

Swema 3000 manual



Version 5.46



Swema AB
Tel: 08 94 00 90

Pepparvägen 27
Fax: 08 93 44 93

SE-123 56 FARSTA
swema@swema.se

www.swema.se

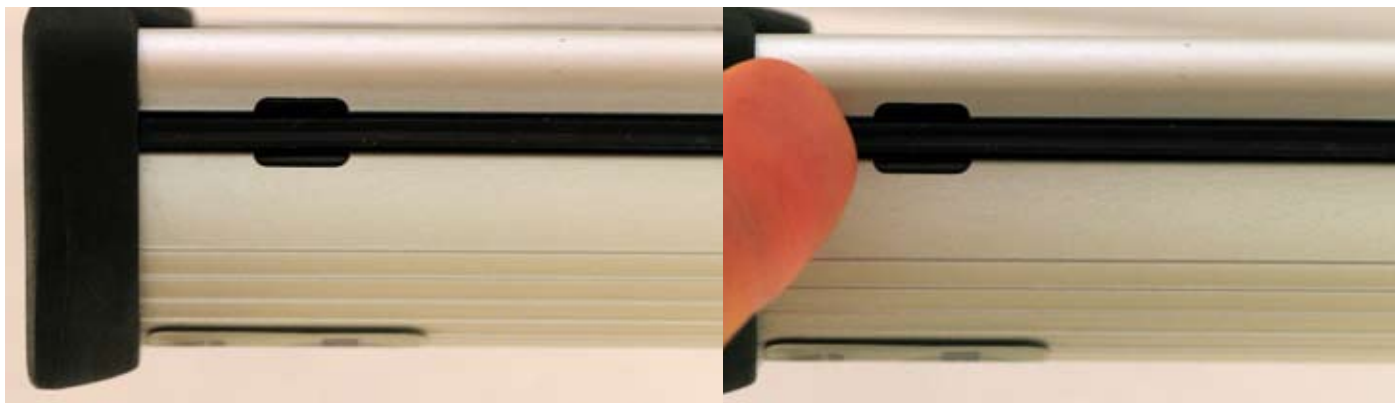
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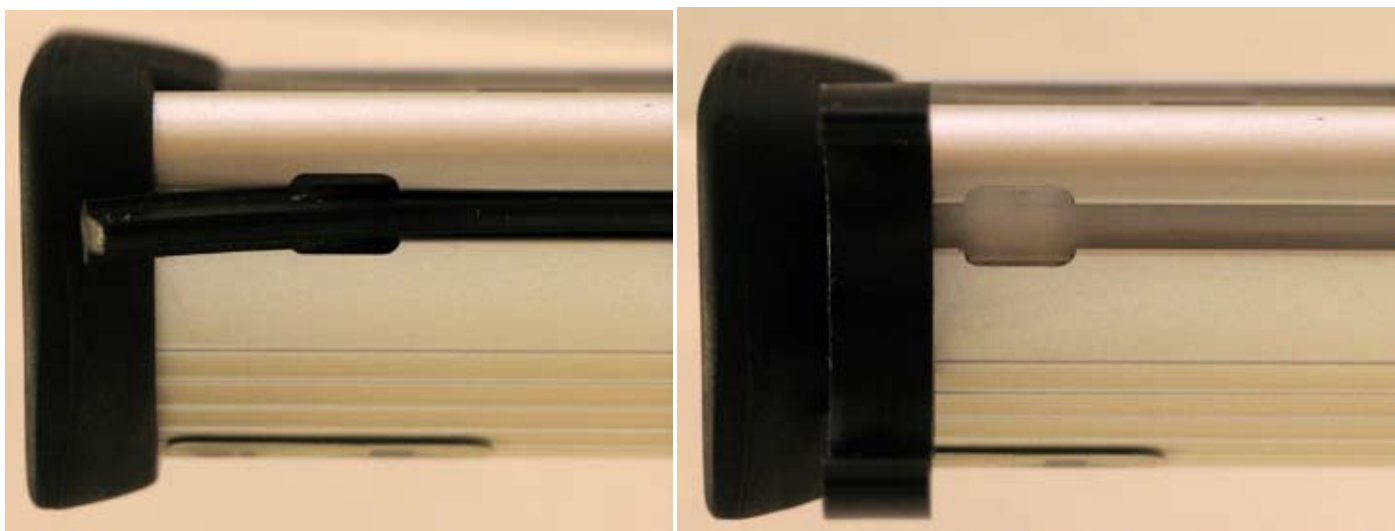
1. Overview



2. Mounting of holder



Start by remove the rubber board by grabbing it with the fingers. Push the board approximately 1 cm to the opening.



Remove the the board by pulling it out. When the list has been removed, place the holders in the opening and push them to a suitable place.



Senor with two holders. (The image shows a SWA 10 wth a holder)

3. Start Guide

General

Swema 3000 has high computing capacity and stores both measured and calculated data. Data that can be transferred to a PC. Interchangeable, individually calibrated sensors can be connected to the instrument. For air flow measurements, the most common programs are DPF and APF.

Start-up information

After turned on, the start-up information is shown for a few seconds or as long as the ON key is pressed down:

Models:

Swema 3000: Basic version without built-in sensor.

Swema 3000md: Includes differential pressure sensor (–300 ... 1500 Pa), barometer and Type K thermocouple connector for density compensation.

Swema 3000mdH+: As 3000md, but with a wider pressure range ($\pm 10\,000$ Pa).

Instrument serial number (S/N)

Next calibration date (instrument) and sensor

Model of sensor

Sensor serial number

Software (Firmware) version

Battery voltage (auto-shutdown below 2.0 V).

If a built-in pressure sensor is present it is shown. But if an external sensor is connected, its data is selected instead. RH/temperature sensors show no data at start-up.

Measurement Mode

When a sensor is connected, Swema 3000 starts in measurement mode. The display shows the current reading from the sensor. If an external sensor is connected, its readings are displayed, otherwise the internal differential pressure sensor is displayed. If there is no sensor at all, Menu 1 is displayed. If an external sensor is connected after power-up that sensor will not be noticed by the instrument.

Switching between Built-in and External Sensor

With Swema 3000md/mdH+, it is possible to switch between an external connected sensor and the built-in differential pressure sensor using the EXT/INT button (left function key, see illustration). When the built-in differential pressure sensor is in use, “EXT.” will appear on the display. This indicates that this button will switch to the externally connected sensor. The button label will then change to “INT.” (Internal). Press INT to return to measuring with the built-in differential pressure sensor.



Modes:

Swema 3000 automatically detects the connected sensor and enables only measurement modes compatible with that sensor type. For example, DPF (airflow with K-factor) is not available for a hot-wire anemometer.

General modes that are available with any sensor are AP (except SWA 03), AS, and LOG.

Function Keys

The lower display area is divided into three sections, each controlled by a function key located directly below. Key functions vary and are described in the corresponding display sections.

Changing Settings / Menu Navigation

To change measurement mode or settings, press MENU1 (right function key in measurement mode). Swema 3000 has three menus for various settings.

Use the UP/DOWN arrows to move the cursor and make selections. To modify a setting, press ENTER, the right ARROW, or SELECT (middle function key). Confirm with ENTER.

To reset to default, press ENTER, the left ARROW, or EXIT (left key). Press EXIT again to return to measurement mode. When a sensor is connected for the first time, Swema 3000 automatically selects its default program, reads calibration data and enables only relevant measurement Modes. The instrument stores settings from Menu 1 and 2 for the two most recently used external sensors plus the internal one. Each sensor retains its previous settings (program, time constant, decimals).

Taking notes with Swema 3000:

Press ENTER to begin to temporarily store a measurement. Depending on the mode, the instrument stores a measurement point, performs a calculation, or starts logging.

In modes collecting multiple points, the display shows mean, max, min, and number of collected points. Press ENTER again to record another point and update the mean value.

Saving Notes

After collecting all data, press SAVE to store or CLEAR to delete. Saved data is placed in the first available slot in Note Book or Log Book memory, available in Menu 1. Swema 3000 emits a short signal and displays the slot number (see Saved Data, Logging and Files).

13:33:22	%RH	
	30.0	
	20.4 °C	
Dew Point	1.5	°C
Mix Ratio	4.20	g/kg
	%RH	°C
Avg	28.7	20.2
Max	28.7	20.2
Min	28.7	20.2
1 pts		
CLEAR		SAVE

Swema 3000 in measurement mode.

Density Compensation

There are two ways to present the measured air velocity and air flow measurements, actual or standard. Actual means that the measurement is presented as it is at current conditions - at actual air density - at actual temperature and barometric pressure. Standard means that the measurement is presented and recalculated into standard conditions of 20 °C and 1013 hPa. That is, the actual air is converted into air of 20 °C and 1013 hPa and the velocity or flow is presented as the air had that condition.

When Density = Actual in Menu 2, air flow or velocity is corrected using barometric pressure (Baro. T) and temperature values from Menu 1. Swema 3000d/md/mdH+ units have a built-in barometer and a Type K thermocouple connector (black connector). These parameters can be viewed and set in Menu 1. Upon saving, only the mean values of temperature and air pressure are stored; these are later used to correct the displayed results.

Important: When a sensor with its own temperature element is connected (e.g., hot-wire anemometer, airflow hood, draught, or RH/T sensor), that sensor's temperature is always used for density compensation of the air flow and velocity. That is, the Temperature in Menu 1 is not used and will not affect the measurement result.

4. MENU 1

Program, area, and k-values are configured in Menu 1

See Mode APF and DPF

Time constant

The Time Constant determines the instrument's damping or response delay (see Time Constant and Filter).

Atmospheric pressure

Atmospheric pressure is used in air-density calculations for air flow and velocity.

Swema 3000 exists in three models:

- 3000 md (764.202) and 3000 mdH+ (764.203) – with built-in barometer and differential-pressure sensor.
- 3000 (764.200) – without built-in barometer.

In Swema 3000 (no barometer), barometric pressure is set manually. Move the cursor to Baro.T with the UP/DOWN arrows, adjust using arrow keys, and confirm with ENTER or EXIT. Swema 3000 md/mdH+ automatically compensates for air pressure. To disable automatic mode, highlight Baro.T and press ENTER or SELECT; select M (Manual) with the UP/DOWN arrows. To enable again select A (Automatic).

Temperature

This setting applies to Swema 3000 md/mdH+. Temperature is used in all air-density calculations for air flow and velocity. Both models have a Type K thermocouple connector.

If the thermocouple is connected, its temperature is used automatically for density compensation of air flow or velocity.

Important The thermocouple must be connected before power up; otherwise it will not be detected.

If disconnected while running, the display shows –270 °C until restart, risking incorrect compensation.

If no thermocouple is connected—or when using Swema 3000, which has no connector—temperature can be entered manually. Move the cursor to Temperature, press ENTER or SELECT, adjust with arrows, and confirm with ENTER or EXIT.

Menu 1		
Mode	APF	
Time Constant	2s	
Ø		
H x W	400x600mm	
Area		
Unit	m ³ /h	
Atmos. P A	1008.4 hPa	
Temp.	20.0 °C	
Note Book	1	
File	0/(0)	
EXIT	MENU2	SET

Highlight the parameter you want to change and press Enter or SET. Change the parameter with the key keys and press Enter or EXIT to confirm.

5. Menu 2

Swema Twin	ON or OFF Activate only when using SwemaTwin. Set ON at the master unit
Communication	USB or RS232 Communicate via USB (Virtual com-port with cable 764.430) or RS232 (cable 759.030 or SwemaTwin modem).
Baud Rate	2400, 4800, 9600, 19200 or 57600 Select 4800 for SwemaTwin. Normally 9600 is used for PC-transfer (RS232 cable).
Density	Actual or Standard Select whether air flow and velocity measurements are compensated to actual or standard air density.
Add Flow	ON or OFF If set to ON. Swema 3000 will add the flow from each measurement in one file and present a total flow.
Protocol	SHORT or LONG Select long or short protocol for PC printout.
1 Unit Decimal	0, 1, 2, or 3, Select number of decimals for large digits. The display shows up to four large digits per row. If a fifth digit is needed, one decimal is removed. Saved values follow the decimals shown on the display.
2 Unit Decimal	0, 1 or 2, Select number of decimals for small digits
Auto Zero	ON or OFF When using a SWA 10 pressure sensor or Swema 3000md, you can enable automatic zeroing while collecting values.
K₂ Factor	ON or OFF If ON, Swema 3000 calculates flow using the k2-factor: Flow = air velocity × k2 × area. If OFF, the formula is Flow = air velocity × area. See APF mode for details.
Exponent	Change exponent (e) in the formula for K factor measurement. $q = k \cdot \Delta P^e$

Menu 2	
Swema Twin	Off
Communication	RS232
Baud Rate	9600
Density	Actual
Add Flow	Off
Protocol	Short
1 Unit Decimals	1
2 Unite Decimals	1
Auto Zero	On
K2-factor	On
Exponent	0.500
EXIT	MENU3
SET	

Move in the menu with the up/down key keys. Press Enter, Set or right key key to select.

Menu 3

Time/Date	Set clock/date
Adjust Clock	Set a value to compensate the clock error
Auto off	Set time before automatic shut down after no key has been pressed. When logging in LOG and LOGP and when using a USB voltage supply there is no auto shut off.
Unit System	SI or US Set which units you want to use Metric (SI) or American (US).
Contrast	Set display contrast.
Print Out	Select comma or point as decimal separator at PC printout. Both work in Excel.
Language	English, German, Swedish, Finnish, French, Danish, Norwegian, Dutch or Polish. Set the language you would like to use.

Menu 3		
Time	16:55:10	
Date	2008-02-29	
Adj-Clock	0.00 s/d	
Auto off	Off	
Unit System	SI	
Contrast	2	
Print Out	Point	
Language	English	
EXIT	MENU1	SET

Change with the up/down key keys.

7. Sensors for Swema 3000

Hot Wire Anemometers

Models: SWA 31/32 or SWA 31/32E. Ø 8–10 mm, 66 cm long; SWA 31/32E extendable to 116 cm.
Range: Air velocity 0–10 m/s (optional 10–30 m/s), temperature –20 to 80 °C.
Programs: APF, AP, AS, ASF, LOG and LOGP.

Extend the sensor to the required length — air must flow through both holes. Note: Do not push by pulling the cable. Align the arrow on the sensor head so the mark on the lowest telescopic section points in the same direction as the arrow; it must match the airflow direction. Air velocity readings vary with sensor hole orientation (see graph).

Differential Pressure Sensors

Models & Ranges:

Swema 3000md: –300 to 1500 Pa

Swema 3000mdH+: ±10 000 Pa

SWA 10: –300 to 1500 Pa

Programs: APF (with Pitot tube), DPF (K-factor), DPK (flow factor), AP, AS and LOG.

Ensure the zero pressure is correctly set; any offset affects all readings.

SWA 10 and Swema 3000md/mdH+ include a solenoid valve, allowing zeroing even under pressure by pressing the ZERO key.

Zero the sensor in its measurement position and do not move it afterward.

The discontinued SWA 07 can only be zeroed when no pressure is applied.

Auto Zero – SWA 10 / Swema 3000md / mdH+

Auto Zero ON: (Default) Each time ENTER is pressed, the pressure is zeroed automatically using the internal valve (≈3 s). Manual zeroing not required.

Auto Zero OFF: No automatic zeroing when pressing ENTER, enabling faster measurements. Due to high sensor stability, auto-zeroing is not always needed.

(Select ON/OFF in Menu 2.)

Swema 3000md and SWA 10 show slight position dependence, eliminated if zeroed and kept still during the process.

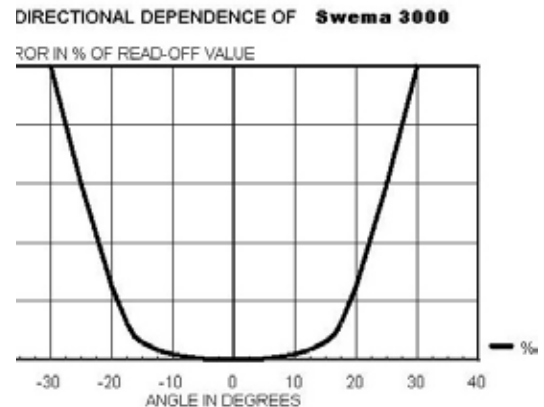
Legacy Sensor SWA 07

SWA 07 is position-sensitive — switching from vertical to horizontal can cause ≈ 4–5 Pa error.

Use magnet holder Art. No. 760.020 for stability.

It is also temperature-sensitive — avoid hand contact. Rapid temperature changes induce pressure drift; stabilization may take 1–2 minutes.

Temperature compensation handles only slow variations, but long-term logging (> hours) remains accurate with minimal zero drift.



Airflow Cones (Flow Hoods)

(Note: newer models cannot be connected to Swema 3000)

SwemaFlow 65 – 2–65 l/s

SwemaFlow 125 – 2–125 l/s

SwemaFlow 125D – 2–125 l/s (can be used with Swema 3000 after adaptation)

SwemaFlow 2000 – 4–900 l/s

SwemaFlow 4000 – 5–1300 l/s (can be used with Swema 3000 after adaptation)

Supported programs: AF, BP (only SWF 125), AS, LOG and AP.

Draught sensors

SWA 03: 0,05...3,0 m/s (omni directional) and 10...34°C.

SWA 03 fulfils ISO 7726.

Possible measuring modes: CO, AS, LOG and LOGP.

Relative Humidity and Temperature

All sensors 0....100%RH

Temperature: HygroClip2-S -40.....+150°C depending on sensor

Possible measuring modes: AP, AS and LOG.

Temperature Sensors

Black globe, SWA 53, SWT 315, SWT 215 and with temperature handle SWA 25 also SWT 14, 18, 22, 28, 39, 50, 51 and 53.

Range: -50...280 °C depending on sensor.

Possible measuring modes: AP, AS and LOG.

CO₂

Connect the Airtest to save and log carbon dioxide values.

Possible measuring modes: AP, AS and LOG.

SwemaTwin – Ventilation Balancing

SwemaTwin transfers data from a Swema 3000 or SwemaMan 8 (reference unit) to the Swema 3000 used for measurement.

Both measured values and their ratio are displayed.

SwemaTwin enables one-person balancing via the proportional method.

See SwemaTwin manual for details.

Leakage Testers

Leakage testers for ventilation ducts and for flats or entire buildings are available as accessories.

8. Measurement Programs in Swema 3000

AP (Average Point)

Measures actual values from the connected sensor (except SWA 03).
Displays mean, max, min and number of points during data collection.

APF (Average Point air Flow)

As AP, but calculates airflow in l/s or m³/h.

Area can be entered in cm² or as duct height, width or diameter.

Swema 3000 then determines effective area = actual area × duct factor k2 (Menu 2 can disable K2-factor). Used for measuring airflow in ducts and grilles.

DPF (Differential Pressure Flow)

Available only with differential pressure sensors.

Calculates airflow from pressure drop across a device using: $q = k \cdot \Delta P^e$

The k-factor is supplied by the device manufacturer.

Default exponent e = 0.5, giving $q = k \cdot \sqrt{\Delta P}$ (since $\sqrt{\Delta P} = \Delta P^{0.5}$).

Airflow is shown directly in l/s or m³/h.

DPK (Differential Pressure k-factor)

Also for differential pressure sensors.

Determines the k-factor corresponding to a desired flow: $k = q / (\Delta P)^e$

The user enters target flow (l/s), and Swema 3000 calculates k.

AF (Average Flow)

For use with airflow cones. Averages airflow over a user-set measurement time.

Displays the average when the period ends.

BP (Back pressure air flow)

Available only with SwemaFlow 125. Compensates for flow reduction caused by the flow capture.

BP mode calculates the actual flow unaffected by the capture.

AS (Auto Sampling)

Collects values continuously at the interval set by Sampling Rate. Useful for measuring average velocity, max, min, and standard deviation at one point.

ASF (Auto Sampling Flow)

As AS, but converts to airflow (l/s or m³/h) using entered area (cm²).

For measuring airflow/velocity in fume cupboards, intake grilles and diffusers.

Not intended for ducts—diameter and duct factor omitted.

CO (Comfort draught of air).

For the omnidirectional draught sensor SWA 03.

Measures mean velocity, temperature and standard deviation over a set time, then calculates Draught Rating (DR).

LOG/LOGP

Performs long-term logging with selectable interval and time constant.

Used to record variations in velocity and temperature over time (e.g. 24 h).

LOG: collects direct measurement points.

LOGP: records full series with protocol showing max, min and mean values.

LOGP is designed for SWA 03 and includes DR calculation per ISO 7730.

8.1. AP (Average Point)

Possible with all sensors except SWA 03.

The AP programme measures the primary parameter from the connected sensor and calculates average, maximum and minimum values from a measurement series.

Sensor Measurements in AP

Differential pressure sensor:

Measures velocity (m/s) and differential pressure (Pa). Velocity requires a PST (Prandtl Tube) connection.

Hot wire anemometer:

Speed (m/s) & Temperature (°C)

Air flow sensor:

Measures airflow (l/s or m³/h) and temperature (°C).

Temperature sensor:

Measures temperature (°C).

Humidity sensor:

Measures relative humidity (%RH) and temperature (°C). Dew point (°C) and water content (g/kg dry air) are also calculated if a measurement is taken with ENTER.

Carbon dioxide sensor:

Measures CO₂ concentration.

Settings in AP mode

Time constant

Recommended standard is 2 s.

See **Time constant and Filter** for details.

Atmos P.

Barometric pressure affects the measurement result through air density compensation.

Differential pressure (air velocity calculation)

Hot-wire anemometers (air velocity calculation)

Air flow hoods (air flow calculation)

Temperature

This temperature affects air velocity density compensation only when a differential pressure sensor is used. Other sensor types use their own temperature sensor for compensation.

Menu 1

Mode	AP
Time Constant	2s
Atmos. P A	1008.4 hPa
Temp.	20.0 °C
Note Book	1
File	0/(0)

EXIT	MENU2	SET
------	-------	-----

Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the up/down key key. Confirm your choice with ENTER or EXIT. Set the parameters and press EXIT to start measuring.

13:33:22	%RH	
	30.0	
	20.4 °C	
Dew Point	1.5	°C
Mix Ratio	4.20	g/kg
	%RH	°C
Avg	28.7	20.2
Max	28.7	20.2
Min	28.7	20.2
1 pts		
CLEAR		SAVE

When measuring, collect values with the enter key. When values are collected the display will show average-, maximum-, minimum-values and number of measurements.

8.2 Measuring with APF (Average Point Air Flow)

Available with the hot-wire anemometer SWA 32 and differential pressure sensor + Prandtl tube.

Used for measuring airflow in ducts, with results in l/s or m³/h.

Note

At delivery, the k2-factor is set to ON in Menu 2.
This factor reduces the measured flow in duct applications according to standard methods.

Flow Calculation

Airflow = Velocity × k2 × Area
In duct measurements, flow is reduced by a k2-factor (per EN 16211 & NBI Report) to compensate for wall friction and sensor obstruction.

Enable k2= ON in Menu 2 for automatic correction, or set OFF if no reduction is desired.
To check the current k2-setting: perform a measurement (ENTER), press SAVE, and view the stored data in Menu 1.

Velocity Measurement with Differential Pressure Sensor

Connect a Prandtl tube:

Middle port → positive (+) side
Side port → negative (–) side

Swema 3000 calculates air velocity using:
$$V = \sqrt{(2 \Delta P / \rho)}$$

where
 ΔP = dynamic pressure = total – static pressure (Pa)
 ρ = air density = $1.293 \times ((B \times 273) / (1013 \times (273 + t)))$ (kg/m³)
B = barometric pressure (default 1013 hPa)
t = air temperature (default 20 °C)

Settings for APF Measurements

Time Constant: Recommended = 2 s (see Time Constant and Filter).

Diameter (Ø): For circular ducts, move the marker to “Ø” → ENTER.

Select a standard diameter with UP/DOWN, or press EDIT to input a custom value.

Preset diameters can also be selected directly in measurement mode.

Height × Width (H × W): For rectangular ducts, select “H × W” → ENTER.

Set height using arrow keys, confirm, then set Width.

Menu 1		
Mode	APF	
Time Constant	2s	
Ø		
H x W	400x600mm	
Area		
Unit	m³/h	
Atmos. P A	1008.4 hPa	
Temp.	20.0 °C	
Note Book	1	
File	0/(0)	
EXIT	MENU2	SET

Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the up/down key key. Confirm with EXIT or ENTER. Set the parameters and press EXIT to start measuring.

17:01:56		l/s	
		2.41	
		23.4 °C	
		Ø 200mm	
INT.		MENU1	

Use UP-/DOWN keys to choose between standard duct diameters.

Area

To measure in a duct with a freely set area, move the marker to "Area" and press ENTER.

Enter the desired area in m².

Note: When using a freely set area, no k2 reduction is applied, even if k2-factor is set to ON in Menu 2.

Unit

Select measurement unit: l/s or m³/h.

Atmos P.

Barometric pressure affects the measurement result through air density compensation.

Temperature

Temperature influences results through air density compensation only when measuring with a differential pressure sensor and Prandtl tube.

For hot-wire anemometers, the sensor's own temperature reading is used instead.

Measurement

When all parameters are set, press EXIT to return to measurement mode.

Swema 3000 displays the selected Ø, H×W, or Area at the bottom of the display.

With a pressure sensor (Prandtl tube): pressure and flow are displayed.

With a hot-wire anemometer: temperature and flow are displayed.

Press ENTER to collect measurement points. During data collection, Swema 3000 shows mean, max, min, and the number of points.

When finished, you can SAVE or DELETE the measurement.

17:03:33	l/s	
	0.00	
	23.6 °C	
	l/s	°C
Avg	4.52	23.6
Max	7.24	23.6
Min	3.02	23.6
4 pts	Ø	200mm
CLEAR		SAVE

When measurement values are collected Swema 3000 displays mean-, max-, min-value and total measure points. Choose if you would like to save or delete the measure.

8.3. DPF (Differential Pressure Flow) - Air Flow with K-factor

DPF is available with a differential pressure sensor.

DPF measures airflow across diffusers or ventilation devices using a K-factor. Enter the diffuser's K-factor in Swema 3000 to display flow directly. The air flow is calculated as:

$$q = k \cdot \Delta P^e$$

The K-factor is provided by the manufacturer.

The exponent $e = 0.5$ by default (equivalent to $\sqrt{\Delta P}$) but can be changed in Menu 2 if another value is specified.

Note: If the K-factor is given for m^3/h , divide it by 3.6 before entry; otherwise, the flow will be displayed $3.6\times$ too high. Always use a K-factor defined in l/s — Swema 3000 automatically converts to m^3/h when selected.

Settings for DPF Measurements

Time Constant: Recommended = 2 s (see Time Constant and Filter).

K-factor: Select memory slot (1–20) with UP/DOWN. Press EDIT to modify, then adjust with arrow keys.

Unit: Choose between l/s or m^3/h .

Atmos P. and Temperature

Used for air density compensation of measurement value.

Measurement

When all parameters are set, press EXIT to return to measurement mode.

Swema 3000 displays the selected k-factor, pressure, and flow.

You can switch between stored k-factors (1–20) using the UP/DOWN arrows.

To manually zero the sensor, press ZERO (middle function key). For automatic zeroing, see **Menu 2**.

Press ENTER to collect data points. Swema 3000 then shows mean, max, min, and the number of points.

After completing the measurement, choose to SAVE or CLEAR to delete the results.

Menu 1

Mode	DPF
Time Constant	2s
K-factor	3.40
Unit	m^3/h
Atmos. P A	1009.9 hPA
Temp.	20.0 °C
Note Book	0
File	0/(0)

EXIT	MENU2	SET
------	-------	-----

Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the up/down key key. Confirm with EXIT or the ENTER. Set the parameters and press EXIT to start measuring.

12:27:03	m^3/h
14.0	
1.3 Pa	

	m^3/h	Pa
Avg	42.6	19.7
Max	80.3	43.1
Min	0.0	0.5
3 pts	K=3.40	

CLEAR	ZERO	SAVE
-------	------	------

When measuring, collect values with the enter key. When values are collected the display will show average-, maximum-, minimum-values and number of measurements.

8.4. DPK (Differential Pressure K-factor) - K-factor with Air flow

DPK is available with a differential pressure sensor.

DPK is used to adjust a diffuser to a desired airflow.

Enter the target flow in Swema 3000 to calculate the K-factor directly on the display:

$$k = q / \Delta P^e$$

The instrument measures and suggests a K-factor. Set this value on the diffuser and verify the reading — adjust until both match, indicating correct airflow. DPK can also be used to determine the K-factor when the actual airflow is known. If the manufacturer specifies another exponent than 0.5, change it in Menu 2 (Section 5).

Note: The displayed k-factor is always based on flow in l/s.

If m³/h is selected, Swema 3000 converts internally from the corresponding l/s value.

Settings for DPK Measurements

Time Constant: Recommended = 2 s (see Time Constant and Filter).

Flow: Set the flow used for k-factor calculation. Swema 3000 stores up to 20 flow values. Select slot (1–20) with UP/DOWN, press EDIT to change, then adjust with arrows.

Unit: Choose l/s or m³/h. Even if entered in m³/h, calculations are based on l/s.

Atmos P. and Temperature

Used for air density compensation of measurement value.

Measurement

When all parameters are set, press EXIT to return to measurement mode. Swema 3000 displays flow, pressure, and k-factor. Switch between stored flow values (1–20) using UP/DOWN. Press ZERO (middle function key) to manually zero the sensor. For automatic zeroing, see Menu 2.

Menu 1		
Mode		DPK
Time Constant		2s
Flow	3	35
Unit		l/s
Atmos. P A	1019.4	hPA
Temp.	20.0	°C
Note Book		2
File		2/(2)
EXIT	MENU2	SET

2:16:28		K	
13.31			
1.3 Pa			
		F=35	
	ZERO	MENU1	

8.5 AF (Average Flow) - Air Flow with discontinued SwemaFlow 65, 125, 125D, 2000, and 4000 air flow hoods.

When using SwemaFlow 125, first measure in BP (Back Pressure) mode to compensate for cone pressure loss.

The average flow is calculated over the selected interval and displayed in l/s or m³/h.

(Total interval = Delay + Measuring Time)

Settings for AF Measurements

Delay: Waiting time before measurement. Recommended = 2 s to stabilise flow.

Measuring Time: Set averaging duration.

Flow Factor: Multiplies the measured flow.

With Flow Factor = 1.00, calibration remains valid.

Warning: Calibration is only valid at Flow Factor = 1. Use other factors only for compensation (e.g., leakage).

Unit: Choose l/s or m³/h.

Atmos P.

Used for air density compensation of measurement value.

Temperature Not used for compensation. The sensor's temperature is used for density compensation.

Measurement

After all parameters are set, press EXIT to return to measurement mode.

Start measurement with ENTER or the button on SwemaFlow 125/2000.

Swema 3000 displays mean, max, min, and standard deviation. When complete, press SAVE (or hold the cone button) to store, or CLEAR to delete the data.

Press CLEAR to delete. Press SAVE or hold the button on SwemaFlow 125/2000 to save.

Menu 1	
Mode	AF
Start Delay	2s
Sampling Time	5s
Flow-factor	1 1.00
Unit	m ³ /h
Atmos. P A	1021.7 hPa
Temp.	20.0 °C
Note Book	1
File	0/(0)

EXIT	MENU2	SET
------	-------	-----

Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the up/down key key. Confirm with EXIT or the ENTER. Set the parameters and press EXIT to start measuring.

10:19:56		l/s
		0.0
		22.7 °C
	l/s	°C
Avg	4.8	23.1
Max	7.7	23.1
Min	0.0	23.1
Sdev	2.8	0.0
CLEAR		SAVE

When measuring, Start the measuring with the enter key. Then you can choose if you want to clear or save your measurement.

8.6 BP (Back Pressure) - Air Flow with discontinued SwemaFlow 125 or 125D.

For systems with low pressure drops, cone measurements must be corrected for the restriction the cone creates. SwemaFlow 125/125D performs this automatically by measuring twice — with and without the throttle ring.

Swema 3000 then calculates the true airflow, i.e., the flow from the diffuser without the cone.

As in AF mode, BP averages results over a selectable time interval.

Settings for BP Measurements

Delay: Waiting time before measurement. Recommended = 2 s for flow stabilisation.

Measuring Time: Set averaging duration.

Flow Factor: Multiplies measured flow.

Warning: Calibration is only valid at Flow Factor = 1. Use other factors only for compensation (e.g., leakage).

Unit: Choose l/s or m³/h.

Atmos P.

Used for air density compensation of measurement value.

Temperature: Not used for compensation. The sensor's temperature is used for density compensation.

Measurement

The display shows "PO 1".

Place the throttle ring on the sensor and position the cone over the diffuser.

Press ENTER to start averaging for Point 1.

When Point 1 is complete, a beep sounds and the display shows "PO 2".

Within one minute, perform the second measurement without the throttle ring — otherwise, the instrument returns to PO 1. Remove the ring, reposition the cone, and press ENTER to start averaging for Point 2.

You may also start with the measurement without the ring and take the second one with it.

The display then shows the true airflow ("True") together with results from Points 1 and 2.

If the displayed value blinks, the difference between the two points is too large, and the result should not be trusted.

Menu 1	
Mode	BP
Start Delay	2s
Sampling Time	5s
Flow-factor	1 1.00
Unit	m ³ /h
Atmos. P A	1021.7 hPa
Temp.	20.0 °C
Note Book	1
File	0/(0)

EXIT | **MENU2** | **SET**

Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the up/down key key. Confirm with EXIT or the ENTER.. Set the parameters and press Exit to start measuring.

10:40:28	l/s	10:42:20	l/s
2.2		2.4	
PO 1		PO 2	
PO 1	Start with ↵	PO 2	Start with ↵
	MENU1		CLEAR

The display will show PO 1. Start with the throttle ring on and press Enter to collect the first value, When ready with the first value the display will show PO 2. Remove the throttle ring and collect the second value by pressing Enter. The key on SwemaFlow 125 can also be used as a Enter-key. A long press will save a measurement.

After PO 2 is measured, Swema 3000 calculates the actual airflow.

The display shows True, Max, and Min values:

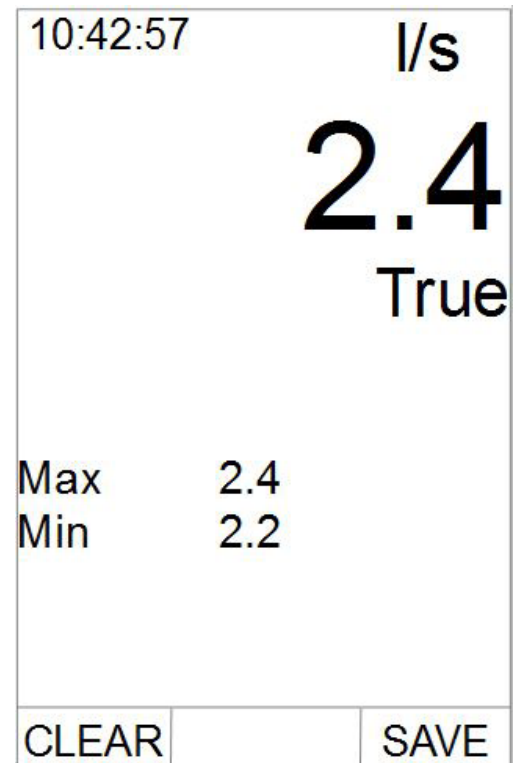
Max = measurement without the throttle ring

Min = measurement with the throttle ring

True = corrected airflow

Choose to SAVE or CLEAR the result.

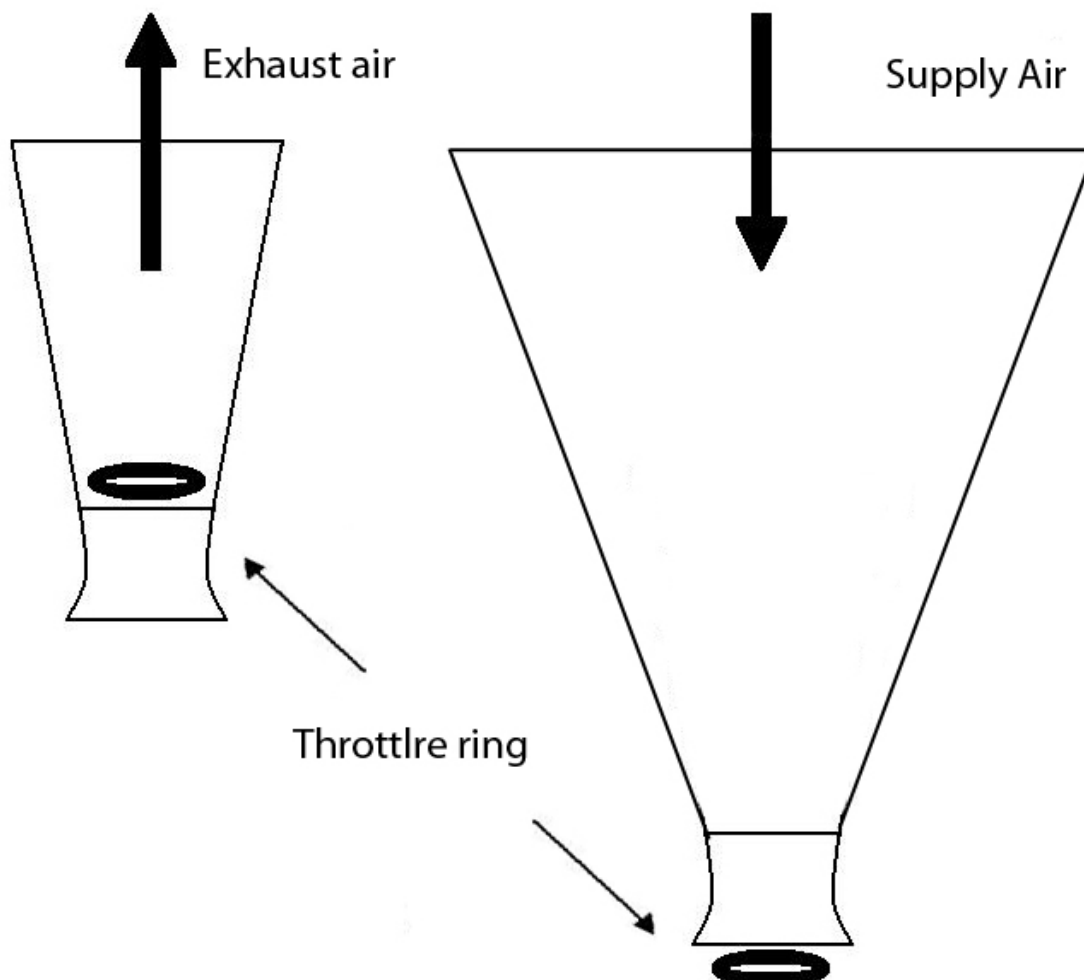
Press CLEAR to delete, or SAVE (or hold the cone button on SwemaFlow 125/2000) to store the data.



Placement of throttle ring

Always position the throttle ring after the measuring wires relative to the airflow direction, the air must pass the wires before reaching the throttle ring

After PO 2 is measured the display will calculate the true value and show it on the display. The display will also show point 1 & 2. Max is without the ring and Min is with the ring. Then you can choose if you want to clear or save your measurement.



8.7 AS (Auto Sampling) - Automatic Data Collection

AS is available to all sensors.

AS mode automatically collects measurement data and continuously calculates mean, max, min, and standard deviation. Use AS to determine average air velocity, temperature, and turbulence intensity at a single point.

Settings for AS Measurements

Sampling Rate:

Defines how Swema 3000 collects, averages, and updates displayed values.

A moving average is applied — e.g., with a 30 s rate, the instrument collects 2 readings per second (60 total), averages them, and updates the display continuously.

After each new reading, the oldest value is replaced.

At rates ≥ 0.5 s, two samples per second are always taken; below 0.5 s, updates follow the selected rate.

Atmos P.

Barometric pressure affects the measurement result through air density compensation.

Differential pressure (air velocity calculation)

Hot-wire anemometers (air velocity calculation)

Air flow hoods (air flow calculation)

Temperature

This temperature affects air velocity density compensation only when a differential pressure sensor is used. Other sensor types use their own temperature sensor for compensation.

Measurement

Start with ENTER. A timer in the lower-left corner shows elapsed time.

During measurement, Swema 3000 displays mean, max, min, and standard deviation in real time.

Press ENTER again to stop.

After completion, choose to SAVE or DELETE the measurement.

10:42:57		l/s	
		2.4	
		True	
Max	2.4		
Min	2.2		
CLEAR			SAVE

Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the up/down key key. Confirm your choice with ENTER or EXIT. Set the parameters and press Exit to start measuring.

Bat		m/s	
		1.1	
		-0.7 Pa	
	l/s	°C	
Avg	2.8	15.5	
Max	14.4	124.7	
Min	0.0	- 0.8	
Sdev	4.3	30.5	
146 sec			
CLEAR			SAVE

Start and stop the sampling by pressing Enter. When the sampling are done you can choose if you want to clear or save your measurement.

8.8 ASF (Auto Sampling Flow) - Sampling with Air Flow Calculation

ASF is available with hot wire anemometers.

ASF operates like AS mode but also calculates airflow in l/s or m³/h.

Enter the opening as height × width or directly as area.
ASF does not apply k₂-reduction, since it is intended for grilles, fume cupboards, or other non-duct measurements.

Settings for ASF Measurements

Sampling Rate: Same as in AS mode (see Section 8.7).

H × W: Enter the opening's height and width.

Area: Input total area directly.

Unit: Select l/s or m³/h.

Atmos P.

Barometric pressure is used for density compensation

Temperature: Sensor temperature is used automatically. This temperature has no effect.

Measurement

Press ENTER to start. A timer in the lower-left corner shows elapsed time.

During measurement, Swema 3000 displays mean, max, and min airflow values.

Press ENTER again to stop.

After completion, choose to SAVE or DELETE the results

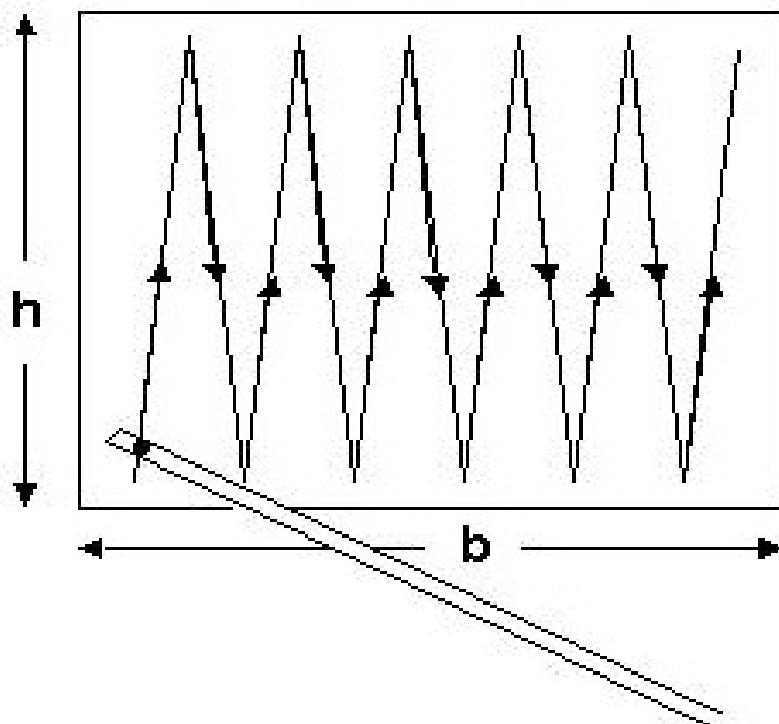
Menu 1	
Mode	ASF
Sampling Rate	0.1 s
H x W	400x 600mm
Area	
Unit	m ³ /h
Atmos. P A	1021.1 hPA
Temp.	20.0 °C
Note Book	1
File	0/(0)

EXIT	MENU2	SET
------	-------	-----

Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the up/down key key. Confirm your choice with ENTER or EXIT. Set the parameters and press Exit to start measuring.

15:15:11		l/s
		4
		20.7 °C
	l/s	°C
Avg	4	20.7
Max	12	20.8
Min	1	20.7
62 sec Area 1140 cm ²		
CLEAR		SAVE

Start and stop the auto sampling flow by pressing Enter.



Traversing technique:

By slowly sweeping (traversing) the sensor over the surface — for example, an intake grille or the opening of a fume cupboard — you can measure the total airflow.

Repeat the measurement until consistent readings are obtained to refine the measurement technique.

8.9 CO (Comfort) - Draught Rating Calculation

CO mode is available only with the SWA 03 draught sensor

the CO mode measures mean velocity, temperature, and standard deviation over a selectable time period (typically 3 minutes).

When saved or printed, Swema 3000 calculates the Draught Rating (DR) — the percentage of people likely to find the air movement uncomfortable.

The index is based on studies by Professor Fanger at the Technical University of Denmark and defined in ISO 7730 for indoor climate assessment.

Settings for CO Measurements

Display Time: Update interval: 0.5, 0.25, or 0.1 s.

Measuring Time: Set averaging duration (data collected internally every 0.1 s).

Swema 3000 calculates mean, max, min, standard deviation, and DR.

Per ISO 7730, use a measuring time of 3 minutes.

Atmos P.

Barometric pressure is used for density compensation

Temperature: Sensor temperature is used automatically; manual input has no effect.

Measurement

Start with ENTER.

Swema 3000 records data for the selected time, then saves the result in the next available slot in Saved Data.

A short signal confirms storage, and the memory location is displayed briefly.

To view the Draught Rating (DR), press MENU1, select Saved Data, and press ENTER.

Menu 1	
Mode	CO
Display Time	0.5s
Measure Time	3m
Atmos. P	1007.7 hPA
Temp.	20.0 °C
Note Book	0
File	0/(0)

EXIT | **MENU2** | **SET**
Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the up/down key key. Confirm your choice with ENTER or EXIT. Set the parameters and press EXIT to start measuring.

15:30:01		m/s	File 1
0.019		18.5 °C	Note 1 of (1)
			2008-02-29 15:30:11
			SWA03 S/N: 362369
			Mode CD, TC 0.5 s
			1008 hPa
			Average velocity 0.025 m/s
			Max 0.118 m/s
			Min 0.000 m/s
			Average temp. 18.5 °C
			Measuring Time 55 s
			Std. deviation 0.021 m/s
			Draught Rating 0.0 %
45 sec			
CLEAR	SAVE	EXIT	PRINT
		ERASE	

The measurement is automatically saved in the note book. To see the draft rate, press the MENU-key and move the marker to Note Book and press enter.

8.10 LOG - Logging of Measurement Values

LOG is available with all sensors.

LOG mode records data at defined intervals for long-term monitoring of airflow, temperature, or pressure (e.g., 24-hour sessions).

Use a mains adapter for logging periods longer than 12 hours.

Settings for LOG Measurements

Time Constant:

Sets instrument damping/response (see Time Constant and Filter).

Interval:

Defines how often Swema 3000 saves a measurement.

The saved value is the one shown on the display at each logging point.

When logging with SWA 10 or the built-in differential pressure sensor, pressure is auto-zeroed between log points if:

Interval > 10 s and Auto Zero = ON.

If the interval is <10 s, set Auto Zero OFF (no zeroing will occur).

Tip:

To log mean values instead of instantaneous readings, set Time Constant = Interval.

Example: Time Constant = Interval = 15 s → each log point = 15-second average.

Atmos P.

Barometric pressure is used for density compensation when logging with hot-wire anemometers (velocity), airflow sensors (airflow), and draught sensors (velocity).

Temperature:

Does not affect logged values.

If a thermocouple is connected (Swema 3000d/md/mdH+), and differential pressure is logged, thermocouple temperature is also recorded.

Logging

Start/stop logging with ENTER.

Swema 3000 records during the set period and saves results in a new file.

When logging ends, press ENTER or SAVE (right MENU key).

A short signal confirms saving, and the file number briefly appears on-screen.

View logged data under Log Book.

To access earlier logs, open Files.

If the interval is ≥10 s, the display also shows time until the next log point.

Menu 1	
Mode	LOG
Time Constant	0.5s
Interval	10m
Atmos. P A	1007.8 hPA
Temp.	20.0 °C
Log Book	0
File	0/(0)

EXIT

DEF

Choose mode by pressing the MENU1-KEY and move the marker to "Mode" with the up/down key key. Press ENTER or SET and choose mode with the Up/down key key. Confirm your choice with ENTER or EXIT. Set the parameters and press Exit to go to measuring position.

15:47:35

m/s

0.05

20.9 °C

LOG 1 New 15:56:16

SAVE

Start and stop the log with the ENTER-key.

8.11 LOGP - Logging of Protocol

LOGP is available with differential pressure sensors, hot-wire anemometers, and draught sensors.

LOGP collects series-based measurements and compiles them into a protocol including mean, max, min, standard deviation, and related data.

Unlike LOG (which saves single readings), LOGP groups results into structured measurement sets.

Settings for LOGP

Time Constant:

Sets instrument damping/response speed (see Time Constant and Filter).

Measure Time:

Defines duration of each series.

Swema 3000 calculates mean, max, min, and standard deviation for that period.

Protocol Interval:

Specifies how often new series start.

If Protocol Interval = Measure Time, logging is continuous.

If longer, a pause occurs between series.

Example: 5 s Measure Time + 10 s pause = 15 s total interval.

Atmos P.

Barometric pressure is used for density compensation of air velocity.

Temperature

Affects only the differential pressure sensor (for velocity calculation). Other sensors use their internal temperature sensor automatically.

Logging

Start/stop with ENTER.

Swema 3000 records data for the defined Measure Time and saves each series as a new file.

A timer in the lower-left corner shows elapsed time.

If a pause is configured, the text LOGP appears during idle periods.

When logging ends, press ENTER or SAVE (right MENU key).

A short signal confirms saving, and the file number appears briefly.

If logging stops before the first series ends, no data is stored.

Review logged protocols under Log Book.

To access previous logs, open the desired file under Files.

Menu 1

Mode	LOGP
Time Constant	2s
Measure Time	3m
Prot. Interval	10m
Atmos. P A	1007.8 hPA
Temp.	20.0 °C
Log Book	1
File	1/(1)

EXIT	MENU2	SET
------	-------	-----

In this example:

Each serie is set to 3 minutes. After one serie is finished another one starts after 7 minutes.

15:47:35	m/s
0.05	
20.9 °C	

LOG 1 New	15:56:16
-----------	----------

SAVE

Start and stop the log with the ENTER-key.

9. Displayed measurement units

Swema 3000 can display two measurement units simultaneously, depending on the connected sensor and the selected program. For most sensors, the displayed values represent direct readings from the sensor. However, in programs using differential pressure sensors or hot-wire anemometers, Swema 3000 also displays calculated values derived from the measured data.

The following tables list the displayed units for each sensor and corresponding measurement program.

Differential pressure sensor:

Mätprogram	Enhet 1	Enhet 2
AP Note 1	m/s	Pa
APF Note 1	l/s or m ³ /h	Pa
AS Note 1	m/s	Pa
DPF Note 2	l/s or m ³ /h alt. Pa (if k = 0)	Pa
DPK	k-factor	Pa
LOG Note 3	Pa	-
LOGP	m/s	Pa

Note 1: Velocity/flow calculation requires a Prandtl tube (PST).

Note 2: If a k-factor is set to "0.00" then only Pa will be shown on the display and then on Unit 1's place

Note 3: If there is a Swema 3000md/mdH+ which has a barometer and a thermocouple, the measurement values will be shown on the display requires that "Atmospheric pressure" is set to "A" (see Menu1) and that a thermocouple is connected.

Hot wire anemometer:

Mode	Unit 1	Unit 2
AP	m/s	°C
APF	l/s or m ³ /h	°C
AS	m/s	°C
ASF	l/s or m ³ /h	°C
LOG	m/s	°C
LOGP	m/s	°C

Air flow sensors:

Mode	Unit 1	Unit 2
All	l/s or m ³ /h	°C

Tensile sensor:

Mode	Unit 1	Unit 2
All	m/s	°C

Temperature sensors:

Mode	Unit 1	Unit 2
All	°C	-

Relative humidity sensor:

Mode	Unit 1	Unit 2
All	%RF	°C

10. Note Book, Log Book and Files

Access Saved Data or Loggings via MENU1.

If using AP, APF, AS, ASF, DPF, BP, or CO, you access Files → Saved Data. If using LOG or LOGP, you access Files → Loggings directly.

Saved Data / Loggings

Open Saved Data or Loggings by moving the cursor to the desired option with the arrow keys, then press ENTER or SELECT. Navigate between measurements using UP/DOWN.

To print or transfer data to a PC:

Press PRINT briefly to print the selected measurement(s).

Hold PRINT to send all saved measurements.

Use SwemaTerminal or SwemaUSB software for PC transfer.

In Saved Data, delete individual measurements or entire files with DELETE.

In Loggings, DELETE removes the entire file.

Return to the main menu with EXIT.

Files

Files organize and group measurements. In the Files menu, you can start new files or review existing ones.

Navigate using UP/DOWN, then press ENTER or SELECT to open a file.

Switch between files with UP/DOWN, and press EXIT to return. Measurements can then be viewed under Saved Data or Loggings.

To create a new file for Saved Data, press ENTER in the Files menu. For LOG/LOGP, a new file is created automatically when logging starts.

To print: Press PRINT to print the current file. Hold PRINT to print all files.

Deleting Files: To delete the last file, select it in Files and press DELETE. Choose OK to delete the selected file, or ALL to remove all files.

If OK is selected, the file is emptied, and new data continues to save under the same file number. The display shows "New empty file X", where X is the file number.

If another file is deleted later, file X is removed completely, and X-1 becomes empty.

Press EXIT to close the Files menu.

File 2 Note 1 of (1)

04-05-27 16:13:23

SWA 31 S/N: 390989

ASF - Continuosly Flow

Time Constant 2 sec

Measuring Time 55 s

Barometer 1008 hPa

Area: 40x60 cm 0.24 m2

Average flow 330 l/s

Average velocity 1.37 m/s

Max 11.31 m/s

Min 0.00 m/s

Average temp. 21.9 °C

EXIT

PRINT

ERASE

Open your Note or Log files by moving the marker to "Note Book" or "Log Book" with the key keys and press Enter.

File 2 Note 1 of (1)

04-05-27 16:13:23

SWA 31 S/N: 390989

AP - Average by Points

Time Constant 2 sec

1008 hPa

Average velocity 6.79 m/s

Average temp. 23.3 °C

No	m/s	dgC
----	-----	-----

1	0.950	23.27
---	-------	-------

2	5.303	23.27
---	-------	-------

3	14.579	23.35
---	--------	-------

4	6.335	23.32
---	-------	-------

EXIT

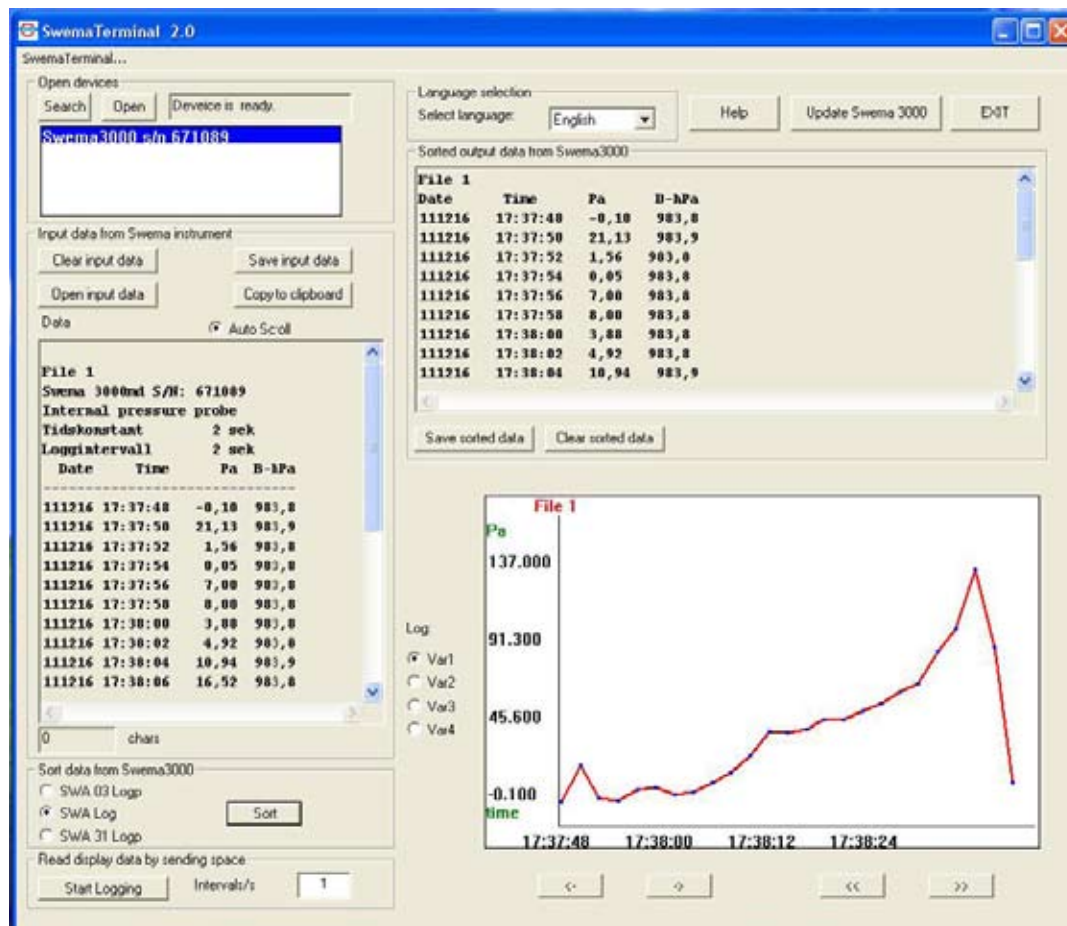
PRINT

ERASE

In the Note Book or Log Book:
Alter between your notes with UP/DOWN key keys.

This is also how the note will look like on the PC.

11. SwemaTerminal 2 (PC Software)



SwemaTerminal 2 is a free PC program for downloading data and updating firmware on the Swema 3000. Visit www.swema.se to download the software and USB driver, or contact Swema for updates.

Installation & Connection: Install the USB driver as described on the website.

Connect Swema 3000 to the PC via USB cable. Power on the instrument and, in MENU2, set Communication → USB. Start SwemaTerminal 2 and click Search. When “Swema 3000” appears, click Open. “Device is ready” confirms a successful connection.

Transferring & Viewing Data: Transfer saved measurement data from Swema 3000 as described in Saved Data, Loggings, and Files. Downloaded data appears in the lower-left text window, where it can be saved, copied, or cleared. You can also open previously saved files to review or edit measurements.

Sorting & Graphing: The right-hand panel of SwemaTerminal 2 sorts and visualizes log files and LOGP files from sensors (SWA03/31).

Steps:

Click Clear input data to reset the workspace.

Choose file type: SWA Log, SWA03 LOGP, or SWA31 LOGP.

Print the selected file from Swema 3000.

Click Sort to organize and prepare data for analysis or graphing.

Live Logging & Keyboard Commands

Click Start Logging to stream live measurements to your PC at the chosen interval.

Minimum logging interval: 10 Hz (0.1 s).

Keyboard Shortcuts:

ENTER – Transfers calibration protocol for the connected sensor.

SPACE – Prints the current displayed readings.

V – Prints the instrument protocol.

12. Time Constant and Filter

Swema 3000 measures continuously at 40 Hz. The time constant determines how quickly the displayed value responds to changes.

All Sensors in LOG and LOGP (incl. pressure sensors)

Displayed values represent the mean over the selected time constant, filtered with a rectangular filter. For pressure sensors, an additional noise suppression applies at low pressures.

Noise Reduction (Differential Pressure):

Below 0.4 Pa or with 0.25 s time constant → actual time constant = 4 s

Below 0.4 Pa and between 0.5–8 s → actual time constant = 8 s

When logging (LOG / LOGP), all sensors use the rectangular filter, while pressure sensors retain noise filtering.

All Sensors Outside LOG and LOGP (except pressure sensors)

Measured data is filtered using a Bessel filter for smoother display response.

Step response:

After 1 time constant → ~90% of change

After 1.5 time constants → ~99%

After 1.8 time constants → ~99.9%

General

Displayed values update twice per second, except when the time constant is 0.25 s or 0.1 s, where updates match those intervals.

Displayed values are used to calculate mean, max, min, and standard deviation in AP, APF, DPF, LOG, and LOGP.

In CO mode, data is always sampled at 0.1 s, regardless of the selected constant.

13. Displaying and saving of measured values

Small and Large Numbers

In measurement mode, the display switches automatically between large and small digits:

Small digits appear when the time constant = 0.1 s

Or when the integer part exceeds 5 digits (positive) or 4 digits (negative)

Number of Decimals

Displayed decimals follow Menu 2 settings until a fifth digit is required.

At that point, one decimal is removed (the display can show only four digits in normal mode).

When saving, the same number of decimals is stored as shown on the display.

Saving Values (APF & DPF)

For Swema 3000d and 3000md (with built-in barometer and thermocouple):

Mean, max, and min values are calculated using the corresponding temperature and pressure at each point.

When saving, only the mean temperature and mean pressure are stored.

These are later used to correct values in printed or displayed reports.

14. Technical Data

The measurement uncertainty for each sensor reflects the combined uncertainty of the sensor and the Swema 3000 instrument. This includes contributions from interchangeability, calibration accuracy, temperature dependence, hysteresis, and repeatability. The uncertainty stated for each sensor already factors in Swema 3000's own measurement uncertainty. To achieve the specified accuracy, the user must apply the corrections listed in the calibration certificate to the measured values. All uncertainties are expressed with a 95% confidence level.

Swema 3000 instrument:

Instrument temperature:	0...+50°C
Memory capacity, Note book - Log book:	approx. 1 600 notes or 14 000 pairs of values or 20 000 single values
Interchangeability accuracy:	Negligible in relation to accuracy of sensors.
Digital Output:	RS232, send "." or "Space". Swema 3000 sends the displayed value (big digits) or (big and small digits) Transmitting rate max 10 times/second (Time constant 0.1s) USB
Battery:	2 x 1,5V AA
Battery life with SWA 31 at 1 m/s:	13 hours with NiMH, 17 hours with alkaline Use the 230V-adaptor (764.610) for continuous operation.
Battery with backlight on:	5,5 hours with NiMH, 8,5 hours with alkaline
Instrument Calibration:	Recommended every 5 year
Only on Swema 3000d part no. 764.201 and Swema 3000dm part no. 764.202	Barometer 600...1200hPa, $\pm 2,5$ hPa Thermo couple Type K -270...1370°C $\pm 0,3^\circ\text{C}$ at -10...70°C

Draught sensor, SWA 03:

Measuring range of velocity	0,05...3,0 m/s at +10...+34°C
Measuring media	Non condensing, non moist air, <80%RH, non aggressive gases
Accuracy (m/s) at 23°C:	$\pm 0,03$ m/s at 0,05... 1,00 m/s $\pm 3\%$ read value at 1,00...3,00 m/s
at 10...34°C:	$\pm 0,04$ m/s at 0,05... 1,00 m/s $\pm 4\%$ read value at 1,00...3,00 m/s
Response time of velocity sensor:	0,2 sec.
Measuring range of temperature:	+10...+40°C
Accuracy (°C):	$\pm 0,3^\circ\text{C}$ at 20°C $\pm 0,5^\circ\text{C}$ at 10...+40°C
Sensor Calibration:	Recommended every 6 months.

Air velocity sensor, SWA 31/32:

Ø8mm at the top, Ø10mm first step on the telescopic handle

Measure range velocity: 0,1...10 m/s, option 10...30 m/s at - 10...+ 45°C
Measure media: Not condensed, no moist air, less than 80% relative humidity, no aggressive gases

Uncertainty: At 20°C: 0,10...1,33 m/s 0,04 m/s
1,33...30 m/s 3% of read value
Otherwise: 0,10...1,10 m/s 0,05 m/s
1,10...30 m/s 4,5 % of read value

Measure range temperature: - 20...+ 80°C
Uncertainty: ± 0,3°C at 20°C
± 1,0°C - 20...+ 80°C

Calibration: Recommended every 12th month.

Pressure sensor:

	Swema 3000md	Swema3000mdH+	SWA 10	SWA 07
Measuring range	-300... 1500 Pa	± 10 000 Pa	-300... 1500 Pa	± 7 000 Pa
Uncertainty at 20°C	±0,3% read value, lowest ±0,3Pa	±1% read value, lowest ± 0,4 Pa	±1% read value, lowest ±0,3Pa	After Reset: ±0,3Pa ±2% read value
Max load	± 50 000 Pa	± 50 000 Pa	± 20 000 Pa	± 35 000 Pa
Temp dependent:	0,2 Pa/°C	0,2 Pa/°C	0,2 Pa/°C	0,4 Pa/°C
Working temperature:	0... 50°C			
Long-time stability	0,1 %FSO/year			
Zero point:				
Total measure area:	0,1 %FSO/year			
Measure media	Not condensed, no moist air, less than 80% relative humidity, no aggressive gases			
Calibration	Recommended every 12th month.			

Temperature sensor (SWT sensor):

Measuring range (sensor dependant): -50...280°C
Interchangeability accuracy: max ±0.1°C

Sensors at 20°C: 1DIN 43760 ca ±0.4°C or 1/2DIN 43760 ca ±0.2°C

Total uncertainty at 20 °C: 1DIN 43760 ca ±0.6°C or 1/2DIN 43760 ca ±0.4°C

Calibration: Recommended every 24th month, with Swema 3000 for the best result.

Flow hood SwemaFlow 125, discontinued

Measure range flow:	2-125 l/s (7 - 450 m ³ /h). The Instrument shows always zero if the flow is lower than 2 l/s (7m ³ /h).
Measure media:	Not condensed, no moist air, less than 80% relative humidity, no aggressive gases
Uncertainty:	± 3% read value, minimum ± 1 l/s
Measuring range temperature:	-10...+50 °C
Uncertainty At 20°C:	± 0,3 °C
-10...+50 °C:	± 0.5 °C
Calibration:	Recommended every 6th month

The Battery:

SwemaFlow 125 contains loadable batteries of the type nickel-methal hydride (NiMH). A fully charged battery is enough for a normal working day. However, this is controled of which flow measured, the more the higher consumption.

Warning if the battery is about to end.

When the battery is about to end in SwemaFlow 125 will the battery sign start to blink. When the battery is fully exhausted will the Swema 3000 automatically shut down.

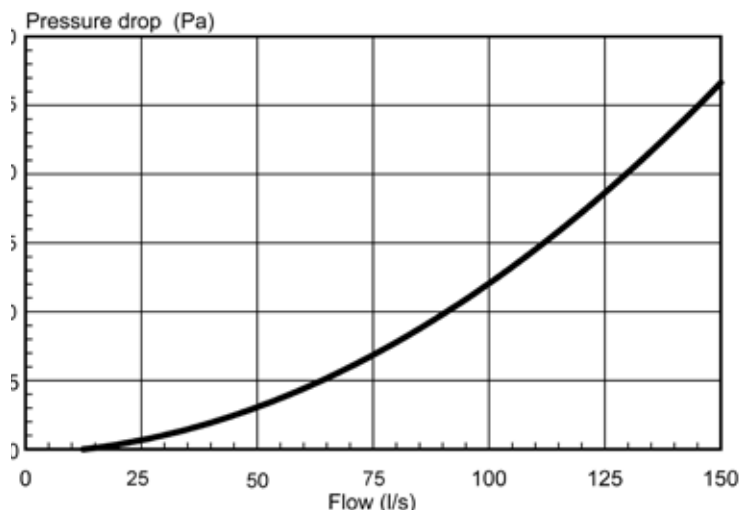
Charge the battery, you can charge it when it suits you.

When you should load the battery you should use the charger that comes with the SwemaFlow 125, to use other chargers causes danger. Connect the charger to the power supply, subsequently the SwemaFlow 125, a red lamp will be lightened beside the contact on the SwemaFlow 125. If the red light starts to blink directly, the contact should be connected again. When the battery is fully charged will the red light start to blink.

If you have Swema 3000 connected to SwemaFlow 125 should Swema 3000 not be on when you charge SwemaFlow 125.

The battery is secured by an electric circuit as it makes it possible to charge it whenever it suits you without any damage. It takes approximately 1 hour to charge the battery full when it is empty. At charging should the instrument's temperature be between. 10 - 45 °C.

When the battery in Swema 3000 is going out starts the battery sign to light up. When it is totally empty the Swema 3000 will shut down automatically.



Relative Humidity & Temperature:

Measure area humidity:	0...100%RF
Accuracy SWA 13 & 16 at 23°C:	± 1,6%RF at 10...90%RF, otherwise ± 2.6%RF
HC2-S & SWHP28_HC2 at 23°C:	± 0,8%RF at 0...100%RF

Measure area temperature:	
SWHP 28:	-40...85°C
SWA 13:	-20...60 °C
SWA 16:	-20...150°C
Hygroclip2-S (other models):	-40...85°C (-50...200°C)
Accuracy temperature:	± 0.3 °C

Calibration: Recommended every 12th month

Calculations: Dew point and water content (g water / kg dry air)

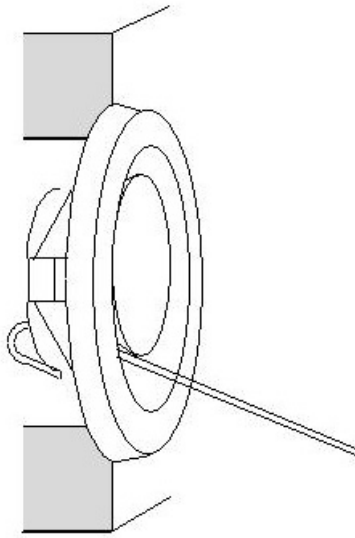
Analogic cable with output

Analogic cable with a volt signal for each Swema 3000 sensor. Also gives an output for the built-in differential pressure sensor in Swema 3000md and Swema 3000mdH+. Same cable suits for all sensors. Connected to Swema 3000 left contact. The other end has loose cable ends.

Swema3000md, SWA10:	1mV/Pa, 1,0V = 0Pa
Swema3000mdH+, SWA07:	0,1mV/Pa, 1,0V = 0Pa
SWA31:	100mV/m/s, 5...10mV = 0m/s
SWA03:	1V/m/s, 5...10mV=0m/s
SWA25 Ni100:	10mV/°C, 1,0V=0°C
Pt100-sensor:	1mV/°C, 1,0V=0°C
CO2-cable:	1mV/ppm, 5...10mV=0ppm
SwemaFlow 65, 125, 2000	10mV/l/s, 5...10mV=0l/s
Humidity sensor:	10mV/%RF, 5...10mV=0%RF

15. Theory

15.1 K-factor calculation



Use the k-factor to calculate the air flow. Some suppliers calculates the correction formula accordingly:

$$q = \sqrt{I_k \Delta P}$$

In this case you have to calculate: $k = \sqrt{I_k}$ Put in the calculated k in Swema 3000.

If the supplier has not stated a K-factor, you can by yourself calculate in if you have a pressure drop diagram :

Do like this: $q = k \sqrt{\Delta P} \rightarrow k = q / \sqrt{\Delta P}$.

Go into the diagram for e.g.:

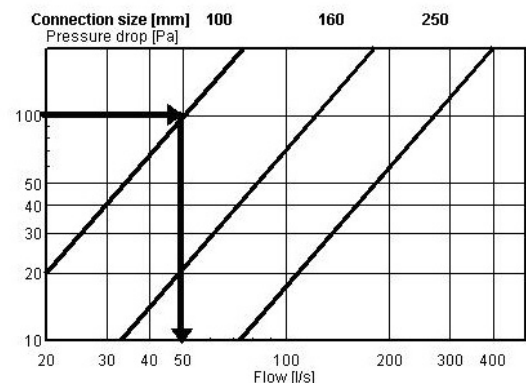
$$\Delta P = 100 \text{ Pa} \rightarrow \sqrt{\Delta P} = \sqrt{100} = 10$$

So, for $\varnothing 100 \rightarrow 100\text{Pa}$ corresponds 50 l/s

Use the connection above for k: $k = 50/10 \rightarrow 5,0$

In this case the k-factor was 5.0. Set $k=5,0$ in Swema 3000 then you will get the flow directly in l/s, m³/h or CFM.

If the diagram does not reach 100 Pa, then choose e.g. 25 Pa
($\sqrt{25} = 5$)



15.2 Necessary straights before and after measure plans

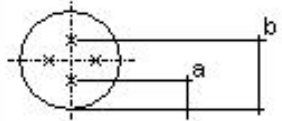
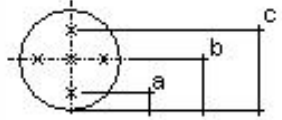
(According to T22 Methods for measurement of air flow inventilation systems)

	Round channels	Rectangular channels
Before measure plan	$a \geq 5 \times D$	$a \geq 6 \times D_h$
After measure plan	$a \geq 2 \times D$	$a \geq 2 \times D_h$

D_h = Hydralic diameter (diameter from corner to corner for rectangular channels)

15.3 Recommended measure points channel measurements

From T22 "Methods for measurement of air flow in ventilation installations", of the Nordic Ventilation Group and Building Research Council, 1998, ISBN 91-540-5827-9.

Nominell diam = D [mm]	Mätplan	a	b	c	d
100 } 125 } ¹⁾ 160 }	 b=0.71D a=0.29D	29 36 46	71 89 114		
200 250 315 400	 c=0.9D b=0.5D a=0.1D	20 25 32 40	100 125 160 200	180 225 283 360	
500 630 800 100 1250	 d=0.957D c=0.71D b=0.29D a=0.043D	22 27 34 43 54	145 185 230 290 360	355 445 570 710 890	478 603 766 957 1196

¹⁾ Prandtlrörets diameter bör inte överstiga 1/30 av kanaldiametern.

Vid kanaldimensioner < 200 mm bör prandtlrör med diameter 3-4 mm användas.

Rektangulärt tvärsnitt:

*) Stående kanal ($L_1 > L_2$) $\Rightarrow k_Q = 0.94$
 Liggande kanal ($L_1 < L_2$) $\Rightarrow k_Q = 0.98$
 Kvadratisk tvärsnitt $\Rightarrow k_Q = 0.96$

Enligt ny kanalstandard SIS 82 72 04

Två dim områden för L_2

I $150 < L_2 \leq 300$

II $400 < L_2 \leq 2000$

För område I gäller att:

$a = 0.08L_2$, $b = 0.43L_2$, $c = 0.57L_2$, $d = 0.92L_2$

För område II gäller att:

$a = 0.060L_2$, $b = 0.235L_2$, $c = 0.430L_2$, $d = 0.570L_2$,

$e = 0.765L_2$, $f = 0.940L_2$

Tre mätfall för kanalhöjden L_1 :

1

$100 < L_1 \leq 400$

2

$400 < L_1 \leq 800$

3

$800 < L_1 \leq 2000$

För mätfallen 1, 2 och 3 erhålls då följande mätpunktsplacering beroende på kanalbredden L_2

L_2	150	200	250	300	400	500	600	800	1000	1200	1400	1600	1800	2000
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a	13	16	20	25	25	30	35	50	60	70	85	95	110	120
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b	65	85	110	130	95	120	140	190	235	280	330	375	420	470
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c	85	115	140	170	170	215	260	345	430	515	600	690	775	860
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d	137	184	230	275	230	285	340	455	570	685	800	910	1025	1140
---	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------

e	—	—	—	—	305	380	460	610	765	920	1070	1225	1380	1530
---	---	---	---	---	-----	-----	-----	-----	-----	-----	------	------	------	------

f	—	—	—	—	380	470	565	750	940	1130	1314	1505	1690	1880
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15.4 Values of K2-factor

Values of K2-factor which is used in Swema 3000:

Prandtl tube

Circular channels:

$$\varnothing \leq 160 \text{ mm} \gg k2 = 0.89$$

$$160 < \varnothing \leq 400 \text{ mm} \gg k2 = 0.95$$

$$400 < \varnothing \leq 1250 \text{ mm} \gg k2 = 0.98$$

Rectangular channels:

$$\text{Height} > \text{Width} \gg k2 = 0.94$$

$$\text{Height} < \text{Width} \gg k2 = 0.98$$

$$\text{Height} = \text{Width} \gg k2 = 0.96$$

Hot wire anemometer

Circular channels:

$$\varnothing \leq 160 \text{ mm} \gg k2 = 0.92$$

$$160 < \varnothing \leq 400 \text{ mm} \gg k2 = 0.96$$

$$400 < \varnothing \leq 1250 \text{ mm} \gg k2 = 0.98$$

Rectangular channels:

$$\text{Height} > \text{Width} \gg k2 = 0.94$$

$$\text{Height} < \text{Width} \gg k2 = 0.98$$

$$\text{Height} = \text{Width} \gg k2 = 0.96$$

Source: Methods for measurement of air flows in ventilation installations (T09) with the right from NBI's report north test Proj. 1463-99 rev. 23-05-01.