

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division	NUMBER IH62690
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INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	DATE 11/19/07
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SUBJECT: INSTRUMENT OPERATION TSI VELOCICALC[®] 9555 Series Air Velocity Meter Operation	

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1.0 Purpose/Scope

The purpose of this document is to provide a simple field procedure for operating the *TSI VelociCalc[®] 9555* air velocity meter. This document shows the user how to use the meter for collecting airflow data. The procedure for operating the *TSI VelociCalc[®] 9555* is based on information provided in the operation and service manual.

The data collected with this meter may be used to determine acceptable airflow in chemical hoods as well as local exhaust ventilation and HVAC systems.

2.0 Responsibilities

- 2.1 This procedure will be implemented through the SHSD Industrial Hygiene Group Leader. The IH Group Leader may assign the duties to a Toxic Exhaust Ventilation *Program Administrator*. Members of the SHSD Industrial Hygiene Group, the Radiation Control Division Facility Support Group, and Plant Engineering can qualify to perform tasks in this program based on their approval by the line management for the person conducting the measurement. Personnel who have demonstrated competency in

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performing tasks, in accordance with this procedure, will be qualified to serve as Qualified Sampler. Qualification is documented in Attachment 9.2.

- 2.2 Data Quality Control procedures: The Qualified Sampler is responsible for the integrity of the data and proper transfer to the IH Group database.
- 2.3 Hazard Analysis of the Sampling Task: It is the responsibility of the Qualified Sampler and his/her supervisor to ensure that training is current and the appropriate personal protective equipment is worn. In addition, the person performing this procedure and his/her supervisor are responsible to ensure that all required training and qualification for other hazards that may be present in areas (such as respiratory protection or radiation contamination) have been met. The Qualified Sampler and their line supervisor are responsible to comply with all work planning and work permit system requirements.
- 2.4 The Qualified Sampler is required to request and check the instrument in and out of the IH lab in accordance with the SOP's IH 51200 & 51500.

3.0 Definitions:

Program Administrator: A person designated by the IH Group Leader or SHSD management to administer this procedure and the associated program of toxic exhaust ventilation.

Qualified Sampler: A person who has demonstrated competency in accordance with Section 7 to perform the proper use of this instrument.

Sample: Consists of all of the measurement parameters stored at the same time.

Test ID: This consists of a group of samples. Model 9555 calculates the statistics (average, minimum, maximum, and count) for each test ID. The maximum number of test IDs is 100.

Time Constant: The time constant is an averaging period and is used to dampen the display. A longer time constant will slow the fluctuations. The display will update every second, but the displayed reading will be the average over the last time constant period. For example, if the time constant is 10 seconds, the display will update every second, but the displayed reading will be the average from the last 10 seconds.

Logging Interval: This logging interval is a frequency period that the instrument will log readings. For example, if the logging interval is set to 30 minutes, each sample will be the average of the last 30 minutes.

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4.0 Prerequisites

Training: For SHSD personnel, the SHSD Industrial Hygiene Group Leader, Program Administrator or their designee, will qualify personnel in the use and interpretation of results from the VelociCalc using Attachment 9.2.

5.0 Precautions

5.1 **Hazard Determination:**

- 5.1.1 This meter may be used in areas where chemical contamination may be present. These contaminants can have significant health effects and must receive a hazard evaluation by a cognizant ESH professional. This meter does not generate a hazard to the operator or occupants.
- 5.1.2 Smoke generating devices such as candles, matches, or smoke generators may be used in conjunction with this meter for visual observation of airflow patterns. Although the smoke is hazardous it is typically used in small quantities and controlled by the ventilation system being tested.
- 5.1.3 Using this procedure does not generate Hazardous Wastes or have negative environmental consequences.
- 5.1.4 The test equipment design does not cause significant ergonomic concerns in routine use. The meter does not have a noise hazard.

5.2 **Personal Protective Equipment**

- 5.2.1 This meter is primarily used for measuring airflow velocity and volume flow rates where there is some risk to the sampler from hazardous chemicals or radiological contamination. Personal Protective Equipment may be needed as appropriate to the task.
- 5.2.2 The use of smoke generating devices will require eye protection.

6. Procedure

- 6.1. Equipment: (see Attachment 9.1)
 - TSI VelociCalc[®] 9555 air velocity meter
 - Static pressure tip

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- Rubber tubing
- Probe with sensors
- Four (4) AA batteries or AC Adapter
- Source of smoke, for visual observation of airflow patterns.

6.2. Inspect the meter

- 6.2.1. Visually inspect the meter to ensure all parts are working, undamaged and the batteries are good. Each unit has a calibration sticker, which shows the past calibration date and the due date for the next calibration. Do Not Use a meter that is out of calibration.

6.3. Using the Probe

- 6.3.1. The telescoping probe, mounted on the side of the unit contains the velocity, temperature and humidity sensors. You can use the probe either mounted on the side or hand held. To extend the probe, hold the handle in one hand while pulling on the probe tip with the other hand. Do not hold the cable while extending the probe as this prevents the probe from extending. To retract the probe, hold the handle in one hand while gently pushing on the probe tip with the other hand. If you feel the probe antenna binding, pull gently on the probe cable until the smallest antenna section is retracted. Collapse the rest of the antenna by pressing the probe tip.

WARNING: Excessive heat can damage sensor. The range of operation is 14 to 140 °F (-10 to 60 °C). The pressure sensor is protected from damage up to 7 psi (48kPa or 360 mmHg).

- 6.3.2. When using the probe, make sure the sensor window is fully exposed and the orientation dimple is facing upstream.

NOTE: For temperature and humidity measurements, make sure that at least 3 inches (7.5 cm) of the probe is in the flow to allow the temperature and humidity sensors to be in the air stream.

- 6.3.3. The probe is marked in inches for conducting traverse measurements. Make sure all necessary sections of the probe are extended for the depth to be measured.

6.4. Using the Keypad Functions

The only official copy is on-line at the SHSD IH Group website.
Before using a printed copy, verify that it is current by checking the document issue date on the website.

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Key

- ON/OFF Press to turn the unit ON. During power up the display will show: Model No. and Serial No., Software Rev., and Last Date Calibrated.
- Arrows (▲ ▼) Scroll to set parameters. Pressing both keys simultaneously locks the keypad to prevent unauthorized adjustments to the instrument. To unlock the keypad, press both keys again simultaneously.
- <↓ (Enter) Press to accept a value or condition
- Arrows (◀ or ▶), Press arrows keys to change choices while setting parameters. Press the Menu soft key to select: Display Setup, Pressure Zero, Settings, Flow Setup, Actual/Std Setup, Data Logging, Applications, Calibration, and Printer.

DISPLAY SETUP

This sets up the desired parameters to be displayed on the running screen. The ON soft key selects the highlighted parameter; the OFF soft key turns off the parameter. Use PRIMARY soft key to select the larger display of the parameter. Only one parameter can be selected as a primary, and up to 4 secondary parameters can be selected at one time.

PRESSURE ZERO

To zero the pressure reading, select Pressure Zero menu. The meter will indicate if the pressure zero was successful.

SETTINGS

Settings menu is where you can set the general settings. These include Language, Beeper, Select Units, Time Constant, Contrast, Set Time, Set Date, Time Format, Date Format, Number Format, Backlight, and Auto OFF. Use the ◀ or ▶ soft keys to adjust the settings for each option and use the <↓ (Enter) key to accept settings.

FLOW SET UP

In Flow Setup mode, there are 5 types: Round Duct, Rectangular Duct, Duct Area, Horn and K-Factor. Use the ◀ or ▶ soft keys to scroll through the types and then press the <↓ (Enter) key to accept the desired type. To change the value, highlight the 'Enter Settings' option and press the <↓ (Enter) key.

ACTUAL/ STANDARD SETUP

Choose Actual/ Standard measurements and parameters in the Act/Std Setup menu. Within this menu, the user can also select Standard Temperature, Standard Pressure and a source for the actual temperature. The Model 9555 measures the actual barometric pressure.

DATA LOGGING

Measurements to be logged are independent of measurements on the display, and must therefore be selected under Data Logging → Measurements. Refer to the User's Manual for Log Settings.

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Logging Intervals can be set from 1 second to 1 hour.

APPLICATIONS

You can choose Draft Rate, Heat flow, Turbulence and % Outside Air in the Applications menu.

CALIBRATION

To maintain a high degree of accuracy in your measurements, the Model 9555 may be returned to TSI for annual recalibration. Refer the User's Manual for instruction on doing so.

The Model 9555 can also be recalibrated in the field using the 'Calibration' menu. These field adjustments are intended to make minor changes in calibration to match a user's calibrations standards. The field adjustment is NOT intended as a complete calibration capability. For complete, multiple-point calibration and certification, the instrument should be returned to the factory.

PRINTING

To print logged data, first enter the 'Data Logging' menu. Then, use the 'Choose Test' time to select the data to be printed. After selecting the test, use 'View Stats' and 'View Samples' to select statistics or individual data points to view and print. Press 'Print' key to print the data.

TRAKPRO™ SOFTWARE

VelociCalc Model 9555 comes with software on a CD-ROM for data analysis. Refer to the software's Help function for information on its use. Updates are available from the TSI website at <http://software.tsi.com>.

To download data from the Model 9555, connect the supplied computer interface USB cable to a computer USB port.

6.5. Measuring Velocity

6.5.1. The unit automatically starts in the velocity mode. When using the probe, make sure the sensor window (tip of probe) is fully exposed and the orientation dimple is facing upstream. When the tip is not visible (eg. inside a duct) slowly rotate the probe to get the highest reading.

6.5.2. Fluctuating velocity readings mean the probe is in a turbulent flow area. Find another location for testing or adjust the time constant (see Time Constant adjustment later).

6.6. Measuring Flow Rate

6.6.1. Press the Menu soft key to select 'Display Setup.' The 'Flow' option should be set 'ON.' Return to the Menu and select 'Flow Setting.' This is where you can set up the shape and size of the duct. Under 'Flow Type' you can select round duct, rectangle duct, duct area, horn, and k-factor.

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- 6.6.2. You can enter the dimensions under ‘Enter Settings.’ For a circular duct enter the inside diameter of the duct.
- 6.6.3. For a rectangular duct the first size is the horizontal width. Use the ◀or ▶ soft keys to adjust the internal duct size to that of the duct being measured. Press ‘Enter’ to accept setting. Now adjust the vertical dimension and press ‘Enter’ to accept.
- 6.6.4. Press ‘ESC’ to exit the ‘Flow Setting,’ and again to exit the ‘Menu’. The flow rate reads in cubic feet per minute (CFM).

6.7. Selecting the Time Constant

- 6.7.1. The time constant can be set from the Menu by selecting ‘Settings,’ then ‘Time Constant.’ This value is an averaging period. It is adjusted when velocity, flow rate or pressure levels are fluctuating. A longer time constant will slow down fluctuations. The display will update every second, but the displayed reading will be the average over the last time constant period. For example, if the time constant is 5 seconds, the display will update every second, but the displayed reading will be the average from the last 5 seconds. This is also referred to as a “moving average.”
- 6.7.2. Displayed values are not accurate until at least one time constant has elapsed.

6.8. Batteries/ AC Adapter

- 6.8.1. The Model 9555 is designed to operate with either alkaline or NiMH rechargeable batteries. Battery life will be shorter if NiMH batteries are used. If NiMH batteries are used the DIP switch inside the back of the unit will need to be changed. Refer to the User’s Manual, Appendix B for instructions on doing so.
- 6.8.2. When using the AC adapter, the batteries (if installed) will be bypassed.

7.0 Implementation and Training

- 7.1 Testing shall be performed only by persons who have demonstrated competence to satisfactorily perform the tests as evidenced by experience and training. The qualification to use this procedure, demonstration of competency, and qualification is documented using Attachment 9.3 Job Performance Measure. All persons must have met the qualification criteria set in IH50300 *BNL IH Program and IH Group Training & Qualification Matrix*.

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- 7.2 Qualification Frequency & Recordkeeping: The supervisor of *Qualified Samplers* is responsible to ensure that the employees remain competent in the operation of this meter.
- Personnel are re-qualified when there is evidence that they do not clearly understand the principles of operation of this meter.
 - The re-qualification frequency is 3 years. However, if a person has not used this instrument for a period of over 12 months from the date of last qualification, demonstration of competency to perform this procedure to the satisfaction of the supervisor may be required before sampling commences.
 - If significant and substantive changes to the procedure are made, *Qualified Samplers* will be notified of the changes.

8.0 References

- 8.1 TSI Incorporated Operation and Service Manual Model 9555 Series VelociCalc Air Velocity Meter.

9.0 Attachments

- 9.1 Photograph of meter
 9.2 *Job Performance Measure*

10.0 Documentation

Document Development and Revision Control Tracking		
Prepared By: <i>(signature/date on file)</i> W. Litzke 11/19/07	Reviewed By / Date: <i>(signature/date on file)</i> R. Selvey 11/19/07 Certified Industrial Hygienist	Approved By / Date: <i>(signature/date on file)</i> R. Selvey 11/19/07 Industrial Hygienist Group Leader
ESH Coordinator/ Date: <i>none</i>	Work Coordinator/ Date: <i>none</i>	SHSD Manager / Date <i>none</i>
QA Representative / Date: <i>none</i>	Training Coordinator / Date: <i>none</i>	Filing Code: IH52.05
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ISM Review - Hazard Categorization <input type="checkbox"/> High <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Low/Skill of the craft	Validation: <input type="checkbox"/> Formal Walkthrough <input type="checkbox"/> Desk Top Review <input type="checkbox"/> SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 12/07/07 Hard Copy files updated: 11/19/07
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Revision Log		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls		
Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input type="checkbox"/> none of the above		
Section/page and Description of change:		
SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

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Attachment 9.1

Photograph of the VelociCalc



IH62690 Attachment 9.2 HP-IHP-62690

Environmental, Safety, Health & Quality Directorate
SHSD Industrial Hygiene

Operation of the TSI VelociCalc® 9555 Air Velocity Meters Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:
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Knowledge of the Principles of IAQ Investigations

Criteria	Qualifying Standard	Unsatis- factory	Recov- ered	Satisf- actory
Hazard Analysis	Understands the need to perform a hazard analysis of the sampling area and potential exposure to the sampler.			
Personal Protective Equipment	Understands the need to be aware of potential exposures to the sampler and how to determine appropriate PPE.			
Sampling Protocol	Understands the ventilation system design parameters and logic necessary to appropriately select sampling locations for accurate measurements.			
Analysis of data	Understands the need to perform analysis on the sampling data to assess the effectiveness of the ventilation system and potential exposure to the sampler, worker, public and environment. Also, to recommend corrective actions as necessary.			

Practical Skill Evaluation: Demonstration of Sampling Methodology

Criteria	Qualifying Performance Standard	Unsatis- factory	Recov- ered	Satisf- actory
Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
Meter Operation	Demonstrates the proper way to set up, turn on and use the meter.			
Record forms	Shows how to correctly and completely fill all forms associated with this SOP.			
Data Analysis	Knows the correct criteria and operating ranges. Shows how to correctly analyze data and compare to acceptable criteria.			
Report preparation and distribution	Knows how to document the assessment and the correct distribution.			

Employee: I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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Evaluator: I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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