

PROCESS SYSTEMS INTERNATIONAL, INC.

WASHINGTON CORNER STATION

VERTEX SECTION

<i>TAG NO.</i>	<i>SER. NO.</i>
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 2



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-1

P/N – VO49-4-128-01

1	Quality Plan sign offs.	
2	Hyspan Metal Bellows documentation package.	
3	Material test reports for shells, heads and large flanges. (over 60") C of C for nozzles, small parts, flanges (under 60") and weld wire. C of C to Codes and Standards.	
4	Heat-treat charts. (by Ranor). When applicable.	
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. WHAM1 Ser. No. 01

QUALITY PLAN FOR LIGO

FOR

LIGO

HORIZONTAL ACCESS MODULE (HAM)

Serial No. ~~V0494123-01 thru 19~~

CONTROLLED-COPY

OCT 24 1996

1	GS107596		Release Per DEO No. 0302
0	046 7/8/96	REC	released per DEO 0114
REV LTR.	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE
PROCESS SYSTEMS INTERNATIONAL, INC.			SPECIFICATION
INITIAL APPROVALS	PREPARED	DATE	APPROVED DATE
	<i>AR Sudh...</i>	4/8/96	<i>R. B...</i> 4/17/96
			Number 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	V049-2-087	Rev	1
A			

Number

Rev.

SPECIFICATION

V049-2-087

REV. 1

Social No. V0494128-01



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. 2
(where Applicable)

JOB NO. V59049
DWG NO. V049-2-128
PG 3 OF 97

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>MLL</u> 2/20/96			
Inspect Welding Long Seam/Lower Shell	V	V049-4-128	V049-2-071	X <u>MLL</u> 9/16/96			
Verify Roundness of Shell	V-D	V049-4-128		X <u>MLL</u> 9/16/96			
Inspect Welding Long Seam 60" Nozzles	V	V049-4-128	V049-2-071	X <u>MLL</u> 9/16/96			
Verify Roundness of 60" Nozzles	V-D	V049-4-128		X <u>MLL</u> 9/16/96			
Verify Fixtures in Shell & 60" Nozzles				X <u>MLL</u> 9/16/96			



Serial No. V0494128-01

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 Welding and Location of Saddle Support Plates and Lift Lugs	V-D	V049-4-128	V049-2-071	MAN 9/2/96			
Inspect Welding of 60" Nozzles	V	V049-4-128		MAN 9/10/96			
Verify Nozzle Alignment and Dimensions (ALL Nozzles)	V-D	V049-4-128		MAN 2/5/97			PSI QA GS
Verify Steam Cleaning of Vessel				MAN 2/5/97			
Thermal Stress Relief Vessel		V049-2-046		GS 7-31-97			

Serial No. V0494128-01

SPECIFICATION V049-2-057

REV. 1

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 _____	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	I-D	V049-2-046		X	<u>MSL</u>	<u>11/18/96</u>					
Verify Cutout Location of the 4-Critical "E" Nozzles	I-D	V049-4-128		X	<u>MSL</u>	<u>11/18/96</u>					
Inspect welding of 84" Flanges to Shell	V	V049-4-054	U049-2-071	X	<u>MSL</u>	<u>12/14/96</u>					
Verify Flange (84") Straightness and Flatness	V-D	V049-4-054		X	<u>MSL</u>	<u>12/14/96</u>					
Inspect welding of 60" flanges to Nozzle Neck	V	V049-4-054	U049-2-071	X	<u>MSL</u>	<u>12/14/96</u>					

PSI
QA
GS

Serial No. V0494128-01

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 60" Flange Straightness & Flatness	V-D	V049-4-054		X <u>MAN</u> <u>12/1/96</u>			
Inspect Welding of Expansion Joint to 60" Nozzle	V	V049-4-054 V049-4-053	V049-2-071	X <u>MAN</u> <u>12/1/96</u>			
Inspect Welding of Internal Saddle to Shell	V	V049-4-128	V049-2-071	X <u>MAN</u> <u>11/3/97</u>			
Inspect Welding of ALL Non-Critical Flanges	V	V049-4-128	V049-2-071	X <u>MAN</u> <u>12/1/96</u>			PSI QA GS
Inspect Welding of Critical "E" Nozzles and Flanges (with fixtures)	V	V049-4-128	V049-2-071	X <u>MAN</u> <u>12/1/96</u>			
Verify Alignment Straightness & Flatness of "E" Nozzles	V-D	V049-4-128		X <u>MAN</u> <u>12/1/97</u>			

SPECIFICATION V049-2-087

REV. 1

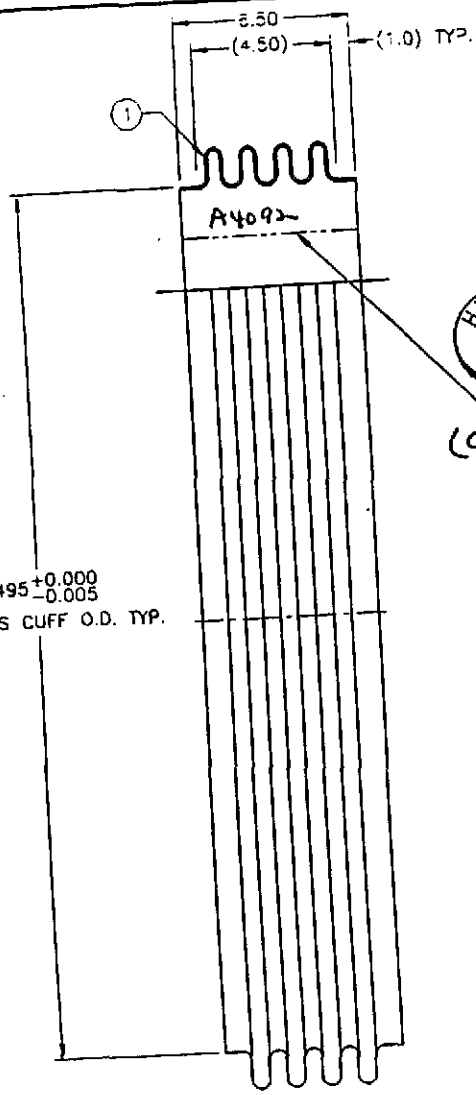
Serial No. V0494128-01

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 Bellows Tie-Rod	V	V049-4-040	V049-2-072	X <u>Max</u> 12/3/97			
Verify Installation of Annulus Tubing	V	V049-4-054		<u>Max</u> 1/7/97			
Verify Installation & Alignment of Support Saddles	V-D	V049-4-052 V049-4-002	V049-2-072 V049-2-071	X <u>Max</u> 3/27/97			
Steam Clean Complete Vessel Inside & Out	X			X <u>Max</u> 2-17-97			PSI QA GS
Verify final cleaning at PSI	V	V049-2-015		X <u>GS</u> 3-1-97			
Verify Final Bakeout at PSI	V	V049-2-019		X <u>GS</u> 4-14-97			
Verify final Ver. of He Leak Test at PSI	V	V049-2-014		X <u>GS</u> 4-17-97			
Shipment to IICA		V049-2-123		X <u>GS</u> 9-8-97			

LTR	REVISION	DATE	APP'D.
1	WAS ENG. NO. 021632-1 TEMP. WAS 370°F REV'D NOTE 8, 11 & 14 DEL. NOTE 12 & 13 SUBMIT FOR APPL.	SEP. 17, 96	
2	REV'D PER CUST. COMMENT SUBMIT FOR APPROVAL	OCT. 07, 96	A.M.P.

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
 - 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
- ~~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 1×10^{-9} 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.

HYSPAN
W
30
WPS
007
(CO₂ SCRUB)

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

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. 1685 Brandysene 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
SCALE NONE	SHT. 1 OF 1		V049-4-053

- DRAWING NOTES
1. ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.
 2. DESIGNED IN ACCORDANCE WITH THE STANDARDS OF THE EXPANSION JOINT MANUFACTURERS ASSOCIATION.
 - ~~3. INTERNAL 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

SN 001 V0494053-P1-01



To:
AVESTA SHEFFIELD INC
425 NORTH MARTINGALE
SCHMINBURG
ILLINOIS 60173
U.S.A.
F.A.D. KEITH HOOD

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

21/05/96 Date

Customer Order No.
9102374

Specification
ASIM 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 spectroscopic examination Test Position: Front, Back Orientation: Isotropy, Longitudinal El. codes: 1=500, 2=5, 3=5, 4=50mm, 5=50mm, 6=80mm, 7=35mm, 8=25mm

Folio	Cast. No.	Material Description	Temp C	Coil No./Plate No.	Proof Stress		Tensile Strength	Elongation	RA	RA/AV	Band Test	I/C Test	Iodine Impact
					0.2% PSI	1.0% Yield							
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	14328/1	81 45385 81 36975	52345 44370	89175 86855	52 (51) 57 (51)	63.5 155 58.6 144	OK OK	OK OK		

MATERIAL TESTED TO ASIM A240 CONFORMS TO LATEST REVISIONS OF ASIM 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 ASIM A240 also conforms to latest revisions of ASIM A400 and ASME SA207/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. Solution annealed by heating to 1900 deg f min. except 321H 347H *NO WELD REPAIR*

INTERCRYSTALLINE CORROSION TEST TO ASIM A282 (1993) PRACTICE E SATISFACTORY

Avesta Sheffield Ltd
LHQA Approval Numbers



940258
940175

Cast No.	C	Si	Mn	P	S	Cr	Mo	Ni	Nb	Co	N	
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 requirements 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
CITY OF SANTA FE, N.M.
CITY OF SANTA FE, N.M.
25-038153

MASS SPECTROMETER TEST REPORT

Fig. -1

V0424053-PI-01

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

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



PROCESS SYSTEMS INTERNATIONAL, INC.

20 Walkup Drive, Westborough, MA 01581

CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

⚡ **LIGO PROJECT**

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 1

SERIAL NUMBER: 01

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 1 S/N 01

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 1 S/N 01

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 1 S/N 01

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 659 A 657
35	1	EA	V0494031	60-1/2 I.D. FLANGE GROOVED WITH SLOTS (HAM)	A 745
36	1	EA	V0494032	60-1/2 I.D. FLANGE FLAT FACED (HAM)	A 561
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 665 A 377

Material Tracer Record

Part Number WHAM I S/N 01

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 588 A 589
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 379
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 1 S/N 01

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 361 A 907
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 665 A 914
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



717-248-4911

STANDARD STEEL

QP090-F1
A Division of FREEDOM FORGE Corporation

METALLURGICAL CERTIFICATION

PAGE 1

FOR: PROCESS SYS INT MA
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 10/30/96

PCS SHIPPED: 24
OUR ORDER NO 432320502
SHIPLIST NO: 58598
PSI MIC NO. A914

IF-26

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 40.50" OD \pm .06 X 60.0" ID \pm .06 X 1.250" W \pm .06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

V049M243-1

1000000000

0000000000

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	.50	.030	1.01	.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 OFST	X ELONG	X RED AREA	I M P A C T D A T A				
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
09281	6I1427D		+75		PROLONG	79.0	34.5		61.0	77.0					
09281	6I1427E														
09281	6I1428A														
09281	6I1428B														
09281	6I1428C														
09281	6I1428D														
09281	6I1428E														

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with SA/SB-182 Gr. 304L
95 Edition Addenda
By C. Wotawski Date 11-5-96



Ham, PA 17009
717 248-4911
STANDARD STEEL
QP090-F1
A Division of FREEDOM FORGE Corporation

M E T A L L U R G I C A C E R T I F I C A T I O N

PSI MIC 377

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

PCB SHIPPED: 4
03 OUR ORDER NO 532685002
SHIPLIST NO: 54475

P
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C
T

RING MACH 250/500 TO SIZES: 92.25" +.06" -0" OD X 83.75 +0" -.06" ID X 1.375" +.06" -0" WD (MSDS BA)
SPECIFICATION: ASME SA102 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC. VO49M136
AV049-2-040 REV 3 EXCEPT PARA. 4.7 (CLEANLINESS) THE LAST 2 SENTENCES OF THE PARAGRAPH ARE NOT INCLUDED.

C
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R

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

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies with ASME-19A Gr. 304L 95 Edition, Addenda
By C. Kojacki Date 7-27-96

CHEMICAL ANALYSIS

HEAT 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	TEN	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				
			TEMP (F)	BHN							TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
S09072	6E1597A		+75		PROLONG	78.5	33.5		60.0	55.0					
S09072	6E1597B														
S09072	6E1597C														
S09072	6E1597D														

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED



STANDARD STEEL

STANDARD STEEL

A Division of FERRIS PIPE Corporation

FOR: PROCESS SYS INTL MA

IT-5

CUSTOMER ORDER NUMBER 555492

PCS SHIPPED: 30

04 OUR ORDER NO 432620501

REPORT DATE: 07/13/78

SHIFTLIST NO: 56855

PSI MIC NO. A765

PRODUCT

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 48.5" OD +.06 X 20.0" ID -.06 X 1.625" WD
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6
(A) +.06

V049M135-1

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			
809279														
809200	.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 BT	ELONG	XRED AREA	IMPACT DATA				
											LOCATION	TEMP (F)	FT. LBS	X GIR	LAY EXP
809279	602844A		+75		PROLONG	74.5	37.0		61.0	81.0					
809279	602844B														
809279	602844C														
809279	602844D														
809279	602844E														
809279	602845A														
809279	602845B														
809279	602845C														
809279	602845D														
809279	602845E														

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies with ASME 198 Gr. 304L
95 Edition Addenda
By: C. N. [Signature] Date: 10-1-78



STANDARD STEEL

A Division of Pittsburgh-based Corporation

M E C E R T I F I C A T I O N PAGE 2

FOR: PROCESS SYSTEMS INT'L

PCS SHIPPED: 30

CUSTOMER ORDER NUMBER 033492 PAGE-2

04 OUR ORDER NO 472420001

REPORT DATE: 09/13/98

SHIPMENT NO: 56855

MECHANICAL PROPERTIES

NO.	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	GRM BZE		
	809279	602846A																	
	809279	602846B																	
	809279	602846C																	
	809279	602846D																	
	809279	602846E																	
	809280	602847A																	
	809280	602847B			+75		74.5	36.5	64.0	79.0									
	809280	602847C																	
	809280	602847D																	
	809280	602847E																	
	809280	602848A																	
	809280	602848B																	
	809280	602848C																	
	809280	602848D																	
	809280	602848E																	
	809280	602849A																	
	809280	602849B																	
	809280	602849C																	
	809280	602849D																	
	809280	602849E																	

PSI MIC NO. A765

A765 IT-5

PROCESS SYSTEMS INT'L, INC.
 Reviewed this report and it complies
 with ASME 18A Gr. 304L
 9th Edition Addenda
 By C. W. Teich Date 10-1-98

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. Kelly
HOR. LABORATORIES

P. 174

M. LAB. STANDARD STEEL

11:41PM

SEP. 8. 1997



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 532691504
SHIPLIST NO: 56061

PSI MIC NO. A665

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD X 1.06 X 03.75" ID .06 X 1.375" WD .06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

VD49M136-1

PRODUCT

CUSTOMER

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

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with SA 182 Gr. F304L
95 Edition, Addenda
By C. W. [Signature] Date 9-16-96

CHEMICAL ANALYSIS

HT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
609279	✓ .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)	X .20X OF ST	X ELONG	X RED AREA	I_M_P_A_C_T_D_A_T_A				
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
609279	602856A		+75		PROLONG	74.5	37.0		61.0	01.0					
609279	602856B					✓	✓	✓	✓						
609279	602856C														
609279	602856D														
609279	602857A														
609279	602857B														
609279	602857C														
609279	602857D														

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: 09/06/96

PCS SHIPPED: 9

02 OUR ORDER NO 432620500

SHIPLIST NO: 56599

PRODUCT

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 60.50" OD +.06 X 60.0" ID -.06 X 1.250" WD -1.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 5

V049H243-1

PSI MIC NO. A561

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L., INC.

Reviewed this report and it complies

with SAISB-182 Gr. 304L
2nd Edition, Addenda

By C. Watonki Date 9-11-96

CHEMICAL ANALYSIS

AT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
5509280	✓	✓	✓	✓	✓	✓	✓								
	.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	X SHR	LAT EXP
5509280	602745D		175		PROLONG	74.5	36.5		64.0	79.0					
5509280	602743A														
5509280	602743B														
5509280	602743C														
5509280	602743D														
5509280	602743E														
5509280	602746A														
5509280	602746B														
5509280	602746C														



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 UNS-S30403 / UNS-S30400
 DIMENSIONS .500 X 76.125 X 270.188 EXACT

----- SPECIFICATIONS -----

V049-2-041 REV0 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 SA/SE 840 Gr. 304/304L
 9th Edition, 9th Addenda
 By C. Worcieki Date 7-30-96

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



717-248-4911

STANDARD STEEL

A Member of FREEDOM FORGE Corporation

METALLURGICAL CERTIFICATION

PAGE 2

FOR: PROCESS SYS INT MA

PCS SHIPPED: 30

CUSTOMER ORDER NUMBER 555492

PAGE-2

04 OUR ORDER NO 432620501

REPORT DATE: 09/13/96

SHIPLIST NO: 56855

MECHANICAL PROPERTIES

P. 55

NO. 174

M. LAB

STANDARD STEEL

11:41AM

8.1997

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN DHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	.20XOFST	X ELONG	XRED AREA	IMPACT DATA					
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
509279	662846A															
509279	662846B															
509279	662846C															
509279	662846D															
509279	662846E															
509280	662847A															
509280	662847B		+75			74.5	36.5		64.0	79.0						
509280	662847C															
509280	662847D															
509280	662847E															
509280	662848A															
509280	662848B															
509280	662848C															
509280	662848D															
509280	662848E															
509280	662849A															
509280	662849B															
509280	662849C															
509280	662849D															
509280	662849E															

PSI MIC NO. A745

PROCESS SYSTEMS INT'L., INC.
 Reviewed this report and it complies
 with SA 98-18A Gr. 304L
95 Edition, Addenda

By C. Wojcicki 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

Allegheeny Ludlum

2-10/24

Page 1

300 Green Street
Washington, Pennsylvania 15101

CERTIFIED MATERIAL TEST REPORT

PSI MIC NO. A907

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

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

19320

19320

HELEN M. O'CONNOR
Quality Assurance Represent

Order No: 19817-00

Our Order no: LP6342970
Your Order No: 1017
Date: 09/10/96
DUAL CERT

304L STAINLESS HRAP
ASTM A240-95B ASME SA-240-A95 AMS 5511F

Req No	Slip	Lot No	Size	Pcs	Weight					Gr
873101	35934 A	13065	2500 x 77.0000 x 360.0000	1	2149 GV-STOCK					
873101	C .025	MN 1.73	P .03 S .0012	SI .48	NI 8.20	CR 18.24	MO .37	CO .14	CU .39	N .09
Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion				
38.9 KSI	86.3 KSI	56.6	70.5	B78-80	OK	OK				

MATERIAL WAS NOT WELDED

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with SA/ASME 240 Gr. 304L
9th Edition Addenda

By A. Wharick Date 1-4-96

APPROVED

SEP 20 1996

Q.C. DEPT

58 9-17
R.G.

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.

2-1220

500 Green Street
Washington, Pennsylvania 15301
CERTIFIED MATERIAL TEST REPORT

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

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

19320

19320

HELEN M. D'CONNOR
Quality Assurance Representative

Memo No: 107461-00

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

Our Order no: LP532575
Your Order No: 6039
Date: 12/27/95
DUAL CERT

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

By C. Wotwick Date 9-12-96

Heat	Slip	Lot No.	Size			Pcs	Weight					
876050	49930 C		.3750 x 101.0000 x 366.0000			1	4235.04-68016					
Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N	
870050	.024	1.81	.027	.0003	.35	8.28	18.39	.23	.10	.31	.098	
Slip	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion				
49930	.3750	41.3 KSI	87.7 KSI	57.1	77.4	880-81		OK				

MATERIAL WAS NOT WELDED

Memo No: 112242-00

Our Order no: LP532575
Your Order No: 6001
Date: 03/23/96
DUAL CERT

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

Heat	Slip	Lot No.	Size			Pcs	Weight					
870739	54507 A		.3750 x 96.0000 x 260.0000			1	2859 From Slip 10275					
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	.098	
Slip	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion				
54507	.3750	48.3 KSI	86.5 KSI	64.0	73.0	88H63	OK	OK				

MATERIAL WAS NOT WELD REPAIRED

Memo No: 112647-00

Our Order no: DP634570
Your Order No: 6001
Date: 04/01/96
DUAL CERT

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

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.

2-12-20

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

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

Slip 54568 Gauge .3750 Yield Strength 40.3 KSI Tensile Strength 86.3 KSI Elong 59.4 Red. of Area 74.9 Hardness BHN167 Bend OK Corrosion OK

MATERIAL WAS NOT WELDED

Memo No: 1113167-00

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies with SA58-240 Gr. 304L 95 Edition, Addenda

Our Order no: DP6349
Your Order No: 10001
Date: 04/12/96
DUAL CERT

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

By C. Wotwicki Date 9-12-96

Heat 770796 Slip 54804 A Lot No Size .3750 x 98.0000 x 233.0000 Pcs 1 Weight 2584 From slip 10291 GV STC

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

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

MATERIAL WAS NOT WELDED

Memo No: 1115191-00

Our Order no: LU4333
Your Order No: 7026
Date: 05/21/96
DUAL CERT

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

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

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

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

Allegheny Ludlum CORPORATION

Jessop Specialty Products
500 Green Street
Washington, PA 15301

CERTIFIED MATERIAL TEST REPORT

OUR ORDER NO. LP6346050
YOUR ORDER NO. 73160-99-S-90-08
MEMO NO. 113518 DUAL CERT
DATE 04/19/96
SALESMAN NO. 416

H. M. O'Connor

AUTHORIZED SIGNATURE

Ship TO WILLIAMS & CO
2105 LARRICK RD
CAMBRIDGE OH

WILLIAMS & COMPANY INC
THE ARBORETUM
760 CONSTITUTION DR
EXTON PA

43725

19341

ESSOP T 304L STAINLESS HRAP
STM A240-91a ASME SA-240-A93
HEM & MECH PROP. TO ASTM A276-91a
ASTM A167-91
CHEM ONLY ASTM A312-91b

A361

Heat	Slip	Lot No	Size	Pcs	Weight
70890	15067 A	6667	.2500 x 96.0000 x 353.0000	1	2627
71153	15068 A	6746	.2500 x 96.0000 x 360.0000	1	2679
71153	15068 B	6746	.2500 x 96.0000 x 360.0000	1	2679

Heat	C	MN	P	S	SI	NI	CR	MO	CO	CU	N
70890	.025	1.74	.028	.0029	.22	8.16	18.56	.27	.16	.23	.084
71153	.017	1.82	.026	.0007	.34	8.70	18.39	.26	.08	.29	.094

Lot No	Gauge	Yield Strength	Tensile Strength	Elong	Red. of Area	Hardness	Bend	Corrosion	Grain Size
6667	.2500	39.0 KSI	84.8 KSI	62.0	70.2	B76	OK	OK	
6746	.2500	40.3 KSI	84.4 KSI	57.8	70.7	B82	OK	OK	

MATERIAL WAS NOT WELDED
MATERIAL WAS PRODUCED WITHOUT KNOWN CONTACT WITH MERCURY OR LOW MELTING POINT CONTAMINANTS

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with S.A.S.B. 240 Gr. 304L
95 Edition, 95 Addenda
By C. Wotawicki Date 7-22-96

WMS. & CO.
Q.A. APPROVED
APR 23 '96
KD



Tel 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INTL MA

CUSTOMER ORDER NUMBER 555492

REPORT DATE: 09/13/96

PCS SHIPPED: 30

04 OUR ORDER NO 432620501

SHIPLIST NO: 56855

PSI MIC NO. A745

PRODUCT

RING
 MACHINE 250/500 MICRO TO SIZES SHOWN: 68.5" OD +.06 X 20.0" ID -.02 X 1.625" WD (**)
 SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
 AV049-2-040 REV 6
 (*) +.06

VO49M135-1

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L., INC.

Reviewed this report and it complies with SA182 Gr. 304L Edition, Addenda

By C. Watwood Date 10-1-96

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI			
609279	✓	✓	✓	✓	✓	✓	✓							
609280	.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) .20XOFST	X ELONG	XRED AREA	I_M_P_A_C_T_D_A_T_A				
										LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
609279	662844A				PROLONG	74.5	37.0	61.0	81.0					
609279	662844B													
609279	662844C													
609279	662844D													
609279	662844E													
609279	662845A													
609279	662845B													
609279	662845C													
609279	662845D													
609279	662845E													

← A745 +75

IT-4

STANDARD STEEL
A Division of METECOR INC. Corporation



STANDARD STEEL

A Division of METECOR INC. Corporation

METALLURGICAL CERTIFICATION

PAGE 1

FOR: PROCESS SYS INT MA

PCB SHIPPED: 11

CUSTOMER ORDER NUMBER 555492

03 OUR ORDER NO 532891603

REPORT DATE: 08/28/96

SHIPLIST NO: 56374

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD +.06 X 84.0-.06 X 1.625" WD +.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

VD49M133-1

PSI MIC NO. **A657**

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: W. Watacki Date 9-16-97

CHEMICAL ANALYSIS

HEAT NO.	C	BI	P	MN	S	NI	CR	MO	V	AL	TI				
809280	✓ .031	✓ .45	✓ .032	✓ 1.72	✓ .001	✓ 11.48	✓ 18.55								N .0500

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENBILE LOCATION	UTS (KSI)	YIELD ST (KBI) .20XOFBT	X ELONG	XRED AREA	I.M.P.A.C.T DATA					
										LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
809280	682749A		+75		PROLONG	74.5	36.5	64.0	79.0						
809280	682749B														
809280	682749C														
809280	682749D														
809280	682750A														
809280	682750B														
809280	682750C														
809280	682750D														
809280	682751B														
809280	682751C														
809280	682751D														

← A657

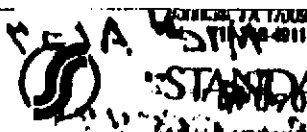
NO. 103 P. 2/6

10000000

CUSTOMER

STANDARD STEEL M. LABS

NOV. 19. 1997 11:01AM



STANDARD STEEL

STANDARD STEEL

METALLURGICAL CERTIFICATION

PAGE 2

FOR: PROCESS BYS INT MA

PCS SHIPPED: 11

CUSTOMER ORDER NUMBER 555492

03 OUR ORDER NO 532691603

REPORT DATE: 08/28/96

SHIPLIST NO: 56374

MIC# A657

PC-2

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

MOR. LABORATORIES

P.3/6

NO.103

STANDARD STEEL M.LAB

11:01AM

NOV.19.1997

1



Dunstable, PA 17008
Tel 717-398-4311

STANDARD STEEL

A Division of FREEBORN FORGE Corporation

METALLURGICAL CERTIFICATION PAGE 1

FOR: PROCESS SYS INT MA

PCB SHIPPED: 11

CUSTOMER ORDER NUMBER 555492

03 OUR ORDER NO 532891603

REPORT DATE: 08/28/96

SHIPLIST NO: 56374

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD +.06 X 84.0-.06 X 1.625" WD +.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

VO49M133-1

PSI MIC NO. **A659**

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. Wojcicki Date 9-16-96

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI			
809280	✓ .031	✓ .45	✓ .032	✓ 1.72	✓ .001	✓ 11.48	✓ 18.55							

N
.0500

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENBILE LOCATION	UTS (KSI)	YIELD ST (KSI)	.20XOFBT	% ELONG	XRED AREA	I.M.P.A.C.T DATA					
											LOCATION	TEMP (F)	FT. LBS	X GHR	LAT EXP	GRN SIZE
809280	682749A ← A659		+75		PROLONG	74.5	36.5		64.0	79.0						
809280	682749B															
809280	682749C															
809280	682749D															
809280	682750A															
809280	682750B															
809280	682750C															
809280	682750D															
809280	682751A															
809280	682751C															
809280	682751D															

NO. 103 P. 2/4
INDUSTRY
STANDARD STEEL M. LAB
NOV. 19. 1997 11:51AM

STANDARD STEEL

STANDARD STEEL

A Division of THE LUKEN FORGE COMPANY

METALLURGICAL CERTIFICATION

PAGE 2

FOR: PROCESS 6Y8 INT MA

PCS SHIPPED: 11

CUSTOMER ORDER NUMBER 555492

03 OUR ORDER NO 532691603

REPORT DATE: 08/28/96

SHIPLIST NO: 56374

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED

MIC# A659

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

PG. 2

D.W. Keller

HGR. LABORATORIES

P. 3/6

NO. 103

NOV. 19. 1997 11:01AM STANDARD STEEL M. LAB

1

Weld Wire
Certs



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/77410500

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
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 E. Berg, Director, Quality and Metallurgy
Daniel Damiani, Quality Engineer

(66119)(10)

5



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

D TO: BOC GASES (AIRCO)
LISLE IL

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

TOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: *8/8*

DVIK ORDER NO.: 16249

QUANTITY: *180LB.*

IK 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 9002-1994.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

with M. Hottle, 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 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. 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

INSPECTION CERTIFICATE
FLUX CORED WIRE

CERTIFICATE NO.: A 017

DATE OF ISSUE : 1997.01.28

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 SPA-5.22 E308LT-1

ELEMENTS	CHEMICAL COMPOSITION (%)													
	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		- °C	AVG.	
- kgf/mm ²	- kgf/mm ²	59.8 kgf/mm ²	52 %		- 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 (SCHARPFLEER 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.

◆ KOBELCO STEEL, LTD.
 WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR 

84/09/1997 15:57

7139746424

KOBELCO

BOC GASES

KOBELCO

90 RESEARCH ROAD

HINGHAM, MA 02043

PO# 70040-R / 774101500

PROCESS SYSTEMS

INSPECTION CERTIFICATE

CERTIFICATE NO.: A 002

FLUX CORED WIRE

DATE OF ISSUE : 1997.01.07

TRADE DESIGNATION	DIMENSION (mm)	MFG. 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	Ti	FN	FS	PHW	
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	DCRP	SHIELDING GAS	CO ₂	FS = FERRITE (SCHAEFFLER DIAGRAM) PH = FERRITE (DELONG DIAGRAM) PHW = FERRITE (VRC)	
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.

☐ KOBELCO STEEL, LTD.
WELDING DIV. FUJISAWA PLANT

CHIEF INSPECTOR

1997年01月14日 19:12 页次 XVA1

04/09/1997 15:57 7139748424 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:

ANSI 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

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 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/774/01500*

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/cp

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. 700388/7741000

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
NIوبيUM		.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

9

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
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
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

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

Celeste Brennan
15(66119)(10)

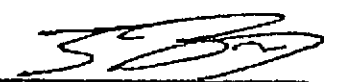
BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 70031R/774101500

X/11

KOBE

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			PSI OC CW	APPLICABLE SPECIFICATION AND CLASSIFICATION								
DW-309L	1.2	B6F2110382				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	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		— °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.



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)

90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 70031R/774101500

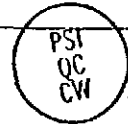
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4/11

KOB

PURCHASER: Process Systems Int'l 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	BLM1015	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
ELONGATION	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	TEST TEMP.	ABSORBED ENERGY		HARDNESS TEST	
				AVG.			
37 %	N/mm ² MPa	555 N/mm ² 555 MPa	- °C	- J	- kgf·m		

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	FS = FERRITE (SCHAEFFER 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

NORTHEAST AIRGAS

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
 WESTBURY MA 01581-0000

Order Date: 04/22/97

Page : 001 OF 0

NAME : PROCESS SYSTEMS TER: 142 SHIP VIA: COST PICKUP -NONE- INITIALS: REP
 PO # : 700248 JUNE/74-1915 SLS: 0 SHIP CODE: 03 UPS: 0 DRU TYPE: OREG-07
 SELL : BRN: 16 COUNTRY: FRENCH DATE : 28-APR-97 12:00
 PHONE#: 508-898-0285 ROUTE # : LFL :

QTY	UNIT	HW	DESCRIPTION	LINE	ITEM	LOC	QTY	NET	WGT	WT	UNIT	EXT
SHIP			2 HAZARD CLASS	NO	NUMBER		ORDER	BRAND	LOC		AMOUNT	AMT

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

120 LB	5183	3/32X36	ALUMINUM	1	ALC 518333-36	LAK	120	0		120.0		
					QSPS: 000078							
120 LB	5183	1/8X36	ALUM.	2	ALC 518318-36	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 C. Williams

2/26



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

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49666 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:

James L. Swann (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
RS183	.094	TIG Rod Box	363348

P.O.# - 105019



*Try look
1 box of 10,
to T if same as
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:

James L. Downum

V.P. - Quality Control

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

Shipped To: Process Systems
PO. 70015R

Date _____
Date Shipped _____
Order No. _____

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



Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AWS A.510-00 ASME SFA.5.10	QQ-A-566B P. Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elms Each
1100 Aluminum (B)	ER1100 R1100	1100	.10	.10	0.05-0.20	0.05					0.05
2019 Aluminum (C)	ER2019 R2019	2019	0.20	0.30	5.0-6.0	0.05-0.12	0.02				0.05
4043 Aluminum	ER4043 R4043	4043	4.5-5.0	0.0	0.30	0.05	0.05				0.05
710 Aluminum	ER710 R710	710	11.0-13.0	0.0	0.30	0.15	0.05				0.05
5103 Aluminum	ER5103 R5103	5103	.40	0.40	0.10	0.15	0.10				0.05
5356 Aluminum	ER5356 R5356	5356	0.25	0.40	0.10	0.50-1.0	4.0-5.2	0.05-0.25			0.05
5052 Aluminum	ER5052 R5052	5052		0.40	0.10		4.5-5.5	0.05-0.25			0.05
5083 Aluminum	ER5083 R5083	5083		0.40	0.10		4.5-5.5	0.05-0.25			0.05
5086 Aluminum	ER5086 R5086	5086		0.40	0.10		4.5-5.5	0.05-0.25			0.05
5087 Aluminum	ER5087 R5087	5087		0.40	0.10		4.5-5.5	0.05-0.25			0.05

NOTES

1. Silicon plus iron shall not exceed 0.0009 percent.
2. Lead content shall not exceed 0.0009 percent.
3. A. Zinc plus iron shall not exceed 0.007 percent.
4. B. Vanadium content shall be 0.05-0.15 percent. Calcium content shall be 0.10-0.25 percent.
5. C. Vanadium content shall be 0.05-0.15 percent. Calcium content shall be 0.10-0.25 percent.
6. 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: 6177490165
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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...

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

[Signature]
6119(10)

BOC GASES
80 RESEARCH ROAD
HINGHAM, MA 02043

20



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	Tl	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)

(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 H. Berg, Director, Quality and Metallurgy

15(66119)(10)

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 . . .



**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)



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:

ANSI 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

Daniel Damiani
15(66119)(10)

BOC G
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 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 9002-1994.

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

Bengt H. Berg, Director, Quality and Metallurgy

5(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:

ANS 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



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.: **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.

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

Bengt H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
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
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 Swann

General

[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
PO#

Shipped To: PROCESS SYSTEMS INTL
WEST BORO MA.

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

P.O. No.

Item	Weight	Size	Alloy	Heat No.
1.	9LB	5/32 x 36	ALUM	AA1005183D
2.	10LB	5/32 x 36	ALUM	7895
3.				

Comments:

P.O. 700643-R/V590490430C



Alloy	A9S A510-08 ASME SFA.5.10		QQ-R-566B Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Element	
	ER	R											T
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	5.8-6.8	0.20-0.40	0.02		0.10	0.10-0.20	0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.02		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 0.0008 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 GARDNER
90 RESEARCH ROAD
HINGHAM, MA 02043

30



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

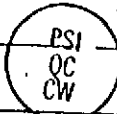
J. W. Harris Comp
Certificate of Compl

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 0103
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					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 0.0008 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



HARRIS
SOLID STATE WELDING PRODUCTS

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. PO#

Shipped To: PROCESS SYSTEMS
700643-R/V5904904300

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

Comments:

PSI
QC
CW

Alloy	AWS A510-00 ASME SFA5.10	QQ-R-566B r. Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements 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	5.8-6.0	0.20-0.40			0.10		0.05
4043 Aluminum	ER4043 R4043	4043	4.5-6.0	0.0	0.30	0.05	0.02		0.10	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	0.25	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	0	0	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 order specifications.

1996.10-31 04:01 #926 P.02/02
5082705930
HINGHAM TO
FROM : AIRCO/SOC 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:

[Signature]
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 CONEG legislation.

Additional Order Requirements:

James J. ...

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

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:

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
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(861197)(10)

3

BOC GASES

RESEARCH ROAD

BINGHAM, MA 02043



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

J. W. Harris Coml
Certificate of Comp

Date _____
Date Shipped 3-18-97
Order No. 797282

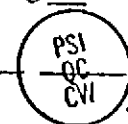
Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: Process Systems Intl
PO 70015R/7741000

Item	Weight	Size	Alloy	Heat No.
1.	40 LB	1/6 x 36	ALUM	0268
2.				
3.				

Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



Alloy	AYS A510-00 ASME SFA5.10		OO-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	0.8	0.30	0.05	0.05		0.10	0.20	0.05 ...
710 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	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.
- 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 _____ actions as per

57

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

SOLDERING, BRAZING & WELDING PRODUCTS

CERTIFICATE OF COMPLIANCE

RML ISSUE DATE: 04-16-96

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 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.

Rodnie M. Lee
CERTIFICATION CLERK

BOC GASES
80 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 / CP
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: 9/09/96

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
ST10846	.013	.430	1.720	.020	.013	19.98	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

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

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
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. Kottle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

42



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

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49866 USA
(816) 841-4111 Phone
(816) 841-9154 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

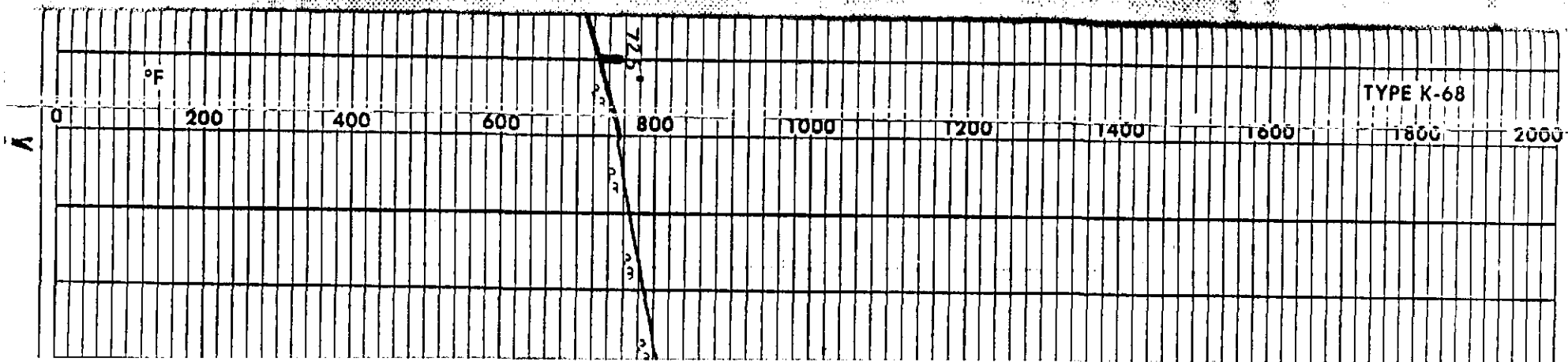
Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

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.

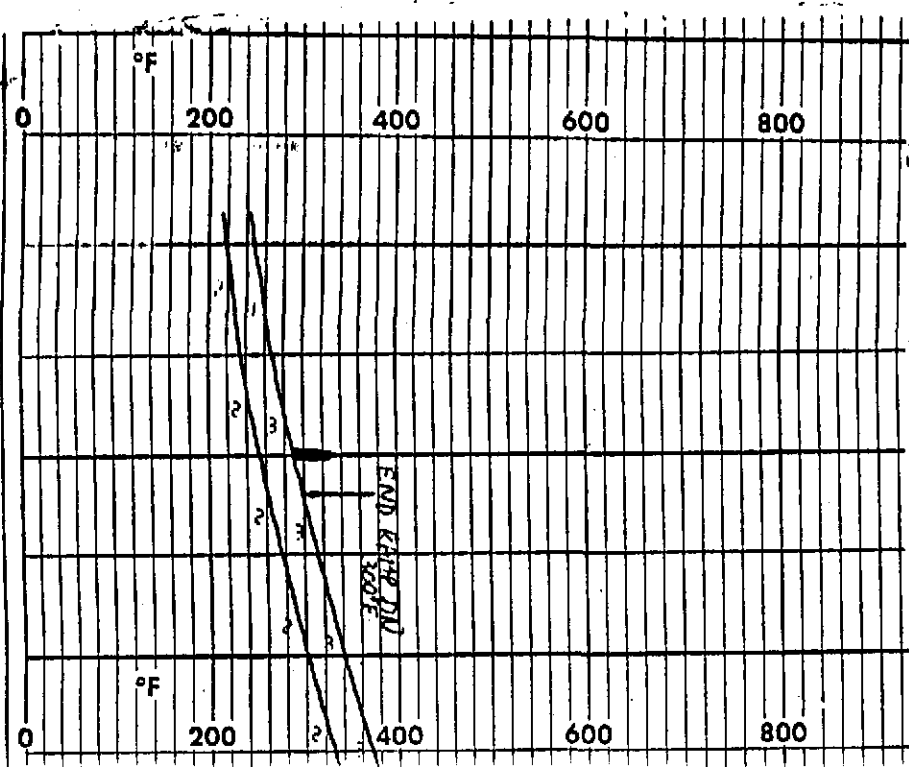
All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. Swann



TYPE K-68



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

BSC #1
HAM #1
Job # V59049
DGC. No 1049-S-634-01

TYPE K-68

TAG# WHAM 1 SMO1

Sam 1

Title

SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET

Project V59049

Component

Serial Number

HAM		1
DOORS	60"	0494-014-04
	60"	0494-A4-05
	84"	2332-3 0494-027-16
	84"	0494-027-01

Wash Cycle: MANUAL

Flowrates: 30 Gpm Max. Temp.: 150°F Duration: 2 hrs

Operator: Jean / Joseph Date: 3/6/97

Comments: 1st Clean Vessel by Jean
2nd Clean a Doors by Joseph

Component(s) Inspected By: [Signature] Date: 3/6/97

Quality Assurance: [Signature] Date: 3-12-97

Comments: _____

Number
Rev.

SPECIFICATION		
Number	V049-2-015	Rev.
A		2

LIGO DATA SHEET
MANUAL WASH STATION

PART DESCRIPTION: HAM SN: 1 WORK ORDER: V59049-200
 DATE/TIME: _____
 OPERATOR: Joseph / Jean

REMOVE ALL TIE-RODS:

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.
2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER.
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.
7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.
8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.
9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM.

TI925= 175 F

MIX 1:1

WASH TIME = 20 MIN

RINSE TIME = 90 MIN

DRY TIME = 24⁰ MIN

NOTES: Initial Clean by Jean - 2nd Cleaned - Joseph L
Doves Cleaned by Joseph L

SPECIFICATION

Number AV049-2-184 Rev. 0

Page 2 of 2

Jean

LIGO DATA SHEET

014-17 MANUAL WASH STATION

A4-05

127-16

PART DESCRIPTION: DOORS S/N: 127-16-01 WORK ORDER: V59049-260
DATE/TIME: _____
OPERATOR: Joseph

REMOVE ALL TIE-RODS:

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 = 145 F

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

MIX 1:1

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 = 30 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 = 24 MIN

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

NOTES: Hand scrub Doors - Dry overnight

SPECIFICATION

Number AV049-2-184

Page 2 of 2

Rev. ϕ

11/27/01

Title: COMPONENT RGA TEST PROCEDURE

TITLE	TEST ARTICLE PARAMETERS PUMPDOWN LOG
DATE:	5/7/97
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM_1
PSI TEST ENGINEER:	J.E.
QUALITY ASSURANCE:	

PHYSICAL DIMENSIONS			
S.S. SURFACE AREA		ft ²	cm ²
VITON LINEAL LENGTH		inches	cm
VOLUME		ft ³	liters

PUMPDOWN	TIME		PRESSURE	
5/7/97	14:05	hr:min	1.6×10^{-1}	Torr
5/8/97	7:00	hr:min	1.7×10^{-6}	Torr
5/9/97	7:00	hr:min	2.6×10^{-6}	Torr
	14:00	hr:min	2.9×10^{-6}	Torr
5/10/97	7:00	hr:min	2.2×10^{-6}	Torr
	14:30	hr:min	1.9×10^{-6}	Torr
	15:20	hr:min	2.7×10^{-6}	Torr
	16:40	hr:min	5.0×10^{-6}	Torr
5/12/97	7:10	hr:min	2.8×10^{-6}	Torr
	13:30	hr:min	2.8×10^{-6}	Torr
	16:30	hr:min	3.3×10^{-6}	Torr
	21:00	hr:min	3.4×10^{-6}	Torr
5/13/97	2:00	hr:min	2.5×10^{-6}	Torr
	4:00	hr:min	2.4×10^{-6}	Torr
	7:00	hr:min	2.4×10^{-6}	Torr
	11:30	hr:min	2.3×10^{-6}	Torr
5/14/97	7:00	hr:min	8.2×10^{-6}	Torr
	7:30	hr:min	6.7×10^{-6}	Torr
		hr:min		Torr

SPECIFICATION

Number: V049-2-127
A

Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	BAKE OUT TEMPERATURE LOG
DATE:	5/7/97
TIME:	2:00
TEST I.D.: e.g. WBSC1_1	UHAM-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

BAKEOUT LOG / DATE	TIME		TEMPERATURE	%
5/7/97	14:05	hr:min	17	°C
	1900	hr:min	37	°C
5/8/97	700	hr:min	57	°C
5/9/97	700	hr:min	98	°C
	1400	hr:min	111	°C
5/10/97	700	hr:min	121	°C
	1430	hr:min	121	°C
	1520	hr:min	~130	°C
	1640	hr:min	~140	°C
5/12/97	710	hr:min	~150	°C
	1630	hr:min	150	°C
	2100	hr:min	150	°C
5/13/97	700	hr:min	150	°C
	1130	hr:min	150	°C
	1700	hr:min	150	°C
5/14/97	700	hr:min	~70	°C
		hr:min		°C
		hr:min		°C
		hr:min		°C

1445 Change s.p. to 150°C 5/10
 200 CHANGE VARIAC SP. ~100°C. 5/14

SPECIFICATION

Number: V049-2-127
 A

Rev 1

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA ION SOURCE SETTINGS SHEET
DATE:	5/14/97
TIME:	
TEST I.D.: e.g. WBSCI_1	WHAM1-1
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.	<<1700>>

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	

Ion Source	
Filament #	
IS-Set	

Resolution	
Threshold	

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	RGASCANPARAMETERFILESETTINGS
DATE:	5/14/97
TIME:	
TESTID.: e.g. WBSC1_1	WHAM1-1.
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	
RGANUMBER:	
RGASENSORHEADSERIAL# QMS	
RGAELECTRONICSUNITSERIAL# 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

ITL	OUTGASSING RATES REPORT SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	W1HAM1-1
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 245 x 10 ⁵ cm ² Torr-L/s-cm ²
H2	1.35 x 10 ⁻⁷	4.8 x 10 ⁻⁹		2.66 x 10 ⁻⁷	36.6	4.94 x 10 ⁻⁶	2.0 x 10 ⁻¹¹
12			0.42				
14			0.5				
15			0.54				
CH4			0.57				
17			0.6				
H2O			0.64				
19			0.67				
26			0.71				
28	1.44 x 10 ⁻⁹	9.5 x 10 ⁻⁷		5.16 x 10 ⁻⁹	255.4	3.7 x 10 ⁻⁷	1.5 x 10 ⁻¹²
32			1.14				
38			1.36				
40	1.63 x 10 ⁻¹¹	9.4 x 10 ⁻⁹		3.14 x 10 ⁻¹⁰	315.8	5.15 x 10 ⁻⁹	7.0 x 10 ⁻¹⁴
43			1.53				
44			1.57				
129	7.6 x 10 ⁻¹³	2.5 x 10 ⁻⁹		6.98 x 10 ⁻¹²	4019.3	3.1 x 10 ⁻⁹	1.2 x 10 ⁻¹⁴
131	-	2.0 x 10 ⁻⁹		5.02 x 10 ⁻¹²			
132	-	2.5 x 10 ⁻⁹		5.67 x 10 ⁻¹²			
134	6.1 x 10 ⁻¹³	1.0 x 10 ⁻⁹		3.4 x 10 ⁻¹²	3584.2		

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	WHAM1-1
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
26							
27							
29							
30							
31							
39							
41							
42							
43							
55							
56							
57							
TOTAL	3.8 × 10 ⁻¹⁰				255.4	9.7 × 10 ⁻⁸	3.96 × 10 ⁻¹³

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.: e.g. WBSC1_1	WHAMI-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

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

BARGRAPH DATA FILE NAME WHAMI-1.sbc

ANALOG SCAN DATA FILE NAME WHAMI-1.sac

OTHER DATA FILES WHAMI-AR.
WHAMI-LK.

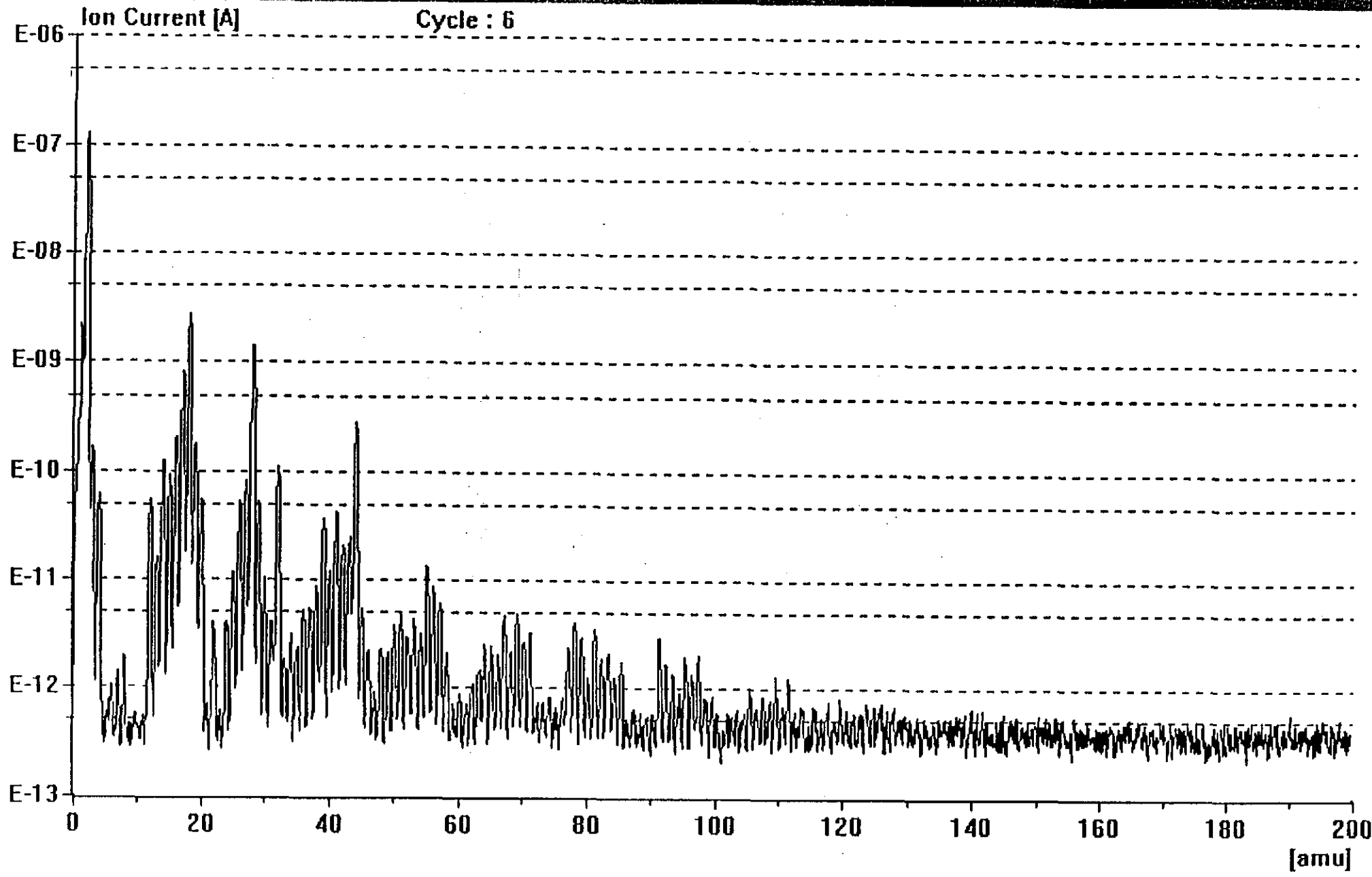
PRINTOUT OF

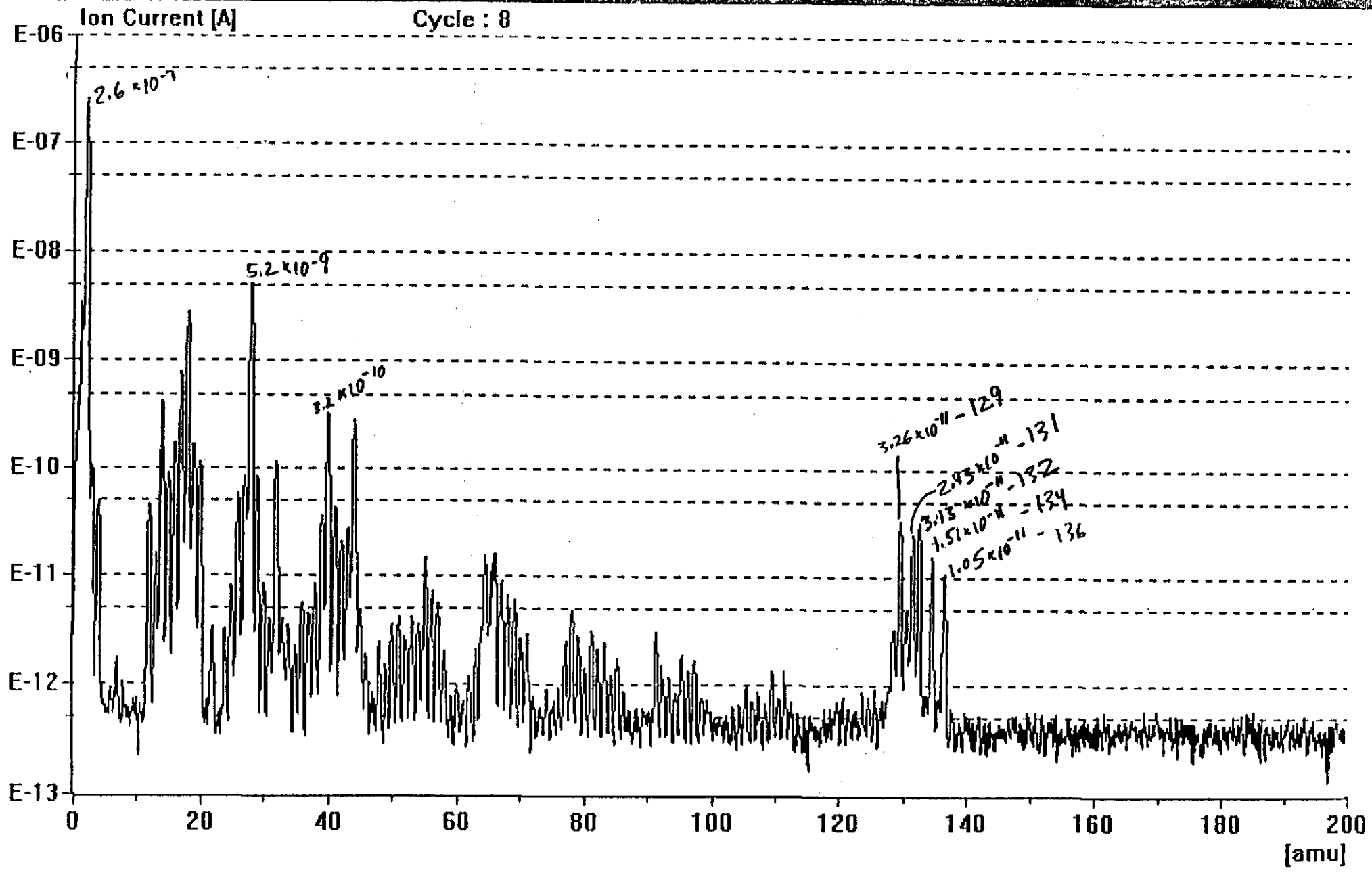
1. LAST ANALOG SCAN BEFORE CALIBRATION
2. ANALOG SCAN WITH CALIBRATED LEAK OPEN
3. BARGRAPH PLOT

SPECIFICATION

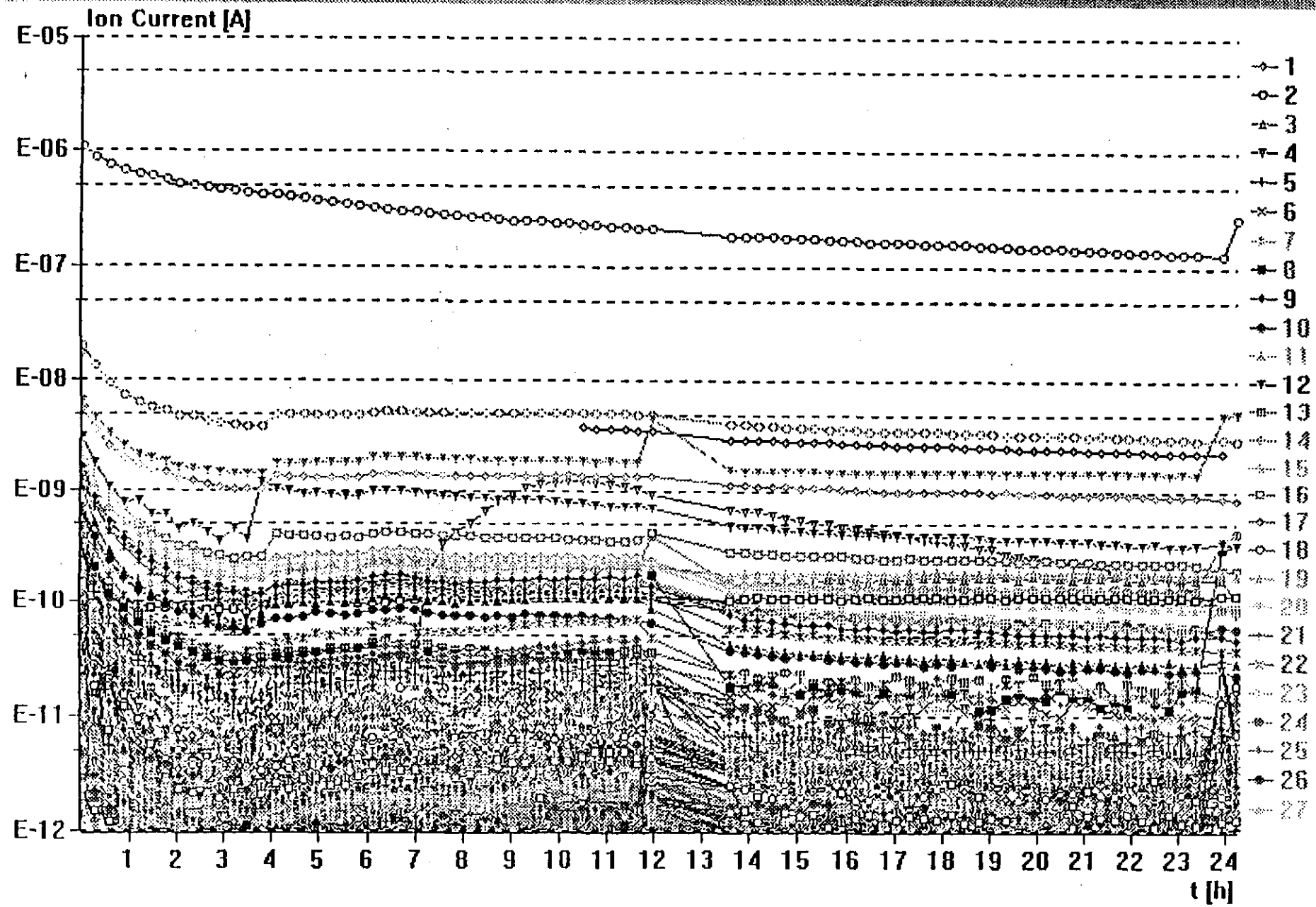
Number: V049-2-127
A

Rev.1





X: 62.81 Y: 6.695636E-07 G: 8



T: 58070.000 Y: 1.206280E-06

CYC: 76 5/15/97 6:47:39 AM:60 TIC: 1.453754E-07 [A]

m/e	Intensity [A]	m/e	Intensity [A]	m/e	Intensity [A]	m/e	Intensity [A]
1.06	2.299479E-09	2700	1.7356591E-07	2.94	1.562906E-10	3.94	1.450069E-10
6.94	1.281566E-12	8.03	1.919374E-12	9.38	7.387434E-13	11.97	6.016017E-11
12.91	2.173444E-11	13.97	1.270008E-10	14.97	9.506421E-11	15.97	2.181067E-10
16.97	8.720561E-10	17.97	3.039753E-09	18.94	1.781378E-10	19.97	5.932895E-11
21.91	4.260423E-12	23.97	5.053623E-12	25.03	1.331401E-11	26.00	5.604701E-11
27.03	8.658396E-11	28700	1.7444256E-09	29.03	5.453824E-11	30.06	8.060946E-12
31.09	4.120722E-12	32.00	1.084849E-10	32.94	2.295597E-12	33.94	2.881203E-12
35.13	2.461209E-12	35.97	7.353292E-12	37.06	6.812179E-12	38.13	9.828135E-12
39.03	3.868911E-11	40709	1.7628093E-11	41.09	4.605650E-11	42.09	2.396395E-11
43.06	2.751191E-11	44.06	3.080846E-10	45.09	5.840002E-12	46.25	2.230754E-12
47.03	1.108059E-12	48.16	2.712683E-12	49.22	1.745544E-12	50.13	4.977771E-12
51.16	5.001779E-12	52.13	3.232657E-12	53.19	4.296523E-12	54.19	3.116560E-12
55.19	1.923485E-11	56.13	6.700266E-12	57.25	8.166295E-12	58.09	1.961155E-12
59.28	7.242871E-13	60.22	1.097541E-12	61.09	8.662404E-13	62.25	8.759914E-13
63.19	1.803421E-12	64.03	2.223711E-12	65.13	2.457828E-12	66.31	2.075734E-12
67.16	4.696704E-12	68.25	2.226868E-12	69.16	4.416608E-12	70.34	2.463225E-12
71.31	2.800725E-12	72.38	9.634554E-13	73.25	7.605564E-13	74.34	9.781771E-13
76.13	9.773045E-13	77.25	2.723020E-12	78.31	3.933150E-12	79.44	2.879098E-12
80.34	1.215440E-12	81.41	3.217153E-12	82.38	1.806243E-12	83.56	2.365498E-12
84.28	1.406633E-12	85.53	1.900078E-12	91.34	3.171083E-12	92.41	1.696414E-12
93.44	1.332140E-12	94.38	8.821815E-13	95.44	1.992366E-12	96.56	1.484537E-12
97.56	2.047251E-12	98.53	8.448696E-13	99.44	8.398055E-13	104.56	9.695065E-13
105.47	1.043131E-12	106.50	6.664863E-13	107.63	1.033390E-12	108.53	6.592576E-13
109.66	1.216424E-12	110.56	8.762415E-13	111.50	1.154237E-12	113.78	6.771155E-13
116.72	5.842546E-13	117.53	6.759508E-13	119.84	7.042712E-13	120.75	6.979375E-13
121.56	7.434118E-13	123.84	8.488586E-13	125.75	8.507558E-13	127.03	5.826967E-13
129.69	7.617642E-13	133784	7.6104221E-13	135781	5.1911229E-13	138.03	5.881743E-13
141.78	5.781149E-13	148.19	5.699355E-13	151.06	5.606464E-13	152.22	5.788523E-13
153.06	6.429157E-13	164.72	5.837613E-13	168.34	5.185080E-13	170.41	4.955906E-13
175.31	5.278125E-13	177.97	5.180857E-13	182.19	5.700903E-13	187.66	5.150790E-13
190.00	5.191206E-13	193.34	5.098039E-13	196.50	5.698544E-13		

TOTAL HC ~ 3.8 x 10⁻¹⁰

CYC: 79	5/15/97	7:54:58 AM:60	TIC: 2.781865E-07[A]				
m/e	Intensity[A]	m/e	Intensity[A]	m/e	Intensity[A]	m/e	Intensity[A]
2.00	2.666341E-07	2.97	1.065544E-10	3.94	7.677610E-11	5.94	7.786779E-13
6.94	1.362372E-12	11.94	4.662718E-11	12.91	1.184683E-11	13.94	4.167568E-10
14.97	9.613923E-11	15.97	1.877096E-10	16.97	8.220198E-10	17.97	2.951810E-09
18.97	1.709981E-10	19.97	1.119294E-10	21.97	4.145470E-12	23.94	3.415298E-12
24.97	1.146151E-11	26.00	5.790706E-11	27.03	8.623926E-11	28.00	5.164331E-09
29.00	8.359740E-11	30.09	8.321168E-12	31.03	4.252571E-12	32.03	1.147253E-10
32.84	3.755656E-12	34.13	3.725239E-12	35.16	2.015315E-12	36.06	7.061922E-12
37.03	4.746589E-12	38.00	9.099646E-12	39.09	3.730611E-11	40.03	3.144258E-10
41.09	4.620565E-11	42.06	2.209651E-11	43.13	2.864804E-11	44.06	3.153074E-10
45.16	7.224754E-12	46.03	2.584409E-12	47.25	8.446565E-13	48.06	2.367910E-12
49.09	1.657143E-12	50.19	4.055994E-12	51.19	4.721638E-12	52.16	2.881304E-12
53.16	5.081667E-12	54.22	5.238675E-12	55.16	1.416882E-11	56.09	5.521035E-12
57.13	6.425251E-12	58.25	2.115264E-12	59.22	7.805333E-13	60.19	1.130718E-12
61.13	9.644942E-13	62.16	8.491821E-13	63.19	1.622411E-12	64.69	1.631265E-11
66.19	1.874999E-11	67.31	6.885096E-12	68.22	6.424410E-12	69.34	4.188046E-12
70.38	2.502274E-12	71.38	3.343893E-12	72.25	7.730441E-13	74.44	8.540670E-13
75.41	7.343642E-13	76.34	8.928053E-13	77.34	2.978361E-12	78.25	4.523444E-12
79.38	2.856060E-12	80.31	1.128098E-12	81.31	3.180441E-12	82.38	1.718682E-12
83.41	2.567818E-12	84.56	1.220517E-12	85.34	1.808174E-12	86.63	7.720370E-13
87.56	5.894632E-13	91.50	3.130600E-12	92.44	1.480630E-12	93.34	1.180134E-12
94.50	9.691703E-13	95.63	1.963083E-12	96.38	1.354861E-12	97.53	1.857771E-12
98.53	9.282315E-13	99.56	1.017713E-12	103.41	5.938984E-13	104.44	7.404938E-13
105.41	1.035696E-12	106.69	7.600952E-13	107.63	9.034868E-13	109.66	1.395341E-12
110.53	8.223930E-13	111.63	1.267375E-12	112.66	7.018348E-13	115.75	7.303788E-13
117.75	5.236429E-13	118.63	5.423470E-13	119.59	5.901217E-13	120.63	6.045302E-13
121.84	6.813229E-13	122.78	6.972255E-13	123.81	8.471236E-13	125.94	7.613399E-13
128.63	1.499787E-12	129.63	6.7976581E-12	130.50	1.7924537E-12	131.69	5.18055E-12
132.66	5.674659E-12	134.59	3.427550E-12	136.56	2.7518102E-12	137.81	6.489068E-13
140.94	5.180160E-13	141.81	5.156796E-13	145.91	5.660468E-13	148.00	4.686705E-13
152.09	5.851849E-13	158.03	5.091977E-13	160.88	5.057842E-13	162.19	5.058063E-13
167.63	4.973641E-13	177.03	4.681944E-13	180.44	5.033625E-13	191.09	4.908403E-13
192.50	5.177435E-13	198.84	5.568232E-13				

w/
CALIBRATED
MIXED
LEAK

Process Systems International, Inc.
DISCREPANCY REPORT

ROUTE TO Senecal/Bailey

D.R. NUMBER
4790
 SHEET
1 OF

JOB NUMBER V59049 ECT	P.O. NO.	VENDOR PSI	ORIGINATOR Senecal	DATE 2-7-97	REFER TO D.R. NUMBER
LIGO					

I T E M	DWG. ZONE	DISCREPANCIES (LIST CHARACTERISTICS, SPECIFICATIONS AND ACTUAL)	NO. ACC.	FOR REVIEW	QTY. OF PCS./DISPOSITION					REMARKS
					USE NO. CHGE	USE DWG. CHGE	RWK IN SHOP	RET. TO SUP.	SCRAP	
		<u>Drawing U049-4-002 Rev 3.</u> <u>Side Elevation Dimension 68.50"</u> <u>Overall for "E" Nozzle.</u> <u>Measures 68.375" - .025" under</u> <u>allowable tolerance of $\pm .098$"</u> <u>For HAM U049-4-128 Ser #01</u>	0	1						OK by TJM 5/1 3-20-97

DISPOSITION ---
SUBMIT TO LIGO FOR APPROVAL

 SIGNATURE DATE

DISPOSITION CONCURRENCE

PROJECT MGR. <u>Ruth Bailey</u>	DATE <u>2/25/97</u>	MFG. ENG. <u>Phillip F. ...</u>	DATE <u>2/26/97</u>	QUALITY ASSURANCE <u>Gene Senecal</u>	DATE <u>2-25-97</u>
------------------------------------	------------------------	------------------------------------	------------------------	--	------------------------

REINSPECTION

 SIGNATURE DATE

CORRECTIVE ACTION ---

 SIGNATURE DATE

AI/ANI _____ DATE _____

TECHNICAL INFORMATION MEMORANDUM

California Institute of Technology

TIM 51

To Richard Bagley	Contract No. PC175730
Contractor Process Systems International 20 Walkup Dr. Westborough Mass.	Doc. No. LIGO-C970053-00-V

PURPOSE <input checked="" type="checkbox"/> Response to RF/Needs List <input type="checkbox"/> Clarification <input type="checkbox"/> RFI <input type="checkbox"/> Recommendation
<p>Rich;</p> <ol style="list-style-type: none"> 1. LIGO agrees to Change Order Request No. 22, Option 1 (Metal Seal Leak Measurement), in the amount of \$15,974. A contract change will be processed. 2. LIGO does not wish to pursue Change Order Request No. 20 (Use Prototype BSC As a Production Unit and Delete One BSC Weldment) 3. Regarding HAM chamber "E Nozzle" dimensions and tolerances, LIGO has concluded that Figure 9 of the VE Specification (LIGO-E940002-02-V) is the appropriate document. Please send us the dimensional inspection report for the first HAM chamber as soon as possible. <p>John</p>

The Contractor acknowledges receipt by signing and dating below, and returning to Caltech.

<p>SIGNED</p> <p style="font-size: 1.5em; font-family: cursive;">John Worden</p> <p style="text-align: right; margin-right: 50px;">2/14/97</p> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <p style="text-align: center;">AUTHORIZED REPRESENTATIVE DATE</p> <p>John Worden</p> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <p style="text-align: center;">PRINT NAME</p> <p>Technical Manager</p> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <p style="text-align: center;">TITLE</p> <p>CALIFORNIA INSTITUTE OF TECHNOLOGY</p>	<p style="text-align: center;">THE CONTRACTOR HAS RECEIVED THIS TECHNICAL INFORMATION MEMORANDUM</p> <p>SIGNED</p> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <p style="text-align: center;">AUTHORIZED REPRESENTATIVE DATE</p> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <p style="text-align: center;">PRINT NAME</p> <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <p style="text-align: center;">TITLE</p> <p style="text-align: center;">CONTRACTOR</p>
--	---

IRANOR, INC

NONCONFORMANCE REPORT

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

JOB NUMBER 7400 F/m		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. # 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				

NCR NUMBER NCR- 1030	PAGE 1 OF 1 SKETCH ATTACHED <input type="checkbox"/>
-------------------------	---

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 Bell DATE: 3-27-97

RESPONSIBILITY FOR NONCONFORMANCE						
<input type="checkbox"/> VENDOR MACHINING	<input type="checkbox"/> DESIGN INSPECTION	<input type="checkbox"/> MATERIAL CALIBRATION	<input type="checkbox"/> CUTTING QC	<input type="checkbox"/> FORMING QA	<input type="checkbox"/> WELDING	<input checked="" type="checkbox"/> OTHER Heat Treat

TECHNICAL JUSTIFICATION/DESCRIPTION OF DISPOSITION

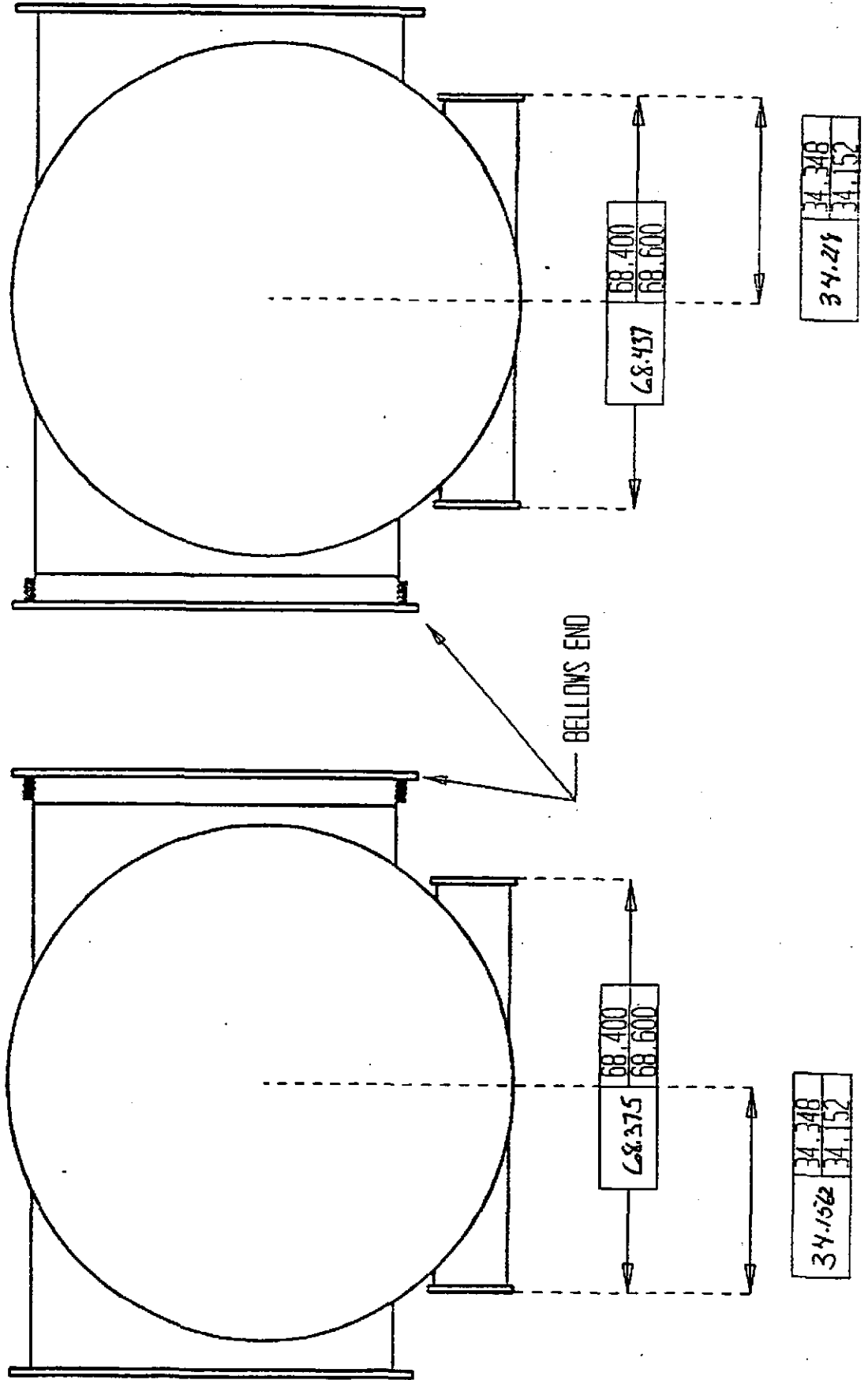
ITEM	TECHNICAL JUSTIFICATION	DESCRIPTION OF DISPOSITION
	Submit to PSI for Justification and Written Disposition. <u>Steve Bell</u> 3-27-97	REC'D OR 1029 USE AS IS R. D. Lietz 4/16/97 GS 4-17-97

TECHNICAL JUSTIFICATION: _____ DISPOSITION: _____
 BY _____ DATE: _____ BY Steve 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: _____
APPROVAL OF DISPOSITION: VP-ENGINEERING _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	VERIFICATION OF DISPOSITION: ACCEPTED BY _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	

WHAM 1 Ser# 01

HAM WELDMENT 2-14-97
 V0494128
 SN 01

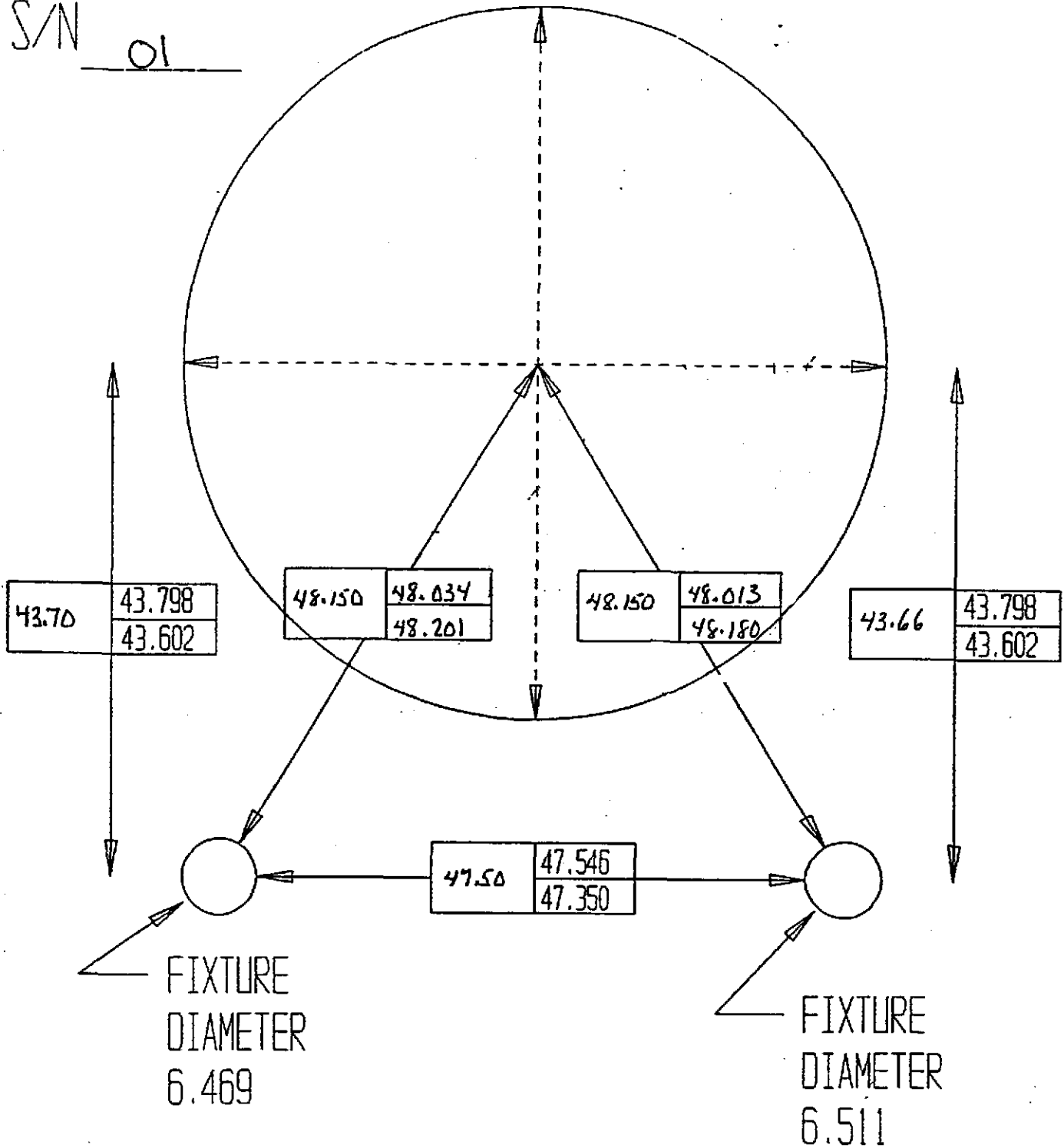


HAM WELDMENT

V0494128

S/N 01

BELLOWS END

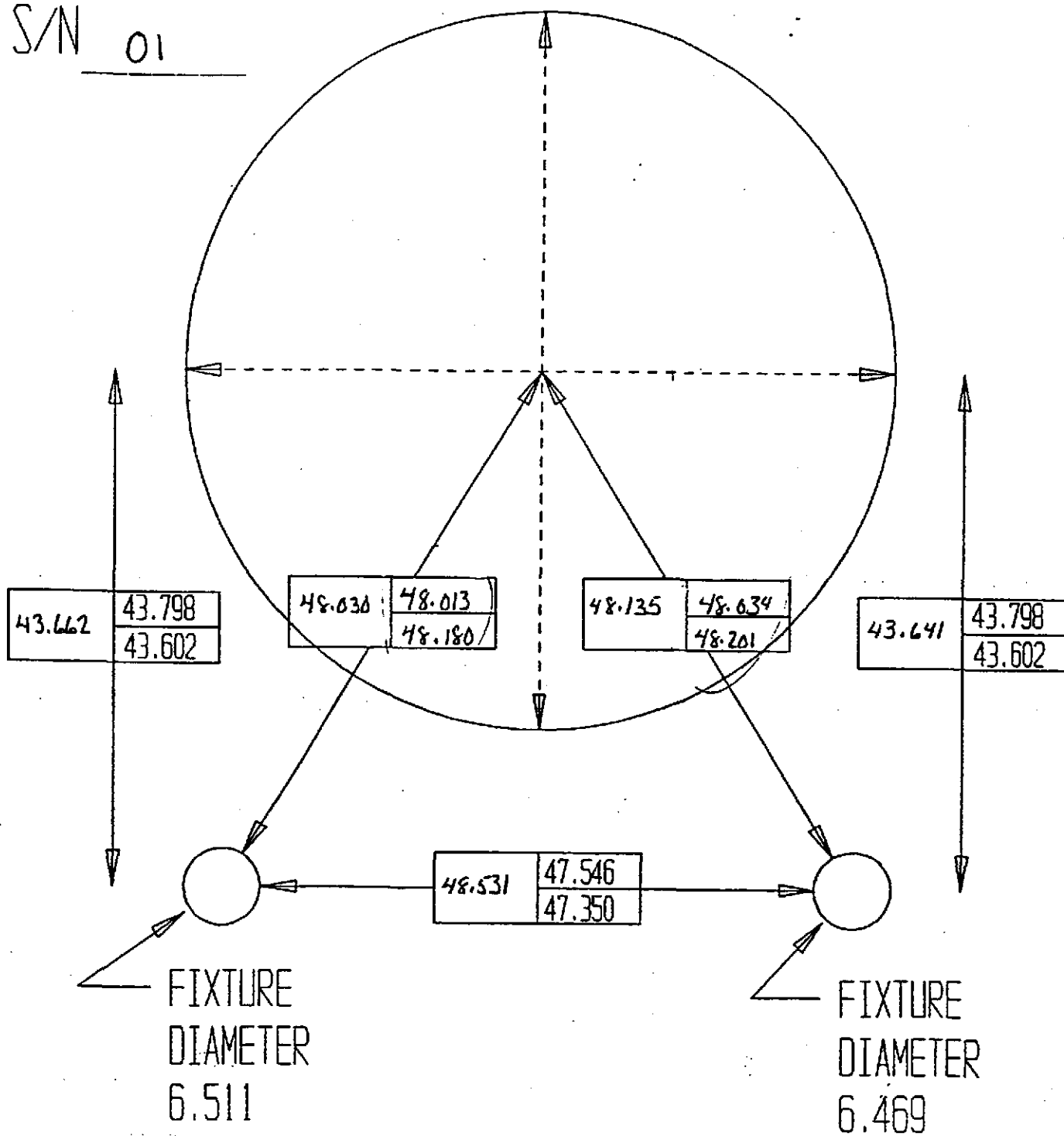


HAM WELDMENT

V0494128

S/N 01

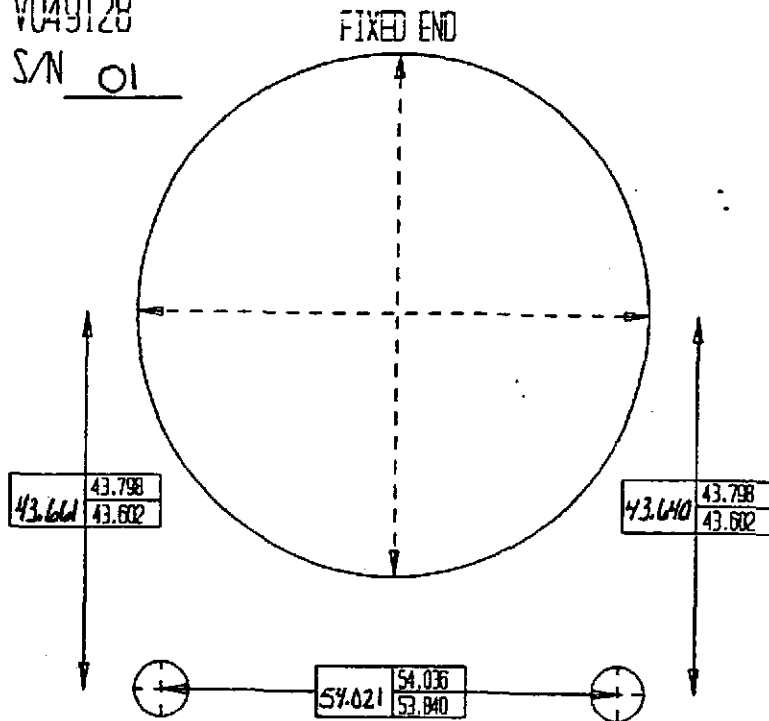
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HAM WELDMENT

V049128

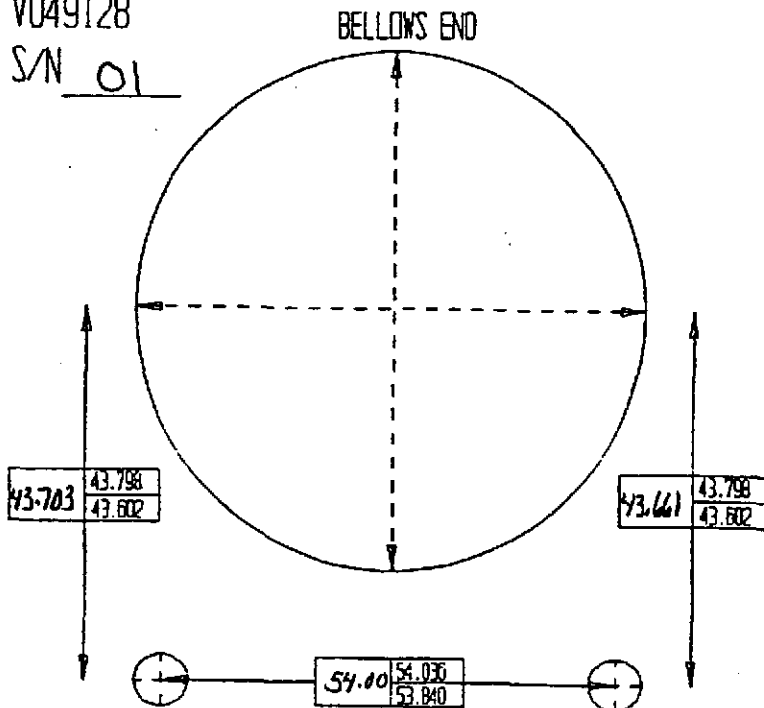
S/N 01



HAM WELDMENT

V049128

S/N 01



WHAMLS/NO1

Sheet1

HAM INSPECTION LOG									
S/N V049-4-128 - 01									
Section		Characteristic		Actual	Tolerance	Drawing	Date	Insp. By	Q.A. Sign
Plan		75" F-F			0.098	2		GS	2-14-97
Elevation		68.5			0.098	128		GS	↓
Elevation		68.5	Bellows End Concentricity		0.098	128		GS	
			Fixed End Concentricity		0.098	128		GS	
		60.5	Bellows End Cylindrical		0.098	128		GS	
			Fixed End Cylindrical		0.098	128		GS	
Elevation					0.098	128		GS	
B-B		84.25	Left		0.098	2		GS	
		84.25	Right		0.098	2		GS	
Elevation								GS	
E Nozzle		68.5	Bellows End		0.098	128		GS	
E Nozzle		68.5	Fixed End		0.098	128		GS	
End Elev.								GS	
E Nozzle		53.937	Bellows End		0.098	128		GS	
		53.937	Fixed End		0.098	128		GS	
End Elev.								GS	
D Nozzle		55.5			0.098	128		GS	
D Nozzle		66	A-A		0.098	128		GS	
C Nozzle		33	A-A		0.098	128		GS	
Saddle								GS	
Repads		12.25	A		0.098	128		GS	
Lift Lug		21	Typical		0.098	128		GS	2-14-97



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-2

P/N - VO49-4-128-03

1	Quality Plan sign offs.	
2	Hyspan Metal Bellows documentation package.	
3	Material test reports for shells, heads and large flanges. (over 60") C of C for nozzles, small parts, flanges (under 60") and weld wire. C of C to Codes and Standards.	
4	Heat-treat charts. (by Ranor). When applicable.	
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. WHAM2 Ser. No. 03

QUALITY PLAN FOR LIGO

FOR

LIGO

HORIZONTAL ACCESS MODULE (HAM)

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

CONTROLLED-COPY

OCT 24 1996

REV LTR.	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE
1	GS 10/5/96		Release Per DEO No. 0302
0	DRB 7/8/96	RJB	released per DEO 0114

PROCESS SYSTEMS INTERNATIONAL, INC.				SPECIFICATION		
INITIAL APPROVALS	PREPARED	DATE	APPROVED	DATE	Number	Rev.
	DRB	4/8/96	R. Brady	4/17/96	V049-2-087	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

Number

Rev.

Serial No. V0494128-02

SPECIFICATION V049-2-087

REV. 1

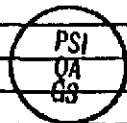


Process Systems International, Inc.
20 Walkup Drive
Westborough, MA 01581-5003
(508) 366-9111 Fax (508) 870-5930

PROJECT LIGO
ITEM HORIZONTAL Access Module (HAM)
APPLICABLE CODE ASME Sect VIII Div. 2
(where Applicable)

JOB NO. V59049
DWG NO. V049-2-128
PG 8 OF 97

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>GS</u> 9-3-96									
Inspect Welding Long Seam/Lower Shell	V	V049-4-128	V049-2-071	X <u>MARK</u> 9/19/96										
Verify Roundness of Shell	V-D	V049-4-128		X <u>MARK</u> 9/19/96										
Inspect Welding Long Seam 60" Nozzles	V	V049-4-128	V049-2-071	X <u>MARK</u> 9/19/96										
Verify Roundness of 60" Nozzles	V-D	V049-4-128		<u>MARK</u> 9/19/96										
Verify Fixtures in Shell & 60" Nozzles				<u>MARK</u> 9/19/96										

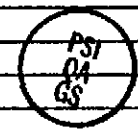


Serial No. V0494128-02

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	MMR 12/15/97																
Inspect Welding of 60" Nozzles	V	V049-4-128		MMR 10/15/97																
Verify Nozzle Alignment and Dimensions (ALL Nozzles)	V-D	V049-4-128		MMR 4/4/97																
Verifies Steam Cleaning of Vessel				XMMR 4/4/97																
Thermal Stress Relief Vessel		V049-2-046		XGS 7-31-97																

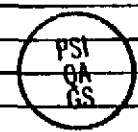


Serial No. V0494128-02

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>CS</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>Mark</u> 3/4/97							
Verify Cutout Location of the 4-Critical "E" Nozzles	U-D	V049-4-128		X <u>Mark</u> 5/6/97							
Inspect Welding of 84" Flanges to Shell	V	V049-4-054	U049-2-071	X <u>Mark</u> 3/26/97							
Verify Flange (84") Straightness and Flatness	V-D	V049-4-054		X <u>Mark</u> 3/26/97							
Inspect Welding of 60" Flanges to Nozzle Neck	V	V049-4-054	U049-2-071	X <u>Mark</u> 3/27/97							



Serial No. V0494128-02

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 60" Flange Straightness & Flatness	V-D	V049-4-054		X <u>[Signature]</u> 4/16/97			
Inspect Welding of Expansion Joint to 60" Nozzle	V	V049-4-054 V049-4-053	V049-2-071	X <u>[Signature]</u> 4/13/97			
Inspect Welding of Internal Saddle to Shell	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 4/17/97			
Inspect Welding of ALL Non-Critical Flanges	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 4/13/97			PSI QA GS
Inspect Welding of Critical "E" Nozzles and Flanges (with fixtures)	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 4/13/97			
Verify Alignment Straightness & Flatness of "E" Nozzles	V-D	V049-4-128		X <u>[Signature]</u> 4/13/97			

Serial No. V0494128-02

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> AT	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	V049-4-040	V049-2-072	X <u>[Signature]</u> 11/7/97					
Verify Installation of Annular Tubing	V	V049-4-054		X <u>[Signature]</u> 11/16/97					
Verify Installation & Alignment of Support Saddles	V-D	V049-4-052 V049-4-002	V049-2-072 V049-2-071	X <u>[Signature]</u> 5/23/97					PSI QA GS
Steam Clean Complete Vessel Inside & Out		V049-2-015		X <u>[Signature]</u> 5/26/97					
Verify final cleaning at PSI	V	V049-2-015		X <u>GS</u> 5-21-97					
Verify final check-out at PSI	V	V049-2-019		X <u>GS</u> 6-18-97					
Verify final Ver. of He Leak Test at PSI	V	V049-2-014		X <u>GS</u> 6-24-97					
Shipment to LIC		V049-2-123		X <u>GS</u> 9-8-97					



PSI DWG # V049-8-429

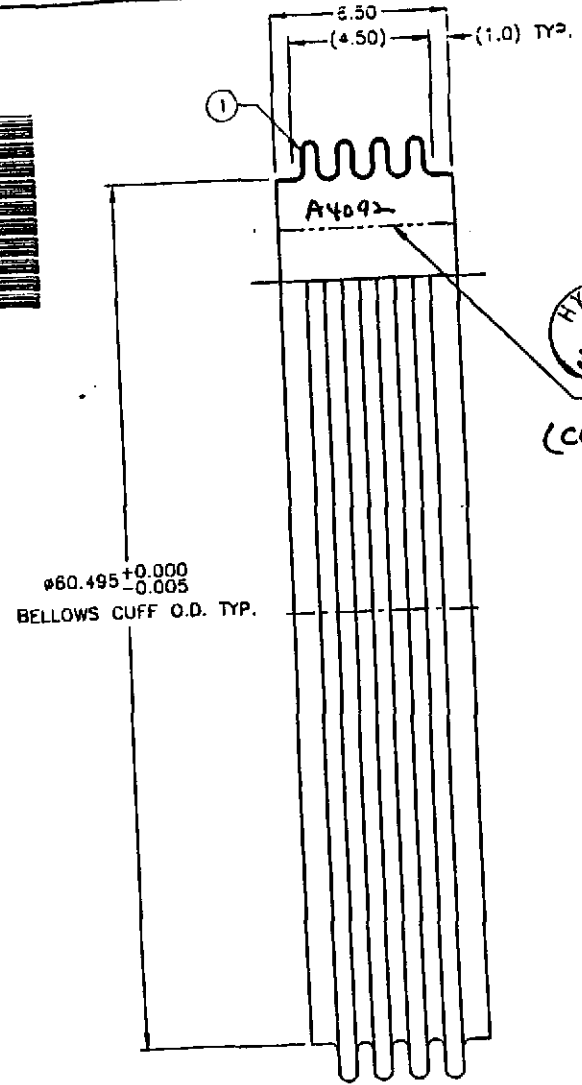
REVISION	DATE	APP.
1 WAS SWG. NO. CE1632-1 TEMP. WAS 370°F REV'D NOTES 11 & 14 DEL. NOTE 12 & 13 SUBMIT FOR APPL.	SEP/11/96	A.P.S.
2 REV'D PER CUST COMMENT SUBMIT FOR APPROVAL	OCT/07/96	A.M.P.

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
 : 2,860 Lb./in. @ 2.0 in. MAINTENANCE COMPRESSION
 LIFE : 1,000 CYCLES

- 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^{-9} 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.



HYSPAN
W
30
 WPS
 007
 11
 (CO₂ SCRUB)

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

② TAG DETAIL

SUBMITTED FOR APPROVAL
 HYSAN 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.~~

2	1	TAG, .06 THK.	A240-304
1	1	BELLOWS, (60.423 I.D.), 63.423 O.D., 1 PLY, .036 THK., 4 CONS.	SA240-304L
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		Hyspan Precision Products, Inc. 1685 Brandysine Avenue Chico Vista, California 91811	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
SCALE NONE	SHT. 1 OF 1		V049-4-053



TEST CERTIFICATE
Cert. No. 175583

L. O. H.
Sheff.
Sheff.
S9 177

1 44 (0) 114 244 3311

1 44 (0) 114 244 0200

547025

V01 S3-P1-03

EN 10204 3.10

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

21/05/96 Date

Customer Order No.
9102376

Specification
ASIM A240-95 304 UNS30400
00-S-7660 FEB 5 1988
ANS 5513F 6/15/33
NIL-S-5059D 30/5/83

Supply Condition
Cold Rolled Softened Descaled and Pinch Passed

Quality confirmed by spectroscopic examination Test Position: Front, Back, Orientation: Transverse, Longitudinal El codes: 1=500, 2=500, 3=500, 4=600, 5=600, 6=600, 7=600, 8=25mm, 9=25mm

Folio	Cast. No.	Material Description	Temp C	Coil No./ Plate No.	Proof Stress		Tensile Strength	Elongation	RA/AV	Bend Test	IIC Test	Irod Charpy	Impact II. lbs. J
					0.2% PSI	1.0% PSI							
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	74328/1	BT 45385 FT 36975	52345 44370	89175 86855	52 151 57 151	63.5 155 58.6 144	OK OK	OK OK		

MATERIAL TESTED TO ASIM A240 CONFORMS TO LATEST REVISIONS OF ASIM 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 ASIM A240 also conforms to latest revisions of ASIM A240 and ASME SA240/SA400. 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. "NO WELD REPAIR"

INTERCRYSTALLINE CORROSION TEST TO ASIM A262 (1993) PRACTICE "E" SATISFACTORY

Avesta Sheffield Ltd
LROA Approval Numbers



940258
940175

Cast No.	C	Si	Mn	P	S	Cr	Mo	Ni	IV	Nb	Co	N	Cu	Zn
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, 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.)

Form No: C17_101 PCI

VINCENT METAL GOODS
SANTA FE SPRINGS
CUST. ORDER # 9102376
CUST. ORDER # 60506
CUST. ORDER # 25-038153

MASS SPECTROMETER TEST REPORT


Fig.-1

V0494053-p1-03

CUSTOMER: Process Systems International, Inc.				
Sales Order No.: 70904 Item: <i>17</i>		Drawing No.: <i>53/40</i>		
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
<i>003</i>	<i>1x10⁻⁹</i>	<i>1430</i>	<i>12-4-96</i>	<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
<i>A4092</i>	<i>N/A</i>	<i>N/A</i>

Inspector: *[Signature]*  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 2

SERIAL NUMBER: 03

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 2 S/N 03

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 2 S/N 03

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 2 S/N 03

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 650 A 654
35	1	EA	V0494031	60-1/2 I.D. FLANGE GROOVED WITH SLOTS (HAM)	A 746
36	1	EA	V0494032	60-1/2 I.D. FLANGE FLAT FACED (HAM)	A 559
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 2 S/N 03

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 973 A 972
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 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
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 519
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 712
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 2 S/N 03

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



TEST CERTIFICATE

PAGE NO. 01 OF 01
 FILE NO: 8860-01-0
 DATE: 07/24/96
 MILL ORDER NO: 22195-002

CUSTOMER P.O.: F74104
 DESCRIPTION:

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

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

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

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

CINCINNATI OH 45241

CINCINNATI OH 45241

CINCINNATI OH 45241

THE 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-755R COND. A-304L

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

MELT SLAB

CHEMICAL ANALYSIS

PRACTICE

Y1149 /3CA	C	MN	P	S	CU	SI	NI	CR	MO	V	TI	B	N				
Y1149	✓ .025	✓ 1.77	✓ .028	✓ .006	.23	.54	8.50	18.24	.39				✓ .0840				
PROD ANALYSIS	.025	1.79	.025	.005	.23	.55	8.31	18.03	.39				.0790				

TENSILES

CHARPY V IMPACTS

OTHER TESTS PERFORMED

TYPE	YLD (PSI)	TENS (K 100)	% ELONG	% RA	TYPE	TEMP	MILS LATERAL EXPANSION	% SHEAR	BEND TEST - LOC/DYR BX - PASS	BRINELL - 179	CORROSION A262E	TEST LOI SATISFACTORY
BOX	510	564	68.0	62.0								

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

By O. W. ... Date 11-15-96

INFORMATION

HEAT TREAT CYCLES - MATL OR TESTS - DEG F/AT

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

HEAT TREAT CYCLES - TESTS ONLY - DEG F/AT

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

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. 2-12121
 S/L 337215 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:

Quality Assurance Laboratory
 Coatesville, PA 19320

Jurham, PA 17009
Tel: 717-248-4911

METALLURGICAL CERTIFICATION PAGE



STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 11/01/96

PCS SHIPPED: 4
04 OUR ORDER NO 532691604
SHIPLIST NO: 58708
PSI MIC NO. A929

RING V049M136-1
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 ASME 182 Gr. 304L
95 Edition, Addenda
By C. W. Wroblecki Date 11-7-96

CHEMICAL ANALYSIS

NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI			
9279	✓ .081	✓ .48	✓ .033	✓ 1.78	✓ .002	✓ 11.72	✓ 18.82							N .0530

MECHANICAL PROPERTIES

AT BER	SERIAL NUMBER	BRINELL	TEN	TEN	TENSILE	UTS	YIELD ST	X	XRED	I_M_P_A_C_T_D_A_T_A									
			TEMP (F)	DHN	LOCATION	(KSI)	20XOFST			ELONG	AREA	LOCATION	TEMP (F)	FT. LBS	% SHR	LAT EXP	GRN SIZE		
	611227A		475		PROLONG	74.5	37.0												
	611227B																		
	611227C																		
	611227D																		

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED



TEST CERTIFICATE

CUSTOMER P.O. #24107
DESCRIPTION:

PAGE NO. . OF 01
FILE NO: 8860-01-0
DATE: 08/08/96
MILL ORDER NO: 22193-001

1 - RECTANGLE .375 -X- 96 -X- 192

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

CINCINNATI OH 45241

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

CINCINNATI OH 45241

SHIP TO:
TRINITY INDUSTRIES-CUST PICKUP
P.O. BOX 41192
PSI MIC NO. A972

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 A167-93-304L, Q35-766D COND, A-304L,

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

MELT SLAB		CHEMICAL ANALYSIS													PRACTICE		
Y1126 /303		C	MN	P	S	CU	SI	NI	CR	MO	V	TI	B	N			
Y1126		✓ .024	✓ 1.81	✓ .025	✓ .004	.29	✓ .52	8.45	18.18	.23				✓ .0779			
PROD ANALYSIS		.025	1.84	.024	.004	.29	.53	8.41	18.13	.23				.0800			

TENSILES				CHARPY V IMPACTS				OTHER TESTS PERFORMED			
YIELD (PSI X 10 ³)	TENSILE (PSI X 10 ³)	% ELONG 2"	% RA	TYPE	TEMP	MILS LATERAL EXPANSION	% SHEAR	BEND TEST - LOC/DIR BX - PASS			
526	872	71.0	66.0					BRINELL - 163 TEST LO			
								CORROSION A262E SATISFACTORY			

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

INFORMATION				By <u>C. Wotack</u> Date <u>11-18-96</u>		HEAT TREAT CYCLES - MATL OR TESTS DEG FAI							
WEIGHT PER PIECE = 2111 LBS. 960 KG.						MATL	TEST	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS	COOL METHOD	FAI
MERCURY OR MERCURY COMPOUNDS ARE NOT USED IN THE MANUFACTURE OF LUKENS'/WASHINGTON'S PRODUCTS.						X	X	1950			0012	MQ	
CORROSION TEST PER ASTM A262 PRACTICE A & E.						HEAT TREAT CYCLES - TESTS ONLY - DEG FAI							
PART NO. 2-12121						START END TEMP	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS	HEAT RATE MAX	FAI	
M/L 038239 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:

Quality Assurance Laboratory
Coatesville, PA 19320



Avesta Sheffield Plate Inc.

Certificate of Analysis and Tests

OUR ORDER 84645 - 07

HEAT & PIECE 39233-2A 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 39233 - 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/ES-240 Gr. 304/304L
95 Edition, AddendaBy C. W. Wiercki Date 9-3-96

KNOWINGLY & WILLFULLY FALSIFYING OR CONCEALING A MATERIAL FACT ON THIS FORM,
 OR MAKING FALSE, PICTITIOUS 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 555492
REPORT DATE: 09/06/96

PCS SHIPPED: 9
02 OUR ORDER NO 432620502
SHIPLIST NO: 54599

PRODUCT

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 68.50" 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

0049H243-1

PSI MIC NO. A559

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, Addend
By C. Wotnicki 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)	.20X OFST	% ELONG	XRED AREA	I_M_P_A_C_T_D_A_T_A				
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
509280	662745D		475		PROLONG	74.5	36.5		64.0	79.0					
509280	662743A														
509280	662743B														
509280	662743C														
509280	662743D														
509280	662743E														
509280	662746A														
509280	662746B														
509280	662746C														



Avesta Sheffield East, Inc.

PSI MIC NO. A712

Certificate of Analysis and Tests

OUR ORDER 83468 - 02

HEAT & PIECE 39725-3B 8/01/96

SOLD TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE

SHIP TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE

WESTBOROUGH

MA 01581

WESTBORO
737001-01

MA 01581

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

5/03/96

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

HEAT & PIECE 39725 - 3B
WEIGHT 1824

FINISH 1
GRADE 304L / 304 UNS-S30403 / UNS-S30400
DIMENSIONS .500 X 62.125 X 195.188 EXACT

----- SPECIFICATIONS -----

V049-2-041 REV0 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 BALTIMORE, MD.
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 79
GRAIN SIZE 5
YIELD STRENGTH (PSI) 40700 ✓
TENSILE STRENGTH (PSI) 82600 ✓
BEND OK
INTERGRANULAR CORROSION OK
ELONGATION % IN 2" 61.0 ✓
REDUCTION OF AREA % 68.0

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

CARBON (C) .015 ✓
MANGANESE (MN) 1.48 ✓
PHOSPHORUS (P) .028 ✓
SULFUR (S) .002 ✓
SILICON (SI) .31 ✓
CHROMIUM (CR) 18.39 ✓
NICKEL (NI) 8.67 ✓
COBALT (CO) .08
COPPER (CU) .25
MOLY (MO) .47 ✓
NITROGEN (N) .07 ✓

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with SA 38-240 Gr 304/304L
96 Edition. Addenda

By C. Wojcicki Date 9-26-96

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.

J. BONGARDT, LAB MANAGER



Tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORCE Corporation

FOR: PROCESS SYS INT MA

CUSTOMER ORDER NUMBER 555492

REPORT DATE: 09/13/96

IT-4

PCS SHIPPED: 30

04 OUR ORDER NO 432620501

SHIPLIST NO: 56855

PSI MIC NO. A746

PRODUCT

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 68.5" 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

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH
ATTENTION:

MA 01581

PROCESS SYSTEMS INT'L, INC.

Reviewed this report and it complies

with ASME-182 Gr304L
93 Edition, Addenda

By C. Watacki Date 10-1-96

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI			
S09279	✓	✓	✓	✓	✓	✓	✓							
S09280	.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)	20% OF ST	X ELONG	X RED AREA	I_M_P_A_C_T_D_A_T_A						
											LOCATION	TEMP (F)	FT. LBS	K SHR	LAT EXP	GRN SZE	
S09279	602844A																
S09279	602844B																
S09279	602844C																
S09279	602844D																
S09279	602844E																
S09279	602845A																
S09279	602845B																
S09279	602845C																
S09279	602845D																
S09279	602845E																

← A746

IT-4

+75 PROLONG 74.5 37.0 41.0 81.0



RE 7172684911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

MECHANICAL CERTIFICATION

FOR: PROCESS SYS INT MA

PAGE 2

CUSTOMER ORDER NUMBER 555492

PAGE-2

PCS SHIPPED: 30

REPORT DATE: 09/13/96

04 OUR ORDER NO 432620501

SHIPLIST NO: 56855

MECHANICAL PROPERTIES

P. 5/5

NO. 174

STANDARD STEEL M. LAB

SEP 8. 1997 11:41AM

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI) .20XOFST	X ELONG	X RED AREA	I.M.P.A.C.T DATA						
										LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE	
809279	6G2846A															
809279	6G2846B															
809279	6G2846C															
809279	6G2846D															
809279	6G2846E															
809280	6G2847A															
809280	6G2847B		+75			74.5	36.5	64.0	79.0							
809280	6G2847C															
809280	6G2847D															
809280	6G2847E															
809280	6G2848A															
809280	6G2848B															
809280	6G2848C															
809280	6G2848D															
809280	6G2848E															
809280	6G2849A															
809280	6G2849B															
809280	6G2849C															
809280	6G2849D															
809280	6G2849E															

PSI MIC NO. A746

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with ASME 18A Gr. 304L
95 Edition, Addenda

By C. Watcicki 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. Kelly
MGR. LABORATORIES

Dunham, PA 17009
Tel 717-245-4911

METALLURGICAL CERTIFICATION PAGE 1



STANDARD STEEL

A Division of FINEFORM FABCO Corporation

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

PCB SHIPPED: 11
03 OUR ORDER NO 532891603
SHIPLIST NO: 56374

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD +.06 X 84.0-.06 X 1.625" WD +.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

VO49M133-1

PSI MIC NO. **A650**

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 P. Wotnicki Date 9-16-96

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
809280	✓ .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	ELONG	X RED AREA	I M P A C T D A T A				
											LOCATION	TEMP (F)	FT. LBS	X BHR	TAT EXP
809280	6G2749A		+75		PROLONG	74.5	36.5		64.0	79.0					
809280	6G2749B														
809280	6G2749C														
809280	6G2749D														
809280	6G2750A														
809280	6G2750B														
809280	6G2750C														
809280	6G2750D														
809280	6G2751B														
809280	6G2751C														
809280	6G2751D														

← A650

NOV. 19. 1997 11:01AM STANDARD STEEL M. LAB NO. 103 P. 2/6

STANDARD STEEL
712-200-4000



STANDARD STEEL

Member of the ELSON PERI Corporation

METALLURGICAL CERTIFICATION

PAGE 2

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

PCS SHIPPED: 11
03 OUR ORDER NO 532691603
SHIPLIST NO: 56374

MIC# A650
PG-2

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

HGR. LABORATORIES

P. 3/6

NO. 103

STANDARD STEEL M. LAB

NOV. 19. 1997 11:01AM

1

Barnham, PA 17009
Tel: 717-268-4811

METALLURGICAL CERTIFICATION PAGE 1



STANDARD STEEL

A Division of PROCESS SYSTEMS INTERNATIONAL

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

PCB SHIPPED: 11
03 OUR ORDER NO 532891603
SHIPLIST NO: 56374

NO. 103 P. 2/6

PRODUCT

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD +.06 X 84.0-.06 X 1.625" WD +.06
SPECIFICATION: ASME SA192 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

VO49M133-1

PSI MIC NO. **A654**

CUSTOMER

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

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies
with SA 192 Gr. 304L
95 Edition, Addenda

By C. Wojcik Date 9-16-97

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI			
809280	✓ .031	✓ .45	✓ .032	✓ 1.72	✓ .001	✓ 11.48	✓ 18.55							N .0500

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN DHN	TENBILE LOCATION	UTS (KSI)	YIELD ST (KBI) .20X OF ST	X ELONG	X RED AREA	I_M_P_A_C_T_D_A_T_A				
										LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP
809280	662749A		+75		PROLONG	74.5	36.5	64.0	79.0					
809280	662749B													
809280	662749C													
809280	662749D													
809280	662750A													
809280	662750B													
809280	662750C													
809280	662750D													
809280	662751B													
809280	662751C													
809280	662751D													

← A654

STANDARD STEEL M. LABE
NOV. 19. 1997 11:01AM

METALLURGICAL CERTIFICATION PAGE 2



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

PCS SHIPPED: 11
03 OUR ORDER NO 532691603
SHIPLIST NO: 56374

Mich A654
PG-2

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

HGR. LABORATORIES

P.3/6

NO.103

STANDARD STEEL M. LAB

NOV. 19. 1997 11:01AM

Weld Wire
C of A'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...

70065-R/77410500

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 *S 713906*



C	Si	Mn	P	S	Cr	Ni
.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

(66157)(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

Make Quality happen

TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: 70065-R/774101500
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
Material 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. Hottle, 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. Kottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan
 15(66119)(10)

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

56 lbs

X7K8115-02

KOBELCO

04/09/1997 15:57

7139746424

KOBELCO

PAGE 14

INSPECTION CERTIFICATE
 FLUX CORED WIRE

CERTIFICATE NO.: A 017

DATE OF ISSUE : 1997.01.28

PURCHASER
 PO 70040 R/774101500
 PROCESS SYSTEMS

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:FN		UNIT:FN
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	59.6 kgf/mm ²	52 %	- °C	- J	
					- kgf.cm	

WELDING CONDITIONS

TYPE OF CURRENT	DCRP	SHIELDING GAS	CO2	POSTWELD HEAT TREATMENT	FS = FERRITE (SCHARPFLE 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 HEREIN 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

CERTIFICATE NO.: 1 002

FLUX CORED WIRE

DATE OF ISSUE : 1997.01.07

TRADE DESIGNATION	DIMENSION (mm)	HPG. NO.	PSI OC CW	APPLICABLE SPECIFICATION AND CLASSIFICATION	
DW-309L	0.9	B6M1015		AWS A5.22 E309LT-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	FS	UNIT:PH
DEPOSITED METAL	0.028	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														

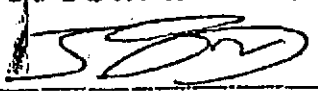
TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL		HARDNESS TEST	
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		VICKERS HARDNESS (AVG.)
- N/mm ²	- N/mm ²	540 N/mm ²	40 %	- °C	AVG.		
- kgf/mm ²	- kgf/mm ²	55.1 kgf/mm ²			- J		
					-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

WELDING CONDITIONS				POSTWELD HEAT TREATMENT	
TYPE OF CURRENT	DCEP	SHIELDING GAS	CO2	FS = FERRITE (SCHAEFFLER DIAGRAM) PH = PERRITE (DELONG DIAGRAM) PHW = PERRITE (VRC)	
AMPERAGE	110	A		- Cx -	
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



2008/19
 (株) 神戸製鋼所
 神戸製鋼所
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 0571010418

04/09/1997 15:57 7139748424 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



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
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			

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

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 ✓

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+:		@ -20°F. (ft.-lbs.) 117	
Tantalum:		@ -29°C. (Joules) 159	
Molybdenum: .01	(.30 Max.)	(Specification Requirements)	
Tungsten:		Minimum Unless	
Copper: .01	(.35 Max.)	Otherwise Stated	As Welded MPa
Titanium:		Yield Strength (Psi) 58,000	400
Phosphorus: .013	(.03 Max.)	Tensile Strength (Psi) 70-90,000	480-620
Sulphur: .010	(.03 Max.)	Elongation (2"), % 22.0	22
Vanadium: .02	(.08 Max.)	Red. of Area, %	
Hydrogen: 4.2 ml/100 gr. of weld metal		Charpy V-Notch Impacts	
Filletts: Vertical-Up/Overhead		@ -20°F. (ft.-lbs.) 20	
Shielding Gas: 75% AR/ 25% CO ₂		@ -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
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

We make Quality happen

SOLD TO: *PROCESS SYSTEMS*

SHIP TO:

AIRCO-NEW ENGLAND
HINGHAM MA

CUSTOMER PURCHASE ORDER NO.: *70029R/774181500*

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. Bettle, 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

X/11

KOBE

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			PSI OC CW	APPLICABLE SPECIFICATION AND CLASSIFICATION								
DW-309L	1.2	B6F2110382				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	555 N/mm ²		37 %			AVG.	—						
— MPa	— MPa	555 MPa				— °C	— 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. 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)

90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 170031R/774101500

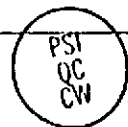
6-13-97

X/11

KOB

PURCHASER <i>Process Systems Int'l</i>	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
0W-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	
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH		ELONGATION	TEST TEMP.	ABSORBED ENERGY		HARDNESS
						AVG.		
N/mm ²	N/mm ²	555	N/mm ²	37 %	- °C	- J		
KPa	KPa	555	KPa			- 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. 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 # : 72600

Order # : 306626-00

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

Order Date: 04/28/97

Page : 001 OF 00

NAME : PROCESS SYSTEMS TBR: 142 SHIP VIA: COST PICKUP -ROPE- INITIALS: NEN
PG # : 700248 JUNE/74-1915 SLS: 0 SHIP LOC: 03 UPS: 0 ORG TYPE: CARG-UP
WLT : BNC: 16 COL/PKP : PROCESS TIME : 28-APR-97 12:00
PHONE# : 508-898-0255 ROUTE # :

QTY UNIT NR DESCRIPTION LWB (LBS) (LBS) LDC QTY WGT RIF WT UNIT EXTS
SHIP HAZARD CLASS MU NUMBER ORDER BRUSH LDC SHOWN AMT

Table with 2 rows of material data: 120 LB 5183 3/32X36 ALUMINUM, 120 LB 5183 1/8X36 ALUM.

***** 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 [Signature]

Handwritten number 16

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) 941-9154 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:

James L. Swanson (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

PSI
QC
CW

*Tony took
1 box of 10,
to TIF source
ab.
4/29/97*

Chemical Composition Limits

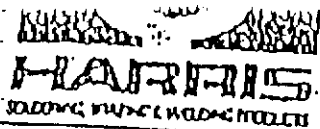
Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

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 CONEC legislation.

Additional Order Requirements:

James L. Swann



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

J. W. Harris Co.
Certificate of Conformity

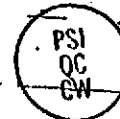
Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
POB

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 A510-80 ASME SFA 5.10		OO-R-566U r. Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elem Each
	ER1100	R1100										
1100 Aluminum (F)	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	0.05					0.05
4043 Aluminum	ER4043	R4043	4043	4.5-5.0	0.0	0.20	0.05	0.02				0.05
718 Aluminum	ER718	R718	718	11.0-13.0	0.0	0.30	0.15	0.05				0.05
5103 Aluminum	ER5103	R5103	5103	.40	0.40	0.10	0.50-1.0	0.10				0.05
5356 Aluminum	ER5356	R5356	5356	0.25	0.40	0.10		4.3-5.2	0.05-0.25			0.05
5854 Aluminum	ER5854	R5854	5854		0.40	0.10		4.5-5.3	0.05-0.25			0.05
5083 Aluminum	ER5083	R5083	5083		0.40	0.10		0.05-0.25				0.05
5052 Aluminum	ER5052	R5052	5052		0.40	0.10		0.05-0.25				0.05

NOTES:

1. Silicon plus iron are maximum percentages.
2. Cadmium shall not exceed 0.0020 percent.
- A. Strontium plus barium shall not exceed 0.25 percent.
- B. Vanadium content is the difference between 0.010 percent or more each, expressed as the difference between 0.010 percent and 0.005 percent.
- C. Vanadium content shall be 0.05-0.15 percent. Calcium 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.



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:

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



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

Ulf H. Berg, Director, Quality and Metallurgy
Daniel Dawiani, Quality Engineer

Daniel Dawiani
6119(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)



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)

C

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) SHIP TO: AIRCO-NEW ENGLAND
LISLE IL 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:

ANSI 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

Daniel Damiani
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



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
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 E. Berg, Director, Quality and Metallurgy

5(66119)(10)

BOC GASES
1000 WASHINGTON ROAD
BINGHAM 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: 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:

ANS 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 99002-1994.

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

[Signature]
15(661)(9)(10)



RESEARCH ROAD
HINGHAM, MA 02043

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
Ba	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

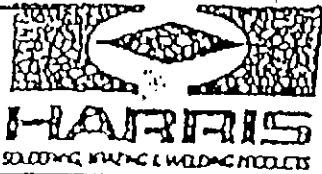
AlcoTec Wire Company hereby certifies that the material covered by this report has been inspected in accordance with and been found to meet the applicable requirements of specification AWS A5.10-92 and any order requirements listed below.

All Packaging materials are in compliance with CONEC legislation.

Additional Order Requirements:

[Signature]
Control

[Signature]
Certifying Signature



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
WEST BORO MA.

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

P.O. No.

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

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	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	5.8-6.8	0.20-0.40			0.10		0.05		
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.02		0.10	0.10-0.20	0.05		
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.8	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	0.05-0.25	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.
- 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.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

30



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

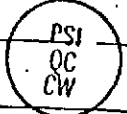
J. W. Harris Comp
Certificate of Comp

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

Shipped To: PROCESS SYSTEMS INTL
PO 700.643R/V6904.9043000

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

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

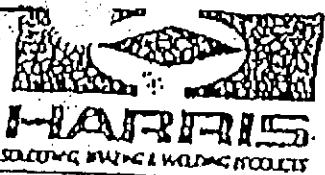


Comments: BOC 3
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AWS A.510-00 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	5.8-6.8	0.20-0.40			0.10			0.05	
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.02		0.10	0.10-0.20		0.05	
710 Aluminum	ER4047	R4047	4047	11.0-13.0	0.0	0.30	0.15	0.05		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:
- 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



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
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	AWS A510-00 ASME SFA 5.10		QQ-R-566D r. Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements Each
	ER	R	1100									
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 with applicable purchase orders.

FROM: AIRCO/BOC GASES HINGHAM TO: 5035705930 1996-10-31 04:01 #926 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 49866 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. Johnson

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
Re	---	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. Dawson

V.P. - Quality Control



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

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 E. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
RESEARCH AND
HINGHAM, MA 02043

36

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.: *700650-R/15904904500*

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: *18LB*

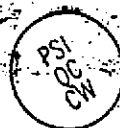
WORK ORDER/LOT NO.:

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.

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

[Signature]
15(861197)(10)

3

BOC GASES
RESEARCH ROAD
BINGHAM, MA 02043

[Handwritten mark]



SOLDING, WELDING & WELDING PROJECTS

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
PO#

Shipped To: *Process Systems Intl*
PO 70015R/7741000

Date Shipped *3-28-97*

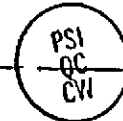
Order No. *797282*

P.O. No.

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 Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements Each
	1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05			0.10	
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.
- Yttrium 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 below 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.

We certify that the items and/or materials listed above are in accordance applicable purchase specifications having passed our actions as not

37

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 SPA 8.10/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.

Robin M. Lee
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/CP
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
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 H. Berg, Director, Quality and Metallurgy

15(66119)(10)

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

4



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.

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
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)

AlcoTec

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) 841-4111 Phone
(616) 841-6154 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	

PSI
QC
CW

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:



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

TO

LAM 3

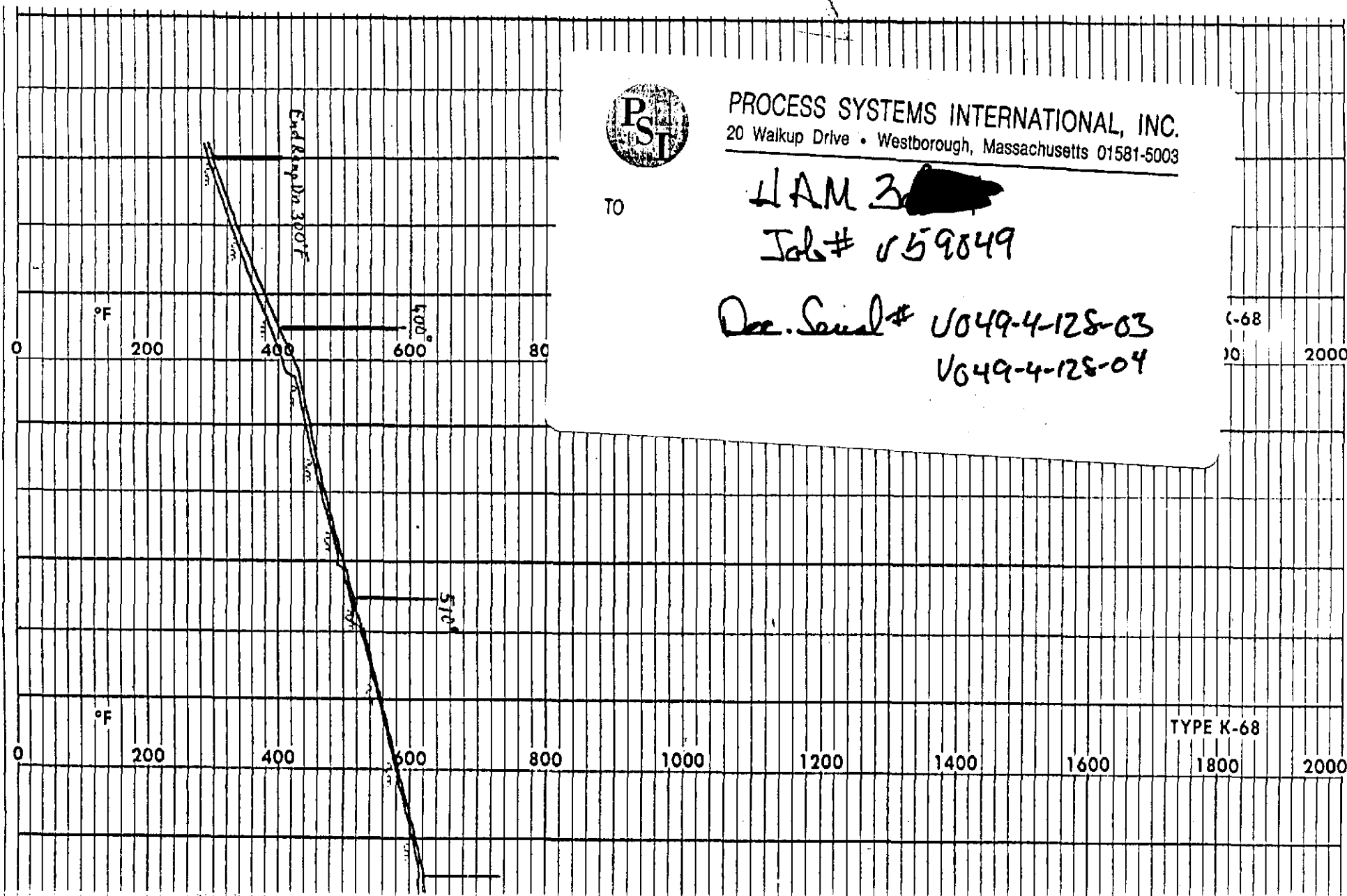
Job# 059049

Doc. Serial# 0049-4-128-03

0649-4-128-04

C-68

10 2000



WHAM 2 Ser#03

HAM # 3

Title

SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET

Project V59049

Component

Serial Number

HAM

#3

4/17/97-2⁰⁰PM

84" DOORS

V0494 723 18
V0494 127 15

60" Test Doors

Wash Cycle: FULL Cycle-MANUAL

Flowrates: 30 GPM Max. Temp.: 146 Duration: 2.5 HRS

Operator: BRUCE / JOSEPH

Date: 4-17-97

Comments: HAM VESSEL WAS 100% PASSIVATED (INSIDE)
on 4/16/97.

Component(s) Inspected By: JF

Date: 4/17/97

Quality Assurance: Coreneal

Date: 4-22-97

Comments: _____

Number
Rev.

SPECIFICATION

Number A V049-2-015 Rev. 2

LIGO DATA SHEET
MANUAL WASH STATION

PART DESCRIPTION: H Am SN: 3 WORK ORDER: 213
 DATE/TIME: 4/17
 OPERATOR: Joseph Bailey

REMOVE ALL TIE-RODS:

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 = 150 MIN

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

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

DRY TIME = 240 MIN

NOTES: _____

H Am 3

Number
AV049-2-184
 Rev.
Q

Title: COMPONENT RGA TEST PROCEDURE

TITLE	BAKE OUT TEMPERATURE LOG
DATE: 7/11/97	
TIME:	
TEST I.D.: e.g. WBSCI_1	WHAM2-2
PSI TEST ENGINEER:	J. Flinn
QUALITY ASSURANCE:	

BAKEOUT LOG / DATE	TIME		TEMPERATURE	
7/8/97	0900	hr:min		°C
7/9/97	0700	hr:min	150°C	°C
7/9/97	2000	hr:min	75-95	°C
7/10/97	0730	hr:min	45-65	°C
7/10/97	1240	hr:min	40-50	°C
7/10/97	1530	hr:min	33-48	°C
7/10/97	1615	hr:min	AMB	°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

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	WHAM2-2
PSI TEST ENGINEER:	J.P.Linn
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	

all setpoints checked prior to scanning

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	WHAM2-2	
PSI TEST ENGINEER:	J. Flinn	
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

all setpoints verified

SPECIFICATION

Number: V049-2-127

Rev. 1

A

Title: COMPONENT RGA TEST PROCEDURE

TITLE	OUTGASSING RATES REPORT SHEET
DATE:	
TIME:	
TESTID.: e.g. WBSC1_1	WHAM2-2
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 2.452 x 10 ⁵
H2	1.43 x 10 ⁻⁸	4.8 x 10 ⁻⁹		2.53 x 10 ⁻⁸	436.4	6.24 x 10 ⁻⁶	2.5 x 10 ⁻¹¹
12	8.52 x 10 ⁻¹²		0.42				
14	1.41 x 10 ⁻¹¹		0.5				
15			0.54				
CH4	1.80 x 10 ⁻¹¹		0.57		1265.6	2.28 x 10 ⁻⁸	9.3 x 10 ⁻¹⁴
17			0.6				
H2O	2.25 x 10 ⁻¹⁰		0.64		1339.7	1.67 x 10 ⁻⁷	6.8 x 10 ⁻¹³
19			0.67				
26			0.71				
28	1.51 x 10 ⁻¹⁰	9.5 x 10 ⁻¹¹		7.17 x 10 ⁻¹⁰	1678.4	2.5 x 10 ⁻⁷	1 x 10 ⁻¹²
32			1.14				
38			1.36				
40	1.28 x 10 ⁻¹²	9.4 x 10 ⁻⁹		4.85 x 10 ⁻¹¹	1990.7	2.55 x 10 ⁻⁹	1.04 x 10 ⁻¹⁴
43			1.53				
44	2.06 x 10 ⁻⁸		1.57		2102.1	4.33 x 10 ⁻⁸	1.77 x 10 ⁻¹³
129	1.51 x 10 ⁻¹³	2.5 x 10 ⁻⁸		4.82 x 10 ⁻¹²	5354.5		
131	1.56 x 10 ⁻¹³	2.0 x 10 ⁻⁸		3.81 x 10 ⁻¹²	5464.5		
132	1.44 x 10 ⁻¹³	2.5 x 10 ⁻⁸		4.5 x 10 ⁻¹²	5739.2		
134	1.53 x 10 ⁻¹³	1.0 x 10 ⁻⁸		1.94 x 10 ⁻¹²	5596.0		

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

WHAM 2-2

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
24	1.36 × 10 ⁻¹²						
25	2.33 × 10 ⁻¹²						
26	6.39 × 10 ⁻¹²	33.51 × 10 ⁻¹²					
27	7.12 × 10 ⁻¹²						
29	5.6 × 10 ⁻¹²						
30	9.0 × 10 ⁻¹³						
31	5.8 × 10 ⁻¹³						
39	3.61 × 10 ⁻¹²						
41	3.63 × 10 ⁻¹²						
42	2.16 × 10 ⁻¹²						
43	1.31 × 10 ⁻¹²						
55	7.37 × 10 ⁻¹³						
56	5.6 × 10 ⁻¹³						
57	2.91 × 10 ⁻¹³						
67	3.6 × 10 ⁻¹³						
69	2.95 × 10 ⁻¹³	48.2 × 10 ⁻¹³					
71	1.8 × 10 ⁻¹³						
78	6.47 × 10 ⁻¹³						
91	2.94 × 10 ⁻¹³						

TOTAL 3.833 × 10⁻¹¹

1678.4

6.43 × 10⁻⁸

2.6 × 10⁻¹³

SPECIFICATION

Number: V049-2-127

A

Rev. 1

Title: COMPONENT RGA TEST PROCEDURE

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

TITLE	RGA COMPUTER DATA FILE LOG
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	

BARGRAPH DATA FILE NAME

ANALOG SCAN DATA FILE NAME

OTHER DATA FILES

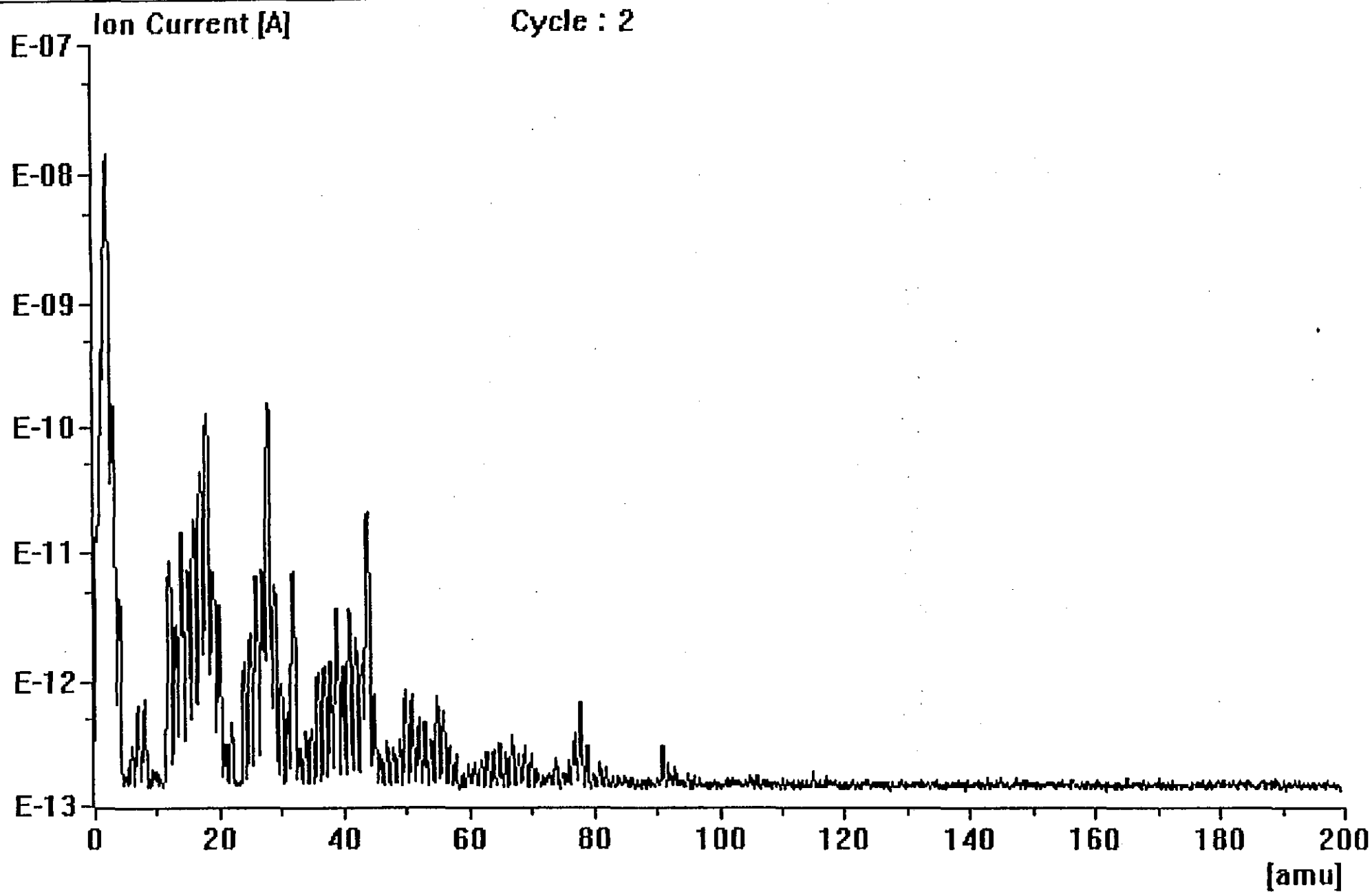
PRINTOUT OF

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

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



File Display Setup Function Special Info



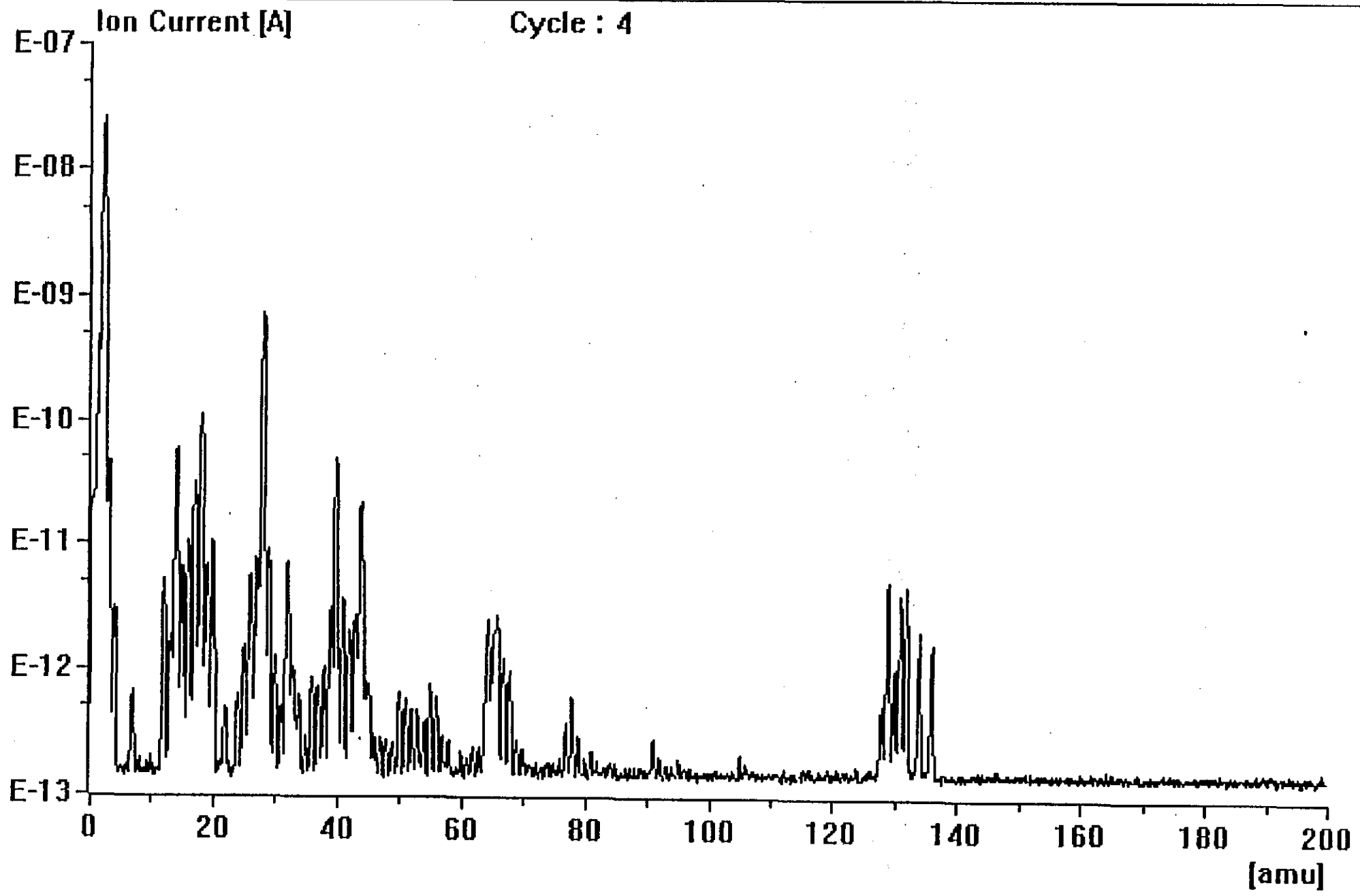
X: 97.38

Y: 2.682696E-10

C: 2



File Display Setup Function Special Info



Process Systems International, Inc.
DISCREPANCY REPORT

ROUTE TO Senecal/Bagley

D.R. NUMBER
4841

JOB NUMBER <u>159049</u>	P.O. NO.	VENDOR <u>PSI Shop (HYSAN Bellows)</u>	SHEET 1 OF
CT <u>LIGO</u>	ORIGINATOR <u>Senecal</u>	DATE <u>5-26-97</u>	REFER TO O.R. NUMBER

I T E M	DWG. ZONE	DISCREPANCIES (LIST CHARACTERISTICS, SPECIFICATIONS AND ACTUAL)	NO. ACC.	FOR REVIEW	QTY. OF PCS./DISPOSITION					REMARKS
					USE NO. CHGE	USE DWG. CHGE	RWK IN SHOP	RET. TO SUP.	SCRAP	
1		<u>Bellows on HAM Ser #3 WHAM #2 has 2 areas on Bellows Convolution that were touched by a grinding wheel causing one area to become .034" thk vs bellows nominal of .0387" the other area measures .0370"</u>	1				1			

DISPOSITION ---

1) REVIEW BY RAY CIATTO
 REPAIR BY POLISHING WITH FINE EMERY CLOTH TO
 SMOOTH AFFECTED AREA.
 JUSTIFICATION: DESIGN THICKNESS IS .036 IN. ∴ THICKNESS
 AT AFFECTED AREA IS 5.5% BELOW DESIGN. STRESSES ARE
 LOW; STRUCTURAL INTEGRITY IS NOT IMPAIRED. SMOOTHING
 WILL ELIMINATE SMALL STRESS RISERS. Cl. D. Pinto 6/2/97

DISPOSITION CONCURRENCE

PROJECT MGR. <u>W. Bagley</u>	DATE <u>6/9/97</u>	MFG. ENG. <u>Phillip [unclear]</u>	DATE <u>6/9/97</u>	QUALITY ASSURANCE <u>Senecal</u>	DATE <u>6-9-97</u>
----------------------------------	-----------------------	---------------------------------------	-----------------------	-------------------------------------	-----------------------

REINSPECTION Area was reworked to reduce stress riser.

SIGNATURE Senecal DATE 6-9-97

CRECTIVE ACTION --- Review work Procedures with HAM Assembly crew on the road
 to call attention when working with bellows.

SIGNATURE Senecal DATE 6-9-97

RANOR, INC

NONCONFORMANCE REPORT

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

JOB NUMBER 7400 ¹ / _m		CUSTOMER P.S.I.	PURCHASE ORDER NUMBER 556008	QUANTITY 2
PART DESCRIPTION H.A.M. Main Assy.			DOCUMENT NUMBER AND REVISION A V049-2-046 Rev. 0	SERIAL NUMBER Pc. #314

NCR NUMBER NCR- 1032	PAGE 1 OF 1 SKETCH ATTACHED <input type="checkbox"/>
-------------------------	---

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; Ramp Up @ 100°F/hr. max. starting at 350°F	1. Ramp Up @ 125°/hr. from 435° to 560°F Ramp Dn @ 110°/hr. from 510° to 400°F Ramp Dn @ 100°/35 minutes 400° to 300°F

REMARKS:

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

ORIGINATOR/INSPECTOR: Steve 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 Heat Treat

TECHNICAL JUSTIFICATION/DESCRIPTION OF DISPOSITION

ITEM	TECHNICAL JUSTIFICATION	DESCRIPTION OF DISPOSITION
	Submit to PSI for Justification and Written Disposition. <u>Steve Bell</u> 3.27.97	REF. NCR 1029 USE AS IS A.D. <u>Greiner</u> 4/14/97 GS 4.17.97

TECHNICAL JUSTIFICATION:

DISPOSITION:

BY _____ DATE: _____ BY R. Bailey 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: _____

APPROVAL OF DISPOSITION: VP-ENGINEERING QA MANAGER ANI	DATE DATE DATE	VERIFICATION OF DISPOSITION: ACCEPTED BY QA MANAGER ANI	DATE DATE DATE
---	----------------------	--	----------------------

RANOR, INC

NONCONFORMANCE REPORT

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

NCR NUMBER NCR- 1029	PAGE 1 OF 1 SKETCH ATTACHED <input type="checkbox"/>
--------------------------------	---

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: ASME SECTION III SAFETY RELATED ASME SECTION VIII MIL SPEC 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: *Ken Bluh* 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 Heat Treat

TECHNICAL JUSTIFICATION/DESCRIPTION OF DISPOSITION

ITEM	TECHNICAL JUSTIFICATION	DESCRIPTION OF DISPOSITION
	Submit to PSI for Justification and Written Disposition. <u><i>Ken Bluh</i></u> 3-27-97	NO MAJL PROBLEMS PER DISCUSSION W/ METALLURGIST. USE AS IS. <u><i>R. D. Galt</i></u> 4/16/97 GS 4-17-97

TECHNICAL JUSTIFICATION:

DISPOSITION:

BY _____

DATE: _____

BY *R. Bluh*

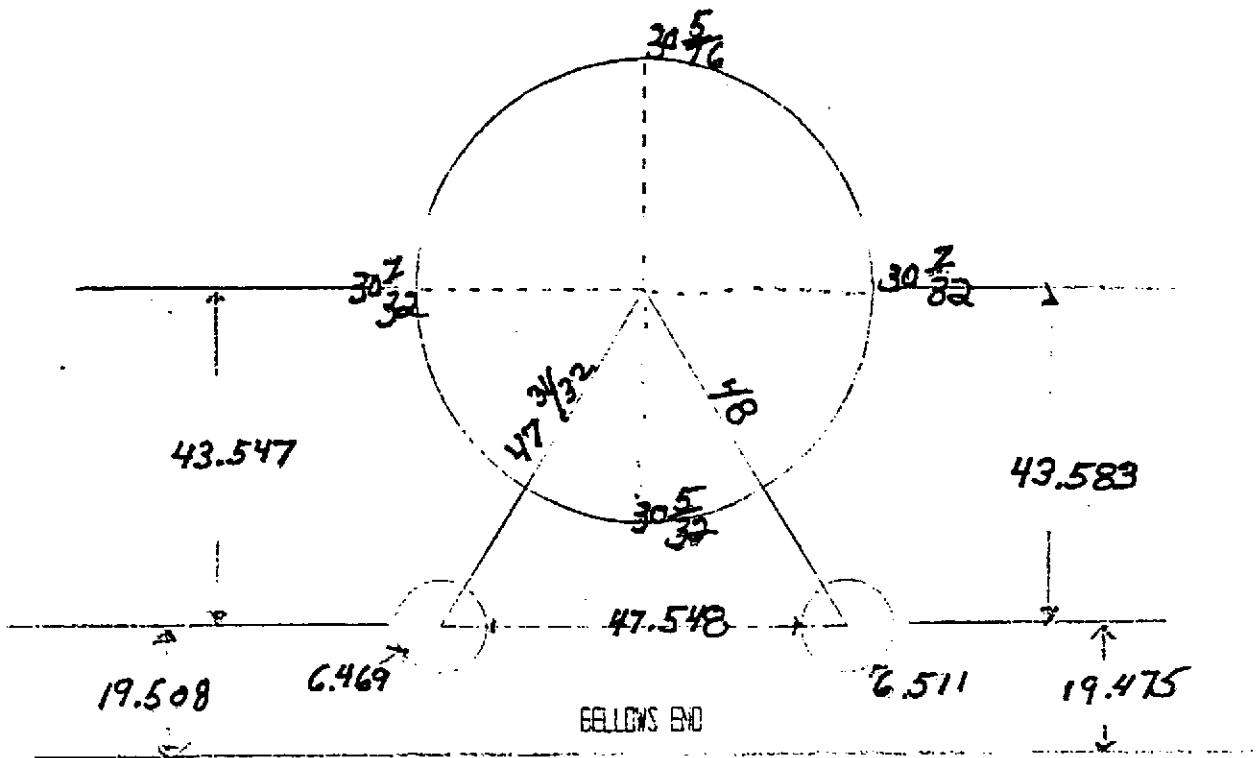
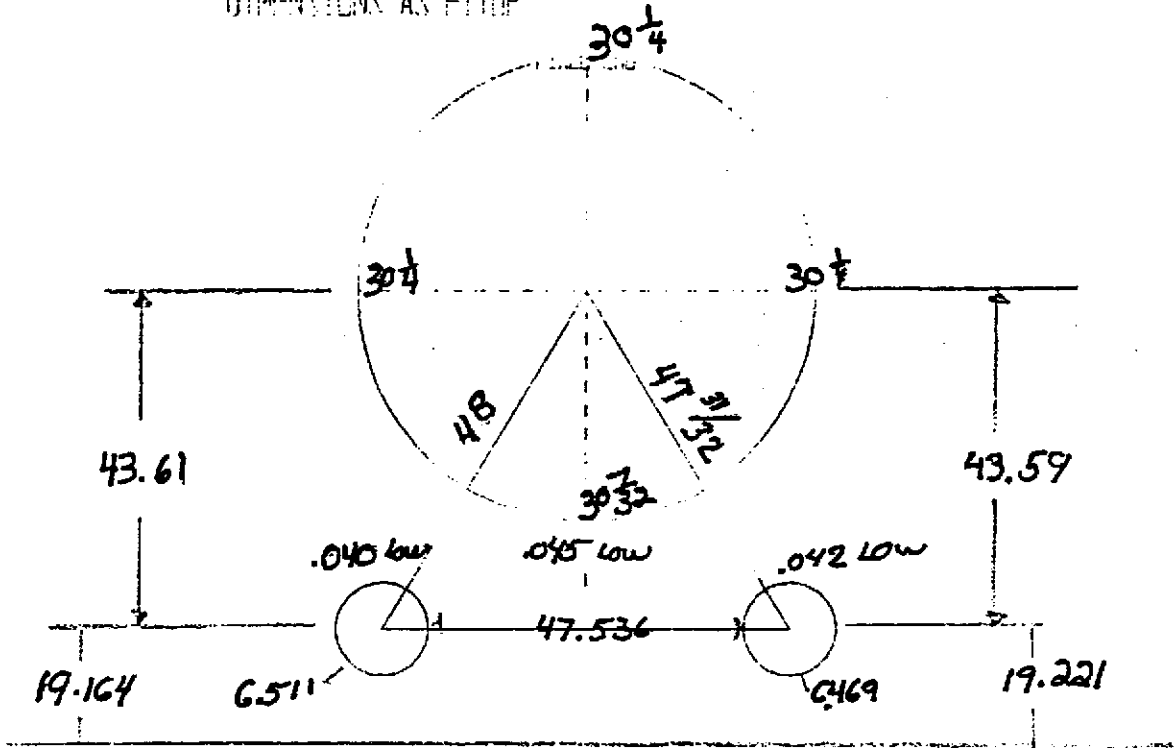
DATE: **4/17/97**

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
--	--	--

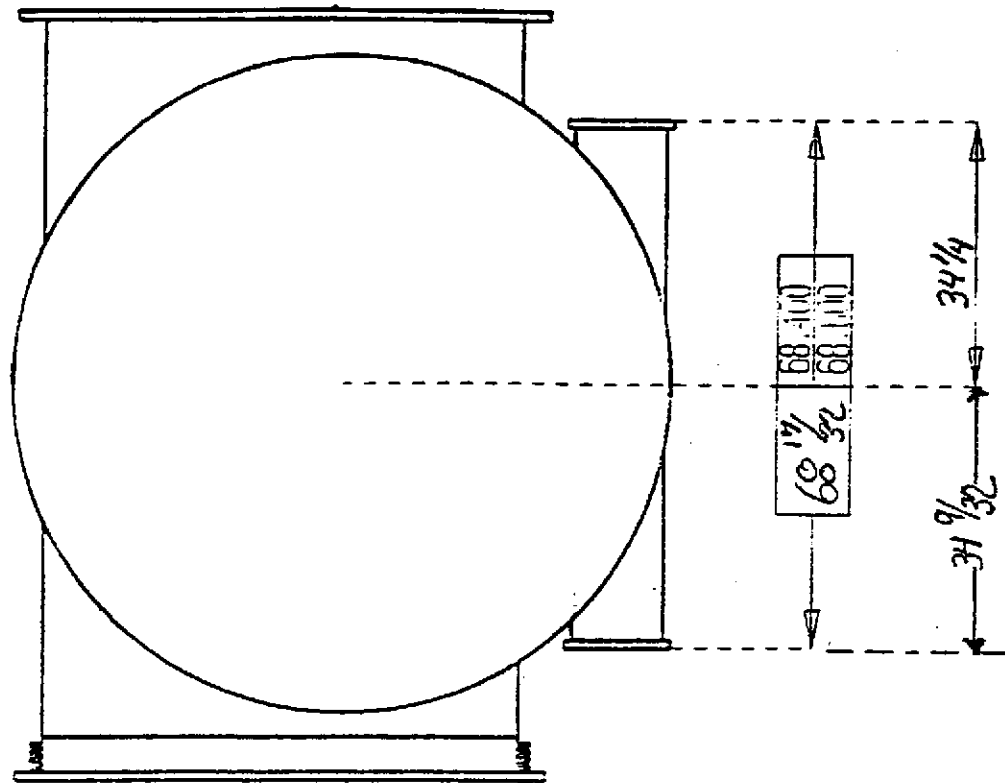
APPROVAL OF DISPOSITION: VP-ENGINEERING _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____	VERIFICATION OF DISPOSITION: ACCEPTED BY _____ DATE _____ QA MANAGER _____ DATE _____ ANI _____ DATE _____
--	---

WELDED 2 S/N 03

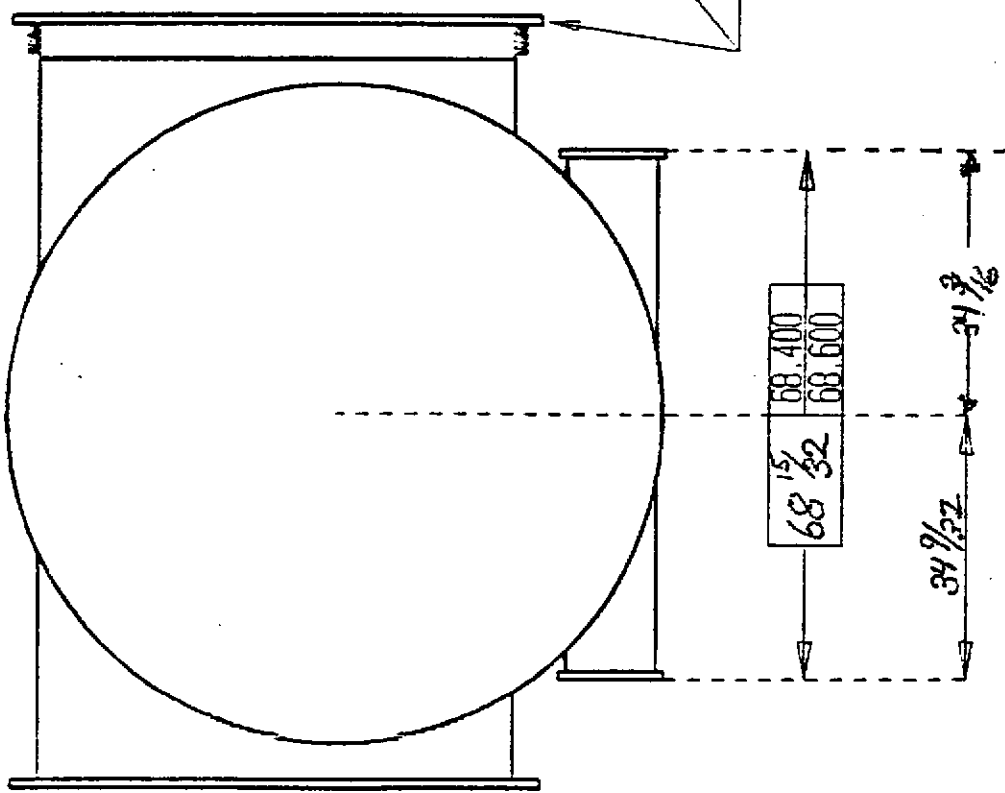
BEAM WELDMENT
 V049128
 S/N # 3
 DIMENSIONS AS FITUP



HAM WELDMENT
 V0494128
 S/N #3



BELLOWS END



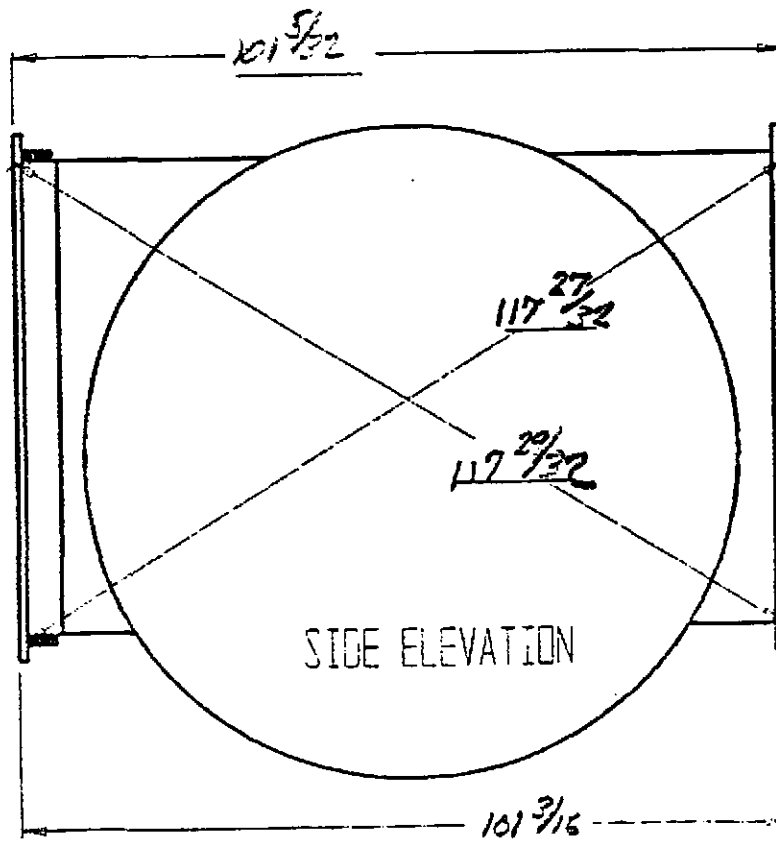
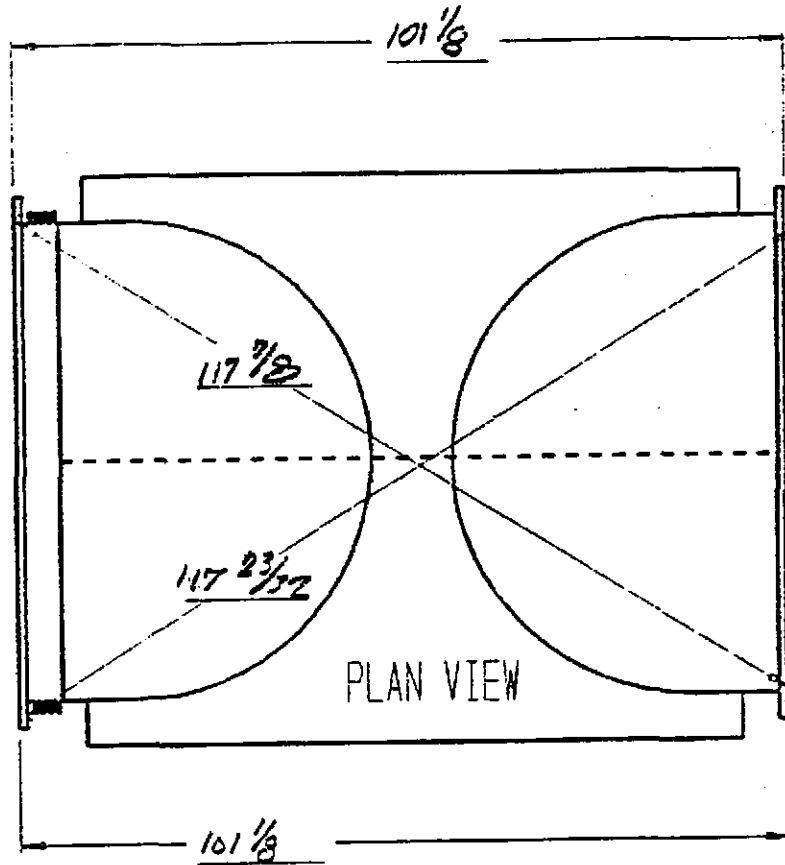
	34.348
	34.152

	34.348
	34.152

V0494034

S/N #3

AND DIAGONALS OF 50 INCH
PORTS





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-3

P/N – VO49-4-128-04

1	Quality Plan sign offs.	
2	Hyspan Metal Bellows documentation package.	
3	Material test reports for shells, heads and large flanges. (over 60") C of C for nozzles, small parts, flanges (under 60") and weld wire. C of C to Codes and Standards.	
4	Heat-treat charts. (by Ranor). When applicable.	
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. WHAN3 Ser. No. 04

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

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

CONTROLLED-COPY

OCT 24 1996

REV LTR.	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE
1	GS107596		Release Per DEO No. 0302
0	AR 7/8/96	R.B.	released per DEO 0114

PROCESS SYSTEMS INTERNATIONAL, INC.				SPECIFICATION		
INITIAL APPROVALS	PREPARED	DATE	APPROVED	DATE	Number	Rev.
	AR	4/8/96	R. B.	4/17/96	V049-2-087	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

Number

Rev.

Serial No. 26494128-03

SPECIFICATION V049-2-087

REV. 1



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

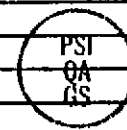
PROJECT LIGO
 ITEM HORIZONTAL Access Module (HAM)
 APPLICABLE CODE ASME Sect VIII Div. 2
 (where Applicable)

JOB NO. V59049
 DWG NO. V049-2-128
 PG 13 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 # <u>CS</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> 25/10/96			
Inspect Welding Long Seam/Lower Shell	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 10/10/96			
Verify Roundness of Shell	V-D	V049-4-128		X <u>[Signature]</u> 10/10/96			
Inspect Welding Long Seam 60" Nozzles	V	V049-4-128	V049-2-071	X <u>[Signature]</u> 10/10/96			
Verify Roundness of 60" Nozzles	V-D	V049-4-128		<u>[Signature]</u> 10/10/96			
Verify Fixtures in Shell & 60" Nozzles				<u>[Signature]</u> 10/10/96			



Serial No. V0494128-03

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
Verify Welding and Location of Saddle Support Plates and Lift Lugs	V-D	V049-4-128	V049-2-071	<u>MAR</u> <u>12/23/97</u>			
Inspect Welding of 60" Nozzles	V	V049-4-128		<u>MAR</u> <u>12/23/97</u>			
Verify Nozzle Alignment and Dimensions (ALL Nozzles)	V-D	V049-4-128		<u>MAR</u> <u>2/3/97</u>			PSI QA GS
Verify Steam Cleaning of Vessel				X <u>MAR</u> <u>2/2/97</u>			
Thermal Stress Relief Vessel		V049-2-046		X <u>GS</u> <u>7-31-97</u>			

Serial No. V0494128-03

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" Nozzle End Dimensions after Machining	I-D	V049-2-046		X <u>Mark</u> <u>11/17/97</u>							
Verify Cutout Location of the 4-Critical "E" Nozzles	I-D	V049-4-128		X <u>Mark</u> <u>11/17/97</u>							
Inspect Welding of 84" Flanges to Shell	V	V049-4-054	U049-2-071	X <u>Mark</u> <u>11/17/97</u>							
Verify Flange (84") Straightness and Flatness	V-D	V049-4-054		X <u>Mark</u> <u>11/17/97</u>							
Inspect Welding of 60" Flanges to Nozzle Neck	V	V049-4-054	U049-2-071	X <u>Mark</u> <u>11/17/97</u>							

PSI
QA
GS

Serial No. V0494128-03

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>Mark</u> 2/2/97						
Inspect Welding of Expansion Joint to 60" Nozzle	V	V049-4-054 V049-4-053	V049-2-071	X <u>Mark</u> 1/24/97						
Inspect Welding of Internal Saddle to Shell	V	V049-4-128	V049-2-071	X <u>Mark</u> 2/2/97						
Inspect Welding of ALL Non-Critical Flanges	V	V049-4-128	V049-2-071	X <u>Mark</u> 1/20/97						
Inspect Welding of Critical "E" Nozzles and Flanges (with fixtures)	V	V049-4-128	V049-2-071	X <u>Mark</u> 2/16/97						
Verify Alignment Straightness & Flatness of "E" Nozzles	V-D	V049-4-128		X <u>Mark</u> 2/2/97						

Serial No. V0494128-03

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 Installation of Bellows Tie-Rod	V	V049-4-040	V049-2-072	X <u>Mal</u> 11/4/97							
Verify Installation of Annulus Tubing	V	V049-4-054		<u>Mal</u> 2/27/97							
Verify Installation & Alignment of Support Saddles	V-D	V049-4-052 V049-4-002	V049-2-072 V049-2-071	X <u>Mal</u> 3/12/97							
Steam Clean inside Vessel Inside & Out		V049-2-015		X <u>Mal</u> 4/17/97			PSI QA GS				
Verify final cleaning at PSI	V	V049-2-015		X <u>GS</u> 4/22/97							
Verify final Backwash at PSI	V	V049-2-019		X <u>GS</u> 5-16-97							
Verify final Vbc. & He Leak Test at PSI	V	V049-2-014		X <u>GS</u> 5-16-97							
Shipment to LICA		V049-2-123		X <u>GS</u> 9-8-97							

PSI DWG # V049-8-429

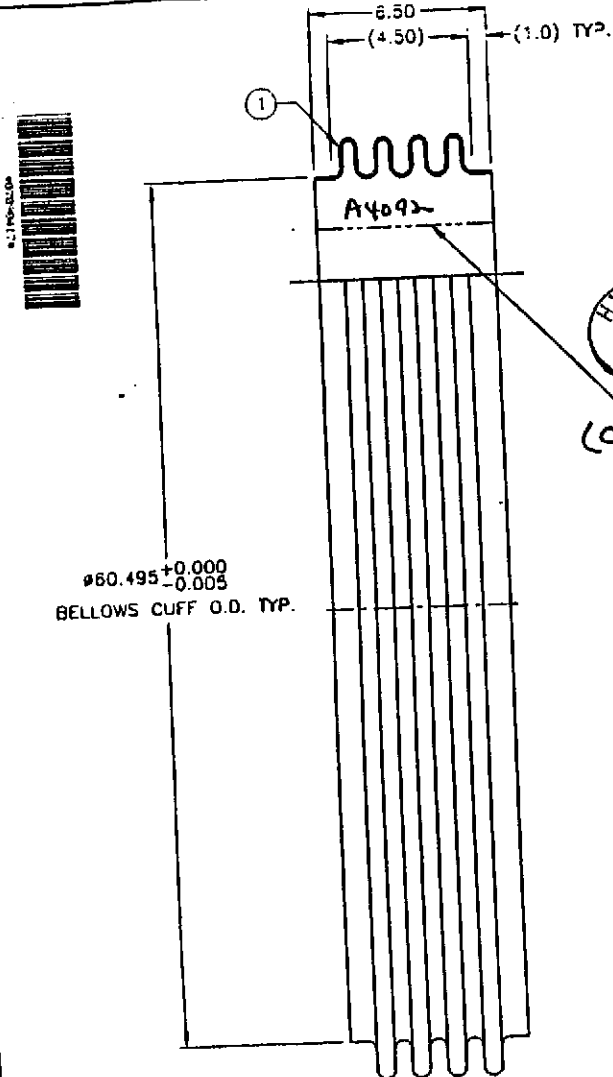
LTR	REVISION	DATE	BY
A	WAS D.W.G. NO. 632-1 TEMP. WAS 370°F REV'D NOTE 8, 11 & 14 DEL. NOTE 12 & 13 SUBMIT FOR APPL.	SEP/11/96	A.P.G.
B	REV'D PER CUST COMMENT SUBMIT FOR APPROVAL	OCT/07/96	A.P.G.

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
 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 .065, 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 1×10^{-4} 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.



HYSPAN
W
30
 WPS
 007
 (CO₂ SCRUB)

CERTIFIED BY :
 HYSAN PRECISION PRODUCTS, INC.
 HYSAN 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
 HYSAN PART NO.: 53140

② TAG DETAIL

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

- 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.~~

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		Hyspan Precision Products, Inc. 1885 Brandysville Avenue Chico Vista, California 91811	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
SCALE NONE		SHT. 1 OF 1	V049-4-053

S/N 004 V0494053 - P1 - 04



TEST CERTIFICATE
Cert. No. 175583

L. 17. Shop Sheffield S9 ITR

1 44 10114 244 3311

1 44 10114 244 8210

547025

V0 653 PI-04

EN 10204 3.18

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

Cons. Inv. No. 175/84392/05



21/05/96 Date

Customer Order No.
9102376

Specification
ASTM A240-95 304 UNS30400
Q0-8-7660 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 spectroscope examination Test Position: Front, Back Orientation: Transverse, Longitudinal El codes: 1=500, 3=5.65/50, 5=50mm, 6=80mm, 7=115mm, 8=25mm

Folio	Cast. No.	Material Description	Temp C	Coil No./ Plate No.	Proof Stress		Tensile Strength	Ei%	RAHV	Hard Test	I/C Test	Impact Test	ft. lbs. J
					0.2% PSI	1.0% Yield/Reflow							
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	14328/1	BT 45305 FT 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 SA240/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 deg C) for 30 min. except 321H 347H "NO WELD REPAIR"								

ROCKWELL TEST, 1.20, 30T, 0.36/1.20, 15T, 40.38 INTERCRYSTALLINE CORROSION TEST TO ASTM A262 (1993) PRACTICE E SATISFACTORY

Avesta Sheffield Ltd
LHOA 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				.039	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.)

VINCENT METAL GOODS
SANTA FE SPRINGS
CUSTOMER: H. H. S. P. A.
CUSTOMER: 602506
Date: 25-05-95

MASS SPECTROMETER TEST REPORT


Fig.-1

V0494053-p1-04

CUSTOMER: Process Systems International, Inc.				
Sales Order No.: 70904 Item: <u>17</u>		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
<u>004</u>	<u>1x10⁻⁹</u>	<u>1430</u>	<u>12-4-96</u>	<u>[Signature]</u>

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
<u>A4092</u>	<u>N/A</u>	<u>N/A</u>

Inspector: [Signature]  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: 11/10/97

CONTRACT ORDER NUMBER: PC 175730

PSI JOB NUMBER: V59049

DRAWING NUMBER(S): V049 4 128

TAG NUMBER: WHAM 3

SERIAL NUMBER: 04

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 11-10-97
Gene Senecal
Quality Assurance Engineer

Material Tracer Record

Part Number WHAM 3 S/N 04

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 3 S/N 04

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 3 S/N 04

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 660 A 658
35	1 EA	V0494031	60-1/2 I.D. FLANGE GROOVED WITH SLOTS (HAM)	A 753
36	1 EA	V0494032	60-1/2 I.D. FLANGE FLAT FACED (HAM)	A 831
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
40	1 EA	V0494128	HAM SHELL WELDMENT	A 518
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 WHAM3 S/N 04

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 591 A 973
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 663 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
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 518
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 712
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 3 S/N 04

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

Burnham, PA 17009
Tel: 717-248-4911

METALLURGICAL CERTIFICATION

PAGE 1



STANDARD STEEL

QP090-F1
A Division of FREDERICK FORD Corporation

FOR: PROCESS SYS INT MA

CUSTOMER ORDER NUMBER 555492

REPORT DATE: 10/10/96

PCS SHIPPED: 3

02 OUR ORDER NO 432620502

SHIPLIST NO: 57865

PSI MIC NO. A861

RING MACHINE 250/300 MICRO TO SIZES SHOWN: 68.50" OD +.06 X 60.0" ID -.06 X 1.250" WD
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

V049M243-1

PRODUCT CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L., INC.

Reviewed this report and it complies

with SA/SP-182 Gr. 304L
95 Edition, Addenda

By C. Veteck Date 10-24-96

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	TEN	TENSILE	UTS	YIELD ST	X ELONG	XRED AREA	I_M_P_A_C_T_D_A_T_A					
			(F)	BHN	LOCATION	(KSI)	.20XOFST			TEMP	FT.	X	LAT	GRN	
										LOCATION	(F)	LBS	SHR	EXP	SIZE
509280	662745C		+75		PROLONG	74.5	36.5	64.0	79.0						
509280	662745E														
509280	662747E														

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

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

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

PRODUCT

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD x .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

VD49H136-1

PSI MIC NO. A663

CUSTOMER

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

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

CHEMICAL ANALYSIS

WT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
W09279	.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)	.20% OFST	% ELONG	% RED AREA	I_M_P_A_C_T_D_A_T_A				
											LOCATION	TEMP (F)	FT. LBS	% SHR	LAT EXP
W09279	662856A		+75		PROLONG	74.5	37.0		61.0	81.0					
W09279	662856B														
W09279	662856C	663													
W09279	662856D														
W09279	662857A														
W09279	662857B														
W09279	662857C														
W09279	662857D														

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED



TEST CERTIFICATE

CUSTOMER P.O.: F74104
DESCRIPTION:

PAGE NO. 01 OF 01
FILE NO: 8860-01-0
DATE: 07/26/96
MILL ORDER NO: 22195-002

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

SOLD TO:
TRINITY INDUSTRIES, INC.
P.O. BOX 41192
CINCINNATI OH 45241

ORDER:
TRINITY INDUSTRIES, INC.
P.O. BOX 41192
ATTN: JAMES WITHROW
CINCINNATI OH 45241

SHIP TO:
TRINITY INDUSTRIES-CUSTY PICKUP
P.O. BOX 41192
PSI MIC NO. A973
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 A167-93-304L, Q95-7550 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				.0840			
		.025	1.79	.025	.005	.23	.55	8.31	18.03	.39				.0790			

TENSILES				CHARPY V IMPACTS				OTHER TESTS PERFORMED				
TYPE	YLD (PSI)	TENS (K 100)	% ELONG	% RA	TYPE	TEMP	MILS LATERAL EXPANSION	% SHEAR	BEND TEST - LOC/DIR BX - PASS			
BX	510	865	68.0	62.0					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
By G. Wozicki Date 11/15/26

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. 2-12121
D/L 037215 CUSTOMER'S TRUCK
SIZE = .3750" NOM X 96.0000" NOM X 192.0000" ACT X WGT. = 1984

HEAT TREAT CYCLES - MATL OR TESTS - DEG							FAI
MATL	TEST	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS.	COOL METHOD	TI
X	X	1950			0012	WQ	

HEAT TREAT CYCLES TESTS ONLY						DEG	FAI
START END TEMP	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS.	HEAT RATE MAX		C R L

WE HEREBY CERTIFY THE ABOVE INFORMATION IS CORRECT:
FORM NO 221TW (1993) Quality Assurance Laboratory Coatesville, PA 19320

2-12-20

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 Represent

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

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

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

MATERIAL WAS NOT WELDED

Memo No: 113167-00

Our Order no: DP63493
Your Order No: 0001
Date: 04/12/94
DUAL CERT

JES80P T 304L STAINLESS HRAP
ASTM A240-94a; ASME SA-240-A93; AMS 5511F;
(WAIVE CLM);

Heat 770796 Slip 54804 A Lot No Size .3750 x 98.0000 x 235.0000 Pcs 1 Weight 2584 From slip 13021 GV STC

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

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

MATERIAL WAS NOT WELDED

Memo No: 115191-00

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

Our Order no: LU4333
Your Order No: 7024
Date: 05/21/94
DUAL CERT

JES80P T 304L STAINLESS HRAP
ASTM A240-94a; ASME SA-240-A93;

By C. Wafariki Date 9-12-96

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

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

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

Jurnham, PA 17009
Tel: 717-248-4911



STANDARD STEEL

A Division of FREEDOM FORGE Corporation

METALLURGICAL CERTIFICATION

PAGE

FOR: PROCESS SYS INT NA

PCS SHIPPED: 4

CUSTOMER ORDER NUMBER 555492

04 OUR ORDER NO 532691604

REPORT DATE: 11/01/96

SHIPLIST NO: 56708

PSI MIC NO. A929

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

U049M136-1

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 P. Worecki 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 TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	%		I_M_P_A_C_T_ D_A_T_A							
								.20XOFST	ELONG	XRED AREA	LOCATION	TEMP (F)	FT. LBS	% SHR	LAT EXP	GRN SIZE	
9279	611227A		475		PROLONG	74.5	37.0	61.0	81.0								
9279	611227B																
9279	611227C																
9279	611227D																

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED



Tel: 717-248-4811

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA

CUSTOMER ORDER NUMBER 555492

REPORT DATE: 09/13/96

PCS SHIPPED: 30

04 OUR ORDER NO 432620501

SHIPLIST NO: 56855

PSI MIC NO. A753

IT-5

PRODUCT

RING MACHINE 250/500 MICRO TO SIZES SHOWN: 68.5" OD +.06 X 30.0" ID -.04 X 1.625" WT ...
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6
(*) +.06

VO49M135-1

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															
S09280	.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)	% ELONG	XRED AREA	I_M_P_A_C_T_D_A_T_A					
										LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
S09279	6G2844A		+75		PROLONG	74.5	37.0	61.0	81.0						
S09279	6G2844B														
S09279	6G2844C														
S09279	6G2844D														
S09279	6G2844E														
S09279	6G2845A														
S09279	6G2845B														
S09279	6G2845C														
S09279	6G2845D														
S09279	6G2845E														

PROCESS SYSTEMS INT'L., INC.
Reviewed this report and it complies with ASME 182 Gr. 304L
96 Edition Addenda
By C. Wotolicki Date 10-1-96

← A753 IT-5



717-248-1911

STANDARD STEEL

A Division of FRIEDRICH WURGLER Corporation

MECHANICAL CERTIFICATION

PAGE 2

FOR: PROCESS SYS INT MA

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)	.20% OF ST	% ELONG	XRED AREA	I M P A C T D A T A						
												LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE	
	509279	662846A																
	509279	662846B																
	509279	662846C																
	509279	662846D																
	509279	662846E																
	509280	662847A		+75			74.5	36.5	64.0	79.0								
	509280	662847B																
	509280	662847C																
	509280	662847D																
	509280	662847E																
	509280	662848A																
	509280	662848B																
	509280	662848C																
	509280	662848D																
	509280	662848E																
	509280	662849A																
	509280	662849B																
	509280	662849C																
	509280	662849D																
	509280	662849E																

PSI MIC NO. A753

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

By C. Watwicki 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. Kelly
HGR. LABORATORIES

P. 5/5

NO. 174

STANDARD STEEL M. LAB

11:41AM

SEP. 8. 1997



Avesta Sheffield Plate Inc.

 DT-104
 Certificate of Analysis and Tests

OUR ORDER 84645 - 07

HEAT & PIECE 39233-1B 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 39233 - 1B
 WEIGHT 3101
 FINISH 1
 GRADE 304L / 304 UNS-S30403 / UNS-S30400
 DIMENSIONS .500 X 76.250 X 270.375 EXACT

----- SPECIFICATIONS -----

 V049-2-041 REVO 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 SAISE-240 Gr. 304/304L
95 Edition, Addenda
By C. Wajcicki Date 9-3-96
 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



Avesta Sheffield East, Inc.

PSI MIC NO. A712

Certificate of Analysis and Tests

OUR ORDER 83468 - 02

HEAT & PIECE 39725-3B 8/01/96

SOLD TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE

SHIP TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE

WESTBOROUGH MA 01581

WESTBORO MA 01581
737001-01

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

5/03/96

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

HEAT & PIECE 39725 - 3B
WEIGHT 1824

FINISH 1
GRADE 304L / 304 UNS-S30403 / UNS-S30400
DIMENSIONS .500 X 62.125 X 195.188 EXACT

----- SPECIFICATIONS -----

V049-2-041 REV0 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 BALTIMORE, MD.

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 79
GRAIN SIZE 5
YIELD STRENGTH (PSI) 40700 ✓
TENSILE STRENGTH (PSI) 82600 ✓
BEND OK
INTERGRANULAR CORROSION OK
ELONGATION % IN 2" 61.0 ✓
REDUCTION OF AREA % 68.0

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

CARBON (C) .015 ✓
MANGANESE (MN) 1.48 ✓
PHOSPHORUS (P) .028 ✓
SULFUR (S) .0025 ✓
SILICON (SI) .31 ✓
CHROMIUM (CR) 18.39 ✓
NICKEL (NI) 8.67 ✓
COBALT (CO) .08 ✓
COPPER (CU) .25 ✓
MOLY (MO) .47 ✓
NITROGEN (N) .07 ✓

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with SA 98-210 Gr. 304/304L
95 Edition. Addenda
By C. Wojcicki Date 9-26-96

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.

J. BONGARDT, LAB MANAGER

Burnham, PA 18039
Tel 717-260-4811

METALLURGICAL CERTIFICATION PAGE 1



STANDARD STEEL

FOR: PROCESS SYS INT MA

PCB SHIPPED: 11

CUSTOMER ORDER NUMBER 555492

03 OUR ORDER NO 532891603

A Division of FREEDOM FORCE Distributors

REPORT DATE: 08/28/96

SHIPLIST NO: 56374

NO. 103 P. 2/8

PRODUCT

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD +.06 X 84.0-.06 X 1.625" WD +.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 6

VD49M133-1

PSI MIC NO. **A658**

CUSTOMER

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

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

By C. W. Tichler Date 9-16-97

CHEMICAL ANALYSIS

HEAT 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) .20X OF BT	X ELONG	X RED AREA	I M P A C T D A T A					
										LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
809280	602749A		+75		PROLONG	74.5	36.5	64.0	77.0						
809280	602749B	← A658													
809280	602749C														
809280	602749D														
809280	602750A														
809280	602750B														
809280	602750C														
809280	602750D														
809280	602751A														
809280	602751C														
809280	602751D														

NOV. 19. 1997 11:01AM

STANDARD STEEL M. LAB

5-27



METALLURGICAL CERTIFICATION

PAGE 2

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

PCS SHIPPED: 11
03 OUR ORDER NO 532691603
SHIPLIST NO: 56374

MIC# A658

Pg - 2

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

HGR. LABORATORIES

P.3/6

NO.103

STANDARD STEEL M.LAB

11:01AM

NOV.19.1997

1

STANDARD STEEL
A Division of UNITED STEEL CORPORATION



STANDARD STEEL

A Division of UNITED STEEL CORPORATION

METALLURGICAL CERTIFICATION

PAGE 1

FOR: PROCESS SYS INT MA

PCB SHIPPED: 11

CUSTOMER ORDER NUMBER 555492

03 OUR ORDER NO 532891603

REPORT DATE: 08/28/96

SHIPLIST NO: 56374

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 92.25" OD +.06 X 84.0-.06 X 1.625" WD +.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 2

VO49M133-1

PSI MIC NO. **A660**

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 A. Uchi Date 9-16-96

CHEMICAL ANALYSIS

HEAT 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)	.20X OFST	% ELONG	RED AREA	IMPACT DATA					
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
509280	602749A		+75		PROLONG	74.5	36.5		64.0	79.0						
509280	602749B															
509280	602749C															
509280	602749D															
509280	602750A															
509280	602750B															
509280	602750C															
509280	602750D															
509280	602751A															
509280	602751C															
509280	602751D															

← A660

NO. 103 P. 245

CUSTOMER

NOV. 19. 1997 11:01AM STANDARD STEEL M. LAB



METALLURGICAL CERTIFICATION

PAGE 2

FOR: PROCESS SYS INT MA

PCB SHIPPED: 11

CUSTOMER ORDER NUMBER 555492

03 OUR ORDER NO 532691603

REPORT DATE: 08/28/96

SHIPLIST NO: 56374

Mic# A660

PG-2

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

HGR. LABORATORIES

P.346

NO.103

STANDARD STEEL M. LAB

11:01AM

NOV.19.1997

Web Wire
@ of C'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...

70065-R/77410500

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:

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
<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]

(661197)(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

TO: BOC GASES (AIRCO)
LISLE IL

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

TOMER PURCHASE ORDER NO.:

CERTIFICATE DATE: *8/8*

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 <i>S440928</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. Bettle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan

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

Celeste Brennan
15(66119)(10)

BOC GASES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

56 lbs


X7K8115-02

KOBELCO

04/09/1997 15:57 7139746424 KOBELCO PAGE 14

PURCHASER PO 70040 R/774101500 <i>PROCESS SYSTEMS</i>				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	FNV
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: FN	6.0	6.8
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		59.8 kgf/mm ²				- J							
							- kgf.m							
WELDING CONDITIONS														
TYPE OF CURRENT	DCEP		SHIELDING GAS			CO2		POSTWELD HEAT TREATMENT			FS = FERRITE (SCHARFFLER DIAGR.) FN = FERRITE (DELONG DIAGRAM) FNV = FERRITE (VRC)			
AMPERAGE	110 A													
ARC VOLTAGE	25 V							- °C - 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.

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

BOC GASES

KOBELCO

80 RESEARCH ROAD

INSPECTION CERTIFICATE

CERTIFICATE NO.: A 002

HINGHAM, MA 02043

FLUX CORED WIRE

DATE OF ISSUE : 1997.01.07

PO# 70040-R / 774101500
PROCESS SYSTEMS

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

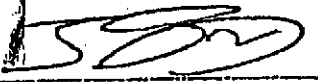
CHEMICAL COMPOSITION (%)															
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	Ti	PH	FS	PHW	
												UNIT: FN		UNIT: PH	
DEPOSITED METAL	0.028	0.43	1.10	0.022	0.012	0.04	12.75	22.56	0.04	0.02	0.07	15.0	8.7	12.0	
ELEMENTS															

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.	- J	-	-
- kgf/mm ²	- kgf/mm ²	55.1 kgf/mm ²			- J	- kgf.m		

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

FS = FERRITE (SCHAEFFLER DIAGRAM)
PH = PERLITE (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.

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

01/19/97 19:12 IAWI 免先 XWA I 7139746424 7139746424 092-09-1-992 14:57 092-09-1-992 14:57

04/09/1997 15:57 7139746424 KOBELCO PAGE 11

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 59OLD 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

15(66119)(10)
BOC GASES90 RESEARCH ROAD
HINGHAM, MA 02043PROCESS SYSTEMS
120 LBS 308L 3/32
70040-R/774101500

6



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
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 Damiani, Quality Engineer

15(661197)(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: *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. Bottle, Manager, Quality & Metallurgy
Celeste Brennan, Sr. Quality Engineer

Celeste Brennan (cp)
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.: 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
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*

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 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. Bottle, 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

X/11

KOBEL

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 E309LTO-1 ASME SFA-5.22 E309LT- (1995 Edition)

PSI
QC
CW

CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	NO	NB	N	FN	FS	FN#
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

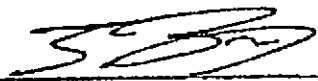
TENSILE TEST OF DEPOSITED METAL				IMPACT TEST OF DEPOSITED METAL			HARDNESS TEST.
YIELD POINT	YIELD STRENGTH AT 0.2% OFFSET	TENSILE STRENGTH	ELONGATION	TEST TEMP.	ABSORBED ENERGY		—
— N/mm ²	— N/mm ²	555 N/mm ²	37 %	— °C	AVG.	—	
— MPa	— MPa	555 MPa			J	—	
					— kJ/m		

WELDING CONDITIONS				POSTYIELD 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. 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.: 979936

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)


90 RESEARCH ROAD
HINGHAM, MA 02043

PO. 70031R/774101500

6-13-97

4/11

KOBEL

PURCHASER		INSPECTION CERTIFICATE										CERTIFICATE No : D 021		
PROCESS SYSTEMS INT'L		FLUX CORED WIRE										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 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	FNH
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			HARDNESS				
							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		- °C x - h								
AMPERAGE	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. FUJISAMA PLANT CHIEF INSPECTOR 							

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.



SERVING NEW ENGLAND

P I C K I N G T I C K E T

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

Dist # : 72600
Order # : 306626-00
Order Date: 04/23/97
Page : 001 OF 00

Ship To: PROCESS SYSTEMS INTERNATL.
20 WALKUP DR
WESTBURY MA 01581-0000

NAME : PROCESS SYSTEMS TER: 142 SHIP VIA: COST FULCRP -NOPE- INITIALS: NEW
PO # : 70034F JUNE774-1915 SLS: 9 SHIP UNIT: 00 UNIT: 0 NEW TYPE: OREG-UP
PCLT : BRN: 16 CUL/PYD : PCEP610 DATE : 26-APR-97 12:00
PHONE#: 508-898-0285 KDATE # :

QTY UNIT HG DESCRIPTION LOG UNIT LAC QTY WGT SUM WT UNIT EXTS
SHIP 2 HAZARD CLASS NO NUMBER ORDER BRNSD LUC LUC SHDWT AMT

QTY	UNIT	HG	DESCRIPTION	LOG	UNIT	LAC	QTY	WGT	SUM	WT	UNIT	EXTS
SHIP				NO	NUMBER		ORDER	BRNSD	LUC	LUC	SHDWT	AMT
***** SHIP COMPLETE LOG *****												
120	LB	5183	3/32X36 ALUMINUM	1	ALC 51833236	LAK	120	0			120.0	
					MSNS: 000078							
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 *L. Collins Smith*
236

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	

PSI
QC
CW

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 (C)



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 took
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	---	0.0003
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.

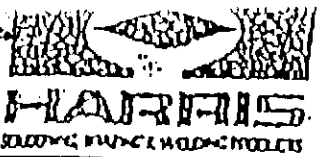
All Packaging materials are in compliance with CONEG legislation.

Additional Order Requirements:

James L. Demaree

V.P. - Quality Control

Ⓞ



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

J. W. Harris Co.
Certificate of Compliance

FORM 16177490165

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

Shipped To: Process Systems
PO 70015R

Date _____
Date Shipped _____
Order No. _____

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

Comments:

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043



Alloy	A95 A-510-00 ASME SFA 5.10		OO-R-5668 r. Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements Each
	ER1100	R1100										
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	0.05-0.10	0.02		0.10-0.20	0.20-0.25	0.05
4043 Aluminum	ER4043	R4043	4043	4.5-5.0	0.0	0.30	0.05	0.05		0.10-0.20	0.20	0.05
710 Aluminum	ER7047	R7047	7047	11.0-13.0	0.0	0.30	0.15	0.10		0.10-0.20	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		0.15	0.05
5654 Aluminum	ER5654	R5654	5654		0.40	0.10		0.05-0.20				0.05
5754 Aluminum	ER5754	R5754	5754		0.40	0.10		0.05-0.20				0.05
5083 Aluminum	ER5083	R5083	5083		0.40	0.10		0.05-0.20				0.05

- NOTES:
1. Strength values shown are maximum permitted values.
 2. Impurities shall not exceed 0.0009 percent.
 - A. Silicon plus iron shall not exceed 0.20 percent.
 - B. Zinc plus copper content is the difference between the zinc plus copper content and the iron plus silicon content, each expressed as a percentage of the alloy.
 - 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 inspections as required.

FORM 16177490165



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:

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



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

[Signature]
5(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(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

C

15(66119)(10)

Handwritten marks and initials in the bottom right corner.



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

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:

ANSI 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

Daniel Damiani
15(66119)(10)

BOC G
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 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

(2)



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

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/159049-042
TK 693415
50 LB.*

Bengt E. Berg, Director, Quality and Metallurgy

5(66119)(10)

BOC GASES
HINGHAM ROAD
HINGHAM MA 02043

(26)



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 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))



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
90 RESEARCH ROAD
HINGHAM, MA 02043

(28)



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:

James L. Devann
Control

[Signature]
Certifying Signature

29



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

J. W. Harris Comp
Certificate of Compl

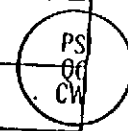
Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PQ#

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.	9 LB	5/32 X 36	ALUMIN	AA1005183D
2.	10 LB	5/32 X 36	ALUMIN	7295
3.				

Comments:
P.O. 700643-R/V5904904302



Alloy	A9S 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			0.10		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.
- 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 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**
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	A95 A.510-00 ASME SFA.5.10		99-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	
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.
 3. Silicon plus iron shall not exceed 0.95 percent.
 4. 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 detoming the sum, and shall not be less than 99.0.
 5. Vanadium content shall be 0.05-0.15 percent. Zirconium content shall be 0.10-0.25 percent.
 6. Silicon plus iron shall not exceed 0.45 percent.

(31)

1996.10-31 04:01 #926 P.02/02
 5082705930
 HINGHAM TO
 FROM : AIRCO/BOC BASES



HARRIS
SOLDING, WELDING & WELDING PROJECTS

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	AWS A510-00 ASME SFA 5.10		QW-R-566B r Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elems Each
	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			0.10		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	0.30	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		0.05
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	0.15	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	0.10	0.06-0.20	0.05
5654 Aluminum	ER5654	R5654	5654	0	0	0.10	0.50-1.0	4.7-5.5	0.05-0.20	0.25	0.05-0.20	0.05
				D	D	0.05	0.01	3.1-1.9	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.

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



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

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49886 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:

[Signature]

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
Re	---	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. Dawson
V.P. - Quality Control



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

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/V5904904500

CERTIFICATE DATE: 10/04/96

SANDVIK ORDER NO.: 92899

QUANTITY: 18 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
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(661197)(10)

BOC GASES
RESEARCH ROAD
BIRMINGHAM, MA 02043


HARRIS

SOLDING, WELDING & WELDING PRODUCTS

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

J. W. Harris Company
Certificate of Compliance

Date _____

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043Shipped To: Process Systems Intl
60 70015 R / 7741000


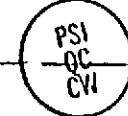
Date Shipped 3-28-97

Order No. 797282

P.O. No. PO#

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 SFA5.10		QQ-R-566B Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elements 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	5.8-6.8	0.20-0.40	0.02		0.10	0.10-0.20	0.05
4043 Aluminum	ER4043	R4043	4043	4.5-6.0	0.8	0.30	0.05	0.05		0.10	0.20	0.05
710 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	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 are in accordance with applicable purchase specifications having passed our inspections as no

37

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 70015R/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 SPA 8.10/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. Pyle
CERTIFICATION CLERK

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

703



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.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

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

Celeste Brennan / c.p.
15(66119)(10)

(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
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



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.: 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
15(66119)(10)

3
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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)

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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
(616) 941-4111 Phone
(616) 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:

V.P. - Quality Control

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

TO

LAM ~~159849~~ 4

Job # 159849

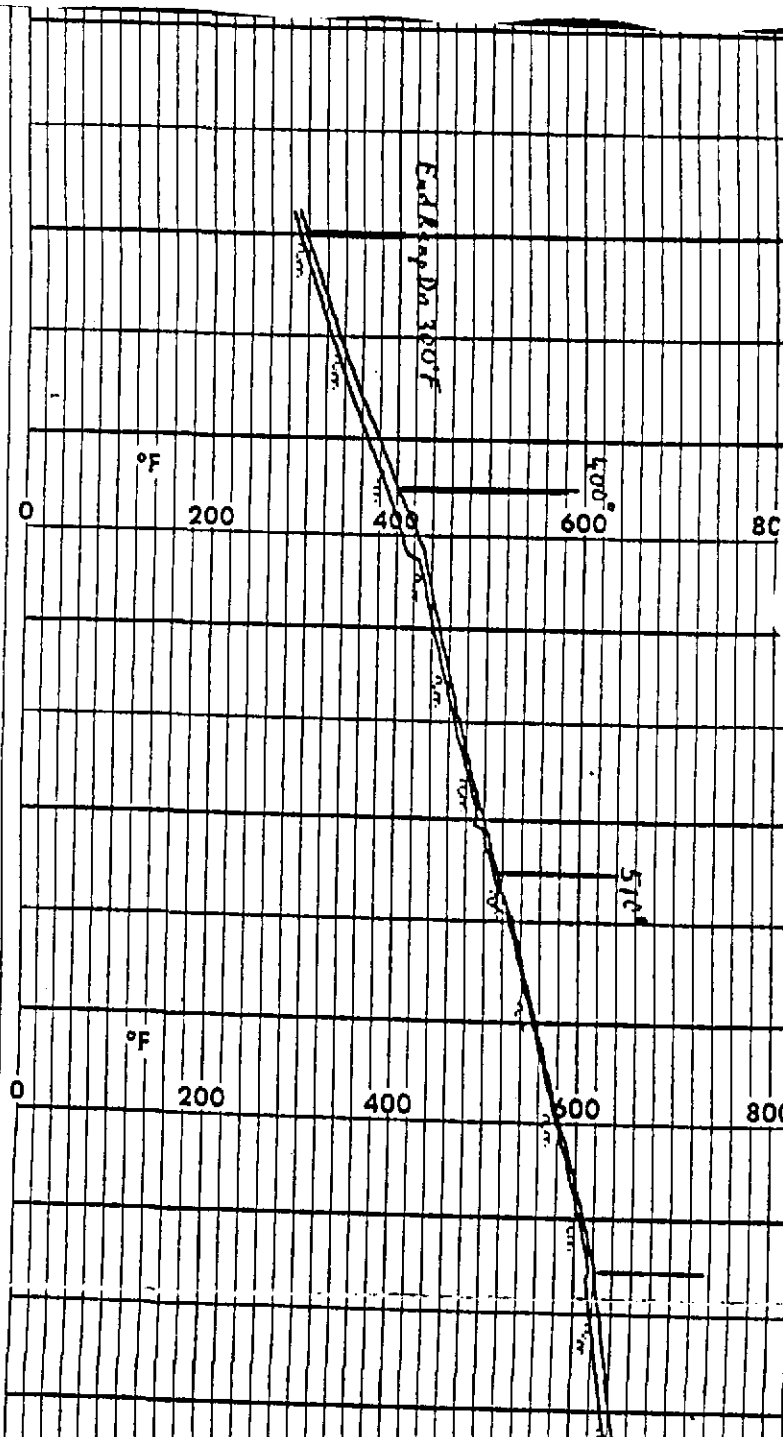
Doc. Serial # 1049-4-128-03
 1049-4-128-04

C-68

10 2000

TYPE K-68

1800 2000



WHA M 3 S/N 04

HAM #4

Title

SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET

Project V59049

Component	Serial Number
A-4 Door	02
127 Door	11
127 Door	22
HAM 4	

Wash Cycle: Manual

Flowrates: 30 Gpm Max. Temp.: 176 Duration: 2 1/2 WASH/RUN

Operator: Joseph McG / Bill

Date: 5/15/97

Comments: TRAIN BILL

Component(s) Inspected By: JF

Date: 5/15/97

Quality Assurance: Ann Senechal

Date: 5-21-97

Comments: _____

SPECIFICATION

Number	V049-2-015	Rev.
A		2

Page 9 of 9

Number

Rev.

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: Ham S/N: 4 WORK ORDER: 1220
 DATE/TIME: 5/14/97
 OPERATOR: js-ep

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= 145 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 = 120 MIN

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

NOTES: Vessel was Passivated on 5/14/97 - Dan B + Bill
will train on proper procedure

SPECIFICATION

Number AV049-2-184 Rev. 1

Ham

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: Cover S/N: A 127-11
 DATE/TIME: 5/16/97 WORK ORDER: 220
 OPERATOR: Doug w/ Dave Conl

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= 174F

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 = 12 MIN 9:30

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

RINSE TIME = 5 MIN 9:35

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

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

DRY TIME = 30 MIN Total

NOTES: Door # A1-02 already washed and being used as
A Test Door. A-15
8 1/2" Doors were prevented by Andy and Dave for use

Handy

SPECIFICATION

Number AV049-2-184 Rev. 1

Number Rev.

Title: COMPONENT RGA TEST PROCEDURE

TITLE	RGA ION SOURCE SETTINGS SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM3-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	474476 X 006
RGA ELECTRONICS UNIT SERIAL # QME	48

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

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

Detector	
Type	CH-TRON
SEM Volt.	<< 1700 >>

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	0
Width	6
Speed	105
Resolution	50
Microscop	

Ion Source	
Filament #	FIL. 2
IS-Set	SET 1

IS-Emission	
Emiss [mA]	0.5
Protect [A]	3.5

Fil.Prot.	Thresh. [mbar]
(0) below	
(0) 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. WBSC1_1	WHAM3-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	
RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	X006
RGA ELECTRONICS UNIT SERIAL # QME	8

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

Rev. 1

A

Title: COMPONENT RGA TEST PROCEDURE

TITLE	OUTGASSING RATES REPORT SHEET
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM3-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	X006
RGA ELECTRONICS UNIT SERIAL # QME	8

AMU	I (Amp)	Leak rate CALIBRATED 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	4.16×10^{-7}	4.8×10^0		1.06×10^{-6}	7.45	3×10^{-6}	1.3×10^{-11}
12			0.42				
14	8.7×10^{-10}		0.5			1.3×10^{-8}	
15			0.54				
CH4	1.3×10^{-9}		0.57			2.3×10^{-8}	1.3×10^{-13}
17			0.6				
H2O	2.7×10^{-8}		0.64			5.9×10^{-7}	2.9×10^{-12}
19			0.67				
26			0.71				
28	9.5×10^{-9}	9.5×10^{-1}		3.91×10^{-8}	32.1	3×10^{-7}	1.3×10^{-12}
32	7.3×10^{-10}		1.14			2.6×10^{-8}	
38			1.36				
40	1.2×10^{-10}	9.4×10^{-3}		2.61×10^{-9}	38	4.6×10^{-9}	1.9×10^{-14}
43			1.53				
44			1.57				
129	BACKGROUND	2.5×10^{-8}		2.64×10^{-10}	100		1.1×10^{-13}
131	"	2.0×10^{-8}		2.2×10^{-10}			
132	"	2.5×10^{-8}		2.67×10^{-10}			
134	"	1.0×10^{-8}		1.05×10^{-10}			

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. WBSC1_1	WHAM3-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

RGA NUMBER:	
RGA SENSOR HEAD SERIAL # QMS	X006
RGA ELECTRONICS UNIT SERIAL # QME	8

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							
26							
27							
29							
30							
31							
36							
37							
38							
29							
41							
42							
43							
51							
55							
56							
57							
67							
69							
71							
TOTAL	5x10 ⁻⁹				32 use N2	1.6 x 10 ⁻⁷	6 x 10 ⁻¹³

* ALL 10¹⁰ A HC listed

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

Title: COMPONENT RGA TEST PROCEDURE

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

TITLE	RGa COMPUTER DATA FILE LOG
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM 3_1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	
RGa NUMBER:	
RGa SENSOR HEAD SERIAL # QMS	X006
RGa ELECTRONICS UNIT SERIAL # QME	8

BARGRAPH DATA FILE NAME WHAM3-1.SBC

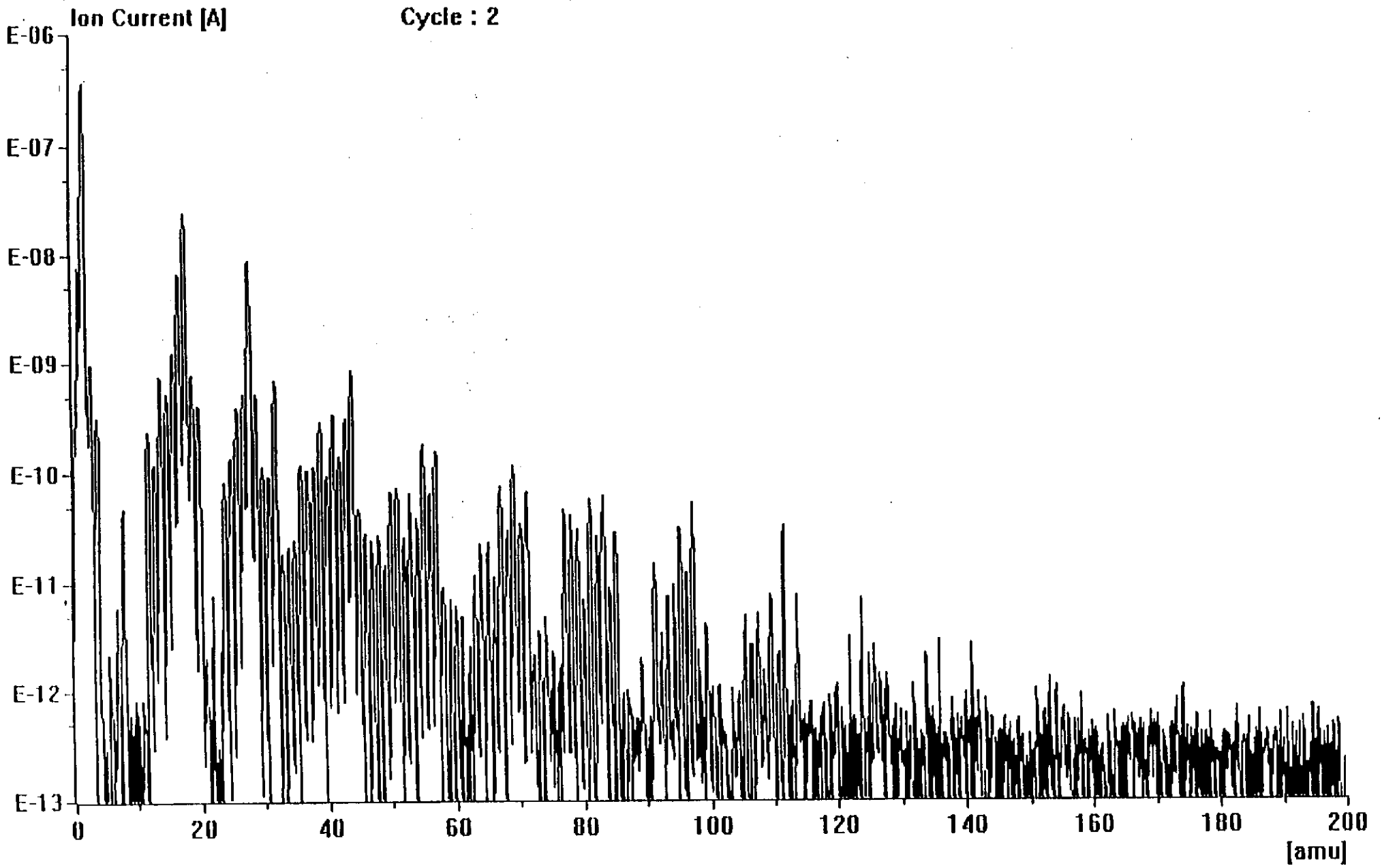
ANALOG SCAN DATA FILE NAME WHAM3-1.SAC

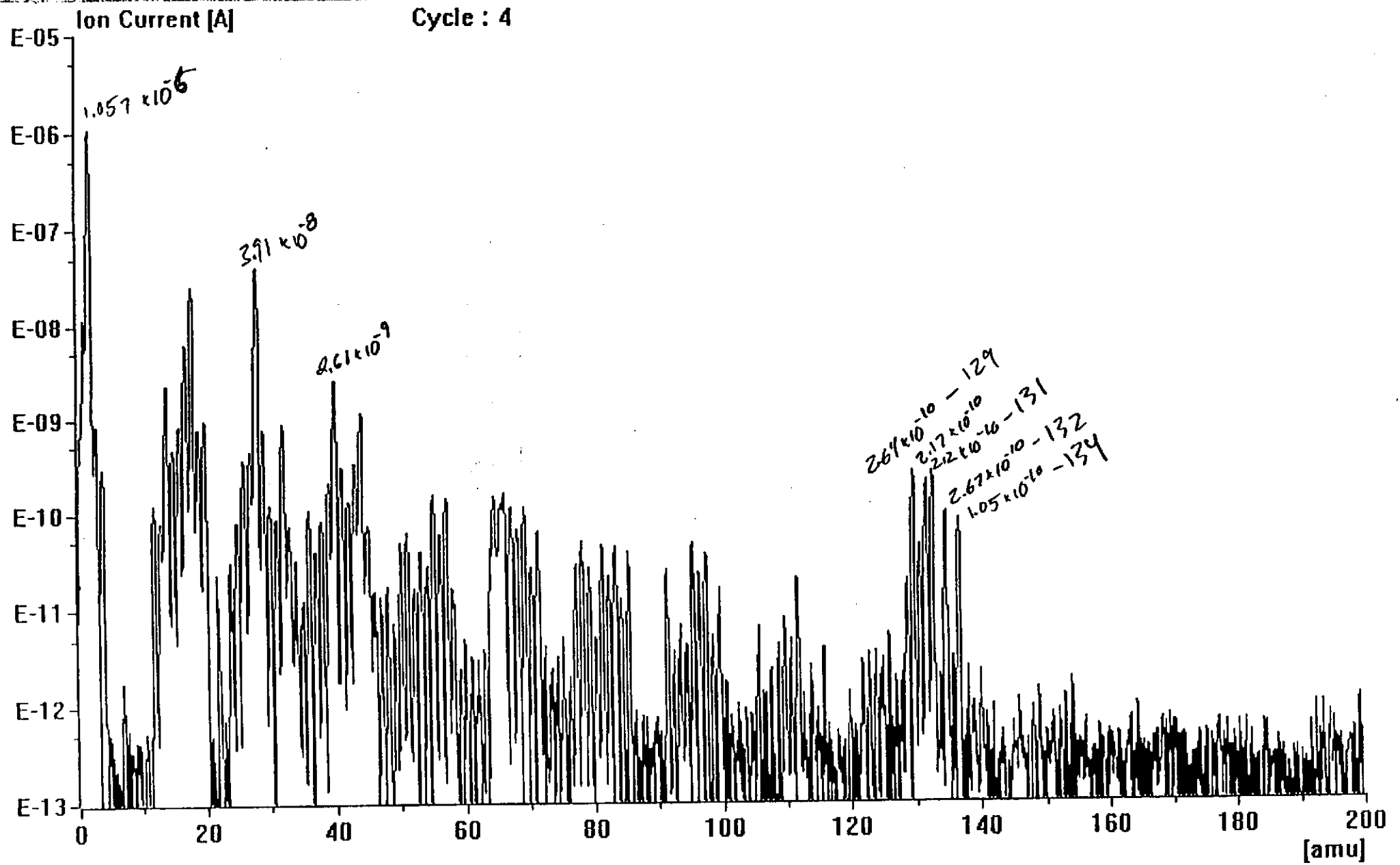
OTHER DATA FILES

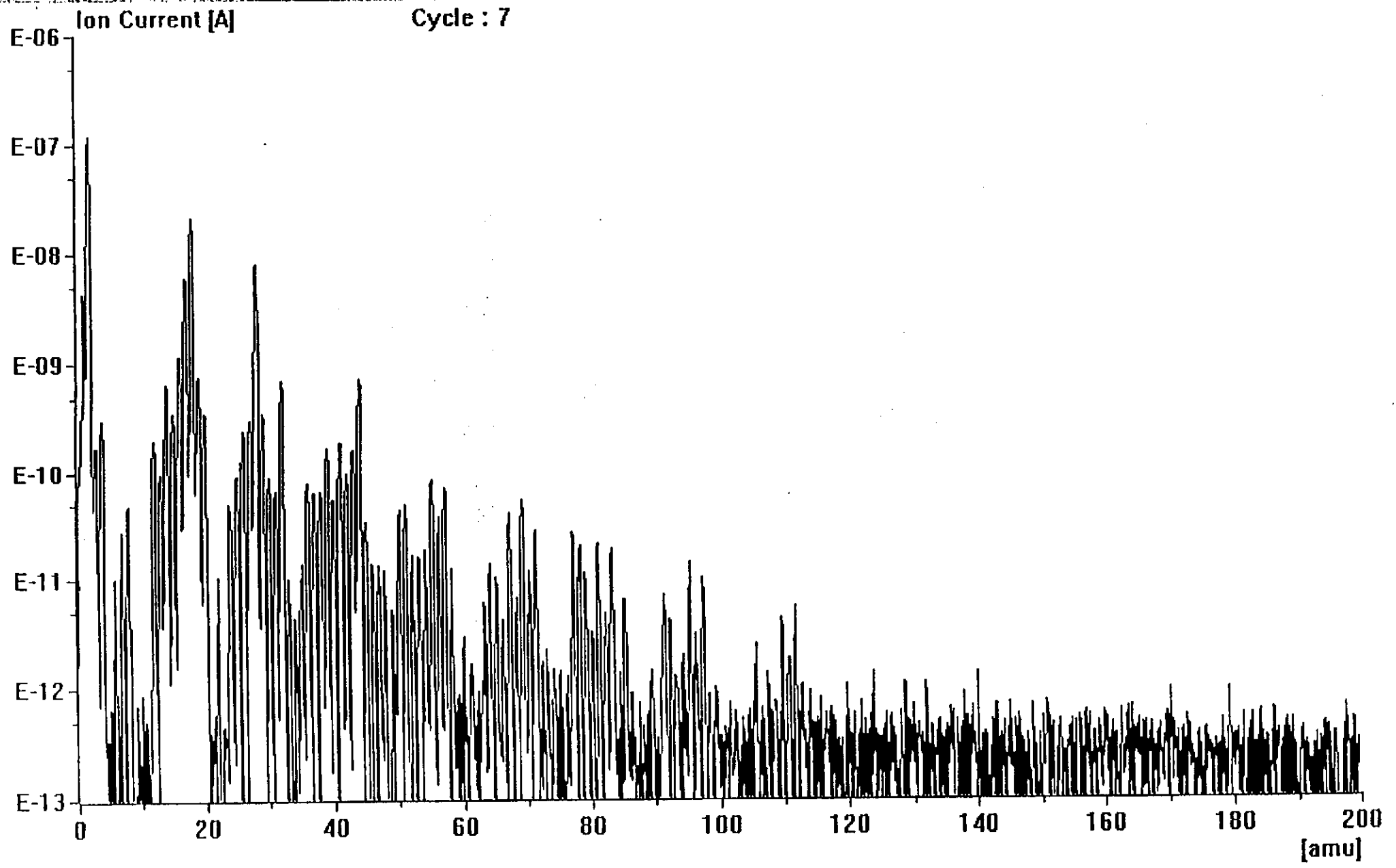
PRINTOUT OF

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

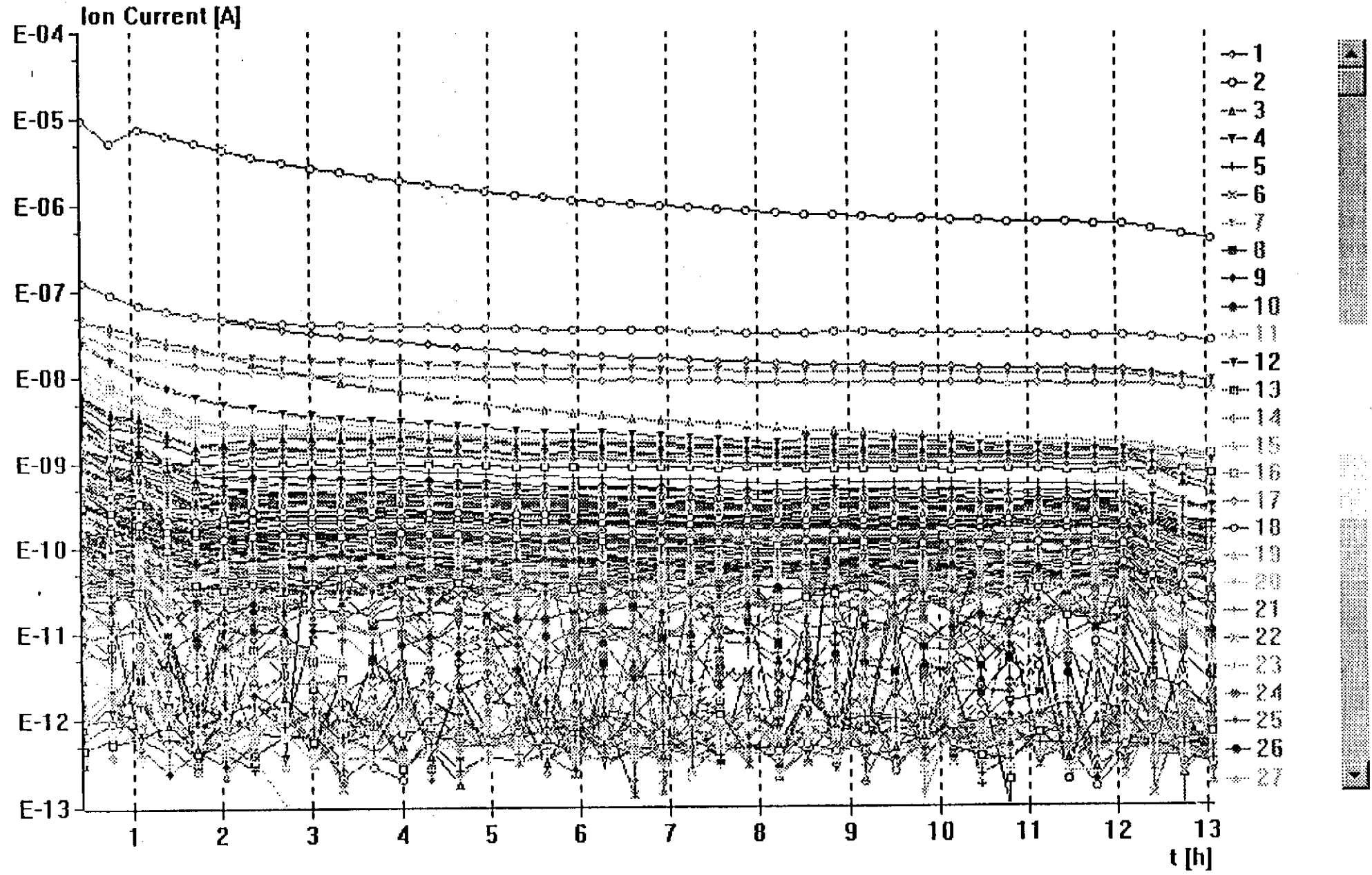
SPECIFICATION	
Number: V049-2-127 A	Rev. 1







X: 14.81 Y: 4.847528E-08



m/e	Intensity [A]	m/e	Intensity [A]	m/e	Intensity [A]	m/e	Intensity [A]
1.06	9.075232E-09	2.00	4.160606E-07	3.00	1.131752E-09	3.97	3.049582E-10
4.56	5.449239E-13	6.91	4.804950E-12	9.75	2.597998E-13	10.81	5.871670E-13
11.97	2.862764E-10	12.97	1.600551E-10	13.97	8.696324E-10	14.97	7.394846E-10
15.97	1.307938E-09	16.97	7.387504E-09	17.97	2.705710E-08	18.97	8.554950E-10
19.97	4.925707E-10	22.06	5.858341E-12	23.00	3.131311E-13	24.00	1.003056E-10
25.00	1.805905E-10	26.00	5.377205E-10	27.03	7.374146E-10	28.00	9.509084E-09
29.03	6.439359E-10	30.03	1.354689E-10	31.03	1.188999E-10	32.03	7.353303E-10
32.94	2.861316E-11	33.94	2.316854E-11	35.13	4.055756E-11	36.06	1.518400E-10
37.06	1.361850E-10	38.09	1.521175E-10	39.09	4.424704E-10	40.06	1.196414E-10
41.09	5.159221E-10	42.13	1.906057E-10	43.16	4.428471E-10	44.09	1.018902E-09
45.09	8.027014E-11	46.09	2.714315E-11	47.06	3.638616E-11	48.22	2.191738E-11
49.00	4.312819E-11	50.09	9.638403E-11	51.19	1.087947E-10	52.16	4.239173E-11
53.25	7.538695E-11	54.19	8.527910E-11	55.19	2.609762E-10	56.25	1.016505E-10
57.25	2.471508E-10	60.38	6.406993E-12	61.25	8.455624E-12	62.22	9.002038E-12
63.28	2.484580E-11	65.22	3.551323E-11	66.25	1.976989E-11	67.28	1.165623E-10
69.34	1.667119E-10	70.22	9.643263E-11	71.34	1.115241E-10	72.38	7.395950E-12
74.34	6.326602E-12	75.13	3.222372E-12	77.38	5.993677E-11	78.31	5.312940E-11
79.38	5.589293E-11	81.38	8.753570E-11	82.50	3.582900E-11	83.41	6.979785E-11
84.38	1.469938E-11	85.34	5.446919E-11	88.41	7.338678E-13	88.97	4.611869E-13
89.38	2.473405E-12	90.16	6.001175E-13	90.56	7.102379E-13	91.53	4.301234E-11
92.50	7.312556E-12	94.63	8.579415E-12	95.56	5.532623E-11	96.66	1.849138E-11
97.56	5.223244E-11	99.66	1.338855E-11	100.47	2.830661E-12	101.53	1.040594E-12
101.94	5.239836E-13	102.59	7.797940E-13	103.13	3.661246E-13	104.09	6.820544E-13
105.56	9.999953E-12	106.13	2.830028E-13	109.69	1.603169E-11	111.66	2.279115E-11
114.25	8.013404E-13	114.84	6.167122E-13	117.81	2.454925E-12	119.81	3.595294E-12
121.75	2.054935E-12	124.91	6.131981E-12	125.84	5.844031E-12	126.28	3.795259E-13
126.88	1.434814E-12	127.88	2.490556E-12	129.69	1.7079629E-12	130.41	3.561642E-13
131.78	2.379252E-12	132.75	4.308646E-13	133.28	4.347604E-13	134.28	4.714451E-13
135.88	1.064263E-12	136.28	3.613675E-13	136.94	1.128189E-12	140.09	1.147184E-12
141.00	9.016293E-13	143.91	9.848195E-13	148.66	4.949700E-13	151.56	3.032989E-13
153.59	5.056505E-13	154.22	1.683348E-12	154.91	3.271342E-13	155.22	8.323392E-13
156.50	4.816286E-13	157.34	4.420789E-13	158.19	4.947317E-13	158.81	2.797319E-13
159.78	5.247451E-13	160.16	6.134584E-13	160.66	3.987531E-13	163.56	5.418056E-13
164.31	9.622089E-13	165.19	4.042945E-13	165.50	2.846132E-13	168.06	6.189906E-13
168.41	5.721368E-13	169.44	5.819437E-13	169.88	4.656875E-13	171.19	6.675457E-13
172.13	6.033785E-13	173.50	6.271461E-13	174.13	5.076444E-13	175.16	3.889851E-13
177.41	4.275155E-13	178.75	6.267599E-13	180.84	4.004573E-13	182.00	3.703774E-13
182.44	7.450963E-13	183.22	5.773167E-13	184.34	8.185691E-13	186.59	5.894201E-13
187.03	1.871644E-13	187.63	3.117489E-13	188.94	5.373432E-13	191.38	3.229892E-13
191.66	6.627896E-13	192.78	4.575131E-13	194.13	2.745083E-13	195.63	4.270350E-13
197.00	3.180135E-13	198.63	4.180926E-13				

RANOR, INC

NONCONFORMANCE REPORT

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

NCR NUMBER NCR- 1032	PAGE 1 OF 1 SKETCH ATTACHED <input type="checkbox"/>
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JOB NUMBER 7400⁵/m	CUSTOMER P.S.I.	PURCHASE ORDER NUMBER 556008	QUANTITY 2
PART DESCRIPTION H.A.M. Main Assy.		DOCUMENT NUMBER AND REVISION A V049-2-046 Rev. 0	SERIAL NUMBER Pc. #314

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; Ramp Up @ 100°F/hr. max. starting at 350°F	1. Ramp Up @ 125°/hr. from 435° to 560°F Ramp Dn @ 110°/hr. from 510° to 400°F Ramp Dn @ 100°/35 minutes 400° to 300°F

REMARKS: _____

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

ORIGINATOR/INSPECTOR: Steve 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 Bell</u> 3-27-97	REF. NCR 1029 USE AS IS <u>R.D. Givette</u> 4/14/97 <u>GS</u> 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 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: _____

APPROVAL OF DISPOSITION:	VERIFICATION OF DISPOSITION:
VP-ENGINEERING _____ DATE _____	ACCEPTED BY _____ DATE _____
QA MANAGER _____ DATE _____	QA MANAGER _____ DATE _____
ANI _____ DATE _____	ANI _____ DATE _____

RANOR, INC

NONCONFORMANCE REPORT

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

NCR NUMBER NCR- 1029	PAGE 1 OF 1 SKETCH ATTACHED <input type="checkbox"/>
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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: ASME SECTION III SAFETY RELATED ASME SECTION VIII MIL SPEC 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 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><i>Steve Bell</i></u> 3-27-97	NO MAJOR PROBLEMS PER DISCUSSION W/ METALLURGIST. Use as is - <u><i>R. D. Gatto</i></u> 4/16/97 GS 4-17-97

TECHNICAL JUSTIFICATION:

DISPOSITION:

BY _____ DATE: _____ BY *Steve 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: _____
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 # WHAM-4
P/N - VO49-4-128-05

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 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. WHAM 4 Ser. No. 05

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

Serial No. V0494123-01 thru 12

CONTROLLED-COPY

OCT 24 1996

1	GS 107596		Release Per DEO No. 0302
φ	DRG 4/8/96	REB	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.	1
	<i>AR Budnick</i>	4/8/96	<i>R. Boyer</i>	4/17/96				

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

Number

Rev.

Serial No. V0494128-05

SPECIFICATION V049-2-087

REV. 1

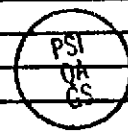


Process Systems International, Inc.
 20 Walkup Drive
 Westborough, MA 01581-5003
 (508) 366-9111 Fax (508) 870-5930

PROJECT LIGO
 ITEM HORIZONTAL Access Module (HAM)
 APPLICABLE CODE ASME Sect VIII Div. 2
 (where Applicable)

JOB NO. V59049
 DWG NO. V049-2-128
 PG 23 OF 97

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>Mark</u> <u>12/20/96</u>									
Inspect Welding Long Seam/Lower Shell	V	V049-4-128	V049-2-071	X <u>Mark</u> <u>11/1/96</u>										
Verify Roundness of Shell	V-D	V049-4-128		X <u>Mark</u> <u>11/1/96</u>										
Inspect Welding Long Seam 60" Nozzles	V	V049-4-128	V049-2-071	X <u>Mark</u> <u>11/1/96</u>										
Verify Roundness of 60° Nozzles	V-D	V049-4-128		<u>Mark</u> <u>11/1/96</u>										
Verify Fixtures in Shell & 60° Nozzles				<u>Mark</u> <u>11/1/96</u>										



Serial No. V0494128-05

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 Welding and Location of Saddle Support Plates and Lift Lugs	V-D	V049-4-128	V049-2-071	<u>MAN</u> <u>1/16/96</u>			
Inspect Welding of 6" Nozzles	V	V049-4-128		<u>MAN</u> <u>1/16/96</u>			
Verify Nozzle Alignment and Dimensions (ALL Nozzles)	V-D	V049-4-128		<u>MAN</u> <u>3/6/97</u>			PSI QA GS
Verify Steam Cleaning of Vessel				X <u>MAN</u> <u>3/6/97</u>			
Thermal Stress Relief Vessel		V049-2-046		X <u>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
Verify 60" Nozzle End Dimensions after Machining	I-D	U049-2-046		X <u>Mast</u> <u>1/18/97</u>			
Verify Cutout Location of the 4-Critical "E" Nozzles	U-D	U049-4-128		X <u>Mast</u> <u>1/22/96</u>			
Inspect Welding of 84" Flanges to Shell	V	U049-4-054	U049-2-071	X <u>Mast</u> <u>1/21/97</u>			
Verify Flange (84") Straightness and Flatness	V-D	U049-4-054		X <u>Mast</u> <u>1/21/97</u>			
Inspect Welding of 60" Flanges to Nozzle Neck	V	U049-4-054	U049-2-071	X <u>Mast</u> <u>1/21/97</u>			

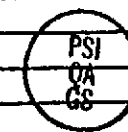


SPECIFICATION V049-2-087

REV. 1

SERIAL No. V0494128-05

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 _____	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>Mark</u> 1/27/97			
Inspect Welding of Expansion Joint to 60" Nozzle	V	V049-4-054 V049-4-053	V049-2-071	X <u>Mark</u> 1/29/97			
Inspect Welding of Internal Saddle to Shell	V	V049-4-128	V049-2-071	X <u>Mark</u> 3/7/97			
Inspect Welding of All Non-Critical Flanges	V	V049-4-128	V049-2-071	X <u>Mark</u> 1/28/97			
Inspect Welding of Critical "E" Nozzles and Flanges (with fixtures)	V	V049-4-128	V049-2-071	X <u>Mark</u> 2/27/97			
Verify Alignment Straightness & Flatness of "E" Nozzles	V-D	V049-4-128		X <u>Mark</u> 3/6/97			



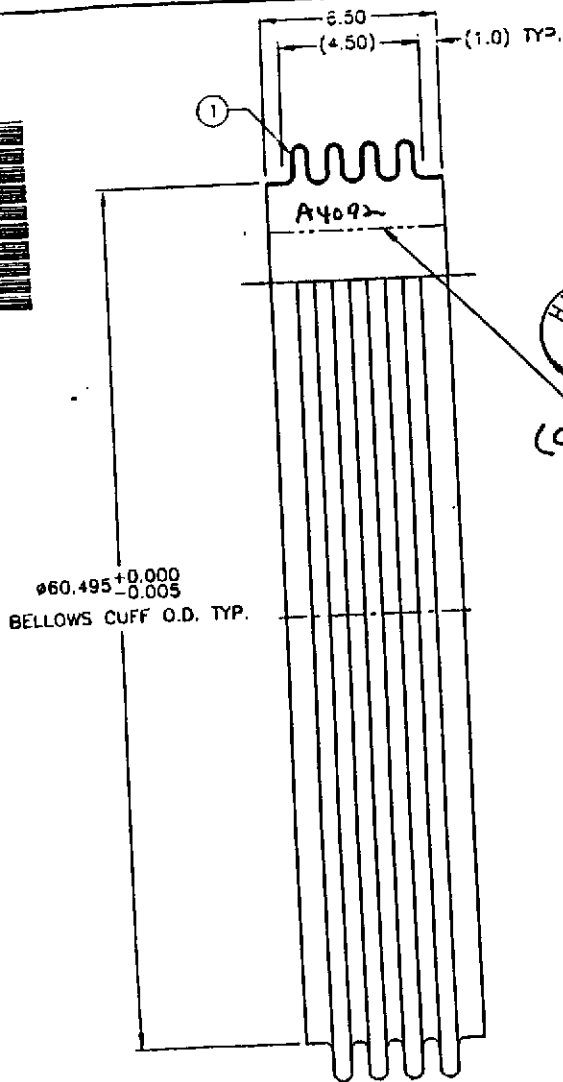
Serial No. U0494128-05

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
Verify Installation of Bellows Tie-Rod	V	U049-4-040	U049-2-072	X <u>MAW</u> 1/23/97			
Verify Installation of Annals Tubing	V	U049-4-054					
Verify Installation & Alignment of Support Saddles	V-D	U049-4-052 U049-4-002	U049-2-072 U049-2-071	X <u>MAW</u> 6/26/97		GS 6-26-97	
Steam Clean rondote vessel Inside & Out		U049-2-015		X <u>MAW</u> 5/27/96			
Verify final cleaning at PSI	V	U049-2-015		X GS 5/27/97			
Verify Final Bakeout at PSI	V	U049-2-019		X GS 6-20-97			
Verify final lbr. of He Leak Test at PSI	V	U049-2-014		X GS 6-26-97			
Shipment to LICA		U049-2-123		X GS 9/8/97			

PSI
QA
GS



HYSPAN
W
30
WPS
007
(CO₂ SCRUB)

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 PRIOR TO INSTALLATION REMOVE PRIOR TO PRESSURE TESTING.~~

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

REV	DESCRIPTION	DATE	BY
1	WAS DWG. NO. 632-1 TEMP. WAS 370°F REV'D NOTE 3, 11 & 14 CEL. NOTE 12 & 13 SUBMIT FOR APPL.	SEP/07/96	
2	REV'D FOR CUST COMMENT SUBMIT FOR APPROVAL	OCT/07/96	

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

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 .065. OUTSIDE ONLY~~
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. 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
SCALE NONE		SHT. 1 OF 1	V049-4-053

S/N 005 V0494053-P1-05



21/05/96 Date

To:
AVESTA SHEFFIELD INC
425 NORTH MARTINGALE SUITE 2000
SCHALNBURG
ILLINOIS 60173
U.S.A
F.A.O. KEITH WOOD

Cons./Inv. No. 175/04392/05

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 spectroscopy examination Test Position: f=Front, B=Back Orientation: L=transverse, L=longitudinal El codes: 1=500, 2=5.65/80, 3=50mm, 6=80mm, 7=15mm, 8=

Folio	Cast. No.	Material Description	Temp C	Coil No./ Plate No.	Proof Stress		Tensile Strength	El%	RA/IV	Hard Test	I/C Test	Impact Test
					0.2% PS1	1.0% Yield						
A4092	C2004	2 Coils 48ins. wide x 0.035ins. 1202-1203	20 20	14320/1	81 45385 81 36975	52345 44370	89175 86855	52 (S) 57 (S)	63.3 155 58.6 144	OK OK	OK OK	
<p>MATERIAL TESTED TO ASTM A240 CONFORMS TO LATEST REVISIONS OF ASTM A400/ASME SA240/400 Reasonable steps were taken to ensure that the material was not contaminated with metallic mercury or mercury compounds by Avesta Sheffield. (1W/mm sq = 145.04 PSI)</p>					<p>Material inspected and tested to ASTM A240 also conforms to latest revisions of ASTM A400 and ASME SA240/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. Solution annealed by heating to 1900 deg F min. except 321H 347H 348H (2000 deg F min.) "NO WELD REPAIR"</p>							

Intermetallic Corrosion Test to ASTM A262 (1993) PRACTICE 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	16.15	.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 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. H. P. S. H.
DATE ORDERED: 6.03.96
ORDER NO: 25-038153


MASS SPECTROMETER TEST REPORT

No 494053-01-05

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
005	1x10 ⁻⁹	1330	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: 11/10/97

CONTRACT ORDER NUMBER: PC 175730

PSI JOB NUMBER: V59049

DRAWING NUMBER(S): V049 4 128

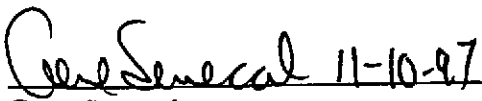
TAG NUMBER: WHAM 4

SERIAL NUMBER: 05

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 4 S/N 05

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 4 S/N 05

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 4 S/N 05

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 376
35	1	EA	V0494031	60-1/2 I.D. FLANGE GROOVED WITH SLOTS (HAM)	A 744 A 558
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
40	1	EA	V0494128	HAM SHELL WELDMENT	A 524
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 4 S/N 05

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 592 A 972
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 376 A 662
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 524
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 428
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 4 S/N 05

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



Burnham, PA 17009
Tel: 717-248-4911

STANDARD STEEL
QP090-F1
A Division of FREEDOM FORGE Corporation

M E T A L L U R G I C A L C E R T I F I C A T I O N

PSI M. NO. **A376**

FOR: PROCESS SYS. INT'L

PCS SHII

CUSTOMER ORDER NUMBER 555370

01 OUR ORDER NO 532685001

REPORT DATE: 07/08/96

SHIPLIST NO: 54474

P
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T

RING MACH 250/500 TO SIZES: 92.25" +.06" -0" OD X 84" +0" -.06" ID X 1.625" +.06" -0" WD
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 3 EXCEPT PARA. 4.7 (CLEANLINESS) THE LAST 2 SENTENCES OF THE PARAGRAPH ARE NOT INCLUDED.

VO49M133

(MSDS BA)

C
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R

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. Watecki Date 7-29-96

CHEMICAL ANALYSIS

HEAT 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)	.20% OFST	% ELONG	% RED AREA	I_M_P_A_C_T_D_A_T_A				
											LOCATION	TEMP (F)	FT. LBS	% SHR	LAT EXP
S09072	6E1596A		+75		PROLONG	78.5	33.5		60.0	55.0					
S09072	6E1596B														
S09072	6E1596C														
S09072	6E1596D														

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED



Dunham, MA 1/10/89
Tel 717-248-4911

STANDARD STEEL
QP090-F1
A Division of FREEDOM FORGE Corporation

METALLURGICAL CERTIFICATION

FOR: PROCESS SYS. INT'L

PSI MIC NO. **A375**

CUSTOMER ORDER NUMBER **555370**

PCB SHIP. ---

REPORT DATE: 07/08/96

02 OUR ORDER NO 432617501

SHIPLIST NO: 54441

PRODUCT

RING MACHINE TO DRAWING SIZES Dwg: VO49M135-1
SPECIFICATION, ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AVD49-2-040 REV 3

VO49M135-1

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 C. W. Wadzicki Date 7-29-96

HEAT NO.	CHEMICAL ANALYSIS										
	C	SI	P	MN	S	NI	CR	MO	V	AL	TI
SD9072	.020	.42	.028	1.76	.005	11.39	18.96				

N .0630

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	X .20% OF ST	% ELONG	% RED AREA	I_M_P_A_C_T_D_A_T_A					
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SZE
SD9072	6E1594A		+75		PROLONG	78.5	33.5		60.0	55.0						
SD9072	6E1594B															
SD9072	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

2-12120

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 Represen

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	86.3 KSI	59.4	74.9	BHN167	OK	OK

MATERIAL WAS NOT WELDED

Memo No: 113167-00

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

Our Order no: DP6349
Your Order No: 0001
Date: 04/12/94
DUAL CERT

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

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 13021 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: 115191-00

Our Order no: LU4333
Your Order No: 7024
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.



Avesta Sheffield Plate Inc.

PSI MIC NO. A524

ST-4

Certificate of Analysis and Tests

OUR ORDER 84645 - 07

HEAT & PIECE 39233-3A 8/30/96

SOLD TO: PROCESS SYSTEMS INTERNATIONAL
20 WALKUP DRIVE

SHIP 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 39233 - 3A
 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 84
 YIELD STRENGTH (PSI) 45004 ✓
 TENSILE STRENGTH (PSI) 83603 ✓
 BEND OK
 INTERGRANULAR CORROSION OK
 ELONGATION % IN 2" 58.8 ✓
 REDUCTION OF AREA % 71.8

----- 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) SB-240 Gr. 304/304L
 95 Edition, Addenda

By R. Worzicki Date 9-5-96

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



Avesta Sheffield East, Inc.

PSI MIC NO. A428

Certificate of Analysis and Tests

OUR ORDER 84643 - 04

HEAT & PIECE 39734-6B 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 - 6B
WEIGHT 1827

FINISH
GRADE 304L ✓ 1 / 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 EN ISO 240 Gr. 304L-301
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 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

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 432620802
SHIPLIST NO: 56599

PSI MIC NO. A558

PRODUCT

RING
MACHINE 250/500 MICRO TO SIZES SHOWN: 68.50" OD +.04 X 20.0" ID .04 X 1.250" WD +.06
SPECIFICATION: ASME SA182 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 3

U049M243-1

CUSTOMER

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

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

CHEMICAL ANALYSIS

ST NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
309280	✓	✓	✓	✓	✓	✓	✓								
	.031	.45	.032	1.72	.001	11.48	18.55								N .0500

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP	TEN BHN	TENSILE	UTS	YIELD ST	% ELONG	%RED AREA	I M P A C T D A T A						
			(F)		LOCATION	(KSI)	(KSI)			20% OF ST	LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
09280	6G2745D		175		PROLONG	74.5	36.5	54.0	79.0							
09280	6G2743A															
09280	6G2743D															
09280	6G2743C															
09280	6G2743D															
09280	6G2743E															
09280	6G2746A															
09280	6G2746B															
09280	6G2746C															

WASHINGTON STEEL

TEST CERTIFICATE

PAGE NO. 1 OF 01
 FILE NO: 8860-01-0
 DATE: 08/08/96
 MILL ORDER NO: 22195-008

CUSTOMER P.O.: #24107
 DESCRIPTION:

1 - RECTANGLE .375 -X- 96 -X- 192

SHIPPED TO: TRINITY INDUSTRIES, INC. P.O. BOX 41192 CINCINNATI OH 45241	SENT TO: TRINITY INDUSTRIES, INC. P.O. BOX 41192 ATTN: JAMES WITHROW CINCINNATI OH 45241	SHIP TO: TRINITY INDUSTRIES-CUST PICKUP P.O. BOX 41192 PSI MIC NO. A972 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 A167-93-304L, Q35-7660 COND, A-304L,
 ASTM A240-304L, ASME SA240-304L,
 AMS 5511, MIL-S-5059

MELT SLAB	CHEMICAL ANALYSIS														PRACTICE		
Y1126 /3CA	C	MN	P	S	CU	SI	NI	CR	MO	V	TI	Ø	N				
Y1126	✓ .024	✓ 1.81	✓ .025	✓ .004	.29	✓ .52	9.4	18.18	.22				✓ .0779				
PROD ANALYSIS	.025	1.84	.024	.004	.29	.53	8.4	18.13	.23				.0800				

TENSILES				CHARPY V IMPACTS				OTHER TESTS PERFORMED				
TYPE	YLD (PSI X 10 ³)	TENS (K 10 ³)	% ELONG 2"	% RA	TYPE	TEMP	MILS LATERAL EXPANSION	% SHEAR	BEND TEST - LOC/DIR BX - PASS			
Ø BX	✓ 524	✓ 872	✓ 71.0	66.0					BRINELL - 163 TEST LOC			
									CORROSION A262E SATISFACTORY			

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

INFORMATION				HEAT TREAT CYCLES - MATL OR TESTS - DEG				FAI		
WEIGHT PER PIECE = 2111 LBS. 960 KG.				HEAT TREAT CYCLES - TESTS ONLY - DEG				FAI		
MERCURY OR MERCURY COMPOUNDS ARE NOT USED IN THE MANUFACTURE OF LUKENS®/WASHINGTON®S PRODUCTS.				START END TEMP	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS	COOL METHOD	
CORROSION TEST PER ASTM A262 PRACTICE A C E. Ø				X	X	1950		0012	WQ	
PART NO. 2-12121										
Ø/L Ø38239 CUSTOMER'S TRUCK										
Ø Ø SIZE = .3750"ØM X 96.0000"ØM X 192.0000"ACT X WGT. = 1984										

WE HEREBY CERTIFY THE ABOVE INFORMATION IS CORRECT:

Quality Assurance Laboratory
 Coatesville, PA 19320

[Handwritten signature]



Tel: 717-248-4911

STANDARD STEEL

A Division of FREEDOM FORGE Corporation

FOR: PROCESS SYS INT MA

CUSTOMER ORDER NUMBER 555492

REPORT DATE: 09/13/96

IT-4

PCS SHIPPED: 30

04 OUR ORDER NO 432620501

SHIPLIST NO: 56855

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.
AUG-2-040 REV 2
(*) +.06

VO49M135-1

PSI MIC NO. A744

CUSTOMER

PROCESS SYSTEMS INTERNATIONAL, INC.

20 WALKUP DRIVE

WESTBOROUGH MA 01581
ATTENTION:

PROCESS SYSTEMS INT'L, INC.

Reviewed this report and it complies

with SA/SB-182 Gr. 304L
95 Edition Addenda

By C. W. Tolak Date 10-1-96

CHEMICAL ANALYSIS

HEAT NO.	C	SI	P	MN	S	NI	CR	MO	V	AL	TI				
809279	✓	✓	✓	✓	✓	✓	✓								
809280	.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 DHN	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	X SHR	LAT EXP
809279	6G2844A	← A744	+75		PROLONG	74.5	37.0		61.0	81.0					
809279	6G2844B														
809279	6G2844C														
809279	6G2844D														
809279	6G2844E														
809279	6G2845A														
809279	6G2845B														
809279	6G2845C														
809279	6G2845D														
809279	6G2845E														

IT-4



ST 71720-4911

STANDARD STEEL

A Division of FREEMAN PORCE Corporation

MECHANICAL CERTIFICATION

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	XRED AREA	I M P A C T D A T A						
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE	
	509279	662846A															
	509279	662846B															
	509279	662846C															
	509279	662846D															
	509279	662846E															
	509280	662847A		+75			74.5	36.5	64.0	79.0							
	509280	662847B															
	509280	662847C															
	509280	662847D															
	509280	662847E															
	509280	662848A															
	509280	662848B															
	509280	662848C															
	509280	662848D															
	509280	662848E															
	509280	662849A															
	509280	662849B															
	509280	662849C															
	509280	662849D															
	509280	662849E															

PSI MIC NO. A744

PROCESS SYSTEMS INT'L., INC.
 Reviewed this report and it complies
 with ASME-182 Gr. 304L
95 Edition, Addenda
 By C. Watecki Date 0-1-96

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. Keller
 HGR. LABORATORIES

P. 5/5
NO. 174
M. LAB
STANDARD STEEL
11:41AM
SEP 8 1997

WASHINGTON STEEL

TEST CERTIFICATE

PAGE NO. 01 OF 01
FILE NO: 8860-01-0
DATE: 08/08/96
MIL ORDER NO: 22193-001

CUSTOMER P.O.: #24103
DESCRIPTION: 1 - RECTANGLE .375 -X- 96 -X- 192

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

CINCINNATI OH 45241

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

CINCINNATI OH 45241

SHIP TO:
TRINITY INDUSTRIES-CUSTY PICKUP
P.O. BOX 41192
PSI MIC NO. A972

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

ASTM A240-304L, ASME SA240-304L,
ANS 5511, MIL-5-5059

MELT SLAB		CHEMICAL ANALYSIS													PRACTICE		
Y1126	/303	C	MN	P	S	CU	SI	N	CR	MO	V	TI	B	N			
Y1126		✓ .024	✓ 1.81	✓ .025	✓ .004	.29	✓ .52	✓ 9.4	✓ 18.18	.22				✓ .0775			
PROD ANALYSIS		.025	1.84	.024	.004	.29	.53	8.4	18.13	.23				.0800			

TENSILES				CHARPY V IMPACTS				OTHER TESTS PERFORMED				
TYPE	YLD (PSI X 10 ³)	TENS (PSI X 10 ³)	ELONG 2"	% RA	TYPE	TEMP	MILS LATERAL EXPANSION	% SHEAR	BEND TEST - LOC/DIR BX - PASS			
BK	524	872	71.0	66.0					BRINELL - 163 TEST LOC			
									CORROSION A262E SATISFACTORY			

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

INFORMATION				HEAT TREAT CYCLES - MATL OR TESTS - DEG FAI							
WEIGHT PER PIECE = 2111 LBS. 960 KG.				MATL	TEST	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS	COOL METHOD	
MERCURY OR MERCURY COMPOUNDS ARE NOT USED IN THE MANUFACTURE OF LUKENS/WASHINGTON'S PRODUCTS.				X	X	1950			0012	WQ	
CORROSION TEST PER ASTM A262 PRACTICE A C E.				HEAT TREAT CYCLES - TESTS ONLY - DEG FAI							
PART NO. 2-12121				START END TEMP	NOM TEMP	MIN TEMP	MAX TEMP	HOLD MINS	HEAT RATE MAX		
B/L 038239 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: Quality Assurance Laboratory
Coatesville, PA 19320

#244 P.16

TEL NO: 513 672 3236

NOV-13-'96 WED 15:48 ID:



Burnham, PA 17009
Tel. 717-248-4911

STANDARD STEEL

QPO90-F1
A Division of FREEDOM FORGE Corporation

METALLURGICAL CERTIFICATION

FOR: PROCESS SYS. INT'L

PSI MIC NO. A375

CUSTOMER ORDER NUMBER 555370

PCS SHIP. ---

REPORT DATE: 07/08/96

02 OUR ORDER NO 432617501

SHIPLIST NO: 54441

RING MACHINE TO DRAWING SIZES DWG: VD49M135-1
SPECIFICATION: ASME SA102 GRADE F304L IN ACCORDANCE WITH PROCESS SYSTEMS SPEC.
AV049-2-040 REV 3

VD49M135-1

PRODUCT

PROCESS SYSTEMS INTERNATIONAL, INC.
20 WALKUP DRIVE

WESTBOROUGH
ATTENTION:

MA 01581

PROCESS SYSTEMS INT'L, INC.
Reviewed this report and it complies
with SA102-102 Gr. 304L
21 Edition Addenda

By C. W. Wozniak Date 7-29-96

CERTIFIED

HEAT NO.	CHEMICAL ANALYSIS										
	C	SI	P	MN	S	NI	CR	MO	V	AL	TI
S09072	.020	.42	.028	1.76	.005	11.39	18.96				

N .0630

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	MECHANICAL PROPERTIES				I.M.P.A.C.T DATA					
						UTS (KSI)	YIELD ST (KSI)	% ELONG	% RED AREA	LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
S09072	6E1594A		+75		PROLONG	78.5	33.5	60.0	55.0						

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

FOR: PROCESS SYS INT MA
CUSTOMER ORDER NUMBER 555492
REPORT DATE: 08/20/96

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

PRODUCT

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

VD49M136-1

PSI MIC NO. A662

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 18A Gr. F304L
93 Edition, Addenda
By C. W. [Signature] Date 9-16-96

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 .0550		

MECHANICAL PROPERTIES

HEAT NUMBER	SERIAL NUMBER	BRINELL	TEN TEMP (F)	TEN BHN	TENSILE LOCATION	UTS (KSI)	YIELD ST (KSI)	X .20% OF ST	ELONG	X RED AREA	I_M_P_A_C_T_D_A_T_A					
											LOCATION	TEMP (F)	FT. LBS	X SHR	LAT EXP	GRN SIZE
S09279	6G2856A		+75		PROLONG	74.5	37.0		61.0	81.0						
S09279	6G2856B	A662														
S09279	6G2856C															
S09279	6G2856D															
S09279	6G2857A															
S09279	6G2857B															
S09279	6G2857C															
S09279	6G2857D															

TYPE OF HEAT TREATMENT: SOLUTION TREATED AND QUENCHED

Weld Wire Coats



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/77410500

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
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

TO: BOC GASES (AIRCO)
LISLE IL

SHIP TO: *70065-R/774101500*
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
<i>5440928</i>	.021	.470	1.800	.014	.013	20.00	9.68
Mo	Co	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
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 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 GAZES
 90 RESEARCH ROAD
 HINGHAM, MA 02043

56 lbsy

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	B6MT085		AWS A5.22 E308LT0-1 ASME SPA-5.22 E308LT-1										
CHEMICAL COMPOSITION (%)														
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	H	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:FN	6.0	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			- °C	AVG.								
- kgf/mm ²	- kgf/mm ²	59.6 kgf/mm ²		52 %		- J								
						- kgf.m								
WELDING CONDITIONS														
TYPE OF CURRENT	DCEP	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 - 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

80 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)	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			

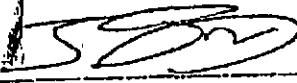
CHEMICAL COMPOSITION (%)																
ELEMENTS	C	SI	MN	P	S	CU	NI	CR	MO	NB	TI	FN	FS	PHU		
DEPOSITED METAL	0.026	0.43	1.10	0.022	0.012	0.04	12.75	22.56	0.04	0.02	0.07	15.0	8.7	12.0		
ELEMENTS																

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.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)
 FN = FERRITE (DELONG DIAGRAM)
 PHU = 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.

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

197#01R18 (A) 19:12 宛先 K W A I
 電話 045452577
 東京都千代田区豊洲 1-1-3 住友ビルディング 10F
 (株) 海外部
 08/19

04/09/1997 15:57 7139748424 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.

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



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
\$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 Damiani, Quality Engineer

15(66119)(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

.035

STAINLESS STEEL WELDING WIRE TYPE ER 308L

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

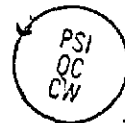
JGP ISSUE DATE: 08-30-96
DATE SENT 6-27-97

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
NIوبيUM		.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

9

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

17-14-97 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: 49455-66LB ✓
49720-33LB ✓
50293-33LB ✓

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
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*

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)



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.

BOC GASES
90 RESEARCH ROAD
HINGHAM, MA 02043

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


Celeste Brennan
15(66119)(10)

90 RESEARCH ROAD
HINGHAM, MA 02043

X/11

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		PSI OC CW		APPLICABLE SPECIFICATION AND CLASSIFICATION								
DW-309L	1.2	B6F2110382				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	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			
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) FRC = FERRITE (NRC)				
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.							◆ KOBEL 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



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/1774101500

6-13-97

X/11

KOBE

PURCHASER <i>Process Systems Inc/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										
0W-309L	.035 84LB	B6M1015		AWS A5.22-95 E309LTO-1 ASME SFA-5.22 E309LT- (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			HARDNESS			
N/mm ²	N/mm ²		555 N/mm ²		37 %		- °C	AVG. — 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		— °C x — h								
CURRENT	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 <i>[Signature]</i>				

REMARKS: CAPITAL LETTERS ARE USED EXCEPT FOR UNIT.

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) 941-9154 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:

Handwritten signature and initials



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



*Tommy took
1 box of 10
to TIF same
at
4/29/97*

Chemical Composition Limits

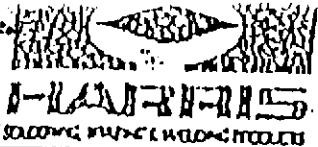
Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

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:

V.P. - Quality Control



J. W. HARRIS CO., INC. | 10939 DEENFIELD ROAD | CINCINNATI, OHIO 45242

J. W. Harris Co.
Certificate of Conformance

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

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	A95 A510-00 ASME SFA 5.10		90-A-5660 Class	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Elms Each
	ER1100	R1100										
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	0.05-0.10	0.02				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	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	0.05-0.10	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		0.15	0.05
5052 Aluminum	ER5052	R5052	5052		0.40	0.10			0.05-0.20			0.05
5083 Aluminum	ER5083	R5083	5083		0.40	0.10			0.05-0.20			0.05
5052 Aluminum	ER5052	R5052	5052		0.40	0.10			0.05-0.20			0.05

NOTES:

1. Specifications shown are machine purchased specifications.
2. Impurity shall not exceed 0.0009 percent.
- A. Silicon plus iron shall not exceed 0.25 percent.
- B. Zinc plus copper content is the difference between the total zinc plus copper content and the zinc plus copper content of the base metal. Each shall not exceed 0.010 percent or more each, expressed as the difference between the total zinc plus copper content and the zinc plus copper content of the base metal.
- 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 inspections as mentioned.



FORM 1-6177490165

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:

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
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

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

Daniel Dawlani
6119(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/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)

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

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)



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, 9.58. 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

Signature of Daniel Damiani
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
70062.7-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

(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/459049-042
TK 693415
50 LB.*

Bengt H. Berg, Director, Quality and Metallurgy

5(66119)(10)

BOC GASES
1000 WOOD 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-E/V59049-042

TAG:

ANS 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

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
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:

Lucas E. Deman
Control

[Signature]
Certifying Signature

29



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.

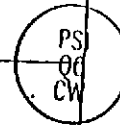
Date Shipped 10-18-96

Order No. 712222

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

Comments:

P.O. 700643-R/V5904904302



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							
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		0.20			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.
- 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 Compl

Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. P011

Shipped To: PROCESS SYSTEMS INTL

Date _____
Date Shipped 10-25-96

PO 700.643R/V5904.9043000

Order No. 713960-01

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

Comments: BOC 010-3
90 RESEARCH ROAD
HINGHAM, MA 02043

Alloy	AWS 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	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	0.02		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	0.15	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 0.95 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.

(1)

1996.10-31 04:01 #925 P.02/02
 5083705930
 FROM: AIRCO/EOC 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 SFA.5.10		QQ-R-566B + Glass	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Percent Other Ele
1100 Aluminum (B)	ER1100	R1100	1100	A	A	0.05-0.20	0.05					Each
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	0.0	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	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.

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

52

AlcoTec

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:



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 CONEC legislation.

Additional Order Requirements:

James L. 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 ILSHIP TO: *PROCESS SYSTEM*CUSTOMER PURCHASE ORDER NO.: *700650-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."

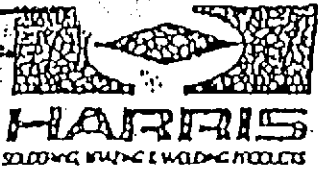
Material has been manufactured in accordance with Sandvik Steel Company Quality Manual Revision 10 dated October 1, 1995. Quality system approved to ISO-9002/ANSI/ASQC Q9002-1994.

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

 15(661197)(10)
BOC GASES

RESEARCH ROAD

BINGHAM, MA 02043





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

J. W. Harris Com
Certificate of Comp

Date _____

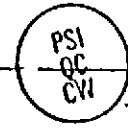
Sold To: AIRCO NEW ENGLAND
90 RESEARCH ROAD
HINGHAM, MA 02043
P.O. No. PO#

Shipped To: Process Systems Intl
PO 70015R/7741000

Date Shipped 3-28-97

Order No. 797282

Item	Weight	Size	Alloy	Heat No.
1.	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		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
718 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 0.0008 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 with applicable purchase specifications having passed our inspections as noted.

35

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 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. 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 / CP
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
ST10840	.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
S712975 -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. Kettle, Manager, Quality & Metallurgy

15(03030, REV.2)(10)

42



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

AlcoTec Wire Company
2750 Aero Park Drive
Traverse City, MI 49888 USA
(818) 941-4111 Phone
(818) 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

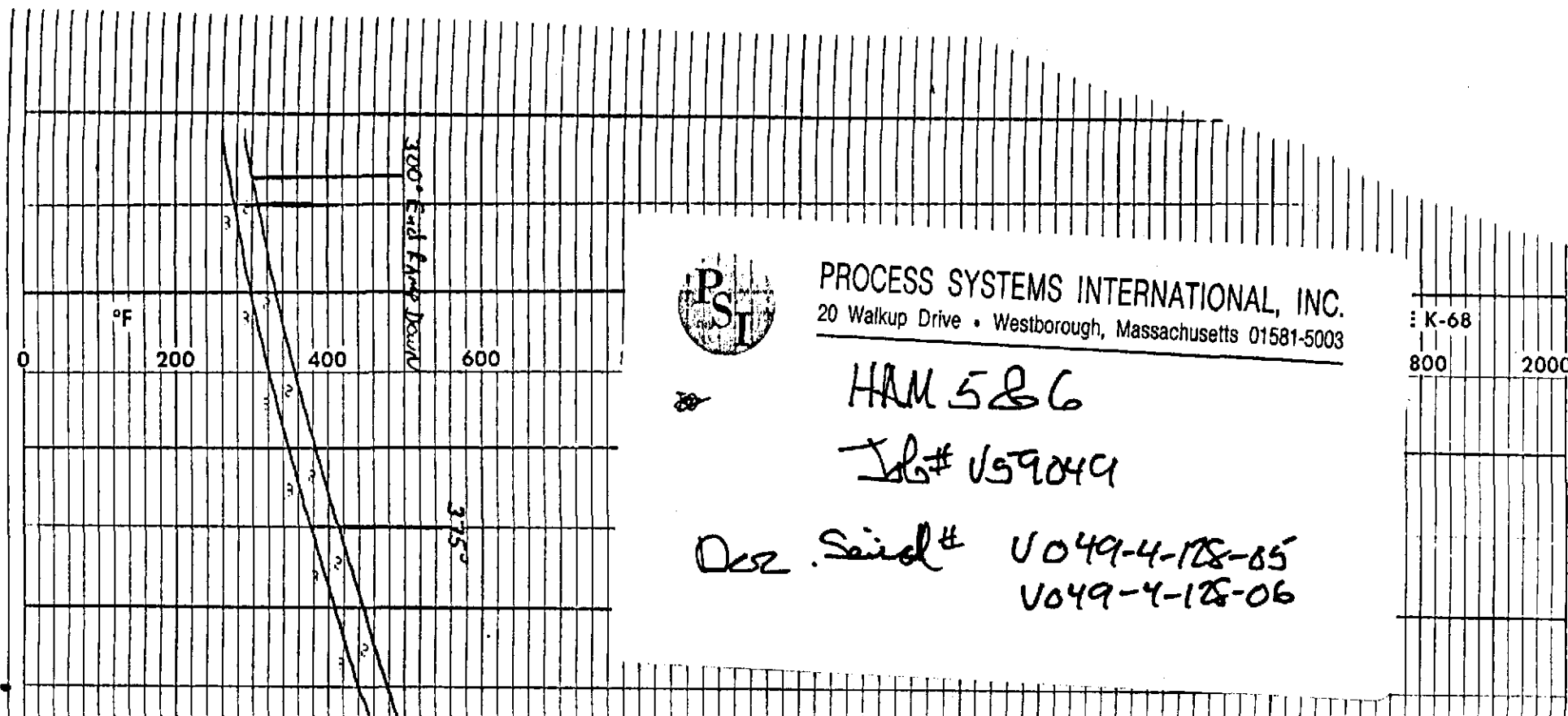
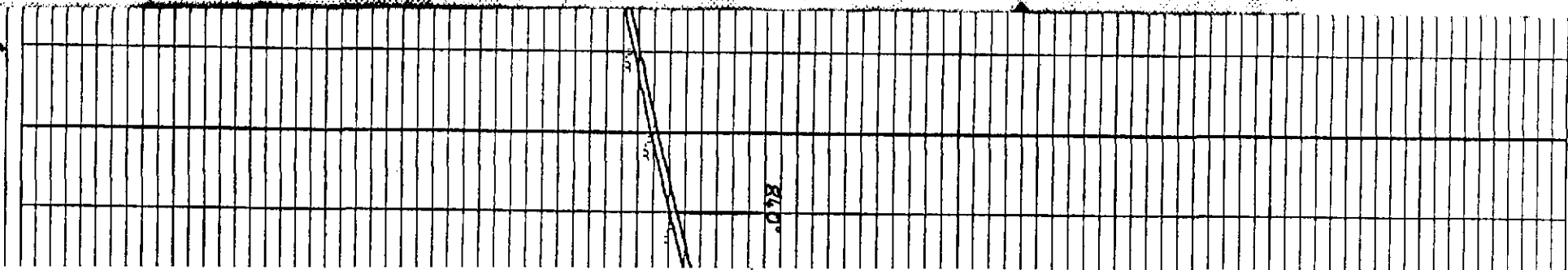
Element	Minimum %	Maximum %
Si	---	0.40
Fe	---	0.40
Cu	---	0.10
Mn	0.50	1.0
Mg	4.3	5.2
Cr	0.05	0.25
Zn	---	0.25
Ti	---	0.15
Be	---	0.0008
Other Each	---	0.05
Other Total	---	0.15
Aluminum	Remainder	

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:

[Handwritten Signature]



TAG# WHAM4 Ser#5 Ham #5

Title

SPECIFICATION FOR CLEANING PROCEDURE

Attachment

LIGO COMPONENT CLEANING DATA SHEET

Project V59049

Component	Serial Number
# Ham	5
84" Cover	12715
84" Cover	12709
2-60" Test Covers	

Wash Cycle: Manual

Flowrates: 30 Gpm Max. Temp.: 146° Duration: 5 hrs

Operator: Bruce / Bill Date: 5-27-97

Comments: _____

Component(s) Inspected By: John Hill Date: 5/27/97

Quality Assurance: Quibee Date: 5-30-97

Comments: _____

Number
Rev.

SPECIFICATION		
Number	V049-2-015	Rev.
A		2

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: HADIN S/N: 5 WORK ORDER: 215
 DATE/TIME: 3/27 11:00 pm
 OPERATOR: Bruce / E/14

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 = 30 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 = 120 MIN

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

NOTES: Passivated 5/27 by Bruce

SPECIFICATION

Number AV049-2-184 Rev. 1

Page 2 of 2

Number _____ Rev. _____

Hand #5

LIGO DATA SHEET
MANUAL WASH STATION

Title

PART DESCRIPTION: Cover 84" S/N: 12715 WORK ORDER: 215
 DATE/TIME: 5/28
 OPERATOR: Bruce / Jess

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.
2. FILL POWER WASHER TANK WITH A 50% SOLUTION OF IMPRO CLEAN 1300 AND D.I. WATER.
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.
7. POWER RINSE COMPONENT. ALL SURFACES SLOWLY COVERED AT LEAST TWICE.
8. REMOVE EXCESS WATER WITH VACUUM OR CLEAN AIR WAND.
9. ALLOW COMPONENT TO DRY BEFORE MOVING TO CLEAN ROOM.

TI925= 145 F
 MIX 1:1 Done
 WASH TIME = 20 MIN
 RINSE TIME = 40 MIN
 DRY TIME = 40 MIN

NOTES: Assisted for Rust Spots

Handwritten initials

Number
A1049-2-184
 Rev
 1

SPECIFICATION

Number Rev

Title: COMPONENT RGA TEST PROCEDURE

TITLE	TEST ARTICLE PARAMETERS PUMPDOWN LOG
DATE:	6/13/97
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM 4-1 4-1
PSI TEST ENGINEER:	<i>[Signature]</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	
	6/13	1515	hr:min	7.0×10^{-3} Torr
		1750	hr:min	restart turbo
		2330	hr:min	1.9×10^{-7} Torr
	6/14	0300	hr:min	4.0×10^{-6} Torr
		1330	hr:min	2.0×10^{-6} Torr
		2100	hr:min	1.0×10^{-5} Torr
	6/15	1120	hr:min	4.4×10^{-6} Torr
	6/16	650	hr:min	3.0×10^{-6} Torr
	6/16	11:00	hr:min	2.7×10^{-6} Torr
		1500	hr:min	2.7×10^{-6} Torr
	6/17	700	hr:min	2.2×10^{-6} Torr
		1520	hr:min	4.7×10^{-7} Torr
		1920	hr:min	1.6×10^{-7} Torr
	6/18	700	hr:min	1.8×10^{-8} Torr
		945	hr:min	6.2×10^{-9} Torr
		1100	hr:min	4.5×10^{-9} Torr
		1140	hr:min	4.3×10^{-9} Torr
		1230	hr:min	1.5×10^{-8} Torr
			hr:min	Torr

START TURBO

✓ leak

1750 turbo tripped due to lightning

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. WBSC1_1

WHAM ~~4-1~~ 4-1

PSI TEST ENGINEER:

B

QUALITY ASSURANCE:

BAKEOUT LOG / DATE	TIME		TEMPERATURE	
START BAKE 6/13	1500	hr:min	23	°C
5°C/hr	1750	hr:min	31	°C
	2330	hr:min	29°	°C
6/14	0300	hr:min	80°	°C
	1330	hr:min	80°	°C
	2100	hr:min	147°	°C
6/15	1120	hr:min	150°	°C
6/16	650	hr:min	150°	°C
	1500	hr:min	150°	°C
6/17	700	hr:min	150°	°C
	1520	hr:min	99°	°C
	1920	hr:min	79	°C
6/18	700	hr:min	40-45	°C
	945	hr:min	35-40	°C
	1100	hr:min	30	°C
		hr:min		°C
		hr:min		°C
		hr:min		°C
		hr:min		°C

51B, 43B TC REMOVED

@ TEMP (150°C) FOR 57 hrs.

6/17 700 START RAMP DOWN

1920 TURN OFF (DEACTIVATE) ALL ZONES EXCEPT 54, 55, 56 (SPOOL)

- ALL ZONES WERE 0% RELAY

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	WHAM 4-1
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. WBSC1_1	WHAM 4-1	
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: 6/19/97	
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM 4-1
PSI TEST ENGINEER: <i>DM</i>	
QUALITY ASSURANCE:	

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

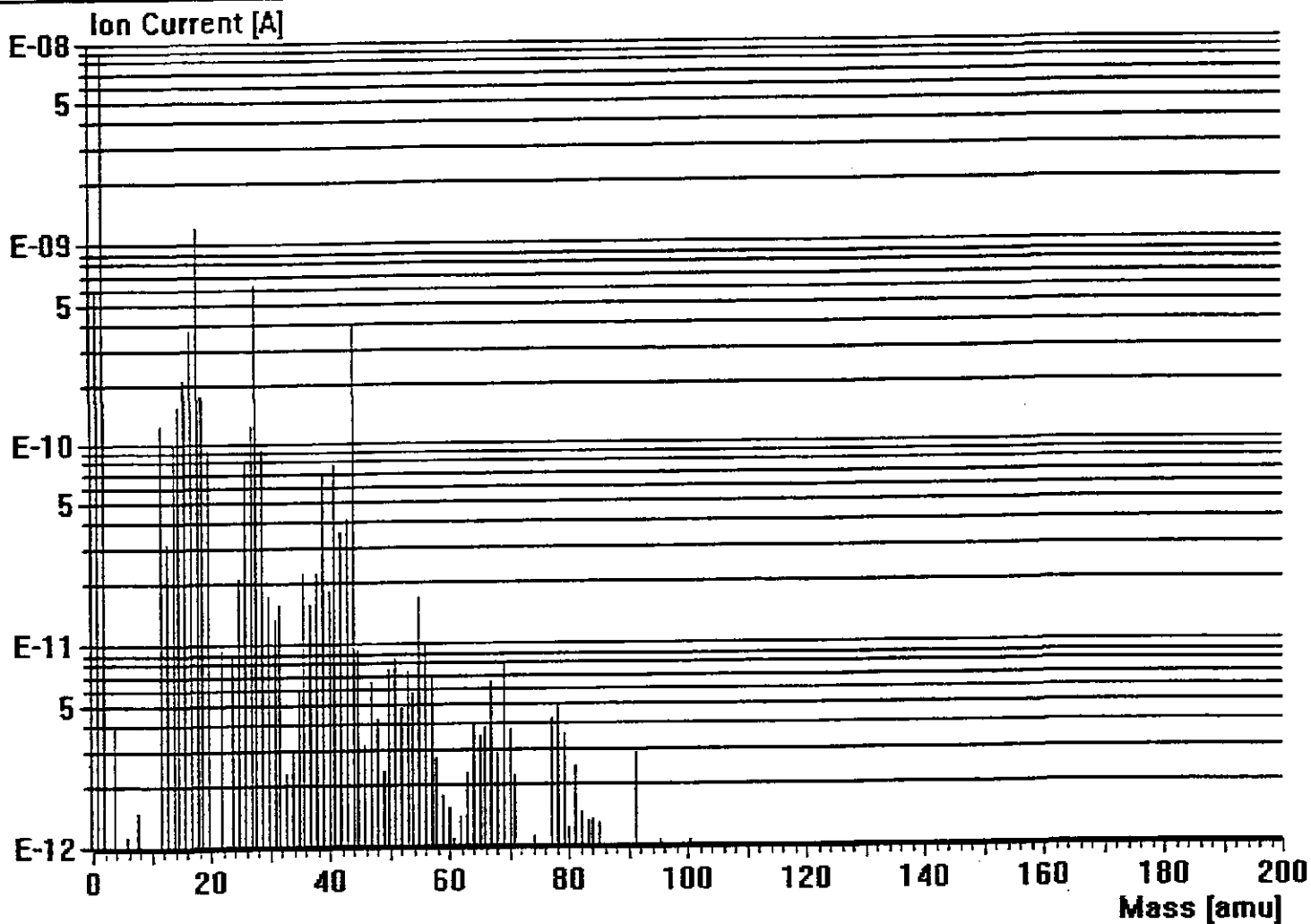
AMU	I (Amp)	Leak rate Torr-L/s	F _{amu} Sensitivity Factor wt N2	I with leak (Amp)	Gas load sensitivity Torr-L/s-A	Q Torr-L/s	q Torr-L/s-cm ²
H2	9.0E-9	4.8X10 ⁻⁹		2.9E-8	240.	2.16E-6	8.8E-12
12			0.42				
14	5.E-11		0.5		1730.	6.1E-8	2.5E-13
15			0.54				
CH4	2.1E-10		0.57		1730.	2.7E-7	1.1E-12
17			0.6				
H2O	1.2E-9		0.64		1730.	1.7E-6	6.7E-12
19			0.67				
26			0.71				
28	4.5E-10	9.5X10 ⁻¹¹		1.0E-9	1730.	7.8E-7	3.2E-12
32	1.4E-11		1.14		1730	2.6E-8	1.0E-13
38			1.36				
40	1.8E-11	9.4X10 ⁻⁹		5.9E-11	2290.		
43			1.53				
44	2.0E-10		1.57		1730.	4.3E-7	1.8E-12
129	3.E-13	2.5X10 ⁻⁹		5.0E-12	5320.		
131		2.0X10 ⁻⁹					
132		2.5X10 ⁻⁹					
134		1.0X10 ⁻⁹					
OTHER	5.6E-10				1730	9.7E-7	3.9E-12

AREA = 2.45 E5 CM²

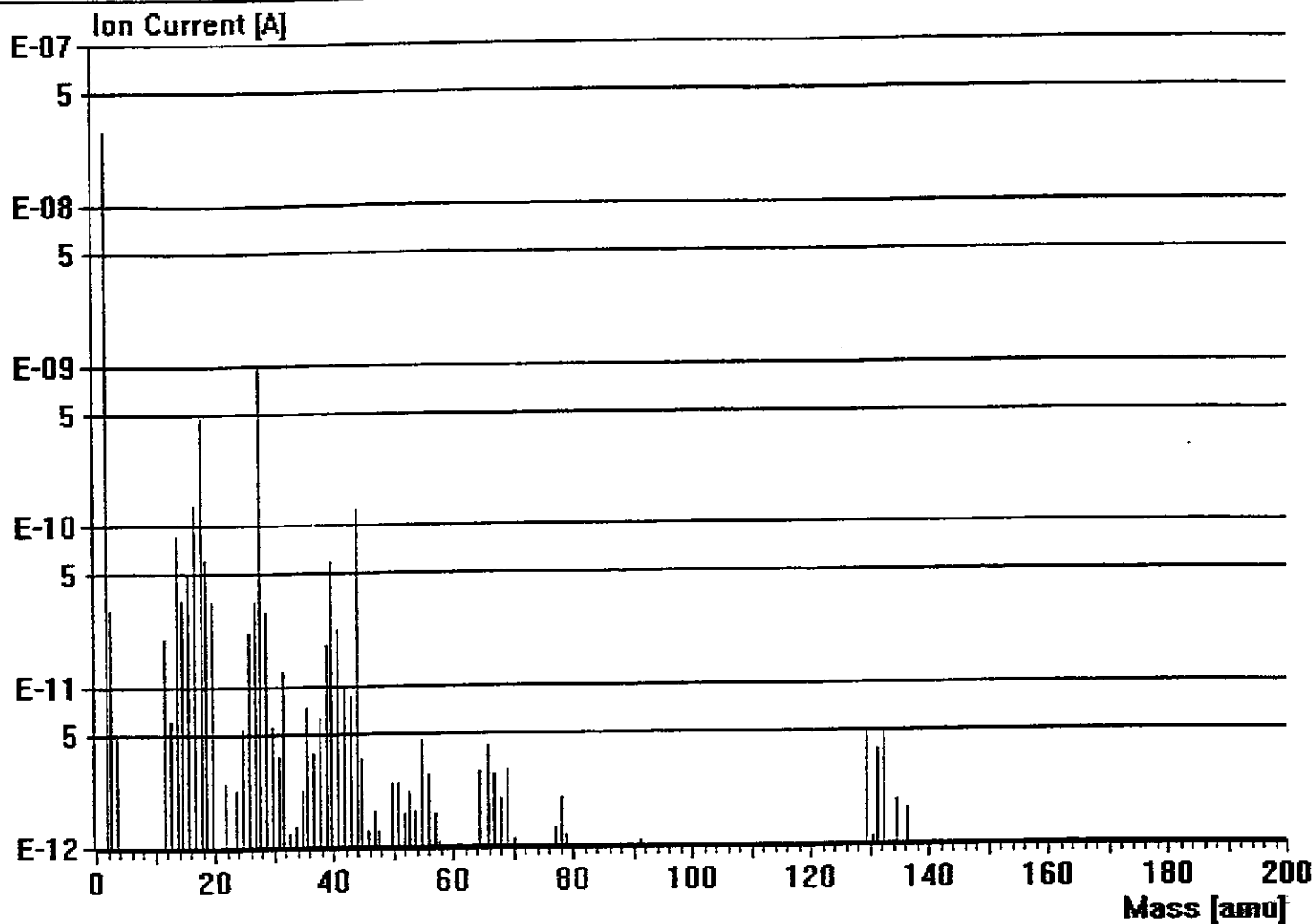
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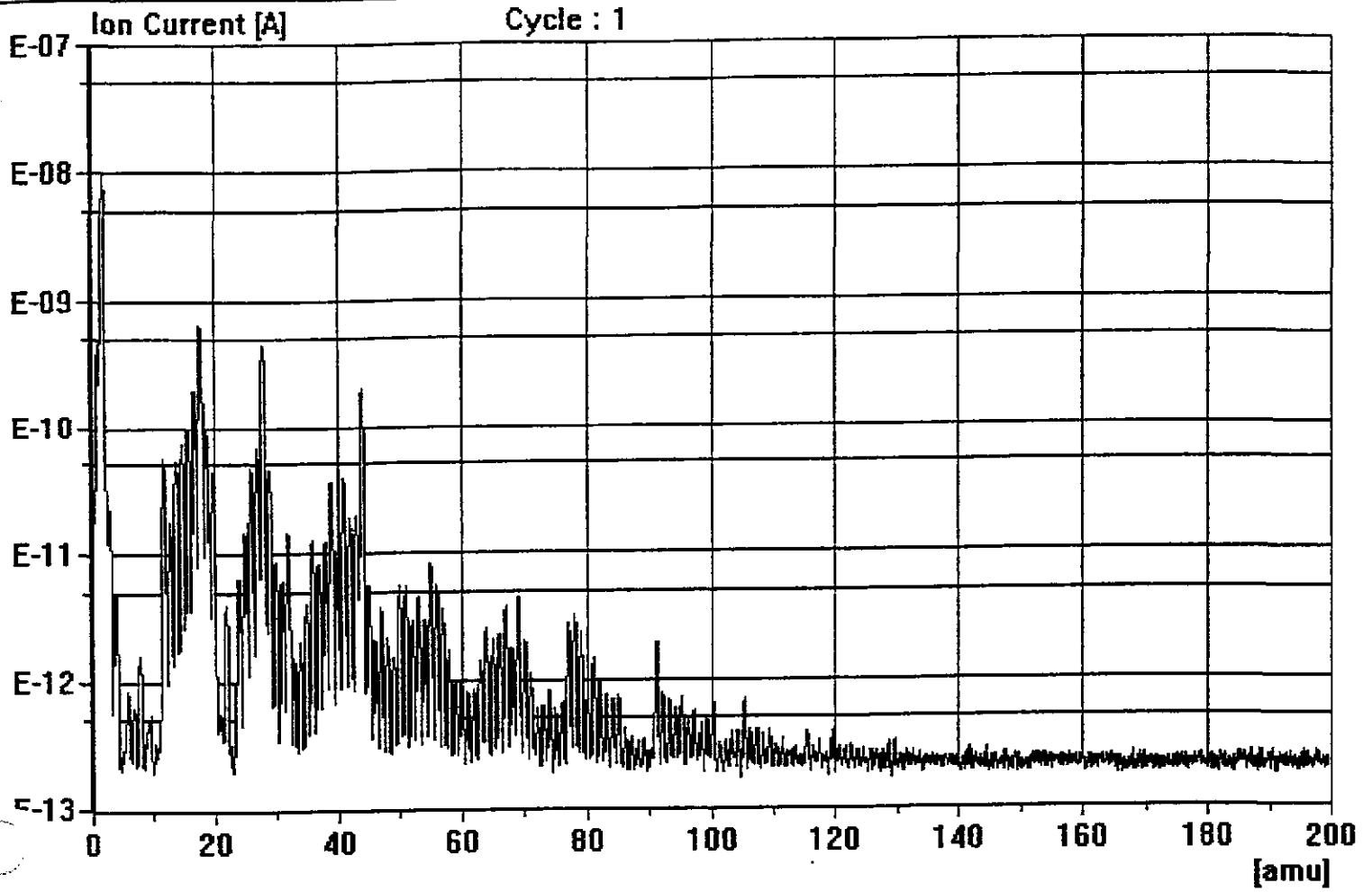
Number: V049-2-127 A	Rev. 1
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Setup Print Library



Setup Print Library

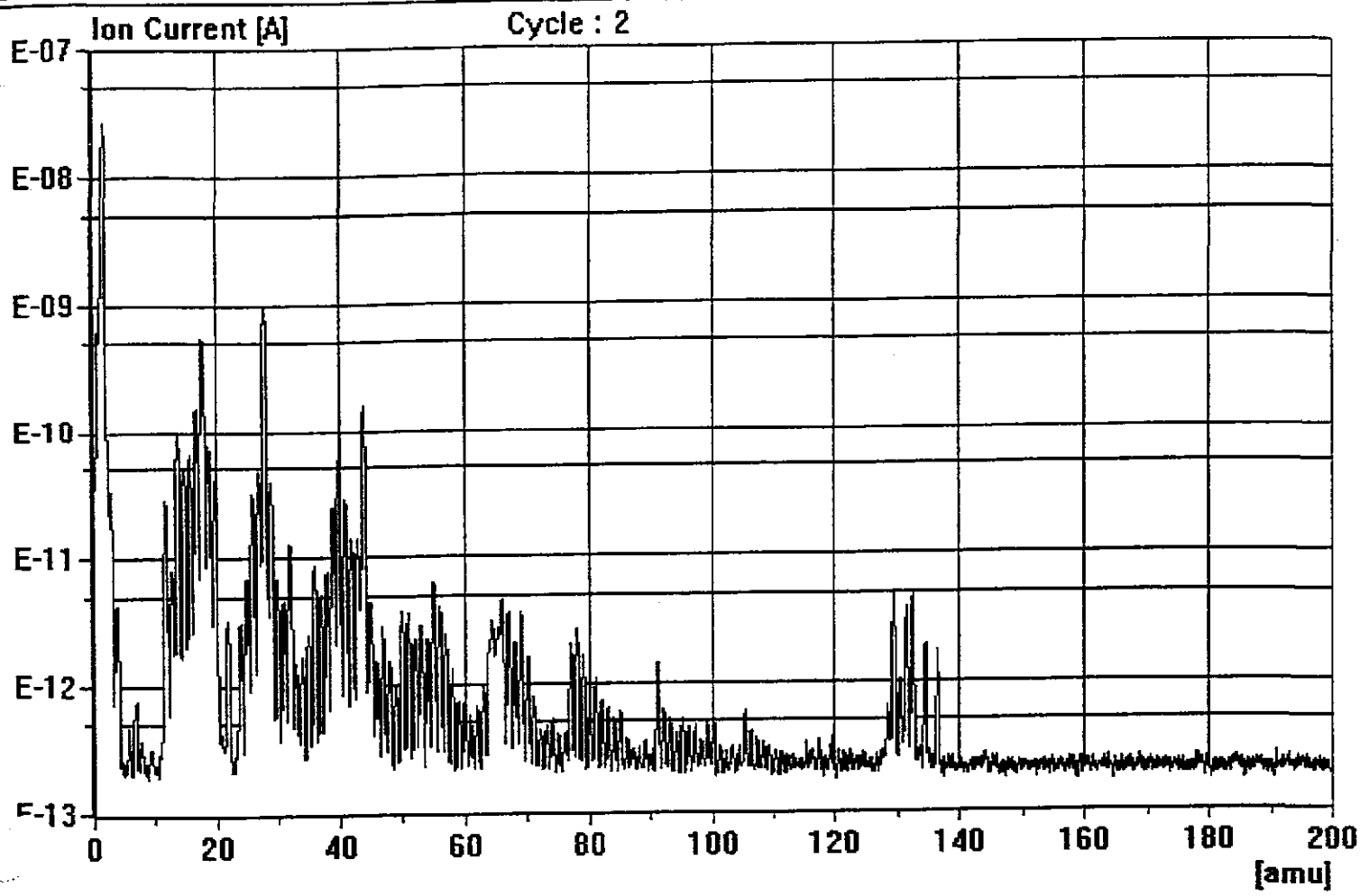


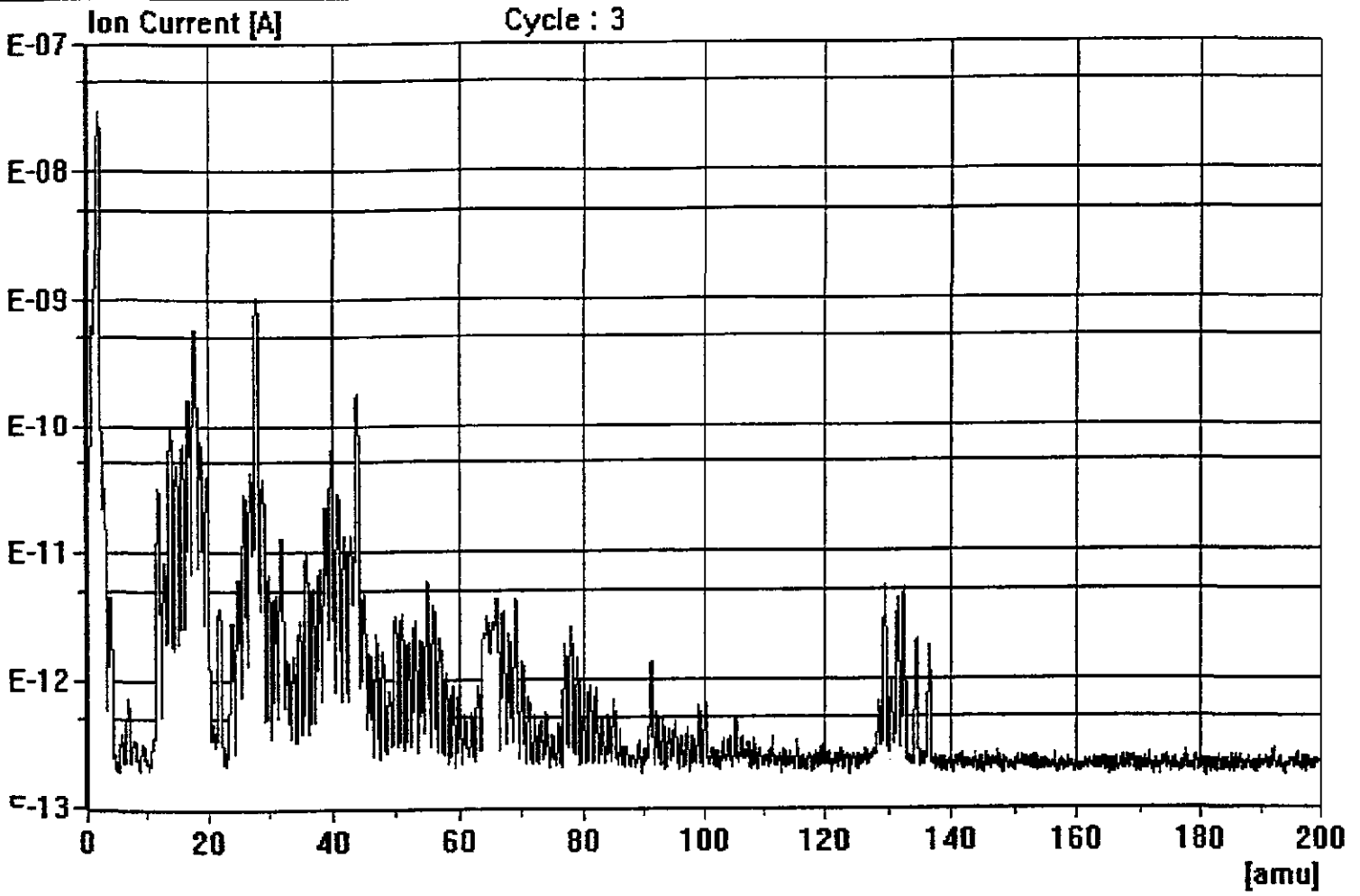


X: 110.72

Y: 1.982179E-11

C: 1





X: 179.25

Y: 1.503636E-11

C: 3

SCAN BARGRAPH CYCLES : wham4 1.sbc

CYC: 2 6/18/97 12:33:14 PM:89 TIC: 3.122776E-08[A]

m/e	Intensity[A]	m/e	Intensity[A]	m/e	Intensity[A]
1.94	2.887667E-08	2.91	2.998119E-11	3.88	4.722673E-12
6.81	6.638152E-13	11.88	1.964547E-11	12.88	6.146325E-12
13.88	8.690597E-11	14.91	3.512730E-11	15.88	4.979133E-11
16.88	1.321889E-10	17.91	4.720902E-10	18.91	6.000663E-11
19.91	3.318087E-11	21.91	2.444424E-12	23.91	2.218915E-12
24.88	5.434288E-12	25.94	2.203396E-11	26.94	3.333534E-11
27.94	9.642720E-10	28.97	2.909581E-11	29.97	5.479211E-12
30.94	3.558795E-12	31.94	1.240628E-11	32.88	1.207663E-12
33.97	1.304692E-12	34.94	2.252435E-12	35.97	7.430567E-12
36.94	3.793052E-12	37.97	6.204485E-12	39.00	1.805813E-11
39.94	5.886398E-11	41.03	2.242532E-11	42.03	9.695667E-12
43.03	8.633949E-12	44.00	1.235794E-10	45.00	3.459618E-12
46.00	1.231857E-12	46.94	1.646643E-12	47.97	1.231407E-12
48.94	6.951844E-13	50.06	2.450756E-12	51.06	2.503035E-12
52.06	1.616762E-12	53.06	2.166459E-12	54.06	1.635926E-12
55.13	4.594111E-12	56.13	2.822405E-12	57.13	1.613705E-12
58.09	1.069567E-12	59.22	7.167953E-13	60.16	5.816991E-13
63.09	7.288634E-13	64.56	2.862964E-12	66.13	4.164361E-12
67.19	2.804546E-12	68.13	1.955401E-12	69.16	2.954090E-12
70.19	1.099327E-12	71.19	6.126317E-13	73.16	4.165427E-13
76.13	4.439213E-13	77.19	1.300300E-12	78.25	2.011516E-12
79.22	1.184698E-12	80.22	4.280279E-13	81.34	6.810744E-13
82.41	5.632071E-13	85.25	5.124035E-13	91.34	1.077446E-12
92.34	4.527487E-13	93.34	4.175356E-13	95.50	4.452394E-13
99.44	4.228157E-13	100.41	5.268537E-13	105.47	4.156108E-13
129.53	5.063137E-12	130.56	1.083139E-12	131.56	3.804069E-12
132.56	4.900306E-12	134.56	1.885905E-12	136.63	1.654390E-12

SCAN BARGRAPH CYCLES : wham4 1.sbc

CYC: 1

6/18/97

11:14:42 AM:61

TIC: 1.401880E-08[A]

m/e	Intensity[A]	m/e	Intensity[A]	m/e	Intensity[A]
1.06	5.922441E-10	1.94	9.040678E-09	3.94	4.046019E-12
5.88	1.129431E-12	6.94	5.365084E-13	7.81	1.490270E-12
9.28	7.504794E-13	11.88	1.218787E-10	12.91	3.213296E-11
13.91	9.668957E-11	14.91	1.562718E-10	15.91	2.094188E-10
16.91	3.717487E-10	17.91	1.203551E-09	18.88	1.762041E-10
19.91	9.183115E-11	21.97	9.376273E-12	23.88	8.993533E-12
24.94	2.156730E-11	25.94	8.237413E-11	26.97	1.263281E-10
27.94	6.307423E-10 [*]	28.97	9.298969E-11	29.97	1.742366E-11
30.97	1.325728E-11	31.97	1.579331E-11	32.94	2.267937E-12
34.00	2.961974E-12	34.94	6.018909E-12	35.97	2.271172E-11
36.97	1.572123E-11	38.00	2.247193E-11	39.03	6.901694E-11
40.00	1.828011E-11	41.03	7.849554E-11	42.06	3.598729E-11
43.06	4.211304E-11	44.00	4.008739E-10	45.03	9.417031E-12
46.06	3.120942E-12	46.97	6.444774E-12	48.00	4.231819E-12
49.09	2.322098E-12	49.97	7.503738E-12	51.03	8.403165E-12
52.06	4.802487E-12	53.09	7.278125E-12	54.13	5.742001E-12
55.13	1.687903E-11	56.13	9.869831E-12	57.13	6.993516E-12
58.16	2.719730E-12	59.09	1.754335E-12	60.13	1.517065E-12
61.06	1.084527E-12	62.13	1.371253E-12	63.09	2.296672E-12
64.09	3.972800E-12	65.19	3.474119E-12	66.16	3.849249E-12
67.22	6.429242E-12	68.19	2.861276E-12	69.22	7.867996E-12
70.19	3.760060E-12	71.25	2.206770E-12	72.34	7.773337E-13
73.19	8.661795E-13	74.19	1.116960E-12	75.13	7.185673E-13
76.25	9.097356E-13	77.25	4.256452E-12	78.25	4.967088E-12
79.28	3.550444E-12	80.25	1.210249E-12	81.28	2.445473E-12
82.28	1.459718E-12	83.31	1.329860E-12	84.31	1.338314E-12
85.25	1.279178E-12	86.41	4.612728E-13	87.38	3.991202E-13
89.25	4.730791E-13	91.34	2.832316E-12	92.34	9.897202E-13
93.44	9.273862E-13	94.44	8.181225E-13	95.41	1.056249E-12
96.41	7.925537E-13	97.50	8.123025E-13	98.44	6.012012E-13
99.50	7.104355E-13	100.47	1.050432E-12	103.53	4.870480E-13
104.50	4.574180E-13	105.44	9.570267E-13	106.50	5.340317E-13
107.56	5.528724E-13	108.56	4.541751E-13	109.56	5.209210E-13
110.69	4.317800E-13	115.59	5.258559E-13	117.63	4.159567E-13
119.59	4.090225E-13	122.56	3.623598E-13		

Title: COMPONENT RGA TEST PROCEDURE

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

TITLE	RGA COMPUTER DATA FILE LOG
DATE:	
TIME:	
TEST I.D.: e.g. WBSC1_1	WHAM 4-1
PSI TEST ENGINEER:	
QUALITY ASSURANCE:	

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

BARGRAPH DATA FILE NAME WHAM 4-1.Sbc

ANALOG SCAN DATA FILE NAME WHAM 4-1.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

Process Systems International, Inc.
DISCREPANCY REPORT

ROUTE TO Senecal/Bagley

D.R. NUMBER
4844

JOB NUMBER 159049	P.O. NO. N/A	VENDOR PST	SHEET 1 OF
ICT LIGO		ORIGINATOR Senecal	DATE 6-6-97
			REFER TO D.R. NUMBER

I T E M	DWG. ZONE	DISCREPANCIES (LIST CHARACTERISTICS, SPECIFICATIONS AND ACTUAL)	NO. ACC.	FOR REVIEW	QTY. OF PCS./DISPOSITION					REMARKS
					USE NO. CHGE	USE DWG. CHGE	RWK IN SHOP	RET. TO SUP.	SCRAP	
		<u>HAM Ser #5 U049-4-313</u> <u>WHAM 4</u>	<u>0</u>	<u>1</u>			<u>X</u>			
		<u>Failed RGA</u>								

DISPOSITION ---
RECLEAN / TEST / BALEOUT / RGA
RGA SCAN SHOWED THE UNIT WAS NOT
PROPERLY RINSED OR WASH RESIDUE.
REVIEW PROCEDURES WITH ALL WASH TRAINS
 Signature: Phil Fahl DATE: 6/10/97

DISPOSITION CONCURRENCE

PROJECT MGR <u>Phil Bagley</u>	DATE <u>6/10/97</u>	MFG. ENG. <u>Phil Fahl</u>	DATE <u>6/10/97</u>	QUALITY ASSURANCE <u>Gene Senecal</u>	DATE <u>6-13-97</u>
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REINSPECTION

SIGNATURE	DATE

RECTIVE ACTION ---
REVIEWED PROCEDURE w/ ALL PERSONNEL J. J. J.
2. Reclean, Leak test J. J. J.
 Signature: _____ DATE: _____

AI/ANI _____ DATE: _____

RANOR, INC

NONCONFORMANCE REPORT

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

NCR NUMBER: **1038** PAGE 1 OF 1
 NCR- SKETCH ATTACHED

JOB NUMBER 74007/m	CUSTOMER P. S. I.	PURCHASE ORDER NUMBER 556008	QUANTITY 2
PART DESCRIPTION H. A. M. Main Assy.		DOCUMENT NUMBER AND REVISION A V049-2-046 Rev 0	SERIAL NUMBER R.#516

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

DESCRIPTION OF NONCONFORMANCE

ITEM	REQUIREMENT	NONCONFORMANCE
1	Heat Treat Ramp-Up @ 100°F/hr. max.;	Ramp-Up @ 110°/hr. from 510° to 620°F
	Ramp Down @ 100°F/hr. max.	Ramp-Dn @ 110°/hr. from 950° to 840°F
		Ramp-Dn @ 125°/hr from 500° to 375°F

REMARKS:

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

ORIGINATOR/INSPECTOR: Steve 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>

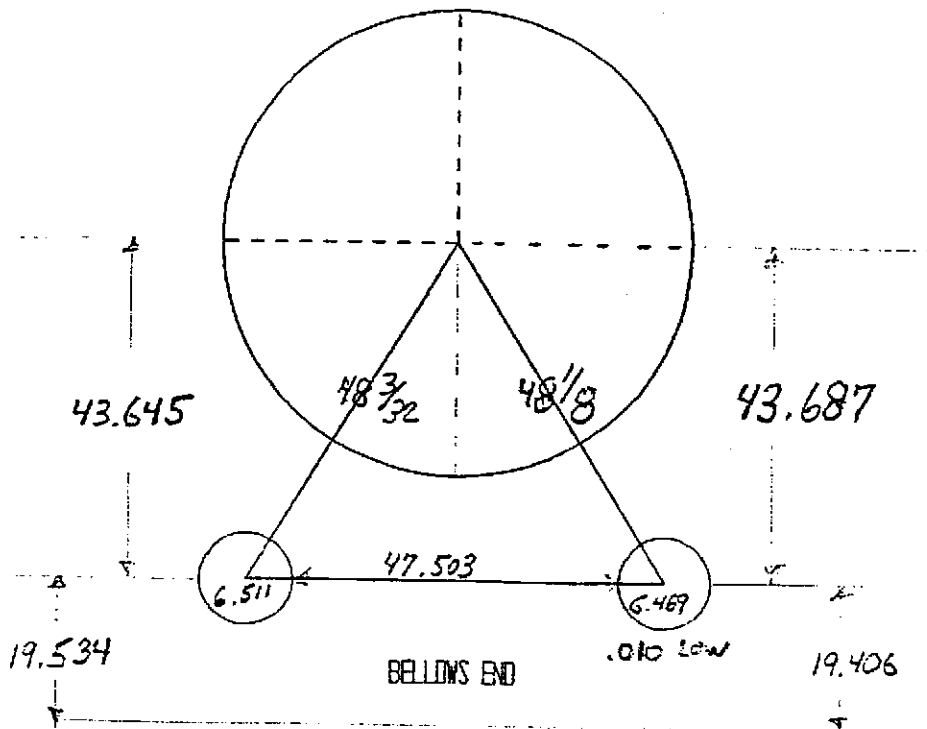
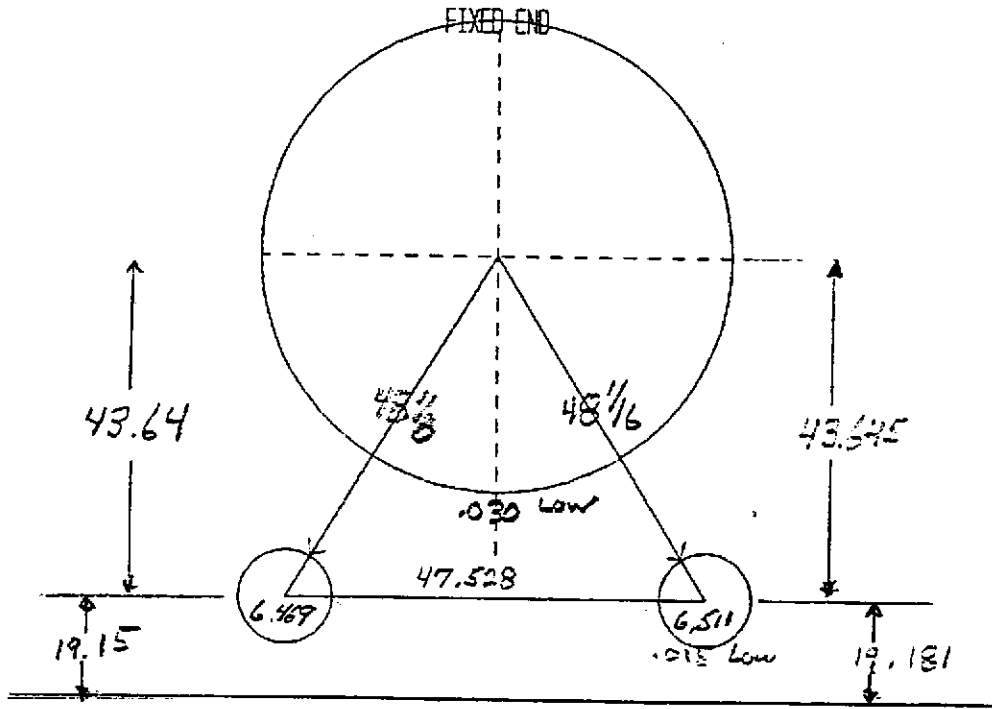
TECHNICAL JUSTIFICATION/DESCRIPTION OF DISPOSITION

ITEM	TECHNICAL JUSTIFICATION	DESCRIPTION OF DISPOSITION
	Submit to PSI for justification and written disposition. <u>Steve Bell</u> 3-27-97	REF NCR 1029. Use AS IS <u>R. D. Lichte</u> 4/16/97 GS 4-17-97

TECHNICAL JUSTIFICATION: BY _____ DATE: _____ DISPOSITION: BY _____ DATE: _____

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 _____	

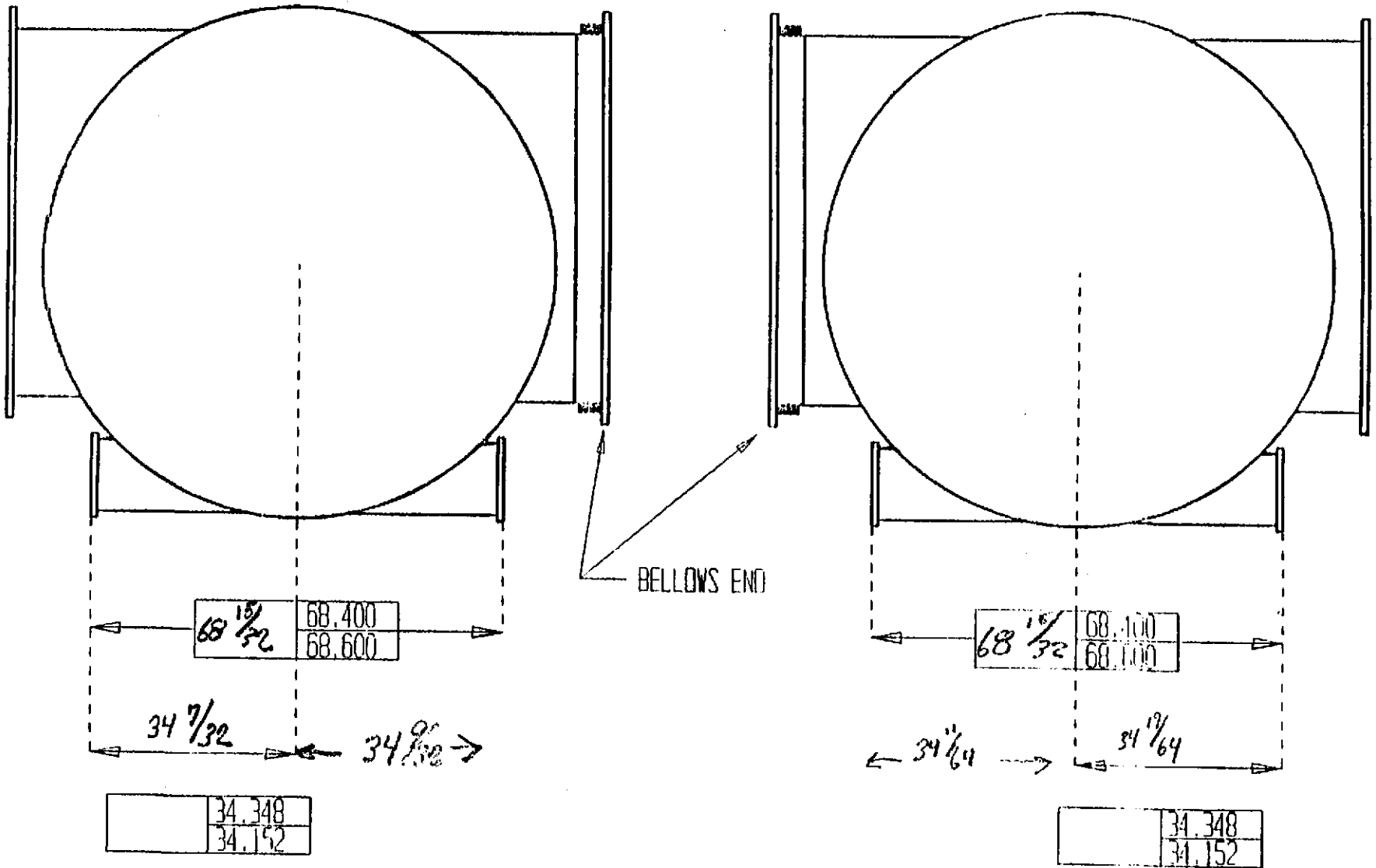
HEAM WELDMENT
 V049128
 S/N # 5
 DIMENSIONS AS FITUP



HAM WELDMENT

VD494128

S/N #5



VU434054

S/N # 5

MEASUREMENTS OF PORTS
AND DIAGONALS OF 60 INCH
PORTS

