TISCH Environmental

RECALIBRATION DUE DATE:
November 20, 2018

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	November 20, 2017	**Rootsmeter S/N:** 438320	**Ta:** 294	°K
Operator:	Jim Tisch		**Pa:** 756.9	mm Hg
Calibration Model #:	TE-5025A	**Calibrator S/N:** **2456**		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4440	3.2	2.00
2	3	4	1	1.0260	6.4	4.00
3	5	6	1	0.9130	7.8	5.00
4	7	8	1	0.8680	8.8	5.50
5	9	10	1	0.7190	12.7	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
1.0052	0.6961	1.4209	0.9958	0.6896	0.8814
1.0010	0.9756	2.0095	0.9915	0.9664	1.2465
0.9991	1.0943	2.2467	0.9897	1.0840	1.3936
0.9978	1.1495	2.3563	0.9884	1.1387	1.4616
0.9926	1.3805	2.8418	0.9832	1.3675	1.7628
QSTD	**m=**	**2.07133**	**QA**	**m=**	**1.29703**
	b=	**-0.01892**		**b=**	**-0.01173**
	r=	**0.99995**		**r=**	**0.99995**

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	**Va=**	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	**Qa=**	Va/ΔTime

For subsequent flow rate calculations:

Qstd= $1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$

Qa= $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg

Key
ΔH: calibrator manometer reading (in H2O)
ΔP: rootsmeter manometer reading (mm Hg)
Ta: actual absolute temperature (°K)
Pa: actual barometric pressure (mm Hg)
b: intercept
m: slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

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Email : mcl@fugro.com.hk

MaterialLab

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmantal Monitoring Works For Contract No. KLN/2015/07
Location : KTD2a
Brand: Tisch
Model: TE-5170 S/N: 3838

Date of Calibration: 3-Apr-18
Next Calibration Date: 2-Jul-18
Technician: Toby Wan

CONDITIONS

Sea Level Pressure (hPa):	1013.6	Corrected Pressure (mm Hg):	760
Temperature (°C):	25	Temperature (K):	298

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.07013
Model:	TE-5025A	Qstd Intercept:	-0.01892
Calibration Date:	20-Nov-17	Expiry Date:	20-Nov-18
S/N:	2456		

CALIBRATIONS

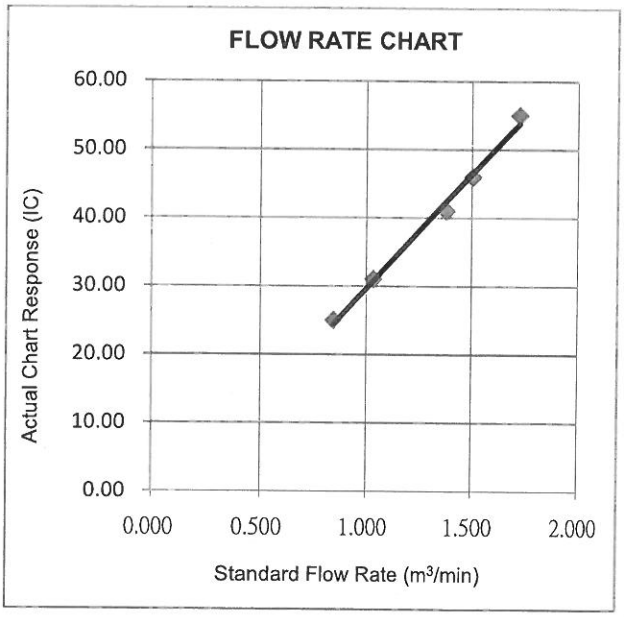
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	6.90	-5.70	12.600	1.724	55.00	55.00	Slope =	33.3531
13	5.40	-4.20	9.600	1.506	46.00	46.00	Intercept =	-3.7146
10	4.70	-3.40	8.100	1.384	41.00	41.00	Corr. coeff.=	0.9963
7	2.90	-1.60	4.500	1.034	31.00	31.00		
5	2.00	-1.00	3.000	0.846	25.00	25.00		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



CHOI KAM HO
Project Consultant

Report Date: 3rd April, 2018

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MaterialLab

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmantal Monitoring Works For Contract No. KLN/2015/07
Location : KTD1a
Brand: Tisch
Model: TE-5170 S/N: 4037

Date of Calibration: 3-Apr-18
Next Calibration Date: 2-Jul-18
Technician: Toby Wan

CONDITIONS

Sea Level Pressure (hPa):	1013.6	Corrected Pressure (mm Hg):	760
Temperature (°C):	25	Temperature (K):	298

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.07013
Model:	TE-5025A	Qstd Intercept:	-0.01892
Calibration Date:	20-Nov-17	Expiry Date:	20-Nov-18
S/N:	2456		

CALIBRATIONS

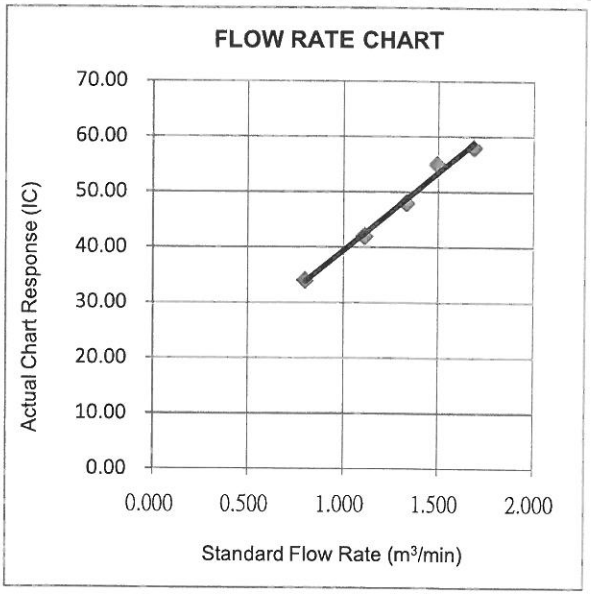
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	6.00	-6.10	12.100	1.689	58.00	58.00	Slope =	28.1358
13	4.80	-4.70	9.500	1.498	55.00	55.00	Intercept =	11.1997
10	3.60	-3.90	7.500	1.332	48.00	48.00	Corr. coeff.=	0.9947
7	2.50	-2.70	5.200	1.111	42.00	42.00		
5	1.30	-1.40	2.700	0.803	34.00	34.00		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



CHOI KAM HO
Project Consultant

Report Date: 3rd April, 2018

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MaterialLab

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmantal Monitoring Works For Contract No. KLN/2015/07
Location : KER1b
Brand: Tisch
Model: TE-5170 S/N: 3482

Date of Calibration: 3-Apr-18
Next Calibration Date: 2-Jul-18
Technician: Toby Wan

CONDITIONS

Sea Level Pressure (hPa):	1013.6	Corrected Pressure (mm Hg):	760
Temperature (°C):	25	Temperature (K):	298

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.07013
Model:	TE-5025A	Qstd Intercept:	-0.01892
Calibration Date:	20-Nov-17	Expiry Date:	20-Nov-18
S/N:	2456		

CALIBRATIONS

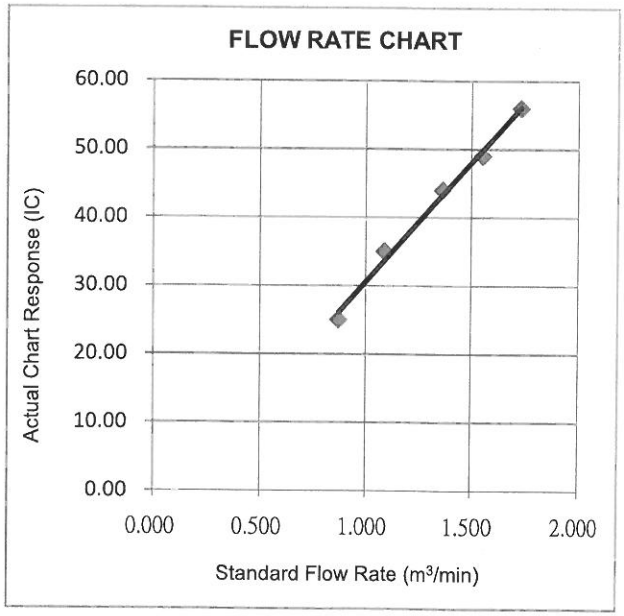
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	7.00	-5.70	12.700	1.731	56.00	56.00	Slope =	34.9372
13	5.70	-4.50	10.200	1.552	49.00	49.00	Intercept =	-4.4008
10	4.60	-3.30	7.900	1.367	44.00	44.00	Corr. coeff.:	0.9965
7	3.10	-1.90	5.000	1.089	35.00	35.00		
5	2.20	-1.00	3.200	0.873	25.00	25.00		

Calculations:

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)
m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure



CHOI KAM HO
Project Consultant

Report Date: 3rd April, 2018

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Website : www.fugro.com

MateriaLab

Report no.: 172379CA171674

CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : MateriaLab Consultants Ltd.

Address : Room 723 & 725, 7F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description	:	Sound Level Meter
Manufacturer	:	Casella
Model No.		Casella (Model no. CEL-63X(meter), CEL-251(microphone), CEL-495(Preamplifier))
Serial No.	:	1057034 (meter), 01308 (microphone), 002672 (Preamplifier))
Next Calibration Date	:	30-Jul-2018
Specification Limit	:	EN 61672: 2003 Type 1

Laboratory Information

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 31-Jul-2017 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MateriaLab

Method Used : By direct comparison

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weighing frequency response	4000Hz	2.5	2.6 to -0.6
	2000Hz	0.5	2.8 to -0.4
	1000Hz	-1.0	1.1 to -1.1
	500Hz	-4.5	-1.8 to -4.6
	250Hz	-10.0	-7.2 to -10.0
	125Hz	-17.4	-14.6 to -17.6
	63Hz	-27.3	-24.7 to -27.7
	31.5Hz	-40.0	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.0	± 0.6
	104dB-114dB	0.0	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighing is fast
4. The equipment complies with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by : _____ Date : 2-8-2017 Certified by : _____ Date : 2-8-2017

CA-R-297 (22/07/2009)

Kwok Chi Wa (Assistant Manager)

** End of Report **

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MateriaLab

Report no.: 172379CA180329

CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : MateriaLab Consultants Ltd.

Address : Room 723 & 725, 7/F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter

Manufacturer : Casella

	Meter	Microphone	Preamplifier
Model No.	CL63X	CE-251	CEL-495
Serial No. :	1057055	00995	002317

Next Calibration Date : 12-Feb-2019

Specification Limit : EN 61672: 2003 Type 1

Laboratory Information

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 13-Feb-2018 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of FTS

Method Used : By direct comparison

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weighing frequency response	4000Hz	0.4	2.6 to -0.6
	2000Hz	1.0	2.8 to -0.4
	1000Hz	0.2	1.1 to -1.1
	500Hz	-3.0	-1.8 to -4.6
	250Hz	-8.3	-7.2 to -10.0
	125Hz	-15.7	-14.6 to -17.6
	63Hz	-25.7	-24.7 to -27.7
	31.5Hz	-38.7	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.1	± 0.6
	104dB-114dB	0.0	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighing is fast
4. The equipment does comply with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by : _____ Date : 14-2-2018 Certified by : _____ Date : 16.2.2018

CA-R-297 (22/07/2009)

Chan Chun Wai (Manager)

** End of Report **

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MateriaLab

Report no.: 172379CA172109

CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : MateriaLab Consultants Ltd.

Address : Room 723 & 725, 7/F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter

Manufacturer : Casella

	Meter	Microphone	Preamplifier
Model No. :	CL63X	CE-251	CEL-495
Serial No. :	4637931	01993	003538

Equipment ID : N-13

Next Calibration Date : 17-Sep-2018

Specification Limit : EN 61672: 2003 Type 1

Laboratory Information

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 18-Sep-2017 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MateriaLab

Method Used : By direct comparison

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weighing frequency response	4000Hz	1.4	2.6 to -0.6
	2000Hz	1.3	2.8 to -0.4
	1000Hz	0.0	1.1 to -1.1
	500Hz	-3.2	-1.8 to -4.6
	250Hz	-8.8	-7.2 to -10.0
	125Hz	-16.3	-14.6 to -17.6
	63Hz	-26.3	-24.7 to -27.7
	31.5Hz	-39.3	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.0	± 0.6
	104dB-114dB	0.0	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference range is 30-130dB, reference SPL is 94,104 & 114dB, frequency weighing is A,
4. The equipment does comply with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by : _____ Date : 19-9-2017 Certified by : _____ Date : 20.9.2017

Chan Chun Wai (Manager)

CA-R-297 (22/07/2009)

** End of Report **

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MateriaLab

Report no.: 172379CA171364

CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

Client Supplied Information

Client : MateriaLab Consultants Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description	:	Sound Calibrator
Manufacturer	:	Casella (Model CEL-120/1)
Serial No.	:	4358250
Equipment ID	:	N/A
Next Calibration Date	:	15-Jun-2018
Specification Limit	:	EN 60942: 2003 Type 1

Laboratory Information

Description : Reference Sound level meter

Equipment ID. : R-119-1

Date of Calibration : 16-Jun-2017 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MateriaLab

Method Used : By direct comparison

Calibration Results :

Parameters (Setting of UUT)	Mean Value (error of measurement)	Specification Limit(dB)
94dB	-0.2 dB	±0.4dB
114dB	-0.1 dB	

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The equipment does comply with the specification limit.

Checked by : _____ Date : 19.6.2017 Certified by : _____ Date : 19.6.2017

CA-R-297 (22/07/2009)

Chan Chun Wai (Manager)

** End of Report **

CASELLA CEL

Certificate of Conformance and Calibration for

CEL-120 Acoustic Calibrator

Applicable Standards :- IEC 60942: 2003 & ANSI S1.40: 2006

CEL-120/1 Class 1 ☑

CEL-120/2 Class 2 ☐

Serial No: 1677126

Firmware: 04

Temperature: 22.8 °C **Pressure:** 1010.8 mb **%RH** 51.8

Frequency = 1.00kHz ± 2Hz T.H.D. = < 1%	Calibration Level
SPL @ 114.0dB Setting	114.01 dB
SPL @ 94.0dB Setting (CEL-120/1 only)	93.96 dB/N.A

Engineer :- _____ **Date :-** 14 JUN 2017

Company test equipment and acoustic working standards, used for conformance testing, are subject to periodic calibration, traceable to UK national standards, in accordance with the company's ISO9001 Quality System.

DECLARATION OF CONFORMITY

This certificate confirms that the instrument specified above has been produced and tested to comply with the manufacturer's published specifications and the relevant European Community CE directives.

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E-mail: info@casellacel.com
Web: www.casellameasurement.com

Kalibrier-Protokoll

Certificate of conformity • Protocole d'étalonnage
Certicifato di taratura • Informe de calibración

We measure it. testo

Gerät / Module type / Modèle / Modelo:	**0560 0480**
Serien-Nr. / Serial no. / No. de série / Número de serie:	**61003846**
Segmenttest / Display test / Testes d´affichage / Test del visualizador:	ok
Tastaturtest / Keyboard test / Testes de clavier / Test del teclado:	ok

Messwerte / Measured values / Valeurs mesurées / Valores medidos:

Sollwert / Reference / Référence / Referencia:	**Toleranz / Tolerance / Tolérance / Tolerancia:**	**Istwert / Actual Value / Valeur réelle / Valor medido:**
Druck / Pressure / Pression / Presión		
10.000 hPa	± 0.103 hPa	10.000 hPa
19.999 hPa	± 0.203 hPa	20.000 hPa
Temperatur / Temperature / Température / Temperatura (TE1, TE2)		
500.0 °C	± 1.3 °C	500.0 °C
500.0 °C	± 1.3 °C	499.9 °C
Absolutdruck / Absolute pressure / Pression absolue / Presión absoluta		
927.8 hPa	± 3.0 hPa	927.8 hPa

Datum / Date / Date / Fecha:

20.06.2017

Prüfer / Inspector / Vérificateur / Verificador:

40

Kalibrier-Protokoll

Certificate of conformity • Protocole d'étalonnage
Certicifato di taratura • Informe de calibración

We measure it. testo

Gerät / Module type / Modèle / Modelo: **0628 0143**

Serien-Nr. / Serial no. / No. de série / Número de serie: **03216409**

Messwerte / Measured values / Valeurs mesurées / Valores medidos:

Sollwert / Reference / Référence / Referencia:	**Toleranz / Tolerance / Tolérance / Tolerancia:**	**Istwert / Actual Value / Valeur réelle / Valor medido:**
Strömung / Velocity / Vitesse d'air / Velocidad		
1.00 m/s	± 0.07 m/s	1.01 m/s
3.00 m/s	± 0.15 m/s	3.08 m/s
5.00 m/s	± 0.23 m/s	5.04 m/s
Temperatur / Temperature / Température / Temperatura (NTC)		
21.3 °C	± 0.5 °C	21.0 °C
Absolutdruck / Barometric pressure / Pression d'air / Présion atmosférica		
926.5 hPa	± 3.0 hPa	926.4 hPa

Datum / Date / Date / Fecha: **21.06.2017**

Prüfer / Inspector / Vérificateur / Verificador: **425**