschrif**

  
**METINVEST TRAMETAL S.p.A.**  
 F. Vidac  
 Add. Test Resp. te

MATERIAL IN ACC. TO DIR 97/23 PED.  
 VERIFIED TO ASME II Part. A  
 ed. 2007 + add. 2009b  
 & found conforming.

CERTIFICHIAMO che le lamiere elencate sono conformi alle prescrizioni dell'ordina, che i controlli della mercatura, dell'aspetto superficiale e dimensionale hanno dato esito positivo.

WE CERTIFY that the above mentioned are consistent with the order prescriptions: marking, inspection and measurement without objection.

WIR BESTÄTIGEN hiermit, dass oben genannte Erzeugnisse den Bestellevorgaben entsprechen; Markenung, Oberflächen und Abmessung ohne Preskriptionen der la commande, contrôle de marquage, d'aspect et de dimensions satisfaisant.

PRODUCED FROM CONTINUOUS CAST SLAB AND HAVE A MINIMUM REDUCTION RATIO OF 3 TO 1.

TEST SAMPLE IN ACCORDING TO ASME SA-370 FIG. 3 AND FIG. 10 (FIG. 11 b 5x10mm)

ACCORDING TO ASME II PART A ED. 2007 + ADD. 2009a. FULLY KILLED, FINE GRAIN STEEL. PLATES AND TEST SAMPLES NORMALIZED AT 910°C, 1,5 MIN/MM. COOLING IN STILL AIR.



**centro tecnologico sperimentale** s.r.l.  
Via Puccini, 9 - Ceprana (SP)

CERTIFICATO DI ANALISI  
E CARATTERISTICHE MECCANICHE  
CHEMICAL ANALYSIS AND MECHANICAL  
PROPERTIES CERTIFICATE

AZIENDA CON SISTEMA DI  
GESTIONE PER LA QUALITÀ  
CERTIFICATO DA DNV  
=UNI EN ISO 9001:2000=

BOLLETTINO N° 76310  
Report N°  
COMMESSA N° 468/10  
Job CTS

CLIENTE  
Customer

S.I.A.T. S.p.A.  
PREDOSA (AL)

ORDINE CLIENTE  
Customer order

COMMESSA CLIENTE  
Customer Job

RIFERIMENTO - Item  
Lettera del 11/03/2010

N° PEZZI	DESCRIZIONE	DIMENSIONI	MATERIALE	PLACCA	COLATA	N° PROVA
N° Pieces	Description	Dimensions	Material	Plate n°	Heat n°	Test n°
01	SPEZZONE RICAVATO DA LAMIERA	16x3000x12000	SA 516 Gr. 70/P355NH	1NE 936 04 02 B	1NE 936	36/010

CARATTERISTICHE MECCANICHE - Mechanical properties

NOTE - Notes

PROVE IN ACCORDO A UNI EN 10045-1

Test n°	Dimens. Provette Sample dimension			Rottura Tensile strength		Snervam. Yield point		Allung. Elong.	Striz Reduct. of Area	Resilienza Impact test		Piega Bend	Durezza Hardness	Schiacc. Flattening
	larg. x spes. width x thk.	Ld	Area							KV 10x10 cm <sup>2</sup> 0,80 T = -29°C				
	mm	mm	mm <sup>2</sup>	kN	N/mm <sup>2</sup>	kN	N/mm <sup>2</sup>	%	%	JOULE	Average	Result	Average	Result
36/010										307 - 321 - 288	305			
VALORI RICHIESTI										27				
Required values										min		max		

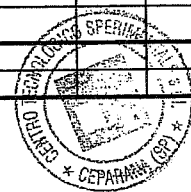
ANALISI CHIMICA - Chemical analysis

NOTE - Notes

N° provino e/o colata Sample and/or heat n°														
36/010														
VALORI RICHIESTI										min		max		
Required values														

ALLEGATI / Attached


C.T.S. S.p.A.  
P. MEMO



NOTE/ Notes

PROVINI PRELEVATI IN SENSO TRASVERSALE

OPERATORE Operator	ISPETTORE Inspector	ISPETTORE Inspector	IL DIRETTORE The Director	DATA Date
Paolo DEL CHIARO			Dott. Ing. C. DELLABIANCA Federico BONDI	16/03/2010

 <b>centro tecnologico sperimentale</b> s.r.l. Via Puccini, 9 - Ceparana (SP)	CERTIFICATO DI ANALISI E CARATTERISTICHE MECCANICHE CHEMICAL ANALYSIS AND MECHANICAL PROPERTIES CERTIFICATE		AZIENDA CON SISTEMA DI GESTIONE PER LA QUALITÀ CERTIFICATO DA DNV =UNI EN ISO 9001:2000=		BOLLETTINO N° 116010 Report N° COMMESSA N° 764/10 Job CTS									
	CLIENTE Customer  S.I.A.T. S.p.A. PREDOSA (AL)		ORDINE CLIENTE Customer order		COMMESSA CLIENTE Customer Job									
RIFERIMENTO - Item Lettera del 19/04/2010														
N° PEZZI	DESCRIZIONE		DIMENSIONI		MATERIALE	PLACCA	COLATA	N° PROVA						
N° Pieces	Description		Dimensions		Material	Plate n°	Heat n°	Test n°						
01	SPEZZONE RICAVATO DA LAMIERA		16x3000x12000		SA 516 Gr. 70/P355NH	1NE 936 04 02 A	1NE 936	36-2/010						
01	SPEZZONE RICAVATO DA LAMIERA		25x3000x12000		SA 516 Gr. 70/P355NH	90815-01	341802	36-3/010						
CARATTERISTICHE MECCANICHE - Mechanical properties														
NOTE - Notes														
PROVE IN ACCORDO A UNI EN 10045-1														
Test n°	Dimens. Provette Sample dimension			Rottura Tensile strength		Snervam. Yield point		Allung Elong.	Striz Reduct. of Area	Resilienza Impact test		Piega Bend	Durezza Hardness	Schiacc. Flattening
	larg. x spes. width x thk.	Lo	Area							KV 10x10 cm <sup>2</sup> 0,80 T = -29°C				
	mm	mm	mm <sup>2</sup>	kN	N/mm <sup>2</sup>	kN	N/mm <sup>2</sup>	%	%	JOULE	Average	Result	Average	Result
36-2/010										120 - 144 - 144	136			
36-3/010										186 - 201 - 209	199			
VALORI RICHIESTI			min											
Required values			max											
ANALISI CHIMICA - Chemical analysis														
NOTE - Notes														
N° provino e/o colata Sample and/or heat n°														
VALORI RICHIESTI														
Required values														
ALLEGATI / Attached														
NOTE/ Notes														
PROVINI PRELEVATI IN SENSO TRASVERSALE														
OPERATORE Operator			ISPETTORE Inspector			ISPETTORE Inspector			IL DIRETTORE The Director			DATA Date		
Paolo DEL CHIARO									Dott. Ing. C. DELLABIANCA Federico BONDI			22/04/2010		

SN4320 Pos. 305-315

**CERTIFICATO D'ISPEZIONE / INSPECTION CERTIFICATE / ABNAHMEPRUFZEUGNIS 3.1 EN 10204:2004**

<b>Client/Customer/Kunde/Cliant</b> COSTRUZIONI INDUSTRIALI CIVIDAC SPA	<b>Certificato/Certificate/Abnahmeprufzeugnis/Certificat d'essai</b> 1860031	<b>del</b> 23/09/2009	<b>Bolla</b> 20911888	<b>Del</b> 21/09/2009
<b>Lamiere/Plates/Bleche/foles</b> ASME SA516GR70MT/1TY	<b>1</b> N	<b>(1)</b> AR allo stato naturale / in as rolled condition / in Werkstoffe in der Natur / in der Natur / in normalizing rolling / normalisierendes Walzverfahren / après laminage contrôlé / normalizzato / annealed / gegluht / result	<b>(2)</b> Posizione/Location/Prüfplatz/Emplacement: 1-Testa/Top/Kopfseite 2-Fondo/Bottom/Fußseite	<b>(4)</b> C=Chiuso/Close P=Perforato/Perforated D=Disegnato/Designed E=Elettrolitico/Electrolytic C=Calda/Hot C=Calda/Hot
<b>Ord.N</b> 20902456	<b>Vs</b> 2009/223	<b>(3)</b> L=Longitudinale/Longitudinal/Längslag T=Trasversale/Transverse/Querschnittslage	<b>(5)</b> R=Resistenza/Resistance/Bruchwert S=Struttura/Structure/Struktur	

**In allegato certificato di controllo ultrasonoro N° - in attached ultrasonic examination report N°18936-2005 23/09/2009**

MIN MAX	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	Al	V	Nb	Ti	N	B	C.Eq.							
	ReH	Rm	A5%	Resilienze /Impact	Temp	Z%	Rp02	Temp	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	Al	V	Nb	Ti	N	B

**Analisi Chimica di Colata / Chemical Analysis / Analyse chimique**

Colata / heat	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	Al	V	Nb	Ti	N	B	C.Eq.
1TE282	0,16	1,5	0,24	0,012	0,003	0,02	0,03	0,04	0,000	0,037	0,000	0,000	0,000	0,004	0,0000	0,421
4SB640	0,19	1,09	0,28	0,014	0,006	0,01	0,01	0,02	0,000	0,04	0,000	0,000	0,000	0,007	0,0000	0,378
7SE803	0,20	1,02	0,34	0,013	0,001	0,01	0,02	0,03	0,001	0,036	0,000	0,000	0,000	0,004	0,0000	0,377

**Analisi Chimica di Prodotto / Product Analysis / Stuckanalyse / Analyse sur produit**

N° Lamiere/ Plate/Bleche/fole	Lotto / lot	N° Prova N° Test VersuchsN° N° D'essai	Dimensioni/Size/ Größe/Dimension (mm)	Trazione/Traction/Zugversuch/Traction				Temp °C	Rp 0,2 N/mm2	Rm N/mm2	A 2" %	HB	Z%	Resilienze/Impact test/Kerbschlagzähigkeit/Resilience		Media Average Mittelwerte Moyenne					
				(2)	(4)	(5)	(6)							Temp °C	Temp °C		Plega Type Form	Resilienze KV			
1TE282/10/05A	224334	JH259-2009	029x3000x10000	2	P	CC	+20	378,16	522,24	35,31				KV	T	-18	P	112	115	104	110,333
7SE803/07/04A	224360	JH262-2009	029x2000x11000	2	P	CC	+20	375,34	520,51	32,45				KV	T	-18	P	102	109	116	109,000
7SE803/07/03A	224359	JH261-2009	029x2000x11000	2	P	CC	+20	388,36	524,17	31,13				KV	T	-18	P	111	108	115	111,333
4SB540/04/02A	224595	JH260-2009	029x3000x11000	2	P	CC	+20	382,14	512,13	34,27				KV	T	-18	P	102	108	95	101,667

**Analisi Chimica di Prodotto / Product Analysis / Stuckanalyse / Analyse sur produit**

<b>Firma / signature / unterschrift</b> METINVEST TRAMETAL S.p.a. M. Carrara CQ Resp. is	<b>MATERIAL IN ACC. TO DIR 97/23 PED.</b>  Verified to ASME II Part. A ed. 2002 + add. 2003b C.I. TRAMETAL S.p.A. C.Q. MGR. P. MEMO & found conforming.
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**PRODUCED FROM CONTINUOUS CAST SLAB AND HAVE A MINIMUM REDUCTION RATIO OF 3 TO 1.**

**TEST SAMPLE IN ACCORDING TO ASME SA-370 FIG. 4 AND FIG. 10**

**ACCORDING TO ASME II PART A ED. 2007 + ADD. 2008. FULLY KILLED, FINE GRAIN STEEL. PLATES AND TEST SAMPLES NORMALIZED AT 910°C, 1,5 MIN/MM. COOLING IN STILL-AIR.**

SN 4320 Pos. 306

**OFFICINE SANTAFEDE srl**

CAP. SOC. € 156.000 INT. VERS.  
**FLANGE E ARTICOLI FORGIATI IN GENERE**  
 23819 CORTABBO DI PRIMALUNA (LC)  
 VIA FREGERA, 1 - FAX 0341.979.919  
 TEL. 0341.979.980 (3 linee r.a.)  
 http://www.officinesantafede.com  
 E-mail: info@officinesantafede.com

**CERTIFICATO DI COLLAUDO / TEST CERT. EN 10204/3.1**

N.	DATA/DATE	PAG.
500916	03-11-2008	1
D.D.T. / DELIVERY NOTE		
N.	DATA/DATE	
916	03-11-2008	

Cliente/Customer  
 MEMIT Forniture Industriali SRL

Via Risorgimento, 16  
 20030 SENAGO MI

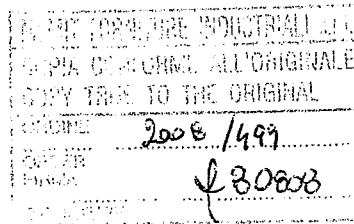
**Note**

**DESCRIZIONE/DESCRIPTION**

DIM. ACCORDING TO ASME B16.5 ED. 2003 MATERIAL CONFORMING TO ASME SECTION II PART A EDITION 2007 AND TO NACE MR 01-75/03 - ISO 15156

COLATA/HEAT	MATERIALE/MATERIAL	ACCIAIERIA/STEEL PLANT	QUANTITA'	DESCRIZIONE/DESCRIPTION	ORDINE/ORDER	TTR/RT											
628737	A/SA 105N	NTMK	9	FL. B16 A105 150BLRF 24" GREZZA	ORD. 80523	1											
<b>Analisi Chimiche / Chemical Analysis</b>																	
C	Mn	Si	P	S	Cr	Ni	Mo	Ti	V	Cu	Al	Sn	Nb	N	Ca	B	C.Eq.
0,164	1,180	0,244	0,005	0,001	0,080	0,120	0,040	0,001	0,001	0,160	0,025	0,015	0,000	0,003		0,0002	0,40
<b>Prove meccaniche / Mechanical tests</b>																	
SNERVAMENTO Rp 0,2% (Mpa)	ROTTURA Rm (Mpa)	ALLUNGAMENTO A%-ELONG	CONTRAZIONE Z%-REDUCT	TIPO TYPE	TEMP. C°	TEST 1	TEST 2	TEST 3	MEDIA AVERAGE	DUREZZA HARDNESS HB							
369,0	540,0	32,0	59,0							167 169							

COLATA/HEAT	MATERIALE/MATERIAL	ACCIAIERIA/STEEL PLANT	QUANTITA'	DESCRIZIONE/DESCRIPTION	ORDINE/ORDER	TTR/RT											
623738	A/SA 105N	NTMK	9	FL. B16 A105 150WNR 24" SCH. 80 GREZZA	ORD. 80532	1											
<b>Analisi Chimiche / Chemical Analysis</b>																	
C	Mn	Si	P	S	Cr	Ni	Mo	Ti	V	Cu	Al	Sn	Nb	N	Ca	B	C.Eq.
0,188	1,180	0,270	0,008	0,006	0,011	0,052	0,000	0,000	0,002	0,090	0,034	0,000	0,005		0,000		0,39
<b>Prove meccaniche / Mechanical tests</b>																	
SNERVAMENTO Rp 0,2% (Mpa)	ROTTURA Rm (Mpa)	ALLUNGAMENTO A%-ELONG	CONTRAZIONE Z%-REDUCT	TIPO TYPE	TEMP. C°	TEST 1	TEST 2	TEST 3	MEDIA AVERAGE	DUREZZA HARDNESS HB							
344,5	542,3	31,4	67,4							165 167							



Verified to ASME II<sup>o</sup> Part. A  
 ed. 2007 + add. 2009b  
 & found conforming.

C.I. [Signature] S.p.A.  
 Q.C. MEMIT

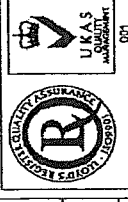
- a) **Trattamento termico / Heat treatment**
- 1) Normalizzato a 920°C e raffreddato in aria calma  
*Normalized at 920°C and cooled in still air*
- 2) Solubilizzato / Solution treated and quenched
- 3) Bonificato / Quenched and tempered
- 4) Normalizzato e rinvenuto / Normalized and tempered
- 5) .....
- b) I valori delle analisi chimiche sono ricavati dal certificato di Acciaieria  
*Chemical analysis values are taken from base certificate*
- c) C. E. = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15
- d) Prove secondo ASTM A 370 / Test conforming to ASTM A 370
- e) Diametro provino 12,5 mm / Specimen diameter 12,5 mm.
- f) Dimensioni del provino 10x10x55 mm  
*Specimen dimensions 10x10x55 mm*



Controllo visivo e dimensionale soddisfacente / Satisfactory visual and dimensional check  
 Acciaio elaborato al forno elettrico e calmato / Killed steel made by electric furnace

TRADE MARK 	REDATTO DA / PRINTED BY <b>OFF. SANTAFEDE s.r.l.</b> CORTABBO DI PRIMALUNA (LC)	APPROVATO DA / APPROVED BY  RESP. S.Q.	ENTE COLLAUDATORE / INSPECTING AGENCY
----------------	---	--	---------------------------------------





**EMIS SRL**  
**VIA PONTEVECCHIO, 36**  
**16042 CARASCO GE**  
**TEL. 0185/38.00.63-38.49.62**

**CLIENTE C.I. CIVIDAC SPA**  
 Customer

**ORDINE N. 2010/177-29.03.10**  
 Order

**NS. CONF. N. 253-30.03.10**  
 our job

**CERTIFICATO DI COLLAUDO N. 4179**  
 Test certificate EN 10204 3.1 Directive  
 97/23/CE PED (ANNEX 1)

**DATA 06.05.10**  
 Date

**DATI CONFORMI AI CERTIFICATI DI ORIGINE SOTTOSPECIFICATI**  
 In conformity to the original below mentioned

N.	PROV test	DESCRIZIONE - description	PROVE MECCANICHE - mechanical test								RESILIENZA	
			PROV Test N.	R. u.t.s.	Rs y.p.	Rp 0.2 p.i.	A % elong.	Z % reduc.	DUREZZA hardness	impact test	KV 20°C	
100 200	1 2	STUD BOLTS ASTM A 193M B7 -07 GALV. M 33X190 UNI 6610 M 24X215 UNI 6610	912			792	19.4	60.2	HB=274	88	84	90
20 40	3 4	STUD BOLTS ASME SA 193 B7 sec.II part.A ed.2007 ad.2009 B GALV. 1.1/4"8UNX190 ← P.308 7/8"UNCX215 ← P.504	932			818	20.4	59.4	HB=288	78	86	89
200 400	5 6	HEX. NUTS ASTM A 194M 2H -07 GALV. M 33 UNI 5587 M 24 UNI 5587	911			831	21.8	61.4	HB=280			
40 80	7 8	HEX. NUTS ASME SA 194 2H sec.II part.A ed.2007 ad.2009 B GALV. 1.1/4"8UN ← P.308 7/8"UNC ← P.505	916			812	20.8	60.8	HB=282			
1-4 TEMPERING AT 615°C MIN. 5-8 TEMPERING AT 560°C MIN. 5-8 AFTER T.T. AT 540°C X 24h HB>179			1-8 VISUAL AND DIMENSIONAL TEST SATISFACTORY 1-8 STEEL MAKING PROCESS ELECTRIC FURNACE 5-8 PROOF LOAD TEST SATISFACTORY									
ANALISI CHIMICHE - chemical analysis %												
PROV. test	C	Mn	Si	Cr	Ni	Mo	N	P	S	COLATA heat	FORNIT. supplier	
1	.425	.85	.24	.93		.23		.011	.002	AB2091	MOL.	
2	.405	.83	.23	.94		.22		.009	.006	AB4747	MOL.	
3	.40	.80	.22	1.01		.17		.007	.026	AC5300	MOL.	
4	.42	.79	.25	1.03		.19		.010	.025	AD0462	MOL.	
5	.44	.75	.18					.007	.024	42029	MOL.	
6	.44	.76	.24					.024	.023	33246	MOL.	
7	.44	.70	.25					.018	.026	10364	MOL.	
8	.44	.78	.26					.013	.025	75583	MOL.	

**C.I. CIVIDAC S.p.A.**  
 C.C. MEMO

NOTE - notes:  
 REF. OUR DDT N°451-06.05.10

EMI  
**QA MANAGER**  
 Tullio M. De Grego

ISPETTORE - inspector

SN4320  
 P. 308-309  
 504-505





SN4320 Pos. 324

<b>CTA</b>	F.P.S. SERVICE SPA Via Baccanello 35 Terno d'Isola	Mt 42	Kg 42	Pz No.: 42
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 11814	Fps's job: OC0000555	Date: 29/03/2010
	Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PO: AG00287	Item: (8)	

	OFFICINE MECCANICHE RIGHI <b>MIR</b> S.p.A. 20111 Bergamo T. Fiume (PC) ITALY - Zone A. Sgarbi Tel. (0522) 817111 c.a. - Fax (0522) 817124		COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV = ISO 9001/2000 =	THE QUALITY MANAGEMENT SYSTEM SUPPORTS THE REQUIREMENT OF ANNEX I, SECT. 4.3 OF PED 97/23/EC
	CERTIFICATO DI COLLAUDO INSPECTION CERTIFICATE (EN 10204 3.1 M - 3.2 D) CERTIFICAT DE CONTROLE		Norme di collaudo - Test specification - Specification des essais	
32959/1		32198		ASTM A420R.05-ASME B16.9/03-SHLS
Commissa - MR order - Commande		Ordine del cliente - Customer's order - Commande du client		Cliente - Customer - Client
05 083-06		FITTINGS & PIPES STAINLESS SERVICE SPA		

ANALISI CHIMICA DI COLATA - LEADLE ANALYSIS - ANALYSE CHIMIQUE SUR COULÉE

Posizione Item Poste	Prova Test Essai	Colata - Heat - Coulée	C %	Mn %	Si %	P %	S %	Hf %	Cr %	Mo %	Cu %	V %	Ti %	Nb %	C.E.
052	10839	11814	0,150	0,620	0,230	0,010	0,009	0,100	0,020	0,020	0,190	0,001		0,001	0,280

CARATTERISTICHE MECCANICHE - MECHANICAL PROPERTIES - CARACTERISTIQUES MECANQUES

Posizione Item Poste	Prova Test Essai	Descrizione e Dimensione del Raccordi Description and Dimension of Fittings Description et Dimension des Raccords	Quantità Quantity Quantité	Sieramento Yield Point Limite Elasticità		Rottura Tensile Strength Limite Rottura		Allungamento Elongation Allongement		Diametro Dia
				Richiesto Required N/mm²	Ottenuto Result N/mm²	Richiesto Required N/mm²	Ottenuto Result N/mm²	Richiesto Required %	Ottenuto Result %	
052	10839	TEE 1/2"	100		366		532		37,4	2"

Posizione Item Poste	Prova Test Essai	Durezza su prodotto Hardness on Product Dureté sur Produit			Resistenza - Impact test - Resilienz - LONG				
		Tipo Type	Richiesto Required	Ottenuto Result	Dimensioni Dimensions	Temp. °C	Ottenuto - Result Joules	Ottenuto - Result Joules	
052	10839	HB		164	10x2,5	-50	34	40	32

CTA  
 CUSTOMER'S PROJECT  
 P.O. NO.: 052  
 PIPES NO.: 11814  
 DATE: 29/03/2010  
 THIS CERTIFICATE IS VALID FOR OCCASIONAL USE ONLY.  
 C.C.S. - INVALLO COLLAUDO  
 ITEM NO.: 08

FITTINGS HEAT TREATED IN BATCH TYPE FURNACE CONTROLLED WITHIN A RANGE OF 28°C. AND EQUIPPED WITH RECORDING PYROMETER.  
VISUAL & DIMENSIONAL CONTROL OF FITTINGS SATISFACTORY RESULTS.

10% OF THE FITTINGS WERE EXAMINED ACCORDING TO ASTM E709 WITH SATISFACTORY RESULT.  
WE CERTIFY THAT THE DELIVERED PRODUCTS COMPLY WITH THE ORDER SPECIFICATION.

METHOD OF FABRICATION: COLD FORMING.  
HEAT TREATMENT: NORMALIZING AT 920°C WITH COOLING IN STILL AIR. PERMANENCE 1 HR./1" WTH. (30' MIN. MINIMUM):

$$Cq = C + (Mn)/6 + (Cr+Mo+V)/5 + (Ni+Cu)/15$$

<< THIS MATERIAL MEETS THE WACK SPECIFICATION HR-01-75 Ed. 2003 WHEN USED UNDER THE SPECIFIC CONDITIONS DETAILED IN THE STANDARD. >> HRC < 22 .

Note - Remarks - Notes	Date - Date	Controlled Quantity - Q. C. Manager	Inspector - Inspector - Inspecteur
C.I. CNIDAC S.p.A. Q.C. MGR. P. MEMO	24/09/07	G. FURIA	

Verified to ASME II<sup>e</sup> Part A  
ed. 2007 + add. 2009b  
& found conforming.





COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 48	Mt 19,45	Pz No.: 3
This document is reproduced by a computerized system and is conform to the original	Heat No.: 771412	Cla's job: VC0000638	Date: 30/03/2010
Customer: COSTRUZIONI INDUSTRIALI CIVDAC SPA	P.O. No.: PO: NR 2010/164 DEL 24.3.2010	Item: 01	

SILCOTUB S.p.A.  
VIALE LIDICE 40  
10095 GRUGLIASCO (TO)

**INSECTION CERTIFICATE**  
**CERTIFICAT DE INSPECTIE**  
**(UNI EN 10204 3.1 / ISO 10474 3.1.B)**



Customer/Client: **COMMERCIALE TUBI ACCIAIO SPA**  
 Address/Adresa: **VIALE LIDICE, 40**  
 Town/City: **10095 GRUGLIASCO TO**  
 Country/Pais: **ITALIA**

Customer's order/Comanda client: **PO VD70316260122**  
 Job Number/Nr. Comanda lin: **EX/105724/3**  
 Date/Zila: **12/11/2007**

Material's certificate/Comanda client: **2240558/003**  
 Shipping Note/Nota de expeditie: **00010451 - 12/11/2007**

Product/Produs: **SEAMLESS HOT FINISHED PIPES FOR LOW TEMPERATURE SERVICES (WITH SUPPLEMENTARY REQUIREMENTS) ACCORDING TO ASTM A 333 ASME SA 333, SPEC. PAC-02-S4133 GS REV.3 AND TO 4847 STEEL GR 8 ASTM A 333 AND ASTM SA 333 (GROUP C-1)**  
**TEVIT. TEMPERATURII JOASE LAMINATE LA CALD (CU CERCI SI SUPPLEMENTARE) CONFORME CU 1. SPEC. PAC-02-S4133 GS REV.3 AND TO 4847 CTEL GR 8 ASTM A 333 AND ASME SA 333 (GRUPA C-1)**  
**ROZVALNICE INTERIORA NEPROTEKATE, EXTENZIJA LAGUJITE CATEVE NEVSE**

Dimensions/Dimensiuni: **Lg. 7000**  
 O.D. TolUpans: **33,400**  
 Wt. min/G: mm: **3,380**

**CHEMICAL COMPOSITION/COMPOZITIE CHIMICA**

Heat	Si	Mn	P	S	Mo	Cu	Ni	Cr	Fe				C	Al	Ti	Nb	V	B	Co	F	
									10000	1000	100	10									
771412	0.015	0.010	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
A1640	0.015	0.010	0.002	0.001	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005

**LEAK TEST/PROBA DE ETANSEITATE**  
 Type/Tip: **HYDRAULIC/PROBA HIDROSTATICA**  
 U.M.: **MPa**  
 Sec.: **5**  
 Volumes/Volum: **17,0**

**REMARKS/NOTA**  
 MATERIAL ACC. TO ASTM/ASME II PART.D TAB Y1/RACE NR 01-754FED97/23/7C  
 NONDESTRUCTIVE TEST-EDDY CURRENT ACC. TO ASME E309: WITHOUT OBJECTIONS  
 NONDESTRUCTIVE TEST - EMI ACC. TO ASTM E 570: WITHOUT OBJECTIONS  
 HARDNESS HRC 22 MAX., ACCORDING TO RACE NR - 01 - 75  
 HEAT TREATMENT: NORMALIZED

**STANDARD EDITION/NORMA EDITIA**

Standard/Norma	Year/An	Revision/Revizie	Year/An
ASTM A 333	2005		
ASME SA 333	2007		
RACE MR0175/ISO 15156	2003		
RACE MR0103	2005		

This certificate is issued by a computerized system and is valid without signature. On the original certificate the signature of the responsible person is required. The original certificate is valid only if it is signed by the responsible person. The original certificate is valid only if it is signed by the responsible person. The original certificate is valid only if it is signed by the responsible person.

**CIVDAC S.p.A.** Verified to ASME II Part. A  
 ed. 2007 + add. 2003b  
 & found conforming.



COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 48	Mt 19,45	Pz No.: 3
This document is reproduced by a computerized system and is conform to the original	Heat No.: 771412	Cta's job: VC0000638	Date: 30/03/2010
Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: PO: NR 2010/164 DEL 24.3.2010	Item: 01	

SILCOTUB S.A.  
 51, MIHAI VITEAZU BLD  
 750059 ZALAU, SA, AJ  
 ROMANIA  
 Tel: 3363 208 020796  
 Fax: 0040 36 286 081589

**INSPECTION CERTIFICATE**  
**CERTIFICAT DE INSPECTIE**  
 (UNI EN 10204 3.1 / ISO 10474 3.1.B)

Customer's order/Comanda nr  
 : PO VD70316L80122

Customer's order/Comanda nr  
 : 003/003

Customer's order/Comanda nr  
 : 12/11/2007

Customer's order/Comanda nr  
 : EX/105724/3

Customer's order/Comanda nr  
 : 2240558/003

Customer's order/Comanda nr  
 : 00010451 - 12/11/2007

Customer/Client  
 : COMMERCIALE TUBI ACCIAIO SPA

Address/Adresa  
 : VIALE LIDICE, 40

City/Localitate  
 : 10095 GRUGLIASCO TO

Country/Pais  
 : ITALIA

Product/Produs  
 : SEAMLESS HOT FINISHED PIPES FOR LOW TEMPERATURE SERVICES (WITH SUPPLEMENTARY REQUIREMENTS) ACCORDING TO ASTM A 333 ASME SA 333, SPEC RAQ-92 SA333 OR REV.1 AND TO 4047 STEEL OR 6 ASTM A 333 AND ASME SA 333

Normalizing/Normalizare  
 : TEM PT, TEMPERATURII JOARE LAMINATE LA CALD (CU CERINTE SUPPLEMENTARE FATA DE NORMA) NORMA ASTM A 333 ASME SA 333, SPEC-RAQ-92 SA333 OR REV.1 AND TO 4047 OTEL OR 6 ASTM A 333 AND ASME SA 333

Dimensions/Dimensiuni  
 Lp, Front/Lun, de la 5000 0.0 mm/DE rfm 33,400

Wt, mm/G rfm 3,380

Quantities/Comenzii  
 Pieces/Buc 229

Weight/Kg/Kg 1482,50 3708

Length/Metric 4863,10" 8174,7

Visual and Dimensional Control has been carried out with satisfactory result  
 Controlul vizual dimensional s-a realizat cu rezultate satisfactoare

Steel is fully killed and produced by electric furnace to a fine grain practice  
 Otelul este produs in cuptor electric complet calmat conform unei practici de obtinere a unui graunite fin

The product supplied is in compliance with the requirements of the order.  
 Produsul livrat este in conformitate cu cerintele comenzii

**SIGNATURE/SIGNATURA**

Quality System Certified  
 n° 1-0658002

CHIEF OF QUALITY CERTIFICATION DT  
 MANAGER CERTIFICAREA CALITATE

Daniela RUSCAs

QUALITY REGIONAL MANAGER  
 MANAGER REGIONAL DE CALITATE

Lazaro MORENT

Verified to ASME II\* Part. A  
 ed. 2007... + add. 2007b  
 & found conforming.

*[Signature]*  
 C.I. CIVIDAC S.p.A.  
 C.C. VIA LIDICE

This document is issued by a computerized system and is valid only if signed by the responsible person. On the request certificate the responsible person must be indicated. In case of signature on the certificate the responsible person must be indicated. In case of signature on the certificate the responsible person must be indicated. In case of signature on the certificate the responsible person must be indicated.

	F.P.S. SERVICE.SPA Via Baccanello 35 Terno d'Isola	Mt 36	Kg 36	Pz No.: 36
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 387074	Fps's Job: OC0000555	Date: 29/03/2010
	Customer: COMMERCIALE TUBI ACCIAIO SPA	P.O. No.: PD: AG00267		Item: 01

		<b>Abnahmeprüfzeugnis</b> <b>Inspection Certificate</b> <b>EN 10204 - 3.1</b>		<b>Zeugnisnummer [certificate no.]</b> 044500/09-HG		<b>Rev.</b>		<b>Datum [date]</b> 11/12/2008	
erme fittings gmbh A-8324 Schönlis Hauptstrasse 4b Austria/Europa Telefon +43/5524 501-0 Telefax +43/5524 501-930 Reg. No. 13 100 304		Ihre Bestellnummer [your order no.] CS 90105		Unsere Auftrags.Nr. [our order no.] 115940GJ-0030		Ident Nr. [ident no.] 10D		Datum [date]	
Ihre Artikelnummer [your item no.] Menge Artikelbezeichnung [designation] 273 elbows LR-90-S-WPL6-1"-STD		Ihre Artikelnummer [your item no.] 387074		Schmelze Nr [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Hersteller [manufacturer] Y&M		Hersteller [manufacturer] Y&M		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Formmaterial [tube work's cert.no.] 508172h07		Formmaterial [tube work's cert.no.] 508172h07		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Analyse [analysis] Y C Si Mn P S Cr Mo Ni Cu V Nb Ti N Caq CEQ J-Factor C + (Mn / 8) + (Cr + Mo + V) / 5 + (Cu + Ni) / 15		Analyse [analysis] Y C Si Mn P S Cr Mo Ni Cu V Nb Ti N Caq CEQ J-Factor C + (Mn / 8) + (Cr + Mo + V) / 5 + (Cu + Ni) / 15		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Index 1 2		Index 1 2		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Proben [test no.] 184208		Proben [test no.] 184208		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Zugversuch [tensile test] Temp. +20 °C Dm. Ø 2 Dm. Ø 2 Zugfestigkeit [tensile strength] Rm (MPa) 472 Dehnung [elongation] Z (%) 45.8 PR-Lage [pos. of sample] 27-28-28		Zugversuch [tensile test] Temp. +20 °C Dm. Ø 2 Dm. Ø 2 Zugfestigkeit [tensile strength] Rm (MPa) 472 Dehnung [elongation] Z (%) 45.8 PR-Lage [pos. of sample] 27-28-28		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Härteprüfung [hardness test] 131-137 HB Wärmebehandlung [heat treatment] Normalized Temperature 820 °C Holding Time 30 min. Cooling in still air		Härteprüfung [hardness test] 131-137 HB Wärmebehandlung [heat treatment] Normalized Temperature 820 °C Holding Time 30 min. Cooling in still air		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Kerbschlagversuch [notched bar impact test] Form: ISO-V Kerbschlagarbeit [impact value] (J) 27-28-28		Kerbschlagversuch [notched bar impact test] Form: ISO-V Kerbschlagarbeit [impact value] (J) 27-28-28		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Mech.-technologische Prüfung [mech. technological test] Verifiziert nach ASME II <sup>e</sup> Part. A ed. 2002 + add. 2002b & found conforming.		Mech.-technologische Prüfung [mech. technological test] Verifiziert nach ASME II <sup>e</sup> Part. A ed. 2002 + add. 2002b & found conforming.		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Kennzeichnung [marking] LOGO:		Kennzeichnung [marking] LOGO:		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Besichtigung und Ausmessung [visual inspection and dimensional check] 100% (E) or (G)		Besichtigung und Ausmessung [visual inspection and dimensional check] 100% (E) or (G)		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	
Bemerkungen [remarks] hot formed over mandrel		Bemerkungen [remarks] hot formed over mandrel		Schmelze Nr. [heat no.] 387074		Ident Nr. [ident no.] 10D		Datum [date]	

Zusatzmarkierung [add. mark.]  
 Die gelieferten Produkte entsprechen den Anforderungen der Bestellung (einschließlich Herstellung, Probennahme, Testen und Prüfen). (The supplied products comply with the requirements of the order (including manufacturing, sampling, testing and inspections).)  
 Der Werkseinschreibungsbeauftragte für die Werke Inspektion  
 11/12/08  
 Grabherr Harald  
 -321  
 Dieses Dokument wurde elektronisch erstellt und ist ohne Unterschrift gültig. (The certificate is issued by the computerized system and is valid without signature.)  
 Zertifiziert nach DGRL 97/23/EG Anhang I - Absatz 4.3 durch TÜV SÜD Industrie Service, Bernarnta Stele 0036, Zertifikat Nr. 129/2002MUC (Certificate: 129/2002MUC)  
 Nachr./Body code, Certificate No. 129/2002MUC  
 La société Erme Fittings GmbH garantit que les produits, objet du présent certificat, respectent en leur totalité les spécifications suivantes:  
 C.S. 0.25 % S et P ≤ 0.05 %, R<sub>m</sub> ≤ 700 N/mm<sup>2</sup>, R<sub>eH</sub> (A-2) ≥ 10500, A% (L = 5.65 √S) ≥ 1.6 %

CTA	THIS CERTIFICATE IS VALID FOR	ACS
CUSTOMER:	BSI INALU CIVDAG	
P.O. no.:	20010614	ITEM no.:
PROJECT:	OSATA 387074	
PIPES no.:	36	kg.:
DATE		



**CERTIFICADO DE INSPECCION / INSPECTION CERTIFICATE**  
**CERTIFICADO DE INSPECCION S/EN 10204-3.1**  
**INSPECTION CERTIFICATE EN 10204-3.1**

**CLIENTE / Customer**  
 SOCIETA ITALIANA ACCIAI TUBI S.P.A.  
 VIA DEI CAVALLARI, 37  
 15077 - PREDOSA (ALESSANDRIA)  
 ITALIA

**CLIENTE / Customer**  
 PO 1.156

**FECHA / Date** 2007-06-02  
**PEDIDO CLIENTE / Customer's order** A07 ARCELOR

**ORDEN SUMINISTRO /** 305929  
**Work order** A02

**N. CERTIFICADO /** 88468-02  
**N. Certificate** A03

**SOCIEDAD INSPECTORA /** ARCELOR  
**Classification Society** A06

**La chapas amparadas por este certificado**  
**comply with the specification**  
**especificación y de la orden de suministro** C70

**We certify hereby that the plates mentioned in this certificate comply with the specification and order requirements** 201

**N. DE CHAPA (PLATE N.) / MARCA FABRICANTE (TRADEMARK)** ENS  
**LTV** MT  
**N. COLADA (HEAT N.)**  
**CALIDAD (QUALITY GRADE) /**

**ESPECIFICACION / Specification**  
 SA516-GRADE 70 JP 355 NH  
 ASME II-2004 JEN 10028-3:03

**SA516-GRADE 485 JP 355 NH**  
**ASME II-2004 JEN 10028-3:03**

**COMPOSICION QUIMICA (Chemical composition)**

NO. MUESTRA	DIMENSIONES (Dimensions)	PESO (Weight)	N. PIEZAS (Number of pieces)	COLADA (Heat)	NUMERO DE LA MUESTRA (Sample no.)	COMPOSICION QUIMICA (Chemical composition)											T. Grano (Grain size) C80								
						C	Mn	Si	S	P	AI	N	CU	NI	CR	MO		NB	V	TI	C85	C86	C87	C88	C89
A10	ESPESOR ANCHO LARGO (Thickness) (Width) (Length)	B12	B08	B07	C00	C71	C72	C73	C74	C75	C76	C77	C78	C79	C80	C81	C82	C83	C84	C85	C86	C87	C88	C89	SU03
D01	10,00 2000 12000	7836	4	700612		0,16	1,15	0,245	0,04	0,14	0,039	0,065	0,180	0,332	0,023	0,002	0,015	0,025	0,002	0,016	0,001	0,40	0,20	0,04	
D17	60,00 2500 8000	9420	1	777161		0,16	1,13	0,241	0,01	0,12	0,025	0,030	0,207	0,347	0,025	0,002	0,013	0,016	0,001	0,016	0,001	0,40	0,23	0,03	

**TOTAL :** 16956 5

**SU03 : NB+V+TI**  
**SU07 : CU+CR+MO**  
**CQ01 : C+Mn+Si+CR+MO+V+5+Ni+Cu/15**  
**FULLY KILLED STEEL**

**Per la Sociedad Inspectora (for the classification society)**  
 Per la Sociedad Inspectora (for the classification society)

**Par (For)**  
 Jefe de Calidad Placas  
 Plant Products Quality Manager  
 Upstream Asturias  
 Francisco Suarez-Valdés  
 Tlf: +34985187778  
 Fax: +34985187518

**C.I. SUIVIC S.p.A.**  
**C.I. SUIVIC S.p.A.**  
**OC: MEMO**  
 Verified to ASME II Part. A  
 ad. 2007 + add. 2003B  
 & found conforming.

**Copias conformes al original**

**ARCELOR**  
 España

**Z02-203**







COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 108	Mt 12	Pipes No.: 2
This document is reproduced by a computerized system and is conform to the original	Heat No.: 13269	Cta's job: VC0000171	Date: 12/02/2007
Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: NR 2007/067 DEL 29/01/2007	Item: 07	

<b>PIETRA</b> IN LIGUIDAZIONE SOCIETÀ PER AZIONI 25125 Brescia - Via Orzinuovi, 2 telef.: 030 3540545 - fax 030 3540204 Internet: www.pietra-spa.com- e-mail: info@pietra-spa.com	<b>CERTIFICATO DI COLLAUDO</b> Inspection certificate - Abnahmeprüfzeugnis - Certificat de Réception EN 10204 3.1	Nr 20302 Pag. 2
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ANALISI CHIMICA DI COLATA % - Heat chemical analysis %  
 C 0,14 Mn 0,68 Si 0,20 P 0,014 S 0,009 Cr 0,03 Mo 0,01  
 Ni 0,05 Cu 0,14 Sn 0,008 V 000 Al 0,025  
 Ceq 0,27 CERTIFICATO DI COLATA- Heat certificate

COLATA-Heat 13270  
 77,4 50,8 351 525 34,2 79 37 35 36  
 SCHIACCIAMENTO CON ESITO POSITIVO Flattening test with positive result

QUANTITA-Quantity N.TUBI 35 METRI 210,00 PESO KG 1.840  
 ANALISI CHIMICA DI COLATA % - Heat chemical analysis %  
 C 0,14 Mn 0,65 Si 0,21 P 0,024 S 0,010 Cr 0,02 Mo 0,02  
 Ni 0,08 Cu 0,14 Sn 0,008 V 000 Al 0,023  
 Ceq 0,27 CERTIFICATO DI COLATA- Heat certificate

PROVA IDRAULICA ALLA PRESSIONE DI - Hydraulic test pressure 3000 psi 207 bar  
 ORIENTI INDOTTE Eddy current acc.to: ASTM A 106  
 ISPEZIONE E CONTROLLO DIMENSIONALE: POSITIVO  
 Results of inspection and dimensional control: positive  
 CERTIFICHIAMO CHE LA FORNITURA E' CONFORME AGLI ACCORDI DELL'ORDINE  
 We hereby certify that material complies with the terms of the order  
 I TUBI HANNO SUBITO UN TRATTAMENTO COMPLETO DI DEMAGNETIZZAZIONE  
 The tubes have been subjected to a complete demagnetization treatment  
 ACCIAIO PRODOTTO AL FORNO ELETTRICO COMPLETAMENTE CALMATO  
 Steel made by electric furnace, fully killed  
 CERTIFICATO ENTE COMPETENTE : IT-0035 IGQ 9105  
 Competent Body registration number:  
 DATA DI CONVALIDA - Issued on : 24.06.2004  
 DATA DI SCADENZA - Valid Until : 30.06.2007

C.I. CIVIDAC S.p.A.  
 C.C. MEMO

Verified to ASME II<sup>o</sup> Part. A  
 ed. 2007 + add. 2009b  
 & found conforming.

DATA  
 22.02.06

PIETRA S.p.A.

RESPONSABILE COLLAUDO  
 QUALITY INSPECTION MANAGER

P. Sabotti

Questo certificato è emesso da un sistema computerizzato ed è valido senza firma. Il certificato originale riporta il marchio "Pietra" di colore blu.  
 Nel caso in cui il destinatario ne ritenga copia, deve attestarne a suo nome la conformità, assumendosi ogni responsabilità per usi illeciti o non consentiti  
 dalla Pietra Spa. Alterazioni e/o falsificazioni saranno perseguite a termini di legge.

This certificate is issued by computerized system and it is valid without signature. Many trade marks "Pietra" are printed in blue on the original certificate.  
 In case the consignee of the original certificate issues a copy of it, he must certify by his name the conformity to the original one. He takes upon himself the  
 responsibility for any illegal or not allowed use. All alterations and/or falsifications will be prosecuted.



PIETRA S.p.A. - TEL. 030 3540545









**Ronconi SpA**  
Via Lambro, 9 - 20090 OPERA (MI)

CERTIFICATO PROVE MATERIALI  
Mod. MDCQ01 B5  
Test Certificate-Abnahmeprüfzeugnis  
**EN 10204 3.1**

REPARTO  
COLLAUDO CQ  
Inspezione Dept. -  
Abnahmeabteilung

Num. Cert **7406**  
Data 22/03/2010  
Date - Datum

Foglio 1/1  
Sheet - Blatt

Cliente **COSTRUZIONI INDUSTRIALI CIVIDAC SPA**

Customer - Kunde

Ordine num. 2010/039

Order - Bestellung

Descrizione **TUBI SS TRAFILATI A FREDDO**

Description - Beschreibung

Norma e Acciaio **ASME SA210 Gr.A1**

Norm and Steel Grade - Norm und Stahl

Pezzi 186+202+186

Quantity - Anzahl

Data 28/01/2010

Date - Datum

Ns. Commessa 30 11 12 100/1

Our order - Unsere Bestellung

Trattamento termico **Normalized**

Heat treatment - Wärmebehandlung

In accordo a **ASME II PART.A ED.2007+ADD.2009**

Acc.to - Gemäss

Data 04/02/2010

Date - Datum

Dimensioni **15,88 x 2,11MW x 8955/9220/9538 mm**

Sizes - Abmessungen

Valori richiesti Requirements Anforderungen	Rs		Rm		A <sub>2</sub>	A <sub>p5</sub>	HRB				min
	min	max	min	max	min	min	min	max	min	med	
255	415				22			79			
Provino Specimen Probestab	Snervamento Yield point Streckgrenze	Rottura Tensile strenght Zugfestigkeit	Allungamento Elongation Bruchdehnung	Durezza Hardness Haerte	Resilienza Notch impact Kerbschlagarbeit	Prova a caldo Hot test Waermeprüfung					
N	Sez mm <sup>2</sup>	Lo mm	Risultati ottenuti (Results - Ergebnisse)								
			N/mm <sup>2</sup>	N/mm <sup>2</sup>	%	%	J	J	N/mm <sup>2</sup>		
1	97	50	313	441	46		73				
2	97	50	311	444	46		73				
3	Prova di Schiacciamento eseguita con esito positivo - Flattening test satisfactory - Aufweitversuch zufriedenstellend durchgeführt										OK
4	Prova di Allargamento eseguita con esito positivo - Flaring test satisfactory - Ringfaltversuch zufriedenstellend durchgeführt										OK
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											

Si certifica che è stato eseguito con esito positivo il:

We here by certify that we successfully run:

Wir garantieren, dass folgenden Prüfungen zufriedenstellend durchgeführt wurden:

- Controllo (100%) Eddy current secondo norma **ASME SA450 24.8.2.1**  
Eddy current test (100%) acc.to - Wirbelstromprüfung (100%) gemäss
- Controllo (100%) Ultrasuoni secondo norma  
Ultrasonic test (100%) acc.to - Ultraschallprüfung (100%) gemäss
- Controllo PMI (100%)  
PMI test (100%) - PMI (100%)

Il controllo visivo e dimensionale dei tubi è stato eseguito con esito positivo

The visual and dimensional test has been performed with satisfactory result - Die visuellen und dimensional Kontrollen wurden mit zufriedenstellenden Ergebnissen durchgeführt

Analisi chimica

Chemical analysis - Chemische Analyse

Acciaio calmato ed elaborato al forno elettrico, degasato

Steel elaborated in electric furnace, fully killed and degassed - Beruhigter Elektro entgast Stahl

Colata N. Heat No - Schmelz Nr	C %	Si %	Mn %	P %	S %	Cr %	Mo %	Ni %	Cu %	V %	Nb %	Al %	N %	Sn %	Ti %	As %	Sb %
192727	0,14	0,20	0,83	0,012	0,005												

Marcatura (Marking - Markierung) **RONCONI/ITALY/SA210/GR.A1/CD/192727/15,88X2,11**

Note Notes - Anmerkungen

Il Capo reparto

Chief of Dept. - Abteilungschef  
CND II Lev. ET-UT Cert. n. FG1746

Ente collaudatore

Inspected by - Abnahmebeamter

**RONCONI SpA**  
CONTROLLO QUALITÀ  
QUALITY CONTROL

**C.I. CIVIDAC S.p.A.**  
Q.C. MEMO

Certificato in accordo alla PED 97/23/EC APPENDICE 1 Par.4.3 e AD 2000-Merkblatt W0 Cert N° 01 202 IQ 05-1859 TÜV Rheinland

Certificate in accordance to PED 97/23/EC ANNEX 1 Par.4.3 and AD 2000-Merkblatt W0 Cert N° 01 202 IQ 05-1859 TÜV Rheinland

Abnahmeprüfzeugnis gemäss PED 97/23/EC ANHANG 1 Par.4.3 und AD2000-Merkblatt W0 Cert N° 01 202 IQ 05-1859 TÜV Rheinland



**CERTIFICAZIONE DI ISPEZIONE / INSPECTION CERTIFICATE / ABNAHMEPRUFZEUGNIS 3.1 EN 10204:2004**

**Trametal s.p.a.**  
 STABILIMENTO : 33058 S. GIORGIO DI NOGARO (UD)  
 VIA E.FERMI, 44 - TEL 0437629888 (RIC. AUT.)  
 TELEFAX 04371629886 (RIC. AUT.)  
 SEDE LEGALE : 18121 GENOVA - VIA XII OTTOBRE, 2 14° piano  
 CAP.SOC. Eur.10.320.000.00 I.V. - C.C.I.A.A. N.R.E.A. GE312155  
 P.IVA IT 11627130161 - C.F./R.I. 03026980108

**Clienti/Customer/Kunde/Client**  
 SOCIETA' ITALIANA ACCIAI TUBI SPA

**Certificato/Certificate/Abnahmeprufzeugnis/Certificat d'essai**  
 139542 1-1 del 21/03/2007

**Lamiere/Plates/Bleche/toles**  
 ASME SA51.6GR60  
 Ord.N 20905851 Vs 1,26

**Resilienze/Temp**  
 Z% Rp02  
 / Impact /

**Additional Location/Indicazioni/Additional Location:**  
 (4) C-Corona sample/Kamporbe/Cesur  
 P-Pelle rolled surface/Waldbereitete/Plau  
 D-Divertimento/Diversion/Overs - 1/4 Spth  
 E-Estetic/Esthetic/Esthetisch/Esthetique  
 L-Loggato/Loggato/Loggato/Loggato  
 C-Corona sample/Kamporbe/Cesur  
 P-Pelle rolled surface/Waldbereitete/Plau

MIN	MAX	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	Al	V	Nb	Ti	N	B	C.Eq.

**Analisi Chimica di Colata / Chemical Analysis / Analyse chimique**

Colata / heat	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	Al	V	Nb	Ti	N	B	C.Eq.
PSA337	0,13	1,04	0,25	0,015	0,002	0,05	0,02	0,05	0,000	0,04	0,000	0,000	0,000	0,000	0,000	0,317
PSA781	0,14	1,02	0,25	0,013	0,003	0,02	0,05	0,05	0,000	0,04	0,000	0,000	0,000	0,000	0,000	0,320
PSA782	0,13	1,04	0,24	0,013	0,003	0,02	0,02	0,04	0,000	0,04	0,000	0,000	0,000	0,000	0,000	0,314

**Analisi Chimica di Prodotto / Product Analysis / Stuckanalyse / Analyse sur produit**

N° Lamiere/Plate/Blech/Tole	Lotto / lot	N° Prova N° Test Versuche N° D'essai	Dimensioni/Size/Grossesse/Dimension	Trazione/Traction/Zugversuch/Traction		HB	Z%	Piega Type Form	Temp °C	(4)	KV	Media Average Mittelwerte Moyenne
				Temp °C	Rm N/mm2							
PSA782/02/01A	131523	JC073-2007	020x2500x10000	2	322,24	454,38	43,22	CC	+20	2	126	128,333
PSA781/04/07A	131522	JC071-2007	018x2500x10000	2	337,55	451,53	38,24	CC	+20	2	115	114,000
PSA781/04/05A	131522	JC070-2007	018x2500x10000	2	335,28	454,26	38,32	CC	+20	2	112	117,667
PSA781/04/06A	131522	JC069-2007	017x2500x10000	2	341,32	452,22	39,09	CC	+20	2	114	119,667
PSA337/01/07A	131521	JC072-2007	016x2500x10000	2	338,55	447,42	42,13	CC	+20	2	113	113,667
PSA781/02/05B	131255	JC068-2007	014x2500x10000	2	341,52	458,26	38,45	CC	+20	2	116	123,667
PSA781/02/01A	131255	JC067-2007	012x2500x10000	2	348,42	460,38	39,28	CC	+20	2	122	120,333

**IL COLLAUDATORE**  
The Inspector

**TRAMETAL S.p.A.**  
IL CAPO SERVIZIO CROCIATO QUALITA'  
Chief Inspection Dpt.

MATERIALE CONFORME ALLA DIRETTIVA 97/23/EC. (PBR)

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 are consistent with the order prescriptions: marking, inspection and measurement without objection.  
 WIR BESTÄTIGEN hiermit, dass oben genannte Erzeugnisse den Bestellevorschriften entsprechen: Markierung, Oberfläche und Abmessung ohne Nachprüfungen.  
 NOUS CERTIFIONS que les produits énumérés ci dessus sont conformes aux prescriptions de la commande, contrôle de marquage, d'aspect et de dimensions satisfaisant.

PRODUCED FROM CONTINUOUS CAST SLAB AND HAVE A MINIMUM REDUCTION RATIO OF 3 TO 1.

ACCORDING TO ASME II PART A ED. 2004. FULLY KILLED, FINE GRAIN STEEL. NORMALIZING AT 910°C, 1,5 MIN / mm. STILL AIR.

Verified to ASME II Part. A  
 ed. 2004 + add. 2004b  
 & found conforming.



Dalmire plant.  
 Piazza Caduti 6 luglio 1944, 1  
 24044 Dalmire (Bg) - Italy  
 + 39 035 560 111 tel  
 + 39 035 560 3627 fax

Pagine/Page 002/004  
 Data/Data 12/12/2006

Contenna / Pozz./Mill order  
 1271859/012  
 Avviso di spedizione/Shipping Note  
 00041490 - 12/12/2006

Ordine di Vendita/Job Number  
 I/444151/12

Rifer. Ordine Cili/Customer's order  
 VD/0307/06/OS0261  
 Stato/Country  
 ITALIA

Prodotto/Product  
 10095 GRUGLIASCO TO  
 Localita'/Town  
 10095 GRUGLIASCO TO  
 D.E. mm/O.D. mm 323,900 12,700  
 Lgh. Da/Lg. From Lgh. Al/Lg. To SP mm/W.T. mm  
 10000 11800 323,900 12,700

**PROVA DI DUREZZA/HARDNESS TEST**

Prova/Test	Col./Heat	T	1" Dia/From 2" A/To	3"	Tipotype	Min.	Max.
02669	967785	0.0	0.0	100.0	HRB	0.0	100.0
02670	967785	0.0	0.0	72.1			
02671	967568	0.0	0.0	72.0			
02672	967568	0.0	0.0	72.5			

T = 1:1000 P.M.H.T./AFTER P.M.H.T. STRAIN AGEING/  
 2:1000 P.M.H.T./AFTER P.M.H.T. STRAIN AGEING/  
 3:1000 P.M.H.T./AFTER P.M.H.T. STRAIN AGEING

**PROVE TECNICI/TECHNICAL TESTS**

Prova/Test	Col./Heat	T	1	3	5	Schiacc./Flat Test
02669	967785	Esito ok/Test ok				
02670	967785	Esito ok/Test ok				
02671	967568	Esito ok/Test ok				
02672	967568	Esito ok/Test ok				

T = 1:1000 P.M.H.T./AFTER P.M.H.T. STRAIN AGEING/  
 2:1000 P.M.H.T./AFTER P.M.H.T. STRAIN AGEING/  
 3:1000 P.M.H.T./AFTER P.M.H.T. STRAIN AGEING

**COMPOSIZIONE CHIMICA/CHEMICAL COMPOSITION**

C	Si	Mn	P	S	Ni		Cr		Mo	V	Cu	Al	Ti	Nb	B	Ca	
					%1000	%100	%1000	%100								%10000	%100
Col/ata	Max	18	30	130	25	10			12	8	40	40	20	20	5	42	0.0000
Heat	H Min	10	29													0	0.0214
967568	H	1.1	24	11.1	14	3	8	7	3	1	10	23	2	2	2	33	0.214
967785	H	1.1	24	10.1	15	2	9	13	5	1	14	26	2	2	2	33	0.314

Ca FI = F.L./1. F. (C-Mn)/6+(Cr-Mo+V)/5+(Ni+Cu)/15  
 FI = IV. #N#H#I#C#E#H#C#I

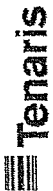
Verified to ASME II<sup>o</sup> Part. A  
 ed. 2007 + add. 2009b  
 C. CIVIDAC S.p.A.  
 G.S. VENTURA

Q = 1: TUTTI I TUBI/ EACH PIPE  
 2: 1 TUBO PER LOTTO/ 1 PIPE OF THE LOT  
 3: 1 TUBO PER LOTTO/ 1 PIPE OF THE LOT

E = 1: AD UNA ESTREMITA'/ AT ONE END  
 2: ALLE 2 ESTREMITA'/ AT BOTH ENDS

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 nome la conformità, assumendone ogni responsabilità per un illecito o semplicemente non consentiti dalla Dalmire.  
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**CERTIFICATO DI COLLAUDO**  
**INSPECTION CERTIFICATE**  
 (UNI EN 10204-3.1 / ISO 10474-3.1.B)

Page/Numero  
 003/004  
 Date/Data  
 12/12/2006

Customer/Cliente  
 00041490 - 12/12/2006

Order/Ordine  
 I/444151/12

Posiz./Position  
 1271859/012

Plant/Impianto  
 24044 Dalmine (Bg) - Italy

Product/Prodotto  
 COMMERCIALE TUBI ACCIAIO SPA

Address/Indirizzo  
 VIALE LIDICE, 40

City/Localita'  
 10095 GRUGLIASCO TO

Client/Customer: COMMERCIALE TUBI ACCIAIO SPA  
 Address/Indirizzo: VIALE LIDICE, 40  
 City/Localita': 10095 GRUGLIASCO TO

Product/Prodotto: TUBI S. S. DI QUALITA' FINITI A CALDO PER IMPIEGHI A BASSE TEMPERATURE (TUORI STANDARD) NORMA ASTM A 333, SPEC. RAQ-02-BA333 GS REV.2 E CRP 9661 REV.7 ACC. GR 6 ASTM A 333 E ASME SA 333  
 NORMALIZZATI FREZZE IMPERMEABILI, CLEARE ESTERNEMENTE CON PTL (PELLICOLA ASSIUTTA-TRANSPARENTE) ND 602, EMBRANTO SECONDO ASME B 16.25 FIG. 2A CTA:9554  
 SEAMLESS HOT FINISHED PIPES FOR LOW TEMPERATURE SERVICES (WITH SUPPLEMENTARY REQUIREMENTS) ACCORDING TO ASTM A 333, SPEC. RAQ-02-SA333 GS REV.2 AND CRP 9661 REV.7 STEEL GR 6 ASTM A 333  
 AND ASME SA 333 NORMALIZED INTERNALLY BARE, EXTERNALLY VARNISHED WITH PTL (FILM DRI-TRANSPARENT) ND 602, REVELLED AS PER ASME B 16.25 FIG. 2A CTA:9554

Dimensions/Dimensioni: Lgh. Del/Lg. From Lgh. All/Up. To D.E. mm/O.D. mm SP mm/W.T. mm  
 10000 11800 323,900 12,700  
 La Societa' DALMINE garantit que tous les produits, objet du Certificat susdit, respectent en leur totalite' les Specifications de l'Article 15 de l'Arrete Ministeriel du 24 mars 1978 modifiè: C max 0.25% P max 0.05% S max 0.05%  
 Rm (N/mm2) max 700 A(10=5.65V80) min 16% long Rm (A-2) min 10500  
 E max 0.9 A(10=5.65V80) min 14% trans RA min 10500

PROVA DI TENUTA/LEAK TEST

U.M.	Sec.	Valore/Value
BAR	5	113.0

TIPOLOGIA/HYDRAULIC

NOTE/REMARKS  
 MATERIALE FABBRICATO IN ACCORDO ALLA SPEC. ASME II PART. D TAB. Y1  
 DALMINE OPERA CON UN QUALITY MANAGEMENT SYSTEM CERTIFICATO DA LLOYD'S REGISTER NO. LRC 110950/001 CHE SUPPORVA I REQUISITI DELL'ANNEX 1, SECT. 4.3 OF PRESSURE EQUIPMENT DIRECTIVE (PED) 97/23/EC  
 DUREZZA HBW 225 MAX. IN ACCORDO ALLA SPEC. NACE MR-01-03  
 DUREZZA HRC 22 MAX. IN ACCORDO ALLA SPEC. NACE MR-01-75  
 TUTTI I TUBI SONO STATI NORMALIZZATI A 920°C PER 40'  
 DOPO LE OPERAZIONI DI CONTROLLO IL MATERIALE NON PRESENTA UN MAGNETISMO RESIDUO SUPERIORE A 20 GAUSS  
 MATERIAL ACCORDING TO ASME II PART. D TAB. Y1  
 DALMINE OPERATES A QUALITY MANAGEMENT SYSTEM, CERTIFIED BY LLOYD'S REGISTER - No. LRC 110950/001 HAVING UNDERGONE A SPECIFIC ASSESSMENT, SUPPORTING THE REQUIREMENTS OF ANNEX 1 SECT. 4.3 OF PRESSURE EQUIPMENT DIRECTIVE PED 97/23/EC  
 HARDNESS HBW 225 MAX., ACCORDING TO NACE MR-01-03  
 HARDNESS HRC =22 MAX., ACCORDING TO NACE MR-01-75  
 ALL PIPES HAVE BEEN NORMALIZED AT 920°C FOR 40 MINS.  
 AFTER INSPECTION OPERATION, THE MATERIAL HAS NOT A RESIDUAL MAGNETISM GREATER THAN 20 GAUSS

EDIZIONE/NORME/STANDARD SELECTION

Norma/Standard	Revisione/Revision	Anno/Year
ASTM A 333		2004
ASME SA 333	2005	Add...
NACE MR0175/ISO 15156		2003
NACE MR0103		2005

Verified to ASME II Part. A  
 ed. 2007 + add. 2009 b  
 & found conforming.

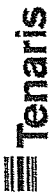
Q.C. CONTROL P. MEMO

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COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 1129	Mt 11,42	Pipes No.: 1
This document is reproduced by a computerized system and is conform to the original	Heat No.:967568	Cta's J00000858	Date:31/05/2007
Customer : COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.:nr 2007/277 dell 11.5.2007		Item: 01



Dalmine plant  
 Piazza Cacciati 6 luglio 1944, 1  
 24044 Dalmine (Bg) - Italy  
 + 39 035 560 111 tel  
 + 39 035 560 382 fax



Dalmine plant  
 Piazza Caduti 6, luglio 1944, 1  
 24044 Dalmine (BG) - Italy  
 + 39 035 560 111 tel  
 + 39 035 560 3827 fax

N. **06/27189** **004/004**  
 Date/Date **12/12/2006**

**CERTIFICATO DI COLLAUDO**  
**INSPECTION CERTIFICATE**  
 (UNI-EN 10204 3.1 / ISO 10474 3.1.B)

COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 1129	Mt 11,42	Pipes No.: 1
This document is reproduced by a computerized system and is conform to the original	Heat No.:967568	Cta's <del>Y</del> 00000858	Date:31/05/2007
Customer : COSTRUZIONI INDUSTRIALI CIVDAC SPA	P. O. No.:nr 2007/277 del 11.5.2007		Item: 01

Client/Customer	COMERCIALE TUBI ACCIAIO SPA	Order/Order Number	1271859/012
Address/Address	VIALE LIDICE, 40	Order di Vendita/Job Number	00041490 - 12/12/2006
Localities/Town	10095 GRUGLIASCO TO	Quantity/Quantity	24
Product/Product	TUBI S. S. DI QUALITA' FINITI A CALDO PER IMPIEGHI A BASSE TEMPERATURE (FUORI STANDARD) NORMA ASTM A 333, SPEC. RAQ-02-SA333 GS REV.2 E CRP 9661 REV.7 ACC. GR 6 ASTM A 333 E ASME SA 333	Weight/Weight	272,24
Dimensions/Dimensions	SEAMLESS HOT FINISHED PIPES FOR LOW TEMPERATURE SERVICES (WITH SUPPLEMENTARY REQUIREMENTS) ACCORDING TO ASTM A 333, SPEC. RAQ-02-SA333 GS REV.2 AND CRP 9661 REV.7 STEEL GR 6 ASTM A 333 AND ASME SA 333 NORMALIZED INTERNALLY BARE, EXTERNALLY VARNISHED WITH FTI (FILM DRY- TRANSPARENT) ND 602, REVEALED AS PER ASME B 16.25 FIG. 2A, CT4:8554	Length/Length	11800
	SP mm/W.T. mm	Weight/Kg	27046
	323,900	Length/Feet	893,02"
	12,700	Weight/Lb	59626,1

TUBI SENZA SALDATURA FINITI A CALDO  
 SEAMLESS HOT FINISHED PIPES  
 IL CONTROLLO VISIVO E DIMENSIONALE HA DATO ESITO SODDISFACENTE  
 VISUAL AND DIMENSIONAL CONTROL HAS BEEN CARRIED OUT WITH SATISFACTORY RESULT  
 L'ACCIAIO E' DI TIPO CALMATO, A GRANO FINE, PRODOTTO AL FORNO ELETTRICO  
 STEEL IS FULLY KILLED AND PRODUCED BY ELECTRIC FURNACE TO A FINE GRAIN PRACTICE  
 IL MATERIALE FORNITO E' IN ACCORDO AI REQUISITI DELL'ORDINE.  
 THE PRODUCT SUPPLIED IS IN COMPLIANCE WITH THE REQUIREMENTS OF THE ORDER.

 Quality System Certified n.110950001	RESPONSABILE SERVIZIO QUALITA' QUALITY SERVICE MANAGER <b>Raul POSATIERIS</b>
	RESPONSABILE UFFICIO CERTIFICAZIONE QUALITA' CHIEF OF QUALITY CERTIFICATION DPT <b>Marco BELLOLI</b>

Verified to ASME II° Part. A  
 ed. 2007 + add. 2001b  
 & found conforming.

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SN4320 Ps. 402

	COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 714	Mt 11,06	Pz No.: 1
	This document is reproduced by a computerized system and is conform to the original	Heat No.: 900447	Cta's job: VC0000638	Date: 30/03/2010
	Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: PO: NR 2010/164 DEL 24.3.2010	Item: 03	

Dalmine S.p.A. - Dalmine plant  
Piazza Caduti 6 Luglio 1944, 1  
24044 Dalmier (BO) - Italy  
+39 059 590 111 tel  
+39 059 560 2827 fax

Number / Numero: 10/01943  
Date / Data: 24 February 2010  
Page / Pagina: 1 / 7

**INSPECTION CERTIFICATE**  
**CERTIFICATO DI COLLAUDO**  
(UNI EN 10204 3.1 / ISO 10474 3.1.B)

Customer / Cliente: COMMERCIALE TUBI ACCIAIO SPA	Customer's Order Item / Rifer. Ordine Cliente: VD90503/LS0000070	Manufacturer's Works Order N° / Conferma-Posizione: 1213245/001
Manufacture Process / Processo di fabbricazione: NORMALIZZATI	Product Type / Tipo di prodotto: See note nr.1	Surface / Superficie: See note nr.2
Standard or Specification / Norme o specifica: See note nr.3	See note nr.1	Vedi nota nr.2
Dimensions / Dimensioni: Ø 219,1mm O.D. x 12,7mm W.T.	Schedule / Scheda: N/A	Ends / Estremità: See note nr.4
	Length / Lunghezza: 10000 mm + 11800 mm	Vedi nota nr.4
	Quantity / Quantità: 32Pos/Pz	Nominal Weight / Peso nominale:
	1173'05" ft	50860,5 lb
	357,66 mt	23070 kg

**DELIVERY NOTES / AVVISI DI SPEDIZIONE**

Delivery Notes / Avvisi di spedizione	Delivery Notes / Avvisi di spedizione
Job number: 1492798/1	Town: 10085 GRUGLIASCO TO
Shipping note: 00003272 - 24/02/2010	Country: ITALIA
Address: VIALE LIDICE, 40	

**TENSILE TEST / PROVA DI TRAZIONE**

Heat N° Coilata N°	Sample N° Prova N°	Specimen condition Condizioni della provetta	Specimen dimensions Dimensioni della provetta	Test temp Temp. di prova	Y.S. / U.T.S.		Elongation / Allungamento			
					EUL 0.5%	Req.	Lo	Min.	Obt.	
900447	Q8958	1 B N	38.20 x 12.20	+20	346.00	494.00	0.70	50.0	30.0%	48.0%
900447	Q8959/C	1 B N	38.10 x 12.20	+20	352.00	492.00	0.72	50.0	30.0%	48.0%

B: Body / Corpo  
L: Longitudinal / Lunghezza iniziale  
Lo: Initial length / Lunghezza iniziale  
Ls: Location of sample / Ubicazione provetta

Max: Maximum / Massimo  
Min: Minimum / Minimo  
N: Normalized / Normalizzato  
Obt: Obtained / Ottenuto

Ori: Orientation / Orientamento  
Req: Max: Required maximum / Massimo richiesto  
Req: Required / Richiesto  
Sc: Specimen condition / Condizioni Provetta

Ss: Strip specimen / Rettangolo  
U.T.S: Ultimate Tensile Strength / Rottura  
Y.S: Yield Strength / Snervamento

Verified to ASME II<sup>o</sup> Part. A  
ed. 2007 + add. 2005b  
& found conforming.

CIVIDAC S.p.A.  
QUALITY CONTROL MEMO

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 Customer : COSTRUZIONI INDUSTRIALI CIVIDAC SPA

Kg 714  
 Heat No.: 900447  
 P.O. No.:

Mt 11,06  
 Cta's job: VC0000638  
 PO: NR 2010/164 DEL 24.3.2010

Pz No.: 1  
 Date: 30/03/2010  
 Item: 03

Dalmine S.p.A. - Dalmine plant  
 Piazza Carletti 6 Luglio 1944, 1  
 24044 Dalmine (BG) - Italy  
 +39 035 860 111 tel  
 +39 035 560 5827 fax

Number / Numero: 10101943  
 Page / Pagina: 2 / 7  
 Date / Data: 24 February 2010

**INSPECTION CERTIFICATE**  
**CERTIFICATO DI COLLAUDO**  
 (UNI EN 10204 3.1 / ISO 10474 3.1.B)

**Tenaris**  
 COMMERCIALE TUBI ACCIAIO SPA

Customer / Cliente: COMMERCIALE TUBI ACCIAIO SPA		Customer's Order Item / Rif. Ordine Cliente - Item / Posizione Cliente: VD90503/LS0000070		Manufacturer's Works Order N° / Conforma-Posizione: 1213245/001	
Manufacture Process / Processo di fabbricazione: NORMALIZZATI		Product Type / Tipo di prodotto: See note nr.1		Surface / Superficie: See note nr.2	
Standard or Specification / Norme o specifica: See note nr.3		Steel Grade / Grado dell'Acciaio: STEEL GR 6 ASTM A 333 AND ASME SA 333 ACC. GR 6 ASTM A 333 E ASME SA 333		Ends / Estremità: See note nr.4	
Dimensions / Dimensioni: Ø 219,1mm O.D. x 12,7mm W.T.		Length / Lunghezza: 10000 mm + 11800 mmm		Nominal Weight / Peso nominale: 50860,5 lb 23070 kg	
Schedule / Schedulaz: N/A		Quantity / Quantità: 32Pcs/Pz		1173'05" ft	

**CHEMICAL COMPOSITION / COMPOSIZIONE CHIMICA**

Heat N° Colata N°	Sample N° Prova N°	Lot N° Lotto N°	Composition % / Composizione %																	
			x 100							x 1000							x 10000			
H	P	C	Mn	Si	Ni	Cr	Mo	Cu	Ce	LF	PCM	Fe	P	S	Al	Ti	Nb	V	B	Ca
900447	Q8958	1	13	103	26	8	15	3	14	35	21	33,5	18	2	25	3	2	10	3	11
900447	Q8959/C	1	14	100	26	8	15	3	15	36	22	34,4	18	2	27	2	2	10	4	12
			14	101	27	8	15	3	15	36	22	34,5	19	2	27	3	2	10	4	11

Verified to ASME II<sup>h</sup> Part. A  
 ed. 2007 + add. 2009b  
 & found conforming.  
 C.I. CIVIDAC S.p.A.  
 C.I. N. 10101943 - MEMO

Ce LF: C+Mn+Si+(Cr+Mo+V)/5+(Ni+Cu)/15  
 H: Heat / Colata  
 P: Product / Prodotto  
 Min: Minimum / Minimo  
 Max: Maximum / Massimo

**SUPERFICIAL HARDNESS / DUREZZA SUPERFICIALE**

Heat N° Colata N°	Sample N° Prova N°	Lot N° Lotto N°	External / Esterna		Internal / Interna	
			Scale / Scala: HBW	Req. Min: 4	Req. Max: 200.0	Scale / Scala: HBW
900447	Q8958	1	B	N	B	N
			137.0		130.0	

B: Body / Corpo  
 Ls: Location of sample / Ubicazione provetta  
 N: Normalized / Normalizzato  
 Sc: Specimen condition / Condizioni Provetta

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COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 714	Mt 11,06	Pz No.: 1
This document is reproduced by a computerized system and is conform to the original	Heat No.: 900447	Cta's job: VC0000638	Date: 30/03/2010
Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: PO: NR 2010/164 DEL 24.3.2010	Item: 03	

Dobson S.p.A. - Dobson plant  
Piazza Caddi 6 luglio 1944, 1  
20041 Dalmonte (TO) - Italy  
+39 035 960 111 tel  
+39 035 960 9827 fax

Number / Numero: 10101943  
Date / Data: 24 February 2010  
Page / Pagina: 3 / 7

# INSPECTION CERTIFICATE CERTIFICATO DI COLLAUDO (UNI EN 10204 3.1 / ISO 10474 3.1.B)

Customer / Cliente: COMMERCIALE TUBI ACCIAIO SPA	Customer's Order Item / Rifer. Ordine Cliente - Item / Posizione Cliente: VD90503/LS0000070	Manufacturer's Works Order N° / Conferma-Posizione: 1213245/001
Manufacture Process / Processo di fabbricazione: NORMALIZED	Product Type / Tipo di prodotto: See note nr.1	Surface / Superficie: See note nr.2
Standard or Specification / Norme o specifica: See note nr.3	See note nr.1	Vedi nota nr.2
Dimensions / Dimensioni: Ø 219,1mm O.D. x 12,7mm W.T.	Length / Lunghezza: 10000 mm + 11800 mm	Ends / Estremità: See note nr.4
Schedule / Scheda: N/A	Quantity / Quantità: 32Pcs/Pz	Nominal Weight / Peso nominale: 50860,5 lb 23070 kg
	Steel Grade / Grado dell'Acciaio: STEEL GR 6 ASTM A 333 AND ASME SA 333	
		AGC GR 6 ASTM A 333 E ASME SA 333

## IMPACT TEST / PROVA DI RESILIENZA

Type/Posizione:	Temp: -50	Orientation/Direzione: L		Unit / Unità: JOULE		Ind. Min. Req: 41.0	Req. Min. Avg: 41.0	Shear area / Area duttile %		Lateral Expansion/Espansione laterale mm					
		Size / Dimensioni	Lot N°	Results / Risultato	Unit / Unità: °C			Results / Risultato	Req. Min. Req: --	Results / Risultato	Req. Min. Avg: --				
Heat N° / Colata N°: 900447	Sample N° / Prova N°: C8958	Zone / Zona: B	Lot N° / Lotto N°: 1	1	2	3	Avg: 276.0	1	2	3	Avg: 1.867				
				2	265.0	284.0	276.0	85	85	85	92.0	1.9	1.8	1.9	1.867

Avg: Average / Media  
B: Body / Corpo  
Ind. Min. Req: Individual Minimum Required /  
N: Normalized / Normalizzato  
Req. Min. Avg: Required minimum average / Minima media richiesta  
Temp: Temperature / Temperatura  
Sc: Specimen condition / Condizioni Provetta

Verified to ASME II Part. A  
ed. 2002 + add. 2005b  
& found conforming.  
C.I. CIVIDAC S.p.A.  
Q.C. MEMO

N: Normalized / Normalizzato  
Req. Min. Avg: Required minimum average / Minima media richiesta  
Temp: Temperature / Temperatura  
Sc: Specimen condition / Condizioni Provetta

Type/Posizione:	Temp: 0	Orientation/Direzione: T		Unit / Unità: JOULE		Ind. Min. Req: --	Req. Min. Avg: 27.0	Shear area / Area duttile %		Lateral Expansion/Espansione laterale mm		
		Size / Dimensioni	Lot N°	Results / Risultato	Unit / Unità: °C			Results / Risultato	Req. Min. Req: --	Results / Risultato	Req. Min. Avg: 27.0	
Heat N° / Colata N°: 900447	Sample N° / Prova N°: C8958	Zone / Zona: B	Lot N° / Lotto N°: 1	1	2	3	Avg: 217.3	1	2	3	Avg: 1.867	
				2	225.0	221.0	206.0	259.0	259.0	259.0	243.0	250.7

Avg: Average / Media  
B: Body / Corpo  
Ind. Min. Req: Individual Minimum Required /  
N: Normalized / Normalizzato  
Req. Min. Avg: Required minimum average / Minima media richiesta  
Temp: Temperature / Temperatura  
Sc: Specimen condition / Condizioni Provetta

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Customer: COSTRUZIONI INDUSTRIALI CIVDAC SPA	P.O. No.: PO: NR 2010/164 DEL 24.3.2010	Item: 03	

Daimine S.p.A. - Daimine plant  
Piazza Cackli 6 Luglio 1944, 1  
21034 Daimine (BG) - Italy  
+39 035 660 111 tel  
+39 035 660 9827 fax

Number / Numero: 10/01943  
Date / Data: 24 February 2010  
Page / Pagina: 4 / 7

**INSPECTION CERTIFICATE**  
**CERTIFICATO DI COLLAUDO**  
(UNI EN 10204 3.1 / ISO 10474 3.1.B)

Customer / Cliente: <b>COMMERCIALE TUBI ACCIAIO SPA</b>	Customer's Order Item / Rif. Ordine Cliente - Item	Customer's Reference / Posizione Cliente: <b>VD90503/LS0000070</b>	Manufacturer's Works Order N° / Conferma-Posizione: <b>1213248001</b>
Manufacture Process / Processo di fabbricazione: <b>NORMALIZED</b>	Product Type / Tipo di prodotto: <b>See note nr.1</b>	Surface / Superficie: <b>See note nr.2</b>	Ends / Estremità: <b>See note nr.4</b>
Standard or Specification / Norme o specifiche: <b>See note nr.3</b>	Length / Lunghezza: <b>10000 mm + 11800 mm</b>	Steel Grade / Grado dell'Acciaio: <b>STEEL GR 6 ASTM A 333 AND ASME SA 333</b>	Nominal Weight / Peso nominale: <b>50860,5 lb</b>
Dimensions / Dimensioni: <b>ø 219.1mm O.D. x 12.7mm W.T.</b>	Schedule / Scheda: <b>N/A</b>	Quantity / Quantità: <b>32Pcs/Pz</b>	<b>23070 kg</b>

**IMPACT TEST / PROVA DI RESILIENZA**

Avg: Average / Media  
B: Body / Corpo  
Ind. Min. Req: Individual Minimum Required /  
Minimo singolo richiesto  
Ls: Location of sample / Ubicazione provetta  
N: Normalized / Normalizzato  
Req. Min. Avg: Required minimum average / Minima media richiesta  
T: Transversal / Trasversale  
Temp: Temperature / Temperatura  
Sc: Specimen condition / Condizioni Provetta

**FLATTENING TEST / PROVA DI SCHIACCIAMENTO**

Standard / Norme:		Sample N° / Prova N°		Zone		Test Frequency / Frequenza prova		Result / Esito	
Heat N° / Colata N°	Lot N°	Sample N° / Prova N°	Zone	Sample N° / Prova N°	Zone	Test Frequency / Frequenza prova	Result / Esito	Heat N° / Colata N°	Lot N°
900447	1	Q89533	E1	Q89533	E1	5% of the lot	Good / Buono	900447	1

E1/E2: Ends of Sampling / Estremità della provetta

**HYDROSTATIC TEST / PROVA IDRAULICA**

Pressure / Pressione	Time / Tempo	Results / Risultato
Unit / Unità: BAR	Value / Valore: 167	Seconds / Secondi: 5
		Satisfactory / Soddisfacente

Verified to ASME 1<sup>st</sup> Part. A  
ed. 2007 + add. 2009b  
& found conforming.

*Signature*  
G. CIVDAC S.p.A.  
Q.C. INCHIOSTRO MEMO

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Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: PO: NR 2010/164 DEL 24.3.2010	Item: 03	

Dainnis S.p.A. - Dainnis plant  
Piazza Cavalli 6 Luglio 1942, 1  
24034 Dainnis (BG) - Italy  
+39 035 960 111 tel  
+39 035 960 3827 fax

<b>INSPECTION CERTIFICATE</b> CERTIFICATO DI COLLAUDO (UNI EN 10204 3.1 / ISO 10474 3.1.B)	Number / Numero: <b>10/01943</b>	Page / Pagina: <b>5 / 7</b>
	Date / Data: <b>24 February 2010</b>	

Customer / Cliente: <b>COMMERCIALE TUBI ACCIAIO SPA</b>	Customer's Order Item / Rifer. Ordine Cliente - Item Customer's Reference / Posizione Cliente: <b>VD90603/LS0000070</b>	Manufacturer's Works Order N° / Conferma-Posizione: <b>1213245/001</b>
Manufacture Process / Processo di fabbricazione: <b>NORMALIZED</b>	Product Type / Tipo di prodotto: See note nr.1 Vedi nota nr.1	Surface / Superficie: See note nr.2 Vedi nota nr.2
Standard or Specification / Norme o specifiche: See note nr.3 Vedi nota nr.3	Steel Grade / Grado dell'Acciaio: <b>STEEL GR 6 ASTM A 333 AND ASME SA 333</b> <b>ACC. GR 6 ASTM A 333 E ASME SA 333</b>	Ends / Estremità: See note nr.4 Vedi nota nr.4
Dimensions / Dimensioni: <b>ø 219.1mm O.D. x 12.7mm W.T.</b>	Quantity / Quantità: <b>32Pcs/Pz</b>	Nominal Weight / Peso nominale: <b>60860.5 lb</b> <b>23070 kg</b>
	Length / Lunghezza: <b>10000 mm + 11800 mm</b>	
	Schedule / Schedulati: <b>N/A</b>	

**SUPPLEMENTARY INFORMATION / INFORMAZIONI SUPPLEMENTARIE**

STANDARD EDITIONS  
EDIZIONI NORME

Standard:ASTM A 333M Year:2005  
Standard:ASME SA 333 Year:2007  
Standard:NACE MR0176/ISO 15156 Year:2003  
Standard:NACE MR0103 Year:2005

Norma:ASTM A 333M Anno:2005  
Norma:ASME SA 333 Anno:2007  
Norma:NACE MR0176/ISO 15156 Anno:2003  
Norma:NACE MR0103 Anno:2005

PRODUCT DESCRIPTION NOTES

NOTE DI DESCRIZIONE DEL PRODOTTO

Note 1 is the full description of the 'Product type'  
SEAMLESS HOT FINISHED PIPES FOR LOW TEMPERATURE SERVICES (WITH SUPPLEMENTARY REQUIREMENTS)  
Note 2 is the full description of the 'Surface'  
INTERNALLY-BARE, EXTERNALLY VARNISHED WITH PT1 (FILM DRY- TRANSPARENT) ND 602.  
Note 3 is the full description of the 'Standard or specification'  
ACCORDING TO ASTM A 333 /M ASME SA 333,SPEC:RAQ-02-SA333 GS REV.6, NACE AND TQ CTA-002 (JUN 2009)  
Note 4 is the full description of the 'Ends'  
BEVELLED AS PER ASME B 16.25 FIG. 2A CTA-8554

La nota 1 è la descrizione completa del 'Tipo prodotto'  
TUBI S.S. DI QUALITÀ FINITI A CALDO PER IMPIEGHI A BASSE TEMPERATURE (FUORI STANDARD)  
La nota 2 è la descrizione completa della 'Superficie'  
GREZZI INTERNAMENTE, OLEATI ESTERNAMENTE CON PT1 (PELLICOLA ASCIUTTA-TRASPARENTE) ND 602.  
La nota 3 è la descrizione completa delle 'Norme o specifiche'  
NORMA ASTM A 333 /M ASME SA 333,SPEC:RAQ-02-SA333 GS REV.6, NACE E TQ CTA-002 (JUN 2009)  
La nota 4 è la descrizione completa delle 'Estremità'  
SMUSSATI SECONDO ASME B 16.25 FIG. 2A CTA-8554

Supplementary Information  
Informazioni supplementari

DALMINE OPERATES A QUALITY MANAGEMENT SYSTEM CERTIFIED BY LLOYD'S REGISTER NR. LRC 110950/001 HAVING UNDERGONE A SPECIFIC ASSESSMENT, SUPPORTING THE REQUIREMENTS OF ANNEX 1 SECT 4.3 OF 'PRESSURE EQUIPMENT DIRECTIVE (PED) 97/23/EC'. MATERIAL ACCORDING TO ASME II PART. D TAB. Y1 AFTER INSPECTION OPERATION, THE MATERIAL HAS NOT A RESIDUAL MAGNETISM

DALMINE OPERA CON UN QUALITY MANAGEMENT SYSTEM CERTIFICATO DAL LLOYD'S REGISTER NR. LRC 110950/001 CHE SUPPORTA I REQUISITI DELL'ANNEX 1, SECT. 4.3 DEL "PRESSURE EQUIPMENT DIRECTIVE (PED) 97/23/EC". MATERIALE IN ACCORDO ALLA SPEC. ASME II PART. D TAB. Y1 DOPO LE OPERAZIONI DI CONTROLLO, IL MATERIALE NON PRESENTA UN MAGNETISMO RESIDUO SUPERIORE A 20 GAUSS

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**CIVIDAC S.p.A.**

Verified to ASME II Part A

ed. 2007 + add. 2002b

& found conforming.

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This document is reproduced by a computerized system and is conform to the original	Heat No.: 900447	Cl'a's job: VC0000638	Date: 30/03/2010
Customer : COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: PO: NR 2010/164 DEL 24.3.2010	Item: 03	

Dalmine S.p.A. - Dalmine plant  
Piazza Cardù 6 Luglio 1944, 1  
24034 Dalmine (BG) - Italy  
+39 035 860 111 tel  
+39 035 860 282 fax

Number / Numero: 10/01943  
Page / Pagina: 6 / 7  
Date / Data: 24 February 2010

**INSPECTION CERTIFICATE**  
**CERTIFICATO DI COLLAUDO**  
(UNI EN 10204 3.1 / ISO 10474 3.1.B)

Customer / Cliente: COMMERCIALE TUBI ACCIAIO SPA	Customer's Order / Item / Réf. / Ordine Cliente - Item / Posizione Cliente: VD90503/LS0000070	Manufacturer's Works Order N° / Confirma+Posizione: 1213245/001
Manufacture Process / Processo di fabbricazione: NORMALIZED	Product Type / Tipo di prodotto: See note nr.1	Surface / Superficie: See note nr.2
Standard or Specification / Norme o specifica: See note nr.3	See note nr.1	See note nr.4
Dimensions / Dimensioni: Ø 219,1mm O.D. x 12,7mm W.T.	Schedule / Schedia: N/A	Nominal Weight / Peso nominale:
	Length / Lunghezza: 10000 mm + 11800 mm	Ends / Estremità: See note nr.4
	Quantity / Quantità: 32Pcs/Pz	See note nr.4
	1173'05" ft	
	50860,5 lb	
	23070 kg	

**SUPPLEMENTARY INFORMATION / INFORMAZIONI SUPPLEMENTARIE**

Supplementary Information / Informazioni supplementari	Supplementary Information / Informazioni supplementari
<p>GREATHER THAN 20 GAUSS HARDNESS HRC 22 MAX, ACCORDING TO NACE MR-01-75/ISO 15156 HARDNESS HBW 225 MAX, ACCORDING TO NACE MR-01-03 ALL PIPES HAVE BEEN TESTED BY ELECTROMAGNETIC TEST ACCORDING TO SPEC. E 570, WITH SATISFACTORY RESULT ALL PIPES HAVE BEEN NORMALIZED AT 920°C FOR 43 MINS. THE ENDS (FOR 300 mm) HAVE BEEN TESTED WITH WET FLUORESCENT MAGNETIC PARTICLES, WITH SATISFACTORY RESULT STEEL IS CALCIUM TREATED SEAMLESS HOT FINISHED PIPES VISUAL AND DIMENSIONAL CONTROL. HAS BEEN CARRIED OUT WITH SATISFACTORY RESULT STEEL IS FULLY KILLED AND PRODUCED BY ELECTRIC FURNACE TO A FINE GRAIN PRACTICE THE PRODUCT SUPPLIED IS IN COMPLIANCE WITH THE REQUIREMENTS OF THE ORDER. MANUFACTURED BY TENARIS DALMINE NO WELD REPAIR, MERCURY AND RADIATION FREE</p>	<p>DUREZZA HRC 22 MAX. IN ACCORDO ALLA SPEC. NACE MR-01-75/ISO 15156 DUREZZA HBW 225 MAX. IN ACCORDO ALLA SPEC. NACE MR-01-03 I TUBI SONO STATI SOTTOPOSTI AL CONTROLLO ELETTROMAGNETICO IN ACCORDO ALLA SPEC. E 570, CON ESITO SODDISFACENTE I TUBI SONO STATI NORMALIZZATI A 920°C PER 43 MIN. LE ESTREMITA' DEI TUBI SONO STATE CONTROLLATE (PER 300 mm) CON PARTICELLE MAGNETICHE FLUORESCENTI, CON ESITO SODDISFACENTE ACCIAIO TRATTATO AL CALCIO TUBI SENZA SALDATURA FINITI A CALDO IL CONTROLLO VISIVO E DIMENSIONALE HA DATO ESITO SODDISFACENTE L'ACCIAIO E' DI TIPO CALMATO, A GRANO FINE, PRODOTTO AL FORNO ELETTRICO IL MATERIALE FORNITO E' IN ACCORDO AI REQUISITI DELL'ORDINE. FABBRICATO DA TENARIS DALMINE NON RIPARATO MEDIANTE SALDATURA, ESENTE DA MERCURIO E RADIAZIONI</p>

Supplementary Information / Informazioni supplementari	Supplementary Information / Informazioni supplementari
<p>La Société 'DALMINE' garantit que tous les produits, objet du Certificat susditi, respectent en leur totalité les Specifications de l'Article 15 de l'Arrêté Ministeriel du 24 mars 1978 modifié: C max 0.25% P max 0.05% S max 0.05% Rm (N/mm2) max 700 A(Lo=5.65VSo) min 16% long Rm (A-2) min 10500</p>	<p>La Société 'DALMINE' garantisce tutti que tous les produits, objet du Certificat susditi, respectent en leur totalité les Specifications de l'Article 15 de l'Arrêté Ministeriel du 24 mars 1978 modifié: C max 0.25% P max 0.05% S max 0.05% Rm (N/mm2) max 700 A(Lo=5.65VSo) min 16% long Rm (A-2) min 10500</p>

This certificate is issued by a computerized system and it is valid with electronic signature. On the original certificate the trade-mark green colored "Tenaris" is stamped. In case the owner of this original certificate would release a copy of it, he must attest its conformity to the original one taking upon himself the responsibility for any unlawful or not allowed use. Any alteration and/or falsification will be subjected to the law.

Questo certificato è emesso da un sistema computerizzato ed è valido con firma elettronica. Il certificato originale riporta il marchio "Tenaris" in colore verde. In possesso elettronico, qualora rilasci copia, deve stabilire a suo nome la conformità all'originale, assumendosi ogni responsabilità per usi illeciti o non consentiti. Qualunque alterazione o falsificazione sarà perseguita a norme di legge.

Verified to ASME II\* Part. A  
ed. 2007 + add. 2009  
& found conforming.

C. I. CIVIDAC S.p.A.  
G. I. CIVIDAC MEMO

FOR03171



COMMERCIALE TUBI ACCIAIO Viale Lidice 40-Grugliasco(TO)	Kg 714	Mt 11,06	Pz No.: 1
This document is reproduced by a computerized system and is conform to the original	Heat No.: 900447	Cta's job: VC0000638	Date: 30/03/2010
Customer: COSTRUZIONI INDUSTRIALI CIVIDAC SPA	P.O. No.: PO: NR 2010/164 DEL 24.3.2010		Item: 03

Dalmine S.p.A. - Dalmine plant  
Piazza Cantù 6 luglio 1944, 1  
24044 Dalmine (BS) - Italy  
+39 035 860 111 tel  
+39 035 860 827 fax

Number / Numero: 10/01943  
Date / Data: 24 February 2010

**INSPECTION CERTIFICATE**  
**CERTIFICATO DI COLLAUDO**  
(UNI EN 10204 3.1 / ISO 10474 3.1.B)

**Tenaris**  
Customer / Cliente: COMMERCIALE TUBI ACCIAIO SPA

Customer's Order Item / Rifer. Ordine Cliente - Item / Posizione Cliente: VD90503/LS0000070	Manufacturer's Works Order N° / Conferma-Posizione: 1213245/001
Product Type / Tipo di prodotto: See note nr.1	Surface / Superficie: See note nr.2
Standard or Specification / Norme o specifica: See note nr.3	Ends / Estremità: See note nr.4
Dimensions / Dimensioni: Ø 219,1mm O.D. x 12,7mm W.T.	Nominal Weight / Peso nominale: 50860,5 lb 23070 kg
Schedule / Scheda: N/A	Quantity / Quantità: 32 Pcs/Pz
Length / Lunghezza: 10000 mm + 11800 mm	Steel Grade / Grado dell'Acciaio: STEEL GR 6 ASTM A 333 AND ASME SA 333 ACC. GR 6 ASTM A 333 E ASME SA 333

**SUPPLEMENTARY INFORMATION / INFORMAZIONI SUPPLEMENTARIE**

Supplementary Information / Informazioni supplementari  
E max 0.9 A(L0=5.65V(S0) min 14% trans RA min 10500

This is to certify that the product described here has been manufactured, sampled, tested, and inspected in accordance with purchaser order requirements. This certificate is not a declaration of origin nor may it be used as a declaration of origin.

 Quality System Certified n. 110950/001	<b>CUSTOMER - THIRD PARTY</b>  INSPECTION COMPANY COMPAGNIA D'ISPEZIONE	<b>TENARIS QUALITY DEPARTMENT SIGNATURE</b>  QUALITY CERTIFICATION DEPT. UFFICIO CERTIFICAZIONE QUALITA' BELLOLI Marco
	Verified to ASME 1 <sup>st</sup> Part, A ed. 2007 + add. 2009b & found conforming.	CHIEF OF QUALITY CERTIFICATION DEPT. RESPONSABILE DELL'UFFICIO CERTIFICAZIONE QUALITA' BERTINO Sergio

This certificate is issued by a computerized system and it is valid with electronic signature. On the original certificate the trade-mark green colored "Tenaris" is stamped. In case the owner of the original certificate would release a copy of it, he must attest its conformity to the original one taking upon himself the responsibility for any unlawful or not-allowed use. Any alteration and/or falsification will be subjected to the law.

FOR03171



# INSPEKČNÍ CERTIFIKÁT 3.1

## INSPECTION CERTIFICATE, ABNAHMEPRÜFZEUGNIS, CERTIFICAT DE RÉCEPTION

A02

**VÍTKOVICE STEEL, a.s.****EN 10204:2004**

A03/ Číslo dokumentu, No. Nr.

Z02/ Datum, Date.

Strana, Page, Seite

AD-2000 W1

32819/2006

28.06.2006

1/1

A01, A05 / VÍTKOVICE STEEL, a.s.,  
Ostrava - Hůvkový Štramberská 2871/47, PSČ 709 00  
ČESKÁ REPUBLIKA

A06/ Odběratel/Offence, Customer/consignee, Beststeller/Firma/Förner, Acheteur/Destination

A08/ Číslo záhlaví výrobce, Manufacturer's works  
order No., Werksauftragstr., Num. de la commande  
de l'usine productrice

167404/2006

**S.I.A.T. SPA**  
**VIA DEI CAVALLARI, 37**  
**15077**  
**PREDOSA (AL)**  
**IT**

A07/ Číslo objednávky odběratele, Purchaser's  
order No., Kundenbestellnr., Numéro de la commande  
du client

505235/005  
1.75

A10/ Advo. Č., Advice Note No., Advco. Nr., Advco. No.:

B14/Vaon. Č., Waagon No., Waagon Nr.; B13/St. hm., Act. mass, Ist-Masse, Masse eff.

629235

315439376981

5 652 kg

Hot rolled heavy plates in quality P265GH/ P275 NH per EN  
10028/ASME SA 516 Gr.60/Gr.415 SA 20



EN ISO 9001:2000 / EN ISO 14001:1995  
Certifikáty E. 041003144800-EI, 041043144800-EI

Certified acc. to Pressure Equipment Directive 97/23/EC  
by TÜV CERT-Certification body for pressure equipment  
Certificate No. 04 202 2 111 01 0001.  
Zertifiziert nach Druckgeräten-Richtlinie 97/23/EG durch  
das TÜV CERT-Zertifizierungsorgan für Druckgeräte  
Zertifikat-Nr. 04 202 2 111 01 0001.

spedizioni@siatspa.it

B01/ Výrobek, Product, Erzeugnis, Produkt; B08/ Počet ks, No. of pieces, Stückzahl, Stückzahl;  
B09-B11/Rozměry, Dimensions, Maße, B12/ Teor. hm., Th. mass, Th. Masse, Masse th.

B02/ Označení oceli, Steel designation, Stahlbezeichnung,  
Désignation de l'acier

B03/ Dodací podmínky, Terms of Delivery,  
Lieferbedingungen, Conditions de livraison

12-2500-12000 mm

5 652 kg

2 plates

P265GH N

P265GH N

EN 10028-2

EN 10029 B/N

EN 10163-2, B/2

P275NH/SA 516 Gr.60/Gr.415

B14/ Tavná č.  
Heat No.  
Schmelz-Nr.  
No. de la coulée

C70

B08/ Počet ks  
No. of pieces  
Stückzahl  
No. de pièces

C00/ Identifik.  
Identification  
Identifizierung  
Identifizierung

C01

C02

C03

C10

C11

C13

C11

C12

C13

C02

C03

C40

C41

C42

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

C43

17226 Y

1

17346

A T

20

P

ReH

A5

324

465

26.4

L

-51

KV

300/7.5

159

108

106

124

1

17347

A T

20

P

ReH

A5

328

473

35.5

L

-51

KV

300/7.5

180

180

176

C71-C82/ Chemical composition

Heat	C	Mn	Si	P	S	Cu	Ni	Cr	Mo	V	Ti	Al	N	Nb	CEV
17226	0.13	0.95	0.21	0.013	0.005	0.04	0.03	0.05	0.01	0.004	0.002	0.044	0.009	0.003	0.31

B07/ Identification of the product:

Heat Test plates

17226 17346 82426 002 ←

17347 82427 002

NORMALIZED: walking beam furnace-length 70m, temperature 900°C/dwell 9min.

"C killed"

"Material produced in agreement with P.E.D.97/23/EG"

ASME ED 2004 ASME CODE SECTION II SA 20 AD 2005

C.I. CERTIFAC S.p.A.

Q.C. MGR. V. MEMO

Verified to ASME II<sup>o</sup> Part. A

ed. 2007 + add. 2008b

&amp; found conforming.

Original Certificate of Origin

S.I.A.T. SPA

SN 4320

Pos. 411-412  
501

Control of dimensions and results of surface inspection ; without objection.  
Masskontrolle un Oberflächenbesichtigung ; ohne Beanstandung.  
Contrôle de dimensions et contrôle visuel de surface : sans défauts.

Z01/ Tímto prohlašujeme na svou výlučnou odpovědnost, že uvedené výrobky na něž se vztahuje toto prohlášení jsou ve shodě s předpisy, které jsou specifikovány kupní smlouvou a je na výrobky vydáno prohlášení o shodě podle zákona č. 22/1967 Sb., o technických požadavcích na výrobky a o změně a doplnění některých zákonů, ve znění pozdějších předpisů a nařízení vlády č. 163/2002 Sb.. Es wird hiermit auf ausschließliche Verantwortung erklärt, dass die hier angeführten Erzeugnisse auf die sich diese Erklärung bezieht, entsprechen den im Kaufvertrag spezifizierten Vorschriften. Hereby we declare to our exclusive responsibility that the mentioned products to which this declaration is in accordance with regulations, which are specified by the contract. Nous déclarons à notre responsabilité exclusive que les produits mentionnés se référant à cette déclaration sont conformes aux prescriptions spécifiées par le contrat d'achat.

A04/ Značka výrobce:  
Manufacturer's mark:  
Zeichen des Herstellers:  
Marque du producteur:



Inspector's Stamp:  
Zeichen des Sachverständigen:  
Poinçon de réception:



Z02/ Ověření platnosti  
Z03/ Razítko zástupce kontroly

**VÍTKOVICE STEEL**

Martin ŠTEBEL

Independent authorized agent  
unabhängiger berechtigter Vertreter  
representant autorizat

SN4320 Pos. 770

<b>Inspection certificate 3.1</b>		No./N° (A03)	597734
<b>Certificato Collaudo Materiali 3.1</b>		Page/Pag	1/2
<b>DIN EN 10204</b>		Date/Data	19.11.2005
(A02)			
No. (A07)	500276	11.10.2005	No. (A07) 500276
Purchaser	Siderurgica Astico S.p.A.	Customer	Siderurgica Astico S.p.A.
Committee	I-36030 Fara Vicentino	Destination	I-36030 Fara Vicentino
(A06)			
Product	Hot rolled wide strip	Works order No.	0001035661
Prodotto	Nastro largo a caldo	N° d'ordine	
(B01)			
Steel grade and terms of delivery	Grade 60	Dispatch note No.	0080669481
Condizioni di materia e consegna	SA 516 / SA 20	Avviso di spedizione N°	16.11.2005
(B02-B03)		ASME SECTION II -Part A / Ed.99	Inspection
140		Collaudo	WS
		(A05)	

Material data / Dati del materiale (B01-B03)						
Item Pos.	Quantity Numero (B06)	Product No. N° prodotta (B07)	Heat No. N° Calata (B07)	Cond. of delivery State di fornitura (B04)	Thickness x Width Spessore x Largh. (B09-B11)	mm x mm
28	1	682950	52109	N	5,00 x 1500,0	
Σ	1	Weight Peso (B12)	29.460 kgs kg	N: normalized / normalizzato		
Dimensional check and visual examination of the surface condition: without objection						
Controllo delle dimensioni e controllo a vista della superficie: soddisfacente						


Ladle analysis / Analisi di colata (C70-C99)										
Heat No. N° Colata (B07)	C %	Si %	Mn %	P %	S %	N %	Al %	Cu %	Cr %	Ni %
52109	≤0,21	0,15-0,30	0,60-1,20	≤0,035	≤0,035			≤0,40	≤0,30	≤0,40
	0,09	0,24	1,15	0,011	0,004	0,006	0,033	0,07	0,04	0,05
Heat No. N° Colata (B07)	Mo %	Nb %	Ti %	V %	C.E.9(L)					
52109	≤0,12	≤0,02		≤0,03	0,30					
Steelmaking process: Basic oxygen process Procedimento di elaborazione: Proc. ossigeno (C70)										

*[Signature]*  
C. F. B. WIDAC S.p.A. Verified to ASME II° Part. A  
C. F. B. WIDAC S.p.A. MEMO ed. 2007 + add. 2009B  
& found conforming.

We hereby certify that the delivered material complies with the terms of the order.  
Viene confermato, che la consegna corrisponde alle richieste delle condizioni di consegna.  
(Z01)

 Trademark  
Marchio del produttore  
(A04)

Salzgitter Flachstahl GmbH  
Eisenhüttenstr. 39  
D-38239 Salzgitter  
(A01)

 Inspection Stamp  
Timbra dell'ispettore  
(Z03)

Inspection Representative  
Perito officina  
(Z02)

This certificate was prepared by a suitable data processing system and is valid without signature according to EN 10 204, section 5.  
Questo certificato è stato rilasciato da un sistema di elaborazione dei dati adatto secondo EN 10 204, articolo 5, e valido anche senza firma.

Kratz

**CERTIFICADO DE INSPECCION / INSPECTION CERTIFICATE**  
 CERTIFICADO DE INSPECCION 3.1 S/ EN 10204 / EN 10168  
 INSPECTION CERTIFICATE 3.1 ACCORDING TO EN 10204 / EN 10168

**ORDEN SUMINISTRO 7**  
 Works order: 306619

**N. CERTIFICADO / HOJA**  
 N. Certificate: 01547-02 Page of: 02

**FECHA / Date** 2007-10-03 **Z02** **SOCIEDAD INSPECTORA / Classification Society**  
 PEDIDO CLIENTE Customer's order: PO 1.102 **A07** **ARCELOR**

**CLIENTE / Customer**  
 SOCIETA ITALIANA ACCIAI TUBI S.P.A.  
 VIA DEI CAVALLARI, 37  
 15077 - PREDOSA (ALESSANDRIA)  
 ITALIA

**CHAPA**  
 PLATE  
 BLECHE  
 TOLES  
 LAMIERE

**ESPECIFICACION / Specification**  
 SA516-GRADE 70 ; P. 355 NH  
 ASME II-2004 ; EN 10028-3:03

**PROCEDIMIENTO DE ELABORACION / Making Process:**  
 B.O.S. CONTINUOUSLY CAST SLAB

**We certify hereby that the plates mentioned in this certificate comply with the specification and order requirements**

**N. DE CHAPA (PLATE N.) / MARCA FABRICANTE (TRADEMARK)** ENS  
 LTY N. COLADA (HEAT N.) MT  
 CALIDAD (QUALITY GRADE) /

NO. DE PLACA (Plate no.)	DIMENSIONES (Dimensions)		PESO (Weight) Kg	N. PIEZAS (Number of pieces)	COLADA (Heat)	NUMERO DE LA MUESTRA (Sample no.)	COMPOSICION QUIMICA (Chemical composition)																				
	mm	mm					C	Mn	Si	S	P	AI	N	CU	NI	CR	MO	NB	V	TI	C85	C86	C87	C88	SU07	SU05	T. Grano (Grain size) C80
A10	12,00	3000	3391	1	701048	C00	C71	C72	C73	C74	C75	C76	C77	C78	C79	C80	C81	C82	C83	C84	C85	C86	C87	C88	C89	C90	0,04
002	12,00	3000	16956	2	779483		0,16	1,10	0,24	0,03	0,13	0,36	0,031	1,94	0,358	0,020	0,002	0,15	0,24	0,003	0,002	0,013	0,013	0,002	0,017	0,017	0,04
006	30,00	3000	16956	2	779483		0,17	1,13	0,24	0,01	0,12	0,22	0,032	1,73	0,334	0,013	0,002	0,17	0,25	0,002	0,002	0,013	0,013	0,002	0,017	0,017	0,04
TOTAL :		20347		3																							

**Verified to ASME II° Part. A**  
 ed. 2007. + add. 2003b  
 & found conforming.

**CHAPA CALIDAD ORIGINAL**  
 ORIGINAL QUALITY PLATE  
 S.I.A.T. S.A.

**Por la Sociedad Inspectora (for the classification society)**  
 SN4320  
 Pos. 901

**Por (For)**  
 Jefe de Calidad Platos  
 Flat Products Quality Manager  
 Upstream Asturias  
 Francisco Suárez-Vaidés  
 Tlf: +34985187778  
 Fax: +34985187519

**ArceIorMittal**

**CGI/MC**







# WELDING MATERIALS

**NICROS s.r.l.**  
Via Tiepolo, 26 Z.I. Zerman  
31021 Mogliano Veneto (TV)  
tel. 041 5970166 fax 041 5970161  
P. IVA: 10992870153

deposito:  
Via G. Di Vittorio, 3  
20056 Trezzo sull'Adda (MI)  
tel. 02 9090477 fax 02 9091303

<b>CERTIFICATO N°: 136/07 EN 10204 2.2</b> Certificate n°:  <b>DATA: 10/09/2007</b> Date :  Merce consegnata con nostro DdT n. <b>000372</b> del <b>13/07/2007</b>	<b>CLIENTE:</b>  <b>C.I. CIVIDAC S.p.A.</b> <b>Via Borgo Cattanei, 35 Loc. Cavrie</b> <b>31048 SAN BIAGIO (TV)</b>
<b>PRODOTTO: FILO RAMATO SG2 Ø 0,80mm</b> Item:	<b>COLATA: 1916/P</b> Batch :
<b>SPECIFICHE: AWS A5.18 ER 70S-6</b> Specification:	<b>Quantita' consegnata</b>  <b>KG. 16,20</b>

**ANALISI CHIMICA %:**  
Chemical analysis %:

C	Si	Mn	P	S	Cr	Ni	Mo	Fe	V
0,06	0,82	1,44	0,013	0,008	0,05	0,024	0,004	Resto	0,002
Cu	Al	N	Zr + Ti	O					
0,134	0,002	0,007	0,007	0,001					

**NICROS s.r.l.**

**C.I. CIVIDAC S.p.A.**

(I dati riportati sono conformi all'originale)

## Certificato di prodotto / Product certificate

**Certificato N°:** Ordine N°: Bolla N°: Cliente:  
Certificate n°: Order n°: Delivery Note n°: Customer:  
ALW50090011-1375 18187 COSTRUZIONI IND.LI CIVIDAC  
**Data:** **Quantità:** **UM** VIA BORGO CATTANEI 35 LOC.CAVRIE'  
Date: Quantity: Unit: 31048 SAN BIAGIO DI CALLALTA  
20/04/2010 KG ITALY

**Designazione:** W000282661  
Trade name: FILCORD C 1.2X0016XB300XP

**Lotto N°:** / Batch n°:  
10043 1

**Classificazione:** ISO 14341: G 42 4 M G3Si1  
Classification: AWS A5.18 ER70S-6

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 prodotto / Product chemical analysis (%):

In accordo a / According to EN 10204-2.2

C	Mn	Si	P	S	Cr	Ni	Mo	V	Cu
0,075	1,44	0,85	0,01	0,009	0,024	0,017	0,003	0,001	0,08
Ti+Zr	Al								
0,001	0,001								

### 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/mm <sup>2</sup> ]	Trazione Tensile Strength Rm [N/mm <sup>2</sup> ]	Allungamento Elongation A [%]	Durezza Hardness HB	Resilienza - Impact strength (Charpy-V)		
						Temp: °C	Joule	Media Average
Come Saldato As Welded	20	421	511	26		-20	125,125	125
						-40	,101	101

**Note:** Cu - incluso rame del rivestimento (including copper coating)

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 - Storo Plant

Bocchi Luigi

Emesso da - issued by: Olivieri Elena

*[Signature]*  
C.I. CIVIDAC S.p.A.  
Q.C. M&P SIVEMO

## Certificato di prodotto / Product certificate

**Certificato N°:** Ordine N°: Bolla N°: Cliente:  
Certificate n°: Order n°: Delivery Note n°: Customer:  
ALW00090433-15  
**Data:** **Quantità:** **UM** **VIA BORGHI CATTANEI 35 - LOC.CAVRIE'**  
Date: Quantity: Unit: 31048 SAN BIAGIO DI CALLALTA  
14/01/2010 KG ITALY

**Designazione:** W000283324  
Trade name: CARBOROD 1 2.4X1000XTUB05

**Lotto N°:** / Batch n°:  
CBV011

**Classificazione:** ISO 636-A: W46 5 W4Si  
Classification: AWS A5.18:ER70S-6

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 prodotto / Product chemical analysis (%):

In accordo a / According to EN 10204-2.2

C	Mn	Si	S	P	Cu	Ni	Cr	Mo	V
0,07	1,7	0,9	0,014	0,01	0,035	0,05	0,05	0,006	0,01
Ti+Zr	Al								
0,07	0,01								

### 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/mm <sup>2</sup> ]	Trazione Tensile Strength Rm [N/mm <sup>2</sup> ]	Allungamento Elongation A [%]	Durezza Hardness HB	Resilienza - Impact strength (Charpy-V)		
						Temp: °C	Joule	Media Average
Come Saldato As Welded	20	440	540	26		-50		50

### 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 - Verona Unit

Piubello Andrea

Emesso da - issued by: Macchia Dino

C.I. CIVIDAC S.p.A.  
Q.C. NGR F. MEMO

ETC OERLIKON S.p.A.

SEDE LEGALE: VIA VÒ DI PLACCA 56  
35020 DUE CARRARE (PD) - ITALY  
TEL.: +39 049 91 99 411  
FAX: +39 049 91 99 405  
E-mail: info@etc.it  
web site: www.etc.it

The undersigned representative of

*Il sottoscritto rappresentante della*

ETC Oerlikon SpA  
Via Vò di Placca, 56  
35020 Due Carrare (PD) - Italy

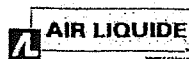
Certifies that the welding consumable listed below, except for trade name, are identical and they are manufactured to the same specifications, in the same plants, using the same raw materials, processes and facilities, and they have same AWS/SFA classification.

*Certifica che i consumabili di saldatura sotto indicati, sono identici eccetto per il loro nome commerciale e vengono fabbricati con le stesse specifiche, negli stessi siti produttivi, utilizzando le stesse materie prime, lo stesso processo produttivo e le stesse attrezzature, e hanno la stessa classificazione AWS/SFA.*

OERLIKON TRADE NAMES	ETC TRADE NAMES
CARBOROD 1	ETC TIG SG2


*Enrico Zuin*  
ETC Technical Office

*C. CIVIDAC*  
C. CIVIDAC S.p.A.  
D.C. MGR. P. MEMO



EN 10204/3.1

OAM, Hans Aström 2C22D0000

Buyer ref - Erhverf - Nr - Ref acheteur <b>4414000442</b>		Date - Datum - Date <b>2007-04-24</b>		Cert No - Zeugnis Nr - No de cert <b>294136</b>								
Consignes ref - Kunden-Best Nr - Ref destinataire		Our order - Auftrag - Notre référence <b>1041000442 000070</b>		Pack - Koffi - Coils <b>1018927</b>								
BOEHLER THYSSEN SALDATURA S.P.A.  20157 MILANO Italy		Requirements - Anforderungen - Exigences <b>EN 12072:1999 ISO 14343-A:2002</b>		W 23 12 2 L W 23 12 2 L (309LMO) <b>AWS A5.9</b>								
Product - Produkt - Produit <b>TIG WIRE ELECTRODES FOR STAINLESS STEEL WELDING</b>		Inspector's stamp  Abnahmeprüfstempel  Poinçon de l'appert										
Brand Mark  Herstellerzeichen  Sigt av produkt												
Designation - Bezeichnung - Désignation <b>AVESTA P6</b>												
Units of delivery - Lieferumfang - Etendue de livraison												
Pos	Weight	Dimension	Lpl No	Article No								
Anzahl	Gewicht	Dimension	Lot Nr	Artikel Nr								
Nombre	Poids	Dimension	No de lot	No. d'article								
	<b>50.00 Kg</b>	<b>2.40 mm</b>	<b>7454</b>	<b>TW8335-240000 58547</b>								
Chemical composition - Chemische Zusammensetzung - Composition chimique %					Fertile according to							
C	Si	Mn	P	S	Cr	Ni	Mo	Nb+Ta	Cu	N	DeLong WRC-92	
0.014	0.27	1.4	0.017	0.002	21.4	14.8	2.88	0.01	0.11	0.058	10	8
Test results - Prüfgebnisse - Résultats d'essai (1 N/mm <sup>2</sup> = 1 MPa)												
Temp	Rp0.2	Rm	A5									
°C	N/mm <sup>2</sup>	N/mm <sup>2</sup>	%									
+ 20	425	613	31									
THE ABOVE MECHANICAL PROPERTIES REFER TO PURE WELD METAL. THE VALLIES ARE STATISTICAL DATA, OBTAINED FROM OUR CONTINUOUS QUALITY CONTROL SYSTEM.												

AVESTA WELDING AB  
BOX 401  
S-774 27 AVESTA  
SWEDEN  
VAT NR: SE 564017785601  
[www.avestawelding.com](http://www.avestawelding.com)

The requirements stipulated are satisfied.  
Die gestellten Anforderungen sind erfüllt.  
Les conditions imposées sont satisfaites.

AVESTA WELDING AB  
QA-DEPARTMENT

Martin Larén



Certificate No. 2006-SWEN-AQ-2191

C.I. CIVIAC S.p.A.  
G.C. MGR P. MEMO

## Certificato di prodotto / Product certificate

**Certificato N°:** Ordine N°: Bolla N°. Cliente:  
Certificate n°: Order n°: Delivery Note n°: Customer:  
ALW04081050-998  
**Data:** **Quantità:** **UM** **Cliente:**  
Date: Quantity: Unit: Customer:  
22/02/2010 N. 31048 SAN BIAGIO DI CALLALTA  
ITALY

**Designazione:** 0010502015 **Lotto N° / Batch n°:**  
Trade name: ELECTRODE ETC PH 35S 3.25X0450XCBOX 0042001

**Classificazione:** AWS A5.1 E7018-1 H4  
Classification: EN ISO 2560-A: E42 5 B32 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 10204-2.2

C	Mn	Si	Cr	Ni	Mo	S	P	Cu	Nb
0,046	1,33	0,4	0,02	0,03	0,01	0,005	0,013	0,02	0,006
V									
0,021									

### 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/mm <sup>2</sup> ]	Trazione Tensile Strength Rm [N/mm <sup>2</sup> ]	Allungamento Elongation A [%]	Durezza Hardness HB	Resilienza - Impact strength (Charpy-V)		
						Temp: °C	Joule	Media Average
Come Saldato As Welded	20	483	537	31,8		-50		163

### 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

Buletto Graziano

Emesso da - issued by: Marastoni Francesca

  
C.I. OERLIKON S.p.A.  
Q.C. MICRO MEMO

## Certificato di prodotto / Product certificate

**Certificato N°:** Ordine N°: Bolla N°: Cliente:  
Certificate n°: Order n°: Delivery Note n°: Customer:  
ALW04060332-880 2650 COSTR.IND.LI CIVIDAC SPA  
**Data:** **Quantità:** **UM** VIA BORGO CATTANEI 35 - LOC.CAVRIE'  
Date: Quantity: Unit: 31048 SAN BIAGIO DI CALLALTA  
24/03/2010 N. ITALY

**Designazione:** 0010502016  
Trade name: ELECTRODE ETC PH 35S 4.00X0450XCBOX

**Lotto N°:** / Batch n°:  
0032001

**Classificazione:** AWS A5.1 E7018-1 H4  
Classification: EN ISO 2560-A: E42 5 B32 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 10204-2.2

C	Mn	Si	Cr	Ni	Mo	S	P	Cu	Nb
0,064	1,39	0,39	0,02	0,01	0,01	0,005	0,013	0,02	0,006
V									
0,02									

### 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/mm <sup>2</sup> ]	Trazione Tensile Strength Rm [N/mm <sup>2</sup> ]	Allungamento Elongation A [%]	Durezza Hardness HB	Resilienza - Impact strength (Charpy-V)		
						Temp: °C	Joule	Media Average
Come Saldato As Welded	20	487	533	32,5		-50		161

#### 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

Moretti Francesco

Emesso da - issued by: Olivieri Elena

C.I. CIVIDAC S.p.A.  
Q.C. MEMO

## Certificato di prodotto / Product certificate

**Certificato N°:** Ordine N°: Bolla N°: Cliente:  
Certificate n°: Order n°: Delivery Note n°: Customer:  
ALW04060334-540  
COSTR.IND.LI CIVIDAC SPA  
VIA BORGO CATTANEI 35 - LOC.CAVRIE'  
**Data:** **Quantità:** **UM**  
Date: Quantity: Unit:  
22/02/2010 N.  
31048 SAN BIAGIO DI CALLALTA  
ITALY

**Designazione:** 0010502018 **Lotto N°:** / Batch n°:  
Trade name: ELECTRODE ETC PH 35S 5.00X0450XCBOX 9402005

**Classificazione:** AWS A5.1 E7018-1 H4  
Classification: EN ISO 2560-A: E42 5 B32 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 10204-2.2

C	Mn	Si	Cr	Ni	Mo	S	P	Cu	Nb
0,065	1,3	0,35	0,03	0,03	0,01	0,007	0,014	0,03	0,005
V									
0,014									

### 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/mm <sup>2</sup> ]	Trazione Tensile Strength Rm [N/mm <sup>2</sup> ]	Allungamento Elongation A [%]	Durezza Hardness HB	Resilienza - Impact strength (Charpy-V)		
						Temp: °C	Joule	Media Average
Come Saldato As Welded	20	462	522	34,4		-50		163

### 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

Moretti Francesco

Emesso da - issued by: Marastoni Francesca

C.I. CIVIDAC S.p.A.  
Q.C. MEMO



# PRODUCT CONFORMANCE REPORT

<b>Product Class</b> L61 AWS A5.17 ASME SFA 5:17:EM12K EN756:S2Si	<b>Item No.</b> FL61-4-25 <b>Lot/batch</b> e140403387 <b>Size(s) mm</b> 4.0 X 25Kg
<b>Customer</b> COSTRUZ.INDUSTRIALI CIVIDAC SPA BORGO CATTANEI 35 31048 S.BIAGIO DI CALLALTA Italy	<b>Customer ref.</b> 10/00010 <b>Our reference:</b> SIC10532 <b>Quantity</b> 1.000,0 KG

Chemical analysis (%) According to EN10204:2004 2.2

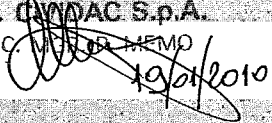
C	Si	Mn	P	S	Cr	Ni	Mo	Cu	V	Al
0.109	0.21	0.99	0.01	0.01	0.031	0.036	0.01	0.017	0.01	0.01

Mechanical tests, all weld metal According to EN10204:2004

Additional information According to EN10204:2004

Other tests

Remarks

C.I. CIVIDAC S.p.A.  
 Q.C. MEMO  
  
 19/01/2010

The product identified above has been manufactured, tested and supplied in compliance with a certified ISO 9001:2000 Quality Assurance Programme.

<b>Company</b> LINCOLN ELECTRIC ITALIA S.p.A. Registered office: VIA F.LLI CANEPA 8 16010 SERRA RICCO, GE Italy		<b>Printed by</b> S. Lucchi Telephone: 010/754111	<b>Function</b> DGE Fax: 010/7541150	<b>Date</b> 14/01/2010	<b>Cert. No.</b> 9956729
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# PRODUCT CONFORMANCE REPORT

<b>Product Class</b> L50M (LNS133U) AWS A5.17 ASME SFA 5.17:EH12K EN756-S3Si	<b>Item No.</b> FL50M-32-25 <b>Lot/batch</b> F1SW90530 <b>Size(s) mm</b> 3,2
<b>Customer</b> SOMA srl VIA DELLE INDUSTRIE 15 31050 PONZANO VENETO Italy	<b>Customer ref.</b> DIRETTO CALLEGHER <b>Our reference:</b> SIC10746 <b>Quantity</b> 100,0 KG

Chemical analysis (%) According to EN10204:2004 2.2

C	Si	Mn	P	S	Cr	Ni	Mo	Al	Cu	V
0,08	0,35	1,60	<0,01	<0,01	0,06	0,05	<0,01	<0,01	0,05	<0,01

Mechanical tests, all weld metal According to EN10204:2004

Additional information According to EN10204:2004

Other tests

Remarks

C.I. DAC S.p.A.  
 Q.C. MEMO  
 20/01/2010

The product identified above has been manufactured, tested and supplied in compliance with a certified ISO 9001:2000 Quality Assurance Programme

<b>Company</b> LINCOLN ELECTRIC ITALIA SpA Registered office: VIA F.LLI CANEPA 8 16010 SERRA RICCO', GE Italy	LINCOLN ELECTRIC FRANCE Avenue Franklin Roosevelt 76127 LE GRAND QUILLY CEDEX France Téléphone: 02 35 40 40 Fax: 02 32 40 11 RC 80001530 ROUEN SIRET: 800015301000107	<b>Printed by</b> S. Lucchi Telephone: 010/754111	<b>Function</b> DGE Fax: 010/7541150	<b>Date</b> 19/01/2010	<b>Cert. No.</b> 9956848
--	--	--	---	---------------------------	-----------------------------



# Test Report

Product Class: P240  
 AWS A5.17/23 ASME SFA5.17/23  
 F7A6 EM12K F7AP10 EN12-Ni2

Customer: SOMA srl  
 VIA DELLE INDUSTRIE 15  
 31050 PONZANO VENETO  
 Italy

Item No.: FXP240-25SRB  
 Lot/batch: F1FX100024A **OK**  
 Size(s) mm: X

Customer ref.: SIC16161  
 Our reference: SIC16161  
 Quantity: 400,0 KG

Chemical analysis (%) According to EN10204:2004 2.2

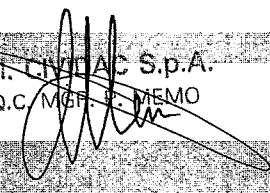
Si	Mn	Cr	Ni	Mo	Al	Ti	V	Zr	Mg	Fe	Ca	K
8,94	0,58	0,08	0,08	0,13	7,88	0,36	0,07	0,13	18,60	0,66	17,70	0,49

Mechanical tests, all weld metal According to EN10204:2004

Additional information Other tests According to EN10204:2004

Remarks

C. LUCCHI S.p.A.  
 Q.C. MGR. F. MEMO



The product identified above has been manufactured, tested and supplied in compliance with a certified ISO 9001:2000 Quality Assurance Programme

Company: LINCOLN ELECTRIC ITALIA S.p.A.  
 Registered office:  
 VIA F.LLI CANEPA 8  
 16010 SERRA RICCO, GE  
 Italy

**LINCOLN ELECTRIC FRANCE**  
 Avenue Franklin Roosevelt  
 76177 LE GRAND QUILLY CEDEX  
 FRANCE  
 Téléphone: 02 35 74 40 40  
 Fax: 02 35 74 40 11  
 N°C 180 251 375 B 00128  
 SIREN 311 92107

Printed by: S. Lucchi  
 Telephone: 010/754111

Function: DGE Date: 16/04/2010 Cert. No.: 9960261  
 Fax: 010/7541150



**CLIENT / CLIENTE** : **TURBODEN**  

---

**ITEM / SIGLA** : **REGENERATOR/CONDENSER T10 HR**  

---

**S.N. / NF** : **4320**  

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**JOB / COMM.** : **2010/005/T**  

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**ORDER / ORDINE** : **10PU - 000265 - PR**  

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**DWG / DISEGNO** : **6725-2010**  

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**CERTIFICATE OF CONFORMITY**

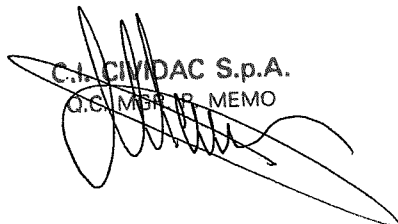
We confirm that all material, which certificate are not listed in “ Summary of mill report “ correspond to that required on the “As built ” drawing.

**CERTIFICATO DI CONFORMITA'**

Noi confermiamo che tutti i materiali ,i cui certificati non sono inseriti nell'elenco materiali usati, corrispondono a quelli riportati nel disegno costruttivo.

**DATE / DATA :** 16/06/2010

**C.I. CIVIDAC S.p.A.**

  
C.I. CIVIDAC S.p.A.  
O.S. MEMBER MEMO



*Costruzioni Industriali Cividac Spa*  
*S. Biagio di Callalta – Treviso – Italy*

Tel. 0039.0422.895090 – Fax 0039.0422.895121 – Email [info@cividac.com](mailto:info@cividac.com)

# SECTION

# F



**DIMENSIONAL AND VISUAL CHECK REPORT**  
 CERTIFICATO CONTROLLO DIMENSIONALE E VISIVO

REPORT NO. **4320/DT**  
 Certific. N°

SHEET **1** OF **1**  
 Foglio Di

<b>CUSTOMER</b> Cliente	<b>ORDER NO.</b> Ordine N°	<b>JOB NO.</b> Commessa N°	<b>DATE</b> Data
<b>TURBODEN</b>	<b>10PU-000265-PR</b>	<b>2010/005/T</b>	<b>16/06/2010</b>
<b>ITEM</b> Sigla	<b>PLANT</b> Impianto		<b>SERIAL NO.</b> N° fabbr.
<b>T10 HR</b>	<b>CONDENSATOR / REGENERATOR</b>		<b>4320</b>
			<b>DWG NO.</b> Dis. N°
			<b>6725-2010</b>
			<b>REV. NO.</b> Rev. N°
			<b>01</b>

**CODE CONSTRUCTION**  
 Norme di costruzione **ASME VIII Div. 1 Ed. 2007 Add. 2009b**

**TECHNIQUE USED**  
 Tecnica usata  **DIRECT** Diretta  **REMOTE** Indiretta

**PROCEDURE NO.**  
 Procedura N° **VT-315** **REV. 03**  
 Rev.

**CHECK RESULT**  
 Risultato esame

THE DIMENSIONS TAKEN DURING THE DIMENSIONAL CONTROL ARE IN ACCORDANCE WITH THE REQUIRED TOLERANCE AS PER YOUR SUBJECT ORDER.

WE HEREBY DECLARE THAT VISUAL CHECK ON THE **APPARATUS** FOR THE A. M. DRAWINGS HAS GIVEN SATISFACTORY / ~~NOT SATISFACTORY~~ RESULTS.

LE QUOTE RILEVATE NEL CONTROLLO DIMENSIONALE RIENTRANO NELLE TOLLERANZE PRESCRITTIVE DAL VOSTRO ORDINE SOPRACITATO.

SI DICHIARA CHE IL CONTROLLO VISIVO RELATIVO ALL' **APPARECCHIO** DI CUI AI SOPRACITATI DISEGNI HA DATO ESITO SODDISFACENTE / ~~INSODDISFACENTE~~.

**REMARKS**  
 Note:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

<b>DATE</b> Data	<b>INSPECTOR SIGN.</b> Firma ispettore	<b>DATE</b> Data	<b>INSPECTOR SIGN.</b> Firma ispettore	<b>DATE</b> Data	<b>Q. C. MANAGER SIGN.</b> Firma Q. C. Manager
		16/06/2010		16/06/2010	



**DIM. EXAMINATION FOR FORMED HEADS**

ESAME DIMENSIONALE PER FONDI FORMATI

SHEET 1 OF 1  
Foglio di

DATE 21/04/2010  
Data

JOB NO. 2010/005/T Commessa N°  
ORDER NO. 10PU-000265-PR Ordine N°  
ITEM NO. T10 HR Sigla  
SERIAL NO. 4320 N° fabbr.

SHAPE OF HEAD:  ELLIPTICAL  POLYCENTRIC  COCENT. CONE  ECCENT. CONE  EXP. BELLOW  
Forma del fondo:  Ellittico  Policentrico  Cono Concentr.  Cono Eccentr.  Dilatatore

MATERIAL SA 516 Gr. 70  
HEAT NO. 341802 Colata N°  
TEST NO. 90815 01 Prova N°  
TEST REPORT NO. 351602-002 04/01/2010 Certif. prova N°

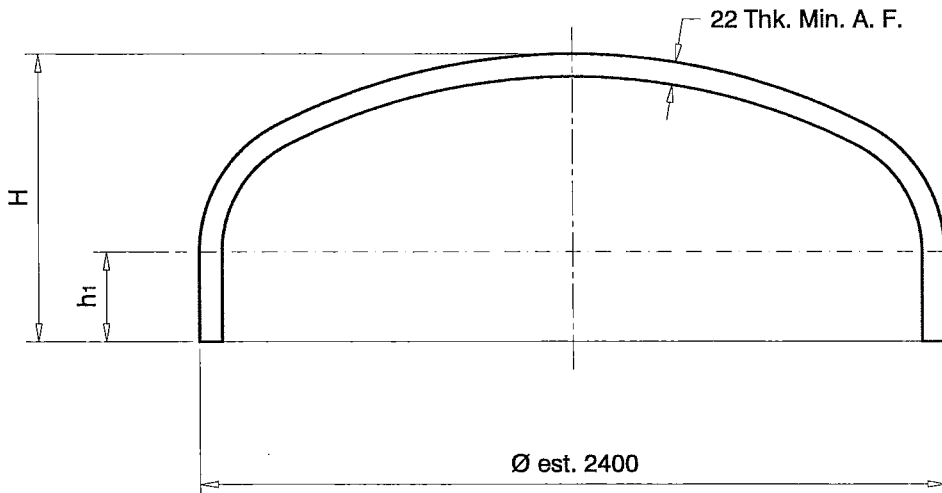
FORMING PROCESS:  COLD  HOT  
Tipo formatura:  A freddo  A caldo

HEAT TREATMENT:  STR. RELIEVING AT  NORMALIZING AT  SOLUT. ANNEAL AT  
Tratt. termici:  Ricottura a °C  Normalizzazione a °C  Solubilizzazione a °C

ATTACHED:  CHART  STATEMENT  
Allegato:  Diagramma  Dichiarazione

FIGURES Diciture	DIAMETERS Diametri Ext. / Int. (mm)	LENG. CIRCUMF. Lung. circonferenza Ext. / Int. (mm)	OUT OF ROUNDNESS Fuori rotondità (mm)				Thk. Sp. (mm)	H (mm)	h1 (mm)	DEV. OF SHAPE Dev. di forma (mm)
NOMINAL VALUES AND TOLERANCES Valori nominali e tolleranze	2400	7540	( $\leq 1\%$ ) = 24 max				22	685	75	+ 30 / - 15
	/	/	/							
FOUND VALUES Valori rilevati	2399,1	7537	A	B	C	D	22,89	685	75	+ 11
	/	/	-1	-1	-1	0				
	/	/	A	B	C	D				
	/	/	/	/	/	/				

HEAD NO. "1" Pos. 201



DATE Data	INSPECTOR SIGNATURE Firma ispettore ARIS WITNESS ASME AI - J. BREDA 13819 A 7/104/2010	DATE Data 21/04/2010	INSPECTOR SIGNATURE Firma ispettore Q.C.I. - L. Mazzocato	DATE Data 21/04/2010	Q.C. MANAGER SIGNATURE C.I. CIVIDAC S.p.A. Q.C. MGR. MEMO
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**DIM. EXAMINATION FOR FORMED HEADS**

ESAME DIMENSIONALE PER FONDI FORMATI

SHEET 1 OF 1  
Foglio di

DATE 05/05/2010  
Data

JOB NO. 2010/005/T Commessa N°  
ORDER NO. 10PU-000265-PR Ordine N°  
ITEM NO. T10 HR Sigla  
SERIAL NO. 4320 N° fabbr.

SHAPE OF HEAD:  ELLIPTICAL  POLYCENTRIC  COCENT. CONE  ECCENT. CONE  EXP. BELLOW  
Forma del fondo:  Ellittico  Policentrico  Cono Concentr.  Cono Eccentr.  Dilatatore

MATERIAL Materiale SA 516 Gr. 70 SA 516 Gr. 70	HEAT NO. Colata N° 1NE936 1NE936	TEST NO. Prova N° 1NE936/04/02B 1NE936/04/02B	TEST REPORT NO. Certif. prova N° 187601 13/10/2009 187601 13/10/2009
---	---	--	---

FORMING PROCESS:  COLD  HOT  
Tipo formatura:  A freddo  A caldo

HEAT TREATMENT:  STR. RELIEVING AT °C  NORMALIZING AT 910 °C  SOLUT. ANNEAL AT °C  
Tratt. termici:  Ricottura a  Normalizzazione a  Solubilizzazione a

ATTACHED:  CHART  STATEMENT  
Allegato:  Diagramma  Dichiarazione

FIGURES Diciture	DIAMETERS Diametri Ext. / Int. (mm)	LENG. CIRCUMF. Lung. circonferenza Ext. / Int. (mm)	OUT OF ROUNDNESS Fuori rotondità (mm)				Thk. Sp. (mm)	H (mm)	h1 (mm)	DEV. OF SHAPE Dev. di forma (mm)
NOMINAL VALUES AND TOLERANCES Valori nominali e tolleranze	2370	7445,6	1% = 23,7				16	1030	65	R = 190
	1070	3361,5	1% = 10,7						45	R = 90
FOUND VALUES Valori rilevati	2371,1	7449	A +2	B 0	C +1	D +1	16,15	1030	65	OK
	1072,4	3369	A +2	B +3	C +3	D +2			45	OK

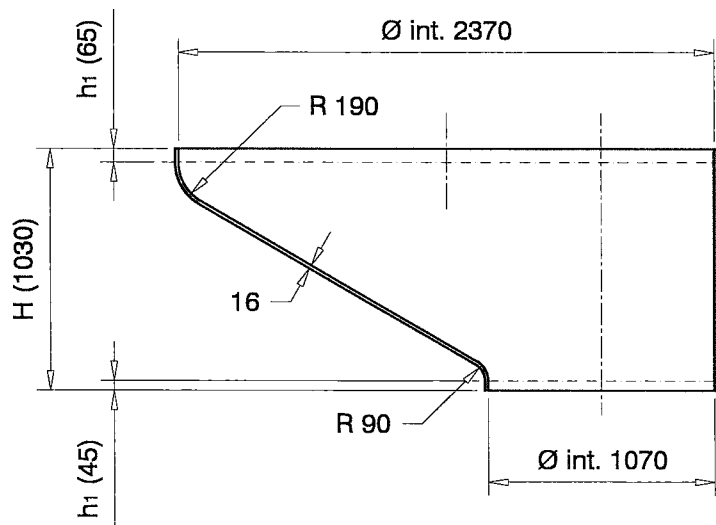
ECCENTRIC CONE NO. "1" Pos. 301

ALLOWABLE REDUCTION OF THICKNESS OF THE 12% ON THE KNUCKLE RADIUS ( Thk. ≥ 14,08 After Forming )

E' ammissibile una riduzione dello spessore sul 12% della curvatura raggio ( Spessore ≥ 14,08 dopo formatura )

MINIMUM THICKNESS FOUND ON THE KNUCKLE RADIUS: 15,40 mm

Spessore minimo rilevato su curvatura raggio:



DATE Data	INSPECTOR SIGNATURE Firma ispettore ARISE WITNESS ASME AI- U BREDA 18676 A 7/10/2010	DATE Data 05/05/2010	INSPECTOR SIGNATURE Firma ispettore Q.C.I. - L. Mazzocato	DATE Data 05/05/2010	Q.C. MANAGER SIGNATURE C.I. CIVIDAC S.p.A. Q.C. MGR V. MEMO
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Società Italiana Fondi bombati e affini  
 35020 Legnaro (Padova) - Via L. Da Vinci, 3  
 Tel. ++39 0498 830 188 - Fax ++39 0496 412 47

Legnaro, li 22/04/2010

Spett. le

Costr. Ind. CIVIDAC S.p.A.  
 Via Borgo Cattanei, 35 - Loc. Cavrie  
 31048 S. BIAGIO di CALLALTA (TV)

Subject: forming declaration.

Certificate nr. : 28746CL 1  
 Order nr : 2010/186  
 Job : 2010/016/T+2010/005/T+2010/012-13/T

We hereby confirm that cones listed have been cold beaded on bigger diameter and formed by hot pressing on smaller diameter, according to code:

**ASME Sect. VIII Div. 1 Ed. 2007 Add. 2009b Para. UCS-56, UCS-79, UG-80 and UG-81**

Heat treatment : **normalizing**

Q.TY	TYPE PRODUCT	DIMENSIONS	MATERIAL	Job
1	Ecc. cone	I.D. 2370 X 16	SA516-70	2010/005/T
		I.D. 1070 TH=1030		

Best regards.

S.I.F.E.B. S.p.A.

C.I. CIVIDAC S.p.A.  
 Q.C. MGR. P. MEMO

ARISE  
 Reviewed by  
 ASME AI - UBBREDA  
 13876 A 7/10/2010



Trattamento Termico n. 47/2010  
Heat treatment nr.

del 21/04/2010  
of

Cliente: / Costumer:

Il materiale sottoposto al trattamento termico è descritto nella distinta allegata:  
Products treated are described in the attached list.

Descrizione del trattamento termico:  
Heat treatment details:

Temperatura di Ingresso: ambiente  
Load temperature: room temperature

Velocità salita: 150°C/h max da 300°C  
Heating rate:

Permanenza: 60 minuti  
Holding time:

Temperatura di trattamento: 910°C ±10°C  
Treatment temperature:

Raffreddamento: aria calma  
Cooling rate:

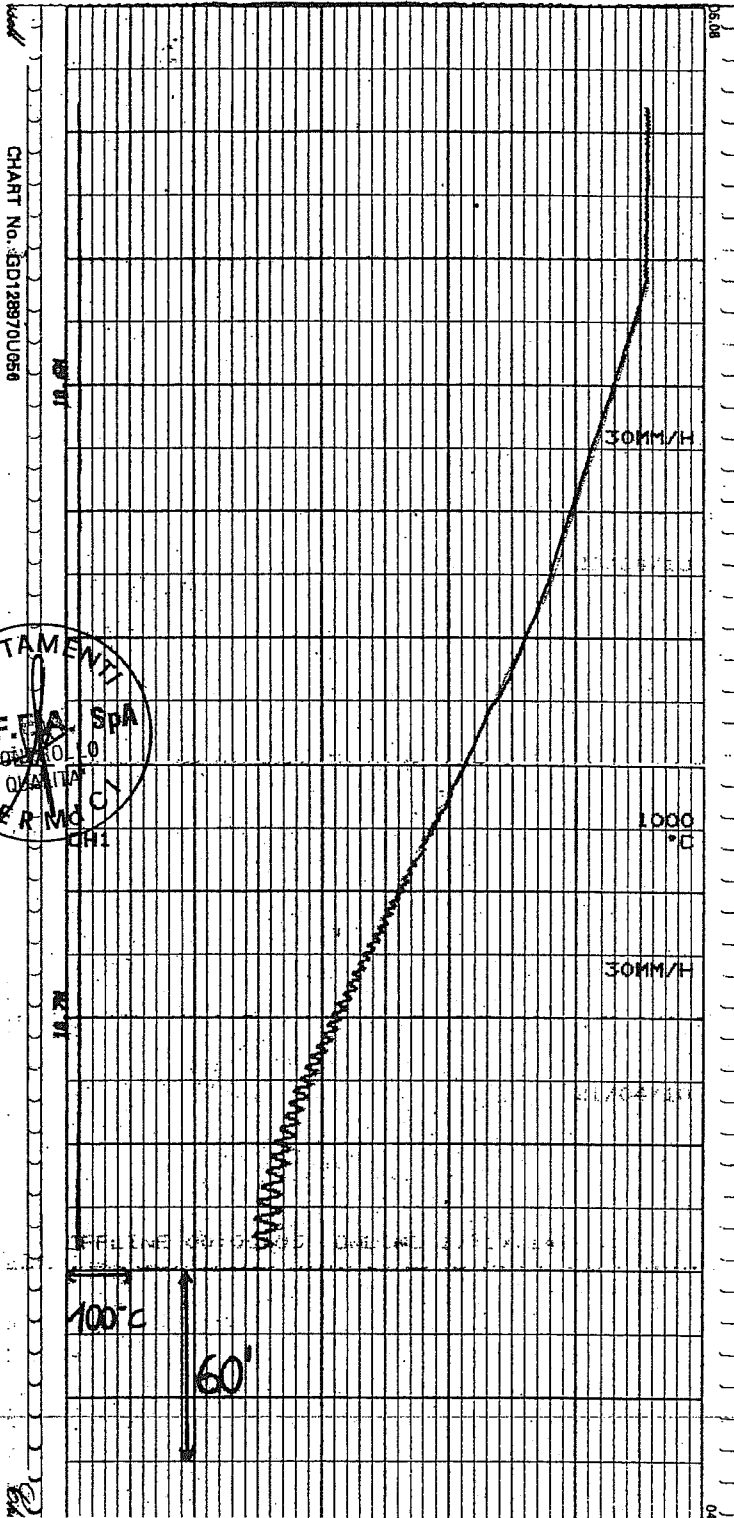
Termocoppie tipo Chromel-Allumen: (K)  
Chromel-Alumen Thermocouples (k)

Registratore Eurotherm Chessel Mod. 4102  
Eurotherm Chessel recorder Mod. 4102

Velocità carta 30 mm/h  
Paper Speed 30 mm/h

Scala Carta 0° C - 1000°C  
Paper scale 0° C - 1000°C

Diagramma ridotto 24%  
Diagram reduced to 24%



ARISE  
Reviewed by  
ASME AL - U. BREDA  
13616 A 7/may/2010

S.I.F.E.A. S.p.a.  
Rosso Marco

C.I. CIVIDAC S.p.A.  
Q.C. MGR/MEMO



**STUDIO TECNICO**  
**Mario Cuzzolin s.r.l**

## LABORATORIO/LABORATORY

Pagina/Page: **1 di/of 4**

**RAPPORTO DI PROVA N° :** 14813

*Test report n°*

**RICHIEDENTE :** CIVIDAC S.p.a. - Costruzioni Industriali

*Customer*

**INDIRIZZO :** Via Borgo Cattanei, 35 - Localit# CAVRIE'  
31048 - SAN BIAGIO DI CALLALTA (TV)

*Address*

**OGGETTO :** Test accoeding to ASME VIII Div. 1 Ed. 2007 Add. 2009b + ASME UG 84

*Item*

**IDENTIFICAZIONE :** Sample 1NE936-1NE936/04/02B

*Identification*

**BOLLA DI ENTRATA :** Ddt 136

*Bill of entry*

Distinta di prelievo 2010/005/T-1 del 06,05,2010

**DATA :**

06,05,2010

*Date*

IL PRESENTE RAPPORTO E' COSTITUITO DAI SEGUENTI RESOCONTI DI PROVA :

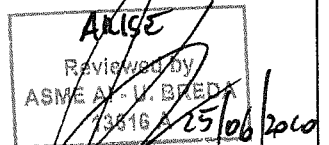
*This report includes the following tests*

Prova di Trazione/Tensile test	*	Vedi pag./see page :	2 di 4
Prova di Piega/Bend test		Vedi pag./see page :	
Prova di Resilienza/Impact test	*	Vedi pag./see page :	3 di 4
Prova di Durezza/Hardness test		Vedi pag./see page :	
Prova di Frattura/Fracture test	*	Vedi pag./see page :	
Esame Macrografico/Macro examination		Vedi pag./see page :	
Esame Micrografico/Micro examination		Vedi pag./see page :	
Trattamenti Termici/Heat treatment	*	Vedi pag./see page :	4 di 4
Controllo M.T/Magnetic particle examination	*	Vedi pag./see page :	
Controllo R.X./Radiographic examination	*	Vedi pag./see page :	
Controllo L.P./Penetrant examination	*	Vedi pag./see page :	
Controllo U.T./Ultrasonic examination	*	Vedi pag./see page :	
Esame Visivo/Visual examination	*	Vedi pag./see page :	

(\* Prova non accreditata dal SINAL)

**DATA DI ESECUZIONE DELLA/E PROVA/E :** see annex

*Test date*



LA RIPRODUZIONE DEL PRESENTE RAPPORTO DEVE ESSERE AUTORIZZATA ESPPLICITAMENTE DAL RESPONSABILE DEL LABORATORIO E DAL SINAL - *This report shall not be reproduced without the approval of the laboratory responsible and SINAL.*

I RISULTATI CONTENUTI NEL PRESENTE RAPPORTO SI RIFERISCONO ESCLUSIVAMENTE AGLI OGGETTI PROVATI - *The test results relate only to the item tested.*

CAMPIONAMENTO EFFETTUATO DAL CLIENTE - *Sampling executed by customer*

TEMPO DI CONSERVAZIONE - *STORAGE TIME :*

- CAMPIONE - *SAMPLE* = 90 giorni - 90 days
- RAPPORTO DI PROVA - *TEST REPORT* = 10 anni - 10 years
- REGISTRAZIONE DATI PROVE - *DATA RECORDING TEST* = 2 anni - 2 years

C.I. CIVIDAC S.p.A.  
Q.C. MGR. P. MEMO

**DATA DI EMISSIONE :**

*Emission date*

20,05,2010

**RESPONSABILE LABORATORIO**

*Laboratory responsible*

**Per.Ind. Mario Cuzzolin**



**STUDIO TECNICO**  
Mario Cuzzolin s.r.l

**RAPPORTO DI PROVA**

**PROVA DI TRAZIONE**

Tensile test

Cliente/Customer : <b>CIVIDAC S.p.a. - Costruzioni Industriali</b>	Commessa/Job : 2010/0520	Rapporto/Report : <b>14813</b>
Materiale/Material : <b>SA 516 Gr. 70</b>	Data di prova/Test date : 20,05,2010	Pagina/Page : <b>2 di/of 4</b>

**CONDIZIONI D'ESAME/TEST CONDITIONS**

Norma di rif./Reference standard <b>ASTM A 370</b>	Criteri di accettabilità/Reference standard <b>ASME VIII Div.1 Ed.2007 Add.2009b + UG 84</b>	Istruzione di lavoro/Instruction of work <b>IL006#0 - IL006#1</b>
Norma di taratura/Calibration Standard <b>UNI EN ISO 7500-1:2005</b>		

**MACCHINE DI PROVA/TESTING MACHINE**

Galdabini PM 50 matr. 32508-32509 (01A)	Galdabini PM 20 matr. 24394-24395 (02A)	Galdabini PM 60 matr. 29618 (03A)																										
<table border="1"> <tr><th>Scala (KN)</th><th>Classe</th></tr> <tr><td>25</td><td>1</td></tr> <tr><td>50</td><td>0,5</td></tr> <tr><td>100</td><td>0,5</td></tr> <tr><td>250</td><td>0,5</td></tr> <tr><td>500</td><td>0,5</td></tr> </table> <input type="checkbox"/>	Scala (KN)	Classe	25	1	50	0,5	100	0,5	250	0,5	500	0,5	<table border="1"> <tr><th>Scala (KN)</th><th>Classe</th></tr> <tr><td>25</td><td>1</td></tr> <tr><td>50</td><td>0,5</td></tr> <tr><td>100</td><td>0,5</td></tr> <tr><td>200</td><td>0,5</td></tr> </table> <input checked="" type="checkbox"/>	Scala (KN)	Classe	25	1	50	0,5	100	0,5	200	0,5	<table border="1"> <tr><th>Scala (KN)</th><th>Classe</th></tr> <tr><td>600</td><td>0,5</td></tr> </table> <input type="checkbox"/>	Scala (KN)	Classe	600	0,5
Scala (KN)	Classe																											
25	1																											
50	0,5																											
100	0,5																											
250	0,5																											
500	0,5																											
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25	1																											
50	0,5																											
100	0,5																											
200	0,5																											
Scala (KN)	Classe																											
600	0,5																											
Certificati di taratura n° 0906933FSE e n°0906936FSE e n° 0906932FSE eseguiti in data 10/09/2009 da centro SIT n°52																												

**Risultati delle prove / Test results**

CARATTERISTICHE MECCANICHE Mechanical characteristics						Carico snervamento superiore R <sub>eH</sub> Upper yield strength		Carico di rottura R <sub>m</sub> Tensile strength		Allungamento % dopo rottura Elongation % after fracture		Strizione reduction of area		
Valori richiesti Requirements														
Pos.	Direz. prel.	Numero saggio	Spessore mm		Area S <sub>0</sub> mm <sup>2</sup>	L <sub>0</sub> mm	N.	N/mm <sup>2</sup>	N.	N/mm <sup>2</sup>	mm	A %	Z%	
Position	direction	N° test piece	Thickness		Area									
1	T	1NE936-1NE936/04/02 B	15,9	x	12,5	198,8	50,8	71689	360,7	98493	495,6	71,1	40,0	77,5
/														

Annotazioni :  
Notes :

**Esecutore**  
Operator  
Per. Inf. Andrea Simionato

**L' Ispettore**  
Inspector

**APUSC**  
Reviewed by  
ASME A - U BREDA  
CIVIDAC S.p.A.  
C.C. MEMO







RAPPORTO DI PROVA

TRATTAMENTI TERMICI

STUDIO TECNICO  
Mario Cuzzolin s.r.l

Heat treatment

Clientel/Customer : <b>CIVIDAC S.p.a. - Costruzioni Industriali</b>	Commessa/Job : 2010/0520	Rapporto/Report : <b>14813</b>
Materiale base/Base material : <b>SA 516 Gr. 70</b>	Data di prova/Test date : 17,05,2010	Pagina/Page : <b>4 di/of 4</b>
Saggio/Test piece : <b>1NE936-1NE936/04/02B</b>	Spessore mm/Thickness mm : <b>16,0 mm</b>	D.est.mm/D.ext mrr Tipo/Type : <b>Plate</b>
OGGETTO/ITEM : <b>Trattamento termico ( Heat treatment )</b>		

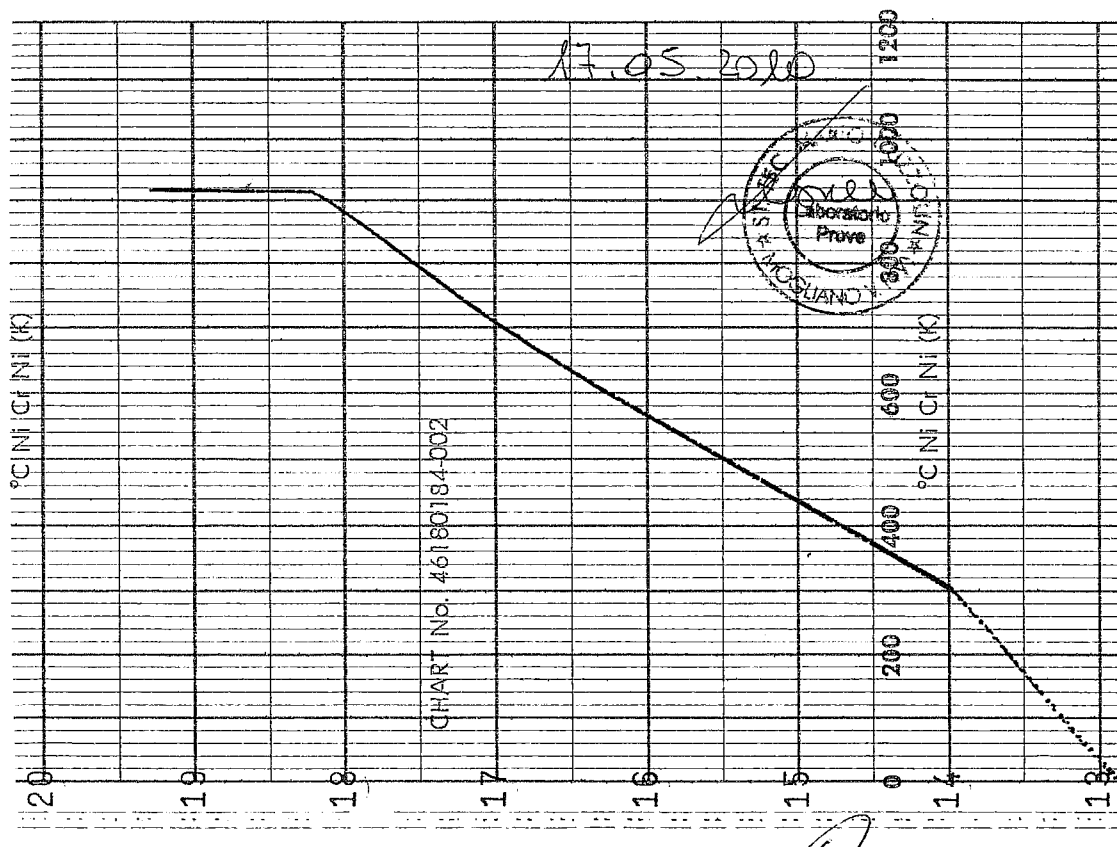
CONDIZIONI D'ESAME/TEST CONDITIONS

Procedura di controllo/Test procedure Istruzione di lavoro/Instruction of work  
 Raccolta "S"  Richiesta cliente  Altre : **IL001#0 - IL001#1**

TECNICHE E MATERIALE IMPIEGATI/TECHNIQUE AND MATERIAL EMPLOY

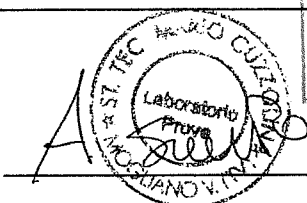
Caratteristiche forno	Caratteristiche trattamento termico
Forno elettrico G H con programmatore digitale controllato serie DCP 200 e un Registratore Multicurve serie MU 1 L - 0036	Gradiente di salita/Heating rate : <b>150°C/h</b> Temperatura di mantenim./Holding temperature : <b>910°C ± 10°C</b> Tempo di mantenimento/Holding time : <b>60 min</b> Gradiente di discesa/Cooling rate : <b>Still air</b>

GRAFICO/GRAPHIC



Mod. CCT.02 Rev. : 03 del 12.04.05

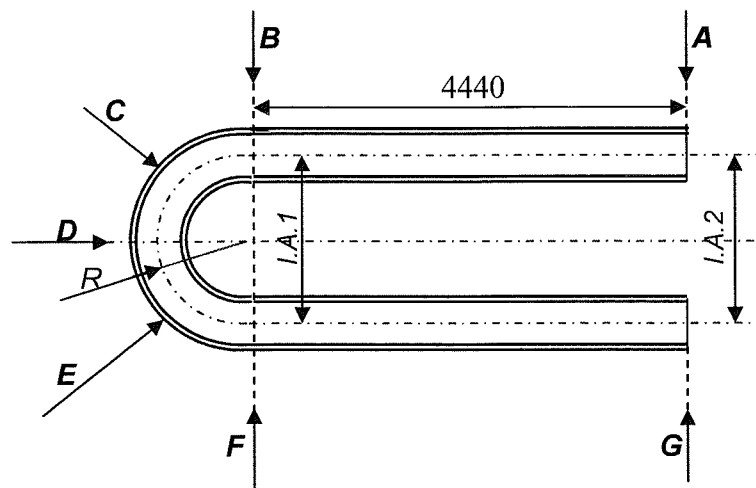
Esecutore/Operator  
Per.Ind. Andrea Simionato



ARISE  
 Reviewed by  
 ASME AI - U. BREDI  
 13918/A 25/06/2010

CIVIDAC S.p.A.  
C.C. MGT. MEMO

<b>Cliente:</b> Customer:	CIVIDAC	<b>Ordine cliente:</b> Customer order	2010/087	<b>Ns commessa:</b> Our job	B4089/10
<b>Materiale:</b> Material:	SA210 Gr.A1	<b>Item n°:</b> Item n°:		005/T (560 pz. – 1 apparecchio)	
<b>Dimensioni:</b> Dimensions:	OD15,88mm x Thk.2,11mm mw	<b>Raggio di Curvatura:</b> Bending radius:	45,00mm		
<b>Specifiche di riferimento/Norma:</b> Reference Specifications:	TEMA "R" Section 5 para RCB 2.3.1.				


**MISURE DA CONTROLLARE**

- $\phi$  esterno tubo dritto (A-G)
- Spessore parete tubo parte dritta (A-C)
- $\phi$  esterno tubo curvato (B-C-D-E-F)
- Spessore parete tubo parte curvata (A-B-C-D-E-F)

C.I. CIVIDAC S.p.A.  
 Q.C. CONTROL MEMO

**DIMENSIONI RICHIESTE NELLA ZONA CURVATA / Required dimensions in the bend portion**

$\phi$ esterno min. OD. Min.	$\phi$ esterno max. OD. Max.	Ovalizzazione Flattenig	Spessore min. W.Thk. Min.	Spessore max. W.Thk. Max.	Riduzione sp. Thinning
14,29	17,46	10% max	1,75	2,47	17% max.

**DIMENSIONI RILEVATE NELLA ZONA CURVATA**
*Measured dimensions of the bend portion*

Punto Point	$\phi$ esterno min. OD. Min.	$\phi$ esterno max. OD. Max.	Ovalizzazione Flattening	Spessore min. W.Thk. Min.	Spessore max. W.Thk. Max.	Riduzione sp. Thinning
A	15,87	15,92	OK (entro il 10%)	2,18	2,24	OK (entro il 17%)
B(0°)	15,77	16,27	OK (entro il 10%)	2,06	2,27	OK (entro il 17%)
C(45°)	15,42	16,36	OK (entro il 10%)	1,94	2,40	OK (entro il 17%)
D(90°)	15,34	16,41	OK (entro il 10%)	1,91	2,44	OK (entro il 17%)
E(135°)	15,40	16,38	OK (entro il 10%)	1,98	2,37	OK (entro il 17%)
F(180°)	15,71	16,29	OK (entro il 10%)	2,04	2,29	OK (entro il 17%)
G	15,87	15,92	OK (entro il 10%)	2,19	2,24	OK (entro il 17%)

**Interasse / Legs Spacing**
**Raggio di curvatura / Bending radius**

RICHIESTO/Required	RILEVATO/Measured	RICHIESTO/Required	RILEVATO/Measured
<b>90,00</b>	<b>90,40</b>	<b>45,00</b>	<b>45,20</b>

R.A.Qualità / Q.C.Manager

 PANTANI  
 DIVISIONE TUBI S.R.L.


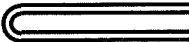

Data/Date:

17/05/2010



<b>Cliente:</b> <i>Customer:</i>	CIVIDAC	<b>Ns commessa:</b> <i>Our job</i>	B4089/10
<b>Ordine cliente:</b> <i>Customer order</i>	2010/087	<b>Item n°:</b> <i>Item n°:</i>	005T (560 pz. – 1 apparecchio)
<b>Dimensioni:</b> <i>Dimensions:</i>	OD 15,88mm x Thk. 2,11mm	<b>Materiale:</b> <i>Material:</i>	SA210 Gr.A1
<b>Specifiche di riferimento/Norma:</b> <i>Reference Specifications:</i>	ASTM A450 – Customer purchase order		

<b>Tipo di prova a pressione:</b> <i>Test pressure type:</i>	
<input type="checkbox"/> <b>Idraulica / Hydrostatic</b>	<input checked="" type="checkbox"/> <b>Pneumatica / Pneumatic</b>

<b>Tipo di prova a pressione:</b> <i>Test pressure type:</i>		
<input type="checkbox"/> <b>Tubi rettilinei lisci</b> <i>Straight plain tubes</i>	<input checked="" type="checkbox"/> <b>Tubi curvati a U</b> <i>U bend tubes</i>	<input checked="" type="checkbox"/> <b>Tubi low fin</b> <i>Low fin tubes</i>
		

<b>PARAMETRI DEL PROVA A PRESSIONE</b> <i>Pressure Test parameters</i>			
<b>Posizioni controllate</b> <i>Rows inspected</i>	100%	<b>Quantità controllate</b> <i>Quantity inspected</i>	560
<b>Pressione di prova</b> <i>Test pressure</i>	10 Bar	<b>Stasi</b> <i>Holding time</i>	5 sec.
<b>Manometro</b> <i>Manometer</i>	485 DIG.	<b>Esito del test</b> <i>Test result</i>	OK

<b>TEST COMPLEMENTARI</b> <i>Complementary Test</i>					
<input type="checkbox"/> <b>Liquidi penetranti</b> <i>Dye penetrant Test</i>	<input type="checkbox"/> <b>Test magnetoscopico</b> <i>Magnetoscopic Test MPI</i>	<input type="checkbox"/> <b>Test Lampada di Wood</b> <i>Wood lamp Test</i>			
<b>Posizioni controllate</b> <i>Rows inspected</i>	<b>Quantità controllate</b> <i>Quantity inspected</i>	<b>Esito della prova</b> <i>Test result</i>			

**R.A. Qualità/Q.C. Manager**
  
**PANTANI**  
 DIVISIONE TUBI S.R.L.

**Data/Date:**

17/05/2010



# RADIOGRAPHIC TEST REPORT

## CERTIFICATO ESAME RADIOGRAFICO

REPORT NO. **4320/RT**  
 Certificato N°

SHEET **1** OF **3**  
 Foglio di

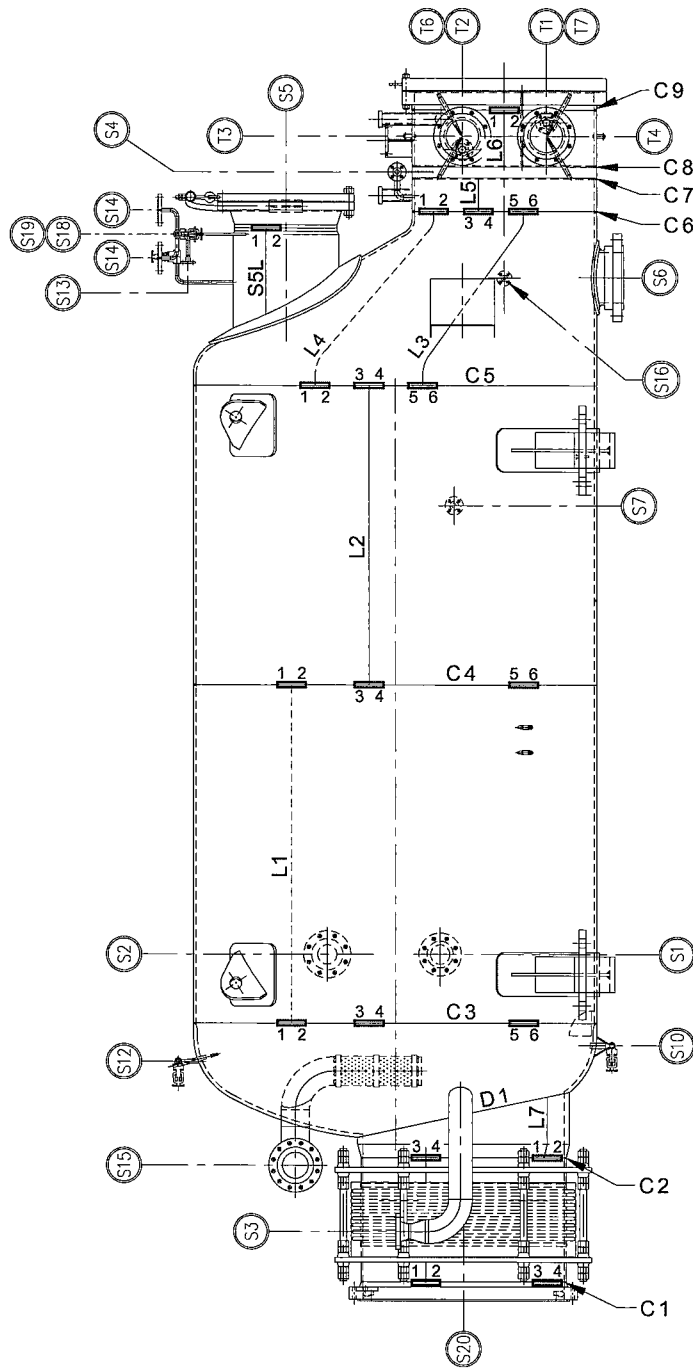
JOB NO. **2010/005/T**  
 Commessa N°

ORDER NO. **10PU-000265-PR**  
 Ordine N°


ITEM NO. **T10 HR**  
 Sigla

SERIAL NO. **4320**  
 N° fabbr.

### FILMS POSITION REFERENCE SKETCH - Schema di riferimento per posizione films



<b>OPERATOR</b> Operatore LEVEL I SNT-TC-1A	<b>SIGNATURE</b> Firma	<b>DATE</b> Data	<b>OPERATOR</b> Operatore LEVEL II SNT-TC-1A M. PAVAN RT Level II/EN 473/SNT-TC-1A	<b>SIGNATURE</b> Firma	<b>DATE</b> Data 14/06/2010
<b>DATE</b> Data	<b>INSPECTOR SIGNATURE</b> Firma ispettore	<b>DATE</b> Data	<b>INSPECTOR SIGNATURE</b> Firma ispettore Reviewed by ASME A - J. BREDI 1/8/10 25/06/2010	<b>DATE</b> Data 14/06/2010	<b>Q.C. MANAGER SIGNATURE</b> C. CIVIDAC S.p.A. Q.C. MESSA MEMO

		<b>RADIOGRAPHIC TEST REPORT</b> CERTIFICATO ESAME RADIOGRAFICO				REPORT NO Certificato N° 4320/RT								
						SHEET Foglio 2 OF 3 Di								
JOB NO. Comessa N° 2010/005/T		ORDER NO. Ordine N° 10PU-000265-PR		ITEM NO. Sigla T 10 HR		SERIAL NO. N° fabbr. 4320								
Joint Giunto	Section Sezione	Classification Classificazione	Film Density Densità del film	Evaluation Valutazione	Joint Giunto	Section Sezione	Classification Classificazione	Film Density Densità del film	Evaluation Valutazione	Joint Giunto	Section Sezione	Classification Classificazione	Film Density Densità del film	Evaluation Valutazione

L1	1-2			1	C4	1-2			1					
	2-3			1		3-4			1					
	3-4			1		5-6			1					
	4-5			1	C5	1-2			1					
	5-6			1		3-4			1					
	6-7			1		5-6			1					
L2	1-2			1	C6	1-2			1					
	2-3			1		3-4			1					
	3-4			1		5-6			1					
	4-5			1	C9	1-2	Ab		2					
	5-6			1	S5L	1-2			1					
	6-7			1	S5C	1-2			1					
L3	1-2			1	T1	1-2			1					
	2-3			2		2-3			1					
	3-4			1		3-1			1					
	4-5	W		2	T2	1-2			1					
	5-6			1		2-3	F.D.		2					
L4	1-2			1		3-1			1					
	2-3			1	T4320	1-2	F.D.		2					
	3-4			1		2-3			1					
	4-5			1										
	5-6			1										
L5	1-2			1										
L6	1-2			1										
L7	1-2			1										
C1	1-2			1										
	3-4			1										
C2	1-2	F.D.		2										
	3-4			1										
C3	1-2			1										
	3-4			1										
	5-6	F.D.		2										

VALUTATION / Valutazioni									
EVALUATION Valutazione				CLASSIFICATION Classificazione					
1	WITHOUT COMMENTS Senza rilievi	Aa	POROSITY Porosità	Bg	METALLIC INCLUSIONS Inclusioni metalliche	Ec	RADIATED CRACKS Cricche diffuse		
2	ALLOWED DEFECTS Difetti tollerabili	Ab	PIPES Tubi	C	LACK OF FUSION Mancanza di fusione	F	UNDERCUTTINGS Incisioni		
3	TO BE REPAIRED Saldatura da riparare	Ba	SLAG INCLUSIONS OF ANY SHAPE Scorie di qualsiasi forma	D	LACK OF PENETRATION Mancanza di penetrazione	Fa	EXCESSIVE PENETRATION Eccesso di penetrazione		
		Bb	SLAG LINES Scorie allineate	Da	CONC. WELD-WITHOUT NOTCHES Sald. concava - senza incisioni	Fb	EXCES. WELD REINFORCEMENT Eccesso di rinforzo		
		Bc	WEAVING FAULTS Maglia irregolare	Db	CONC.WELD - MOTCH ON ONE SIDE Sald.concava - incisione su un lato	M	FAULT FROM MISALIGNMENT Dif. da disallineamento		
		Bd	FAULT FROM BAD CHIPPING Dif. al cattiva scelpellatura	Dc	CONC.WELD - MOTCH ON BOTH SIDE Sald.concava - incisioni su due lati	N	DEFECT IN BASE METAL Difetto in metallo base		
F.D.	FILM DEFECT Difetto pellicola	Be	FAULT AT ELECTRODE CHANGE Dif. al cambio elettrodo	Ea	LONGITUDINAL CRACKS Cricche longitudinali	G	CONCAVITY Insellamento		
S.D.	SUPERFICIAL DEFECT Difetto superficiale	Bf	FAULT AT SEAMS JUNCTION Dif. all'incrocio dei giunti	Eb	TRANSVERSE CRACKS Cricche trasversali	W	TUNGSTEN INCLUSION Inclusione di tungsteno		
OPERATOR Operatore		SIGNATURE Firma		DATE Data		OPERATOR Operatore		SIGNATURE Firma	
		LEVEL-I (SNT-TC-1A)				LEVEL-II (SNT-TC-1A)		M. PAVAN RT Date 14/06/2010	
DATE Data		INSPECTOR SIGNATURE Firma ispettore		DATE Data		INSPECTOR SIGNATURE Firma ispettore		DATE Data	
		ARIS		14/06/2010		Q.C. MANAGER SIGNATURE		CIVIDAC S.p.A. Q.C. MANAGER	

Reviewed by  
ASME AI - W. BREDA  
13675 A 25/06/2010



# RADIOGRAPHIC TEST REPORT

## CERTIFICATO ESAME RADIOGRAFICO

REPORT NO. **4320 / RT**  
 Certificato N°

SHEET **3** OF **3**  
 Foglio di

SERIAL NO. **4320**  
 N° fabbr.

REV. **0** STEP **several**  
 Rev. Fasi

JOB NO. **2010/005/T** ORDER NO. **10PU-000265-PR** ITEM NO. **T10 HR**  
 Commessa N° Ordine N° Sigla

DRAWING NO **6725-2010** INSPECTION PRG. **ITP/2010/005**  
 Disegno N° Prg. ispezione

EXAMINED JOINTS <i>Giunti esaminati</i>		LONG. AND CIRC. WELDS	CIRC. NOZZLE WELDS			
MATERIALS <i>Materiali</i>		Gr.1	Gr.1			
THICKNESS (ES) <i>Spessori</i>		mm 15/25	12.7/15			
EXTENSION OF EXAMINATION <i>Estensione dell'esame</i>		LONG. 100% CROSSING 100% CIRC. 10%	10%			
PROCEDURE/ SPECIFICATION <i>Procedura / Specifica</i>		RT/2010/T	RT/2010/T			
CONDITION OF HEAT TREAT. <i>Condizioni di tratt. Termico</i>	AS WELDED <i>Come saldato</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	FINAL P.W.H.T. <i>Distens. finale</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	NORMALIZED <i>Normalizzato</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CONDITION OF WELD <i>Condizioni di saldatura</i>	AS WELDED <i>Come saldato</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RADIUS SET <i>Raccordato</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	ONE SIDE FLUS. GROU. <i>Molata a filo un lato</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	BOTH SIDES F. GR. <i>Molata a filo due lati</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WELD / WELD REINFORC. Thk. <i>Spess. saldatura / rinforzo saldatura</i>	mm 16/26	1	14 / 16			
TYPE OF SOURCE <i>Tipo di sorgente</i>	mm	<input checked="" type="checkbox"/> RX <input type="checkbox"/> Ir <sup>192</sup>	<input type="checkbox"/> RX <input checked="" type="checkbox"/> Ir <sup>192</sup>	<input type="checkbox"/> RX <input type="checkbox"/> Ir <sup>192</sup>	<input type="checkbox"/> RX <input type="checkbox"/> Ir <sup>192</sup>	<input type="checkbox"/> RX <input type="checkbox"/> Ir <sup>192</sup>
DIMENSION OF FOCAL SPOT <i>Dimensioni macchia focale</i>	mm	2,5 x 2,5	2,1 X 2,3			
MIN. SOURCE TO OBJ. DISTANCE <i>Distanza min. sorgente-oggetto</i>	mm	700	206 / 300			
MAX OBJ. TO FILM DISTANCE <i>Distanza max. oggetto - pellicola</i>	mm	16/26	14 / 16			
GEOMETRICAL UNSHARPNESS <i>Penombra geometrica</i>	mm	0,08/0.095	0.21 / 0.17			
SCHERMS <i>Schermi</i>	<input checked="" type="checkbox"/> LEAD <i>Piombo</i>	FACE <i>Anteriore</i>	0,05	0,05		
	<input type="checkbox"/> NONE <i>Niente</i>	<input type="checkbox"/> COPPER <i>Rame</i>	REAR <i>Posteriore</i>	0,1	0,1	
FILM <i>Pellicola</i>	ASME TYPE <i>Tipo ASME</i>	BRAND TYPE <i>Marca</i>	2 KODAK AA400	1 KODAK MX 125		
	DIMENSION cm <i>Dimens. cm</i>	FILMS PER HOLDER <i>Films per busta</i>	10 x 48 No. 1	10X24 10X48 No. 1	No.	No.
VOLTAGE <i>Tensione</i>	Kv	250	/			
EXPOSURE <i>Esposizione</i>	ma./min → RX C/h → Ir <sup>192</sup>	6 ma./min	25 C			
DEVELOPING TIME <i>Tempo di sviluppo</i>	min.	8	8			
DEVELOPING TEMPERATURE <i>Temperatura di sviluppo</i>	°C	28	28			
IMAGE QUALITY IND. <i>I.Q.I.</i>	TYPE <i>Tipo</i>	Q.TY <i>Q.ta'</i>	EN 1	EN 1		
	SIDE <i>Lato</i>	<input checked="" type="checkbox"/> SOURCE <i>Sorgente</i>	<input type="checkbox"/> FILM <i>Film</i>	<input checked="" type="checkbox"/> SOURCE <i>Sorgente</i>	<input type="checkbox"/> FILM <i>Film</i>	<input type="checkbox"/> SOURCE <i>Sorgente</i>
SHIM UNDER PENETRAMENT <i>Spess. sotto il penetrametro</i>	cm	/	/			
SENSITIVITY OR IMAGE QUALITY <i>Sensibilita' o qualita' immagine</i>		WIRE 8-10	WIRE 8-10			
TECHNIQUE <i>Tecnica</i>	WALL <i>Parete</i>	SINGLE <i>Singola</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		DOUBLE <i>Doppia</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	VIEWING <i>Visione</i>	SINGLE WALL <i>Parete Singola</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		DOUBLE WALL <i>Parete doppia</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

REFERENCE CODE SECTION (S) **ASME VIII DIV.1 ED. 2007 Add. 2009b**  
 Sezione (I) del codice di riferimento

ACCEPTANCE CRITERIAS **ASME VIII DIV. 1 UW51 and UW52 ED2007 Add. 2009b**  
 Criteri di accettabilita'

OPERATOR <i>Operatore</i>	LEVEL I SNT-TC-1A	SIGNATURE <i>Firma</i>	DATE <i>Data</i>	OPERATOR <i>Operatore</i>	LEVEL II SNT-TC-1A	SIGNATURE <i>Firma</i>	DATE <i>Data</i>
						M. PAVAN RT Level II EN 473 SNT-TC-1A	14/06/2010
DATE <i>Data</i>	INSPECTOR SIGNATURE <i>Firma ispettore</i>	DATE <i>Data</i>	INSPECTOR SIGNATURE <i>Firma ispettore</i>	DATE <i>Data</i>	Q.C. MANAGER SIGNATURE <i>Firma</i>		
REV. 1	DATE 05/12/2000		Reviewed by ASME AI - J. BREGDA 13/06/2010 25/06/2010	14/06/2010	C.T. CIVIDAC S.p.A. Q.C. MGR. P. PAVAN		



# PENETRANT TEST REPORT

CERTIFICATO ESAME LIQUIDI PENETRANTI

REPORT NO. 4320/PT  
Certificato N°

SHEET 1 OF 1  
Foglio di

JOB NO. 2010/005/T  
Commessa N°

ORDER NO. 10PU-000265-PR  
Ordine N°

ITEM NO. T10 HR  
Sigla

SERIAL NO. 4320  
N° fabbr.

DRAWING NO. 6725-2010 Rev. 01  
Disegno N°

INSPECTION PRG. ITP/2010 / 005  
Prg. ispezione

REV. 0 STEP (\*)  
Rev. Fasi

### INSPECTION PERFORMED ON:

Ispezione condotta su:

**CONDENSATOR - REGENERATOR**

(\*) 100% Back Gougings ( Step B7 - C5 - D6 - D17 )

(\*) 100% Tube to Tubesheet welds ( Step F14 )

MATERIAL (S) P.N. 1 THICKNESS (ES) 2,11 ÷ 25  
Materiale (l) Spessore (i) mm

REF. CODE SECTION ASME VIII DIV. 1 ED 2007 ACCEPTANCE STANDARDS ASME VIII DIV.1 APP.8 ED 2007  
Sezione codice rifer. Add 2009b Criteri accettabilita' Add 2009b

PROCEDURE PT/2010/005 REV. 0 SPECIFICATION ASME V ART. 6 ED 2007  
Procedura PT - 303 rev.4 Specifica Add 2009b

SURFACE CONDITION  ROUGH  MACHINED  GROUND  BRUSHED  
Condizioni superfic. Grezzo Lav. a macchina Molato Spazzolato

WELD SURFACE STATUS  AS WELDED  RADIUSSET  1 SIDE FLUSH GROUND  2 SIDE FLUSH GROUND  
Stato superf. saldat. Come saldato Raccordo Molato da 1 lato Molato da 2 lati

HEAT TREATMENT COND.  AS WELDED  FINAL P.W.H.T  NORMALIZED  SOLUBILIZZATO  
Cond trat. termico Come saldato Distens. finale Normalizzato

TECNIQUE  COLOR CONTRAST  FLUORESCENT  
Tecnica A contrasto di colore Fluorescente

PENETRANT  WATER WASHABLE  SOLVENT REMOVABLE  
Penetrante Lavabile con acqua Asportabile con solvente

DEVELOPER  DRY  WET  AQUEOUS  NOT AQUEOUS  
Sviluppatore Secco Umido Acquoso Non acquoso

PRODUCTS PENETRANT NDT DP51  
Prodotti Penetrante  
DEVELOPER NDT D100  
Sviluppatore  
SOLVENT NDT DR62  
Solvente

TEMPERATURE OF PART DURING EXAMINATION 19 °C  
Temperatura della parte durante l'esame

POS. Pos.	INSPECTION STEP Fase d'ispezione	METHOD Metodo	TIMES Tempi
1	CLEANING Pulizia	CLOTHS / SOLVENT	DRYNG TIME Tempo asciugatura 10 min
2	PENETRANT APPLICATION Applicazione penetrante	SPRAY	PENETRATION Penetrazione 15 min
3	REMOVER APPLICATION Applic. Asportatore	CLOTHS / WATER	TIME OF DRYNG Tempo di asciug. Minim. 5 min Max. 20 min
4	DEVELOPER APPLICATION Applic. Sviluppatore	SPRAY	DEVELOPING Sviluppo Minim. 7 min Max. 20 min
5	INSPECTION Ispezione	VISUAL Light intensity: 100w bulb lamp, distance ≤ 400 mm	LIGHTING <input checked="" type="checkbox"/> NATURAL / Naturale <input checked="" type="checkbox"/> ARTIFICIAL / Artificiale
6	POST CLEANING Pulizia finale	CLOTHS / WATER	

### REMARKS

Note : - POSTEMULSIFICATION PENETRANT ACTUALLY ARE NOT IN USE.

### RESULTS Risultati

SATISFACTORY Soddisfacente ISSUED NON CONFORMITY REPORT Emesso rapporto di non conformità RESOLVED BY REPORT NO Risolta con rapporto N° DATE Data  
 UNSATISFACTORY Non soddisfacente NCR NO DATE NOT RESOLVED-REJECTION REPORT NO Non Risolta-Rapporto di scarto N° DATE Data

DATE Data	INSPECTOR SIGNATURE Firma ispettore Reviewed by ASME AI-7. BREDA 1303A 25/06/2010	DATE Data	INSPECTOR SIGNATURE Firma ispettore L. MAZZOCATO RIPT-VT Level II EN 473/SNT-TC-1A	DATE Data	Q.C. MANAGER SIGNATURE CIVIDAC S.p.A. Q.C. MEMORANDUM
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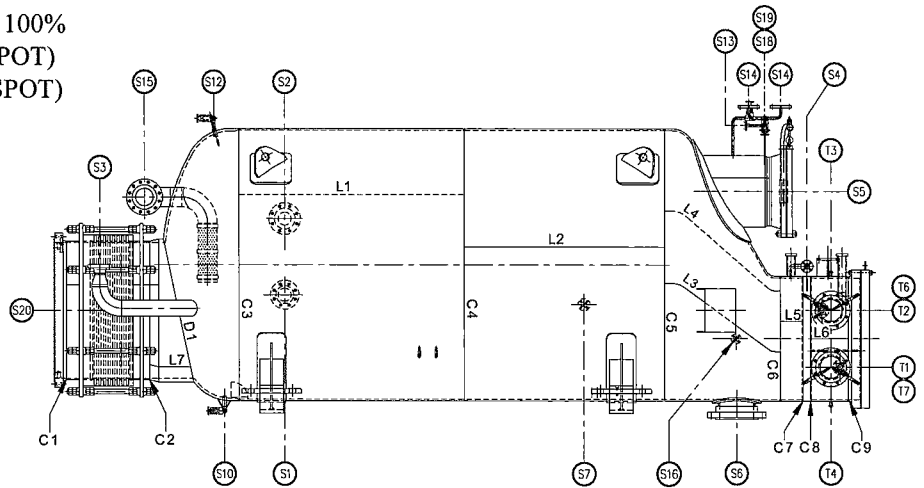
<b>CLIENTE</b> <i>Purchaser</i>	C.I. CIVIDAC S.p.A.	<b>ORDINE</b> <i>Order N°</i>	10PU-000265-PR	<b>COMM.</b> <i>Job</i>	2010/005/T
<b>MPIANTO</b> <i>Plant</i>	CONDENSATOR - REGENERATOR			<b>SIGLA</b> <i>Item</i>	T10 HR
<b>OGGETTO</b> <i>Object</i>	ITP/2010/005	STEP : C8-D13-D19-E2-E5-E6		<b>N.F.</b> <i>S.N.</i>	4320
<b>MATERIALE</b> <i>Material</i>	P.N° 1	<b>FASE DI LAVORAZIONE</b> <i>Working step</i>	BEFORE HYDROTEST	<b>DISEGNO</b> <i>Dwg.</i>	6725 - 2010

**DATI TECNICI DELL'ESAME**

<b>APPARECCH.</b> <i>Equipment</i>	<b>TIPO/Type</b>	<b>TIPO MAGNETIZZ.</b> <i>Magnetic Field</i>	<b>CORRENTE/Current</b>	<b>INTENSITÀ/Magnitude</b>	
MAGNAFLUX 48 V	Y6	ELETTROMAGNETIC	A.C.	6180 ASp / mt	
<b>PARTICELLE/Particles</b>		<b>MARCA/Brand</b>	<b>TIPO/Type</b>	<b>COLORE/Colour</b>	
DRY/A SECCO <input type="checkbox"/>		C.G.M.	P4.24 <input type="checkbox"/>	YELLOW/GIALLO <input type="checkbox"/>	
WET SUSP./A UMIDO <input checked="" type="checkbox"/>		C.G.M.	K35/A44 <input checked="" type="checkbox"/>	BLACK/NERA <input type="checkbox"/>	
FLUOR./FLUORESCENTE <input type="checkbox"/>		C.G.M.	K31-73/A44 <input type="checkbox"/>	FLUOR./FLUORESC. <input type="checkbox"/>	
<b>SURFACE COND.TION</b> <i>Condizioni superfic</i>	<b>WELD SURFACE STATUS</b> <i>Stato superf. saldat.</i>		<b>HEAT TREATMENT COND.</b> <i>Cond. Trattam. termico</i>	<b>TEMP. OF PART</b> <i>Temp. della parte</i>	
ROUGH/Grezzo <input checked="" type="checkbox"/>	AS WELDED/Come saldato <input checked="" type="checkbox"/>		AS WELDED/Come saldato <input checked="" type="checkbox"/>	19 °C	
RADIUSED/Raccord. <input checked="" type="checkbox"/>	RADIUSED/Raccordato <input checked="" type="checkbox"/>		FINAL P.W.H.T./Distens. finale <input type="checkbox"/>		
GROUND/Molato <input checked="" type="checkbox"/>	1 SIDE FLUSH GROUND/Molato da 1 lato <input type="checkbox"/>				
<b>OPERATING MODE</b> <i>Modo di operare</i>	<b>MAGNETIC FIELD</b> <i>Campo Magnetico</i>		<b>DEMAGNETIZATION</b> <i>Smagnetizzazione</i>	<b>CLEANING</b> <i>Pulizia</i>	
CONTINUOUS/Continuo <input type="checkbox"/>	LONGITUDINAL/Longitudinale <input checked="" type="checkbox"/>		NOT REQUIRED/Non richiesta <input checked="" type="checkbox"/>	ALCOHOL/Alcool <input type="checkbox"/>	
PULSES/Impulsi <input type="checkbox"/>	TRASVERSE/Trasversale <input type="checkbox"/>		REQUIRED/Richiesta <input type="checkbox"/>	SOLVENT/Solvente <input type="checkbox"/>	
	CIRCULAR/Circolare <input type="checkbox"/>		MEASURED RESIDUAL/Residuo misu. <input type="checkbox"/>	MEC. BRUSHING/ Spazzol. mecc. <input checked="" type="checkbox"/>	
<b>METHOD OF PARTICLES APPLICATION/</b> <i>Metodo di applicazione polveri</i>		SPRAY	<b>METHOD OF PARTICLES REMOVAL</b> <i>Metodo di asportazione polveri</i>		
<b>POST EXAMINATION CLEANING</b> <i>Pulizia dopo l'esame</i>		NONE			
<b>DIREZ. E SEQUENZA/Direction an sequence</b>		<b>PASSO/Skip</b>	<b>ILLUMINAZIONE/Lighting</b>		
PUNTATE INCROCIATE N°2 EXAM. APPR.. PERP. EACH TO OTHER		150 mm	NATURAL <input checked="" type="checkbox"/> AND WOOD <input type="checkbox"/>		
<b>Specifica</b> <i>Specification</i>	ASME V ART.7 ED 2007 Add 2009b	<b>Procedura</b> <i>Procedure</i>	MT/2010/005 Rev. 0 and MT-302 Rev.4	<b>Accettabilità</b> <i>Acceptability</i>	ASME VIII DIV.1 APP.6 ED 2007 Add. 2009b

- C8 : Completed weld (not Rx tested ) 100% Circumferential weld (C7-C8)
- D13 : Completed girth welds (SPOT) Nozzle welds: (pipe-elbow-flange)
- D19 : Completed welds (SPOT) Nozzle to shell welds
- E2 : Removal of temporary welds 100%
- E5 : Internal attachments welds (SPOT)
- E6 : External attachments welds (SPOT)

ARISE  
Reviewed by  
ASME NDT  
15/06/2010





**RISULTATI dell'ESAME**  
*Examination result* SATISFACTORY

CHECK OF JOKE WITH WEIGHT OF 4.5 KG PRIOR TO USE.

**NOTE** - We use the light intensity of the 100W bulb lamp at a maximum distance of 400 mm and we found 1200 Lux.

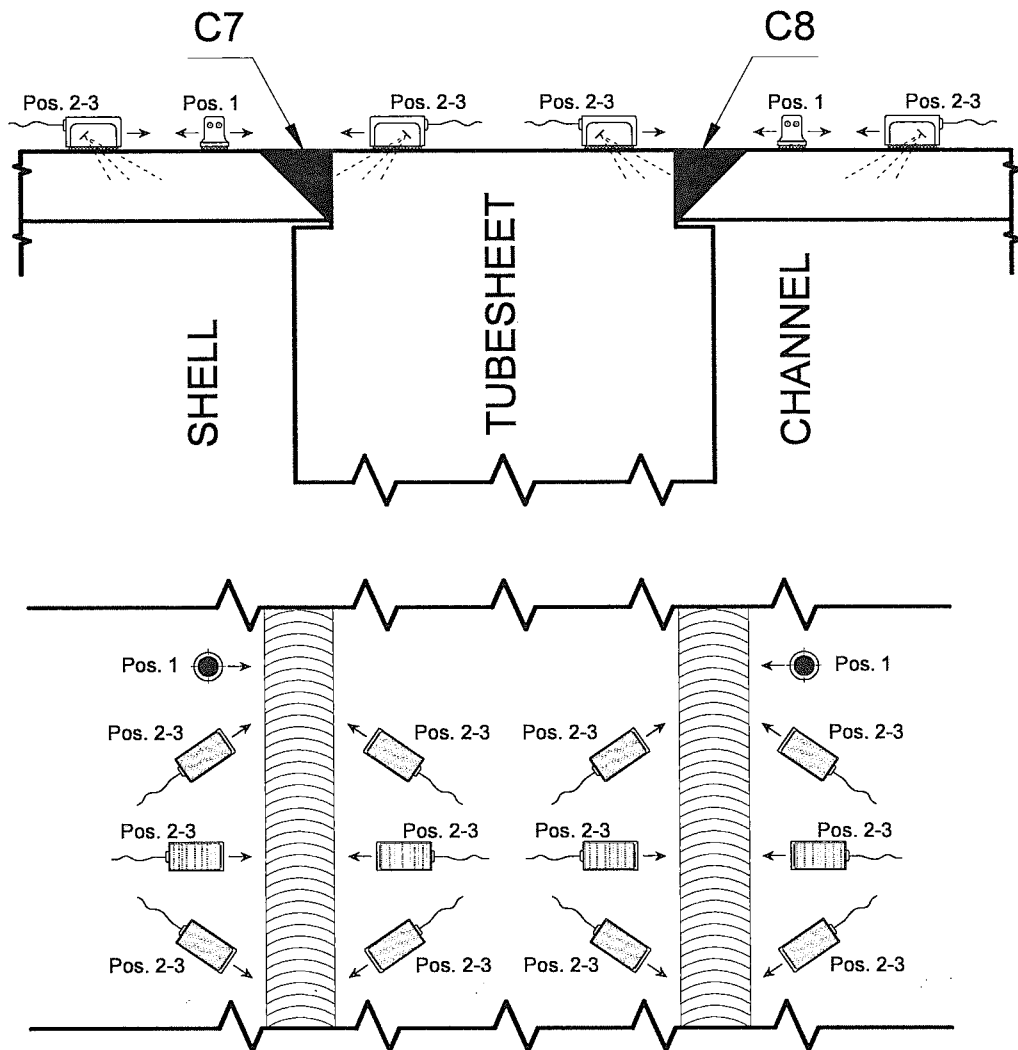
<b>DATA</b> <i>Date</i>	<b>OPERATORE</b> <i>Operator</i>	<b>VISTO</b> <i>Signed By</i>	<b>ISPETTORE CLIENTE</b> <i>Customer Inspector</i>
15/06/2010			

		UT Examination Report. <i>Certificato esame UT</i>		N° N° <b>4320/UT</b>		Date Data <b>15/06/2010</b>		Sheet 1 / 3 Pag. 1 / 3							
Gen. Proc. N.° <i>Proc Gen. N.°</i>		<b>UT-316 Rev.05</b>		Work. Proc. N.° <i>Proc. di lav. N.°</i>		Rev. <b>UT/2010/005 Rev.0</b>		Reference <i>Nor. di Rif.</i>		ASME V ART.4+ART.5 ED 2007+Add. 2009b					
Purchaser <i>Cliente</i>		<b>TURBODEN</b>		Order N° <i>Ordine N°</i>		<b>10PU-000265-PR</b>		D.W.G. <i>Disegno</i>		<b>6725-2010 Rev.01</b>					
Job: <i>Commessa</i>		<b>2010/005/T</b>		Serial Number <i>Numero di Fabbrica</i>		<b>4320</b>		Item <i>Sigla</i>		<b>T 10 HR</b>		Step <i>Fase</i>		<b>C9</b>	
Weld Examination <i>Saldatura Esaminata</i>		<b>(**) SEE REMARK ITP/2010/005 REV. 0</b>													
UT Equipment – <i>Apparecchio UT</i>				<b>Krautkramer</b>		Search Units – <i>Tipo di Sonde</i>				<b>Krautkramer</b>					
Expsloration <i>Esplorazione</i>		Manufactory <i>Fabbricante</i>		Serial Number <i>Numero Serie</i>		Frequency <i>Frequenza</i>		Angle <i>Angolo</i>		Size <i>Dimen.</i>		Gain Set Scan <i>Ampl. Scans.</i>		Gain Set Evalut. <i>Amplif. Valutaz.</i>	
<b>Pos. 1</b>		<b>MSEB 4H</b>		/		<b>4 MHz</b>		<b>0°</b>		<b>Ø 10</b>		<b>46 db</b>		<b>40 db</b>	
<b>Pos. 2</b>		<b>MWB 60</b>		/		<b>4 MHz</b>		<b>60°</b>		<b>8X9</b>		<b>44 db</b>		<b>38 db</b>	
<b>Pos. 3</b>		<b>MWB 70</b>		/		<b>4 MHz</b>		<b>70°</b>		<b>8X9</b>		<b>48 db</b>		<b>42 db</b>	
Couplant <i>Accoppiamento</i>		<b>CELLULOSIC PASTE</b>		Tranfer Loss Corrective <i>Perdite di Trasferimento</i>				<b>2 db</b>							
Heat Treatment <i>Trattamento Termico</i>		<b>AS WELD</b>		Material Examination <i>Materiale da Esaminare</i>				<b>P. N° 1</b>		Examination Tickness <i>Spessore da Esaminare</i>				<b>15 mm</b>	
<b>Computerized Program – Programma Computerizzato</b>												Special Equipment ( When Used ) – <i>Apparecchiature Speciali se Usate</i>			
Search Units <i>Sonde</i>		Wedges <i>Cunei</i>		Shoes <i>Scarpette</i>		Automatic Scan. Equipment <i>Scansione Automatica</i>				Record Equipment <i>Registrazione</i>					
NA		NA		NA		NA				NA					
<b>Calibration Block Identification</b> <i>Identificazione Blocco di Taratura</i>						<b>Calibration Data</b> <i>Dati di Taratura</i>									
Material <i>Materiale</i>		Thk <i>Spessore</i>		Figure <i>Figura</i>		WPS <i>WPS</i>		Surface <i>Superficie</i>		Reflector Riferiment <i>Riflettori di Riferimento</i>		Amplitude Read <i>Lettura Amplitudine</i>			
<b>P. N° 1</b>		<b>19 mm</b>		<b>T-434.2.1</b>		<b>NA</b>		<b>Brushed</b>		(Thk:19mm) Hole Ø 2.5 mm <b>80% FSH</b>		Distance Read <i>Lettura Distanza</i>			
										(1/4-1/2-3/4) T		Other <i>Altro</i>			
												<b>NA</b>			
<b>Instruments Level Gain</b> <i>Livello Amplificazione Strumento</i>						<b>Search Unit Cable</b> <i>Cavo Collegamento Sonde</i>									
Damping <i>Smorzatura</i>		<b>50 OHM</b>		Reject Set <i>Soglia</i>		<b>NA</b>		Type <i>Tipo</i>		<b>Coaxial</b>		Length <i>Lunghezza</i>		<b>2 mt</b>	
Block Ident <i>Identific. Blocco</i>				<b>NA</b>				Data Correlating Simulation <i>Dati Correlati alla Simulazione</i>				<b>NA</b>			
Area Restricted Examination <i>Area di Limitazione dell'esame</i>				<b>NA</b>				Block <i>Blocco</i>		<b>NA</b>		Electronic <i>Elettronica</i>		<b>NA</b>	
Surface of Examination <i>Superficie D'Esame</i>		<b>External</b>				Surface Conditions <i>Condizioni Superficiali</i>				<b>Flush Ground</b>					
Examination Result <i>Risultati dell'Esame</i>		<b>SATISFACTORY</b>													
Level. II Examiner / Operatore  NDT - MICHELIN M. II Lev. EN 473 / EN 797 - TC - MA				Date of exam. / Data dell'esame <b>15/06/2010</b>				Verified / Verificato  G.C. CIVIDAC S.p.A. Q.C. VERVA MEMO							

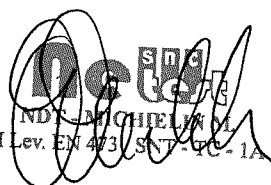
See following pages for map of examination and indications found  
 Vedere la pagina seguente per la mappa dell'esame e le indicazioni rilevate

ITP/2010/005 REV.0

STEP C9: COMPLETED WELD (not RX tested) 100%



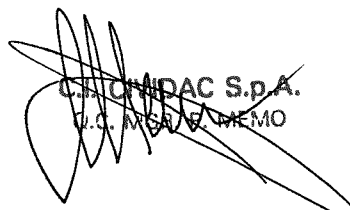
Examiner / Operatore

  
 NDA MICHELE M.  
 II Lev. EN 473 / SNT-UT-1A


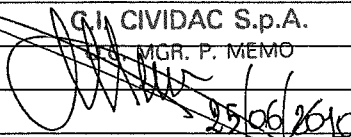
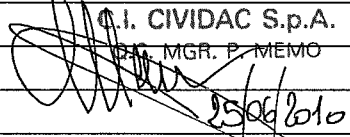
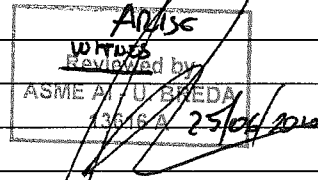
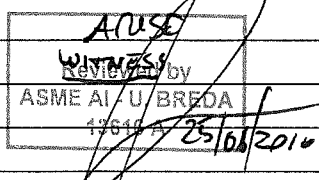
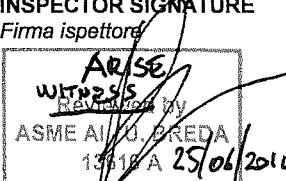
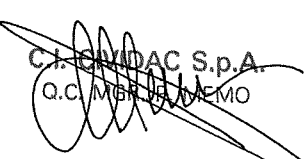
Date of exam / Data dell'esame

15/06/2010

Verified / Verificato

  
 C. CIVIDAC S.p.A.  
 U.C. MSA/6 MEMO



		<b>PRESSURE TEST REPORT</b> <b>CERTIFICATO PROVA DI PRESSIONE</b>		REPORT NO. Certificato N° <b>4320/HY</b>	
SHEET Foglio <b>1</b> OF <b>2</b> di					
JOB NO. Commessa N° <b>2010/005/T</b>		ORDER NO. Ordine N° <b>10PU-000265-PR</b>		ITEM NO. Sigla <b>T10 HR</b>	
DRAWING NO. Disegno N° <b>6725-2010</b>		INSPECTION PRG. Prg. ispezione <b>ITP/2010/005</b>		SERIAL NO. N° fabbr. <b>4320</b>	
PRESSURE TEST ON Prova di pressione su: <b>CONDENSATOR - RIGENERATOR</b>				REV. <b>0</b> STEP <b>G2 - G3</b> Rev. Fasi <b>G4</b>	
<b>SHELL SIDE / Lato Corpo</b>			<b>TUBE SIDE / Lato tubi</b>		
<b>H.T. CONDITIONS</b> Stato di t.t.		<b>SURFACE FINISH</b> Finitura superficiale		<b>H.T. CONDITION</b> Stato di t.t.	
<input checked="" type="checkbox"/> <b>AS WELDED</b> Come saldato		<input type="checkbox"/> <b>SAND BLASTED-BRUSHER</b> Spazzolat.-sabbatura		<input checked="" type="checkbox"/> <b>AS WELDED</b> Come saldato	
<input type="checkbox"/> <b>P.W.H.T.</b> Disteso finale		<input checked="" type="checkbox"/> <b>AS SUPPLIED</b> Come fornito		<input type="checkbox"/> <b>P.W.H.T.</b> Disteso finale	
<input type="checkbox"/>		<input type="checkbox"/> <b>PICKLED-PASSIVATED</b> Decapato-Passivato		<input type="checkbox"/>	
<b>TEST POSITION</b> Posizione		<b>TEST FLUID</b> Fluido prova		<b>TEST POSITION</b> Posizione	
<input checked="" type="checkbox"/> <b>HORIZONTAL</b> Orizzontale		<input checked="" type="checkbox"/> <b>WATER</b> Acqua		<input checked="" type="checkbox"/> <b>HORIZONTAL</b> Orizzontale	
<input type="checkbox"/> <b>VERTICAL</b> Verticale		<input type="checkbox"/> <b>ADDITIVED WATER</b> Acqua additiva		<input type="checkbox"/> <b>VERTICAL</b> Verticale	
<input type="checkbox"/> <b>STACKED WITH</b> Accoppiato con _____		<input checked="" type="checkbox"/> <b>CL PPM max. 4,2</b>		<input type="checkbox"/> <b>STACKED WITH</b> Accoppiato con _____	
<input checked="" type="checkbox"/> <b>CL PPM max. 4,2</b>				<input checked="" type="checkbox"/> <b>CL PPM max. 4,2</b>	
<b>PRESSURE</b> Pressione		<b>SOAKING TIME</b> Perm. in pressione		<b>PRESSURE</b> Pressione	
<input checked="" type="checkbox"/> <b>KPa g 780</b>		<input checked="" type="checkbox"/> <b>TIME 1 h</b>		<input checked="" type="checkbox"/> <b>KPa g 2080</b>	
<input checked="" type="checkbox"/> <b>bar g 7,8</b>		<input checked="" type="checkbox"/> <b>DATE 25/06/2010</b>		<input checked="" type="checkbox"/> <b>bar g 20,8</b>	
<input type="checkbox"/> <b>psi g</b>		<input type="checkbox"/>		<input type="checkbox"/> <b>psi g</b>	
<input type="checkbox"/>				<input type="checkbox"/>	
<b>CALIB. PRESS. GAGE</b> Manometro tarato		<b>TEMPERATURE</b> Temperatura		<b>CALIB. PRESS. GAGE</b> Manometro tarato	
<b>TEMPERATURE</b> Temperatura				<b>TEMPERATURE</b> Temperatura	
SERIAL NO. N° serie <b>203 206</b>		METAL TEMP. °C		SERIAL NO. N° serie <b>302 308</b>	
RANGE Scala bar <b>0÷25 0÷25</b>		HEATED BY Riscald. con /		RANGE Scala bar <b>0÷40 0÷40</b>	
HEATED BY Riscald. con /				HEATED BY Riscald. con /	
<b>REMARKS</b> Note :			<b>REMARKS</b> Note :		
- NO LEAKAGE OR PERMANENT DEFORMATIONS HAS BEEN OBSERVED.			- NO LEAKAGE OR PERMANENT DEFORMATIONS HAS BEEN OBSERVED.		
- RESULT : SATISFACTORY.			- RESULT : SATISFACTORY.		
G.I. CIVIDAC S.p.A. MGR. P. MEMO  25/06/2010			G.I. CIVIDAC S.p.A. MGR. P. MEMO  25/06/2010		
 WITNESSES ASME AI-U BREDA 13618 A 25/06/2010			 WITNESSES ASME AI-U BREDA 13618 A 25/06/2010		
DATE Data	INSPECTOR SIGNATURE Firma ispettore	DATE Data	INSPECTOR SIGNATURE Firma ispettore	DATE Data	Q.C. MANAGER SIGNATURE
			 WITNESSES ASME AI-U BREDA 13618 A 25/06/2010	25/06/2010	 G.I. CIVIDAC S.p.A. Q.C. MGR. P. MEMO



# PRESSURE TEST REPORT

## CERTIFICATO PROVA DI PRESSIONE

REPORT NO. **4320/HY**  
 Certificato N°

SHEET **2** OF **2**  
 Foglio di

SERIAL NO. **4320**  
 N° fabbr.

REV. **0** STEP **G2 - G3**  
 Rev. Fasi **G4**

JOB NO. **2010/005/T** ORDER NO. **10PU-000265-PR** ITEM NO. **T10 HR**  
 Commessa N° Ordine N° Sigla

DRAWING NO. **6725-2010** INSPECTION PRG. **ITP/2010/005**  
 Disegno N° Prg. ispezione

PRESSURE TEST ON **CONDENSATOR - RIGENERATOR**  
 Prova di pressione su:

### BATTERY / Batteria alettata

H.T. CONDITIONS Stato di t.t.	SURFACE FINISH Finitura superficiale	<del>H.T. CONDITION Stato di t.t.</del>	<del>SURFACE FINISH Finitura superficiale</del>
<input checked="" type="checkbox"/> AS WELDED Come saldato	<input type="checkbox"/> SAND BLASTED-BRUSHER Spazzolat. -sabbatura	<del><input type="checkbox"/> AS WELDED Come saldato</del>	<del><input type="checkbox"/> SAND BLASTED-BRUSHER Spazzolat. -sabbatura</del>
<input type="checkbox"/> P.W.H.T. Disteso finale	<input checked="" type="checkbox"/> AS SUPPLIED Come fornito	<del><input type="checkbox"/> P.W.H.T. Disteso finale</del>	<del><input type="checkbox"/> AS SUPPLIED Come fornito</del>
<input type="checkbox"/>	<input type="checkbox"/> PICKLED-PASSIVATED Decapato-Passivato	<del><input type="checkbox"/></del>	<del><input type="checkbox"/> PICKLED-PASSIVATED Decapato-passivato</del>
TEST POSITION Posizione	TEST FLUID Fluido prova	<del>TEST POSITION Posizione</del>	<del>TEST FLUID Fluido prova</del>
<input checked="" type="checkbox"/> HORIZONTAL Orizzontale	<input checked="" type="checkbox"/> WATER Acqua	<del><input type="checkbox"/> HORIZONTAL Orizzontale</del>	<del><input type="checkbox"/> WATER Acqua</del>
<input type="checkbox"/> VERTICAL Verticale	<input type="checkbox"/> ADDITIVED WATER Acqua additiva	<del><input type="checkbox"/> VERTICAL Verticale</del>	<del><input type="checkbox"/> ADDITIVED WATER Acqua additiva</del>
<input type="checkbox"/> STACKED WITH Accoppiato con _____	<input checked="" type="checkbox"/> CL PPM max. <b>4,2</b>	<del><input type="checkbox"/> STACKED WITH Accoppiato con _____</del>	<del><input type="checkbox"/> CL PPM max.</del>
PRESSURE Pressione	SOAKING TIME Perm. in pressione	<del>PRESSURE Pressione</del>	<del>SOAKING TIME Perm. in pressione</del>
<input checked="" type="checkbox"/> KPa g <b>2470</b>	<input checked="" type="checkbox"/> TIME <b>1</b> h	<del><input type="checkbox"/> MPa g</del>	<del><input type="checkbox"/> TIME h</del>
<input checked="" type="checkbox"/> bar g <b>24,7</b>	<input checked="" type="checkbox"/> DATE <b>03/06/2010</b>	<del><input type="checkbox"/> bar g</del>	<del><input type="checkbox"/> DATE</del>
<input type="checkbox"/> psi g	<input type="checkbox"/>	<del><input type="checkbox"/> psi g</del>	<del><input type="checkbox"/></del>
CALIB. PRESS. GAGE Manometro tarato	TEMPERATURE Temperatura	<del>CALIB. PRESS. GAGE Manometro tarato</del>	<del>TEMPERATURE Temperatura</del>
SERIAL NO. N° serie <b>302 308</b>	METAL TEMP. <b>19</b> °C	<del>SERIAL NO. N° serie</del>	<del>METAL TEMP. Temp. metallo °C</del>
RANGE Scala bar <b>0÷40 0÷40</b>	HEATED BY Riscald. con <b>/</b>	<del>RANGE Scala bar</del>	<del>HEATED BY Riscald. con</del>

REMARKS Note:

- NO LEAKAGE OR PERMANENT DEFORMATIONS HAS BEEN OBSERVED.

- RESULT : SATISFACTORY.

C. CIVIDAC S.p.A.  
 P. MEMO  
 03/06/2010

ARISE  
 WITNESS  
 ASME AUTHORIZED  
 13616 A 3/06/2010

DATE Data	INSPECTOR SIGNATURE Firma ispettore	DATE Data	INSPECTOR SIGNATURE Firma ispettore	DATE Data	Q.C. MANAGER SIGNATURE
				25/06/2010	C. CIVIDAC S.p.A. Q.C. MEMO



**CERTIFICATO DI CALIBRATURA**  
**CALIBRATION REPORT**

REPORT NO°  
CERTIFICATO N°

203/1

SHEET  
FOGLIO

1

OF  
DI

1

GAUGE TYPE  
TIPO DI STRUMENTO

<input checked="" type="checkbox"/> MANOMETER MANOMETRO	<input type="checkbox"/> VACUOMETER VACUOMETRO	<input type="checkbox"/> MANOVACUOMETER MANOVACUOMETRO
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MANUFACTURER  
COSTRUTTORE

WIKA

DIAL RANGE  
SCALA (bar)

0÷25

No. OF GAUGE  
N° DI STRUMENTO

203

SERIAL No.  
N° DI SERIE

/

MASTER GAUGE  
MANOMETRO CAMPIONE

DIAL RANGE SCALA (bar)	0÷40	SERIAL No. N° DI SERIE	9910409
CALIBRATION PROCEDURE PROCEDURA DI CALIBRAZIONE		C.P. 311 REV. 2 - CAL/CIC/01 REV. 0	

READINGS  
LETTURE

UPWARD ASCENDENTE				DOWNWARD DISCENDENTE			
POS.	MASTER GAUGE VALUE VALORE MANOMETRO CAMP.	READING VALUE VALORE LETTO	DEVIATION VALUE SCOSTAMENTO RILEVATO	POS.	MASTER GAUGE VALUE VALORE MANOMETRO CAMP.	READING VALUE VALORE LETTO	DEVIATION VALUE SCOSTAMENTO RILEVATO
1	5	5	0	1	20	20	0
2	10	10	0	2	15	15.1	+0.1
3	15	15	0	3	10	10.1	+0.1
4	20	19.9	-0.1	4	5	5	0
5	25	24.8	-0.2	5			
6				6			
7				7			
8				8			
9				9			
10				10			
11				11			
12				12			
13				13			
14				14			
15				15			

EXPIRY DATE: 04 SET. 2010

LO STRUMENTO E' - GAUGE IS

SATISFACTORY  
SODDISFACENTE

UNSATISFACTORY  
NON SODDISFACENTE

DATA-DATE	INSPECTOR SIGNATURE	DATA-DATE	INSPECTOR SIGNATURE	DATA-DATE	Q.C. MANAGER SIGNATURE
		05 SET. 2009	 Q.C.I. L. Mazzocato	05 SET. 2009	 C.I. CIVIDAC S.p.A. Q.C. MGR. P. MEMO



**CERTIFICATO DI CALIBRATURA**  
**CALIBRATION REPORT**

REPORT NO°  
CERTIFICATO N°

206/1

SHEET  
FOGLIO

1

OF  
DI

1

**GAUGE TYPE**  
**TIPO DI STRUMENTO**

<input checked="" type="checkbox"/> <b>MANOMETER</b> MANOMETRO	<input type="checkbox"/> <b>VACUOMETER</b> VACUOMETRO	<input type="checkbox"/> <b>MANOVACUOMETER</b> MANOVACUOMETRO
---	--	--

MANUFACTURER  
CONSTRUTTORE

**OMET**

DIAL RANGE  
SCALA (bar)

**0÷25**

No. OF GAUGE  
N° DI STRUMENTO

**206**

SERIAL No.  
N° DI SERIE

/

**MASTER GAUGE**  
**MANOMETRO CAMPIONE**

DIAL RANGE SCALA (bar)	<b>0÷40</b>	SERIAL No. N° DI SERIE	<b>9910409</b>
CALIBRATION PROCEDURE PROCEDURA DI CALIBRAZIONE		<b>C.P. 311 REV. 2 - CAL/CIC/01 REV. 0</b>	

**READINGS**  
**LETTURE**

UPWARD ASCENDENTE				DOWNWARD DISCENDENTE			
POS.	MASTER GAUGE VALUE VALORE MANOMETRO CAMP.	READING VALUE VALORE LETTO	DEVIATION VALUE SCOSTAMENTO RILEVATO	POS.	MASTER GAUGE VALUE VALORE MANOMETRO CAMP.	READING VALUE VALORE LETTO	DEVIATION VALUE SCOSTAMENTO RILEVATO
1	5	5	0	1	20	20.1	+0.1
2	10	10	0	2	15	15.1	+0.1
3	15	15.1	+0.1	3	10	10	0
4	20	20.2	+0.2	4	5	5.1	+0.1
5	25	25.1	+0.1	5			
6				6			
7				7			
8				8			
9				9			
10				10			
11				11			
12				12			
13				13			
14				14			
15				15			

**EXPIRY DATE: 04 SET. 2010**

**LO STRUMENTO E' - GAUGE IS**

**SATISFACTORY**  
SODDISFACENTE

**UNSATISFACTORY**  
NON SODDISFACENTE

DATA-DATE	INSPECTOR SIGNATURE	DATA-DATE	INSPECTOR SIGNATURE	DATA-DATE	Q.C. MANAGER SIGNATURE
		05 SET. 2009	<i>Q.C.I. L. Mazzocato</i>	05 SET. 2009	<i>C. CIVIDAC S.p.A.</i> G.C. WSH. P. MEMO





**CERTIFICATO DI CALIBRATURA**  
**CALIBRATION REPORT**

REPORT NO°  
CERTIFICATO N°

**302/1**

SHEET  
FOGLIO

**1**

OF  
DI

**1**

**GAUGE TYPE**  
**TIPO DI STRUMENTO**

<input checked="" type="checkbox"/> <b>MANOMETER</b> MANOMETRO	<input type="checkbox"/> <b>VACUOMETER</b> VACUOMETRO	<input type="checkbox"/> <b>MANOVACUOMETER</b> MANOVACUOMETRO
---	--	--

<b>MANUFACTURER</b> CONSTRUTTORE	<b>OMET</b>	<b>DIAL RANGE</b> SCALA (bar)	<b>0÷40</b>
<b>No. OF GAUGE</b> N° DI STRUMENTO	<b>302</b>	<b>SERIAL No.</b> N° DI SERIE	/

**MASTER GAUGE**  
**MANOMETRO CAMPIONE**

<b>DIAL RANGE</b> SCALA (bar)	<b>0÷160</b>	<b>SERIAL No.</b> N° DI SERIE	<b>9910410</b>
<b>CALIBRATION PROCEDURE</b> PROCEDURA DI CALIBRAZIONE		<b>C.P. 311 REV. 2 - CAL/CIC/01 REV. 0</b>	

**READINGS**  
**LETTURE**

<b>UPWARD</b> ASCENDENTE				<b>DOWNWARD</b> DISCENDENTE			
<b>POS.</b>	<b>MASTER GAUGE VALUE</b> VALORE MANOMETRO CAMP.	<b>READING VALUE</b> VALORE LETTO	<b>DEVIATION VALUE</b> SCOSTAMENTO RILEVATO	<b>POS.</b>	<b>MASTER GAUGE VALUE</b> VALORE MANOMETRO CAMP.	<b>READING VALUE</b> VALORE LETTO	<b>DEVIATION VALUE</b> SCOSTAMENTO RILEVATO
1	7	7.2	+0.2	1	35	35.2	+0.2
2	14	14.2	+0.2	2	28	28.1	+0.1
3	21	21	0	3	21	21	0
4	28	28	0	4	14	14	0
5	35	35.1	+0.1	5	7	7.2	+0.2
6	40	40	0	6			
7				7			
8				8			
9				9			
10				10			
11				11			
12				12			
13				13			
14				14			
15				15			

**EXPIRY DATE: 04 SET. 2010**

**LO STRUMENTO E' - GAUGE IS**

**SATISFACTORY**  
SODDISFACENTE

**UNSATISFACTORY**  
NON SODDISFACENTE

<b>DATA-DATE</b>	<b>INSPECTOR SIGNATURE</b>	<b>DATA-DATE</b>	<b>INSPECTOR SIGNATURE</b>	<b>DATA-DATE</b>	<b>Q.C. MANAGER SIGNATURE</b>
		05 SET. 2009	<i>L. Mazzocato</i> Q.C.I. - L. Mazzocato	05 SET. 2009	<i>[Signature]</i> C.I. CIVIDAC S.p.A. Q.C. MGR. P. MEMO



**CERTIFICATO DI CALIBRATURA**  
**CALIBRATION REPORT**

REPORT NO°  
CERTIFICATO N°

**308/1**

SHEET  
FOGLIO

**1**

OF  
DI

**1**

**GAUGE TYPE**  
**TIPO DI STRUMENTO**

<input checked="" type="checkbox"/> <b>MANOMETER</b> MANOMETRO	<input type="checkbox"/> <b>VACUOMETER</b> VACUOMETRO	<input type="checkbox"/> <b>MANOVACUOMETER</b> MANOVACUOMETRO
---	--	--

<b>MANUFACTURER</b> COSTRUTTORE	<b>OMET</b>	<b>DIAL RANGE</b> SCALA (bar)	<b>0÷40</b>
<b>No. OF GAUGE</b> N° DI STRUMENTO	<b>308</b>	<b>SERIAL No.</b> N° DI SERIE	<b>/</b>

**MASTER GAUGE**  
**MANOMETRO CAMPIONE**

<b>DIAL RANGE</b> SCALA (bar)	<b>0÷160</b>	<b>SERIAL No.</b> N° DI SERIE	<b>9910410</b>
<b>CALIBRATION PROCEDURE</b> PROCEDURA DI CALIBRAZIONE		<b>C.P. 311 REV. 2 - CAL/CIC/01 REV. 0</b>	

**READINGS**  
**LETTURE**

<b>UPWARD</b> <b>ASCENDENTE</b>				<b>DOWNWARD</b> <b>DISCENDENTE</b>			
<b>POS.</b>	<b>MASTER GAUGE VALUE</b> VALORE MANOMETRO CAMP.	<b>READING VALUE</b> VALORE LETTO	<b>DEVIATION VALUE</b> SCOSTAMENTO RILEVATO	<b>POS.</b>	<b>MASTER GAUGE VALUE</b> VALORE MANOMETRO CAMP.	<b>READING VALUE</b> VALORE LETTO	<b>DEVIATION VALUE</b> SCOSTAMENTO RILEVATO
1	7	7.3	+0.3	1	35	35	0
2	14	14.3	+0.3	2	28	28	0
3	21	21.1	+0.1	3	21	21	0
4	28	28	0	4	14	14.1	+0.1
5	35	35	0	5	7	7.1	+0.1
6	40	39.8	-0.2	6			
7				7			
8				8			
9				9			
10				10			
11				11			
12				12			
13				13			
14				14			
15				15			

**EXPIRY DATE: 04 SET. 2010**

**LO STRUMENTO E' - GAUGE IS**

<input checked="" type="checkbox"/> <b>SATISFACTORY</b> SODDISFACENTE	<input type="checkbox"/> <b>UNSATISFACTORY</b> NON SODDISFACENTE
--	---

<b>DATA-DATE</b>	<b>INSPECTOR SIGNATURE</b>	<b>DATA-DATE</b>	<b>INSPECTOR SIGNATURE</b>	<b>DATA-DATE</b>	<b>Q.C. MANAGER SIGNATURE</b>
		05 SET. 2009	<i>L. Mazzocato</i> Q.C.I. - L. Mazzocato	05 SET. 2009	<i>[Signature]</i> C.I. CIVIDAG S.p.A. Q.C. MGR. P. MEMO



**STUDIO TECNICO**  
**Mario Cuzzolin s.r.l.**

## LABORATORIO/LABORATORY

Pagina/Page: **1** di/of **2**

**RAPPORTO DI PROVA N° :** 14016

*Test report n°*

**RICHIEDENTE :** CIVIDAC S.p.a. - Costruzioni Industriali

*Customer*

**INDIRIZZO :** Via Borgo Cattanei, 35 - Località# CAVRIE'

*Address* 31048 - SAN BIAGIO DI CALLALTA (TV)

**OGGETTO :** Chemical analysis

*Item*

**IDENTIFICAZIONE :** n.1 water sample

*Identification*

**BOLLA DI ENTRATA :**

*Bill of entry*

**DATA :**

*Date*

IL PRESENTE RAPPORTO E' COSTITUITO DAI SEGUENTI RESOCONTI DI PROVA :

*This report includes the following tests*

Analisi Chimica/Chemical analysis

Vedi pag./see page : 2 di 2

**DATA DI ESECUZIONE DELLA/E PROVA/E :** 06/07/2009

*Test date*

LA RIPRODUZIONE DEL PRESENTE RAPPORTO DEVE ESSERE AUTORIZZATA ESPLICITAMENTE DAL RESPONSABILE DEL LABORATORIO

*This report shall not be reproduced without the approval of the laboratory responsible*

I RISULTATI CONTENUTI NEL PRESENTE RAPPORTO SI RIFERISCONO ESCLUSIVAMENTE AGLI OGGETTI PROVATI - *The test results relate only to the item tested.*

CAMPIONAMENTO EFFETTUATO DAL CLIENTE - *Sampling executed by customer*

TEMPO DI CONSERVAZIONE - STORAGE TIME :

- CAMPIONE - SAMPLE = 90 giorni - 90 days
- RAPPORTO DI PROVA - TEST REPORT = 10 anni - 10 years
- REGISTRAZIONE DATI - DATA RECORDING = 2 anni - 2 years

**DATA DI EMISSIONE :**

*Emission date*

06/07/2009

**RESPONSABILE LABORATORIO**

*Laboratory responsible*

**Per.Ind. Mario Cuzzolin**

CIVIDAC S.p.A.  
G.C. MGR. BLUMMO



**STUDIO TECNICO**  
**Mario Cuzzolin s.r.l**

**RAPPORTO DI PROVA**

**ANALISI CHIMICA**  
Chemical analysis

Cliente/Customer :

**CIVIDAC S.p.a. - Costruzioni Industriali**

Commessa/Job :

2009/0685

Rapporto/Report :

**14016**

Materiale/Material :

n. 1 water sample

Data di prova/Test date :

06/07/2009

Pagina/Page : **2 di/of 2**

**STRUMENTI D'ANALISI / ANALYSIS INSTRUMENTS**

**SPECTROPHOTOMETER**

Modello / Model : JENWAY 6100

**Risultati dell'analisi / Analysis results**

**Campione/Numero saggio**

Sample/N° test piece

Water

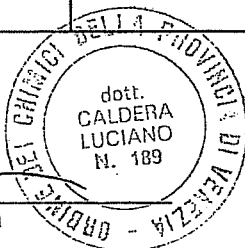
CHLORIDE CONTENT (INCLUDING BROMIDE AND IODIDE) = 4.2 PPM

**Annotazioni :**

Notes :


**L'analizzatore**  
Analyser



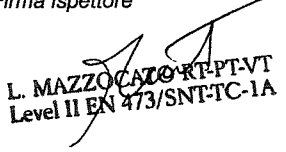
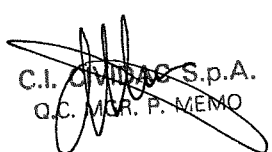
  
**dott. L. Caldera**



**L'ispettore**  
Inspector

  
**C. F. CIVIDAC S.p.A.**  
J.C. MBSLR MEMO

		<b>LOW PRESSURE PNEUMATIC TEST REPORT</b> <b>CERTIFICATO PROVA PNEUMATICA</b>			REPORT NO. Certificato N°	4320/LT1			
					SHEET Foglio	1	OF di	1	
JOB NO. Commessa N°	2010/005/T	ORDER NO. Ordine N°	10PU-000265-PR	ITEM NO. Sigla	T10 HR		SERIAL NO. N° fabbr.	4320	
DRAWING NO. Disegno N°	6725-2010		INSPECTION PRG. Prg. ispezione	ITP/2010/005		REV. Rev.	0	STEP Fasi	E8
PNEUMATIC TEST ON Prova pneumatica su: <u>CONDENSATOR - REGENERATOR</u>									
<b>COMPONENT / Componenti in prova</b>									
SUBJECT Oggetto in prova	<input type="checkbox"/> TUBE / TUBESHEET JOINT Giunto tubi / piastra tubiera	<input checked="" type="checkbox"/> REINFORCING PADS Piastre di rinforzo	<input type="checkbox"/> ASSEMBLER SHELL Corpo assieme	<input type="checkbox"/> PIPING (*) Tubazioni					
EXAMINATION TEST Fase di esame	<input checked="" type="checkbox"/> BEFORE HYDROTEST Prima della prova id.	<input type="checkbox"/> REPLACE HYDROTEST Sostit. della p.i.	<input type="checkbox"/> AFTER HYDROTEST Dopo la p.i.						
JOINT TYPE Tipo di giunto	<input checked="" type="checkbox"/> WELDED Saldato	<input type="checkbox"/> EXPANDED Mandrinato	<input type="checkbox"/> FLANGED Flangiato	<input type="checkbox"/> THREADED Filettato					
<b>WELDING CONDITIONS / Condizioni di saldatura</b>									
WELDING PROCESS Tipi di saldatura	<input checked="" type="checkbox"/> TIG	<input type="checkbox"/> TIG / AUT. -SEMI	<input checked="" type="checkbox"/> SMAW	<input type="checkbox"/> SAW					
WELDING STEP Fase di saldatura	<input type="checkbox"/> AFTER 1ST PASS Dopo la prima passata	<input type="checkbox"/> AFTER EACH PASS Dopo ogni passata	<input checked="" type="checkbox"/> UPON COMPLET. Completato	<input type="checkbox"/>					
H.T. CONDITION Stato di t.t.	<input checked="" type="checkbox"/> AS WELDED Come saldato	<input type="checkbox"/> ITERM. H.T. T.T. intermedio	<input type="checkbox"/> P.W.H.T. Disteso	<input type="checkbox"/>					
<b>TEST CONDITION / Condizioni di prova</b>									
TEST MEDIUM Mezzi di prova	<input checked="" type="checkbox"/> AIR Aria	<input type="checkbox"/> NITROGEN Azoto	<input type="checkbox"/> HELIUM Elio	<input checked="" type="checkbox"/> SOAPY SOLUTION Acqua saponata					
PRESS. SIDE Lato pressurizzato	<input type="checkbox"/> SHELL SIDE Lato corpo	<input type="checkbox"/> TUBE SIDE Lato tubi	<input checked="" type="checkbox"/> REINFORCING Rinforzo	<input type="checkbox"/> VACUUM BOX Cam. a vuoto					
TEST CONDITION Condizioni di prova	SOAKING TIME Perman. in pressione	10 min	TEST PRESSURE Press. prova	0.5 bar g	METAL TEMPERATURE Temperatura metallo	19 °C			
CLEANING COND. Pulizia	<input type="checkbox"/> SAND BLASTING Sabbatura	<input checked="" type="checkbox"/> BRUSHING Spazzolatura	<input type="checkbox"/> SOLVENT Solvente	<input type="checkbox"/>					
SURFACE FINISH Finitura superfice	<input checked="" type="checkbox"/> ROUGH-AS SUPPLIED Grezzo fornitura	<input type="checkbox"/> MACHINED Lavorato	<input type="checkbox"/> GROUND Molato	<input type="checkbox"/>					
ILLUMINATION Illuminazione	<input checked="" type="checkbox"/> NATURAL Naturale	<input checked="" type="checkbox"/> ARTIFICIAL Artificiale	<input type="checkbox"/> LENS x2 Esame con lente	<input type="checkbox"/>					
<b>REMARKS</b> Note : <u>- NO LEAKAGE / Nessuna perdita.</u>									
<b>RESULTS Risultati</b>									
<input checked="" type="checkbox"/> SATISFACTORY Soddisfacente	ISSUED NON CONFORMITY REPORT Emesso rapporto di non conformità		RESOLVED BY REPORT NO Risolta con rapporto N°		DATE Data				
<input type="checkbox"/> UNSATISFACTORY Non soddisfacente	NCR NO NCR N°	DATE Data	NOT RESOLVED-REJECTION REPORT NO Non Risolta-Rapporto di scarto N°		DATE Data				
DATE Data	INSPECTOR SIGNATURE Firma ispettore	DATE Data	INSPECTOR SIGNATURE Firma ispettore	DATE Data	Q.C. MANAGER SIGNATURE				
		16/06/2010	L. MAZZOCATO RT-PT-VT Level II EN 473/SNT-TC-1A	16/06/2010	C.I. CIVIDAC S.p.A. Q.C. MGR. P. MEMO				

		<b>LOW PRESSURE PNEUMATIC TEST REPORT</b> <b>CERTIFICATO PROVA PNEUMATICA</b>			<b>REPORT NO.</b> Certificato N° <b>4320/LT2</b>		
<b>JOB NO.</b> Commessa N° <b>2010/005/T</b>		<b>ORDER NO.</b> Ordine N° <b>10PU-000265-PR</b>		<b>ITEM NO.</b> Sigla <b>T10 HR</b>		<b>SHEET</b> Foglio <b>1</b> OF <b>1</b> di <b>1</b>	
<b>DRAWING NO.</b> Disegno N° <b>6725-2010</b>		<b>INSPECTION PRG.</b> Prg. ispezione <b>ITP/2010/005</b>		<b>SERIAL NO.</b> N° fabbr. <b>4320</b>		<b>REV.</b> Rev. <b>0</b>	<b>STEP</b> Fasi <b>F12</b>
<b>PNEUMATIC TEST ON</b> Prova pneumatica su: <b>CONDENSATOR - REGENERATOR</b>							
<b>COMPONENT / Componenti in prova</b>							
<b>SUBJECT</b> Oggetto in prova	<input checked="" type="checkbox"/> <b>TUBE / TUBESHEET JOINT</b> Giunto tubi / piastra tubiera	<input type="checkbox"/> <b>REINFORCING PADS</b> Piastre di rinforzo	<input type="checkbox"/> <b>ASSEMBLER SHELL</b> Corpo assiemato	<input type="checkbox"/> <b>PIPING</b> Tubazioni			
<b>EXAMINATION TEST</b> Fase di esame	<input checked="" type="checkbox"/> <b>BEFORE HYDROTEST</b> Prima della prova id.	<input type="checkbox"/> <b>REPLACE HYDROTEST</b> Sostit. della p.i.	<input type="checkbox"/> <b>AFTER HYDROTEST</b> Dopo la p.i.				
<b>JOINT TYPE</b> Tipo di giunto	<input checked="" type="checkbox"/> <b>WELDED</b> Saldato	<input type="checkbox"/> <b>EXPANDED</b> Mandrinato	<input type="checkbox"/> <b>FLANGED</b> Flangiato	<input type="checkbox"/> <b>THREADED</b> Filettato			
<b>WELDING CONDITIONS / Condizioni di saldatura</b>							
<b>WELDING PROCESS</b> Tipi di saldatura	<input type="checkbox"/> <b>TIG</b>	<input checked="" type="checkbox"/> <b>TIG / AUT. -SEMI</b>	<input type="checkbox"/> <b>SMAW</b>	<input type="checkbox"/> <b>SAW</b>			
<b>WELDING STEP</b> Fase di saldatura	<input type="checkbox"/> <b>AFTER 1ST PASS</b> Dopo la prima passata	<input type="checkbox"/> <b>AFTER EACH PASS</b> Dopo ogni passata	<input checked="" type="checkbox"/> <b>UPON COMPLET.</b> Completato				
<b>H.T. CONDITION</b> Stato di t.t.	<input checked="" type="checkbox"/> <b>AS WELDED</b> Come saldato	<input type="checkbox"/> <b>ITERM. H.T.</b> T.T. intermedio	<input type="checkbox"/> <b>P.W.H.T.</b> Disteso				
<b>TEST CONDITION / Condizioni di prova</b>							
<b>TEST MEDIUM</b> Mezzi di prova	<input checked="" type="checkbox"/> <b>AIR</b> Aria	<input type="checkbox"/> <b>NITROGEN</b> Azoto	<input type="checkbox"/> <b>HELIUM</b> Elio	<input checked="" type="checkbox"/> <b>SOAPY SOLUTION</b> Acqua saponata			
<b>PRESS. SIDE</b> Lato pressurizzato	<input checked="" type="checkbox"/> <b>SHELL SIDE</b> Lato corpo	<input type="checkbox"/> <b>TUBE SIDE</b> Lato tubi	<input type="checkbox"/> <b>REINFORCING</b> Rinforzo	<input type="checkbox"/> <b>VACUUM BOX</b> Cam. a vuoto			
<b>TEST CONDITION</b> Condizioni di prova	<b>SOAKING TIME</b> Perman. in pressione <b>10</b> min	<b>TEST PRESSURE</b> Press. prova <b>0.5</b> bar g	<b>METAL TEMPERATURE</b> Temperatura metallo <b>19</b> °C				
<b>CLEANING COND.</b> Pulizia	<input type="checkbox"/> <b>SAND BLASTING</b> Sabbatura	<input checked="" type="checkbox"/> <b>BRUSHING</b> Spazzolatura	<input type="checkbox"/> <b>SOLVENT</b> Solvente				
<b>SURFACE FINISH</b> Finitura superfice	<input checked="" type="checkbox"/> <b>ROUGH-AS SUPPLIED</b> Grezzo forniture	<input type="checkbox"/> <b>MACHINED</b> Lavorato	<input type="checkbox"/> <b>GROUND</b> Molato				
<b>ILLUMINATION</b> Illuminazione	<input checked="" type="checkbox"/> <b>NATURAL</b> Naturale	<input checked="" type="checkbox"/> <b>ARTIFICIAL</b> Artificiale	<input type="checkbox"/> <b>LENS x2</b> Esame con lente				
<b>REMARKS</b> Note : <b>- NO LEAKAGE / Nessuna perdita.</b>							
<b>RESULTS Risultati</b>							
<input checked="" type="checkbox"/> <b>SATISFACTORY</b> Soddisfacente	<input type="checkbox"/> <b>ISSUED NON CONFORMITY REPORT</b> Emesso rapporto di non conformità	<input type="checkbox"/> <b>RESOLVED BY REPORT NO</b> Risolta con rapporto N°	DATE Data				
<input type="checkbox"/> <b>UNSATISFACTORY</b> Non soddisfacente	<b>NCR NO</b> NCR N°	<b>DATE</b> Data	<input type="checkbox"/> <b>NOT RESOLVED-REJECTION REPORT NO</b> Non Risolta-Rapporto di scarto N°	DATE Data			
<b>DATE</b> Data	<b>INSPECTOR SIGNATURE</b> Firma ispettore  Reviewed by ASME AI-U BREDA 15/06/2010	<b>DATE</b> Data <b>16/06/2010</b>	<b>INSPECTOR SIGNATURE</b> Firma ispettore  L. MAZZOCATO REPT-VT Level II EN 473/SNT-TC-1A	<b>DATE</b> Data <b>16/06/2010</b>	<b>Q.C. MANAGER SIGNATURE</b>  C.I. CIVIDAC S.p.A. Q.C. MGR. P. MEMO		

U

W  
RT3

W  
RT3

W

(NB)

647

CERTIFIED BY

COSTRUZIONI INDUSTRIALI CIVIDAC S.P.A.-ITALY

SHELL SIDE

MAX. ALLOWABLE WORKING PRESSURE

600 KPa AT 340 °C

MAX. ALLOWABLE EXTERNAL WORKING PRESSURE

100 KPa AT 340 °C

MIN. DESIGN METAL TEMPERATURE

-9 °C AT 600 KPa

TUBE SIDE

MAX. ALLOWABLE WORKING PRESSURE

1600 KPa AT 150 °C

MAX. ALLOWABLE EXTERNAL WORKING PRESSURE

/ KPa AT / °C

MIN. DESIGN METAL TEMPERATURE

-29 °C AT 1600 KPa

FINNED COIL

MAX. ALLOWABLE WORKING PRESSURE

1900 KPa AT 300 °C

MAX. ALLOWABLE EXTERNAL WORKING PRESSURE

100 KPa AT 300 °C

MIN. DESIGN METAL TEMPERATURE

-9 °C AT 1900 KPa

MANUFACTURER'S SERIAL NUMBER

4320

YEAR BUILT

2010

ARISE  
WITNESS  
Reviewed by  
ASME AI-1/BREDA  
13816 A 25/SUPZ/2010

CIVIDAC S.p.A.  
C.S. MEMBER MEMO  
25/06/2010

Job 2010/005/T SN 4320



SAN BIAGIO DI CALLALTA (TREVISO) ITALY

REGENERATOR / CONDENSER - PLANT TURBODEN 10 HR

CODE	ASME SEC. VIII DIV.1 ED. 2007 Add. 2009b		
	SHELL SIDE	TUBE SIDE	FINNED COIL
DESIGN PRESSURE	600/FV	1600/ATM	1900/FV KPa g
DESIGN TEMPERATURE	340	150	300 °C
M.D.M.T.	-9	-29	-9 °C
CORROSION ALLOWANCE	1.6	1.6	1.6 mm
HYDROTEST PRESSURE	780	2080	2470 KPa g
FLUID	SILICONE OIL	WATER	SILICONE OIL
TEST DATE	25.06.2010		
CAPACITY	20200	850	750 L
EMPTY WEIGHT	18200 Kg	TYPE EXCHANGER	
P.W.H.T	NO	RADIOGRAPH 10%+100%	
DATE BUILT	2010	SERIAL No.	4320
MANUFACTURER	C.I. CIVIDAC S.p.A.		

Job 2010/005/T  
SN 4320

C.I. CIVIDAC S.p.A.  
OC. MGR. MEMO  
*[Signature]*  
25/06/2010



Manufactured by  
 **Eurocoil**  
Bovolone - Verona  
+39 045 6902236

MODEL  
BATTERIA RIG.

Dwg DG62.4

N.F. 0251

Fluid  
**SILICONE OIL**

DESIGN PRESS.  
INT. PS bar.g 19/-1 F.V.  
EXT. PS bar.g 6/-1 F.V.

TEST PRESS.  
Press INT. PT bar.g 30.5  
Press EXT. PT bar.g 14

DESIGN TEMP.  
INT. TS°C -10°C/300°C  
EXT. TS°C -10°C/340°C

CAPACITY 260 L.

TEST PRES. DATE

ANNO 2010

FLUID GROUP  1

Manufactured by  
 **Eurocoil**  
Bovolone - Verona  
+39 045 6902236

MODEL  
BATTERIA RIG.

Dwg DG62.4

N.F. 0252

Fluid  
**SILICONE OIL**

DESIGN PRESS.  
INT. PS bar.g 19/-1 F.V.  
EXT. PS bar.g 6/-1 F.V.

TEST PRESS.  
Press INT. PT bar.g 30.5  
Press EXT. PT bar.g 14

DESIGN TEMP.  
INT. TS°C -10°C/300°C  
EXT. TS°C -10°C/340°C

CAPACITY 260 L.

TEST PRES. DATE

ANNO 2010

FLUID GROUP  1

Job 2010/005/T  
SN 4320



ARISE  
Reviewed by  
ASME A. U. BREDA  
1986 A 25/08/2010

*[Handwritten signature]*

JOB 2010/005/T  
SN 4320



JOB 2010/005/T  
SN 4320



**STUDIO TECNICO**  
**Mario Cuzzolin s.r.l**

## LABORATORIO/LABORATORY

Pagina/Page: **1 di/of 6**

**RAPPORTO DI PROVA N° : 14751**

Test report n°

**RICHIEDENTE : CIVIDAC S.p.a. - Costruzioni Industriali**

Customer

**INDIRIZZO : Via Borgo Cattanei, 35 - Località# CAVRIE'**

Address 31048 - SAN BIAGIO DI CALLALTA (TV)

**OGGETTO : Sample test according to ASME IX Ed. 2007 Add. 2008**

Item

**IDENTIFICAZIONE : Sample T 10/005-2**

Identification

**BOLLA DI ENTRATA : Ddt 099**

Bill of entry

Distinta di prelievo 10/005/T-2

**DATA : 26,04,2010**

Date

**IL PRESENTE RAPPORTO E' COSTITUITO DAI SEGUENTI RESOCONTI DI PROVA :**

*This report includes the following tests*

Prova di Trazione/Tensile test	*	Vedi pag./see page :	2 di 6
Prova di Piega/Bend test	*	Vedi pag./see page :	3 di 6
Prova di Resilienza/Impact test	*	Vedi pag./see page :	4 di 6
Prova di Durezza/Hardness test	*	Vedi pag./see page :	5 di 6
Prova di Frattura/Fracture test	*	Vedi pag./see page :	
Esame Macrografico/Macro examination	*	Vedi pag./see page :	6 di 6
Esame Micrografico/Micro examination	*	Vedi pag./see page :	
Trattamenti Termici/Heat treatment	*	Vedi pag./see page :	
Controllo M.T./Magnetic particle examination	*	Vedi pag./see page :	
Controllo R.X./Radiographic examination	*	Vedi pag./see page :	
Controllo L.P./Penetrant examination	*	Vedi pag./see page :	
Controllo U.T./Ultrasonic examination	*	Vedi pag./see page :	
Esame Visivo/Visual examination	*	Vedi pag./see page :	

(\* Prova non accreditata dal SINAL)

**DATA DI ESECUZIONE DELLA/E PROVA/E : 05,05,2010**

Test date

LA RIPRODUZIONE DEL PRESENTE RAPPORTO DEVE ESSERE AUTORIZZATA ESPLICITAMENTE DAL RESPONSABILE DEL LABORATORIO E DAL SINAL - *This report shall not be reproduced without the approval of the laboratory responsible and SINAL.*

I RISULTATI CONTENUTI NEL PRESENTE RAPPORTO SI RIFERISCONO ESCLUSIVAMENTE AGLI OGGETTI PROVATI - *The test results relate only to the item tested.*

CAMPIONAMENTO EFFETTUATO DAL CLIENTE - *Sampling executed by customer*

TEMPO DI CONSERVAZIONE - *STORAGE TIME :*

- CAMPIONE - *SAMPLE* = 90 giorni - *90 days*
- RAPPORTO DI PROVA - *TEST REPORT* = 10 anni - *10 years*
- REGISTRAZIONE DATI PROVE - *DATA RECORDING TEST* = 2 anni - *2 years*

**DATA DI EMISSIONE :**

Emission date

05,05,2010

**RESPONSABILE LABORATORIO**

Laboratory responsible

Per.Ind. Mario Cuzzolin

CIVIDAC S.p.A.  
O.C. VIGH. P. MEMO



**STUDIO TECNICO**  
Mario Cuzzolin s.r.l.

**RAPPORTO DI PROVA**

**PROVA DI TRAZIONE**

Tensile test

Cliente/Customer : <b>CIVIDAC S.p.a. - Costruzioni Industriali</b>	Commessa/Job : 2010/0449	Rapporto/Report : <b>14751</b>
Materiale/Material : <b>SA 516 Gr. 70</b>	Data di prova/Test date : 05,05,2010	Pagina/Page : <b>2 di/of 6</b>

**CONDIZIONI D'ESAME/TEST CONDITIONS**

Norma di rif./Reference standard <b>QW 462.1 (a)</b>	Criteri di accettabilità/Reference standard <b>ASME IX Ed. 2007 Add. 2008</b>	Istruzione di lavoro/Instruction of work <b>IL006#0 - IL006#1</b>
Norma di taratura/Calibration Standard <b>UNI EN ISO 7500-1:2005</b>		

**MACCHINE DI PROVA/TESTING MACHINE**

Galdabini PM 50 matr. 32508-32509 (01A)	Galdabini PM 20 matr. 24394-24395 (02A)	Galdabini PM 60 matr. 29618 (03A)																										
<table border="1"> <thead> <tr> <th>Scala (KN)</th> <th>Classe</th> </tr> </thead> <tbody> <tr><td>25</td><td>1</td></tr> <tr><td>50</td><td>0,5</td></tr> <tr><td>100</td><td>0,5</td></tr> <tr><td>250</td><td>0,5</td></tr> <tr><td>500</td><td>0,5</td></tr> </tbody> </table> <input type="checkbox"/>	Scala (KN)	Classe	25	1	50	0,5	100	0,5	250	0,5	500	0,5	<table border="1"> <thead> <tr> <th>Scala (KN)</th> <th>Classe</th> </tr> </thead> <tbody> <tr><td>25</td><td>1</td></tr> <tr><td>50</td><td>0,5</td></tr> <tr><td>100</td><td>0,5</td></tr> <tr><td>200</td><td>0,5</td></tr> </tbody> </table> <input checked="" type="checkbox"/>	Scala (KN)	Classe	25	1	50	0,5	100	0,5	200	0,5	<table border="1"> <thead> <tr> <th>Scala (KN)</th> <th>Classe</th> </tr> </thead> <tbody> <tr><td>600</td><td>0,5</td></tr> </tbody> </table> <input type="checkbox"/>	Scala (KN)	Classe	600	0,5
Scala (KN)	Classe																											
25	1																											
50	0,5																											
100	0,5																											
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50	0,5																											
100	0,5																											
200	0,5																											
Scala (KN)	Classe																											
600	0,5																											
Certificati di taratura n° 0906933FSE e n°0906936FSE e n° 0906932FSE eseguiti in data 10/09/2009 da centro SIT n°52																												

**Risultati delle prove / Test results**

CARATTERISTICHE MECCANICHE <i>Mechanical characteristics</i>						Carico snervamento superiore R <sub>eH</sub> <i>Upper yield strength</i>		Carico di rottura R <sub>m</sub> <i>Tensile strength</i>		Allungamento % dopo rottura <i>Elongation % after fracture</i>		Pos. * rottura <i>Failure position</i>	
Valori richiesti <i>Requirements</i>													
Pos. <i>Position</i>	Direz. prel. <i>direction</i>	Numero saggio <i>N° test piece</i>	Spessore mm <i>Thickness</i>		Area S <sub>0</sub> <i>mm<sup>2</sup></i> Area	L <sub>0</sub> <i>mm</i>	N.	N/mm <sup>2</sup>	N.	N/mm <sup>2</sup>	mm	A %	
1	T W	T10/005-2	14,9	x	19,0	283,1			156356	552,3			B M

**Annotazioni :** \* BM = Fuori saldatura (*Out of weld*); W = In saldatura (*Weld metal*); H.A.Z. = Zona termicamente alterata (*Heat affected zone*);

Mod.CPM.02 Rev. : 04 del 15.06.07

Esecutore  
Operator  
Laboratory  
Prove  
Per. Ing. Andrea Simionato

L' Ispettore  
Inspector

CIVIDAC S.p.A.  
D.C. MGR. P. MEMO









**STUDIO TECNICO**  
**Mario Cuzzolin s.r.l.**

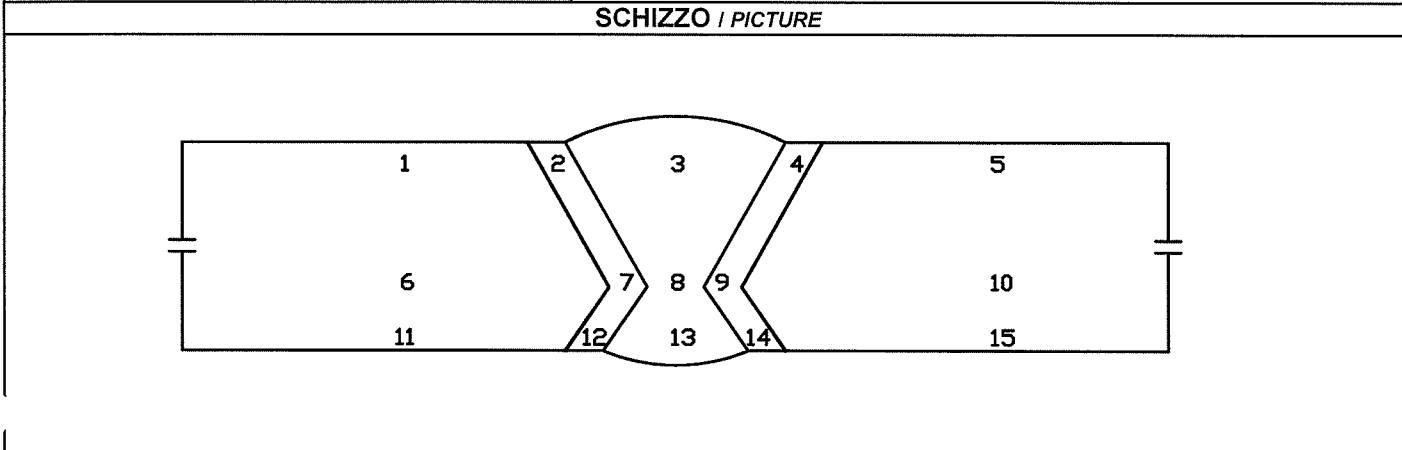
**RAPPORTO DI PROVA**  
**PROVE DI DUREZZA**

**Hardness test**

Cliente/Customer : <b>CIVIDAC S.p.a. - Costruzioni Industriali</b>	Commessa/Job : 2010/0449	Rapporto/Report : <b>14751</b>
Materiale base/Base material : <b>SA 516 Gr. 70</b>	Data di prova/Test date : 05,05,2010	Pagina/Page : <b>5 di/of 6</b>
Saggio/Test piece : <b>T 10/005-2</b>	Spessore mm/Thickness mm : <b>15,0 mm</b>	D.est.mm/D.ext : <b>Butt full penetration</b>
<b>OGGETTO : Sample test accordin to ASME IX Ed. 2007 Add. 2008</b>		

<b>CONDIZIONI D'ESAME/TEST CONDITIONS</b>		
Norma di rif./Reference standard <b>Costumer request</b>	Criteri di accettabilità/Reference standard <b>ASME IX Ed. 2007 Add. 2008</b>	Istruzione di lavoro/Instruction of work <b>IL011#0 - IL011#3</b>
Condizioni superficiali/Surface finish <b>Lappato</b>		Posizione/Position <b>Trasversale</b>

<b>MACCHINE DI PROVA/TESTING MACHINE</b>		
Parametri durometro		
Costruttore : Tipo : Matricola :	<b>WOLPERT</b> <b>Dia TESTOR 2RC</b> <b>7957 (07A)</b>	Penetratori : Matricola : Sistema di misura : Matricola :
	Certificato di taratura n° 0906939FSE eseguito in data 10/09/2009 da centro SIT n°52	<b>VICKERS</b> <b>2005 - 63557</b> <b>Ottico con ingranditore ZEISS 70 x, 140 x</b> <b>62157 - 63857</b>



Numero/Number	Posizione di identificazione/Position of indication	Durezza HV 10 / Hardness HV 10
1	Materiale base superfice/Parent metal surface	168 - 168 - 167
2	Zona term.alterata superf./Heat affected zone top	184 - 191 - 201
3	Zona fusa superfice/Weld metal top	183 - 186 - 184
4	Zona term.alterata superf./Heat affected zone top	198 - 187 - 179
5	Materiale base superfice/Parent metal surface	167 - 169 - 165
6	Materiale base centro/Parent metal centre	164 - 166 - 167
7	Zona term.alterata centro./Heat affected zone centre	180 - 188 - 194
8	Zona fusa centro/Weld metal centre	180 - 183 - 181
9	Zona term.alterata centro./Heat affected zone centre	193 - 182 - 175
10	Materiale base centro/Parent metal centre	164 - 163 - 161
11	Materiale base superfice/Parent metal surface	166 - 167 - 165
12	Zona term.alterata superf./Heat affected zone botton	183 - 189 - 197
13	Zona fusa superfice/Weld metal botton	188 - 186 - 187
14	Zona term.alterata superf./Heat affected zone botton	196 - 184 - 179
15	Materiale base superfice/Parent metal surface	167 - 168 - 168

Esecutore/Operator  
Per. Ind. **Andrea Simonato**

Ispettore / Inspector  
**C.I. CIVIDAC S.p.A.**  
**G.C. MGR. P. MEMO**

Mod. DUR.02 Rev. : 02 del 12.04.05







**STUDIO TECNICO**  
**Mario Cuzzolin s.r.l.**

**RAPPORTO DI PROVA**

**ESAME MACROGRAFICO**

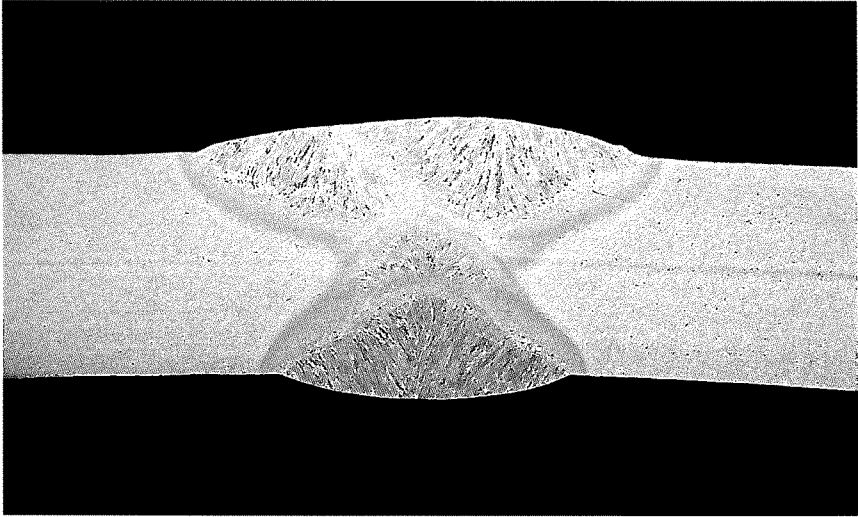
**Macro examination**

Cliente/Customer : <b>CIVIDAC S.p.a. - Costruzioni Industriali</b>	Commessa/Job : 2010/0449	Rapporto/Report : <b>14751</b>
Materiale base/Base material : <b>SA 516 Gr. 70</b>	Data di prova/Test date : 05,05,2010	Pagina/Page : <b>6 di/of 6</b>
Saggio/Test piece : <b>T 10/005-2</b>	Spessore mm/Thickness mm : <b>15,0 mm</b>	D.est.mm/D.ext : <b>Butt full penetration</b>
OGGETTO / ITEM : <b>Esame Macrografico secondo / Macro examination according to :</b>		<b>ASME IX Ed. 2007 Add. 2008</b>

**CONDIZIONI D'ESAME/TEST CONDITIONS**

Norma di rif./Reference standard <b>QW 472</b>	Criteri di accettabilità/Reference standard <b>ASME IX Ed. 2007 Add. 2008</b>	Istruzione di lavoro/Instruction of work <b>IL011#1</b>
Condizioni superficiali/Surface finish <b>Lappatura secondo / Polishing according to :</b>	<b>CR 12361:1996</b>	Posizione/Position <b>Trasversale al giunto saldato</b>

<b>DATI / DATA</b>		<b>TECNICHE E MATERIALI IMPIEGATI / Technique and materials employed in according to CR 12361:1996</b>	
ingrandimento / Magnification : <b>2,0 x</b>		Metodo d'attacco/Etching method :	<input type="checkbox"/> Immersione/dipping <input checked="" type="checkbox"/> Strofinamento/swabbing <input type="checkbox"/> Elettrolitico/Electrolytic
Lato "Z" cordone 1 : n.a.		Tipo d'attacco / Etching :	<b>Nital 2%</b>
Lato "Z" cordone 2 : n.a.			

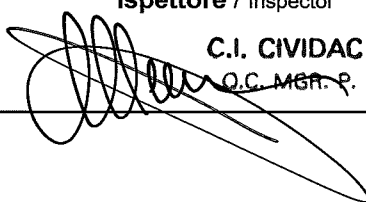
<b>DIFETTI / Imperfections</b>	<b>FOTOGRAFIA / Photograph</b>
	

**NOTE / Notes**

Mod. MAC.02 Rev. : 03 del 12.04.05

Esecutore / Operator  
 Per. Ind. **Andrea Simonato**

Ispettore / Inspector  
**C.I. CIVIDAC S.p.A.**  
 Q.C. MGR-P. MEMO





**STUDIO TECNICO**  
**Mario Cuzzolin s.r.l**

## LABORATORIO/LABORATORY

Pagina/Page: 1 di/of 2

**RAPPORTO DI PROVA N° :** 14815 / B

Test report n°

**RICHIEDENTE :** CIVIDAC S.p.a. - Costruzioni Industriali

Customer

**INDIRIZZO :** Via Borgo Cattanei, 35 - Localit# CAVRIE'  
Address 31048 - SAN BIAGIO DI CALLALTA (TV)

**OGGETTO :** Material testing

Item

**IDENTIFICAZIONE :** Sample T10/005-3 - Curve 180° d. 15,88 x thk 2,11 mm

Identification

**BOLLA DI ENTRATA :** Ddt 152  
Bill of entry Distinta di prelievo 10/005/T-3 del 19,05,2010

**DATA :** 19,05,2010  
Date

IL PRESENTE RAPPORTO E' COSTITUITO DAI SEGUENTI RESOCONTI DI PROVA :

This report includes the following tests

Prova di Trazione/Tensile test		Vedi pag./see page :	
Prova di Piegia/Bend test		Vedi pag./see page :	
Prova di Resilienza/Impact test		Vedi pag./see page :	
Prova di Durezza/Hardness test	*	Vedi pag./see page :	2 di 2
Prova di Frattura/Fracture test	*	Vedi pag./see page :	
Esame Macrografico/Macro examination		Vedi pag./see page :	
Esame Micrografico/Micro examination		Vedi pag./see page :	
Trattamenti Termici/Heat treatment	*	Vedi pag./see page :	
Controllo M.T/Magnetic particle examination	*	Vedi pag./see page :	
Controllo R.X./Radiographic examination	*	Vedi pag./see page :	
Controllo L.P./Penetrant examination	*	Vedi pag./see page :	
Controllo U.TI/Ultrasonic examination	*	Vedi pag./see page :	
Esame Visivo/Visual examination	*	Vedi pag./see page :	

(\* Prova non accreditata dal SINAL)

**DATA DI ESECUZIONE DELLA/E PROVA/E :** 20,05,2010

Test date

LA RIPRODUZIONE DEL PRESENTE RAPPORTO DEVE ESSERE AUTORIZZATA ESPLICITAMENTE DAL RESPONSABILE DEL LABORATORIO E DAL SINAL - This report shall not be reproduced without the approval of the laboratory responsible and SINAL.

I RISULTATI CONTENUTI NEL PRESENTE RAPPORTO SI RIFERISCONO ESCLUSIVAMENTE AGLI OGGETTI PROVATI - The test results relate only to the item tested.

CAMPIONAMENTO EFFETTUATO DAL CLIENTE - Sampling executed by customer

TEMPO DI CONSERVAZIONE - STORAGE TIME :

- CAMPIONE - SAMPLE = 90 giorni - 90 days
- RAPPORTO DI PROVA - TEST REPORT = 10 anni - 10 years
- REGISTRAZIONE DATI PROVE - DATA RECORDING TEST = 2 anni - 2 years

**DATA DI EMISSIONE :**

Emission date

20,05,2010

**RESPONSABILE LABORATORIO**

Laboratory responsible

Per.Ind. Mario Cuzzolin

**CIVIDAC S.p.A.**  
QC MOBIL MEMO



RAPPORTO DI PROVA

PROVE DI DUREZZA

STUDIO TECNICO  
Mario Cuzzolin s.r.l

Hardness test

Cliente/Customer :	Commessa/Job :	Rapporto/Report :
<b>CIVIDAC S.p.a. - Costruzioni Industriali</b>	2010/0525	<b>14815 / B</b>
Materiale base/Base material :	Data di prova/Test date :	Pagina/Page : <b>2 di/of 2</b>
<b>ASTM A 210 Gr. A1</b>	20,05,2010	
Saggio/Test piece :	Spessore mm/Thickness mm :	D.est.mm/D.ext :
<b>T 10/005-3</b>	<b>2,11 mm</b>	<b>15,88 mm</b>
		Tipo/Type : <b>Curve 180°</b>

OGGETTO : **Prove materiale**  
 ITEM: **Material testing**

CONDIZIONI D'ESAME/TEST CONDITIONS

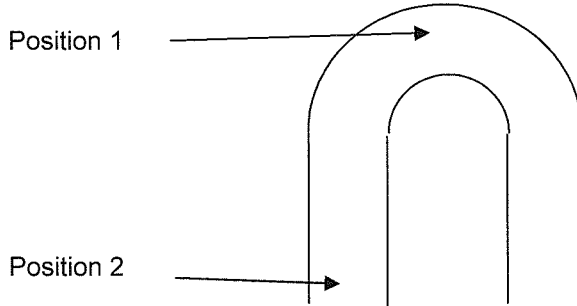
Norma di rif./Reference standard	Criteri di accettabilità/Reference standard	Istruzione di lavoro/Instruction of work
<b>ASTM A 370</b>	<b>Customer request</b>	<b>IL011#0 - IL011#3</b>
Condizioni superficiali/Surface finish		Posizione/Position
<b>To lap</b>		<b>In surface</b>

MACCHINE DI PROVA/TESTING MACHINE

Parametri durometro

Costruttore :	WOLPERT	Penetratori :	TESTOR
Tipo :	Dia TESTOR 2RC	Matricola :	6905
Matricola :	2957	Sistema di misura :	Ottico con ingranditore ZEISS 70 x, 140 x
		Matricola :	6257 - 63857

SCHIZZO / PICTURE



HRBW  
Max 79 HRBW

Position 1	Position 2
78,0	76,5
77,5	75,5
78,5	76,5

Mod. DUR.02 Rev. : 02 del 12.04.05

Esecutore / Operator  
 Per.Ind. **Andrea Simichato**

Ispettore / Inspector  
**C.I. CIVIDAC S.p.A.**  
 Q.C. MGR. P. NEMO



# DRYING INSPECTION REPORT

CERTIFICATO COLLAUDO ASCIUGATURA

REPORT NO 4320/ASC  
Certificato N°

SHEET 1 OF 1  
Foglio di

JOB NO. 005/T  
Commessa N°

ORDER NO. 10PU-000265-PR  
Ordine N°

ITEM NO. T10 HR  
Sigla

SERIAL NO. 4320  
N° fabbr.

DRAWING NO 6725-2010  
Disegno N°

INSPECTION PRG. ITP/2010/005  
Prg. ispezione

REV. 0 STEP H4  
Rev. Fasi

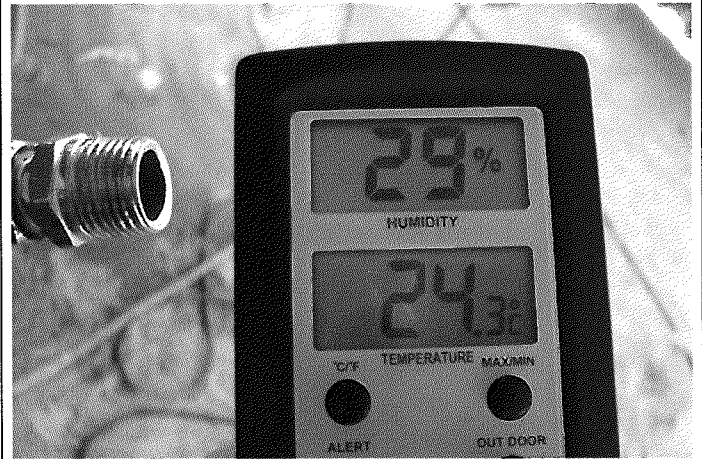
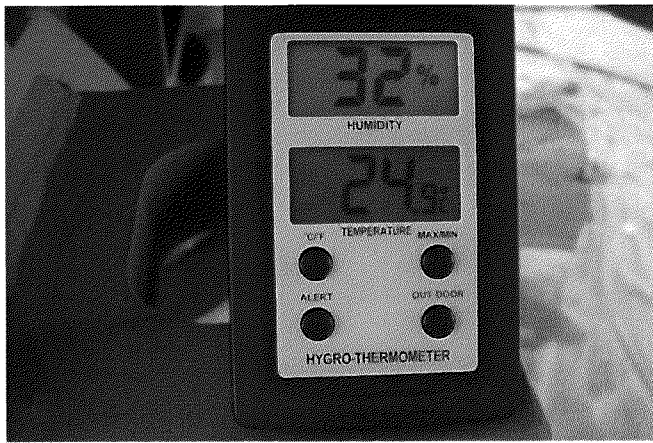
COMPONENTE DENOMINATION REGENERATOR (BATTERY)  
Denominazione Componente:

**AMBIENT CONDITION:**  
Ambiente esterno:

**BLOW AIR:**  
Flussaggio aria compressore :

AIR TEMPERATURE (°C) 24.9  
RELATIVE HUMIDITY (%) 32

AIR TEMPERATURE (°C) 24.3  
RELATIVE HUMIDITY (%) 29



**INTERNAL BATTERIES:**  
Interno batterie:

AIR TEMPERATURE (°C) 24.2  
RELATIVE HUMIDITY (%) 22



REMARKS  
NOTE

**RESULTS / Risultati**

<input checked="" type="checkbox"/> <b>SATISFACTORY</b> Soddisfacente		<input type="checkbox"/> <b>ISSUED NON CONFORMITY REPORT</b> Emesso rapp.to di non conformita'		<input type="checkbox"/> <b>RESOLVED BY REPORT NO</b> risolta con rapporto N°		<input type="checkbox"/> <b>DATE</b> Data	
<input type="checkbox"/> <b>UNSATISFACTORY</b> Non soddisfacente		<input type="checkbox"/> <b>NO</b> N°		<input type="checkbox"/> <b>NOT RESOLVED-REJECTION REPORT NO</b> Non risolta-rapporto di scarto N°		<input type="checkbox"/> <b>DATE</b> Data	
<b>DATE</b> Data	<b>INSPECTOR SIGNATURE</b> Firma ispettore	<b>DATE</b> Data	<b>INSPECTOR SIGNATURE</b> Firma ispettore	<b>DATE</b> Data	<b>Q.C. MANAGER SIGNATURE</b> C.I. CIVIDAC S.p.A. Q.C. (D.P.R.) MEMO	<b>DATE</b> Data	<b>Q.C. MANAGER SIGNATURE</b> C.I. CIVIDAC S.p.A. Q.C. (D.P.R.) MEMO
		26/06/2010	<i>[Signature]</i>	26/06/2010			



# PAINTING INSPECTION REPORT

CERTIFICATO COLLAUDO VERNICIATURA

REPORT NO. **4320/P**  
*Certificato N°*

SHEET **1** OF **1**  
*Foglio di*

SERIAL NO. **4320**  
*N° fabbr.*

REV. **0** STEP **H1 - H2**  
*Rev. Fasi*

JOB NO. **2010/005/T** ORDER NO. **10PU-000265-PR** ITEM NO. **T10 HR**  
*Commessa N° Ordine N° Sigla*

DRAWING NO. **6725-2010** INSPECTION PRG. **ITP/2010/005**  
*Disegno N° Prog. ispezione*

COMPONENTE DENOMINATION **CONDENSATOR - REGENERATOR**  
*Denominazione componente*

PAINTING SPEC. **PV / CIC / 01** INSPECT. SPEC. **/**  
*Norma di verniciatura Norma di collaudo*

**STRUCTURES OF ITEMS** *Strutture particolari*

DESCRIPTION **CARBON STEEL PARTS**  
*Descrizione*

**SURFACE PREPARATION** *Preparazione superfice*

DEGREASING *Sgrassaggio*   
  SOLVENT *Solvente*   
  RIC. SOLUTION *Soluzione alcalina*   
  OTHER *Altro*  
 MACHANICAL PREP. *Prep. meccanica*   
  GRIT BLASTING   
  GLASS BLASTING *SWEEP BLAST ONLY*   
  SURFACE PROFILE *25 + 45 µm*

REQU. SURFACE QUALITY GRADE *Grado di preparazione richiesto*

St 2   
  St 3   
  Sa 2   
  Sa 2 ½ *(ISO8501-1)*   
  Sa 3

**PAINT FEATURE** *Caratteristiche delle vernici ( \*\*\*)*

PRIMER <i>Fondo</i>		FINAL PAINTS <i>Vernici a finire</i>	
TYPE <i>Tipo</i>	<b>Primer coat:</b> Inorganic Zinc ( Zincante Inorganico )	TYPE <i>Tipo</i>	RAL
TYPE <i>Tipo</i>	<b>Intermediate coat:</b>	TYPE <i>Tipo</i>	RAL

OPERATIONS <i>Operazioni</i>			INSPECTIONS AND TEST <i>Ispezioni e risultati</i>		
STEPS <i>Fasi</i>	DATE <i>Data</i>	REQU. THK. <i>Sp. richiesto</i>	VISUAL CHECK <i>Controllo visivo</i>	THICKNESS CHECK <i>Controllo spessori</i>	ADHESION TEST <i>Prova aderenza</i>
			RESULT (**) <i>Risultato</i>	RESULT (**) <i>Risultato</i>	RESULT (**) <i>Risultato</i>
Grit blast.	26/06/2010	50 ÷ 75 µm			
Primer coat	26/06/2010	min 75 µm	SATISFACTORY	80 µm	
Interm. coat		µm			
Final coat		µm			
TOTAL DFT		min 75 µm			

FINAL INSPECTION *Collaudo finale*

( \*\* ) DATE AND INSPECTOR SIGNATURE IF TEST IS WITNESSED  
*Data e firma dell' ispettore, se la prova è presenciata*

( \*\*\*) ENCLOSE PAINTING DATA SHEETS  
*Allegare le schede tecniche delle vernici*

REMARKS  
*Note*

**RESULTS** *Risultati*

<input checked="" type="checkbox"/> SATISFACTORY <i>Soddisfacente</i>	ISSUED NON CONFORMITY REPORT <i>Emesso rapporto di non conformità</i>	RESOLVED BY REPORT NO <i>Risolta con rapporto N°</i>	DATE <i>Data</i>
<input type="checkbox"/> UNSATISFACTORY <i>Non soddisfacente</i>	NCR NO _____ DATE _____ <i>NCR N° Data</i>	NOT RESOLVED-REJECTION REPORT NO <i>Non Risolta-Rapporto di scarto N°</i>	DATE <i>Data</i>

DATE <i>Data</i>	INSPECTOR SIGN. <i>Firma ispettore</i>	DATE <i>Data</i>	INSPECTOR SIGN. <i>Firma ispettore</i>	DATE <i>Data</i>	Q. C. MANAGER SIGN. <i>Firma Q. C. Manager</i>
		26/06/2010	<i>Q.C.I. L. Mazzocato</i>	26/06/2010	<i>C.I. CIVIDAC S.P.A. Q.C. MGR. MEMO</i>



*Costruzioni Industriali Cividac Spa*  
*S. Biagio di Callalta – Treviso – Italy*

Tel. 0039.0422.895090 – Fax 0039.0422.895121 – Email [info@cividac.com](mailto:info@cividac.com)

# SECTION

# G



*Costruzioni Industriali Cividac Spa*  
*S. Biagio di Callalta – Treviso – Italy*

*Tel. 0039.0422.895090 – Fax 0039.0422.895121 – Email [info@cividac.com](mailto:info@cividac.com)*

# VALVE'S DOCUMENTATION



To the kind attention:

TURBODEN SRL

DDT N° 4273 23/03/2010 # 3 HEAT 0

ITEM VASO4A05CL2104 VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.J00701

Your Doc Ref 10-PU-001235/1 16/03/2010 C

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C.C.I.A.A. 137039 Reg. Soc. No 119572  
 Imp. e Soc. s.p.a. n. 23001000  
 Imp. e Soc. s.p.a. n. 23001000  
 Codice Fiscale: 00339000165  
 Vat Number IT: 00339000165  
 Export IT: 0238221

OMIB Valves S.p.A. - Imp. e Stabilimento  
 Via Sarnola, 7 - 33050 Caneva Suse (Belluno) ITALY  
 Phone ITALY: 043-4267511  
 Fax ITALY: 043-4267538  
 URL: http://www.omibvalves.com

Cod. C 180016

Address / Indirizzo  
**TRANS MARK FCX ITALY S.R.L.**  
**VIA DELLE INDUSTRIE, 9**  
**ARESE**  
**20020**  
**IT**

VAT Number / Codice Fiscale

OMB Code: PAB83AAD20043

**UNIT EN 10204 2.1 TRIM AND BOLTING MATERIAL ACCORDING TO ORDER REQUIREMENTS**

OMB Fig.: EG-833-SW A105N F5/F6NACE/F6HF

Marking: XVSP

Customer code: GLOBE ECO-L-VALVE® - BOLTED BONNET SQUARE - GASKET JOINT - CLASS 600 - 1/2" - REDUCED BORE - SW ENDS - INTEGRAL HF SEAT - INTEGRAL SEAT, STD DISC - STD BONNET - STD STEM - STD BULLSTD -

Qty: 200

NACE HR. 01.75



**DECLARATION OF CONFORMITY:**

According to Article 19 of 97/23/EC, OMIB Valves S.p.A. - Caneva Suse (TV) declares that the products subject to this declaration, are in conformity with the directives 97/23/EC and are subjected to the surveillance of the competent authorities of the Member State.



Certificate N° / Certificato N°: 906392 Date/Date: 21/5/2009 Pag. 1

CERTIFICATE ACC. TO UNIT EN 10204 3.1

OMB Job: 01 9000882 Rev.: 03/03/2009

Customer Order / Ordine Cliente: 11382

Project / Progetto: ESSO/SARPOM

**STD. REF. API 598 PRESSURE TEST (BAR) DURATION TEST (SEC) BS 6755 PART 1 - LAST ISSUE**

Shell Comp.	Hydraulic Medium Water			Pneum. Air			Description	Material	Heat no	Code Forging	Forging Cert. no
	Seals	Seals	Seals	Seals	Seals	Seals					
598	116	116	116	15	15	15	BODY BODY BONNET	ASTM A105N ASTM A105N ASTM A105N	07-20778 77074 0872757	BQ JIS MOV	731A 94-E302 505

Copies of mill sheet attached / Copia dei certificati di colata allegati  
 MARKING, VISUAL AND DIMENSIONAL CHECK SATISFACTORY  
 Inspector / Collaudatore: Inspection Services Q.C. Dep. Matteo Brevi

C.I. OMIB S.p.A.  
 Q.C. MGR. BREVIO





**To the kind attention:**  
 TURBODEN SRL  
**DDT N°** 4273    23/03/2010    # 3    **HEAT** 0  
**ITEM** VASO4A05CL2104  
 VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.00701  
**Your Doc Ref** 10-PU-001235/1 16/03/2010 C

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**FEAT INDUSTRIALE S.P.A.**  
 SEDE LEGALE:  
 20135 MILANO - Via Bergamo, 22  
 Capitale sociale L. 2.000.000.000  
 C.C.I.A.A. Milano n. 1208259  
 Tribunale Milano n. 28678/891717  
 Odd. Fisc. n. Part. IVA 03587320159  
 UFFICIO AMMINISTRATIVO:  
 22040 BOSGIO PARINZI (Co) - Via dei Livelli  
 Tel. 031-878187 - Fax 031-878176  
 STABILIMENTO ED UFFICIO COMMERCIALI:  
 22030 CESANA BRIANZA (Co) - Via Giuseppe Parini, 30  
 Tel. 031-8591 - Fax 031-859218

TEST CERTIFICATE No. 94- 6802  
 CERTIFICATO DI COLLAUDO  
 DATE 21-12-1994

115

O.M.B. SPA  
 VIA EUROPA, 7  
 CENATE SOTTO (BG) 24089

CUSTOMER ORDER - ORDINE CLIENTE 663		P.O.	ROLLS 882		INVOICE - FATTELLA 3478						
DESCRIPTION OF PARTICULARS - DESCRIZIONE DEL PARTICOLARE BOBY 679D				TYPE AND MATERIAL SPECIFICATIONS - TIPO E SPECIFICA MATERIALE ASTM A. 105							
HEAT NUMBER - NUMERO COLATA STEEL MILL ACCIAIERIA ST. N° CERT. N° CERTIFICAZ. N°	CHEMICAL ANALYSIS - ANALISI CHIMICA										
	77074 TANARO 78486/94	Mn	Si	C	Ca	Cr	Ni	S	Mo	P	V
	0.960	0.280	0.200	0.080	0.080	0.050	0.014	0.010	0.010	0.005	
HEAT CODE ON FORGING CODICE COLATA	FEAT COUNTER DWG DISSEGNO DEL FORGIATO LAPE	QUANTITY - QUANTITA'		MECHANICAL PROPERTIES - CARATTERISTICHE MECCANICHE							
I-15	49/228	450		YIELD STRENGTH P.S.A. SNEBAM N/mm²	TENS. STRENGTH P.S.L. BOZZ. N/mm²	ELONG. % ALLUNG. %	RED. OF AREA % CONTRAZ.	J.R.			
MECHANICAL PROPERTIES - RESILLENZA				48140	76850	39.40	55.00	152			
HEAT TREATMENT - TRATTAMENTO TERMICO											

REMARKS Nb - 0.003 C.R. 0.384  
 1) The result of chemical analysis is a true and correct copy of the mill certificate issued by the manufacturer of the steel employed, or by the laboratory which has determined it.  
 2) The material components shipped under the above order number did not come in direct contact with mercury or any of its components or with any mercury containing device employing a single boundary of contact during the manufacturing process.  
 3) Il materiale a) particolare specificato per questo ordine non venne mai venuto a contatto diretto con mercurio, o con gli elementi costituenti il mercurio durante il ciclo di lavorazione, connesso o interconnesso.

Verified to ASME II Part. A  
 Ed. 2007... Add. 2009.b  
 and found conforming to  
 SA 105

C.A. MANAGER S.p.A.  
 G.C. N.M. P. MEMO

I certify these tests to be correct as performed in the records of the company.  
 G.C. MANAGER  
 RESPONSABILE CONTROLLI CERTIFICATI  
 M. MANZONI

G.A. MANAGER  
 RESP. ASSICURAZ. QUALITÀ  
 M. MORGANI



**To the kind attention:**  
 TURBODEN SRL  
 DDT N° 4273 23/03/2010 # 3 HEAT 0  
 ITEM VASO4A05CL2I04  
 VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.J00701  
 Your Doc Ref 10-PU-001235/1 16/03/2010 C

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<b>STAMPERIA DI MENZAGO s.r.l.</b> STAMPING A CHARG BELLECASO Via L. Biondi 19 / M. RTT. 201.104 / Tel. 0361.21400 21040 MENZAGO IN VARESE / Italy		AZIENDA CON SISTEMA DI GESTIONE PER LA QUALITÀ CERTIFICATO DA DNV UNI EN ISO 9001:2008		<b>CERTIFICATO DI CONFORMITÀ</b> CONFORMITY CERTIFICATE			N° 505		
CLIENTE CUSTOMER  <b>O.M.B. S.p.A.</b>		NOME DEL PRODOTTO NAME OF THE PRODUCT  <b>COPERCHIO</b>		DISEGNO DRAWING  N° 2/8		Data Date 26/02/02			
RIFERIMENTO ALL'ORDINE ORDER  N° 2800330/AC1 Del/Dated 20/06/08 ALLEGATO AL RIMBORSO ENCLOSED TO THE DOCUMENT OF THE TRANSPORT N° 1037 Del/Dated 06/10/08		FABBRICATO CON ATTREZZATURA MANUFACTURED WITH EQUIPMENT PROVVISORIA PROVISIONAL <input type="checkbox"/> DEFINITIVA DEFINITIVE <input checked="" type="checkbox"/>		TIPO DI CONSEGNA TYPE OF DELIVERY CALCO IN FIDANZO MOD. IN LEAD <input type="checkbox"/> CAMPIONATURA SAMPLES <input type="checkbox"/> LOTTO PARCELS <input checked="" type="checkbox"/>		QUANTITÀ QUANTITY  A105 15370 LF2 2200			
CAUSA DEL CERTIFICATO REASON OF THE CERTIFICATE		PRODOTTO NUOVO NEW PRODUCT <input type="checkbox"/>		ATTREZZATURA NUOVA NEW EQUIPMENT <input type="checkbox"/>		VERIFICA SISTEMATICA SYSTEMATICAL VERIFICATION <input checked="" type="checkbox"/>			
CERTIFICAZIONE DELLA QUALITÀ DEL PRODOTTO / CERTIFICATION OF THE QUALITY OF THE PRODUCT									
N° Ref.	QUOTE CONTROLLATE CHECKED QUOTES	VALORI PRESCRITTI PRESCRIBED VALUES	Dimensioni di Misura Dimension Equipment use for concrete	LIMITI MIN E MAX RILEVATI MIN AND MAX LIMITS FOUNDED	VALORI OTTENUTI SU SINGOLI PEZZI CONTROLLATI VALUES OBTAINED ON THE INDIVIDUAL CHECKED PIECES				
					1	2	3	4	5
	SPESSORE	14 +0,5 -0,5	26A	14, 14,2	14,1	14,2	14,1	14,2	14
	DIAMETRO	27 +0,5 -0	26A	27,1 27,3	27,1	27,3	27,2	27,2	27,1
	LARGHEZZA	62 +0,5 -0,5	26A	62,5 62,5	62,5	62,5	62,5	62,5	62,5
	LARGHEZZA	52 +0,5 -0,5	26A	53 53	53	53	53	53	53
	LARGHEZZA	36 +0,5 -0,5	26A	35,5 35,5	35,5	35,5	35,5	35,5	35,5
ACCIAIO UTILIZZATO UTILIZED STEEL		COLATA CASTING	MARCATURA MARKING	TRATTAMENTO TERMICO TREATMENT		VALORI RILEVATI FOUNDED VALUES			
1)	A105	08/72757	M 0 V A105N						
2)	A105	08/72757	M 0 V A105N						
3)	A105	08/72757	M 0 V A105N						
4)	LF2	08/72757	M 6 V LF2						
5)	LF2	08/72757	M 6 V LF2						
DUROMETRO UTILIZZATO UTILIZED DUROMETER:		A200 <input type="checkbox"/>	HRC3000 <input type="checkbox"/>						
RELAZIONI DI PROVA ALLEGATE / RELATIONS OF ENCLOSED RESULTS									
CERTIFICATO ACCIAIERIA / STEELWORKS CERTIFICATE <input type="checkbox"/> BOLLINO TRATTAMENTO TERMICO / HEAT TREATMENT CERTIFICATE <input type="checkbox"/> CERTIFICATO 3 LB / 3 T B CERTIFICATE <input type="checkbox"/>									
NOTE REMARKS:									
DICHIARAZIONE DI CONFORMITÀ DEL PRODOTTO / DECLARATION OF CONFORMITY OF THE PRODUCT LA CONFORMITÀ DELLA FORNITURA ALLE PRESCRIZIONI CONTENUTE NEI DISEGNI, CAPITOLI, NORME, TABELLE ED EVENTUALE CAMPIONE DEPOSITATO, È ASSICURATA DA SISTEMATICI CONTROLLI A CUI IL PRODOTTO VENE SOTTOPOSTO THE CONFORMITY OF THE SUPPLY TO THE PRESCRIPTIONS IN THE DRAWINGS, CONTRACTS, NORMS, TABLES AND POSSIBLE DEPOSITED SAMPLE, IS ASSURED FROM SYSTEMATICAL INSPECTIONS WHICH THE PRODUCT IS SUBORDINATE									
DATA / DATE		COMPILATO DA / FILLED IN FROM		CQ / QUALITY CONTROL					
6 ottobre 2008									

JR10 / PQ06 Rev. 00

Customer order / Ordine cliente: 11382

C.I. CHIVAC S.p.A.  
 G.C. M.B. PAMENO



## To the kind attention:

TURBODEN SRL

DDT N° 4273 23/03/2010 # 3 HEAT 0

ITEM VASO4A05CL2104  
VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.300701

Your Doc Ref 10-PU-001235/1 16/03/2010 C

Questo documento è riprodotto mediante un sistema computerizzato ed è conforme all'originale custodito presso i nostri archivi

N° / Nr.		505 A		ORDINE / ORDER		2800330/AC1 Del/Dated 20/06/08					
DATA / DATE		06/10/2008		RIMESSO / RIESSUSE		1037 del 06/10/08					
GLIENTE / CUSTOMER		O.M.B. S.p.A.		DESCRIZIONE / DESCRIPTION		COPERCHIO Dis. N° 2/8					
				MATERIALE / MATERIAL		ASTM A105					
				COLATA / HEAT		08/72757					
				MARCATURA / MARKING		M O V A105N					
ANALISI CHIMICA / CHEMICAL COMPOSITION											
	C%	Mn%	Si%	P%	S%	Cr%	Ni%	Mn%	Cu%	V%	Nb%
Min	0,00	0,60	0,10	0,000	0,000	0,00	0,00	0,00	0,00	0,00	0,00
Max	0,22	1,05	0,35	0,035	0,040	0,30	0,40	0,12	0,40	0,08	0,03
VALORI VALUES	0,195	0,92	0,21	0,01	0,004	0,11	0,05	0,01	0,18	0,016	0,001
CARATTERISTICHE MECCANICHE / MECHANICAL PROPERTIES											
DESCRIZIONE / DESCRIPTION	U.M. / M.U.	Min	Max	VALORI VALUES							
SNERVAMENTO / YIELD STRENGTH 0,2%	N / mm <sup>2</sup>	250		318							
ROTTURA / TENS. STRENGTH	N / mm <sup>2</sup>	485		515							
ALLUNGAMENTO / ELONGATION	%	22		32,7							
STRIZIONE / REDUCT OF AREA	%	30		56,6							
DUREZZA / HARDNESS	HB		187	153-153-153							
TRATTAMENTO TERMICO / HEAT TREATMENT											
NORMALIZING: ALL PIECES WERE HEATED TO 1670 F., HELD AT THIS TEMPERATURE FOR 1 HOUR EACH 1" OF THICKNESS AND COOLED IN STILL AIR.											
NOTE / NOTES											
3.1 CERTIFICATE ACCORDING TO EN 10204											
CE = 0391											
STAMPERIA DI MENZAGO S.r.L. CONTROLLO QUALITA' QUALITY CONTROL						STAMPERIA DI MENZAGO S.r.L.					

DR25 / PQ06 Rev. 00

Customer order / Ordine cliente: 11382

C.I. OMBAC S.p.A.  
Q.C. MEMO

Verified to ASME II Part. A  
Ed. 2007... Add. 2009b  
and found conforming to  
SA 105



**To the kind attention:**  
 TURBODEN SRL  
 DDT N° 4273 23/03/2010 # 3 HEAT 0  
 ITEM VASO4A05CL2L04  
 VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.300701  
 Your Doc Ref 10-PU-001235/1 16/03/2010 C

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C.C.I.A.A. 157030149 - 06-82 20542  
 Capitale Sociale € 2.000.000  
 Partita IVA: 118608165  
 Codice Fiscale: 00139600165  
 VAT NUMBER: 0039600165  
 Euro: B 712991

OMB Valves S.p.A. - 11804 - Sullinonzo  
 Via E. Mattei, 7 - 04069 (Tuscani) (Pescina) (TR) - Italy  
 Phone: ITALY 0475-255211  
 Fax: ITALY 0475-292338  
 URL: http://www.ombvalves.com

Cod. C 180016

ME

Address / Indirizzo

MRC TRANSMARK ITALY S.R.L.  
 VIA DELLE INDUSTRIE, 9  
 20020 ARESE  
 IT

VAT Number / Codice Fiscale

OMB Code: PAB83AA020023

UNI EN 10204 2-1: TRIM AND BOLTING MATERIAL ACCORDING TO ORDER REQUIREMENTS

Item: 1 OMB fig.: 60-833-SW A105N FH1F

Customer code: GLOBE ECO-L-VALVE® - BOLTED BONNET SQUARE - GASKET JOINT - BODY CLASS #800, BELLOW CLASS #600 - 1/2" REDUCED BORE - SW ENDS - INTEGRAL HF SEAT - INTEGRAL SEAT, HF DISC - STD BONNET - STD STEM - X BULLSTD -

MADE IN ITALY

STD. REF. API 598

BS 6755 PART 1 - LAST ISSUE

Shell Comp	PRESSURE TEST (BAR)		DURATION TEST (SEC)		Test result	Description	Material	Heat no	Coil Forging	Forging Cont. no
	Hydraulic Medium Water	Hydraulic Air	Hydraulic Medium Water	Hydraulic Air						
211	155	155	15	15	Conform	BODY BONNET BONNET BONNET BONNET	ASTM A105N ASTM A105N ASTM A105N ASTM A105N ASTM A105N	05-74779 06-74804 07-76865 08-75451 07-78498 0872757	10R 7F 8T H1W H9U MOV	157A 200-A 352-A 016A 658-A 505

Inspector / Collaudatore: *Matteo Brevi*  
 Inspection Service Q.C. Rep. *Matteo Brevi*

*G. N. DAC S.p.A.*  
 Q.C. MEMO

DECLARATION OF CONFORMITY:  
 According to Annex VI of 2002/95/EC OMB Valves S.p.A. - Sullinonzo (TR) declares that the product object of this declaration is in compliance with the directive 2002/95/EC and is subjected to the conformity assessment procedure Annex III - Module B Surveillance performed by TÜV SÜD Industrie Service GmbH - Mannheim (D) (0909)



Certificate No / Certificato N°: 1002262 Date / Data: 19/5/2010 Page: 1  
 CERTIFICATE ACC. TO UNI EN 10204 3.1  
 OMB Job: 01 - 8000622 Rev.: 31/07/2008  
 Customer Order / Ordine Cliente: 11162  
 Project / Progetto:

Copies of mill sheet attached / Copia dei certificati di colata allegati  
 MARKING, VISUAL AND DIMENSIONAL CHECK SATISFACTORY

To the kind attention:

TURBODEN SRL

DDT N° 4273 23/03/2010 # 3 HEAT 0

ITEM VASO4A05CL2104  
VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.00701

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Your Doc Ref 10-PU-001235/1 16/03/2010 C

N° / Nr.		ORDINE / ORDER									
352 A		2700071/AC1 del 12/02/07									
DATA / DATE		RIMESSO / RIESSUSE									
29/05/2007		675 del 29/05/07									
CLIENTE / CUSTOMER		DESCRIZIONE / DESCRIPTION									
O.M.B. S.p.A.		COPERCHIO Dis. N° 2/8									
		MATERIALE / MATERIAL									
		ASTM A105									
		COLATA / HEAT									
		0776865									
MARCATURA / MARKING		M 8 T A105N									
ANALISI CHIMICA / CHEMICAL COMPOSITION											
	C%	Mn%	Si%	P%	S%	Cr%	Ni%	Mn%	Cu%	V%	Nb%
Min	0,00	0,60	0,10	0,000	0,000	0,00	0,00	0,00	0,00	0,00	
Max	0,22	1,05	0,35	0,035	0,040	0,30	0,40	0,12	0,40	0,08	
VALORI VALUES	0,20	0,93	0,21	0,009	0,010	0,05	0,04	0,01	0,11	0,017	0,000
CARATTERISTICHE MECCANICHE / MECHANICAL PROPERTIES											
DESCRIZIONE / DESCRIPTION	U.M. / M.U.	Min	Max	VALORI VALUES							
SNERVAMENTO / YIELD STRENGTH 0,2%	N / mm <sup>2</sup>	250		323							
ROTTURA / TENS. STRENGTH	N / mm <sup>2</sup>	485		521							
ALLUNGAMENTO / ELONGATION	%	22		32,1							
STRIZIONE / REDUCT. OF AREA	%	30		56,2							
DUREZZA / HARDNESS	HB		187	170 - 170 - 170							
TRATTAMENTO TERMICO / HEAT TREATMENT											
NORMALIZING: ALL PIECES WERE HEATED TO 1670 F, HELD AT THIS TEMPERATURE FOR 1 HOUR EACH 1" OF THICKNESS AND COOLED IN STILL AIR.											
NOTE / NOTES											
3.1.B CERTIFICATE ACCORDING TO EN 10204											
STAMPERIA DI MENZAGO S.p.A. CONTROLLO QUALITÀ QUALITY CONTROL						STAMPERIA DI MENZAGO S.p.A.					

DR25/PC06 Rev. 00

Customer order / Ordine cliente: 11162



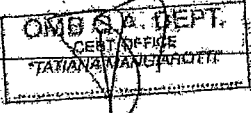


C.I. CAIPAC S.p.A.  
Q.C. MGR F. MEMO

Verified to ASME II Part. A  
Ed. 2007. Add. 2009.b  
and found conforming to  
SA 105



**To the kind attention:**  
 TURBODEN SRL  
 DDT N° 4273 23/03/2010 # 3 HEAT 0  
 ITEM VASO4A05CL2I04  
 VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.300701  
 Your Doc Ref 10-PU-001235/1 16/03/2010 C

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<b>STAMPERIA DI MENZAGÒ S.p.A.</b> <small>RAMIFICAZIONE A CARICO DELL'ACCIAIO          Via delle Industrie 29 / 41 - 36100 PD (VI) - Tel. 0429/311111          31049 MENZAGÒ DI SERRAVALLE (VI) - Italy</small>		<b>AZIENDA CON SISTEMA DI GESTIONE PER LA QUALITÀ CERTIFICATO CERTIFICATO DA UNI EN ISO 9001:2008</b>		<b>CERTIFICATO DI CONFORMITÀ</b> <b>CONFORMITY CERTIFICATE</b>		N° 157			
<b>CLIENTE</b> CUSTOMER  <b>O.M.B S.p.A.</b>		<b>NOME DEL PRODOTTO</b> NAME OF THE PRODUCT  <b>CORPO</b>		<b>DISEGNO</b> DRAWING  N° 2/9  <small>Data di ultima modifica</small> Date 190603		Page / Page di / of			
<b>REFERIMENTO ALL'ORDINE</b> ORDER  N° 2800030/ACI Del/Dated 28/01/08 <small>ALLEGATO AL RIMBORSO                  ENVELOPE TO THE DOCUMENT OF THE TRANSPORT</small>		<b>FABBRICATO CON ATTREZZATURA</b> MANUFACTURED WITH EQUIPMENT PROVVISORIA PROVISIONAL <input type="checkbox"/> DEFINITIVA DEFINITIVE <input checked="" type="checkbox"/>		<b>TIPO DI CONSEGNA</b> TYPE OF DELIVERY CALCO IN PRONTO MODEL IN LEAD <input type="checkbox"/> CAMPIONATURA SAMPLES <input type="checkbox"/> LOTTO BATCH <input checked="" type="checkbox"/>		<b>QUANTITÀ</b> QUANTITY A105 18200 A105 605 NEUTRO			
<b>CAUSALE DEL CERTIFICATO</b> REASON OF THE CERTIFICATE		PRODOTTO NUOVO NEW PRODUCT <input type="checkbox"/>		ATTREZZATURA NUOVA NEW EQUIPMENT <input type="checkbox"/>		VERIFICA SISTEMATICA SYSTEMATICAL VERIFICATION <input checked="" type="checkbox"/>			
<b>CERTIFICAZIONE DELLA QUALITÀ DEL PRODOTTO / CERTIFICATION OF THE QUALITY OF THE PRODUCT</b>									
N° Ref.	QUOTE CONTROLLATE CHECKED QUOTES	VALORI PRESCRITTI PRESCRIBED VALUES	Tolleranze Tollerances	LIMITI MIN E MAX RILEVATI MIN AND MAX LIMITS FOUND	VALORI OTTENUTI SU SINGOLI PEZZI CONTROLLATI VALUES OBTAINED ON THE INDIVIDUAL CHECKED PIECES				
					1	2	3	4	5
	SPESSORE	37 +0,5 -0,5	26A	37,1 37,3	37,2	37,3	37,1	37,1	37,3
	ALTEZZA	13 +0,5 -0,3	EHK6003	13,4 13,5	13,4	13,4	13,4	13,5	13,5
	ALTEZZA	38 +0,5 -0,5	EHK6003	37,9 38,2	38,1	38	37,9	38,2	38
	ALTEZZA	31 +0,5 -0,5	EHK6003	31,6 31,8	31,7	31,6	31,6	31,8	31,8
	LUNGHEZZA	82 +0,5 -0,5	26A	82,6 82,8	82,8	82,8	82,8	82,6	82,6
	LARGHEZZA	62 +0,5 -0,5	26A	62 62,2	62	62	62	62,1	62,2
	DIAMETRO	32 +0,5 -0,5	26A	32 32,4	32,2	32,1	32,4	32,2	32
<b>ACCIAIO UTILIZZATO</b> UTILIZED STEEL  ASTM A105		<b>COLATA</b> CASTING  03174779		<b>MARCATURA</b> MARKING  10 R A105N		<b>TRATTAMENTO ESEGUITO</b> TREATMENT		<b>VALORI RILEVATI</b> POUNDED VALUES	
<b>DIURETTO UTILIZZATO</b> UTILIZED DUROMETER:		A200 <input type="checkbox"/>		HPO3000 <input type="checkbox"/>					
<b>RELAZIONI DI PROVA ALLEGATE / RELATIONS OF ENCLOSED RESULTS</b>								<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	
<b>CERTIFICATO ACCIAIERIA / STEELWORKS CERTIFICATE</b> <b>BOLLETTINO TRATTAMENTO TERMICO / HEAT TREATMENT CERTIFICATE</b> CERTIFICATO 31/33 CERTIFICATE									
<b>NOTE</b> REMARKS:									
<b>DICHIARAZIONE DI CONFORMITÀ DEL PRODOTTO / DECLARATION OF CONFORMITY OF THE PRODUCT</b> LA CONFORMITÀ DELLA FORNITURA, ALLE PRESCRIZIONI CONTENUTE NEI DISEGNI, CAPITOLI, NORME, TABELLE, ED EVENTUALE CAMPIONE DEPOSITATO, È ASSICURATA DA SISTEMATICI CONTROLLI A CUI IL PRODOTTO VIENE SOTTOPOSTO THE CONFORMITY OF THE SUPPLY TO THE PRESCRIPTIONS IN THE DRAWINGS, CONTRACTS, NORMS, TABLES AND POSSIBLE DEPOSITED SAMPLES IS ASSURED FROM SYSTEMATICAL INSPECTIONS WHICH THE PRODUCT IS SUBORDINATE									
DATA / DATE 25 marzo 2008		COMPIUTA DA / FILLED IN FROM 		CQ / QUALITY CONTROL		STAMPERIA DI MENZAGÒ S.p.A. 			

Customer order / Ordine cliente: 11182

C.I. OMB S.p.A.  
 Q.C. M.B. P. MEMO



## To the kind attention:

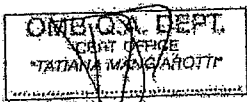
TURBODEN SRL

DDT N° 4273 23/03/2010 # 3 HEAT 0

ITEM VASO4A05CL2I04  
VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.J00701

Your Doc Ref 10-PU-001235/1 16/03/2010 C

Questo documento è riprodotto mediante un sistema computerizzato ed è conforme all'originale custodito presso i nostri archivi

STAMPERIA DI MENZAGO S.r.l. MANIFATTURA A CARICO SEPARATO via della Metallurgia 29 / tel. 031.206.116 / fax 031.21048 21048 MENZAGO (DI) - VERBA / Italy		AZIENDA CON SISTEMA DI GESTIONE PER LA QUALITÀ CERTIFICATO DA DNV UNI EN ISO 9001:2008		CERTIFICATO DI ANALISI CHIMICA E CARATTERISTICHE MECCANICHE CERTIFICATE OF CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES							
Pag. 11											
N° / Nr.	157 A	ORDINE / ORDER	2800030/AC1 del 28/01/08								
DATA / DATE	25/03/2008	RIMESSO / RISSLISE	N° 310-311-324 Del/Dated 19-25/3/08								
GLIENTE / CUSTOMER		DESCRIZIONE / DESCRIPTION	CORPO Dis. N° 2/9 del 19/06/03								
O.M.B. S.p.A.		MATERIALE / MATERIAL	ASTM A105								
		COLATA / HEAT	03/74779								
		MARCATURA / MARKING	10 R A105N								
ANALISI CHIMICA / CHEMICAL COMPOSITION											
	C%	Mn%	Si%	P%	S%	Cr%	Ni%	Mo%	Cu%	V%	Nb%
Min	0,00	0,60	0,10	0,000	0,000	0,00	0,00	0,00	0,00	0,00	0,00
Max	0,22	1,05	0,35	0,035	0,040	0,30	0,40	0,12	0,40	0,08	0,03
VALORI VALUES	0,19	0,97	0,17	0,022	0,027	0,11	0,05	0,01	0,25	0,003	0,001
DESCRIZIONE / DESCRIPTION	U.M. / M.LL.	Min	Max	VALORI VALUES							
SNERVAMENTO / YIELD STRENGTH 0,2%	N / mm <sup>2</sup>	250		321							
ROTTURA / TENSILE STRENGTH	N / mm <sup>2</sup>	485		518							
ALLUNGAMENTO / ELONGATION	%	22		32,3							
STRIZIONE / REDUCT OF AREA	%	30		56,5							
DUREZZA / HARDNESS	HB		187	170 - 170 - 170							
TRATTAMENTO TERMICO / HEAT TREATMENT											
NORMALIZING: ALL PIECES WERE HEATED TO 1670 °E, HELD AT THIS TEMPERATURE FOR 1 HOUR EACH 1" OF THICKNESS AND COOLED IN STILL AIR.											
NOTE / NOTES											
31 CERTIFICATE ACCORDING TO EN 10204											
<div style="text-align: right;">  </div>											
STAMPERIA DI MENZAGO S.r.l. CONTROLLO QUALITÀ QUALITY CONTROL						STAMPERIA DI MENZAGO S.r.l.					

DR25/PQ06 Rev.00

Customer order / Ordine cliente: 11162

C.I. C.T. DAC S.p.A.  
O.C. MGR/R MEMO

Verified to ASME II Part. A  
Ed. 2007... Add. 2009b  
and found conforming to  
SA 105.....



To the kind attention:

TURBODEN SRL  
 DDT N° 4273 23/03/2010 # 3 HEAT 0  
 ITEM VASO4A05CL2I04  
 VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.J00701

Your Doc Ref 10-PU-001235/1 16/03/2010 C

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		AZIENDA CON SISTEMA DI GESTIONE PER LA QUALITÀ CERTIFICATO DA UNI EN ISO 9001:2008		<b>CERTIFICATO DI CONFORMITÀ</b> CONFORMITY CERTIFICATE		N° 016			
CLIENTE CUSTOMER  <b>O.M.B S.p.A.</b>		NOME DEL PRODOTTO NAME OF THE PRODUCT  <b>COPERCHIO</b>		DISEGNO DRAWING  <b>N° 2/8</b>		Data Date 25/02/09			
IMPIANTO ALL'ORDINE ORDER  N° 2800567/ACI Del/Dated 29/10/08 ALLICATO AL DIMIENSO ENCLOSED TO THE DOCUMENT OF THE TRANSPORT		FABBRICATO CON ATTREZZATURA MANUFACTURED WITH EQUIPMENT PROVVISORIA PROVISIONAL <input type="checkbox"/>		TIPO DI CONSEGNA TYPE OF DELIVERY  CALCO IN FIORINO MODEL IN LEAD <input type="checkbox"/> CAMPIONATURA SAMPLES <input type="checkbox"/> LOTTO PARCEL <input checked="" type="checkbox"/>		QUANTITÀ QUANTITY  <b>15840</b>			
N° 30 Del/Dated 16/01/09 CAUSALE DEL CERTIFICATO REASON OF THE CERTIFICATE:		PRODOTTO NUOVO NEW PRODUCT <input type="checkbox"/>		ATTREZZATURA NUOVA NEW EQUIPMENT <input type="checkbox"/>		VERIFICA SISTEMATICA SYSTEMATICAL VERIFICATION <input checked="" type="checkbox"/>			
CERTIFICAZIONE DELLA QUALITÀ DEL PRODOTTO / CERTIFICATION OF THE QUALITY OF THE PRODUCT									
N° Ref.	QUOTE CONTROLLATE CHECKED QUOTES	VALORI PRESCRITTI PRESCRIBED VALUES	Strumenti di Misura Utilizzati Equipment use for measures	LIMITI MIN E MAX RILEVATI MIN AND MAX LIMITS FOUND	VALORI OTTENUTI SU SINGOLI PEZZI CONTROLLATI VALUES OBTAINED ON THE INDIVIDUAL CHECKED PIECES				
					1	2	3	4	5
	SPESORE	14 +0,5 -0,5	26A	14,2 14,4	14,2	14,3	14,4	14,4	14,4
	DIAMETRO	27 +0,5 -0	26A	27,4 27,5	27,4	27,4	27,5	27,5	27,5
	LARGHEZZA	62 +0,5 -0,5	26A	62,5 62,5	62,5	62,5	62,5	62,5	62,5
	LARGHEZZA	52 +0,5 -0,5	26A	53 53	53	53	53	53	53
	LARGHEZZA	36 +0,5 -0,5	26A	35,4 35,4	35,4	35,4	35,4	35,4	35,4
ACCIAIO UTILIZZATO UTILIZED STEEL		COLATA CASTING	MARCATURA MARKING	TRATTAMENTO ESEGUITO TREATMENT		VALORI RILEVATI FOUNDED VALUES			
ASTM A105		08175451	M 1 W A105N						
DUROMETRO UTILIZZATO UTILIZED DURÓMETER:		A200 <input type="checkbox"/>		HPO3000 <input type="checkbox"/>		RELAZIONI DI PROVA ALLIGATH / RELATIONS OF ENCLOSED RESULTS			
CERTIFICATO ACCIAIERIA / STEELWORKS CERTIFICATE		<input type="checkbox"/>		BOLLETTINO TRATTAMENTO TERMICO / HEAT TREATMENT CERTIFICATE		<input checked="" type="checkbox"/>		CERTIFICATO 31/31 CERTIFICATE	
NOTE REMARKS:									
DICHIARAZIONE DI CONFORMITÀ DEL PRODOTTO / DECLARATION OF CONFORMITY OF THE PRODUCT LA CONFORMITÀ DELLA FORNITURA, ALLE PRESCRIZIONI CONTENUTE NEI DISEGNI, CAPITOLATI, NORME, TABELLE, ED EVENTUALE CAMPIONE DEPOSITATO, È ASSICURATA DA SISTEMATICI CONTROLLI A CUI IL PRODOTTO VIENE SOTTOPOSTO THE CONFORMITY OF THE SUPPLY TO THE PRESCRIPTIONS IN THE DRAWINGS, CONTRACTS, NORMS, TABLES AND POSSIBLE DEPOSITED SAMPLE, IS ASSURED FROM SYSTEMATICAL INSPECTIONS WHICH THE PRODUCT IS SUBORDINATE									
DATA / DATE		COMPIATO DA / FILED IN FROM		C.Q. / QUALITY CONTROL					
19 gennaio 2009									

Customer order / Ordine cliente: 11182



## To the kind attention:

TURBODEN SRL  
 DDT N° 4273 23/03/2010 # 3 HEAT 0  
 ITEM VASO4A05CL2104  
 VALVOLA A SOFFIETTO S.800 A105 SW 1/2" - VS SIGLA 10 COMM.300701

Your Doc Ref 10-PU-001235/1 16/03/2010 C

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N° / Nr.		ORDINE / ORDER									
016 A		2800667/AC1 Del 29/10/08									
DATA / DATE		RIMESSO / RIÈSSUSE									
19/01/2009		30 del 16/01/09									
CLIENTE / CUSTOMER		DESCRIZIONE / DESCRIPTION									
O.M.B. S.p.A.		COPERCHIO Dis. N° 2/8									
MATERIALE / MATERIAL		ASTM A105									
COLATA / HEAT		08/75451									
MARCATURA / MARKING		M1W A105N									
ANALISI CHIMICA / CHEMICAL COMPOSITION											
	C%	Mn%	Si%	P%	S%	Cr%	Ni%	Mo%	Cu%	V%	Nb%
Min	0,00	0,60	0,10	0,000	0,000	0,00	0,00	0,00	0,00	0,00	0,00
Max	0,22	1,05	0,35	0,035	0,040	0,30	0,40	0,12	0,40	0,08	0,03
VALORI VALUES	0,185	0,95	0,21	0,011	0,01	0,09	0,05	0,01	0,17	0,016	0,002
c.e = 0,38											
DESCRIZIONE / DESCRIPTION	U.M. / M.U.	Min	Max	VALORI VALUES							
SNERVAMENTO / YIELD STRENGTH 0,2%	N / mm <sup>2</sup>	250		318							
ROTTURA / TENSIL STRENGTH	N / mm <sup>2</sup>	485		519							
ALLUNGAMENTO / ELONGATION	%	22		32,6							
STRIZIONE / REDUCT OF AREA	%	30		56,9							
DUREZZA / HARDNESS	HB		187	153-153-153							
TRATTAMENTO TERMICO / HEAT TREATMENT											
NORMALIZING: ALL PIECES WERE HEATED TO 1670 F. HELD AT THIS TEMPERATURE FOR 1 HOUR EACH 1" OF THICKNESS AND COOLED IN STILL AIR.											
NOTE / NOTES											
3 1 CERTIFICATE ACCORDING TO EN 10204											
STAMPERIA DI MENZAGO S.r.l. CONTROLLO QUALITÀ QUALITY CONTROL				STAMPERIA DI MENZAGO S.r.l.							

DR25 / PQ06 Rev. 00

Customer order / Ordine cliente: 11162

C.I. SIV/DAC S.p.A.  
 C.C. MGR P. MEMO

Verified to ASME II Part. A  
 Ed. 2007 Add. 2009b  
 and found conforming to  
 SA 105

To the kind attention:

TURBODEN SRL

DDT N° 4273 23/03/2010 # 3

HEAT 0

ITEM VASO4A05CL2104

VALVOLA A SOFFIETTO 5.800 A105 SW 1/2" - VS SIGLA 10 COMM.000701

Your Doc Ref

10-PU-001235/1 16/03/2010 C

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N° / No.		ORDINE / ORDER									
658 A		2700425/AC1 del 17/09/07									
DATA / DATE		RIMESSO / RISSUSE									
07/11/2007		1281 del 07/11/07									
CLIENTE / CUSTOMER		DESCRIZIONE / DESCRIPTION									
O.M.B. S.p.A.		COPERCHIO Dis. N° 2/8									
		MATERIALE / MATERIAL									
		ASTM A105									
		COLATA / HEAT									
		07/79498									
		MARCATURA / MARKING									
		M 9 U A105N									
ANALISI CHIMICA / CHEMICAL COMPOSITION											
	C%	Mn%	Si%	P%	S%	Cr%	Ni%	Mo%	Cu%	V%	Nb%
Min	0,00	0,60	0,10	0,000	0,000	0,00	0,00	0,00	0,00	0,00	
Max	0,22	1,05	0,35	0,035	0,040	0,30	0,40	0,12	0,40	0,08	
VALORI VALUES	0,20	0,89	0,20	0,011	0,008	0,10	0,06	0,02	0,15	0,02	0,000
CARATTERISTICHE MECCANICHE / MECHANICAL PROPERTIES											
DESCRIZIONE / DESCRIPTION		U.M. / M.U.		Min	Max	VALORI VALUES					
SNERVAMENTO / YIELD STRENGTH 0,2%		N / mm <sup>2</sup>		250		319					
ROTTURA / TENSIL STRENGTH		N / mm <sup>2</sup>		485		515					
ALLUNGAMENTO / ELONGATION		%		22		32,4					
STRIZIONE / REDUCT OF AREA		%		30		56,6					
DUREZZA / HARDNESS		HB			187	170 - 170 - 170					
TRATTAMENTO TERMICO / HEAT TREATMENT											
NORMALIZING: ALL PIECES WERE HEATED TO 1670 F., HELD AT THIS TEMPERATURE FOR 1 HOUR EACH 1" OF THICKNESS AND COOLED IN STILL AIR.											
NOTE / NOTES											
3.1.B CERTIFICATE ACCORDING TO EN 10204											
STAMPERIA DI MENZAGO S.r.l. CONTROLLO QUALITÀ QUALITY CONTROL						STAMPERIA DI MENZAGO S.r.l.					

DR25 / PQ06 Rev. 01

Customer order / Ordine cliente: 11462

C.I. CHIFAC S.p.A.  
Q.C. MGR. F. MEMO

Verified to ASME II Part. A  
Ed. 2007... Add. ...2009b  
and found conforming to  
SA 105