

PROCESS SYSTEMS INTERNATIONAL, INC.

WASHINGTON CORNER STATION

VERTEX SECTION

TAG NO.

SER. NO.

WBSC 1	09
WBSC 2	02
WBSC 3	03
WHAM 1	01
WHAM 2	03
WHAM 3	04
WHAM 4	05
WHAM 5	07
WHAM 6	02
WA3A	01
WA3B	02
WB3A	01
WB5A	01
WBE2A	01
WBE2B	02
WBE3A1	01
WBE3B	01

PSI Documentation No. V049-1-172

VOLUME 3



PROCESS SYSTEMS INTERNATIONAL, INC.
20 Walkup Drive, Westborough, MA 01581

⚡ **LIGO PROJECT**

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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TAG # WHAM-5
P/N - VO49-4-128-07

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5	Final Cleaning Certificate.	
6	Bakeout Certificate. Final Vacuum Test Reports. Acceptance Test Data.	
7	Non Conformance Reports. Use As Is, when applicable.	
8	As Built Drawings/Dimensions.	

Title: QUALITY PLAN FOR HORIZONTAL ACCESS MODULE (HAM)

TAG No. WHAM5 Ser. No. 07

**QUALITY PLAN FOR LIGO
FOR
LIGO
HORIZONTAL ACCESS MODULE (HAM)**

Serial No. V0494123-01 ~~01-12~~

CONTROLLED-COPY

OCT 24 1996

1	CS107546		Release Per DEO No. 0302
0	045 7/8/96	R23	released per DEO 0114
REV LTR.	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE

PROCESS SYSTEMS INTERNATIONAL, INC.				SPECIFICATION	
INITIAL APPROVALS	PREPARED	DATE	APPROVED	DATE	Number
	<i>AR Sudh</i>	4/8/96	<i>R. B...</i>	4/7/96	V049-2-087
					Rev. 1

Title

QUALITY PLAN FOR HORIZONTAL ACCESS MODULE (HAM)

APPLICABLE DRAWINGS

V049-4-054 HAM Flange/Annulus Tubing Assembly

V049-4-128 HAM Shell Weldment Assembly

V049-4-002 Horizontal Access Module Chamber Assembly

V049-4-031 60-1/2" I.D. Flange Detail (Grooved)

V049-4-032 60-1/2" I.D. Flange Detail (Flat Face)

V049-4-021 84-14" I.D. Flange Detail (Grooved)

V049-4-027 60-1/2" I.D. Flange Face (Detail)

V049-4-0A4 60" End Cover

V049-4-052 HAM Chamber Support Saddle

V049-4-053 60-1/2" I.D. Expansion Joint

V049-4-127 84-1/4" Access Cover

V049-4-040 HAM Tie Rod Assembly

APPLICABLE PROCEDURES

V049-2-072 Welding GTAW (PWHT) P8-P8

V049-2-071 Welding PAW (PWHT) P8-P8

V049-2-074 General Repair Procedure

V049-2-046 Thermal Stress Relief

V049-2-078 Ham Chamber Fabrication

SPECIFICATION

Number **A** V049-2-087

Rev

Number

Rev.

Serial No. V0494128-05

SPECIFICATION V049-2-087

REV. 1



Process Systems International, Inc.
20 Walkup Drive
Westborough, MA 01581-5003
(508) 366-9111 Fax (508) 870-5930

PROJECT

LIGO

JOB NO.

V59049

ITEM

HORIZONTAL Access Module (HAM)

DWG NO.

V049-2-128

APPLICABLE CODE

ASME Sect III Div. 1

PG

23

OF

97

(where Applicable)

ASME CODE
QUALITY PLAN

LEGEND: D = DIMENSIONAL
V = VISUAL
RT = RADIOGRAPHY

PT = LIQUID PENETRANT
MT = MAGNETIC PARTICLE
ET = EDDY CURRENT

LT = LEAK TEST
UT = ULTRASONIC
W = WITNESS

X = HOLD POINT
√ = APPROVED
R = REVIEW

VR = VERIFY

QUALITY PLAN REVIEWED QA: <u>GS</u> AI: <u>N/A</u>	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS
Verify Acceptance of Materials	X			X <u>[Signature]</u> 25/11/96			
Inspect Welding Long Seam/Lower Shell	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 11/1/96			
Verify Roundness of Shell	V-D	V049-4-128		X <u>[Signature]</u> 11/1/96			
Inspect Welding Long Seam 60" Nozzles	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 11/1/96			
Verify Roundness of 60" Nozzles	V-D	V049-4-128		<u>[Signature]</u> 11/1/96			
Verify Fixtures In Shell & 60" Nozzles				<u>[Signature]</u> 11/1/96			



Serial No. V0494128-05

SPECIFICATION V049-2-087

REV. 1

ASME CODE QUALITY PLAN	LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC √ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY																			
	QUALITY PLAN REVIEWED QA <u>GS</u> AI _____	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS												
Verify Welding and Location of Saddle Support Plates and Lift Lugs	V-D	V049-4-128	V049-2-071	<u>MSB</u> <u>1/6/96</u>																
Inspect Welding of 60" Nozzles	V	V049-4-128		<u>MSB</u> <u>1/6/96</u>																
Verify Nozzle Alignment and Dimensions (ALL Nozzles)	V-D	V049-4-128		<u>MSB</u> <u>3/6/97</u>																
Verify Steam Cleanuc of Vessel				<u>X MSB</u> <u>3/6/97</u>																
Thermal Stress Relief Vessel		V049-2-046		<u>X GS</u> <u>4-7-97</u>																



Serial No. U0494128-05

SPECIFICATION U049-2-057

REV. 1

ASME CODE QUALITY PLAN		LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC ✓ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY									
QUALITY PLAN REVIEWED QA <u>GS</u> AI _____	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS				
Verify 60" Nozzle End Dimensions after Machining	U-D	U049-2-046		X <u>MAJ</u> 11/18/99							
Verify Cutout Location of the 4-Critical "E" Nozzles	U-D	U049-4-128		X <u>MAJ</u> 11/22/99							
Inspect Welding of 84" Flanges to Shell	V	U049-4-054	U049-2-071	X <u>MAJ</u> 11/21/99							
Verify Flange (84") Straightness and Flatness	V-D	U049-4-054		X <u>MAJ</u> 11/21/99							
Inspect Welding of 60" Flanges to Nozzle Neck	V	U049-4-054	U049-2-071	X <u>MAJ</u> 11/29/99							

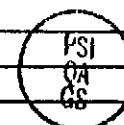
PSI
QA
GS

Serial No. V0494128-05

SPECIFICATION V049-2-087

REV. 1

ASME CODE QUALITY PLAN		LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC ✓ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY									
QUALITY PLAN REVIEWED QA: <u>GS</u> AI: _____	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS				
Verify 60" Flange Straightness & Flatness	V-D	V049-4-054		X <u>MAN</u> 1/23/97							
Inspect Welding of Expansion Joint to 60" Nozzle	V	V049-4-054 V049-4-053	V049-2-071	X <u>MAN</u> 1/24/97							
Inspect Welding of Internal Scribe to Shell	V	V049-4-128	V049-2-071	X <u>MAN</u> 3/7/97							
Inspect Welding of ALL Non-Critical Flanges	V	V049-4-128	V049-2-071	X <u>MAN</u> 1/23/97							
Inspect Welding of Critical "E" Nozzles and Flanges (with fixtures)	V	V049-4-128	V049-2-071	X <u>MAN</u> 2/27/97							
Verify Alignment Straightness & Flatness of "E" Nozzles	V-D	V049-4-128		X <u>MAN</u> 3/6/97							

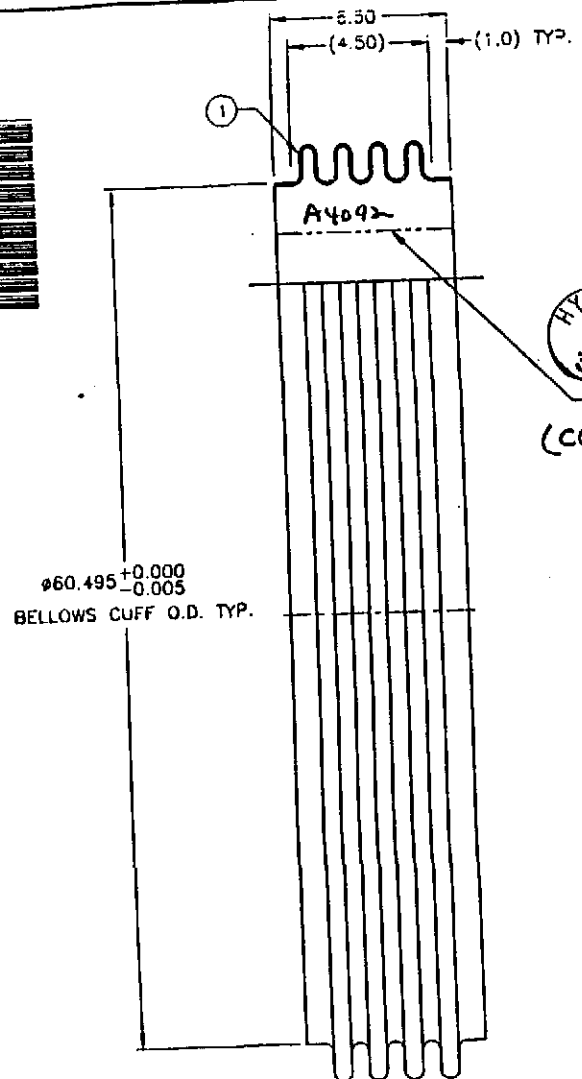


Serial No. U0494128-05

SPECIFICATION U049-2-087

REV. 1

ASME CODE QUALITY PLAN	LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC √ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY						
QUALITY PLAN REVIEWED QA <u>GS</u> AI	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS
Verify Installation of Bellows Tie-Rod	V	U049-4-040	U049-2-072	X <u>MMW</u> 1/23/97			
Verify Installation of Annulus Tubing	V	U049-4-054					
Verify Installation & Alignment of Support Saddles	√-D	U049-4-052 U049-4-002	U049-2-072 U049-2-071	X MMW 6/26/97	<u>GS</u> 6-26-97		
Steam Clean Complete Vessel Inside & Out		U049-2-015		X <u>MMW</u> 5/27/97			
Verify Final Cleaning at PSI	V	U049-2-015		X <u>GS</u> 5/27/97			
Verify Final Bakeout at PSI	V	U049-2-019		X <u>GS</u> 6-20-97			PSI QA GS
Verify Final Vbr. & He Leak Test at PSI	V	U049-2-014		X <u>GS</u> 6-26-97			
Shipment to LIC		U049-2-123		X <u>GS</u> 9/10/97			



60.495^{+0.000}_{-0.005}
BELLOWS CUFF O.D. TYP.

HYSPAN
W
30
WPS
007
(CO₂ SCRUB)

② TAG DETAIL

CERTIFIED BY :
HYSPAN PRECISION PRODUCTS, INC.
HYSPAN SALES ORDER NO.: 70904
PROCESS SYSTEM INT'L. P.O. NO: 555830
PROCESS SYSTEM INT'L. PART NO: V0494053
PROCESS SYSTEM INT'L. SERIAL NO: 01 THRU 18
HYSPAN PART NO.: 53140

- DRAWING NOTES**
1. ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.
 2. DESIGNED IN ACCORDANCE WITH THE STANDARDS OF THE EXPANSION JOINT MANUFACTURERS ASSOCIATION.
 3. EXTERNAL SHIPPING RESTRAINTS (PAINTED YELLOW) TO BE MARKED "REMOVE AFTER INSTALLATION" REMOVE PRIOR TO PRESSURE TESTING.

SUBMITTED FOR APPROVAL
HYSPAN PRECISION PRODUCTS, INC.
BY _____ DATE OCT/07/96

LTR	TEVISION		
A	WAS DWG. NO. CE 632-1 TEMP. WAS 370°F REV'D NOTE 8, 11 & 14 DEL. NOTE 12 & 13 SUBMIT FOR APPL.	SEP/11/96	N.F.S.
B	REV'D PER CUST. COMMENT SUBMIT FOR APPROVAL	OCT/07/96	N.M.P.

SALES ORDER NO. 70904-17
CUSTOMER PROCESS SYS. INT'L
QTY. 12 DUE 11/25/96

4. DESIGN CONDITIONS
- DESIGN PRESSURE : F.V. AND 15 PSIG. AT 400°F.
 - TEST PRESSURE : 23 PSIG. (PNEUMATIC)
 - ~~CHLORIDE CONTENT OF TEST WATER NOT TO EXCEED 100 PPM~~
 - AXIAL SPRING RATE : 4,812 Lb./in. @ 0.5 in. THERMAL AXIAL COMPRESSION
 - AXIAL SPRING RATE : 2,860 Lb./in. @ 2.0 in. MAINTENANCE COMPRESSION
 - LIFE : 1,000 CYCLES
5. ALL WELDING PER ASME BOILER AND PRESSURE VESSEL CODE SECTION IX.
 6. STANDARD SHOP NDE OF ALL PRESSURE CARRYING WELDS IN ACCORDANCE WITH ASME PRESSURE VESSEL CODE SECTION V.
 7. ESTIMATED WEIGHT : 45 Lbs.
 8. TAG ASSEMBLY : SEE DETAIL
 - ~~9. USE VIBRATORY TOOL WITH MIN. TIP RADIUS OF .005, OUTSIDE ONLY.~~
 9. BELLOWS IS CAPABLE OF 2 in. OF COMPRESSION DURING INSTALLATION AND 0.5 Deg. OF ANGULATION WHILE INSTALLED.
 10. A 2 in X 2 in. COUPON FROM EACH HEAT NUMBER AND LOT THICKNESS OF BELLOWS MATERIAL SHALL BE SUPPLIED TO PSI FOR INFORMATION.
 11. BELLOWS SHALL BE HELIUM LEAK CHECKED TO 1 X 10⁻⁸ torr-1/SEC.
 - ~~12. DO NOT GRIND INSIDE WELD.~~
 - ~~13. POSITION LONG SEAMS PER PROCESS SYSTEMS INTERNATIONAL DRAWINGS.~~
 14. CLEANLINESS SHALL BE IN ACCORDANCE WITH P.S.I. SPEC. V049-2-017, SECTION 8.0.
 15. AFTER FINAL CLEANING, BELLOWS ASSEMBLY SHALL BE WRAPPED IN POLYETHYLENE.

2	1	TAG, .06 THK.	A240-304
1	1	BELLOWS, (60.423 I.D.), 63.423 O.D.	SA240-304L
		1 PLY, .036 THK., 4 CONS.	

ITEM	QTY	DESCRIPTION	MATERIAL
LIST OF MATERIAL			
Information proprietary to Hyspan Precision Products, Inc. is contained on this drawing. Disclosure or use is expressly prohibited except as agreed to in writing by Hyspan Products, Inc.			
		Hyspan Precision Products, Inc. 1885 Brandywine Avenue Chula Vista, California 91911	Phone (619) 421-1355 FAX (619) 421-1702
CODE IDENT 30009			

TITLE FORMED BELLOWS, SINGLE, (60.423 I.D.)		DRAWING NUMBER 53140		REV B
DRAWN BY PARIS	DESIGNED BY M.O.C.	DATE JUL/11/96	CUSTOMER PROCESS SYSTEM INT'L.	
APPROVED	DATE	SPECIFICATION V049-4-053		
SCALE NONE	SHT. 1 OF 1			

S/N 007 V0494053-01-07



TEST CERTIFICATE
Cert. No 175583

1.1. Sheffield
99 17R

1 44 10114 244 3311 1 44 10114 244 8200 647025

V6 2053-PI-07

EN 10204 3.10

To:
AVESTA SHEFFIELD INC
425 NORTH MARTINGALE SUITE 2000
SCHAMBURG
ILLINOIS 60173
U.S.A
F.A.D. KEITH MOOD

Cons./Inv. No. 175/84392/05



21/05/96 Date

Customer Order No.
9102376

Specification
ASTM A240-95 304 UNS30400
00-S-7660 FEB 5 1988
AMS 5513F 6/15/53
MIL-S-5059D 30/5/83

Supply Condition
Cold Rolled Softened Descaled and Pinch Passed

Quality confirmed by spectroscopy examination Test Position: F=Front, B=Back Orientation: T=transverse, L=longitudinal

Folio	Cast. No.	Material Description	Temp C	Coil No./ Plate No.	Proof Stress		Yensile Strength	El%	HR/HV	Band Test	I/C Test	Impact (ft. lbs. J)
					0.2% PSI	1.0% MPa/Warped						
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	74328/1	BT 45385 FI 36975	52345 44370	89175 86855	52 (5) 57 (5)	63.5 155 58.6 144	OK OK	OK OK	

MATERIAL TESTED TO ASTM A240 CONFORMS TO LATEST REVISIONS OF ASTM A240/ASME SA240/400 Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds by Avesta Sheffield. (1N/mm sq = 145.04 PSI)

Material inspected and tested to ASTM A240 also conforms to latest revisions of ASTM A400 and ASME SA20/SA400 (N/mm sq. = 145.0 PSI) Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds by heating to 1900 deg F min. except 321H 347H

INTERCRYSTALLINE CORROSION TEST TO ASTM A262 (1993) PRACTICE E SATISFACTORY

Avesta Sheffield Ltd
LRQA Approval Numbers



940258
940175

Cast No.	C	Si	Mn	P	S	Cr	Mo	Ni	Ti	Nb	Co	N	
C2004	.021	.39	1.38	.020	.001	18.15	.24	9.08				.019	Cu .27

Witnessed _____ Inspecting Authority _____
Signed for Avesta Sheffield Ltd
M de Jong, Chief Inspector

We certify that the above material has been tested in accordance with the order and specification and that the results comply with the requirement of the order or specification. (Note that where more than one specification is involved, only the mechanical properties and cast chemical composition are certified to the requirements of each individual specification.)

VINCENTI METAL GOODS
SANTA FE SPRINGS
CUST. ORDER # 45894
DATE ORDERED 6/5/96
DATE SHIPPED 25-038/53

All Test Certificates issued by Avesta Sheffield Ltd will contain either an embossed seal, or be impregnated with an Avesta Sheffield Ltd watermark logo, or a combination of both. Any recipient of a copy of a Avesta Sheffield Ltd Test Certificate without either the seal or watermarking should ensure from the supplier that it is a true and accurate reproduction of the original.

MASS SPECTROMETER TEST REPORT

Fig.

V0444053-P1-L

CUSTOMER: Process Systems International, Inc.				
Sales Order No.: 70904 Item: 17		Drawing No.: 53180		
Equipment: DuPont 120 SSA		Leak Standard. Sn. 1051		
Test Procedure per ASTM E-498		Test Area: Bellows and weld ends		
PSI Part No.:				
Sn.	Leak Rate - Std. cm ³ /s.	Time	Date	Inspector
007	1x10 ⁻⁹	1430	12-6-96	<i>[Signature]</i>

The above referenced expansion joint has passed the mass spectrometer leak test to the required sensitivity.

Material HT#		
Bellows	Tagged weld end	Untagged weld end
A4092	N/A	N/A

Inspector *[Signature]* Level II Date 12-6-96



PROCESS SYSTEMS INTERNATIONAL, INC.

20 Walkup Drive, Westborough, MA 01581

CALIFORNIA INSTITUTE OF TECHNOLOGY  **LIGO PROJECT**
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CERTIFICATE OF CONFORMANCE

CUSTOMER: The LIGO Project
California Institute of Technology
Mail Stop 18-34
Pasadena, CA 91125

DATE: 11/18/97

CONTRACT ORDER NUMBER: PC 175730

PSI JOB NUMBER: V59049

DRAWING NUMBER(S): V049 4 128


TAG NUMBER: WHAM 5

SERIAL NUMBER: 07

ITEM: Refer to attached Material Tracer Record

APPLICABLE SPECIFICATION(S): SA-240 A-500
SA-193 B7
SA-194 2H
F-436

PSI certifies that the items furnished in this shipment have been manufactured from the materials and in accordance with the process test and acceptance criteria requirements specified within the drawing(s) and/or specification(s) listed above. All inspection records and test results are on file with PSI and are available for examination.


Gene Senecal
Quality Assurance Engineer

Material Tracer Record

Part Number WHAM 5 S/N 07

Page 2

Item #	Qty	U/M	Part code	Description	C of C MIC # CMTR
5	2	EA	V049M306 3	FLANGE SST304L COFC CONFLAT NON-ROTATABLE 4-1/2 OD BLANK	C of C
10	2	EA	V049M760 3	GASKET OFHC COP COFC 4-1/2 OD CONFLAT FLANGE (PKG QTY 10) PER SPEC V049-2-037/T4	C of C
11	16	EA	V049M776	BOLT SST 18-8 HEX HD 5/16-18 X 2- 1/4 LG	C of C
14	1	EA	V0494142P2 3	FLANGE SST304L COFC CONFLAT REDUCING PER DETAIL B DWG V049-4-142 WITH 4 1/2X 2 1/2 CONFLAT BORE AND TAPPED HOLES WITH 4 1/2X2 1/2 CONFLAT BLANK GASKET AND HARDWARE PER SPEC V049-2-037 CLASS T4	C of C
15	8	EA	202549 3	FLANGE SST304L COFC CONFLAT 12 OD BLANK NON ROT. .332 DIA THRU HOLES 32 PLACES EQ. SP. ON A 11.181 DIA. B.C.	C of C
16	10	EA	202667 3	FLANGE SST304L COFC CONFLAT BLANK 10 OD NON ROT. .332 DIA THRU 24 HOLES EQ. SP. ON A 9.128 DIA B.C.	C of C
18	4	EA	V049M142 3	FLANGE SST304L COFC CONFLAT BLANK 14 OD NON ROT. .390 DIA THRU HOLE 30 PLACES EQ SPACED ON A 9.128 DIA B.C.	C of C
21	1	EA	202670 3	GASKET COP OFHC COFC CONFLAT 16-1/2 OD FLANGE	C of C
22	8	EA	202552 3	GASKET COP OFHC COFC CONFLAT 12 OD FLANGE	C of C
23	10	EA	202671 3	GASKET COP OFHC COFC CONFLAT 10 OD FLANGE	C of C
25	156	EA	V049M780	BOLT SST 18-8 HEX HD 3/8 -16 X3 LG	C of C

Material Tracer Record

Part Number WHAM 5 S/N 07

Page 3

27	500	EA	V049M777	BOLT SST 18-8 HEX HD 5/16 -18 X2-1/2 LG.	C of C
28	2	EA	V049M019	O'RING VITON A500 BAKED .275 NOM X 265.125 LG VULCANIZED	C of C
29	2	EA	V049M018	O'RING VITON A500 BAKED .275 NOM X 274.375 LG VULCANIZED	C of C
30	4	EA	V049M144 3	GASKET COP OFHC COFC CONFLAT CoFC 14 OD FLANGE	C of C
31	1	EA	V049M023	O'RING VITON A500 BAKED .275 NOM X 191-1/4 LG VULCANIZED	C of C
32	1	EA	V049M022	O'RING VITON A500 BAKED .275 NOM X 200-5/8 LG VULCANIZED	C of C
33	140	EA	202678 3	BOLT STL SA193 B7 COFC HEX HD 7/8-9 UNC X 4 LG ZINC PLATED .0002 MIN THK.CLEAR CHROMATE	C of C
34	140	EA	202679 3	NUT STL SA194 2H COFC HEX HD 7/8-9 UNC ZINC PLATED .0002 MIN THK CLEAR CHROMATE PROCESS	C of C
35	280	EA	202581 3	WASHER STL ASTM F436 COFC 1-3/4 ODX15/16 IDX1/4 THK ELECTROLESS NICKEL PLATED	C of C
36	156	EA	V049M783	NUT SILICON BRZ HEX 3/8 -16	C of C
37	72	EA	V049M786	WASHER SST 18-8 FLAT 3/8	C of C
38	530	EA	V049M782	NUT SILICON BRZ HEX 5/16 -18	C of C
39	###	EA	V049M785	WASHER SST 18-8 FLAT 5/16	C of C
40	256	EA	V049M1011	WASHER SST 18-8 3/8 IDX5/8 OD X.062 THK	C of C
4	1	EA	202667 3	FLANGE SST304L COFC CONFLAT BLANK 10 OD NON ROT. .332 DIA THRU 24 HOLES EQ. SP. ON A 9.128 DIA B.C.	C of C
5	1	EA	202671 3	GASKET COP OFHC COFC CONFLAT 10 OD FLANGE	C of C
6	24	EA	V049M777	BOLT SST 18-8 HEX HD 5/16 -18 X2-1/2 LG.	C of C

Material Tracer Record

Part Number WHAM 5 S/N 07

Page 4

7	24	EA	V049M782	NUT SILICON BRZ HEX 5/16 -18	C of C
8	48	EA	V049M785	WASHER SST 18-8 FLAT 5/16	C of C
1	20	FT	V049M452 1	TUBE A269 304L CMTR 1-1/2OD X .065 WT PER SPEC V049-2-037/T4	C of C
2	4	EA	V049M551 3	TEE SST304L CofC BTWLD 1- 1/2ODX.065 WT PER SPEC C049-2- 037/T4	C of C
3	1	EA	V049M502 3	ELBOW SST304L 90DEG 1-1/2ODX .065WT BTWLD COFC PER SPEC V049-2-037/T4	C of C
4	3	EA	V049M602 3	REDUCER SST304L COFC CONC BTWLD 1-1/2 ODX 3/4 ODX.065 WT PER SPEC V049-2-037/T4	C of C
5	4	EA	V049M505 3	ELBOW SST304L 90DEG 3/4ODX.035 WT BTWLD COFC PER SPEC V049-2- 037/T4	C of C
6	3	FT	V049M454 1	TUBE A269 304L CMTR 3/4 OD X .065 WT PER SPEC V049-2-037/T4	C of C
9	2	EA	V049M305 3	FLANGE SST304L COFC CONFLAT NON-ROTATABLE 4-1/2 OD X 1-1/2 ID	C of C
34	2	EA	V0494021	84-1/4 I.D. FLANGE GROOVED (HAM)	A 375 A 660
35	1	EA	V0494031	60-1/2 I.D. FLANGE GROOVED WITH SLOTS (HAM)	A 899
36	1	EA	V0494032	60-1/2 I.D. FLANGE FLAT FACED (HAM)	A 568
37	1	EA	V0494053	60.5 HAM METAL BELLOWS PER SPEC V0492017	C of C
38	20	FT	V049M890 1	BAR SST304L SA479 CMTR FL 1/2 X2	C of C
39	1	EA	V0494040	HAM BELLOWS TIE-ROD ASSY	C of C
45	1	EA	V049M601 3	REDUCER SST304L COFC CONC BTWLD 1 ODX 3/4 ODX.065 WT PER SPEC V049-2-037/T4	C of C

Material Tracer Record

Part Number WHAM 5 S/N 07

Page 5

46	1	EA	V049M501 3	ELBOW SST304L 90DEG 1 ODX.065 WT BTWLD COFC PER SPEC V049-2-037/T4	C of C
47	0.5	FT	V049M451 1	TUBE A269 304L CMTR 1 ODX .065 WT PER SPEC V049-2-037/T4	C of C
1	1	EA	V049M132 1	HEAD SST304L SA240 CMTR ASME FLGD & DISHED 84.25 ID .344 MIN THK (3/8 NOM. THK) 85 DISH RAD 5.25 INSIDE CORNER RAD WITH 2 S.F. APPROX OVERALL HEIGHT 16.66 COLD FORMED-DIP PICKLED	A 594 B 205
2	1	EA	V049M136 1	FLANGE SST F304L SA182 CMTR FORGED BLANK ASME CODE 1992 EDITION THRU 1994 ADDENDA MACHINE TO 1-3/8 +.06 THK 92.25 +.06 OD X 83.75 -.06 ID FINISH 250/500 PER SPEC V0492040	B 235 A 664
3	5	EA	V049M220 1	FLANGE SST304L CMTR HALF NIPPLE CONFLAT NON ROT. 10 OD X 8 OD TUBE X 1/4 WT 3-1/8 OVER ALL HEIGHT .332 DIA 24 HOLES EQ. SP. ON A 9.128 DIA. B.C.	C of C
4	4	FT	C387904-F 3	BAR SA479 TP304 CofC FL .250X0.75	C of C
3	1	EA	V0494128P3 14	SHELL SST GR304/304L SA240 CMTR MAKE FROM V049P7815 14 CMTR ROLL TO 84.25 ID X 76 LG PER SPEC V0492136 AND DWG.V0494128 DETAIL 12	A 516
11	1	EA	V0494128P11 14	SHELL SST GR304/304L SA240 CMTR MAKE FROM V049P7817 14 CMTR ROLL TO 60.50 ID X 62 LG	A 426
12	4	EA	V049M322 3	FLANGE SST304L COFC HALF NIPPLE CONFLAT NON ROT. 14 OD X 12 ODTUBEX.120WT 30 OVERALL HEIGHT .390 DIA THRU 30 HOLES EQ. SP. ON A 12.810 DIA B.C.	C of C

Material Tracer Record

Part Number WHAM 5 S/N 07

Page 6

13	16	FT	V049M876 1	BAR SST 304/304L SA240 CMTR FL .375X3	C of C
14	1	EA	V049M309 3	FLANGE SST304L COFC HALF NIPPLE CONFLAT NON ROT. 16-1/2 ODX14 OD TUBEX.120WT 5 OVERALL HEIGHT .390 DIA THRU 36 HOLES EQ.SP. ON A 15.310 DIA B.C.	C of C
15	8	EA	V049M311 3	FLANGE SST304L COFC HALF NIPPLE CONFLAT NON ROT. 12 OD X 10 OD TUBEX.120WT 5 OVERALL HEIGHT .332 DIA THRU 32 HOLES EQ. SP. ON A 11.181 DIA B.C.	C of C
38	2	EA	V0494128P38 1	LIFTING LUG/STIFFENER PER DWG V0494128 DETAIL 5	C of C
39	20	FT	V049M215 1	PLATE SST304/304L SA240 CMTR .75X6.50 PER V0492041	C of C
48	0	EA	V049M870 14	PLATE SST304/304L SA240 CMTR .500 X9 X12	C of C

2-1220

500 Green Street
Washington, Pennsylvania 15301
CERTIFIED MATERIAL TEST REPORT

Bill to:
PLATE PROD DIV / A-L
1201 VALLEY ROAD
COATESVILLE PA

Shipto:
PLATE PROD DIV / A-L
1201 VALLEY ROAD
COATESVILLE PA

19320

19320

HELEN M. O'CONNOR
Quality Assurance Representative

Heat	Slip	Lot No	Size	Pcs	Weight
870739	54568 A		.3750 x 95.0000 x 252.0000	1	2742 From slip 10291 GV ST

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
870739	.023	1.72	.027	.0004	.43	8.24	18.40	.35	.11	.29	.090

Slip	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion
#54568	.3750	40.3 KSI	84.3 KSI	59.4	74.9	BHN167	OK	OK

MATERIAL WAS NOT WELDED

Memo No: 1113167-00

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with SAIB-240 Gr. 304L
95 Edition, Addenda

Our Order no: DP63495
Your Order No: 10001
Date: 04/12/94
DUAL CERT

JESSOP T 304L STAINLESS HRAP
ASTM A240-94a; ASME SA-240-A93; AMS 5511F;
(WAIVE CLM);

By: C. Wotawicki Date: 9-12-96

Heat	Slip	Lot No	Size	Pcs	Weight
770796	54804 A		.3750 x 98.0000 x 235.0000	1	2584 From slip 10291 GV ST

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
770796	.018	1.79	.028	.0006	.28	8.72	18.47	.29	.13	.32	.092

Slip	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion
#54804	.3750	39.3 KSI	84.3 KSI	61.6	76.9	B78-80	OK	OK

MATERIAL WAS NOT WELDED

Memo No: 1115191-00

Our Order no: LU43347
Your Order No: 7026
Date: 05/21/94
DUAL CERT

JESSOP T 304L STAINLESS HRAP
ASTM A240-94a; ASME SA-240-A93;

Heat	Slip	Lot No	Size	Pcs	Weight
871014	91531 A		.3750 x 120.0000 x 360.0000	1	4949 GV-STOCK

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
871014	.018	1.83	.032	.0160	.35	8.35	18.36	.34	.13	.33	.091

Slip	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion
91531	.3750	43.8 KSI	83.8 KSI	61.7	71.4	BHN163		OK

EXCEPT AS OTHERWISE NOTED, THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH THE LISTED SPECIFICATIONS AND RESULTS CONFORM TO THE SPECIFICATION AND ORDER REQUIREMENTS. THE ABOVE INFORMATION HAS BEEN REPRODUCED FROM THE ORIGINAL CERTIFIED MATERIAL TEST REPORT.



Tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 08/28/96

PCS SHIPPED: 0
OUR ORDER NO 532691604
SHIPLIST NO: 56061

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD \pm .06 X 93.75" ID \pm .06 X 1.375" WD \pm .06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

V049H136-1

PSI MIC NO. A664

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE
WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with ASME 182 Gr. 304L
95 Edition, Addenda
By C. Katoicki Date 9-16-96

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
209279	.031	.48	.033	1.79	.002	11.72	18.82								N .0530

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI) .20% OFST	% ELONG	XRED AREA	I_M_P_A_C_T_D_A_I_A					
										LOCATION	TEMP (F)	FT. LBS	% SHR	LAT EXP	GRN SZE
209279	6G2856A		+75		PROLONG	74.5	37.0	61.0	81.0						
209279	6G2856B														
209279	6G2856C														
209279	6G2856D	664													
209279	6G2857A														
209279	6G2857B														
209279	6G2857C														
209279	6G2857D														

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED

PRODUCT

CUSTOMER

3



Durham, PA 17009
Tel. 717-248-4911

STANDARD STEEL
QP090-F1
A Division of FREEDOM FORGE Corporation

METALLURGICAL CERTIFICATION

PSI NO. **A375**

FOR: PROCESS SYS. INT'L
CUSTOMER ORDER NUMBER 555370
REPORT DATE: 07/08/96

PCS SHIP. ---
02 OUR ORDER NO 432617501
SHIPLIST NO: 54441

PRODUCT

RING MACHINE TO DRAWING SIZES DWG: V049M135-1 V049M135-1
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 3

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE
WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with SAISE-180 Gr. 304L
95 Edition, Addenda
By C. W. Wicks Date 7-27-96

CHEMICAL ANALYSIS

AT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
S09072	.020	.42	.028	1.76	.005	11.39	18.96								N .0630

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	% ELONG	% RED AREA	I_M_P_A_C_T_D_A_T_A					
										LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
S09072	6E1594A		+75		PROLONG	78.5	33.5	60.0	55.0						
S09072	6E1594B														
S09072	6E1594C														

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED

THIS REPORT CERTIFIES THAT THE ABOVE RESULTS ARE
CORRECT AS REPORTED AND CONTAINED IN THE COMPANY RECORDS

D.W. Keller
MGR. LABORATORIES



Tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

METALLURGICAL CERTIFICATION

FOR: PROCESS SYS INT MA

CUSTOMER ORDER NUMBER 555492

REPORT DATE: 10/14/96

PCS SHIPPED: 24

OUR ORDER NO 432620501

SHIPLIST NO: 57948

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 60.5" OD +.06 X 60.0" ID -.06 X 1.625" WD (*)
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6
(*) +.06

VO49M135-1

PSI MIC NO. A899

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

CHEMICAL ANALYSIS

T NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
09281	.013	.58	.030	1.81	.002	11.64	19.13								

N .0600

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	X 20X OFST	X ELONG	X RED AREA	IMPACT DATA				
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
09281	6I1421A		+75		PROLONG	73.0	34.5		61.0	77.0					
09281	6I1421B														
09281	6I1421C														
09281	6I1421D														
09281	6I1421E														
09281	6I1422A														
09281	6I1422B														
09281	6I1422C														
09281	6I1422D														
09281	6I1423A														
09281	6I1423B														
09281	6I1423C														
09281	6I1423D														
09281	6I1423E														

Dec 1996
S09281 6I1424A
S09281 6I1424B
S09281 6I1424C
S09281 6I1424D
S09281 6I1424E
S09281 6I1425A
S09281 6I1425B
S09281 6I1425C
S09281 6I1425D
S09281 6I1425E

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies with SA/BB-182 Gr. 304L
95 Edition, Addend
By: *C. W. W. W.* Date: 10-1-96

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED

THIS REPORT CERTIFIES THAT THE ABOVE RESULTS ARE CORRECT AND TO BE MAINTAINED IN THE COMPANY RECORDS



Avesta Sheffield East, Inc.

PSI MIC NO. A426

Certificate of Analysis and Tests

OUR ORDER 84643 - 04 HEAT & PIECE 38791-1B 8/06/96

SOLD TO: PROCESS SYSTEMS INTERNATIONAL SHIP TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE 20 WALKUP DRIVE
WESTBOROUGH MA 01581 WESTBORO MA 01581
737001-01

----- YOUR ORDER & DATE -----
555-477 ✓ 6/17/96

----- ITEM DESCRIPTION -----

✓ HEAT & PIECE 38791 - 1B
WEIGHT 1827
FINISH ✓ 1 ✓
GRADE 304L / 304
DIMENSIONS .500 X 62.187 X 195.312 EXACT
UNS-S30403 / UNS-S30400

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with SAE 240 Gr. 304L-304
95 Edition, 95 Addenda

By SS Date 8-17-96

----- SPECIFICATIONS -----

V049-2-041 REV0 WITH EXCEPTS
ASTM A480-94B, ASME SA480-95
✓ COUPONS REQUIRED
ASTM A262-93 PRAC A
ASTM A240-95B, ASME SA240-95 ✓
NO GRIP MARKS-NO WELD REPAIR ✓
ASTM A262-93 PRAC E

PLATES & TEST PCS SOLUTION ANNEALED @ 1950 DEGREES FARENHEIT MINIMUM.
THEN WATER COOLED OR RAPIDLY COOLED BY AIR
FREE OF MERCURY CONTAMINATION
HOT ROLLED, ANNEALED & PICKLED (HRAP) ✓

----- MECHANICAL & OTHER TESTS -----

✓ HARDNESS RB 88
GRAIN SIZE 5
✓ YIELD STRENGTH (PSI) 41100
✓ TENSILE STRENGTH (PSI) 82900
BEND OK
INTERGRANULAR CORROSION OK
✓ ELONGATION % IN 2" 58.0
REDUCTION OF AREA % 68.0

----- CHEMICAL COMPOSITION -----

✓ CARBON (C) .018
✓ MANGANESE (MN) 1.49
✓ PHOSPHORUS (P) .029
✓ SULFUR (S) .019
✓ SILICON (SI) .28
✓ CHROMIUM (CR) 18.38
✓ NICKEL (NI) 8.61
COBALT (CO) .11
COPPER (CU) .35
MOLY (MO) .39
✓ NITROGEN (N) .06

KNOWINGLY & WILLFULLY FALSIFYING OR CONCEALING A MATERIAL FACT ON THIS FORM,
OR MAKING FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR REPRESENTATIONS
HEREIN COULD CONSTITUTE A FELONY PUNISHABLE UNDER FEDERAL STATUTES.

J. BONGARDT, LAB MANAGER



Avesta Sheffield Plate Inc.

Certificate of Analysis and Tests

OUR ORDER 84645 - 07

HEAT & PIECE 39232-2A 8/29/96

SOLD TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVESHIP TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE

WESTBOROUGH

MA 01581

WESTBORO
737001-01

MA 01581

----- YOUR ORDER & DATE -----

555-477

6/17/96

----- ITEM DESCRIPTION -----

HEAT & PIECE 39232 - 2A
 WEIGHT 3101
 FINISH 1
 GRADE 304L / 304 UNS-S30403 / UNS-S30400
 DIMENSIONS .500 X 76.250 X 270.375 EXACT

----- SPECIFICATIONS -----

V049-2-041 REV0 WITH EXCEPTS
 ASTM A480-94B, ASME SA480-95
 COUPONS REQUIRED
 ASTM A262-93 PRAC A

ASTM A240-95B, ASME SA240-95
 NO GRIP MARKS-NO WELD REPAIR

ASTM A262-93 PRAC E

PLATES & TEST PCS SOLUTION ANNEALED @ 1950 DEGREES FARENHEIT MINIMUM.
 THEN WATER COOLED OR RAPIDLY COOLED BY AIR
 FREE OF MERCURY CONTAMINATION
 HOT ROLLED, ANNEALED & PICKLED (HRAP)

----- MECHANICAL & OTHER TESTS -----

HARDNESS RB 74
 YIELD STRENGTH (PSI) 36252 ✓
 TENSILE STRENGTH (PSI) 80169 ✓
 BEND OK
 INTERGRANULAR CORROSION OK ✓
 ELONGATION % IN 2" 63.0 ✓
 REDUCTION OF AREA % 74.9 ✓

----- CHEMICAL COMPOSITION -----

CARBON (C) .015 ✓
 MANGANESE (MN) 1.60 ✓
 PHOSPHORUS (P) .029 ✓
 SULFUR (S) .001 ✓
 SILICON (SI) .29 ✓
 CHROMIUM (CR) 18.12 ✓
 NICKEL (NI) 8.53 ✓
 COBALT (CO) .12
 COPPER (CU) .50
 MOLY (MO) .42
 NITROGEN (N) .06 ✓
 COLUMBIUM (CB) .010
 TITANIUM (TI) .010
 ALUMINUM (AL) .002
 TIN (SN) .015
 BORON (B) .002

PROCESS SYSTEMS INT'L, INC.
 Reviewed this report and it complies
 with SA 240 Gr. 304/304L
95 Edition. Addenda

By C. Woreicki Date 7-3-96

KNOWINGLY & WILLFULLY FALSIFYING OR CONCEALING A MATERIAL FACT ON THIS FORM,
 OR MAKING FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR REPRESENTATIONS
 HEREIN COULD CONSTITUTE A FELONY PUNISHABLE UNDER FEDERAL STATUTES.

A. L. TRISSLER, LAB TESTING MANAGER



Tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA
CUSTOMER ORDER NUMBER 555422
REPORT DATE: 09/05/96

PCS SHIPPED: 17
02 OUR ORDER NO 432620502
SHIPLIST NO: 56570

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 68.50" OD ±.06 X 30.0" ID ±.06 X 1.250" WD ±.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

V049M243 1

PSI MIC NO. A568

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE
WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with ASME-182 Gr. 304L
95 Edition, Addenda
By C. Wataiki Date 9-11-96

CHEMICAL ANALYSIS

AT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
509280	✓ .031	✓ .45	✓ .032	✓ 1.72	✓ .001	✓ 11.48	✓ 18.55								N .0500

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	.20XOFST	X ELONG	XRED AREA	I M P A C T D A T A				
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
509280	662744A		+75		PROLONG	74.5	36.5		64.0	79.0					
509280	662744B														
509280	662744C														
509280	662744D														
509280	662745A														
509280	662745B														
509280	662746D														
509280	662746E														
509280	662747A														
509280	662747B														
509280	662747C														
509280	662747D														
509280	6H1504A														
509280	6H1504B														

PRODUCT

CUSTOMER

Burnham, PA 17009
Tel: 717-248-4911



STANDARD STEEL
QP090-F1
A Division of FREEDOM FORGE Corporation

METALLURGICAL CERTIFICATION PAGE

FOR: PROCESS SYS INT MA

CUSTOMER ORDER NUMBER **555492**

REPORT DATE: 12/16/96

PCS SHIPPED: 8

04 OUR ORDER NO 532691604

SHIPLIST NO: 60402

PRODUCT

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD +.06 X 83.75" ID -.06 X 1.375" WD -.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

PSI MIC NO. B235

RANES

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
S09279	.031	.48	.033	1.78	.002	11.72	18.82								

N
.0530

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	X .20XOFST	X ELONG	XRED AREA	IMPACT DATA					
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SZE
S09279	6I1226A		+75		PROLONG	74.5	37.0		61.0	81.0						
S09279	6I1226B															
S09279	6I1226C															
S09279	6I1226D															
S09279	6I1513A															
S09279	6I1513B															
S09279	6I1513C															
S09279	6I1513D															

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies with SA 182 Gr. 304L
95 Edition, Addenda

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED

By C. Worech Date 1-15-97

RECEIVED DEC 29 1996



TEST CERTIFICATE

CUSTOMER P.O.: F24106
DESCRIPTION:

PAGE NO. 01 OF 01
FILE NO: 8860-01-0
DATE: 07/24/96
MILL ORDER NO: 22197-001

A LUKENS COMPANY

SOLD TO:
TRINITY INDUSTRIES, INC.
P.O. BOX 41192

SEND TO:
2 - RECTANGLE .375 -X- 96 -X- 192

01-C SHIP TO:
TRINITY INDUSTRIES-CUST PICKUP
P.O. BOX 41192

CINCINNATI OH 45241

PSI MIC NO. B205

CINCINNATI OH 45241

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATIONS:

ASTM A240 YR 94A TYPE-304L

ASTM A240-304L, ASME SA240-304L,
AMS 5511, MIL-S-5059

ASTM A167-93-304L, Q95-7660 COND. A-304L,

MELT SLAB

CHEMICAL ANALYSIS

PRACTICE

Y1133 /91CA	C	MN	P	S	CU	SI	NI	CR	MO	V	TI	B	N
Y1133	.021	1.80	.026	.007	.21	.53	8.52	18.20	.27				
PROD ANALYSIS	.024	1.83	.026	.006	.21	.54	8.57	18.17	.28				.0820 .0840

TENSILES				CHARPY V IMPACTS				OTHER TESTS PERFORMED	
TYPE	VLD (PSI X 100)	TENS % ELONG	% RA	TYPE	TEMP	MILS LATERAL EXPANSION	% SHEAR	BEND TEST - LOC/DIR BX - PASS	
BX	438	829	71.0	57.0				BRINELL - 149 TEST LO	
								CORROSION A262 SATISFACTORY	

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with SA/GB-240 Gr. 304L
95 Edition Addenda

By A. Wotcicki Date 1-8-97

INFORMATION

WEIGHT PER PIECE = 2111 LBS. 960 KG.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED IN THE
MANUFACTURE OF LUKENS/WASHINGTON'S PRODUCTS.

CORROSION TEST PER ASTM A262 PRACTICE A & E.
PART NO. 2-12122

B/L #37215 CUSTOMER'S TRUCK

SIZE = .3750" NOM X 96.0000" NOM X 192.0000" ACT X HGT. = 1.58"

HEAT TREAT CYCLES MATL OR TESTS DEG FA

MATL	TEST	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS.	COOL METHOD	FA
BX	X	1950			0012	WQ	

HEAT TREAT CYCLES TESTS ONLY DEG FA

START END TEMP.	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS.	HEAT RATE MAX	FA

WE HEREBY CERTIFY THE ABOVE INFORMATION IS CORRECT:

Quality Assurance Laboratory
Coatesville, PA 19320

Weld Wire Cuts



We make Quality happen ...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

T0065-R/774/0500

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEMS*

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: *180 LBS*

DRK ORDER / LOT NO.:

TAG:

ANSI A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: *1/8"*

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
<i>S 713906</i>	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]

(66115)(10)

3

C



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *70065-R/774101500*
PROCESS SYSTEMS

TOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: *8/8*

SVIK ORDER NO.: 16249

QUANTITY: *180LB*

WIK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: *3/32"*

Filler Metal Analysis, %

Feat <i>5440928</i>	C	Si	Mn	P	S	Cr	Ni
	.021	.470	1.800	.014	.013	20.00	9.68
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.020			.002	.040	.030	.053



The material has not come in contact with mercury or mercury-containing compounds.

Material not touched by hand after final production process cleaning.

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC 19002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

with M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan /cp

5(66119)(10)

SANDVIK

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1320 SCRANTON, PA. 18501 P (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WESTERLY EXIT 59

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 47910

CERTIFICATE DATE: 7/14/97

SANDVIK ORDER NO.: 16249

QUANTITY: PER PACKING NOTE

WORK ORDER, LOT NO.: 980309

AWS A 9 9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S713039	.013	.380	1.800	.015	.013	20.06	9.84
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.100			.002	.070	.030	.044



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYS
120 LBS
70040-R / 77410500

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

56 lbs

XJK 8115-02

KOBELCO

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KOBELCO

PAGE 14

CERTIFICATE NO.: A 017

DATE OF ISSUE : 1997.01.28

INSPECTION CERTIFICATE

FLUX CORED WIRE

PURCHASER
 PO 70040-R/774401500
 PROCESS SYSTEMS

TRADE DESIGNATION	DIMENSION (mm)	MPG. NO.	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-308L	0.9	B6M1085	AWS A5.22 E308LT0-1 ASME SFA-5.22 E308LT-1

CHEMICAL COMPOSITION (%)

ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	PN	FS	PHV
DEPOSITED METAL	0.034	0.39	1.22	0.026	0.008	0.05	0.73	18.91	0.11	0.01	0.041	6.0	6.3	6.0
ELEMENTS														

TENSILE TEST OF DEPOSITED METAL

IMPACT TEST OF DEPOSITED METAL

HARDNESS TEST

YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY	VICKERS HARDNESS (AVG.)
- N/mm ²	- N/mm ²	584 N/mm ²			AVG.	
- kgf/mm ²	- kgf/mm ²	59.6 kgf/mm ²	52 %	- °C	- J	-
					- kgf.m	

WELDING CONDITIONS

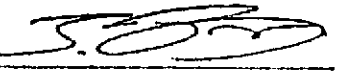
POSTWELD HEAT TREATMENT

FS = FERRITE (SCHAEFFLER DIAGR.)
 FN = FERRITE (DELONG DIAGRAM)
 PHV = FERRITE (VRC)

TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2	POSTWELD HEAT TREATMENT
AMPERAGE	110 A			
ARC VOLTAGE	25 V			- °C x - h

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREBIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBELCO STEEL, LTD.
 WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR 

BOC GASES

KOBELCO

90 RESEARCH ROAD

HINGHAM, MA 02043

PO# 70040-R / 774101500

PROCESS SYSTEMS

INSPECTION CERTIFICATE

FLUX CORED WIRE

CERTIFICATE NO.: A 002

DATE OF ISSUE : 1997.01.07

TRADE DESIGNATION	DIMENSION (mm)	WPG. NO.	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	0.9	B6M1015	AWS A5.22 E309LT0-1 ASME SPA-5.22 E309LT-1

ELEMENTS	CHEMICAL COMPOSITION (%)														
	C	SI	MN	P	S	CU	NI	CR	MO	NB	Ti	PH	FS	PHW	UNIT:PH
DEPOSITED METAL	0.026	0.43	1.10	0.022	0.012	0.04	12.75	22.56	0.04	0.02	0.017	15.0	8.7	12.0	
ELEMENTS															

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL		HARDNESS TEST	
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		VICKERS HARDNESS (AVG.)
- N/mm ²	- N/mm ²	540 N/mm ²	40 %	- °C	AVG.		
- kgf/mm ²	- kgf/mm ²	55.1 kgf/mm ²			- J		
					- kgf.m		

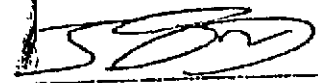
WELDING CONDITIONS				POSTWELD HEAT TREATMENT	
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2		
AMPERAGE	110	A			
ARC VOLTAGE	25	V		- °C -	

FS = FERRITE (SCHAEFFLER DIAGRAM)
 PH = PERRITE (DELONG DIAGRAM)
 PHW = FERRITE (VRC)

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HERETH AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

☞ KOBE STEEL, LTD.
 WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR



208/19

(港) 海外部

検査科 検査課 検査係

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KOBELCO

PAGE 11



We make Quality happen

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO:

CUSTOMER PURCHASE ORDER NO.:
SANDVIK ORDER NO.: 12603
WORK ORDER / LOT NO.:

CERTIFICATE DATE: 4/21/97
QUANTITY: PER PACKING NOTE
TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712976	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

PROCESS SYSTEMS
120 LBS 308L 3/32
70040-R/774101500

6



We make Quality happen ...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.:

TAG:

ANSI A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat #	C	Si	Mn	P	S	Cr	Ni
711088	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
120 LBS 308L 1/8
70040-R/774101500

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]

15(661197)(10)

(7)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

make Quality happen

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *Process Systems Intl*
7-8-97

CUSTOMER PURCHASE ORDER NO.: *70038-R/774101500*

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

.035
DIAMETER: ~~3/32~~ *120 LB*

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
<i>3713617</i>	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES

90 RESEARCH ROAD

HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)



HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

PROCESS SYSTEMS INTL
P.O. 70038R/7741000

JGP ISSUE DATE: 08-30-96

DATE SENT 6-27-97

HEAT NUMBER/LOT NUMBER: 61202878W3-60LB
E50836-K1-20LB

CHEMICAL COMPOSITION LIMITS

ALLOY: 308L
SPEC : AWS A5.9-93 ER308L

CARBON		.030
MANGANESE	1.000 -	2.500
SULFUR		.030
NICKEL	9.000 -	11.000
TANTALUM		.500
TITANIUM		.500
NITROGEN		.500
MAGNESIUM		.500
NIObIUM		.500

SILICON	.300 -	.650
PHOSPHORUS		.030
CHROMIUM	19.500 -	22.000
MOLYBDENUM		.750
CB + TA		.500
COPPER		.750
COBALT		.500
OTHER		.5

PSI
QC
CW

7-7-97

PSI
QC
CW

7-7-97

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY BRITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Janice Pittman
CERTIFICATION CLERK

9

THE ESAB GROUP, INC.
1500 Karen Lane, Hanover, PA 17331

CERTIFICATE OF TYPICAL ANALYSIS

11/19/96 *PROCESS SYSTEMS INTL*

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

7-14-97 Order No.: *700384/7741000*

This Material Conforms to Specification:
AWS A5.20-95, ASME SFA 5.20

Trade Name
or Trademark: Dual Shield II 70 Ultra

Diameter Size: .035" x 33# Spool

Type: E71T-1* / E71T-12M

Weight: *132 LB*

X-Rays Satisfactory

Lot Number: *49455 - 66 LB ✓*
49720 - 33 LB ✓
50293 - 33 LB ✓



Typical Mechanical Properties

Typical Chemical Properties	(Specification Requirements)
Carbon: .02	(.15 Max.)
Manganese: 1.10	(1.60 Max.)
Chromium: .04	(.20 Max.)
Nickel: .01	(.50 Max.)
Silicon: .34	(.90 Max.)
Niobium+:	
Tantalum:	
Molybdenum: .01	(.30 Max.)
Tungsten:	
Copper: .01	(.35 Max.)
Titanium:	
Phosphorus: .013	(.03 Max.)
Sulphur: .010	(.03 Max.)
Vanadium: .02	(.08 Max.)

	As Welded	MPa
Yield Strength (Psi)	70,000	483
Tensile Strength (Psi)	76,800	530
Elongation (2"), %	32.0	
Red. of Area, %	74.6	

Charpy V-Notch Impacts		
@ -20°F. (ft.-lbs.)	117	
@ -29°C. (Joules)	159	

(Specification Requirements)

Minimum Unless Otherwise Stated	As Welded	MPa
---------------------------------	-----------	-----

Hydrogen: 4.2 ml/100 gr. of weld metal

Yield Strength (Psi)	58,000	400
Tensile Strength (Psi)	70-90,000	480-620
Elongation (2"), %	22.0	22
Red. of Area, %		

Filletts: Vertical-Up/Overhead

Shielding Gas: 75% AR/ 25% CO₂

Charpy V-Notch Impacts		
@ -20°F. (ft.-lbs.)	20	
@ -29°C. (Joules)	27	

* No data being issued for E71T-1 classification using the CO₂ shielding gas.

The undersigned certifies that the product supplied will meet the requirements of the applicable AWS Filler Metal Specification when tested in accordance with that specification, and that no significant change has been made in the elements described in the qualification approval.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

By: *D. A. Smith*
D. A. Smith, Supervisor, Q. A. Services



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: *PROCESS SYS*

SHIP TO:

CUSTOMER PURCHASE ORDER NO. *70029R/774101500*

CERTIFICATE DATE: 4/25/97

SANDVIK ORDER NO.

QUANTITY: *120 LBS*

DRK ORDER / LOT NO.: 978457

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712976	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb-Ta	N
	.070			.002	.060	.030	.035

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

(11)



Always Make Quality Happen

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *70029R/774161500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY:

WORK ORDER / LOT NO.: *976164*

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Bottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

90 RESEARCH ROAD
HINGHAM, MA 02043

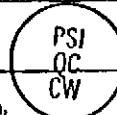
PO 70031R/774101500

4/11

KOBELCO

PURCHASER: Process Systems Intl INSPECTION CERTIFICATE
FLUX CORED WIRE
CERTIFICATE No: D 021
DATE OF ISSUE: 1997.04.24

TRADE DESIGNATION	DIMENSION (mm)	MFG. NO.	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	1.2	B6F2110382	AWS A5.22-95 E309LTO-1 ASME SFA-5.22 E309LT- (1995 Edition)



CHEMICAL COMPOSITION (%)

ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL		HARDNESS TEST
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY	
- N/mm ²	- N/mm ²	555 N/mm ²	37 %	- °C	AVG. + J - kgf·m	—
- MPa	- MPa	555 MPa				—

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE(SCHAEFFLER DIAGRAM) FN = FERRITE(DELONG DIAGRAM) WRC = FERRITE(WRC)
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2		
AMPERAGE	200 A			- °C x - h	
ARC VOLTAGE	29 V				

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

KOBE STEEL, LTD
WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 48184

CERTIFICATE DATE: 6/10/97

SANDVIK ORDER NO.: 17126

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 979336

TAG: 848523-01

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308LSI

DIAMETER: .035"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S712152 -60LB	.014	.840	1.700	.016	.013	19.50	10.23
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.030			.002	.040	.020	.042

PSI
QC
CW

Process Systems Intl
PO 70031R/77410/500

The material has not come in contact with mercury or mercury-containing compounds.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 170031R/774101500

6-13-97

4/11

KOBEL

PURCHASER PROCESS SYSTEMS INT'L	INSPECTION CERTIFICATE FLUX CORED WIRE	CERTIFICATE No: D 021 DATE OF ISSUE: 1997.04.24
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TRADE DESIGNATION	DIMENSION (mm)	MFG. NO	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	.035 84LB	B6M1015	AWS A5.22-95 E309LT0-1 ASME SFA-5.22 E309LT- (1995 Edition)

CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6

TENSILE TEST OF DEPOSITED METAL					IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST
TEST POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY			
					AVG.			
N/mm ²	- N/mm ²	555 N/mm ²	37 %	- °C	- J			
MPa	- MPa	555 MPa			- kgf·m			

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE (SCHAEFFLER DIAGRAM) FN = FERRITE (DELONG DIAGRAM) WRC = FERRITE (WRC)
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2		
AMPERAGE	200 A			— °C x — h	
VOLTAGE	29 V				

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBEL STEEL, LTD
WELDING DIV. FUJISANA PLANT

CHIEF INSPECTOR

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



NORTHEAST AIRGAS

SERVING NEW ENGLAND

PICKING TICKET

Sold By: AIRGAS NORTHEAST
 199 SOUTHWEST CUT OFF
 WORCESTER, MA 01604
 800-821-9852

Cost # : 72600

Order # : 306626-00

Ship To: PROCESS SYSTEMS INTERN'L
 20 WALKUP DR
 WESTBORO MA 01581-0000

Order Date: 04/22/97

Page : 001 OF 00

NAME : PROCESS SYSTEMS TER: 142 SHIP VIA: COST PICKUP -MODE- INITIALS: KEN
 PO # : 70034K JUNE7/4-1915 SLS: 0 SHIP LOC: 03 OPS: 0 DRG TYPE: ORES-DF
 FELT : BRG: 16 COL/PPD : PENDING TRK : 20-APR-97 12:00
 PHONE#: 508-898-0385 RTRN # :

QTY	UNIT	HAZARD CLASS	DESCRIPTION	LINE NO	ITEM NUMBER	UIC	PTT	WT	WGT	NET	UNIT	EXT
SHIP							ORDER	BRAND	LCL		SHRDS	NO.

***** SHIP COMPLETE ONLY *****												
120	LB		5183 3/32X36 ALUMINUM	1	ALC 51833236	LAK	120	0			120.0	
120	LB		5183 1/8X36 ALUM.	2	ALC 51831836	LAK	120	0			120.0	
***** This order is complete *****												
Total Weight: 240.0												



This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Authorized Signature _____

Received by K. Collins

236



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49688 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/08/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363072

P.O.# - 86207

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

[Signature]
V.P. - Quality Control



A Partnership of Alcoa Weld Wire Company, Inc. and Aluminum Technology Corporation

3/32

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

04/23/97

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.094	TIG Rod Box	363348

P.O.# - 105019



*Tony Task
1 box of 101
to TIF service
also
4/29/97*

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. DeWann

V.P. - Quality Control

HARRIS
SPECIALTY WELDING PRODUCTS

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Conformance

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
POB

Shipped To: Process Systems
PO 70015R

Date _____
Date Shipped _____
Order No. _____

P.O. No. _____

Item	Weight	Size	Alloy	Heat No.
1.	100 LBS	1/16 x 36	AL6M	0294
2.				
3.				



Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AVS A510-00 ASME SFA.5.10	OO-R-5660 Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements
1100 Aluminum (H)	ER1100 R1100	1100	A	A	0.05-0.20	0.05					0.05
2018 Aluminum (C)	ER2019 R2019	2018	0.20	0.30	0.0-0.0	0.05					0.05
4043 Aluminum	ER4043 R4043	4043	4.5-5.0	0.0	0.30	0.05	0.02		0.10-0.25	0.20	0.05
710 Aluminum	ER7103 R7103	4047	11.0-13.0	0.0	0.30	0.15	0.05		0.10	0.20	0.05
5103 Aluminum	ER5103 R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.20		0.15	0.05
5356 Aluminum	ER5356 R5356	5356	0.25	0.40	0.10		4.5-5.5	0.05-0.20			0.05
5954 Aluminum	ER5954 R5954	5954		0.40	0.10		0.0	0.05-0.20			0.05
5083 Aluminum	ER5083 R5083	5083		0.40	0.10		0.0	0.05-0.20			0.05

NOTES:

1. Silicon is allowed per maximum percentage in the specification.
2. Iron shall not exceed 0.0099 percent.
- A. Zinc plus iron shall not exceed 0.25 percent.
- B. Titanium content is the difference between the maximum and minimum values of 0.10 percent of more each, expressed as the average.
- C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance with applicable purchase specifications having passed our inspection as mentioned above.

FORM 1: 5177490165
TO
FORM 2: 5177490165



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 43594

CERTIFICATE DATE: 10/18/96

SANDVIK ORDER NO.: 94986

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 969410

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

PSI
OC
CW

J-12-97

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS

180 LBS

PO 70012R

Perengt H. Berg, Director, Quality and Metallurgy
Daniel Dawlani, Quality Engineer

5119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

20



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen ...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBORO MA

CUSTOMER PURCHASE ORDER NO.: 41276

CERTIFICATE DATE: 8/26/96

SANDVIK ORDER NO.: 88712

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967451

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



10-7-96

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

(21)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES

SHIP TO: PROCESS SYSTEMS
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603R//V59049045000

CERTIFICATE DATE: 6/18/96

SANDVIK ORDER NO.: TK # 591854

QUANTITY: 60 LBS 308L x 36

WORK ORDER / LOT NO.: 965227

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
S709276	.019	.430	1.800	.018	.012	19.92	9.82	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
		.080			.002	.130	.030	.045



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

C

15(66119)(10)

2



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...



**90 RESEARCH ROAD
HINGHAM, MA 02043**

SOLD TO:

SHIP TO:

PROCESS SYSTEMS INTL
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603r/V59049045000
TK 591854-02

CERTIFICATE DATE: 6/17/96

SANDVIK ORDER NO.:

QUANTITY: 120 LBS er308L 1/16 x 36

WORK ORDER/LOT NO.:

965225

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S708727	.014	.390	1.800	.016	.012	20.20	9.87
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.003	.040	.030	.060



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt B. Berg, Director, Quality and Metallurgy

15(66119)(10)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

process systems intl
westboro, Ma. CERTIFICATE DATE: 9/27/96

SANDVIK ORDER NO.: 90814

PO-700627-V59049-041 QUANTITY: PER PACKING NOTICE

WORK ORDER / LOT NO.: 968845

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Table with 8 columns: Heat, C, Si, Mn, P, S, Cr, Ni. Row 1: S437864, .013, .430, 1.720, .020, .013, 19.88, 9.58. Row 2: Mo, Cb/Nb, Ta, Ti, Cu, Cb/Nb+Ta, N. Row 2 values: .250, .010, .005, .150, .055.



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

Handwritten signature of Daniel Damiani

15(66149)(10)

BOC GASES
90 RESEARCH BLVD
HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.: 967820

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC 9002-1994.

*PROCESS SYSTEMS
700627-R/V 59049-044
TK 693421*

Bengt H. Berg, Director, Quality and Metallurgy

240 LB

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

(2)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
BINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967818

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

*PROCESS SYSTEMS
700627-R/V59049-042
TK 693415
50 LB.*

Bengt H. Berg, Director, Quality and Metallurgy

5(66119)(10)

BOC GASES
... ROAD
... MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: process systems

CUSTOMER PURCHASE ORDER NO.: 693415

CERTIFICATE DATE: 10/03/96

SANDVIK ORDER NO.:

QUANTITY: 60 LBS

WORK ORDER / LOT NO.: 700627-r/v59049-042

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]

15(661)(9)(10)

5



RESEARCH ROAD
HINGHAM, MA 02040

21



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/03/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967819

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

PROCESS SYSTEMS
700627-R/V59049-04
TK 693420
240 LB.

BOC GASES
50 RESEARCH ROAD
HINGHAM, MA 02043



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax

05/07/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	362769

P.O.# - 72454



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
B	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

Lucas D. ...
Control

[Signature]
Certifying Signature

27



HARRIS
SOLWING, BRUING & WELDING PRODUCTS

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Compl

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO//

Shipped To: PROCESS SYSTEMS INTL
WEST BORO MA.

Date 10-17-96
Date Shipped 10-18-96
Order No. 712222

Item	Weight	Size	Alloy	Heat No.
1.	9LB	5/32 x 36	ALUM	AA1005183D
2.	10LB	5/32 x 36	ALUM	7295
3.				

Comments:

P.O. 700643-R/V5904904302



Alloy	AWS A510-00 ASME SFA 5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element		
	ER	R										Each	T	
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05							
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10			0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.10-0.20		0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20		0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	0.10		0.20			0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.3-5.2	0.05-0.25	0.25	0.15		0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20		0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20		0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20		0.05	
							0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15		0.05	

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0008 percent, all alloys.
- Silicon plus iron shall not exceed 0.95 percent.
- The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- Vanadium content shall be 0.05-0.15 percent, Zirconium content shall be 0.10-0.25 percent.
- Silicon plus iron shall not exceed 0.45 percent.

BOC GAMES
90 RESEARCH ROAD
HINGHAM, MA 02043

30



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Compl

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: PROCESS SYSTEMS INTL
PO 700.643R/V5904.9043000

Date _____
Date Shipped 10-25-96
Order No. 713960-01

Item	Weight	Size	Alloy	Heat No.
1.	50LB	5/32	ALUM	0233
2.				
3.				

Comments: BOC
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AWS A510-00 ASME SFA 5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element		
	ER	R										Each	Ti	
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05							
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10			0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.10-0.20		0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20		0.05	
5183 Aluminum	ER5103	R5103	5183	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25			0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20		0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20		0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20		0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15		0.05	

- NOTES:
- Single values shown are maximum percentages, except where a minimum is specified.
 - Beryllium shall not exceed 0.0008 percent, all alloys.
 - A. Silicon plus iron shall not exceed 0.95 percent.
 - D. The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
 - C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
 - D. Silicon plus iron shall not exceed 0.45 percent.

31

04:01 #926 P.02/02
 1995.10-31
 5038705930
 FROM : AIRCO/BOC GASES HINGHAM TO



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Con

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: PROCESS SYSTEMS
700643-R/V5904904300

Date 10-31-96
Date Shipped
Order No. 712225

Item	Weight	Size	Alloy	Heat No.
1.	50	5/32	ALUM	96248
2.				
3.				



Comments:

Alloy	AWS A510-00 ASME SA5.10		QQ-R-566B r. Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elems Each
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10		0.05
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.05		0.10	0.10-0.20	0.05
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20	0.05
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.20		0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.25	0.15	0.05
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.10	0.06-0.20	0.05
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05
5654 Aluminum	ER5654	R5654	5654	0	0	0.05	0.01	3.1-3.9	0.05-0.20	0.25	0.05-0.20	0.05
									0.15-0.35	0.20	0.05-0.15	0.05

NOTES:

1. Single values shown are maximum percentages, except where a minimum is specified.
2. Beryllium shall not exceed 0.0008 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- B. The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent, Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance applicable purchase specifications.



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(816) 941-4111 Phone
(816) 941-9154 Fax
alcotec@traverse.com E-mail

11/13/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86330

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40 ✓
Fe	---	0.40 ✓
Cu	---	0.10 ✓
Mn	0.50	1.0 ✓
Mg	4.3	5.2 ✓
Cr	0.05	0.25 ✓
Zn	---	0.25 ✓
Ti	---	0.15 ✓
Be	---	0.0008 ✓
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. DeWann

V.P. - Quality Control



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/11/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86330

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Pb	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEO legislation.

Additional Order Requirements:

James J. Swann

V.P. - Quality Control



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

CUSTOMER PURCHASE ORDER NO.: 700650-R/VS904904500

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: 20 LB

WORK ORDER / LOT NO.:

TAG:

ANSI A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %



Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

The material has not come in contact with mercury or mercury-containing compounds.
"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
RESEARCH AND
HINGHAM, MA 02043

35

SANDVIK
Steel

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

We make Quality happen...

P.O. BOX 1220, SCRANTON, PA 18501 PH (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEM*

CUSTOMER PURCHASE ORDER NO.: *7006SD-R/15904904500*

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: *18LB*

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9



STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Daniani, Quality Engineer

[Signature]
15(66119)(10)

3

BOC GASES
RESEARCH ROAD
BINGHAM, MA 02043

[Handwritten mark]



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Comp

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO//

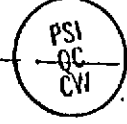
Shipped To: Process Systems Intl
PO 70015R/7741000

Date _____
Date Shipped 3-28-97
Order No. 797282

Item	Weight	Size	Alloy	Heat No.
1.	40 LB	1/16 x 36	ALUM	0268
2.				
3.				

Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



Alloy	AWS A510-00 ASME SFA.5.10		DD-R-566B r. Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements		
	ER1100	R1100										1100	A	A
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10		0.05		
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.02		0.10	0.10-0.20	0.05		
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20	0.05		
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05		
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05		
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05		
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05		
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05		

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0000 percent, all alloys.
- Si plus iron shall not exceed 0.95 percent.
- the aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- Si plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance applicable purchase specifications having effect.

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HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

RWL ISSUE DATE: 04-15-96

PROCESS SYSTEMS
PO 7001SR/7741000
10 LBS 4043 1/16x36

HEAT NUMBER/LOT NUMBER: 0243

CHEMICAL COMPOSITION LIMITS

ALLOY: 4043
SPEC: AWS A5.10R/ER4043/AMS 4190D
ASME SPA 5.10/QQ-R-666-B



SILICON	4.500	-	6.000	TITANIUM	.200
COPPER			.300	MAGNESIUM	.050
IRON			.800	ZINC	.100
BERYLLIUM			.0008	REMAINDER	ALUMINUM
OTHER			.15		

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY BRITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Rodie M. Pe
CERTIFICATION CLERK

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen.

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *7005R/774101500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY: *180 LBS.*

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
S711375	.007	.400	1.800	.014	.012	20.02	9.85	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
		.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan/cr
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

39



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/09/96

SANDVIK ORDER NO.: 90816



QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967819

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER-308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710846	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
70018R/774101500

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

40



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 46682

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.: 978457

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712976 -60LB	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
4-28-97	.070			.002	.060	.030	.035



PROCESS SYSTEMS

P.O. 70018R/77410500

Shipped 4-25-97 ORDER #805966-01

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES

90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

3
41



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBOTO MA

CUSTOMER PURCHASE ORDER NO.: 47334

CERTIFICATE DATE: 4/29/97

SANDVIK ORDER NO.: 14445

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 970470

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .035"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

Keith M. Hottle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

CUSTOMER ORIGINAL

4/29



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail
01/13/97

1/8

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363423

P.O.# - 93118



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

Lucretia Swann

V.P. - Quality Control

ED

TRUE COPY OF ORIGINAL HEAT

CHART

Q. C. DEPT.

BSC S/N 7300-2

H.A.M.'s Pc. # 7 & 8

NCR's No. 1033 & 1035 Apply.



PROCESS SYSTEMS INTERNATIONAL, INC.
20 Walkup Drive • Westborough, Massachusetts 01581-5003

BSC # 2

HAM # 4

Job # V59049

Doc # U049-8-634-02

350°F START KMP UP

K-68

Ham 7

Title SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET Project V59049

PROCEDURE USED: V049-I-147 WASH STATION OF V049-I-179 LONG SPOOL

Table with 2 columns: Component, Serial Number. Row 1: Ham 7, Row 2: Covers

Wash Cycle: Manual
Flowrates: 30 Gpm Max. Temp.: 145° Duration: 7.5 Hrs

Operator: Ray / Bill Date: 7-11-97

Comments:

Component(s) Inspected By: John Flu Date: 7-11-97

Quality Assurance: Chris Senecal Date: 7-14-97

Comments:

SPECIFICATION Number A V049-2-015 Rev. 3 Page 9 of 9

Number Rev

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: Ham 7 S/N: _____ WORK ORDER: 230
 DATE/TIME: 7-11-97
 OPERATOR: B:11

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F.

TI925= 146°F

2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER.

MIX 1:1 Done

3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.

4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.

5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.

6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

WASH TIME = 90 MIN

7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

RINSE TIME = 60 MIN

8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.

DRY TIME = 90 MIN

9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM.

NOTES: _____

SPECIFICATION
 Number AV049-2-184
 Rev. 1

Number _____
 Rev. _____

Ham 7

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: Ham 7 Doors S/N: _____ WORK ORDER: 230
DATE/TIME: 7-12-97
OPERATOR: Ray / Bruce

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F. TI925= 148°F

2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER. MIX 1:1 Done

3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.

4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.

5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.

6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE. WASH TIME = 60 MIN

7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE. RINSE TIME = 45 MIN

8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.

9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM. DRY TIME = 90 MIN

NOTES: _____

Number **AV049-2-184** Rev. **1**
SPECIFICATION

Number _____ Rev. _____

Ham 7

Title: COMPONENT RGA TEST PROCEDURE

TITLE	TEST ARTICLE PARAMETERS PUMPDOWN LOG
DATE:	6/22 - 6/25/97
TIME:	
TEST I.D.: e.g. WBSCI_1	WHAM5
PSI TEST ENGINEER:	SM 6/27/97
QUALITY ASSURANCE:	

PHYSICAL DIMENSIONS				
S.S. SURFACE AREA		ft ²		cm ²
VITON LINEAL LENGTH		inches		cm
VOLUME		ft ³		liters
PUMPDOWN	TIME		PRESSURE	
6/23/97	1454	hr:min	1.1 x 10 ⁻⁶	Torr
6/24/97	0815	hr:min	4.3 x 10 ⁻⁵	Torr
6/24/97	1145	hr:min	1.2 x 10 ⁻⁶	Torr
6/24/97	1645	hr:min	1.0 x 10 ⁻⁶	Torr
6/24/97	2030	hr:min	1.0 x 10 ⁻⁶	Torr
6/25/97	0300	hr:min	1.1 x 10 ⁻⁷	Torr
6/25/97	0520	hr:min	2.7 x 10 ⁻⁸	Torr
6/25/97	0630	hr:min	1.5 x 10 ⁻⁸	Torr
6/25/97	0945	hr:min	8.8 x 10 ⁻⁹	Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr

SPECIFICATION	
Number: V049-2-127 A	Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	BAKE OUT TEMPERATURE LOG
DATE:	6/22-6/25/97
TIME:	
TEST I.D.: e.g. WBSC1_1	WITAM 5
PSI TEST ENGINEER:	SM 6/27/97
QUALITY ASSURANCE:	

BAKEOUT LOG / DATE	TIME		TEMPERATURE	
6/23/97	1454	hr:min	145.	°C
6/24/97	0815	hr:min	148.	°C
6/24/97	1145	hr:min	148.	°C
6/25/97	0300	hr:min	65.	°C
6/25/97	0520	hr:min	55.	°C
6/25/97	10630	hr:min	50.	°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
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		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C

SPECIFICATION

Number: V049-2-127
A

Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	OUTGASSING RATES REPORT SHEET
DATE:	6/22 - 6/25/97
TIME:	
TEST I.D.: e.g. WBSCI_1	WHAMS-3 S/N 005
PSI TEST ENGINEER:	dm 4/27/97
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

File: WHAMS-3.SAC CYCLE 1, CYCLE 4 (LEAK OPEN)

AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
H2	2.4E-7	4.8X10 ⁻⁹		3.9E-7	32.0	7.68E-6	3.1E-11
12	5.9E-11		0.42				
14	6.3E-10		0.5				
15	1.7E-10		0.54		146.2	1.8E-8	7.5E-14
CH4	3.3E-10		0.57		146.2	3.6E-8	1.5E-13
17	7.8E-10		0.6				
H2O	2.8E-9		0.64		146.2	3.3E-7	1.3E-12
19	5.9E-10		0.67				
26	1.2E-10		0.71				
28	7.5E-9	9.5X10 ⁻¹		1.4E-8	146.2	1.10E-6	4.5E-12
32	9.1E-10		1.14				
38	2.0E-11		1.36				
40	7.0E-11	9.4X10 ⁻⁹		4.8E-10	229.3	1.6E-8	6.5E-14
43	6.2E-11		1.53				
44	1.5E-10		1.57		146.2	2.7E-8	1.1E-13
129	1E-12	2.5X10 ⁻⁹		3.9E-11	658.	6.6E-10	
131	1E-12	2.0X10 ⁻⁹		3.0E-11	690.	6.9E-10	
132	1E-12	2.5X10 ⁻⁹		3.7E-11	694.	6.9E-10	
134	1E-12	1.0X10 ⁻⁹		1.2E-11	909.	9.1E-10	
OTHER	7.6E-10				146.2	1.1E-7	4.5E-13

SPECIFICATION

Number: V049-2-127
A

Rev.1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	OUTGASSING RATES REPORT SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBS1_1	
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²

SPECIFICATION	
Number: V049-2-127 A	Rev.1

Title: COMPONENT RGA TEST PROCEDURE

AGE: TEST I.D. FILENAME: XXXXXXXXX.SAC

TITLE	RGa COMPUTER DATA FILE LOG
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM5
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGa NUMBER:	
RGa SENSOR HEAD SERIAL # QMS	
RGa ELECTRONICS UNIT SERIAL # QME	

BARGRAPH DATA FILE NAME

ANALOG SCAN DATA FILE NAME WHAM5-3.SAC

OTHER DATA FILES

PRINTOUT OF

1. LAST ANALOG SCAN BEFORE CALIBRATION
2. ANALOG SCAN WITH CALIBRATED LEAK OPEN
3. BARGRAPH PLOT

SPECIFICATION

Number: V049-2-127

A

Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA ION SOURCE SETTINGS SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

Type	CH-TRON	IS-TYPE:	HS-THOR.
------	---------	----------	----------

Channel	0 ENABLE
---------	----------

Detector	
Type	CH-TRON
SEM Volt.	<< >>

Amplifier	
Offset	ON

RF-Polarity	inverse
IS-Voltages	[V]
IonRef	138
Cathode	90.0
Focus	9.38
Field Axis	5.75
Extract	12

Mass Mode	SCAN-N
First Width	
Speed	
Resolution	
Threshold	

Ion Source	
Filament #	
IS-Set	

IS-Emission	
Emiss [mA]	
Protect [A]	3.5

Fil.Prot.	Thresh. [mbar]
ON below	
OFF above	

SPECIFICATION

Number: V049-2-127 A	Rev.1
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Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA SCAN PARAMETER FILE SETTINGS	
DATE:		
TIME:		
TESTID.: e.g. WBSC1_1		
PSI TEST ENGINEER:		
QUALITY ASSURANCE:		
RGA NUMBER:		
RGA SENSOR HEAD SERIAL # QMS		
RGA ELECTRONICS UNIT SERIAL # QME		

PARAMETER FILE: LIGO200.SAP

PARAMETER FILE: LIGO200.SBP

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Detector

SEM Voltage	1700	
-------------	------	--

SEM Voltage	1700	
-------------	------	--

Mass

Speed	5 s	
Width	200	
Resolution	25	
Threshold	1E-15	

Speed	5 s	
Width	200	
Resolution	25	

Amplifier

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

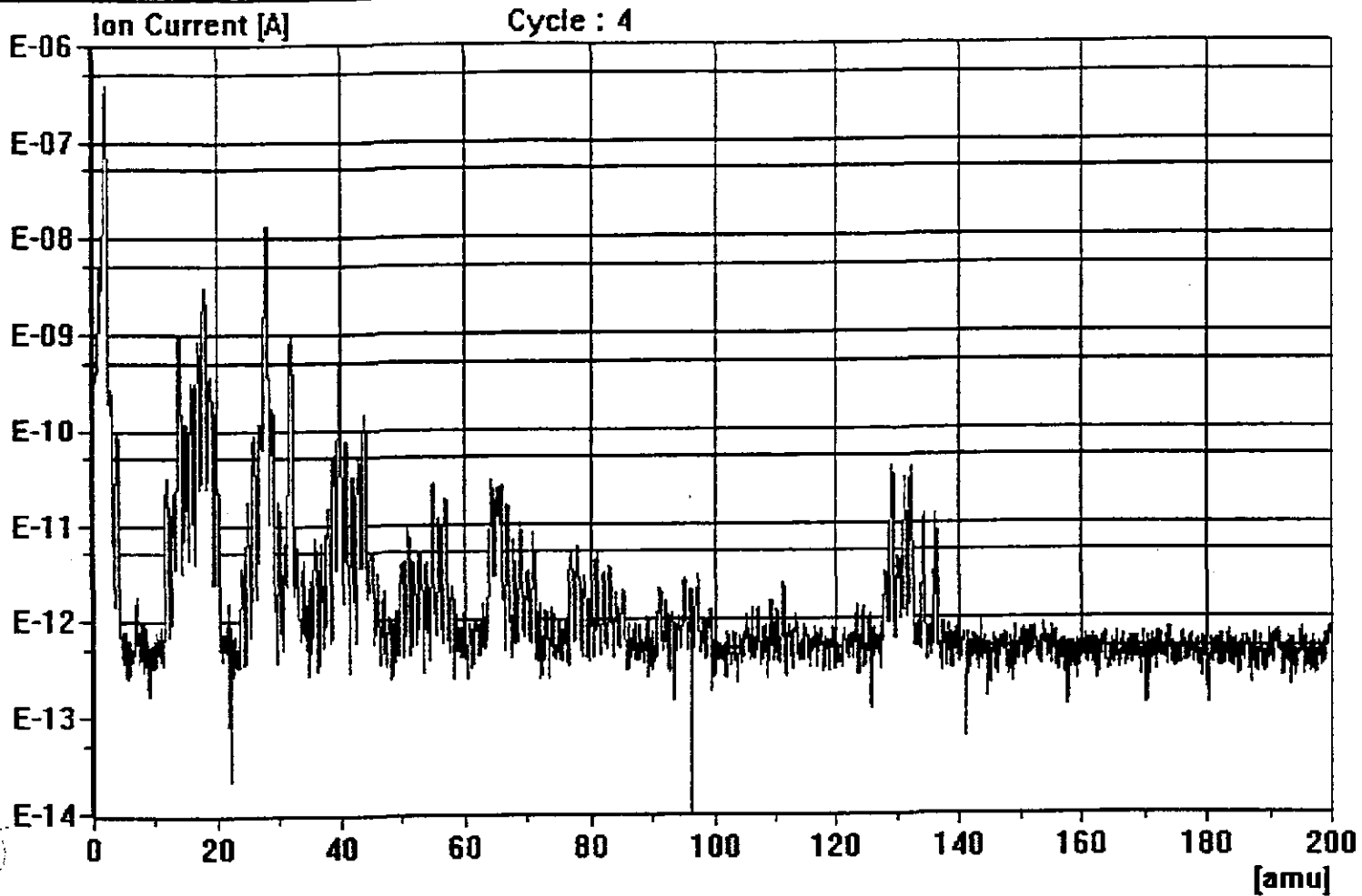
OUTPUT: User discretion
 DISPLAY: User discretion

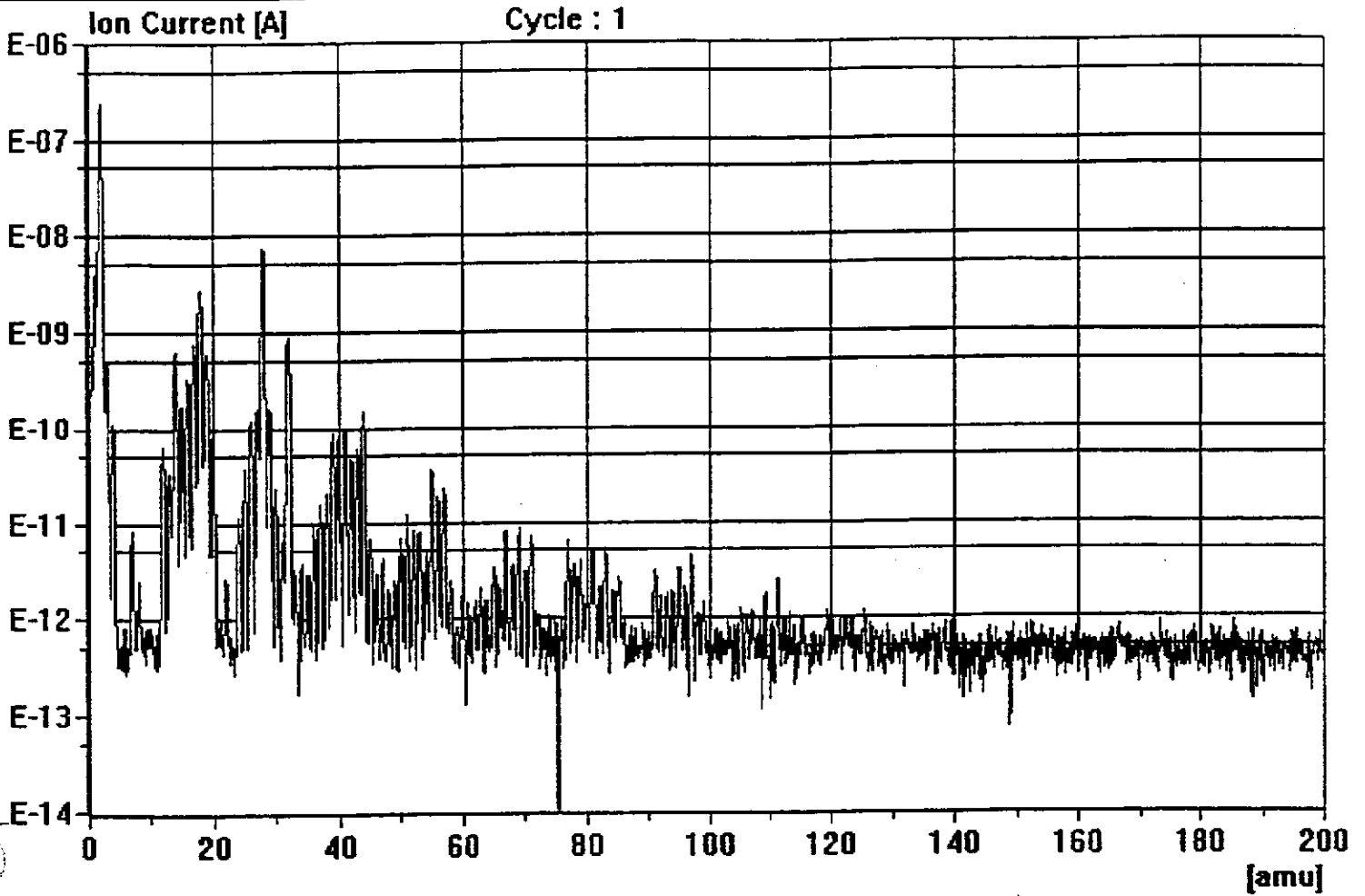
SPECIFICATION

Number: V049-2-127

A

Rev.1





X: 39.03

Y: 3.877675E-07

C: 1

RANOR, INC

NONCONFORMANCE REPORT

FORM QA 12.1 REV. 6 (07/30/96)

NCR NUMBER NCR- 1035		PAGE 1 OF SKETCH ATTACHED <input type="checkbox"/>	
JOB NUMBER 7300 ^{9/m}	CUSTOMER P.S.I.	PURCHASE ORDER NUMBER 555822-00	QUANTITY 1
PART DESCRIPTION LIGO BSC Lower Shell Assy.		DOCUMENT NUMBER AND REVISION A V049-2-046 Rev. 0	SERIAL NUMBER 7300-2

CODE/SPECIFICATION: ASME SECTION III SAFETY RELATED ASME SECTION VIII MIL SPEC COMMERCIAL

DESCRIPTION OF NONCONFORMANCE

ITEM	REQUIREMENT	NONCONFORMANCE
1	Heat Treat Ramp Down @ 100°F/hr. max. ending at 300°F	1. Ramp Dn. @ 110°/hr from 950° to 840°F
2	Temp. of vessel to be monitored by recording with K-thermocouple attached.	2. BSC 7300-2 and H.A.M.'s Pc.# 7 & 8 were heat treated together but individual thermocouples are not identified to parts. One of the three T.C.'s failed at 2 hrs. into the soak cycle.

REMARKS:

This NCR also applies to P.O. 556008 for H.A.M.'s Pc. 7 & 8

ROUTING SHEET IDENTIFIED WITH NCR NO. AND DATE OF ISSUE: BY _____ DATE: _____

ORIGINATOR/INSPECTOR: Steve Pollock DATE: 3-27-97

RESPONSIBILITY FOR NONCONFORMANCE

VENDOR DESIGN MATERIAL CUTTING FORMING WELDING
 MACHINING INSPECTION CALIBRATION QC QA OTHER Heat Treat

TECHNICAL JUSTIFICATION/DESCRIPTION OF DISPOSITION

ITEM	TECHNICAL JUSTIFICATION	DESCRIPTION OF DISPOSITION
	Submit to P.S.I. for justification and written disposition. <u>Steve Pollock</u> 3-27-97	GS 4-17-97

TECHNICAL JUSTIFICATION:

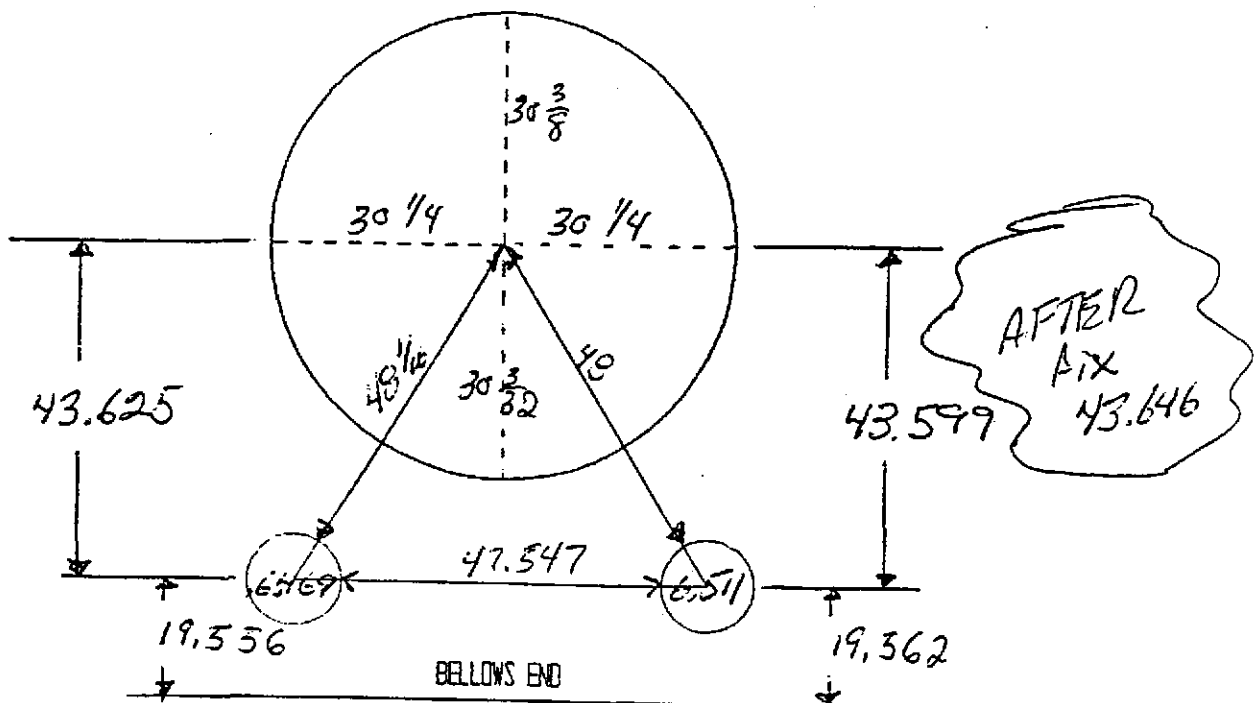
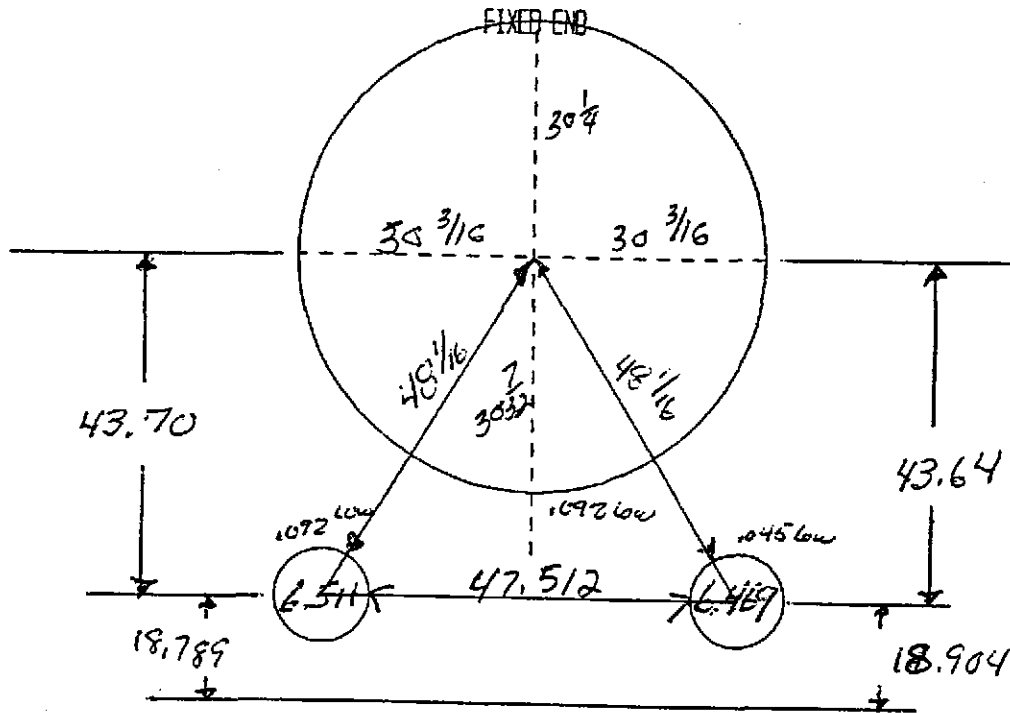
DISPOSITION:

BY _____ DATE: _____

BY R. Bayly DATE: 4/17/97

DISPOSITION OF NONCONFORMANCE: <input type="checkbox"/> ACCEPT AS IS <input type="checkbox"/> USE AS IS <input type="checkbox"/> REPAIR/REWORK <input type="checkbox"/> REJECT	RECOMMENDED DISPOSITION: <input type="checkbox"/> ACCEPTED <input type="checkbox"/> NOT ACCEPTED	10CFR21 EVALUATION REQUIRED: <input type="checkbox"/> YES <input type="checkbox"/> NO CORRECTIVE ACTION REQUIRED: <input type="checkbox"/> YES <input type="checkbox"/> NO CUSTOMER APPROVAL REQUIRED: <input type="checkbox"/> YES <input type="checkbox"/> NO
CONDITIONAL RELEASE: CR NO. _____	APPROVED BY: _____	DATE: _____
APPROVAL OF DISPOSITION: VP-ENGINEERING _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	VERIFICATION OF DISPOSITION: ACCEPTED BY _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	

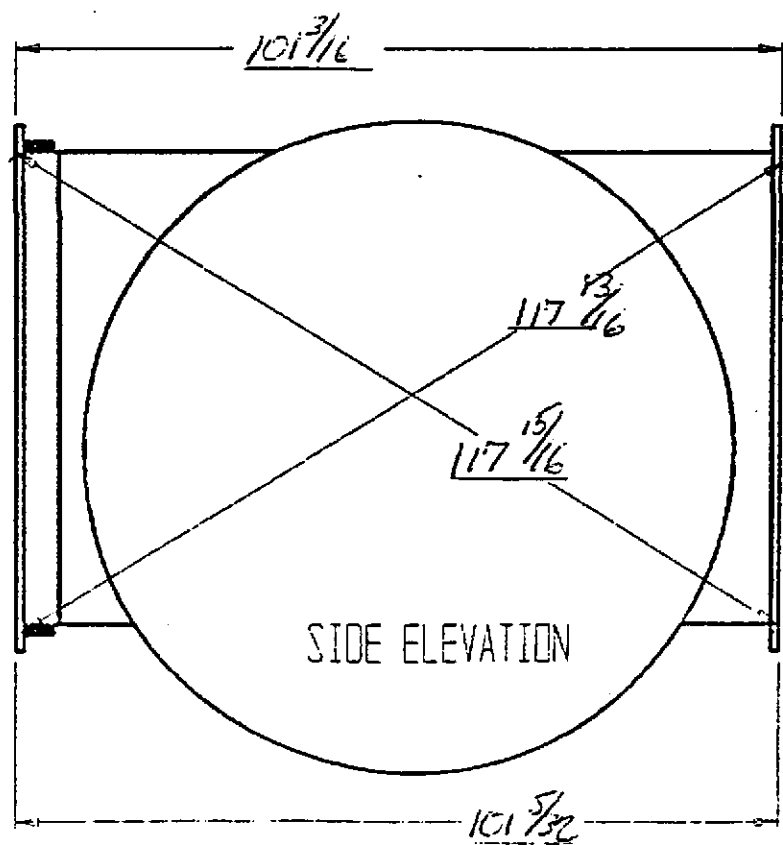
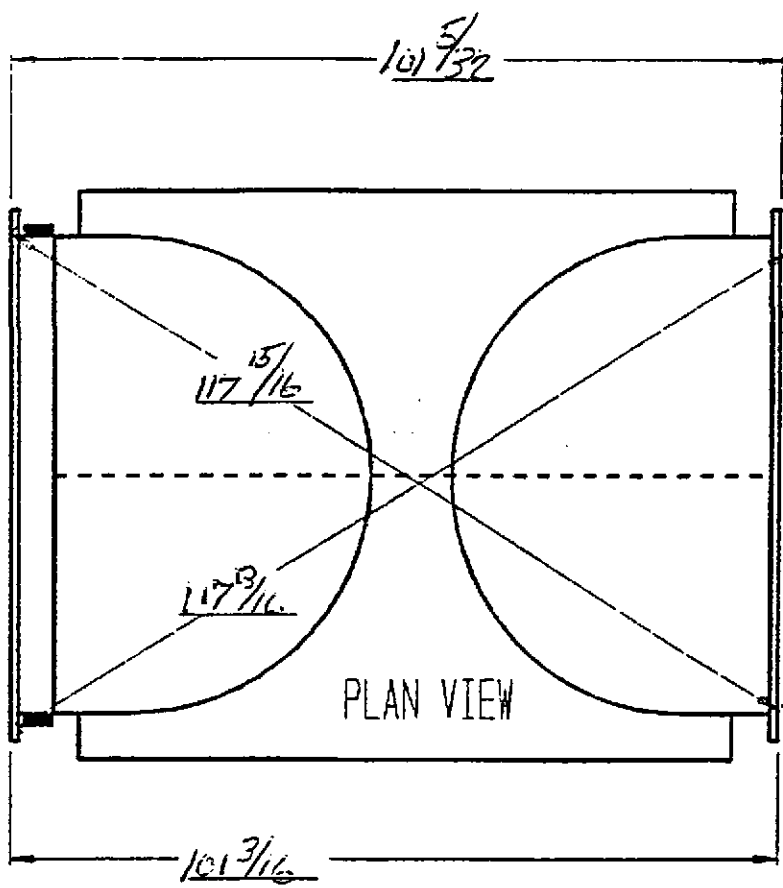
HEAM WELDMENT
 V049128
 S/N # 7
 DIMENSIONS AS FITUP



70440-4

S/N # 7

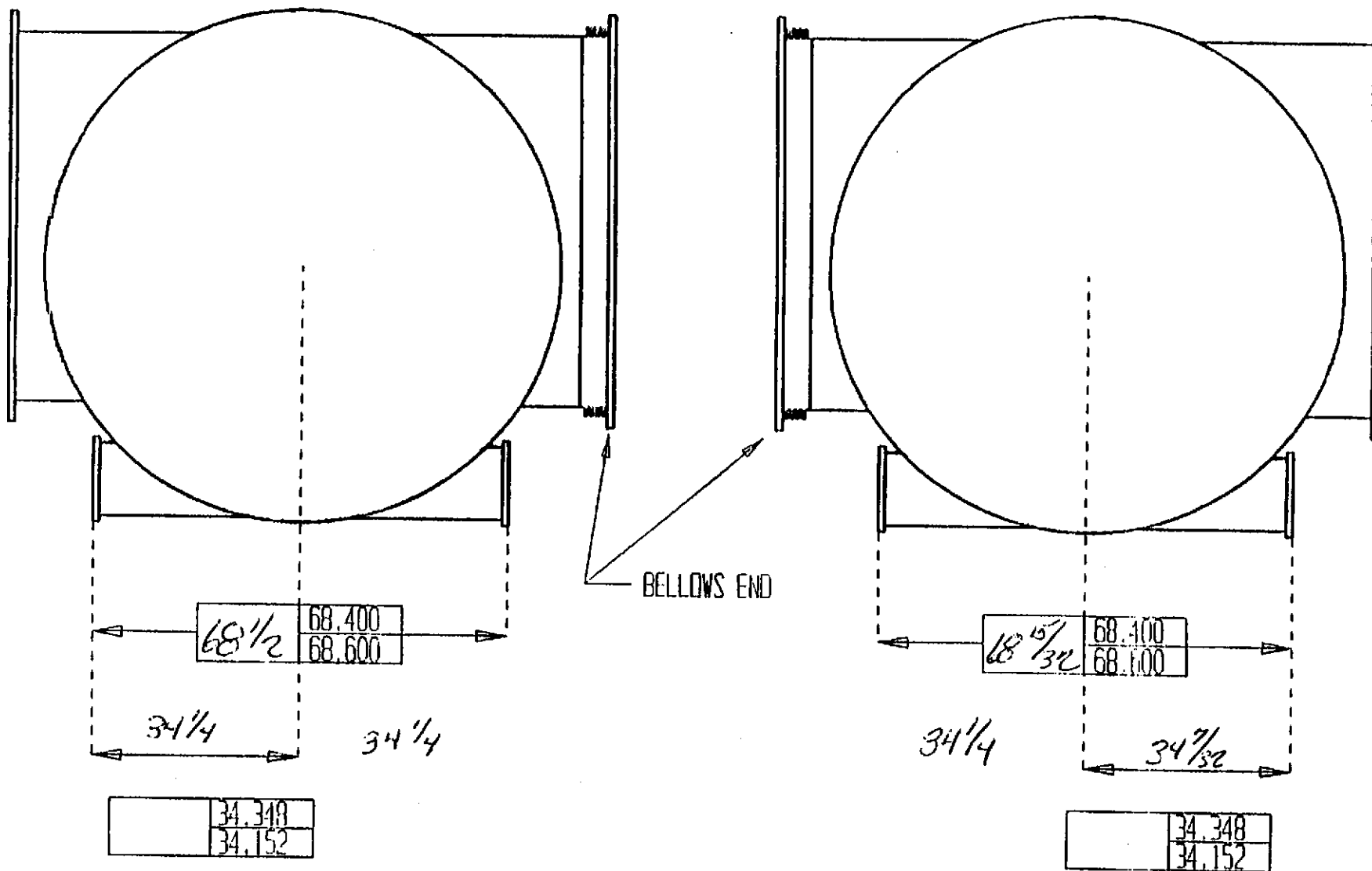
RELATIVE WEAR LIMITS
AND DIAGONALS OF 50 INCH
PORTS



HAM WELDMENT

V0494128

S/N# 7





PROCESS SYSTEMS INTERNATIONAL, INC.

20 Walkup Drive, Westborough, MA 01581

LIGO PROJECT

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Table of Contents

TAG # WHAM-6
P/N - VO49-4-128-02

1	Quality Plan sign offs.	
2	Hyspan Metal Bellows doc. Package.	
3	Material test reports for shells, heads and large flanges. C of C for nozzles, small parts and flanges. C of C to Codes and Standards.	
4	Heat-Treat Charts.	
5	Final Cleaning Certificates.	
6	Bakeout Certificate. Final Vacuum Test Reports. Acceptance Test Data.	
7	Non Conformance Reports. Use As Is, when applicable.	
8	As Built Drawings/Dimensions.	

Title: QUALITY PLAN FOR HORIZONTAL ACCESS MODULE (HAM)

TAG No. WHAM6 Ser. No. 02

**QUALITY PLAN FOR LIGO
FOR
LIGO
HORIZONTAL ACCESS MODULE (HAM)**

Serial No. V0494123-01 thru 12

CONTROLLED-COPY

OCT 24 1996

1	GS107596		Release Per DEO No. 0302
φ	046 4/8/96	R23	released per DEO 0114
REV LTR.	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE

PROCESS SYSTEMS INTERNATIONAL, INC.				SPECIFICATION			
INITIAL APPROVALS	PREPARED	DATE	APPROVED	DATE	Number	V049-2-087	Rev.
	<i>A.R. Buckland</i>	4/8/96	<i>R. Bruff</i>	4/17/96			1

Title **QUALITY PLAN FOR HORIZONTAL ACCESS MODULE (HAM)**

APPLICABLE DRAWINGS

- V049-4-054 HAM Flange/Annulus Tubing Assembly
- V049-4-128 HAM Shell Weldment Assembly
- V049-4-002 Horizontal Access Module Chamber Assembly
- V049-4-031 60-1/2" I.D. Flange Detail (Grooved)
- V049-4-032 60-1/2" I.D. Flange Detail (Flat Face)
- V049-4-021 84-14" I.D. Flange Detail (Grooved)
- V049-4-027 60-1/2" I.D. Flange Face (Detail)
- V049-4-0A4 60" End Cover
- V049-4-052 HAM Chamber Support Saddle
- V049-4-053 60-1/2" I.D. Expansion Joint
- V049-4-127 84-1/4" Access Cover
- V049-4-040 HAM Tie Rod Assembly

APPLICABLE PROCEDURES

- V049-2-072 Welding GTAW (PWHT) P8-P8
- V049-2-071 Welding PAW (PWHT) P8-P8
- V049-2-074 General Repair Procedure
- V049-2-046 Thermal Stress Relief
- V049-2-078 Ham Chamber Fabrication

SPECIFICATION

Number	V049-2-087	Rev
A		1

SPECIFICATION V049-2-087

REV. 1

Serial No. V0494128-06



Process Systems International, Inc.
20 Walkup Drive
Westborough, MA 01581-5003
(508) 366-9111 Fax (508) 870-5930

PROJECT LIGO
ITEM HORIZONTAL Access Module (HAM)
APPLICABLE CODE ASME Sect III Div. 1
(where Applicable)

JOB NO. V59049
DWG NO. V049-2-128
PG 28 OF 97

ASME CODE QUALITY PLAN	LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC ✓ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY						
	QUALITY PLAN REVIEWED QA AI	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE
QA <u>GS</u> AI <u>N/A</u>							
Verify Acceptance of Materials	X				X <u>[Signature]</u> <u>2/20/96</u>		
Inspect Welding Long Seam/Lower Shell	V	V049-4-128	V049-2-071	X <u>[Signature]</u> <u>11/4/96</u>			
Verify Roundness of Shell	V-D	V049-4-128		X <u>[Signature]</u> <u>11/4/96</u>			PSI QA GS
Inspect Welding Long Seam 60" Nozzles	V	V049-4-128	V049-2-071	X <u>[Signature]</u> <u>11/4/96</u>			
Verify Roundness of 60° Nozzles	V-D	V049-4-128		<u>[Signature]</u> <u>11/4/96</u>			
Verify Fixtures in Shell & 60° Nozzles				<u>[Signature]</u> <u>11/4/96</u>			

Serial No. V0494128-06

SPECIFICATION V049-2-087

REV. 1

ASME CODE QUALITY PLAN	LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC √ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY								
QUALITY PLAN REVIEWED QA <u>GS</u> AI _____	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS		
Verify Welding and Location of Saddle Support Plates and Lift Lugs	V-D	V049-4-128	V049-2-071	<u>MSL</u> 11/2/96					
Inspect Welding of 60" Nozzles	V	V049-4-128		<u>MSL</u> 11/1/96					
Verify Nozzle Alignment and Dimensions (ALL Nozzles)	V-D	V049-4-128		<u>MSL</u> 4/3/97					
Verify Steam Cleaning of Vessel				<u>X MSL</u> 4/3/97			<div style="border: 1px solid black; border-radius: 50%; width: 50px; height: 50px; display: flex; align-items: center; justify-content: center;"> PSI QA GS </div>		
Thermal Stress Relief Vessel		V049-2-046		<u>X GS</u> 4-7-97					

Serial No. V0494128-06

SPECIFICATION V049-2-057

REV. 1

ASME CODE QUALITY PLAN	LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC √ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY											
	QUALITY PLAN REVIEWED QA <u>GS</u> AI _____	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS				
Verify 60" Nozzle End Dimensions after Machining	U-D	V049-2-046		X <u>[Signature]</u> 1/7/96								
Verify Cutout Location of the 4-Critical "E" Nozzles	U-D	V049-4-128		X <u>[Signature]</u> 1/7/96								
Inspect Welding OF 84" Flanges To Shell	√	V049-4-054	V049-2-071	X <u>[Signature]</u> 3/5/97								PSI QA GS
Verify Flange (84") Straightness and Flatness	V-D	V049-4-054		X <u>[Signature]</u> 3/5/97								
Inspect Welding OF 60" Flanges to Nozzle Neck	√	V049-4-054	V049-2-071	X <u>[Signature]</u> 3/7/97								

Serial No. V0494128-06

SPECIFICATION V049-2-087

REV. 1

ASME CODE QUALITY PLAN	LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC √ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY																			
	QUALITY PLAN REVIEWED QA <u>GS</u> AJ _____	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS												
Verify 60" Flange Straightness & Flatness	V-D	V049-4-054		X <u>[Signature]</u> 3/1/97																
Inspect Welding of Expansion Joint to 60" Nozzle	V	V049-4-054 V049-4-053	V049-2-071	X <u>[Signature]</u> 3/1/97																
Inspect Welding of Internal Support to Shell	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 3/1/97																
Inspect Welding of All Non-Critical Flanges	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 3/1/97																
Inspect Welding of Critical "E" Nozzles and Flanges (with fixtures)	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 3/31/97																
Verify Alignment Straightness & Flatness of "E" Nozzles	V-D	V049-4-128		X <u>[Signature]</u> 4/1/97																

PSI
QA
GS

Serial No. V0494128-06

SPECIFICATION V049-2-087

REV. 1

ASME CODE QUALITY PLAN	LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC √ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY						
	QUALITY PLAN REVIEWED QA <u>GS</u> AI _____	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE
Verify Installation of Belkous Tie-Rod	V	V049-4-040	V049-2-072	X <u>MM</u> 3/1/97			
Verify Installation of Annulus Tubing	V	V049-4-054		X <u>MM</u> 4/1/97			
Verify Installation & Alignment of Support Saddles	V-D	V049-4-052 V049-4-002	V049-2-072 V049-2-071	X <u>MM</u> 6-27-97			
Steam Clean Complete Vessel Inside & Out		V049-2-015		X <u>AM</u> 6-2-97			
Verify final cleaning at PSI	V	V049-2-015		X <u>GS</u> 6-2-97			
Verify final Bakeout at PSI	V	V049-2-019		X <u>GS</u> 6-26-97			
Verify final lbc. of the Leak Test at PSI	V	V049-2-014		X <u>GS</u> 7-2-97			
Shipment to LIGA		V049-2-123		X <u>GS</u> 9-8-97			

REV	REVISION	DATE	BY
A	WAS SWG. CODE 032-1 TEMP WAS 370°F REV'D NOTES 11 & 14 DEL. NOTE 12 & 13 SUBMIT FOR APPL.	SEP. 11/96	...
B	REV'D PER CUST COMMENT SUBMIT FOR APPROVAL	OCT. 07/96	...

PSI DWG # V049-8-429

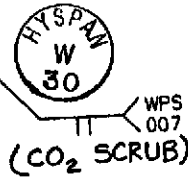
SALES ORDER NO. 70904-17
 CUSTOMER PROCESS SYS. INT'L
 QTY. 12 DUE 11/25/96

4. DESIGN CONDITIONS

DESIGN PRESSURE : F.V. AND 15 PSIG. AT 400°F.
 TEST PRESSURE : 23 PSIG. (PNEUMATIC)
~~CHLORIDE CONTENT OF TEST WATER NOT TO EXCEED 100 PPM~~
 AXIAL SPRING RATE : 4,812 Lb./in. @ 0.5 in. THERMAL AXIAL COMPRESSION : 2,860 Lb./in. @ 2.0 in. MAINTENANCE COMPRESSION : 1,000 CYCLES
 LIFE

- ALL WELDING PER ASME BOILER AND PRESSURE VESSEL CODE SECTION IX.
- STANDARD SHOP NDE OF ALL PRESSURE CARRYING WELDS IN ACCORDANCE WITH ASME PRESSURE VESSEL CODE SECTION V.
- ESTIMATED WEIGHT : 45 Lbs.
- TAG ASSEMBLY : SEE DETAIL
- ~~USE VIBRATORY TOOL WITH MIN. TIP RADIUS OF .065, OUTSIDE ONLY~~
- BELLOWS IS CAPABLE OF 2 in. OF COMPRESSION DURING INSTALLATION AND 0.5 Deg. OF ANGULATION WHILE INSTALLED.
- A 2 in X 2 in. COUPON FROM EACH HEAT NUMBER AND LOT THICKNESS OF BELLOWS MATERIAL SHALL BE SUPPLIED TO PSI FOR INFORMATION.
- BELLOWS SHALL BE HELIUM LEAK CHECKED TO 1×10^{-8} torr-1/SEC.
- ~~DO NOT GRIND INSIDE WELD~~
- ~~POSITION LONG SEAMS PER PROCESS SYSTEMS INTERNATIONAL DRAWINGS~~
- CLEANLINESS SHALL BE IN ACCORDANCE WITH P.S.I. SPEC. V049-2-017, SECTION 8.0.
- AFTER FINAL CLEANING, BELLOWS ASSEMBLY SHALL BE WRAPPED IN POLYETHYLENE.

Ø60.495^{+0.000}
 -0.005
 BELLOWS CUFF O.D. TYP.



CERTIFIED BY :
 HYSpan PRECISION PRODUCTS, INC.
 HYSpan SALES ORDER NO.: 70904
 PROCESS SYSTEM INT'L. P.O. NO: 555830
 PROCESS SYSTEM INT'L. PART NO: V0494053
 PROCESS SYSTEM INT'L. SERIAL NO: 01 THRU 18
 HYSpan PART NO.: 53140

② TAG DETAIL

SUBMITTED FOR APPROVAL
 HYSpan PRECISION PRODUCTS, INC.
 BY _____ DATE OCT. 07/96

- DRAWING NOTES
- ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.
 - DESIGNED IN ACCORDANCE WITH THE STANDARDS OF THE EXPANSION JOINT MANUFACTURERS ASSOCIATION.
 - ~~EXTERNAL SHIPPING RESTRAINTS (PAINTED YELLOW) TO BE MARKED "REMOVE AFTER INSTALLATION" REMOVE PRIOR TO PRESSURE TESTING~~

ITEM	QTY	DESCRIPTION	MATERIAL
2	1	TAG, .06 THK.	A240-304
1	1	BELLOWS, (60.423 I.D.), 63.423 O.D.,	SA240-304L
		1 PLY, .036 THK., 4 CONS.	
LIST OF MATERIAL			
Information proprietary to Hyspan Precision Products, Inc. is contained on this drawing. Disclosure or use is expressly prohibited except as agreed to in writing by Hyspan Products, Inc.			
Hyspan		Hyspan Precision Products, Inc. 1685 Brandywine Avenue Chula Vista, California 91911	Phone (619) 421-1355 FAX (619) 421-1702
CODE IDENT 30009			
TITLE FORMED BELLOWS, SINGLE, (60.423 I.D.)		DRAWING NUMBER 53140	REV B
DRAWN BY PARIS	DESIGNED BY M.O.C.	DATE JUL/11/96	CUSTOMER PROCESS SYSTEM INT'L.
APPROVED		DATE	SPECIFICATION V049-4-053
SCALE NONE	SHT. 1 OF 1		

S/N 002

V0494053-PI-02

To: AVESTA SHEFFIELD INC 425 NORTH MARTINGALE SUITE 2000 SCHAMBURG ILLINOIS 60173 U.S.A. F.A.O. KEITH HOOD	Cons./Inv. No. 175/04392/05	Date 21/05/98
	Customer Order No. 9102376	Specification ASTM A240-95 304 UNS30400 QQ-S-7660 FEB 5 1988 AMS 5513F 6/15/53 MIL-S-5059D 30/5/83

Quality confirmed by spectroscopy examination Test Positions: Front, Back, Orientation: L=Longitudinal, T=Transverse

Folio	Cast. No.	Material Description	Temp C	Coil No./ Plate No.	Proof Stress		Tensile Strength		Elongation	RA/RT	Band	UC	Impact
					0.2%	1.0%	PS1	PS2					
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	14320/1	81 45385 F1 36975	52345 44370	89175 86855	52 (5) 57 (5)	63.5 155 58.6 144	OK OK	OK OK		
MATERIAL TESTED TO ASTM A240 CONFORMS TO LATEST REVISIONS OF ASTM A480/ASME SA240/480 Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds by Avesta Sheffield. (1N/mm sq = 145.04 PSI)					Material inspected and tested to ASTM A240 also conforms to latest revisions of ASTM A480 and ASME SA20/SA480 (N/mm sq. = 145.0 PSI) Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds. Solution annealed by heating to 1900 deg F min. except 321H 347H ,348H (2000 deg F min.) *NO WELD REPAIR*								

Avesta Sheffield Ltd
LRQA Approval Numbers



940258
940175

Cast No.	C	Si	Mn	P	S	Cr	Mo	Ni	Ti	Nb	Co	N	Cu
C2004	.021	.39	1.38	.020	.001	18.15	.24	9.08				.039	Cu .27

Witnessed	Inspecting Authority	Signed for Avesta Sheffield Ltd <i>M de Jong</i> M de Jong, Chief Inspector
-----------	----------------------	---

We certify that the above material has been tested in accordance with the order and specification and that the results comply with the requirement of the order and specification. (Note that where more than one specification is involved, only the mechanical properties and cast chemical composition are certified to the requirements of each individual specification.)

VINCENT METAL GOODS
SANTA FE SPRINGS
CUSTOMER: HANSON
ORDER NO: 60306
DATE: 25-05-8153

MASS SPECTROMETER TEST REPORT

Fig.-1

V0494053-PI-02

CUSTOMER: Process Systems International, Inc.				
Sales Order No.: 70904		Item: 17	Drawing No.: 53140	
Equipment: DuPont 120 SSA		Leak Standard. Sn. 1051		
Test Procedure per ASTM E-498		Test Area: Bellows and weld ends		
PSI Part No.:				
Sn.	Leak Rate - Std. cm ³ /s.	Time	Date	Inspector
002	1x10 ⁻⁹	1300	12-4-96	<i>[Signature]</i>

The above referenced expansion joint has passed the mass spectrometer leak test to the required sensitivity.

Material RT#		
Bellows	Tagged weld end	Untagged weld end
A4092	N/A	N/A

Inspector: *[Signature]* VSPAX
12 Level II Date 12-4-96



PROCESS SYSTEMS INTERNATIONAL, INC.

20 Walkup Drive, Westborough, MA 01581

CALIFORNIA INSTITUTE OF TECHNOLOGY  **LIGO PROJECT**
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CERTIFICATE OF CONFORMANCE

CUSTOMER: The LIGO Project
California Institute of Technology
Mail Stop 18-34
Pasadena, CA 91125

DATE: 11/19/97

CONTRACT ORDER NUMBER: PC 175730

PSI JOB NUMBER: V59049

DRAWING NUMBER(S): V049 4 128

TAG NUMBER: WHAM 6

SERIAL NUMBER: 02

ITEM: Refer to attached Material Tracer Record

APPLICABLE SPECIFICATION(S): SA-240 A-500
SA-193 B7
SA-194 2H
F-436

PSI certifies that the items furnished in this shipment have been manufactured from the materials and in accordance with the process test and acceptance criteria requirements specified within the drawing(s) and/or specification(s) listed above. All inspection records and test results are on file with PSI and are available for examination.

Gene Senecal 11-19-97
Gene Senecal
Quality Assurance Engineer

Material Tracer Record

Part Number WHAM 6 S/N 02

Page 2

Item #	Qty	U/M	Part code	Description	C of C MIC # CMTR
5	2	EA	V049M306 3	FLANGE SST304L COFC CONFLAT NON-ROTATABLE 4-1/2 OD BLANK	C of C
10	2	EA	V049M760 3	GASKET OFHC COP COFC 4-1/2 OD CONFLAT FLANGE (PKG QTY 10) PER SPEC V049-2-037/T4	C of C
11	16	EA	V049M776	BOLT SST 18-8 HEX HD 5/16-18 X 2- 1/4 LG	C of C
14	1	EA	V0494142P2 3	FLANGE SST304L COFC CONFLAT REDUCING PER DETAIL B DWG V049- 4-142 WITH 4 1/2X 2 1/2 CONFLAT BORE AND TAPPED HOLES WITH 4 1/2X2 1/2 CONFLAT BLANK GASKET AND HARDWARE	C of C
15	8	EA	202549 3	FLANGE SST304L COFC CONFLAT 12 OD BLANK NON ROT. .332 DIA THRU HOLES 32 PLACES EQ. SP. ON A 11.181 DIA. B.C.	C of C
16	10	EA	202667 3	FLANGE SST304L COFC CONFLAT BLANK 10 OD NON ROT. .332 DIA THRU 24 HOLES EQ. SP. ON A 9.128 DIA B.C.	C of C
18	4	EA	V049M142 3	FLANGE SST304L COFC CONFLAT BLANK 14 OD NON ROT. .390 DIA THRU HOLE 30 PLACES EQ SPACED ON A 9.128 DIA B.C.	C of C
21	1	EA	202670 3	GASKET COP OFHC COFC CONFLAT 16-1/2 OD FLANGE	C of C
22	8	EA	202552 3	GASKET COP OFHC COFC CONFLAT 12 OD FLANGE	C of C
23	10	EA	202671 3	GASKET COP OFHC COFC CONFLAT 10 OD FLANGE	C of C

Material Tracer Record

Part Number WHAM 6 S/N 02

Page 3

25	156	EA	V049M780	BOLT SST 18-8 HEX HD 3/8 -16 X3 LG	C of C
27	500	EA	V049M777	BOLT SST 18-8 HEX HD 5/16 -18 X2-1/2 LG.	C of C
28	2	EA	V049M019	O'RING VITON A500 BAKED .275 NOM X 265.125 LG VULCANIZED	C of C
29	2	EA	V049M018	O'RING VITON A500 BAKED .275 NOM X 274.375 LG VULCANIZED	C of C
30	4	EA	V049M144 3	GASKET COP OFHC COFC CONFLAT CofC 14 OD FLANGE	C of C
31	1	EA	V049M023	O'RING VITON A500 BAKED .275 NOM X 191-1/4 LG VULCANIZED	C of C
32	1	EA	V049M022	O'RING VITON A500 BAKED .275 NOM X 200-5/8 LG VULCANIZED	C of C
33	140	EA	202678 3	BOLT STL SA193 B7 COFC HEX HD 7/8-9 UNC X 4 LG ZINC PLATED .0002 MIN THK.CLEAR CHROMATE	C of C
34	140	EA	202679 3	NUT STL SA194 2H COFC HEX HD 7/8-9 UNC ZINC PLATED .0002 MIN THK CLEAR CHROMATE	C of C
35	280	EA	202581 3	WASHER STL ASTM F436 COFC 1-3/4 ODX15/16 IDX1/4 THK ELECTROLESS NICKEL PLATED	C of C
36	156	EA	V049M783	NUT SILICON BRZ HEX 3/8 -16	C of C
37	72	EA	V049M786	WASHER SST 18-8 FLAT 3/8	C of C
38	530	EA	V049M782	NUT SILICON BRZ HEX 5/16 -18	C of C
39	###	EA	V049M785	WASHER SST 18-8 FLAT 5/16	C of C
40	256	EA	V049M1011	WASHER SST 18-8 3/8 IDX5/8 OD X.062 THK	C of C
1	20	FT	V049M452 1	TUBE A269 304L CMTR 1-1/2OD X .065 WT PER SPEC V049-2-037/T4	C of C
2	4	EA	V049M551 3	TEE SST304L CofC BTWLD 1-1/2ODX.065 WT PER SPEC C049-2-037/T4	C of C
3	1	EA	V049M502 3	ELBOW SST304L 90DEG 1-1/2ODX .065WT BTWLD COFC PER SPEC V049-2-037/T4	C of C

Material Tracer Record

Part Number WHAM 6 S/N 02

Page 4

4	3	EA	V049M602 3	REDUCER SST304L COFC CONC BTWLD 1-1/2 ODX 3/4 ODX.065 WT PER SPEC V049-2-037/T4	C of C
5	4	EA	V049M505 3	ELBOW SST304L 90DEG 3/4ODX.035 WT BTWLD COFC PER SPEC V049-2- 037/T4	C of C
6	3	FT	V049M454 1	TUBE A269 304L CMTR 3/4 OD X .065 WT PER SPEC V049-2-037/T4	C of C
9	2	EA	V049M305 3	FLANGE SST304L COFC CONFLAT NON-ROTATABLE 4-1/2 OD X 1-1/2 ID	C of C
32	1	EA	V0494129	HAM ANNULUS FLEX HOSE	C of C
34	2	EA	V0494021	84-1/4 I.D. FLANGE GROOVED (HAM)	A 661 A 652
35	1	EA	V0494031	60-1/2 I.D. FLANGE GROOVED WITH SLOTS (HAM)	A 899
36	1	EA	V0494032	60-1/2 I.D. FLANGE FLAT FACED (HAM)	A 566
37	1	EA	V0494053	60.5 HAM METAL BELLOWS PER SPEC V0492017	C of C
38	20	FT	V049M890 1	BAR SST304L SA479 CMTR FL 1/2 X2	C of C
39	1	EA	V0494040	HAM BELLOWS TIE-ROD ASSY	C of C
45	1	EA	V049M601 3	REDUCER SST304L COFC CONC BTWLD 1 ODX 3/4 ODX.065 WT PER SPEC V049-2-037/T4	C of C
46	1	EA	V049M501 3	ELBOW SST304L 90DEG 1 ODX.065 WT BTWLD COFC PER SPEC V049-2- 037/T4	C of C
47	0.5	FT	V049M451 1	TUBE A269 304L CMTR 1 ODX .065 WT PER SPEC V049-2-037/T4	C of C
49	1	EA	V0494123	HAM 75 L/S ION PUMP SUPPORT	C of C
50	1	EA	V0494206	HAM ANNULUS TUBE SUPPORT	C of C
1	1	EA	V049M132 1	HEAD SST304L SA240 CMTR ASME FLGD & DISHED 84.25 ID .344 MIN THK (3/8 NOM. THK) 85 DISH RAD 5.25 INSIDE CORNER RAD WITH 2 S.F. APPROX OVERALL HEIGHT 16.66	A 360 A 973

Material Tracer Record

Part Number WHAM 6 S/N 02

Page 5

2	1	EA	V049M136 1	FLANGE SST F304L SA182 CMTR FORGED BLANK ASME CODE 1992 EDITION THRU 1994 ADDENDA MACHINE TO 1-3/8 +.06 THK 92.25 +.06 OD X 83.75 -.06 ID FINISH 250/500 PER SPEC V0492040	A 662 A 929
3	5	EA	V049M220 1	FLANGE SST304L CMTR HALF NIPPLE CONFLAT NON ROT. 10 OD X 8 OD TUBE X 1/4 WT 3-1/8 OVER ALL HEIGHT .332 DIA 24 HOLES EQ. SP. ON A 9.128 DIA. B.C.	C of C
4	4	FT	C387904-F 3	BAR SA479 TP304 CofC FL .250X0.75	C of C
1	1	EA	V0494009	HAM TEST/BAKE ASSY (WITH A4 COVER)	C of C
2	1	EA	V0494059G4	SHIPPING COVER ASSY 60 WITH FILTER	C of C
4	1	EA	202667 3	FLANGE SST304L COFC CONFLAT BLANK 10 OD NON ROT. .332 DIA THRU 24 HOLES EQ. SP. ON A 9.128 DIA B.C.	C of C
5	1	EA	202671 3	GASKET COP OFHC COFC CONFLAT 10 OD FLANGE	C of C
6	24	EA	V049M777	BOLT SST 18-8 HEX HD 5/16 -18 X2-1/2 LG.	C of C
7	24	EA	V049M782	NUT SILICON BRZ HEX 5/16 -18	C of C
8	48	EA	V049M785	WASHER SST 18-8 FLAT 5/16	C of C
3	1	EA	V0494128P3 14	SHELL SST GR304/304L SA240 CMTR MAKE FROM V049P7815 14 CMTR ROLL TO 84.25 ID X 76 LG PER SPEC V0492136 AND DWG.V0494128	A 379
11	1	EA	V0494128P11 14	SHELL SST GR304/304L SA240 CMTR MAKE FROM V049P7817 14 CMTR ROLL TO 60.50 ID X 62 LG BEVEL INSIDE LONG SEAM 25 DEG EACH END WITH .045 LAND SQUARE ENDS	A 430
12	4	EA	V049M322 3	FLANGE SST304L COFC HALF NIPPLE CONFLAT NON ROT. 14 OD X 12 ODTUBEX.120WT 30 OVERALL HEIGHT .390 DIA THRU 30 HOLES EQ. SP. ON A 12.810 DIA B.C.	C of C

Material Tracer Record

Part Number WHAM 6 S/N 02

Page 6

13	16	FT	V049M876 1	BAR SST 304/304L SA240 CMTR FL .375X3	C of C
14	1	EA	V049M309 3	FLANGE SST304L COFC HALF NIPPLE CONFLAT NON ROT. 16-1/2 ODX14 OD TUBEX.120WT 5 OVERALL HEIGHT .390 DIA THRU 36 HOLES EQ.SP. ON A 15.310 DIA B.C.	C of C
15	8	EA	V049M311 3	FLANGE SST304L COFC HALF NIPPLE CONFLAT NON ROT. 12 OD X 10 OD TUBEX.120WT 5 OVERALL HEIGHT .332 DIA THRU 32 HOLES EQ. SP. ON A 11.181 DIA B.C.	C of C
38	2	EA	V0494128P38 1	LIFTING LUG/STIFFENER PER DWG V0494128 DETAIL 5	C of C
39	20	FT	V049M215 1	PLATE SST304/304L SA240 CMTR .75X6.50 PER V0492041	C of C
48	0	EA	V049M870 14	PLATE SST304/304L SA240 CMTR .500 X9 X12	C of C
1	1	EA	V049M002 1	HEAD SST304L SA240 CMTR ASME FLGD & DISHED 60.5 ID .22 MIN. THK. (1/4 NOM. THK) 60-1/2 DISH RAD 3-3/4 INSIDE CORNER RADIUS WITH 2 S.F. APPROX OVERALL HEIGHT 12.56 COLD FORMED-DIP PICKLED	A 789
2	1	EA	V049M135 1	FLANGE SST F304L SA182 CMTR FORGED BLANK ASME CODE 1992 EDITION THRU 1994 ADDENDA MACHINE TO 1-5/8 +.06 THK 68-1/2+.06 OD X 60.0 -.06 ID FINISH 250/500 PER SPEC V0492040	A 762
3	3	EA	V049M220 1	FLANGE SST304L CMTR HALF NIPPLE CONFLAT NON ROT. 10 OD X 8 OD TUBE X 1/4 WT 3-1/8 OVER ALL HEIGHT .332 DIA 24 HOLES EQ. SP. ON A 9.128 DIA. B.C.	C of C
4	4	FT	C387904-F 3	BAR SA479 TP304 CofC FL .250X0.75	C of C

2-11084

500 Green Street
 Washington, Pennsylvania 15301

CERTIFIED MATERIAL TEST REPORT

Bill to:
 PLATE PROD DIV / A-L
 1201 VALLEY ROAD
 COATESVILLE PA

Shipto:
 PLATE PROD DIV / A-L
 1201 VALLEY ROAD
 COATESVILLE PA

19320

19320

HELEN M. O'CONNOR
 Quality Assurance Representative

Memo No: 113167-00

Our Order no: DP6349530
 Your Order No: 0001
 Date: 04/12/96
 DUAL CERT

JESSOP T 304L STAINLESS HRAP
 ASTM A240-94a; ASME SA-240-A93; AMS 5511F;
 (WAIVE CLH);

Heat	Slip	Lot No	Size	Pcs	Weight						
770796	54804 A		.3750 x 96.0000 x 235.0000	1	2584 From slip 13025 GV STOCK						
Heat	C ✓	MN ✓	P ✓	S ✓	SI ✓	NI ✓	CR ✓	MO	CO	CU	N
770796	.018	1.79	.028	.0006	.28	8.72	18.47	.29	.13	.32	.092

Slip	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grain Size
*54804	.3750	39.3 KSI	84.3 KSI	61.6	76.9	B78-80	OK	OK	

MATERIAL WAS NOT WELDED

PROCESS SYSTEMS INT'L, INC.
 Reviewed this report and it complies
 with SA 240-94 Gr. 304L
B Edition, 95 Addend
 By C. Woznicki Date 7-2-96

A. H 5.7



Avesta Sheffield East, Inc.

PSI MIC NO. A430

Certificate of Analysis and Tests

OUR ORDER 84643 - 04

HEAT & PIECE 39734-7B 8/06/96

SOLD TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE
WESTBOROUGH MA 01581

SHIP TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE
WESTBORO MA 01581
737001-01

----- YOUR ORDER & DATE -----

555-477 ✓ 6/17/96

----- ITEM DESCRIPTION -----

✓ HEAT & PIECE 39734 - 7B
WEIGHT 1827

FINISH 1 ✓
GRADE 304L / 304
DIMENSIONS .500 X 62.187 X UNS-S30403 / UNS-S30400
195.312 EXACT

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with SA 95-240 Gr. 304L 304
95 Edition, 95 Addenda
SS Date 8-13-96

----- SPECIFICATIONS -----

V049-2-041 REV0 WITH EXCEPTS
ASTM A480-94B, ASME SA480-95
✓ COUPONS REQUIRED
ASTM A262-93 PRAC A

ASTM A240-95B, ASME SA240-95
NO GRIP MARKS-NO WELD REPAIR

ASTM A262-93 PRAC E

PLATES & TEST PCS SOLUTION ANNEALED @ 1950 DEGREES FARENHEIT MINIMUM.
THEN WATER COOLED OR RAPIDLY COOLED BY AIR
FREE OF MERCURY CONTAMINATION
HOT ROLLED, ANNEALED & PICKLED (HRAP) ✓

----- MECHANICAL & OTHER TESTS -----

✓ HARDNESS RB 87
GRAIN SIZE 5
✓ YIELD STRENGTH (PSI) 42400
✓ TENSILE STRENGTH (PSI) 84000
BEND OK
INTERGRANULAR CORROSION OK
✓ ELONGATION % IN 2" 58.0
✓ REDUCTION OF AREA % 68.0

----- CHEMICAL COMPOSITION -----

✓ CARBON (C) .015
✓ MANGANESE (MN) 1.50
✓ PHOSPHORUS (P) .029
✓ SULFUR (S) .001
✓ SILICON (SI) .39
✓ CHROMIUM (CR) 18.51
NICKEL (NI) 8.58
COBALT (CO) .11
COPPER (CU) .45
✓ MOLY (MO) .40
NITROGEN (N) .06

KNOWINGLY & WILLFULLY FALSIFYING OR CONCEALING A MATERIAL FACT ON THIS FORM,
OR MAKING FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR REPRESENTATIONS
HEREIN COULD CONSTITUTE A FELONY PUNISHABLE UNDER FEDERAL STATUTES.

J. BONGARDT, LAB MANAGER



Avesta Sheffield Plate Inc.

Certificate of Analysis and Tests

OUR ORDER 83468 - 01

HEAT & PIECE 46235-1A 7/25/96

SOLD TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVESHIP TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE

WESTBOROUGH

MA 01581

WESTBORO
737001-01

MA 01581

----- YOUR ORDER & DATE -----

555378

5/03/96

----- ITEM DESCRIPTION -----

HEAT & PIECE 46235 - 1A
 WEIGHT 3094
 FINISH 1
 GRADE 304L / 304
 DIMENSIONS .500 X 76.125 X 270.188 EXACT
 UNS-S30403 / UNS-S30400

----- SPECIFICATIONS -----

V049-2-041 REVO WITH EXCEPTS
 ASTM A240-95B, ASME SA240-95
 NO GRIP MARKS-NO WELD REPAIR
 COUPONS REQUIRED
 ASTM A262-93 PRAC A

NO WELD REPAIR ON MATERIAL
 ASTM A480-94B, ASME SA480-95
 MFG IN NEW CASTLE, IN, USA

ASTM A262-93 PRAC E

PLATES & TEST PCS SOLUTION ANNEALED @ 1950 DEGREES FARENHEIT MINIMUM.
 THEN WATER COOLED OR RAPIDLY COOLED BY AIR
 FREE OF MERCURY CONTAMINATION
 HOT ROLLED, ANNEALED & PICKLED (HRAP)

----- MECHANICAL & OTHER TESTS -----

HARDNESS RB 78
 YIELD STRENGTH (PSI) 41675 ✓
 TENSILE STRENGTH (PSI) 84594 ✓
 BEND OK
 INTERGRANULAR CORROSION OK
 ELONGATION % IN 2" 56.1 ✓
 REDUCTION OF AREA % 67.1 ✓

----- CHEMICAL COMPOSITION -----

CARBON (C) .015 ✓
 MANGANESE (MN) 1.49 ✓
 PHOSPHORUS (P) .033 ✓
 SULFUR (S) .003 ✓
 SILICON (SI) .41 ✓
 CHROMIUM (CR) 18.28 ✓
 NICKEL (NI) 8.68 ✓
 COBALT (CO) .10
 COPPER (CU) .35
 MOLY (MO) .46
 NITROGEN (N) .05

PROCESS SYSTEMS INT'L., INC.
 viewed this report and it complies
 with SAISE 840 Gr. 304/304L
 2nd Edition, 95 Addenda
 By C. Worecki Date 7-31-96

KNOWINGLY & WILLFULLY FALSIFYING OR CONCEALING A MATERIAL FACT ON THIS FORM,
 OR MAKING FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR REPRESENTATIONS
 HEREIN COULD CONSTITUTE A FELONY PUNISHABLE UNDER FEDERAL STATUTES.

A. L. TRISSLER, LAB TESTING MANAGER

Ham, PA 17009
Tel: 717-248-4911

METALLURGICAL CERTIFICATION PAGE



STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA

PCS SHIPPED: 4

CUSTOMER ORDER NUMBER 555492

04 OUR ORDER NO 532691604

REPORT DATE: 11/01/96

SHIPLIST NO: 58708

PSI MIC NO. A929

VO49M136-1

RTNG MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD +.06 X 83.75" ID -.06 X 1.375" WD -.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L, INC.

Reviewed this report and it complies

with SA 182 Gr. 304L
95 Edition, Addenda

By C. Wotzki Date 11-7-96

CHEMICAL ANALYSIS

NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI			
9279	✓	✓	✓	✓	✓	✓	✓							
	.031	.48	.033	1.78	.002	11.72	18.82							N .0530

MECHANICAL PROPERTIES

AT BER	SERIAL NUMBER	BRINELL	TEN	TEN	TENSILE LOCATION	UTS (KSI)	YIELD ST	X ELONG	X RED AREA	I M P A C T D A T A				
			TEMP (F)	BHN			(KSI)			20% OF ST	LOCATION	TEMP (F)	FT. LBS	% SHR
	6I1227A		475		PROLONG	74.5	37.0	61.0	81.0					
	6I1227B													
	6I1227C													
	6I1227D													

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED



Tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA

CUSTOMER ORDER NUMBER 555492

REPORT DATE: 08/28/96

PCS SHIPPED: 0

04 OUR ORDER NO 532691604

SHIPLIST NO: 53031

PRODUCT

RING
 MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD x .06 x 83.75" ID x .02 x 1.375" WD x .06
 SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
 AV049-2-040 REV 6

VO49M136-1

PSI MIC NO. A662

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L, INC.

Reviewed this report and it complies

with ASME 18A Gr. 304L
95 Edition, Addenda

By G. Watajda Date 9-16-96

CHEMICAL ANALYSIS

PT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
09279	✓	✓	✓	✓	✓	✓	✓								N .0550
	.031	.48	.033	1.78	.002	11.72	18.82								

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN	TEN	TENSILE LOCATION	UTS (KSI)	YIELD ST	X ELONG	XRED AREA	I_M_P_A_C_T_D_A_T_A					
			TEMP (F)	BHN			.20%DFST			LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
09279	6G2856A		+75		PROLONG	74.5	37.0	61.0	81.0						
09279	6G2856B	A662													
09279	6G2856C														
09279	6G2856D														
09279	6G2857A														
09279	6G2857B														
09279	6G2857C														
09279	6G2857D														

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED



DE 77-20-011

STANDARD STEEL

A Division of FREDERICK FINEK Corporation

SJA

FOR: PROCESS SYS INTL MA

ITS

CUSTOMER ORDER NUMBER 555492

PCS SHIPPED: 30

04 OUR ORDER NO 432620501

REPORT DATE: 07/13/96

SHIPLIST NO: 56855

PSI MIC NO. A762

PRODUCT

RING MACHINE 250/300 MICRO TO SIZES SHOWN: 60.5" OD +.06 X 60.0" ID .06 X 1.625" WD (*)
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AU049-2-040 REV 6
(*) +.06

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI			
509279														
509280	.031	.48	.033	1.78	.002	11.72	18.82						N	.0530
	.031✓	.45✓	.032✓	1.72✓	.001✓	11.48	18.55						N	.0500

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	X .20X OF ST	X ELONG	X RED AREA	I_M_P_A_C_T_D_A_T_A				
											LOCATION	TEMP (F)	FT. LBS	K	LAY EXP
609279	602844A		+75		PROLONG	74.5	37.0		61.0	81.0					
609279	602844B														
609279	602844C														
609279	602844D														
609279	602844E														
609279	602845A														
609279	602845B														
609279	602845C														
609279	602845D														
609279	602845E														

PROCESS SYSTEMS INT'L, INC.
 Reviewed this report and it complies
 with SA 182 Gr. 304L
 95 Edition Addenda
 By C. N. [Signature] Date 10/96



STANDARD STEEL

A Division of FERRIS STEEL Corporation

M E C H A N I C A L C E R T I F I C A T I O N

PAGE 2

FOR: PROCESS SYS INT NA

PCS SHIPPED: 30

CUSTOMER ORDER NUMBER 555492

PAGE-2

04 OUR ORDER NO 432620501

REPORT DATE: 09/13/96

SHIPLIST NO: 56855

MECHANICAL PROPERTIES

NO. 174	HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	.20XOFST	% ELONG	% RED AREA	I.M.P.A.C.T DATA					
												LOCATION	TEMP (F)	FT. LBS	SHR	LAT	BRN
	609279	602846A															
	609279	602846B															
	609279	602846C															
	609279	602846D															
	609279	602846E															
	609280	602847A															
	609280	602847B															
	609280	602847C															
	609280	602847D															
	609280	602847E															
	609280	602848A															
	609280	602848B															
	609280	602848C															
	609280	602848D															
	609280	602848E															
	609280	602849A															
	609280	602849B															
	609280	602849C															
	609280	602849D															
	609280	602849E															

PSI MIC NO. A762

A762 IT-5

74.5 36.5 64.0 79.0

PROCESS SYSTEMS INT'L, INC.
 Reviewed this report and it complies
 with SA 98-182 Gr. 30TL
 95 Edition Addenda
 By C. Wojcik Date 10-1-96

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED

THIS REPORT CERTIFIES THAT THE ABOVE RESULTS ARE CORRECT AS REPORTED AND CONTAINED IN THE COMPANY RECORDS

D.W. Kelley
HGR. LABORATORIES

P. 23
M. LAB
STANDARD STEEL
11:41PM
SEP. 8. 1997

WASHINGTON STEEL

A LUKENS COMPANY

TEST CERTIFICATE

2/2/25

CUSTOMER P.O.: 731599950306
DESCRIPTION: 1 - RECTANGLE .25 -X- 96 -X- 320

PAGE NO. 01 OF 12
FILE NO: 8697-03-16
DATE: 05/01/96
MILL ORDER NO: 16592-001

MAY 13 1:46PM WILLIAMS AND COMPANY

LD TO: WILLIAMS & CO. INCORPORATED 901 PENNSYLVANIA AVENUE PITTSBURGH PA 15233	SEND TO: WILLIAMS & CO. INCORPORATED 901 PENNSYLVANIA AVENUE ATTN: S. MCNAMEE PITTSBURGH PA 15233	SHIP TO: WILLIAMS & CO. INC. 7640 REINHOLD DRIVE CINCINNATI OH 45237
---	---	---

ALL MATERIAL HAS BEEN MANUFACTURED AND TESTED BY ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATIONS

MILLI A240 YR 93 TYPE-304L
 STR A240-94A TYPE 304/304L, ASME SA240
 PRACTICE A E E, ASTM A240-94A, ASTM A276-94A

ASTM A240 TYPE-304L
 95 EDITION TYPE 304/304L, ASTM A262-93A
 (CHEM & MECH PROPERTIES ONLY) TYPE 304/304L

MELT/SLAB	CHEMICAL ANALYSIS														PRACTICES
Y0967 /6DB	C	MN	P	S	CU	SI	NI	CR	MO	V	TI	B	N		
Y0967	.018	1.83	.030	.003	.31	.42	9.06	18.31	.43				.0790		
ROD ANALYSIS	.020	1.85	.029	.003	.39	.43	9.04	18.31	.43				.0780		

WMS & CO.
Q.A. APPROVED
MAY 13 '96
SMT

TENSILES					CHARPY V IMPACTS			MILS LATERAL EXPANSION		% SHEAR		OTHER TESTS PERFORMED				
YLD (PSI X 100)	TENS (X 100)	% ELONG	% RA	TYPE	TEMP							BEND TEST - LOC/DIR BK - PASS				
488	833	60.0	55.0									BRINELL - 152 TEST LOC-2				
												CORROSION - A262 SATISFACTORY				
												PROCESS SYSTEMS INT'L., INC. Reviewed this report and it complies with SANS 240 Gr. 304L 95 Edition, Addenda				

INFORMATION										HEAT TREAT CYCLES - MATL OR TESTS - DEG							
WEIGHT PER PIECE = 2381 LBS. 1082 KG.										MATL	TEST	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS.	COOL METHOD	END TEMP
END WELD REPAIR WAS PERFORMED BY LUKENS.										X	X	1950			0030	WQ	618
MERCURY OR MERCURY COMPOUNDS ARE NOT USED IN THE MANUFACTURE OF LUKENS/WASHINGTON'S PRODUCTS.																	
CORROSION TEST PER ASTM A262 PRACTICE A E E.																	
D/L 629330 BEST TRANSFER CR.																	
SIZE = .2500" NOM X .2600" NOM X .320" THICK X WGT. = 2206																	

WE HEREBY CERTIFY THE ABOVE INFORMATION IS CORRECT:

Quality Assurance Laboratory
Coatesville, PA 19320

Edison Kashitno
SUPERVISOR TEST REPORTING

Tel: 717-248-4911



STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 09/06/96

PCS SHIPPED: 9
02 OUR ORDER NO 432626502
SHIPLIST NO: 56599

PRODUCT

RING V049M243-1
MACHINE 250/500 MICRO TO SIZES SHOWN: 48.50" OD \pm .06 X 80.0" ID \pm .06 X 1.250" WD \pm .06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

PSI MIC NO. **A566**

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE
WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with ASME 182 Gr. 304L
85 Edition, Addenda
By C. W. [Signature] Date 9-11-96

CHEMICAL ANALYSIS

HT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
09280	✓ .031	✓ .45	✓ .032	✓ 1.72	✓ .001	✓ 11.48	✓ 18.55								N .0500

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN	TEN	TENSILE LOCATION	UTS (KSI)	YIELD ST	% ELONG	XRED AREA	I_M_P_A_C_T_D_A_T_A					
			TEMP (F)	BHN			(KSI)			20% OF ST	LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
09280	6G2745D		175		PROLONG	74.5	36.5	64.0	79.0						
09280	6G2743A					✓	✓	✓	✓						
09280	6G2743B														
09280	6G2743C														
09280	6G2743D														
09280	6G2743E														
09280	6G2746A														
09280	6G2746B														
09280	6G2746C														



Tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 08/28/96

PCS SHIPPED: 3
04 OUR ORDER NO 532691604
SHIPLIST NO: 53061

PRODUCT

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD \pm .06 X 83.75" ID \pm .06 X 1.375" WD \pm .06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

U049M136-1

PSI MIC NO. A661

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE
WESTBOROUGH MA 01501
ATTENTION:

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with ASME-182 Gr. F304L
95 Edition, Addend
By A. V. Tacki Date 9-16-96

CHEMICAL ANALYSIS

WT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
09279	✓	✓	✓	✓	✓	✓	✓								
	.031	.48	.033	1.79	.002	11.72	18.82								N .0530

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	20% OF ST	X ELONG	XRED AREA	I_M_P_A_C_T_D_A_T_A				
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
09279	6G2856A	A661	+75		PROLONG	74.5	37.0		61.0	81.0					
09279	6G2856B					✓	✓		✓	✓					
09279	6G2856C														
09279	6G2856D														
09279	6G2857A														
09279	6G2857B														
09279	6G2857C														
09279	6G2857D														

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED



TEST CERTIFICATE

PAGE NO. 01 OF 01
 FILE NO: 8860-01-0
 DATE: 07/26/96
 MILL ORDER NO: 22195-001

CUSTOMER P.O. #7410
 DESCRIPTION:

2 - RECTANGLE .375 - X - 96 - X - 192

SOLD TO:
 TRINITY INDUSTRIES, INC.
 P.O. BOX 41192

SHIP TO:
 TRINITY INDUSTRIES, INC.
 P.O. BOX 41192
 ATTN: JAMES WITHROW

SHIP TO:
 TRINITY INDUSTRIES-CUST PICKUP
 P.O. BOX 41192
 PSI MC NO. A973

CINCINNATI OH 45241

CINCINNATI OH 45241

CINCINNATI OH 45241

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATIONS.

ASTM A240 YR 96A TYPE-304L
 ASTM A167-93-304L, QQS-755B COND. A-304L,

ASTM A240-304L, ASME SA240-304L,
 AMS 5511, MIL-S-5059

MELT SLAB

CHEMICAL ANALYSIS

PRACTICE

Y1149 /3CA	C	MN	P	S	CU	SI	NI	CR	MO	V	TI	B	N				
Y1149	✓	✓	✓	✓													
PROD ANALYSIS	.025	1.77	.028	.006	.23	.54	8.50	18.24	.39								
	.025	1.79	.025	.005	.23	.55	8.31	18.03	.39								

TENSILES

CHARPY V IMPACTS

OTHER TESTS PERFORMED

YIELD (PSI)	TENSILE (K 100)	% ELONG	% RA	TYPE	TEMP	MILS LATERAL EXPANSION	% SHEAR
510	864	68.7	62.0				

BEND TEST - LOC/DIR BX - PASS
 BRINELL - 179 TEST LOI
 CORROSION A262E SATISFACTORY

PROCESS SYSTEMS INT'L., INC.
 Reviewed this report and it complies
 with ASME 240 Gr. 304/304L
95 Edition, Addenda

INFORMATION

By G. W. Wicks Date 7/15/96

HEAT TREAT CYCLES - MATL OR TESTS - DEG F

MATL	TEST	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS.	COOL METHOD	
X	X	1950			0012	MQ	

HEAT TREAT CYCLES - TESTS ONLY - DEG F

START END TEMP	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS.	HEAT RATE MAX	

WEIGHT PER PCE = 2111 LBS. 960 KG.
 MERCURY OR MERCURY COMPOUNDS ARE NOT USED IN THE
 MANUFACTURE OF LUKENS®/WASHINGTON'S PRODUCTS.
 CORROSION TEST PER ASTM A262 PRACTICE A & E.
 PART NO. 2-12121
 ON L 237215 CUSTOMER'S TRUCK
 SIZE = .3750" NOM X 96.0000" NOM X 192.0000" ACT X WGT. = 1984

WE HEREBY CERTIFY THE ABOVE INFORMATION IS CORRECT:
 FORM NO 221TW (10/90)

Quality Assurance Laboratory
 Coatesville, PA 19320



STANDARD STEEL
A Division of FREDSON FURSE Corporation

REQUIREMENTS FOR IDENTIFICATION

FOR: PROCESS SYS INT MA
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 10/14/96

IT-22

PCS SHIPPED: 24
04 OUR ORDER NO 432620501
SHIPLIST NO: 57948

PRODUCT

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 60.5" OD +.06 X 60.0" ID -.06 X 1.625" WD (*)
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AU049-2-040 REV 6
(*) +.06
PSI MIC NO. A899

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE
WESTBOROUGH MA 01581
ATTENTION:

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
809281	013	.58	.030	1.81	.002	11.64	19.13								N .0600

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN DHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	X ELONG	XRED AREA	I M P A C T D A T A					
										LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
809281	6I1421A		+75		PROLONG	73.0	34.5	61.0	77.0						
809281	6I1421B														
809281	6I1421C														
809281	6I1421D														
809281	6I1421E														
809281	6I1422A														
809281	6I1422B														
809281	6I1422C														
809281	6I1422D														
809281	6I1423A														
809281	6I1423B														
809281	6I1423C														
809281	6I1423D														
809281	6I1423E														

IT-22

DEC 1996

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies with SAISB-182 Gr. 304L
95 Edition, 96 Addenda
By *C. Watcick* Date *9-8-97*

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED

THIS REPORT CERTIFIES THAT THE ABOVE RESULTS ARE COMPLETELY OBTAINED IN THE COMPANY'S LABORATORY

Weld Wire Co. Co.



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

T0065-R/774/01500

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: 180 LBS

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S 713906	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

PSI
QC
CW

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

(66119)(10)

5

C



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

Make Quality happen

70065-R/774101500

TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

TOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: ~~18~~

NDVIK ORDER NO.: 16249

QUANTITY: 180LB

WARRANTY ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Element	C	Si	Mn	P	S	Cr	Ni
Heat 5440928	.021	.470	1.800	.014	.013	20.00	9.68
Element	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.020			.002	.040	.030	.053



The material has not come in contact with mercury or mercury-containing compounds.

Material not touched by hand after final production process cleaning.

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC 9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

With M. Kettle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan/cp
66119(10)

SANDVIK

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1320 SCRANTON, PA. 18501 P (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WATERLY EXIT 59

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 47910

CERTIFICATE DATE: 7/14/97

SANDVIK ORDER NO.: 16249

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 980309

AWS A 9 9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S713039	.013	.380	1.800	.015	.013	20.06	9.84
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.100			.002	.070	.030	.044



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYS
120 LBS
70040-R / 77410500

Keith M. Rottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(68119)(10)

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

56 lbs

XJK 8115-02

KOBELCO

04/09/1997 15:57 719746424 KOBELCO PAGE 14

PURCHASER
 PO 70040-R/774101500
 PROCESS SYSTEMS

INSPECTION CERTIFICATE
 FLUX CORED WIRE

CERTIFICATE NO.: A 017
 DATE OF ISSUE : 1997.01.28

TRADE DESIGNATION	DIMENSION (mm)	WPG. NO.	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-308L	0.9	B6M1085	AWS A5.22 E308LT0-1 ASME SPA-5.22 E308LT-1

CHEMICAL COMPOSITION (%)

ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	PN	FS	PNV
DEPOSITED METAL	0.034	0.39	1.22	0.028	0.008	0.05	0.73	18.91	0.11	0.01	0.041	UNIT:PN 6.0	6.8	UNIT:PN 6.0
ELEMENTS														

TENSILE TEST OF DEPOSITED METAL

IMPACT TEST OF DEPOSITED METAL

HARDNESS TEST


YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		VICKERS HARDNESS (AVG.)
					AVG.		
- N/mm ²	- N/mm ²	584 N/mm ²			- J		
- kgf/mm ²	- kgf/mm ²	59.6 kgf/mm ²	52 %	- °C	- kgf.m		

WELDING CONDITIONS

TYPE OF CURRENT	DCRP	SHIELDING GAS	CO2	POSTWELD HEAT TREATMENT	FS = FERRITE (SCHAEFFLER DIAGR.) FN = FERRITE (DELONG DIAGRAM) PNV = PERRITE (VRC)
AMPERAGE	110 A				
ARC VOLTAGE	25 V			- °C x - h	

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREBIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBELCO STEEL, LTD.
 WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR 

BOC GASES

KOBELCO

90 RESEARCH ROAD
 HUNTINGHAM, MA 02043
 PO# 70040-R / 774101500
 PROCESS SYSTEMS

INSPECTION CERTIFICATE
FLUX CORED WIRE

CERTIFICATE NO.: A 002
 DATE OF ISSUE : 1997.01.07

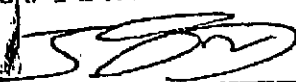
TRADE DESIGNATION	DIMENSION (mm)	HPC. NO.	PSI OC CW	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	0.9	B6M1015		AWS A5.22 E309LT0-1 ASME SPA-5.22 E309LT-1

ELEMENTS	CHEMICAL COMPOSITION (%)						PHYSICAL PROPERTIES							
	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	PH	FS	PHW
DEPOSITED METAL	0.028	0.43	1.10	0.022	0.012	0.04	12.75	22.56	0.04	0.02	0.07	15.0	8.7	12.0
ELEMENTS														

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL		HARDNESS TEST	
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY	VICKERS HARDNESS (AVG.)	
- N/mm ²	- N/mm ²	540 N/mm ²	40 %	- °C	AVG.		
- kgf/mm ²	- kgf/mm ²	55.1 kgf/mm ²			- J		
					- kgf.cm		

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	
TYPE OF CURRENT	DCRP	SHIELDING GAS	CO2	FS = FERRITE (SCHAEFFLER DIAGRAM) PH = FERRITE (DELONG DIAGRAM) PHW = FERRITE (WRC)	
AMPERAGE	110	A		- °C -	
ARC VOLTAGE	25	V			

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HERETH AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◀ KOBELCO STEEL, LTD.
 WELDING DIV. FUJISAWA PLANT
 CHIEF INSPECTOR 

08/19 P081
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04/09/1997 15:57 7139746424 KOBELCO PAGE 11



We make Quality happen

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO:

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712976	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

PROCESS SYSTEMS
120 LBS 308L 3/32
70040-R/774101500

(6)

SANDVIK

Steel

We make Quality happen...

MATERIAL CERTIFICATE**SANDVIK STEEL COMPANY**P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59SOLD TO: BOC GASES (AIRCO)
LISLE ILSHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %


Heat	C	Si	Mn	P	S	Cr	Ni
\$711088	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

PSI
QC
CW

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
120 LBS 308L 1/8
70040-R/774101500Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer
15(661197)(10)

SANDVIK

Steel

make Quality happen

MATERIAL CERTIFICATE**SANDVIK STEEL COMPANY**P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59OLD TO: BOC GASES (AIRCO)
LISLE ILSHIP TO: *Process Systems Intl*
*7-8-97*CUSTOMER PURCHASE ORDER NO.: *70038-R/774101500*

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: *.035*
~~3/32~~ 120 LB

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
<i>3713617</i>	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual
Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC
Q9002-1994.**BOC GASES**90 RESEARCH ROAD
HINGHAM, MA 02043Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer*Celeste Brennan*
15(86119)(10)

⑧

HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

PROCESS Systems INTL
P.O. 70038R/7741000

JGP ISSUE DATE: 08-30-96

DATE SENT 6-27-97

HEAT NUMBER/LOT NUMBER: 61202878W3-60LB
E50836-K1-20LB

CHEMICAL COMPOSITION LIMITS

ALLOY: 308L
SPEC : AWS A5.9-93 ER308L

CARBON		.030	SILICON	.300	.650
MANGANESE	1.000	- 2.500	PHOSPHORUS		.030
SULFUR		.030	CHROMIUM	19.500	- 22.000
NICKEL	9.000	- 11.000	MOLYBDENUM		.750
TANTALUM		.500	CB + TA		.500
TITANIUM		.500	COPPER		.750
NITROGEN		.500	COBALT		.500
MAGNESIUM		.500	OTHER		.5
NIOBIUM		.500			

PSI
QC
CW

7-7-97

PSI
QC
CW

7-7-97

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY BRITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Janice Pittman
CERTIFICATION CLERK

THE ESAB GROUP, INC.
1500 Karen Lane, Hanover, PA 17331

CERTIFICATE OF TYPICAL ANALYSIS

11/19/96 *Process Systems Intl*

BOC GASES
70 RESEARCH ROAD
HINGHAM, MA 02043

7-14-97 Order No.: 700386/7741000

This Material Conforms to Specification:
AWS A5.20-95, ASME SFA 5.20

Trade Name
or Trademark: Dual Shield II 70 Ultra

Diameter Size: .035" x 33# Spool

Type: E71T-1* / E71T-12M

Weight: 132 LB

X-Rays Satisfactory

Lot Number: *49455 - 66 LB ✓*
49720 - 33 LB ✓
50293 - 33 LB ✓

PSI
QC
CW Typical Mechanical Properties

Typical Chemical Properties	(Specification Requirements)
Carbon: .02	(.15 Max.)
Manganese: 1.10	(1.60 Max.)
Chromium: .04	(.20 Max.)
Nickel: .01	(.50 Max.)
Silicon: .34	(.90 Max.)
Niobium+:	
Tantalum:	
Molybdenum: .01	(.30 Max.)
Tungsten:	
Copper: .01	(.35 Max.)
Titanium:	
Phosphorus: .013	(.03 Max.)
Sulphur: .010	(.03 Max.)
Vanadium: .02	(.08 Max.)

	As Welded	MPa
Yield Strength (Psi)	70,000	483
Tensile Strength (Psi)	76,800	530
Elongation (2"), %	32.0	
Red. of Area, %	74.6	

Charpy V-Notch Impacts
@ -20°F. (ft.-lbs.) 117
@ -29°C. (Joules) 159

(Specification Requirements)

Minimum Unless
Otherwise Stated As Welded MPa


Hydrogen: 4.2 ml/100 gr. of weld metal	Yield Strength (Psi)	58,000	400
	Tensile Strength (Psi)	70-90,000	480-620
Filletts: Vertical-Up/Overhead	Elongation (2"), %	22.0	22
	Red. of Area, %		

Shielding Gas: 75% AR/ 25% CO₂

Charpy V-Notch Impacts
@ -20°F. (ft.-lbs.) 20
@ -29°C. (Joules) 27

* No data being issued for E71T-1 classification using the CO₂ shielding gas.

The undersigned certifies that the product supplied will meet the requirements of the applicable AWS Filler Metal Specification when tested in accordance with that specification, and that no significant change has been made in the elements described in the qualification approval.

 BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

By: *D. A. Smith*
D. A. Smith, Supervisor, Q. A. Services



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: *PROCESS SYS*

SHIP TO:

CUSTOMER PURCHASE ORDER NO. *70029R/774101500*

CERTIFICATE DATE: 4/25/97

SANDVIK ORDER NO.

QUANTITY: *120 LBS*

CRK ORDER / LOT NO.: 978457

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
5712976	.013	.440	1.800	.015	.015	19.96	9.63	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb-Ta	N
		.070			.002	.060	.030	.035

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES

90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan lcp
15(66119)(10)

✓

11



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality Happen

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *70029R/774101500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY:

WORK ORDER / LOT NO.: *976164*

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan/CP
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

90 RESEARCH ROAD
HINGHAM, MA 02043

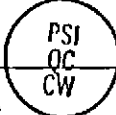
KOBE

PO 70031R/774101500
PURCHASER
PROCESS SYSTEMS INTL

INSPECTION CERTIFICATE
FLUX CORED WIRE

CERTIFICATE No: D 021
DATE OF ISSUE: 1997.04.24

TRADE DESIGNATION	DIMENSION (mm)	MFG. NO	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	1.2	B6F2110382	AWS A5.22-95 E309LT0-1 ASME SFA-5.22 E309LT-1 (1995 Edition)



CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		—
— N/mm ²	— N/mm ²	555 N/mm ²	37 %	— °C	AVG.	—	
— MPa	— MPa	555 MPa			+ J	—	
						— kJ/m	—

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE(SCHAEFFLER DIAGRAM) FN = FERRITE(DELONG DIAGRAM) WRC = FERRITE(WRC)
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2	— °C x — h	
AMPERAGE	200 A				
ARC VOLTAGE	29 V				

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

KOBE STEEL, LTD
WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 48184

CERTIFICATE DATE: 6/10/97

SANDVIK ORDER NO.: 17126

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 979336

TAG: 848523-01

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308LSI

DIAMETER: .035"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S712152 -60LB	.014	.840	1.700	.016	.013	19.50	10.23
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.030			.002	.040	.020	.042

PSI
QC
CW

Process Systems Intl
PO 70031R/77410/500

The material has not come in contact with mercury or mercury-containing compounds.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy

90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 170031R/1774101500

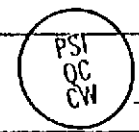
6-13-97

4/11

KOBE

PURCHASER: PROCESS SYSTEMS INT'L INSPECTION CERTIFICATE
FLUX CORED WIRE
CERTIFICATE No: D 021
DATE OF ISSUE: 1997.04.24

TRADE DESIGNATION	DIMENSION (mm)	MFG. NO	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	.035 84LB	BLM1015	AWS A5.22-95 E309LT0-1 ASME SFA-5.22 E309LT- (1995 Edition)



CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		—
N/mm ²	N/mm ²	N/mm ²	37 %	— °C	AVG.	—	
MPa	MPa	MPa			— J	— kgf·m	
		555					
		555					

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE (SCHAEFFLER DIAGRAM) FN = FERRITE (DELONG DIAGRAM) WRC = FERRITE (WRC)
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2	— °C x — h	
AVERAGE	200 A				
VOLTAGE	29 V				

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBEL STEEL, LTD
WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



SERVING NEW ENGLAND

NORTHEAST AIRGAS

PICKING TICKET

Sold By: AIRGAS NORTHEAST
 199 SOUTHWEST CUT OFF
 WORCESTER, MA 01604
 800-821-9852

Cust # : 72800
 Order # : 306626-00
 Order Date: 04/22/97
 Page : 001 OF 00

Ship To: PROCESS SYSTEMS INTERN'TL.
 20 WALKUP DR
 WESTBURY MA 01581-0000

NAME : PROCESS SYSTEMS TER: 142 SHIP VIA: GUST FLOWP -ROPE- INITIALS: REP
 PO # : 700348 JUNE7/4-1913 SLS: 8 SHIP CODE: 01 UPS: 0 DEPT: CHEM-DE
 FELT : BRN: 16 CUL/PFD : PENDING DATE : 28-APR-97 12:00
 PHONE# : 508-836-0260 ROUTE # :

QTY	UNIT	HAZ	DESCRIPTION	LINE NO	ITEM NUMBER	LOC	QTY ORDER	QTY BRND	WGT LBS	NET WT	UNIT PRICE	TOTAL PRICE

SHIP 2 HAZARD CLASS												

***** SHIP COMPLETE ONLY *****												

120	LB		S183 3/8X36 ALUMINUM	1	ALC S18333236	LAK	120	0		120.0		
ASDA: 000078												
120	LB		S183 1/8X36 ALUM.	2	ALC S1831836	LAK	120	0		120.0		
***** This order is complete *****												
Total Weight: 240.0												



This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Authorized Signature _____

Received by *L. Collins*
 230



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49688 USA
(616) 941-4111 Phone
(616) 941-8154 Fax
alcotec@traverse.com E-mail

11/08/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363072

P.O.# - 86207

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. ...



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

3/32

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

04/23/97

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.094	TIG Rod Box	363348

P.O.# - 105019



*Tony Task
1 box of 101
to TIF source
abs
4/29/97*

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0003
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

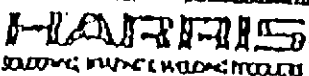
All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

Lucas L. Swann

V.P. - Quality Control





J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

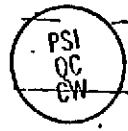
J. W. Harris Co.
Certificate of Compliance

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
PO#

Shipped To: Process Systems
PO 700158

Date _____
Date Shipped _____
Order No. _____

Item	Weight	Size	Alloy	Heat No.
1.	100 LBS	1/16 x 36	Alum	0294
2.				
3.				



Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	A95 A510-80 ASME SFA 5.10		OO-R-5660 Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elms Each
	ER	R										
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					0.05
2019 Aluminum (C)	ER2019	R2019	2019	0.30	0.30	5.0-6.0	0.05-0.10	0.02		0.10	0.10-0.20	0.05
4043 Aluminum	ER4043	R4043	4043	4.5-5.0	0.0	0.30	0.05	0.05		0.10	0.20	0.05
710 Aluminum	ER710	R710	710	11.0-13.0	0.0	0.30	0.15	0.10		0.20	0.20	0.05
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.05-0.10	4.3-5.2	0.05-0.20		0.10	0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.30	0.10		4.5-5.5	0.05-0.20		0.10	0.05
5554 Aluminum	ER5554	R5554	5554		0.30	0.10		4.5-5.5	0.05-0.20		0.10	0.05
5656 Aluminum	ER5656	R5656	5656		0.30	0.10		4.5-5.5	0.05-0.20		0.10	0.05
5754 Aluminum	ER5754	R5754	5754		0.30	0.10		4.5-5.5	0.05-0.20		0.10	0.05

NOTES:

1. All values shown are maximum percentages unless otherwise indicated.
2. Emission shall not exceed 0.0009 percent.
- A. Silicon plus iron shall not exceed 0.50 percent.
- B. Silicon content is the difference between the silicon and iron content, expressed as a percentage of iron each, expressed as a percentage of iron.
- C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance with applicable purchase specifications having passed our inspection as required.

FORM 1: 5177490165
10
FORM P. 02/02



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 43594

CERTIFICATE DATE: 10/18/96

SANDVIK ORDER NO.: 94386

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 969410

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

PSI
OC
CW

J-12-97

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
 Daniel Dawlani, Quality Engineer

Daniel Dawlani
8(19)(10)

PROCESS SYSTEMS
180 LBS
PO 70012R

BOC GASES
80 RESEARCH ROAD
HINGHAM, MA 02043 (20)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen ...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBORO MA

CUSTOMER PURCHASE ORDER NO.: 41276

CERTIFICATE DATE: 8/26/96

SANDVIK ORDER NO.: 88712

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967451

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

PSI
QC
CS
10-7-96

(2)

(3)



MATERIAL CERTIFICATE

We make Quality happen

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: BOC GASES

SHIP TO: PROCESS SYSTEMS
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603R/V59049045000

CERTIFICATE DATE: 6/18/96

SANDVIK ORDER NO.: TK # 591854

QUANTITY: 60 LBS 308L x 36

WORK ORDER / LOT NO.: 965227

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S709276	.019	.430	1.800	.018	.012	19.92	9.82
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.080			.002	.130	.030	.045



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

C

15(66119)(10)

3 E



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...



**90 RESEARCH ROAD
HINGHAM, MA 02043**

SOLD TO:

SHIP TO:

PROCESS SYSTEMS INTL
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603r/V59049045000
TK 591854-02

CERTIFICATE DATE: 6/17/96

SANDVIK ORDER NO.:

QUANTITY: 120 LBS er308L1/16 x 36

WORK ORDER/LOT NO.: 965225

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S708727	.014	.390	1.800	.016	.012	20.20	9.87
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.003	.040	.030	.060



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

23



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO) SHIP TO: AIRCO-NEW ENGLAND
LISLE IL process systems intl HINGHAM MA
CUSTOMER PURCHASE ORDER NO.: 42100 westboro, Ma. CERTIFICATE DATE: 9/27/96
SANDVIK ORDER NO.: 90814 PO-700627-V59049-041 QUANTITY: PER PACKING NO.
WORK ORDER / LOT NO.: 968845 TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Table with 8 columns: Heat, C, Si, Mn, P, S, Cr, Ni. Row 1: S437864, .013, .430, 1.720, .020, .013, 19.88, 9.98. Row 2: Mo, Cb/Nb, Ta, Ti, Cu, Cb/Nb+Ta, N. Row 2 values: .250, .010, .005, .150, .055.



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

Handwritten signature of Daniel Damiani

15(66119)(10)

BOC G
90 RESEARCH ROAD
HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967820

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
700627-R/V59049-044
TK 693421

Bengt H. Berg, Director, Quality and Metallurgy

2.40 LB

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

(2)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: **BOC GASES (AIRCO)
LISLE IL**

SHIP TO: **AIRCO-NEW ENGLAND
HINGHAM MA**

CUSTOMER PURCHASE ORDER NO.: **42100**

CERTIFICATE DATE: **9/04/96**

SANDVIK ORDER NO.: **90816**

QUANTITY: **PER PACKING NOTE**

WORK ORDER / LOT NO.: **967818**

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

*PROCESS SYSTEMS
700627-R/V59049-042
TK 693415
50 LB.*

Bengt E. Berg, Director, Quality and Metallurgy

5(66119)(10)



BOC GASES
HINGHAM ROAD
HINGHAM MA 02043





MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

Let make Quality happen ...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: process systems

CUSTOMER PURCHASE ORDER NO.: 693415

CERTIFICATE DATE: 10/03/96

SANDVIK ORDER NO.:

QUANTITY: 60 lbs

WORK ORDER / LOT NO.: 700627-r/v59049-042

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]

15(661(9)(10))

BOC GASES
RESEARCH ROAD
HINGHAM, MA 02043

2



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/03/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967819

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

PROCESS SYSTEMS
700627-R/V59049-0
TK 693420
240 LB.

BOC GASES
80 RESEARCH ROAD
HINGHAM, MA 02043



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax

05/07/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	362769

P.O.# - 72454



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
B	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

[Signature]

Control

[Signature]

Certifying Signature



HARRIS
SOLUTIONS IN WELDING & FABRICATION

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Compl

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
PO#

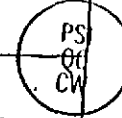
Shipped To: **PROCESS SYSTEMS INTL**
WEST BORO MA.

Date 10-17-96
Date Shipped 10-18-96
Order No. 712222

Item	Weight	Size	Alloy	Heat No.
1.	9LB	5/32 x 36	ALUM	AA1005183D
2.	10LB	5/32 x 36	ALUM	7295
3.				

Comments:

P.O. 700643-R/V5904904302



Alloy	AWS A510-00 ASME SFA.5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element	
	ER	R										Each	T
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.8-6.8	0.20-0.40	0.02		0.10		0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.05		0.10	0.10-0.20	0.05	
718 Aluminum	ER4047	R4047	4047	11.0-13.0	0.8	0.30	0.15	0.10		0.10	0.20	0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25		0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05	

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0008 percent, all alloys.
- Silicon plus iron shall not exceed 0.95 percent.
- the aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- Silicon plus iron shall not exceed 0.45 percent.

BOC GARDNER
90 RESEARCH ROAD
HINGHAM, MA 02043

30



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

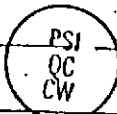
J. W. Harris Comp
Certificate of Comp

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: PROCESS SYSTEMS INTL
PO 700.643R/V5904.9043000

Date _____
Date Shipped 10-25-96
Order No. 713960-01

Item	Weight	Size	Alloy	Heat No.
1.	50LB	5/32	ALUM	0233
2.				
3.				



Comments: BOC 0233
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AWS A510-00 ASME SFA 5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element		
	ER	R										1100	A	A
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05							
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.8-6.0	0.20-0.40	0.02		0.10			0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.05		0.10	0.10-0.20		0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.8	0.30	0.15	0.10		0.10	0.20		0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25			0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.08-0.20		0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20		0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20		0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15		0.05	

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0008 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- B. The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before denoting the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

(31)



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Con

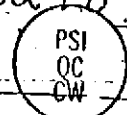
Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: PROCESS SYSTEMS
700643-R/V5904904300

Date 10-31-96
Date Shipped
Order No. 712225

Item	Weight	Size	Alloy	Heat No.
1.	50	5/32	ALUM	96248
2.				
3.				

Comments:



Alloy	AWS A510-00 ASME SFA 5.10		QQ-R-566B r. Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements
	ER	R										
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10		0.05
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.10-0.20	0.05
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20	0.05
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05

NOTES:

1. Single values shown are maximum percentages, except where a minimum is specified.
2. Beryllium shall not exceed 0.0008 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- D. the aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent, Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above...

FROM: AIRCO/BOC GASES HINGHAM TO 50897059330 1996.10-31 04:01 #525 P.02/02



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/13/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86330

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40 ✓
Fe	---	0.40 ✓
Cu	---	0.10 ✓
Mn	0.50	1.0 ✓
Mg	4.3	5.2 ✓
Cr	0.05	0.25 ✓
Zn	---	0.25 ✓
Ti	---	0.15 ✓
Be	---	0.0008 ✓
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order. All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. Swann
V.P. - Quality Control



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/11/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

Prod# - 86330

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Pb	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEO legislation.

Additional Order Requirements:

James L. Newman
V.P. - Quality Control



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

CUSTOMER PURCHASE ORDER NO.: 700650-R/VS904904500

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: 60 LB

WORK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %



Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

The material has not come in contact with mercury or mercury-containing compounds.
"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
RESEARCH AND
BINGHAM, MA 02043

33

SANDVIK
Steel

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA 18501 PH: (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEM*

CUSTOMER PURCHASE ORDER NO.: *700650-R/V5904904500*

CERTIFICATE DATE: 10/04/96

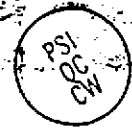
SANDVIK ORDER NO.: 92899

QUANTITY: *18 LB*

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9



STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

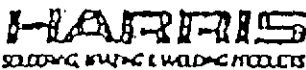
Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]
15661197(10)

BOC GASES
RESEARCH ROAD
BIRMINGHAM, MA 02043





HARRIS
SOLDING, CUTTING & WELDING TOOLS

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Com
Certificate of Comp

Date _____

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: *Process Systems Intl*
PO 70015R/7741000

Date Shipped *3-28-97*

Order No. *797282*

Item	Weight	Size	Alloy	Heat No.
1.	<i>40 LB</i>	<i>1/16 x 36</i>	<i>ALUM</i>	<i>0268</i>
2.				
3.				

Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AWS A.510-00 ASME SFA.5.10		QQ-R-566B r. Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements Each	
	ER	R											
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05			0.10		0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.8-6.0	0.20-0.40	0.02		0.10	0.10-0.20	0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.20	0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.20		0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05	

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Barium shall not exceed 0.0000 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- D. the aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance applicable purchase specifications having passed our inspections as noted

APR 15 '96 (MON) 08:38

HARRIS WELCO CUSTSRV

TEL: 704 739 2801

F 003

HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

EML ISSUE DATE: 04-15-96

PROCESS SYSTEMS
PO 7001SR/7741000
10 LBS 4043 1/16x3/16

HEAT NUMBER/LOT NUMBER: 0243

CHEMICAL COMPOSITION LIMITS

ALLOY: 4043
SPEC: AWS A5.10R/ER4043/AMS 4190D
ASME SPA 5.10/QQ-R-566-B



SILICON	4.500	-	6.000	TITANIUM	.200
COPPER			.300	MAGNESIUM	.050
IRON			.800	ZINC	.100
BERYLLIUM			.0008	REMAINDER	ALUMINUM
OTHER			.15		

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY BRITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Rodney M. Bee
CERTIFICATION CLERK

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

36



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen.

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *7005R/77410500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY: *180 LBS.*

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Rb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

39



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/03/96

SANDVIK ORDER NO.: 90816



QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.: 967819

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER-308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5710846	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS

70018R/774101500

Bengt E. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

40



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen.

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 46682

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 978457

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S712976 -60LB	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
4-28-97	.070			.002	.060	.030	.035



PROCESS SYSTEMS

P.O. 70018R/77410500

Shipped 4-25-97 ORDER #805966-01

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES

90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan (signature)
15(66119)(10)

3
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SANDVIK
Steel

We make Quality happen...

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

MATERIAL CERTIFICATE

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBOTO MA

CUSTOMER PURCHASE ORDER NO.: 47994

CERTIFICATE DATE: 4/29/97

SANDVIK ORDER NO.: 14445

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 970470

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .035"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

Keith M. Hottle, Manager, Quality & Metallurgy

15(03030, REV. 2)(10)

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A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(818) 941-4111 Phone
(818) 941-9154 Fax
alcotec@traverse.com E-mail

01/13/97

1/6

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363423

P.O.# - 93118



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

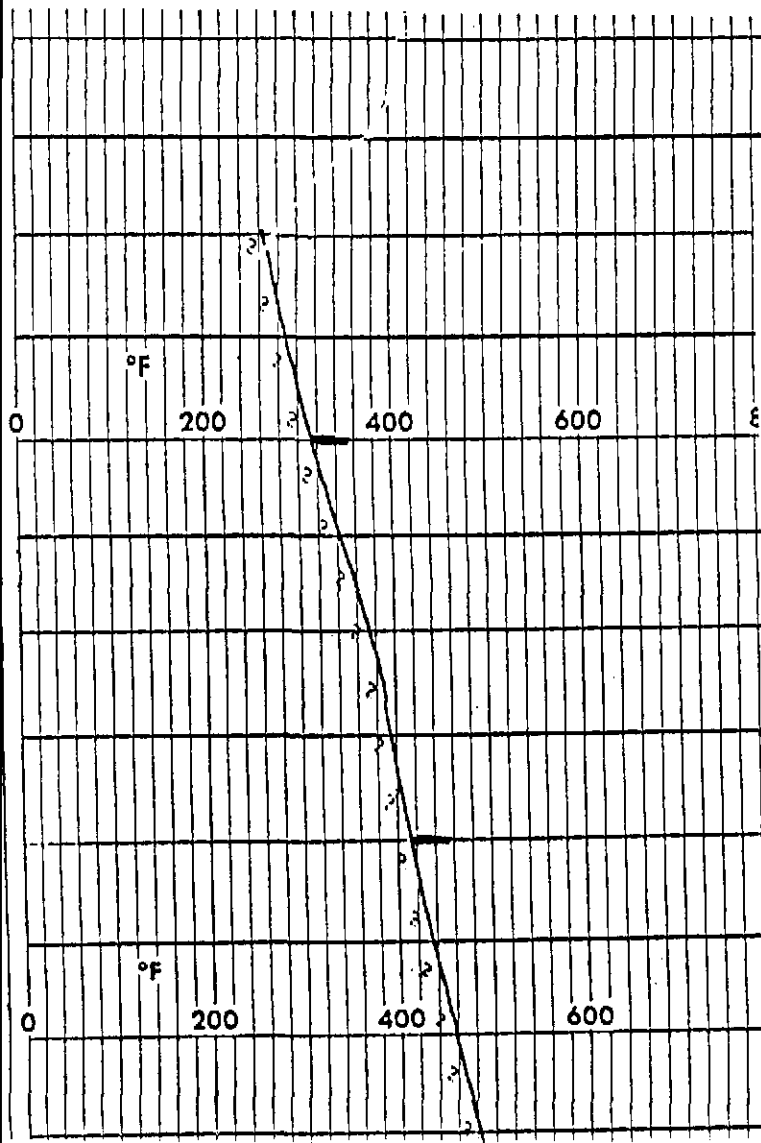
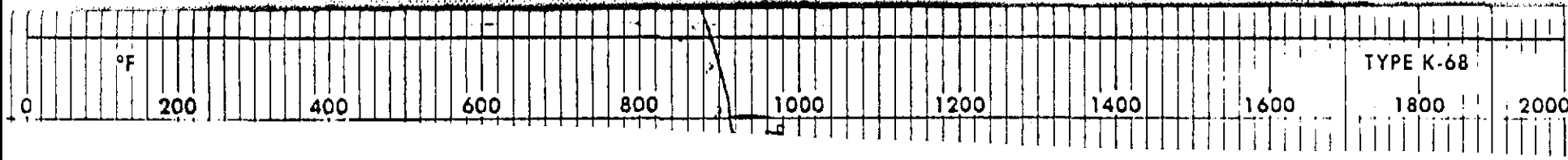
AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. Swanson

V.P. - Quality Control



PROCESS SYSTEMS INTERNATIONAL, INC.
 20 Walkup Drive • Westborough, Massachusetts 01581-5003

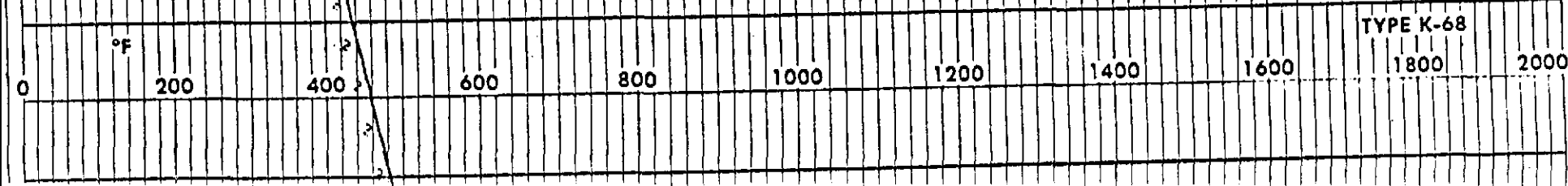
HAN # 02

Job # U59849

Order # V0494-125-02

20

TYPE K-68
 300 2000



Ham # 2

Title

SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET

Project V59049

Component

Serial Number

84" Corp	V0494127-10
84"	V0494723-18
TEST	
TEST	

Wash Cycle: Manual

Flowrates: 30 GPM

Max. Temp.: 146°

Duration:

60 min Wash
15 min Rinse
90 min Dry

Operator: B:11 / Tom

Date: 5-22-97

Comments: _____

Component(s) Inspected By: [Signature]

Date: 5-22-97

Quality Assurance: [Signature]

Date: 5-27-97

Comments: _____

Number
Rev.

SPECIFICATION

Number

A

V049-2-015

Rev.

2

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: HAM S/N: Z WORK ORDER: 255
 DATE/TIME: 5/20
 OPERATOR: Bill / Tom

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F.

T1925= 146 F

2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER.

MIX 1:1 Done

3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.

4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.

5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.

6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

WASH TIME = 45 MIN

7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

RINSE TIME = 130 MIN

8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.

DRY TIME = 90 MIN ^{AIR}

9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM.

NOTES: PASSIVATED inside of Ham 5/20/97 - Bruce

HAM #2

SPECIFICATION

Number AV049-2-184 Rev. 1

Number Rev

LIGO DRAWING SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: Cover - 84" S/N: U0494127-10 WORK ORDER: 255
DATE/TIME: 5-21-97
OPERATOR: _____

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F. T1925= 146° F

2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER. MIX 1:1 Done

3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.

4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.

5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.

6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE. WASH TIME = 60 MIN

7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE. RINSE TIME = 45 MIN

8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.

9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM. DRY TIME = 90 MIN

NOTES: PASS. VAS 72318 DO REMOVE WHAT APPEARS TO BE WAXING O.L.

Hand #2

Number
A V049-2-184
Rev.
1

SPECIFICATION

Number
Rev.

Title: COMPONENT RGA TEST PROCEDURE

TITLE	TEST ARTICLE PARAMETERS PUMPDOWN LOG
DATE:	7/25
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM 6
PSI TEST ENGINEER:	<i>John F. Li</i>
QUALITY ASSURANCE:	

PHYSICAL DIMENSIONS				
S.S. SURFACE AREA		ft ²		cm ²
VITON LINEAL LENGTH		inches		cm
VOLUME		ft ³		liters
PUMPDOWN		TIME		PRESSURE
7/18		630	hr:min	3.8×10^{-6} Torr
			hr:min	Torr
7/19			hr:min	2.3×10^{-6} Torr
			hr:min	Torr
7/22			hr:min	7.4×10^{-7} Torr
			hr:min	Torr
7/23		700	hr:min	8.8×10^{-7} Torr
		1310	hr:min	8.4×10^{-7} Torr
			hr:min	Torr
7/24		705	hr:min	8.1×10^{-7} Torr
		shut down	hr:min	Torr
		1600	hr:min	3.6×10^{-8} Torr
			hr:min	Torr
7/25		1123	hr:min	1.5×10^{-8} Torr
		1445	hr:min	4.8×10^{-9} Torr
			hr:min	Torr
			hr:min	Torr
			hr:min	Torr
			hr:min	Torr

w/cal. back

SPECIFICATION	
Number: V049-2-127 A	Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	BAKE OUT TEMPERATURE LOG
DATE:	7/25
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM6
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

BAKEOUT LOG / DATE	TIME	TEMPERATURE
	7/18	START BAKE °C
		hr:min °C
		150 °C °C
	7/24	shut down °C
		hr:min °C
	7/25	amb. °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C
		hr:min °C

SPECIFICATION	
Number: V049-2-127 A	Rev 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA ION SOURCE SETTINGS SHEET
DATE:	7/25
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM6
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

Type	CH-TRON	IS-TYPE:	HS-THOR.
------	---------	----------	----------

Channel	0 ENABLE
---------	----------

Detector	
Type	CH-TRON
SEM Volt.	<< 2500 >>

Amplifier	
Offset	ON

RF-Polarity	inverse
IS-Voltages	[V]
IonRef	138
Cathode	90.0
Focus	9.38
Field Axis	5.75
Extract	12

Mass	
Mode	SCAN-N
First	
Width	
Speed	
Resolution	25
Threshold	

Ion Source	
Filament #	
IS-Set	

IS-Emission	
Emiss [mA]	
Protect [A]	3.5

Fil.Prot.	Thresh.
	[mbar]
ON below	
OFF above	

SPECIFICATION	
Number: V049-2-127 A	Rev 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA SCAN PARAMETER FILE SETTINGS
DATE:	7/25
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM/
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	
RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

PARAMETER FILE: LIGO200.SAP

PARAMETER FILE: LIGO200.SBP

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Detector

SEM Voltage	1700	2500
-------------	------	------

SEM Voltage	1700	
-------------	------	--

Mass

Speed	5 s	
Width	200	
Resolution	25	
Threshold	1E-15	

Speed	5 s	
Width	200	
Resolution	25	

Amplifier

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

OUTPUT: User discretion
DISPLAY: User discretion

SPECIFICATION

Number: V049-2-127

Rev.1

A

Title: COMPONENT RGA TEST PROCEDURE

10/1/97

TITLE	OUTGASSING RATES REPORT SHEET
DATE: 7/25/97	
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM 6
PSI TEST ENGINEER: Jm	
QUALITY ASSURANCE:	UNNAMED WHAM6 RGSAC

RGA FILE: 672597.SAC CYCLE 6 (w cal leak, cycle 8 w/out Cal leak)*

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
H2	2.3E-7	4.8X10 ⁻⁶		6.6E-7	11.2	2.6E-6	1.1E-11
12			0.42				
14			0.5				
15			0.54				
x CH4	1.0E-9		0.57		35.6	2.7E-8	1.1E-13
17			0.6				
x H2O	1.1E-8		0.64		35.6	3.1E-7	1.3E-12
19			0.67				
26			0.71				
28	6.3E-9	9.5X10 ⁻⁷		3.3E-8	35.6	2.2E-7	9.0E-13
32			1.14				
38			1.36				
40	2.5E-11	9.4X10 ⁻⁸		2.3E-9	41.3	1.0E-9	
43			1.53				
y 44	3.2E-9		1.57		35.6	1.4E-7	5.8E-13
129	8.E-13	2.5X10 ⁻⁶		5.0E-10	50.1	4.E-11	
131		2.0X10 ⁻⁶					
132		2.5X10 ⁻⁶					
134		1.0X10 ⁻⁶					

Final pressure = 4.6 x 10⁻⁹ Torr w/o leak
 = 1.8 x 10⁻⁸ Torr w/leak open

AREA = 2.452 E5

* SEM VOLTAGE = 2500. Volts

SPECIFICATION

Number: V049-2-127 A	Rev. 1
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15

Title: COMPONENT RGA TEST PROCEDURE

TITLE	OUTGASSING RATES REPORT SHEET
DATE: 7/25/97	
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM 6. GAC
PSI TEST ENGINEER: <i>SW</i>	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

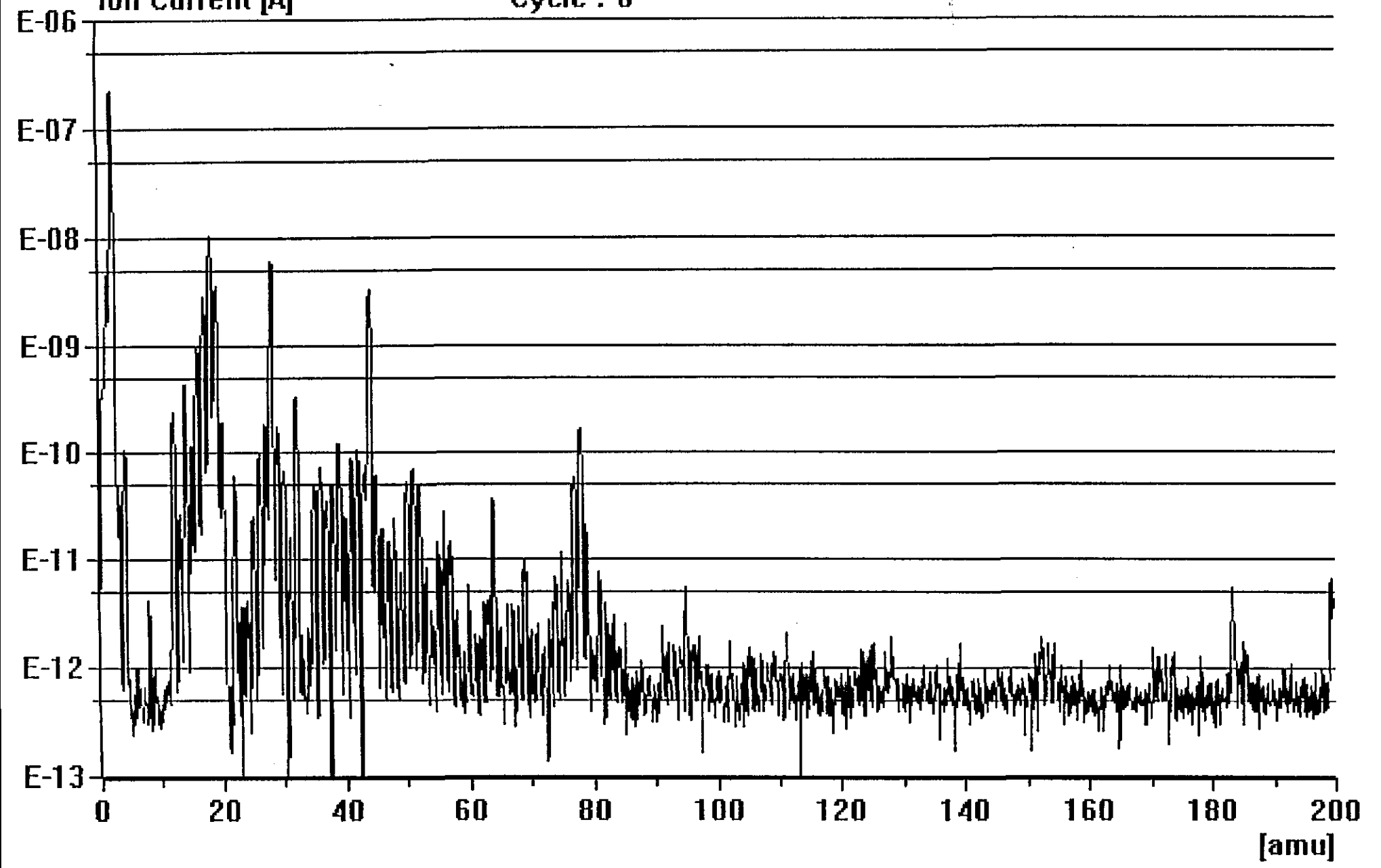
AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
25	2.5E-11						
26	1.0E-10						
27	1.8E-10						
29	1.8E-10						
39	6.7E-11						
39	1.2E-10						
41	8.5E-11						
42	1.1E-10						
43	6.0E-11						
45	6.0E-11						
50-52	1.5E-10						
64	4.1E-11						
77	6E-11						
78	1.7E-10						
79	2.0E-11						
5@	5E-12						
TOT.	1.4E-9				35.6	5.1E-8	2.1E-13

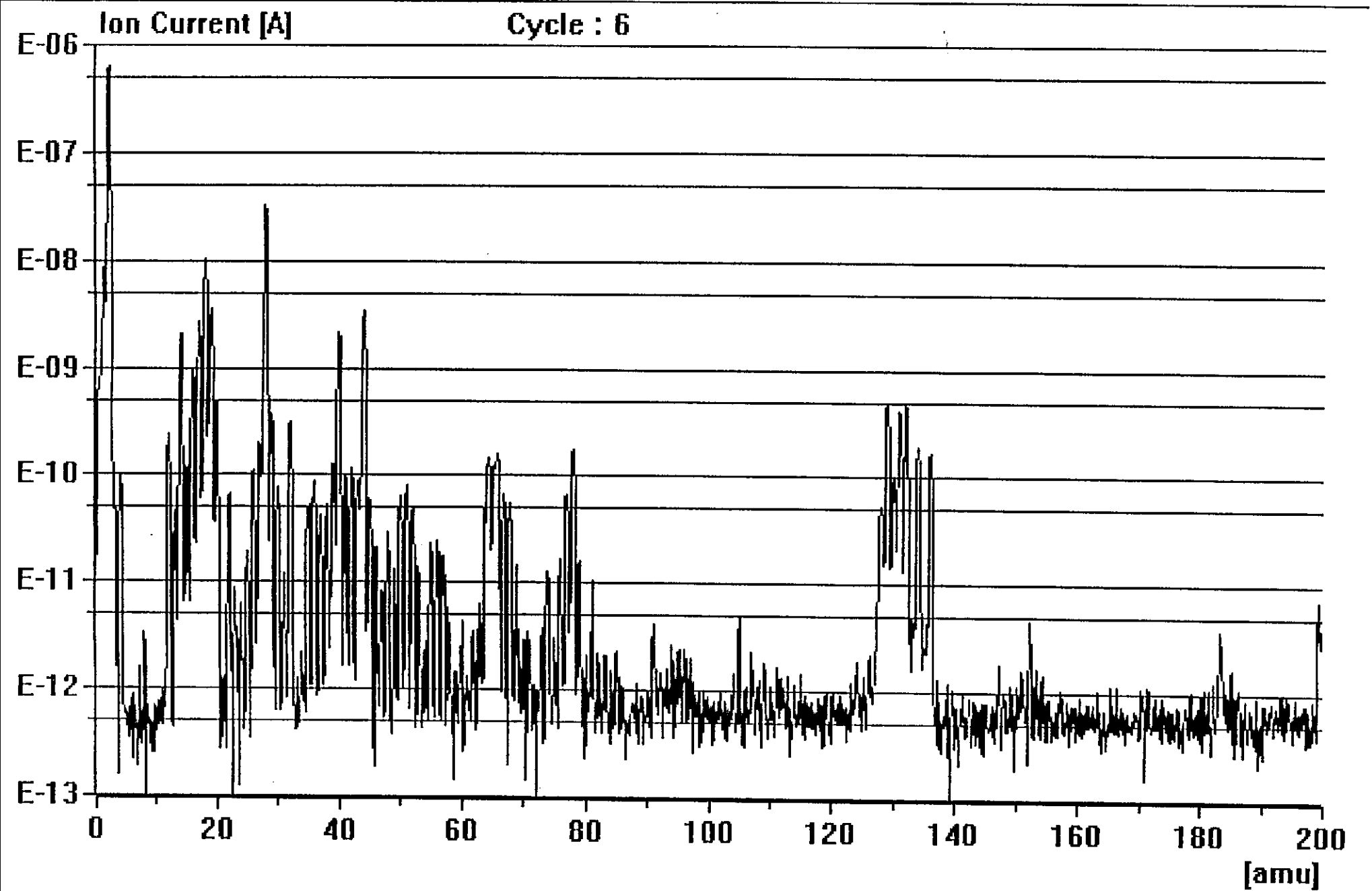
SPECIFICATION

Number: V049-2-127 A	Rev. 1
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Ion Current [A] Cycle : 8





X: 60.09

Y: 8.709636E-07

C: 6

RANOR, INC

NONCONFORMANCE REPORT

FORM QA 12.1 REV. 6 (07/30/96)

NCR NUMBER: **1031** PAGE 1 OF 1
 NCR- SKETCH ATTACHED

JOB NUMBER 7400^{5/4}	CUSTOMER P.S.I.	PURCHASE ORDER NUMBER 556008	QUANTITY 1
PART DESCRIPTION H.A.M. Main Assy.		DOCUMENT NUMBER AND REVISION A V049-2-046 Rev. 0	SERIAL NUMBER Pc.#2

CODE/SPECIFICATION: ASME SECTION III SAFETY RELATED ASME SECTION VIII MIL SPEC COMMERCIAL

DESCRIPTION OF NONCONFORMANCE

ITEM	REQUIREMENT	NONCONFORMANCE
1	Heat Treat Ramp Down @ 100°F/hr. max ending at 300°F	1. Ramp Dn @ 115°/hr from 915° to 800°F

REMARKS: _____

ROUTING SHEET IDENTIFIED WITH NCR NO. AND DATE OF ISSUE: BY _____ DATE: _____

ORIGINATOR/INSPECTOR: Stan Bell DATE: 3-27-97

RESPONSIBILITY FOR NONCONFORMANCE

<input type="checkbox"/> VENDOR	<input type="checkbox"/> DESIGN	<input type="checkbox"/> MATERIAL	<input type="checkbox"/> CUTTING	<input type="checkbox"/> FORMING	<input type="checkbox"/> WELDING
<input type="checkbox"/> MACHINING	<input type="checkbox"/> INSPECTION	<input type="checkbox"/> CALIBRATION	<input type="checkbox"/> QC	<input type="checkbox"/> QA	<input checked="" type="checkbox"/> OTHER <u>Heat Treat</u>

TECHNICAL JUSTIFICATION/DESCRIPTION OF DISPOSITION

ITEM	TECHNICAL JUSTIFICATION	DESCRIPTION OF DISPOSITION
	Submit to PSI for Justification and Written Disposition. <u>Stan Bell</u>	REF. NCR 1029 USE AS IS
	<u>3-27-97</u>	<u>R. D. Gath 4/16/97</u>
		<u>GS 4-17-97</u>

TECHNICAL JUSTIFICATION: BY _____ DATE: _____ DISPOSITION: BY R. B. Gath DATE: 4/17/97

DISPOSITION OF NONCONFORMANCE: <input type="checkbox"/> ACCEPT AS IS <input type="checkbox"/> USE AS IS <input type="checkbox"/> REPAIR /REWORK <input type="checkbox"/> REJECT CONDITIONAL RELEASE: CR NO. _____	RECOMMENDED DISPOSITION: <input type="checkbox"/> ACCEPTED <input type="checkbox"/> NOT ACCEPTED	10CFR21 EVALUATION REQUIRED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO CORRECTIVE ACTION REQUIRED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO CUSTOMER APPROVAL REQUIRED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO APPROVED BY: _____ DATE: _____
APPROVAL OF DISPOSITION: VP-ENGINEERING _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	VERIFICATION OF DISPOSITION: ACCEPTED BY _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	

RANOR, INC

NONCONFORMANCE REPORT

FORM QA 12.1 REV. 6 (07/30/96)

JOB NUMBER 7300 F/M		CUSTOMER P. S. I.	PURCHASE ORDER NUMBER 555822-00	QUANTITY 1
PART DESCRIPTION LIGO BSC Lower Shell Assy.		DOCUMENT NUMBER AND REVISION A V049-2-046 Rev. 0		SERIAL NUMBER 7300-1
CODE/SPECIFICATION: <input type="checkbox"/> ASME SECTION III <input type="checkbox"/> SAFETY RELATED <input type="checkbox"/> ASME SECTION VIII <input type="checkbox"/> MIL SPEC <input checked="" type="checkbox"/> COMMERCIAL				

DESCRIPTION OF NONCONFORMANCE

ITEM	REQUIREMENT	NONCONFORMANCE
1	Heat Treat Ramp-Up @ 100°F/hr max. starting at 350°F; Ramp-Down @ 100°F/hr max. ending at 300°F	1. Ramp up @ 180°/hr. from 350° to 530°F Ramp up @ 130°/hr. from 600° to 730°F Ramp Dn @ 115°/hr. from 1015° to 900°F Ramp Dn @ 120°/hr from 725° to 605°F
2	Temp. of vessel to be monitored by recording with K-thermocouple attached	Ramp Dn @ 135°/hr from 500° to 365°F 2. Multiple parts were processed without identification of parts to thermocouples.

REMARKS:

ROUTING SHEET IDENTIFIED WITH NCR NO. AND DATE OF ISSUE: BY _____ DATE: _____

ORIGINATOR/INSPECTOR: Steve R. Bell DATE: 3-27-97

RESPONSIBILITY FOR NONCONFORMANCE

<input type="checkbox"/> VENDOR	<input type="checkbox"/> DESIGN	<input type="checkbox"/> MATERIAL	<input type="checkbox"/> CUTTING	<input type="checkbox"/> FORMING	<input type="checkbox"/> WELDING
<input type="checkbox"/> MACHINING	<input type="checkbox"/> INSPECTION	<input type="checkbox"/> CALIBRATION	<input type="checkbox"/> QC	<input type="checkbox"/> QA	<input checked="" type="checkbox"/> OTHER <u>Heat Treat</u>

TECHNICAL JUSTIFICATION/DESCRIPTION OF DISPOSITION

ITEM	TECHNICAL JUSTIFICATION	DESCRIPTION OF DISPOSITION
	Submit to PSI for Justification and Written Disposition. <u>Steve R. Bell</u> 3-27-97	NO MAJOR PROBLEMS PER DISCUSSION W/ METALLURGIST. USE AS IS - R.D. Galt 4/16/97 GS 4-17-97

TECHNICAL JUSTIFICATION: _____ DISPOSITION: _____
BY _____ DATE: _____ BY Steve R. Bell DATE: 4/17/97

DISPOSITION OF NONCONFORMANCE: <input type="checkbox"/> ACCEPT AS IS <input type="checkbox"/> USE AS IS <input type="checkbox"/> REPAIR/REWORK <input type="checkbox"/> REJECT	RECOMMENDED DISPOSITION: <input type="checkbox"/> ACCEPTED <input type="checkbox"/> NOT ACCEPTED	10CFR21 EVALUATION REQUIRED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO CORRECTIVE ACTION REQUIRED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO CUSTOMER APPROVAL REQUIRED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
CONDITIONAL RELEASE: CR NO. _____	APPROVED BY: _____ DATE: _____	APPROVED BY: _____ DATE: _____
APPROVAL OF DISPOSITION: VP-ENGINEERING _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	VERIFICATION OF DISPOSITION: ACCEPTED BY _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	



PROCESS SYSTEMS INTERNATIONAL, INC.

20 Walkup Drive, Westborough, MA 01581

 **LIGO PROJECT**

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Table of Contents

TAG # - WA3A

P/N - VO49-4-A3-01

1	Quality Plan Sign Offs.	
2	Hyspan Metal Bellows Documentation Package.	
3	C of C to Codes and Standards. Material test reports for shells, heads and large flanges. C of C for nozzles, small parts, flanges and weld wire.	
4	Final Cleaning Certificates.	
5	Bakeout Certificate. Acceptance Test Data. Final Vacuum Test Data	
6	Non Conformance Reports. Use As Is when applicable.	
7	As Built Drawings/Dimensions.	

Title:

QUALITY PLAN FOR LIGO-

ADAPTERS

TAG# WAZA SMOI

QUALITY PLAN

FOR

LIGO

ADAPTERS

SERIAL No. V049-4-A3-01

DATE

NOV 26 1996

φ	ARB 11/22/96	—	RELEASED ON DED # 0363
REV LTR	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE

PROCESS SYSTEMS INTERNATIONAL, INC.			SPECIFICATION	
INITIAL APPROVALS	PREPARED DATE	APPROVED DATE	Number	Rev.
	ARB 11/22/96	ARB 11/25/96	A V049-2-172	φ

Title

APPLICABLE DRAWINGS

REFER TO FABRICATION PLAN

APPLICABLE PROCEDURES

V049-2-070	WELDING	PAW P8-P8 75%Ar, 25%He
V049-2-071	WELDING	PAW P8-P8 75%Ar, 25%He PWHT
V049-2-072	WELDING	GTAW P8-P8 100%Ar PWHT
V049-2-073	WELDING	GTAW P8-P8 100%Ar
V049-2-146	WELDING	PAW P8-P8 75%He, 25%Ar
V049-2-074	GENERAL REPAIR PROCEDURE	
V049-2-014	LEAK CHECK PLAN	
V049-2-015	CLEANING PROCEDURE	
V049-2-019	BAKEOUT PROCEDURE	
V049-2-040	STAINLESS STEEL FLANGE FORGINGS	
V049-2-047	COMPONENT SHOP CONDITIONING PLAN	
V049-2-097	SPOOLS/MODE CLEANERS/BEAM TUBE MANIFOLDS FAB	
V049-2-120	RAW MATERIAL HANDLING PROCEDURE	
V049-2-121	PROCEDURE FOR VERIFYING COMPONENT DIMENSIONAL ACCURACY	
V049-2-123	COMPONENT PACKAGING, HANDLING AND SHIPPING	
V049-2-084	WELD DATA SHEET SPECIFICATIONS	

Number

Rev.

SPECIFICATION

Number **A** V049-2-172

Rev. ϕ

ADAPTER V049-4-A3-01

SPECIFICATION V049-2-172

REV. Ø



Process Systems International, Inc.
 20 Walkup Drive
 Westborough, MA 01581-5003
 (508) 366-9111 Fax (508) 870-5930


PROJECT LIGO
 ITEM Adapter A-3 48.25" ID with 60.5" ID Flanges
 APPLICABLE CODE ASME VIII DIV.1
 (WHERE APPLICABLE)

JOB NO. V59049
 DWG NO. V049-4-A3
 PG 3 OF 5

ASME CODE QUALITY PLAN

LEGEND: D - DIMENSIONAL PT - LIQUID PENETRANT LT - LEAK TEST X - HOLD POINT
 V - VISUAL MT - MAGNETIC PARTICLE UT - ULTRASONIC ✓ - APPROVED
 RT - RADIOGRAPHY ET - EDDY CURRENT W - WITNESS R - REVIEW VR - VERIFY

QUALITY PLAN REVIEWED
 QA GS
 AI N/A

QUALITY PLAN REVIEWED QA <u>GS</u> AI <u>N/A</u>	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection		AUTHORIZED INSPECTOR		CUSTOMER QA		REMARKS
				SIGN/DATE	SIGN/DATE	SIGN/DATE	SIGN/DATE			
	V-D	V049-A3		X	N/A	GS	5/2/97			
	V-D			X	N/A	GS	10/22/97			
	V-D			X	N/A	GS	10/22/97			
				X	N/A	GS	10/22/97			



ADAPTER V049-4-A3-01

SPECIFICATION V049-2-172

REV. ~~0~~

ASME CODE QUALITY PLAN		LEGEND: D = DIMENSIONAL V = VISUAL RT = RADIOGRAPHY							PT = LIQUID PENETRANT MT = MAGNETIC PARTICLE ET = EDDY CURRENT		LT = LEAK TEST UT = ULTRASONIC W = WITNESS		X = HOLD POINT √ = APPROVED R = REVIEW		VR = VERIFY	
QUALITY PLAN REVIEWED QA <u>GS</u> AI <u>N/A</u>	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS									
Inspect following Pre fab Nozzles:	V-D			X N/A GS 10/22/97												
Leg Assemblies:	V-D			X N/A GS 10/22/97												
Verify Fit-Up And Welding of Flanges to Shell	V-D	V049-4-A3		M.S 8/9/97												
Inspect following Fit-Up And Welding:				X N/A GS 10/22/97												
Nozzles	V-D			X N/A GS 10/22/97												
Angle Stiffness	V-D			X N/A GS 10/22/97												
Perform Gross Leak Check	R	V049-2-014		X GS 7/25/97												
Perform Final Dimensional Insp.	V-D	V049-2-121		X GS 8/2/97												

PS
GS

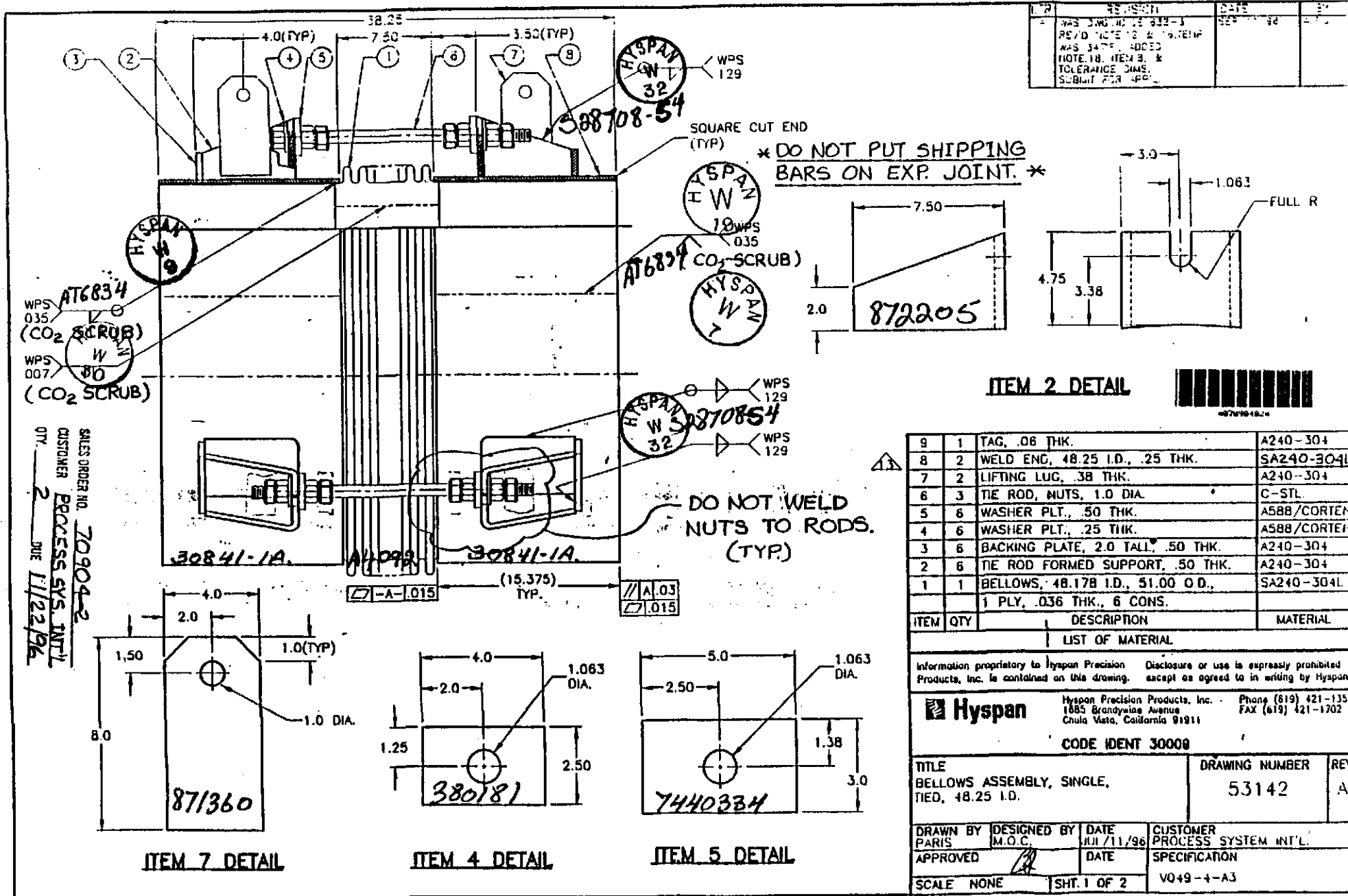
ADAPTER V049-4-A3-01

SPECIFICATION V049-2-172

REV. Ø

ASME CODE QUALITY PLAN	LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC √ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY															
QUALITY PLAN REVIEWED QA <u>GS</u> AI <u>N/A</u>	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS									
Perform Final Detergent Clean	Y	V049-2-015		X GS 7/23/97												
Bakeout	R	V049-2-019		X GS 7/31/97												
Perform Final Leak Check	R	V049-2-047		X GS 7/31/97												
Ship to LIGO		V049-2-123		X GS 9/8/97												





REV	DESCRIPTION	DATE	BY
1	WAS JAWING TO 812-1 REV'D NOTE 10 & 11 WAS 3475 ADDED NOTE 18, ITEM 3, & TOLERANCE DIMS. SUBMIT FOR APP.		

ITEM	QTY	DESCRIPTION	MATERIAL
9	1	TAG, .08 THK.	A240-304
8	2	WELD END, 48.25 I.D., .25 THK.	SA240-304L
7	2	LIFTING LUG, .38 THK.	A240-304
6	3	TIE ROD, NUTS, 1.0 DIA.	C-STL
5	6	WASHER PLT., .50 THK.	A588/CORTEN
4	6	WASHER PLT., .25 THK.	A588/CORTEN
3	6	BACKING PLATE, 2.0 TALL, .50 THK.	A240-304
2	6	TIE ROD FORMED SUPPORT, .50 THK.	A240-304
1	1	BELLOWS, 48.178 I.D., 51.00 O.D., 1 PLY, .036 THK., 6 CONS.	SA240-304L

Information proprietary to Hyspan Precision Products, Inc. is contained on this drawing. Disclosure or use is expressly prohibited except as agreed to in writing by Hyspan.

Hyspan Hyspan Precision Products, Inc. Phone (819) 421-1355
1885 Grandyville Avenue FAX (819) 421-1702
Chula Vista, California 91911

CODE IDENT 30009

TITLE BELLOWS ASSEMBLY, SINGLE, TIED, 48.25 I.D.	DRAWING NUMBER 53142	REV A
--	-------------------------	----------

DRAWN BY PARIS	DESIGNED BY M.O.C.	DATE JULI/11/96	CUSTOMER PROCESS SYSTEM INT'L.
APPROVED		DATE	SPECIFICATION
SCALE NONE	SHT. 1 OF 2		V049-4-A3

5/12/01 (V0494A3-01-00)

OF	DATE ENTER	SALESMAN NO	QUANTITY	UNIT	DATE	ORDER NUMBER
1	10/17/96	503.000	50	N	10/17/96	CS - 056542 REPRINT*
P658600 REYNOLDS ALUMINUM SUPPLY N: ACCOUNTS PAYABLE J BOX 26385 RICHMOND VA 23161			REYNOLDS ALUMINUM SUPPLY 6446 E WASHINGTON BLVD CITY OF COMMERCE CA 92626			SHIPPING CHI WILL CALL F.O.B. SHIPPING SANTA FE SPRINGS CA CUST. ORDER NO. 0980LPO55

SOLD TO	SHIP TO	W/STL	PC	COLL	ALW	CHRG	RENEG	TERMS
00	07	02		X			1	1/2 % NET 30

HRAP STAINLESS PLATE

HEAT NO. 872205

SIZE & DESCRIPTION 1/2

T304

MILL Allegheny Ludlum Corporation
SPECIALTY Jessop Specialty Products

EXCEPT AS OTHERWISE NOTED, THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS AND RESULTS CONFORM TO THE SPECIFICATION AND ORDER REQUIREMENTS.

Allegheny Ludlum

Jessop Specialty Products
500 Green Street
Washington, PA 15301

CERTIFIED MATERIAL
TEST REPORT

OUR ORDER NO PP6559950
 YOUR ORDER NO CS-2890
 MEMO NO 113262
 DATE 08/07/96
 SALESMAN ID 099

H. J. O'Donnor
AUTHORIZED SIGNATURE

8111 LOS ANGELES WAREHOUSE
 To ALLEGHENY LUDLUM CORP
 14420 SOUTH MARQUARDT AVE
 SANTA FE SPRINGS CA 90670

JESSOP T 304 STAINLESS HRAP
 AMS-5513F; ASTM A167-92; ASTM A240-92; ASME SA-240-95;
 ASTM A262-73a PRACTICE A4;

Heat	Slip	Lot No	Size	Pcs	Weight
872205	30721 AB	11660	.5000 x 96.0000 x 246.0000	1	1553
872205	30721 BB	11658	.5000 x 96.0000 x 256.0000	1	3697
872205	30721 AA	11660	.5000 x 96.0000 x 252.0000	1	3640
872205	30721 BA	11660	.5000 x 96.0000 x 251.0000	1	3625

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
872205	.047	1.71	.026	.0004	.40	8.30	18.27	.40	.11	.38	.089

Lot No	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grain Size
11660	.5000	47.3 KSI	99.7 KSI	59.6	74.2	BHN170	OK	OK	
11658	.5000	45.1 KSI	99.7 KSI	59.5	71.6	BHN167	OK	OK	
11660	.5000	47.3 KSI	99.7 KSI	59.6	74.2	BHN170	OK	OK	

MATERIAL WAS NOT WELD REPAIRED

P.O. 61326

872205

21,787"

TOTAL PRICE:

24,455.91

Gulf States Steel, Inc.

GADSDEN, AL 36041-1008

AX-4577-01

CERTIFICATE OF TESTS

LINE ORDER NO. NUMBER ITEM MFG			PURCHASE ORDER DATE		ACCOUNT NUMBER	PAGE NO.	INVOICE NUMBER	
F 35232 04 742			66 09 94		73800003	4	712-17002	
PURCHASE ORDER NO.				SHIPPING FROM	DATE SHIPPED			ROUTE/VEHICLE IDENTIFICATION
040				ALA CITY	08 27 94			SD11152181

HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATION.

C. F. BEARDEN, JR.
RGR, TECHNOLOGY AND
QUALITY - PLATE PRODUCTS

MATERIAL DESCRIPTION	QUANTITY SHIPPED
PLATE HSLA ASTM A-508-93 GRD A ASTM A-508-93 GRD B ASTM A-242-93 TYPE 1 5000 X 96.0000 SWARREN EDGE X 240.0000 IN HT 7440334 3 PCS HT 7440395 1 PCS HT 7033576 2 PCS CH C 18NH NH 90/1.00 P 040HX S 050HX SI 30/90 CU 20/40 NI 40HX CR 40/65 NO RPT CB RPI U 02/10 AL 020HX NR YLD 50000 MIN TEN 70000 MIN XELONG MIN 2 IN.25 OR 8 IN 18 IL 2 T/R CA 2 T/R SENICO 937 SOUTH CENTER STREET MESA AZ 85210	19602

HEAT NUMBER	BRN	C	Mn	P	S	SI	CU	NI	CR	MO	CB	V	AL	N	B	Ca	TI	CL
7440334		.09	0.97	.028	.020	.353	0.33	0.12	0.51	.02	.015	.016	.104					
7440395		.10	0.95	.007	.015	.380	0.33	0.10	0.42	.02	.010	.033	.038					
7033576		.08	0.92	.007	.012	.325	0.33	0.13	0.43	.02	.001	.026	.037					

HEAT NUMBER	TEST OR PRICE IDENTIFY NO.	YIELD KSI	TENSILE KSI	% ELONG		HARDNESS	BEND TEST	HEAT TREAT	Y8/TS RATIO	% RED. AREA	GALV COATING	DROP WEIGHT YEAR TESTS					
				2"	4"							DIA	TEMP °F	1	2	AC	
7440334	0157401	71.0	81.0		26			AR	.87								
7440334	0126101	60.0	74.0		25			AR	.81								
7440395	0233101	66.0	78.0		20			AR	.84								
7440395	0234901	62.0	74.0		22			AR	.83								
7033576	0304601	58.0	71.0		28			AR	.81								

HEAT NUMBER	TEST OR PRICE IDENTIFY NO.	HEAT TREAT	SIZE	DIP	TEMP °F	ENERGY				% BREAK				MILS LATERAL EXPANSION				
						1	2	3	AUG	1	2	3	AUG	1	2	3	AUG	

DATE: 38798
61305
11/13/96



SAN DIEGO WELDERS SUPPLY INC

EL CAJON VALLEY WELDERS SUPPLY

2506 Market Street
San Diego, CA 92102
(619) 239-7571
FAX (619) 239-0529

2446 Main Street
Chula Vista, CA 91911
(619) 423-9911
FAX (619) 423-6159

2051 Vineyard Avenue
Escondido, CA 92029
(619) 432-0445
FAX (619) 432-8223

1180 N. Marshall Ave.
El Cajon, CA 92020
(619) 562-1300
FAX (619) 562-9975

ACCOUNTING AND CREDIT FAX FOR ALL LOCATIONS (619) 239-0620

CERTIFICATIONS

COMPANY NAME: HYSpan INC
P.O.#: 61129
INV#: 59996
DATE: 10-29-96

TYPE: 308L
SIZE: 1/16
WEIGHT: 20
HEAT#: AT6834

TYPICAL CHEMICAL PROPERTIES

C 0.024
Si 0.38
Mn 1.80
P 0.019
S 0.001
Cr 19.72
Ni 9.63
Mo 0.07
Cu 0.09

SPECIFICATIONS

AWS/ASME SFA 5.9, CLASS 308L

We hereby certify that the above product meets the listed specifications.

Mary Mc Mahon
San Diego Welders Supply

V0494A3-01-01



SAN DIEGO WELDERS SUPPLY ^{INC}

EL CAJON VALLEY WELDERS SUPPLY

2506 Market Street
San Diego, CA 92102
(619) 239-7571
FAX (619) 239-0529

2446 Main Street
Chula Vista, CA 91911
(619) 423-9911
FAX (619) 423-6159

2051 Vineyard Avenue
Escondido, CA 92029
(619) 432-0445
FAX (619) 432-8223

1180 N. Marshall Ave.
El Cajon, CA 92020
(619) 562-1300
FAX (619) 562-9975

ACCOUNTING AND CREDIT FAX FOR ALL LOCATIONS (619) 239-0620

CERTIFICATIONS

COMPANY NAME: HYSpan INC
P.O.#: 61129
INV#: 59996 A
DATE: 10-31-96

TYPE: 308L
SIZE: 045
WEIGHT: 75
HEAT#: S28708-S4
-

TYPICAL CHEMICAL PROPERTIES

C	0.024
Si	0.38
Mn	1.80
P	0.019
S	0.001
Cr	19.72
Ni	9.63
Mo	0.07
Cu	0.09

SPECIFICATIONS

AWS/ASME SFA 5.9, CLASS 308L

We hereby certify that the above product meets the listed specifications.

Mary McMahon

San Diego Welders Supply



TEST CERTIFICATE
Certy. No. 175503

F.O. SHEPHERD
Sheffield
S9 1TR

1 44 (0)114 244 3311 1 44 (0)114 244 8200 547025 VO 93-PI-01

EN 10204 3.18

To:
AVESTA SHEFFIELD INC
425 NORTH HARTINGDALE SUITE 2000
SCHALMURG
ILLINOIS 60173
U.S.A
F.A.D. KEITH HOOD

Cons./Inv. No. 175/04392/05



21/05/96 Date

Customer Order No.
9102376

Specification
ASTM A240-95 304 UNS30400
00-S-7660 FEB 5 1988
AMS 5513F 6/15/53
NIL-S-50590 30/5/83

Supply Condition
Cold Rolled Softened Descaled and Pinch Passed

Quality confirmed by spectroscopic examination Test Position: f=front, B=Back Orientation: L=transverse, L=Longitudinal El codes: 1=50mm, 2=65mm, 3=50mm, 4=80mm, 5=35mm, 6=25mm

Folio	Cest. No.	Material Description	Temp C	Coil No./ Plate No.	Final Surfs		Tensile Strength PSI	Elong %	RA/RAV	Band Test	I/C Test	Impact Test	ft. lbs. J
					0.2% PSI	1.0% MPa/MPa							
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	14320/1	BT 45385 FT 36975	52345 44370	89175 86855	52 (5) 57 (5)	63.5 155 58.6 144	OK OK	OK OK		
<p>MATERIAL TESTED TO ASTM A240 CONFORMS TO LATEST REVISIONS OF ASTM A480/ASME SA240/480 Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds by Avesta Sheffield. (11/mm sq = 145.04 PSI)</p>					<p>Material inspected and tested to ASTM A240 latest revisions of ASTM A480 and ASME SA20/SA480 (N/mm sq. = 145.0 PSI) Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds. Solution annealed by heating to 1900 deg f (1040 (2000 deg f min.) "NO WELD REPAIR"</p>								

Rockwell Test 110, 21.201301, 0.3071, 201151, 40.38 INTERCRYSTALLINE CORROSION TEST TO ASTM A262 (1993) PRACTICE E SATISFACTORY

Avesta Sheffield Ltd
LRQA Approval Numbers



940258
940175

Cest No.	C	SI	Mn	P	S	Cr	Mo	Ni	Ti	Nb	Co	N	
C2004	.021	.39	1.38	.020	.001	18.15	.24	9.08				.019	Cu .27

Witnessed _____ Inspecting Authority _____ Signed for Avesta Sheffield Ltd
M de Jong
M de Jong, Chief Inspector

We certify that the above material has been tested in accordance with the order and specification and that the results comply with the requirement of the order and specification. (Note that where more than one specification is involved, only the mechanical properties and cast chemical composition are certified to the requirements of each individual specification.)

VINCENT METAL GOODS
SANTA FE SPRINGS
CUSTOMER: H-15894
ORDER NO: 60306
DATE: 25-03-15

6111

V0494A3-01

OREGON STEEL MILLS

P.O. BOX 2750, Portland, Oregon 97208 • (503) 286-8851 Fax (503) 240-8288

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO. 421480P	DATE Oct 14, 1996	PAGE 1
MI L ORDER NO. 69010	DATE	
CUSTOMER ORDER NO. 59471		
JOB/REQ NO.		
SHIPPING NO. 421480	DATE 10/16/1996	
CARRIER WESTERN STATES TRUCK		
CAR/TRUCK NO. 459		



GARY STEEL COMPANY-LONG BEACH
PO BOX 1607
LONG BEACH, CA 90801

GARY STEEL COMPANY-LONG BEACH
PO BOX 1607
LONG BEACH, CA 90801

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS
OSM HSLA STRUCTURAL QUALITY PLATE ASTM A508-94 GRADE A ASTM A242-93A TYPE 1 ASTM A709-94A GR 50W TYPE A.

PHYSICAL PROPERTIES

QSA (HEAT NO)	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI X 100	TENSILE PSI X 100	% ELONG 1" 2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
1	0.2500 X 96.000 X 180.000 4 PCS 13068 LBS	380181	✓	570 645	750 780	23 24				
	4 PCS 13068 LBS TOTALS									

APPROVED: _____ DATE: _____
 PACKING SLIP# 37756
 CUST PO# 61143
 DATE SHIPPED 10.31.96

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Co	Al	Cr	Mo	Ti	B	Nb	Ca	CE	U.S. Steel Cert. No.
+380181	.10	.86	.006	.009	.37	.26	.10	.028	1.008	.027	.45	.03						
ALL HEATS INDICATED WITH (+) WERE MELTED AND MANUFACTURED IN THE USA.																		
..... END OF REPORT																		

I certify the above to be correct as contained in the records of OREGON STEEL MILLS By Susan M. Yenne Q.C. RECORDS ADMINISTRATOR
 SUSAN M. YENNE

0002/002
 GARY STEEL-L.B.
 USE-IECR SVC-PDZ
 08-04
 10/15/96

60095

V0494 P1-01

JB 0051 104
APPROVAL

Allegheny Ludlum
Jesop Specialty Products
CALIFORNIA DIVISION

871360

SALES ORDER

AGE	OF	DATE ENTER	SALESMAN NO.	INVT.	DEPT.	TAX	CUST. ORD. DATE	REQ. DATE	SALES ORDER NO.
L	1	07/12/94	505 000	02	70	N	07/12/94		05-055345
S O L D T O	9658300 REYNOLDS ALUMINUM SUPPLY ATTN: ACCOUNTS PAYABLE P O BOX 26895 RICHMOND VA			S H I P T O	135 REYNOLDS ALUMINUM SUPPLY 6446 E WASHINGTON BLVD CITY OF COMMERCE CA			ROUTING	CHI WILL CALL
	3326100				90040			F.O.B. SHIPPING	SANTA FE SPRINGS C
								CUST. ORDER NO.	0909121

EST. (OPI)
SPEC
COMMENT

HEAT NO. 871360

SIZE & DESCRIPTION 3/8 T304

MILL Allegheny Ludlum Corporation
SOURCE Jesop Specialty Products

EXCEPT AS OTHERWISE NOTED, THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH THE LISTED SPECIFICATIONS AND RESULTS CONFORM TO THE SPECIFICATION AND ORDER REQUIREMENTS.

Allegheny Ludlum

Jesop Specialty Products
500 Green Street
Washington, PA 15301
8111 LOS ANGELES WAREHOUSE
To ALLEGHENY LUDLUM CORP
14420 SOUTH MARQUARDT AVE
SANTA FE SPRINGS CA 90670

CERTIFIED MATERIAL
TEST REPORT

OUR ORDER NO. PP6357120
YOUR ORDER NO. 2851
MEMO NO. 116805
DATE 07/03/94
SALESMAN NO. 099
H. J. O'Donnor
AUTHORIZED SIGNATURE

JESOP T 304 STAINLESS HRAP
AMS-3513F; ASTM A167-91; ASTM A240-95b; ASME SA-240-A95;
ASTM A242-93a PRACTICE A1;

Heat	Slip	Lot No	Size	Pcs	Weight
871360	26716 AB	10412	.3750 x 96.0000 x 252.0000	1	2771
871360	26716 AA	10421	.3750 x 96.0000 x 252.7500	1	2780
871360	26717 BB	10412	.3750 x 96.0000 x 240.0000	1	2639
871360	26717 CA	10412	.3750 x 96.0000 x 244.0000	1	2903
871360	26717 CB	10412	.3750 x 96.0000 x 245.7500	1	2703

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
871360	.054	1.75	.025	.0008	.41	8.27	18.30	.28	.15	.28	.088

Lot No	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grain Size
10412	.3750	51.3 KSI	90.2 KSI	58.9	74.2	BHN179	OK	OK	
10421	.3750	47.8 KSI	90.1 KSI	58.6	74.1	BHN179	OK	OK	
10412	.3750	51.3 KSI	90.2 KSI	58.9	74.2	BHN179	OK	OK	

MATERIAL WAS NOT WELD REPAIRED

MASS SPECTROMETER TEST REPORT

Fig. -1

V0494A3 - P1 - 01

CUSTOMER: Process Systems International, Inc.				
Sales Order No.: 70904 Item: 2		Drawing No.:		
Equipment: DuPont 120 SSA		Leak Standard. Sn. 1051		
Test Procedure per ASTM E-498		Test Area: Bellows and weld ends		
PSI Part No.:				
Sn.	Leak Rate - Std. cm ³ /s.	Time	Date	Inspector
001	1x10 ⁻⁹	1330	12/3/86	<i>[Signature]</i> 12

The above referenced expansion joint has passed the mass spectrometer leak test to the required sensitivity.

Material HT#		
Bellows	Tagged weld end	Untagged weld end
A 4092	30841-1A	30841-1A

Inspector *[Signature]* HYSP
12 Level II Date 12/3/86

Material Tracer Record

Part Number WA 3 S/N 01

Page 2

Item #	Qty	U/M	Part code	Description	C of C MIC # CMTR
1	1	EA	V0494081	48-1/4 ID FL'G GROOVED & SLOTTED	A 607
2	1	EA	V0494070	48.81 ID X 68-1/4 OD FLANGE FLAT FACED	A 703
5	1	EA	V0494A3P1	BELLOWS ASSY 48.25 ID MAKE FROM V049M163 1 PER SPEC V049-2-017 & DWG V049-4-A3	HYSpan DOC 53142 S/N 001
10	54	EA	202678 3	BOLT STL SA193 B7 COFC HEX HD 7/8-9 UNC X 4 LG ZINC PLATED .0002 MIN THK.CLEAR CHROMATE PROCESS	C of C
11	54	EA	202679 3	NUT STL SA194 2H COFC HEX HD 7/8- 9 UNC ZINC PLATED .0002 MIN THK CLEAR CHROMATE PROCESS	C of C
12	162	EA	202581 3	WASHER STL ASTM F436 COFC 1-3/4 ODX15/16 IDX1/4 THK ELECTROLESS NICKEL PLATED	C of C
13	1	EA	V049M024	O'RING VITON A500 BAKED .275 NOM X 162.5 LG VULCANIZED	C of C
14	1	EA	V049M025	O'RING VITON A500 BAKED .275 NOM X 153.125 LG VULCANIZED	C of C
15	1	EA	V0494061	ELBOW SST304L COFC 3/4 ODX 2 3/4 OD CONFLAT DWG SIZE: B	C of C



Avesta Sheffield East
 P.O. Box 1975
 Baltimore, MD 21203 U.S.A.

Mill Sheet: 1996/04/02

To: Avesta Sheffield Trading Company
 425 N. Martingale Road, Suite 2000
 Schaumburg, IL 60173-2218

PROCESS SYSTEMS INT'L., INC.
 Reviewed this report and it complies
 with SAISE-240 Gr. 304/304L
93 Edition, Addenda

Customer: G.O. Carlson
 Your Order: 97877T (Our Ref# 81964)

By C. Wataieki Date 9-28-96

Specification:

Heat No.: 39240 (G.O. Carlson Ht # 6X142)

Steel Grade: 304L to 304L CC-B.7
 Product: Slabs 5.25" x 50.00" x RDM

Slabs no:	Length(in)	Width(in)	Thickness(in)	Weight(lbs)
3924-1	302.50"	50.00"	5.25"	22550
3924-2	300.50"	50.00"	5.25"	22460
3924-3	301.00"	50.00"	5.25"	22610
3924-4	301.50"	50.00"	5.25"	22870
3924-5	300.50"	50.00"	5.25"	22100
Total Pieces:	5		Total Weight:	112590 lbs

Chemical Composition %

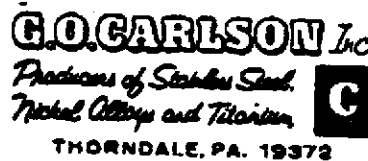
C ✓	Si ✓	Mn ✓	P ✓	S ✓	Cr ✓	Ni ✓	Mo
.011	.40	1.77	.029	.003	18.36	8.99	0.46
Ti	Cb	Cu	Co	N ✓	Sn	Ta	Ca
.010	0.010	.57	.11	.06 ✓	.016		
V	Al	Pb	Ca	B	As	Fer No.	
	.002	.001					

These slabs have not been weld repaired.

These slabs are free of mercury contamination

Knowingly and willingly falsifying or concealing a material fact on this or making false, fictitious or fraudulent statements or representations herein could constitute a felony punishable under Federal statutes.

Jane E. Dwyer
 Authorized Signature



A 713

DATE: 20-Sep-96

GOC: 90473

T E S T C E R T I F I C A T E

*** SOLD TO: ***

*** SHIP TO: ***

PROCESS SYSTEMS INTERNATI
20 WALKUP DRIVE

PROCESS SYSTEMS INT'L
20 WALKUP DRIVE
WESTBOROUGH MA 01581

WESTBOROUGH MA 01581

CUSTOMER ORDER #
555559

CUSTOMER MARK #

 304L BB HOT ROLLED; ANNEALED; DESCALED
 UNS S30403/UNS S30400; TYPE 304L/304 PLATE
 ASTM A240-95a; ASME SA240, ASME B&PV CODE SECTION II, 1995 EDITION,
 1995 ADDENDA; GENERAL REQUIREMENTS TO ASTM/ASME A/SA480.

ITEM	DESCRIPTION	MARK: 555559/PT. V049M251-1
1	1.25 x 44.900 ID x 80.30 OD	

No Welding Performed

ITEM	DESCRIPTION	MARK: 555559/PT. V049M252-1
1	1.25 x 48.5 ID x 68.5 OD	

Qty Heat-Slab

320	3 6X142-1D	Test Dir TT	Yield-.2% Tensile PSI 38000	Elong-2in % 53.32
	6X142-1D	Rock B 85		

The above material has been visually and dimensionally inspected and found to conform to the above referenced specifications.

It is hereby certified that all items furnished in this shipment are in full compliance with the purchase order and specification requirements. It is further certified that the test reports represent the actual attributes of the items furnished and are in full conformance with all applicable specifications and order requirements.

Melter's Ladle Analysis attached.



Tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS. INT'L
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 07/24/96

PCS SHIPPED: 12
09 OUR ORDER NO 432620505
SHIPLIST NO: 55097

PRODUCT

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 56.25" OD +.06 X 48.0" ID -.06 X 1.5" WD +.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

VO49M242-1

PSI MIC NO. A607

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE
WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with ASME-182 Gr. 304L
95 Edition, Addenda
By C. Notarick Date 9-12-96

CHEMICAL ANALYSIS

AT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI			
S09240	✓ .018	✓ .54	✓ .028	✓ 1.80	✓ .004	✓ 11.41	✓ 19.01							N .0630

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	.20XOFST	% ELONG	% RED AREA	I_M_P_A_C_T_D_A_T_A				
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
09240	6G1251A		+75		PROLONG	76.5	41.5		59.0	73.0					
09240	6G1251B														
09240	6G1251C														
09240	6G1251D														
09240	6G1252A														
09240	6G1252B														
09240	6G1252C														
09240	6G1252D														
09240	6G1253A														
09240	6G1253B														
09240	6G1253C														
09240	6G1253D														

Wald Wire

C of C'S



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

T0065-R/774/0500

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEMS*

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: *180 LBS*

WORK ORDER / LOT NO.:

TAG:

ANSI A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: *1/8"*

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
<i>S 713906</i>	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]

(66119)(10)

5



Make Quality happen

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

DESTINATION: **BOC GASES (AIRCO)
LISLE IL**

SHIP TO: **70065-R/774101500
PROCESS SYSTEMS**

FORMER PURCHASE ORDER NO.:

CERTIFICATE DATE: ~~8/8~~

NDVIK ORDER NO.: **16249**

QUANTITY: **180LB**

WORK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: **3/32"**

Filler Metal Analysis, %

Element	Si	Mn	P	S	Cr	Ni	
Heat 5440928 C	.021	.470	1.800	.014	.013	20.00	9.68
Element	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.020			.002	.040	.030	.053



The material has not come in contact with mercury or mercury-containing compounds.

Material not touched by hand after final production process cleaning.

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC 19002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

with M. Kottler, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
5(66119)(10)

SANDVIK

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220 SCRANTON, PA. 18501 P (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WATERLY EXIT 59

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 47910

CERTIFICATE DATE: 7/14/97

SANDVIK ORDER NO.: 16249

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 980309

AWS A 5 9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S713039	.013	.380	1.800	.015	.013	20.06	9.84
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.100			.002	.070	.030	.044



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYS

120 LBS

70040-R / 77410500

Keith M. Kettle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

56 lbs

XJK 8115-02

KOBELCO

04/09/1997 15:57 7139746424

PURCHASER
 PO 70040-R/774101500
 PROCESS SYSTEMS

INSPECTION CERTIFICATE
 FLUX CORED WIRE

CERTIFICATE NO.: A 017

DATE OF ISSUE : 1997.01.28

TRADE DESIGNATION	DIMENSION (mm)	WPG. NO.	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-308L	0.9	B6M1085	AWS A5.22 E308LT0-1 ASME SPA-5.22 E308LT-1

56 lbs

CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	TI	PN	FS	PHV
DEPOSITED METAL	0.034	0.39	1.22	0.028	0.008	0.05	0.73	18.91	0.11	0.01	0.041	6.0	6.3	6.0
ELEMENTS														

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		VICKERS HARDNESS (AVG.)
- N/mm ²	- N/mm ²	584 N/mm ²	52 %	- °C	AVG.		-
- kgf/mm ²	- kgf/mm ²	59.6 kgf/mm ²			- J		
					- kgf.m		

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2		
AMPERAGE	110 A				
ARC VOLTAGE	25 V			- °C x	- h

FS = FERRITE (SCHAEFFLER DIAGR.)
 FN = FERRITE (DELONG DIAGRAM)
 PHV = FERRITE (VRC)

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREBIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

KOBE STEEL, LTD.
 WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR 

KOBELCO PAGE 14

BOC GASES

KOBELCO

90 RESEARCH ROAD

HINGHAM, MA 02043

PO# 70040-R / 774101500

PROCESS SYSTEMS

INSPECTION CERTIFICATE

FLUX CORED WIRE

CERTIFICATE NO.: A 002

DATE OF ISSUE : 1997.01.07

TRADE DESIGNATION	DIMENSION (mm)	WPG. NO.	PSI OC CW	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	0.9	B6M1015		AWS A5.22 E309LT0-1 ASME SPA-5.22 E309LT-1

ELEMENTS	CHEMICAL COMPOSITION (%)							PHYSICAL PROPERTIES						
	C	SI	MN	P	S	CU	NI	CR	MO	HB	H	PH	FS	PHU
DEPOSITED METAL	0.026	0.43	1.10	0.022	0.012	0.04	12.75	22.56	0.04	0.02	0.017	15.0	8.7	12.0
ELEMENTS														

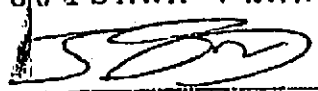
TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST	
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		VICKERS HARDNESS (AVG.)	
- N/mm ²	- N/mm ²	540 N/mm ²	40 %	- °C	AVG.			
- kgf/mm ²	- kgf/mm ²	55.1 kgf/mm ²			- J	- kgf.m		

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE (SCHAEFFLER DIAGRAM) PH = PERLITE (DELONG DIAGRAM) PHU = FERRITE (VRC)
TYPE OF CURRENT	DCRP	SHIELDING GAS	CO ₂		
AMPERAGE	110	A			
ARC VOLTAGE	25	V		- °C	

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HERETH AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBE STEEL, LTD.
WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR



97#01R14B (K) 19:12 宛先 K W A I
 東京 住友金属工業株式会社 (株) 海外部 P08/19

04/09/1997 15:57 7139748424 KOBELCO PAGE 11



Welding Quality Happens

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO:

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712976	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan (signature)
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

PROCESS SYSTEMS
120 LBS 308L 3/32
70040-R/774101500



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S 711088	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
120 LBS 308L 1/8
70040-R/774101500

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

15(66119)(10)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEMS INTL*
7-8-97

CUSTOMER PURCHASE ORDER NO.: *70038-R/774101500*

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

.035

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: ~~3/32~~ *120 LE*

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
<i>3713617</i>	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086
 SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

PROCESS SYSTEMS INTL
 P.O. 70038R/7741000

JGP ISSUE DATE: 08-30-96

DATE SENT 6-27-97

HEAT NUMBER/LOT NUMBER: 61202878W3-60LB
 E50836-K1-20LB

CHEMICAL COMPOSITION LIMITS

ALLOY: 308L
 SPEC: AWS A5.9-93 ER308L

CARBON		.030	SILICON	.300	.650
MANGANESE	1.000	- 2.500	PHOSPHORUS		.030
SULFUR		.030	CHROMIUM	19.500	- 22.000
NICKEL	9.000	- 11.000	MOLYBDENUM		.750
TANTALUM		.500	CB + TA		.500
TITANIUM		.500	COPPER		.750
NITROGEN		.500	COBALT		.500
MAGNESIUM		.500	OTHER		.5
NIObIUM		.500			

PSI
 OC
 CW

7-7-97

PSI
 OC
 CW

7-7-97

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY BRITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

Janice Pittman
 CERTIFICATION CLERK

THE ESAB GROUP, INC.
1500 Karen Lane, Hanover, PA 17331

CERTIFICATE OF TYPICAL ANALYSIS

11/19/96 PROCESS SYSTEMS INTL

BOC GASES
70 RESEARCH ROAD
HINGHAM, MA 02043

7-14-97 Order No.: 700381/7741000

This Material Conforms to Specification:
AWS A5.20-95, ASME SFA 5.20

Trade Name
or Trademark: Dual Shield II 70 Ultra

Diameter Size: .035" x 33# Spool

Type: E71T-1* / E71T-12M

Weight: 132 LB

X-Rays Satisfactory

Lot Number: 49455 - 66 LB ✓
49720 - 33 LB ✓
50293 - 33 LB ✓



Typical Mechanical Properties

Typical Chemical Properties	(Specification Requirements)
Carbon: .02	(.15 Max.)
Manganese: 1.10	(1.60 Max.)
Chromium: .04	(.20 Max.)
Nickel: .01	(.50 Max.)
Silicon: .34	(.90 Max.)
Niobium+:	
Tantalum:	
Molybdenum: .01	(.30 Max.)
Tungsten:	
Copper: .01	(.35 Max.)
Titanium:	
Phosphorus: .013	(.03 Max.)
Sulphur: .010	(.03 Max.)
Vanadium: .02	(.08 Max.)

	As Welded	MPa
Yield Strength (Psi)	70,000	483
Tensile Strength (Psi)	76,800	530
Elongation (2"), %	32.0	
Red. of Area, %	74.6	
Charpy V-Notch Impacts		
@ -20°F. (ft.-lbs.)	117	
@ -29°C. (Joules)	159	

(Specification Requirements)

Minimum Unless Otherwise Stated	As Welded	MPa
Yield Strength (Psi)	58,000	400
Tensile Strength (Psi)	70-90,000	480-620
Elongation (2"), %	22.0	22
Red. of Area, %		
Charpy V-Notch Impacts		
@ -20°F. (ft.-lbs.)	20	
@ -29°C. (Joules)	27	

Hydrogen: 4.2 ml/100 gr. of weld metal

Fillets: Vertical-Up/Overhead

Shielding Gas: 75% AR/ 25% CO₂

* No data being issued for E71T-1 classification using the CO₂ shielding gas.

The undersigned certifies that the product supplied will meet the requirements of the applicable AWS Filler Metal Specification when tested in accordance with that specification, and that no significant change has been made in the elements described in the qualification approval.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

By: D. A. Smith
D. A. Smith, Supervisor, Q. A. Services



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: *PROCESS SYS*

SHIP TO:

CUSTOMER PURCHASE ORDER NO: *70029R/774101500*

CERTIFICATE DATE: 4/25/97

SANDVIK ORDER NO.

QUANTITY: *120 LBS*

DRK ORDER/LOT NO.: 978457

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712976	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb-Ta	N
	.070			.002	.060	.030	.035

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan lcp
15(66119)(10)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen

SOLD TO: *PROCESS SYSTEMS*

SHIP TO:

AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *70029R/774101500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY:

WORK ORDER / LOT NO.: *976164*

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Ch/Nb	Ta	Ti	Cu	Ch/Nb-Ta	N
	.010			.002	.030	.030	.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.


Keith M. Bottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan/CP
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 70031R/774101500

4/11

PURCHASER PROCESS SYSTEMS INTL		INSPECTION CERTIFICATE FLUX CORED WIRE				CERTIFICATE No: 0 021				DATE OF ISSUE: 1997.04.24				
TRADE DESIGNATION	DIMENSION (mm)	MFG. NO		APPLICABLE SPECIFICATION AND CLASSIFICATION		AWS A5.22-96 E309LT0-1		ASME SFA-5.22 E309LT		(1995 Edition)				
DW-309L	1.2	B6F2110382		PSI DC CW										
CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6
TENSILE TEST OF DEPOSITED METAL							IMPACT TEST OF DEPOSITED METAL					HARDNESS TEST		
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH		ELONGATION		TEST TEMP.	ABSORBED ENERGY							
- N/mm ²	- N/mm ²	555 N/mm ²		37 %		- °C	AVG.	-			-			
- MPa	- MPa	555 MPa					+ J							
							- kgf·m							
WELDING CONDITIONS							POSTWELD HEAT TREATMENT					FS = FERRITE(SCHAEFFLER DIAGRAM) FN = FERRITE(DELONG DIAGRAM) WRC = FERRITE(WRC)		
TYPE OF CURRENT	DCEP	SHIELDING GAS		CO2										
AMPERAGE	200 A													
ARC VOLTAGE	29 V					- °C x - h								
WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.							◆ KOBEL STEEL, LTD WELDING DIV. FUJISAMA PLANT							
							CHIEF INSPECTOR 							

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



We make Quality happen ...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 48184

CERTIFICATE DATE: 6/10/97

SANDVIK ORDER NO.: 17126

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 979336

TAG: 848523-01

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308LSI

DIAMETER: .035"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S712152 - 60LB	.014	.840	1.700	.016	.013	19.50	10.23
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.030			.002	.040	.020	.042



Process Systems Intl
PO 70031R/77410/500

The material has not come in contact with mercury or mercury-containing compounds.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy

90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 170031R/1774101500

6-13-97

4/11

KOBE

PURCHASER PROCESS SYSTEMS INT'L	INSPECTION CERTIFICATE FLUX CORED WIRE	CERTIFICATE No: D 021 DATE OF ISSUE: 1997.04.24
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TRADE DESIGNATION	DIMENSION (mm)	MFG. NO	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	.035 84LB	B6M1015	AWS A5.22-95 E309LTO-1 ASME SFA-5.22 E309LT- (1995 Edition)



CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FHW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST
WELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		—
					AVG.	—	
	N/mm ²	— N/mm ²	555 N/mm ²	37 %	— °C	— J	—
	MPa	— MPa	555 MPa			— kgf·m	

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE(SCHAEFFLER DIAGRAM) FN = FERRITE(DELONG DIAGRAM) WRC = FERRITE(WRC)
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2		
AMPERAGE	200 A			— °C x — h	
VOLTAGE	29 V				

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBE STEEL, LTD
WELDING DIV. FUJISAMA PLANT

CHIEF INSPECTOR

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



SERVING NEW ENGLAND

DELIVERY COPY

NORTHEAST AIR

PICKING TICKET

Sold By: AIRGAS NORTHEAST
199 SOUTHWEST CUT OFF
WORCESTER, MA 01609
800-821-9852

Cost # : 72600

Ship To: PROCESS SYSTEMS INTERN'T.
20 WALKUP DR
WESTBURY MA 01581-0000

Order # : 306626-0

Order Date: 04/22/97

Page : 001 OF

NAME : PROCESS SYSTEMS TER: 142 SHIP VIA: LOST PICKUP -NOPE- INITIALS: REP
PO # : 70024R JUNE7/4-1915 SLS: 0 SHIP LOG: 00 USE: 0 DRG TYPE: DRG5-07
SELT : BBN: 10 COUNTRY: FOREIGN CODE : 28-APR-97 12:
PHONE#: 508-898-0285 SOURCE # : LFI :

QTY UNIT NO DESCRIPTION LBS LBS LBS QTY QTY XIF WT UNIT LB
SHIP HAZARD CLASS NO NUMBER ORDER BRND LUL AROUNG A

Table with 2 rows of material data: 120 LB 5183 3/32X36 ALUMINA, 120 LB 5183 1/8X36 ALUM. Includes total weight of 240.0 and a 'SHIP COMPLETE' note.



This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Authorized Signature _____

Received by [Signature]

AlcoTecA Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology CorporationAlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/08/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363072

P.O.# - 86207

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

PSI
QC
CN

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. Swann (JL)



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

3/32

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

04/23/97

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.094	TIG Rod Box	363348

P.O.# - 105019



*Tony took
1 box of 10
to TIF sawmill
ab
4/29/97*

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

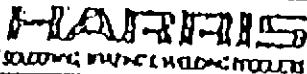
AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

[Signature]

V.P. - Quality Control



J. W. HARRIS CO., INC. | 10939 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Conformance

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
POB

Shipped To: Process Systems
PO 70015R

Date _____
Date Shipped _____
Order No. _____

Item	Weight	Size	Alloy	Heat No.
1.	100 LBS	1/16 x 36	ALUM	0294
2.				
3.				



Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	A95 A510-00, ASME SFA 5.10		OO-R-5660 Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elem Each
	ER	R										
1100 Aluminum (B)	ER1100	R1100	1100	0.05	0.05	0.05-0.20	0.05					0.05
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.05					0.05
4043 Aluminum	ER4043	R4043	4043	4.5-5.0	0.0	0.20	0.05	0.02		0.10-0.20	0.10-0.20	0.05
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.05		0.10	0.20	0.05
5103 Aluminum	ER5103	R5103	5103	0.40	0.40	0.10	0.05	0.10				0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.30	0.10	0.05	4.0-5.2	0.05-0.20		0.15	0.05
5554 Aluminum	ER5554	R5554	5554		0.40	0.10		4.5-5.5	0.05-0.20			0.05
5652 Aluminum	ER5652	R5652	5652		0.40	0.10		4.5-5.5	0.05-0.20			0.05
5654 Aluminum	ER5654	R5654	5654		0.40	0.10		4.5-5.5	0.05-0.20			0.05

- NOTES:
1. All values shown are maximum percentages unless otherwise indicated.
 2. Elements shall not exceed 0.0009 percent.
 - A. Silicon plus iron shall not exceed 0.20 percent.
 - B. The aluminum content is the difference between the silicon and iron content, expressed as a percentage.
 - C. Vanadium content shall be 0.05-0.15 percent. Arsenium content shall be 0.10-0.25 percent.
 - D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance with applicable purchase specifications having passed our inspection as noted.

FORM 1: 6177490165
TO :
FORM P. 02/02

SANDVIK
Steel

We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 43594

CERTIFICATE DATE: 10/18/96

SANDVIK ORDER NO.: 94386

QUANTITY: PER PACKING NOTE

CRK ORDER / LOT NO.: 969410

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



J-12-97

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS

180 LBS

PO 70012R

Bengt H. Berg, Director, Quality and Metallurgy
 Daniel Dawlani, Quality Engineer

Daniel Dawlani
6119(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043 (2)



MATERIAL CERTIFIC

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen . . .

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBORO MA

CUSTOMER PURCHASE ORDER NO.: 41276

CERTIFICATE DATE: 8/26/96

SANDVIK ORDER NO.: 88712

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967451

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



10-7-96

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt E. Berg, Director, Quality and Metallurgy

15(66119)(10)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen

SOLD TO: BOC GASES

SHIP TO: PROCESS SYSTEMS
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603R/V59049045000

CERTIFICATE DATE: 6/18/96

SANDVIK ORDER NO.: TK # 591854

QUANTITY: 60 LBS 308L x 36

WORK ORDER / LOT NO.: 965227

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
S709276	.019	.430	1.800	.018	.012	19.92	9.82	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
		.080			.002	.130	.030	.045



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

2



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...



**90 RESEARCH ROAD
HINGHAM, MA 02043**

SOLD TO:

SHIP TO:

PROCESS SYSTEMS INTL
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603r/V59049045000
TK 591854-02

CERTIFICATE DATE: 6/17/96

SANDVIK ORDER NO.:

QUANTITY: 120 LBS er308 1/16 x 36

WORK ORDER/LOT NO.: 965225

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S708727	.014	.390	1.800	.016	.012	20.20	9.87
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.003	.040	.030	.060



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO) LISLE IL
 SHIP TO: AIRCO-NEW ENGLAND HINGHAM MA
 Process systems intl
 westboro, Ma. CERTIFICATE DATE: 9/27/96

CUSTOMER PURCHASE ORDER NO.: 42100
 SANDVIK ORDER NO.: 90814 PO-700627-V59049-041 QUANTITY: PER PACKING NOTE
 WORK ORDER / LOT NO.: 968845 TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

15(66119)(10)

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967820

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

PSI
QC
CW

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
700627-R/V 59049-044
TK 693421

Bengt H. Berg, Director, Quality and Metallurgy

240 LB

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

2



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: **BOC GASES (AIRCO)
LISLE IL**

SHIP TO: **AIRCO-NEW ENGLAND
HINGHAM MA**

CUSTOMER PURCHASE ORDER NO.: **42100**

CERTIFICATE DATE: **9/04/96**

SANDVIK ORDER NO.: **90816**

QUANTITY: **PER PACKING NOTE**

WORK ORDER / LOT NO.: **967818**

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

*PROCESS SYSTEMS
700627-R/V59049-042
TK 693415
50 LB.*

Bengt H. Berg, Director, Quality and Metallurgy

5(56119)(10)

BOC GASES
HINGHAM ROAD
HINGHAM MA 02043





MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: process systems

CUSTOMER PURCHASE ORDER NO.: 693415

CERTIFICATE DATE: 10/03/96

SANDVIK ORDER NO.:

QUANTITY: 60 lbs

WORK ORDER / LOT NO.: 700627-r/v59049-042

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.



RESEARCH ROAD
HINGHAM, MA 02043

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]
15(661)(9)(10)

5

2



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/09/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.: 967819

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
700627-R/V59049-04
TK 693420
240 LB.

Bengt E. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
50 RESEARCH ROAD
HINGHAM, MA 02043



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax

05/07/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	362769

P.O.# - 72454

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Ba	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

Lance L. DeWann
Control

[Signature]
Certifying Signature



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Compl

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PQ#

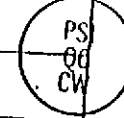
Shipped To: PROCESS SYSTEMS INTL
WEST BORO MA.

Date 10-17-96
Date Shipped 10-18-96
Order No. 712222

Item	Weight	Size	Alloy	Heat No.
1.	9LB	5/32 x 36	ALUM	AA1005183D
2.	10LB	5/32 x 36	ALUM	7295
3.				

Comments:

P.O. 700643-R/V5904904302



Alloy	AWS A510-88 ASME SFA.5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element		
	ER	R												
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05							
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.8-6.8	0.20-0.40			0.10			0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05			0.10	0.10-0.20		0.05	
718 Aluminum	ER4047	R4047	4047	11.0-13.0	0.8	0.30	0.15			0.10	0.20		0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	0.10		0.20			0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.3-5.2	0.05-0.25	0.25	0.15		0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	4.5-5.5	0.05-0.20	0.10	0.06-0.20		0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20		0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20		0.05	
							0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15		0.05	

- NOTES:
- Single values shown are maximum percentages, except where a minimum is specified.
 - Beryllium shall not exceed 0.0008 percent, all alloys.
 - A Silicon plus iron shall not exceed 0.95 percent.
 - The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
 - Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
 - Silicon plus iron shall not exceed 0.45 percent.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

30



HARRIS
SOLUTIONS IN WELDING & WELDING MODELS

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Compl

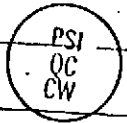
Sold To:
AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: **PROCESS SYSTEMS INTL**
PO 700643R/V59049043000

Date _____
Date Shipped 10-25-96
Order No. 713960-01

Item	Weight	Size	Alloy	Heat No.
1.	50LB	5/32	ALUM	0233
2.				
3.				

Comments:
BOC
90 RESEARCH
HINGHAM, MA 02043



Alloy	AWS A510-00 ASME SFA 5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element	
	ER	R										Each	Ti
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.8-6.8	0.20-0.40			0.10		0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.02		0.10	0.10-0.20	0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.05	0.05		0.10	0.20	0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.15	0.10		0.20		0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05	
						0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05	

- NOTES:
1. Single values shown are maximum percentages, except where a minimum is specified.
 2. Beryllium shall not exceed 0.0000 percent, all alloys.
 - A. Silicon plus iron shall not exceed 0.95 percent.
 - D. the aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
 - C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
 - D. Silicon plus iron shall not exceed 0.45 percent.

(3)



HARRIS
SPECIALTY WELDING PRODUCTS

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Con

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: PROCESS SYSTEMS
700643-R/V5904904300

Date 10-31-96
Date Shipped _____
Order No. 712225

Item	Weight	Size	Alloy	Heat No.
1.	50	5/32	ALUM	96248
2.				
3.				

Comments:

PSI
QC
CW

Alloy	A95 A.510-00 ASME SFA.5.10		QQ-R-566B r. Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Ele
	ER	R										
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10		0.05
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.10-0.20	0.05
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20	0.05
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	0.10		0.20		0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.3-5.2	0.05-0.25	0.25	0.15	0.05
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05
							0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0008 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- B. The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent, Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed are as specified.

1996.10-31 04:01 #926 P.02/02
5038705930
HINGHAM TO
FROM : AIRCO/BOC GASES



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/13/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86330

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40 ✓
Fe	---	0.40 ✓
Cu	---	0.10 ✓
Mn	0.50	1.0 ✓
Mg	4.3	5.2 ✓
Cr	0.05	0.25 ✓
Zn	---	0.25 ✓
Ti	---	0.15 ✓
Be	---	0.0008 ✓
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order. All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. Duran

V.P. - Quality Control

35



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/11/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86300

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Pb	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James J. Swann

V.P. - Quality Control



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

CUSTOMER PURCHASE ORDER NO.: 700650-R/VS904904500

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: 60 LB

WORK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %



Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
RESEARCH AND
HINGHAM, MA 02043

35

SANDVIK
Steel

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA 18501 PH (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEM*

CUSTOMER PURCHASE ORDER NO.: *700650-R/15904904500*

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: *18 LB*

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"



Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

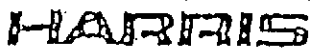
Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]
15(66119)(10)

BOC GASES
RESEARCH ROAD
BIRMINGHAM, MA 02043



**HARRIS**

SOLDING BRUING & WELDING TOOLS

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Com
Certificate of Comp

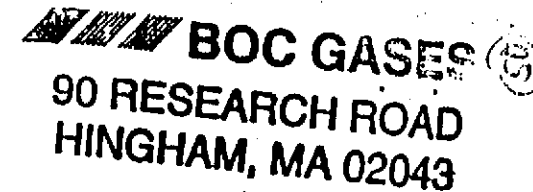
Date _____

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043Shipped To: *Process Systems Intl*
*PO 70015R/7741000*Date Shipped *3-28-97*Order No. *797282*

P.O. No. PO#

Item	Weight	Size	Alloy	Heat No.
1.	<i>40 LB</i>	<i>1/16 x 36</i>	<i>ALUM</i>	<i>0268</i>
2.				
3.				

Comments:

**BOC GASES**
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AAYS A-510-08 ASME SFA-5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements Each	
	ER	R											
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05			0.10		0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10	0.10-0.20	0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.20	0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.20		0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05	

NOTES:

1. Single values shown are maximum percentages, except where a minimum is specified.
2. Beryllium shall not exceed 0.0000 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- B. The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent, Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance
applicable purchase specifications having passed our _____ actions as not

HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

RML ISSUE DATE: 04-15-96

PROCESS SYSTEMS
PO 7001SR/7741000
10 LBS 4043 1/16 X 3/16

HEAT NUMBER/LOT NUMBER: 0243

CHEMICAL COMPOSITION LIMITS

ALLOY: 4043
SPEC: AWS A5.10R/ER4043/AMS 4190D
ASME 57A 5.10/QQ-R-566-B



SILICON	4.500	-	6.000	TITANIUM	.200
COPPER			.300	MAGNESIUM	.050
IRON			.800	ZINC	.100
BERYLLIUM			.0008	REMAINDER	ALUMINUM
OTHER			.15		

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY WHITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Rodney M. Pyle
CERTIFICATION CLERK

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



We make Quality happen

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *7005R/774101500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY: *180 LBS.*

WORK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan / c.p.
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: **BOC GASES (AIRCO)**
LISLE IL

SHIP TO: **AIRCO-NEW ENGLAND**
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: **42100**

CERTIFICATE DATE: **9/03/96**

SANDVIK ORDER NO.: **90816**



QUANTITY: **PER PACKING NOTE**

WORK ORDER/LOT NO.: **967819**

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER-308L DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
ST10846	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
70018R/774101500

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 46682

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 978457

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S712976 -60LB	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
4-28-97	.070			.002	.060	.030	.035

PSI
QC
CW

PROCESS SYSTEMS
P.O. 70018R/77410500
Shipped 4-25-97 ORDER # 805966-01

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

3
411



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBOTO MA

CUSTOMER PURCHASE ORDER NO.: 47334

CERTIFICATE DATE: 4/29/97

SANDVIK ORDER NO.: 14445

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 970470

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .035"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	010			002	030	030	055



The material has not come in contact with mercury or mercury-containing compounds.

Keith M. Kettle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

72



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49688 USA
(816) 941-4111 Phone
(816) 941-8154 Fax
alcotec@traverse.com E-mail

01/13/97

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363423

P.O.# - 93118



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

TAG# W43A S1N01

Title

SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET Project V59049

PROCEDURE USED: V049-I-147 V049-I-179
WASH STATION OP LONG SPOOL

Component	Serial Number
<u>A3</u>	<u>01</u>
<u>A3</u>	<u>02</u>

Wash Cycle: Manual

Flowrates: 30 Gpm Max. Temp.: 146° Duration: 3 hrs

Operator: Joseph Date: 7-22-97

Comments: _____

Component(s) Inspected By: JFLinn Date: 7-22-97

Quality Assurance: Andrew Date: 7-25-97

Comments: _____

SPECIFICATION		
Number		Rev.
A	V049-2-015	3

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: A3 Spool S/N: 01 WORK ORDER: 410
 DATE/TIME: 7-22-97
 OPERATOR: Joseph Bruce

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F. TI925= 142 F
2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER. MIX 1:1 Done
3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.
4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.
5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.
6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE. WASH TIME = 15 MIN
7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE. RINSE TIME = 30 MIN
8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND. DRY TIME = 45 MIN
9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM.

NOTES: Vac H₂O out of Bellows / Blow Dry w/ Heaton

SPECIFICATION
 Number AV049-2-184
 Rev. 1

Number
 Rev.

A3601D

LIGODA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: A3 S/N: 02 WORK ORDER: 418
DATE/TIME: 7-22-97
OPERATOR: Joseph / Tom

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F.

TI925= 146°F

2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER.

MIX 1:1 DOMP

3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.

4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.

5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.

6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

WASH TIME = 15 MIN

7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

RINSE TIME = 30 MIN

8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.

DRY TIME = 45 MIN

9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM.

NOTES:

Number
A1049-2-184
Rev.
1

SPECIFICATION

Number
Rev

A3 (02)

Title: COMPONENT RGA TEST PROCEDURE

TITLE	TEST ARTICLE PARAMETERS PUMPDOWN LOG
DATE:	
TIME:	
TEST LD.: e.g. WBSC1_1	WA3-1 (SN 142)
PSI TEST ENGINEER:	J. Flinn
QUALITY ASSURANCE:	

PHYSICAL DIMENSIONS				
S.S. SURFACE AREA		ft ²		cm ²
VITON LINEAL LENGTH		inches		cm
VOLUME		ft ³		liters
PUMPDOWN	TIME		PRESSURE	
7/26	1815	hr:min	2×10^{-7}	Torr
7/27	1315	hr:min	1.1×10^{-6}	Torr
7/28	615	hr:min	7.4×10^{-7}	Torr
-	1100	hr:min	7.1×10^{-7}	Torr
-	1530	hr:min	6.9×10^{-7}	Torr
7/29	324	hr:min	6.8×10^{-7}	Torr
-	605	hr:min	6.9×10^{-7}	Torr
-	1420	hr:min	4.8×10^{-8}	Torr
7/30	310	hr:min	2.1×10^{-9}	Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
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		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr

SPECIFICATION	
Number: V049-2-127 A	Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	BAKE OUT TEMPERATURE LOG
DATE:	
TIME:	
TEST I.D.: e.g. WBS1_1	WA3_1
PSI TEST ENGINEER:	J. Flinn
QUALITY ASSURANCE:	

BAKEOUT LOG / DATE	TIME		TEMPERATURE	
7/26	1745	hr:min	START	°C
7/27	1315	hr:min	280	°C
7/28	615	hr:min	280	°C
	1100	hr:min	280	°C
	1530	hr:min	280	°C
7/29	324	hr:min	280	°C
	605	hr:min	280	°C
	1420	hr:min	135	°C
7/30	710	hr:min	66 F	°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C

SPECIFICATION	
Number: V049-2-127 A	Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE		OUTGASSING RATES REPORT SHEET	
DATE:			
TIME:			
TEST I.D.: e.g. WBS1_1		WAZ_1	
PSI TEST ENGINEER:		J. Elinn	
QUALITY ASSURANCE:			

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
H2	5.76×10^{-8}	4.8×10^{-8}		2.76×10^{-7}			
12			0.42				
14			0.5				
15			0.54				
CH4	2.38×10^{-10}		0.57				
17			0.6				
H2O	8.19×10^{-10}		0.64				
19			0.67				
26			0.71				
28	5.3×10^{-9}	9.5×10^{-7}		1.28×10^{-8}			
32	7.96×10^{-10}		1.14				
38			1.36				
40	4.14×10^{-11}	9.4×10^{-9}		6.03×10^{-10}			
43			1.53				
44	1.04×10^{-10}		1.57				
129	5×10^{-13}	2.5×10^{-9}		7.63×10^{-11}			
131	5×10^{-13}	2.0×10^{-9}		6.14×10^{-11}			
132	5×10^{-13}	2.5×10^{-9}		7.63×10^{-11}			
134	5×10^{-13}	1.0×10^{-9}		2.93×10^{-11}			
136				1.97×10^{-11}			

SPECIFICATION

Number: V049-2-127

A

Rev.1

$$A = 7.39 \times 10^4 \times 2 = 1.48 \times 10^5$$

$$+ \pi (15) \times 60 \times (42) = 3.4 \times 10^3 = 1.684 \times 10^5$$

A3 connection ^{below} correction

$$+ 5(3 \times 10^3) = 1.7 \times 10^4 \text{ - manifold}$$

Title: COMPONENT RGA TEST PROCEDURE

ITLE	OUTGASSING RATES REPORT SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBSCI_1	
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
24	1.1 x 10 ⁻¹²						
25	1.7 x 10 ⁻¹²						
26	1.3 x 10 ⁻¹¹						
27	3.3 x 10 ⁻¹¹						
29	5.4 x 10 ⁻¹¹						
30	2.2 x 10 ⁻¹²						
30	1.1 x 10 ⁻¹²						
39	6.1 x 10 ⁻¹²						
41	6.9 x 10 ⁻¹²						
42	2.6 x 10 ⁻¹²						
43	3.2 x 10 ⁻¹²						
51	8 x 10 ⁻¹³						
55	1.2 x 10 ⁻¹²						
56	1.2 x 10 ⁻¹²						
57	1.3 x 10 ⁻¹²						
67	6.5 x 10 ⁻¹³						
69	8.4 x 10 ⁻¹³						
71	6.6 x 10 ⁻¹³						
78	1.1 x 10 ⁻¹²						
TOTAL	1.33 x 10 ⁻¹⁰						

10×10^{-11}
 29.7×10^{-12}
 29.5×10^{-13}
 = 13265

SPECIFICATION	
Number: V049-2-127 A	Rev.1

RGA calculations A3.xls

AMU	I (amp)	Leak Rate (Torr-L/s)	F	I w/ Leak (amp)	ensitivit	Q	q
-----	------------	-------------------------	---	--------------------	-----------	---	---

Area = 1.68E+05

H2	5.76E-08	4.80E-06		2.76E-07	21.978	1.26593E-06	7.51742E-12	✓
16	2.38E-10		0.57	-	95.5116	2.27318E-08	1.34987E-13	✓
18	8.19E-10		0.64	-	101.108	8.28074E-08	4.9173E-13	✓
28	5.30E-09	9.50E-07		1.28E-08	126.667	6.71333E-07	3.98654E-12	✓
40	4.14E-11	9.40E-08		6.03E-10	167.379	6.92949E-09	4.1149E-14	
44	1.04E-10		1.57	-	158.641	1.64986E-08	9.79729E-14	✓
129	5.00E-13	2.50E-08		7.63E-11	329.815	1.64908E-10	9.79262E-16	
131	5.00E-13	2.00E-08		6.14E-11	328.407	1.64204E-10	9.75081E-16	
132	5.00E-13	2.50E-08		7.63E-11	329.815	1.64908E-10	9.79262E-16	
134	5.00E-13	1.00E-08		2.93E-11	347.222	1.73611E-10	1.03094E-15	
Other	1.33E-10				126.667	1.68E-08	1.00E-13	✓

Component: A3 (sn 1&2)
 Date tested: 07/30/97
 Pass/Fail: Pass

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA ION SOURCE SETTINGS SHEET
DATE:	
TIME:	
TEST LD.: e.g. WBSC1_1	WA3-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

Type	CH-TRON	IS-TYPE:	HS-THOR.
------	---------	----------	----------

Channel	0 ENABLE
Detector	
Type	CH-TRON
SEM Volt.	<< >>

Amplifier	
Offset	ON

RF-Polarity	inverse
IS-Voltages	[V]
IonRef	138
Cathode	90.0
Focus	9.38
Field Axis	5.75
Extract	12

Mass	
Mode	SCAN-N
First	
Width	
Speed	
Resolution	
Threshold	

Ion Source	
Filament #	
IS-Set	

IS-Emission	
Emiss [mA]	
Protect [A]	3.5

Fil.Prot.	Thresh.
	[mbar]
ON below	
OFF above	

SPECIFICATION

Number: V049-2-127
A

Rev.1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA SCAN PARAMETER FILE SETTINGS	
DATE:		
TIME:		
TESTLD.: e.g. WBS1_1	W43-1	
PSI TEST ENGINEER:		
QUALITY ASSURANCE:		
RGA NUMBER:		
RGA SENSOR HEAD SERIAL # QMS		
RGA ELECTRONICS UNIT SERIAL # QME		

PARAMETER FILE: LIGO200.SAP

PARAMETER FILE: LIGO200.SBP

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Detector

EM Voltage	1700	
------------	------	--

SEM Voltage	1700	
-------------	------	--

Mass

Speed	5 s	
Width	200	
Resolution	25	
Threshold	1E-15	

Speed	5 s	
Width	200	
Resolution	25	

Amplifier

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

OUTPUT: User discretion
 DISPLAY: User discretion

SPECIFICATION

Number: V049-2-127 A	Rev.1
-------------------------	-------

Title: COMPONENT RGA TEST PROCEDURE

AGE: TEST I.D. FILENAME: XXXXXXXXX.SAC

TITLE	RGA COMPUTER DATA FILE LOG
DATE:	
TIME:	
TESTLD.: eg. WBSC1_1	WA3-1
PSI TEST ENGINEER:	J. Flinn
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

BARGRAPH DATA FILE NAME

ANALOG SCAN DATA FILE NAME WA3-1.SAC

OTHER DATA FILES

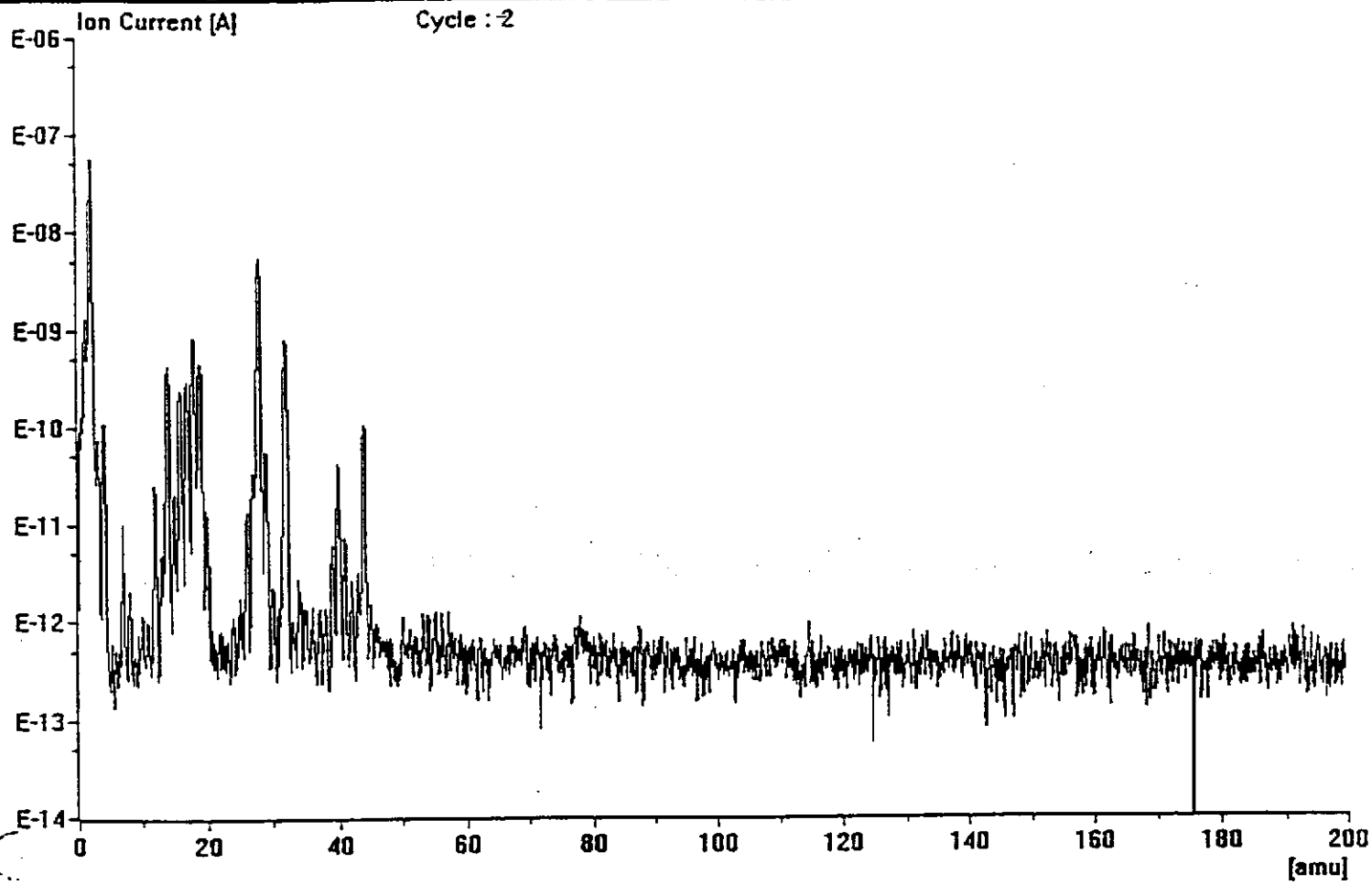
PRINTOUT OF

1. LAST ANALOG SCAN BEFORE CALIBRATION
2. ANALOG SCAN WITH CALIBRATED LEAK OPEN
3. BARGRAPH PLOT

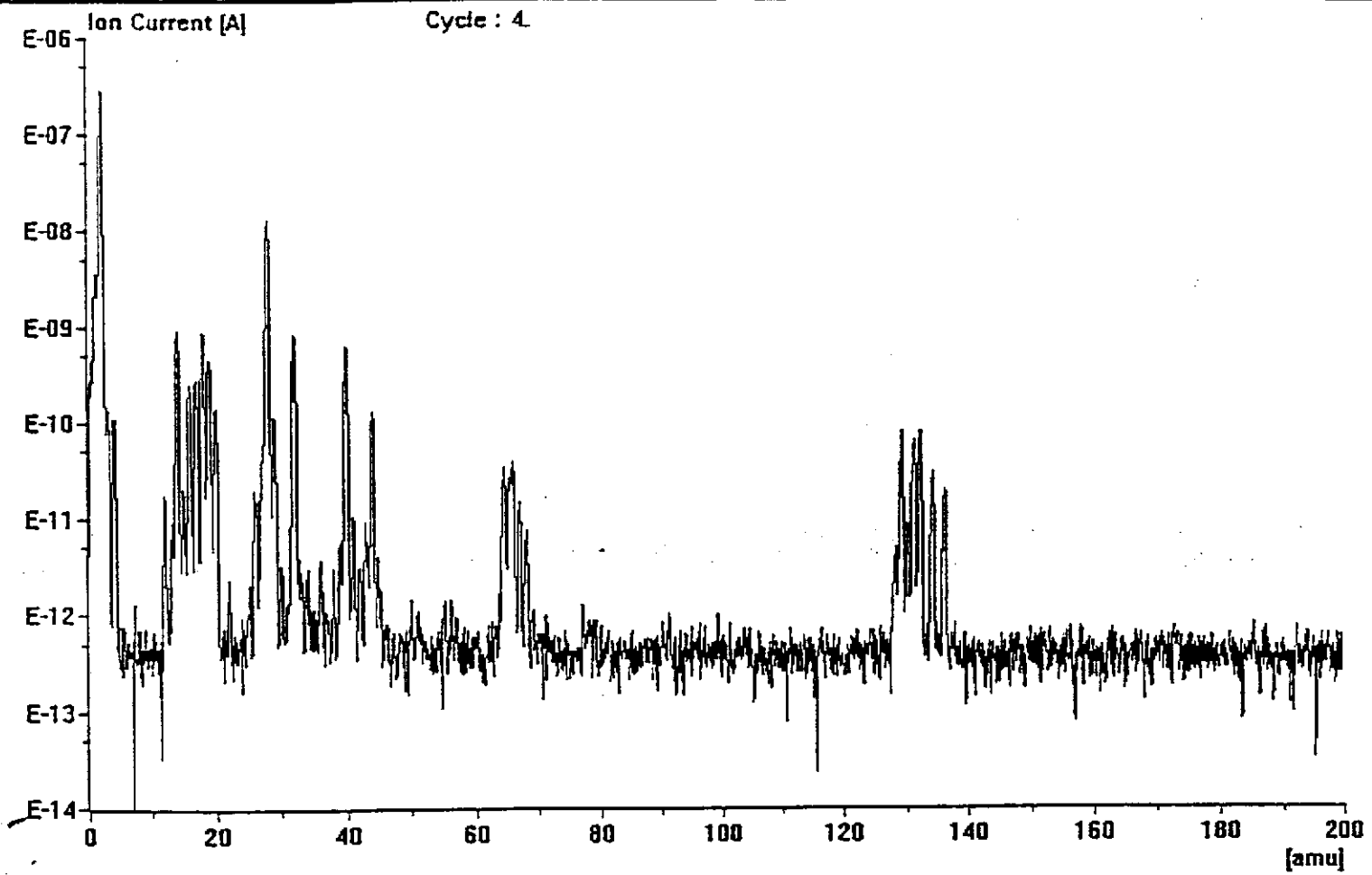
SPECIFICATION

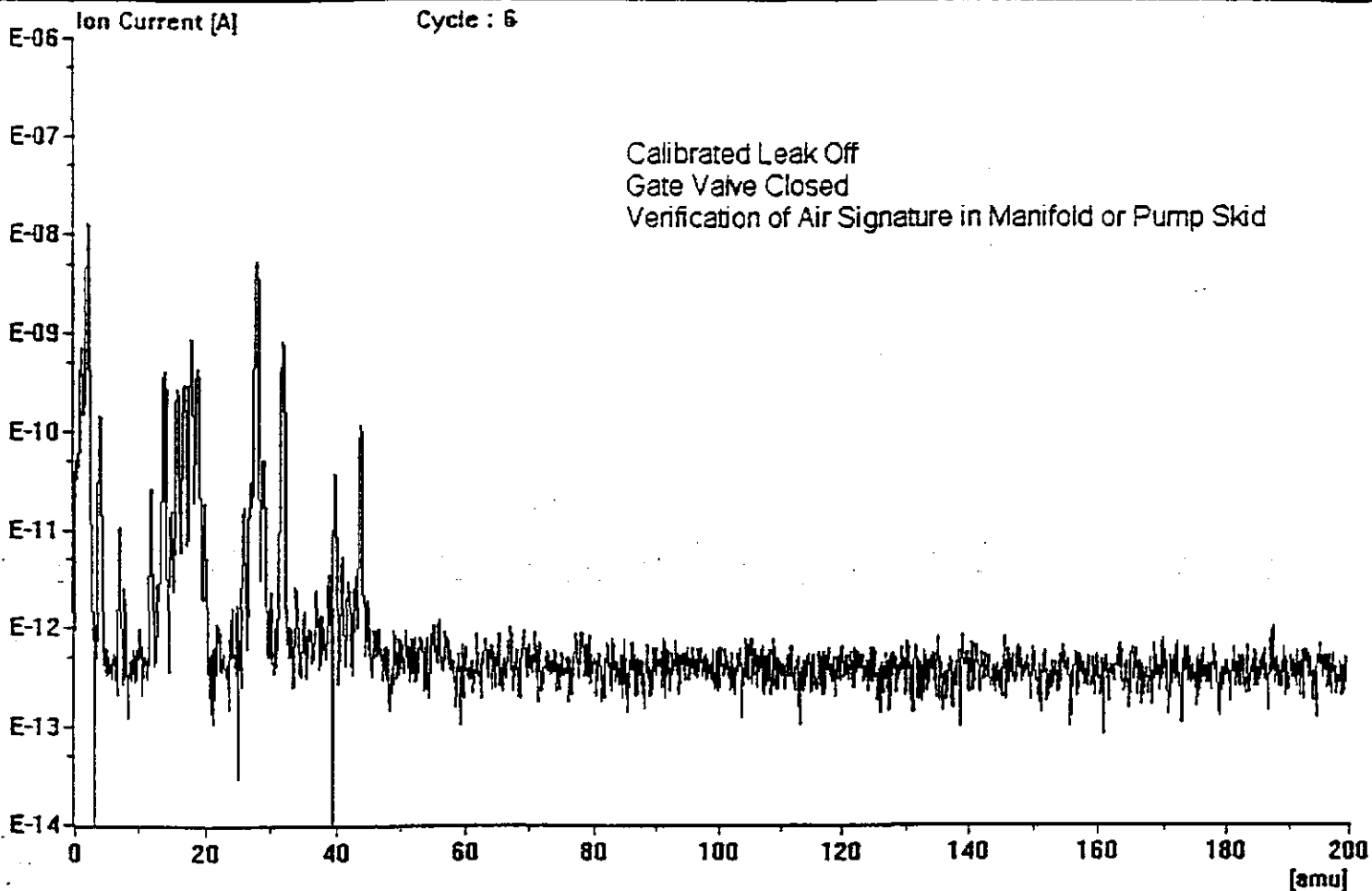
Number: V049-2-127
A

Rev. 1



3.5 fl L = 105 L
48" D = 120cm D





6 NCR'S

TV/A



PROCESS SYSTEMS INTERNATIONAL, INC.
20 Walkup Drive, Westborough, MA 01581

LIGO PROJECT

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Table of Contents

TAG # - WA3B

P/N - VO49-4-A3-02

1	Quality Plan Sign Offs.	
2	Hyspan Metal Bellows Documentation Package.	
3	C of C to Codes and Standards. Material test reports for shells, heads and large flanges. C of C for nozzles, small parts, flanges and weld wire.	
4	Final Cleaning Certificates.	
5	Bakeout Certificate. Acceptance Test Data. Final Vacuum Test Data	
6	Non Conformance Reports. Use As Is when applicable.	
7	As Built Drawings/Dimensions.	

Title: **QUALITY PLAN FOR LIGO- ADAPTERS**

**QUALITY PLAN
FOR
LIGO
ADAPTERS**

SERIAL No. V049-4-A3-02

NOV 26 1996

ϕ	ARB 11/22/96	—	RELEASED ON DED # 0363
REV LTR	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE
PROCESS SYSTEMS INTERNATIONAL, INC.			SPECIFICATION
INITIAL APPROVALS	PREPARED ARB 11/22/96	DATE 11/22/96	APPROVED R 83 11/25/96
		Number	Rev.
		A V049-2-172	ϕ

Title

APPLICABLE DRAWINGS

REFER TO FABRICATION PLAN

APPLICABLE PROCEDURES

V049-2-070	WELDING	PAW P8-P8 75%Ar, 25%He
V049-2-071	WELDING	PAW P8-P8 75%Ar, 25%He PWHT
V049-2-072	WELDING	GTAW P8-P8 100%Ar PWHT
V049-2-073	WELDING	GTAW P8-P8 100%Ar
V049-2-146	WELDING	PAW P8-P8 75%He, 25%Ar
V049-2-074	GENERAL REPAIR PROCEDURE	
V049-2-014	LEAK CHECK PLAN	
V049-2-015	CLEANING PROCEDURE	
V049-2-019	BAKEOUT PROCEDURE	
V049-2-040	STAINLESS STEEL FLANGE FORGINGS	
V049-2-047	COMPONENT SHOP CONDITIONING PLAN	
V049-2-097	SPOOLS/MODE CLEANERS/BEAM TUBE MANIFOLDS FAB	
V049-2-120	RAW MATERIAL HANDLING PROCEDURE	
V049-2-121	PROCEDURE FOR VERIFYING COMPONENT DIMENSIONAL ACCURACY	
V049-2-123	COMPONENT PACKAGING, HANDLING AND SHIPPING	
V049-2-084	WELD DATA SHEET SPECIFICATIONS	

Number

Rev.

SPECIFICATION

Number **A** V049-2-172

Rev. **0**

ADAPTER V049-4-A3-02

SPECIFICATION V049-2-172

REV. Ø



Process Systems International, Inc.
 20 Walkup Drive
 Westborough, MA 01581-5003
 (508) 366-9111 Fax (508) 870-5930

PROJECT LTGO JOB NO. V59049
 ITEM Adapter A-3 49.25" ID with 60.5" ID Flanges DWG NO. V049-4-A3
 APPLICABLE CODE ASME VIII DIV.1 PG 3 OF 5
 (WHERE APPLICABLE)

ASME CODE
QUALITY PLAN

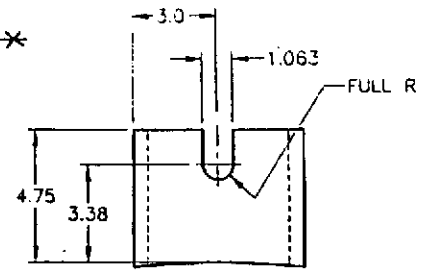
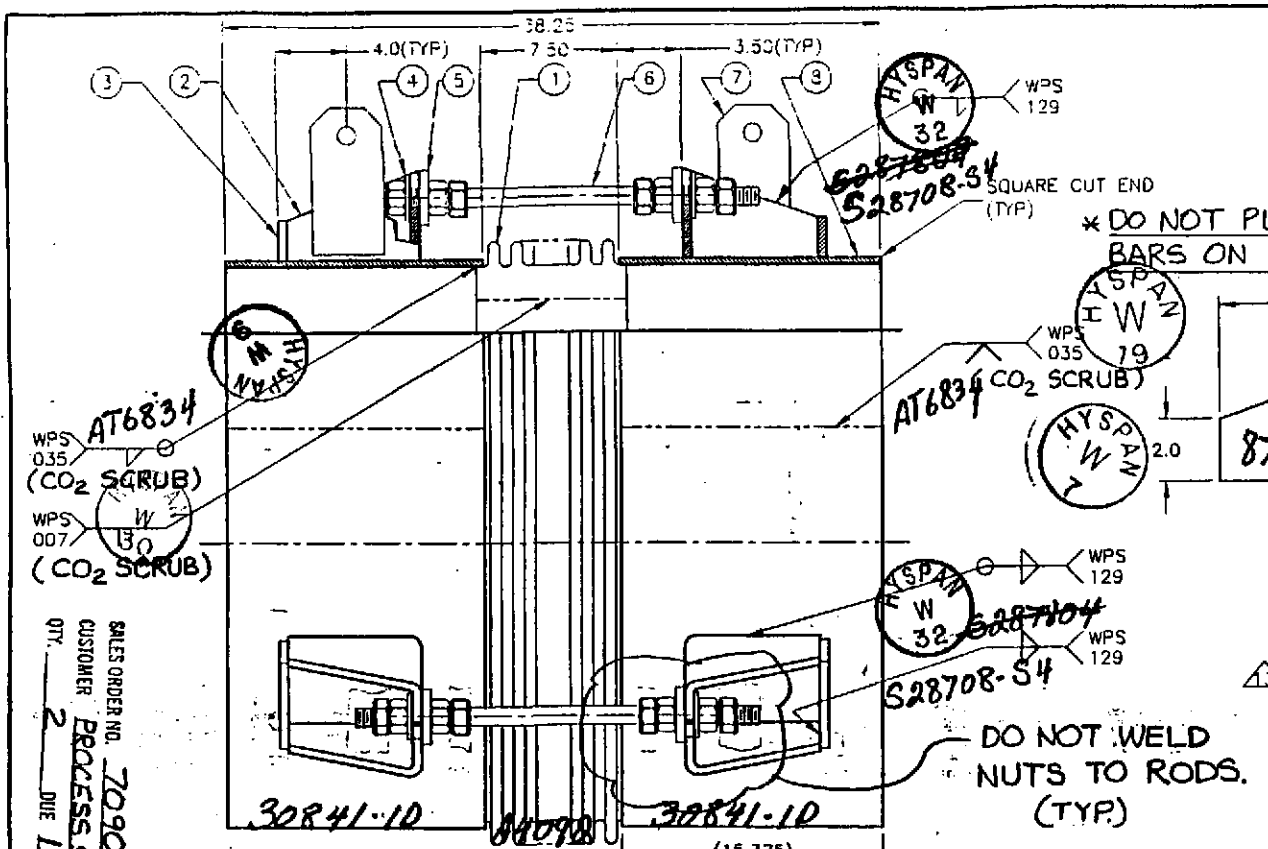
LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT
 V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC ✓ = APPROVED
 RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY

QUALITY PLAN
REVIEWED
QA GS
AI N/A

TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS
V-D	V049-4-A3		X N/A 5/11/97			
V-D			X N/A GS 10-20-97			PSI QA GS
V-D			X N/A GS 10-20-97			
V-D			X N/A GS 10/20/97			

V049FA3-01-02

REV	REVISION	DATE	BY
1	WAS DAWG. DATE 9-22-81 REV'D NOTE 13 & 16 TEMP WAS 347°F. ADDED NOTE 18, ITEM 3, & TOLERANCE DIMS. SUBMIT FOR APPL.	09/22/81	ATP



ITEM 2 DETAIL



ITEM	QTY	DESCRIPTION	MATERIAL
9	1	TAG, .06 THK.	A240-304
8	2	WELD END, 48.25 I.D., .25 THK.	SA240-304L
7	2	LIFTING LUG, .38 THK.	A240-304
6	3	TIE ROD, NUTS, 1.0 DIA.	C-STL.
5	6	WASHER PLT., .50 THK.	A588/CORTEN
4	6	WASHER PLT., .25 THK.	A588/CORTEN
3	6	BACKING PLATE, 2.0 TALL, .50 THK.	A240-304
2	6	TIE ROD FORMED SUPPORT, .50 THK.	A240-304
1	1	BELLOWS, 48.178 I.D., 51.00 O.D., 1 PLY, .036 THK., 6 CONS.	SA240-304L

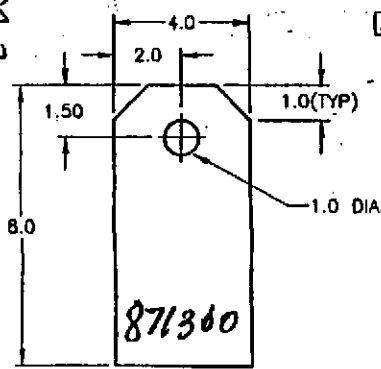
LIST OF MATERIAL

Information proprietary to Hyspan Precision Products, Inc. Disclosure or use is expressly prohibited except as agreed to in writing by Hyspan.

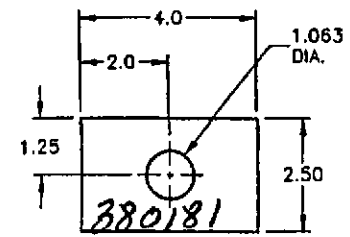
Hyspan Precision Products, Inc. Phone (619) 421-1355
 1885 Brandywine Avenue FAX (619) 421-1702
 Chula Vista, California 91911
CODE IDENT 30009

TITLE BELLOWS ASSEMBLY, SINGLE, TIED, 48.25 I.D.	DRAWING NUMBER 53142	REV A
--	-------------------------	----------

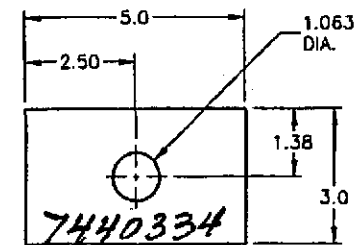
DRAWN BY PARIS	DESIGNED BY M.O.C.	DATE JUL/11/96	CUSTOMER PROCESS SYSTEM INT'L.
APPROVED		DATE	SPECIFICATION
SCALE NONE	SHT. 1 OF 2		V049-4-A3



ITEM 7 DETAIL



ITEM 4 DETAIL



ITEM 5 DETAIL

SALES ORDER NO. 70904-2
 CUSTOMER PROCESS SYS. INT'L
 QTY. 2
 DUE 11/22/96

5/11/002

Gulf States Steel, Inc.

GRANDEN, AL 36004-1008

CERTIFICATE OF TESTS

ORDER NO.	ITEM	QTY	UNIT	PURCHASE ORDER DATE
35232	04	742		06 09 94
PURCHASE ORDER NO.			SHIP FROM	
040			ALA CITY	

ACCOUNT NUMBER	PAGE NO.	INVOICE NUMBER
73800003	4	742-17002
DATE SHIPPED	ACUTE/VEHICLE IDENTIFICATION	
08 27 94	SDU152181	

HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATION.

C. F. BEARDEN, JR.
MGR, TECHNOLOGY AND
QUALITY - PLATE PRODUCTS

MATERIAL DESCRIPTION	QUANTITY SHIPPED
PLATE A572 A572N A-508-93 GRD A A572N A-508-93 GRD B A572N A-242-93 TYPE 1 5000 X 96.0000 SWARDED EDGE X 240.0000 IN HT 7440334 3 PCS HT 7440395 1 PCS HT 7033576 2 PCS CH C 15% MN 50/1.00 P 040% S 050% SI 30/30 CU 20/10 NI 40% CR 40/65 NO RPI CS RPI U 02/10 AL 029% HR YLD 50000 MIN TEN 70000 MIN XELONG MIN 2 IN. 21 OR 8 IN 18 IL 2 T/R CA 2 T/R TENCOC 837 SOUTH CENTER STREET HESS AZ 85210	19602

HEAT NUMBER	C	Mn	P	S	SI	CU	NI	CR	MO	CO	V	AL	N	B	CA	TI	CE
7440334	.09	0.97	.028	.020	.333	0.35	0.12	0.51	.02	.015	.034	.104					
7440395	.10	0.95	.007	.013	.380	0.33	0.10	0.47	.02	.010	.033	.038					
7033576	.08	0.92	.007	.012	.323	0.33	0.15	0.43	.02	.001	.026	.037					

HEAT NUMBER	TEST OR PRICE IDENTITY NO.	YIELD KSI	TENSILE KSI	% ELONG		THICKNESS	BEND TEST	HEAT TREAT	Y8/TS RATIO	% RED. AREA	GALV COATING	DROP WEIGHT TESTS					
				2"	1"							1	2	3	AG		
7440334	W157401	71.0	81.0	26				AR	.87								
7440334	W126101	60.0	74.0	25				AR	.81								
7440395	W233101	66.0	78.0	20				AR	.84								
7440395	W234901	62.0	74.0	22				AR	.93								
7033576	W304601	58.0	71.0	78				AR	.81								

HEAT NUMBER	TEST OR PRICE IDENTITY NO.	HEAT TREAT	SIZE	DIR	TEMP °F	ENERGY				% SHEAR				MILS LATERAL SPACING				
						1	2	3	AVG	1	2	3	AVG	1	2	3	AVG	

DATE:
38798
61305
11/3/94

O-T-P-K



SAN DIEGO WELDERS SUPPLY INC

EL CAJON VALLEY WELDERS SUPPLY

2506 Market Street
San Diego, CA 92102
(619) 239-7571
FAX (619) 239-0529

2446 Main Street
Chula Vista, CA 91911
(619) 423-9911
FAX (619) 423-6159

2051 Vineyard Avenue
Escondido, CA 92029
(619) 432-0445
FAX (619) 432-8223

1180 N. Marshall Ave.
El Cajon, CA 92020
(619) 562-1300
FAX (619) 562-9975

ACCOUNTING AND CREDIT FAX FOR ALL LOCATIONS (619) 239-0620

CERTIFICATIONS

COMPANY NAME: HYSPAN INC
P.O.#: 61129
INV#: 59996 A
DATE: 10-31-96

TYPE: 308L
SIZE: 045
WEIGHT: 75
HEAT#: S28708-S4

TYPICAL CHEMICAL PROPERTIES

C 0.024
Si 0.38
Mn 1.80
P 0.019
S 0.001
Cr 1972
Ni 9.63
Mo 0.07
Cu 0.09

SPECIFICATIONS

AWS/ASME SFA 5.9, CLASS 308L

We hereby certify that the above product meets the listed specifications.

May McMahon

San Diego Welders Supply



SAN DIEGO WELDERS SUPPLY ¹⁰²

EL CAJON VALLEY WELDERS SUPPLY

2506 Market Street
San Diego, CA 92102
(619) 239-7571
FAX (619) 239-0529

2446 Main Street
Chula Vista, CA 91911
(619) 423-9911
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1180 N. Marshall Ave.
El Cajon, CA 92020
(619) 562-1300
FAX (619) 562-9975

ACCOUNTING AND CREDIT FAX FOR ALL LOCATIONS (619) 239-0620

CERTIFICATIONS

COMPANY NAME: HYSpan INC
P.O.#: 61129
INV#: 59996
DATE: 10-29-96

TYPE: 308L
SIZE: 1/16
WEIGHT: 20
HEAT#: AT6834

TYPICAL CHEMICAL PROPERTIES

C 0.024
Si 0.38
Mn 1.80
P 0.019
S 0.001
Cr 1972
Ni 9.63
Mo 0.07
Cu 0.09

SPECIFICATIONS

AWS/ASME SFA 5.9, CLASS 308L

We hereby certify that the above product meets the listed specifications.

Mary Mc Mahon
San Diego Welders Supply

To:
AVESIA SHEFFIELD INC
425 NORTH MARTINGALE SUITE 2000
SCHALMBURG
ILLINOIS 60173
U.S.A
F.A.D. KEITH HOOD

Cons./Inv. No. **175/04392/05**



21/05/96 Date

Customer Order No.
9102376

Specification
ASTM A240-95 304 UNS30400
00-S-7660 FEB 5 1988
AMS 5513F 6/15/53
NIL-S-5059D 30/5/83

Supply Condition
Cold Rolled Softened Descaled and Pinch Passed

Quality confirmed by spectroscopy examination Test Position: Front, Back Orientation: Transverse, Longitudinal

Folio	Cast. No.	Material Description	Temp C	Coil No./ Plate No.	Proof Stress		Tensile Strength		Elongation	TIA/TIV	Bend Test	T/C Test	Impact
					0.2% PSI	1.0% Yield	PSI	PSI					
					Rockwell Test		Rockwell Test						
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	14320/1	BT 45385 FT 36975	52345 44370	89175 86855	52 151 57 151	63.5 155 58.6 144	OK OK	OK OK		
<p>MATERIAL TESTED TO ASTM A240 CONFORMS TO LATEST REVISIONS OF ASTM A480/ASME SA240/480 Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds by Avesta Sheffield. (1N/mm sq = 145.04 PSI)</p>					<p>Material inspected and tested to ASTM A240 also conforms to latest revisions of ASTM A480 and ASME SA207/SA480 (N/mm sq. = 145.0 PSI) Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds. Solution annealed by heating to 1900 deg F min. except 321H 347H , 348H (2000 deg F min.) "NO WELD REPAIR"</p>								

Rockwell Test 110, P1-201301, 0.3671-201151, 40.36 INTERCRYSTALLINE CORROSION TEST TO ASTM A262 (1993) PRACTICE E SATISFACTORY

Avesta Sheffield Ltd
LRQA Approval Numbers



940258
940175

Cast No.	C	Si	Mn	P	S	Cr	Mo	Ni	Ti	Nb	Co	N	Cu
C2004	.021	.39	1.38	.020	.001	18.15	.24	9.08				.039	Cu .27

Witnessed _____ Inspecting Authority _____ Signed for Avesta Sheffield Ltd
M. de Jong
M. de Jong, Chief Inspector

We certify that the above material has been tested in accordance with the order and specification and that the results comply with the requirement of the order specification. (Note that where more than one specification is involved, only the mechanical properties and cast chemical composition are certified to the requirements of each individual specification.)

VINCENT METAL GOODS
SANTA FE SPRINGS
CUST. ORDER H-16 P-11
CUST. ORDER NO. 60306
CUST. ORDER NO. 25-038153

10/15/96 08:04 2503 240 5288 OSM-TECH SVC-PDI GARY STEEL-L.B. 0002/002

OREGON STEEL MILLS

P.O. BOX 2760, Portland, Oregon 97208 • (503) 286-8651 Fax (503) 240-5288

REPORT OF CHEMICAL/PHYSICAL TESTS



SOLD TO
 GARY STEEL COMPANY-LONG BEACH
 PO BOX 1607
 LONG BEACH, CA 90801

GARY STEEL COMPANY-LONG BEACH
 PO BOX 1607
 LONG BEACH, CA 90801

CERTIFICATE NO. 421480P	DATE Oct 14, 1996	PAGE 1
MILL ORDER NO. 69010	DATE	
CUSTOMER ORDER NO. 59471		
JOB/REQ. NO.		
SHIPPING NO. 421480	DATE 10/14/1996	
CARRIER WESTERN STATES TRUCK		
GARTRUCK NO. 459		

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS
 OSM HSLA STRUCTURAL QUALITY PLATE ASTM A588-94 GRADE A ASTM A242-93A TYPE 1 ASTM
 A709-94A GR 50W TYPE A.

PHYSICAL PROPERTIES

ITEM NO.	DESCRIPTION	HEAT NO.	SLAB	YIELD PSI X 100	TENSILE PSI X 100	% ELONG 8" 2"	% RA	HARDNESS BHN	BEND TEST	IMPACTS
1	0.2500 X 96.000 X 480.000 4 PCS 13068 LBS	+ 380181	✓	570 645	750 780	23 24				
	4 PCS 13068 LBS TOTALS									

APPROVED: _____ DATE: _____
 PACKING SLIP# 37736
 CUST PO# 61143
 DATE SHIPPED 10-31-96

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	SI	Cu	NI	V	Co	Al	Cr	Mo	Ti	B	Ni	Ca	CE	U.S. Steel
+380181	.10	.86	.006	.009	.37	.26	.10	.028	1.008	.027	.45	.03						
ALL HEATS INDICATED WITH (+) WERE MELTED AND MANUFACTURED IN THE USA.																		
..... END OF REPORT																		

I certify the above to be correct as contained in the records of OREGON STEEL MILLS By Susan M. Yenne O.C. RECORDS ADMINISTRATOR
 SUSAN M. YENNE

JB 0051 184
APPROVAL

Alleghey Ludlum CORPORATION
Jesseop Specialty Products
CALIFORNIA DIVISION

871360

SALES ORDER

AGE	OF	DATE ENTER	SALESMAN NO.	INVT.	DEPT.	TAX	CUST. ORD. DATE	REQ. DATE	SALES ORDER NO.
L	1	07/12/96	505 000	02	70	N	07/12/96		CS -055345
S O L D T O	9658600 REYNOLDS ALUMINUM SUPPLY ATTN: ACCOUNTS PAYABLE P O BOX 26895 RICHMOND VA			S H I P T O	.35 REYNOLDS ALUMINUM SUPPLY 6446 E WASHINGTON BLVD CITY OF COMMERCE CA			ROUTING GAI WILL CALL F.O.B. SHIPPING SANTA FE SPRINGS C CUST. ORDER NO. 0960121	
	2326100				90040				

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HEAT NO. 871360

MILL SOURCE Alleghey Ludlum Corporation
Jesseop Specialty Products

Alleghey Ludlum CORPORATION
Jesseop Specialty Products
600 Green Street
Washington, PA 15301
8111 LOS ANGELES WAREHOUSE
To ALLEGHEY LUDLUM CORP
14420 SOUTH MARQUARDT AVE
SANTA FE SPRINGS CA 90670

SIZE & DESCRIPTION 3/8 T304

EXCEPT AS OTHERWISE NOTED, THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH THE LISTED SPECIFICATIONS AND RESULTS CONFORM TO THE SPECIFICATION AND ORDER REQUIREMENTS.

CERTIFIED MATERIAL TEST REPORT

OUR ORDER NO. PP6357120
YOUR ORDER NO. 2851
MEMO NO. 116805
DATE 07/03/96
SALESMAN NO. 099

H. M. O'Connor
AUTHORIZED SIGNATURE

JESSOP T 304 STAINLESS HRAP
AMS-5513F; ASTM A167-91; ASTM A240-95b; ASME SA-240-A95;
ASTM A262-93a PRACTICE A1;

Heat	Slip	Lot No	Size	Pcs	Weight
871360	26716 AB	10412	.3750 x 96.0000 x 252.0000	1	2771
871360	26716 AA	10421	.3750 x 96.0000 x 252.7500	1	2780
871360	26717 BB	10412	.3750 x 96.0000 x 240.0000	1	2639
871360	26717 CA	10412	.3750 x 96.0000 x 264.0000	1	2903
871360	26717 CB	10412	.3750 x 96.0000 x 245.7500	1	2703

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
871360	.054	1.75	.025	.0008	.41	8.27	18.30	.28	.15	.28	.088

Lot No	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grain Size
10412	.3750	51.3 KSI	90.2 KSI	58.9	74.2	BHN179	OK	OK	
10421	.3750	47.8 KSI	90.1 KSI	58.6	74.1	BHN179	OK	OK	
10412	.3750	51.3 KSI	90.2 KSI	58.9	74.2	BHN179	OK	OK	

MATERIAL WAS NOT WELD REPAIRED

OF	DATE ENTER	SALESMAN NO	QUANTITY	UNIT PRICE	TAX	ORDER DATE	ORDER DATE
1	10/17/96	503,000	10	50,300	N	10/17/96	
9658600		REYNOLDS ALUMINUM SUPPLY		REYNOLDS ALUMINUM SUPPLY		6446 E WASHINGTON BLVD	
REYNOLDS ALUMINUM SUPPLY		V: ACCOUNTS PAYABLE		CITY OF COMMERCE CA		91020	
P O BOX 26385		RICHMOND VA		23,61		929049055	

SOLD TO	SHIP TO	W/STL	PC	COLL	ALW	CHRG	RENEG	TERMS
00	00	02		Y			1	1/2 % NET 30

HRAP STAINLESS PLATE

HEAT NO. 872205

SIZE & DESCRIPTION 1/2 T304

Allegheny Ludlum Corporation
Jessop Specialty Products

EXCEPT AS OTHERWISE NOTED, THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH THE LISTED SPECIFICATIONS AND RESULTS CONFORM TO THE SPECIFICATION AND ORDER REQUIREMENTS.

Allegheny Ludlum

Jessop Specialty Products

500 Green Street

Washington, PA 15301

Bill LOS ANGELES WAREHOUSE

To ALLEGHENY LUDLUM CORP
14420 SOUTH MARGUARDT AVE
SANTA FE SPRINGS CA 90670

CERTIFIED MATERIAL
TEST REPORT

OUR ORDER NO PP6359950
 YOUR ORDER NO CS-2890
 MEMO NO 113262
 DATE 08/07/96
 SALESMAN NO 399

A. M. O'Donnell
AUTHORIZED SIGNATURE

JESSOP T 304 STAINLESS HRAP
AMS-5513F; ASTM A167-91; ASTM A240-91; ASME SA-240-93;
ASTM A262-93a PRACTICE A:1

Heat	Slip	Lot No	Size	Pos	Weight
872205	30721 AB	11660	.5000 x 96.0000 x 246.0000	1	1553
872205	30721 BB	11658	.5000 x 96.0000 x 256.0000	1	1697
872205	30721 AA	11660	.5000 x 96.0000 x 252.0000	1	1640
872205	30721 BA	11660	.5000 x 96.0000 x 251.0000	1	1625

Heat	C	MN	P	S	SI	NI	CP	ND	CO	CU	N
872205	.047	1.71	.026	.0004	.40	8.30	18.27	.40	.11	.38	.089

Lot No	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grain Size
11660	.5000	47.3 KSI	99.7 KSI	59.6	74.2	BHN170	OK	OK	
11658	.5000	45.1 KSI	99.7 KSI	59.5	71.6	BHN167	OK	OK	
11660	.5000	47.3 KSI	99.7 KSI	59.6	74.2	BHN170	OK	OK	

MATERIAL WAS NOT WELD REPAIRED

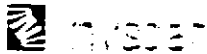
P.O. 61326

872205

21,787"

24,455-91

TOTAL PRICE:



MASS SPECTROMETER TEST REPORT

V0494A3-P1-02

CUSTOMER: Process Systems International, Inc.				
Sales Order No.: 70904		Item: 2	Drawing No.: V049-4-A3	
Equipment: DuPont 120 SSA			Leak Std. S/n: 1051	
Test Procedure per ASTM E-498			Test Area: Bellows and weld ends	
Sn.	Leak Rate-Std.cm ³ /s.	Time	Date	Inspector
002	1x10 ⁻⁹	3 sec	11-26-96	<i>AK</i>

The above referenced expansion joint has passed the Mass Spectrometer Leak test to the required sensitivity.

Inspector *AK* Level II Date 11/26/96



PROCESS SYSTEMS INTERNATIONAL, INC.

20 Walkup Drive, Westborough, MA 01581

CALIFORNIA INSTITUTE OF TECHNOLOGY  **LIGO PROJECT**
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CERTIFICATE OF CONFORMANCE

CUSTOMER: The LIGO Project
California Institute of Technology
Mail Stop 18-34
Pasadena, CA 91125

DATE: 10/28/97

CONTRACT ORDER NUMBER: PC 175730

PSI JOB NUMBER: V59049

DRAWING NUMBER(S): V049 4 A3

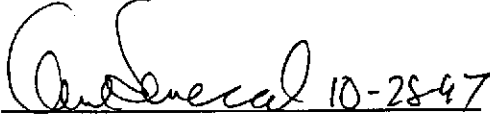
TAG NUMBER: WA3 B

SERIAL NUMBER: 02

ITEM: Refer to attached Material Tracer Record

APPLICABLE SPECIFICATION(S): SA-240 A-500
SA-193 B7
SA-194 2H
F-436

PSI certifies that the items furnished in this shipment have been manufactured from the materials and in accordance with the process test and acceptance criteria requirements specified within the drawing(s) and/or specification(s) listed above. All inspection records and test results are on file with PSI and are available for examination.


Gene Senecal 10-28-97
Gene Senecal
Quality Assurance Engineer

Material Tracer Record

Part Number WA 3 S/N 02

Page 2

Item #	Qty	U/M	Part code	Description	C of C MIC # CMTR
1	1	EA	V0494081	48-1/4 ID FL'G GROOVED & SLOTTED	A 609
2	1	EA	V0494070	48.81 ID X 68-1/4 OD FLANGE FLAT FACED	A 713
5	1	EA	V0494A3P1	BELLOWS ASSY 48.25 ID MAKE FROM V049M163 1 PER SPEC V049-2-017 & DWG V049-4-A3	HYSpan DOC 53142 S/N 002
10	54	EA	202678 3	BOLT STL SA193 B7 COFC HEX HD 7/8-9 UNC X 4 LG ZINC PLATED .0002 MIN THK.CLEAR CHROMATE PROCESS	C of C
11	54	EA	202679 3	NUT STL SA194 2H COFC HEX HD 7/8- 9 UNC ZINC PLATED .0002 MIN THK CLEAR CHROMATE PROCESS	C of C
12	162	EA	202581 3	WASHER STL ASTM F436 COFC 1-3/4 ODX15/16 IDX1/4 THK ELECTROLESS NICKEL PLATED	C of C
13	1	EA	V049M024	O'RING VITON A500 BAKED .275 NOM X 162.5 LG VULCANIZED	C of C
14	1	EA	V049M025	O'RING VITON A500 BAKED .275 NOM X 153.125 LG VULCANIZED	C of C
15	1	EA	V0494061	ELBOW SST304L COFC 3/4 ODX 2 3/4 OD CONFLAT DWG SIZE: B	C of C



Avesta Sheffield East
 P.O. Box 1975
 Baltimore, MD 21203 U.S.A.

Mill Sheet: 1996/04/02

To: Avesta Sheffield Trading Company
 425 N. Martingale Road, Suite 2000
 Schaumburg, IL 60173-2218

PROCESS SYSTEMS INT'L., INC.
 Reviewed this report and it complies
 with SA/SSB-240 Gr.304/304L
 95 Edition, Addenda
 By C. Wataicki Date 9-28-96

Customer: G.O. Carlson
 Your Order: 978771 (Our Ref# 81964)

Specification:

Heat No.: 39240 (G.O. Carlson Ht # 6X142)

Steel Grade: 304L to 304L CC-B.7
 Product: Slabs 5.25" x 50.00" x RDM

Slabs no:	Length(in)	Width(in)	Thickness(in)	Weight(lbs)
3924-1	302.50"	50.00"	5.25"	22550
3924-2	300.50"	50.00"	5.25"	22460
3924-3	301.00"	50.00"	5.25"	22610
3924-4	301.50"	50.00"	5.25"	22870
3924-5	300.50"	50.00"	5.25"	22100
Total Pieces:	5		Total Weight:	112590 lbs

Chemical Composition %

C ✓	Si ✓	Mn ✓	P ✓	S ✓	Cr ✓	Ni ✓	Mo
.011	.40	1.77	.029	.003	18.36	8.99	0.46
Ti	Cb	Cu	Co	N ✓	Sn	Ta	Ca
.010	0.010	.57	.11	.06	.016		
V	Al	Pb	Ca	B	As	Fer No.	
	002	001					

These slabs have not been weld repaired.

These slabs are free of mercury contamination

Knowingly and willingly falsifying or concealing a material fact on this or making false, fictitious or fraudulent statements or representations herein could constitute a felony punishable under Federal statutes.

Jean E. Dwyer
 Authorized Signature

G.O.CARLSON Inc

*Producers of Stainless Steel
Nickel Alloys and Titanium*



THORNDALE, PA. 19372

A 713

DATE: 20-Sep-96

GOC: 90473

T E S T C E R T I F I C A T E

*** SOLD TO: ***

*** SHIP TO: ***

PROCESS SYSTEMS INTERNATI
20 WALKUP DRIVE

PROCESS SYSTEMS INT'L
20 WALKUP DRIVE
WESTBOROUGH MA 01581

WESTBOROUGH MA 01581

CUSTOMER ORDER #
555559

CUSTOMER MARK #

 304L BB HOT ROLLED, ANNEALED, DESCALED
 UNS S30403/UNS S30400; TYPE 304L/304 PLATE
 ASTM A240-95a; ASME SA240, ASME B&PV CODE SECTION II, 1995 EDITION,
 1995 ADDENDA; GENERAL REQUIREMENTS TO ASTM/ASME A/SA480.

ITEM	DESCRIPTION	MARK: 555559/PT.V049M251-1
1	1.25 x 44.900 ID x 80.30 OD	

No Welding Performed

ITEM	DESCRIPTION	MARK: 555559/PT.V049M252-1
1	1.25 x 48.5 ID x 68.5 OD	

1

Qty Heat-Slab

		Test	Yield-.2% Tensile	Elong-2in
		Dir	PSI	Z
320	3 6X142-1D	TT	38000 ✓	53.32 ✓
		Rock		
		B		
	6X142-1D	85 ✓		

The above material has been visually and dimensionally inspected and found to conform to the above referenced specifications.

It is hereby certified that all items furnished in this shipment are in full compliance with the purchase order and specification requirements. It is further certified that the test reports represent the actual attributes of the items furnished and are in full conformance with all applicable specifications and order requirements.

Melter's Ladle Analysis attached.



tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS. INT'L
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 07/24/96

PCS SHIPPED: 12
09 OUR ORDER NO 432620505
SHIPLIST NO: 55097

PRODUCT

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 56.25" OD +.06 X 48.0" ID -.06 X 1.5" WD +.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

U049M242-1

PSI MIC NO. A609

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE
WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with ASME 182 Gr. 304L
92 Edition, Addenda
By C. Wozniak Date 9-12-96

CHEMICAL ANALYSIS

Table with columns: ST NO., C, SI, P, MN, S, NI, CR, MO, V, AL, TI, N. Row 1: 609240, .018, .54, .028, 1.80, .004, 11.41, 19.01, .0630

MECHANICAL PROPERTIES

Table with columns: HEAT NUMBER, SERIAL NUMBER, BRINELL, TEN TEMP (F), TEN BHN, TENSILE LOCATION, UTS (KSI), YIELD ST (KSI), X ELONG, XRED AREA, I_M_P_A_C_T_D_A_T_A LOCATION, TEMP (F), FT. LBS, X SHR, LAT EXP, GRN SIZE. Row 1: 609240, 6G1251A, +75, PROLONG, 76.5, 41.5, 59.0, 73.0

Weld Wire Co's



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

T0065-R/774/01500

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEMS*

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: *180 LBS*

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: *1/8"*

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
<i>S 713906</i>	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

(651197)(10)

3

0



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

Quality Matters

70065-R/774101500

TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

FORMER PURCHASE ORDER NO.:

CERTIFICATE DATE: ~~1/8~~

NDVIK ORDER NO.: 16249

QUANTITY: 180LB

LOT ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Feat	C	Si	Mn	P	S	Cr	Ni
5440928	.021	.470	1.800	.014	.013	20.00	9.68
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.020			.002	.040	.030	.053



The material has not come in contact with mercury or mercury-containing compounds.

Material not touched by hand after final production process cleaning.

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC 9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

With M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan

66119)(10)

SANDVIK

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1730 SCRANTON, PA. 18501 P (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WESTERLY EXIT 59

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 47910

CERTIFICATE DATE: 7/14/97

SANDVIK ORDER NO.: 16249

QUANTITY: PER PACKING NOTE

WORK ORDER LOT NO.: 980309

AWS A 9 9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S713039	.013	.380	1.800	.015	.013	20.06	9.84
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.100			.002	.070	.030	.044



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYS
120 LBS
70040-R / 77410500

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES

90 RESEARCH ROAD
HINGHAM, MA 02043

56 lbs

XJK 8115-02

KOBELCO

04/09/1997

15:57

7139746424

KOBELCO

PAGE 14

PURCHASER
PO 70040-R/774101500
PROCESS SYSTEMS

INSPECTION CERTIFICATE
FLUX CORED WIRE

CERTIFICATE NO.: A 017
DATE OF ISSUE : 1997.01.28

TRADE DESIGNATION	DIMENSION (mm)	MPG. NO.	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-308L	0.9	B6M1085	AWS A5.22 E308LT0-1 ASME SPA-5.22 E308LT-1

CHEMICAL COMPOSITION (%)

ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	PH	FS	PHV
DEPOSITED METAL	0.034	0.39	1.22	0.028	0.008	0.05	0.73	18.91	0.11	0.01	0.041	UNIT:FM 6.0	6.8	UNIT:FM 6.0
ELEMENTS														

TENSILE TEST OF DEPOSITED METAL

IMPACT TEST OF DEPOSITED METAL

HARDNESS TEST


YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY	VICKERS HARDNESS (AVG.)
- N/mm ²	- N/mm ²	584 N/mm ²			AVG.	
- kgf/mm ²	- kgf/mm ²	59.8 kgf/mm ²	52 %	- °C	- J	
					- kgf.m	

WELDING CONDITIONS

TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2	POSTWELD HEAT TREATMENT	FS = FERRITE (SCHAEFFLER DIAGR.) FN = FERRITE (DELONG DIAGRAM) FNV = FERRITE (VRC)
AMPERAGE	110 A				
ARC VOLTAGE	25 V			- °C x - h	

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREBIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBE STEEL, LTD.
WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR 

BOC GASES

KOBELCO

90 RESEARCH ROAD

HINGHAM, MA 02043

PO# 70040-R / 774101500

PROCESS SYSTEMS

INSPECTION CERTIFICATE

FLUX CORED WIRE

CERTIFICATE NO.: A 002

DATE OF ISSUE : 1997.01.07

TRADE DESIGNATION	DIMENSION (mm)	WPC. NO.	PSI OC CW	APPLICABLE SPECIFICATION AND CLASSIFICATION		
DW-309L	0.9	B6M1015		AWS A5.22 E309LT0-1 ASME SPA-5.22 E309LT-1		

CHEMICAL COMPOSITION (%)

ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	PH	FS	PHW
	UNIT: PH		UNIT: PH		UNIT: PH		UNIT: PH		UNIT: PH		UNIT: PH		UNIT: PH	
DEPOSITED METAL	0.026	0.43	1.10	0.022	0.012	0.04	12.75	22.56	0.04	0.02	0.017	15.0	8.7	12.0
ELEMENTS														

TENSILE TEST OF DEPOSITED METAL

IMPACT TEST OF DEPOSITED METAL

HARDNESS TEST

YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		VICKERS HARDNESS (AVG.)
- N/mm ²	- N/mm ²	540 N/mm ²	40 %	- °C	AVG.	- J	-
- kgf/mm ²	- kgf/mm ²	55.1 kgf/mm ²				- kgf.m	

WELDING CONDITIONS

POSTWELD HEAT TREATMENT

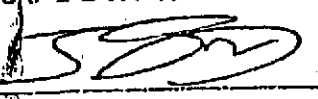
FS = FERRITE (SCHAEFFLER DIAGRAM)
 PH = FERRITE (DELONG DIAGRAM)
 PHW = FERRITE (VRC)

TYPE OF CURRENT	DCEP	SHIELDING GAS	CO ₂	POSTWELD HEAT TREATMENT
AMPERAGE	110 A			- 0x -
ARC VOLTAGE	25 V			

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HERETH AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

☪ KOBELCO STEEL, LTD.
 WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR





Weldable Quality Together

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO:

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712976	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

PROCESS SYSTEMS
120 LBS 308L 3/32
70040-R/774101500

6



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S 711088	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

PSI
QC
CW

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
120 LBS 308L 1/8
70040-R/774101500

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Daniani, Quality Engineer

[Signature]
15(661197)(10)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

make Quality happen

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *Process Systems Intl*
7-8-97

CUSTOMER PURCHASE ORDER NO.: *70038-R/774101500*

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

.035
DIAMETER: ~~3/32~~ *120 LB*

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
<i>3713617</i>	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)



HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

PROCESS SYSTEMS INTL
P.O. 70038R/7741000

JGP ISSUE DATE: 08-30-96

DATE SENT 6-27-97

HEAT NUMBER/LOT NUMBER: 61202878W3-60LB
E50836-K1-20LB

CHEMICAL COMPOSITION LIMITS

ALLOY: 308L
SPEC: AWS A5.9-93 ER308L

CARBON		.030	SILICON	.300	.650
MANGANESE	1.000	- 2.500	PHOSPHORUS		.030
SULFUR		.030	CHROMIUM	19.500	- 22.000
NICKEL	9.000	- 11.000	MOLYBDENUM		.750
TANTALUM		.500	CB + TA		.500
TITANIUM		.500	COPPER		.750
NITROGEN		.500	COBALT		.500
MAGNESIUM		.500	OTHER		.5
NIObIUM		.500			

PSI
OC
CW

7-7-97

PSI
OC
CW

7-7-97

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY BRITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Janice Pittman
CERTIFICATION CLERK

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

9

THE ESAB GROUP, INC.
1500 Karen Lane, Hanover, PA 17331

CERTIFICATE OF TYPICAL ANALYSIS

11/19/96 PROCESS SYSTEMS INTL

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

7-14-97 Order No.: 700384/7741000

This Material Conforms to Specification:
AWS A5.20-95, ASME SFA 5.20

Trade Name
or Trademark: Dual Shield II 70 Ultra

Diameter Size: .035" x 33# Spool

Type: E71T-1* / E71T-12M

Weight: 132 LB

X-Rays Satisfactory

Lot Number: 49455 - 66 LB ✓
49720 - 33 LB ✓
50293 - 33 LB ✓

PSI
OC
CW Typical Mechanical Properties

Typical Chemical Properties	(Specification Requirements)	As Welded	MPa
Carbon: .02	(.15 Max.)	Yield Strength (Psi) 70,000	483
Manganese: 1.10	(1.60 Max.)	Tensile Strength (Psi) 76,800	530
Chromium: .04	(.20 Max.)	Elongation (2"), % 32.0	
Nickel: .01	(.50 Max.)	Red. of Area, % 74.6	
Silicon: .34	(.90 Max.)	Charpy V-Notch Impacts	
Niobium+: .01	(.30 Max.)	@ -20°F. (ft.-lbs.) 117	
Tantalum: .01	(.30 Max.)	@ -29°C. (Joules) 159	
Molybdenum: .01	(.30 Max.)		
Tungsten: .01	(.35 Max.)		
Copper: .01	(.35 Max.)		
Titanium: .013	(.03 Max.)		
Phosphorus: .010	(.03 Max.)		
Sulphur: .02	(.08 Max.)		
Vanadium: .02	(.08 Max.)		
Hydrogen: 4.2 ml/100 gr. of weld metal		Yield Strength (Psi) 58,000	400
Filletts: Vertical-Up/Overhead		Tensile Strength (Psi) 70-90,000	480-620
Shielding Gas: 75% AR/ 25% CO ₂		Elongation (2"), % 22.0	22
		Red. of Area, %	
		Charpy V-Notch Impacts	
		@ -20°F. (ft.-lbs.) 20	
		@ -29°C. (Joules) 27	

* No data being issued for E71T-1 classification using the CO₂ shielding gas.

The undersigned certifies that the product supplied will meet the requirements of the applicable AWS Filler Metal Specification when tested in accordance with that specification, and that no significant change has been made in the elements described in the qualification approval.

 BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

By: D. A. Smith
D. A. Smith, Supervisor, Q. A. Services



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: *PROCESS SYS*

SHIP TO:

CUSTOMER PURCHASE ORDER NO: *70029R/774101500*

CERTIFICATE DATE: *4/25/97*

SANDVIK ORDER NO.

QUANTITY: *120 LBS*

WORK ORDER / LOT NO.: *978457*

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: *3/32"*

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
S712976	.013	.440	1.800	.015	.015	19.96	9.63	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb-Ta	N
		.070			.002	.060	.030	.035

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES

**90 RESEARCH ROAD
HINGHAM, MA 02043**

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

11



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

Weldable Quality Happen

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *70029R/774101500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY:

WORK ORDER / LOT NO.: *976164*

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer


Celeste Brennan
15(66119)(10)

90 RESEARCH ROAD
HINGHAM, MA 02043

PO 70031R/774101500

4/11

KOBE STEEL

PURCHASER PROCESS SYSTEMS INT'L		INSPECTION CERTIFICATE FLUX CORED WIRE					CERTIFICATE No: D 021 DATE OF ISSUE: 1997.04.24							
TRADE DESIGNATION	DIMENSION (mm)	MFG. NO			PSI OC CW	APPLICABLE SPECIFICATION AND CLASSIFICATION								
DW-309L	1.2	B6F2110382				AWS A5.22-95 E309LT-1 ASME SFA-5.22 E309LT- (1995 Edition)								
CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6
TENSILE TEST OF DEPOSITED METAL							IMPACT TEST OF DEPOSITED METAL					HARDNESS TEST		
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH		ELONGATION		TEST TEMP.	ABSORBED ENERGY			—				
— N/mm ²	— N/mm ²	555 N/mm ²		37 %			AVG.	—						
— MPa	— MPa	555 MPa					+ J	—						
WELDING CONDITIONS							POSTWELD HEAT TREATMENT			FS = FERRITE(SCHAEFFLER DIAGRAM) FN = FERRITE(DELONG DIAGRAM) WRC = FERRITE(WRC)				
TYPE OF CURRENT	DCEP	SHIELDING GAS		CO2		— °C x — h								
AMPERAGE	200 A													
ARC VOLTAGE	29 V													
WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.							◆ KOBE STEEL, LTD WELDING DIV. FUJISAMA PLANT							
							CHIEF INSPECTOR 							

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



We make Quality happen ...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 48184

CERTIFICATE DATE: 6/10/97

SANDVIK ORDER NO.: 17126

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 979336

TAG: 848523-01

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308LSI

DIAMETER: .095"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S712152 -60LB	.014	.840	1.700	.016	.013	19.50	10.23
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.030			.002	.040	.020	.042



Process Systems Intl
PO 70031R/77410/500

The material has not come in contact with mercury or mercury-containing compounds.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

90 RESEARCH ROAD
HINGHAM, MA 02043

6-13-97

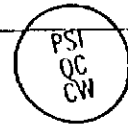
Y/11

KOBE

PO. 70031R/774101500

PURCHASER Process Systems Int'l	INSPECTION CERTIFICATE FLUX CORED WIRE	CERTIFICATE No: D 021 DATE OF ISSUE: 1997.04.24
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TRADE DESIGNATION	DIMENSION (mm)	MFG. NO	APPLICABLE SPECIFICATION AND CLASSIFICATION
0W-309L	.035 84LB	BLM1015	AWS A5.22-96 E309LT0-1 ASME SFA-5.22 E309LT- (1995 Edition)



CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6

TENSILE TEST OF DEPOSITED METAL					IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST	
TEMP. POINT	YIELD STRENGTH AT 0.2% OFFSET		TENSILE STRENGTH		ELONGATION	TEST TEMP.	ABSORBED ENERGY		
	N/mm ²	MPa	N/mm ²	MPa			AVG.	UNIT:J	
	-	-	555	555	37 %	- °C	- J	- kgf.m	-

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE(SCHAEFFLER DIAGRAM) FN = FERRITE(DELONG DIAGRAM) WRC = FERRITE(WRC)
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2		
AMPERAGE	200 A			— °C x — h	
VOLTAGE	29 V				

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆KOBEL STEEL, LTD
WELDING DIV. FUJISAMA PLANT

CHIEF INSPECTOR

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



SERVING NEW ENGLAND

NORTHEAST AIRGAS

PICKING TICKET

Sold By: AIRGAS NORTHEAST
199 SOUTHWEST CUT OFF
WORCESTER, MA 01604
800-821-9852

Cust # : 72600
Order # : 306626-00
Order Date: 04/23/97
Page : 001 OF 00

Ship To: PROCESS SYSTEMS INTERN'TL
20 WALKUP DR
WESTBURY MA 01581-0000

NAME : PROCESS SYSTEMS
PR # : 700298 JUNE/74-1915
FELT :
PHONE# : 508-826-0285
SER: 142
SLB: 3
EMO: 16
SHIP VIA: COST PICKUP -NONE-
SHIP CODE: 03
CUL/APP: PENDING
RIDGE #:

INITIALS: KEB
DEM TYPE: OREG-04
DATE : 28-APR-97 12:00
LFL :

Table with columns: QTY, UNIT, HW, DESCRIPTION, LINE, ITEM, UIC, UTY, UTY, SUP, WT, UNIT, BAL. Includes rows for 120 LB 5183 3/32X36 ALUMINUM and 120 LB 5183 1/8X36 ALUM.



This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Authorized Signature _____

Received by [Signature]
250



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49688 USA
(616) 941-4111 Phone
(616) 941-8154 Fax
alcotec@traverse.com E-mail

11/08/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363072

P.O.# - 86207

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. Demaree (Signature)



A Partnership of Alcoa Weld Wire Company, Inc. and Aluminum Technology Corporation

3/32

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

04/23/97

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.094	TIG Rod Box	363348

P.O.# - 105019



*Tony Task
1 box of 101
to TIF source
abs
4/29/97*

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEC legislation.

Additional Order Requirements:

James L. Duran

V.P. - Quality Control





J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Conformance

FORM 1: 6177490165

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. P08

Shipped To: Process Systems
PO 70015R

Date _____
Date Shipped _____
Order No. _____

Item	Weight	Size	Alloy	Heat No.
1.	100 LBS	1/16 x 36	AL6M	0294
2.				
3.				

Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



Alloy	AWS A510-00 ASME SFA 5.10	QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements Each
1100 Aluminum (B)	ER1100 / R1100	1100	.05	.05	0.05-0.20	0.05					0.05
2019 Aluminum (C)	ER2019 / R2019	2019	0.20	0.30	5.0-6.0	0.05-0.10	0.02		0.05	0.10-0.20	0.05
4043 Aluminum	ER4043 / R4043	4043	4.5-5.0	0.0	0.20	0.15	0.05		0.05	0.20	0.05
718 Aluminum	ER7047 / R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.05	0.20	0.05
5103 Aluminum	ER5103 / R5103	5103	.40	0.40	0.10	0.05-0.10	4.0-5.2	0.05-0.25		0.10	0.05
5356 Aluminum	ER5356 / R5356	5356	0.25	0.40	0.10		5.5-5.5	0.05-0.25		0.10	0.05
5554 Aluminum	ER5554 / R5554	5554		0.40	0.10		5.5-5.5	0.05-0.25		0.10	0.05
5652 Aluminum	ER5652 / R5652	5652		0.40	0.10		5.5-5.5	0.05-0.25		0.10	0.05

- NOTES:
1. Silicon content shall not exceed 0.05 percent.
 2. Copper content shall not exceed 0.0025 percent.
 3. Vanadium content shall not exceed 0.05 percent.
 4. Zinc content shall be the difference between the maximum and minimum values shown in the specification, but shall not exceed 0.05 percent.
 5. Vanadium content shall be 0.05-0.15 percent. Chromium content shall be 0.10-0.25 percent.
 6. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance with applicable purchase specifications having passed our inspection as required.

FORM 1: 6177490165



We make Quality happen . . .

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 43594

CERTIFICATE DATE: 10/18/96

SANDVIK ORDER NO.: 94386

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 969410

TAG:

ANSI A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

PSI
QC
CW

J-12-97

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS

180 LBS

PO 70012R

Bengt H. Berg, Director, Quality and Metallurgy
 Daniel Dawlani, Quality Engineer

5119(10)

BOC GASES
80 RESEARCH ROAD
HINGHAM, MA 02043

20



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen ...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBORO MA

CUSTOMER PURCHASE ORDER NO.: 41276

CERTIFICATE DATE: 8/26/96

SANDVIK ORDER NO.: 88712

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.: 967451

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
S710840	.015	.430	1.800	.016	.013	20.01	9.78	
		Mo	Cb/Wb	Ta	Ti	Cu	Cb/Wb+Ta	N
		.050			.002	.050	.040	.050



10-7-96

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(55119)(10)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen

SOLD TO: BOC GASES

SHIP TO: PROCESS SYSTEMS
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603R/V59049045000

CERTIFICATE DATE: 6/18/96

SANDVIK ORDER NO.: TK # 591854

QUANTITY: 60 LBS 308L x 36

WORK ORDER / LOT NO.: 965227

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S709276	.019	.430	1.800	.018	.012	19.92	9.82
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.080			.002	.130	.030	.045



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

C

15(66119)(10)

E



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...



**90 RESEARCH ROAD
HINGHAM, MA 02043**

SOLD TO:

SHIP TO:

PROCESS SYSTEMS INTL
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603r/V59049045000
TK 591854-02

CERTIFICATE DATE: 6/17/96

SANDVIK ORDER NO.:

QUANTITY: 120 LBS er308L 1/16 x 36

WORK ORDER / LOT NO.:

965225

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S708727	.014	.390	1.800	.016	.012	20.20	9.87
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.003	.040	.030	.060



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

... make Quality happen ...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

process systems intl
westboro, Ma.

CERTIFICATE DATE: 9/27/96

CUSTOMER PURCHASE ORDER NO.: 42100

PO-700627-V59049-041 QUANTITY: PER PACKING NOTE

SANDVIK ORDER NO.: 90814

WORK ORDER / LOT NO.: 968845

TAG:

ANS A-5.9

DIAMETER: .045"

STAINLESS STEEL WELDING WIRE TYPE ER 308L

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]
15(66149)(10)

BOC G
90 RESEARCH RD
HINGHAM, MA 02043

SANDVIK**Steel****MATERIAL CERTIFICATE****SANDVIK STEEL COMPANY**

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

*We make Quality happen...*OLD TO: BOC GASES (AIRCO)
LISLE ILSHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967820

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

PSI
QC
CW

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
700627-R/V59049-044
TK 693421

Bengt H. Berg, Director, Quality and Metallurgy

240 LB

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967818

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

*PROCESS SYSTEMS
700627-R/459049-042
TK 693415
50 LB.*

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
HINGHAM ROAD
HINGHAM MA 02043

(26)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: process systems

CUSTOMER PURCHASE ORDER NO.: 693415

CERTIFICATE DATE: 10/09/96

SANDVIK ORDER NO.:

QUANTITY: 60 lbs

WORK ORDER / LOT NO.: 700627-r/v59049-042

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
RESEARCH ROAD
HINGHAM, MA 02043

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]
15(661(9)(10))



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/03/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967819

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

PROCESS SYSTEMS
700627-R/V59049-0
TK 693420
240 LB.

BOC GASES
50 RESEARCH ROAD
HINGHAM, MA 02043

(2)



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax

05/07/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	362769

P.O.# - 72454



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cr	---	0.10
Cu	0.50	1.0
Mn	4.0	5.2
Mg	0.05	0.25
Zn	---	0.25
Ti	---	0.15
B	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

Control

Certifying Signature



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Comp

Date 10-17-96

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: **PROCESS SYSTEMS INTL**
WEST BORO MA.

Date Shipped 10-18-96

Order No. 712222

Item	Weight	Size	Alloy	Heat No.
1.	9LB	5/32 x 36	ALUM	AR1005183D
2.	10LB	5/32 x 36	ALUM	7295
3.				

Comments:
P.O. 700643-R/V5904904302



Alloy	AAYS A510-00 ASME SFA.5.10		QQ-R-566B + Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element		
	ER	R										Each	T	
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05							
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10		0.05		
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.10-0.20	0.05		
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20	0.05		
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05		
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05		
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05		
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05		
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05		

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0008 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- D. The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

30



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Comp

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
PO#

Shipped To: PROCESS SYSTEMS INTL
PO 700.643R/V5904.9043000

Date _____
Date Shipped 10-25-96
Order No. 713960-01

Item	Weight	Size	Alloy	Heat No.
1.	50LB	5/32	ALUM	0233
2.				
3.				

Comments: BOC
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AAYS A-510-00 ASME SFA.5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element	
	ER	R										Each	T
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.8	0.20-0.40	0.02		0.10		0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.10-0.20	0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20	0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	0.10		0.20		0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05	
							0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05	

- NOTES:
1. Single values shown are maximum percentages, except where a minimum is specified.
 2. Beryllium shall not exceed 0.0000 percent, all alloys.
 - A. Silicon plus iron shall not exceed 0.95 percent.
 - D. the aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
 - C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
 - D. Silicon plus iron shall not exceed 0.45 percent.

31

We certify that the items and/or materials listed above are...

1996, 10-31 04:01 #525 P. 02/02

1996, 10-31 04:01 #525 P. 02/02

5038705930

HINGHAM

FROM : AIRCO/SOC GREENS



HARRIS
SAVING BUSINESS WORLDWIDE

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co. Certificate of Con

Date 10-31-96
Date Shipped _____
Order No. 712225

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. P0//

Shipped To: PROCESS SYSTEMS
700643-R/V5904904300

Item	Weight	Size	Alloy	Heat No.
1.	50	5/32	ALUM	96248
2.				
3.				

Comments:



Alloy	AWS A.510-00, ASME SFA.5.10		QQ-R-566D Class	Si	Fe	Cu	Mn	Al	Cr	Zn	Ti	Percent Other Elements
	ER	R										
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					0.05
2019 Aluminum (C)	ER2019	R2019	2019	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10		0.05
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.05		0.10	0.10-0.20	0.05
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20	0.05
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.15	0.10		0.20		0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.05-0.20	4.3-5.5	0.05-0.20	0.10	0.06-0.20	0.05
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05

NOTES:

1. Single values shown are maximum percentages, except where a minimum is specified.
2. Beryllium shall not exceed 0.0000 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- D. The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance with applicable purchase specifications.



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/13/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86330

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40 ✓
Fe	---	0.40 ✓
Cu	---	0.10 ✓
Mn	0.50	1.0 ✓
Mg	4.3	5.2 ✓
Cr	0.05	0.25 ✓
Zn	---	0.25 ✓
Ti	---	0.15 ✓
Be	---	0.0008 ✓
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. DeWann

V.P. - Quality Control



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/11/06

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86330

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Pb	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-02 and any order requirements listed below.

All Packaging materials are in compliance with CONEO legislation.

Additional Order Requirements:

James L. Swann

V.P. - Quality Control

33



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

CUSTOMER PURCHASE ORDER NO.: 700650-R/V5904904500

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: 60 LB

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.
"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
15(66119)(10)

BOC GASES
RESEARCH AND
HINGHAM, MA 02043

35

SANDVIK
Steel

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220 SCRANTON, PA 18501 PH: (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEM*

CUSTOMER PURCHASE ORDER NO.: *7006SD-R/15904904500*

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: *18 LB*

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L



DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
S437864	.013	.430	1.720	.020	.013	19.88	9.98	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
		.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

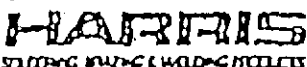
Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]
15(661197)(10)

3

BOC GASES
RESEARCH ROAD
BINGHAM, MA 02043

[Handwritten mark]



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Corp
Certificate of Comp

Date _____
Date Shipped 3-28-97
Order No. 797282

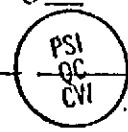
Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: Process Systems Intl
PO 70015R/7741000

Item	Weight	Size	Alloy	Heat No.
1.	40 LB	1/4 x 36	ALUM	0268
2.				
3.				

Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



Alloy	AWS A510-00 ASME SFA.5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements	
	ER	R										Class	Each
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05			0.10		0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10	0.10-0.20	0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.20	0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.20		0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05	

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0000 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.05 percent.
- B. the aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance applicable purchase specifications having passed our _____ actions as not

(u)

HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

RML ISSUE DATE: 04-15-96

PROCESS SYSTEMS
PO 7001SR/7741000
10 LBS 4043 1/16 X 3/6

HEAT NUMBER/LOT NUMBER: 0243

CHEMICAL COMPOSITION LIMITS

ALLOY: 4043
SPEC: AWS A5.10R/ER4043/AMS 4190D
ASME SPA 5.10/QQ-R-666-B



SILICON	4.500	-	6.000	TITANIUM	.200
COPPER			.300	MAGNESIUM	.050
IRON			.800	ZINC	.100
BERYLLIUM			.0008	REMAINDER	ALUMINUM
OTHER			.15		

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY BRITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Rodney M. Pyle
CERTIFICATION CLERK

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



We make Quality happen.

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *7005R/774101500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY: *180 LBS.*

WORK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan / e.p.
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

(33)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/03/96

SANDVIK ORDER NO.: 90816



QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.: 967819

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER-308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5710846	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

PROCESS SYSTEMS
70018R/774101500

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 46682

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.: 978457

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712975 -60LB	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
4-28-97	.070			.002	.060	.030	.035

PSI
QC
CW

PROCESS SYSTEMS

P.O. 70018R/77410500

SHIPPED 4-25-97 ORDER #805966-01

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan /cp

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

3
41



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBOTO MA

CUSTOMER PURCHASE ORDER NO.: 47934

CERTIFICATE DATE: 4/29/97

SANDVIK ORDER NO.: 14445

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 970470

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .035"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

Keith M. Hottle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

CUSTOMER ORIGINAL

4/2



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49888 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

01/13/97

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363423

P.O.# - 93118



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. DeWann

V.P. - Quality Control

37

JAG# WA3A#1 & WA3B S/NO2

Title

SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET Project V59049

PROCEDURE USED: V049-I-147 V049-I-179
WASH STATION OP LONG SPOOL

Component	Serial Number
<u> A3 </u>	<u> 01 </u>
<u> A3 </u>	<u> 02 </u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>

Wash Cycle: Manual

Flowrates: 30 Gpm Max. Temp.: 146° Duration: 3 hrs

Operator: Joseph Date: 7-22-97

Comments: _____

Component(s) Inspected By: John Flinn Date: 7/22/97

Quality Assurance: Owen Senecal Date: 7-24-97

Comments: _____

SPECIFICATION		
Number	V049-2-015	Rev.
A		3
Page <u> 9 </u> of <u> 9 </u>		

Number
Rev

LIGOL ASHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: A3 Spool S/N: 01 WORK ORDER: 410
 DATE/TIME: 7-23-97
 OPERATOR: Joseph Bruce

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F. TI925= 146 F

2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER. MIX 1:1 Done

3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.

4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.

5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.

6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE. WASH TIME = 15 MIN

7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE. RINSE TIME = 30 MIN

8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.

9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM. DRY TIME = 45 MIN

NOTES: Vac H₂O-antid bellows / blow Dry w/ Heat on

Number **A** V049-2-184
 Rev. 1
SPECIFICATION

Number _____
 Rev. _____

73617

LIGOD SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: A3 S/N: 02 WORK ORDER: 418
 DATE/TIME: 7-22-97
 OPERATOR: Joselyn / Tally

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F.

TI925= 146° F

2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER.

MIX 1:1 1300

3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.

4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.

5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.

6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

WASH TIME = 15 MIN

7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

RINSE TIME = 30 MIN

8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.

DRY TIME = 45 MIN

9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM.

NOTES: _____

Number **A V049-2-184** Rev. **1**
SPECIFICATION

Number _____ Rev _____

A3 (02)

Title: COMPONENT RGA TEST PROCEDURE

TITLE	TEST ARTICLE PARAMETERS PUMPDOWN LOG
DATE:	
TIME:	
TEST I.D.: e.g. WBSCI_1	WA3-1 (SN142)
PSI TEST ENGINEER:	J. Flinn
QUALITY ASSURANCE:	

PHYSICAL DIMENSIONS				
S.S. SURFACE AREA		ft ²		cm ²
VITON LINEAL LENGTH		inches		cm
VOLUME		ft ³		liters
PUMPDOWN	TIME		PRESSURE	
7/26	1815	hr:min	2×10^{-7}	Torr
7/27	1315	hr:min	1.1×10^{-6}	Torr
7/28	615	hr:min	7.4×10^{-7}	Torr
-	1100	hr:min	7.1×10^{-7}	Torr
-	1530	hr:min	6.9×10^{-7}	Torr
7/29	324	hr:min	6.8×10^{-7}	Torr
-	605	hr:min	6.9×10^{-7}	Torr
-	1420	hr:min	4.8×10^{-8}	Torr
7/30	310	hr:min	2.1×10^{-9}	Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr
		hr:min		Torr

SPECIFICATION

Number: V049-2-127

A

Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	BAKE OUT TEMPERATURE LOG
DATE:	
TIME:	
TEST I.D.: e.g. WBSCI_1	WA3-1
PSI TEST ENGINEER:	J. Flinn
QUALITY ASSURANCE:	

BAKEOUT LOG / DATE	TIME		TEMPERATURE	
7/26	1745	hr:min	START	°C
7/27	1315	hr:min	280	°C
7/28	615	hr:min	280	°C
	1100	hr:min	280	°C
	1530	hr:min	280	°C
7/29	324	hr:min	280	°C
	605	hr:min	280	°C
	1420	hr:min	135	°C
7/30	710	hr:min	66	°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C

SPECIFICATION	
Number: V049-2-127 A	Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	OUTGASSING RATES REPORT SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBSCI_1	WA3_1
PSI TEST ENGINEER:	J. Flinn
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
H2	5.76 x 10 ⁻⁸	4.8 x 10 ⁻⁹		2.76 x 10 ⁻⁷			
12			0.42				
14			0.5				
15			0.54				
CH4	2.38 x 10 ⁻¹⁰		0.57				
17			0.6				
H2O	8.19 x 10 ⁻¹⁰		0.64				
19			0.67				
26			0.71				
28	5.3 x 10 ⁻⁹	9.5 x 10 ⁻¹¹		1.28 x 10 ⁻⁸			
32	7.96 x 10 ⁻¹⁰		1.14				
38			1.36				
40	4.14 x 10 ⁻¹¹	9.4 x 10 ⁻⁹		6.03 x 10 ⁻¹⁰			
43			1.53				
44	1.04 x 10 ⁻¹⁰		1.57				
129	5 x 10 ⁻¹³	2.5 x 10 ⁻⁸		7.63 x 10 ⁻¹¹			
131	5 x 10 ⁻¹³	2.0 x 10 ⁻⁸		6.14 x 10 ⁻¹¹			
132	5 x 10 ⁻¹³	2.5 x 10 ⁻⁸		7.63 x 10 ⁻¹¹			
134	5 x 10 ⁻¹³	1.0 x 10 ⁻⁸		2.93 x 10 ⁻¹¹			
136				1.97 x 10 ⁻¹¹			

$$A = 7.39 \times 10^4 \times 2 = 1.48 \times 10^5$$

$$+ \pi (1.5) \times 60 \times (1.2) = 3.4 \times 10^3$$

$$= 1.684 \times 10^5$$

A3 connection ^{belows} correction

$$+ 5 (3^4 \times 10^3) = 1.7 \times 10^4 \text{ - manifold}$$

SPECIFICATION

Number: V049-2-127
A

Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

ITILE	OUTGASSING RATES REPORT SHEET
DATE:	
TIME:	
TESTI.D.: e.g. WBSCI_1	
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
24	1.1 × 10 ⁻¹²						
25	1.7 × 10 ⁻¹²						
26	1.3 × 10 ⁻¹¹						
27	3.3 × 10 ⁻¹¹						
29	5.4 × 10 ⁻¹¹						
30	2.2 × 10 ⁻¹²						
30	1.1 × 10 ⁻¹²						
39	6.1 × 10 ⁻¹²						
41	6.9 × 10 ⁻¹²						
42	2.6 × 10 ⁻¹²						
43	3.2 × 10 ⁻¹²						
51	8 × 10 ⁻¹³						
55	1.2 × 10 ⁻¹²						
56	1.2 × 10 ⁻¹²						
57	1.3 × 10 ⁻¹²						
67	6.5 × 10 ⁻¹³						
69	8.4 × 10 ⁻¹³						
71	6.6 × 10 ⁻¹³						
78	1.1 × 10 ⁻¹²						
TOTAL	1.33 × 10 ⁻¹⁰						

$$\begin{aligned}
 &10 \times 10^{-11} \\
 &29.7 \times 10^{-12} \\
 &29.5 \times 10^{-13} \\
 &= 13265
 \end{aligned}$$

SPECIFICATION	
Number: V049-2-127 A	Rev. 1

RGA calculations A3.xls

AMU	I (amp)	Leak Rate (Torr-L/s)	F	I w/ Leak (amp)	ensitivit	Q	q
-----	------------	-------------------------	---	--------------------	-----------	---	---

Area = 1.68E+05

H2	5.76E-08	4.80E-06		2.76E-07	21.978	1.26593E-06	7.51742E-12 ✓
----	----------	----------	--	----------	--------	-------------	---------------

16	2.38E-10		0.57	-	95.5116	2.27318E-08	1.34987E-13 ✓
----	----------	--	------	---	---------	-------------	---------------

18	8.19E-10		0.64	-	101.108	8.28074E-08	4.9173E-13 ✓
----	----------	--	------	---	---------	-------------	--------------

28	5.30E-09	9.50E-07		1.28E-08	126.667	6.71333E-07	3.98654E-12 ✓
----	----------	----------	--	----------	---------	-------------	---------------

40 4.14E-11 9.40E-08 6.03E-10 167.379 6.92949E-09 4.1149E-14

44	1.04E-10		1.57	-	158.641	1.64986E-08	9.79729E-14 ✓
----	----------	--	------	---	---------	-------------	---------------

129 5.00E-13 2.50E-08 7.63E-11 329.815 1.64908E-10 9.79262E-16

131 5.00E-13 2.00E-08 6.14E-11 328.407 1.64204E-10 9.75081E-16

132 5.00E-13 2.50E-08 7.63E-11 329.815 1.64908E-10 9.79262E-16

134 5.00E-13 1.00E-08 2.93E-11 347.222 1.73611E-10 1.03094E-15

Other	1.33E-10				126.667	1.68E-08	1.00E-13 ✓
-------	----------	--	--	--	---------	----------	------------

Component: A3 (sn 1&2)

Date tested: 07/30/97

Pass/Fail: Pass

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA ION SOURCE SETTINGS SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	WA3-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

Type	CH-TRON	IS-TYPE:	HS-THOR.
------	---------	----------	----------

Channel	0 ENABLE
---------	----------

Detector	
Type	CH-TRON
SEM Volt	<< >>

Amplifier	
Offset	ON

RF-Polarity	inverse
IS-Voltages	[V]
IonRef	138
Cathode	90.0
Focus	9.38
Field Axis	5.75
Extract	12

Mass	
Mode	SCAN-N
First	
Width	
Speed	
Resolution	
Threshold	

Ion Source	
Filament #	
IS-Set	

IS-Emission	
Emiss [mA]	
Protect [A]	3.5

Fil.Prot.	Thresh.
	[mbar]
ON below	
OFF above	

SPECIFICATION

Number: V049-2-127
A

Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA SCAN PARAMETER FILE SETTINGS	
DATE:		
TIME:		
TESTID.: e.g. WBSC1_1	WA3-1	
PSI TEST ENGINEER:		
QUALITY ASSURANCE:		
RGA NUMBER:		
RGA SENSOR HEAD SERIAL # QMS		
RGA ELECTRONICS UNIT SERIAL # QME		

PARAMETER FILE: LIGO200.SAP

PARAMETER FILE: LIGO200.SBP

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Detector

EM Voltage	1700	
------------	------	--

SEM Voltage	1700	
-------------	------	--

Mass

Speed	5 s	
Width	200	
Resolution	25	
Threshold	1E-15	

Speed	5 s	
Width	200	
Resolution	25	

Amplifier

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

OUTPUT: User discretion
DISPLAY: User discretion

SPECIFICATION

Number: V049-2-127
A

Rev.1

Title: COMPONENT RGA TEST PROCEDURE

AGE: TEST I.D. FILENAME: XXXXXXXXX.SAC

TITLE	RGA COMPUTER DATA FILE LOG
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	WA3-1
PSI TEST ENGINEER:	J. Flinn
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

BARGRAPH DATA FILE NAME

ANALOG SCAN DATA FILE NAME WA3-1.SAC

OTHER DATA FILES

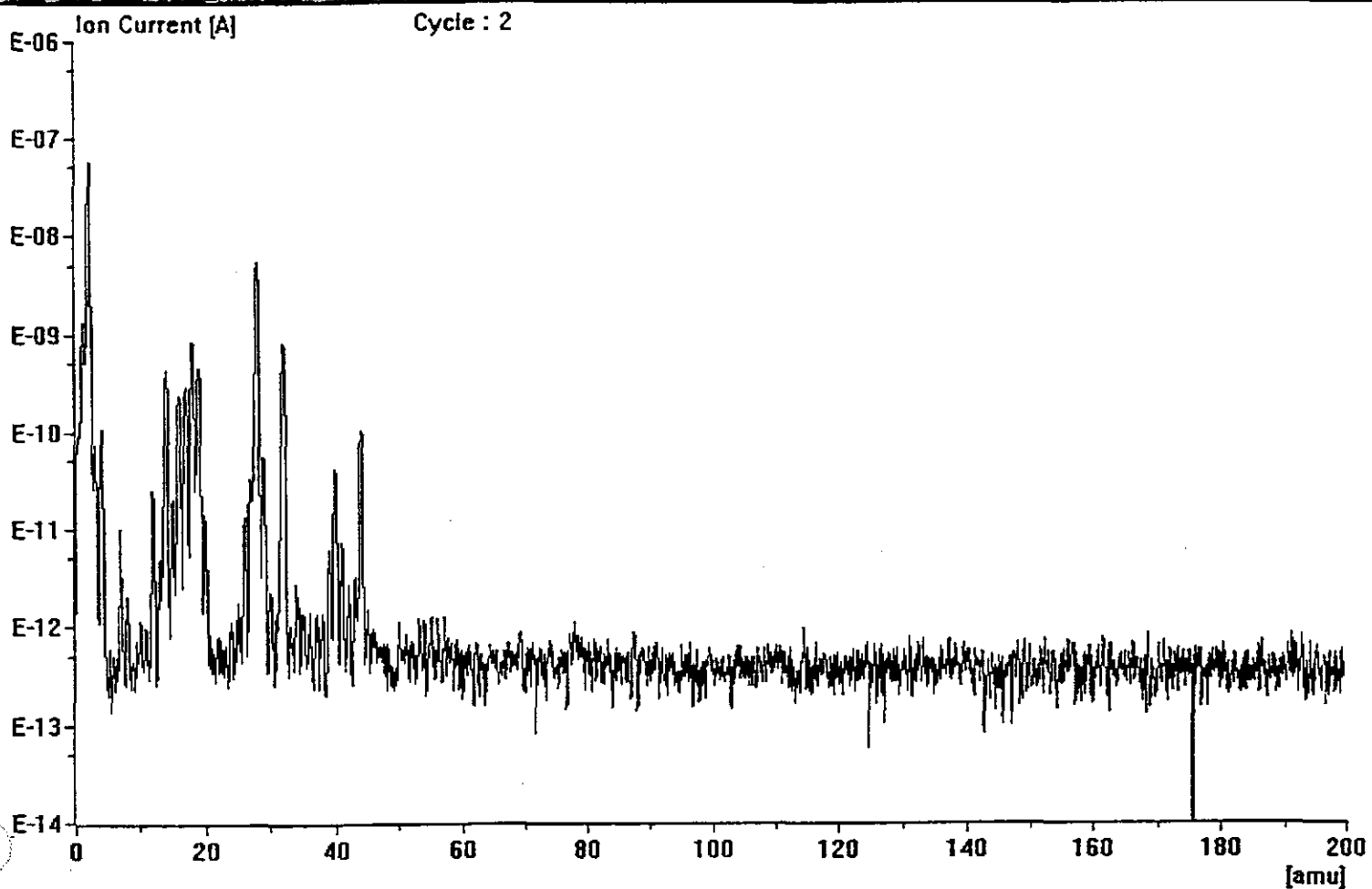
PRINTOUT OF

1. LAST ANALOG SCAN BEFORE CALIBRATION
2. ANALOG SCAN WITH CALIBRATED LEAK OPEN
3. BARGRAPH PLOT

SPECIFICATION

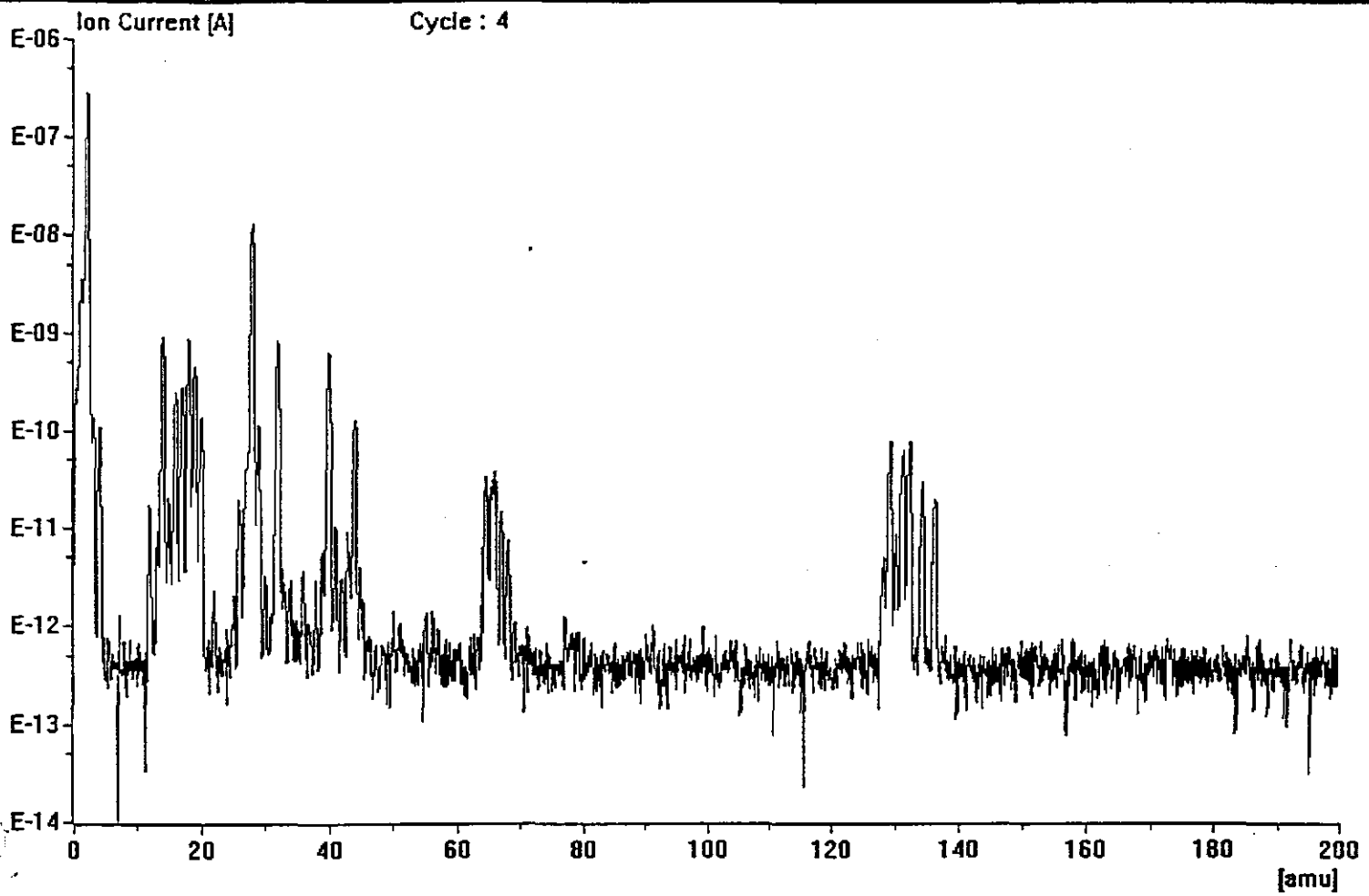
Number: V049-2-127
A

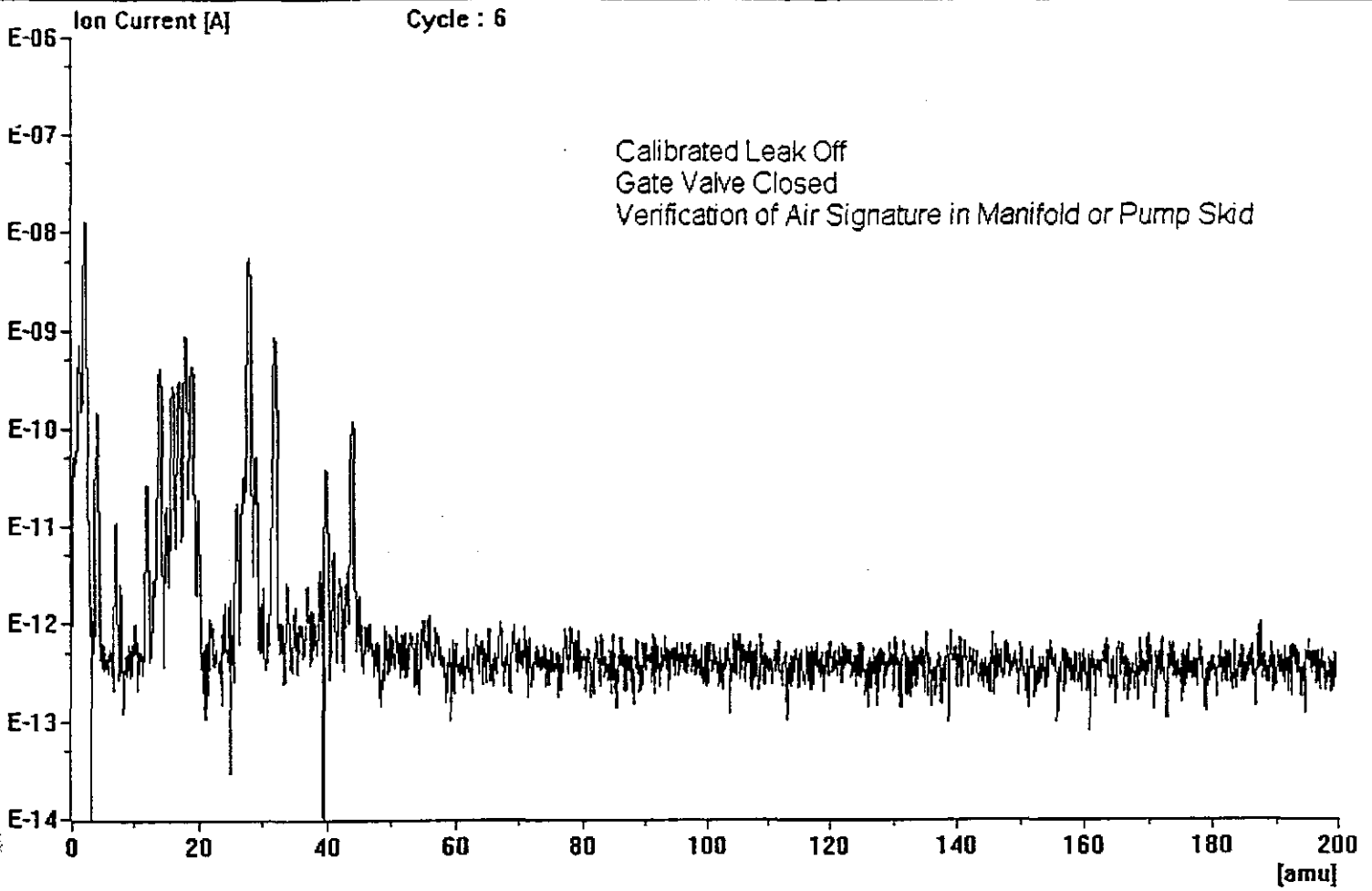
Rev. 1



3.5 ft L = 105 L

48" D = 120cm D





No NCR's



PROCESS SYSTEMS INTERNATIONAL, INC.

20 Walkup Drive, Westborough, MA 01581

LIGO PROJECT

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Table of Contents

TAG # - WB3A

P/N - VO49-4-B3A-01

1	Quality Plan Sign Offs.	
2	Hyspan Metal Bellows Documentation Package.	
3	C of C to Codes and Standards. Material test reports for shells, heads and large flanges. C of C for nozzles, small parts, flanges and weld wire.	
4	Final Cleaning Certificates.	
5	Bakeout Certificate. Acceptance Test Data. Final Vacuum Test Data	
6	Non Conformance Reports. Use As Is when applicable.	
7	As Built Drawings/Dimensions.	

TAG# WB3A SN/01

Title: QUALITY PLAN FOR LIGO-

SPOOLS

QUALITY PLAN

FOR

LIGO

SPOOLS

SERIAL No. V049 - 4 - B3A-01

CONTROLLED-COPY

NOV 26 1996

φ

ARB 11/22/96

RELEASED ON DED # 0364

REV LTR

BY-DATE

APPD. DATE

DESCRIPTION OF CHANGE

PROCESS SYSTEMS INTERNATIONAL, INC.

SPECIFICATION

INITIAL APPROVALS

PREPARED
ARB *[Signature]*

DATE

11/22/96

APPROVED

B 93

DATE

11/25/96

Number

A V049-2-173

Rev.

φ

Title

APPLICABLE DRAWINGS

REFER TO FABRICATION PLAN

APPLICABLE PROCEDURES

V049-2-070	WELDING	PAW P8-P8 75%Ar, 25%He
V049-2-071	WELDING	PAW P8-P8 75%Ar, 25%He PWHT
V049-2-072	WELDING	GTAW P8-P8 100%Ar PWHT
V049-2-073	WELDING	GTAW P8-P8 100%Ar
V049-2-146	WELDING	PAW P8-P8 75%He, 25%Ar
V049-2-074	GENERAL REPAIR PROCEDURE	
V049-2-014	LEAK CHECK PLAN	
V049-2-015	CLEANING PROCEDURE	
V049-2-019	BAKEOUT PROCEDURE	
V049-2-040	STAINLESS STEEL FLANGE FORGINGS	
V049-2-047	COMPONENT SHOP CONDITIONING PLAN	
V049-2-097	SPOOLS/MODE CLEANERS/BEAM TUBE MANIFOLDS FAB	
V049-2-120	RAW MATERIAL HANDLING PROCEDURE	
V049-2-121	PROCEDURE FOR VERIFYING COMPONENT DIMENSIONAL ACCURACY	
V049-2-123	COMPONENT PACKAGING, HANDLING AND SHIPPING	
V049-2-084	WELD DATA SHEET SPECIFICATIONS	

Number

Rev.

SPECIFICATION

Number **A V049-2-173**

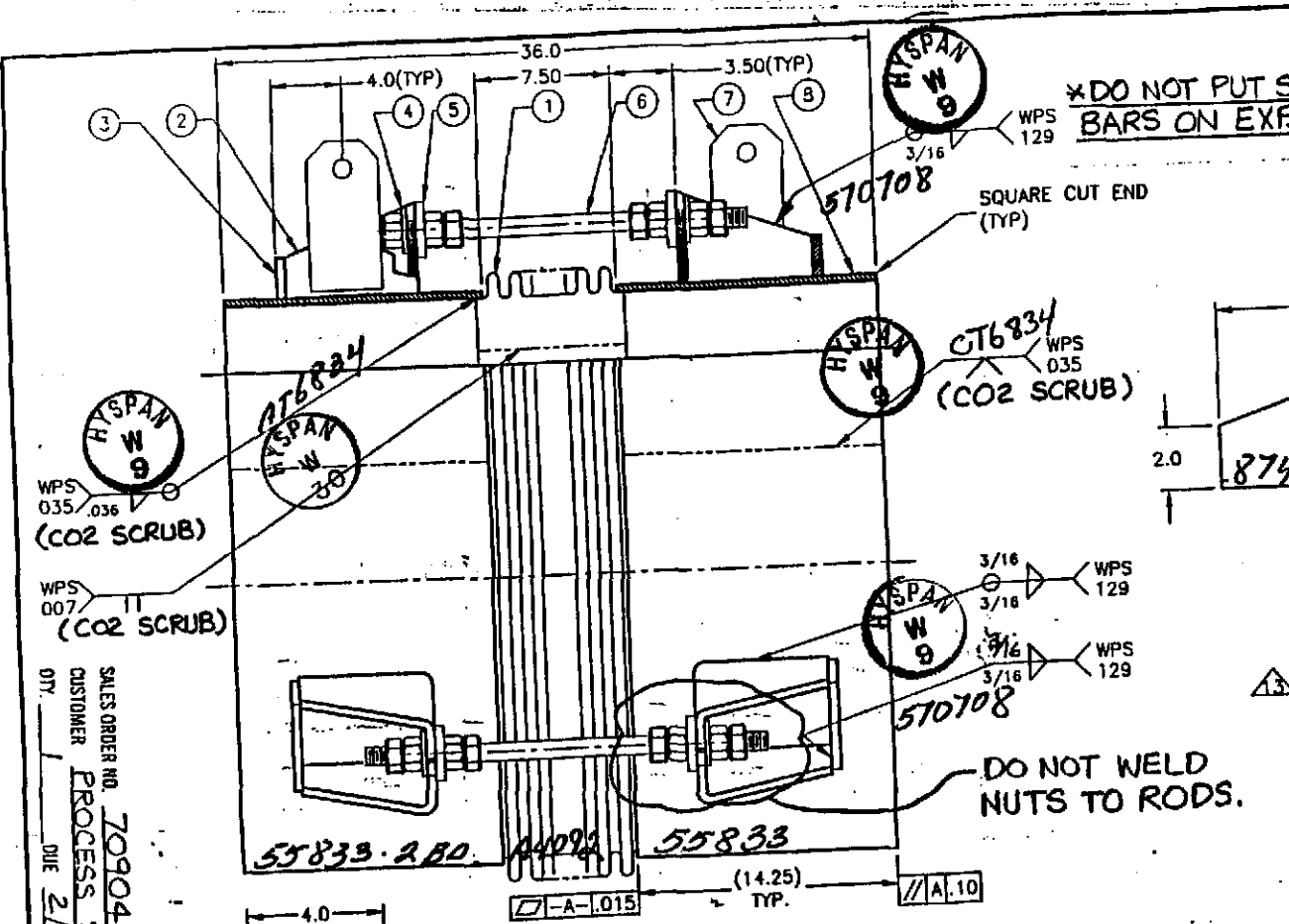
Rev. **φ**

SPool J049-4-B3A-01

SPECIFICATION V049-2-173

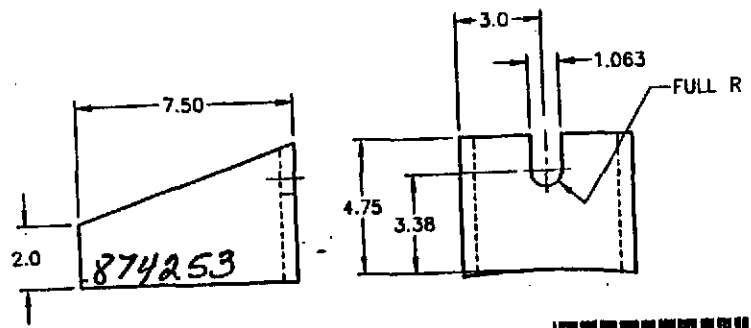
REV. 0

ASME CODE QUALITY PLAN		LEGEND: D = DIMENSIONAL PT = LIQUID PENETRANT LT = LEAK TEST X = HOLD POINT V = VISUAL MT = MAGNETIC PARTICLE UT = ULTRASONIC ✓ = APPROVED RT = RADIOGRAPHY ET = EDDY CURRENT W = WITNESS R = REVIEW VR = VERIFY									
QUALITY PLAN REVIEWED QA <u>GS</u> AI <u>N/A</u>	TYPE INSP.	PROCEDURE OR DRAWING	WELDING PROCEDURE	PSI Inspection SIGN/DATE	AUTHORIZED INSPECTOR SIGN/DATE	CUSTOMER QA SIGN/DATE	REMARKS				
Inspect Following											
Pre fab Nozzles:	V-D	V049-4-B3A		X MS 5/11/97							
Leg Assembly:	V-D			X GS 03-30-97							
Verify Fit-Up And Welding of Flanges to Shell	V-D			X MS 5/12/97							
Inspect Following Fit-Up AND Welding				X N/A			PSI QA GS				
Nozzles	V-D			X MS 5/11/97							
Angle Stiffness	V-D	✓		X MS 5/9/97							
Perform Gross Leak Check	R	V049-2-014		X GS 09-18-97							
Perform Final Dimensional Insp.	V-D	V049-2-121		X RD 5/14/97							



***DO NOT PUT SHIPPING BARS ON EXP. JOINT.**

REV	REVISION	DATE	BY
A	WAS DWG NO. 021632-17 REV'D NOTE 12 & 16, TEMP. 347F & NOTE 16, ADDED NOTE 18, ITEM 8, & TOLERANCE DIMS. SUBMIT FOR APP'L	SEP/11/96	A.F.G.
B	REV'D PER CUST COMMENT SUBMIT FOR APPROVAL	OCT/07/96	A.M.P.



ITEM 2 DETAIL



ITEM	QTY	DESCRIPTION	MATERIAL
9	1	TAG, .06 THK.	A240-304
8	2	WELD END, 30.50 I.D., .25 THK.	SA240-304L
7	2	LIFTING LUG, .38 THK.	A240-304
6	3	TIE ROD, NUTS, 1.0 DIA.	C-STL
5	6	WASHER PLT., .50 THK.	A588/CORTEN
4	6	WASHER PLT., .25 THK.	A588/CORTEN
3	6	BACKING PLATE, 2.0 TALL, .50 THK.	A240-304
2	6	TIE ROD FORMED SUPPORT, .50 THK.	A240-304
1	1	BELLOWS, 30.378 I.D., 33.128 O.D., 1 PLY, .038 THK., 6 CONS.	SA240-304L

Information proprietary to Hyspan Precision Products, Inc. is contained on this drawing. Disclosure or use is expressly prohibited except as agreed to in writing by Hyspan.

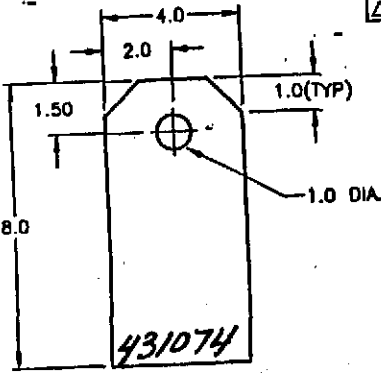


Hyspan Precision Products, Inc.
1685 Brandysine Avenue
Chula Vista, California 91911
Phone (619) 421-1355
FAX (619) 421-1702

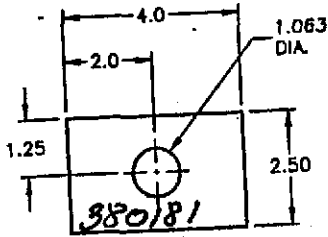
CODE IDENT 30008

TITLE BELLOWS ASSEMBLY, SINGLE, TIED, 30.50 I.D.	DRAWING NUMBER 53156	REV A
--	-------------------------	----------

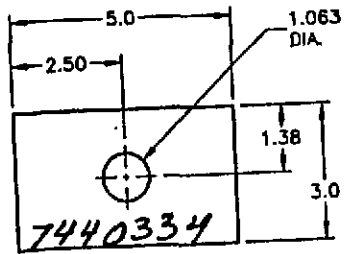
DRAWN BY PARIS	DESIGNED BY M.O.C.	DATE JUL/11/96	CUSTOMER PROCESS SYSTEM INT'L
APPROVED	DATE	SPECIFICATION V049-4-B3A	
SCALE NONE	SHT. 1 OF 2		



ITEM 7 DETAIL



ITEM 4 DETAIL



ITEM 5 DETAIL

SALES ORDER NO. 70904-20
CUSTOMER PROCESS SYS INT'L
DATE 2/21/97



TEST CERTIFICATE
Cert. No. 175583

F.O. B. 1
Sheep
Sheep
69 IT.

144 (0)114 244 3311 144 (0)114 244 8200 64702 V04 99A - P1 - 02

EN 10204 3.18

To: AVESTA SHEFFIELD INC 425 NORTH MARTINGALE BLVD 2000 SCHALMBURG ILLINOIS 60173 U.S.A F.A.O. KEITH MOOD		Cons./Inv. No. 175/04392/05	Date 21/05/96	
Customer Order No. 9102376	Specification ASTM A240-95 304 UNS30400 QQ-S-7660 FEB 5 1988 AMS 5513F 6/15/53 NIL-S-50590 30/5/83	Supply Condition Cold Rolled Softened Descaled and Pinch Passed		

Quality confirmed by spectroscopy examination Test Position: Front, Back Orientation: Transverse, Longitudinal El codes: 1=50, 3=5, 45/50, 5=50mm, 6=80mm, 7=35mm, 8=25mm

Folio	Cast. No.	Material Description	Temp C	Coil No./ Plate No.	Proof Stress		Tensile Strength	El%	RA/IV	Bend Test	UC Test	Irod Charpy	Impact ft. lbs. J
					0.2% PSI	1.0% Yield/Min							
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	14328/1	BT 45305 FT 36975	52345 44370	89175 86855	52 (S) 57 (S)	63.5 155 58.6 144	OK OK	OK OK		

MATERIAL TESTED TO ASTM A240 CONFORMS TO LATEST REVISIONS OF ASTM A480/ASME SA240/480 Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds by Avesta Sheffield. (1N/mm sq = 145.04 PSI)

Material inspected and tested to latest revisions of ASTM A480 and ASME SA20/SA480 (N/mm sq. = 145.0 PSI) Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds. Solution annealed by heating to 1900 deg f min. except 321H *NO WELD REPAIR*

to ASTM A240 also conforms to ASTM A480 and ASME SA20/SA480

the material was not contaminated with metallic mercury or mercury compounds. Solution annealed by heating to 1900 deg f min. except 321H 347H

Rockwell Test 110, 110, 101, 101, 101, 101, 101, 101 INTERCRYSTALLINE CORROSION TEST TO ASTM A262 (1995) PRACTICE B SATISFACTORY

Avesta Sheffield Ltd
LRQA Approval Numbers



940258
940175

Cast No.	C	Si	Mn	P	S	Cr	Mo	Ni	IV	Nb	Co	N	
C2004	.021	.39	1.38	.020	.001	18.15	.24	9.08				.039	Cu .27

All Test Certificates issued by Avesta Sheffield Ltd will contain either an embossed seal, or be impregnated with an Avesta Sheffield Ltd watermarked logo, or a combination of both. Any recipient of a copy of a Avesta Sheffield Ltd Test Certificate without either the seal or watermarking should ensure from the supplier that it is a true and accurate reproduction of the original

Witnessed	Inspecting Authority	Signed for Avesta Sheffield Ltd <i>M. de Jong</i> M. de Jong, Chief Inspector
-----------	----------------------	---

We certify that the above material has been tested in accordance with the order and specification and that the results comply with the requirement of the order and specification. (Note that where more than one specification is involved, only the mechanical properties and cast chemical composition are certified to the requirements of each individual specification.)

Form No: CIV_101 PCI

VINCENT METAL GOODS
SANTA FE SPRINGS
CUSTOMER: H. J. P. A. N.
ORDER NO: 60306
DATE: 25-03-85

OREGON STEEL MILLS

P.O. BOX 2780, Portland, Oregon 97208 • (503) 288-9851 Fax (503) 240-8288

REPORT OF CHEMICAL/PHYSICAL TESTS

CERTIFICATE NO. 421480P	DATE Oct 14, 1996	PAGE 1
MILL ORDER NO. 69010	DATE	
CUSTOMER ORDER NO. 59471		
JOB/REQ. NO.		
SHIPPING NO. 421480	DATE 10/14/1996	
CARRIER WESTERN STATES TRUCK		
CAR/TRUCK NO. 459		

THE FIRST ISO 9002 REGISTERED
 GARY STEEL COMPANY-LONG BEACH
 PO BOX 1607
 LONG BEACH, CA 90801

GARY STEEL COMPANY-LONG BEACH
 PO BOX 1607
 LONG BEACH, CA 90801

THIS MATERIAL HAS BEEN MANUFACTURED, TESTED AND FOUND TO MEET THE SPECIFICATIONS AND PURCHASE ORDER REQUIREMENTS
 OSM HSLA STRUCTURAL QUALITY PLATE ASTM A588-94 GRADE A ASTM A242-93A TYPE 1 ASTM A709-94A GR 50W TYPE A.

PHYSICAL PROPERTIES

ITEM NO.	DESCRIPTION	HEAT NO.	SLAB	YIELD		TENSILE		% ELONG		% RA	HARDNESS	BEND	IMPACTS
				PSI X 100	PSI X 100	PSI X 100	PSI X 100	1"	2"				
1	0.2500 X 96.000 X 180.000 4 PCS 13068 LBS	+ 380181	✓	570	750	23							
	4 PCS 13068 LBS TOTALS			645	780	24							

APPROVED: _____ DATE: _____
 PACKING SLIP# 37736
 CUST PO# 61143
 DATE SHIPPED 10-31-96

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	P	S	Si	Cu	Ni	V	Co	Al	Cr	Mo	Ti	B	Nb	Ca	CE	REMARKS
+380181	.10	.86	.006	.009	.37	.26	.10	.028	1.008	.027	.45	.03						
ALL HEATS INDICATED WITH (+) WERE MELTED AND MANUFACTURED IN THE USA.																		
..... END OF REPORT																		

I certify the above to be correct as contained in the records of OREGON STEEL MILLS by Susan M. Yenne Q.C. RECORDS ADMINISTRATOR
 SUSAN M. YENNE

10/15/96 08:04 3503 240 5268 OSM-TECH STC-PDI GARY STEEL-L.B. 002/002

Gulf States Steel, Inc.

MOBILE, AL 36684-10

V049483A-P1-02

AX-4377-01

ORDER NO. NUMBER	ITEM	INFO	PURCHASE ORDER DATE
38232	04	742	06 09 94
PURCHASE ORDER NO.		SHIPPING FROM	
040		ALA CITY	

CERTIFICATE OF TESTS

ACCOUNT NUMBER	PAGE NO.	INVOICE NUMBER
73800003	4	742-17002
DATE SHIPPED	ROUTE/VEHICLE IDENTIFICATION	
08 27 94	8D1152181	

HEREBY CERTIFY THAT THE MATERIAL LISTED HEREIN HAS BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE METHODS PRESCRIBED IN THE GOVERNING SPECIFICATIONS AND BASED UPON THE RESULTS OF SUCH INSPECTION AND TESTING HAS BEEN APPROVED FOR CONFORMANCE TO THE SPECIFICATIONS.

C. F. BEARDEN, JR.
MGR. TECHNOLOGY AND QUALITY - PLATE PRODUCTS

MATERIAL DESCRIPTION	QUANTITY SHIPPED
PLATE A514 ASTM A-500-93 GRD A ASTM A-500-93 GRD B ASTM A-242-93 TYPE 1 5000 X 96.0000 SHEARED EDGE X 240.0000 IN. HT 7440334 3 PCS HT 7440395 1 PCS HT 7033576 2 PCS CH C 15NH NH 80/1.00 P 040HX S 050HX ST 30/90 CU 20/40 NI 60HX CR 40/65 NO RPI CB RPI 0 02/10 AL 020HX NR YLR 50000 NIN TEN 70000 NIN XELONG NIN 2 IN. 21 OR 8 IN 18 IL 2 1/R CA 2 1/R TENICO 937 SOUTH CENTER STREET NESH AZ 85210	19602

HEAT NUMBER	GRAN	C	Mn	P	S	SI	CU	N	CR	MO	CB	V	AL	N	B	Ca	Ti	Q2
7440334		.09	0.97	.028	.020	.333	0.33	0.12	0.53	.02	.013	.034	.104					
7440395		.10	0.95	.007	.013	.380	0.33	0.10	0.47	.02	.010	.033	.038					
7033576		.08	0.92	.007	.012	.325	0.33	0.13	0.43	.02	.001	.026	.037					

HEAT NUMBER	TEST OR PIECE IDENTITY NO.	YIELD KSI	TENSILE KSI	% ELONG		WIDNESS	GRID TEST	HEAT TREAT	Y87S RATIO	% RED AREA	GALV COATING	DROP WEIGHT TESTS					
				2"	1"							1	2	3	AVG		
7440334	W127401	71.0	81.0			26		RR	.87								
7440334	W126101	60.0	74.0			25		RR	.81								
7440395	W213101	66.0	78.0			20		RR	.84								
.3395	W214901	62.0	74.0			22		RR	.83								
7033576	W304601	58.0	71.0			78		RR	.81								

HEAT NUMBER	TEST OR PIECE IDENTITY NO.	HEAT TREAT	SIZE	DWR	TEMP °F	ENERGY				% BREAK			MILS LATERAL EXPANSION				
						1	2	3	AVG	1	2	3	AVG				

DATE: 3/13/98
61305
11/13/94

Po 46043

SO 50697

V049487A-PI-02



Jessop Steel Company

CALIFORNIA DIVISION

SALES ORDER

OFF	DATE ENTER	SALESMAN NO.	INVT.	DEPT.	TAX	CUST. ORD. DATE	REQ. DATE	SALES ORDER NO.	
1	01/20/94	462 000	02	70	N	01/20/94		CS -041765 REPRINT	
9136346			002			ROUTING			
CASTLE A M & CO 14001 ORANGE AVE P O BOX 1402 PARAMOUNT CA			SHIP TO	CASTLE A M & CO 4320 VANDEVER AVE NORTH COUNTY SAN DIEGO CA			CUSTOMER PICK UP		
90723				92120			F.O.B. SHIPPING SANTA FE SPRINGS		
								CUST. ORDER NO. 02-393740	

EAT NO. 431074 A

SIZE & DESCRIPTION 3/8" T-304

SOURCE Jessop Steel Co.

EXCEPT AS OTHERWISE NOTED, THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH THE LISTED SPECIFICATIONS AND RESULTS CONFORM TO THE SPECIFICATION AND ORDER REQUIREMENTS.



STEEL COMPANY

500 Green St.
Washington, Pennsylvania 15301

8111 JESSOP STEEL OF CALIF
To 14420 SOUTH MARQUARDT AVE
SANTA FE SPRINGS CA

90670

CERTIFIED MATERIAL
TEST REPORT

OUR ORDER NO. PP3207630
 YOUR ORDER NO. 1718
 MEMO NO. 037466
 DATE 11/08/93
 SALESMAN NO. 099

[Signature]
AUTHORIZED SIGNATURE

JESSOP T 304 STAINLESS HRAP
 5513F ASTM A167-91 ASTM A240-91a ASTM A666-91 (ANNEALED) COMPOSITION ONLY
 ASME SA-240-A92 MIL-S-5059D AMEND 3 COMPOSITION ONLY QQ-S-766D COND A
 (WAIVE CLM)

Heat	Slip	Size	Pcs	Weight							
431074A	45736	.3750 x 96.0000 x 264.0000	3	8709							
Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
431074A	.052	1.69	.024	.012	.40	8.27	18.27	.20	.20	.17	.089
Heat	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grain Size		
431074A	.3750	45.0 KSI	89.5 KSI	60.1	65.8	B80-82	OK	OK			

MATERIAL WAS NOT WELD REPAIRED



874253

1/5 T304

HEAT NO.

MILL Allegheny Ludlum Corporation
SOURCE Jessop Specialty Products

SIZE & DESCRIPTION
EXCEPT AS OTHERWISE NOTED, THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH THE LISTED SPECIFICATIONS AND RESULTS CONFORM TO THE SPECIFICATION AND ORDER REQUIREMENTS.

 **Allegheny Ludlum** CORPORATION

Jessop Specialty Products
500 Green Street
Washington, PA 15301

CERTIFIED MATERIAL
TEST REPORT

OUR ORDER NO. MD63764B1
YOUR ORDER NO. 3013
MEMO NO. 123374-03 REVISION
DATE 11/27/96
SALESMAN NO. 099

H. M. O'Connor
AUTHORIZED SIGNATURE

8111 LOS ANGELES WAREHOUSE
To ALLEGHENY LUDLUM CORP
14420 SOUTH MARQUARDT AVE
SANTA FE SPRINGS CA 90470

JESSOP T 304 STAINLESS HRAP
AMC B30400-60 REV 6 ASME SA-240-A93 AMS 5513F AMS-55134F UNS 930400
ASME SA-312-A93 (CHEM ONLY) ASTM A276-94b (CHEM ONLY)
ASTM A240-94a ASTM A480-94b ASTM A262 PRACTICE E
ASTM A479-94a (chem only) ASTM A312-94b (chem only) ASTM A249-94a (chem only)

Heat	Slip	Lot No	Size	Pcs	Weight
B74037	77324 A	16749	.5000 x 96.0000 x 266.0000	1	3842 From slip 44283
<u>B74253</u>	77286 A	16945	.5000 x 96.0000 x 272.0000	1	3928 From slip 45337
<u>B74253</u>	77287 A	16945	.5000 x 96.0000 x 274.0000	1	3957 From slip 45338

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
<u>B74253</u>	.019	1.79	.029	.0005	.46	8.20	18.21	.24	.14	.30	.087

Lot No	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grain
<u>16945</u>	44.5 KSI	87.5 KSI	67.0	77.0	B82	OK	OK	

MATERIAL WAS NOT WELD REPAIRED
MATERIAL WAS PRODUCED WITHOUT KNOWN CONTACT WITH MERCURY

CASTLE METALS - LA
DATE REC'D 12-31-96
REC'D FROM Allegheny #78590
APPROVED BY SA IAC 5240



SAN DIEGO WELDERS SUPPLY INC

EL CAJON VALLEY WELDERS SUPPLY

2506 Market Street
San Diego, CA 92102
(619) 239-7571
FAX (619) 239-0529

2446 Main Street
Chula Vista, CA 91911
(619) 423-9911
FAX (619) 423-6159

2051 Vineyard Avenue
Escondido, CA 92029
(619) 432-0445
FAX (619) 432-8223

1180 N. Marshall Ave.
El Cajon, CA 92020
(619) 562-1300
FAX (619) 562-9975

ACCOUNTING AND CREDIT FAX FOR ALL LOCATIONS (619) 239-0620

CERTIFICATIONS

COMPANY NAME: HYSPAN INC
P.O.#: ~~60652~~
INV#: 74653
DATE: 12-18-96

TYPE: 308L
SIZE: .045
WEIGHT: 60
HEAT#: 570708

TYPICAL CHEMICAL PROPERTIES

C	0.024
Si	0.38
Mn	1.80
P	0.019
S	0.001
Cr	1972
Ni	9.63
Mo	0.07
Cu	0.09

SPECIFICATIONS

AWS/ASME SFA 5.9, CLASS 308L

We hereby certify that the above product meets the listed specifications.


San Diego Welders Supply



SAN DIEGO WELDERS SUPPLY ^{INC}

EL CAJON VALLEY WELDERS SUPPLY

2506 Market Street
San Diego, CA 92102
(619) 239-7571
FAX (619) 239-0529

2446 Main Street
Chula Vista, CA 91911
(619) 423-9911
FAX (619) 423-6159

2051 Vineyard Avenue
Escondido, CA 92029
(619) 432-0445
FAX (619) 432-8223

1180 N. Marshall Ave.
El Cajon, CA 92020
(619) 562-1300
FAX (619) 562-9975

ACCOUNTING AND CREDIT FAX FOR ALL LOCATIONS (619) 239-0620

CERTIFICATIONS

COMPANY NAME: HYSpan INC
P.O.#: 61129
INV#: 59996
DATE: 10-29-96

TYPE: 308L
SIZE: 1/16
WEIGHT: 20
HEAT#: AT6834

TYPICAL CHEMICAL PROPERTIES

C	0.024
Si	0.38
Mn	1.80
P	0.019
S	0.001
Cr	1972
Ni	9.63
Mo	0.07
Cu	0.09

SPECIFICATIONS

AWS/ASME SFA 5.9, CLASS 308L

We hereby certify that the above product meets the listed specifications.

Mary Mc Mahon
San Diego Welders Supply

V0494B3A - A1-02



SAN DIEGO WELDERS SUPPLY

EL CAJON VALLEY WELDERS SUPPLY

2506 Market Street
San Diego, CA 92102
(619) 239-7571
FAX (619) 239-0529

2446 Main Street
Chula Vista, CA 91911
(619) 423-8911
FAX (619) 423-6159

2051 Vineyard Avenue
Escondido, CA 92029
(619) 432-0445
FAX (619) 432-8223

1180 N. Marshall Ave.
El Cajon, CA 92020
(619) 562-1300
FAX (619) 562-9975

ACCOUNTING AND CREDIT FAX FOR ALL LOCATIONS (619) 239-0820

CERTIFICATIONS

COMPANY NAME: HYSpan INC
P.O.#: 61252
INV#: 64157
DATE: 11-7-96

TYPE: 308L
SIZE: 3/32
WEIGHT: 20
HEAT#: CT6834

TYPICAL CHEMICAL PROPERTIES

C	0.024
Si	0.38
Mn	1.80
P	0.019
S	0.001
Cr	19.72
Ni	9.63
Mo	0.07
Cu	0.09

SPECIFICATIONS

AWS/ASME SFA 5.9, CLASS 308L

We hereby certify that the above product meets the listed specifications.

Mary McMahon
San Diego Welders Supply

MASS SPECTROMETER TEST REPORT

Fig.-1

CUSTOMER: Process Systems International, Inc.				
Sales Order No.: 70904 Item: 20		Drawing No.: 33156		
Equipment: DuPont 120 SSA		Leak Standard. Sn. 1051		
Test Procedure per ASTM E-498		Test Area: Bellows and weld ends		
PSI Part No.: V0494B3API				
Sn.	Leak Rate - Std. cm ³ /s.	Time	Date	Inspector
002	1x10 ⁻⁹		2-5-97	May

The above referenced expansion joint has passed the mass spectrometer leak test to the required sensitivity.

Material HT#		
Bellows	Tagged weld end	Untagged weld end
A4092	48831	48831

Inspector: May Palmer Level II Date 2-5-97



Material Tracer Record

Part Number WB3A S/N 01

Page 2

Item #	Qty	U/M	Part code	Description	C of C MIC # CMTR
1	1	EA	V0494057	31.06 ID X 68-1/4 OD FLANGE GROOVED	A 730
2	1	EA	V0494056	31.06 ID X 68-1/4 OD FLANGE FLAT FACED	A 717
3	1	EA	V0494B3AP3A	SHELL SST304/304L SA240 30.5 ID X .25	C of C
4	3	EA	V0494B3AP4	SHELL SST304/304L SA240 30.5 ID X .25	C of C
7	1	EA	V049M022	O'RING VITON A500 BAKED .275 NOM X 200-5/8 LG VULCANIZED	C of C
8	1	EA	V049M023	O'RING VITON A500 BAKED .275 NOM X 191-1/4 LG VULCANIZED	C of C
9	2	EA	V049M308 3	FLANGE SST304L COFC HALF NIPPLE 16-1/2 ODX 14 OD TUBE X.250 WT 5 LG NON ROT. .390 DIA THRU 36 HOLES EQ. SP. ON A 15.310 DIA B.C.	C of C
10	2	EA	202666 3	FLANGE SST304L COFC CONFLAT BLANK 16-1/2 OD NON ROT. .390 DIA THRU 36 HOLES EQ. SP. ON A 15.310 DIA B.C.	C of C
12	60	EA	202678 3	BOLT STL SA193 B7 COFC HEX HD 7/8-9 UNC X 4 LG ZINC PLATED .0002 MIN THK.CLEAR CHROMATE PROCESS	C of C
13	60	EA	202679 3	NUT STL SA194 2H COFC HEX HD 7/8-9 UNC ZINC PLATED .0002 MIN THK CLEAR CHROMATE PROCESS	C of C
14	150	EA	202581 3	WASHER STL ASTM F436 COFC 1-3/4 ODX15/16 IDX1/4 THK ELECTROLESS NICKEL PLATED	C of C

Material Tracer Record

Part Number WB3A S/N 01

Page 3

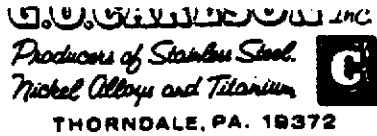
15	1	EA	V0494B3AP1	BELLOWS ASSY 30.5ID MAKE FROM V049M157 1 PER SPEC V049-2-017 & DWG V049-4-B3A	HYPAN DOC 53156 S/N 002
17	2	EA	V0494B3AP17	SUPPORT ASSEMBLY DWG SIZE: D	C of C
18	2	EA	V0494B3AP18	SUPPORT ASSEMBLY DWG SIZE: D	C of C
19	4	EA	V049M815 1	STIFFENING RING SST304 CMTR MAKE FROM 2X2X1/4 ANGLE ROLLED TO 31.06 ID LEG IN ONE PIECE WITH NO WELD.	C of C
20	2	EA	V049M820 1	STIFFENING RING SST304 CMTR MAKE FROM 3X3X1/4 ANGLE ROLLED TO 31.06 ID LEG IN ONE PIECE WITH NO WELD.	C of C
21	1	EA	V049M821 1	STIFFENING RING SST304 CMTR MAKE FROM 3X3X3/8 ANGLE ROLLED TO 31.06 ID LEG IN ONE PIECE WITH NO WELD.	C of C
22	4	FT	V049M852 3	BAR SST304 COFC FLAT 3/8 X4	C of C
28	12	EA	V049M753 3	BOLT STL A325 HEX HD 5/8-11 UNC X 3-1/2 LG ELECTROLESS NICKEL PLATED	C of C
29	18	EA	V049M755 3	NUT STL A194 2H HEX CofC 5/8-11 UNC ELECTROLESS NICKEL PLATED	C of C
30	18	EA	V049M773 3	WASHER STL F436 COFC LOCK 5/8 ELECTROLESS NICKEL PLATED	C of C
31	2	EA	202670 3	GASKET COP OFHC COFC CONFLAT 16-1/2 OD FLANGE MATERIAL 7	C of C
32	72	EA	V049M780	BOLT SST 18-8 HEX HD 3/8 -16 X3 LG	C of C
33	6	EA	V049M759 3	BOLT STL A325 HEX HD 5/8-11 UNC X 5-1/2 LG ELECTROLESS NICKEL PLATED	C of C
37	1	EA	V049M314 3	FLANGE SST304L COFC HALF NIPPLE CONFLAT NON ROT. 4-1/2 ODX 2-1/2 OD TUBEX.065WT 3-1/8 OVERALL HEIGHT .332 DIA THRU 8 HOLES EQ. SP. ON A 5.128 DIA B.C.	C of C

Material Tracer Record

Part Number WB3A S/N 01

Page 4

38	1	EA	202557 3	FLANGE SST304L COFC CONFLAT 4-1/2 OD BLANK NON ROT. .332 DIA THRU HOLES 8 PLACES EQ. SP. ON A 3.628 DIA. B.C.	C of C
39	1	EA	202558 3	GASKET COP OFHC COFC CONFLAT 4- 1/2 OD FLANGE MATERIAL	C of C
40	8	EA	V049M776	BOLT SST 18-8 HEX HD 5/16-18 X 2-1/4 LG	C of C
41	36	EA	V049M783	NUT SILICON BRZ HEX 3/8 -16	C of C
42	72	EA	V049M786	WASHER SST 18-8 FLAT 3/8	C of C
43	8	EA	V049M782	NUT SILICON BRZ HEX 5/16 -18	C of C
44	16	EA	V049M785	WASHER SST 18-8 FLAT 5/16	C of C
500	1	EA	DV0494B3A	DWG SPOOL B-3A 30.50 ID X60.50 ID MODE CLEANER TUBE	C of C



DATE: 19-Sep-96

GOC: 90473

TEST CERTIFICATE

*** SOLD TO: ***

*** SHIP TO: ***

PROCESS SYSTEMS INTERNATI
20 WALKUP DRIVE
WESTBOROUGH MA 01581

HT # 6C104

PROCESS SYSTEMS INT'L
20 WALKUP DRIVE
WESTBOROUGH MA 01581

CUSTOMER ORDER #
555559

CUSTOMER MARK #

304L BB HOT ROLLED, ANNEALED, DESCALED
UNS S30403/UNS S30400; TYPE 304L/304 PLATE
ASTM A240-95a; ASME SA240, ASME B&PV CODE SECTION II, 1995 EDITION,
1995 ADDENDA; GENERAL REQUIREMENTS TO ASTM/ASME A/SA480.

ITEM	DESCRIPTION	MARK
25	1.25 x 48.5 ID x 68.5 OD	555559

It is hereby certified that all items furnished in this shipment are in full compliance with the purchase order and specification requirements. It is further certified that the test reports represent the actual attributes of the items furnished and are in full conformance with all applicable specifications and order requirements.

Melter's Ladle Analysis attached.

Materials produced under this order have not come into contact with Mercury or its compounds within G.O. Carlson, Inc. facilities.

Knowingly and willfully falsifying or concealing a material fact on this form or making false or fictitious or fraudulent entries on this form could constitute a felony punishable under federal statutes.

No Welding Performed

***** LADLE ANALYSIS *****

HEAT:	C	MN	P	S	SI	CR	NI	N
6C104	0.026	1.690	0.027	0.004	0.520	18.310	9.170	0.038
6G197	0.022	1.650	0.027	0.017	0.260	18.210	8.470	0.056

Satisfactory to supply lite gage for Item 25, Heat 6C104-5A per letter and fax dated 8/30/96.

Dimensional reports attached.

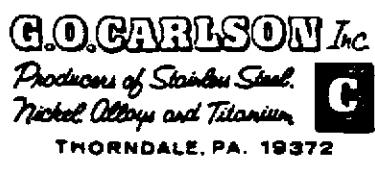
William C. Clark
9/19/96
William C. Clark
Senior Quality Engineer
G. O. Carlson, Inc.

I HEREBY CERTIFY THE ABOVE FIGURES ARE CORRECT AS CONTAINED IN RECORDS OF THIS CORPORATION.

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with SA/SB-240 Gr 304/304L
95 Edition Addenda

By *C. Wajacki* Date *9-27-96*

A717



DATE: 19-Sep-96

GOC: 90473

T E S T C E R T I F I C A T E

**** SOLD TO: ****

**** SHIP TO: ****

PROCESS SYSTEMS INTERNATI
20 WALKUP DRIVE
WESTBOROUGH MA 01581

PROCESS SYSTEMS INT'L
20 WALKUP DRIVE
WESTBOROUGH MA 01581

CUSTOMER ORDER #
555559

CUSTOMER MARK #

304L BB HOT ROLLED, ANNEALED, DESCALED
UNS S30403/UNS S30400; TYPE 304L/304 PLATE
ASTM A240-95a; ASME SA240, ASME B&PV CODE SECTION II, 1995 EDITION,
1995 ADDENDA; GENERAL REQUIREMENTS TO ASTM/ASME A/SA480.

ITEM/ DESCRIPTION MARK: ~~555559/PT.V049M253-1~~
3 1.25 x 48.5 ID x 68.5 OD

The above material has been visually and dimensionally inspected and found to conform to the above referenced specifications.

It is hereby certified that all items furnished in this shipment are in full compliance with the purchase order and specification requirements. It is further certified that the test reports represent the actual attributes of the items furnished and are in full conformance with all applicable specifications and order requirements.

Melter's Ladle Analysis attached.

Materials produced under this order have not come into contact with Mercury or its compounds within G.O. Carlson, Inc. facilities.

Knowingly and willfully falsifying or concealing a material fact on this form or making false or fictitious or fraudulent entries on this form could constitute a felony punishable under federal statutes.

No Welding Performed

ITEM. DESCRIPTION MARK: 555559 (PT.V049M254-1)
4 1.25 x 30.8 ID x 68.50 OD

Qty	Heat-Slab	Test Dir	Yield-.2% PSI	Tensile PSI	Elong-2in %
320	4 6C104-3B	TT	39086	86680	57.88

A730

DATE: 19-Sep-96

GOC: 90473

T E S T C E R T I F I C A T E

**** SOLD TO: ****

**** SHIP TO: ****

PROCESS SYSTEMS INTERNATI
 20 WALKUP DRIVE
 WESTBOROUGH MA 01581

PROCESS SYSTEMS INT'L
 20 WALKUP DRIVE
 WESTBOROUGH MA 01581

CUSTOMER ORDER #
 555559

CUSTOMER MARK #

 304L BB HOT ROLLED, ANNEALED, DESCALED
 UNS S30403/UNS S30400; TYPE 304L/304 PLATE
 ASTM A240-95a; ASME SA240, ASME B&PV CODE SECTION II, 1995 EDITION,
 1995 ADDENDA; GENERAL REQUIREMENTS TO ASTM/ASME A/SA480.

ITEM DESCRIPTION MARK: 555559/PT.V049M257-1
 7 1.25 x 44.9 ID x 68.5 OD

It is hereby certified that all items furnished in this shipment are in full compliance with the purchase order and specification requirements. It is further certified that the test reports represent the actual attributes of the items furnished and are in full conformance with all applicable specifications and order requirements.

Melter's Ladle Analysis attached.

Materials produced under this order have not come into contact with Mercury or its compounds within G.O. Carlson, Inc. facilities.

Knowingly and willfully falsifying or concealing a material fact on this form or making false or fictitious or fraudulent entries on this form could constitute a felony punishable under federal statutes.

No Welding Performed

ITEM DESCRIPTION MARK: 555559/PT.V049M258-1
 8 1.63 x 30.8 ID x 68.5 OD

Qty Heat-Slab

	Test Dir	Yield-.2% PSI	Tensile PSI	Elong-2in %
320 2 6C104-2A	TT	37358	85577	62.18
320 2 6C104-3A	TT	38040 ✓	86245 ✓	62.65 ✓

Rock
 B
 84

6C104-2A

G.O. CARLSON Inc

Producers of Stainless Steel
Nickel Alloys and Titanium



PSI INC. NEW

A730

SHIT 2 of 2

THORNDALE, PA. 19372

DATE: 19-Sep-96

GOC: 90473

TEST CERTIFICATE

*** SOLD TO: ***

*** SHIP TO: ***

PROCESS SYSTEMS INTERNATI
20 WALKUP DRIVE

PROCESS SYSTEMS INT'L
20 WALKUP DRIVE
WESTBOROUGH MA 01581

WESTBOROUGH MA 01581

CUSTOMER ORDER #
55559

CUSTOMER MARK #

304L BB HOT ROLLED, ANNEALED, DESCALED
UNS S30403/UNS S30400; TYPE 304L/304 PLATE
ASTM A240-95a; ASME SA240, ASME B&PV CODE SECTION II, 1995 EDITION,
1995 ADDENDA; GENERAL REQUIREMENTS TO ASTM/ASME A/SA480.

ITEM DESCRIPTION MARK: 55559/PT.V049M257-1
7 1.25 x 44.9 ID x 68.5 OD

It is hereby certified that all items furnished in this shipment are in full compliance with the purchase order and specification requirements. It is further certified that the test reports represent the actual attributes of the items furnished and are in full conformance with all applicable specifications and order requirements.

Melter's Ladle Analysis attached.

Materials produced under this order have not come into contact with Mercury or its compounds within G.O. Carlson, Inc. facilities.

Knowingly and willfully falsifying or concealing a material fact on this form or making false or fictitious or fraudulent entries on this form could constitute a felony punishable under federal statutes.

No Welding Performed

ITEM DESCRIPTION MARK: 55559/PT.V049M258-1
8 1.63 x 30.8 ID x 68.5 OD

Qty Heat-Slab

	Test	Yield-.2% Tensile	Elong-2in
	Dir	PSI	%
320 2 6C104-2A	TT	37358	62.18
320 2 6C104-3A	TT	38040 ✓	62.65 ✓
	Rock		
	B		
6C104-2A	84		

Weld Wire
C of A's



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

T0065-R/774/0500

BLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: 180 LBS

WORK ORDER/LOT NO.:

TAG:

ANSI A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S 713906	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

(66119)(10)

3



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

Quality Happens

70065-R/774101500

TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS

TOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: ~~18~~

NDVIK ORDER NO.: 16249

QUANTITY: 180LB.

NDVIK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Feat	C	Si	Mn	P	S	Cr	Ni
5440928	.021	.470	1.800	.014	.013	20.00	9.68
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.020			.002	.040	.030	.053



The material has not come in contact with mercury or mercury-containing compounds.

Material not touched by hand after final production process cleaning.

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC 9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

with M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan/cp

5(66119)(10)

SANDVIK

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1320 SCRANTON, PA. 18501 P (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WATERLY EXIT 59

SOLD TO:	BOC GASES (AIRCO) LISLE IL	SHIP TO:	AIRCO-NEW ENGLAND HINGHAM MA
CUSTOMER PURCHASE ORDER NO.:	47910	CERTIFICATE DATE:	7/14/97
SANDVIK ORDER NO.:	16249	QUANTITY:	PER PACKING NOTE
WORK ORDER / LOT NO.:	980309		

AWS A 9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S713039	.013	.380	1.800	.015	.013	20.06	9.84
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.100			.002	.070	.030	.044



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYS
120 LBS
70040-R / 77410500

Keith M. Kottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(68119)(10)

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

56 lbs

XJK 8115-02

KOBELCO

04/09/1997

15:57

7139746424

KOBELCO

PAGE 14

PURCHASER
 PO 70040-R/774101500
 PROCESS SYSTEMS

INSPECTION CERTIFICATE
 FLUX CORED WIRE

CERTIFICATE NO.: A 017

DATE OF ISSUE : 1997.01.28

TRADE DESIGNATION	DIMENSION (mm)	WPG. NO.	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-308L	0.9	B6M1085	AWS A5.22 E308LT0-1 ASME SPA-5.22 E308LT-1



ELEMENTS	CHEMICAL COMPOSITION (%)													
	C	SI	MN	P	S	CU	NI	CR	MO	NB	R	PN	FS	PNV
DEPOSITED METAL	0.034	0.39	1.22	0.028	0.008	0.05	9.73	18.91	0.11	0.01	0.041	UNIT:PN	6.8	UNIT:PN
ELEMENTS												6.0	6.8	6.0

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		VICKERS HARDNESS (AVG.)
- N/mm ²	- N/mm ²	584 N/mm ²			AVG.		
- kgf/mm ²	- kgf/mm ²	59.8 kgf/mm ²	52 %	- °C	- J		
					- kgf.m		

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2	- °C x	- h
AMPERAGE	110 A				
ARC VOLTAGE	25 V				

FS = FERRITE (SCHAEFFLER DIAGR.)
 FN = FERRITE (DELONG DIAGRAM)
 PNV = PERRITE (VRC)

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBELCO STEEL, LTD.
 WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR



Where Quality Happens

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO:

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5712976	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan /cf
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

PROCESS SYSTEMS
120 LBS 308L 3/32
70040-R/774101500



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S 711088	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
120 LBS 308L 1/8
70040-R/774101500

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

15(661197)(10)



make Quality happen

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *Process Systems Intl*
7-8-97

CUSTOMER PURCHASE ORDER NO.: *70038-R/774101500*

CERTIFICATE DATE: 4/21/97

SANDVIK ORDER NO.: 12603

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

.035
DIAMETER: ~~3/32~~ *120 LB*

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
<i>3713617</i>	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)



HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086
SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

PROCESS SYSTEMS INTL
P.O. 70038R/7741000

JGP ISSUE DATE: 08-30-96
DATE SENT 6-27-97

HEAT NUMBER/LOT NUMBER: 61202878W3-60LB
E50836-K1-20LB

CHEMICAL COMPOSITION LIMITS

ALLOY: 308L
SPEC: AWS A5.9-93 ER308L

CARBON		.030	SILICON	.300	.650
MANGANESE	1.000	2.500	PHOSPHORUS		.030
SULFUR		.030	CHROMIUM	19.500	22.000
NICKEL	9.000	11.000	MOLYBDENUM		.750
TANTALUM		.500	CB + TA		.500
TITANIUM		.500	COPPER		.750
NITROGEN		.500	COBALT		.500
MAGNESIUM		.500	OTHER		.5
NIOBIUM		.500			



SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY BRITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Janice Pittman
CERTIFICATION CLERK

THE ESAB GROUP, INC.
1500 Karen Lane, Hanover, PA 17331

CERTIFICATE OF TYPICAL ANALYSIS

11/19/96 *PROCESS SYSTEMS INTL*

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

7-14-97 Order No.: 700281/7741000

This Material Conforms to Specification:
AWS A5.20-95, ASME SFA 5.20

Trade Name
or Trademark: Dual Shield II 70 Ultra

Diameter Size: .035" x 33# Spool

Type: E71T-1* / E71T-12M

Weight: 132 LB

X-Rays Satisfactory

Lot Number: *49455 - 66 LB ✓*
49720 - 33 LB ✓
50293 - 33 LB ✓

PSI
OC
CW Typical Mechanical Properties

Typical Chemical Properties	(Specification Requirements)
Carbon: .02	(.15 Max.)
Manganese: 1.10	(1.60 Max.)
Chromium: .04	(.20 Max.)
Nickel: .01	(.50 Max.)
Silicon: .34	(.90 Max.)
Niobium+:	
Tantalum:	
Molybdenum: .01	(.30 Max.)
Tungsten:	
Copper: .01	(.35 Max.)
Titanium:	
Phosphorus: .013	(.03 Max.)
Sulphur: .010	(.03 Max.)
Vanadium: .02	(.08 Max.)

	As Welded	MPa
Yield Strength (Psi)	70,000	483
Tensile Strength (Psi)	76,800	530
Elongation (2"), %	32.0	
Red. of Area, %	74.6	
Charpy V-Notch Impacts		
@ -20°F. (ft.-lbs.)	117	
@ -29°C. (Joules)	159	

(Specification Requirements)

Minimum Unless
Otherwise Stated As Welded MPa

Hydrogen: 4.2 ml/100 gr. of weld metal	Yield Strength (Psi)	58,000	400
	Tensile Strength (Psi)	70-90,000	480-620
	Elongation (2"), %	22.0	22
	Red. of Area, %		


Charpy V-Notch Impacts			
@ -20°F. (ft.-lbs.)	20		
@ -29°C. (Joules)	27		

Shielding Gas: 75% AR/ 25% CO₂

Fillets: Vertical-Up/Overhead

* No data being issued for E71T-1 classification using the CO₂ shielding gas.

The undersigned certifies that the product supplied will meet the requirements of the applicable AWS Filler Metal Specification when tested in accordance with that specification, and that no significant change has been made in the elements described in the qualification approval.

 BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

By: *D. A. Smith*

D. A. Smith, Supervisor, Q. A. Services



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: *PROCESS SYS*

SHIP TO:

CUSTOMER PURCHASE ORDER NO. *70029R/774101500*

CERTIFICATE DATE: 4/25/97

SANDVIK ORDER NO.

QUANTITY: *120 LBS*

WORK ORDER/LOT NO.: 978457

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
5712976	.013	.440	1.800	.015	.015	19.96	9.63	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
		.070			.002	.060	.030	.035

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

11



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: ~~XXXXXXXXXX~~
AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *70029R/774101500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY:

WORK ORDER / LOT NO.: *976164*

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Bottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

90 RESEARCH ROAD
HINGHAM, MA 02043

PO 70031R/774101500

PURCHASER: PROCESS SYSTEMS INTL INSPECTION CERTIFICATE
FLUX CORED WIRE
CERTIFICATE No: D 021
DATE OF ISSUE: 1997.04.24

TRADE DESIGNATION	DIMENSION (mm)	MFG. NO	APPLICABLE SPECIFICATION AND CLASSIFICATION
OW-309L	1.2	B6F2110382	AWS A5.22-95 E309LTO- ASME SFA-5.22 E309L- (1995 Edition)

PSI
QC
CW

CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6

TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		
- N/mm ²	- N/mm ²	555 N/mm ²	37 %	- °C	AVG.	-	-
- MPa	- MPa	555 MPa			+ J	-	-
					- kgf·m	-	-

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2		
AMPERAGE	200 A				
ARC VOLTAGE	29 V			- °C x	- h

FS = FERRITE (SCHAEFFLER DIAGRAM)
FN = FERRITE (DELONG DIAGRAM)
WRC = FERRITE (WRC)

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBEL STEEL, LTD
WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR 

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen . . .

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 48184

CERTIFICATE DATE: 6/10/97

SANDVIK ORDER NO.: 17126

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 979336

TAG: 848523-01

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308LSI

DIAMETER: .035"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S712152 -60LB	.014	.840	1.700	.016	.013	19.50	10.23
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.030			.002	.040	.020	.042



*Process Systems Intl
PO 70031R/77410/500*

The material has not come in contact with mercury or mercury-containing compounds.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Keith M. Hottle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

14

90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 170031R/774101500

6-13-97

X/11

KOBEL

PURCHASER <i>PROCESS SYSTEMS INT'L</i>	INSPECTION CERTIFICATE FLUX CORED WIRE	CERTIFICATE No: 0 021 DATE OF ISSUE: 1997.04.24
---	---	--

TRADE DESIGNATION	DIMENSION (mm)	MFG. NO	APPLICABLE SPECIFICATION AND CLASSIFICATION
DW-309L	.035 84LB	B6M1015	AWS A5.22-95 E309LTO-1 ASME SFA-5.22 E309LT- (1995 Edition)

CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	N	FN	FS	FNW
DEPOSITED METAL	0.024	0.44	1.25	0.018	0.013	0.02	12.78	23.76	0.02	<0.01	0.011	UNIT:FN 19.7	9.7	UNIT:FN 11.6

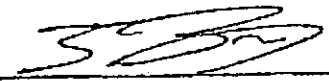
TENSILE TEST OF DEPOSITED METAL					IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST
TENSILE POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH		ELONGATION	TEST TEMP.	ABSORBED ENERGY		HARDNESS
		MPa	MPa			AVG.	UNIT:FN	
		555	MPa	37 %	- °C	- J		
		555	MPa			- kgf·m		

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE (SCHAEFFLER DIAGRAM) FN = FERRITE (DELONG DIAGRAM) WRC = FERRITE (WRC)
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2		
AVERAGE	200 A			- °C x - h	
VOLTAGE	29 V				

WE HEREBY CERTIFY THAT THE TEST RESULTS OF THE ABOVE WELDING MATERIAL ARE AS DESCRIBED HEREIN AND SATISFY THE REQUIREMENTS OF THE APPLICABLE SPECIFICATION.

◆ KOBEL STEEL, LTD
WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR



REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



SERVING NEW ENGLAND

PICKING TICKET

Sold By: AIRGAS NORTHEAST
199 SOUTHWEST CUT OFF
WORCESTER, MA 01604
800-821-9852

Cost # : 72600

Order # : 306628-00

Ship To: PROCESS SYSTEMS INTERN'L

Order Date: 04/22/97

20 WALKUP DR
WESTBOROUGH MA 01581-0000

Page : 001 OF 00

NAME : PROCESS SYSTEMS	TER: 142	SHIP VIA: LOST PICKUP	-NONE-	INITIALS: KEM
PO # : 700248 JUNE/74-1915	SLS: B	SHIP CODE: 00	UPS: 0	ORD TYPE: CREG-UP
SELT :	BRN: 10	LOU/PPD : PREPAID		DATE : 28-APR-97 13:00
PHONE# : 508-898-0285		ROUTE # :		LFL :

QTY	UNIT	NO	DESCRIPTION	LINE	ITEM	LOC	MTY	MTY	WGT	WT	UNIT	DATE
SHIP			& HAZARD CLASS	NO	NUMBER		ORDER	BRAND	LCL		ABOVE	AM

			***** SHIP COMPLETE ONLY *****									

120 LB		S183	3/32X36 ALUMINUM	1	ALC S1833236	LAK	120	0				120.0
					MSDS: 000078							
120 LB		S183	1/8X36 ALUM.	2	ALC S1831836	LAK	120	0				120.0
			***** This order is complete *****									
			Total Weight:									240.0



This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Authorized Signature _____

Received by Le... ..

5/2

AlcoTec

A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49688 USA
(616) 941-4111 Phone
(616) 941-8154 Fax
alcotec@traverse.com E-mail

11/08/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363072

P.O.# - 86207

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

3/32

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

04/23/97

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.094	TIG Rod Box	363348

P.O.# - 105019

PSI
QC
CW

*Tony Task
1 box of 101
to TIF source
also
4/29/97*

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

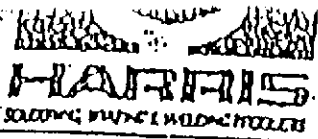
All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

[Signature]

V.P. - Quality Control

①



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Con

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
POB

Shipped To: Process Systems
PO 70015R

Date _____
Date Shipped _____
Order No. _____

P.O. No.

Item	Weight	Size	Alloy	Heat No.
1.	100 LBS	1/16 x 36	ALUM	0294
2.				
3.				



Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	A95 A510-00 ASME SFA 5.10		OO-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements Each
	ER1100	R1100										
1100 Aluminum (U)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					0.05
2319 Aluminum (C)	ER2319	R2319	2319	0.30	0.30	5.0-6.0	0.05-0.10					0.05
4043 Aluminum	ER4043	R4043	4043	4.5-5.0	0.0	0.30	0.05	0.02		0.10-0.20	0.10-0.20	0.05
710 Aluminum	ER710	R710	710	11.0-13.0	0.0	0.30	0.05	0.05		0.10	0.20	0.05
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.15	0.10		0.20		0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25		0.15	0.05
5654 Aluminum	ER5654	R5654	5654		0.40	0.10		4.5-5.5	0.05-0.25			0.05
5754 Aluminum	ER5754	R5754	5754		0.40	0.10		4.5-5.5	0.05-0.25			0.05
5954 Aluminum	ER5954	R5954	5954		0.40	0.10		4.5-5.5	0.05-0.25			0.05

- NOTES:
1. Values shown are maximum percentages unless otherwise indicated.
 2. Iron shall not exceed 0.0099 percent.
 - A. Zinc plus iron shall not exceed 0.05 percent.
 - B. Silicon content is the difference between the maximum and minimum values shown, unless otherwise indicated. Vanadium plus titanium shall not exceed 0.012 percent or more each, expressed as the sum of the two elements.
 - C. Vanadium content shall be 0.05-0.15 percent. Bismuth content shall be 0.10-0.25 percent.
 - D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance with applicable purchase specifications having passed our inspection as required.

FROM: 6177490165 TO: 7023 P. 02/02

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen . . .

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 43594

CERTIFICATE DATE: 10/18/96

SANDVIK ORDER NO.: 94386

QUANTITY: PER PACKING NOTE

CRK ORDER / LOT NO.: 969410

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

PSI
QC
CW

J-12-97

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
180 LBS
PO 70012R

Ingert H. Berg, Director, Quality and Metallurgy
Daniel Dawlani, Quality Engineer

Daniel Dawlani
6(19)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

20



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen . . .

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBORO MA

CUSTOMER PURCHASE ORDER NO.: 41276

CERTIFICATE DATE: 8/26/96

SANDVIK ORDER NO.: 88712

QUANTITY: PER PACKING NOTE

WORK ORDER/LOT NO.: 967451

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
S710840	.015	.430	1.800	.016	.013	20.01	9.78	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
		.050			.002	.050	.040	.050



10-7-96

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(86119)(10)

(2)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen . . .

SOLD TO: BOC GASES

SHIP TO: PROCESS SYSTEMS
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603R//V59049045000

CERTIFICATE DATE: 6/18/96

SANDVIK ORDER NO.: TK # 591854

QUANTITY: 60 LBS 308L x 36

WORK ORDER/LOT NO.: 965227

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S709276	.019	.430	1.800	.018	.012	19.92	9.82
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.080			.002	.130	.030	.045



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt E. Berg, Director, Quality and Metallurgy

15(66119)(10)



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191

PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...



**90 RESEARCH ROAD
HINGHAM, MA 02043**

SOLD TO:

SHIP TO:

PROCESS SYSTEMS INTL
WESTBORO MA 01581

CUSTOMER PURCHASE ORDER NO.: 700603r/V59049045000
TK 591854-02

CERTIFICATE DATE: 6/17/96

SANDVIK ORDER NO.:

QUANTITY: 120 LBS er308L 1/16 x 36

WORK ORDER / LOT NO.: 965225

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S708727	.014	.390	1.800	.016	.012	20.20	9.87
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.003	.040	.030	.060



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

23



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO) SHIP TO: AIRCO-NEW ENGLAND
LISLE IL process systems intl HINGHAM MA
CUSTOMER PURCHASE ORDER NO.: 42100 westboro, Ma. CERTIFICATE DATE: 9/27/96
SANDVIK ORDER NO.: 90814 PO-700627-V59049-041 QUANTITY: PER PACKING NOTICE
WORK ORDER/LOT NO.: 968845 TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .045"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

15(66119)(10)

BOC G
90 RESEARCH BLVD
HINGHAM, MA 02043

SANDVIK
Steel

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: **BOC GASES (AIRCO)**
LISLE IL

SHIP TO: **AIRCO-NEW ENGLAND**
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: **42100**

CERTIFICATE DATE: **9/04/96**

SANDVIK ORDER NO.: **90816**

QUANTITY: **PER PACKING NOTE**

WORK ORDER / LOT NO.: **967820**

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS
700627-R/V59049-044
TK 693421

Bengt H. Berg, Director, Quality and Metallurgy

240 LB

15(65119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043





MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967818

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

*PROCESS SYSTEMS
700627-R/V59049-042
TK 693415
50 LB.*

Bengt H. Berg, Director, Quality and Metallurgy

(66119)(10)

BOC GASES
HINGHAM ROAD
HINGHAM MA 02043

26



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: process systems

CUSTOMER PURCHASE ORDER NO.: 693415

CERTIFICATE DATE: 10/03/96

SANDVIK ORDER NO.:

QUANTITY: 60 lbs

WORK ORDER / LOT NO.: 700627-r/v59049-042

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]
15(661)(9)(10)

BOC GASES
RESEARCH ROAD
HINGHAM, MA 02043



We make Quality happen...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: **BOC GASES (AIRCO)
LISLE IL**

CUSTOMER PURCHASE ORDER NO.: **42100**

SANDVIK ORDER NO.: **90816**

WORK ORDER / LOT NO.: **967819**

SHIP TO: **AIRCO-NEW ENGLAND
HINGHAM MA**

CERTIFICATE DATE: **9/03/96**

QUANTITY: **PER PACKING NOTE**

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S437864	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

*PROCESS SYSTEMS
700627-R/V59049-04
TK 693420
240 LB.*

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)



**90 RESEARCH ROAD
HINGHAM, MA 02043**



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax

05/07/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
RS183	.125	TIG Rod Box	362769

P.O.# - 72454



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

Luca L. Savani
Control

[Signature]
Certifying Signature

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HARRIS
SPECIALTY SURFACE WELDING PRODUCTS

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Comp

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: PROCESS SYSTEMS INTL
WEST BORO MA.

Date 10-17-96
Date Shipped 10-18-96
Order No. 712222

Item	Weight	Size	Alloy	Heat No.
1.	9 LB	5/32 x 36	ALUM	AA1005183D
2.	10 LB	5/32 x 36	ALUM	7895
3.				

Comments:

P.O. 700643-R/V590490430Z

PS
OF
CW

Alloy	AWS A510-00 ASME SFA 5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element	
	ER	R										Each	T
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.8-6.8	0.20-0.40	0.02		0.10		0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.10-0.20	0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20	0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15	0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05	

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0000 percent, all alloys.
- Silicon plus iron shall not exceed 0.95 percent.
- the aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- Silicon plus iron shall not exceed 0.45 percent.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

30



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Comp
Certificate of Compliance

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
PO#

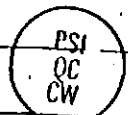
Shipped To: PROCESS SYSTEMS INTL

Date _____
Date Shipped 10-25-96
Order No. 713960-01

P.O. No.

PO 700.643R/V5904.9043000

Item	Weight	Size	Alloy	Heat No.
1.	50LB	5/32	ALUM	0233
2.				
3.				



Comments: BOC
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AWS A510-88 ASME SFA 5.10		QQ-R-566B Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element	
	ER1100	R1100										1100	Each
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.8-6.8	0.20-0.40	0.02		0.10		0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.05		0.10	0.10-0.20	0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.8	0.30	0.15	0.10		0.10	0.20	0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.20		0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.25	0.15	0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.10	0.06-0.20	0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05	

- NOTES:
- Single values shown are maximum percentages, except where a minimum is specified.
 - Beryllium shall not exceed 0.0008 percent, all alloys.
 - Si plus Fe shall not exceed 0.95 percent.
 - The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
 - Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
 - Si plus Fe shall not exceed 0.45 percent.



J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Con

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: PROCESS SYSTEMS
700643-R/V5904904300

Date 10-31-96
Date Shipped
Order No. 712225

Item	Weight	Size	Alloy	Heat No.
1.	50	5/32	ALUM	96248
2.				
3.				

Comments:

PSI
OC
CW

Alloy	AWS A510-00 ASME SFA 5.10		QQ-R-566B + Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elems Each
	ER1100	R1100										
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40			0.10		0.05
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05			0.10	0.10-0.20	0.05
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15			0.10	0.20	0.05
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0			0.20		0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.05-0.20	4.3-5.2	0.05-0.25	0.25	0.15	0.05
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.50-1.0	4.5-5.5	0.05-0.20	0.10	0.06-0.20	0.05
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20	0.05
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05
							0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15	0.05

NOTES:

- Single values shown are maximum percentages, except where a minimum is specified.
- Beryllium shall not exceed 0.0008 percent, all alloys.
- Si: Silicon plus iron shall not exceed 0.95 percent.
- D: The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C: Vanadium content shall be 0.05-0.15 percent, Zirconium content shall be 0.10-0.25 percent.
- D: Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance with applicable purchase orders.

FROM : AIRCO/BOC GASES HINGHAM TO 1995.10-31 04:01 #926 P.02/02 5098705930

25



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company

2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/13/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86330

Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40 ✓
Fe	---	0.40 ✓
Cu	---	0.10 ✓
Mn	0.50	1.0 ✓
Mg	4.3	5.2 ✓
Cr	0.05	0.25 ✓
Zn	---	0.25 ✓
Ti	---	0.15 ✓
Be	---	0.0008 ✓
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. Swanson

V.P. - Quality Control



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(616) 941-4111 Phone
(616) 941-9154 Fax
alcotec@traverse.com E-mail

11/11/96

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.156	TIG Rod Box	362884

P.O.# - 86330

Chemical Composition Limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Pb	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	



AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEC legislation.

Additional Order Requirements:

James E. Swann

V.P. - Quality Control



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEMS*

CUSTOMER PURCHASE ORDER NO.: *700650-R/VS904904500*

CERTIFICATE DATE: 9/04/96

SANDVIK ORDER NO.: 90816

QUANTITY: *60 LB*

WORK ORDER/LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"

Filler Metal Analysis, %



Heat	C	Si	Mn	P	S	Cr	Ni
S710840	.015	.430	1.800	.016	.013	20.01	9.78
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.050			.002	.050	.040	.050

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
RESEARCH AND
HINGHAM, MA 02043

(35)

SANDVIK
Steel

We make Quality happen ...

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA 18501 PH: (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

OLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *PROCESS SYSTEM*

CUSTOMER PURCHASE ORDER NO.: *7006SD-R/15904904500*

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: *18LB*

WORK ORDER/LOT NO.:

TAG:

ANS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/8"



Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni	
S437864	.013	.430	1.720	.020	.013	19.88	9.98	
		Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
		.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Bengt H. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

[Signature]
15(66119)(10)

BOC GASES
RESEARCH ROAD
BINGHAM, MA 02043

[Handwritten mark]

HARRIS
SOLDING, WELDING & WELDING TOOLS

J. W. HARRIS CO., INC. | 10930 DEERFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris/Com
Certificate of Comp

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
PO#

Shipped To: Process Systems Intl
PO 70015R/7741000

Date _____
Date Shipped 3-28-97
Order No. 797282

Item	Weight	Size	Alloy	Heat No.
1.	40 LB	1/4 x 36	ALUM	0268
2.				
3.				

Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



Alloy	AWS A510-00 ASME SFA 5.10		OO-R-566B r Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements		
	ER	R										Class	Each	
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05						0.05	
2319 Aluminum (C)	ER2319	R2319	2319	0.20	0.30	5.0-6.0	0.20-0.40	0.02		0.10			0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.0	0.30	0.05	0.05		0.10	0.10-0.20		0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.10		0.10	0.20		0.05	
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	0.10		0.20			0.05	
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10	0.50-1.0	4.3-5.2	0.05-0.25	0.25	0.15		0.05	
5554 Aluminum	ER5554	R5554	5554	0.25	0.40	0.10	0.05-0.20	4.5-5.5	0.05-0.20	0.10	0.06-0.20		0.05	
5556 Aluminum	ER5556	R5556	5556	0.25	0.40	0.10	0.50-1.0	2.4-3.0	0.05-0.20	0.25	0.05-0.20		0.05	
5654 Aluminum	ER5654	R5654	5654	D	D	0.05	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20		0.05	
							0.01	3.1-3.9	0.15-0.35	0.20	0.05-0.15		0.05	

NOTES:

1. Single values shown are maximum percentages, except where a minimum is specified.
2. Beryllium shall not exceed 0.0000 percent, all alloys.
- A. Silicon plus iron shall not exceed 0.95 percent.
- B. The aluminum content is the difference between 100.00 percent and the sum of all other metallic elements present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum, and shall not be less than 99.0.
- C. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
- D. Silicon plus iron shall not exceed 0.45 percent.

We certify that the items and/or materials listed above are in accordance with applicable purchase specifications.

57

HARRIS-WELCO | 1051 YORK ROAD P.O. BOX 69 | KINGS MOUNTAIN, NC 28086

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

RWL ISSUE DATE: 04-15-96

PROCESS SYSTEMS
PO 7001SR/7741000
10 LBS 4043 1/16 X 3/6

HEAT NUMBER/LOT NUMBER: 0243

CHEMICAL COMPOSITION LIMITS

ALLOY: 4043
SPEC: AWS A5.10R/ER4043/AMS 4190D
ASME SPA 8.10/QC-R-566-B



SILICON	4.500	-	6.000	TITANIUM	.200
COPPER			.300	MAGNESIUM	.050
IRON			.800	ZINC	.100
BERYLLIUM			.0008	REMAINDER	ALUMINUM
OTHER			.15		

SINGLE VALUES ARE MAXIMUM UNLESS OTHERWISE SPECIFIED.

SAFETY SILV, STAY SILV, STAY CLEAN, STAY WHITE & BRIDGIT ARE REGISTERED TRADEMARKS OF J.W. HARRIS CO., INC

WE CERTIFY THAT THE ITEMS AND/OR MATERIALS LISTED ABOVE ARE IN ACCORDANCE WITH ALL APPLICABLE PURCHASE SPECIFICATIONS HAVING PASSED OUR INSPECTIONS AS NOTED.

Rodney M. Bell
CERTIFICATION CLERK

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



We make Quality happen

MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

SOLD TO: *PROCESS SYSTEMS*

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *7005R/774101500*

CERTIFICATE DATE: 3/20/97

SANDVIK ORDER NO.:

QUANTITY: *180 LBS.*

WORK ORDER / LOT NO.:

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 1/16"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY
P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: 42100

CERTIFICATE DATE: 9/03/96

SANDVIK ORDER NO.: 90816



QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 967819

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER-308L DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
ST10846	.013	.430	1.720	.020	.013	19.88	9.98
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.250	.010		.005	.150		.055

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

PROCESS SYSTEMS

70018R/774101500

Bengt E. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen

SOLD TO:	BOC GASES (AIRCO) LISLE IL	SHIP TO:	AIRCO-NEW ENGLAND HINGHAM MA
CUSTOMER PURCHASE ORDER NO.:	46682	CERTIFICATE DATE:	4/21/97
SANDVIK ORDER NO.:	12603	QUANTITY:	PER PACKING NOTE
WORK ORDER/LOT NO.:	978457	TAG:	

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: 3/32"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
S712976 -60LB	.013	.440	1.800	.015	.015	19.96	9.63
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.070			.002	.060	.030	.035

PSI
OC
CW

4-28-97

PROCESS SYSTEMS

P.O. 70018R/77410500

SHIPPED 4-25-97 ORDER #805966-01

The material has not come in contact with mercury or mercury-containing compounds.

"Material not touched by hand after final production process cleaning."

Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

Keith M. Hottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

3
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MATERIAL CERTIFICATE

SANDVIK STEEL COMPANY

P.O. BOX 1220, SCRANTON, PA. 18501 PH. (717) 587-5191
PLANT LOCATION: INTERSTATE 81, WAVERLY EXIT 59

We make Quality happen...

SOLD TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: PROCESS SYSTEMS INTL
WESTBOTO MA

CUSTOMER PURCHASE ORDER NO.: 47334

CERTIFICATE DATE: 4/29/97

SANDVIK ORDER NO.: 14445

QUANTITY: PER PACKING NOTE

WORK ORDER / LOT NO.: 970470

TAG:

AWS A-5.9

STAINLESS STEEL WELDING WIRE TYPE ER 308L

DIAMETER: .095"

Filler Metal Analysis, %

Heat	C	Si	Mn	P	S	Cr	Ni
5711375	.007	.400	1.800	.014	.012	20.02	9.85
	Mo	Cb/Nb	Ta	Ti	Cu	Cb/Nb+Ta	N
	.010			.002	.030	.030	.055



The material has not come in contact with mercury or mercury-containing compounds.

Keith M. Kottle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

CUSTOMER ORIGINAL

42



A Partnership of Alcoa Weld Wire Company, Inc.
and Aluminum Technology Corporation

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49686 USA
(815) 841-4111 Phone
(815) 841-9154 Fax
alcotec@traverse.com E-mail

01/13/97

1/8

CERTIFIED MATERIAL REPORT

Alloy	Diameter	Package	Lot Number
R5183	.125	TIG Rod Box	363423

P.O.# - 93118



Chemical Composition limits

Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

[Signature]
V.P. - Quality Control

37

Title SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET

Project V59049

Component

Serial Number

B3A

01

Wash Cycle: Manual

Flowrates: 30 Gpm Max. Temp.: 145 Duration: 3 hrs

Operator: NIGHT SHIFT Date: 6-1-97

Comments: Bill MARK TOM Ed PAUL

Component(s) Inspected By: JE Date: 6-1-97

Quality Assurance: [Signature] Date: 6-10-97

Comments:

Number
Rev.

SPECIFICATION

Number A V049-2-015 Rev. 2

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: B3A S/N: 01 WORK ORDER: _____
DATE/TIME: 6-1-97
OPERATOR: Mark / Bill

NOTE: REMOVE ALL TIE RODS PRIOR TO WASHING

1. FILL D.I. WATER TANK XD-103 TO MARK. HEAT D.I. WATER USING PUMP XP-103 AND HTR. XP-102 TO 150.F.

TI925= 148° F

2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER.

MIX 1:1 Done

3. APPLY SOAP SOLUTION TO ALL COMPONENT SURFACES WITH LARGE YELLOW NOZZLE IN POWER WASHER WAND AND SIPHON TUBE IN THE POWER WASHER TANK.

4. HAND SCRUB SURFACES WITH NYLON BRUSH WHERE NEEDED.

5. REMOVE SIPHON TUBE FROM TANK AND INSTALL GREEN NOZZLE INTO WAND.

6. POWER WASH COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

WASH TIME = 45 MIN

7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.

RINSE TIME = 45 MIN

8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.

DRY TIME = 90 MIN

9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM.

NOTES:

SPECIFICATION

Number

AV049-2-184

Rev.

1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA ION SOURCE SETTINGS SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

Type	CH-TRON	IS-TYPE:	HS-THOR.
------	---------	----------	----------

Channel 0 ENABLE

Detector	
Type	CH-TRON
SEM Volt.	<< >>

Amplifier	
Offset	ON

RF-Polarity	inverse
IS-Voltages	[V]
IonRef	138
Cathode	90.0
Focus	9.38
Field Axis	5.75
Extract	12

Mass	
Mode	SCAN-N
First	
Width	
Speed	
Resolution	
Threshold	

Ion Source	
Filament #	
IS-Set	

IS-Emission	
Emiss [mA]	
Protect [A]	3.5

Fil.Prot.	Thresh.
	[mbar]
ON below	
OFF above	

SPECIFICATION	
Number: V049-2-127 A	Rev.1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA SCAN PARAMETER FILE SETTINGS	
DATE:		
TIME:		
TEST I.D.: e.g. WBS1_1		
PSI TEST ENGINEER:		
QUALITY ASSURANCE:		
RGA NUMBER:		
RGA SENSOR HEAD SERIAL # QMS		
RGA ELECTRONICS UNIT SERIAL # QME		

PARAMETER FILE: LIGO200.SAP

PARAMETER FILE: LIGO200.SBP

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Load-Ch:00	CH-0	
State	ENABLE	
Det. Type	CH-TRON	
Mass Mode	SCAN-F	
First Mass	0.00	

Detector

SEM Voltage	1700	
-------------	------	--

SEM Voltage	1700	
-------------	------	--

Mass

Speed	5 s	
Width	200	
Resolution	25	
Threshold	1E-15	

Speed	5 s	
Width	200	
Resolution	25	

Amplifier

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

Amp. Mode	AUTO	
Amp. Range	---	
Range-L	---	
Pause - Cal.	1.0	
Offset	ON	

OUTPUT: User discretion
 DISPLAY: User discretion

SPECIFICATION

Number: V049-2-127 A	Rev. 1
-------------------------	--------

Title: COMPONENT RGA TEST PROCEDURE

TITLE	OUTGASSING RATES REPORT SHEET
DATE: 7/7/97	
TIME:	
TEST I.D.: e.g. WBSC1_1	WB3A_1.SAC
PSI TEST ENGINEER: Am	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	
RGA ELECTRONICS UNIT SERIAL # QME	

CYCLE # 2 , CYCLE # 4 (WITH CALIBRATED MIXED LEAK)

AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wrt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
H2	2.5E-7	4.8X10 ⁻⁹		4.8E-7	20.9	5.2E-6	1.8E-11
12	8.5E-11		0.42		143.9	7.8E-9	2.7E-14
14	3.2E-10		0.5		143.9	2.3E-8	7.9E-14
15	1.5E-10		0.54		143.9	1.6E-8	5.4E-14
CH4	3.0E-10		0.57		143.9	3.2E-8	1.1E-13
17	8.6E-10		0.6		143.9	9.5E-8	3.2E-13
H2O	3.0E-9		0.64		143.9	3.5E-7	1.2E-12
19	3.3E-10		0.67		143.9	3.9E-8	1.3E-13
26	1.1E-10		0.71		143.9	1.2E-8	4.0E-14
28	3.4E-9	9.5X10 ⁻¹		1.0E-8	143.9	4.9E-7	1.7E-12
32	3.0E-10		1.14		143.9	4.6E-8	1.6E-13
38	2.4E-11		1.36		143.9	4.0E-9	1.4E-14
40	3.2E-11	9.4X10 ⁻⁹		5.0E-10	200.9	6.4E-9	2.2E-14
43	4.7E-11		1.53		143.9	8.4E-9	2.9E-14
44	3.0E-10		1.57		143.9	5.4E-8	1.8E-13
129	5.E-12	2.5X10 ⁻⁹		4.3E-11	658.	3.3E-9	1.1E-14
131	5.E-12	2.0X10 ⁻⁹		2.8E-11	870.	4.4E-9	1.5E-14
132	5E-12	2.5X10 ⁻⁹		3.8E-11	758.	3.8E-9	1.3E-14
134	5E-12	1.0X10 ⁻⁹		2.0E-11	667.	3.3E-9	1.1E-14
OTHER	1.04E-9				143.9	1.5E-7	5.1E-13

$$A_{WB3A} = 2.925 \times 10^5 \text{ CM}^2$$

SPECIFICATION

Number: V049-2-127

A

Rev.1

Title: COMPONENT RGA TEST PROCEDURE

AGE: TEST I.D. FILENAME: XXXXXXXXX.SAC

TITLE	RGA COMPUTER DATA FILE LOG
DATE: 7/7/97	WB3A
TIME:	
TEST I.D.: e.g. WBSC1_1	
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:

RGA SENSOR HEAD SERIAL # QMS

RGA ELECTRONICS UNIT SERIAL # QME

BARGRAPH DATA FILE NAME

ANALOG SCAN DATA FILE NAME WB3A.SAC

OTHER DATA FILES

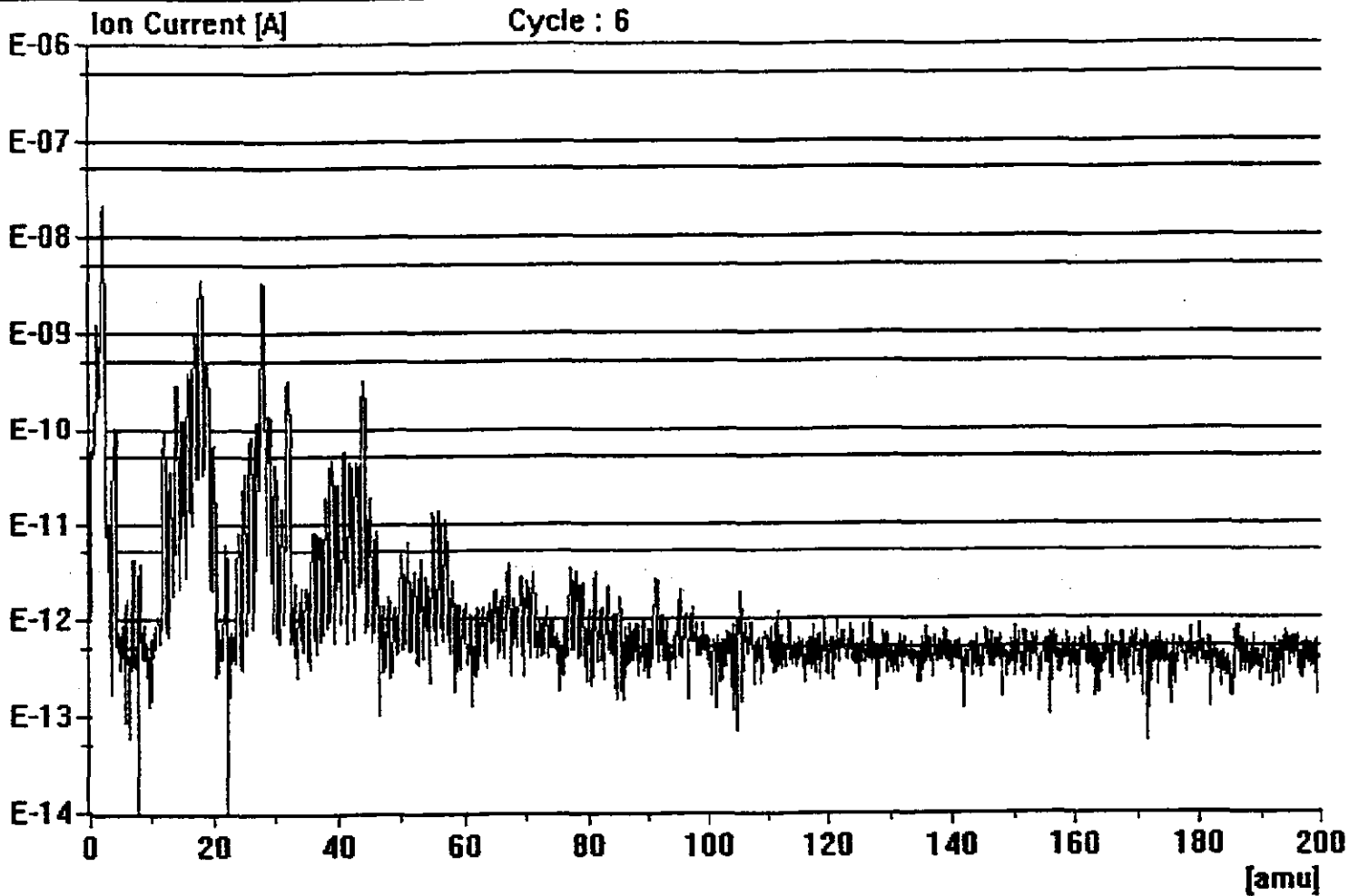
PRINTOUT OF

1. LAST ANALOG SCAN BEFORE CALIBRATION
2. ANALOG SCAN WITH CALIBRATED LEAK OPEN
3. BARGRAPH PLOT

SPECIFICATION

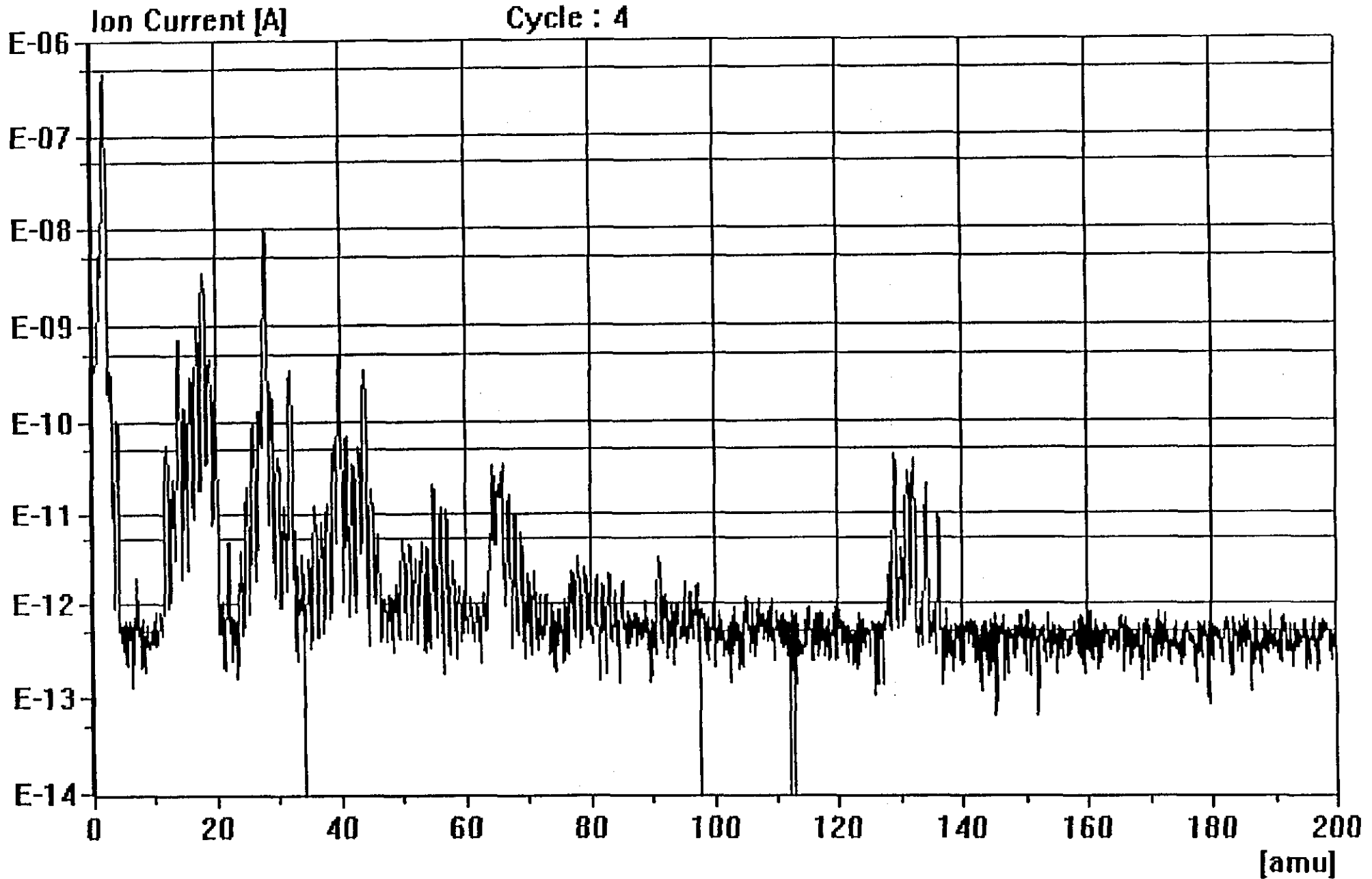
Number: V049-2-127
A

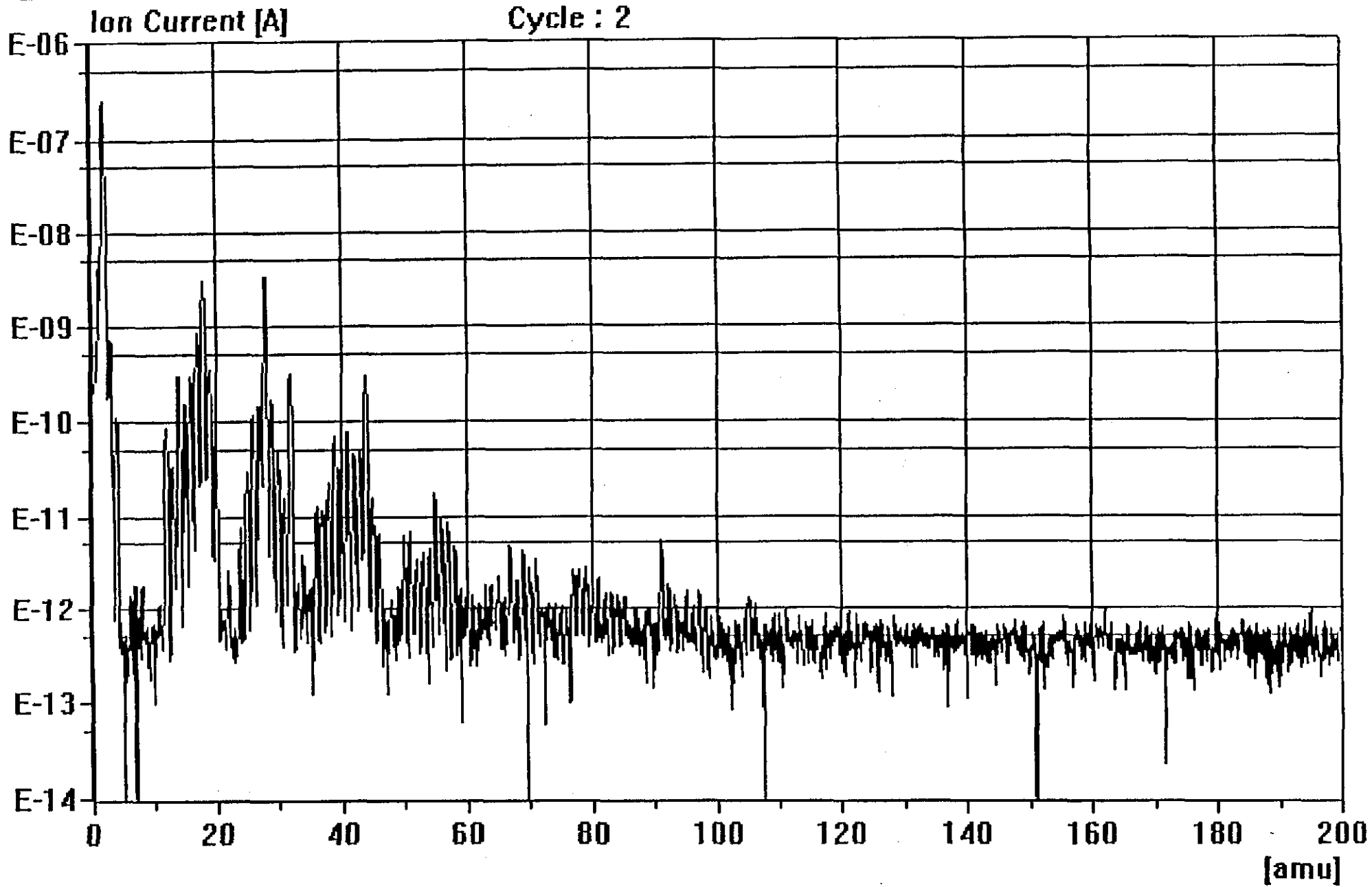
Rev. 1



CYCLE #6

GATE VALVE CLOSED



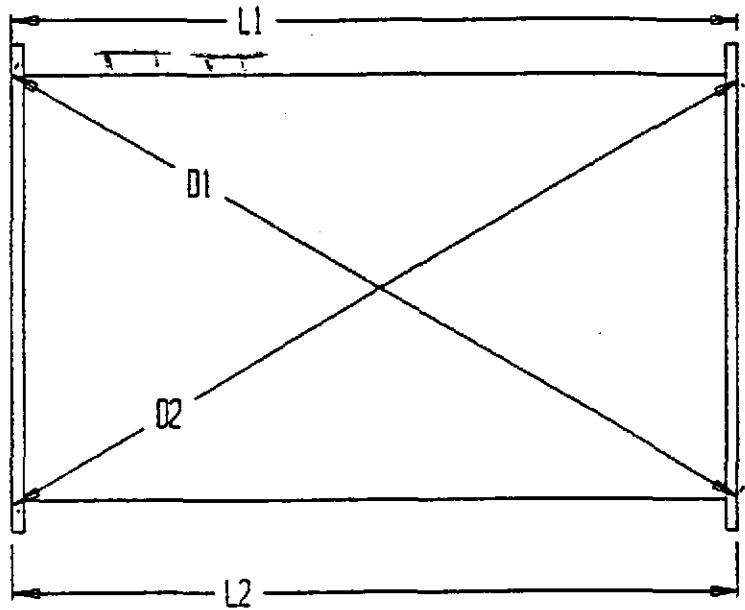


6
NCR'S
N/A

SPOOL/ADAPTER FIT UP DIMENSIONS



PLAN VIEW



RELATIVE LENGTHS AND
INTERNAL DIAGONALS
FOR V049-4-B3A

S/N 01

L1 36' 7' - 0"

L2 36' - 6 ⁷/₁₆"

L3 36' - 6 ¹⁵/₁₆"

L4 36 - 6 ¹³/₁₆"

D1 36' 7 ¹⁵/₁₆"

D2 36' - 7 ¹⁵/₁₆"

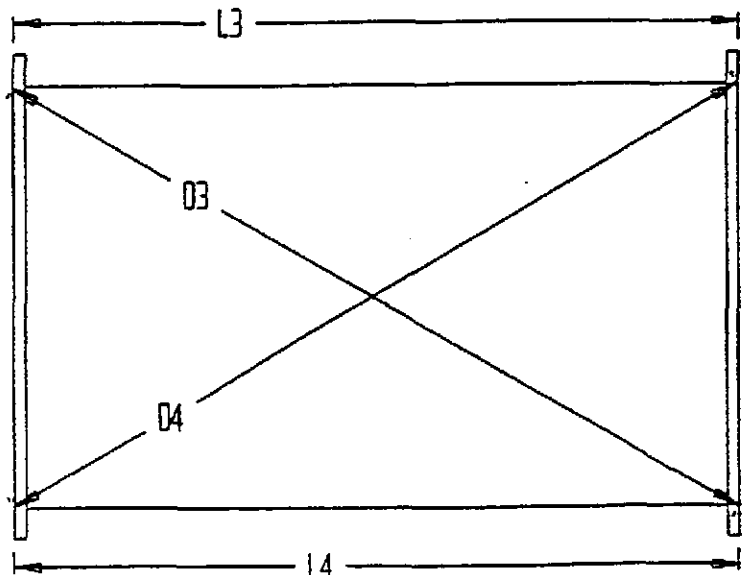
D3 36' 7 ¹⁵/₁₆"

D4 36' 7 ¹⁵/₁₆"

MAX=MAXIMUM OF L1 THRU L4

MIN=MINIMUM OF L1 THRU L4

MAX MINUS MIN MUST BE LESS THAN DRAWING TOLERANCE FOR PARALLELISM



SIDE ELEVATION

ACTUAL LENGTH OF

L = 36' - 7 ¹⁵/₁₆"