C400

Status V4 (1/2005)

CE

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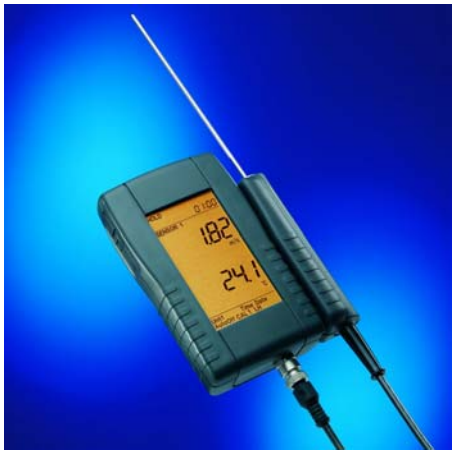
1 Read before commissioning

- Read the operating instructions carefully prior to using the instrument and follow them in every detail.
- Never carry out measurements on live parts.
- Observe the measurement ranges of the sensors (overheating can lead to destruction).
- Observe storage and transport conditions (protect the instrument from direct sunlight).
- Refer to the data sheet for technical data, storage and transport conditions.
- Air flow and temperature calibration must only be carried out using a suitable reference.

Designated use:

- The measuring instrument must only be operated within the range of the specified technical data.
- The measuring instrument must only be applied under the conditions and for the purposes for which it was designed.
- Operational safety ceases to be guaranteed if the instrument is modified or rebuilt.



C400

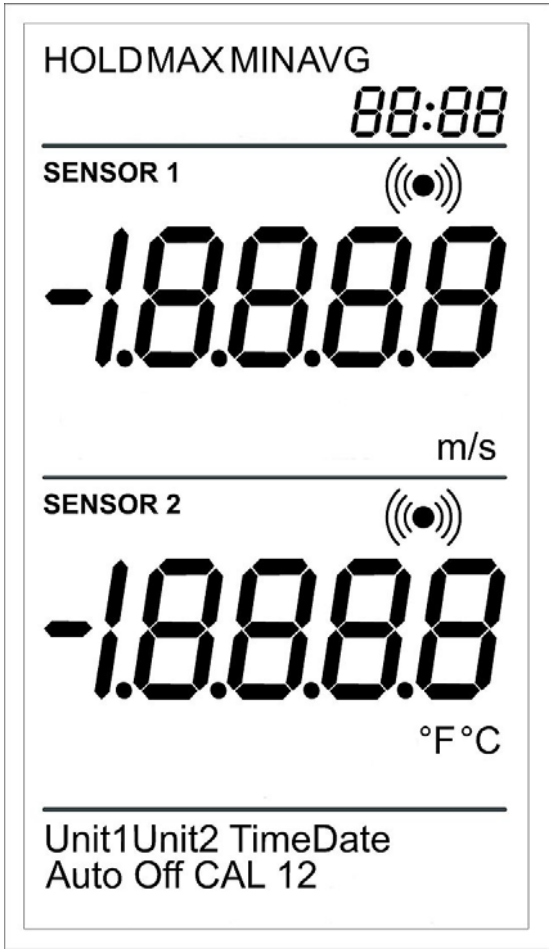
2 C400

The new C-series **C**ompact hand-held measuring instrument for the measurement of airflow and air temperature is characterised by:

- Large backlit display
- Easy operation using a thumb-wheel
- Robust and attractive housing
- High accuracy
- Low price

A sensor with a measuring range of either 0 to 2 m/s or 0 to 20 m/s can be connected to the C400 instrument.

3 The display



◄ Upper menu with date and time

◄ Sensor 1 display (airflow)

◄Sensor 1 units (m/s, fpm)

◄ Sensor 2 display (air temperature)

◄ Sensor 2 units (°F,°C)

◄ Lower configuration and calibration menu

4 Operation

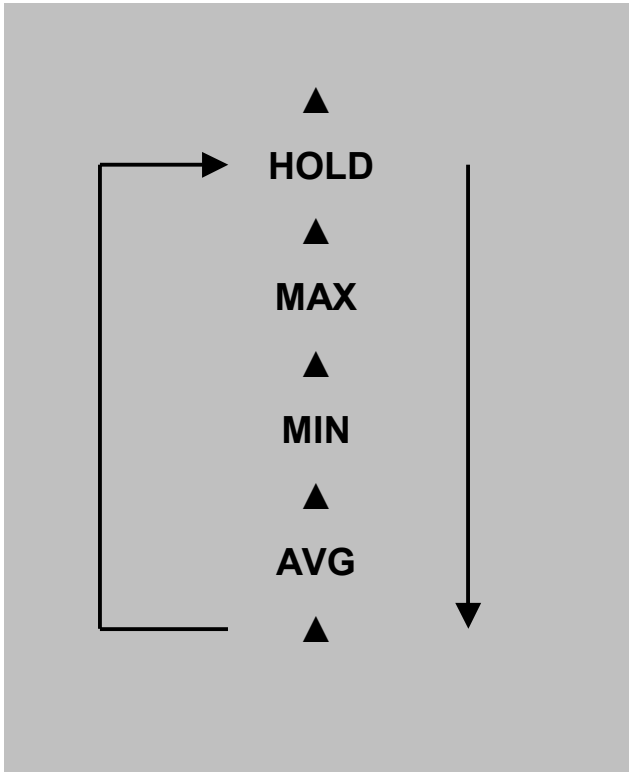
THUMB-WHEEL

In contrast to conventional hand-held measuring instruments, the C400 instrument does not have a keypad but a so-called "***THUMB-WHEEL***" on the left-hand side of the unit.
The wheel rotates 15° upwards and downwards and can also be pressed in the centre position.
The upper menu is selected by rotating the wheel upwards. The lower configuration and calibration menu is selected by rotating the wheel downwards.
The thumb-wheel must be pressed in the centre position to switch the instrument on and off and to confirm input values.

The 3 positions of the **THUMB-WHEEL**

Symbol in text opposite ▶		Switch on: press briefly Switch on with light: press and hold for approx. 2 seconds Switch off: press and hold for approx. 2 seconds (no menu activated).
Symbol in text opposite ▲		Activate upper menu with **HOLD MAX MIN AVG** Select with ▲, confirm with ▶, cancel with ▼ or do not press for 20 seconds.
Symbol in text opposite ▼		Activate lower configuration and calibration menu Select with ▼, confirm with ▶, cancel with ▲ or do not press for 20 seconds.

5 The upper menu



The following standard functions are selected in the upper menu:

HOLD MAX MIN AVG

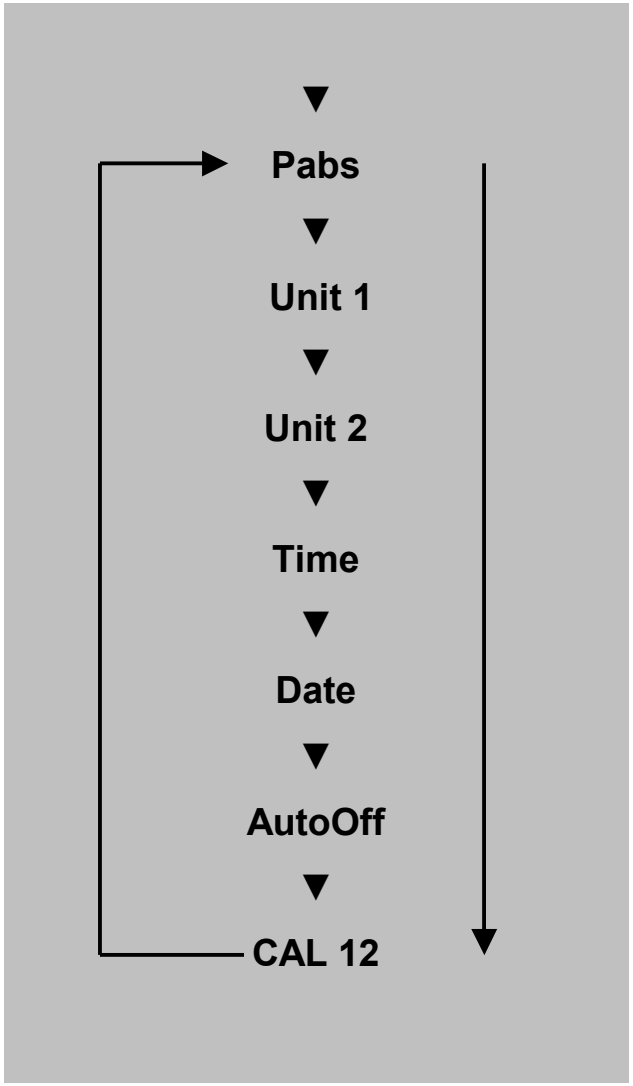
Select using ▲, the selected function flashes and is confirmed by ►. A confirmed function is indicated statically in the display. The menu can be cancelled by ▼ or by not pressing for 20 seconds.

Hold: Hold “freezes” the measurement value.

MAX: MAX shows the maximum value in the active time period.

MIN: MIN shows the minimum value in the active time period.

AVG: AVG shows the arithmetical average value in the active time period.



6 The lower menu

The following functions can be selected in the lower configuration and calibration menu:

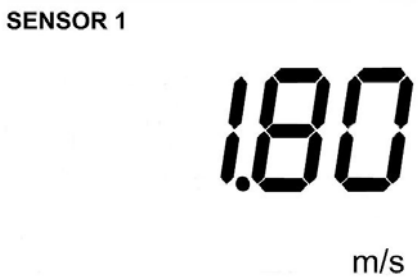
Pabs Unit1 Unit2 Time Date AutoOff CAL 12

Select using ▼, the selected function flashes and is confirmed by ►. A confirmed function is indicated statically in the display. The menu can be cancelled by ▲ or by not pressing for 20 seconds.

Pabs: Measurement of air velocity using a Hot Film Anemometer is dependent on the prevailing air pressure. With Pabs the current air pressure (referenced to sea level) is input and in this way the influence is compensated.

Input is in hPa. Precise determination of the air pressure is can be obtained by using our C300 hand-held measuring instrument. If the current air pressure is not known then the average air pressure referenced to sea level should be input in order to minimise the influence of air pressure (see Table in Chapter “Influence of air pressure”.

The C400 is supplied with a factory setting of 1013hPa.

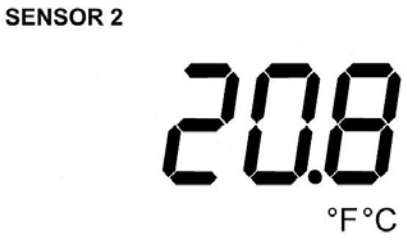


Unit1: The unit of airflow is selected with Unit1.

The options available are m/s and fpm. The fpm unit is indicated in the “left cursor menu”.

Selection can be made using

▲ and ▼; confirm with ►.



Unit2: The unit of air temperature is selected with Unit2.
The options available are °C und °F.
Selection can be made using
▲ and ▼; confirm with ►.

Time: The time is set with Time. Hours and minutes are input sequentially.
Selection can be made using ▲ and ▼; confirm with ►.

Date: The date is set with Date. Day, month and year are input sequentially.
Selection can be made using ▲ and ▼; confirm with ►.

AutoOff: The time period in minutes for automatic switch off is set with AutoOff. If OFF (<1) is set then the instrument never switches off automatically.

Selection can be made using ▲ and ▼; confirm with ►.

Airflow calibration

CAL1: Sensor 1 (airflow) is calibrated with CAL1 (pitch calibration). The calibration value should be more than 50% of the full scale of the sensor. The measured values can be modified by entering a factor which is adjustable from 0.800 to 1.200 in steps of 0.001. The factor is shown in the lower part of the display. **The factory settings are obtained by setting the factor to 1.000.**

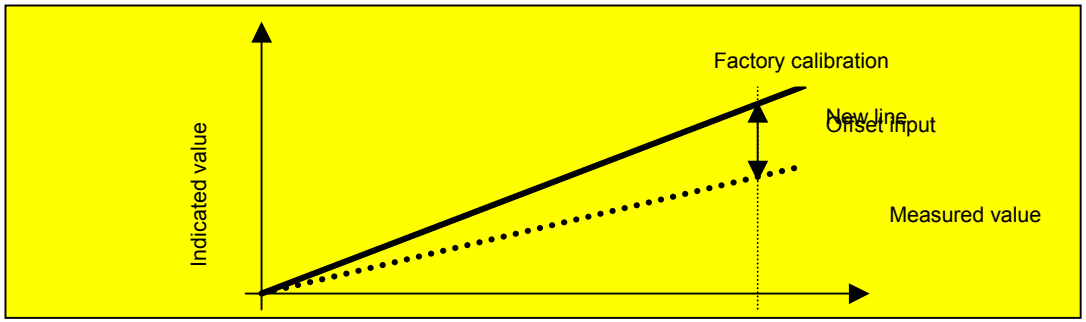


Illustration: Changing the pitch of an airflow sensor

Select the direction of flow onto the instrument from the straight handle side when calibrating.

CAL2: The offset for Sensor 2 (air temperature) is set with CAL2 (single point calibration). The offset is indicated in the upper part of the display. The maximum settings are +/- 10°C or +/- 10°F. **The factory settings are obtained by setting the value to 0.0.**

Important: Calibration should only be carried out by trained personnel using suitable calibration equipment.

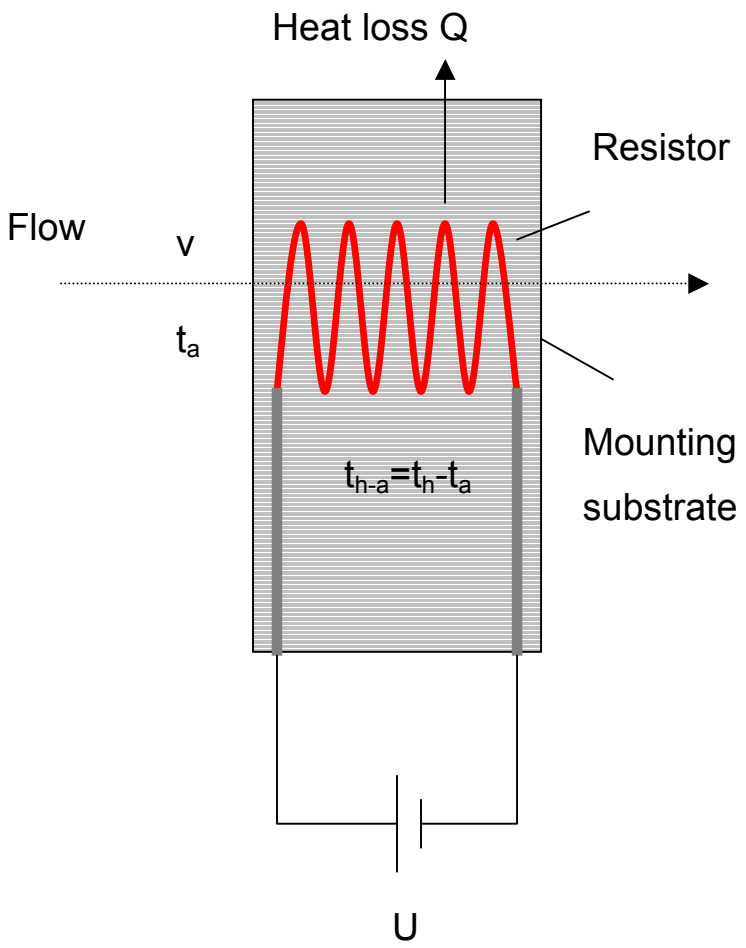
Open C400 battery compartment

7 Changing the batteries

The batteries should be changed when the indication “BAT” appears in the display. Open the battery cover on the rear of the instrument. Remove the empty batteries and replace them with new ones.

Please use only type IEC LR6 AA batteries. Do not use rechargeable batteries!

When inserting the batteries ensure that the polarity is correct. Only use high-quality batteries.



8 Airflow Sensor

8.1 Measurement principle

With the Hot Film Anemometer (HFA) an electrical resistor is heated to a defined temperature. Airflow cools the resistor down until the heat supplied and the heat lost are in balance. The higher is the speed of the airflow, the higher the heat loss. A bridge circuit compensates the influence of environmental temperature.

With the Constant Temperature Anemometer (CTA) the electrical resistor is supplied with power in such a way that the temperature of the resistor is constant. The power necessary to achieve this is thereby a measure for the air velocity. High sensitivities can be achieved using this method.

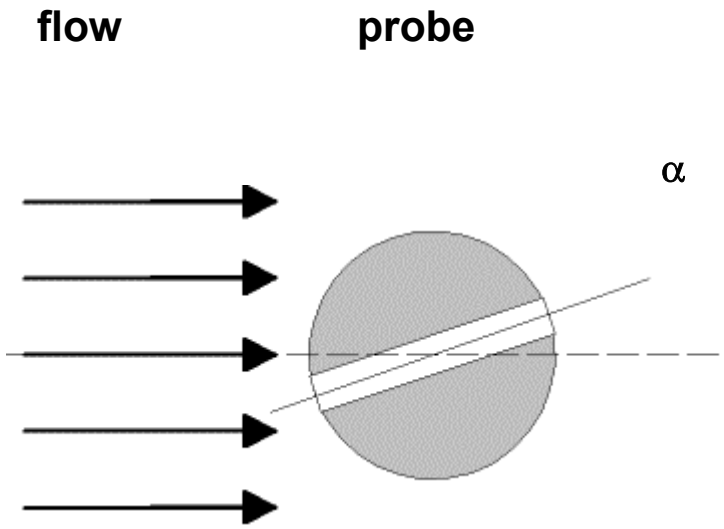
h/[m]	p[hPa=mbar]	Correction factor
0	1013,25	1,000
50	1006,94	1,006
100	1000,67	1,013
200	988,25	1,025
300	975,98	1,038
500	951,9	1,064
800	916,88	1,105
1000	894,26	1,133
1500	840,11	1,206
2000	789,24	1,284
3000	696,56	1,455
4000	614,76	1,648
5000	542,57	1,868
10000	290,53	3,488

Table: Correction factor as a function of location altitude

8.2 Influence of air pressure

Measurement of air velocity with a thermal anemometer is dependent on the prevailing air pressure, “p”.
The sensors are calibrated in the factory to standard pressure po=1013.25 mbar. For a velocity measurement at sea level h the measurement value must be corrected using the **barometric altitude formula**.
In practice it is only necessary to multiply the velocity measured by the sensor vT by a correction factor for the corresponding altitude h (see Table). The correction factor is a quotient of average air pressure (1013.25 hPa) and actual air pressure, referenced to sea level.
On the C400 instrument the actual air pressure is entered in the lower menu and in this way the airflow is compensated.

8.3 Influence of direction



The correct design of the shape of the sensor head decisively influences the accuracy of the flow measurement. This is particularly true for correct measurement when the sensor is rotated on or along its longitudinal axis, away from the prescribed direction of flow onto the sensor.

The C400 sensors have excellent characteristics in this respect and demonstrate relatively small angle dependence.

The measurement error in the range from +/- 15° is less than 3% of the measurement value.

8.4 Tips for correct sensor location

- Turbulence generally occurs after pipe bends, branches, dampers and fans and at cross-sections. This turbulence only settles down after a lengthy distance. Only conduct measurements in areas of low turbulence.
- Always carry out measurement in the centre of the duct.
- The optimum placement for the sensor is after filters and rectifiers (no turbulence).
- Place sensors before diffusers and pipe contractions.
- Select the direction of flow onto the instrument from the straight handle side when calibrating.

9 Calibration and Maintenance

To maintain the highest level of measurement accuracy we recommend that the C400 instrument be returned annually for calibration.

Do not touch the sensor!

The probe tip must be checked regularly for cleanliness. Dust and oil on the sensor reduce the accuracy of the C400.

The C400 must be switched off for cleaning. Compressed air or strong solvents must not be used to clean the sensor tip, as they may damage the sensor.

To remove dust, either blow lightly on the sensor tip or wash under lightly running water. To remove a combination of dust and oil, rinse the sensor tip in isopropanol and then lightly blow off.