

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

Metco MultiCoat Certificate of Calibration

Form # MultiCoat Rev A 4/27/2008

Cert. No. : 2008-036

Page: 1 of 10

Customer:	ABC	Console	Metco MultiCoat	Feeder:	Metco 9MPE-DJ-CL
Address:	6732 8 St. NE	S/N:	SM044588	Serial Number:	A9MPEDJCL20080708-1
City:	Calgary	Device ID#:	HTI 00-033	Device ID:	HTI 00-058
State/Province:	Albert, Canada	Booth #:	1	Feeder:	Metco 9MPE-CL
Zip:	T2E 7H7	With in 3%:	No	Serial Number:	A9MPCL20010525-1
Name:	St Charles	Adjustments:	Yes	Device ID:	HTI 00-057
Phone #:	403-221-1410				

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

Test Inst:	Press. Transducer	Test Inst:	Multi Meter	Test Inst:	Amp Clamp	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 #:	
Next Cal. Due:	1/11/2009	Next Cal. Due:	7/31/2008	Next Cal. Due:	3/11/2009	Next Cal. Due:	

Test Inst: Low Flow	Mass Flow Meter	Test Inst: Med. Flow	Mass Flow Meter	Test Inst: High Flow	Mass Flow Meter		
Make:	Bronkhorst 0-75 scfh	Make:	Bronkhorst 0-400 Scfh	Make:	Bronkhorst 0-2500 Scfh		
Model:	FM21-RBA-22-V	Model:	FM31-RBA-55-V	Model:	F-113AI-RBA-55-V		
Serial No:	M5202125C	Serial No:	M5202125B	Serial No:	M5202125D		
Next Cal. Due:	12/21/2008	Next Cal. Due:	12/21/2008	Next Cal. Due:	12/26/2008		

	Plasma	Plasma	Plasma	Plasma	HVOF	HVOF	HVOF	HVOF
Mass Flow Controller:	Argon Primary	Nitrogen Primary	Hydrogen	Helium	Oxygen	Hydrogen	Methane	Air
Make:	Bronkhorst	Bronkhorst	Bronkhorst	Bronkhorst	Bronkhorst	Bronkhorst	Bronkhorst	Bronkhorst
Device ID:	HTI 00-034	HTI 00-035	HTI 00-036	HTI 00-037	HTI 00-103	HTI 00-104	HTI 00-105	HTI 00-102
Serial Number:	M4205992E	M2202053AZ	M4205594L	M4205992V	M4100848A	M4203899H	M4201257B	M4204007E
Flow Range:	100 l/min	100 l/min	20 l/min	200 l/min	400 l/min	800 l/min	xxx	800 l/min

System Performance w/Parameters as Provided by the Operator Initially

Evidence of Gas Contamination

Gas	SCFH Setting	Gun	Gas	SCFH Setting	Gun	Oxygen		
Oxygen	635	DJ 2700	Argon		F4	Hydrogen (H2)		
Hydrogen (H2)	N/A		Hydrogen		Volts	Propylene (C3H6)		
Propylene (C3H6)	N/A		Nitrogen			Propane (C3H8)		
Propane (C3H8)	N/A				Amps	Shroud Air		
Shroud Air	630					Natural Gas (CH4)		
Natural Gas (CH4)	431							

Notes:

Green 0 - 2% Acceptable
 color: orange;">Orange 2.1 - 3.0% Alert
 color: red;">Red 3.1 and up Fail

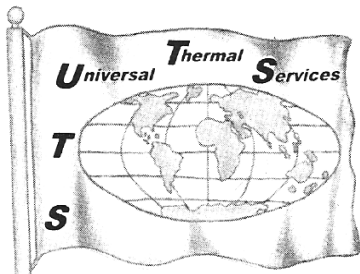
Calibrated By: Allen Hildebrand

Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature:

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Customer: ABC

Oxygen Flow

Form # MultiCoat Rev A 4/27/2008

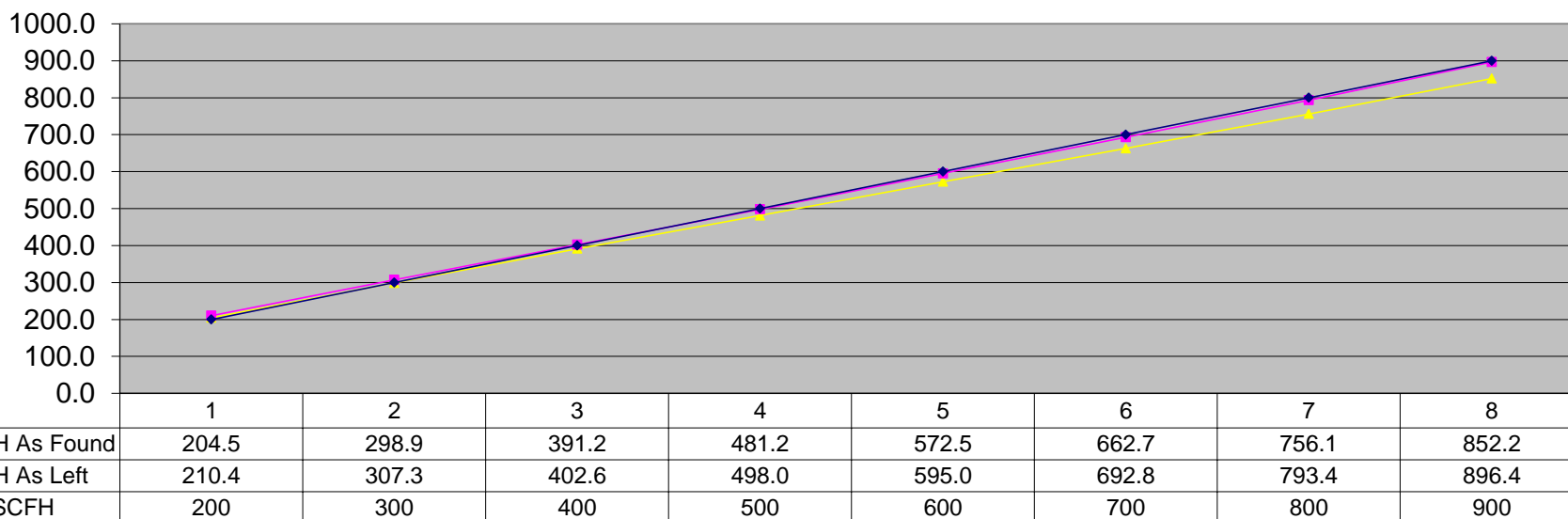
Page: 2 of 10

Cert. No: 2008-036

Console:	Metco MultiCoat	Serial Number:	SM044588	Type of Gas:	Oxygen	Full Flow SCFH [FS]:	914
Device ID #:	HT1 00-103	Booth:	1	Scale Rate:	Flow is in SCFH		
Device Under Test:	O2 Mass Flow Contrl.	Make:	Bronkhorst	Serial Number:	M4100848A	Flow Range:	400 In/min

Testing Instrument:	Mass Flow Meter	Bronkhorst 0-2500 Scfh	Serial Number:	M5202125D	Test Inst.	Multi Meter	87V	Serial Number:	88190113
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Metco MultiCoat Display Actual	Metco MultiCoat SCFH Set Point	As Found NIST Volts	As Found SCFH Actual	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left NIST Volts	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
200	200	0.828	204.5	4.5	0.5	0.852	210.4	10.4	1.1	
300	300	1.210	298.9	-1.1	-0.1	1.244	307.3	7.3	0.8	
400	400	1.584	391.2	-8.8	-1.0	1.630	402.6	2.6	0.3	
500	500	1.948	481.2	-18.8	-2.1	2.016	498.0	-2.0	-0.2	
600	600	2.318	572.5	-27.5	-3.0	2.409	595.0	-5.0	-0.5	
699	700	2.683	662.7	-37.3	-4.1	2.805	692.8	-7.2	-0.8	
800	800	3.061	756.1	-43.9	-4.8	3.212	793.4	-6.6	-0.7	
899	900	3.450	852.2	-47.9	-5.2	3.629	896.4	-3.6	-0.4	

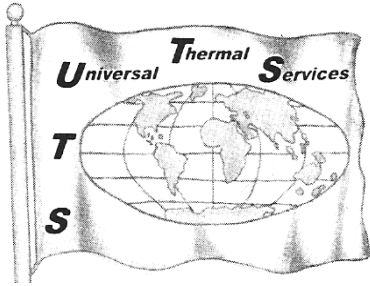


Calibrated By: Allen Hildebrand
Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature:

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Customer: ABC

Air Flow

Form # MultiCoat Rev A 4/27/2008

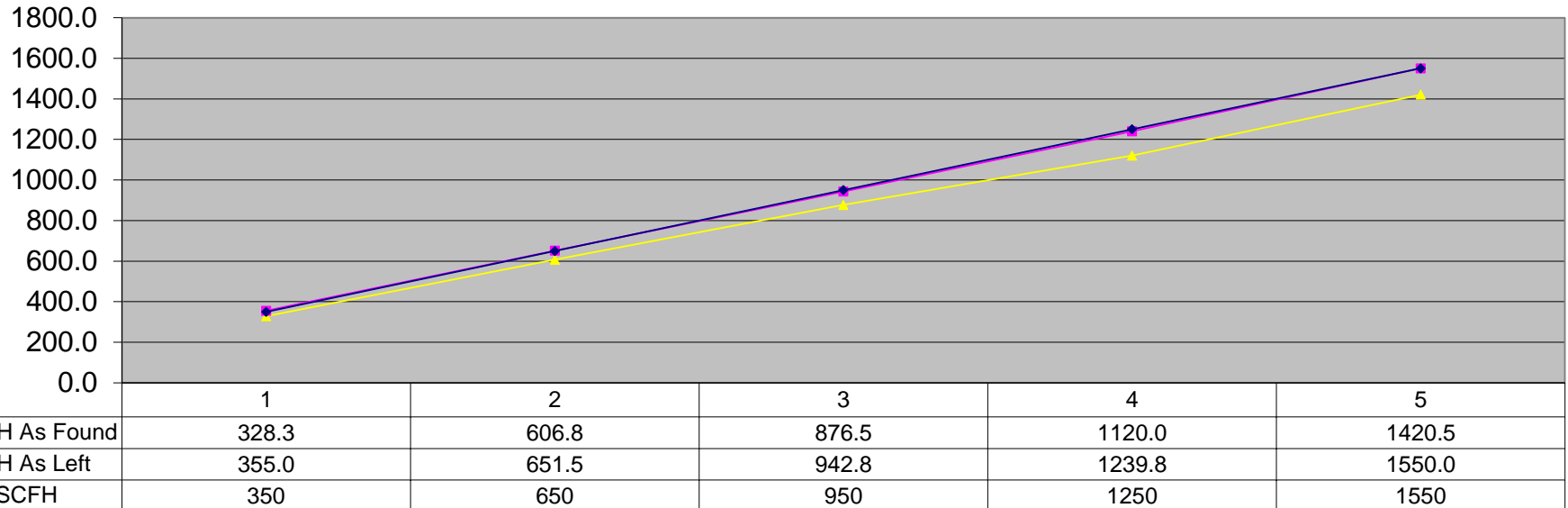
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Cert. No: 2008-036

Console:	Metco MultiCoat	Serial Number:	SM044588	Type of Gas:	Air	Full Flow SCFH [FS]:	1827
Device ID #:	HTI 00-102	Booth:	1	Scale Rate:	Flow is in SCFH		
Device Under Test:	Air Mass Flow Contr.	Make:	Bronkhorst	Serial Number:	M4204007E	Flow Range:	800 In/min

Testing Instrument:	Mass Flow Meter	Bronkhorst 0-2500 Scfh	Serial Number:	M5202125D	Test Inst.:	Multi Meter	87V	Serial Number:	88190113
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Metco MultiCoat Display Actual	Metco MultiCoat SCFH Set Point	As Found NIST Volts	As Found SCFH Actual	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left NIST Volts	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
350	350	1.313	328.3	-21.8	-1.0	1.420	355.0	5.0	0.2	
650	650	2.427	606.8	-43.3	-1.9	2.606	651.5	1.5	0.1	
950	950	3.506	876.5	-73.5	-3.3	3.771	942.8	-7.3	-0.3	
1250	1250	4.480	1120.0	-130.0	-5.9	4.959	1239.8	-10.3	-0.5	
1550	1550	5.682	1420.5	-129.5	-5.8	6.200	1550.0	0.0	0.0	

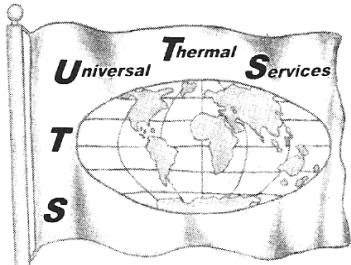


Calibrated By: Allen Hildebrand
Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature:

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Calibration Not Required, Not Used for Parameters

Hydrogen Flow

Customer: ABC

Form # MultiCoat Rev A 4/27/2008

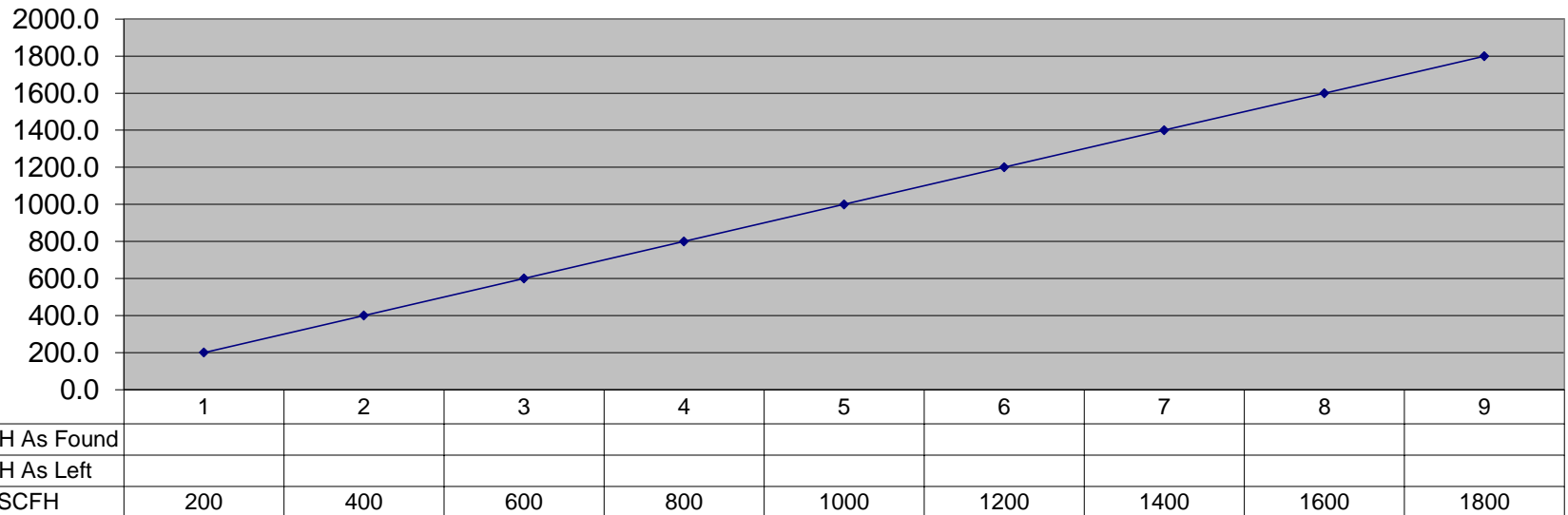
Page: 4 of 10

Cert. No: 2008-036

Console:	DJC	Serial Number:	SM044588	Type of Gas:	Hydrogen	Full Flow SCFH [FS]:	1827
Device ID #:	HTI 00-104	Booth:	1	Scale Rate:	Flow is in SCFH		
Device Under Test:	H2 Mass Flow Contr.	Make:	Bronkhorst	Serial Number:	M4203899H	Flow Range:	20 In/min

Testing Instrument:	Mass Flow Meter	Bronkhorst 0-2500 Scfh	Serial Number:	M5202125D	Test Inst.	Multi Meter	87V	Serial Number:	88190113
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Metco MultiCoat Display Actual	Metco MultiCoat SCFH Set Point	As Found NIST Volts	As Found SCFH Actual	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left NIST Volts	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
	200									
	400									
	600									
	800									
	1000									
	1200									
	1400									
	1600									
	1800									

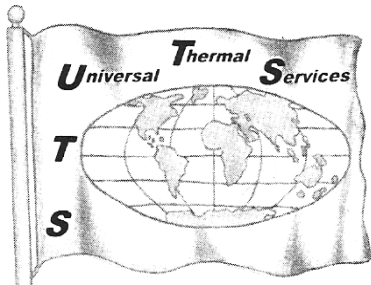


Calibrated By: Allen Hildebrand
Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature: *Allen R. Hildebrand*

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Customer: ABC

Methane Gas Flow

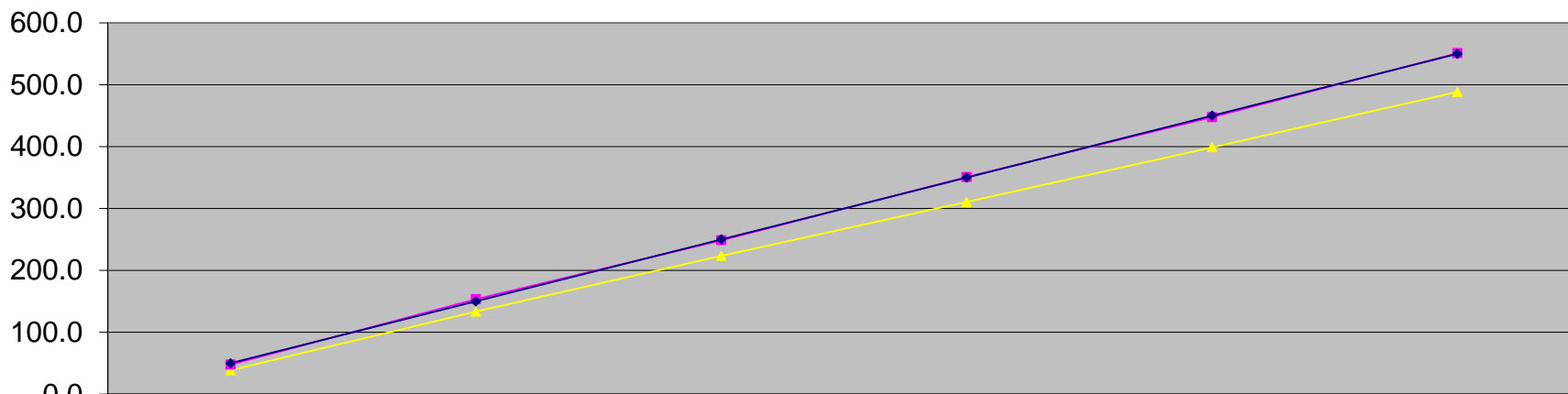
Form # MultiCoat Rev A 4/27/2008
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Cert. No: 2008-036

Console:	Metco MultiCoat	Serial Number:	SM044588	Type of Gas:	Methane	Full Flow SCFH [FS]:	570
Device ID #:	HTI 00-105	Booth:	1	Scale Rate:	Flow is in SCFH		
Device Under Test:	C2H4 Mass Flow Cnt.	Make:	Bronkhorst	Serial Number:	M4201257B	Flow Range:	xxxx

Testing Instrument:	Mass Flow Meter	Bronkhorst 0-2500 Scfh	Serial Number:	M5202125D	Test Inst.	Multi Meter	87V	Serial Number:	88190113
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Metco MultiCoat Display Actual	Metco MultiCoat SCFH Set Point	As Found NIST Volts	As Found SCFH Actual	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left NIST Volts	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
50	50	0.204	38.8	-11.2	-2.0	0.252	47.9	-2.1	-0.4	
150	150	0.702	133.4	-16.6	-2.9	0.808	153.5	3.5	0.6	
250	250	1.176	223.4	-26.6	-4.7	1.309	248.7	-1.3	-0.2	
350	350	1.634	310.5	-39.5	-6.9	1.846	350.7	0.7	0.1	
450	450	2.100	399.0	-51.0	-8.9	2.355	447.5	-2.6	-0.4	
550	550	2.569	488.1	-61.9	-10.9	2.900	551.0	1.0	0.2	



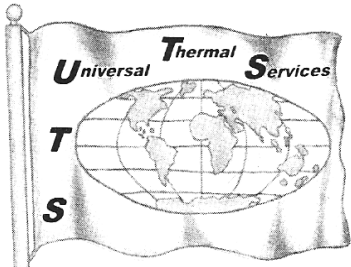
	1	2	3	4	5	6
Flow SCFH As Found	38.8	133.4	223.4	310.5	399.0	488.1
Flow SCFH As Left	47.9	153.5	248.7	350.7	447.5	551.0
Set Point SCFH	50	150	250	350	450	550

Calibrated By: Allen Hildebrand
Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature: *Allen R. Hildebrand*

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Customer: ABC

Argon Flow

Form # MultiCoat Rev A 4/27/2008

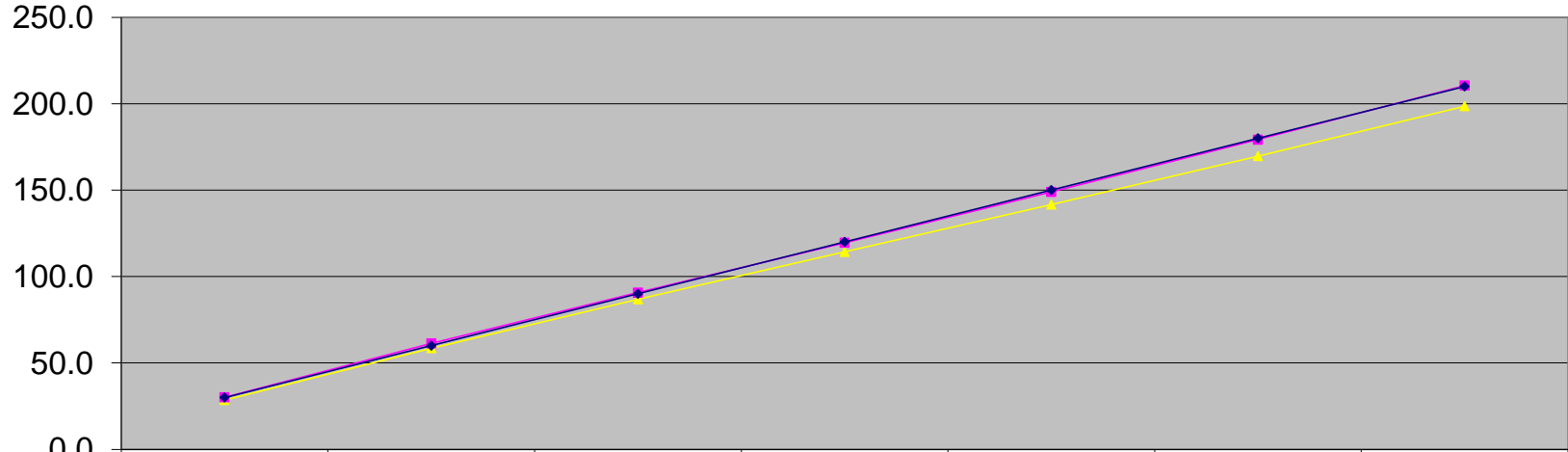
Cert. No: 2008-036

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Console:	Metco MultiCoat	Serial Number:	SM044588	Type of Gas:	Argon	Full Flow SCFH [FS]:	228.3
Device ID #:	HTI 00-034	Booth:	1	Scale Rate:	Flow is in SCFH		
Device Under Test:	Ar Mass Flow Contr.	Make:	Bronkhorst	Serial Number:	M4205992E	Flow Range:	100 In/min

Testing Instrument:	Mass Flow Meter	Bronkhorst 0-400 Scfh	Serial Number:	107020333384001	Testing Instrument:	Multi Meter	87V	Serial Number:	88190113
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Metco MultiCoat Display Actual	Metco MultiCoat SCFH Set Point	As Found NIST Volts	As Found Actual SCFH	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left NIST Volts	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
30	30	0.510	28.6	-1.4	-0.6	0.537	30.1	0.1	0.0	
60	60	1.045	58.5	-1.5	-0.6	1.095	61.3	1.3	0.6	
90	90	1.550	86.8	-3.2	-1.4	1.620	90.7	0.7	0.3	
120	120	2.040	114.2	-5.8	-2.5	2.135	119.6	-0.4	-0.2	
150	150	2.530	141.7	-8.3	-3.6	2.660	149.0	-1.0	-0.5	
180	180	3.030	169.7	-10.3	-4.5	3.200	179.2	-0.8	-0.4	
210	210	3.545	198.5	-11.5	-5.0	3.760	210.6	0.6	0.2	



—▲— Flow SCFH As Found	28.6	58.5	86.8	114.2	141.7	169.7	198.5
—■— Flow SCFH As Left	30.1	61.3	90.7	119.6	149.0	179.2	210.6
—◆— SCFH Target Values	30	60	90	120	150	180	210

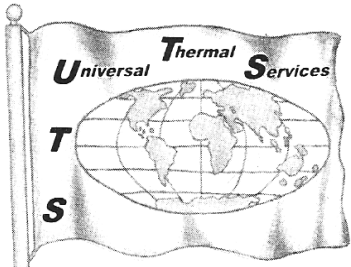
Calibrated By: Allen Hildebrand

Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature:

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Customer: ABC

Nitrogen Flow

Form # MultiCoat Rev A 4/27/2008

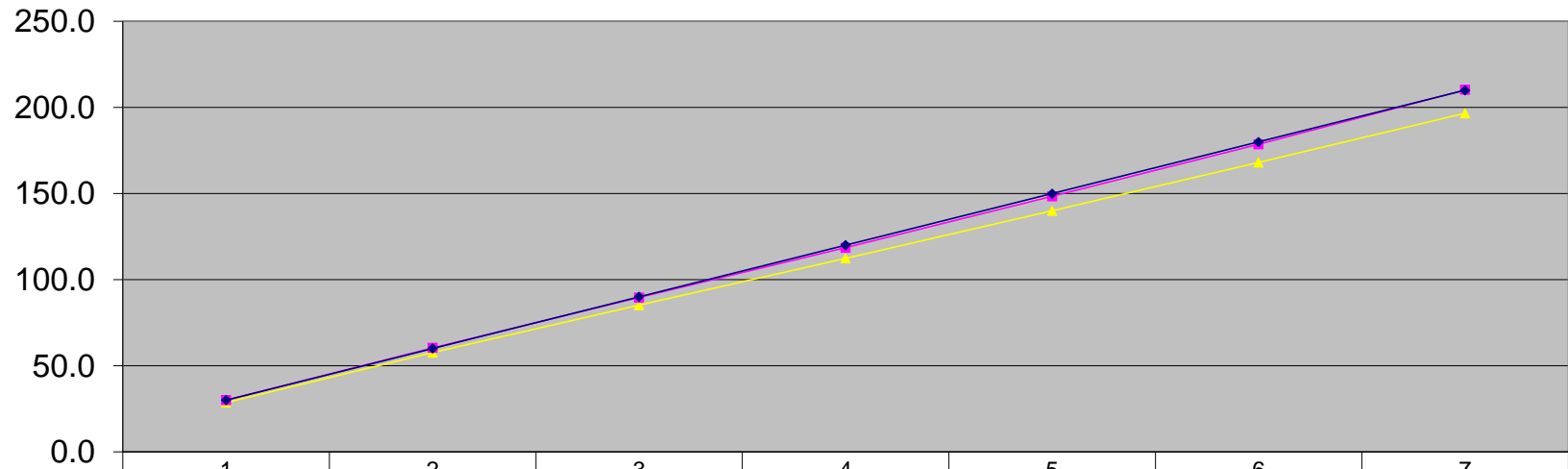
Cert. No: 2008-036

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Console:	Metco MultiCoat	Serial Number:	SM044588	Type of Gas:	Nitrogen	Full Flow SCFH [FS]:	228.3
Device ID #:	HTI 00-035	Booth:	1	Scale Rate:	Flow is in SCFH		
Device Under Test:	N2 Mass Flow Contrl.	Make:	Bronkhorst	Serial Number:	M2202053AZ	Flow Range:	100 In/min

Testing Instrument:	Mass Flow Meter	Bronkhorst 0-400 Scfh	Serial Number:	107020333384001	Testing Instrument:	Multi Meter	87V	Serial Number:	88190113
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Metco MultiCoat Display Actual	Metco MultiCoat SCFH Set Point	As Found NIST Volts	As Found Actual SCFH	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left NIST Volts	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
30	30	0.715	28.6	-1.4	-0.6	0.750	30.0	0.0	0.0	
60	60	1.440	57.6	-2.4	-1.1	1.510	60.4	0.4	0.2	
90	90	2.130	85.2	-4.8	-2.1	2.240	89.6	-0.4	-0.2	
120	120	2.810	112.4	-7.6	-3.3	2.963	118.5	-1.5	-0.6	
150	150	3.500	140.0	-10.0	-4.4	3.710	148.4	-1.6	-0.7	
180	180	4.201	168.0	-12.0	-5.2	4.465	178.6	-1.4	-0.6	
210	210	4.916	196.6	-13.4	-5.9	5.257	210.3	0.3	0.1	



Flow SCFH As Found	28.6	57.6	85.2	112.4	140.0	168.0	196.6
Flow SCFH As Left	30.0	60.4	89.6	118.5	148.4	178.6	210.3
SCFH Target Values	30	60	90	120	150	180	210

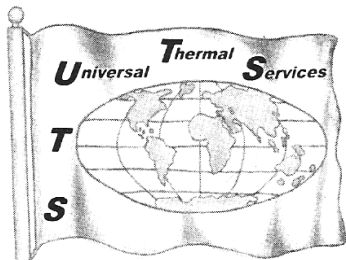
Calibrated By: Allen Hildebrand

Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature:

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Customer: ABC

Helium Flow

Form # MultiCoat Rev A 4/27/2008

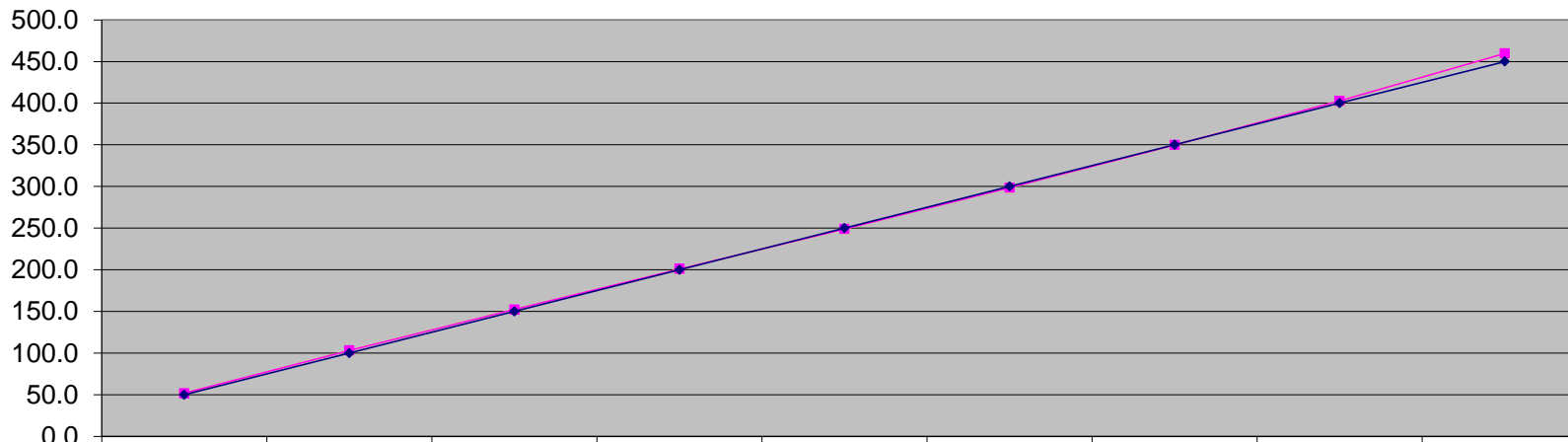
Cert. No: 2008-036

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Console:	Metco MultiCoat	Serial Number:	SM044588	Type of Gas:	Helium	Full Flow SCFH [FS]:	457
Device ID #:	HTI 00-037	Booth:	1	Scale Rate:	Flow is in SCFH		
Device Under Test:	He Mass Flow Contr.	Make:	Bronkhorst	Serial Number:	M4205992V	Flow Range:	200 In/min

Testing Instrument:	Mass Flow Meter	Bronkhorst 0-400 Scfh	Serial Number:	10702033384001	Testing Instrument:	Multi Meter	87V	Serial Number:	88190113
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Metco MultiCoat Display Actual	Metco MultiCoat SCFH Set Point	As Found NIST Volts	As Found Actual SCFH	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left NIST Volts	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
50	50	0.918	51.8	1.8	0.4	0.918	51.8	1.8	0.4	
100	100	1.830	103.2	3.2	0.7	1.830	103.2	3.2	0.7	
151	150	2.700	152.3	2.3	0.5	2.700	152.3	2.3	0.5	
200	200	3.562	200.9	0.9	0.2	3.562	200.9	0.9	0.2	
251	250	4.414	248.9	-1.1	-0.2	4.414	248.9	-1.1	-0.2	
301	300	5.292	298.5	-1.5	-0.3	5.292	298.5	-1.5	-0.3	
351	350	6.200	349.7	-0.3	-0.1	6.200	349.7	-0.3	-0.1	
401	400	7.140	402.7	2.7	0.6	7.140	402.7	2.7	0.6	
450	450	8.150	459.7	9.7	2.1	8.150	459.7	9.7	2.1	



	1	2	3	4	5	6	7	8	9
Flow SCFH As Found	51.8	103.2	152.3	200.9	248.9	298.5	349.7	402.7	459.7
Flow SCFH As Left	51.8	103.2	152.3	200.9	248.9	298.5	349.7	402.7	459.7
SCFH Set Point	50	100	150	200	250	300	350	400	450

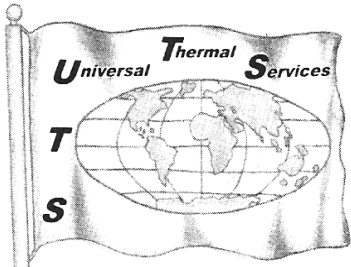
Calibrated By: Allen Hildebrand

Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature:

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Customer: ABC

Hydrogen Flow

Form # MultiCoat Rev A 4/27/2008

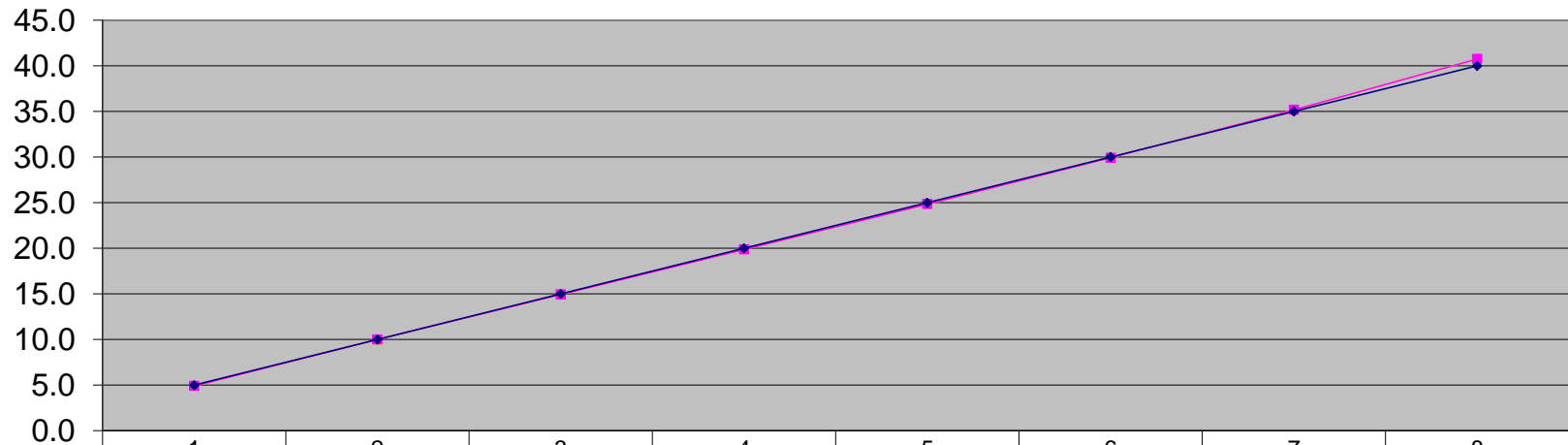
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Cert. No: 2008-036

Console:	Metco MultiCoat	Serial Number:	SM044588	Type of Gas:	Hydrogen	Full Flow SCFH [FS]:	45.7
Device ID #:	HTI 00-036	Booth:	1	Scale Rate:	Flow is in SCFH		
Device Under Test:	H2 Mass Flow Contr.	Make:	Bronkhorst	Serial Number:	M4203899H	Flow Range:	20 In/min

Testing Instrument:	Mass Flow Meter	Bronkhorst 0-75 scfh	Serial Number:	M5202125C	Testing Instrument:	Multi Meter	87V	Serial Number:	88190113
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Metco MultiCoat Display Actual	Metco MultiCoat SCFH Set Point	As Found NIST Volts	As Found Actual SCFH	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left NIST Volts	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
5	5	0.650	4.9	-0.1	-0.2	0.650	4.9	-0.1	-0.2	
10	10	1.320	10.0	0.0	0.0	1.320	10.0	0.0	0.0	
15	15	1.973	14.9	-0.1	-0.1	1.973	14.9	-0.1	-0.1	
20	20	2.624	19.9	-0.1	-0.3	2.624	19.9	-0.1	-0.3	
25	25	3.280	24.8	-0.2	-0.3	3.280	24.8	-0.2	-0.3	
30	30	3.950	29.9	-0.1	-0.2	3.950	29.9	-0.1	-0.2	
35	35	4.645	35.2	0.2	0.4	4.645	35.2	0.2	0.4	
40	40	5.380	40.8	0.8	1.6	5.380	40.8	0.8	1.6	



Flow SCFH As Found	4.9	10.0	14.9	19.9	24.8	29.9	35.2	40.8
Flow SCFH As Left	4.9	10.0	14.9	19.9	24.8	29.9	35.2	40.8
SCFH Target Values	5	10	15	20	25	30	35	40

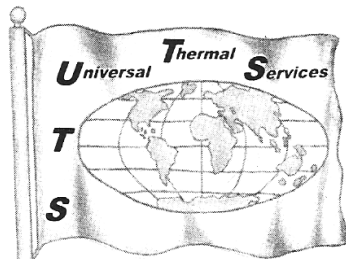
Calibrated By: Allen Hildebrand

Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature:

All instruments have been calibrated against standards traceable to NIST. This Certification Sheet must not be altered in any way!



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

Customer: ABC

Amperage and Voltage Meter

Form # MultiCoat Rev A 4/27/2008

Cert. No. : 2008-036

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Console:	Metco MultiCoat	Serial Number:	SM044588	Booth :	1				
Device ID #:									
Testing Instrument:	Amp Clamp	i1010	Serial Number:	91562357	Testing Instrument:	Multi Meter	87V	Serial Number:	88190113

Amp Meter

Device Under Test: Digital Amp Meter Amps Full Scale [FS] 2000

Amps Set Point	Meter Reading	NIST Meter	Actual Amps Deviation	% Amps Deviation	As Left Meter Reading	As Left Amps Deviation	As Left % Amps Deviation			
300	300	303.0	3.0	0.2	303.0	3.0	0.2			
400	400	405.0	5.0	0.3	405.0	5.0	0.3			
500	500	507.0	7.0	0.4	507.0	7.0	0.4			
600	600	610.0	10.0	0.5	610.0	10.0	0.5			
700	700	712.0	12.0	0.6	712.0	12.0	0.6			
800	800	815.0	15.0	0.8	815.0	15.0	0.8			
900	900	918.0	18.0	0.9	918.0	18.0	0.9			

Volt Meter

Device Under Test: Digital Volt Meter Volts Full Scale [FS] 200

Volt Meter Set Point	Display Reading	NIST Meter	Volts Deviation	% Volts Deviation	Volts As Left Meter Reading	As Left Volts Deviation	As Left % Volts Deviation			
33.9	33.9	34.5	0.6	0.3	34.5	0.6	0.3			
34.5	34.5	34.1	-0.4	-0.2	34.1	-0.4	-0.2			
53.4	52.4	53.0	-0.4	-0.2	61.9	8.5	4.3			
57.2	57.2	57.7	0.5	0.3	57.7	0.5	0.3			
61.3	61.3	61.9	0.6	0.3	53.0	-8.3	-4.2			

Calibrated By: Allen Hildebrand

Calibrated Date: 4/28/2008

Next Calibration Due: 4/28/2009

Signature:

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