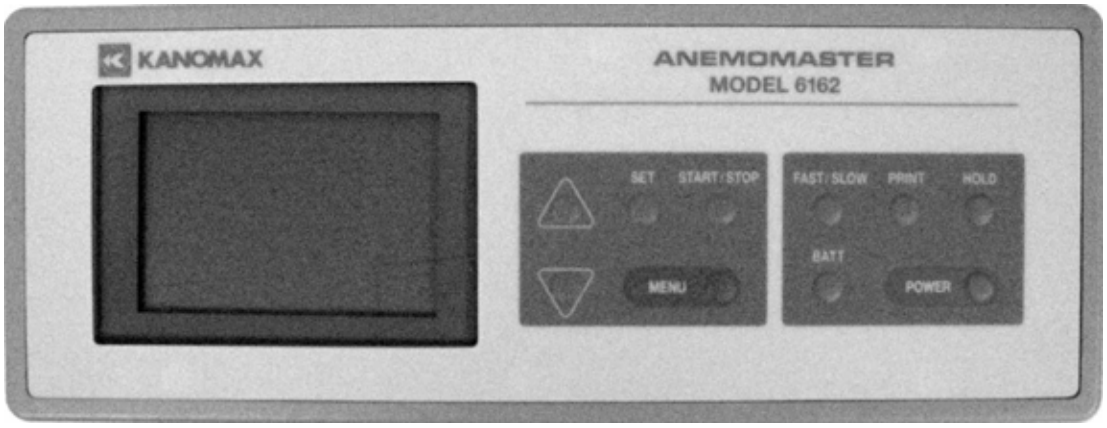
KANOMAX

Anemomaster

MODEL 6162

Operation Manual



Read this operation manual carefully and understand the warnings described in this manual before operating the product.

Keep this manual handy for future reference.

03001

1109

Important Safety Information

Types and definitions of warnings signs used in this operation manual are described as below.

[Classifications]

WARNING: To Prevent Serious Injury or Death
Indicates a potentially hazardous situation which, if not avoided, may result in serious injury or death.

CAUTION: To Prevent Damage to the Product
Indicates a potentially hazardous situation which, if not avoided, may result in damage to the product that may void the product warranty.

[Description of Symbols]

△ indicates the condition (including danger) that requires caution. The subject of each caution is illustrated inside the triangle (e.g., the symbol shown on the left is high temperature caution).

⊘ indicates prohibition. Do not take the prohibited action shown inside or near this symbol (e.g., the symbol on the left prohibits disassembly).

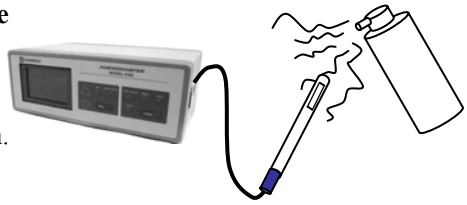
● indicates a mandatory action. A specific action is given near the symbol.

⚠ WARNING

Do not use near flammable gas.

- **Never bring the probe close to a flammable gas atmosphere.**

>>> The heated sensor may cause fire or explosion.



Do not modify / disassemble.

- **Never disassemble, modify or repair the product.**

>>> Failure to observe the above may cause short circuit and/or other failure that will affect the performance.

Handle properly

- **Carefully follow the instructions provided in this Manual.**

>>>> Failure to observe the instructions may lead to electrical shock, fire or damage to the instrument.

- **If abnormal noise, smell or smoke is observed, or if liquid has entered the instrument, turn off the instrument immediately, and remove the batteries or pull out the plug.**

>>> There is a possibility of malfunction, electric shock, and fire.

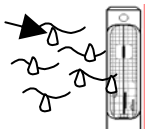
Please contact your local distributor or our service center for repair.

⚠ WARNING

Prohibition

- **Do not use the instrument in a water vapor atmosphere.**

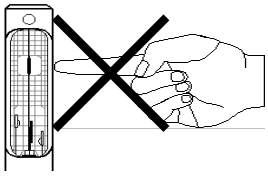
>>> Failure to observe above may cause electrical shock, fire, or damage to the sensor.



High Temperature Warning

- **Never touch the sensor.**

>>> The sensor is heated during operation.
Touching the heated sensor may cause burns, and may also damage the sensor itself.



⚠ CAUTION

- **Always unplug the instrument from the electrical outlet when the instrument is not in use.**

>>> Failure to do so may cause electrical shock, fire or circuit damage.

Handle carefully

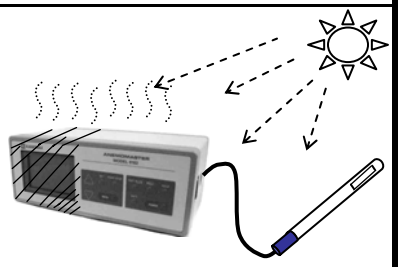
- **Remove the batteries from the battery compartment when storing the instrument.**
- **DO not leave exhausted batteries in the battery compartment.**

>>> Failure to do so may cause battery leakage.

Prohibited Installation

- **Do not use or leave the instrument in a high temperature / humidity environment, or in a dusty environment.**
- **Do not leave the instrument under direct sunlight for a prolonged period.**

>>> The instrument may not function properly out of the specified operating conditions.



Prohibition

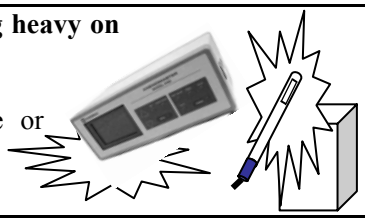
- **Do not wipe the instrument with a volatile solvent.**

>>> The body may deform or deteriorate. Use soft dry cloth to remove stains. If stains persist, soak the cloth in a neutral detergent and wipe the instrument with the soft cloth. Never use volatile solvents such as thinner or benzine.

Prohibition

- **Do not apply strong shock or place / drop anything heavy on the instrument.**

>>> Failure to observe the above may cause damage or malfunction to the instrument.



- **Do not touch the sensor when the sensor is charged.**

>>> Failure to observe the above may affect the measurement value or cause the circuit failure.

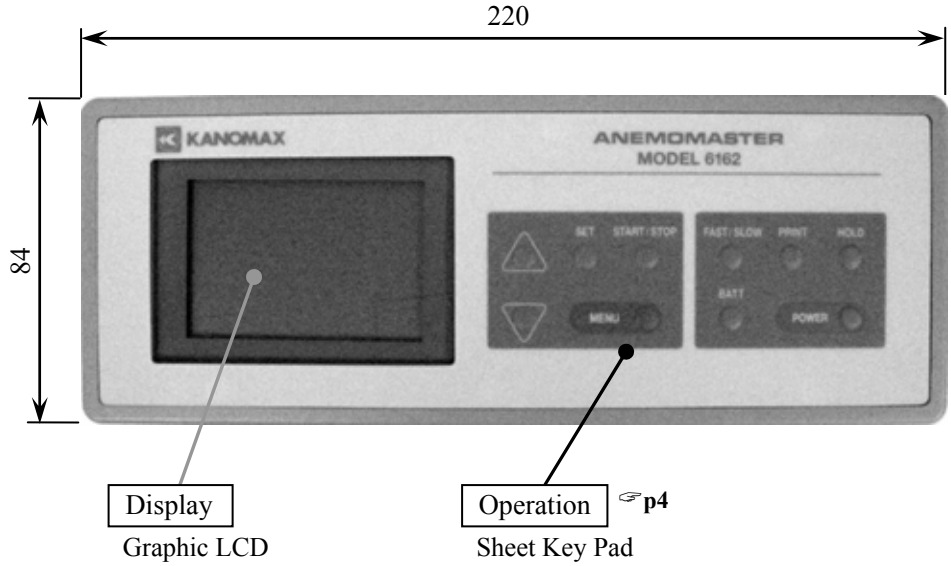
Table of Contents

1. Getting Started

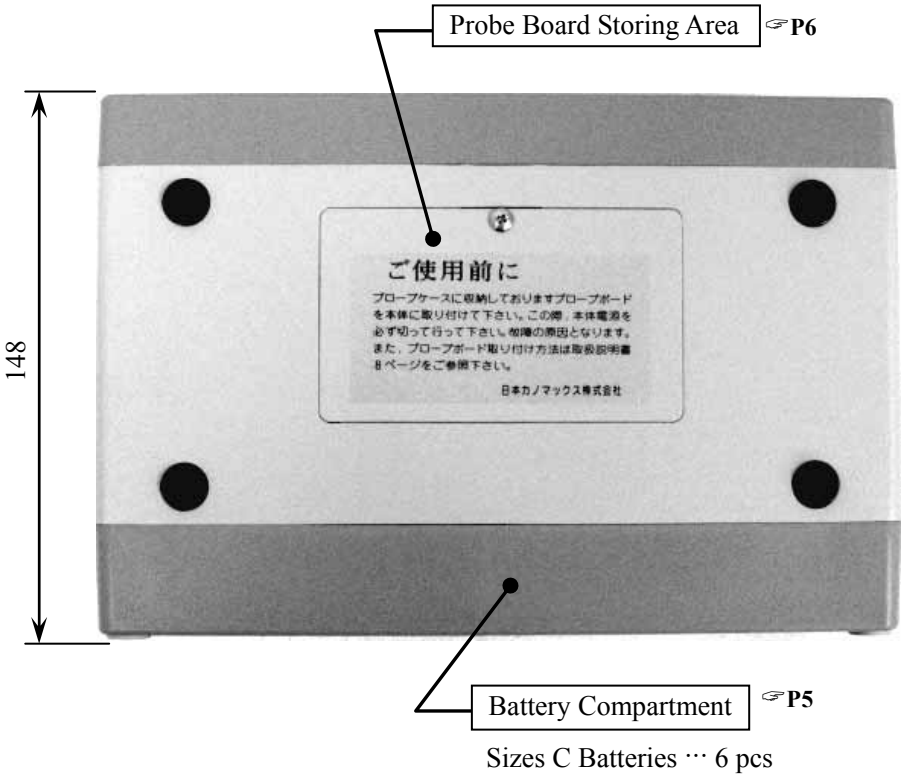
1.1 Part Names and Functions (1) ····· Main Unit

Unit: mm

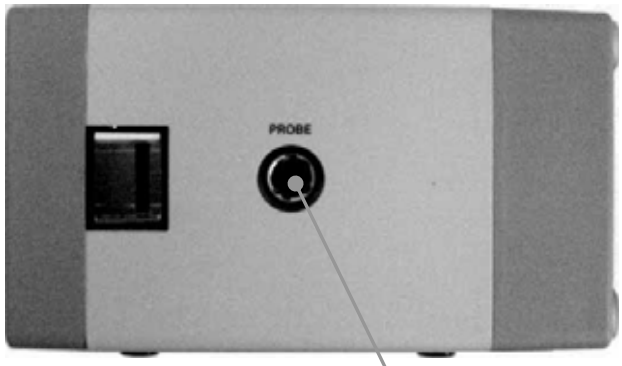
[Front]



[Bottom]



[Right Side]



Probe Connection ☞P6

[Left Side]

Backlight Switch

Turn this ON to make the LCD screen be backlit so that you can see the screen clearer even in a dark place.

* Turn the backlight on only at the time of need in order to prevent battery drain.

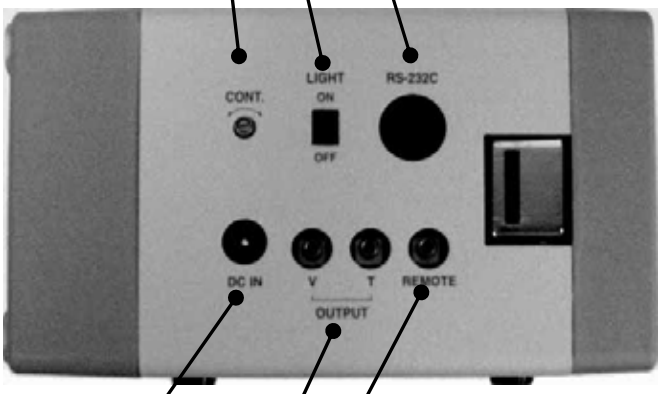
Digital Output Terminal

RS-232C (serial output)

To output raw data or memory data to a computer or printer ☞P13, 32

Brightness Adjustment Volume

Turn the volume to the right and left to change the brightness of the display. Adjust the volume to make the displayed letters easily viewable.



AC Adapter Jack

Use the provided adapter. When the AC adapter is connected, it will have a priority.

⊖ —ⓒ— ⊕ ☞P5

Remote Terminal

Use this to use the remote control function

It responds to START/STOP key and HOLD key in the operation area. This can be used to start/stop a measurement or hold the screen.

Analog Output

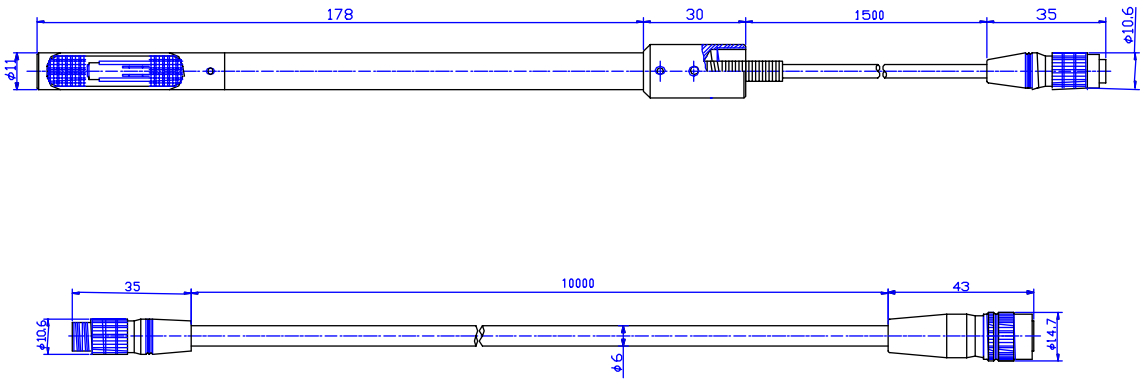
Air velocity and temperature are output simultaneously.☞P30

Output Voltage: DC0 ~ 1V

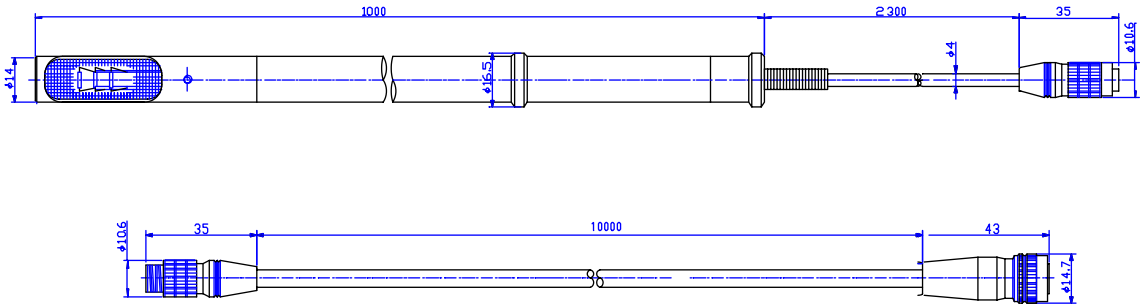
The output range can be changed from the menu.

1.2 Part Names and Functions (2) ····· Probe

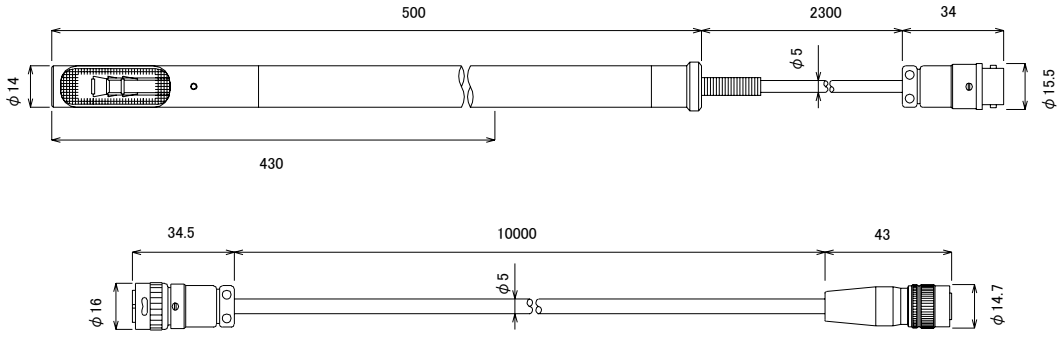
[Probe for Medium Temperature] --- MODEL 0203



[Probe for High Temperature] --- MODEL 0204



[Probe for High Temperature] --- MODEL 0205



1.3 Sheet Key Description

POWER — Turn ON/OFF the power.

HOLD — Hold the reading and release to hold the reading.

PRINT — After holding the display screen, press PRINT key to output the hardcopy of the displayed screen via external printer.

FAST/SLOW — The instrument can be switched into FAST, SLOW1 or SLOW 2.

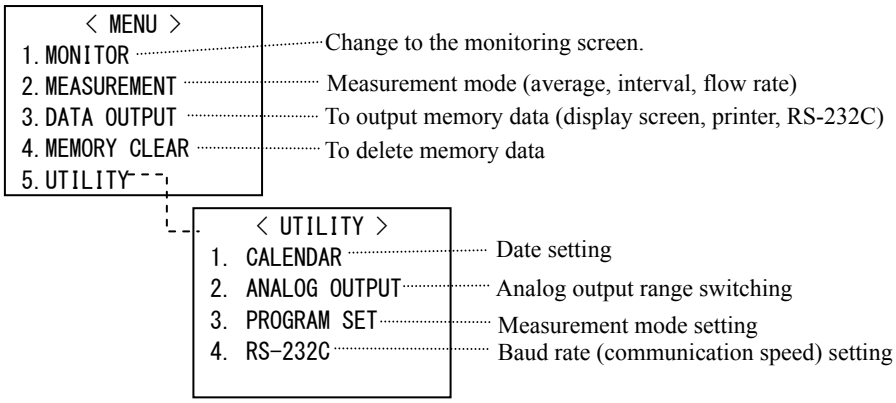
FAST:	To display the instantaneous value every 1 sec
SLOW1:	To display moving average deviations for 5 seconds
SLOW2:	To display moving average deviations for 10 seconds

* This feature cannot be used in the calculation measurement function.

BATT — To display the remaining battery level

This function is available only when batteries are used.

MENU — Select each function. There are following functions in this menu.



START/STOP — Start/Stop a measurement

△, ▽ — Initial Screen: ▽ key: Press it to display variation graph for air velocity and press it again to switch the range.
(There are 6 ranges; 50, 25, 10, 5, 2, 1 m/s.)
△ key: Use this key to go back to the original screen.

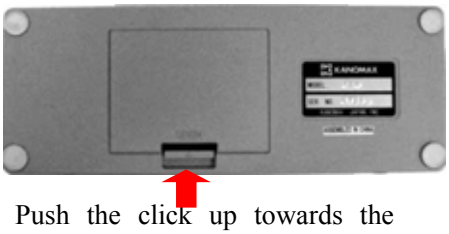
Menu Screen: Use △, ▽ keys to select the function and item as well as to set numeric value.

SET — Use this key to execute the selected item.

1.4 Power Source

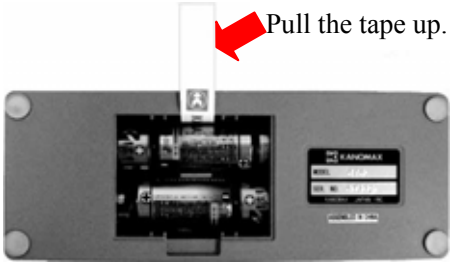
1.4.1 Battery Replacement

1. How to Open the Battery Cover

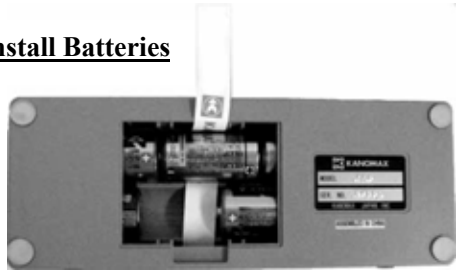


Push the click up towards the arrow direction to remove the lid.

2. How to Remove the Batteries



3. How to Install Batteries



* Insert the middle batteries at last after placing the batteries at the both sides.
Make sure to place the tape under the battery as shown in the above picture.

<<CAUTION>>

Make sure the polarity is right.

Install the batteries by observing the polarity. If not, it may cause malfunction due to short-circuit or heatup.

Install the batteries properly following the directions indicated on the bottom of the battery compartment.

1.4.2 AC Adapter

When the AC adapter is connected, it has a priority. It does not cause any problems even if the batteries are still installed. However, if you do not use the instrument for a prolonged time, remove the batteries. Otherwise, it may cause the contact failure due to the battery corrosion.

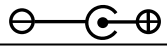
<<CAUTION>>

Use our designated AC adapter.

Other AC adapters on the market place may have different polarity.

=> It may cause short circuit or fire.

AC Adapter

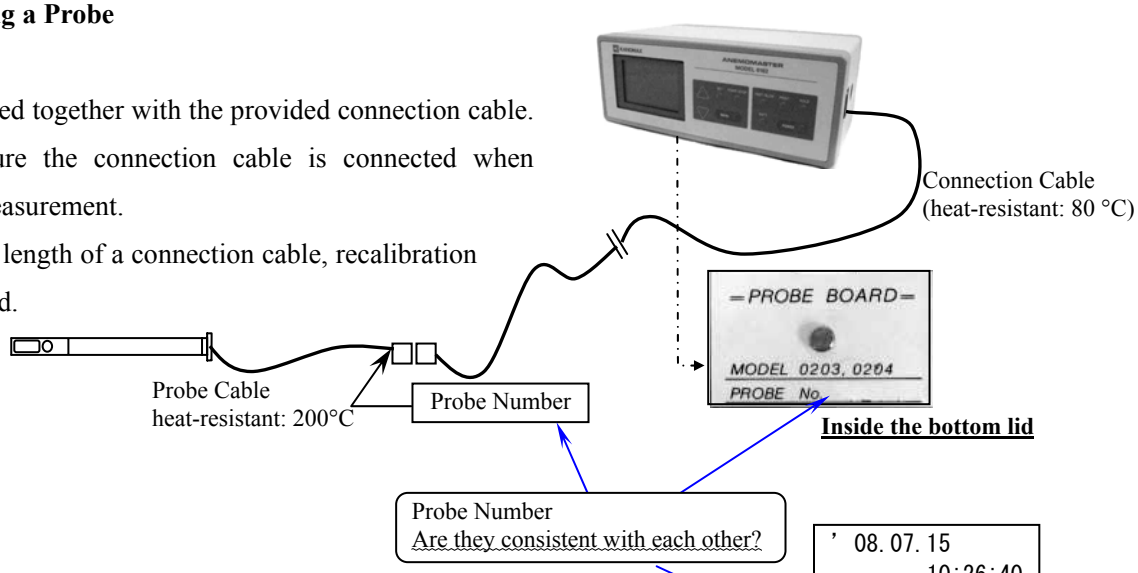
MODEL 6113-02
INPUT: 100-240VAC 50-60Hz
OUTPUT: 9VDC 2A
Connector 

1.5 Getting Ready for Measurement

1.5.1 Connecting a Probe

Probe is calibrated together with the provided connection cable. Please make sure the connection cable is connected when performing a measurement.

* To change the length of a connection cable, recalibration will be required.



1.5.2 Checking the Probe Number

Confirm that the number indicated on the one end of the probe cable (Teflon cable) is consistent with the one indicated on the screen of the instrument.

*** This screen will be displayed when the instrument is turned ON without the probe connected to the instrument.**

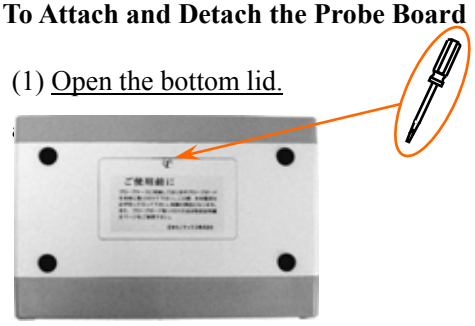
<<CAUTION>>

The probe number needs to be checked when multiple probes are purchased or the same probe is to be used with multiple Anemomasters or a spare probe is used.

>>> Calibration data of the probe is written on characteristic ROM installed on the bottom of the instrument. Please check the probe number because each probe has different characteristic.

1.5.3 To Attach and Detach the Probe Board

(1) Open the bottom lid.



(2) Loosen up the screw.

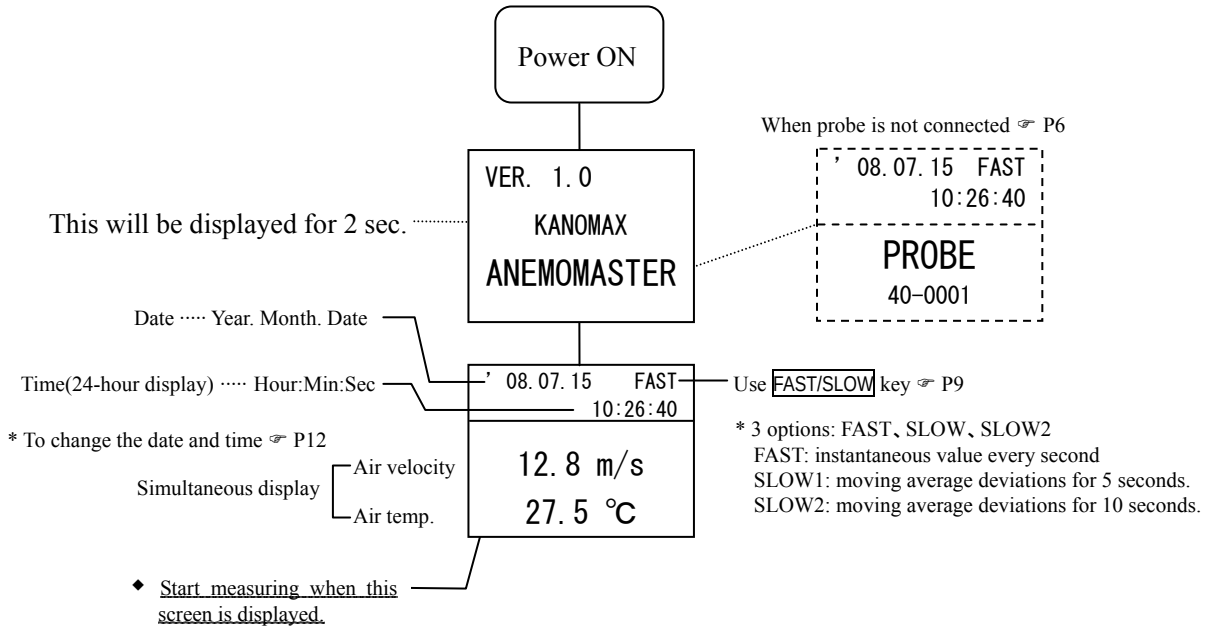
>>> The screw will not come out.

(3) Pull it up vertically.

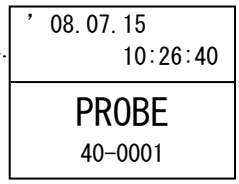
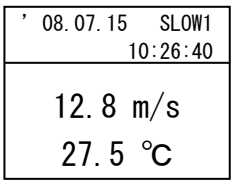
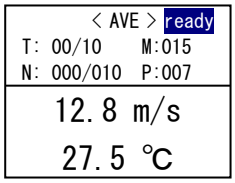
As the board is connected to the connector, do not twist it or pull only one side.

>>> It may cause the connection failure.

1.5.4 Display Screen – Monitor Screen

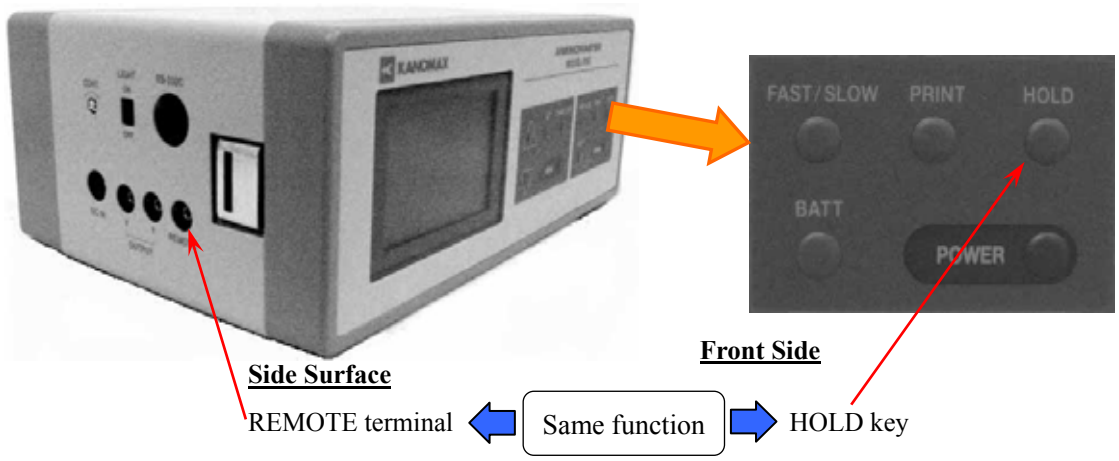


When the display does not change to the monitoring screen

Symptom	Solution
PROBE display remains. 	Probe is not connected. ⇨ Turn the power OFF. Then after connecting the probe, turn the power ON again.
The responsiveness of reading is bad. 	Isn't SLOW1 or SLOW2 (displaying moving average deviations) displayed on the upper right corner of the screen? ⇨ Press FAST/SLOW key to switch to FAST.
Date and time are not displayed. 	Calculation program is set. ⇨ Press MENU key to select 1.MONITOR.

2. Basic Operation

2.1 How to Hold Reading



Display	key	Procedure
' 08.07.01 FAST 10:26:40 5.38 m/s 25.7 ° C	HOLD	Press HOLD key.
' 08.07.01 FAST hold 10:26:40 5.38 m/s 25.7 ° C		★ hold will be displayed on the upper left of the screen indicating that the reading is on hold.
' 08.07.01 FAST 10:26:40 5.38 m/s 25.7 ° C	HOLD	Press HOLD key again to release the hold function.

When the reading is hold.

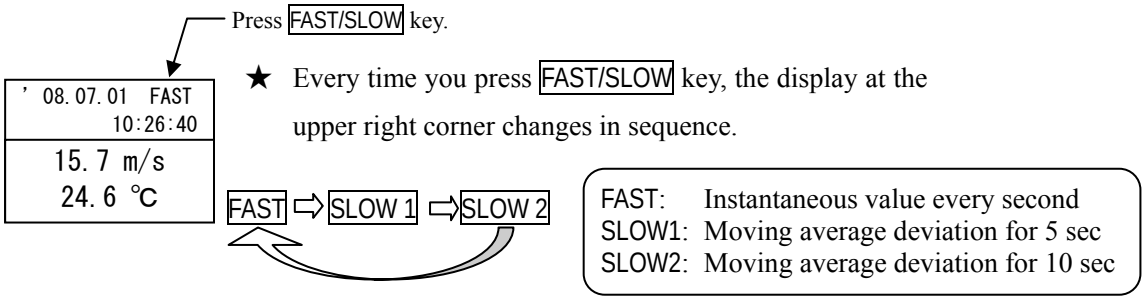
' 08.07.01 FAST
hold 10:26:40
5.38 m/s
25.7 ° C

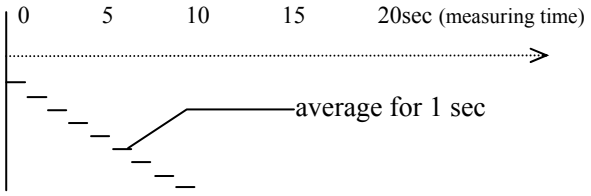
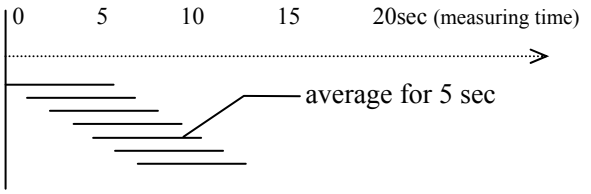
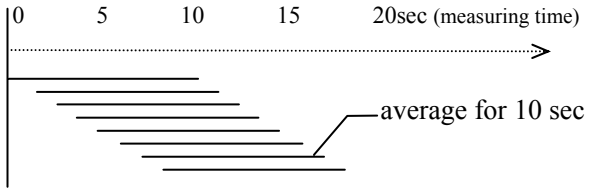
- When a printer is connected, press PRINT key to print out the reading while the reading is on hold.
  For more details please refer to page 13.

2.2 How to Make the Reading More Readable

◆ This function is useful when you want to obtain averaged readings as readings were volatile.

* This function is not available in Average Value Measurement Mode, Intermittent Operation Measurement Mode and Air Flow Measurement Mode.

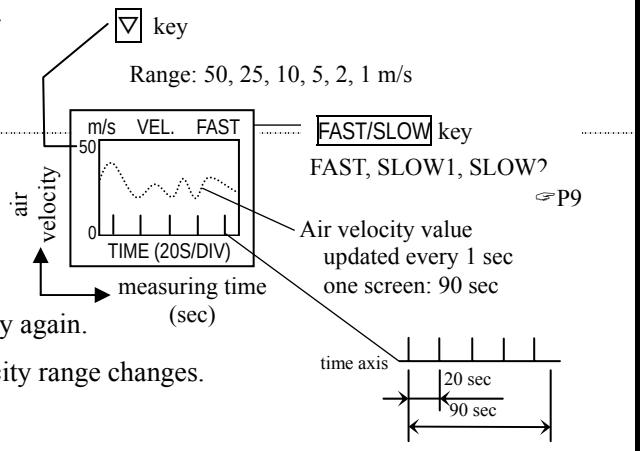


Mode	How to Take in Measurement Data	Explanation
FAST		Data is taken 4 times for one second. The average value of the 4 data is displayed as an instantaneous value every second.
SLOW 1		The average value for 5 seconds is displayed every second. Data shifts by 1 second.
SLOW 2		The average value for 10 seconds is displayed every second. Data shifts by 1 second.

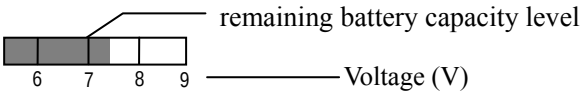
2.3 How to Display Fluctuation Graph

◆ You can monitor velocity fluctuation for 90 seconds.

(* This function cannot be used in the calculation mode.)

Display	Key	Procedure
' 08.07.01 FAST 10:26:40 5.38 m/s 25.7 ℃	▽	Press ▽ key. 
m/s VEL. FAST 50 0 TIME (20S/DIV)	▽	
m/s VEL. FAST 25 0 TIME (20S/DIV)	▽	Press ▽ key again. ★ Air velocity range changes.
m/s VEL. SLOW1 25 0 TIME (20S/DIV)	FAST/SLOW	**FAST/SLOW key is useful when …** >>> reading varies significantly and it is hard to see the graph. Press FAST/SLOW key. ····· SLOW 1 (moving average deviations for 5 sec.)
m/s VEL. SLOW2 25 0 TIME (20S/DIV)	FAST/SLOW	Press FAST/SLOW key ····· SLOW 2 (moving average deviations for 10 sec.)
' 08.07.01 SLOW2 10:26:40 5.38 m/s 25.7 ℃	△	Press △ key to go back to the original screen.
hold VEL. SLOW2 25 0 TIME (20S/DIV)	HOLD	Press HOLD key ★ Display screen will be on hold. Even while the reading is on hold, you can still change the range and switch FAST/SLOW.
	PRINT	Press PRINT key ★ When the reading is on hold, the display can be printed out.

2.4 Remaining Battery Level

Display	Key	Procedure
' 08.07.01 FAST 10:26:40 5.38 m/s 25.7 ℃	BATT	This feature is available only on the monitoring screen or when the instrument is ready for a measurement in the measurement mode (when "ready" is displayed). On other screens this feature cannot be used. Press BATT key.
⇩ <BATTERY CHECK> BATTERY CHANGE VOLTAGE 6V 6 7 8 9 ⇩ ' 08.07.01 FAST 10:26:40 5.38 m/s 25.7 ℃		★ The remaining battery capacity level will be displayed for 2 seconds. Then the screen will go back to the original screen automatically.  * Voltage for a new dry cell battery is 9V. * Voltage for a fully charged Ni-Cd battery is about 8.5V.

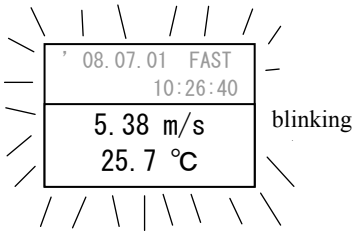
2.4.1 Battery Level Indicator

- When the remaining battery level becomes lower than 6V, the display screen will start blinking.
  Please note that the reading when the screen is blinking cannot be guaranteed.

  * Once the voltage of Ni-Cd battery becomes 6.5V or lower, the voltage will decrease at a rapid pace. Charge the batteries ahead of time.

  * Using backlight drains battery quickly. Please use the backlight only when necessary.

Change the batteries when the screen starts blinking.



When the remaining battery capacity level becomes lower:

⇩

PLEASE
CHANGE BATTERY

2.5 How to Change Data and Time

Display	Key	Procedure
⇩	MENU	(1) Press MENU key.
< MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY	△, ▽ SET	(2) Select 5. UTILITY. Then press SET key.
⇩ < UTILITY > 1. CALENDAR 2. ANALOG OUTPUT 3. PROGRAM SET 4. RS-232C	△, ▽ SET	(3) Select 1. CALENDAR. Then press SET key. * **Second is not configurable.**
⇩ < CALENDAR > DATE ▼ 2008. 07. 01 TIME 10 : 25	△, ▽ SET	(4) Move the ▼ to the item to be changed. Then press SET key. Year. Month. Date → 2008. 07. 01 Hour : Min. → 10 : 25
⇩ < CALENDAR > DATE 2008. 07. 01 TIME 10 : 25	△, ▽ SET	(5) The figure to be changed will be highlighted. Then use △ ▽ keys to change the figure. After the figure is changed, press SET key.
⇩ < CALENDAR > DATE 2008. 07. 01 TIME▼ 10 : 25	MENU	(6) To continue changing the date and time, repeat the above procedure (4) and (5) When you finished changing the data/time, press MENU key.
⇩ < MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT	△, ▽ SET	(7) Select 1. MONITOR. Then SET key.
⇩ ' 08.07.15 FAST 10:26:40 12.8 m/s 27.5 ℃		(8) The display will return to the original screen. Then check if the date/time is changed correctly.

2.6 Printing Hard Copy of the Monitor Screen

2.6.1 What you need

★ Printer (sold separately) ····· Recommended model is DPU-201GS (Seiko Instruments Inc.)

★ Cable to connect the instrument and a printer (sold separately)

2.6.2 Printer Setting

Switch No.	Function	Anemomaster	Printer
SW 1	Word Length	8 bit	ON
SW 2	Parity Yes/No	None	ON
SW 3	Parity Setting	None	ON
SW 4～6	Baud Rate	4800	Table Below

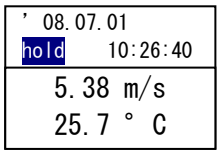
Baud Rate	SW 4	SW5	SW6
4800	OFF	ON	OFF

2.6.3 Signal Cable Connection

Anemomaster		Printer	
Signal Pin No.	Signal Name	Signal Pin No.	Signal Name
3 (orange)	TXD	3	DATA
1 (brown)	GND	5	GND
4 (yellow)	CTS	8	BUSY

2.6.4 Operation Procedure

1. Connect the instrument (RS-232C output terminal) and a printer.
2. Turn on both of the instrument and the printer.
3. Confirm that the Anemomaster's display is an initial screen.
4. Press HOLD key to hold the display screen.
5. When the display is on hold, press PRINT key.



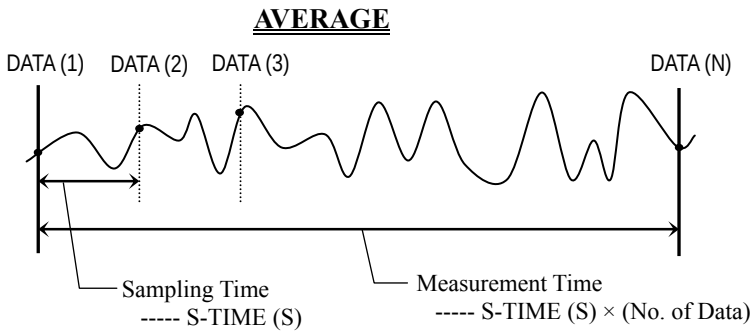
Press PRINT key when this screen (on hold) is displayed.

To Halt Printing Temporarily and To Cancel Printing

- Temporary Halt: To stop printing temporarily, press PRINT key while printing.
  To recommence printing, press PRINT key again.
- Cancel Printing: To stop printing temporarily, press PRINT key while printing.
  When the printing is halted, press MENU key.
  As the menu screen will be displayed, select 1. MONITOR.

3. Measurement Mode

3.1 How to Measure Average, Max and Min value [Average Mode]

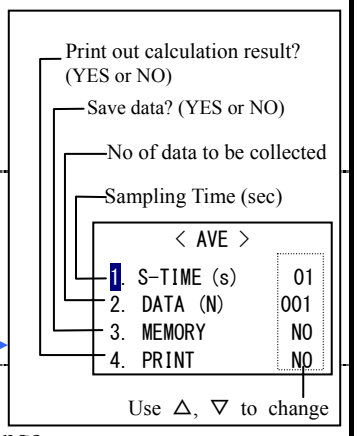


- Average Value
  AVE=ΣDATA(N)/N
- Max & Min Values
  MAX=DATA(i)
  MIN=DATA(j)

* Data is collected every designated sampling time.

Each data (DATA (N)) is not the average value per sampling time but instantaneous value.

Display	Key	Procedure
⇩ < MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY	MENU	(1) Press MENU key.
⇩ < MEASUREMENT > 1. AVERAGE 2. INTERVAL 3. FLOW RATE	△, ▽ SET	(2) Select 2. MEASUREMENT. Then press SET key.
⇩ < AVE > 1. S-TIME (s) 01 2. DATA (N) 001 3. MEMORY NO 4. PRINT NO 5. SET OK!	△, ▽ SET	(3) Select 1. AVERAGE. Then press SET key.
⇩ < AVE > 1. S-TIME (s) 01 2. DATA (N) 001 3. MEMORY NO	△, ▽ SET	(4) Select the item that you want to change. ➢ For more information on the each item, please refer to the "Measurement Condition" on the next page Then press SET key.
⇩ < MENU > 1. S-TIME (s) 01 2. DATA (N) 001 3. MEMORY NO	△, ▽ SET	(5) The item to be changed will be highlighted. Use △, ▽ keys to change the number. Then press SET key.
		(6) For the other items, follow likewise the above procedure (4) and (5).



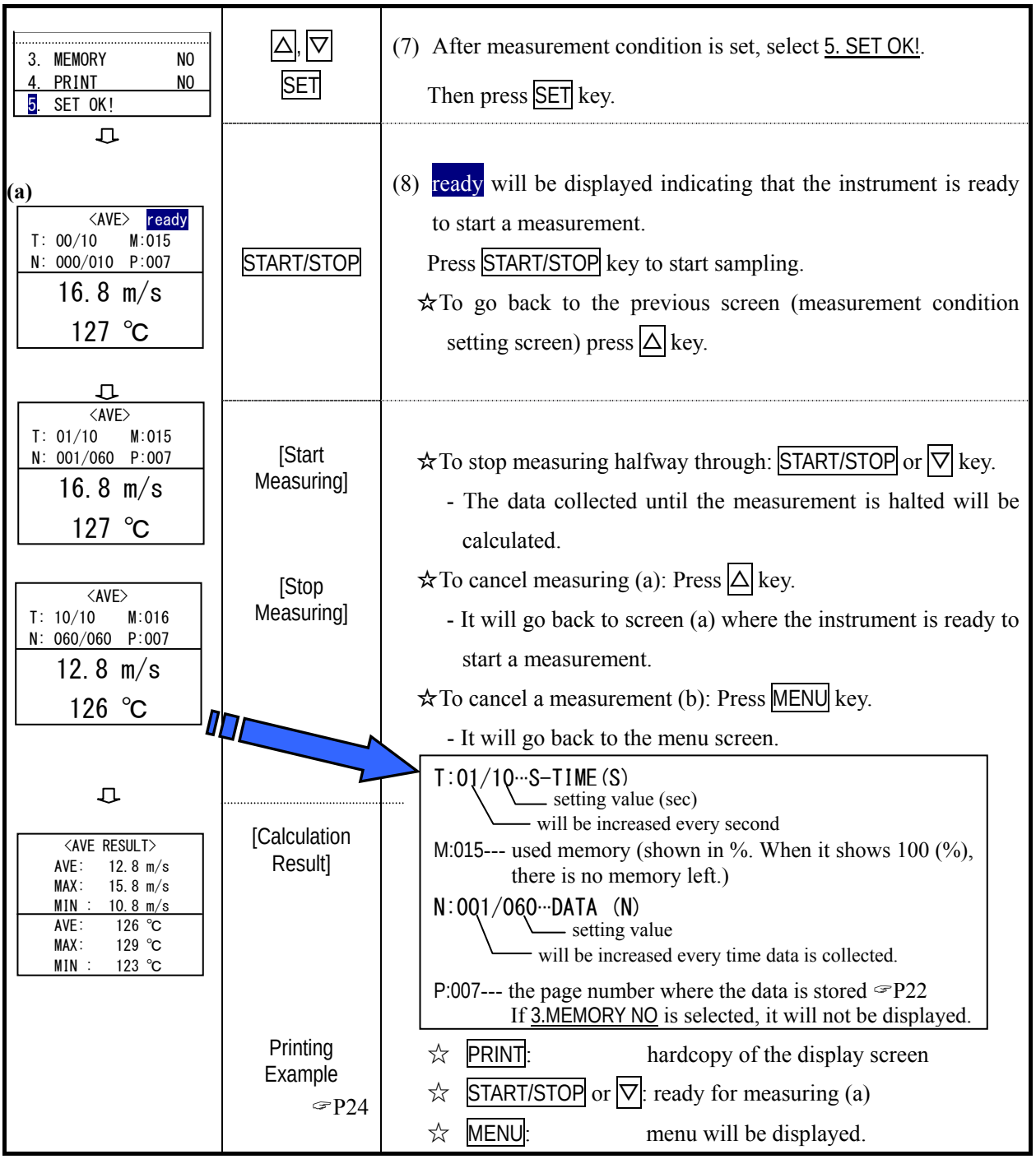
[Measurement Condition]

S-TIME (S): Set the length of sampling (instantaneous value) time.
Configurable sampling time (sec): 1 ~ 6, 10, 12, 15, 20, 30, 40, 50, 60 sec

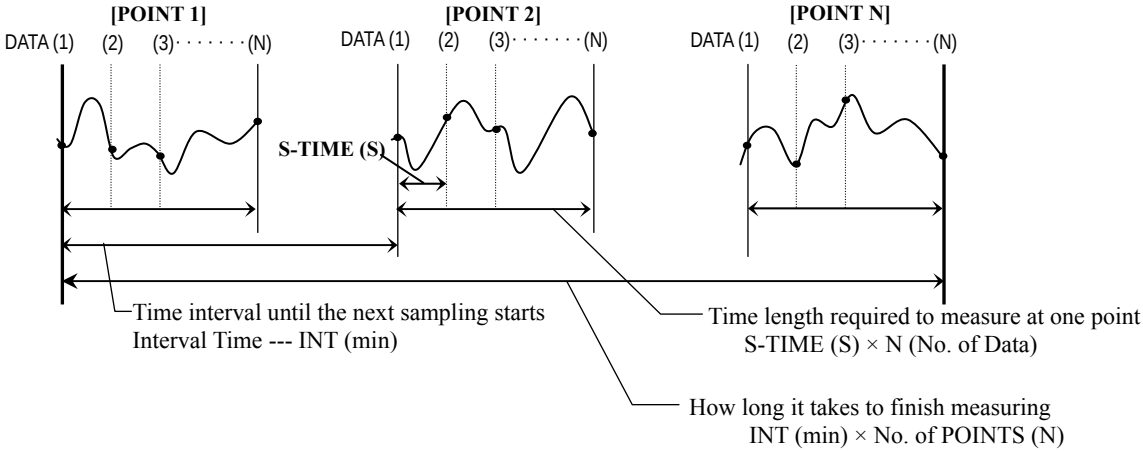
DATA (N): Set how many data to be taken every configured sampling time.
Configurable number of data: 1 ~ 6, 10, 12, 15, 20, 30, 40, 50, 60, 100, 120, 150, 180

MEMORY: When YES, data will be stored in the internal memory.
For details on memory capacity, refer to P22.

PRINT: When YES, the calculation result will be output to the printer automatically.
When NO, you can still print out the hardcopy of the calculation result by pressing [PRINT] key after the calculation result is displayed.
Refer to P24 for printout samples.



3.2 How to Collect Data at Certain Time Intervals [Interval Mode]



◆ Data at each point is average value.

POINT 1···AVE 1=ΣDATA(N)/N
POINT 2···AVE 1=ΣDATA(N)/N
. . .
. . .
POINT N --- AVE H=ΣDATA(N)/N

⇨

Calculation Result

AVE=(AVE1+AVE2+ -----AVE N)/No. of POINT (N)
MAX=AVE I, MIN=AVE J
AVE1, AVE2, ··· AVE N are stored as a data at each point.

Display	Key	Procedure
⇩	MENU	(1) Press MENU key.
< MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY ⇩	△, ▽ SET	(2) Select 2. MEASUREMENT. Then press SET key.
< MEASUREMENT > 1. AVERAGE 2. INTERVAL 3. FLOW RATE ⇩	△, ▽ SET	(3) Select 2. INTERVAL. Then press SET key.
(a) < INT > 1. S-TIME(S) 01 2. DATA (N) 010 3. INT (min) 060 4. POINTS 024 5. MEMORY YES 6. PRINT YES 7. SET OK! <Measurement Setting Screen>	△, ▽ SET SET	(4) Set the measurement condition in the same manner as when configuring Average Mode measurement (P14). ➡ ☆ To select the item to be changed △, ▽⇨SET ☆ To change setting value and YES/NO. △, ▽⇨SET ☆ Setting is complete. 7. SET OK! ⇨ SET When the measurement condition is configured, select 7. SET OK!, and press SET key.

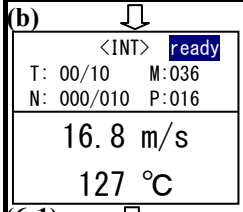
[Measurement Condition]

INT (min): Set how often a measurement to be started.
Configurable sampling interval (min):
1 ~ 6, 10, 12, 15, 20, 30, 40, 50, 60, 100, 120, 150, 180 min.
* Interval (INT) has to be set longer time than sampling time at each point.

POINTS: Set how many points you want to perform a measurement?
Configurable number of points: 1 ~ 999 points

* For S-TIME(S), DATA(N), MEMORY, PRINT, refer to page 15 describing the average measurement.

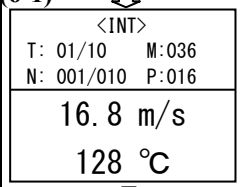
(b)



START/STOP

(5) ready will be displayed indicating that the instrument is ready to start a measurement.
Press START/STOP key to start sampling.
☆ To go back to the measurement setting screen (a), press △ key.

(6-1)

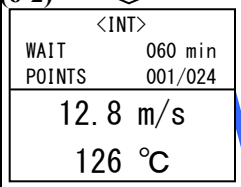


[Start Measuring]

(6)
(6-1):
Sampling at one point.

As for "ready" display, refer to page 16 describing average measurement.

(6-2)

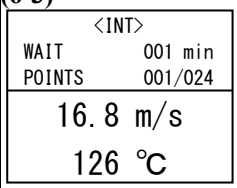


[Waiting]

(6-2):
After a sampling at one point is finished, the instrument will standby for the next sampling. On the screen, the average value for one point will be displayed until the next measurement will start.
(6-3):
One minute is left before the next measurement starts
One minute later, the screen will become screen (6-1) and a measurement will start.

WAIT 060 min: waiting time remaining time length before the next measurement starts (min)
POINTS 001/024: point
Total set No. of measurement trials
Current sampling trial No.

(6-3)



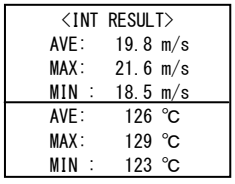
(7) Repeat the above procedure from (6-1) to (6-3) for the configured number of points.

☆To stop measuring halfway through: START/STOP or ▽ key.
- The data collected until the measurement is halted will be calculated.

☆To stop measuring (1): △ key.
- It will go back to the screen (b) where the instrument is ready to start a measurement.

☆To cancel a measurement (2): MENU key.
- It will go back to the menu screen.

[Stop Measuring]



Calculation Result

Printing Example
☞P24

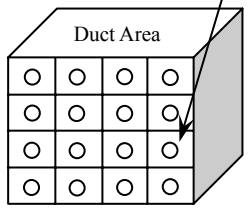
Data at each point is an average data. Average, maximum and minimum of the average data at each point will be displayed.

☆ PRINT: hardcopy of the display screen
☆ START/STOP or ▽: ready for measuring (screen b)
☆ MENU: menu will be displayed

3.3 How to Measure Flow Rate in the Duct [Flow Rate Mode]

FLOW RATE

Example



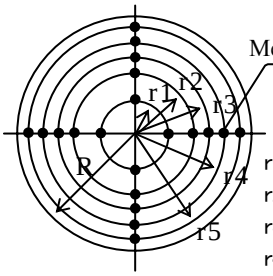
◆ **Measurement**

POINT 1 --- AVE 1 = Σ DATA (N)/N
POINT 2 --- AVE 2 =Σ DATA (N)/N
POINT M --- AVE M =Σ DATA (N)/N ⇨

Average Air Velocity

$$U = \frac{(AVE1+AVE2+\cdots AVE\ N)}{\text{No. of Points (M)}}$$

* To start a measurement at each point: START/STOP key
* For detailed information on measuring at each point, refer to **3.2 How to Collect Data at Certain Time Intervals [Interval Mode]** (P16).



r1=0.316R
r2=0.548R
r3=0.707R
r4=0.837R
r5=0.949R

◆ **Calculation result**

Air Volume (F) = Average Air Velocity (U) × Cross Section (AREA)
indicated in m³/hour and m³/min

Display	Key	Procedure
⇩	MENU	(1) Press MENU key.
< MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY ⇩	△, ▽ SET	(2) Select 2. MEASUREMENT. Then press SET key.
< MEASUREMENT > 1. AVERAGE 2. INTERVAL 3. FLOW RATE ⇩	△, ▽ SET	(3) Select 3. FLOW RATE. Then press SET key.
(a) < FLOW > 1. S-TIME(S) 01 2. DATA (N) 010 3. POINTS 016 4. AREA(m2) 0.100 5. MEMORY YES 6. PRINT YES 7. SET OK! <Measurement Setting Screen>	△, ▽ SET	(4) Set the measurement condition in the same manner as when configuring Average Mode (P14). ➡ ☆ To select the item to be changed △, ▽⇨SET ☆ To change setting value and YES/NO. △, ▽⇨SET ☆ Setting is complete. 7. SET OK! ⇨ SET
	SET	When the measurement condition is configured, select 7. SET OK!, and press SET key.

[Measurement Condition]

POINTS: Set how many points to perform a measurement to find average air velocity?
Configurable number of partitions: 1 ~ 100 points

AREA(m²): Duct's cross section area (Effective Area)
Configurable area size: 0.001～9.999m²

* For S-TIME(S), DATA(N), MEMORY, PRINT, refer to page 15 describing the average measurement.

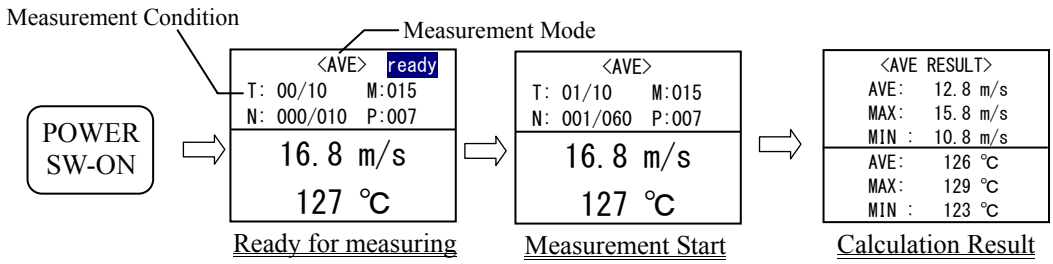
Display	Key	Procedure
(b) ⇩ < FLOW >ready T: 00/10 M:036 N: 000/010 P:012 16.8 m/s 126 ℃	START/STOP	(5) ready will be displayed indicating that the instrument is ready to start a measurement. Press START/STOP key to start sampling. ☆ To go back to the measurement setting screen **(a)**, press △ key.
⇩ **(6-1)**	[Start Measuring]	(6) (6-1) Measuring at one point. (6-2) After measuring at one point is finished, move the probe to the next point and press START/STOP key. Then measuring at the next point will start. ★ Repeat the above procedure (6-1) and (6-2) for the configured number of sampling points.
< FLOW > T: 01/10 M:036 N: 001/010 P:012 16.8 m/s 127 ℃		
⇩		
< FLOW > NEXT START ! POINTS 001/016 16.8 m/s 127 ℃	START/STOP	NEXT START! --- waiting for sampling at the next point. POINTS 001/016 --- No. of Points setting value No. of points where sampling has been done
⇩	START/STOP	☆ To stop measuring halfway through: ▽ key. - While sampling at a point, the sampling at the point will be finished. - When the instrument is waiting for the next sampling, the data taken before the measurement stopped will be calculated.
< FLOW > T: 10/10 M:037 N: 001/010 P:012 16.8 m/s 126 ℃		☆ To stop a measurement (1) : △ key - Will go back to the measurement standby mode (screen (b)) ☆ To stop a measurement (2) : MENU key - Will go back to the menu screen.
⇩	[Calculation Result]	
<FLOW RESULT> 8.100 m3/min ····· Air volume (m³/m) 486.00 m3/hour ····· Air volume (m³/h) VEL 13.5 m/s ····· Avg air velocity TEMP 126 ℃ ····· Avg air temp		☆ PRINT: hardcopy of the display screen ☆ START/STOP or ▽: ready for measuring (to continue sampling) ☆ MENU: menu will be displayed.

3.4 Program Set

3.4.1 How to Pre-set Measurement Mode

- If a measurement mode is preset, the instrument will enter the measurement standby when you turn it on.

  To start a measurement, you only need to press START/STOP key.



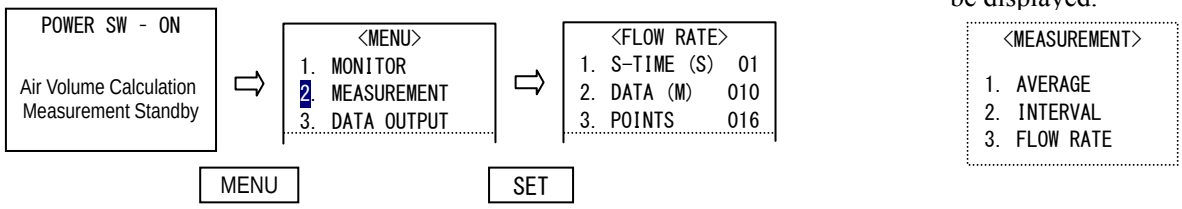
Display	Key	Procedure
⇩ < MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY	MENU	(1) Press MENU key.
⇩ < UTILITY > 1. CALENDAR 2. ANALOG OUTPUT 3. PROGRAM SET 4. RS-232C	△, ▽ SET	(2) Select 5. UTILITY. Then press SET key.
⇩ < PROGRAM SET > 1. OFF 2. AVERAGE 3. INTERVAL 4. FLOW RATE	△, ▽ SET	(3) Select 3. PROGRAM SET. Then press SET key.
⇩ < PROGRAM SET > 1. OFF 2. AVERAGE 3. INTERVAL 4. FLOW RATE	△, ▽ SET	(4) Select a measurement mode to be used. Then press SET key. OFF: No Program Set AVERAGE: Average Value Measurement INTERVAL: Intermittent Operation Measurement FLOW RATE: Air Flow Measurement
		(5) The cursor will move to the selected calculation mode. Then, the measurement condition setting screen will be displayed automatically.
⇩ < AVE > 1. S-TIME (s) 01 2. DATA (N) 10 3. MEMORY YES 4. PRINT YES 5. SET OK! <Measurement Setting Screen>	△, ▽ SET	(6) Configure measurement setting. Then move the cursor to 5. SET OK, and press SET key. The set measurement mode will be applied even when you turn off the instrument. If you turn the power on again, it will enter the measurement standby mode.

3.4.2 Other Measurement Mode Cannot be Used

◆ When a measurement mode is set, only the configured mode can be used. Even if you select 2. MEASUREMENT on the menu screen, a screen that allows you to select a measurement mode will not display. In stead you will see the screen that allows you to configure the measurement setting for the set measurement mode. In order to use other measurement mode, you need to deactivate the current selected mode.

[Example] When Flow Rate mode is set;

Even if you select 2. MEASUREMENT, ... The below screen will not be displayed.



3.4.3 How to Deactivate Pre-set Measurement Mode

◆ In the same manner as when you configure program setting, display the <PROGRAM SET> screen. When it is displayed, select 1. OFF.

Display	Key	Procedure
⇩ < PROGRAM SET > 1. OFF 2. AVERAGE 3. INTERVAL 4. FLOW RATE ⇩	△, ▽ SET	(1) Select 1. OFF. Then press SET key.
< PROGRAM SET > 1. OFF 2. AVERAGE 3. INTERVAL 4. FLOW RATE ⇩	OFF	(2) 1. OFF will be highlighted. Then, the menu screen will be displayed automatically.
< MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY	△, ▽ SET	(3) Select 2. MEASUREMENT to perform a measurement.

3.5 Memory Capacity

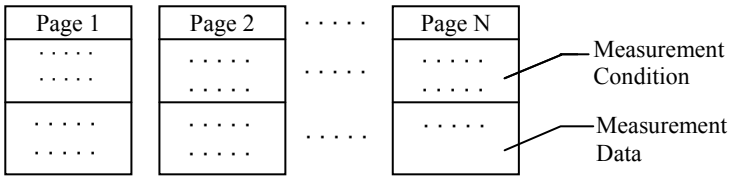
- Measurement data is stored per page. On top of the each page the measurement condition is stored. Therefore, the more pages you save, the less data you can store.

  Below describes how to figure out how many pages of data can be stored when you know how many data you want to take.

★ Measurement data is stored per page.

★ Make sure to check in which page the data is stored.

★ A measurement data consists of air velocity data and air temperature data.



Number of Bytes Used per Page

(1) Measurement Starting Date (08. 7. 1 10:40)	12 bytes
(2) Measurement Item (air velocity, air temp VT)	2 bytes
(3) Measurement (Average: AVE, Interval: INT, Air Flow: FLW)	2 bytes
(4) Sampling Time (S-TIME(S))	2 bytes
(5) No. of Data (DATA (N))	2 bytes
(6) No. of Measurement Points (POINTS)	2 bytes
(7) Measurement Interval INT (min) or Duct Area AREA (m²)	2 bytes
(8) Air Velocity Data and Air Temperature Data	4 bytes × No. of data

Measurement Condition Total: 24 bytes

How to Figure Out How Many Pages Can Be Saved

Internal Memory ─── Memory Capacity 4770 bytes 1 page ··· (24+4×N) bytes

$$P = \underline{4770} / (\underline{24} + \underline{4} \times \underline{N})$$

- 4770: Memory Capacity
- 24: Measurement Condition
- 4: Data
- N: Average Value Measurement: Data Volume (DATA (N)); Intermittent Operation: Number of Points (POINTS); Air Flow Measurement: Number of Points (POINTS)

[Example] When N is 10, P is 74 according to the above formula.

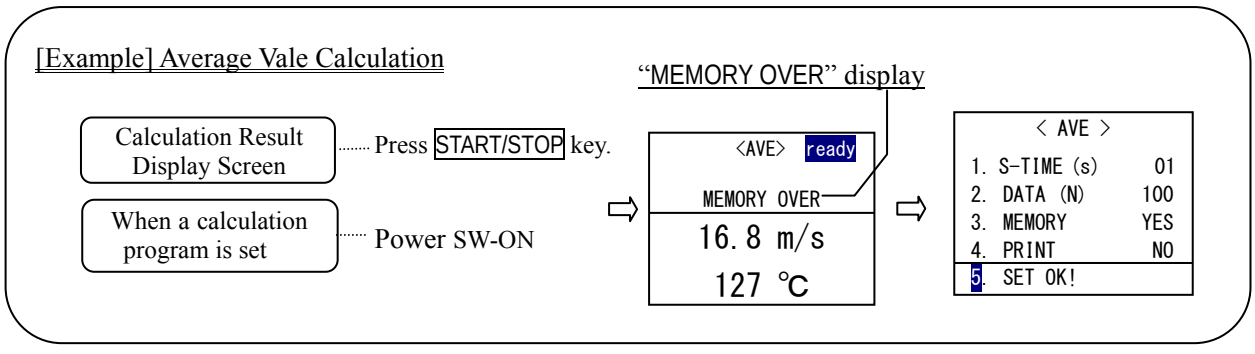
This means that when the number of data is 10, you can perform a measurement for 74 times (pages).

3.5.1 “Memory Over” Display

- When “SET OK!” is selected on the measurement setting screen, the instrument determines if there is enough memory capacity. If there is not enough memory capacity left, “MEMORY OVER” will be displayed.

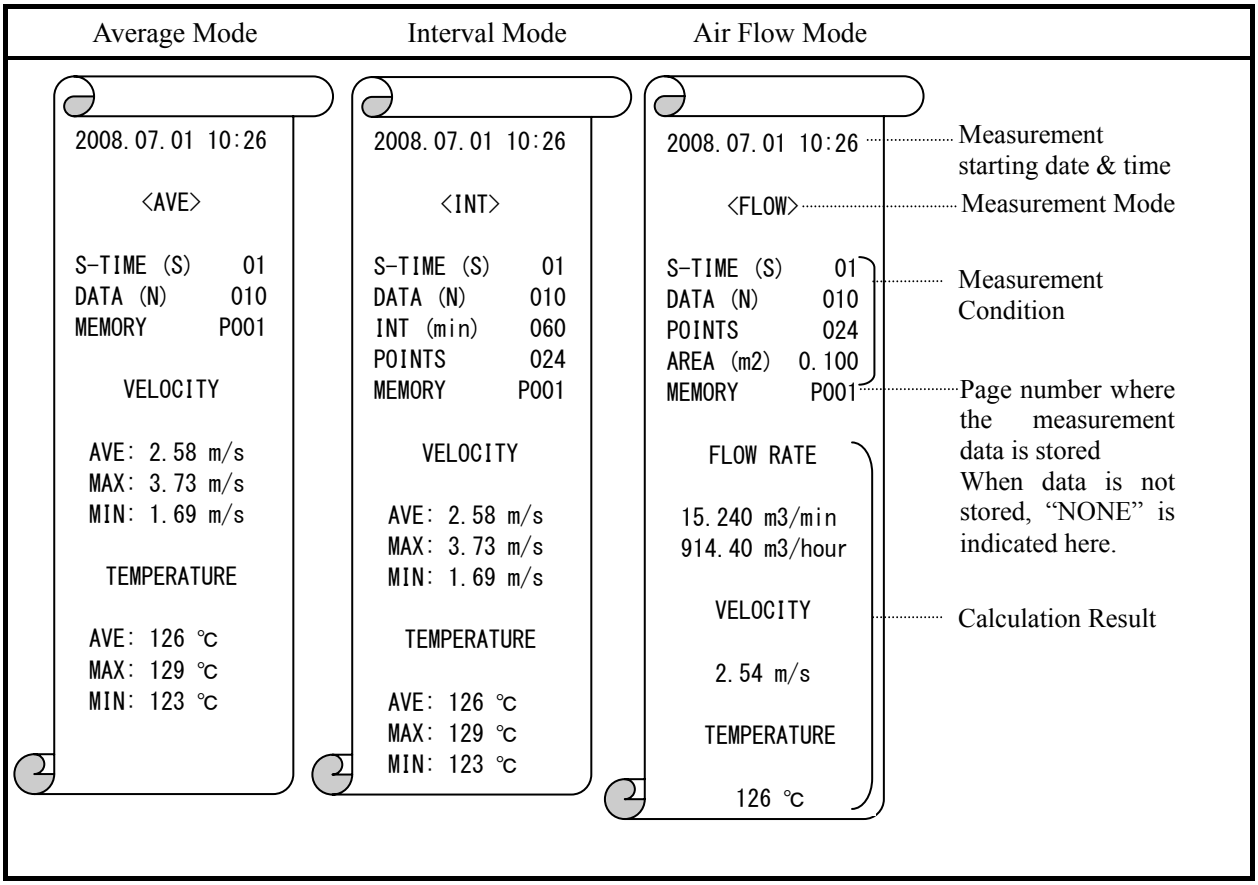
Ave. Value Measurement	Intermittent Operation	Air Flow Measurement	Explanation
< AVE > 1. S-TIME (s) 01 2. DATA (N) 100 3. MEMORY YES 4. PRINT NO 5. SET OK!	< INT > 1. S-TIME(S) 01 2. DATA (N) 010 3. INT (min) 060 4. POINTS 024 5. MEMORY YES 6. PRINT NO 7. SET OK!	< FLOW > 1. S-TIME(S) 01 2. DATA (N) 010 3. POINTS 060 4. AREA(m2) 1.000 5. MEMORY YES 6. PRINT NO 7. SET OK!	After configuring each measurement condition, select SET OK!. Then press SET.
< AVE > 1. S-TIME (s) 01 2. DATA (N) 100 3. MEMORY YES 4. PRINT NO MEMORY OVER	< INT > 1. S-TIME(S) 01 2. DATA (N) 010 3. INT (min) 060 4. POINTS 024 5. MEMORY YES 6. PRINT NO MEMORY OVER	< FLOW > 1. S-TIME(S) 01 2. DATA (N) 010 3. POINTS 060 4. AREA(m2) 1.000 5. MEMORY YES 6. PRINT NO MEMORY OVER	“MEMORY OVER” display
< AVE > 1. S-TIME (s) 01 2. DATA (N) 100 3. MEMORY YES 4. PRINT NO 5. SET OK!	< INT > 1. S-TIME(S) 01 2. DATA (N) 010 3. INT (min) 060 4. POINTS 024 5. MEMORY YES 6. PRINT NO 7. SET OK!	< FLOW > 1. S-TIME(S) 01 2. DATA (N) 010 3. POINTS 060 4. AREA(m2) 1.000 5. MEMORY YES 6. PRINT NO 7. SET OK!	The cursor will move to DATA (N) or POINTS automatically. Change the setting or delete the data (☞P28)

- When repeating a measurement by using START/STOP key or a measurement mode is set, the instrument determines if there is enough memory left on the measurement stand-by screen.

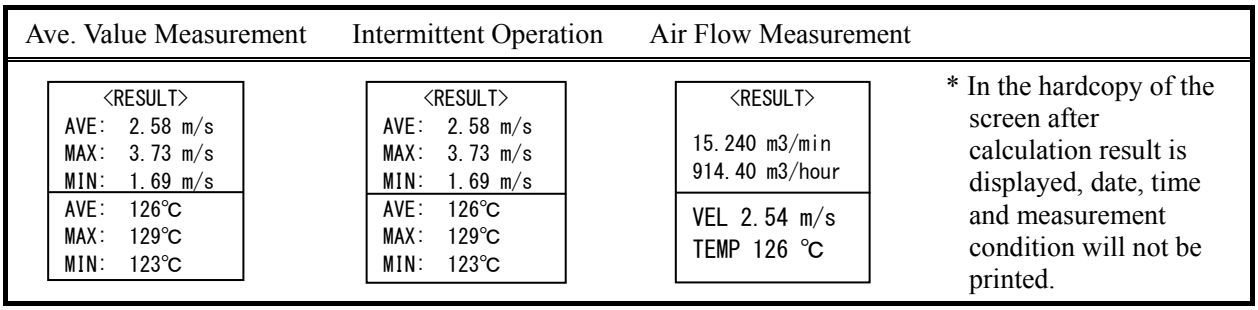


3.6 Printing Example – Automatic Printing and Hardcopy of Calculation Result

3.6.1 Automatic Printing Example



3.6.2 Hardcopy Example



4. How to Redisplay, Print and Delete Stored Data

4.1 How to Redisplay Data

You can re-display the stored calculation result.

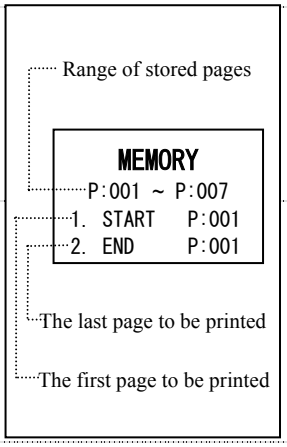
However, each memory data cannot be displayed on the instrument's display. You need to either output to the printer or transfer data to the computer via digital output (RS-232C)

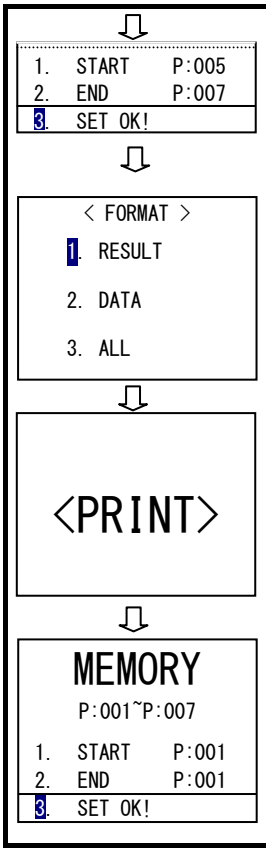
Display	Key	Procedure
⇩	MENU	(1) Press MENU key.
< MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY ⇩	△, ▽ SET	(2) Select 3.DATA OUTPUT. Then press SET key.
< DATA OUTPUT > 1. DISPLAY 2. PRINTER 3. COMPUTER ⇩	△, ▽ SET	(3) Select 1.DISPLAY. Then press SET key. If data is not stored, "data not found! MODE PAGE" will be displayed and go back to the menu screen.
(a) MEMORY P: 001 AVERAGE [VT] ' 08.07.01 10 : 26 <Page Setting Screen> ⇩	△, ▽ SET [Calculation Result]	(4) Select the page to be output. Then press SET key. Memory page number Measurement mode Measurement item VT: velocity & temp. Measurement data& time ☆ START/STOP or ▽: Page setting screen (a) ☆ MENU: menu display
< RESULT > AVE: 12.5 m/s MAX: 13.8 m/s MIN : 11.6 m/s AVE: 126 ℃ MAX: 129 ℃ MIN : 123 ℃		

4.2 How to Output Data to Printer

4.2.1 Procedure for outputting data to a printer

Display	Key	Procedure
⇩	MENU	(1) Press MENU key.
< MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY ⇩	△, ▽ SET	(2) Select 3.DATA OUTPUT. Then press SET key.
< DATA OUTPUT > 1. DISPLAY 2. PRINTER 3. COMPUTER ⇩	△, ▽ SET	(3) Select 2.PRINTER. Then press SET key.
MEMORY P:001~P:007 1. START P:001 2. END P:001 3. SET OK! ⇩	△, ▽ SET	(4) Select 1.START P:001. Then press SET key.
1. START P:005 2. END P:001 3. SET OK! ⇩	△, ▽ SET	(5) 1.START P:001 will be highlighted. Specify the first page to be printed. Then press SET key.
1. START P:005 2. END P:005 3. SET OK! ⇩	SET	(6) Select 2.END P:005. Then press SET key.
1. START P:005 2. END P:007 3. SET OK!	△, ▽	(7) 2.END P:005 will be highlighted.. Specify the last page to be printed. Then press SET key.





SET	(8) Move the cursor to 3. SET OK! Press SET key.
△, ▽ SET	(9) Select the item to be output. Then press SET key. RESULT: Only calculation result is output. DATA: Only measurement data is output. ALL: Both calculation result and measurement data are output.
[Printing]	☆ To halt printing temporarily: Press PRINT key ☆ To stop printing completely: Press PRINT ⇨ MENU key
	(10) After printing, it will go back to the page setting screen. ☆ To continue printing, repeat the above procedure. ☆ To finish printing, press MENU key.

4.2.2 Printing Example

[Average Mode]

```
2008.07.01  10:57
      <AVE>
S-TIME(S)      01
DATA(N)       010
MEMORY       P001
    VELOCITY
 AVE: 2.58 m/s
 MAX: 2.87 m/s
 MIN: 1.89 m/s
  TEMPERATURE
  AVE:  126 ℃
  MAX:  129 ℃
  MIN:  123 ℃
No.   VEL    TEMP
      (m/s)  (℃)
1     2.37    126
2     2.83    126
3     2.47    125
4     1.89    124
```

[Interval Mode]

```
2008.07.01  10:57
      <INT>
S-TIME(S)      01
DATA(N)       010
INT(min)      060
POINTS        024
MEMORY       P001
    VELOCITY
 AVE: 2.58 m/s
 MAX: 2.87 m/s
 MIN: 1.89 m/s
  TEMPERATURE
  AVE:  126 ℃
  MAX:  129 ℃
  MIN:  123 ℃
No.   VEL    TEMP
      (m/s)  (℃)
1     2.37    126
2     2.83    125
```

[Air Flow Mode]

```
2008.07.01  10:57
      <FLOW>
S-TIME(S)      01
DATA(N)       010
POINTS        016
AREA(m2)    0.100
MEMORY       P001
    FLOW RATE
 15.180 m3/min
 910.80 m3/hour
    VELOCITY
  2.53 m/s
  TEMPERATURE
    126 ℃
No.   VEL    TEMP
      (m/s)  (℃)
1     2.37    126
2     2.83    126
3     2.47    125
```

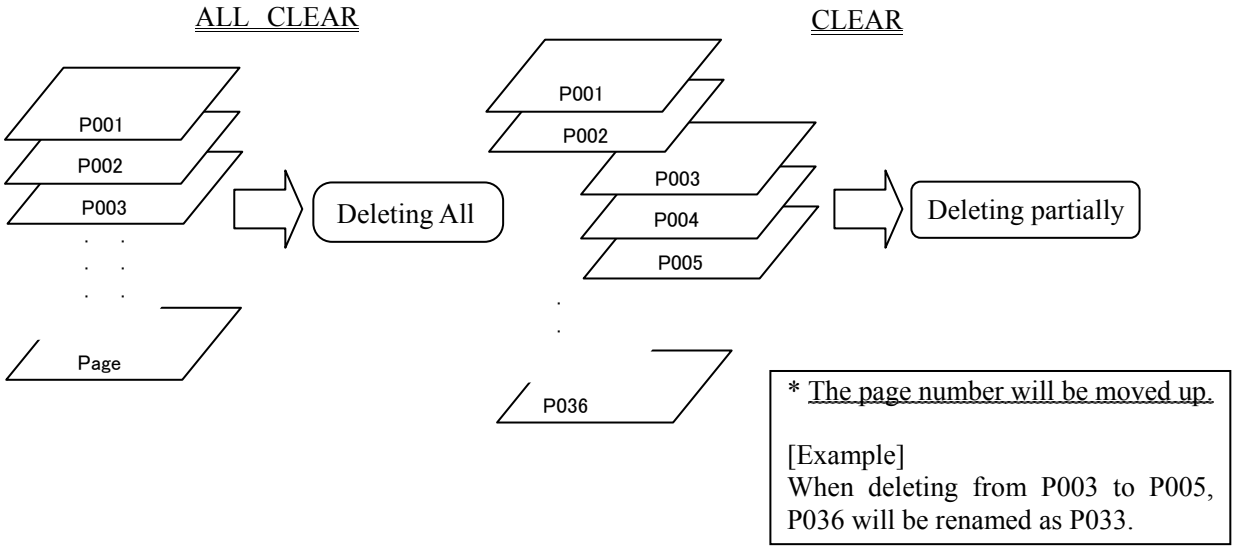
Measurement Condition (will be printed all the time)

Calculation Result <RESULT>

Measurement Data <DATA>

<ALL>

4.3 Deleting Memory Data



4.3.1 Deleting All

Display	Key	Procedure
⇩	MENU	(1) Press MENU key.
< MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY	△, ▽ SET	(2) Select 4. MEMORY CLEAR. Then press SET key.
⇩ < MEMORY CLEAR > 1. ALL CLEAR 2. CLEAR	△, ▽ SET	(3) Select 1. ALL CLEAR. Then press SET key.
⇩ MEMORY ALL CLEAR OK? 1. NO 2. YES	△, ▽ SET	(4) Select 2. YES. Then press SET key.
⇩ < MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY		★ When all data is deleted, it will go back to the menu screen.

4.3.2 Deleting Selected Pages Only

Display	Key	Procedure
⇩ < MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY	MENU	(1) Press MENU key.
⇩ < MEMORY CLEAR > 1. ALL CLEAR 2. CLEAR	△, ▽ SET	(2) Select 4. MEMORY CLEAR. Then press SET key.
⇩ MEMORY P:001~P:025 1. START P:001 2. END P:001 3. SET OK!	△, ▽ SET	(3) Select 2. CLEAR. Then press SET key.
⇩ 1. START P:001 2. END P:001 3. SET OK!	△, ▽ SET	(4) Select 1. START P: 001. Then press SET key. Range of stored pages MEMORY P:001~P:025 1. START P:001 2. END P:001 3. SET OK! The first page to be deleted The last page to be deleted
⇩ 1. START P:003 2. END P:003 3. SET OK!	SET	(5) Specify the first page to be deleted. Then press SET key.
⇩ 1. START P:003 2. END P:003 3. SET OK!	△, ▽ SET	(6) Move to 2. END P: 003. Then press SET key. If any data is not stored, “data not found! NONE PAGE” will be displayed and it will go back to the menu screen.
⇩ 1. START P:003 2. END P:005 3. SET OK!	SET	(7) Specify the last page to be deleted. Then press SET key.
⇩ < MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY		(8) **Confirm the range of the pages to be deleted.** If it is OK, press SET key. (9) The selected pages are deleted and it will go back to the menu screen. * The page number will be moved up.

5. Data Output

5.1 Analog Output

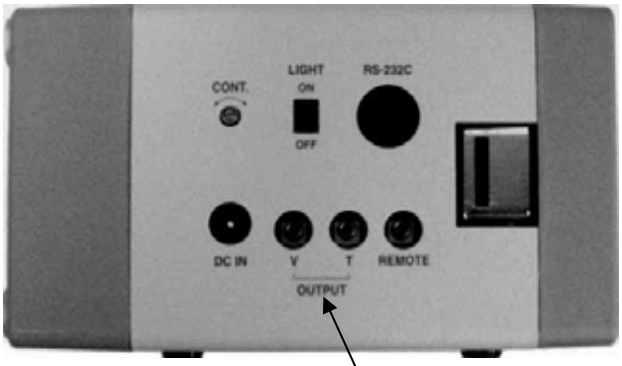
◆ Output on the measurement screen ---------- ★ To be output every 0.25 second

★ Output Voltage: DC0 ~ 1V

★ Output Impedance: 47Ω

Initial Screen: Except when the screen is on hold

Measurement Mode: Except when the calculation result is displayed or the instrument is waiting for the next sampling

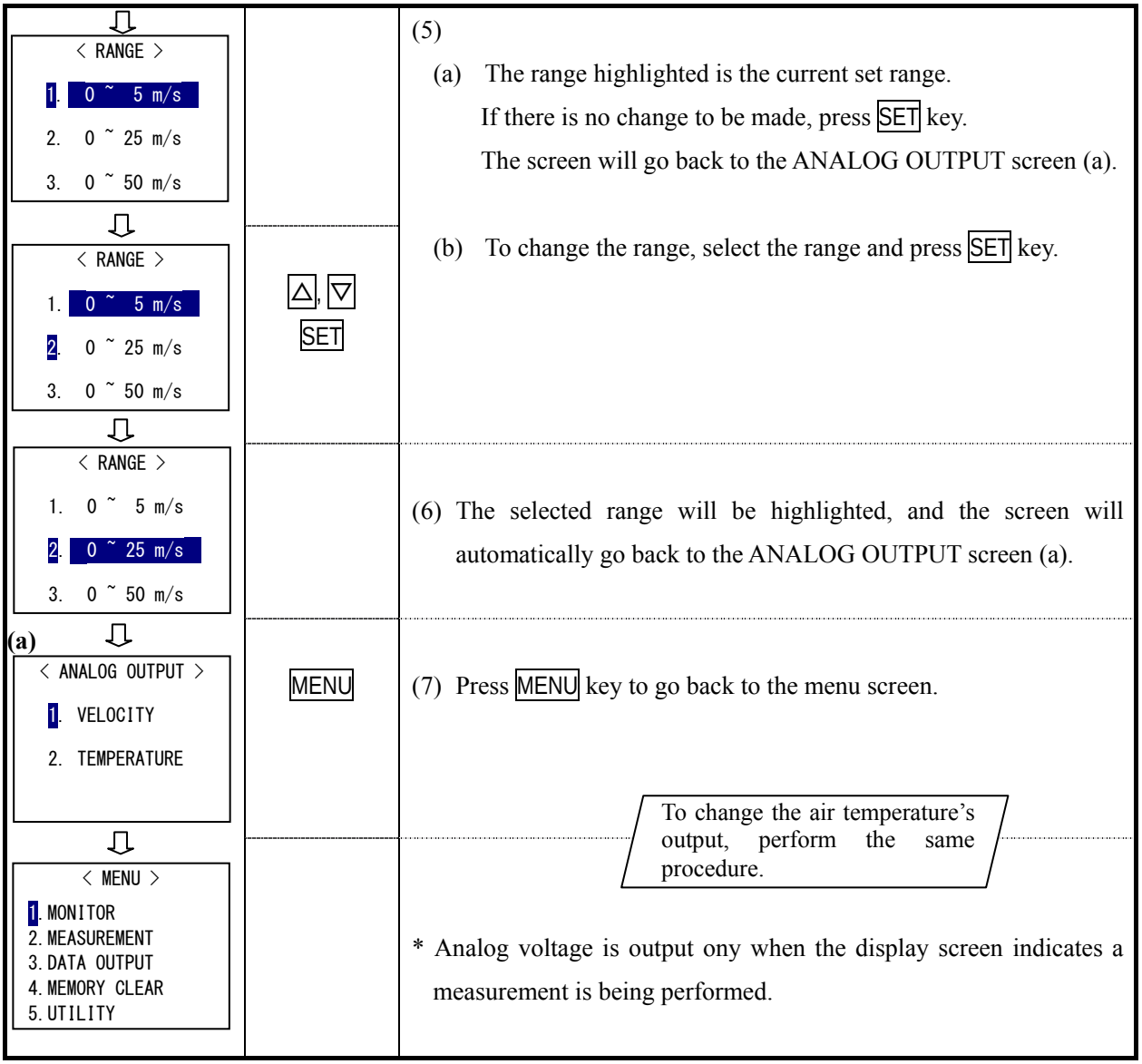


Output Range	
Air Velocity	Air Temp.
0 ~ 5 m/s	0 ~ 50 °C
0 ~ 25 m/s	0 ~ 100 °C
0 ~ 50 m/s	0 ~ 200 °C
	0 ~ 500 °C

V: Air Velocity
T: Air Temperature

5.1.1 How to Change Air Velocity Range

Display	Key	Procedure
⇩	MENU	(1) Press MENU key.
< MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY ⇩	△, ▽ SET	(2) Select 5. UTILITY. Then press SET key.
< UTILITY > 1. CALENDAR 2. ANALOG OUTPUT 3. PROGRAM SET 4. RS-232C ⇩	△, ▽ SET	(3) Select 2. ANALOG OUTPUT. Then press SET key.
(a) < ANALOG OUTPUT > 1. VELOCITY 2. TEMPERATURE ⇩	△, ▽ SET	(4) Select 1. VELOCITY. Then press SET key.



(5)

(a) The range highlighted is the current set range.
If there is no change to be made, press SET key.
The screen will go back to the ANALOG OUTPUT screen (a).

(b) To change the range, select the range and press SET key.

(6) The selected range will be highlighted, and the screen will automatically go back to the ANALOG OUTPUT screen (a).

(7) Press MENU key to go back to the menu screen.

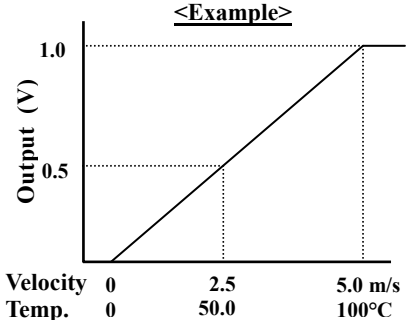
To change the air temperature's output, perform the same procedure.

* Analog voltage is output ony when the display screen indicates a measurement is being performed.

< Output Voltage Conversion>

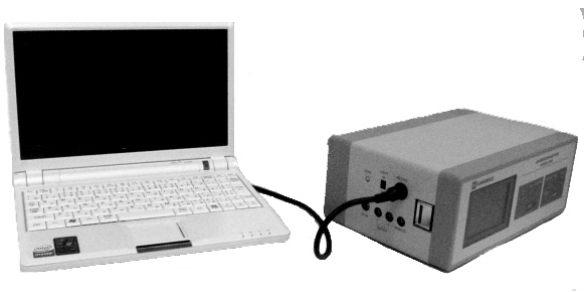
	Range	Conversion Equation
Air Velocity	0~ 5 m/s	U = 0.005 × V
	0~25 m/s	U = 0.025 × V
	0~50 m/s	U = 0.05 × V
Air Temp.	0~50 °C	T = 0.05 × V
	0~100 °C	T = 0.1 × V
	0~200 °C	T = 0.2 × V
	0~500 °C	T = 0.05 × V

<Example>



[Symbols]
U: Air Velocity (m/s)
T: Air Temp (°C)
V: Output Voltage (mV)

5.2 Digital Output (RS-232C)



Output Format	
Baud Rate:	4800, 1200
Word Length:	8 bit
Parity Bit:	None
Stop Bit:	1 bit

5.2.1 Connection Example

Signal Name	Wire Connection	Anemomaster (MODEL 6162)				
		Pin No.	Signal Name	Signal Meaning	Signal Direction	Signal Line Color
GND		1	GND	Signal Ground	- - -	Brown
TXD		2	RXD	Received Data	Input	Red
RXD		3	TXD	Transmit Data	Output	Orange
RTS		4	CTS	Clear To Send	Input	Yellow
CTS		5	RTS	Request To Send	Output	Blue
DSR						
DCD						
DTR						

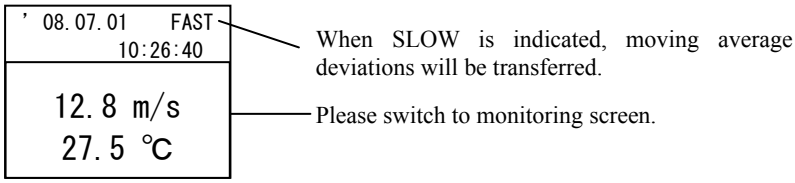
5.2.2 Baud Rate Setting

Display	Key	Procedure
⇩ < MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY	MENU	(1) Press MENU key.
⇩ < UTILITY > 1. CALENDAR 2. ANALOG OUTPUT 3. PROGRAM SET 4. RS-232C	△, ▽ SET	(2) Select 5. UTILITY. Then press SET key.
⇩ < RS - 232C > 1. 1200 bps 2. 4800 bps	△, ▽ SET	(3) Select 4. RS-232C. Then press SET key.
⇩ < RS - 232C > 1. 1200 bps 2. 4800 bps ⇩ < MENU >	△, ▽ SET	(4) Select baud rate. Then press SET key. (5) The selected baud rate will be highlighted, and the screen will automatically display menu screen. ★ To transfer raw data: 1. MONITOR To transfer memory data: 3. DATA OUTPUT

5.2.3 To Transfer Raw Data (measurement data per second)

When transferring data, make sure to display the monitor screen.

While transferring data, do not use other functions.



Output Format

# # # # # ; # # # # # ; # # # # # CRLF			: 19 characters
Air Velocity	Air Temp.	dummy	: (unit: m/s, ℃, **)
[Output Example] 23.6;	126;	*** CRLF	: Air Velocity, Air Temp ***

Command Explanation

Command	Function	Explanation
D *	To set the number of data to be retrieved.	After command is received, AD will be returned. Then, the configured number of data (*) will be output every one second. The maximum number of data to be output is 1,000 data. To retrieve more than 1,000 data, send the command again.
C	To turn probe power OFF	After command is received, AC will be returned. At the same time, the air velocity sensor will be turned off.
S	To turn probe power ON	After command is received, the air velocity sensor will be turned on again. 30 seconds later AS will be returned and the instrument is ready to retrieve data. After AS command is received, transfer data by sending D* command.

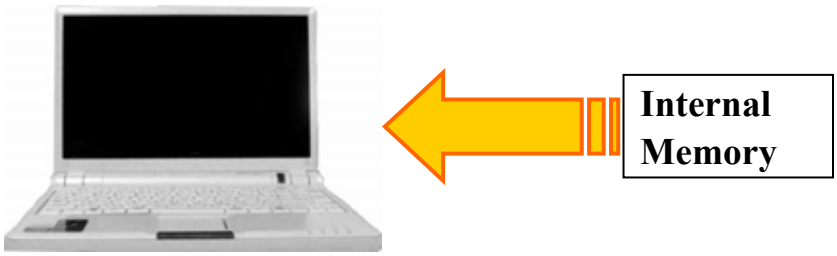
* Command C and S can be used when you want to collect data every one hour or so.
  By turning the probe off when it is not being used, unnecessary battery drain can be used.

* When command or number of data is entered incorrectly, the error codes listed below will be returned. (Example: When the number of data exceeds the maximum, E2 will be returned in stead of AD.)

  E1 ----- Command Error
  E2 ----- Data Setting Error
  B3 ----- Battery Error (battery drain)

5.2.4 To Transfer Memory Data (Measurement Data Stored in Memory)

DATA OUTPUT mode in menu screen



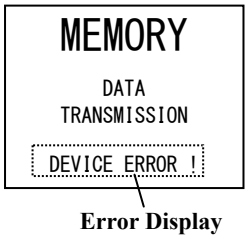
Getting Ready for Transferring Memory Data

Display	Key	Procedure
⇩ < MENU > 1. MONITOR 2. MEASUREMENT 3. DATA OUTPUT 4. MEMORY CLEAR 5. UTILITY	MENU	(1) Press MENU key.
⇩	△, ▽ SET	(2) Select 3. DATA OUTPUT. Then press SET key.
⇩ < DATA OUTPUT > 1. DISPLAY 2. PRINTER 3. COMPUTER	△, ▽ SET	(3) Select 3. COMPUTER. Then press SET key.
⇩ MEMORY DATA TRANSMISSION	Ready! Start Transferring	(4) When the screen shown on the left is on the display, start (RUN) the program on your computer. To Stop Transferring: MENU key

An error message will be displayed when…

1. RS-232C cable is not connected.

2. The wiring connection of the connector is not correct.
   Referring to the example of connecting to the host computer, check the wiring connection. (See **5.2.1 Connection Example** (P.32))



Error Display

3. Data cannot be retrieved.
   Baud rate may not be set correctly.
   Confirm the baud rate of the host computer and the instrument.

Output Format of Measurement Condition ----- M Command

(1) (2) (3) (4) (5) (6)

##␣;####␣;##␣;####␣;####␣;######CRLF : 25 Characters

(1) Measurement Mode (VI: Air Velocity & Air Temperature)

(2) Calculation Mode (AVE: Average Measurement INT: Interval Measurement FLW: Flow Measurement)

(3) S-TIME (S) (Sampling Time)

(4) DATA (N) (Number of Data to be collected)

(5) POINTS (No. of samplings (partitions))

(6) Interval Measurement: INT(measurement interval)

Flow Measurement: AREA (m2) (Duct's cross section area)

* AVG Mode: dummy output

[Output Example]

(1) (2) (3) (4) (5) (6)

VT ; FLW ; 60 ; 100 ; 10 ; 1. 456CRLF

Output Format of Measurement Data ----- T Command

#####␣;######␣;######CRLF : 19 Characters

air velocity air temp dummy : (Unit: m/s, ˚C, **)

[Output Example]

23.6; 126; *** CRLF : air velocity, air temp, dummy

<Command Explanation>

Command	Function	Explanation
P	To check the number of memory pages	After the command is received, AP will be returned. Then, the number of pages stored will be output.
N*	To check the number of memory data	After the command is received, AN will be returned. Then, the number of data in the specified page (*) will be output.
M*	To check measurement condition	After the command is received, AM will be returned. Then, the measurement condition in the specified page will be output.
T*	To output measurement data	After the command is received, AT will be returned. Then, the measurement data in the specified page will be ouput.

* When page number is entered incorrectly, the error message E will be returned.

As for E1 and E3, refer to **5.2.3 To Transfer Raw Data (measurement data per second)**.

6. Main Specification

<table>
<tr><th></th><th>Specification</th></tr>
<tr><td>(1) Model Name</td><td>Main Unit: Model 6162
Probe: Model 0203 (for mid temperature)
Model 0204 (for high temperature)
Model 0205 (for high temperature)</td></tr>
<tr><td>(2) Measurement Feature</td><td>Air velocity and air temperature (simultaneous measurement)</td></tr>
<tr><td>(3) Measurement Object</td><td>Clean air under normal pressure and normal temperature</td></tr>
<tr><td>(4) Measurement Range</td><td>Air Velocity: V_0 ~ 50.0m/s
Air Temperature: 0 ~ 200 °C (MODEL 0203)
0 ~ 500 °C (MODEL 0204)
0 ~ 500 °C (MODEL 0205)
<table>
<tr><td>0 ~ 99 °C</td><td>: V_0 = 0.2 m/s</td></tr>
<tr><td>100 ~ 199 °C</td><td>: V_0 = 0.4 m/s</td></tr>
<tr><td>200 ~ 299 °C</td><td>: V_0 = 0.7 m/s</td></tr>
<tr><td>300 ~ 399 °C</td><td>: V_0 = 1.0 m/s</td></tr>
</table></td></tr>
<tr><td>(5) Measurement Accuracy
(Normal Temp. Accuracy:
18~28 °C)</td><td>
<table>
<tr><th></th><th>Measurement Range</th><th>Specified Accuracy</th><th>Display Resolution</th></tr>
<tr><td rowspan="4">Air Velocity</td><td>V_0 ~ 4.99 m/s</td><td rowspan="4">±3%FS</td><td>0.01 m/s</td></tr>
<tr><td>5.00 ~ 9.99 m/s</td><td rowspan="3">0.1 m/s</td></tr>
<tr><td>10.0 ~ 24.9 m/s</td></tr>
<tr><td>25.0 ~ 50.0 m/s</td></tr>
<tr><td rowspan="3">Air Temp.</td><td>0 ~ 99.9 °C</td><td rowspan="3">±1%±1°C of reading</td><td>0.2 °C</td></tr>
<tr><td>100 ~ 199 °C</td><td rowspan="2">1 °C</td></tr>
<tr><td>200 ~ 500 °C (0204/0205)</td></tr>
</table>
</td></tr>
<tr><td>(6) Temperature
Compensation Accuracy
(Air Velocity)</td><td>
<table>
<tr><th>Temp. / Velocity</th><th>MODEL 0203
0 ~ 200 °C</th><th>MODEL 0204/0205
0 ~ 400 °C</th></tr>
<tr><td>V_0 ~ 4.99 m/s</td><td>±10%FS</td><td>±15%FS</td></tr>
<tr><td>5.00 ~ 9.99 m/s</td><td rowspan="3">±6%FS</td><td rowspan="3">±10%FS</td></tr>
<tr><td>10.0 ~ 24.9 m/s</td></tr>
<tr><td>25.0 ~ 50.0 m/s</td></tr>
</table>
</td></tr>
<tr><td>(7) Heat Resistance of Cable</td><td>Teflon Coated (probe side): 200 °C
Vinyl Code (connection cable): 80 °C</td></tr>
<tr><td>(8) Response</td><td>Air Velocity: 4 sec (90% response at air velocity of 5 m/s)
Air Temperature: 5 sec (90% response at air velocity of 5 m/s)</td></tr>
<tr><td>(9) Display Screen</td><td>Graphic LCD (120×64dot):
displaying velocity and temperature simultaneously
w/t backlight and brightness adjustment functions</td></tr>
<tr><td>(10)Memory Capacity</td><td>Max 999 data (when measuring in one page)</td></tr>
<tr><td>(11)Input & Output Terminal</td><td>Remote Terminal: START/STOP function
Analog output Terminal: simultaneous velocity & temp. output
output voltage 0 ~ 1V (Output Impedance: 47Ω)
(Output Accuracy: 0.5%FS)
Digital Output Terminal: RS-232C (serial)</td></tr>
</table>

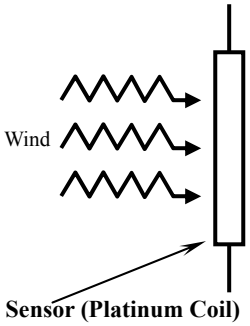
<table>
<tr><th></th><th>General Specification</th></tr>
<tr><td>(12)Power Source
Power Supply Voltage

Power Consumption</td><td>
DC 9V (2A)
Dry Cell: six (6) size C batteries (Alkaline Cell, Manganese Cell)
AC Adapter: (100 ~ 240VAC 50 ~ 60Hz /0.2A)
Max 5.6 VA</td></tr>
<tr><td>(13)Battery Life</td><td>Approx. 8 hours (When the instrument is used consecutively with the backlight off with Alkaline cell at the velocity of 5m/s)</td></tr>
<tr><td>(14)Backup Battery</td><td>Battery Life: Approx. 3 months ····· data and clock backup
(This battery life is for the case where the instrument is not used at all for 3 months. As NiCd battery is used for a backup battery, it is charged every time it is used.)</td></tr>
<tr><td>(15)Environment Condition
(main unit)
Performance Assurance Temp Range
Storage Temperature Range</td><td>

5 ~ 40 °C
-10 ~ 50 °C</td></tr>
<tr><td>(16)Dimension (main unit)</td><td>220 (W) × 85 (D) × 150 (H) mm</td></tr>
<tr><td>(17)Dimension (probe)</td><td>
<table>
<tr><td>Model</td><td>0203</td><td>0204</td><td>0205</td></tr>
<tr><td>Config</td><td>φ11 × 208</td><td>φ14 × 1000</td><td>φ14 × 500</td></tr>
<tr><td>ration</td><td>Teflon coated cable</td><td>Teflon coated cable</td><td>Teflon coated cable</td></tr>
<tr><td>Cable</td><td>1.5m</td><td>2.3m</td><td>2.3m</td></tr>
</table>
</td></tr>
<tr><td>(18)Weight</td><td>Main unit: Approx. 1.8 Kg (inc. dry cell)
Probe: MODEL 0203 Approx. 200 g
MODEL 0204 Approx. 500 g
MODEL 0205 Approx. 300 g</td></tr>
<tr><td>(19)Accessories</td><td>
<table>
<tr><th>Main Unit (MODEL 6162)</th><th>(Qty)</th></tr>
<tr><td>Shoulder Belt</td><td>1</td></tr>
<tr><td>Dry Cell (sizes C Alkaline batteries)</td><td>6</td></tr>
<tr><td>AC Adaptor (DC 9V, 660mA)</td><td>1</td></tr>
<tr><td>Output Cable (alligator clip for analog output)</td><td>2</td></tr>
<tr><td>Operation Manual</td><td>1</td></tr>
</table>
<table>
<tr><th>Probe for Mid Temperature (MODEL 0203)</th><th>(Qty)</th></tr>
<tr><td>Probe Board</td><td>1</td></tr>
<tr><td>Storage Case for Probe</td><td>1</td></tr>
<tr><td>Connection Cable (Vinyl: Approx. 5m)</td><td>1</td></tr>
</table>
<table>
<tr><th>Probe for High Temperature (MODEL 0204/0205)</th><th>(Qty)</th></tr>
<tr><td>Probe Board</td><td>1</td></tr>
<tr><td>Storage Case for Probe</td><td>1</td></tr>
<tr><td>Connection Cable (Vinyl: Approx. 10m)</td><td>1</td></tr>
<tr><td>Reagent Bottle, Beaker, Bamboo Brush</td><td>1 each</td></tr>
</table>
</td></tr>
</table>

7. Measurement Principle

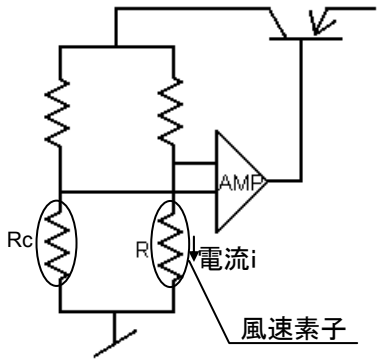
7.1 Principle of Hot-Wire Anemometer



When the heated air velocity sensor is exposed to airflow, the sensor will be cooled. As the sensor temperature changes, the residence value changes accordingly. The faster the velocity is, the greater the residence value changes. Therefore, if how air velocity is proportional to the residence value is understood, air velocity can be calculated using the measured residence value (or electric current).

Our Anemomaster uses this principle. In general, a hot-wire anemometer employs a feedback circuit to keep constant temperature in the sensor area (Constant Temperature Anemometer).

The sensor temperature is kept at constant temperature, and this will not be affected by air velocity. However, the amount of heat drawn from the sensor changes depending on air velocity. In order to compensate the drawn heat, electrical current to be applied to the sensor. Based on the amount of the electrical current (i), the air velocity can be calculated.



The amount of heat [H] that is drawn from the sensor is expressed by:

$H = \left(a + b\sqrt{U}\right)(T - Ta)$ ----- King's formula

H: Heat Dissipation T: Sensor Temperature
Ta: Air Temperature U: Air Velocity a, b: Constant

Also, the amount of heat diffusion can be expressed by the following formula;

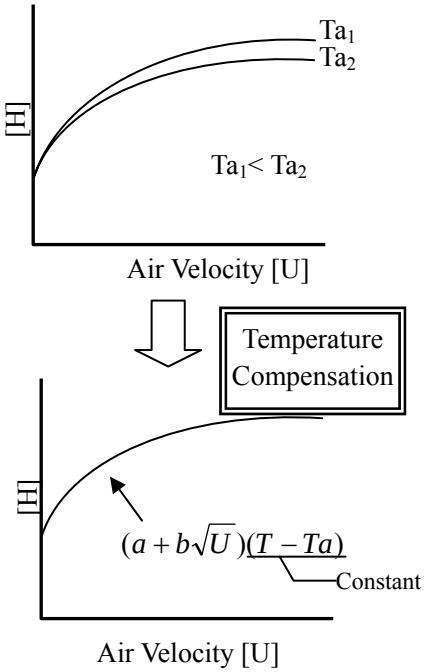
$H = RI^2$

(R is kept constant regardless of air velocity as the temperature is constant.)

Therefore, $RI^2 \quad \infty \quad a + b\sqrt{U}$

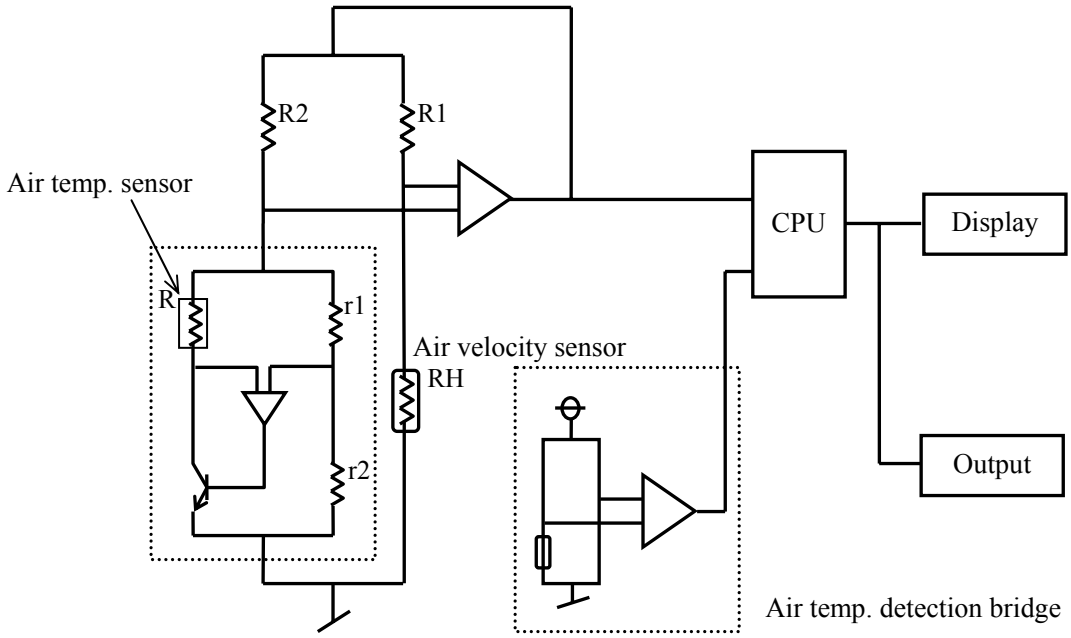
As you can see from this above formula, the change of air velocity [U] can be seen as the change of the current passed to the sensor [i].

7.2 Temperature Compensation



When the air temperature changes, the amount of heat dissipation changes accordingly even when the air velocity is constant. By providing a temperature measurement sensor Rc having the same temperature coefficient as the air velocity at the opposite side of the bridge, the constant difference between the air temperature and sensor temperature is kept.
By fixing the bridge constant as described above, the amount of heat dissipation can bear a constant relation to the air velocity regardless of the air temperature.

When implementing the temperature compensation sensor, the sensor with significant resistance value shall be used in order to avoid self-heating due to the current flow. Consequently, the sensor tends to be big. The more the sensor is big, the worse the response against the air velocity sensor becomes. Then, when the air temperature changes rapidly, it becomes difficult to compensate the temperature. Given this factor, to improve the response of Model 6261 Anemomaster, sub-bridge is being used. If feedback is provided to amplifier in order to counterbalance this sub-bridge, the combined resistance will almost be R(1+r2/r1) when this bridge is viewed as one resistance. In other words, if r2 << r1 is selected, the resistance for temperature detection (R) can be relatively small. Therefore, we managed to keep the temperature detection sensor small, which enables us to achieve the compensation with good response.



7.3 Influence by Gas Composition to be Measured

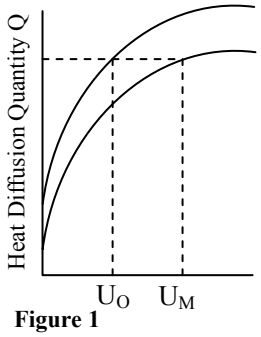


Figure 1
Changes in air velocity values

Hot-wire Anemometers indicate air velocity based on the amount of radiation heat which is the heat quantity deprived from the sensor to fluid. Depending on the fluid to be measured, the amount of radiation heat varies, and the air velocity reading, too, will be affected. Since all of the Anemomaster are calibrated in air at the normal temperature and pressure, the indicated value requires to be compensated when you measure mixed gas. Therefore, you need to know the physical property value of the mixed gas beforehand in order to compensate the air velocity of mixed gas.

Below Figure 2 shows how to obtain the heat quantity diffused by the forced convention from a cylinder (sensor).

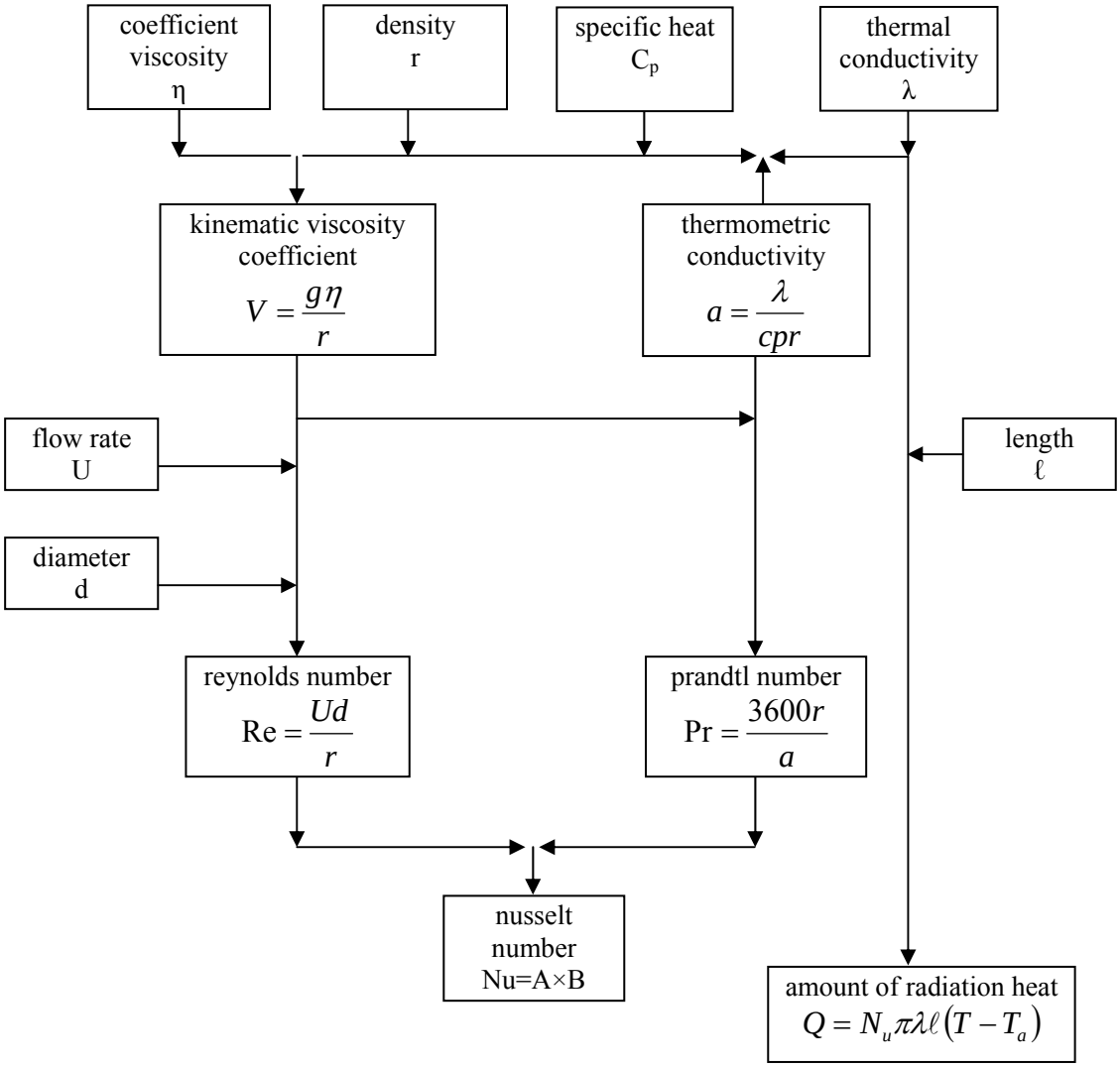


Figure 2 Heat diffusion quantity due to forced convention from a cylinder

Heat diffusion quantity can be found by;

$$Q = N_u \, \pi\lambda\ell\left(T - T_a\right) \quad \cdots\cdots \quad (1)$$

Q: Heat diffusion quantity N_u: Nussselt number π:Circle ratio λ: Thermal conductivity

L: Length of cylinder T: Heating body temp. T_a:Gaseous temperature

In order to obtain the property value of mixed gas, obtain the property value of each component. Based on the mixing ratio, the property value of the mixture can be found. For instance, the specific heat of mixture, C_p, can be found by;

$$C_p = \frac{\Sigma C_{p1} M_1 Y_1}{100M} \quad \cdots\cdots \quad (2)$$

C_p: Specific heat of mixture C_{p1}: The specific heat of each component gas

M: Molecular quantity of mixture M_1: : Molecular quantity of each component gas

Y_1: : Volume percentage of each component gas

As each property value is temperature function and Nusselt number, N_u, is function of flow velocity (U), heat diffusion quantity in the mixed gas (Q_a) can be find by obtaining the air temperature, T_a, and the reference air velocity, U_0 using the above equation (1). Given that the Q_a is equivalent to the diffusion quantity in the air, the air velocity value, U_M, can be obtained. With U_0 and U_M, the air velocity compensation table for the mixed gas can be obtained.

Below is and example graph for air velocity compensation.

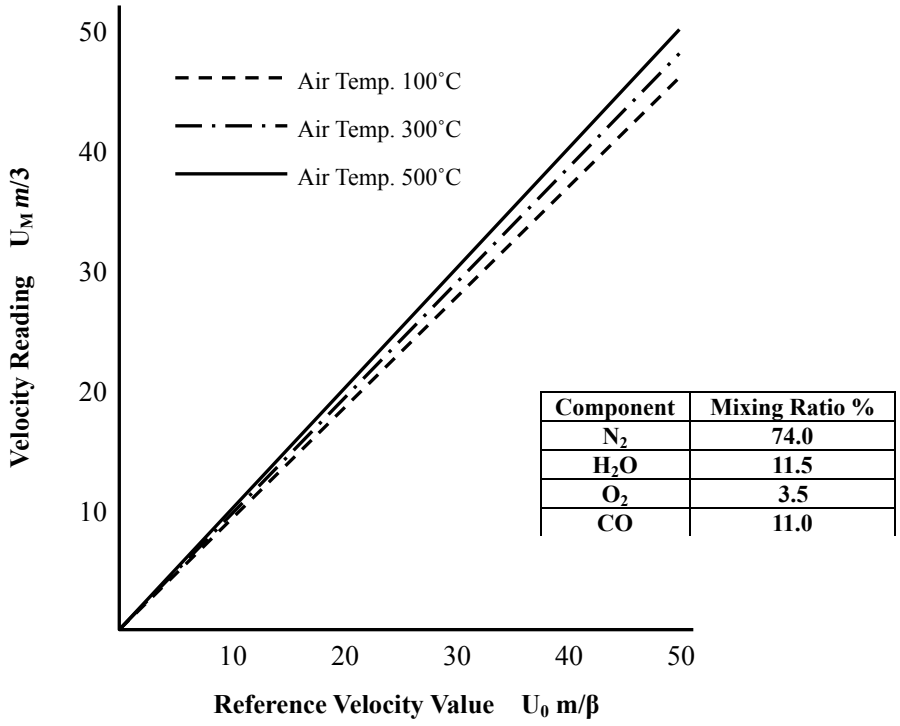


Figure 3 Example Graph for Air Velocity Compensation

8. Troubleshooting

*** Before you send the unit for repairs, please check the followings once again.**

8.1 Checking Power Source

No.	Symptom	Possible Cause / Solution	Refer to
1.	Even when your turn the power switch ON, nothing is displayed.	- The batteries may be drained. ⇒ Need new batteries.	Page 5
2.	Although batteries are used, nothing is displayed on the screen.	- The brightness adjustment has not been done properly. ⇒ Adjust the brightness by the volume.	Page 2
3.	The dry cell dies faster than the specification.	- The polarity of the batteries are not correct. ⇒ Check the batteries.	Page 5
4.	The display screen blinks.	- It shows that the batteries are drained. ⇒ Need new batteries. Press BATT key and check the remaining level of the batteries.	Page 11

8.2 Checking the Initial Operation

No.	Symptom	Possible Cause / Solution	Refer to
1.	The display screen is dark or pale.	- The brightness adjustment has not been done properly. ⇒ Adjust the brightness by the volume. Ambient temperature affects the brightness.	Page 2
2.	The backlight is not ON.	- In a bright place it is sometimes difficult to check if the backlight is ON. ⇒ RIGHT Switch ON	Page 2
3.	When the instrument is turned ON, it goes to calculation mode automatically and “ready” is displayed.	- Calculation program is set. ⇒ PROGRAM OFF	Page 21
4.	Even if I select MEASUREMENT in the menu, the calculation mode selection screen does not display. In stead measurement condition setting screen displays.	- Calculation program is set. ⇒ PROGRAM OFF	Page 21
5	“PROBE” keeps to be displayed on the screen.	- Probe is not connected. ⇒ Connect a probe.	Page 6

8.3 During a Measurement

No.	Symptom	Possible Cause / Solution	Refer to
1.	The displayed measurement value is abnormal. Ex) Air Velocity: **.* Air Temp: 0.0	- If a measurement is performed out of the spec range, "over" will be displayed on the screen. - Probe sensor may be damaged.	
2.	While measuring, the display screen starts blinking.	- The batteries are drained. ⇒ Need new batteries.	Page 11
3.	Data cannot be stored in the internal memory.	- Setting has not been configured properly. ⇒ MEMORY YES	Chapter 3
4.	The response of the reading is slow.	- Moving average deviations is selected. ⇒ FAST/SLOW key	Page 9

8.4 Analog Output

No.	Symptom	Possible Cause / Solution	Refer to
1.	No output.	- Output only on the initial screen or when measuring in the measurement mode? - The screen is on hold.	Page 30
2.	The output value is wrong.	- The output range is wrong.	

8.5 Digital Output

No.	Symptom	Possible Cause / Solution	Refer to
1.	DEVICE ERROR is displayed.	- The cable's wire connection is not correct.	Page 34
2.	Data cannot be collected.	- The host computer's setting is not properly configured. - Baud rate setting is not correct.	Page 32
3.	Data is wrong.	- Output format is not correct.	Page 33, 35

8.6 Printer

No.	Symptom	Possible Cause / Solution	Refer to
1.	The printer turns OFF while printing.	- The printer's NiCd battery is drained.	
2.	Cannot take a hardcopy of the screen.	- The screen may not be on hold. ⇒ Put the screen on hold. - You may be trying to take a hardcopy while measuring. ⇒ After the calculation, try again.	Page 13 Chapter 4
3.	There is not print output after calculation.	- Setting has not been configured properly. ⇒ PRINT YES	Chapter 4

9. Warranty and After-sales Service

KANOMAX Limited Warranty

The limited warranty set below is given by KANOMAX with respect to the KANOMAX brand Anemomaster Model 6162, its attachment parts including Probe and other accessories (hereafter referred to as “PRODUCT”) that you have purchased. PRODUCT you have purchased shall be the only one that the limited warranty stated herein applies to.

Your PRODUCT, when delivered to you in new condition in its original container, is warranted against defects in materials or workmanship as follows: for a period of one (1) year from the date of original purchase, defective parts or a defective PRODUCT returned to your sales representative, as applicable, and proven to be defective upon inspection, will be exchanged for a new or comparable rebuilt parts, or a refurbished PRODUCT as determined by your sales representative. Warranty for such replacements shall not extend the original warranty period of the defective PRODUCT.

This limited warranty covers all defects encountered in normal use of the PRODUCT, and does not apply to the following cases:

(1) Use of parts or supplies other than the PRODUCT sold by your sales representative, which cause damage to the PRODUCT or cause abnormally frequent service calls or service problems.

(2) If any PRODUCT has its serial number or date altered or removed.

(3) Loss of damage to the PRODUCT due to abuse, mishandling, improper packaging by the owner, alteration, accident, electrical current fluctuations, failure to follow operating, maintenance or environmental instructions prescribed in the PRODUCT's instruction manual provided by KANOMAX, or service performed by other than KANOMAX.

NO IMPLIED WARRANTY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, APPLIES TO THE PRODUCT AFTER THE APPLICABLE PERIOD OF THE EXPRESS LIMITED WARRANTY STATED ABOVE, AND NO OTHER EXPRESS WARRANTY OR GUARANTY, EXCEPT AS MENTIONED ABOVE, GIVEN BY ANY PERSON OR ENTITY WITH RESPECT TO THE PRODUCT SHALL BIND KANOMAX. KANOMAX SHALL NOT BE LIABLE FOR LOSS OF STORAGE CHARGES, LOSS OR CORRUPTION OF DATA, OR ANY OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES CAUSED BY THE USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT, REGARDLESS OF THE LEGAL THEORY ON WHICH THE CLAIM IS BASED, AND EVEN IF KANOMAX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL RECOVERY OF ANY KIND AGAINST KANOMAX BE GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE PRODUCT SOLD BY KANOMAX AND CAUSING THE ALLEGED DAMAGE. WITHOUT LIMITING THE FOREGOING, THE OWNER ASSUMES ALL RISK AND LIABILITY FOR LOSS, DAMAGE OF, OR INJURY TO THE OWNER AND THE OWNER'S PROPERTY AND TO OTHERS AND THEIR PROPERTY ARISING OUT OF USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT NOT CAUSED DIRECTLY BY THE NEGLIGENCE OF KANOMAX. THIS LIMITED WARRANTY SHALL NOT EXTEND TO ANYONE OTHER THAN THE ORIGINAL PURCHASER OF THE PRODUCT, OR THE PERSON FOR WHOM IT WAS PURCHASED AS A GIFT, AND STATES THE PURCHASER'S EXCLUSIVE REMEDY.

After-sales Service

If the PRODUCT is malfunctioning, please check with “Troubleshooting” to find possible cause first.

Repair parts are retained for a minimum period of five (5) years after production cessation of the PRODUCT. This storage period of repair parts is considered as the period during which KANOMAX can provide repair service.

For more information, please contact your sales representative. When you make a call, please have the following information of your PRODUCT at hand:

(1) PRODUCT name;
(2) Model number;
(3) Serial number;
(4) Probe number;
(5) Description of Symptom, and;
(6) Date of purchase

10. Contact Information

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