

Service
Training
Calibration
Certification
Maintenance

Universal Thermal Services
Allen R. Hildebrand (President)
E7064 Knopp Road
Manawa, Wisconsin 54949
Phone – Fax 920-596-2983
uts@wolfnet.net

Thermach AT3000 Certificate of Calibration

Form # AT3000 Rev C 3/19/2009

Cert. No. : 2009-930

Page: 1 of 10

Customer:	ABC	Console	AT 3000	Hopper	AT1200 #2	Power Supply	AT1000
Address:	1365 Newton	S/N:	ATCP100102	S/N:	RPFT100274	S/N:	LF440413C
City:	Boucherville	Device ID#:	M280				
State:	QU	Booth #:	2	Hopper	NA		
Zip:	J4B 5H2	With in 3%:	No	S/N:	NA		
Name:	John	Adjustments:	Yes				
Phone #:	451-449-4612						

N.I.S.T. Instruments Used for This Calibration

Test Inst:	Press. Transducer	Test Inst:	Multi Meter	Test Inst:	Amp Clamp Meter	Test Inst:	
Make:	Fluke	Make:	Fluke	Make:	Fluke	Make:	
Model:	PV350	Model:	87V	Model:	i1010	Model:	
Serial No:	107	Serial No:	88190113	Serial No:	91562357	Serial No:	
Next Cal. Due:	1/6/2010	Next Cal. Due:	6/27/2009	Next Cal. Due:	3/11/2009	Next Cal. Due:	

Test Inst: Low Flow	Mass Flow Meter	Test Inst: Medium Flow	Mass Flow Meter			
Make:	Alicat Scientific 0-75 scfh	Make:	Alicat Scientific 0-400 scfh			
Model:	PUC-50SLPM	Model:	PUC-250SLPM			
Serial No:	44770	Serial #:	44771			
Next Cal. Due:	1/13/20010	Next Cal. Due:	1/13/20010			

Gas Orifices	Sizes	Gas	Flow [FS]
Primary Gas	#56	Argon	511.12
Primary Gas	#80	Helium	110.28
Secondary Gas	#97 or #103	Hydrogen	31.43 or 7.34
Powder Carrier Gas	#77	Argon or Nitrogen	46.2 or 50.2

System Performance w/Prameters as Provided by the Operator Initially

Gas	Pressure	Gun						Evidence of Gas Contamination
Ar	40	SG100						Argon: No
H2		Amps						Helium: No
N2		950						Hydrogen: N/A
He	220	Volts	Volts after Calibration					Nitrogen: N/A
		44.1	47.6					Air: N/A

Notes:
Changed the #56 Orifice out, due to above 5% error on the low side. It now is below 3% error on the low side. Please note volts after calibration vs volts before calibration!

Green 0-3% Acceptable
Orange 3.1-5% Alert
Red 5.1 and up Fail

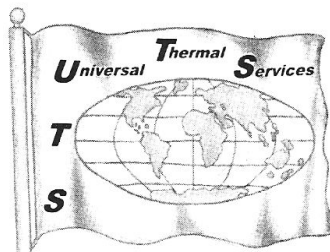
Calibrated By: Allen Hildebrand
Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

Allen R. Hildebrand

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Customer: ABC

Amperage Display

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Cert. No. : 2009-930

Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280A	Booth Number:	2
Device Under Test:	Arc Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Amp Clamp Meter	i1010	Serial Number:	91562357
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Pressure Full Scale [FS] = 1500 Amps

Amps Set Point	As Found Display Reading	As Found NIST Meter	Actual Amps Deviation	As Found Amps % Deviation	As Left Display Reading	As Left Amps Deviation	As Left Amps % Deviation			
500	500	507	7.0	0.5	507	7.0	0.5			
600	600	611	11.0	0.7	611	11.0	0.7			
700	700	711	11.0	0.7	711	11.0	0.7			
800	800	816	16.0	1.1	816	16.0	1.1			
900	900	917	17.0	1.1	917	17.0	1.1			
950	950	969	19.0	1.3	969	19.0	1.3			

Volts Display

Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280B	Booth Number:	2
Device Under Test:	Arc Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113
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Volts Full Scale [FS] = 200 Volts

Volt Meter Set Point	Meter Reading	NIST Meter	Volts Deviation	Volts % Deviation	Volts As Left Meter Reading	As Left Volt Deviation	As Left Volts % Deviation			
30	30	29.5	-0.5	-0.3	29.5	-0.5	-0.3			
32	32	31.1	-0.9	-0.4	31.1	-0.9	-0.4			
35	33	34.1	-0.9	-0.4	34.1	-0.9	-0.4			
39	39	38.2	-0.8	-0.4	38.2	-0.8	-0.4			
42	42	41.3	-0.7	-0.4	41.3	-0.7	-0.4			
45	45	44.3	-0.7	-0.4	44.3	-0.7	-0.4			

System Performance w/Parameters after Calibration

Gas	Pressure	Gun	Amps	Volts						
Ar	40	SG100	950	47						
H2										
N2										
He	220									

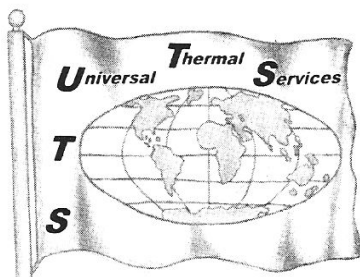
Calibrated By: Allen Hildebrand

Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature: *Allen R. Hildebrand*

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Customer: ABC

Arc Gas Gauge [P1]

Form # AT3000 Rev C 3/19/2009

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Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280C	Booth Number:	2
Device Under Test:	Primary Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Press. Transducer	PV350	Serial Number:	107
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Pressure Full Scale [FS] = 300 PSI

Pressure (PSI) Set Point	As Found Gauge Reading	As Found NIST Pressure	Actual PSI Deviation	As Found PSI% Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10	10	9.9	-0.1	0.0	9.9	-0.1	0.0			
30	30	29.3	-0.7	-0.2	29.3	-0.7	-0.2			
50	50	50.1	0.1	0.0	50.1	0.1	0.0			
70	70	69.9	-0.1	0.0	69.9	-0.1	0.0			
90	90	90.0	0.0	0.0	90.0	0.0	0.0			
110	110	109.7	-0.3	-0.1	109.7	-0.3	-0.1			
130	130	129.9	-0.1	0.0	129.9	-0.1	0.0			
150	150	150.4	0.4	0.1	150.4	0.4	0.1			

Arc Gas Pressure [P2]

Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280D	Booth Number:	2
Device Under Test:	Primary Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Press. Transducer	PV350	Serial Number:	107
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Pressure Full Scale [FS] = 160 PSI

Pressure (PSI) Set Point	As Found Gauge Reading	As Found NIST Pressure	Actual PSI Deviation	As Found PSI% Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10	10	9.8	-0.2	-0.1	9.8	-0.2	-0.1			
30	30	29.0	-1.0	-0.6	29.0	-1.0	-0.6			
50	50	48.7	-1.3	-0.8	48.7	-1.3	-0.8			
70	70	49.0	-21.0	-13.1	49.0	-21.0	-13.1			
90	90	89.3	-0.7	-0.4	89.3	-0.7	-0.4			
110	110	109.7	-0.3	-0.2	109.7	-0.3	-0.2			
130	130	130.2	0.2	0.1	130.2	0.2	0.1			
150	150	150.4	0.4	0.3	150.4	0.4	0.3			

Calibrated By: Allen Hildebrand

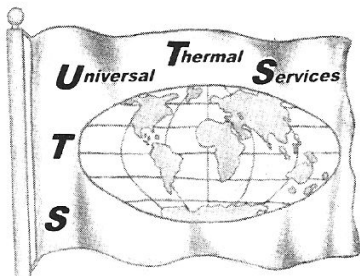
Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

Allen R. Hildebrand

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Aux Gas Gauge [P1]

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Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280E	Booth Number:	2
Device Under Test:	Secondary Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Press. Transducer	PV350	Serial Number:	107
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Pressure Full Scale [FS] = 300 PSI

Pressure (PSI) Set Point	As Found Gauge Reading	As Found NIST Pressure	Actual PSI Deviation	As Found PSI% Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10	10	9.5	-0.5	-0.2	9.5	-0.5	-0.2			
30	30	29.8	-0.2	-0.1	29.8	-0.2	-0.1			
50	50	48.4	-1.6	-0.5	48.4	-1.6	-0.5			
70	70	69.0	-1.0	-0.3	69.0	-1.0	-0.3			
90	90	89.3	-0.7	-0.2	89.3	-0.7	-0.2			
110	110	109.2	-0.8	-0.3	109.2	-0.8	-0.3			
130	130	129.8	-0.2	-0.1	129.8	-0.2	-0.1			
150	150	149.2	-0.8	-0.3	149.2	-0.8	-0.3			

Aux Gas Pressure [P2]

Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280F	Booth Number:	2
Device Under Test:	Secondary Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Press. Transducer	PV350	Serial Number:	107
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Pressure Full Scale [FS] = 160 PSI

Pressure (PSI) Set Point	As Found Gauge Reading	As Found NIST Pressure	Actual PSI Deviation	As Found PSI% Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10	10	10.8	0.8	0.5	10.8	0.8	0.5			
30	30	30.0	0.0	0.0	30.0	0.0	0.0			
50	50	50.4	0.4	0.2	50.4	0.4	0.2			
70	70	70.4	0.4	0.3	70.4	0.4	0.3			
90	90	90.7	0.7	0.4	90.7	0.7	0.4			
110	110	111.0	1.0	0.6	111.0	1.0	0.6			
130	130	131.2	1.2	0.7	131.2	1.2	0.7			
150	150	151.2	1.2	0.7	151.2	1.2	0.7			

Calibrated By: Allen Hildebrand

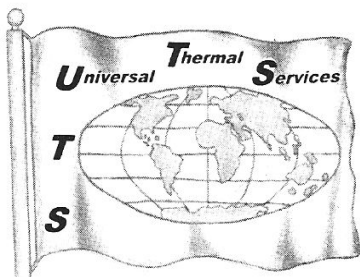
Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

Allen R. Hildebrand

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#1 Carrier Gas Gauge [P1]

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Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280G	Booth Number:	2
Device Under Test:	Arc Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Press. Transducer	PV350	Serial Number:	107
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Pressure Full Scale [FS] = 200 PSI

Pressure (PSI) Set Point	As Found Gauge Reading	As Found NIST Pressure	Actual PSI Deviation	As Found PSI% Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10	10	11.0	1.0	0.5	11.0	1.0	0.5			
20	20	19.8	-0.2	-0.1	19.8	-0.2	-0.1			
30	30	29.9	-0.1	-0.1	29.9	-0.1	-0.1			
40	40	39.7	-0.3	-0.1	39.7	-0.3	-0.1			
60	60	59.6	-0.4	-0.2	59.6	-0.4	-0.2			
80	80	79.4	-0.6	-0.3	79.4	-0.6	-0.3			
90	90	89.5	-0.5	-0.3	89.5	-0.5	-0.3			
100	100	97.1	-2.9	-1.5	97.1	-2.9	-1.5			

#1 Carrier Gas Gauge [P2]

Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280H	Booth Number:	2
Device Under Test:	Arc Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Press. Transducer	PV350	Serial Number:	107
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Pressure Full Scale [FS] = 100 PSI

Pressure (PSI) Set Point	As Found Gauge Reading	As Found NIST Pressure	Actual PSI Deviation	As Found PSI% Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10	10	9.6	-0.4	-0.4	9.6	-0.4	-0.4			
20	20	19.6	-0.4	-0.4	19.6	-0.4	-0.4			
30	30	29.6	-0.4	-0.4	29.6	-0.4	-0.4			
40	40	39.4	-0.6	-0.6	39.4	-0.6	-0.6			
60	60	59.1	-0.9	-0.9	59.1	-0.9	-0.9			
80	80	79.2	-0.8	-0.8	79.2	-0.8	-0.8			
90	90	89.4	-0.6	-0.6	89.4	-0.6	-0.6			
100	100	99.4	-0.6	-0.6	99.4	-0.6	-0.6			

Calibrated By: Allen Hildebrand

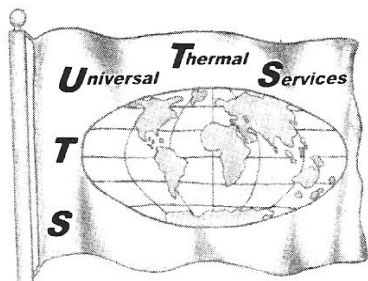
Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

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Customer: ABC

#2 Carrier Gas Gauge [P1]

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Cert. No.: 2009-930

Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280J	Booth Number:	2
Device Under Test:	Arc Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Press. Transducer	PV350	Serial Number:	107
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Pressure Full Scale [FS] = 200 PSI

Pressure (PSI) Set Point	As Found Gauge Reading	As Found NIST Pressure	Actual PSI Deviation	As Found PSI% Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10	10	10.8	0.8	0.4	10.8	0.8	0.4			
20	20	20.0	0.0	0.0	20.0	0.0	0.0			
30	30	29.8	-0.2	-0.1	29.8	-0.2	-0.1			
40	40	39.8	-0.2	-0.1	39.8	-0.2	-0.1			
60	60	59.8	-0.2	-0.1	59.8	-0.2	-0.1			
80	80	79.9	-0.1	0.0	79.9	-0.1	0.0			
90	90	89.4	-0.6	-0.3	89.4	-0.6	-0.3			
100	100	99.4	-0.6	-0.3	99.4	-0.6	-0.3			

#2 Carrier Gas Gauge [P2]

Console:	AT 3000	Serial Number:	ATCP100102
Device ID #:	M280K	Booth Number:	2
Device Under Test:	Arc Gas Gauge	Device ID #:	

Testing Instrument:	Multi Meter	87V	Serial Number:	88190113	Testing Instrument:	Press. Transducer	PV350	Serial Number:	107
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Pressure Full Scale [FS] = 100 PSI

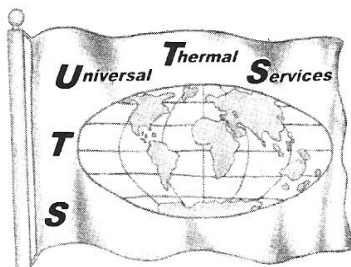
Pressure (PSI) Set Point	As Found Gauge Reading	As Found NIST Pressure	Actual PSI Deviation	As Found PSI% Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10	10	10.8	0.8	0.8	10.8	0.8	0.8			
20	20	20.0	0.0	0.0	20.0	0.0	0.0			
30	30	29.8	-0.2	-0.2	29.8	-0.2	-0.2			
40	40	39.8	-0.2	-0.2	39.8	-0.2	-0.2			
60	60	59.8	-0.2	-0.2	59.8	-0.2	-0.2			
80	80	79.9	-0.1	-0.1	79.9	-0.1	-0.1			
90	90	89.4	-0.6	-0.6	89.4	-0.6	-0.6			
100	100	99.4	-0.6	-0.6	99.4	-0.6	-0.6			

Calibrated By: Allen Hildebrand
Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

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Argon Flow

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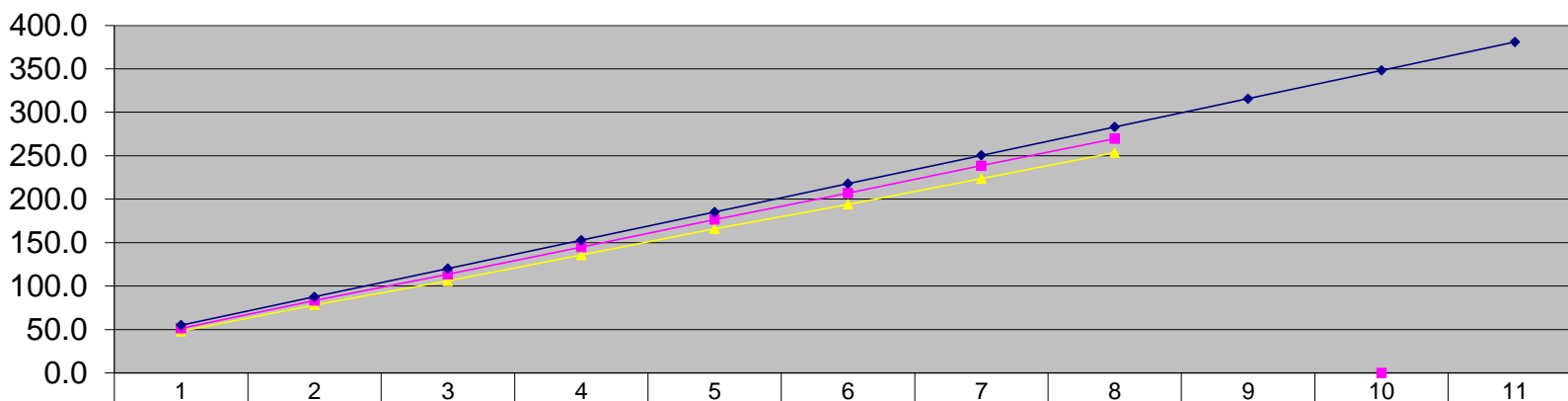
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Console:	AT 3000	Serial Number:	ATCP100102	Type of Gas:	Argon	Full Flow SCFH [FS]:	511.12
Device ID #:	M280L	Booth Number:	2				
Device Under Test:	Critical Orifice Flows	Critical Orifice:	#56	Scale Rate:	Flow is in SCFH		

Testing Instrument: Mass Flow Meter Alicat Scientific 0-400 scfh Serial Number: 44771

Set Point Pressure	Critical Orifices SCFH Converted	As Found SCFH Actual	As Found SCFH Deviation	SCFH % Deviation		As Left SCFH	As Left SCFH Deviation	As Left SCFH % Deviation		
20	55.0	48.0	-7.0	-1.4		51.3	-3.7	-0.7		
40	87.6	78.3	-9.3	-1.8		83.2	-4.4	-0.9		
60	120.2	105.9	-14.3	-2.8		113.4	-6.8	-1.3		
80	152.7	135.8	-16.9	-3.3		144.9	-7.8	-1.5		
100	185.3	165.8	-19.5	-3.8		176.5	-8.8	-1.7		
120	217.9	194.1	-23.8	-4.7		207.0	-10.9	-2.1		
140	250.5	223.6	-26.9	-5.3		238.5	-12.0	-2.3		
160	283.1	253.6	-29.5	-5.8		269.5	-13.6	-2.7		
180	315.6									
200	348.2			Failed		Pass		Pass		
220	380.8									



Flow SCFH As Found	48.0	78.3	105.9	135.8	165.8	194.1	223.6	253.6			
Flow SCFH As Left	51.3	83.2	113.4	144.9	176.5	207.0	238.5	269.5		0.0	
Set Point SCFH	55.0	87.6	120.2	152.7	185.3	217.9	250.5	283.1	315.6	348.2	380.8

Changed the #56 orifice due to failure outside 5%.

Calibrated By: Allen Hildebrand

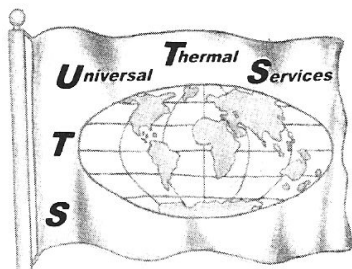
Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

Allen R. Hildebrand

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Customer: ABC

Helium Flow

Form # AT3000 Rev C 3/19/2009

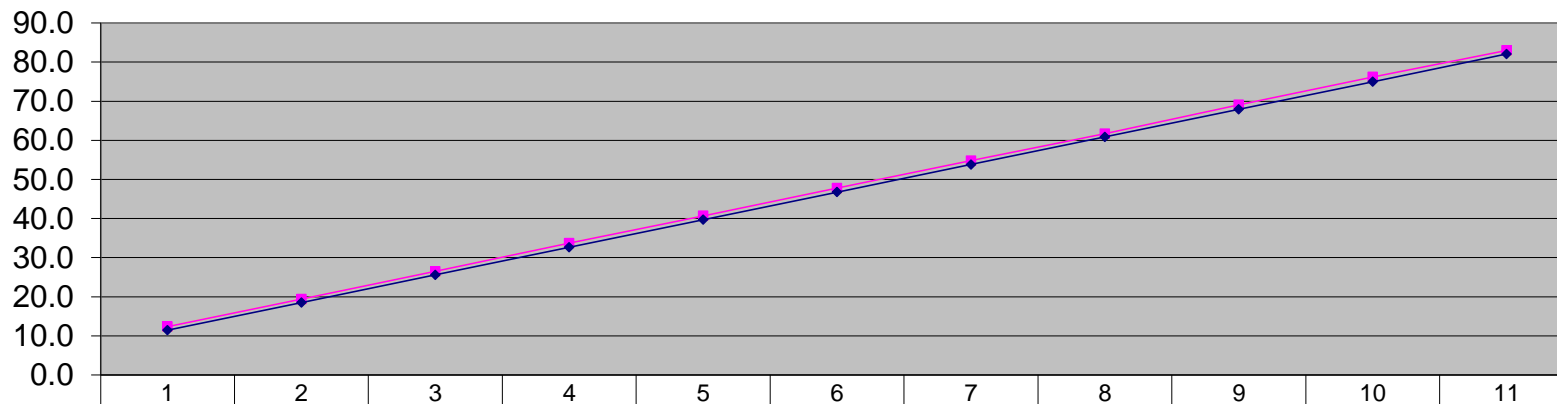
Cert. No: 2009-930

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Console:	AT 3000	Serial Number:	ATCP100102	Type of Gas	Helium	Full Flow SCFH (FS):	110.28
Device ID #:	M280M	Booth #:	2				
Device Under Test:	Critical Orifice Flows	Critical Orifice	#80	Scale Rate:	Flow is in SCFH		

Testing Instrument: Mass Flow Meter Alicat Scientific 0-400 scfh Serial Number: 44771

Set Point Pressure	Critical Orifices SCFH Converted	As Found NIST Volts	As Found SCFH Actual	As Found SCFH Deviation	SCFH % Deviation	As Left NIST Volts	As Left SCFH	As Left SCFH Deviation	As Left SCFH % Deviation		
20	11.5		12.4	0.9	0.8		12.4	0.9	0.8		
40	18.5		19.4	0.9	0.8		19.4	0.9	0.8		
60	25.6		26.5	0.9	0.8		26.5	0.9	0.8		
80	32.6		33.7	1.1	1.0		33.7	1.1	1.0		
100	39.7		40.7	1.0	0.9		40.7	1.0	0.9		
120	46.8		47.8	1.0	0.9		47.8	1.0	0.9		
140	53.8		54.8	1.0	0.9		54.8	1.0	0.9		
160	60.9		61.7	0.8	0.7		61.7	0.8	0.7		
180	67.9		69.1	1.2	1.1		69.1	1.2	1.1		
200	75.0		76.2	1.2	1.1		76.2	1.2	1.1		
220	82.1		83.0	0.9	0.9		83.0	0.9	0.9		



Flow SCFH As Found	12.4	19.4	26.5	33.7	40.7	47.8	54.8	61.7	69.1	76.2	83.0
Flow SCFH As Left	12.4	19.4	26.5	33.7	40.7	47.8	54.8	61.7	69.1	76.2	83.0
Set Point SCFH	11.5	18.5	25.6	32.6	39.7	46.8	53.8	60.9	67.9	75.0	82.1

Calibrated By: Allen Hildebrand

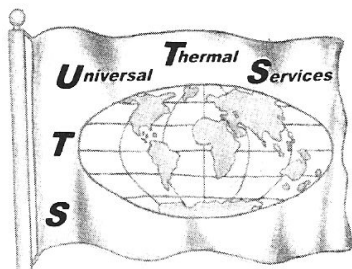
Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

Allen R. Hildebrand

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Service
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Calibration
Certification
Maintenance

Universal Thermal Services
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uts@wolfnet.net

Customer: ABC

Argon Carrier Flow #1

Form # AT3000 Rev C 3/19/2009

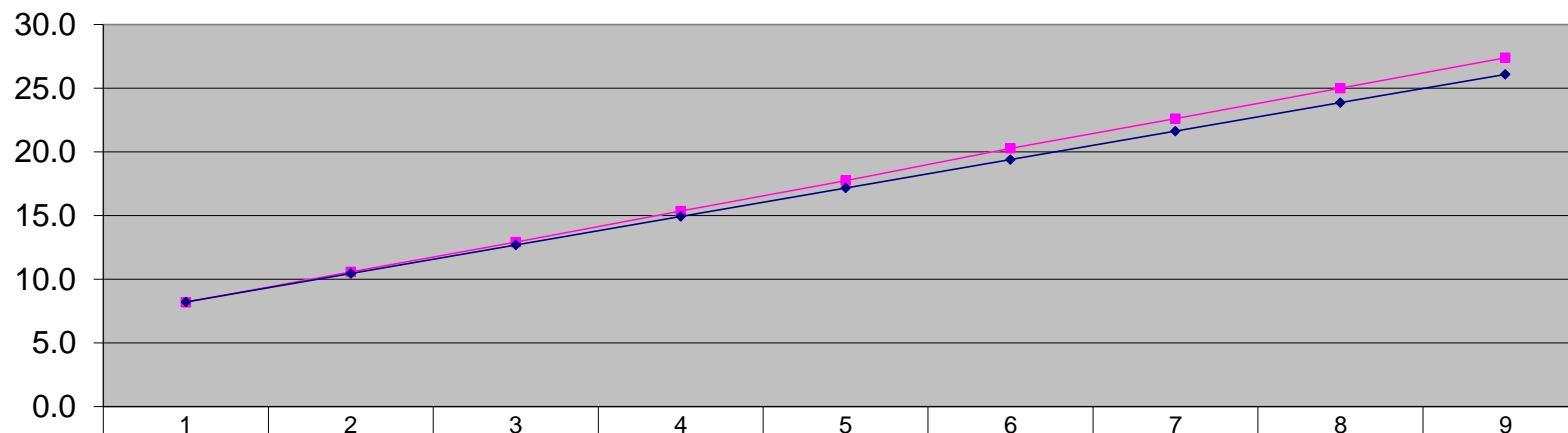
Cert. No: 2009-930

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Console:	AT 3000	Serial Number:	ATCP100102	Type of Gas:	Argon	Full Flow SCFH [FS]:	46.22
Device ID #:	M280N	Booth Number:	2				
Device Under Test:	Critical Orifice Flows	Critical Orifice:	#77	Scale Rate:	Flow is in SCFH		

Testing Instrument:	Mass Flow Meter	Alicat Scientific 0-75 scfh	Serial Number:	44770
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Set Point Pressure	Critical Orifices SCFH Converted	As Found SCFH Actual	As Found SCFH Deviation	SCFH % Deviation	As Left SCFH	As Left SCFH Deviation	As Left SCFH % Deviation
20	8.2	8.2	0.0	-0.1	8.2	0.0	-0.1
30	10.5	10.6	0.1	0.3	10.6	0.1	0.3
40	12.7	12.9	0.2	0.5	12.9	0.2	0.5
50	14.9	15.4	0.4	0.9	15.4	0.4	0.9
60	17.2	17.8	0.6	1.3	17.8	0.6	1.3
70	19.4	20.3	0.9	1.9	20.3	0.9	1.9
80	21.6	22.6	1.0	2.1	22.6	1.0	2.1
90	23.9	25.0	1.1	2.4	25.0	1.1	2.4
100	26.1	27.4	1.3	2.8	27.4	1.3	2.8



Flow SCFH As Found	8.2	10.6	12.9	15.4	17.8	20.3	22.6	25.0	27.4
Flow SCFH As Left	8.2	10.6	12.9	15.4	17.8	20.3	22.6	25.0	27.4
Set Point SCFH	8.2	10.5	12.7	14.9	17.2	19.4	21.6	23.9	26.1

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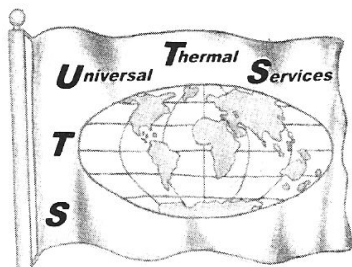
Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

Allen R. Hildebrand

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Service
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Argon Carrier Flow #2

Form # AT3000 Rev C 3/19/2009

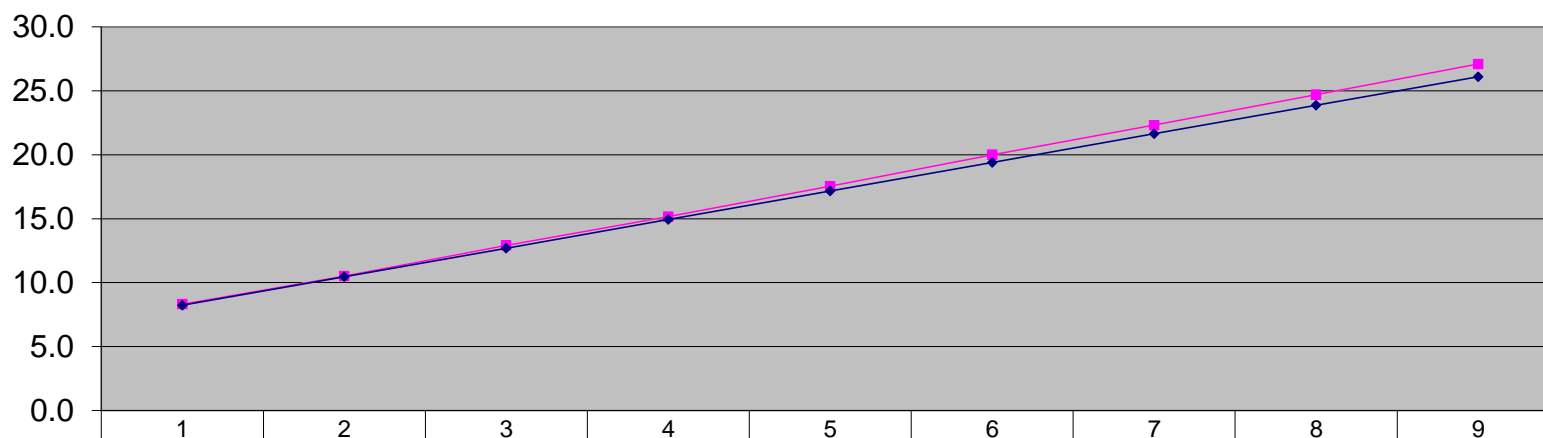
Cert. No: 2009-930

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Console:	AT 3000	Serial Number:	ATCP100102	Type of Gas:	Argon	Full Flow SCFH [FS]:	46.22
Device ID #:	M280P	Booth Number:	2				
Device Under Test:	Critical Orifice Flows	Critical Orifice:	#77	Scale Rate:	Flow is in SCFH	Device ID #:	

Testing Instrument: Mass Flow Meter Alicat Scientific 0-75 scfh Serial Number: 44770

Set Point Pressure	Critical Orifices SCFH Converted		As Found SCFH Actual	As Found SCFH Deviation	SCFH % Deviation		As Left SCFH	As Left SCFH Deviation	As Left SCFH % Deviation		
20	8.2		8.3	0.1	0.2		8.3	0.1	0.2		
30	10.5		10.5	0.0	0.1		10.5	0.0	0.1		
40	12.7		12.9	0.2	0.5		12.9	0.2	0.5		
50	14.9		15.2	0.2	0.5		15.2	0.2	0.5		
60	17.2		17.5	0.4	0.8		17.5	0.4	0.8		
70	19.4		20.0	0.6	1.3		20.0	0.6	1.3		
80	21.6		22.3	0.7	1.5		22.3	0.7	1.5		
90	23.9		24.7	0.8	1.8		24.7	0.8	1.8		
100	26.1		27.1	1.0	2.1		27.1	1.0	2.1		



Flow SCFH As Found	8.3	10.5	12.9	15.2	17.5	20.0	22.3	24.7	27.1
Flow SCFH As Left	8.3	10.5	12.9	15.2	17.5	20.0	22.3	24.7	27.1
Set Point SCFH	8.2	10.5	12.7	14.9	17.2	19.4	21.6	23.9	26.1

Calibrated By: Allen Hildebrand

Calibrated Date: 4/20/2009

Next Calibration Due: 10/20/2010

Signature:

Allen R. Hildebrand

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