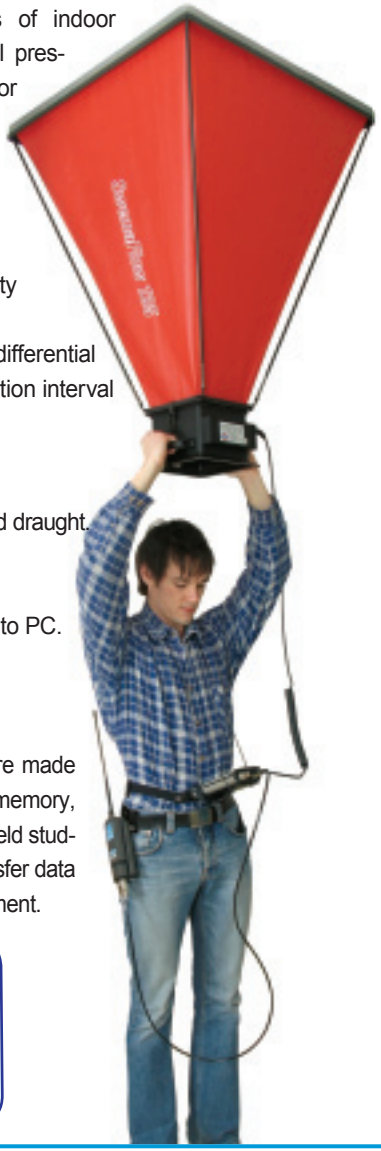
2010

Measuring Instruments

Swema 3000 universal instrument

Swema 3000 is the ultimate tool for professional measurements of indoor climate. Air velocity, air flow, temperature, relative humidity, differential pressure are some of the parameters that can be measured. Every sensor and instrument mode is developed for a specific measurement task.



Four different models:

Swema 3000 (764.200)	Basic version, five year calibration interval
Swema 3000d (764.201)	Built-in barometer and temperature type K connector for compensation of the air density two year calibration interval
Swema 3000md (764.202)	As Swema 3000d additionally with built-in differential pressure, -300...1.500 Pa, one year calibration interval
Swema 3000mdH+ (764.203)	As Swema 3000md but with ±10 000Pa

- Interchangeable sensors designed with highest accuracy and reliability: Air velocity, air flow, differential pressure, temperature, relative humidity and draught.
- The instrument accesses calibration data from each sensor.
- Each sensor and Swema 3000 can be sent for calibration separately.
- Measuring results and probe calibration protocols are easily transferred to PC.
- Built-in data logger, sampling interval: 0,1 second...24 hours.

Field & laboratory

Swema 3000 is a stand alone instrument and logger. All calculations are made inside the Swema 3000 and a measurement protocol can be stored in the memory, which makes the instrument a perfect tool for the laboratory as well as for field studies. Download the SwemaTerminal 2 freeware on www.swema.com to transfer data to a PC. A cable (766.580) can transfer analogue signals to external equipment.

Technical data:

0...50°C, USB, RS232,
2x1,5V IEC LR6, AA, standard / rechargeable types
Memory: 1600 protocols or 12000 pairs or 20.000 single logged values.
Option: Barometer: 600…1200hPa: ±2,5hPa , Type K: -40...1200°C,

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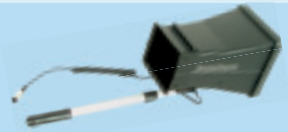
LABORATORY, FIELD

SWA 31 & SWA 31E — 0,1...30 m/s, -20...80°C, Air velocity, flow — page 6

SWA 10 — -300...1500 Pa, Differential pressure, Air velocity, flow — page 7

SWA 07 — -7000...7000 Pa, Differential pressure, Air velocity, flow — page 7

SwemaFlow 125 — page 9
7...450 m³/h 2-125 l/s
300x300 mm adapter
650x650 mm adapter
650x250 mm adapter



SwemaFlow 65 — page 9
7...230 m³/h 2-65 l/s

SWA 03 — 0,05...3,0 m/s, +10...+40 °C, Omnidirectional Air velocity — page 4

HC2-S — 0...100 %RH, -40...+60°C — page 11

SWHP 28 — 0...100%RH, -40...+85°C, Air, air ducts — page 11

SWA 13 — 0...100%RH, -20...+60°C, Paper stacks — page 11

Temperature sensors: -50....+450°C — page 13

Building and Duct leakage tester — page 19

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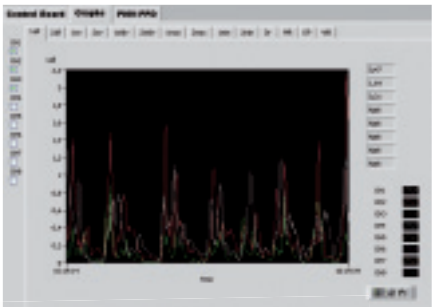
SwemaMultipoint

SwemaMultipoint is developed for laboratory use for logging of measurement data from different locations. The PC-program collects and saves data from up to eight Swema 3000 sensors and presents them in live graphs. Swema 3000 can send data with a minimum interval of 0,1 second. Any combination of Swema 3000 with sensors can be connected. The instruments are connected on a PC with USB cables. Each sensor measurement data is saved in an individual file that can be opened within Excel.



Draught sensor

ISO7726 gives all the required and desirable characteristics of measuring instruments for thermal comfort ISO 7730. However, the air velocity could be the most difficult to measure due to:

1: the air velocity sensor must be direction independent. The air movement in a room is quite low (0.05<V<0.4m/s) and the direction changes easily.

2: the response time of the sensor must be as short as possible.

The turbulence of the air is one important component of the air velocity in the draught rating formula. The room air movement is very unstable. It can change from 0.05m/s to 0.4m/s in very short time. The Swema sensor follows this change.

ISO7726 indicates that the desirable response time of air velocity to be below 0.2 second (90%). Swema fullfills this response time by the control technique in Swema 3000 and by using a small sensing element compared to larger sensors, which have greater inertia and longer response. time. The result is a draught sensor with especially good dynamic qualities for turbulence.

The Swema 3000 also makes it possible to use the SWA 03 without a computer for draught measurements in the field.

Together with Swema 3000 (764.200), the draught sensor SWA 03 (764.730), measures air velocity 0,05-3 m/s and temperature independently of direction.

Technical data:

Air velocity: 0,05...3,00 m/s at 10...34 °C
Accuracy at 23 °C: ±0,03 m/s at 0,05...1,00 m/s, ±3% read value at 1,00...3,00 m/s
at 10…34 °C: ±0,04 m/s at 0,05...1,00 m/s, ±4% read value at 1,00...3,00 m/s
Response time air velocity (90%): 0,2 s

Temperature: 10...40 °C
Accuracy at 23 °C: ± 0,3 °C, at 10...40 °C: ±0,5 °C

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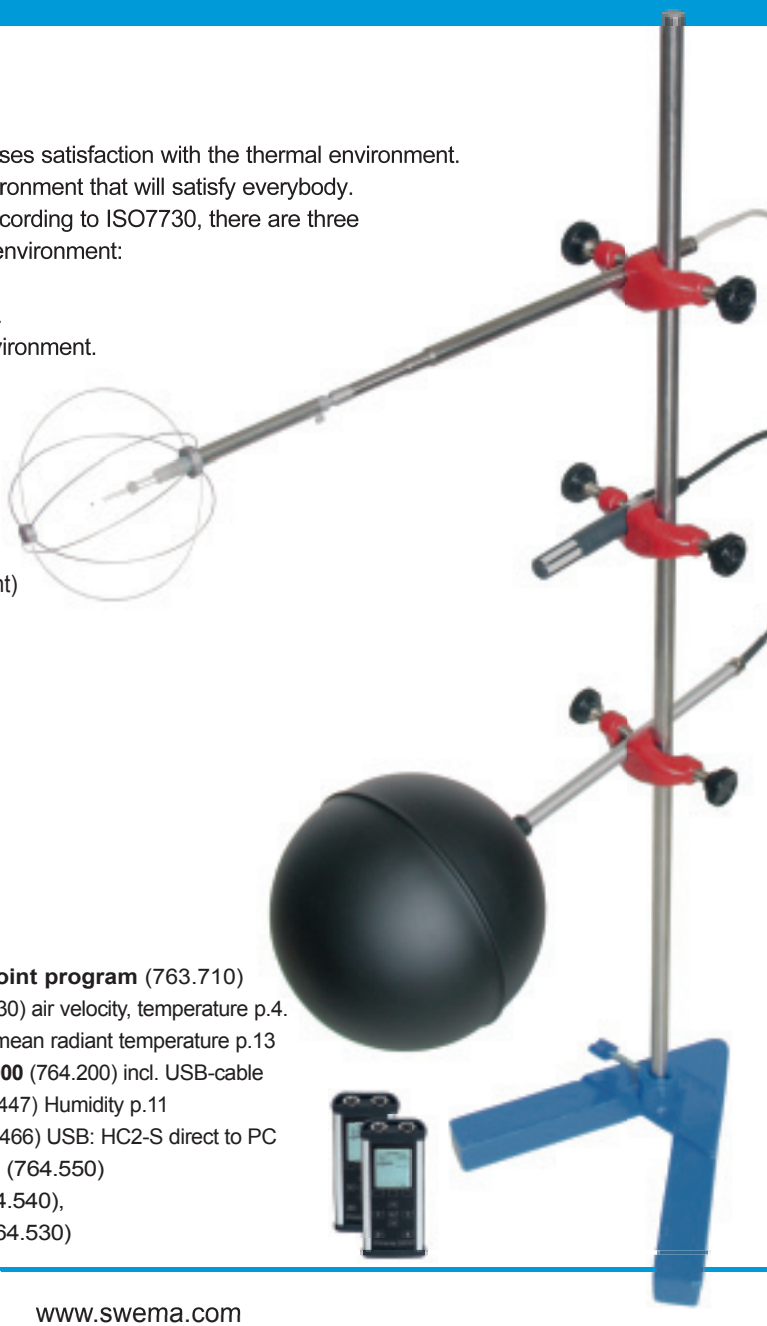
Thermal Comfort

Thermal comfort is defined as that condition of mind which expresses satisfaction with the thermal environment. Due to individual differences, it is impossible to find a thermal environment that will satisfy everybody. The goal must be to get as few unsatisfied people as possible. According to ISO7730, there are three indices to describe dissatisfaction (or satisfaction) rate in thermal environment:
PMV: Predicted Mean Vote is the sensation of:
+3 hot, +2 warm, +1 slightly warm, -1 slightly cold, -2 cool, -3 cold.
PPD is the Predicted Percentage Dissatisfied with the thermal environment.
DR, Draught is an unwanted local cooling of the body caused by air movement. The draught rate may be expressed as the percentage of people predicted to be bothered by draught.

Many test data shows that four measured and two individual variables determine how warm or cold a person feels:
- Air temperature, Air Velocity, Humidity, Mean radiant temperature
- Personal activity and clothing insulation (selected in SwemaMultipont)

PMV, PPD, DR values are calculated, saved and plotted in graphs for each measuring period.

SwemaMultipoint program (763.710)
SWA 03 (764.730) air velocity, temperature p.4.
Black globe (mean radiant temperature p.13
2x **Swema 3000** (764.200) incl. USB-cable
HC2-S (859.447) Humidity p.11
Cable (859.466) USB: HC2-S direct to PC
3x **Clamp** (764.550)
Rod (764.540),
Foot (764.530)



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SWA 31 telescopic anemometer

The sensor SWA 31 with Swema 3000 measures 0,1...30 m/s and is temperature compensated from -10 to +45°C.
On the 66 cm long telescopic shaft there is a scale for easy placement in ventilation ducts.
The measurement is displayed directly or with a number of points as average, maximum and minimum values.

Swema 3000 with SWA 31 (758.150)

Flow calculation

The duct dimension as: diameter, height and width or area, can easily be inserted into Swema 3000 to make the instrument calculate and display the flow in l/s, m^3/h or CFM. To get a good flow value in the duct the instrument makes an average of point measurements over the selected area. According to research, due to friction at the wall, there is a reduction factor k_2, that reduces the calculated flow.

Part no.	
758.150	SWA 31, 0,1...10 m/s Ø 8...10 mm, 66 cm long, calibration certificate
760.090	SWA 31E, 0,1...10 m/s extendable to 116 cm, calibration certificate
763.010	Optional calibration 10...30 m/s

Auto-sampling

For diffusers, the height x width are entered using auto-sampling and a cross-sweeping technique. Set the time constant down to 0,025 sec to get 40 measurements per second. Average, standard deviation, maximum and minimum are automatically calculated.

Technical data:

Air velocity: 0,1...10 m/s (10...30 option)
At 23 °C:
±0,04 m/s at 0,1...1,33 m/s
±3% read value at 1,33...30 m/s
At -10...+45°C (10...30 m/s at 23...45 °C):
±0,05 m/s at 0,1...1,10 m/s
±4,5% read value at 1,10...30 m/s
Temperature: -20...+80°C
At 23 °C ± 0,3 °C, at -20...+80 °C: ± 1,0 °C

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Swema 3000md, mdH+, SWA 10 & SWA 07

Swema 3000md, Swema 3000mdH+ handhelds have inbuilt differential pressure sensors. SWA 10 and SWA 07 are external differential pressure sensors that connect to Swema 3000 or Swema 3000d handhelds. All sensors measure differential pressure, air velocity and flow. The sensors measure pressure differences across ventilation diffusers, valves, fans and filters. Air velocity or air flow is calculated and displayed.

Differential pressure

Swema 3000md, mdH+ and SWA 10 measures differential pressure with high accuracy. An inbuilt valve automatically zero checks the pressure before saving the values. This function gives fully position independent probes that makes them suitable for both field and laboratory measurements. SWA 07 has no inbuilt valve and therefore the pressure needs to be disconnected before zeroing.

Air velocity & flow

By connecting a pitot static pipe Swema 300 measures air velocity. The instrument can automatically calculate the air flow. For ducts the duct cross section is entered into the instrument directly as an area, diameter or height x width. Flow can also be displayed directly by the use of the valve pressure drop and K-factor, the latter supplied by the manufacturer of ventilation valves and diffusers. Swema 3000 calculates the air velocity in m/s or fpm and the air flow in l/s or m^3/h. Density compensation is made automatically for inserted or measured temperature and atmospheric pressure.

Swema 3000md (764. 202) with a 280mm pitot static tube

Part no.	
761.430	SWA 10
758.330	SWA 07
764.760	Holder for SWA10 and 07 on Swema 3000, 2 is needed
764.870	Stop for holders, 1 is needed

Technical data:

Media: Clean air
Ambient temperature 0…50 °C
Resolution: adjustable down to 0,01 Pa

Swema 3000mdH+:
± 10 000 Pa
±1% read value, minimum ± 0,4 Pa
Max overload ±100 000 Pa
Air velocity approx. 2...129 m/s

Swema 3000md, SWA 10:
-300…1 500 Pa
SWA 10: ±1% read value, min. ± 0,3Pa
3000md: ±0,3% read value, min ±0,3 Pa
Max overload ±20 000 Pa
Air velocity approx. 2...49 m/s

SWA07:
±7 000 Pa, ±1 Pa ±2% read value
After zeroing: ±0,3 Pa ±2% read value
Max overload ±35 000 Pa
Air velocity approx. 2...100 m/s
Position dependence: approx. 5Pa

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SwemaFlow measures quickly and accurately the flow over air terminal devices. SwemaFlow 4000, 125, 65 and 233 are based on the well-known Swema measurement priciple.
A net of hot wires gives an accurate average value of the air flow in the flow hood opening. The design has a big cross section which minimizes the restriction of the flow.
With supply hoods SwemaFlow measures air flow, even from angled diffusers. The SwemaFlow 125 and 65 uses Swema 3000 as display. When placing the hood to an air terminal device a measurement value is instantly displayed. Swema 3000 makes averaging, storing and printing out protocols to PC possible.

766.700 SwemaFlow 4000 measuring unit, supply/exhaust air flow capture 650x650 mm, charger, instrument holder and carrying case
764.420 Additional flow capture 1200x250 mm

SwemaFlow 4000

Suitable for high and low flow diffusers, SwemaFlow 4000 measures both supply and exhaust air flow 4...1200 l/s, 15...4300 m^3/h and temperature -10...+50 °C.

The flow measurement section is well defined and the flow hood features high accuracy both for supply and exhaust air.

The user can directly compensate the read-out by the use of a Flow Factor (FF).

SwemaFlow 4000 has the Swema measuring principle - a net of hot wires.

SwemaFlow 4000 is a stand alone flow hood with its own display.

Technical data:

Air flow: 5...1200 l/s, 20...4300 m^3/h
±4% read value, minimum ±1 l/s
Temperature: -10...+50 °C
±0,3 °C at 20 °C, ± 0,5 °C at -10...+50 °C
Weight incl. capture 650x650 mm: 4,0 kg
Battery charge time: max 4 hours

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SwemaFlow 125

For offices and residential ventilation, SwemaFlow 125 measures 2-125 l/s. Use the ”back pressure method” and take two measurements, one with a restriction ring and one without to compensate for restriction and make measurements with high accuracy, even in systems with low pressure. SwemaFlow 125 connects to Swema 3000 for displaying, data storage and SwemaTwin modem balancing.

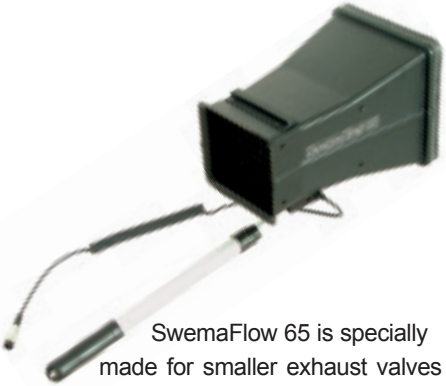
SwemaFlow 125 is using the unique Swema measuring principle - a net of hot wires.

Part no.	
759.700	SwemaFlow 125 including exhaust air adapter 300x300 mm, restriction ring, charger, carrying case, calibration certificate, total weight: 6 kg
758.950	Supply & exhaust air adapter 650x650 mm case
760.740	Supply & exhaust air adapter 650x250 mm case
761.550	Exhaust air adapter 300x300xh130 mm total height = 280 mm

Technical data:

Flow: 2-125 l/s, 7 - 450 m^3/h
Temperature: -10...+50 °C
Accuracy: ± 3% read value, min ± 1 l/s
At 23 °C: ± 0,3 °C, At -10...+50 °C: ± 0,5 °C
Weight incl. exhaust adapter 300x300 mm: 2,05 kg (incl. Swema3000: 2,4 kg)
Charging time: approx. 1 hour

SwemaFlow 65



SwemaFlow 65 is specially made for smaller exhaust valves 2-65l/s. With an adapter supply valves can be measured. Displaying, data storing and radiomodem balancing is carried out together with Swema 3000. Swema principle - net of hot wires.

Part no.	
761.280	SwemaFlow 65 including charger, telescopic handle, case and calibration certificate.
459.096	Foldable supply hood 330 x 330 x height 560 mm
762.330	Foldable exhaust hood 300 x 300 x height 100 mm

Technical data:

Flow: 2...65 l/s / 7-230 m^3/h
At 2…65 l/s at +18…+25 °C and
2...30 l/s at -10...+40 °C:
±4% read value, minimum 1 l/s
At 30…65 l/s at 0…+40 °C:
±6% read value, minimum 1 l/s
Charging time: 3 hours
Weight:: 1,3 kg
Opening: 190x200 mm, Height 330 mm

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SwemaFlow 233

Air flow hood with telescopic handle for quick and accurate flow measurement over ventilation exhaust valves. The Swema measuring principle with a net of hot wires is unique. The net gives an accurate average flow and allows a wide opening, which minimizes restriction of the flow. For the measurement of supply flow use the foldable supply air adapter. The large digital display shows the flow with one decimal place. There is a hold function and it is possible to display l/s or m^3/h. By pressing both buttons the display light is activated.

SwemaFlow 233 (761.960)
incl. instrument, handle, case, calibration certificate and 220V battery charger

Foldable supply adapter (459.096)
Opening: 330x300 mm, Height 560 mm

Foldable exhaust adapter (762.330)
Opening: 300x300 mm Height: 100 mm

Telescopic handle

The angle and handle length are adjustable. This makes it easy to measure outlets and inlets, both on the ceiling and high up on the wall without using a ladder.

Technical data:

2-65 l/s / 7-230 m^3/h
2…65 l/s at +18…+25 °C and
2…30 l/s at –10…+40 °C:
±4% read value, minimum 1 l/s
At 30…65 l/s at 0…+40 °C:
±6% read value, minimum 1 l/s
Battery: Chargeable NiMh for 4 hours continued measurement
Charging time 1,5 hours
Shaft adjustable length: 45...80 cm
Weight: 1,75 kg
Opening: 190x200 mm,
Height: 330 mm

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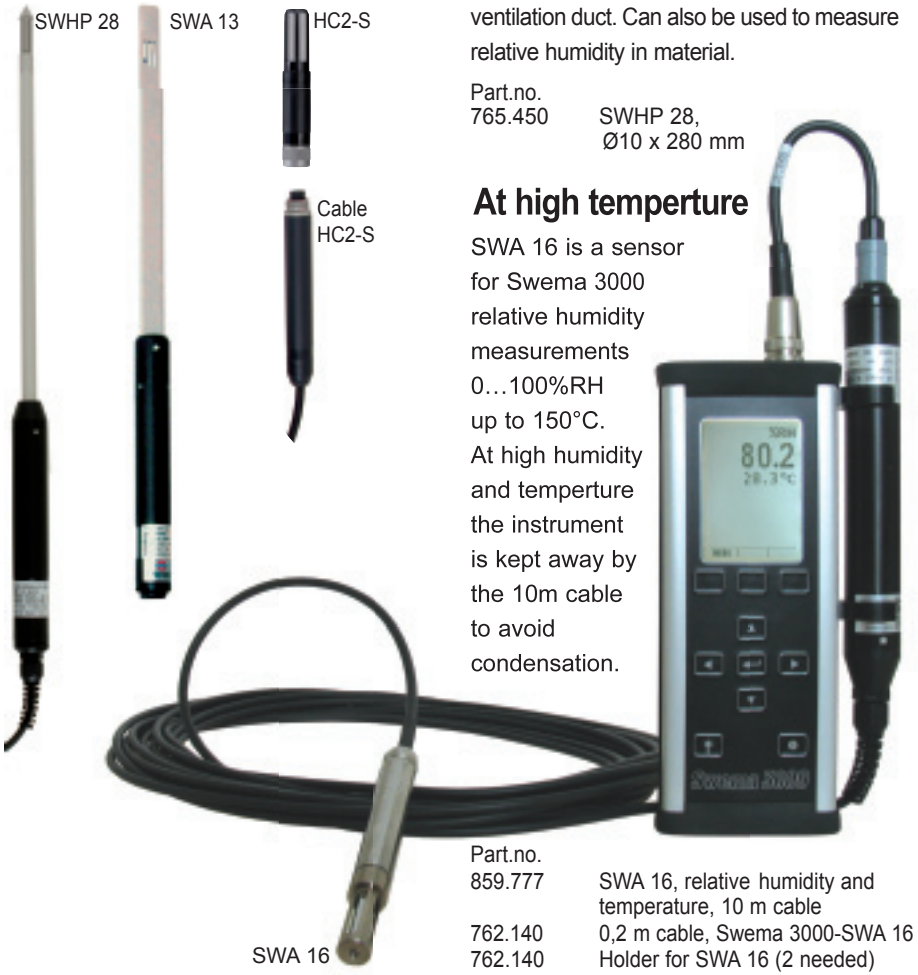
Relative Humidity

Swema 3000 measures relative humidity, temperature. Dew point and water content (g water / kg dry air) are calculated.



In duct and material

In drying or humidifying processes SWHP28 meaures the humidity inside a chamber or ventilation duct. Can also be used to measure relative humidity in material.

Part.no.	
765.450	SWHP 28, Ø10 x 280 mm

At high temperture

SWA 16 is a sensor for Swema 3000 relative humidity measurements 0…100%RH up to 150°C. At high humidity and temperture the instrument is kept away by the 10m cable to avoid condensation.

Part.no.	
859.777	SWA 16, relative humidity and temperature, 10 m cable
762.140	0,2 m cable, Swema 3000-SWA 16
762.140	Holder for SWA 16 (2 needed)

In paper stacks

Paper stack humidity: SWA 13 sword

Part.no.	
859.775	SWA 13 paper sword, 4 x 18 x 280 mm
760.600	Cable to SWA 13

In free air

For free air humidity HC2-S is the best choice.

Part.no.	
859.447	HC2-S Ø15 mm air
859.447	Cable HC2-S to Swema 3000

Technical data:

Relative humidity: 0...100 %RH
HC2-S: ±0,8 %RH at 23 °C
SWHP 28: ±1,5 %RH at 23 °C
SWA 13: ±1,6 %RH at 23 °C
SWA 16: ±1,5 %RH at 23 °C

Temperature:
HC2-S: -40...+60 °C (-50...+100 °C)
SWHP 28: -40...+85 °C
SWA 13: -20...+60 °C
SWA 16: –20…+150 °C
Accuracy: ± 0,3 °C at 23 °C

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Temperature

Two highly accurate temperature instruments. Choose between several different Pt-100 temperature sensors for various application areas.

Swema 3000 is a temperature reference instrument with high accuracy and 0,01 °C resolution. Swema 3000 can also store and log measurements with transfer to PC.

SwemaTemp 20 is a temperature instrument for Pt100 / Ni100 sensor with 0,1 °C resolution.

Tap water temperature with SwemaTemp 20 with T51

Technical data:

Swema 3000 with
SWA 14 / 50 / 51 / 52 / 54 / 55 / 56:
at 0...50 °C: ±0,1 °C
at -50...0 °C: ±0,1°C + 0,2 % read value
at 50...850 °C: ±0,2 % read value

SwemaTemp 20 with
T14/50/51/52/54/55/56:
at 0...50°C: ±0,3 °C
at -50...0°C: ±(0,3 °C + 0,5 % read value)
at 50...850 °C: ±(0,3 °C + 0,3 % read value)

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Part.no.
765.110 SwemaTemp 20
764.230 Case

Temperature Sensors

Mean radiation temperature:
T52 (765.280) / **SWA 52** (765.560)
Foot to black glob (764.410)
Black Globe sensor for measuring mean radiation temperature. Ø150 mm stainless cap.
-20...+50 °C

Air:
T14 (765.250) / **SWA 14** (765.530)
Very fast Pt100 sensor, response time: T_{90} = 15 seconds in 0,5m/s air. Perfect for indoor air temperature measurements.
-50...+60 °C

Liquids and powders:
T54 (765.300) / **SWA 54** (765.580)
Insertion sensor for liquids, powders and air.
Ø3 x 300 mm.
-50...+450 °C

Surface:
T56 (765.500) / **SWA 56** (765.600)
Surface sensor, Ø6 x 150 mm.
Response time: T_{90} = 45 seconds.
-40...+300 °C

Liquid & Air:
T50 (765.260) / **SWA 50** (765.540)
2 m cable sensor, Ø6 mm. Response time: T_{90} = 13 seconds in liquid.
-50...+70 °C

Oven / tap water sensor:
T51 (765.270) / **SWA 51** (765.550)
2 m PTFE cable, L= 110mm, Ø4 mm. Response time: T_{90} = 16 seconds in liquid, T_{90} = 73 seconds in air (1 m/s)
-50...+250 °C

Liquids and powders:
T55 (765.310) / **SWA 55** (765.590)
Insertion sensor for liquids, powders and air.
Ø3 x 150 mm.
-50...+350 °C

Paper cylinder:
SWT 315 (760.660)
Contact temperature sensor for paper cylinders. Telescopic shaft 1... 2m. Response time: T_{90} = 75 seconds.
0...+200 °C, ±2 °C

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SwemaAir 50, 40

SwemaAir 50 and 40 are accurate, professional anemometers for air velocity and temperature. The instruments are dynamically compensated for temperature. The design with protective aluminium casing and rubber ends gives a firm and comfortable grip. SwemaAir 50 and 40 are suitable for a wide range of measurements, such as ventilation balancing and checking, research, monitoring and documenting clean rooms and laminar air flow cabinets. SwemaAir 40/50 display units are m/s, fpm, °C or °F. Time constants are 0.25, 0.5, 2 or 8 seconds. PC-port for on-line measurements.

SwemaAir 50 additional features:

•Barometric pressure - air density compensation due to weather and altitude.

•Display of air flow measurements in l/s, m^3/h or CFM. An area is entered into the instrument. Useful for duct and grill flow measurements.

•Selectable automatic compensation by a duct factor, k_2 for metric units.

•Multiple-point measurements with average, max and min values that can be saved and transferred to a PC.

•Memory for 100 measurements.

•Actual or standard velocity / flow. Actual: fully density compensated. Standard: air at 1013hPa, 20 °C.

•Display light.

Part no.	
762.620	SwemaAir 50, 0,1...12 m/s, calibration certificate
763.000	SwemaAir 40, 0,1...12 m/s, calibration certificate
763.010	Option 12...30 m/s, calibration 20, 30 m/s
763.050	220V adapter
763.040	PC cable
763.020	Adapter, USB to PC cable
763.060	Case

Technical data:

Air velocity 0,1...12 m/s (12...30 option)
At 23 °C:
±0,04 m/s at 0,1…1,33 m/s
±3 % read value at 1,33…30 m/s
Barometer: 600…1200 hPa: ±2,5 hPa

At 10…30 °C (12...30m/s at 23...45 °C):
±0,05 m/s at 0,1…1 m/s
±5% read value at 1…30 m/s

Temperature: –20…+80 °C
At 23 °C: ±0,3 °C, at –20…+80 °C: ±1,0 °C
Output signal: RS232
2x1,5V IEC LR6, AA / rechargeable types

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SwemaMan 80, 60

SwemaMan 80 and 60 are highly accurate, professional micro-manometers for differential pressure, air velocity and with SwemaMan 80 also flow. SwemaMan 80 has a lower range, -100...1500 Pa. Both instruments have a 0,1 Pa resolution up to 999,9 Pa. The measurement value can be continuously sent to a PC. The instruments have selectable time constant: 0.25, 0.5, 2 or 8 seconds. SwemaMan 80/60 are suitable for a wide range of measurements, such as ventilation balancing and checking, research, and other high accurate measurements.

SwemaMan 80 additional features:

•Barometric pressure - air density compensation due to weather and altitude.

•K-factor flow
•Display of air flow in l/s, m^3/h or CFM.
•Display light
•84 note memory
•Transfer to PC
•Multiple-point, average, max, min values
•Actual or standard velocity / flow
•Zero valve zeroing with pressure connected.
•Selectable automatic compensation by a duct factor, k_2.

Part no.	
763.360	SwemaMan 80, -100...1.500 Pa including certificate
763.361	SwemaMan 80H -300...5.000 Pa including certificate
763.362	SwemaMan 80H+ -400...8.000 Pa including certificate
763.350	SwemaMan 60, -300...5.000 Pa including certificate
763.050	220V adapter
756.380	Case for SwemaMan 80, 60
763.040	PC cable to SwemaMan 80, 60
763.020	PC cable converter to USB
763.200	Charger incl. 4 NiMh batteries

Technical data: rv=read value

SwemaMan 80: -100...1500 Pa, 2-50 m/s, 400...9.800 fpm, l/s, m^3/h, CFM
SwemaMan 60:
-300...5000 Pa, 2-91 m/s, 400...17.900 fpm
Differential Pressure at 23 °C:
SwemaMan 80:±0,3 % rv, min.±0,4 Pa
SwemaMan 60:±1 % rv, min ±0,4Pa
Differential Pressure at 0...50°C:
±3,3 % rv, minimum ±0,4 Pa
Barometer (SwemaMan 80) at 23°C:
±2,5 hPa, at 0...50 °C: ±4 hPa
Resolution 0,1Pa
2xAA Alkaline battery life: 75 hours

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Ventilation Balancing

Adjustment with distance transfer via Bluetooth modem. Direct from Swema 3000 to Swema 3000 or via one or several Bluetooth boosters.

SwemaTwin

Ventilation balancing by modems makes the proportional method an easy task for just one person.
SwemaTwin transfers measured values on the reference valve from one Swema 3000 to another through radio or Bluetooth modem.

Air flow balancing

Two Swema 3000 equipped with modems and probes for air flow measurement are used for SwemaTwin air flow balancing. The flexibility of Swema 3000 makes it possible to use for example a differential pressure probe with k-factor on the reference valve and balancing the other valves by a flow hood. The communication between Swema 3000 is made through Bluetooth or radio modems. The proportions between the two Swema 3000 will be shown as a percentage when the measuring units are the same (For air flow: l/s or m3/h). Both Bluetooth and radio modem types are rechargeable.

Modem type

Bluetooth modems are lighter, less expensive and reach approximately 100m in buildings with booster.
Radio modems are more robust and have proven distances of up to 400m in buildings and ships.

Adjustment with distance transfer via radio modem. Flow measuring with differential pressure with a “tube hook” over a valve.

SWEMA
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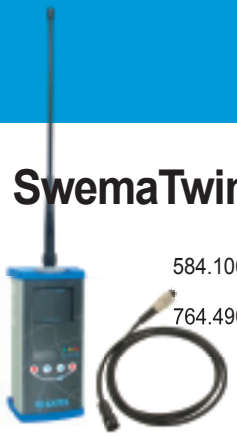
SwemaTwin equipment



584.106 Radio modem with antenna
764.490 Cable

766.320 Holder (2 needed)
766.360 Bluetooth modem
766.380 +5 dBi antenna
766.340 Cable

766.680 Magnet bracket
766.690 Cable
2x 766.360 Bluetooth modem
2x 766.380 +5 dBi antenna

Technical data:

Radio modem:
Sending distance:
Approx. 400 metres in buildings
Operating time: Approx. 16h (4000mAh)
Bluetooth modem:
Sending distance:
Approx. 100 metres in building with booster
Operating time: Approx. 16h (900mAh)

Accessories - airflow measurement

758.210 Measuring hook for pressure (k-factor), Ø 4mm
758.220 Measuring tip for pressure, Ø 4mm

765.070 Pitot static tube 150 mm stainless steel, Ø 2,5mm
756.410 Pitot static tube 280 mm stainless steel, Ø 4 mm
756.530 Pitot static tube 500 mm chromed, Ø 7 mm
756.531 Pitot static tube 750 mm chromed, Ø 7 mm
756.532 Pitot static pipe 1000 mm chromed, Ø 7 mm
756.533 Pitot static tube 1500 mm chromed, Ø 7 mm

762.470 Silicon hose Ø 4...7 mm, per metre

763.680 Squeezable differential pressure hose, patent 9800447-6, for measuring over for example windows

570.130 Powder smoke, 10 bottles

570.132 Smoke pen, including 6 smoke rods

759.670 Plug Ø 8 mm (1 piece)
758.540 Plug Ø 9 mm (1 piece)
758.810 Plug Ø 10 mm (1 piece)
758.550 Plug Ø 12 mm (1 piece)

758.560 Step drill for ducts 4-12 mm

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SwemaRef

SwemaRef has high accuracy and enables the accuracy of air velocity sensors to checked. By regular calibration and checking instruments are fit for measurement. Another advantage is to establish when instruments require adjustment. At delivery SwemaRef is calibrated for specific probe types. For instance SwemaAir 40, 50, SWA 31 and SWA 31E has the same probe and therefore the same calibration factors, C.

SwemaRef should be ordered with a highly accurate pressure sensor: Swema 3000md, SWA 10 for Swema 3000 or a SwemaMan 80. Required range: 5...110 Pa with a resolution of 0,1 Pa.

SwemaRef and the pressure sensor are calibrated with and for the type of air velocity probe that is going to be adjusted or calibrated on site. The data stated below is for a SwemaRef that has been calibrated at 23°C. The data is typical for the repeatability of a SWA 31 air velocity probe and a SwemaMan 80 differential pressure instrument.

0,6... 1 m/s: ±0,04 m/s
1... 3 m/s: ±0,05 m/s
3... 12 m/s: ±3% read value

Measuring principal:
3 different air velocity intervals. Pressure drop over 2 orifice plates: 0,6... 1 m/s and 1... 3 m/s. Nozzle: 3... 12 m/s. Please see the image to the right.
The correlation between air velocity and a measured pressure drop across an orifice plate or nozzle:

$v = C1 * \sqrt{(\Delta P)}$ cm/s
$v = C2 * \sqrt{(\Delta P)}$ cm/s
$v = C3 * \sqrt{(\Delta P)}$ cm/s
C = calibration factor

Orifice plate 26 mm
Orifice plate 35 mm
Nozzle

Measuring across the nozzle for air velocities between 3,0... 12 m/s

Measuring with an orifice plate. There are 2 orifice plates used for either 0,6... 1 or 1... 3 m/s.

SwemaRef air velocity reference bench including orifice plates ((763.980)

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Leakage Tester

Test the leakage flow in a building or in a duct with a leakage tester that connects to a Swema 3000md. Swema 3000md controls the leakage tester fan and saves measuring protocols automatically. The fan generates exactly the selected pressure regardless of the leakage flow.

The equipment needed is a leakage tester, a pressure sensor (SWA 10) and Swema 3000md (inbuilt pressure sensor).

Swema 3000md measures the pressure in the room, building or duct and the SWA 10 measures the leakage flow.

Building leakage tester

According to the standard EN13829 for tightness testing of buildings/ rooms the tightness should be tested at different pressures. Swema 3000md will do this test automatically and will regulate the fan from for example 50 Pa down to 0 Pa in steps and save the values.

765.910 Leakage tester for building, incl. Ø 190mm flange

766.210 Flange Ø 30mm (2-10 l/s)

766.200 Flange Ø 110mm (10-30 l/s)

765.080 Bladder for max Ø 250mm
765.090 Bladder for max Ø 400mm
765.100 Bladder for max Ø 600mm

Duct leakage tester

With Swema 3000md the pressure may be selected for the duct. When this pressure is achieved Swema 3000md will save a measurement protocol.

Leakage tester for duct (765.900)

Technical data:

Measurement uncertainty: ±5 % read value, 220 V AC supply

Building leakage tester
with included Ø 190mm flange (765.910):
Max flow at under pressure (with straight 3 m hose):
295 l/s at -100 Pa, 303 l/s at -90 Pa, 308 l/s at -80 Pa, 316 l/s at -70 Pa, 320 l/s at -60 Pa, 328 l/s at -50 Pa, 334 l/s at -40 Pa, 340 l/s at -30 Pa, 343 l/s at -25 Pa
Min flow with supplied flange: 30 l/s (lower flow with other flange)
Max pressure: 100 Pa
Size including flange: L=75 cm, W=35 cm, H=36 cm
Weight: 15kg

Duct leakage tester:
with hose Ø100mm, measuring tube (766430 included):
Max Flow at under pressure:
128 l/s at -500 Pa, 120 l/s at -750Pa,
Max Flow at over pressure
16 l/s at 1900 Pa, 50 l/s at 1500 Pa, 73 l/s at 1200 Pa, 85 l/s at 1000 Pa, 110 l/s at 500 Pa, 114 l/s at 400 Pa, 122 l/s at 200 Pa
Weight: 18kg, Power: 0,37 kW

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Instrument	Sensors to Swema 3000 instruments	Air Flow	Air Velocity	Differential pressure	Thermo-couple input	Barometer	Tempera-ture	Humidity	Page
Swema 3000mdH+		CALC	2...130 m/s*	±10.000 Pa	X	X	EXT	EXT	2
Swema 3000md		CALC	2...50 m/s*	-300...1.500 Pa	X	X	EXT	EXT	2
Swema 3000d		EXT	EXT	EXT	X	X	EXT	EXT	2
Swema 3000		EXT	EXT	EXT	-	-	EXT	EXT	2
	SWA 03	-	0,05...3 m/s	-	-	-	10...40 °C	-	4
	SWA 31	CALC	0.,1...30 m/s	-	-	-	-20...80 °C	-	6
	SWA 10	CALC	2...50 m/s*	-300...1.500 Pa	-	-	-	-	7
	SWA 07	CALC	2...100 m/s*	±7.000 Pa	-	-	-	-	7
	HC2-S	-	-	-	-	-	-40...60 °C	0...100 %RH	11
	SWHP 28	-	-	-	-	-	-40...85 °C	0...100 %RH	11
	SWA 16	-	-	-	-	-	-20...150 °C	0...100 %RH	11
	SWA 13	-	-	-	-	-	-20...60 °C	0...100 %RH	11
	SwemaFlow 65	2...65 l/s	-	-	-	-	-10...50 °C	-	9
	SwemaFlow 125	2...125 l/s	-	-	-	-	-10...50 °C	-	9
	Temperature sensors	-	-	-	-	-	-50...450 °C	-	13
SwemaFlow 4000		5...1.200 l/s	-	-	-	-	-10...50 °C	-	8
SwemaFlow 233		2...65 l/s	-	-	-	-	-	-	10
SwemaMan 80		CALC	2...50 m/s*	-300...1500 Pa	-	X	-	-	15
SwemaMan 60		-	2...90 m/s*	±5000 Pa	-	-	-	-	15
SwemaAir 50		CALC	0...30 m/s	-	-	X	-20...80 °C	-	14
SwemaAir 40		-	0...30 m/s	-	-	-	-20...80 °C	-	14
SwemaTemp 20		-	-	-	-	-	EXT	-	12

CALC = Calculated from air velocity or differential pressure
EXT = With external sensor
* = A pitot static tube is needed to measure air velocity

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