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INTERCHANGE / INTERMIX

SSP UNILOK® VS. PARKER HANNIFIN CPI™

ENGINEERING TECHNICAL REPORT

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SSP INTRODUCTION

Since 1970, Parker CPI™ Instrumentation Tube Fittings have been designed as leak-free connections for process, power and instrumentation applications. The Parker CPI™ single ferrule system requires only two metal-to-metal seal points to effect a leak-tight seal. These seals are to the fitting and to the tubing. The Parker CPI™ tube fitting is designed so that repeated remakes will not affect sealing performance. Even in the over-made condition sealing ability is excellent. The single-ferrule design is responsible for this performance. The Parker CPI™ single ferrule design allows the ferrule to bow during make-up. The bowing action of the ferrule creates an active element that can expand and contract with temperature cycling and maintain a leak-tight seal.[1]

In 1993 in response to continued customer requests for an alternative product offering in the Instrumentation marketplace; strategic plans were developed within SSP to design, manufacture and distribute American manufactured, Instrumentation quality tube fittings as a direct alternative to the registered trademark brand of Parker CPI™. Following an ISO 9001 design process pattern, the critical elements of design planning, including the detailed documentation of design inputs and outputs occurred for the development of **Unilok®** tube fittings.

To accomplish the required design plan tasks of verification and validation, a specialized Technical Center was built within SSP. In addition to the exhaustive engineering calculations for confirmation of design conformance to industry standards and other engineering developed criteria, customized NIST traceable testing equipment was procured to allow comprehensive validation of design inputs.

In 1998, SSP Unilok brand tube fittings were offered to the marketplace as a direct alternative to Parker CPI™ single ferrule instrumentation tube fittings. Since then, hundreds of thousands of SSP Unilok tube fittings have been manufactured and installed throughout the world.

In 2010, SSP's Technical Center Laboratory was certified by A2LA to be compliant with the requirements of ISO/IEC 17025:2005 (A2LA Certificate No. 3030.01). This certification assures that results developed by SSP's Technical Center Laboratory meet the same standard of accuracy, independence and integrity as other certified third-party commercial laboratories. The scope of SSP's accreditation, includes the following test methods:

Impulse Testing (ASTM F1387, A5)
Pneumatic Proof Test (ASTM F1387, A3)
Hydrostatic Proof Test (ASTM F1387, A4)
Flexural Fatigue Test (ASTM F1387, A6)
Tensile Test (ASTM F1387, A7)
Hydrostatic Burst Test (ASTM F1387, A8)
Rotary Flex Test (ASTM F1387, A10)
Hardness – Rockwell C, B & N (ASTM E18)
Hardness – Vickers (ASTM E384)

[1] US Patent 3,499,671; Parker Instrumentation CPI Tube Fittings catalog 4230, February 2000, p. 2.

1.0 INTRODUCTION

This document's purpose is to report, in a published format for public review, a representative sampling of the **Unilok** tube fitting's actual performance results from Production Validation Tests. The performance results are measured against the Design Team's Approved Acceptance Criteria, which are based on meeting or exceeding the published and / or test-based performance of equivalent Parker CPI™ tube fittings.

1.1 SCOPE

Scope: This test report documents the results of performance testing for the ¼", ½", ¾" and 1", SSP Unilok and Parker-Hannifin CPI Tube Fittings. The samples were tested for Interchange and Intermix in SSP's accredited Technical Center Laboratory.

1.2 REFERENCES

- SSP No. QM06, "SSP Tech Center Laboratory Quality Manual"
- ISO 17025, "General Requirements for the Competence of Testing and Calibration Laboratories"
- ISO 9001:2008, "Quality Management Systems – Requirements"
- ANSI/NCSL Z540-1, "Calibration Laboratories and Measuring and Test Equipment, General Requirements"
- ASTM F1387-99, "Standard Specification for Performance of Piping and Tubing Mechanically Attached Fittings"
- ISO 10012-1, "Quality Assurance Requirements for Measuring Equipment"
- MIL-STD-45662A, "Calibration System Requirements"
- SSP No. IP11, "Interchange Test"

1.3 TEST SPECIMEN DESCRIPTION

This test report will document all of the testing involved in the validation of the Unilok design for Interchange and Intermix with Parker CPI design.

SSP Sample (s)	Heat Code (s)
Size 16 (1 inch)	
SSP Male Connector	ESL
SSP Nut	RRJ
SSP Ferrule	VAE
Size 12 (3/4 inch)	
SSP Male Connector	CNN
SSP Nut	BRV
SSP Ferrule	RAA
Size 8 (1/2 inch)	
SSP Male Connector	CRO
SSP Nut	BRV
SSP Ferrule	RAR
Size 4 (1/4 inch)	
SSP Male Connector	CRO
SSP Nut	BRJ
SSP Ferrule	RAC

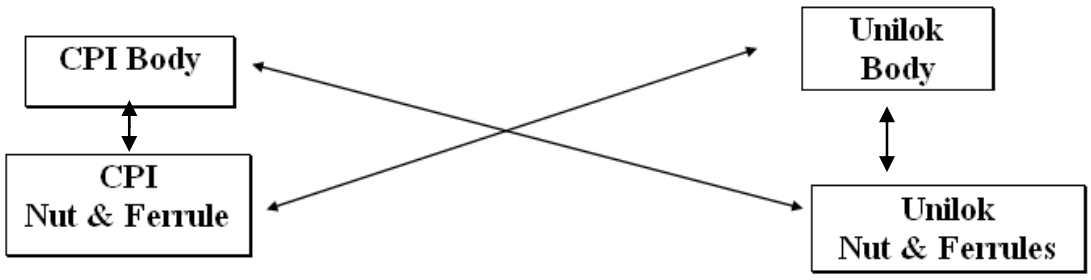
1.4 SUMMARY

In every case all **Unilok** test results met or exceeded the established Design Team's Acceptance Criteria for these products. As such, they also met or exceeded equivalent major competitive product performance, as measured in test data and / or reported in publications.

2.0 TEST PROCEDURES AND RESULTS
2.1: INTERCHANGE TEST

Purpose: Test determines if all combinations of both a tube fitting body and a tubing assembly (tube, nut, back ferrule, and front ferrule, assembled together per standard assembly instructions) of Unilok and a Parker CPI fitting can be Interchanged in a complete tube fitting assembly, resulting in both adequate gas and liquid pressure-retaining capability, based on ANSI / ASME B 31.3 maximum allowable working pressure of the tubing.

This test simulates the interchange of fitting bodies with already made up tube assemblies in the field, for components from either Unilok or Parker CPI fittings.



Test Procedure: Five fittings of each manufacturer are tested. 1 fitting of each manufacturer is tested at a time– one on each end of a 4 ½" long test tube, per Initial Makeup Test (see Section 3). Maximum recommended wall tubing (worst case condition) is used for each tested product configuration. See Figures 2.1.1 – 2.

The tube fitting assembly is assembled with body and components of same brand then subjected to the Pneumatic Proof Test (ASTM F1387, A3), the bodies are then interchanged with the components of the competitive brand and subjected again the Pneumatic Proof Test before being subjected the hydrostatic Proof Test (ASTM F1387, A4) and Hydrostatic Burst Test (ASTM F1387, A8) in this interchanged condition.

Figure 2.1.1, Interchange Test Equipment

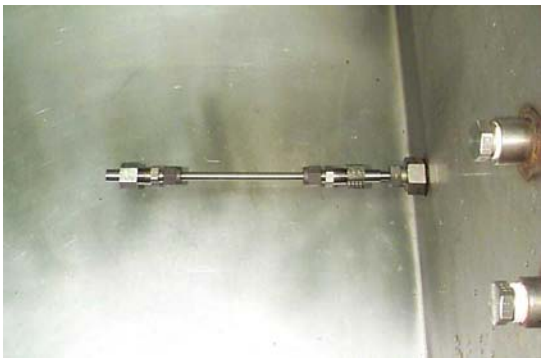


Figure 2.1.2, Interchange Test Combinations

Acceptance Criteria:

Pneumatic Proof Test: The tube fitting assembly is to sustain an air booster test pressure of 100 PSIG, and then again at 1.25 times the ANSI / ASME maximum allowable working pressure of the tubing, up to a maximum pressure of 10,000 PSIG. Failure is any observed air leakage bubble.

Hydrostatic Proof Test: The tube fitting assembly is to sustain a hydrostatic test pressure of 100 PSIG, and then again at 1.50 times the ANSI / ASME maximum allowable working pressure of the tubing, up to a maximum pressure of 10,000 PSIG. Failure is any observed water leakage.

Burst Test: The tube fitting assembly is to sustain a hydrostatic pressure, without observed leakage, exceeding a minimum of 4 times the ANSI / ASME maximum allowable working pressure of the tubing. Failure is to be by tubing burst, not by tube pushout from fitting. Acceptance criteria, not more than one sample to fail per size.

Size 16 Interchange Test																				
Body #	Make up Torque 1" x 0.095					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test 4,563 PSI		Remake Torque Ft lb	2nd Pneumatic Proof Test 100 PSI		2nd Pneumatic Proof Test 4,563 PSI		1st Hydrostatic Proof 5,475 PSI		Hydro Burst 14,600 PSI		
	Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	Ft Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	P/F	Leak None	P/F		Leak None	P/F	Leak None	P/F	Leak None	P/F	Test Press.	None Burst Leak push-off	P/F
1-SSP	25	50	95	150	220	N	P	N	P	75	None	P	None	P	None	P	10,809	other-end	N/A
2-SSP	28	48	142	250	360	N	P	N	P	75	None	P	None	P	None	P	14,913	Burst	P
3-SSP	20	47	93	118	173	N	P	N	P	60	None	P	None	P	None	P	14,923	Burst	P
4-SSP	20	40	95	140	195	N	P	N	P	65	None	P	None	P	None	P	14,922	Burst	P
5-SSP	15	30	73	105	145	N	P	N	P	65	None	P	None	P	None	P	14,918	Burst	P
6-CPI	15	30	60	75	90	N	P	N	P	110	None	P	None	P	None	P	10,809	push-off	F
7-CPI	23	30	60	78	88	N	P	N	P	160	None	P	None	P	None	P	14,913	Burst	P
8-CPI	25	37	70	85	93	N	P	N	P	130	None	P	None	P	None	P	14,923	Burst	P
9-CPI	25	37	63	85	100	N	P	N	P	110	None	P	None	P	None	P	14,922	Burst	P
10-CPI	25	35	70	85	100	N	P	N	P	150	None	P	None	P	None	P	14,918	Burst	P

Table 2.1.0 Size 16 Interchange Test

Size 12 Interchange Test

Body #	Make up Torque 3/4" x 0.095 wall tubing					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test 6,188 PSI		Remake Torque Ft lb	2nd Pneumatic Proof Test 100 PSI		2nd Pneumatic Proof Test 6,188 PSI		1st Hydrostatic Proof 7,425 PSI		Hydro Burst 19,800 PSI		
	Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	Ft Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	P/F	Leak None	P/F		Leak None	P/F	Leak None	P/F	Leak None	P/F	Test Press.	None Burst Leak push-off	P/F
1-SSP	12	19	53	78	105	None	P	None	P	60	None	P	None	P	None	P	21,212	Burst	P
2-SSP	10	23	55	83	112	None	P	None	P	60	None	P	None	P	None	P	21,254	Burst	P
3-SSP	10	30	63	90	105	None	P	None	P	55	None	P	None	P	None	P	20,635	Burst	P
4-SSP	8	18	40	55	70	None	P	None	P	65	None	P	None	P	None	P	21,080	Burst	P
5-SSP	7	15	32	48	58	None	P	None	P	65	None	P	None	P	None	P	21,205	Burst	P
6-CPI	17	25	48	58	63	None	P	None	P	90	None	P	None	P	None	P	21,212	Burst	P
7-CPI	11	15	42	55	65	None	P	None	P	95	None	P	None	P	None	P	21,254	Burst	P
8-CPI	15	22	43	50	58	None	P	None	P	65	None	P	None	P	None	P	20,635	Burst	P
9-CPI	17	22	45	55	63	None	P	None	P	60	None	P	None	P	None	P	21,080	Burst	P
10-CPI	17	20	43	55	62	None	P	None	P	60	None	P	None	P	None	P	21,205	Burst	P

Table 2.1.1, Size 12 Interchange Test

Size 8 Interchange Test

Body #	Make up Torque 1/2" x 0.065 wall tubing					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test 5,938 PSI		Remake Torque Ft lb	2nd Pneumatic Proof Test 100 PSI		2nd Pneumatic Proof Test 5,938 PSI		1st Hydrostatic Proof 7,125 PSI		Hydro Burst 19,000 PSI		
	Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	Ft Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	P/F	Leak None	P/F		Leak None	P/F	Leak None	P/F	Leak None	P/F	Test Press.	None Burst Leak push-off	P/F
1-SSP	27	155	200	270	350	None	P	None	P	310	None	P	None	P	None	P	20,300	Burst	P
2-SSP	55	120	160	195	235	None	P	None	P	290	None	P	None	P	None	P	20,293	Burst	P
3-SSP	50	125	180	205	250	None	P	None	P	260	None	P	None	P	None	P	20,500	Burst	P
4-SSP	50	130	180	240	305	None	P	None	P	310	None	P	None	P	None	P	20,506	Burst	P
5-SSP	50	100	150	190	225	None	P	None	P	310	None	P	None	P	None	P	20,400	Burst	P
6-CPI	95	180	205	265	325	None	P	None	P	340	None	P	None	P	None	P	20,300	Burst	P
7-CPI	90	170	225	290	370	None	P	None	P	270	None	P	None	P	None	P	20,293	Burst	P
8-CPI	90	170	220	265	310	None	P	None	P	300	None	P	None	P	None	P	20,500	Burst	P
9-CPI	95	195	245	280	360	None	P	None	P	330	None	P	None	P	None	P	20,506	Burst	P
10-CPI	70	140	200	260	370	None	P	None	P	260	None	P	None	P	None	P	20,400	Burst	P

Table 2.1.2, Size 8 Interchange Test

Size 4 Interchange Test

Fitting #	Make up Torque 1/4" x 0.049 wall tubing					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test 9,375 PSI		Remake Torque Ft lb	2nd Pneumatic Proof Test 100 PSI		2nd Pneumatic Proof Test 9,375 PSI		1st Hydrostatic Proof 11,250 PSI		Hydro Burst 30,000 PSI		
	Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	IFt Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	P/F	Leak None	P/F		Leak None	P/F	Leak None	P/F	Leak None	P/F	Test Press.	None Burst Leak push-off	P/F
1-SSP	30	60	85	120	160	None	P	None	P	50	None	P	None	P	None	P	35,330	Burst	P
2-SSP	35	70	100	140	180	None	P	None	P	110	None	P	None	P	None	P	34,982	Burst	P
3-SSP	25	60	95	140	210	None	P	None	P	90	None	P	None	P	None	P	35,187	Burst	P
4-SSP	30	60	100	150	210	None	P	None	P	80	None	P	None	P	None	P	34,980	Leak	P
5-SSP	20	60	110	200	270	None	P	None	P	60	None	P	None	P	None	P	40,164	Burst	P
6-CPI	40	70	80	110	150	None	P	None	P	120	None	P	None	P	None	P	35,330	Burst	P
7-CPI	40	65	85	100	120	None	P	None	P	200	None	P	None	P	None	P	34,982	Burst	P
8-CPI	35	70	95	110	150	None	P	None	P	200	None	P	None	P	None	P	35,187	Burst	P
9-CPI	30	90	110	135	160	None	P	None	P	150	None	P	None	P	None	P	34,980	Leak	P
10-CPI	30	70	90	110	150	None	P	None	P	220	None	P	None	P	None	P	40,164	Burst	P

Table 2.1.3, Size 4 Interchange Test

2.2: INTERMIX TEST

Purpose: Test determines if all combinations of tube fitting components (nut, ferrule and fitting body) of Unilok and Parker CPI can be intermixed in a tube fitting assembly, resulting in both adequate gas and liquid pressure-retaining capability, based on ANSI / ASME B 31.3 maximum allowable working pressure of the tubing.

This test simulates the random intermixing of inventoried Unilok and Parker CPI fitting components in the field to make up tube fitting assemblies.

Test Procedure: Five samples of each intermix combination are tested. Two fittings of a given combination of fitting components are tested at a time – one on each end of a 4 ½" long test tube. Maximum recommended wall tubing (worst case condition) is used for each tested product configuration. See Table 3.2.1 below for the intermix combinations tested and figure 3.1.2 above for the test equipment.

The tube fitting assembly is subjected to the Pneumatic Proof Test (ASTM F1387, A3), and then the Hydrostatic Proof Test (ASTM F1387, A4) and finally the Hydrostatic Burst Test (ASTM F1387, A8).

Intermix						
1	2	3	4	5	6	
7	8	9	10	11	12	
13	14	15	16	17	18	
19	20	21	22	23	24	
25	26	27	28	29	30	
CPI	CPI	Unilok	CPI	Unilok	Unilok	**BODY**
CPI	Unilok	CPI	Unilok	CPI	Unilok	**NUT**
Unilok	CPI	CPI	Unilok	Unilok	CPI	**FERRULE**

Table 2.2.0, Intermix Combination Sampling Configuration

Acceptance Criteria:

Pneumatic Proof Test: The tube fitting assembly is to sustain an air booster test pressure of 100 PSIG, and then again at 1.25 times the ANSI / ASME maximum allowable working pressure of the tubing, up to a maximum pressure of 10,000 PSIG. Failure is any observed air leakage bubble.

Hydrostatic Proof Test: The tube fitting assembly is to sustain a hydrostatic test pressure of 100 PSIG, and then again at 1.50 times the ANSI / ASME maximum allowable working pressure of the tubing, up to a maximum pressure of 10,000 PSIG. Failure is any observed water leakage.

Burst Test: The tube fitting assembly is to sustain a hydrostatic pressure, without observed leakage, exceeding a minimum of 4 times the ANSI / ASME maximum allowable working pressure of the tubing. Failure is to be by tubing burst, not by tube pushout from fitting. Acceptance criteria, not more than 1 sample per size allowed to fail.

Size 16 Intermix Test														
Sample #	Make up Torque 1" x 0.095 wall tubing					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test 4,563 PSI		1st Hydrostatic Proof 5,475 PSI		Hydro Burst 14,600 PSI		
	Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	Ft Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	P/F	Leak None	P/F	Leak None	P/F	Test Press.	None Burst Leak push-off	P/F
1	20	40	80	100	120	None	P	None	P	None	P	15,054	Burst	P
2	25	50	150	170	230	None	P	None	P	None	P	15,054	Burst	P
3	30	45	80	90	125	None	P	None	P	None	P	14,959	Burst	P
4	25	50	115	165	250	None	P	None	P	None	P	14,959	Burst	P
5	25	45	80	100	135	None	P	None	P	None	P	14,974	Burst	P
6	25	60	140	210	310	None	P	None	P	None	P	14,974	Burst	P
7	25	35	75	100	125	None	P	None	P	None	P	14,929	Burst	P
8	20	30	70	80	120	None	P	None	P	None	P	14,929	Burst	P
9	25	45	90	110	150	None	P	None	P	None	P	14,858	Burst	P
10	25	50	130	180	250	None	P	None	P	None	P	14,858	Burst	P
11	25	45	75	90	115	None	P	None	P	None	P	14,856	Burst	P
12	30	50	110	160	250	None	P	None	P	None	P	14,856	Burst	P
13	25	40	85	100	115	None	P	None	P	None	P	14,747	Burst	P
14	20	40	95	130	160	None	P	None	P	None	P	14,747	Burst	P
15	25	50	95	125	165	None	P	None	P	None	P	14,831	Burst	P
16	25	55	150	20	310	None	P	None	P	None	P	14,831	Burst	P
17	25	40	70	85	95	None	P	None	P	None	P	14,764	Burst	P
18	30	65	165	250	310	None	P	None	P	None	P	14,764	Burst	P
19	25	40	75	100	125	None	P	None	P	None	P	14,702	Burst	P
20	25	40	75	110	160	None	P	None	P	None	P	14,702	Burst	P
21	25	35	70	90	110	None	P	None	P	None	P	14,859	Burst	P
22	20	35	85	145	165	None	P	None	P	None	P	14,859	Burst	P
23	25	40	70	80	95	None	P	None	P	None	P	14,823	Burst	P
24	20	25	70	80	110	None	P	None	P	None	P	14,823	Burst	P
25	25	50	75	80	90	None	P	None	P	None	P	14,787	Burst	P
26	20	25	75	120	180	None	P	None	P	None	P	14,787	Burst	P
27	30	50	95	120	190	None	P	None	P	None	P	14,725	Burst	P
28	20	45	95	125	160	None	P	None	P	None	P	14,725	Burst	P
29	25	40	75	80	90	None	P	None	P	None	P	14,918	Burst	P
30	30	60	120	180	240	None	P	None	P	None	P	14,918	Burst	P

Table 2.2.1, Size 16 Interchange Test

Size 12 Intermix Test														
Sample #	Make up Torque 3/4" x 0.095 wall tubing					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test 6,188 PSI		1st Hydrostatic Proof 7,425 PSI		Hydro Burst 19,800 PSI		
	Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	Ft Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	P/F	Leak None	P/F	Leak None	P/F	Test Press.	None Burst Leak push-off	P/F
1	15	20	35	50	60	None	P	None	P	None	P	21,090	Burst	P
2	15	35	60	90	130	None	P	None	P	None	P	21,090	Burst	P
3	20	25	45	55	60	None	P	None	P	None	P	20,861	Burst	P
4	15	25	45	60	90	None	P	None	P	None	P	20,861	Burst	P
5	10	25	35	50	65	None	P	None	P	None	P	20,730	Burst	P
6	10	25	50	65	75	None	P	None	P	None	P	20,730	Burst	P
7	15	25	50	60	75	None	P	None	P	None	P	20,552	Burst	P
8	15	30	80	100	140	None	P	None	P	None	P	20,552	Burst	P
9	15	20	40	50	60	None	P	None	P	None	P	20,966	Burst	P
10	15	25	60	90	150	None	P	None	P	None	P	20,966	Burst	P
11	15	25	40	45	55	None	P	None	P	None	P	20,778	Burst	P
12	10	20	35	45	55	None	P	None	P	None	P	20,778	Burst	P
13	15	25	40	45	60	None	P	None	P	None	P	20,673	Burst	P
14	20	35	60	80	125	None	P	None	P	None	P	20,673	Burst	P
15	15	20	45	45	50	None	P	None	P	None	P	21,039	Burst	P
16	15	35	55	120	135	None	P	None	P	None	P	21,039	Burst	P
17	15	20	35	50	70	None	P	None	P	None	P	21,093	Burst	P
18	10	25	55	75	100	None	P	None	P	None	P	21,093	Burst	P
19	15	20	45	55	70	None	P	None	P	None	P	20,945	Burst	P
20	15	20	50	90	135	None	P	None	P	None	P	20,945	Burst	P
21	10	20	40	50	60	None	P	None	P	None	P	20,742	Burst	P
22	10	30	75	110	135	None	P	None	P	None	P	20,742	Burst	P
23	10	20	35	50	60	None	P	None	P	None	P	20,754	Burst	P
24	15	25	70	90	110	None	P	None	P	None	P	20,754	Burst	P
25	20	25	45	50	60	None	P	None	P	None	P	21,023	Burst	P
26	15	25	75	115	150	None	P	None	P	None	P	21,023	Burst	P
27	15	20	35	50	60	None	P	None	P	None	P	20,755	Burst	P
28	10	15	45	60	95	None	P	None	P	None	P	20,755	Burst	P
29	15	20	35	40	55	None	P	None	P	None	P	20,861	Burst	P
30	10	20	45	75	105	None	P	None	P	None	P	20,861	Burst	P

Table 2.2.2, Size 12 Intermix Test

Size 8 Intermix Test														
Sample #	Make up Torque 1/2" x 0.065 wall tubing					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test 5,938 PSI		1st Hydrostatic Proof 7,125 PSI		Hydro Burst 19,000 PSI		
	Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	Ft Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	P/F	Leak None	P/F	Leak None	P/F	Test Press.	None Burst Leak push-off	P/F
1	70	150	190	250	340	None	P	None	P	None	P	20,061	Burst	P
2	50	115	150	195	310	None	P	None	P	None	P	20,061	Burst	P
3	70	140	190	245	295	None	P	None	P	None	P	20,413	Burst	P
4	50	140	200	255	435	None	P	None	P	None	P	20,413	Burst	P
5	80	210	260	295	365	None	P	None	P	None	P	7,737	other-end	N/A
6	50	110	175	245	300	None	P	None	P	None	P	7,737	push-off	F
7	65	150	180	265	365	None	P	None	P	None	P	20,313	Burst	P
8	50	130	210	310	520	None	P	None	P	None	P	20,313	Burst	P
9	85	160	200	245	290	None	P	None	P	None	P	20,020	Burst	P
10	60	130	175	240	345	None	P	None	P	None	P	20,020	Burst	P
11	60	120	125	220	270	None	P	None	P	None	P	20,018	Burst	P
12	45	110	170	230	265	None	P	None	P	None	P	20,018	Burst	P
13	70	140	170	210	240	None	P	None	P	None	P	19,985	Burst	P
14	50	120	200	210	410	None	P	None	P	None	P	19,985	Burst	P
15	90	170	210	250	290	None	P	None	P	None	P	20,428	Burst	P
16	50	120	180	260	400	None	P	None	P	None	P	20,428	Burst	P
17	70	150	180	210	250	None	P	None	P	None	P	19,963	Burst	P
18	50	100	170	220	290	None	P	None	P	None	P	19,963	Burst	P
19	80	150	190	250	340	None	P	None	P	None	P	20,381	Burst	P
20	50	100	170	270	350	None	P	None	P	None	P	20,381	Burst	P
21	100	190	240	270	300	None	P	None	P	None	P	20,603	Burst	P
22	50	110	170	210	350	None	P	None	P	None	P	20,603	Burst	P
23	80	160	190	230	290	None	P	None	P	None	P	20,883	Burst	P
24	50	110	150	200	290	None	P	None	P	None	P	20,883	Burst	P
25	70	140	180	260	300	None	P	None	P	None	P	20,293	Burst	P
26	60	150	180	240	450	None	P	None	P	None	P	20,293	Burst	P
27	60	140	190	240	280	None	P	None	P	None	P	19,861	Burst	P
28	50	110	160	210	350	None	P	None	P	None	P	19,861	Burst	P
29	60	130	170	210	270	None	P	None	P	None	P	20,241	Burst	P
30	50	100	150	190	240	None	P	None	P	None	P	20,241	Burst	P

Table 2.2.3, Size 8 Intermix Test

Size 4 Intermix Test														
Sample #	Make up Torque 1/4" x 0.049 wall tubing					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test 9,375 PSI		1st Hydrostatic Proof 11,250 PSI		Hydro Burst 30,000 PSI		
	Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	Ft Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	**Leak None**	**P/F**	**Leak None**	**P/F**	**Leak None**	**P/F**	Test Press.	None Burst Leak push-off	P/F
1	25	70	115	160	195	None	P	None	P	None	P	39,822	Burst	P
2	8	65	120	165	240	None	P	None	P	None	P	39,822	Burst	P
3	15	65	85	120	150	None	P	None	P	None	P	39,802	Burst	P
4	15	55	100	145	185	None	P	None	P	None	P	39,802	Burst	P
5	20	70	100	145	200	None	P	None	P	None	P	36,153	Burst	P
6	30	45	80	135	225	None	P	Leak	F	None	P	36,153	Burst	P
7	35	55	80	105	160	None	P	None	P	None	P	36,158	Burst	P
8	25	75	145	200	270	None	P	None	P	None	P	36,158	Burst	P
9	20	70	90	105	135	None	P	None	P	None	P	39,164	Burst	P
10	25	65	115	165	230	None	P	None	P	None	P	39,164	Burst	P
11	20	55	80	125	175	None	P	None	P	None	P	35,256	Burst	P
12	20	55	80	120	185	None	P	None	P	None	P	35,256	Burst	P
13	25	55	90	140	180	None	P	None	P	None	P	35,551	Burst	P
14	15	50	90	165	225	None	P	Leak	F	None	P	35,551	Burst	P
15	50	80	115	200	255	None	P	None	P	None	P	38,097	Burst	P
16	20	75	150	235	315	None	P	None	P	None	P	38,097	Burst	P
17	35	60	80	95	125	None	P	None	P	None	P	34,709	Burst	P
18	35	80	140	205	275	None	P	None	P	None	P	34,709	Burst	P
19	40	55	80	130	155	None	P	None	P	None	P	34,122	Burst	P
20	50	95	145	230	310	None	P	None	P	None	P	34,122	Burst	P
21	15	60	85	100	130	None	P	None	P	None	P	33,977	Burst	P
22	25	65	130	210	305	None	P	None	P	None	P	33,977	Burst	P
23	35	60	85	105	140	None	P	None	P	None	P	35,714	Burst	P
24	35	70	105	125	195	None	P	None	P	None	P	35,714	Burst	P
25	30	50	75	100	130	None	P	None	P	None	P	35,248	Burst	P
26	15	60	80	150	225	None	P	Leak	F	None	P	35,248	Burst	P
27	20	60	80	115	165	None	P	None	P	None	P	39,195	Burst	P
28	20	80	150	220	300	None	P	None	P	None	P	39,195	Burst	P
29	20	55	100	145	165	None	P	None	P	None	P	39,748	Burst	P
30	20	55	85	150	225	None	P	None	P	None	P	39,748	Burst	P

Table 2.2.4, Size 4 Intermix Test

3.0: TEST EQUIPMENT AND INSTRUMENTATION

Calibration and Standardization:

1. Description: 10,000 psi digital gage
   Range: 0 - 10,000 psi
   ID #: 67176
   Calibration Date: 01/21/10 Due Date: 01/21/11

2. Description: 10,000 psi transducer
   Range: 0 – 10,000 psi
   ID #: 74466
   Calibration Date: 01/21/10 Due Date: 01/21/11

3. Description: 72,000 psi digital gage
   Range: 0 – 72,000 psi
   ID #: 096221-1
   Calibration Date: 12/01/09 Due Date: 12/01/10

4. Description: 72,000 psi transducer
   Range: 0 – 72,000 psi
   ID #: 096221
   Calibration Date: 12/01/09 Due Date: 12/01/10

4.0: QUALITY ASSURANCE PROGRAM

The preceding lists the major Validation Tests that were performed, and the sections which follow describe the tests and outline specific results. All products manufactured at SSP are to approved and controlled engineering documentation, to established process and quality procedures at every stage of manufacture, with fully calibrated quality and process instrumentation, using only certified and traceable materials. Tested products were selected randomly from documented normal production runs. Before and after test samples were retained for reference. All tubing used in testing meets applicable ASTM specifications, and has approved material and chemical certifications.

All SSP tests conducted on products are with laboratory equipment and instrumentation in current calibration in an ISO 17025 accredited laboratory. Trained personnel conducted tests by following approved, written test procedures. All test results were subjected to thorough engineering review and approval before internal publication.

ASTM Material Standards		
Standard	**Material Shape**	**Description**
A 182	Forged Fittings, Parts	Standard Specification for Forged or Rolled Alloy – Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
A 276	Bars	Standard Specification for Stainless Steel Bars and Shapes
A 479	Bar, Shapes	Standard Specification for Stainless Steel Bars and Shapes for use in Boilers and other Pressure Vessels
B 16	Bar, Shapes	Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for use in Screw Machines
B 124	Bar, Shapes	Standard Specification for Copper and Copper Alloy Forging Rod, Bar and Shapes
B 453	Bar, Shapes	Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Rod
A 179	Tube	Standard Specification for Seamless Cold-Drawn Low-Carbon Steel Heat-Exchanger and Condenser Tubes
A 213	Tube	Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater and Heat-Exchanger Tubes
A 249	Tube	Standard Specification for Welded Austenitic Steel Boiler, Superheater, Heat-Exchanger, and Condenser Tubes
A 269	Tubing	Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
B 68	Tube	Standard Specification for Copper Tube, Bright Annealed
B 75	Tube	Standard Specification for Seamless Copper Tube
B 88	Tube	Standard Specification for Seamless Copper Water Tube

Table 4.0.0, ASTM Material Standards

Applicable Codes and Standards	
Section	**Test Description**
ANSI/ASME B 31.1	Power Piping Code
ANSI/ASME B 31.3	Process Piping Code
ANSI/ASME BPV Section VIII	Boiler & Pressure Vessel Code
ISO 7257	Aircraft – Hydraulic tubing joints and fittings – Rotary flexure test

Table 4.0.1, Applicable Codes and Standards

5.0: ATTACHMENTS

A. PHOTOGRAPHS

Figure 2.1.1, Interchange Test Equipment

Figure 2.1.2, Interchange Test Combinations

B. TEST DATA

SSP Instrumentation

SSP I-Line Doc. # ITR - 1091 - 00 - **Rev.** B

Input values:
Intermediate (computed) values:
Output (computed) values:

Subject: ASTM F 1387 Testing Data Sheets
ITR - 1091 - 00, Test Data

Sam #	Test	Make up Torque					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test		Remake Torque Ft lb	2nd Pneumatic Proof Test 100 PSI		2nd Pneumatic Proof Test		1st Hydrostatic Proof		Hydro Burst		
		Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	lFt Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	Pass Fail	Leak None	Pass Fail		Leak None	Pass Fail	Leak None	Pass Fail	Leak None	Pass Fail	Test Press.	None Burst Leak push-off	Pass Fail
1-SSP	Interchange	25	50	95	150	220	None	Pass	None	Pass	75	None	Pass	None	Pass	None	Pass	10,809	other-end	N/A
2-SSP		28	48	142	250	360	None	Pass	None	Pass	75	None	Pass	None	Pass	None	Pass	14,913	Burst	P
3-SSP		20	47	93	118	173	None	Pass	None	Pass	60	None	Pass	None	Pass	None	Pass	14,923	Burst	P
4-SSP		20	40	95	140	195	None	Pass	None	Pass	65	None	Pass	None	Pass	None	Pass	14,922	Burst	P
5-SSP		15	30	73	105	145	None	Pass	None	Pass	65	None	Pass	None	Pass	None	Pass	14,918	Burst	P
6-CPI		15	30	60	75	90	None	Pass	None	Pass	110	None	Pass	None	Pass	None	Pass	10,809	push-off	F
7-CPI		23	30	60	78	88	None	Pass	None	Pass	160	None	Pass	None	Pass	None	Pass	14,913	Burst	P
8-CPI		25	37	70	85	93	None	Pass	None	Pass	130	None	Pass	None	Pass	None	Pass	14,923	Burst	P
9-CPI		25	37	63	85	100	None	Pass	None	Pass	110	None	Pass	None	Pass	None	Pass	14,922	Burst	P
10-CPI		25	35	70	85	100	None	Pass	None	Pass	150	None	Pass	None	Pass	None	Pass	14,918	Burst	P
1	Intermix	20	40	80	100	120	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	15,054	Burst	P
2		25	50	150	170	230	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	15,054	Burst	P
3		30	45	80	90	125	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,959	Burst	P
4		25	50	115	165	250	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,959	Burst	P
5		25	45	80	100	135	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,974	Burst	P
6		25	60	140	210	310	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,974	Burst	P
7		25	35	75	100	125	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,929	Burst	P
8		20	30	70	80	120	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,929	Burst	P
9		25	45	90	110	150	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,858	Burst	P
10		25	50	130	180	250	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,858	Burst	P
11		25	45	75	90	115	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,856	Burst	P
12		30	50	110	160	250	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,856	Burst	P
13		25	40	85	100	115	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,747	Burst	P
14		20	40	95	130	160	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,747	Burst	P
15		25	50	95	125	165	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,831	Burst	P
16		25	55	150	20	310	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,831	Burst	P
17		25	40	70	85	95	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,764	Burst	P
18		30	65	165	250	310	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,764	Burst	P
19		25	40	75	100	125	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,702	Burst	P
20		25	40	75	110	160	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,702	Burst	P
21		25	35	70	90	110	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,859	Burst	P
22		20	35	85	145	165	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,859	Burst	P
23		25	40	70	80	95	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,823	Burst	P
24		20	25	70	80	110	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,823	Burst	P
25		25	50	75	80	90	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,787	Burst	P
26		20	25	75	120	180	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,787	Burst	P
27		30	50	95	120	190	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,725	Burst	P
28		20	45	95	125	160	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,725	Burst	P
29		25	40	75	80	90	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,918	Burst	P
30		30	60	120	180	240	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	14,918	Burst	P

SSP Instrumentation

SSP I-Line Doc. # ITR - 1091 - 00 - **Rev.** B

Input values:
Intermediate (computed) values:
Output (computed) values:

ACCREDITED TESTING CERT #3030.01

SSP STAINLESS STEEL PRODUCTS

Subject: ASTM F 1387 Testing Data Sheets
ITR - 1091 - 00, Test Data

Sam #	Test	Make up Torque					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test		Remake Torque Ft lb	2nd Pneumatic Proof Test 100 PSI		2nd Pneumatic Proof Test		1st Hydrostatic Proof		Hydro Burst		
		Ft Lbs @ .25 turns	Ft Lbs @ .50 turns	Ft Lbs @ .75 turns	Ft Lbs @ 1.00 turns	Ft Lbs @ 1.25 turns	Leak None	Pass Fail	Leak None	Pass Fail		Leak None	Pass Fail	Leak None	Pass Fail	Leak None	Pass Fail	Test Press.	None Burst Leak push-off	Pass Fail
1-SSP	Interchange	12	19	53	78	105	None	Pass	None	Pass	60	None	Pass	None	Pass	None	Pass	21,212	Burst	P
2-SSP		10	23	55	83	112	None	Pass	None	Pass	60	None	Pass	None	Pass	None	Pass	21,254	Burst	P
3-SSP		10	30	63	90	105	None	Pass	None	Pass	55	None	Pass	None	Pass	None	Pass	20,635	Burst	P
4-SSP		8	18	40	55	70	None	Pass	None	Pass	65	None	Pass	None	Pass	None	Pass	21,080	Burst	P
5-SSP		7	15	32	48	58	None	Pass	None	Pass	65	None	Pass	None	Pass	None	Pass	21,205	Burst	P
6-CPI		17	25	48	58	63	None	Pass	None	Pass	90	None	Pass	None	Pass	None	Pass	21,212	Burst	P
7-CPI		11	15	42	55	65	None	Pass	None	Pass	95	None	Pass	None	Pass	None	Pass	21,254	Burst	P
8-CPI		15	22	43	50	58	None	Pass	None	Pass	65	None	Pass	None	Pass	None	Pass	20,635	Burst	P
9-CPI		17	22	45	55	63	None	Pass	None	Pass	60	None	Pass	None	Pass	None	Pass	21,080	Burst	P
10-CPI		17	20	43	55	62	None	Pass	None	Pass	60	None	Pass	None	Pass	None	Pass	21,205	Burst	P
1	Intermix	15	20	35	50	60	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	21,090	Burst	P
2		15	35	60	90	130	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	21,090	Burst	P
3		20	25	45	55	60	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,861	Burst	P
4		15	25	45	60	90	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,861	Burst	P
5		10	25	35	50	65	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,730	Burst	P
6		10	25	50	65	75	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,730	Burst	P
7		15	25	50	60	75	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,552	Burst	P
8		15	30	80	100	140	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,552	Burst	P
9		15	20	40	50	60	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,966	Burst	P
10		15	25	60	90	150	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,966	Burst	P
11		15	25	40	45	55	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,778	Burst	P
12		10	20	35	45	55	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,778	Burst	P
13		15	25	40	45	60	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,673	Burst	P
14		20	35	60	80	125	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,673	Burst	P
15		15	20	45	45	50	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	21,039	Burst	P
16		15	35	55	120	135	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	21,039	Burst	P
17		15	20	35	50	70	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	21,093	Burst	P
18		10	25	55	75	100	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	21,093	Burst	P
19		15	20	45	55	70	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,945	Burst	P
20		15	20	50	90	135	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,945	Burst	P
21		10	20	40	50	60	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,742	Burst	P
22		10	30	75	110	135	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,742	Burst	P
23		10	20	35	50	60	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,754	Burst	P
24		15	25	70	90	110	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,754	Burst	P
25		20	25	45	50	60	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	21,023	Burst	P
26		15	25	75	115	150	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	21,023	Burst	P
27		15	20	35	50	60	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,755	Burst	P
28		10	15	45	60	95	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,755	Burst	P
29		15	20	35	40	55	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,861	Burst	P
30		10	20	45	75	105	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,861	Burst	P

SSP Instrumentation

SSP I-Line Doc. # ITR - 1091 - 00 - **Rev.** B

Input values:
Intermediate (computed) values:
Output (computed) values:

ACCREDITED TESTING CERT #3030.01

SSP STAINLESS STEEL PRODUCTS

Subject: ASTM F 1387 Testing Data Sheets
ITR - 1091 - 00, Test Data

Sam #	Test	Make up Torque					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test		Remake Torque In lb	2nd Pneumatic Proof Test 100 PSI		2nd Pneumatic Proof Test		1st Hydrostatic Proof		Hydro Burst		
		In Lbs @ .25 turns	In Lbs @ .50 turns	In Lbs @ .75 turns	In Lbs @ 1.00 turns	In Lbs @ 1.25 turns	Leak None	Pass Fail	Leak None	Pass Fail		Leak None	Pass Fail	Leak None	Pass Fail	Leak None	Pass Fail	Test Press.	None Burst Leak push-off	Pass Fail
1-SSP	Interchange	27	155	200	270	350	None	Pass	None	Pass	310	None	Pass	None	Pass	None	Pass	20,300	Burst	Pass
2-SSP		55	120	160	195	235	None	Pass	None	Pass	290	None	Pass	None	Pass	None	Pass	20,293	Burst	Pass
3-SSP		50	125	180	205	250	None	Pass	None	Pass	260	None	Pass	None	Pass	None	Pass	20,500	Burst	Pass
4-SSP		50	130	180	240	305	None	Pass	None	Pass	310	None	Pass	None	Pass	None	Pass	20,506	Burst	Pass
5-SSP		50	100	150	190	225	None	Pass	None	Pass	310	None	Pass	None	Pass	None	Pass	20,400	Burst	Pass
6-CPI		95	180	205	265	325	None	Pass	None	Pass	340	None	Pass	None	Pass	None	Pass	20,300	Burst	Pass
7-CPI		90	170	225	290	370	None	Pass	None	Pass	270	None	Pass	None	Pass	None	Pass	20,293	Burst	Pass
8-CPI		90	170	220	265	310	None	Pass	None	Pass	300	None	Pass	None	Pass	None	Pass	20,500	Burst	Pass
9-CPI		95	195	245	280	360	None	Pass	None	Pass	330	None	Pass	None	Pass	None	Pass	20,506	Burst	Pass
10-CPI		70	140	200	260	370	None	Pass	None	Pass	260	None	Pass	None	Pass	None	Pass	20,400	Burst	Pass
1	Intermix	70	150	190	250	340	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,061	Burst	Pass
2		50	115	150	195	310	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,061	Burst	Pass
3		70	140	190	245	295	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,413	Burst	Pass
4		50	140	200	255	435	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,413	Burst	Pass
5		80	210	260	295	365	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	7,737	other-end	N/A
6		50	110	175	245	300	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	7,737	push-off	Fail
7		65	150	180	265	365	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,313	Burst	Pass
8		50	130	210	310	520	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,313	Burst	Pass
9		85	160	200	245	290	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,020	Burst	Pass
10		60	130	175	240	345	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,020	Burst	Pass
11		60	120	125	220	270	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,018	Burst	Pass
12		45	110	170	230	265	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,018	Burst	Pass
13		70	140	170	210	240	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	19,985	Burst	Pass
14		50	120	200	210	410	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	19,985	Burst	Pass
15		90	170	210	250	290	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,428	Burst	Pass
16		50	120	180	260	400	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,428	Burst	Pass
17		70	150	180	210	250	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	19,963	Burst	Pass
18		50	100	170	220	290	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	19,963	Burst	Pass
19		80	150	190	250	340	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,381	Burst	Pass
20		50	100	170	270	350	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,381	Burst	Pass
21		100	190	240	270	300	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,603	Burst	Pass
22		50	110	170	210	350	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,603	Burst	Pass
23		80	160	190	230	290	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,883	Burst	Pass
24		50	110	150	200	290	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,883	Burst	Pass
25		70	140	180	260	300	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,293	Burst	Pass
26		60	150	180	240	450	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,293	Burst	Pass
27		60	140	190	240	280	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	19,861	Burst	Pass
28		50	110	160	210	350	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	19,861	Burst	Pass
29		60	130	170	210	270	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,241	Burst	Pass
30		50	100	150	190	240	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	20,241	Burst	Pass

SSP Instrumentation

SSP I-Line Doc. # ITR - 1091 - 00 - **Rev.** B

Input values:
Intermediate (computed) values:
Output (computed) values:

ACCREDITED TESTING CERT #3030.01

SSP STAINLESS STEEL PRODUCTS

Subject: ASTM F 1387 Testing Data Sheets
ITR - 1091 - 00, Test Data

Sam #	Test	Make up Torque					1st Pneumatic Proof Test 100 PSI		1st Pneumatic Proof Test		Remake Torque In lb	2nd Pneumatic Proof Test 100 PSI		2nd Pneumatic Proof Test		1st Hydrostatic Proof		Hydro Burst		
		In Lbs @ .25 turns	In Lbs @ .50 turns	In Lbs @ .75 turns	In Lbs @ 1.00 turns	In Lbs @ 1.25 turns	Leak None	Pass Fail	Leak None	Pass Fail		Leak None	Pass Fail	Leak None	Pass Fail	Leak None	Pass Fail	Test Press.	None Burst Leak push-off	Pass Fail
1-SSP	Interchange	30	60	85	120	160	None	Pass	None	Pass	50	None	Pass	None	Pass	None	Pass	35,330	Burst	P
2-SSP		35	70	100	140	180	None	Pass	None	Pass	110	None	Pass	None	Pass	None	Pass	34,982	Burst	P
3-SSP		25	60	95	140	210	None	Pass	None	Pass	90	None	Pass	None	Pass	None	Pass	35,187	Burst	P
4-SSP		30	60	100	150	210	None	Pass	None	Pass	80	None	Pass	None	Pass	None	Pass	34,980	Leak	P
5-SSP		20	60	110	200	270	None	Pass	None	Pass	60	None	Pass	None	Pass	None	Pass	40,164	Burst	P
6-CPI		40	70	80	110	150	None	Pass	None	Pass	120	None	Pass	None	Pass	None	Pass	35,330	Burst	P
7-CPI		40	65	85	100	120	None	Pass	None	Pass	200	None	Pass	None	Pass	None	Pass	34,982	Burst	P
8-CPI		35	70	95	110	150	None	Pass	None	Pass	200	None	Pass	None	Pass	None	Pass	35,187	Burst	P
9-CPI		30	90	110	135	160	None	Pass	None	Pass	150	None	Pass	None	Pass	None	Pass	34,980	Leak	P
10-CPI		30	70	90	110	150	None	Pass	None	Pass	220	None	Pass	None	Pass	None	Pass	40,164	Burst	P
1	Intermix	25	70	115	160	195	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,822	Burst	P
2		8	65	120	165	240	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,822	Burst	P
3		15	65	85	120	150	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,802	Burst	P
4		15	55	100	145	185	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,802	Burst	P
5		20	70	100	145	200	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	36,153	Burst	P
6		30	45	80	135	225	None	Pass	Leak	Fail	N/A	N/A		N/A		None	Pass	36,153	Burst	P
7		35	55	80	105	160	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	36,158	Burst	P
8		25	75	145	200	270	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	36,158	Burst	P
9		20	70	90	105	135	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,164	Burst	P
10		25	65	115	165	230	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,164	Burst	P
11		20	55	80	125	175	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	35,256	Burst	P
12		20	55	80	120	185	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	35,256	Burst	P
13		25	55	90	140	180	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	35,551	Burst	P
14		15	50	90	165	225	None	Pass	Leak	Fail	N/A	N/A		N/A		None	Pass	35,551	Burst	P
15		50	80	115	200	255	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	38,097	Burst	P
16		20	75	150	235	315	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	38,097	Burst	P
17		35	60	80	95	125	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	34,709	Burst	P
18		35	80	140	205	275	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	34,709	Burst	P
19		40	55	80	130	155	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	34,122	Burst	P
20		50	95	145	230	310	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	34,122	Burst	P
21		15	60	85	100	130	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	33,977	Burst	P
22		25	65	130	210	305	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	33,977	Burst	P
23		35	60	85	105	140	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	35,714	Burst	P
24		35	70	105	125	195	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	35,714	Burst	P
25		30	50	75	100	130	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	35,248	Burst	P
26		15	60	80	150	225	None	Pass	Leak	Fail	N/A	N/A		N/A		None	Pass	35,248	Burst	P
27		20	60	80	115	165	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,195	Burst	P
28		20	80	150	220	300	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,195	Burst	P
29		20	55	100	145	165	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,748	Burst	P
30		20	55	85	150	225	None	Pass	None	Pass	N/A	N/A		N/A		None	Pass	39,748	Burst	P

C. MATERIAL CERTS

OUTOKUMPU

Certificate of Test

HEAT E100898 ORDER 614332/ 01 BOL 0209487 * CERTIFICATION * 11/12/10

SHIP TO:
YARDE METALS (VMI ORDERS)
75 AIRCRAFT RD

SOUTHINGTON 064890000

HC: GIK + ESL

YOUR ORDER & DATE
C00617TS002 11/12/10 CUST# 0975001 CUST TAG#C00617TS002

ITEM DESCRIPTION
GRADE 316L/316 Ship Condition CONDA
Size 316L HEX CDA CONDA 1.3750 x 144.000 RL
Country of Melt: UNITED KINGDOM Country of Mfg.: UNITED STATES
NAFTA Country of Origin is Country of Melt

No weld repair
Free of mercury contamination, Free of radiation contamination
No WEEE relevant substances; Meets EU electrical ROHS

DFARS

Total Bundles 1 Total Weight 1784

WO 2013255 Bundles: 1A

SPECIFICATIONS

MFG TO FINISHED BAR IN THE USA FROM BILLETS IMPORTED UNITED KINGDOM
AMS 5648K, 5653F
ASME SA182 E07, A07-09, E10
ASME SA479 E07, A07-09, E10
ASTM A262 02a Practice A/E
ASTM A479/A479M 09
ASTM A320 08 B8M Class 1
DFARS 252.225.7014 6/05
Federal Spec QQ-S-763F
NACE MR0175-03, mid-rad hard
SAE AMS-QQ-S-763B
ASME SA193 E10
ASTM A182 09
ASTM A276 08a
ASTM A484 09
ASTM A193 09 Gr B8M Class 1D
DFARS 225.7002-3(B)(1)
Eddy Current tested
Prodec Quality

Material Heat Code
MAY 16 2011
Certified by:
INSP. #5 SSP

MECHANICAL & OTHER TESTS

Hardness as shipped	(207 HB)		
Hardness as shipped	93 HRB		
Grain size	5.5	Tensile strength, KSI (MPa)	96.0 (662)
Micro	OK	0.2% Yield Strngth, KSI (MPa)	75.5 (521)
Intergranular corrosion	OK		
		Elongation % in 4D	42.0
		Reduction of area %	71.0

CHEMICAL COMPOSITION

Carbon	(C)	.019	Manganese	(Mn)	1.710
Phosphorus	(P)	.031	Sulphur	(S)	.026
Silicon	(Si)	.380	Chromium	(Cr)	16.710
Nickel	(Ni)	10.050	Cobalt	(Co)	.259
Copper	(Cu)	.383	Moly	(Mo)	2.080
Nitrogen	(N)	.073	Columbium	(Cb)	.085
Titanium	(Ti)	.002	Aluminum	(Al)	.005
Tin	(Sn)	.007	Boron	(B)	.003
Vanadium	(V)	.050			.000
Columbium/ Tantalum	(Cb+Ta)	.085			
Iron	(Fe)	Balance			
Melt Practice		EAF			
Refining Practice		AOD			
De-long Ferrite					

YARDE METALS, INC. CERTIFIES THAT THIS IS A TRUE COPY OF THE ORIGINAL MILL TEST REPORT NOW ON FILE. RECEIVED AND INSPECTED
NOV 16 2010
BY Kathy Bell
KATHY BELL, CERTIFICATION PROCESSOR

Knowingly & willfully falsifying or concealing a material act on this form, or making false, fictitious or fraudulent statements or representations herein could constitute a felony punishable under federal statutes. We hereby certify that the test results shown in this report are correct and accurate as contained in the records of the company and are in compliance with the specifications, codes, and standards listed above.

M.F. Marcanio, Quality Manager

Outokumpu Stainless Bar, Inc.
3043 Cranshaw Pkwy.
Richburg, SC 29729

MF Marcanio

YARDE METALS Inc 05-16-11

S10513CV006-1 SSP FITTINGS CO PO: 128395 Part #:
14.00PC 959.00LB

OUTOKUMPU

Certificate of Test

HEAT E100930 ORDER 614333/ 01 BOL 0210146 • CERTIFICATION • 01/07/11

SHIP TO:
YARDE METALS(VMI ORDERS)
75 AIRCRAFT RD

SOUTHINGTON 064890000

HC: FTF & RRJ

YOUR ORDER & DATE
C00617TS003 1/07/11 CUST# 0975001 CUST TAG#C00617TS003

ITEM DESCRIPTION
GRADE 316L/316 Ship Condition CONDA
Size 316L HEX CDA CONDA 1.5000 x 144.000 RL
Country of Melt: UNITED KINGDOM Country of Mfg.: UNITED STATES
NAFTA Country of Origin is Country of Melt

No weld repair
Free of mercury contamination, Free of radiation contamination
No WEEE relevant substances; Meets EU electrical ROHS

Total Bundles 1 Total Weight 1859

WO 2013746 Bundles: 1A

DFARS

Material Heat Code

FEB 03 2011

Certified by:

INSP. #5 SSP

SPECIFICATIONS

MFG TO FINISHED BAR IN THE USA FROM BILLETS IMPORTED UNITED KINGDOM

AMS 5648K, 5653F	SAE AMS-QQ-S-763B
ASME SA182 E07, A07-09, E10	ASME SA193 E10
ASME SA479 E07, A07-09, E10	ASTM A182 09
ASTM A262 02a Practice A/E	ASTM A276 10
ASTM A479/A479M 10	ASTM A484 09
ASTM A320 08 B8M Class 1	ASTM A193 09 Gr B8M Class 1D
DFARS 252.225.7014 6/05	DFARS 225.7002-3(B)(1)
Federal Spec QQ-S-763F	Eddy Current tested
NACE MR0175-03, mid-rad hard	Prodec Quality

MECHANICAL & OTHER TESTS

Hardness as shipped	(207 HB)		
Hardness as shipped	93 HRB		
Grain size	4.0	Tensile strength,KSI (MPa)	95.0 (655)
Micro	OK	0.2% Yield Strngth,KSI(MPa)	72.0 (496)
Intergranular corrosion	OK		
		Elongation % in 4D	43.0
		Reduction of area %	71.0

CHEMICAL COMPOSITION

Carbon	(C)	.020	Manganese	(Mn)	1.710
Phosphorus	(P)	.029	Sulphur	(S)	.024
Silicon	(Si)	.411	Chromium	(Cr)	16.700
Nickel	(Ni)	10.060	Cobalt	(Co)	.270
Copper	(Cu)	.558	Moly	(Mo)	2.070
Nitrogen	(N)	.077	Columbium	(Cb)	.076
Titanium	(Ti)	.002	Aluminum	(Al)	.004
Tin	(Sn)	.008	Boron	(B)	.003
Vanadium	(V)	.050			.000
Columbium/ Tantalum	(Cb+Ta)	.076			
Iron	(Fe)	Balance			
Melt Practice		EAF			
Refining Practice		AOD			
De-long Ferrite					

YARDE METALS, Inc. CERTIFIES THAT THIS IS A TRUE COPY OF THE ORIGINAL MILL TEST REPORT NOW ON FILE. RECEIVED AND INSPECTED

JAN 10 2011

BY
MELISSA GAGNIER CERTIFICATION PROCESSOR

Knowingly & willfully falsifying or concealing a material act on this form, or making false, fictitious or fraudulent statements or representations herein could constitute a felony punishable under federal statutes. We hereby certify that the test results shown in this report are correct and accurate as contained in the records of the company and are in compliance with the specifications, codes, and standards listed above.

M.F. Marcanio, Quality Manager

Outokumpu Stainless Bar, Inc.
3043 Cranshaw Pkwy.
Richburg, SC 29729

M.F. Marcanio

YARDE METALS Inc 02-02-11

S10201CV034-1 SSP FITTINGS CD PO: 124691 Part #:
6.00PC 479.00LB

CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROLE**

CERT SERIAL# 000441188

CARPENTER

Carpenter Technology Corporation
P.O. Box 14662, Reading, PA 19612-4662

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- MATERIAL IS MANUFACTURED FREE FROM MERCURY, RADIUM AND ALPHA SOURCE CONTAMINATION.
- THIS DOCUMENT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE WRITTEN CONSENT OF CARPENTER TECHNOLOGY CORPORATION.

04/06/04
CUSTOMER/BESTELLER/CLIENT

SELLER/VERKÄUFER/VENDEUR PAGE - 1

SSP FITTINGS CORP
ATTN: EVONA MYERS
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

CARPENTER TECHNOLOGY CORP(ALN
SUITE 200
1075 VIRGINIA DRIVE
FORT WASHINGTON,PA 19034

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POID
0094907 HC: WZY & VAE	PHL416202 L39118	03/26/04	399.000

HEAT NUMBER/SCHMELZE-NR./N° DE COULEE: 729003

PRODUCT DESCRIPTION: TYPE 316 PROJECT 70 STAINLESS STRAIN HARDENED GROUND + POLISHED

SPECIFICATION: ASTM-A276-03 (CONDITION B)
*QQ-S-763F (06/27/96)
*ASTM-A479-04
*ASTM-A262-02A

SIZE 1.250000 IN.(31.75 MM) RD BAR

PRIMARY HEAT CHEMISTRY(WT%):

C	MN	SI	P	S	CR
0.019	1.48	0.59	0.028	0.027	17.0

NI	MO	CU	N	*FD
10.2	2.07	0.30	0.049	6.1

*INTERGRANULAR CORROSION TESTED TO ASTM A262, PRACTICE A - ACCEPTABLE.

SOLUTION ANNEALED TO PROVIDE A MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).

YIELD STRENGTH, (0.20 %) KSI(MPA)	91.0(	627)
TENSILE STRENGTH, KSI(MPA)	113.0(	779)
ELONGATION IN 2.00", %	33.0	
REDUCTION OF AREA, %	76.0	
*HARDNESS, HB	232.0	(CONVERTED FROM TENSILE)

*GRAIN SIZE PER ASTM E112: 4

CARPENTER'S QUALITY MANAGEMENT SYSTEM WAS REGISTERED AS OF NOVEMBER 11, 2003 TO THE REQUIREMENTS OF ISO 9001:2000. APPROVAL CERTIFICATE 101921 BY LRQA,INC. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1.B OF EN 10204 (DIN 50049). WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WIT THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS.

DATE REVISED: 04/06/04

JAMES R. GARVERICH
MET RELEASE/REQUIREMENTS ANALYST
CARPENTER TECHNOLOGY CORPORATION

INSP. #9 SSP 3/29/04

James R. Garverich

This certification is made to the customer printed on this form. Carpenter neither makes, nor assumes responsibility for, any representation or certification to other parties.

CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROLE**

CERT SERIAL# 000457693

CARPENTER

Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601

- THE RECORDING OF FALSE, FICTICIOUS OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHED AS A FELONY UNDER FEDERAL STATUTES INCLUDING FEDERAL LAW, TITLE 18, CHAPTER 47.
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- MATERIAL IS MANUFACTURED FREE FROM MERCURY, RADIUM, ALPHA AND GAMMA SOURCE CONTAMINATION.
- THIS DOCUMENT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE WRITTEN CONSENT OF CARPENTER TECHNOLOGY CORPORATION.

07/02/04
CUSTOMER / BESTELLER / CLIENT

SELLER / VERKÄUFER / VENDEUR PAGE - 1

SSP FITTINGS CORP
ATTN: EVONA MYERS
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DUN

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POIDS
0095159 HC: XBF & VAE	W58183		2494

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE : 729928

PRODUCT DESCRIPTION: PROJECT 70+ TYPE 316/316L STAINLESS STRAIN HARDENED GROUND
PART NUMBER: RRT316PS1250

SPECIFICATION: SSP RMT316HT REV C (10/18/01)
ASTM-A276-04
ASTM-A479-04 (CHEMISTRY ONLY)
ASME-SA479 2001 EDITION

SIZE 1.250000 IN.(31.75 MM) RD BAR

PRIMARY HEAT CHEMISTRY(WT%): (TEST METHOD IS SHOWN IN PARENTHESIS)

C (COM)	MN(XRF)	SI(XRF)	P (XRF)	S (COM)	CR(XRF)
0.019	1.59	0.58	0.032	0.025	16.99

NI(XRF)	MO(XRF)	CU(XRF)	N (FUS)
11.30	2.05	0.82	0.02

INTERGRANULAR CORROSION TESTED TO ASTM-A262, PRACTICE A - ACCEPTABLE.

SOLUTION ANNEALED TO PROVIDE A MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).

YIELD STRENGTH, (0.20 %) KSI(MPA)	92.0(634)
TENSILE STRENGTH, KSI(MPA)	110.0(758)
ELONGATION IN 2.00", %	28.0
REDUCTION OF AREA, %	72.0

GRAIN SIZE PER ASTM E112: 6

MICROSTRUCTURE FERRITE - NONE

CARPENTER'S QUALITY MANAGEMENT SYSTEM WAS REGISTERED AS OF NOVEMBER 11, 2003 TO THE REQUIREMENTS OF ISO 9001:2000. APPROVAL CERTIFICATE 101921 BY LRQA,INC. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1.B OF EN 10204 (DIN 50049). WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WITH THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS.

IRVIN D. ULMER, JR.
MET RELEASE/REQUIREMENTS ANALYST
CARPENTER TECHNOLOGY CORPORATION

RECEIVED SSP #9 SSP 7/07/04

Irvin D. Ulmer Jr.

FORM EP-366

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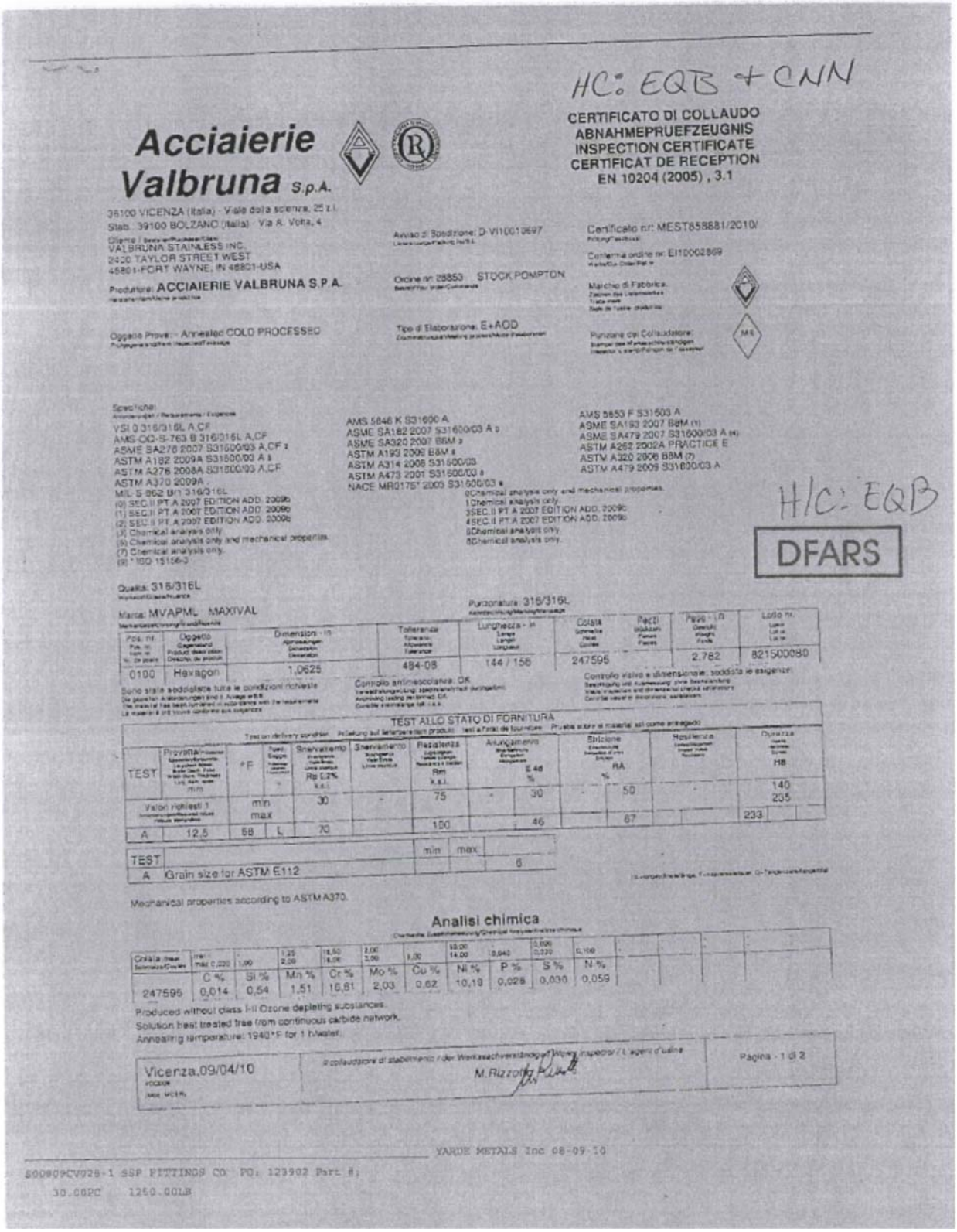


HC: EQB + CNN

Acciaierie Valbruna S.p.A.

36100 VICENZA (Italia) - Viale della scienza, 25 z.i.
Stab.: 39100 BOLZANO (Italia) - Via A. Volta, 4

CERTIFICATO DI COLLAUDO
ABNAHMEPRUEFZEUGNIS
INSPECTION CERTIFICATE
CERTIFICAT DE RECEPTION
EN 10204 (2005) , 3.1

Cliente: VALBRUNA STAINLESS INC.
2400 TAYLOR STREET WEST
46801-FORT WAYNE, IN 46801-USA

Avviso di Spedizione: D-VI10019697

Certificato n°: MEST858881/2010/

Ordine n°: 28853 STOCK POMPTON

Conferma ordine n°: EI10002869

Produttore: ACCIAIERIE VALBRUNA S.P.A.

Marchio di Fabbrica:

Oggetto Prove: Annealed COLD PROCESSED

Tipo di Elaborazione: E+AQD

Puntatura del Collaudatore:

Specifiche:
VSI Q 316/316L A,CF
AMS-QQ-S-763 B 316/316L A,CF
ASME SA276 2007 S31600/03 A,CF 2
ASTM A182 2009A S31600/03 A 3
ASTM A276 2008A S31600/03 A,CF
ASTM A370 2009A ;
MIL-S-862 B(1) 316/316L
(0) SEC.II PT.A 2007 EDITION ADD. 2009b
(1) SEC.II PT.A 2007 EDITION ADD. 2009b
(2) SEC.II PT.A 2007 EDITION ADD. 2009b
(3) Chemical analysis only
(5) Chemical analysis only and mechanical properties.
(7) Chemical analysis only.
(9) * ISO 15156-3

AMS 5648 K S31600 A
ASME SA182 2007 S31600/03 A 5
ASME SA320 2007 B8M 3
ASTM A193 2009 B8M 4
ASTM A314 2008 S31600/03
ASTM A473 2001 S31600/03 4
NACE MR0175* 2009 S31600/03 4
@Chemical analysis only and mechanical properties.
1Chemical analysis only.
3SEC.II PT.A 2007 EDITION ADD. 2009c
4SEC.II PT.A 2007 EDITION ADD. 2009b
5Chemical analysis only.
6Chemical analysis only.

AMS 5653 F S31600 A
ASME SA193 2007 B8M (1)
ASME SA479 2007 S31600/03 A (4)
ASTM A262 2002A PRACTICE E
ASTM A320 2006 B8M (7)
ASTM A479 2009 S31600/03 A

H/C: EQB

DFARS

Qualità: 316/316L

Marca: MVAPML MAXIVAL

Puntatura: 316/316L

Pos. nr.	Oggetto	Dimensioni - in	Tolleranze	Lunghezza - in	Colata	Pezzi	Peso - lb	Lotto nr.
0100	Hexagon	1,0625	484-08	144 / 156	247595		2.762	821500080

Sono state soddisfatte tutte le condizioni richieste
Controllo antimescolanza: OK
Controllo visivo e dimensionale: soddisfa le esigenze

TEST ALLO STATO DI FORNITURA

TEST	Provenita	PF	Trattamento	Snervamento	Resilienza	Allungamento	Strizione	Resilienza	Durezza
				Rp 0,2% N/mm²	Rm N/mm²	E 4d %	RA %		HB
Valori richiesti 1		min	30	-	75	- 30	- 50	-	140
		max							235
A	12,5	58 L	70		100	- 46	67		233

TEST		min	max	
A	Grain size for ASTM E112		6	

Mechanical properties according to ASTM A370.

Analisi chimica

Colata / Heat		1,00	1,25 2,00	16,50 18,00	2,00 2,50	3,00	12,00 14,00	0,040	0,020 0,030	0,100				
	C %	Si %	Mn %	Cr %	Mo %	Cu %	Ni %	P %	S %	N %				
247595	0,014	0,54	1,51	16,81	2,03	0,62	10,19	0,028	0,030	0,059				

Produced without class I-II Ozone depleting substances.
Solution heat treated free from continuous carbide network.
Annealing temperature: 1940°F for 1 h/water.

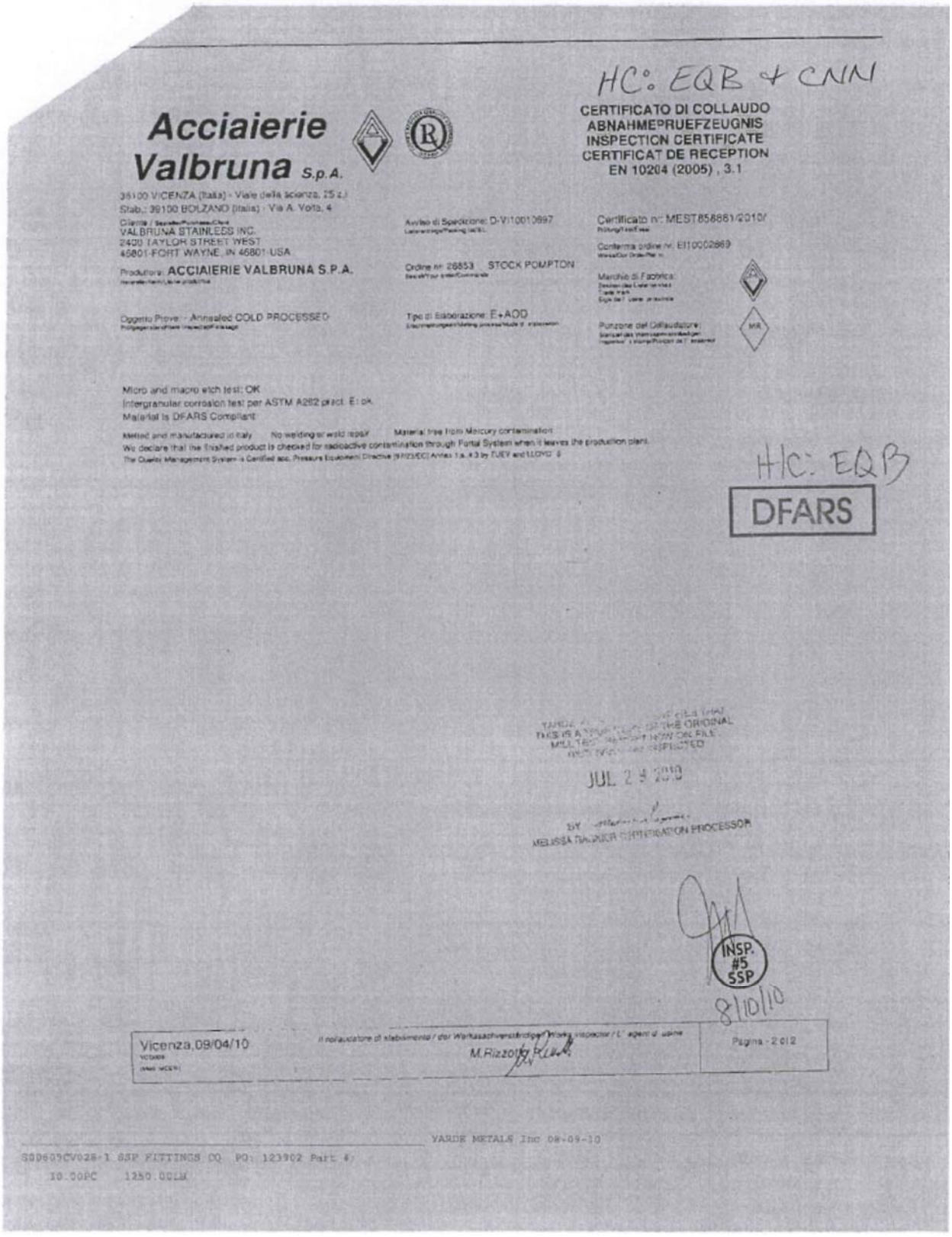
Vicenza,09/04/10

Il collaudatore di stabilimento / Der Werksachverständige / Works Inspector / L'agent d'usine
M.Rizzotto

Pagina - 1 di 2

YARDE METALS Inc 08-09-10

80080PCV928-1 SSP FITTINGS CO PO: 123902 Part #:
30.00PC 1250.00LB



HC: EQB + CNN

Acciaierie Valbruna S.p.A.

36100 VICENZA (Italia) - Viale della Scienza, 25 z.i.
Stab.: 39100 BOLZANO (Italia) - Via A. Volta, 4

Cliente / Kunde / Purchaser / Client
VALBRUNA STAINLESS INC.
2020 TAYLOR STREET WEST
46801-FORT WAYNE, IN 46801-USA

Produttore: **ACCIAIERIE VALBRUNA S.P.A.**

Oggetto Prove: - Annealed COLD PROCESSED

Avviso di Spedizione: D-V/10010897

Ordine nr: 28853 STOCK POMPTON

Tipo di Elaborazione: E+AOD

CERTIFICATO DI COLLAUDO
ABNAHMEPRUEFZEUGNIS
INSPECTION CERTIFICATE
CERTIFICAT DE RECEPTION
EN 10204 (2005) , 3.1

Certificato n°: MEST858861/2010/

Conferma ordine nr: EI10002869

Marchio di Fabbrica:

Punzone del Collaudatore:

Micro and macro etch test: OK
Intergranular corrosion test per ASTM A262 pract. E: OK
Material is DFARS Compliant

Melted and manufactured in Italy No welding or weld repair Material free from Mercury contamination
We declare that the finished product is checked for radioactive contamination through Portal System when it leaves the production plant.
The Quality Management System is Certified acc. Pressure Equipment Directive [97/23/EC] Annex 1 a. 4.3 by TUEV and LLOYD'S

HC: EQB

DFARS

THIS IS A TRUE COPY OF THE ORIGINAL
MILL TEST REPORT NOW ON FILE
AND WAS SUPPLIED

JUL 29 2010

BY
MELISSA DAUGHERTY CERTIFICATION PROCESSOR

INSP. #5 SSP

8/10/10

Vicenza, 09/04/10

Il collaudatore di stabilimento / der Werksachverständige / Works inspector / L' agent d' usine
M.Rizzotti

Pagina - 2 di 2

YARDE METALS Inc 08-09-10

S0D605CV028-1 SSP FITTINGS CO PO: 123902 Part #:
10.00PC 1250.00LB

OUTOKUMPU

Certificate of Test

HEAT E101251 ORDER 617100/ 01 BOL 0210195 * CERTIFICATION * 01/12/11

SHIP TO:
YARDE METALS (VMI ORDERS)
75 AIRCRAFT RD

SOUTHINGTON 064890000

HC: FSA & BRV

YOUR ORDER & DATE
C00921TS413 1/12/11 CUST# 0975001 CUST TAG#

ITEM DESCRIPTION
GRADE 316L/316 Ship Condition CONDA
Size 316L HEX CDA CONDA 1.1250 X 144.000 RL
Country of Melt: UNITED KINGDOM Country of Mfg.: UNITED STATES
NAFTA Country of Origin is Country of Melt

No weld repair
Free of mercury contamination, Free of radiation contamination
No WEEE relevant substances; Meets EU electrical ROHS

Total Bundles 1 Total Weight 1921

WO 2014968 Bundles: 1A

DFARS

Material Heat Code

JAN 28 2011

Certified by:

INSP. #5 SSP

SPECIFICATIONS

MFG TO FINISHED BAR IN THE USA FROM BILLETS IMPORTED UNITED KINGDOM

AMS 5648K, 5653F	SAE AMS-QQ-S-763B
ASME SA182 E07, A07-09, E10	ASME SA193 E10
ASME SA479 E07, A07-09, E10	ASTM A182 09
ASTM A262 D2a Practice A/E	ASTM A276 10
ASTM A479/A479M 10	ASTM A484 09
ASTM A320 08 B8M Class 1	ASTM A193 09 Gr B8M Class 1D
DFARS 252.225.7014 6/05	DFARS 225.7002-3(B)(1)
Federal Spec QQ-S-763F	Eddy Current tested
NACE MR0175-03, mid-rad hard	Prodec Quality
EN 10204 Type 3.1 Document	NACE MR0175-03, ISO 15156:03
Sol Anneal @ 1900F min/WQ	

MECHANICAL & OTHER TESTS

Hardness as shipped	(197 HB)		
Hardness as shipped	91 HRB		
Grain size	4.0	Tensile strength, KSI (MPa)	93.5 (645)
Micro	OK	0.2% Yield Strngth, KSI (MPa)	67.0 (462)
Intergranular corrosion	OK		
Macro	OK	Elongation % in 4D	45.0
		Reduction of area %	72.0

CHEMICAL COMPOSITION

Carbon	(C)	.017	Manganese	(Mn)	1.730
Phosphorus	(P)	.030	Sulphur	(S)	.025
Silicon	(Si)	.455	Chromium	(Cr)	16.660
Nickel	(Ni)	10.070	Cobalt	(Co)	.274
Copper	(Cu)	.370	Moly	(Mo)	2.050
Nitrogen	(N)	.077	Columbium	(Cb)	.013
Titanium	(Ti)	.001	Aluminum	(Al)	.004
Tin	(Sn)	.012	Boron	(B)	.004
Vanadium	(V)	.070			.000
Columbium/ Tantalum	(Cb+Ta)	.013			
Iron	(Fe)	Balance			
Melt Practice		EAF			
Refining Practice		AOD			
De-long Ferrite					

YARDE METALS, INC. CERTIFIED COPY
THIS IS A TRUE COPY OF THE ORIGINAL MILL TEST REPORT NOW ON FILE, RECEIVED AND INSPECTED
JAN 19 2011
BY Kathy Bell
KATHY BELL, CERTIFICATION PROCESSOR

Knowingly & willfully falsifying or concealing a material act on this form, or making false, fictitious or fraudulent statements or representations herein could constitute a felony punishable under federal statutes. We hereby certify that the test results shown in this report are correct and accurate as contained in the records of the company and are in compliance with the specifications, codes, and standards listed above.

M.F. Marcanio, Quality Manager

M.F. Marcanio

Outokumpu Stainless Bar, Inc.
3043 Cranshaw Pkwy.
Richburg, SC 29729

YARDE METALS Inc 01-27-11

S10124CV024-1 SSP FITTINGS CO PO: 126641 Part #1
12.00PC 530.00LB

CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTRÔLE**

CERT SERIAL# 000666316

CARPENTER
Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601
Tel: (610) 208-2000 (800) 338-4592

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10/14/09
CUSTOMER / BESTELLER / CLIENT

SELLER / VERKÄUFER / VENDEUR

SSP FITTINGS CORP
ATTN: JOE MERCER
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DFARS

CARPENTER TECHNOLOGY CORP
101 W. BERN STREET
READING ,PA 19601

CUSTOMER ORDER NO. / BESTELL-NR. / N° DE COMMANDE	CARPENTER NO. / WERKS-NR. / N° DE REFERENCE INTERNE	DATE / DATUM / DATE	WEIGHT / GEWICHT / POIDS
0120601 HC: DJA +RAA	PHL351701 L39351	10/14/09	552.000

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE : 737802

PRODUCT DESCRIPTION: TYPE 316 STRAIN HARDENED GROUND NUCLEAR QUAL

SPECIFICATION: PARKER HANNIFIN SS-62 (07/28/00)
ASTM-A276-06 (CONDITION B)
B&P V CODE SECT III* 2007 EDITION
SUBSECT NCA3800 2007 EDITION
PARKER HANNIFIN ES2040 (10/01/96)

SIZE 0.937500 IN.(23.81 MM) RD BAR

PRIMARY HEAT CHEMISTRY(WT%): (TEST METHOD IS SHOWN IN PARENTHESIS)

C (COM)	MN(XRF)	SI(XRF)	P (XRF)	S (COM)	CR(XRF)
0.06	1.45	0.62	0.020	0.021	17.29

NI(XRF)	MO(XRF)	N (FUS)
10.40	2.0	0.06

INTERGRANULAR CORROSION TESTED TO ASTM-A262, PRACTICE A - ACCEPTABLE. (OXALIC) (END GRAIN I)

ANNEALED MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).

SOLUTION ANNEALED TO PROVIDE A MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).

THIS CERTIFICATE AFFIRMS THAT THE CONTENTS OF THIS REPORT ARE CORRECT AND ACCURATE AND THAT ALL TEST RESULTS AND OPERATIONS PERFORMED BY US, OR OUR SUBCONTRACTORS, ARE IN COMPLIANCE WITH THE ORDER REQUIREMENTS AS MAY HAVE BEEN MODIFIED BY PRIOR CORRESPONDENCE BETWEEN THE PARTIES.

IN PRODUCTION OR TESTING OF MATERIAL SHIPPED AGAINST THIS ORDER, NO DIRECT CONNECTED MERCURY MANOMETER, MERCURY PUMPS, MERCURY SEALS, OR MERCURY IN GLASS THERMOMETERS HAVE BEEN USED. NOR IN SUCH PRODUCTION OR TESTING HAS MERCURY BEEN HANDLED IN THE IMMEDIATE VICINITY OF SUCH MATERIAL.

NO WELD REPAIR.

PROVISIONS OF 10 CFR PART 21 AND 10 CFR PART 50 - APPENDIX B APPLY.
THIS ORDER WAS PRODUCED AND SUPPLIED IN ACCORDANCE WITH CARPENTER SPECIALTY ALLOYS OPERATIONS QUALITY PROGRAM MANUAL REV. 27, DATED 1/08 AND CARPENTER

TECHNOLOGY'S WAREHOUSE QUALITY ASSURANCE MANUAL M25-21, DATED 01/00.

MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATE.

ALL MATERIAL SHIPPED VIA HARTSVILLE, SOUTH CAROLINA DISTRIBUTION CENTER.

CONTINUED ON NEXT PAGE

FORM F2-366

CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTRÔLE**

CERT SERIAL# 000666316

CARPENTER

Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601
Tel: (610) 208-2000 (800) 338-4592

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10/14/09
CUSTOMER / BESTELLER / CLIENT

SSP FITTINGS CORP
ATTN: JOE MERCER
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DFARS

CARPENTER TECHNOLOGY CORP
101 W. BERN STREET
READING ,PA 19601

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POIDS
0120601 HC: DJA & RAA	PHL351701 L39351	10/14/09	552.000

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 737802

MILL HEAT TREATMENT:
TYPE SOLUTION ANNEAL
TEMP 1949F (1065C)
TIME (BATCH FURNACE) .50 HOURS
QUENCH WATER

YIELD STRENGTH, (0.20 %) KSI(MPA)	105.0(	724)
TENSILE STRENGTH, KSI(MPA)	141.0(	972)
ELONGATION IN 2.00", %	23.0	
REDUCTION OF AREA, %	68.0	

MATERIAL PRODUCED ON THIS ORDER WAS MELTED AND MANUFACTURED IN THE U.S.A. MATERIAL HAS BEEN MELTED IN USA OR QUALIFYING COUNTRY TO DFARS REQUIREMENTS 252.225-7014 WITH ALTERNATE 1 FOR QUALIFYING COUNTRY 225.872.1. CARPENTER'S QUALITY MANAGEMENT SYSTEM WAS REGISTERED AS OF NOVEMBER 24, 2007 TO THE REQUIREMENTS OF ISO 9001:2000 APPROVAL CERTIFICATE 07-0869 BY PERFORMANCE REVIEW INSTITUTE. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1 OF EN 10204 (DIN 50049). WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WITH THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS.

DATE REVISED: 10/09/08

MARGARET A TURNER
MET RELEASE/REQUIREMENTS ANALYST
CARPENTER TECHNOLOGY CORPORATION

CERTS OK PER JOHN

INSP. #5 SSP
10/20/09

Margaret A. Turner

FORM F2-365

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CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROL**

CERT SERIAL# 000717502

CARPENTER

Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601
Tel: (610) 208-2000 (800) 338-4592

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- THE VALUES AND OTHER TECHNICAL DATA REPRESENT THE RESULTS OF ANALYSES AND TESTS MADE ON SAMPLES COLLECTED FROM THE TOTAL LOT. ORIGINAL DATA RECORDS CAN BE TRACED BY REFERENCE TO THE CARPENTER ORDER NUMBER.
- MATERIAL IS MANUFACTURED FREE FROM MERCURY, RADIUM, ALPHA AND GAMMA SOURCE CONTAMINATION.
- THIS DOCUMENT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE WRITTEN CONSENT OF CARPENTER TECHNOLOGY CORPORATION.

04/27/10
CUSTOMER / BESTELLER / CLIENT

SELLER / VERKÄUFER / VENDEUR PAGE 1 OF

SSP FITTINGS CORP
ATTN: JOE MERCER
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DFARS

CARPENTER TECHNOLOGY CORP
101 W. BERN STREET
READING ,PA 19601

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POI
0121485 HC: DRV & CRO	PHL828801 L33285	04/27/10	868.00

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 739459

PRODUCT DESCRIPTION: PROJECT 70+ TYPE 316/316L STAINLESS ANNEALED COLD DRAWN

SPECIFICATION: SSP RMT316 REV B (09/11/01) EXCPT LTR (04/11/03) PENDING
ASTM-A276-08A TYPE 316/316L
ASTM-A479-08 TYPE 316/316L
ASME-SA479 2007 EDITION, 2009B ADD TYPE 316/316L

SIZE 0.812000 IN.(20.62 MM) HEX BAR

PRIMARY HEAT CHEMISTRY(WT%): (TEST METHOD IS SHOWN IN PARENTHESIS)

C (COM)	MN(XRF)	SI(XRF)	P (XRF)	S (COM)	CR(XRF
0.015	1.66	0.67	0.027	0.022	16.79

NI(XRF)	MO(XRF)	CU(XRF)	N (FUS)
11.25	2.06	0.82	0.02

INTERGRANULAR CORROSION TESTED TO ASTM-A262, PRACTICE A - ACCEPTABLE.
SOLUTION ANNEALED TO PROVIDE A MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).

HARDNESS AS SHIPPED, HRBW - 97 (MIDRADIUS)

YIELD STRENGTH, (0.20 %) KSI(MPA)	78.5(541)
TENSILE STRENGTH, KSI(MPA)	95.0(655)
ELONGATION IN 2.00", %	40.0
REDUCTION OF AREA, %	75.0

GRAIN SIZE PER ASTM E112: 4

MATERIAL PRODUCED ON THIS ORDER WAS MELTED AND MANUFACTURED IN THE U.S.A. MATERIAL HAS BEEN MELTED IN USA OR QUALIFYING COUNTRY TO DFARS REQUIREMENTS 252.225-7014 WITH ALTERNATE 1 FOR QUALIFYING COUNTRY 225.872.1. CARPENTER'S QUALITY MANAGEMENT SYSTEM WAS REGISTERED AS OF NOVEMBER 24, 2007 TO THE REQUIREMENTS OF ISO 9001:2000 APPROVAL CERTIFICATE 07-0869 BY PERFORMANCE REVIEW INSTITUTE. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1 OF EN 10204 (DIN 50049). WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WITH THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS.

INSP. #5 SSP
4/28/10

HEIDI L. SUNDAY
GROUPLDR - SPECIFICATIONS/CERTIFICATIO
CARPENTER TECHNOLOGY CORPORATION
Heidi L. Sunday

RHT3160812

FORM F2-366

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CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROLE**

CERT SERIAL# 000721567

CARPENTER
Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601
Tel: (610) 208-2000 (800) 338-4592

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05/13/10

CUSTOMER / BESTELLER / CLIENT

SELLER / VERKÄUFER / VENDEUR PAGE 1 OF 1

SSP FITTINGS CORP
ATTN: JOE MERCER
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DFARS

CARPENTER TECHNOLOGY CORP

101 W. BERN STREET
READING ,PA 19601

CUSTOMER ORDER NO. / BESTELL-NR. / N° DE COMMANDE	CARPENTER NO. / WERKS-NR. / N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POI
0122900 HC: EFN + RAR	PHL875401 L35329	05/13/10	1401.00(

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 739518

PRODUCT DESCRIPTION: PROJECT 70+ TYPE 316/316L STAINLESS ANL COLD WORKED PRECISION GRD + PRECISION POLISHED TENSILE MIN 105.0 / MAX 120.0 KSI YIELD MIN 50.0 KSI

SPECIFICATION: SSP RMT316HT REV E (08/04/06) EXCPT LTR (08/23/06) APPROVED
ASTM-A276-08A
ASTM-A479-08 (CHEMISTRY ONLY)
ASME-SA479 2007 EDITION, 2009B ADD

SIZE 0.687500 IN.(17.46 MM) RD BAR

PRIMARY HEAT CHEMISTRY(WT%): (TEST METHOD IS SHOWN IN PARENTHESIS)

C (COM)	MN(XRF)	SI(XRF)	P (XRF)	S (COM)	CR(XRF)
0.017	1.64	0.65	0.028	0.027	16.93

NI(XRF)	MO(XRF)	CU(XRF)	N (FUS)
11.47	2.05	0.82	0.02

INTERGRANULAR CORROSION TESTED TO ASTM-A262, PRACTICE A - ACCEPTABLE.

HARDNESS AS SHIPPED, HBW - 240 (MIDRADIUS)

YIELD STRENGTH, (0.20 %) KSI(MPA)	74.0(510)
TENSILE STRENGTH, KSI(MPA)	113.0(779)
ELONGATION IN 1.40", %	27.0
REDUCTION OF AREA, %	72.0

GRAIN SIZE PER ASTM E112: 7

MATERIAL PRODUCED ON THIS ORDER WAS MELTED AND MANUFACTURED IN THE U.S.A. MATERIAL HAS BEEN MELTED IN USA OR QUALIFYING COUNTRY TO DFARS REQUIREMENTS 252.225-7008 AND 252.225-7009
CARPENTER'S QUALITY MANAGEMENT SYSTEM WAS REGISTERED AS OF NOVEMBER 24, 2007 TO THE REQUIREMENTS OF ISO 9001:2000 APPROVAL CERTIFICATE 07-0869 BY PERFORMANCE REVIEW INSTITUTE. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1 OF EN 10204 (DIN 50049). WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WITH THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS.

TIMOTHY DUVALL
QUALITY ASSURANCE REP.
CARPENTER TECHNOLOGY CORPORATION

INSP. #5 SSP

5/14/10

Timothy M. Duvall

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FORM F2-366

CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROLE**

CERT SERIAL# 000697088

TALLEY METALS
A Carpenter Company

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- MATERIAL IS MANUFACTURED FREE FROM MERCURY, RADIUM, ALPHA AND GAMMA SOURCE CONTAMINATION.
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Talley Metals Technology, Inc.
205 Talley Metals Lane
McBee, SC. 29101 Tel: (610) 208-2000 (800) 338-4592

08/06/10
CUSTOMER / BESTELLER / CLIENT

ALRO - POTTERVILLE
PO BOX 927
JACKSON ,MI 49204

RECEIVED
AUG 10 2010
By

DFARS

SELLER / VERKÄUFER / VENDEUR PAGE 1 OF 2

TALLEY METALS TECH, INC.
ACCOUNTS PAYABLE
P. O. BOX 2498
HARTSVILLE ,SC 29551

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POIDS
JCPVPV7443515 HC: EU1 & CRO	TLY523601 L14390	08/06/10	512.000

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 152839

PRODUCT DESCRIPTION: TYPE 316/316L STAINLESS ANNEALED COLD DRAWN

SPECIFICATION: TALLEY 316L-T1A (12/21/98)
OQ-S-763F (06/27/96)
AMS 5648 REV K (08/ /02)
AMS 5653 REV F (08/ /02)
ASTM-A182-07 (CHEM ONLY)
ASTM-A193-08A (CL 1)
ASTM-A276-06
ASTM-A314-97 REAPPROVED(2002)
ASTM-A320-07A
ASTM-A479-06A
ASTM-A484-06B
ASTM-A580-06 (SIZES .500" AND UNDER ONLY)
ASME-SA182 2007 EDITION (CHEM ONLY)
ASME-SA193 2007 EDITION (CL 1)
ASME-SA320 2007 EDITION
ASME-SA479 2007 EDITION
AMS-QQ-S-763B (08/ /06)

ALRO STEEL/METAL
RT06079433

SIZE 0.562500 IN.(14.29 MM) HEX BAR

PRIMARY HEAT CHEMISTRY(WT%): (TEST METHOD IS SHOWN IN PARENTHESIS)

C (COM)	MN(XRF)	SI(XRF)	P (XRF)	S (COM)	CR(XRF)
0.014	1.46	0.57	0.027	0.028	16.49

NI(XRF)	MO(XRF)	CU(XRF)	CO(XRF)	N (FUS)
10.13	2.03	0.37	0.37	0.054

INTERGRANULAR CORROSION TESTED TO ASTM-A262, PRACTICE E - ACCEPTABLE.
ANNEALED MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).
THIS MATERIAL WAS MANUFACTURED IN ACCORDANCE WITH CARPENTER SPECIALTY ALLOYS OPERATIONS QUALITY PROGRAM MANUAL REVISION 27, DATED 1/08.

YIELD STRENGTH, (0.20 %) KSI(MPA)	81.5(	562)
TENSILE STRENGTH, KSI(MPA)	96.0(	662)
ELONGATION IN 2.00", %	50.0	
REDUCTION OF AREA, %	73.0	
HARDNESS , HBW	202.0	

(CONVERTED FROM TENSILE STRENGTH)

CONTINUED ON NEXT PAGE

FORM F2-266

1

CERTIFICATE OF TESTS ABNAHMEPRUEFZEUGNIS CERTIFICAT DE CONTROLE

CERT SERIAL# 000697088

TALLEY METALS
A Carpenter Company

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- MATERIAL IS MANUFACTURED FREE FROM MERCURY. RADIUM, ALPHA AND GAMMA SOURCE CONTAMINATION.
- THIS DOCUMENT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE WRITTEN CONSENT OF CARPENTER TECHNOLOGY CORPORATION.

Talley Metals Technology, Inc.
205 Talley Metals Lane
McBee, SC. 29101 Tel: (610) 208-2000 (800) 338-4592

08/06/10
CUSTOMER / BESTELLER / CLIENT

ALRO - POTTERVILLE
PO BOX 927
JACKSON ,MI 49204

DFARS

SELLER / VERKÄUFER / VENDEUR PAGE 2 OF 2

TALLEY METALS TECH, INC.
ACCOUNTS PAYABLE
P. O. BOX 2498
HARTSVILLE ,SC 29551

CUSTOMER ORDER NO. / BESTELL-NR. / N° DE COMMANDE	CARPENTER NO. / WERKS-NR. / N° DE REFERENCE INTERNE	DATE / DATUM / DATE	WEIGHT / GEWICHT / POIDS
JCPVPV7443515 HC: EUI + CRO	TLY523601 L14390	08/06/10	512.000

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 152839
GRAIN SIZE PER ASTM E112: 6

NO WELD REPAIR PERFORMED
MATERIAL PRODUCED ON THIS ORDER WAS MELTED AND MANUFACTURED IN THE U.S.A.
MATERIAL HAS BEEN MELTED IN USA OR QUALIFYING COUNTRY TO DFARS REQUIREMENTS 252.225-7014 WITH ALTERNATE 1 FOR QUALIFYING COUNTRY 225.872.1, SUPERSEDED BY DFARS REQUIREMENTS DFARS 252.225-7008 AND 252.225-7009.
WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WITH THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1 OF EN 10204(DIN50049)

SHARON S. BRUNSON
QUALITY ASSURANCE REP.
CARPENTER TECHNOLOGY CORPORATION

10641550

INSP. #5 SSP
8/13/10

Sharon Brunson

FORM F2-3366

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CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROL**

~~CERT~~ SERIAL# 000714646

CARPENTER

Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601
Tel: (610) 208-2000 (800) 338-4592

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02/11/10
CUSTOMER / BESTELLER / CLIENT

SELLER / VERKÄUFER / VENDEUR PAGE 1 OF 1

SSP FITTINGS CORP
ATTN: JOE MERCER
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DFARS

CARPENTER TECHNOLOGY CORP
101 W. BERN STREET
READING ,PA 19601

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POI
0121909 HC: DWN+BRT	PHL636801 L32946	02/11/10	803.00

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 739458

PRODUCT DESCRIPTION: PROJECT 70+ TYPE 316/316L STAINLESS ANNEALED COLD DRAWN

SPECIFICATION: SSP RMT316 REV B (09/11/01) EXCPT LTR (04/11/03) PENDING
ASTM-A276-08A TYPE 316/316L
ASTM-A479-08 TYPE 316/316L
ASME-SA479 2007 EDITION, 2009B ADD TYPE 316/316L

SIZE 0.562500 IN.(14.29 MM) HEX BAR

PRIMARY HEAT CHEMISTRY(WT%): (TEST METHOD IS SHOWN IN PARENTHESIS)

C (COM)	MN(XRF)	SI(XRF)	P (XRF)	S (COM)	CR(XRF)
0.018	1.62	0.67	0.029	0.023	16.64

NI(XRF)	MO(XRF)	CU(XRF)	N (FUS)
11.44	2.05	0.83	0.02

INTERGRANULAR CORROSION TESTED TO ASTM-A262, PRACTICE A - ACCEPTABLE.
SOLUTION ANNEALED TO PROVIDE A MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).

HARDNESS AS SHIPPED, HREW - 97 (MIDRADIUS)

YIELD STRENGTH, (0.20 %) KSI(MPA)	84.5	(583)
TENSILE STRENGTH, KSI(MPA)	98.0	(676)
ELONGATION IN 2.00", %	35.0	
REDUCTION OF AREA, %	74.0	

GRAIN SIZE PER ASTM E112: 5

MATERIAL PRODUCED ON THIS ORDER WAS MELTED AND MANUFACTURED IN THE U.S.A. MATERIAL HAS BEEN MELTED IN USA OR QUALIFYING COUNTRY TO DFARS REQUIREMENTS 252.225-7014 WITH ALTERNATE 1 FOR QUALIFYING COUNTRY 225.872.1. CARPENTER'S QUALITY MANAGEMENT SYSTEM WAS REGISTERED AS OF NOVEMBER 24, 2007 TO THE REQUIREMENTS OF ISO 9001:2000 APPROVAL CERTIFICATE 07-0869 BY PERFORMANCE REVIEW INSTITUTE. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1 OF EN 10204 (DIN 50049). WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WITH THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS.

INSP. #5 SSP
2/12/10

HEIDI L. SUNDAY
MET RELEASE/REQUIREMENTS ANALYST
CARPENTER TECHNOLOGY CORPORATION
Heidi L. Sunday

RHT3160562

FORM F2-365

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CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROLE**

CERT SERIAL# 000751007

CARPENTER

Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601
Tel: (610) 208-2000 (800) 338-4592

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03/02/11
CUSTOMER / BESTELLER / CLIENT

SELLER / VERKÄUFER / VENDEUR PAGE 1 OF 1

SSP FITTINGS CORP
ATTN: JOE MERCER
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DFARS

CARPENTER TECHNOLOGY CORP
101 W. BERN STREET
READING ,PA 19601

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POIDS
127230 HC: FXW & RAC	PHL578701 L23134	03/02/11	469.000

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 740556

PRODUCT DESCRIPTION: PROJECT 70+ TYPE 316/316L STAINLESS ANL COLD WORKED PRECISION GRD + PRECISION POLISHED TENSILE MIN 105.0 / MAX 120.0 KSI YIELD MIN 50.0 KSI

SPECIFICATION: SSP RMT316HT REV E (08/04/06) EXCPT LTR (08/23/06) APPROVED
ASTM-A276-10
ASTM-A479-10A (CHEMISTRY ONLY)
ASME-SA479 2007 EDITION, 2009B ADD

SIZE 0.375000 IN.(9.53 MM) RD BAR

PRIMARY HEAT CHEMISTRY(WT%): (TEST METHOD IS SHOWN IN PARENTHESIS)

C (COM)	MN (XRF)	SI (XRF)	P (XRF)	S (COM)	CR (XRF)
0.017	1.60	0.60	0.022	0.023	16.78

NI (XRF)	MO (XRF)	CU (XRF)	N (FUS)
11.31	2.05	0.82	0.02

INTERGRANULAR CORROSION TESTED TO ASTM-A262, PRACTICE A - ACCEPTABLE.
ANNEALED MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).

YIELD STRENGTH, (0.20 %) KSI(MPA)	92.0(	634)
TENSILE STRENGTH, KSI(MPA)	110.0(	758)
ELONGATION IN 1.40", %	36.0	
REDUCTION OF AREA, %	72.0	
HARDNESS , HBW -	231.0	

(CONVERTED FROM TENSILE STRENGTH)

Material Heat Code
FXW
MAR 03 2011

Certified by:

GRAIN SIZE PER ASTM E112: 6
***FERRITE TESTING PERFORMED BY LTI UNKNOWN

MICROSTRUCTURE - FERRITE - NONE

INSP. #3 SSP

MATERIAL PRODUCED ON THIS ORDER WAS MELTED AND MANUFACTURED IN THE U.S.A. MATERIAL HAS BEEN MELTED IN USA OR QUALIFYING COUNTRY TO DFARS REQUIREMENTS 252.225-7014 WITH ALTERNATE 1 FOR QUALIFYING COUNTRY 225.872.1, SUPERSEDED BY DFARS REQUIREMENTS DFARS 252.225-7008 AND 252.225-7009. CARPENTER'S QUALITY MANAGEMENT SYSTEM WAS REGISTERED AS OF NOVEMBER 24, 2010 TO THE REQUIREMENTS OF ISO 9001:2008 APPROVAL CERTIFICATE 10-1385R BY PERFORMANCE REVIEW INSTITUTE. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1 OF EN 10204 (DIN 50049). WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WITH THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS.

TIMOTHY DUVALL
QUALITY ASSURANCE REP.
CARPENTER TECHNOLOGY CORPORATION

FORM F2.366

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CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROLE**

CERT SERIAL# 000744288

CARPENTER

Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601
Tel: (610) 208-2000 (800) 338-4592

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12/22/10

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SSP FITTINGS CORP
ATTN: JOE MERCER
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DFARS

CARPENTER TECHNOLOGY CORP

101 W. BERN STREET
READING ,PA 19601

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POIDS
123918 HC: 6X 4RAC	PHL412501 L20050	12/22/10	577.000

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 740371

CARPENTER'S QUALITY MANAGEMENT SYSTEM WAS REGISTERED AS OF NOVEMBER 24, 2007 TO THE REQUIREMENTS OF ISO 9001:2000 APPROVAL CERTIFICATE 07-0869 BY PERFORMANCE REVIEW INSTITUTE. CERTIFICATE OF TEST IS PREPARED IN ACCORDANCE WITH PARAGRAPH 3.1 OF EN 10204 (DIN 50049). WE HEREBY CERTIFY THAT THE ABOVE TEST DATA ARE IN ACCORDANCE WITH THE PURCHASE ORDER AND SPECIFICATION REQUIREMENTS.

STEPHANIE E. MCCULLUM
QUALITY ASSURANCE ENGINEER
CARPENTER TECHNOLOGY CORPORATION

INSP. #5 SSP
12/28/10

Stephanie McCullum

[DOM 12-366]

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CERTIFICATE OF TESTS **ABNAHMEPRUEFZEUGNIS** **CERTIFICAT DE CONTROLE**

CERT SERIAL# 000744288

CARPENTER
Carpenter Technology Corporation
101 West Bern Street, Reading, Pa. 19601
Tel: (610) 208-2000 (800) 338-4592

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- THIS DOCUMENT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE WRITTEN CONSENT OF CARPENTER TECHNOLOGY CORPORATION.

12/22/10

CUSTOMER / BESTELLER / CLIENT

SSP FITTINGS CORP
ATTN: JOE MERCER
8250 BOYLE PARKWAY
TWINSBURG ,OH 44087

DFARS

SELLER / VERKÄUFER / VENDEUR PAGE 1 OF 2

CARPENTER TECHNOLOGY CORP
101 W. BERN STREET
READING ,PA 19601

CUSTOMER ORDER NO./BESTELL-NR./N° DE COMMANDE	CARPENTER NO./WERKS-NR./N° DE REFERENCE INTERNE	DATE/DATUM/DATE	WEIGHT/GEWICHT/POID
123918 HC: 6X & RAC	PHL412501 L20050	12/22/10	577.000

HEAT NUMBER / SCHMELZE-NR. / N° DE COULEE: 740371

PRODUCT DESCRIPTION: PROJECT 70+ TYPE 316/316L STAINLESS ANL COLD WORKED PRECISION GRD + PRECISION POLISHED TENSILE MIN 105.0 / MAX 120.0 KSI YIELD MIN 50.0 KSI

SPECIFICATION: SSP RMT316HT REV E (08/04/06) EXCPT LTR (08/23/06) APPROVED
ASTM-A276-10
ASTM-A479-09 (CHEMISTRY ONLY)
ASME-SA479 2007 EDITION, 2009B ADD

SIZE 0.375000 IN.(9.53 MM) RD BAR

PRIMARY HEAT CHEMISTRY(WT%): (TEST METHOD IS SHOWN IN PARENTHESIS)

C (COM)	MN(XRF)	SI(XRF)	P (XRF)	S (COM)	CR(XRF)
0.017	1.62	0.60	0.024	0.025	16.85

NI(XRF)	MO(XRF)	CU(XRF)	N (FUS)
11.23	2.05	0.83	0.02

INTERGRANULAR CORROSION TESTED TO ASTM-A262, PRACTICE A - ACCEPTABLE.
ANNEALED MICROSTRUCTURE FREE FROM CONTINUOUS GRAIN BOUNDARY CARBIDE PRECIPITATION (NETWORK).

HARDNESS AS SHIPPED, HBW - 222 (MIDRADIUS)

YIELD STRENGTH, (0.20 %) KSI(MPA)	87.5(	603)
TENSILE STRENGTH, KSI(MPA)	110.0(	758)
ELONGATION IN 1.40", %	37.0	
REDUCTION OF AREA, %	70.0	
HARDNESS , HBW -	231.0	

(CONVERTED FROM TENSILE STRENGTH)

GRAIN SIZE PER ASTM E112: 5
***FERRITE TESTING COMPLETED BY LTI UNKNOWN

MICROSTRUCTURE - FERRITE - NONE

MATERIAL PRODUCED ON THIS ORDER WAS MELTED AND MANUFACTURED IN THE U.S.A.
MATERIAL HAS BEEN MELTED IN USA OR QUALIFYING COUNTRY TO DFARS REQUIREMENTS 252.225-7014 WITH ALTERNATE 1 FOR QUALIFYING COUNTRY 225.872.1, SUPERSEDED BY DFARS REQUIREMENTS DFARS 252.225-7008 AND 252.225-7009.

CONTINUED ON NEXT PAGE

D. EQUIPMENT

Validation Test Equipment	
Test Description	**Test Equipment Description**
Hydrostatic Burst Pressure Test	1279 Ashcroft Pressure Gage
	DLE 15-75 Maximator Booster Pump
Intermix Assurance Test	2100 Strain Gage Conditioner System.
	The Measurements Group
	DLE 15-75 Maximator Air Booster Pump
	L-400 Maximator Liquid Pump
Interchange Assurance Test	DLE 15-75 Maximator Air Booster Pump
	L-400 Maximator Liquid Pump
Gas Pressure Leak Test	HP 224 McDaniels Pressure Gage

Table 5.0.D.0

E. REVISIONS

Rev. B - 05/25/11

- Corrected “A2LA Accredited” logo to maintain compliance with A2LA policies.

Rev. C – 03/09/15

- Updated data to include tubing wall thickness and test pressures.

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