VAISALA

Operating Manual

HMI 36 & HMI 36A
Humidity Data Processor

EDITION HMI36-00259-2.2

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This manual is valid for programme version 2.02.

1 GENERAL

The microprocessor-based HMI 36 Humidity Data Processor is a light, portable instrument whose optional carrying case and in-built rechargeable battery make it suitable also for spot checking measurements or for use as a transfer standard.

The HMI 36 is used together with Vaisala's probes to measure relative humidity and temperature quickly and accurately. Up to four probes can be connected to each HMI 36; the probes can be Vaisala's HMP 35B or HMP 36B humidity and temperature probes or a psychrometer. When a psychrometer is used, it measures the ambient wet temperature. The HMI 36 also calculates dewpoint, mixing ratio and absolute humidity from the relative humidity and temperature it has measured.

The HMI 36 Humidity Data Processor is used through the menu-based display. The user can select one quantity to be displayed from all probes, all quantities from one probe, one at a time, or any desired combination of probe/quantity. One can also choose between metric (°C, g/m^3, g/kg) and non-metric (°F, grains/ft^3, grains/lb) units.

Output modes are flexible: measured or calculated quantities can be displayed on the front display of the HMI 36 or they can be taken to a computer or printer through one of the two available serial buses. The HMI 36 is equipped with both RS 232 C and RS 485 serial bus. The printing can be continuous or the results can be output at preset times or when ENTER is pressed. Computer can also request for measurement results from the HMI 36 through the serial bus. Because the HMI 36 units are addressable, there can be several units on the same line when RS 485 serial bus is in use.

The HMI 36 can also be used as a data logger which can store up to 2800 readings. The user can choose the logging interval, starting time and length of the logging and from which probe the measurements are stored. The data logging can also be started through the keypad, or when the readings from probe 1 reach a preset level of relative humidity, temperature or dewpoint temperature. The HMI 36 stores the measured relative humidity and temperature values and when the stored data is transferred to a computer or printer through the serial bus, it calculates the other three quantities - dewpoint temperature, mixing ration and absolute humidity - from them.

When HMP 36B probe is used, the composite sensor in the probe can be calibrated using a software function of the HMI 36. This automatic humidity calibration requires no salt solutions or other calibration equipment. Temperature calibration of the probes at one or two points can also be performed through the keypad.

The HMI 36 is powered with DC voltage, but using an AC adapter it can be powered from the mains. The HMI 36A version has an in-built battery and charger.

2 DISPLAY MODES

The HMI 36 can display measurement results on the local LCD display in three different ways. These are quantity display, probe display and mixed display. The display modes can be changed according to the instructions in chapter 9.2.

2.1 Quantity Display

In quantity display the measurement results are displayed from all probes one quantity at a time:

RELAT. HUMIDITY %RH

P1: 90.2 P2: 90.9
P3: 89.9 P4:

In the example the HMI 36 has probes in the first, second and third probe locations; the measured quantity is relative humidity. When the down arrow is pressed, the results for the following quantity are displayed; correspondingly, arrow up brings the previous quantity to display. The quantities are: relative humidity, temperature, dewpoint, mixing ratio and absolute humidity.

2.2 Probe Display

In probe display four measurement results are displayed one probe at a time, for example:

P1: RH= 24.3 %
P1: t= 25.2 °C
P1: Td= 3.4 °C
P1: x= 4.85 g/kg

In the example the measurement results from probe one have been selected to display. If all four probes have been connected to the HMI 36, up to 20 results can be displayed (4 probes x 5 quantities). The following results can be brought to display one at a time by pressing down arrow, for example:

P1: t= 25.2 °C
P1: Td= 3.4 °C
P1: x= 4.85 g/kg
P1: a= 5.66 g/m3

2.3 Mixed Display

The mixed display looks the same as the probe display; the only difference is the maximum number of measurements that can be displayed. In mixed display this maximum number is 12. The user can select freely the probe and the quantity to be displayed on the first line (measurement result 1), and the probe and quantity to be displayed on the second line, etc., up to the 12th measurement result. It is not necessary, however, to define all 12 measurement results into the Humidity Data Processor.

P1: RH= 20.3 %
P1: Td= 3.6 °C
P2: RH= 21.0 %
P3: x= 4.85g/kg

In the example the first measurement result is selected as relative humidity from probe 1, as the second dewpoint from probe 1, etc. The selection procedure is described in chapter 9.2. The following or previous four lines can be scrolled to the display with up and down arrows.

3 CALCULATION

The HMI 36 measures relative humidity and temperature. From these values it calculates dewpoint, mixing ratio and absolute humidity using the following formulas:

(1) $dp = Tn/\{m/\log[P_w \cdot \%RH/(100 \cdot A)] - 1\}$

(2) $x = 621.98 \cdot \%RH \cdot P_w/(100 \cdot p - \%RH \times P_w)$

(3) $a = 216.68 \cdot \%RH \cdot P_w/[100 \cdot (t + 273.2)]$

where
- dp = dewpoint (°C)
- P_w = partial pressure of saturated water vapour (mbar)
- %RH = relative humidity
- x = mixing ratio (g/kg)
- p = pressure (mbar)
- a = absolute humidity (g/m3)
- t = temperature (°C)

The partial pressure of saturated water vapour is reached through

$$P_w = A \times 10^{[m \cdot t/(t + Tn)]}$$

The values of A, m and Tn depend on the temperature:

t	A	m	Tn
-40 ... 50 C	6.1078	7.5	237.3
50 ... 100 C	5.9987	7.3313	229.1
100 ... 150 C	5.8493	7.2756	225.0
150 ... 160 C	6.2301	7.3033	230.0

Dewpoint, mixing ratio and absolute humidity are calculated using either metric (%RH, °C, g/kg, g/m3) or non-metric units (%RH, °F, grains/ lb, grains/ft3). The desired units can be chosen as described in chapter 9.7.1. The air pressure required in the calculation of mixing ratio can be entered through the keypad as described in chapter 9.7.3.

3.1 Psychrometer calculation

The measurement results of a psychrometer probe are calculated with the following equations:

(4) $P_{wdry} = A \cdot 10^{[m \cdot Tdry/(Tdry + Tn)]}$

(5) $P_{wwet} = A \cdot 10^{[m \cdot Twet/(Twet + Tn)]}$

(6) $RH = [P_{wwet} - \text{psychrometer constant} \cdot \text{pressure} \cdot (T_{dry} T_{wet})] / P_{wdry} \cdot 100$

in which

P_{wdry} = water vapour saturation pressure equivalent to dry temperature

P_{wwet} = water vapour saturation pressure equivalent to wet temperature

T_{dry} = dry temperature °C

T_{wet} = wet temperature °C

psychrometer constant = 0.000662

Dewpoint temperature, mixing ratio and absolute humidity are calculated from relative humidity and temperature using formulas (1), (2) and (3). The psychrometer equation is true only when the wet bulb is not frozen.

4 OUTPUT MODES ON THE SERIAL BUS

The HMI 36 can be connected to peripherals, such as printers and computers, through the serial bus. It can output the measurement results on the serial bus in different modes; how to select the mode is described in chapter 9.5.

4.1 Printer Output

The printer output mode is suitable for a terminal or a printer. The HMI 36 outputs measurement results from those probe locations which have been initialized. This initialization is described in chapter 9.1. An example of output:

TIME: 00/02:00:34

PROBE 1:

RH= 25.5 % t= 24.9 C Td= 3.9 C x= 4.95 g/kg a= 5.81 g/m3

PROBE 2:

RH= 25.5 % t= 24.9 C Td= 3.9 C x= 4.95 g/kg a= 5.81 g/m3

In the example probes have been initialized in probe locations 1 and 2. The HMI 36 shows how long has passed since it was switched on. The HMI 36A model features a real-time clock; if it has been set to time, the output shows the correct time. Setting of the real-time clock is described in chapter 9.6.

In printer output mode measurement results can be output continuously, at selected intervals or when ENT key is pressed at the front keypad. These choices are described in chapter 9.5.

The printer connected to the HMI 36 must be fast enough or buffered, so that it can print characters at the same rate the HMI 36 sends them. The Processor sends characters more slowly, if the serial bus speed is decreased. The lowest speed is 300 baud which means approximately 30 characters/second. Setting of the baud rate is described in chapter 9.4.

4.2 Computer Output Mode

The computer output mode has a form which computers can easily accept. As in printer output mode, the HMI 36 outputs measurement results only from initialized probe locations. The initialization is described in chapter 9.1. An example of output:

TIME: 1990-06-15/10:06:39<cr><lf>
P1Q1= 34.5 P1Q2= 23.6 P1Q3= 7.1 P1Q4= 6.24 P1Q5= 7.34 <cr><lf>
P2Q1= 34.7 P2Q2= 23.8 P2Q3= 7.3 P2Q4= 6.25 P2Q5= 7.31 <cr><lf>

P indicates probe location number and Q quantity:

Q1 = relative humidity
Q2 = temperature
Q3 = dewpoint
Q4 = mixing ratio
Q5 = absolute humidity

The results are output in either metric or non-metric units according to the settings of the programme.

In the example probes have been initialized in probe locations 1 and 2. The HMI 36 shows how long has passed since it was switched on. The HMI 36A model features a real-time clock; if it has been set to time, the output shows the correct time. Setting of the real-time clock is described in chapter 9.6. In computer output mode the HMI 36 outputs measurement results continuously.

4.3 Inquiry Output Mode

In the inquiry output mode the HMI 36 does not output any measurement results unless it is requested to send them. Because every HMI 36 is addressable, several HMI 36 Humidity Data Processors can be connected to the same RS 485 serial bus. Then all HMI 36 units must be set in the inquiry mode. Selecting the inquiry output mode and setting the address of HMI 36 are described in chapter 9.5.

In the inquiry output mode all measurement results can be inquired with command:

A01/MEAS<cr>

where 01 is the address of the HMI 36 (1 ... 99). The answer is sent in the computer output mode (see chapter 4.2). All the commands can be given in either upper or lower case.

Single measurement results can also be inquired with command:

A01/PxQy<cr>

where x is the probe location number (1 ... 4) and y quantity number (1 ... 5).

Q1 = relative humidity
Q2 = temperature
Q3 = dewpoint
Q4 = mixing ratio
Q5 = absolute humidity

So if you want the measurement results of relative humidity from the first probe, the command is:

A01/P1Q1<cr>

The answer is given in the following format:

P1Q1=34.6<cr><lf>

logging starts when the reading from the probe goes below or rises above the set value.

Figures 1 and 2 show how the logging by limit works. In Figure 1 the logging starts when the set limit for the desired quantity is exceeded. The data logging continues until the measurement value decreases below the triggering limit minus hysteresis. The hysteresis value is 2 °C for temperature and dewpoint temperature and 5 %RH for relative humidity. If the triggering limit is exceeded again, the data logging starts again. Every new start begins a new data logging record. The data logging can be ended by deactivating the logging by limit (see chapter 9.3.3).

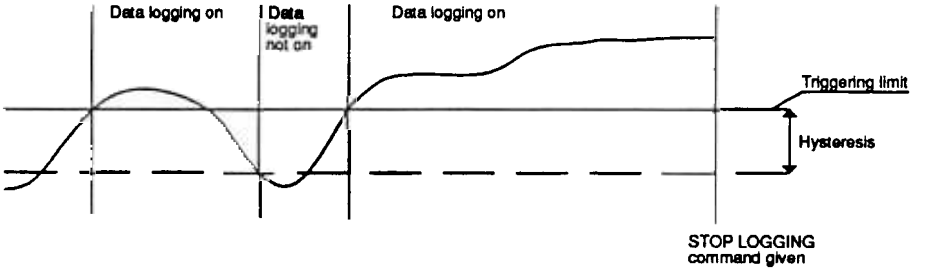

Fig. 1 Logging by limit: exceeding the triggering limit

In Figure 2 the logging starts when measurement value goes below the set limit. The data logging continues until the measurement value increases above the triggering limit plus hysteresis.

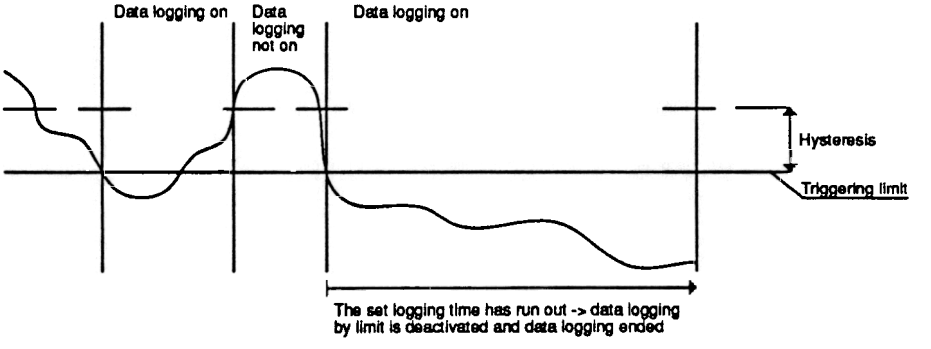

Fig. 2 Logging by limit: going below the triggering limit

5 DATA LOGGING

If the equipment is of type HMI 36A, it can be used as a data logger. The memory can hold approx. 2800 readings. The Data Processor stores only relative humidity and temperature readings from every logged probe at the selected logging time; when the logged data is transferred through the serial bus the other three humidity quantities (dewpoint temperature, mixing ratio and absolute humidity) are calculated from them.

The real time when the logging is started and the logging interval are stored in memory as the data logging begins. From this information precise measurement times for each logging can be determined during the data transfer. The pressure value required in calculating mixing ratio is also stored only at the beginning of data logging. In other words, the pressure value and real-time clock have to be set or changed before the logging is started and not during it. This and the fact that only two quantities are stored has made it possible to fit more measurements in the data logging memory than otherwise would have been possible.

Data logging can be started either through the keypad or by setting a starting time for the logging (see chapter 9.3.1.2). The data logging can be ended either through the keypad or by setting the length of the logging before starting it (see chapter 9.3.1.3). Before starting the data logging you should also specify the probes to be logged (chapter 9.3.1.1) and the logging interval (see chapter 9.3.1.4).

The HMI 36 can perform several data loggings before there is any need for reading the measurements from the memory. When the data logging results are read from the HMI 36, the Humidity Data Processor always transfers the entire contents of the logging memory to the serial bus (until the end sign).

The HMI 36 can be asked if the logging memory is sufficient for storing a data logging with that particular logging interval and number of logged probes. If there is not enough room in the logging memory, the old information must be removed from the memory (deleting logged data, see chapter 9.3.6).

The logging can also be set to start when some relative humidity, temperature or dewpoint value from probe location 1 is reached; this is possible only if LOGGING BY LIMIT has been activated (see chapter 9.3.7). The quantity and the value of the quantity that starts the logging can be set by the user; he can also select whether the

If the data logging time has been set, the data logging can end and the logging by limit can be deactivated when the set data logging time runs out. This happens when one single data logging lasts longer than the set data logging time.

If a power failure occurs during the data logging, the logging continues normally after the power failure ends.

The data logging information can be transferred through serial bus to a PC or printer. If the settings are not changed, the data is transferred in computer output mode; it can, however, be transferred in printer output mode (see chapter 9.3.4). Examples of the two output modes are given in Appendix 1. The HMI 36 always transfers the entire contents of the data logging memory up to the end sign; this way many independent data logging records can be transferred at one go. The end sign is 24H ($).

If some error has occurred during the data logging, an error message is sent on the serial bus (or shown on the display) during the data transfer. If, for example, a power failure has occurred during the data logging, a message is output on the serial bus: THERE HAS BEEN POWER DOWN DURING DATA LOGGING! This type of message is output before the data logging time information, between two logging results.

6 PSYCHROMETER

If the user wants to use a psychrometer, it can also be connected to the HMI 36. A psychrometer measures the wet and dry bulb temperatures of the air; from these temperatures it is possible to calculate the different parameters indicating the water content of the air. These calculations are presented in chapter 3.1. Vaisala, however, does not market any psychrometers.

The Humidity Data Processor has to be informed in which probe location the psychrometer is (see chapter 9.1). The psychrometer measures only wet temperature; dry temperature as well as the pressure used in psychrometer calculation must be given through the keypad (see chapters 9.7.2 and 9.7.3). From the wet temperature and dry temperature the HMI 36 calculates relative humidity, dew-point temperature, mixing ratio and absolute humidity using the formulas given in chapter 3. The HMI 36 does not store the dry temperature value, so after a power failure the dry temperature must be entered through the keypad again.

7 AUTOMATIC CALIBRATION OF THE HUMICAP® SENSOR

The automatic humidity calibration is a function with which the effects of time and environment on the humidity sensor can be cancelled and the accuracy of the sensor restored to its original level. This way the measurements remain more accurate. Nevertheless, the probe must be calibrated using salt solutions at least once a year.

The automatic humidity calibration is very easy to do; it can be performed by giving the command 9. AUTOMATIC HUMIDITY CALIBRATION in the Main Menu of the HMI 36's programme. The calibration takes approximately 2 minutes; during this time the sensor heats up somewhat and so it must be allowed to cool before any measurements are made with it. The HMI 36 must be connected to mains power during the calibration.

In demanding conditions, such as high humidities, the automatic calibration should be performed weekly; in normal conditions once a month is sufficient.

8 TAKING THE HMI 36 HUMIDITY DATA PROCESSOR INTO USE

When the HMI 36 is taken into use for the first time, the factory setting is one HMP 35B probe connected to probe location 1 and no probe in other locations. If this is not true, the HMI 36 must be initialized. During initialization the Humidity Data Processor will be informed which probe locations have probes connected to them. The initialization of probe locations is described in chapter 9.1.

If the instrument is to be used as a data logger (option), the real-time clock must be set to time. Setting the real-time clock is described in chapter 9.6.

In order to be able to calculate mixing ratio accurately, the HMI 36 needs to be given the ambient air pressure; this is done via the keypad. This setting is described in chapter 9.7.3.

The battery in HMI 36A version has been charged at the factory. If the Humidity Data Processor is not used, the battery should nevertheless be charged for one day every three months.

9 USER INTERFACE

When the MENU key is pressed (key 1), the following Main Menu is displayed:

MAIN MENU: (0=RUN)
1. INITIALIZATION
2. SET DISPLAY MODE
3. DATA LOGGING
4. SERIAL INTERFACE
5. OUTPUT MODE
6. SET REAL TIME
7. CALCULATION SETUPS
8. TEMPERATURE CALIBRATION
9. AUTOMATIC HUMIDITY CALIBRATION

The screen can display four lines of the menu at a time. The header of the menu stays on the display even when the menu is scanned. When there is a letter C in the lower right-hand corner of the display, the menu continues; by pressing up or down arrow keys the following three lines or the previous ones can be displayed.

A submenu is chosen by pressing the corresponding number key. A parameter or function can be selected by pressing the number in front of it or, when there is no number, by selecting the parameter or function with up and down arrows and then entering the selection with ENT key. When arrow keys are used, an arrow will also appear on the display to indicate the choices. The arrow can also indicate a factory setting or some previously made selection; if it is the right choice, it can be acknowledged with ENT.

When a wrong key is pressed, it can be canceled by pressing the CL key. CL key also takes the user back to the previous menu.

When the Main Menu is exited with key 0, the HMI 36 proceeds with displaying measurement results.

9.1 Initializing the Probe Locations

Choosing 1. INITIALIZATION in the Main Menu takes the user to initializing the probe locations. The following menu is displayed:

```
INITIALIZATION OF
PROBE TYPES:
PROBE 1: → PSYCHRO
PROBE 2:    HMP 36B
PROBE 3:    HMP 35B
PROBE 4:    NONE
```

The display shows the first four lines. In the example above, probe location 1 has a psychrometer, location 2 a HMP 36B and location 3 a HMP 35B; the fourth probe location has no probe.

The up and down arrow keys select the desired probe type: HMP 35B, HMP 36B, psychrometer or no probe. When the setting is correct, it is acknowledged by pressing ENT and the arrow will then move to probe location 2. When probe location 2 has the correct settings, the display will move upwards and show probe locations 3 and 4. If the settings for some particular probe locations are not changed, the existing information can be acknowledged by pressing ENT. When all the probe locations have been set, the HMI 36 returns to the Main Menu.

9.2 Selecting the Display Mode of Measurement Results

The measurement results can be displayed in three different ways; these are probe display, quantity display and mixed display. The HMI 36 can display all results from the probes one probe at a time or one quantity at a time from all probes or any combination of probe/quantity. These have been described in chapter 2. The submenu for display mode selection is reached by pressing 2. SET DISPLAY MODE in the Main Menu. The following menu will be displayed:

```
SET DISPLAY MODE:
  1.PROBE  →  2.QUANTITY
  3.MIXED     4.SERVICE
```

If you want to change the display mode, press the corresponding number. If the mode does not need to be changed, ENT will take the programme back to the Main Menu. 4.SERVICE is for Vaisala's maintenance personnel's use only! If option 1 or 2 is selected, the programme returns to the Main Menu. If option 3 (mixed display) is chosen, the following prompt is displayed:

CHANGE SETTINGS:
1. NO
2. YES

If the settings of the mixed display are correct, the answer is 1, and the programme reverts to the Main Menu. If the factory settings are used, the first display shows relative humidity, temperature, dewpoint and mixing ratio from the first probe location, the second display the same quantities from the second probe location, and so on. If the settings must be changed, answer 2. YES. Then the following Probe Menu will appear on the screen:

PROBE:
1. PROBE1 2. PROBE2
3. PROBE3 4. PROBE4
5. END

First you select the probe whose results will be displayed on the first line of the HMI 36 display. When 1 ... 4 has been entered, the Quantity Menu appears:

QUANTITY:
1. REL. HUMIDITY
2. TEMPERATURE
3. DEWPOINT
4. MIXING RATIO
5. ABS. HUMIDITY

Here the programme is asking for the quantity to be displayed on the first line. When the choice has been made, the HMI 36 returns to the Probe Menu. The probe whose results will be displayed on the second line of the display is selected and then the quantity to be displayed on that line, etc. The maximum number of selections is 12;

when all the selections have been made, the programme shows the message END OF SELECTION and reverts back to the Main Menu. Before reaching the maximum, the selection can be ended by choosing 5. END in the Probe Menu which will take the programme back to the Main Menu.

9.3 Data Logging

The HMI 36A version of the Humidity Data Processor can be used as a data logger. When 3. DATA LOGGING is chosen in the Main Menu, the Data Logging Menu appears on the display:

DATA LOGGING:
1. SET LOGGING PARAMETERS
2. START LOGGING
3. STOP LOGGING
4. TRANSFER LOGGED DATA
5. MAX LOGGING TIME
6. DELETE LOGGED DATA
7. LOGGING BY LIMIT
8. STATUS OF LOGGING
0. EXIT

Return to the Main Menu is through command 0. EXIT.

9.3.1 Data Logging Parameters

For the Humidity Data Processor to perform the data logging, it must be given the desired logging parameters; at the least the logged probes and logging interval must be set. The factory setting is logging at probe 1 at an interval of 1 minute.

The logging parameters can be set by choosing 1. SET LOGGING PARAMETERS in the Data Logging Menu. The Logging Parameters Menu will then appear:

```
LOGGING PARAMETERS:
PROBES: 1 2
START TIME:
NOT SET
LOGGING TIME:
NOT SET
LOGGING INTERVAL:
1min:0s
CHANGE:  1. NO
         2. YES
```

In the example probes one and two have been selected to be logged at one minute intervals. The starting time for the logging or its length have not been set. If these logging parameters are as they should, choosing 1. NO will return the programme to the Data Logging Menu. If the logging parameters need changing, select 2. YES; the Change Parameters Menu will then be displayed:

```
CHANGE PARAMETERS:
1. SELECT PROBES
2. START TIME
3. LOGGING TIME
4. LOGGING INTERVAL
0. EXIT
```

When all data logging parameters have been set, choose 0. EXIT to return to the Data Logging Menu.

9.3.1.1 Logged Probes

When the setting of the probes to be logged must be altered, choose 1. SELECT PROBES in the Change Parameters Menu; this takes the programme to the Probe Selection Menu:

```
PROBE SELECTION:
   1. PROBE1    2. PROBE2
   3. PROBE3    4. PROBE4
   5. END
```

Choose the probe locations from which measurements are to be logged. A psychrometer can not be logged. When a number is pressed, an arrow appears in front of the probe to show that it has been selected. When all the desired probes have been chosen, end the selection with 5. END which returns the display to the Change Parameters Menu.

9.3.1.2 Start Time for Logging

If the logging is not started through the keypad, it can be began with the help of the real-time clock. This entails that the real-time clock must be set to the right time (see chapter 9.6) and the logging start time has been set. To set the logging start time choose 2. START TIME in the Change Parameters Menu:

SET START TIME
SET MONTHS:
SET DAYS:
SET HOURS:
SET MINUTES:

The logging start time can be set to the minute. Give the month, day, hour and minute using the number keys and acknowledge them with ENT. The cursor shows which value is being set. When all the settings have been made, the programme goes back to the Change Parameters Menu.

If the starting time for data logging needs to be removed, the months, days, hours and minutes must be set to zero.

9.3.1.3 Logging Time

If the logging is not ended through the keypad, the length of the logging time can be set: the logging ends automatically when the set time has run out. The time can be set by choosing 3. LOGGING TIME in the Change Parameters Menu. The Set Logging Time Menu is displayed:

SET LOGGING TIME
SET DAYS:
SET HOURS:
SET MINUTES:

The logging time can be set to the minute; when it has been set, the programme goes back to the Change Parameters Menu. If the set logging time needs to be removed, the days, hours and minutes must be set to zero.

9.3.1.4 Logging Interval

The logging interval can be set by choosing 4. LOGGING INTERVAL in the Change Parameters Menu. The following menu is displayed:

SET LOGGING INTERVAL
SET HOURS:
SET MINUTES:
SET SECONDS:

The programme goes back to the Change Parameters Menu when the logging interval has been set.

When all logging parameters have been set, choose 0. EXIT to go to the Data Logging Menu.

9.3.2 Starting the Data Logging

Before the data logging can be started data logging parameters must be set (see chapter 9.3.1). The data logging can be started either by selecting 2. START LOGGING in the Data Logging Menu or utilizing the real-time clock of the Data Processor. Then the starting time for data logging must be set (see chapter 9.3.1.2). When 2. START LOGGING has been selected in the Data Logging Menu, the following is displayed:

PRESS ENT TO START
DATA LOGGING!
(otherwise CL)

Pressing ENT will begin the data logging.

When the data logging is started using the real-time clock, the following message appears on the display:

DATA LOGGING
STARTED!
(press ENT)

Before the data logging is started, you can check for how long the logging memory is sufficient with the chosen logging parameters by selecting 5. MAX LOGGING TIME in the Data Logging Menu (see chapter 9.3.5).

If the data logging memory is full, the old logging data must be destroyed before a new logging can be started. This is done with command 6. DELETE LOGGED DATA in the Data Logging Menu (see chapter 9.3.6).

9.3.3 Ending the Data Logging

The data logging can be ended with command 3. STOP LOGGING in the Data Logging Menu. Data logging can also end if data logging time has been set (see chapter 9.3.1.3) and it has run out. When the logging ends, the following is displayed:

DATA LOGGING ENDED!
(press ENT)

If data logging by limit (see chapter 9.3.7) is activated when the 3. STOP LOGGING command is given, the data logging is deactivated and this message appears on the display:

DATA LOGGING ENDED
AND DATA LOGGING BY
LIMIT DEACTIVATED!
(press ENT)

or this message:

DATA LOGGING BY
LIMIT DEACTIVATED!
(press ENT)

Which message is displayed depends on whether data logging was on or off.

Data logging can also end and data logging by limit deactivate (if it has been activated), if the data logging memory fills up. The programme will then display any one of the messages above.

9.3.4 Transferring Data Logging Data on the Serial Bus

The logged data can be transferred via the serial bus either to a PC or a printer with a serial interface. The output of measurements on the serial bus must be stopped when the logged data is transferred. This can be done by setting the output mode as inquiry mode, i.e. by selecting 3. INQUIRY MODE in the Output Menu (see chapter 9.5). On the serial bus the data is transferred in computer output mode (see chapter 4). When the data is needed in the printer output mode, (see chapter 4), first select printer mode in the Select Output Mode and then choose 3. BY PRESSING ENT (see chapter 9.5). This way the HMI 36 is in printer output mode, but will not output the measurements on the serial bus unless ENT key is pressed in the display measurements mode.

When the desired output mode has been selected, the logged data is transferred via the serial bus by choosing 4. TRANSFER LOGGED DATA in the Data logging Menu. The following message is displayed:

TRANSFERRING LOGGED
DATA!

The HMI 36 transfers all the data in the records in the data logging memory via the serial bus. When the transfer has been finished, the following text is displayed:

```
LOGGED DATA
TRANSFERRED!
(press ENT)
```

9.3.5 Maximum Logging Time

Before or during the data logging the user can check for how long the free data logging memory will last with the selected logging parameters. This is done with the command 5. MAX LOGGING TIME in the Data Logging Menu; the display will show the maximum logging time with one minute's accuracy:

```
MAX LOGGING TIME:
MONTHS: 0   DAYS: 1
HOURS: 2    MINUTES:20
(press ENT)
```

To maximize the logging time all old data must be removed from the logging memory (see chapter 9.3.6). Lowering the number of logged probes and extending the logging interval will also lengthen the maximum logging time.

9.3.6 Destroying Logged Data

When the logged data has been transferred to a PC or a printer, it should be deleted from the data logging memory in order to fit new information in. When 6. DELETE LOGGED DATA is chosen in the Data Logging Menu, the following message is displayed:

```
PRESS ENT TO DELETE
LOGGED DATA!
(otherwise CL)
```

Pressing ENT will clear the logging memory.

9.3.7 Logging by Limit

If logging by limit has been activated, logging can also begin when some preset relative humidity, temperature or dewpoint temperature reading from probe 1 is reached. The quantity and its value that triggers the logging is set by selecting 7. LOGGING BY LIMIT in the Data Logging Menu: logging must not be on and logging by limit must not be activated. If logging by limit has been activated and its settings need to be changed, it must be deactivated first before the new settings can be given. Logging by limit can be deactivated and at the same time end logging by selecting command 3. STOP LOGGING in the Data Logging Menu.

When 7. LOGGING BY LIMIT is pressed in the Data Logging Menu, the Logging By Limit Menu is displayed:

```
LOGGING BY LIMIT
1. SET QUANTITY
2. SET LIMIT
3. ACTIVATE LOGGING
0. EXIT
```

First set the quantity which will trigger the logging: select 1. SET QUANTITY in the Logging By Limit Menu. The Triggering Quantity Menu will be displayed:

```
TRIGGERING QUANTITY
  1. REL. HUMIDITY
  2. TEMPERATURE
  3. DEWPOINT
```

An arrow will point a previously made selection. Use number keys to choose the desired quantity; when this has been done the programme will go back to the Logging By Limit Menu.

When the quantity has been chosen, the triggering limit can be set: select 2. SET LIMIT in the Logging By Limit Menu. The old triggering limit, if one has been set, will be displayed:

```
ENTER TRIGGERING
LIMIT (%RH):
   95.0      HIGH
```

In this example the triggering quantity is relative humidity and logging will start when relative humidity measured by probe 1 exceeds 95 %RH. A new value can be given using the number keys. When it has been confirmed with the ENT key, the programme will ask whether logging starts when the reading goes below (LOW) or above (HIGH) the given value. This setting can be changed with the arrow keys and acknowledged with the ENT key. The programme then goes back to the Logging By Limit Menu.

When the triggering quantity and value have been chosen, the data logging is activated with command 3. ACTIVATE LOGGING in the Logging By Limit Menu. When this command has been given, the HMI 36 begins to observe the readings of this quantity coming from probe 1 and when the set limit is reached, the logging starts. When the setting is HIGH, the logging ends when the value of the selected quantity goes below the triggering limit minus 5 %RH or 2 °C, e.g. if the limit is 95 %RH, logging ends at 90 %RH. Correspondingly with setting LOW the logging ends when the value goes above the triggering limit plus 5 %RH or 2 °C. Logging starts again if the value goes above or below the triggering limit. When the 3. ACTIVATE LOGGING command has been given the programme goes back to the Data Logging Menu.

Logging is ended and logging by limit deactivated by selecting 3. STOP LOGGING in the Data Logging Menu (see chapter 9.3.3).

9.3.8 Status of Logging

By choosing 8. STATUS OF LOGGING in the Data Logging Menu the user can see if logging is on and if logging by limit is activated:

```
DATA LOGGING: ON
DATA LOGGING BY
LIMIT ACTIVATED: YES
(press ent)
```

ENT keys takes the programme back to the Data Logging Menu.

Setting the Serial Bus

By pressing 4. SERIAL INTERFACE in the Main Menu the baud rate of the serial bus can be set. The following menu appears on the display:

```
SELECT BAUD RATE:
  1. 300      2.  600
  3. 1200  →  4.  2400
  5. 4800     6.  9600
```

If the baud rate must be changed, press the corresponding number. If no number is keyed in, pressing ENT will acknowledge the factory setting. After this the programme goes to the Select Mode Menu:

```
SELECT MODE:
→ 1. 7db/1sb/even
  2. 7db/2sb/no
  3. 8db/1sb/even
  4. 8db/1sb/no
```

Pressing the correct number selects the serial bus mode (db = data bit; sb = stop bit; even, no = parity). The number of start bits is always 1. After this the HMI 36 returns to the Main Menu. When possible avoid using mode 2 (7sb/2sb/no) as it is not compatible with all peripherals.

Selecting the Output Mode of the Serial Bus

The different output modes of the serial bus are described in chapter 4. They can be set by pressing 5. OUTPUT MODE in the Main Menu. The following menu is displayed:

```
SELECT OUTPUT MODE:
  1. PRINTER MODE
  2. COMPUTER MODE
→ 3. INQUIRY MODE
```

Number 2 takes the HMI 36 into an output mode which is meant to be used with computers (see chapter 4). After this the HMI 36 returns to the Main Menu.

By pressing 3 you get to an inquiry mode where the HMI 36 can be asked to send the measurement data via the serial bus. The Humidity Data Processor will then ask from which address the data is required (every HMI 36 has an address of its own):

```
ENTER ADDRESS
(RANGE 1...99):
1
```

The display will give the previously set address. If there is no need to change it, it can be acknowledged with ENT. Otherwise, give the new address and acknowledge it with ENT. After this the HMI 36 returns to the Main Menu.

If number 1 is chosen in the Select Output Mode Menu, the output mode is suitable for printer interface. The HMI 36 asks further:

```
HMI36 PRINTS
   1.   CONTINUOUSLY
→  2.   AT SELECTED
        INTERVALS
   3.   BY PRESSING ENT
```

If 1 is selected, the HMI 36 begins to output the measurement results through the serial bus continuously. If 3 is chosen, the HMI 36 outputs the measurement results only when ENT is pressed while the HMI 36 displays the measurement results on the local display. When either 1 or 3 is chosen, the programme reverts back to the Main Menu. If option 2 is selected, a further inquiry will be displayed; how often the measurement results should be printed through the serial bus:

```
PRINTING INTERVAL:
  SET HOURS:  01
SET MINUTES:  00
SET SECONDS:  00
```

First set the hours, then minutes and seconds; the cursor shows which value is being set. If the existing value needs no changing, acknowledge it with ENT. A new value is given with the number keys and acknowledged with ENT. When the printing interval has been set, the HMI 36 returns to the Main Menu.

9.6 Setting the Real-Time Clock

When the HMI 36 is also used as a data logger, its real-time clock has to be set to time. When 9. TIME SETTING is chosen in the Main Menu, the following menu is displayed:

```
SET TIME:
    SET YEARS: 1990
   SET MONTHS: 06
     SET DAYS: 21
    SET HOURS: 14
  SET MINUTES: 56
  SET SECONDS: 21
```

The screen will display the first four lines of the existing settings. The cursor shows which setting is under modification; if a value is not to be changed, pressing ENT will take the cursor to the next value. A new value is also acknowledged with ENT. When the years, months and days have been set, the display will move on to show hours, minutes and seconds. When the seconds have been set, the programme reverts to the Main Menu. The CL key cancels any erroneous keystroke and it can be used to move backwards in the menu (by pressing it several times).

9.7 Setting the Calculation Parameters (Calculation Units, Dry Temperature and Pressure)

Pressing 7. CALCULATION SETUPS in the Main Menu will bring the following menu on the display:

```
CALCULATION SETUPS:
1. SET UNITS
2. SET DRY
   TEMPERATURE
3. SET PRESSURE
0. EXIT
```

9.7.1 Selecting the Calculation Units

By pressing 1. SET UNITS in the Calculation Setups Menu the calculation units can be set:

```
UNITS:
   1.METRIC UNITS
   2.NON-METRIC UNITS
```

Key 1 chooses the metric units (%RH, °C, g/m^3 and g/kg) and key 2 non-metric units (%RH, °F, grains/ft^3 and grains/lb). When the units have been chosen, the HMI 36 reverts to the Calculation Setups Menu.

9.7.2 Setting the Dry Temperature

If a psychrometer is used, the HMI 36 must be told which probe location it is in (see chapter 9.1). In addition the psychrometer's dry temperature must be fed in through the keypad. Press 2. SET DRY TEMPERATURE in the Calculation Setups Menu to set the dry temperature; any previously given value will then be displayed:

```
ENTER DRY
TEMPERATURE ( C):
60.0
```

Use the number keys to give the new dry temperature which is acknowledged with the ENT key; the HMI 36 will start displaying measurements immediately. The psychrometer's displayed temperature is its wet temperature. The HMI 36 does not store the dry temperature value in its EEPROM, so after a power down it must be entered again.

9.7.3 Setting the Pressure for Calculations

The mixing ratio can not be calculated without data on the air pressure; this value is also used in psychrometer calculations. To enter the pressure choose 3. SET PRESSURE in the Calculation Setups Menu and the following text appears:

ENTER THE PRESSURE
(hPa): 1013.0

The display shows the pressure used in calculating mixing ratio and in psychrometer calculations. If it is correct, acknowledge it with the ENT key; otherwise give the right value through the keypad and press ENT to confirm it. The unit of pressure is hPa. When the pressure value has been given, the HMI 36 returns to the Calculation Setups Menu.

To get back to the Main Menu select 0. EXIT in the Calculation Setups Menu.

Pressure conversion factors

To obtain hPa values		
multiply number of	hPa	1
	mbar	1
	psi a	68.95
	in. Hg	33.86
		with these factors

For example, when you want to convert 13.8 psi a into hPa, you multiply 13.8 psi a with 68.95, and get 951.51 hPa.

9.8 Calibrating the Temperature Sensors

By pressing 6. CALIBRATION in the Main Menu, the temperature sensors can be calibrated. The programme will prompt the user:

```
CALIBRATION OF
TEMPERATURE:
1. ONE POINT CAL.
2. TWO POINT CAL.
3. DELETE CALIBRATION
```

The calibration can be chosen to be done at one or two points. When either one has been selected, the HMI 36 asks which probe(s) is/are to calibrated:

```
PROBE SELECTION:
 1.PROBE1    2.PROBE2
 3.PROBE3    4.PROBE4
 5.END
```

The probe or probes to be calibrated are chosen with the corresponding number key. For example, when key 1 is pressed, probe 1 is chosen and to indicate that an arrow appears in front of it. When all the desired probes have been selected, press 5. END.

If one-point calibration has been selected, the following will be displayed:

```
ENTER REFERENCE
TEMPERATURE (°C):
```

The reference temperature is entered and then acknowledged with ENT. This acknowledgement is also the time of calibration; therefore make sure that the temperature of the sensor to be calibrated and the temperature of the reference meter are the same before the reference temperature is acknowledged. The sign of the temperature can be changed with the plus/minus key. When the instrument is calibrated at one point, the programme reverts to the Main Menu after the reference temperature has been given.

If two-point calibration was chosen, a message will be displayed to notify the user that he is about to give the first reference temperature of two.

FIRST POINT OF
TEMPERATURE
CALIBRATION
(PRESS ENT).

When ENT is pressed, the programme will ask for the first reference temperature. When it has been given, a message is displayed to inform the user that the calibration is now at the second point.

SECOND POINT OF
TEMPERATURE
CALIBRATION
(PRESS ENT).

After ENT has been pressed, the second reference temperature is entered. After this the programme returns to the Main Menu.

If the user has temperature calibrated a probe, it must not be moved to another probe location without a new calibration. If the temperature calibration is to be removed from all probe locations and the factory setting restored, select 3. DELETE CALIBRATION in the Calibration of Temperature Menu. After deleting the calibrations the programme returns to the Main Menu.

Note. Selection between metric and non-metric units does not affect the calibration.

9.9 Automatic Humidity Calibration

If a HMP 36B probe is in use, an automatic humidity calibration can be performed on it when it is in probe location 1. When this is done the HMI 36 calibrates the humidity sensor itself; the calibration requires no salt solutions or other calibration equipment. However, the probe should be calibrated with salt solutions before using the automatic humidity calibration function.

The automatic humidity calibration can not be performed unless the Humidity Data Processor is of type HMI 36A. The probe to be calibrated is always connected to and initialized at probe location 1 (see chapter 9.1).

When 9. AUTOMATIC HUMIDITY CALIBRATION is chosen in the Main Menu, The HMI 36 starts to calibrate the probe. The following text is displayed:

AUTOMATIC HUMIDITY
CALIBRATION STARTED!
IT TAKES 2 MINUTES
TO GO THROUGH!

When the automatic humidity calibration is finished, the following text appears:

HUMIDITY CALIBRATION
ENDED!
(press ENT)

Pressing ENT will bring the following warning on the display:

WAIT 15 MINUTES
BEFORE MEASURING
TO STABILIZE PROBE!
(press ENT)

During the automatic humidity calibration the humidity sensor heats up. This is why the probe must not be used for approx. 15 minutes after the calibration: the humidity and temperature sensors must cool down to the ambient temperature. Only after this stabilization time does the HMI 36 again measure accurately.

During the calibration all other functions of the HMI 36 are interrupted: no measurements, data logging or inquiries via the serial bus can be made then.

10 ERROR INDICATIONS

Error 2: RAM error. RAM memory circuit faulty.

Error 4: EEPROM error. Writing to or reading from EEPROM fails.

Error 5: Reading of temperature calibration factors from EEPROM fails: the HMI 36 has stored the factory settings of temperature calibration factors in the EEPROM. This means that if the user has calibrated the temperature sensors of the probes, these calibration factors have now disappeared from the EEPROM and the calibration must be repeated.

Error 6: The check sum of temperature calibration factors in EEPROM is erroneous: the HMI 36 has stored the factory settings of temperature calibration factors in the EEPROM. This means that if the user has calibrated the temperature sensors of the probes, these calibration factors have now disappeared from the EEPROM and the calibration must be repeated.

Error 7: Reading the calibration factors for electronics from EEPROM fails. If this occurs repeatedly, the instrument must be serviced.

Error 8: The check sum of calibration factors for electronics in EEPROM is erroneous. If this occurs repeatedly, the instrument must be serviced.

Error 9-21: Calculation of measurement results fails. Check the probes.

Error 22: Internal malfunction of electronics. If this occurs repeatedly, the instrument must be serviced.

Error 23-26: Calculation of measurement results fails. Check the probes.

Error 28: Internal malfunction of electronics. If this occurs repeatedly, the instrument must be serviced.

Error 29: The real-time clock has stopped.

Error 30: Calculation error in the calibration of electronics. Check that the factors were given in the correct form.

Error 31: The calibration factors for electronics were given in the wrong form.

Error 32: The battery of the real-time clock is faulty.

Error 33: The real-time clock has been set to an illogical time. The data logging has been stopped and the factory setting restored to the real-time clock.

Error 34: Channelling of the temperature measurement fails. The instrument must be serviced.

Error 35: Channelling of the humidity measurement fails. The instrument must be serviced.

Error 36: A temperature sensor sends no signal. Check that the probe location is correctly initialized (see chapter (9.1). If the probe location is correctly initialized, check that the probe is not faulty.

Error 37: A humidity sensor sends no signal. Check that the probe location is correctly initialized (see chapter 9.1). If the probe location is correctly initialized, check that the probe is not faulty.

Error 38: The electronics voltage references send no signal or the signal is too low. The instrument must be serviced.

Error 39: The pressure setting given via the keypad is too high; maximum value is 99999.99 hPa.

Error 40: Pressure calculation error. Check that the pressure setting given via the keypad is correct.

Error 41: The offset calibration of a temperature sensor has been too big. Check that the calibration has been made correctly and that the correct reference temperatures have been fed in.

Error 42: Calculation error in temperature sensor calibration. Check that the calibration has been made correctly and that the correct reference temperatures have been fed in.

Error 43: The gain calibration of a temperature sensor has been too big. Check that the calibration has been made correctly and that the correct reference temperatures have been fed in.

Error 44: The data logging interval has been set as 0.

Error 45: No function can be used when data logging is on.

Error 46: The set start time for data logging is irrational.

Error 47: Data logging can not be performed, as the HMI 36 has no data logging memory.

Error 48: The set time is not possible.

Error 49: No probe has been selected for logging; at least one probe must be chosen.

Error 50: During initialization all probe locations have been left empty. At least one probe location must have a probe in it.

Error 51: No probe has been selected for calibration; at least one probe must be chosen.

Error 52: There is not sensible time in the real-time clock. The factory setting has been restored.

Error 53: Data logging can not be started, because the data logging memory is full.

Error 57: The pointer indicating the beginning of empty space in the data logging memory has an illogical value. Data logging has been discontinued. Before starting a new data logging the logging memory must be cleared.

Error 58: Automatic humidity calibration could not be performed; it can only be done when HMI 36A version is in use.

Error 59: Automatic humidity calibration could not be performed, because the probe to be calibrated is not connected to probe location 1.

11 TECHNICAL DATA

Measured Quantities

Relative humidity

Measurement range	0 ... 100 %RH
Accuracy at +20 °C	0.1 %RH (for overall system accuracy see specifications for HMP 35B or HMP 36B)
Resolution	0.1 %RH
Input temperature dependance over the entire operating temperature range	±0.3 %RH

Temperature

Measurement range	-40 ... +160 °C (-40 ... +320 °F)
Accuracy at +20 °C	±0.1 °C (0.2 °F)
Resolution	0.1 °C (0.1 °F)
Input temperature dependance over the entire operating temperature range	±0.15 °C

One- and two-point calibration through keypad

Calculated Quantities

Dewpoint

Indication range	-80 ... +160 °C (-112 ... +320 °F)

Mixing ratio

Indication range	0 ... 9999 g_{H2O}/kg d.a. 0 ... 9999 gr/lb

Absolute humidity

Indication range	0 ... 9999 g_{H2O}/m^3 0 ... 9999 gr/ft^3

Calculated values are based on relative humidity and temperature measurements. For their accuracy see specifications for HMP 35B or HMP 36B.

11.3 Serial Interface

Data interface (asynchronous) (only one useable at a time)	RS 232 C, RS 485
Modes data bits/stop bits/parity	7/1/even 7/2/none 8/1/even 8/1/none
Data I/O speed (one selected)	300, 600, 1200, 2400, 4800, 9600
Mode	half duplex
Connector	D-type female D9S
Data format	display/printer or computer compatible ASCII characters

11.4 Battery

Charge current	200 mA typ., 500 mA max.
Charge voltage	13.4 ... 13.8 V max.
Disconnect voltage	10.7 ... 11 V
Battery type	sealed lead-acid battery

Battery Charger

Charge time to full charge (power off, 15 V supply)	10 h typ.
Operating time when fully charged	10 h typ.

Power supply	12 VDC (11 ... 16 VDC) 300 mA typ.
Internal connectors	6-pole screw terminals 10 pin ribbon cable connector
Operating temperature range	0 ... +50 °C (+32 ... +122 °F)
Storage temperature range	-20 ... +70 °C (-4 ... +149 °F)
Charge temperature range	+5 ... +35 °C (+41 ... 95 °F)
Operating humidity	non-condensing
Storage humidity	non-condensing
Vibration	±1.25 mm max. sinus (5 ... 12 Hz) 0.7 G peak sinus (12 ... 100 Hz)
Charger type	voltage limited constant current charger

11.6 General

Display	4 x 20 character alphanumeric high-contrast, wide view angle LCD
character height	3.85 mm (0.15")
Keyboard	4 x 4 keypad
Number of probes	
Supply voltage	15 VDC (11 ... 16 VDC) optional battery DC connector for NES/J 210 plug AC adapter 220 VAC (part no. 1344)
Power consumption	

Operating temperature range	0 ... +50 °C (+32 ... +122 °F)
Storage temperature range	-20 ... +70 °C (-4 ... +158 °F)
Transport temperature range	-40 ... +70 °C (-40 ... +158 °F)
Operating humidity range	95 %RH max. non-condensing
Storage humidity range	10 ... 90 %RH non-condensing

Note. The Humidity Data Processor can be operated at a higher relative humidity than when it is stored, because the air in a warm instrument has a lower relative humidity than the ambient air.

Dimensions (h x w x l)	80 x 200 x 295 mm (3.15 x 7.87 x 11.61 in)

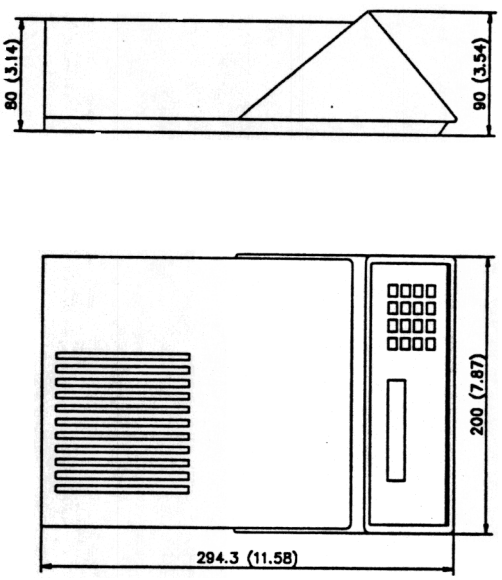

Fig. 1 Dimensions of the HMI 36

OUTPUT MODES OF LOGGED DATA

Output to serial bus in computer output mode:

<cr><lf>
<lf>
DATA LOGGING RECORD 1:<cr><lf>
<lf>
TIME: 1990-06-15/10:06:39<cr><lf>
P1Q1= 14.4 P1Q2= 25.2 P1Q3= -3.8 P1Q4= 2.84 P1Q5= 3.34 <cr><lf>
P2Q1= 12.9 P2Q2= 24.7 P2Q3= -5.6 P2Q4= 2.48 P2Q5= 2.92 <cr><lf>

TIME: 1990-06-15/10:06:59<cr><lf>
P1Q1= 13.0 P1Q2= 24.6 P1Q3= -5.6 P1Q4= 2.48 P1Q5= 2.92 <cr><lf>
P2Q1= 11.6 P2Q2= 26.6 P2Q3= -5.5 P2Q4= 2.49 P2Q5= 2.92 <cr><lf>
<lf>
<lf>
<lf>
DATA LOGGING RECORD 2:<cr><lf>
<lf>
TIME: 1990-06-15/10:09:39<cr><lf>
P1Q1= 34.5 P1Q2= 23.6 P1Q3= 7.1 P1Q4= 6.24 P1Q5= 7.34<cr><lf>
P2Q1= 34.7 P2Q2= 23.8 P2Q3= 7.3 P2Q4= 6.25 P2Q5= 7.31<cr><lf>
<lf>
<lf>
TIME: 1990-06-15/10:10:39<cr><lf>
P1Q1= 34.5 P1Q2= 23.6 P1Q3= 7.1 P1Q4= 6.24 P1Q5= 7.34<cr><lf>
P2Q1= 34.7 P2Q2= 23.8 P2Q3= 7.3 P2Q4= 6.25 P2Q5= 7.31<cr><lf>
<lf>
$

Output to serial bus in printer output mode:

<cr><lf>
<lf>
DATA LOGGING RECORD 1:<cr><lf>
<lf>
TIME: 1990-06-15/10:06:39<cr><lf>
<lf>
PROBE 1:<cr><lf>
<lf>
RH= 25.5 % t= 24.9 C Td= 3.9 C x= 4.95 g/kg a= 5.81 g/m3<cr><lf>
<lf>
PROBE 2:<cr><lf>
<lf>
RH= 25.5 % t= 24.9 C Td= 3.9 C x= 4.95 g/kg a= 5.81 g/m3<cr><lf>
<lf>
<lf>
TIME: 1990-06-15/10:06:49<cr><lf>
<lf>
PROBE 1:<cr><lf>
<lf>
RH= 25.5 % t= 24.9 C Td= 3.9 C x= 4.95 g/kg a= 5.81 g/m3<cr><lf>
<lf>
PROBE 2:<cr><lf>
<lf>
RH= 25.5 % t= 24.9 C Td= 3.9 C x= 4.95 g/kg a= 5.81 g/m3<cr><lf>
<lf>

<lf>
$

TRANSFERRING LOGGED DATA IN EXCEL FORMAT TO A PC

This appendix presents a simple Basic language programme for receiving the data logging files sent by the HMI 36 in computer output mode to a PC and for storing the information in ASCII format and in Microsoft EXCEL compatible format. The programme is made both in Microsoft GW-BASIC and Microsoft QuickBASIC 4.0.

Reception and editing programme made with GW-BASIC

```
10 CLS
20 INPUT "FILENAME"; FILENAME$
30 OPEN FILENAME$ FOR OUTPUT AS #2
40 OPEN "COM1:2400,E,7,1,CS,DS" FOR RANDOM AS #1
50 WHILE 1
60   A$ = INPUT$(1, #1)
70   PRINT #2, A$; : PRINT A$;
80   IF A$ = "$" GOTO 100
90 WEND
100 CLOSE #1, #2
110 OPEN FILENAME$ FOR INPUT AS #2
120 OPEN FILENAME$ + ".CSV" FOR OUTPUT AS #3
130 WHILE NOT EOF(2)
140   LINE INPUT #2, ONELINE$
150   I = INSTR(ONELINE$,"TIME:")
160   IF I=0 GOTO 200
170   PRINT #3,
180   PRINT #3, MID$(ONELINE$,I+14,11);",";
190   GOTO 250
200   I = INSTR(ONELINE$,"=")
210   IF I=0 GOTO 250
220   FOR K=0 TO 4
230     PRINT #3, MID$(ONELINE$,K*11+6,5);",";
240   NEXT K
250 WEND
260 CLOSE #2, #3
270 END
```

Reception and editing programme made with QuickBASIC 4.0

```
CLS
' Input the name of the data file to which
' the ascii data from HMI36A will be transferred.
INPUT "FILENAME"; FILENAME$
OPEN FILENAME$ FOR OUTPUT AS #2
' Communication channel 1 will be opened with baud rate
' 2400, even parity, 7 data bits and 1 stop bit.
OPEN "COM1:2400,E,7,1,CS,DS" FOR RANDOM AS #1
DO WHILE 1
. ' Input one character.
  A$ = INPUT$(1, #1)
  ' Character is displayed and stored to the data file.
  PRINT A$; : PRINT #2, A$;
  ' $ is the end character of the data logging file.
  IF A$ = "$" THEN CLOSE #1, #2: EXIT DO
LOOP

OPEN FILENAME$ FOR INPUT AS #2
' Open the data file
' to which the logged
' data is stored
' in Excel compatible
' format
OPEN FILENAME$ + ".CSV" FOR OUTPUT AS #3
WHILE NOT EOF(2)
  ' Input one line from the data file to variable LINE$.
  LINE INPUT #2, LINE$
  ' Looking for "TIME:" in LINE$.
  I = INSTR(LINE$, "TIME:")
  IF I > 0 THEN
    PRINT #3,
    ' Day and time is transferred to data file.CSV
    PRINT #3, MID$(LINE$, I + 14, 11); ",";
  ELSE
    ' Looking for "=" in LINE$.
    I = INSTR(LINE$, "=")
    IF I > 0 THEN
      FOR K = 0 TO 4
        ' Logged values are transferred to data file.CSV.
        PRINT #3, MID$(LINE$, K * 11 + 6, 5); ",";
      NEXT K
    END IF
  END IF
WEND
CLOSE #2, #3
END
```

Use of the programmes

1. Set the output mode of the HMI 36 to inquiry mode.

2. Set the baud rate of the serial line of HMI 36 to 2400 baud and mode to 7db/1sb/even.

3. Connect the serial line of the HMI 36 to the communication channel 1 (COM1) of your computer.

4. Start running the program.

5. Input the name of the data file to which you want to transfer the ASCII data from the HMI 36. Its maximum length is eight characters, so the name must not have any extension.

6. Transfer the logged data from the HMI 36 to your computer by using TRANSFER LOGGED DATA command.

7. The transferred ASCII data is stored as a data file (the name of which you inputted). You can also see the transferred data scrolling on the screen.

8. Now the Basic program transfers the data from FILENAME to FILENAME.CSV. The format of the FILENAME.CSV is shown below.

9. FILENAME.CSV is Excel compatible data file, the data of which you can analyse in Excel.

In the following an example of what the received data logging file looks like.

DATA LOGGING RECORD 1:

TIME: 1991-10-07/10:18:25
P1Q1= 30.0 P1Q2= 23.5 P1Q3= 4.9 P1Q4= 5.38 P1Q5= 6.34
P2Q1= 30.0 P2Q2= 23.9 P2Q3= 5.3 P2Q4= 5.51 P2Q5= 6.48
P3Q1= 33.4 P3Q2= 22.7 P3Q3= 5.8 P3Q4= 5.70 P3Q5= 6.74

TIME: 1991-10-07/10:18:30
P1Q1= 30.0 P1Q2= 23.5 P1Q3= 5.0 P1Q4= 5.39 P1Q5= 6.35
P2Q1= 30.0 P2Q2= 23.9 P2Q3= 5.3 P2Q4= 5.51 P2Q5= 6.49
P3Q1= 33.3 P3Q2= 22.8 P3Q3= 5.8 P3Q4= 5.71 P3Q5= 6.75

TIME: 1991-10-07/10:18:35
P1Q1= 30.0 P1Q2= 23.5 P1Q3= 5.0 P1Q4= 5.38 P1Q5= 6.35
P2Q1= 30.0 P2Q2= 23.9 P2Q3= 5.3 P2Q4= 5.51 P2Q5= 6.49
P3Q1= 33.2 P3Q2= 22.8 P3Q3= 5.8 P3Q4= 5.71 P3Q5= 6.75

TIME: 1991-10-07/10:18:40
P1Q1= 30.0 P1Q2= 23.5 P1Q3= 5.0 P1Q4= 5.39 P1Q5= 6.35
P2Q1= 30.0 P2Q2= 23.9 P2Q3= 5.3 P2Q4= 5.50 P2Q5= 6.48
P3Q1= 35.8 P3Q2= 22.9 P3Q3= 7.0 P3Q4= 6.19 P3Q5= 7.31

TIME: 1991-10-07/10:18:45
P1Q1= 30.1 P1Q2= 23.5 P1Q3= 5.0 P1Q4= 5.42 P1Q5= 6.39
P2Q1= 30.1 P2Q2= 23.8 P2Q3= 5.3 P2Q4= 5.51 P2Q5= 6.49
P3Q1= 34.1 P3Q2= 22.9 P3Q3= 6.3 P3Q4= 5.91 P3Q5= 6.98

$

The programme edits this data file into data file *.CSV. This file is compatible with Microsoft EXCEL and can be read directly into and edited in EXCEL.

```
07/10:18:25, 30.0, 23.5,  4.9, 5.38, 6.34, 30.0, 23.9,  5.3, 5.51, 6.48, 33.4, 22.7,  5.8, 5.70, 6.74,
07/10:18:30, 30.0, 23.5,  5.0, 5.39, 6.35, 30.0, 23.9,  5.3, 5.51, 6.49, 33.3, 22.8,  5.8, 5.71, 6.75,
07/10:18:35, 30.0, 23.5,  5.0, 5.38, 6.35, 30.0, 23.9,  5.3, 5.51, 6.49, 33.2, 22.8,  5.8, 5.71, 6.75,
07/10:18:40, 30.0, 23.5,  5.0, 5.39, 6.35, 30.0, 23.9,  5.3, 5.50, 6.48, 35.8, 22.9,  7.0, 6.19, 7.31,
07/10:18:45, 30.1, 23.5,  5.0, 5.42, 6.39, 30.1, 23.8,  5.3, 5.51, 6.49, 34.1, 22.9,  6.3, 5.91, 6.98,
```

The *.CSV file shows the information as follows. The first line's first figures show the first logging time: days/hours:minutes: seconds. After this come the measured and calculated quantities from the first logged probe in the order: relative humidity, temperature, dewpoint temperature, mixing ratio and absolute humidity. This order is repeated for each probe until the last logged probe has been output. The second line starts again with the logging time and goes on in the same way as the first line.

The first line and its readings:

time	RH	t	T_d	x	a	RH	t	T_d	x	a	RH	t	T_d	x	a
07/10:18:25	30.0	23.5	4.9	5.38	6.34	30.0	23.9	5.3	5.51	6.48	33.4	22.7	5.8	5.70	6.74