

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 9MC Plasma Certificate of Calibration

Form # 9MC Rev P 2/18/2009

Cert. No.: 2009-922

Page: 1 of 7

<b>Customer:</b> ABC	<b>Console:</b> Metco 9MC	<b>Powder Feeder:</b> 9MP	<b>Distribution Box:</b> 9MCD
<b>Address:</b> 1365 Newton	<b>S/N:</b> 9MP AM9255935-4	<b>Serial Number:</b> 9MP EM94169318-1	<b>Serial Number:</b> N/A
<b>City:</b> Boucherville	<b>Device ID#:</b> M-140		
<b>State:</b> Quebec	<b>Booth #:</b> #4	<b>Powder Feeder:</b>	<b>Power Supply:</b> 9MR
<b>Zip:</b> J4B 5H2	<b>Calibration As Received:</b>	<b>Serial Number:</b>	<b>Serial Number:</b> KD350778
<b>Name:</b> John	<b>With in 3%:</b> No		
<b>Phone #:</b> 451-449-4612	<b>Adjustments:</b> Yes		

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

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

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

Flow Tube	Accuracy	Tube Pressure	Tube Scale	Scfh Per Metco
Argon flow meter	± 3%	75 psi	0-300 scfh	296
Hydrogen flow meter	± 3%	50 psi	0-42 scfh	42
Helium flow meter	± 3%	75 psi	0-225 scfh	225
Nitrogen flow meter	± 3%	75 psi	0-300 scfh	353

### System Performance w/Parameters as Provided by the Operator Initially

Gas	Pressure	Gas [Ball] Flow	Amps	Volts As Found
Ar	75	120	450	58.7
H2	50	15		Volts As Left
N2			3MB	56.1
He				

**Notes:**  
 Console Air Purge Safety Test: Pass  
 Door Switch Safety Test: Pass  
 Argon Supply Test: Pass  
 Hydrogen Supply Test: Pass  
 Nitrogen Supply Test: N/A  
 Helium Supply Test: N/A  
 E-Stop Console: Pass

**Caution: Lowered the Argon and H2 flows by 5% or This made for a 2.7 volt cooler parameter.**  
**Air Vibrator Gauges are not used and for reference only.**

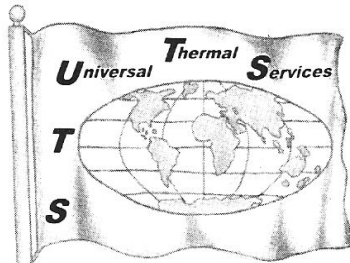
Green 0-3% Acceptable  
 Orange 3.1-5% Alert  
 Red 5.1 and up Fail

**Calibrated By:** Allen Hildebrand  
**Calibrated Date:** 4/16/2009

**Next Calibration Due:** 10/16/2009

**Signature:**

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Customer ABC

## Air Gauges

Form # 9MC Rev P 2/18/2009

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Console: Metco 9MC Serial Number: 9MP AM9255935-4 Booth: #4

Testing Instrument: Press. Transducer PV350 Serial Number: 107 Testing Instrument: Multi Meter 87V Serial Number: 88190113

### Vibrator Air #1

For Reference Only

Device Under Test: Vibrator #1 Gauge Pressure Full Scale [FS] 60 PSI Device ID #:

Pressure (PSI) Set Point	Gauge Reading	NIST Pressure	Actual PSI Deviation	PSI % Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10										
20										
30										
40										
50										
60										

### Vibrator Air #2

For Reference Only

Device Under Test: Vibrator #2 Gauge Pressure Full Scale [FS] 60 PSI Device ID #:

Pressure (PSI) Set Point	Gauge Reading	NIST Pressure	Actual PSI Deviation	PSI % Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
10										
20										
30										
40										
50										
60										

### Cooling Air

Device Under Test: Cooling Air Gauge Pressure Full Scale [FS] 120 PSI Device ID #:

Pressure (PSI) Set Point	Gauge Reading	NIST Pressure	Actual PSI Deviation	PSI % Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
20	20	20.0	0.0	0.0	20.0	0.0	0.0			
40	40	40.0	0.0	0.0	40.0	0.0	0.0			
60	60	59.5	-0.5	-0.4	59.5	-0.5	-0.4			
80	80	78.5	-1.5	-1.3	78.5	-1.5	-1.3			
100	100	98.6	-1.4	-1.2	98.6	-1.4	-1.2			
120										

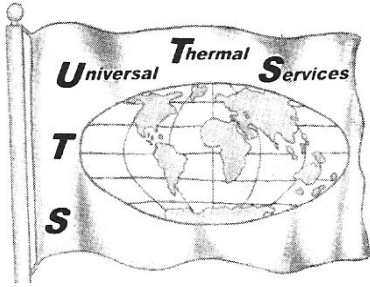
Calibrated By: Allen Hildebrand

Calibrated Date: 4/16/2009

Next Calibration Due: 10/16/2009

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## Gas Gauges

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Console:	Metco 9MC	Serial Number:	9MP AM9255935-4	Booth :	#4
Testing Instrument:	Press. Transducer PV350	Serial Number:	107	Testing Instrument:	Multi Meter 87V
				Serial Number:	88190113

### Primary Gas Pressure Gauge

Device Under Test:	Arc Gas Gauge	Pressure Full Scale [FS]	100 PSI	Device ID #:						
Pressure (PSI) Set Point	Gauge Reading	NIST Pressure	Actual PSI Deviation	PSI % Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
40	40	39.6	-0.4	-0.4	39.6	-0.4	-0.4			
50	50	50.1	0.1	0.1	50.1	0.1	0.1			
60	60	60.3	0.3	0.3	60.3	0.3	0.3			
70	70	70.1	0.1	0.1	70.1	0.1	0.1			
80	80	80.0	0.0	0.0	80.0	0.0	0.0			
90	Max									
100										

### Secondary Gas Pressure Gauge

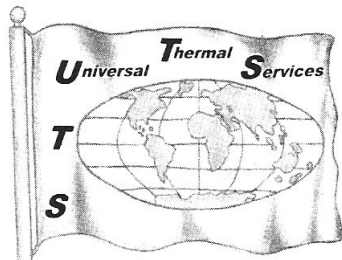
Device Under Test:	Sec. Gas Gauge	Pressure Full Scale [FS]	100 PSI	Device ID #:						
Pressure (PSI) Set Point	Gauge Reading	NIST Pressure	Actual PSI Deviation	PSI % Deviation	As Left Gauge Reading	As Left PSI Deviation	As Left PSI % Deviation			
40	40	40.0	0.0	0.0	40.0	0.0	0.0			
50	50	50.0	0.0	0.0	50.0	0.0	0.0			
60	60	59.5	-0.5	-0.5	59.5	-0.5	-0.5			
70	70	69.6	-0.4	-0.4	69.6	-0.4	-0.4			
80	80	79.6	-0.4	-0.4	79.6	-0.4	-0.4			
90	90	89.6	-0.4	-0.4	89.6	-0.4	-0.4			
100	100	98.8	-1.2	-1.2	98.8	-1.2	-1.2			

Calibrated By: Allen Hildebrand  
Calibrated Date: 4/16/2009

Next Calibration Due: 10/16/2009

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## Amperage and Voltage Meter

Form # 9MC Rev P 2/18/2009

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Console: Metco 9MC Serial Number: 9MP AM9255935-4 Booth : #4  
Device ID #:

Testing Instrument: Amp Clamp Meter 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 Deviation			
300	300	300.0	0.0	0.0	300.0	0.0	0.0			
400	400	404.0	4.0	0.2	404.0	4.0	0.2			
500	500	508.0	8.0	0.4	508.0	8.0	0.4			
600	600	610.0	10.0	0.5	610.0	10.0	0.5			
700	700	713.0	13.0	0.7	713.0	13.0	0.7			
800	800	815.0	15.0	0.8	815.0	15.0	0.8			
900										
1000										

### Volt Meter

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

Volt Meter Set Point	Meter Reading	NIST Meter	Volts Deviation	% Volts Deviation	Volts As Left Meter Reading	As Left Volts Deviation	% As Left Deviation			
36	36	36.0	0.0	0.0	36.0	0.0	0.0			
40	40	40.0	0.0	0.0	40.0	0.0	0.0			
50	50	50.0	0.0	0.0	50.0	0.0	0.0			
60	60	60.0	0.0	0.0	60.0	0.0	0.0			
70	70	70.1	0.1	0.0	70.1	0.1	0.0			

### System Performance w/Parameters after Calibration

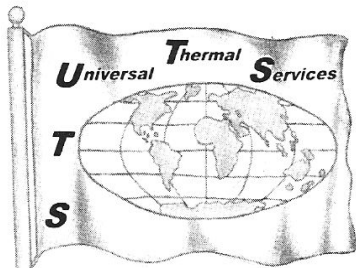
Gas	Pressure	Gas [Ball] Flow	Amps						
Ar	75	120	450						
H2	50	15	Volts						
N2			56						
He									

Calibrated By: Allen Hildebrand  
Calibrated Date: 4/16/2009

Next Calibration Due: 10/16/2009

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## Hydrogen Flow

Tube Scale 0-42 @ 50 psi H2 @ 70°F

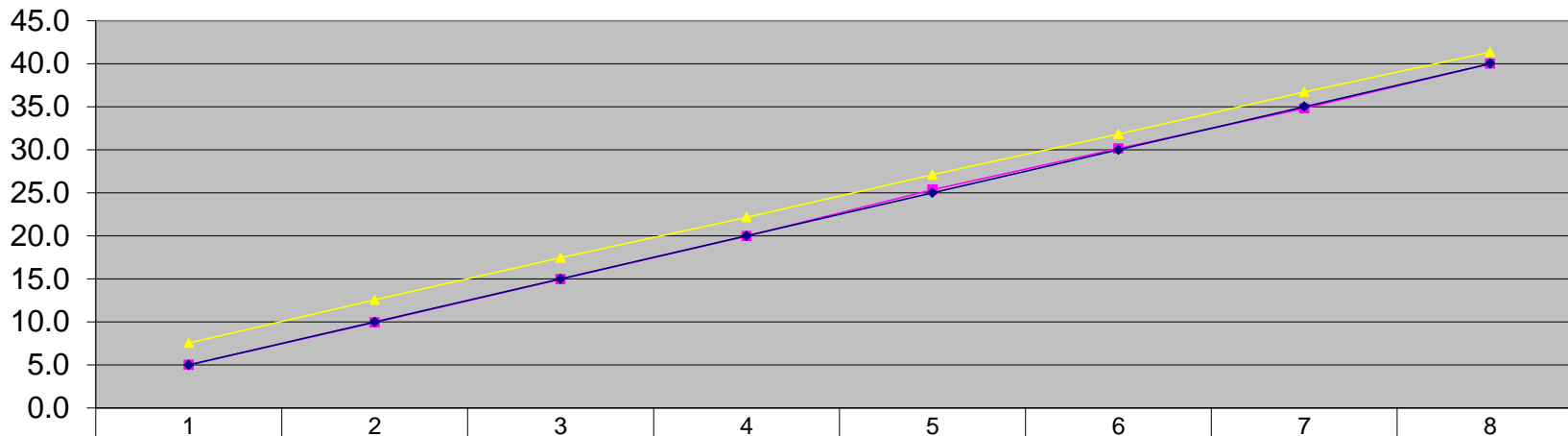
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Console:	Metco 9MC	Serial Number:	9MP AM9255935-4	Type of Gas:	Hydrogen	Full Flow SCFH [FS]:	42
Device ID #:		Booth:	#4				
Device Under Test:	Secondary Gas Flow Tube		Scale Rate:	Flow is in SCFH			
Testing Instrument:	Mass Flow Meter	Alicat Scientific 0-75 scfh	Serial Number:	44770			

Metco Flow Tube SCFH Set Point	Metco Flow Tube SCFH Converted	As Found Actual SCFH	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
5	5	7.6	2.6	6.1	5.0	0.0	0.0	
10	10	12.6	2.6	6.1	9.9	-0.1	-0.2	
15	15	17.5	2.5	5.9	15.0	0.0	-0.1	
20	20	22.2	2.2	5.1	20.0	0.0	-0.1	
25	25	27.1	2.1	5.0	25.4	0.4	0.9	
30	30	31.8	1.8	4.3	30.1	0.1	0.3	
35	35	36.7	1.7	4.0	34.8	-0.2	-0.5	
40	40	41.4	1.4	3.2	40.0	0.0	0.0	



	1	2	3	4	5	6	7	8
Flow SCFH As Found	7.6	12.6	17.5	22.2	27.1	31.8	36.7	41.4
Flow SCFH As Left	5.0	9.9	15.0	20.0	25.4	30.1	34.8	40.0
SCFH Target Values	5	10	15	20	25	30	35	40

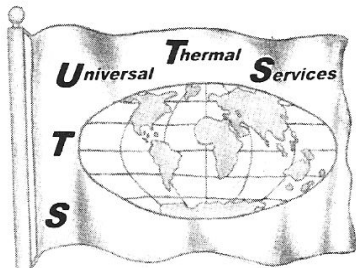
Adjusted over 5%

Calibrated By: Allen Hildebrand  
Calibrated Date: 4/16/2009

Next Calibration Due: 10/16/2009

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## Argon Flow

Tube Scale 0-300 @ 75 psi Ar @ 70°F

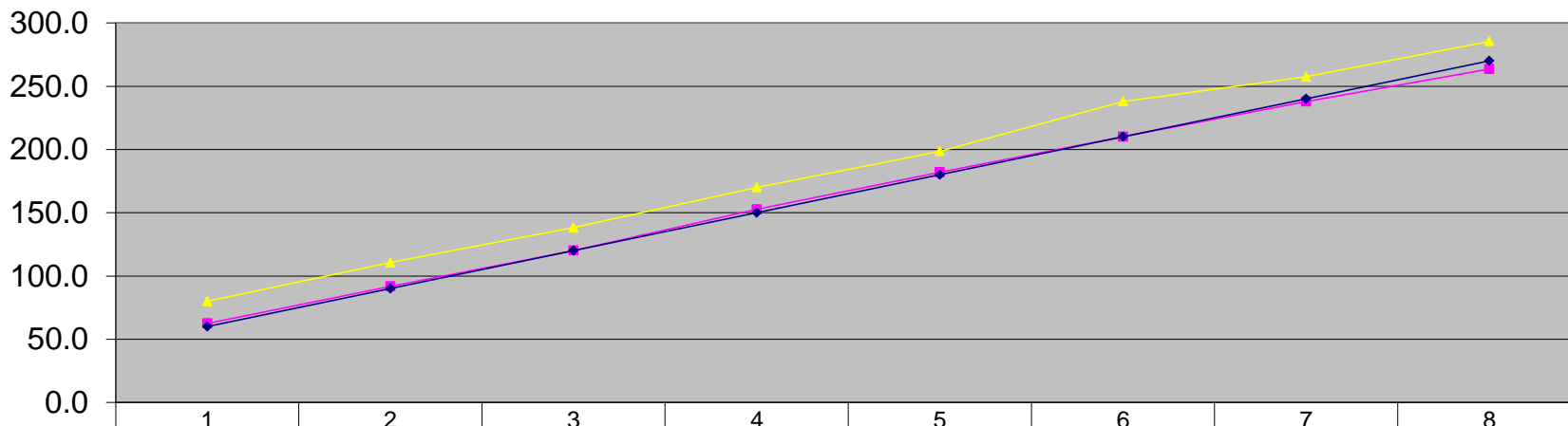
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Console:	Metco 9MC	Serial Number:	9MP AM9255935-4	Type of Gas:	Argon	Full Flow SCFH [FS]:	296
Device ID #:		Booth:	#4				
Device Under Test:	Primary Gas Flow Tube		Scale Rate:	Flow is in SCFH			
Testing Instrument:	Mass Flow Meter	Alicat Scientific 0-400 scfh	Serial Number:	PUC-250SLPM			

Metco Flow Tube SCFH Set Point	Metco Flow Tube SCFH Converted	As Found Actual SCFH	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
60	60	79.9	19.9	6.7	62.5	2.5	0.8	
90	90	110.6	20.6	7.0	91.8	1.8	0.6	
120	120	138.2	18.2	6.1	120.1	0.1	0.0	
150	150	170.0	20.0	6.8	152.6	2.6	0.9	
180	180	198.6	18.6	6.3	181.9	1.9	0.6	
210	210	238.0	28.0	9.5	210.1	0.1	0.0	
240	240	257.5	17.5	5.9	237.9	-2.1	-0.7	
270	270	285.5	15.5	5.2	263.6	-6.4	-2.2	



Flow SCFH As Found	79.9	110.6	138.2	170.0	198.6	238.0	257.5	285.5
Flow SCFH As Left	62.5	91.8	120.1	152.6	181.9	210.1	237.9	263.6
SCFH Target Values	60	90	120	150	180	210	240	270

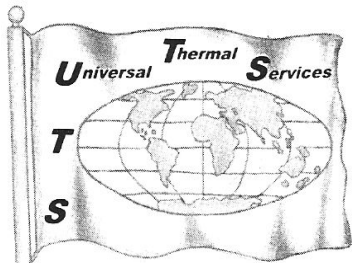
Adjusted outside of 5%

Calibrated By: Allen Hildebrand  
Calibrated Date: 4/16/2009

Next Calibration Due: 10/16/2009

Signature:

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## Helium Flow

Tube Scale 0-225 @ 75 psi He @ 70°F

Form # 9MC Rev P 2/18/2009

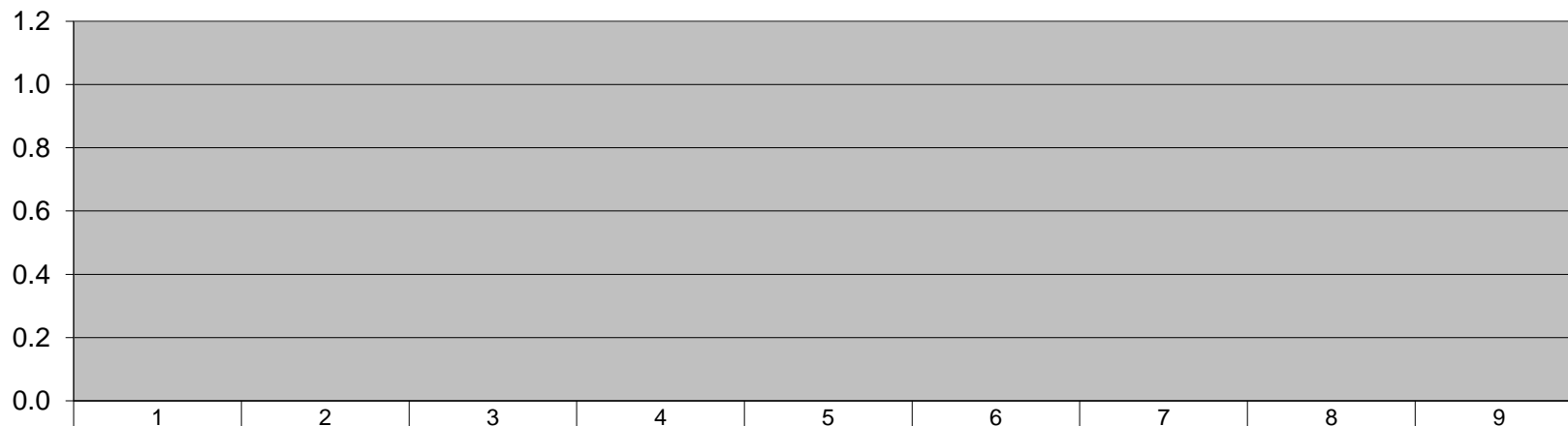
Cert. No: 2009-922

**Not Used For Reference Only**

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Console:	Metco 9MC	Serial Number:	9MP AM9255935-4	Type of Gas:	Helium	Full Flow SCFH [FS]:	225		
Device ID #:		Booth:	#4						
Device Under Test:	Secondary Gas Flow Tube		Scale Rate:	Flow is in SCFH					
Testing Instrument:	Mass Flow Meter	Alicat Scientific 0-400 scfh	Serial Number:	PUC-250SLPM	Testing Instrument:	Multi Meter	87V	Serial Number:	88190113

Metco Flow Tube SCFH Set Point	Metco Flow Tube SCFH Converted	As Found Actual SCFH	As Found Actual SCFH Deviation	As Found SCFH % Deviation	As Left Actual SCFH	As Left SCFH Deviation	As Left SCFH % Deviation	Previous SCFH
20								
40								
60								
80								
100								
120								
140								
160								
180								



- ▲— Flow SCFH As Found
- Flow SCFH As Left
- ◆— SCFH Target Values

Calibrated By: Allen Hildebrand  
Calibrated Date: 4/16/2009

Next Calibration Due: 10/16/2009

Signature: *Allen R. Hildebrand*

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