

USER MANUAL

pH*K 2 1

(Hand-probe for meat quality measurement)

Version 5.nn alpha-numeric

(Date of issue: 01.05.2011)

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PREFACE

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Different pH-values in meat and their significance (short version)

pH-value

pH is a unit of measure which describes the degree of acidity or alkalinity of a solution.

pH **p**otentia **H**ydrogenii.
 strength of reaction of free hydrogen ion in one litre solution.
 The value is the negative logarithm of hydrogen ion concentration.

acid range 0 to < 7
 neutral 7
 alkaline range > 7 to 14

The pH-value of a living muscle is about 7.0. After slaughtering processes take place which cause a gradual reduction of the pH-value from initial values of 7 down to values between 5,3 and 6,5. This reduction is mainly caused by the production of lactic acid by glycolysis of the carbohydrate glycogen in the muscle; this production of lactic acid stops about 24 hours after slaughtering.

The speed of the pH-value reduction and the level of the final pH-value (pH 24 h) are different depending on the animal and do considerably affect the quality of meat.

PSE and DFD meat

PSE-meat

P **P**ale = blaß
 S **S**oft = weich
 E **E**xudative = wäßrig = wasserlässig

45 minutes after slaughtering the pH-value is already below 5,8.

PSE-meat doesn't appear evenly over the whole carcass but mostly (25 - 32 %) in cutlets and hams.

Muscular rigidity takes place much quicker.

Disadvantages of PSE-meat

The loss of weight (due to hanging) is twice as high as in normal meat. Damp surface = strong germ increase.

PSE-meat is not suitable for:

- canned ham (high degree of jelly secretion)
- smoked, rolled fillet of ham (considerable loss of weight, bad colour consistency)
- raw sausage (bad consistency, wrinkles)
- sausage to be heated in water

DFD-meat

D **D**ark = dunkel

F **F**irm = fest

D **D**ry = trocken

45 minutes after slaughtering the pH-value is still above 6.3.

The meat is of dry, dull, sticky or gluey consistency and dark-red colour.

Disadvantages of DFD-meat

The increase of undesired microorganism is supported by the high pH-value, i.e. the missing leavening. The meat is putrefying instead of ripening.

The loss of weight (due to hanging) is higher than in normal meat.

The perishability is reduced considerably.

DFD-meat is not suitable for:

- foil wrapping of whole pieces (putrefaction at +2°C within 7 days)
- foil wrapping of portions (putrefaction at +2°C within 2 or 3 days)
- foil wrapping sliced cold meat
- raw sausage (partially suitable in case of high nitrate concentration)
- salt meat

General description pH*K21

The pH*K21 is a hand-probe which is easy to use and absolutely suitable for slaughterhouses. The following characteristics do clearly point out the instrument's usefulness.

- Absolutely waterproof and fail-safe to breakage
- Easy to handle, uncomplicated and free from interference
- High measuring frequency with up to 600 measurements per hour
- 5 languages directly selectable (German, English, French, Italian and Spanish)
- Data transfer to computer and/or printer with serial interface RS-232
- User-specific evaluations are individually sortable and freely programmable
- Accumulator operated (rechargeable) for approx. 10 hours of actual measuring time
- 12 months guarantee on casing and functioning
- Precise pH-determination of meat because of a second measurement, which means
 - measurement of pH 1 right after slaughtering 45 minutes pm
 - measurement of pH 2 after, for example, 24 hours
- - measurement of pH 2 is automatically related to the current number of measurement pH 1
- Measuring range from 0°C to 80°C
- Measuring range pH from 2 to 14
- Reproducible measured values
- Measuring precision of +/- 0,03 pH
- Integrated memory/storage for 4000 measurements consisting of:
 - 4000 pH 1, 4000 x date and time, 4000 pH 2, 4000 x date and time

- Data transfer to:
 - any IBM-compatible printer with serial interface
 - PC or Host-computer
 - electronic scale with operation from the pH*K21 (for example Bizerba MCIW)
- Data transfer both simultaneous to measuring or after measuring to the required PC or printer
- All data can be output sorted and selected
- Automatic storage of the values measured
- Output pH-value with one or two decimal points
- Reaction times of approx. 2 seconds in operation
- The glass electrode was developed especially for quality measurement in meat. The measuring probe made of "V2A high grade steel" with automatic protection of the electrode is covered by a protective steel case . A telescopic sleeve guarantees that the glass electrode will only leave the protective steel case for the measuring process. Unintentional damage to the electrode is therefore largely prevented by this protective measure (steel for use in the food environment 1.4301).

Data transfer

The pH*K21 allows data transfer to any IBM-compatible printer with serial interface and/or to an EDP-equipment or host-computer, as well as to scales, both simultaneous to measuring and after measuring. The pH*K21 guarantees this thanks to its internal microcontroller.

The pH*K21 can also be set to special remote control mode, which means that it can be used from EDP-equipment.

Data can be selected or sorted as needed and can be output afterwards. A criterion can be individually specified. Data can be sorted according to:

- current number,
- additional mark or sign,
- value pH 1,
- value pH 2 or
- time

Basic terms pH*K21



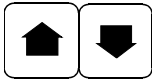
= RETURN: Confirmation / Enter



= UP: **Switching on the pH*K21**
 Display moves upwards/
 next number
 next input point



= DOWN: **Start measurement**
 Display moves downward/
 previous number



= CANCEL: **CANCEL of input**

Activating the pH*K21



To put the pH*K21 into operation, press this key for approximately 1 second (the pH*K21 turns off automatically one minute after the last operation).

If the instrument is switched on, measurement is released and automatically stored with the key . Before starting measuring, please observe the following points:

- Is the measuring temperature adjusted correctly?
- Is the instrument calibrated?
- Is the output format adjusted correctly?
- Is the right pH-value measured (pH1, pH2)?

Adjustment according to the measurements required

There are the following possibilities to measure the pH-value:

- | | |
|---|-----------------------------------|
| • without connection to printer or PC -> | adjust out. device none |
| • with direct data transfer to PC -> | adjust out. device PC/EDP |
| • with direct data transfer to scale -> | adjust out. device PC/EDP |
| • with direct data transfer to printer -> | adjust out. device PRINTER |

After releasing a measurement, the pH*K21 automatically checks if the corresponding equipment is connected. If the connection to the output equipment is not confirmed within 20 seconds, an error message is given.

During this stand-by period no further measurements can be carried out.

To adjust the output equipment please see Adjustment of the output equipment (**printer or PC**), page 41.

ATTENTION!

In case of incorrect default settings or defective output equipment the pH*K21 displays an error message. You can then correct the default settings.


ATTENTION!

Please do observe the temperature of the measuring medium before starting measuring.

To adjust the temperature see Adjustment of temperature for measuring and calibrating, page 27.

Control functions

The pH*K21 gives you the following control functions.

After switching on the instrument the current pH-value (P) is indicated. By pressing the key , you can change the display.

pH-value 1 = current pH-value (here 14.64)
14.64

pH-value 2 = current pH-value right after measuring pH1
14.64 (measurement of pH2 is next)

number = Input/read in and display routine for current number
1 To change the current number please see CHAPTER 2 , page 22.

mark = Input/read in and display routine to mark (identification/tattooing).
1 To change the marking please see CHAPTER 3, page 22.

meas. mode = Input/read in routine for the display
pH-1 **pH-1**= measurement first pH-value (pH1)
pH-2 = measurement second pH-value (pH2)
pH-1 ,pH-2 = measurement of two pH-values in succession (pH1 then pH2)
 please see CHAPTER 4, page 23.

output data = Output of the data stored at the equipment selected under **output data**
 see CHAPTER 5, page 24


range = Input of output range (selections) (**range** = area).
 see CHAPTER 6, page 25

delete = Deletion of data (**delete** = deletion).
data delete No. 5 = partial deletion (current number).
data delete No. 7 = total deletion
 see CHAPTER 7, page 26

special fun. = Input/read in routine for special functions
see CHAPTER 8, page 27

out device = Adjustment of the output equipment
none = no output
PC/EDP = output to PC/EDP or scale
PRINTER = output to printer
 see Adjustment of the output equipment (**printer or PC**), page 41.

contrast = set contrast

aCCU = display current voltage of the accumulator
7.83V (here 7.83 Volt)
 (by pressing the key  in aCCU setting the instrument is switched off)

POWERSUPPLY = supply voltage (here 12.0 Volt)
12.0V


date = Display of month, day and year (MM.DD.YY). Here March 12, 97
22.05.97 see Adjustment of date and time , page 40

time
02:33.43 = Display hours, minutes and second (HH.MM.SS). Here 2³³ 43 sec. p.m.
 see Adjustment of date and time , page 40

load status = Loading condition of the pH*K21
no POWERSUP. = no power supply connected
1 minute test = short test accumulator (one minute unloading/discharging)
discharge = unloading/discharging of the accumulator
charge = loading/charging of the accumulator
life charge

How to call the control functions

Display of the pH-value

When starting the pH*K21 the current measured pH-value is indicated. By pressing the key  the measurement is released and stored.

Display current number



press 1 time The current number is shown for one second.



press 1 time **number** indicates the input/read in routine for the current number.

ATTENTION!

If you want to change the current number please turn to CHAPTER 2 , page 22. If not press the following key.



press 1 time return to measuring mode

Display of the marking (tattooing)



press 2 times **mark** indicates the input/read in routine for the marking

ATTENTION!

If you want to change the marking please refer to CHAPTER 3, page 22 . If not press the following key.



press 1 time return to measuring mode

Selecting the current measurement



press 3 times

meas. mode is displayed.

pH-1 = measurement of the first pH-value (for example pH45)

pH-2 = measurement of the second pH-value (for example pH24)

pH-1, pH-2 = first measurement of pH1 and then measurement of pH2 (for example first outlet and then ham).

ATTENTION!

To change the measuring mode please refer to CHAPTER 4, page 23 . If not press the following key.



press 1 time

return to measuring mode

Data output to printer or EDP



press 4 times

output data indicates the adjustment mode for data output.

If the output equipment should be a printer, you will now be asked for the sorting.

none = no sorting

number = sorting according to the current number



mark = sorting according to the marking

pH-1 = sorting according to pH 1

pH-2 = sorting according to pH 2

time pH-1 = sorting according to time of pH 1

time pH-2 = sorting according to time of pH 2

Press the keys  and  together to terminate the output



press 1 time

return to measuring mode

Selection of output data



press 5 times

range: Here you can select the output data.
ready: Ready. Back to **range**
number: Selection of the current number (0-9999)
mark: Selection of the marking (0-9999)
pH-value 1 : Selection of the pH 1 (pH0.00 to pH99.99)
pH-value 2 : Selection of the pH 2 (pH0.00 to pH99.99)

ATTENTION!

If you want to transfer specific data to the printer please refer to CHAPTER 6, page 25 .



press 1 time return to measuring mode

Deletion of data



press 6 times

Delete is the clearing/deleting function.

ATTENTION!

If you wish to delete data please refer to CHAPTER 7, page 26 . If not press the following key.



press 1 time return to measuring mode

Adjustment of special functions



press 7 times **special fun.** indicates the input routine for special functions (0 to 9)

ATTENTION!

If you want to change special functions please refer to CHAPTER 8, page 27 . If not press the following key.



press 1 time return to measuring mode

Selection of the output device/equipment

The selection of the output device is of great importance for data transfer. The system does offer you two possibilities for data transfer: to a printer or to a PC/scale. You have to select the device required here.



press 8 times **out device** Here you have to select to which output device you want to transfer data.

ATTENTION!

If you want to change the adjustment for the output device please refer to Adjustment of the output equipment (**printer or PC**), page 41. If not press the following key.



press 1 time return to measuring mode


Voltage display

Power supply of your hand-probe takes place by an accumulator. Therefore you have the possibility to ask for the residual voltage of the accumulator. This value always indicates the remaining voltage (real measuring time).



press 9 times **contrast** shows you the brightness of the display



press 10 times **aCCU 7.93V** Indicates the voltage of the accumulator (here 7.93 Volt). Press any key to continue.
key - to switch off the instrument.



press 1 time return to measuring mode




press 11 times **POWERSUPPLY 12,0V** = Display voltage power supply (here 12.0 Volt)



press 1 time return to measuring mode

Display/Input date and time




press 12 time Display **date** DD.MM.JJ (day.month.year)
key  to adjust date and time



press 1 time return to measuring mode



press 13 times Display **time** HH:MM.SS (hours:minutes:second)
key  to adjust date and time



press 1 time return to measuring mode

ATTENTION!

If you want to change the adjustment of date and time please refer to Adjustment of date and time , page 40 . If not press the following key.

Display load status pH*K21



<p>press 14 times</p> <p>load status</p> <p>NO POWERSUP</p> <p>1 minute test</p> <p>DISCHARGE</p> <p>CHARGE</p> <p>life charge</p>	<p>= Loading/charging conditions pH*K21.</p> <p>= No power supply connected.</p> <p>= Accumulator status determination. (One minute discharging. Short test accumulator).</p> <p>= Complete discharging of the accumulator.</p> <p>= Recharging of the accumulator.</p> <p>= Loading/charging conservation of the accumulator.</p>
---	--



press 1time return to measuring mode

CHAPTER 1

Adjusting a number with the pH*K21

To change a number in the pH*K21 please proceed as follows:

Choose the number which has to be adjusted (for example current number, see CHAPTER 2 , page 22)



press 1 time

the number changes by 1 upwards

By constant pressing the number keeps changing upwards up to max. 9999.

By pressing this key (longer than 0.5 seconds) the numbers change by approx. 30 signs per second. With more than 100 changes (approx. 3.5 seconds) the number is changing in steps of 10.



press 1 time

the number changes by 1 downwards.

By constant pressing the number keeps changing upwards.

By pressing this key (longer than 0.5 seconds) the numbers change by approx. 30

signs per second. With more than 100 changes (approx. 3,5 seconds) the number is changing in steps of 10.



press 1 time

the number is selected and the display goes back to the current pH-value.



together

CANCEL: By pressing these two keys together input is terminated and the original value is not changed. In case you did select a point inadvertently this is very important.

CHAPTER 2

Changing the current number (No.)

To perform the change mentioned above please follow the steps starting from the measuring mode.



press as long as **number** appears. **number** indicates the input routine for the current number.



press 1 time The cursor blinks under last number of the current number.

To change the number please refer to CHAPTER 1, page 21.

CHAPTER 3

Changing of the marking (tattoo number)

To perform the change mentioned above please follow the steps starting from the measuring mode.



press as long as **mark** appears. **mark** indicates the input routine for the marking.



press 1 time The cursor blinks under the last number of the current marking.

To change the marking please refer to CHAPTER 1, page 21.

CHAPTER 4

Selection of the display mode

(Measurement of pH1, pH2 or first pH1 and then pH2)



press as long as **meas. mode** appears.



press 1 time

Display blinks.

meas. mode pH-1 = pH1-value is measured

With the next measurement the pH1-value is measured and stored. If there has already been carried out a measurement with the current number, the display shows **record used**. The old measured value is overwritten.

meas. mode pH-2 = pH2-value is measured

With the next measurement the pH2-value is measured and stored. If there has already been carried out a measurement with the current number, the measurement is automatically related to this number.

meas. mode pH-1, pH-2 = First pH1 is measured and right afterwards pH2.

With the next measurement pH1 and then pH2 are measured. Only if both measurements were carried out, the data record is stored.

If there is already a measurement with the current number, the display shows **record used**. The old measured value is overwritten.

Please choose 1, 2 or 3.

To change the number please refer to CHAPTER 1, page 21.

CHAPTER 5

Data output to EDP/PC or printer.



press

as long as **output data** appears.

For this adjustment it is absolutely necessary to set the **out.device** mode. Please find detailed information at **out. device** mode (see Adjustment of the output equipment (**printer or PC**), page 41).



press

If you have entered a PC or an EDP in the **out.device** mode **PC/ECP**, data will be transferred directly now.

If you have entered **data output to PRINTER** (printer output), you will now be asked for a sort specification. The following sorting options are possible:

none = No sorting necessary. Data have already been sorted or the sequence is unimportant.

number = Output sorted according to the current number

mark = Output sorted according to the marking

pH-value 1 = Output sorted according to pH 1

pH-value 2 = Output sorted according to pH 2

time pH-1 = Output sorted according to time of pH 1

time pH-2 = Output sorted according to time of pH 2

To change the number please refer to CHAPTER 1, page 21.



If addresses are existing:

If there are addresses stored in your pH*K21, you can here select the number of the address which should be output now.

address.no. none = No address

address.no. 1-999 = address number 0 to 999

To change the output key please refer to CHAPTER 1, page 21.

press  and  together to end the output

ATTENTION!

If you haven't connected an output device (printer, PC/EDP, scale) but selected an output range, please wait 20 seconds and the instrument will send the corresponding error message. After confirming the error message, the pH*K21 is again free for measurements.

During a printing process you get the following display **sending data please wait**.

After terminating this process the instrument automatically returns to the measuring mode.

Sometimes it is necessary to enter a printout area before data output.

Therefore please refer to **CHAPTER 6**, page 25 .

CHAPTER 6

Output ranges (data selection)



press

as long as **range** appears. **range** indicates the area.



press

Here appears the range of the output area. The following selections are possible:

ready = Ready. Back to **output data**. End of selection.

pH-value 1 = Choose selection range for pH 1.

pH-value 2 = Choose selection range for pH 2.

mark = Choose selection range for marking.

number = Choose selection range for current number.

To change the number please refer to CHAPTER 1, page 21.



press

Now you enter the “from” value.

To change the number please refer to CHAPTER 1, page 21.

Afterwards you enter the “to” value.

To change the number please refer to CHAPTER 1, page 21.

For the change the following areas are valid:

number = 0 - 99.99 current number

mark = 0 - 99.99 marking

pH-value 1 = 0.00 - 99.99 pH1

pH-value 2 = 0.00 - 99.99 pH2

ATTENTION!

All selection areas can be used in combination. If your pH*K21 does not output data, please check the adjustments mentioned above.

After determining the output selection, the pH*K21 goes automatically back to the **data output** mode and you can enter the output address.

CHAPTER 7

Deletion of data



press

as long as **Delete** appears. This mode allows you to delete data.



press 1 time

The display shows the following: **data delete No.: 0**
 Select **data delete No.: 5** or **data delete No.: 7**.
 (To change the number please refer to CHAPTER 1, page 21).

No. : 5 = Here all data in the area “**FROM**” current number to “**TO**”
 current number are deleted.

To enter the selection please see CHAPTER 6, page 25.

No. : 7 = Here all data stored in the pH*K21 are deleted.

The remaining numbers do not have any significance.

To change the number please see CHAPTER 1, page 21.



press 1 time

The selected function is confirmed and data are deleted.

The system returns to measuring mode.

ATTENTION!

Attention when deleting data! Deleted data cannot be restored.


CHAPTER 8

Adjustment of special functions




press until **special fun.** appears on the display.



press Special function 1 is already given. Select the corresponding number with the key .

ATTENTION!

If you get stuck in your selection or do not know what you wanted to select please wait one minute without pressing any key and the pH*K21 is switched off automatically. By pressing the key  you can start the input again.


Meaning of the special functions

special function 0

End of special functions and back to measuring mode.

special function 1

Test of the watchdog timer.

This is a test to check if the pH*K21 is still able to control itself. When selecting this function the pH*K21 has to act as if it has been newly-started. To confirm if this is the case, the display shows **Special fun. WDT-Test.** You have to confirm this by pressing the key .

special function 2

Selection of the measuring precision (decimal point digits).

Here you can determine if the pH-value is output with one or two digits after the decimal point. Measurement is always carried out with two digits after the decimal point. With adjustment at 1, the pH-value is rounded.

special fun. decimals 1 = One digit after the decimal point.

special fun. decimals 2 = Two digits after the decimal point.


To change the number please see CHAPTER 1, page 21.

special function 3

Adjustment of the temperature for the measuring medium.

Here the temperature of the momentary measuring medium is adjusted.

special fun. tmp. 20.°C = display of the momentary temperature.

After pressing the key  **special fun. temperature 20.0°C** appears and under the last digit the cursor blinks.

To change the number please refer to CHAPTER 1, page 21.

special function 4

Input marking mode.

Here you can decide if the marking (tattoo number) is the same for every measurement or if it should be put to "zero (0)" after one measurement. Under usual working conditions this marking remains the same until the user changes it.



special fun. mark mode leave = The marking remains. The value entered doesn't change after one measurement. This is the normal mode and it can be used for tattoo number and so on.

special fun. mark mode cleared = The marking is put to ZERO. The value entered returns to zero after one measurement. This is a special mode and it can be used for complaints and so on.

To change the number please refer to CHAPTER 1, page 21.

special function 5

Remote control mode

To set the pH*K21 to remote control mode, please select **special fun. remote ctrl. (no.5)**. Please observe that this mode only works if the power supply is connected. The display shows **remote ctrl.** The instrument is now ready for remote control operation. If the instrument is not connected to a PC you can leave this mode by pressing the keys  and  together.

To change the number please refer to CHAPTER 1, page 21.

Otherwise you **MUST** enter 0 (zero) here. All other numbers can make the instrument carry out undesired functions.

For technical description please refer to Remote control of the pH*K21, page 55

special function 6

Input values first calibration solution

Here you enter the pH value of the first calibration solution (neutral range, 6.88 or 7.0 or similar).

This function is protected. For data input please proceed as follows:



press

The display shows the value of the momentarily entered calibration solution, **solution 6.88**.





press

The cursor blinks under the last number.

Normally this value is 6.88.

To change the number please refer to CHAPTER 1, page 21.

Press keys  and  to return

special function 7

Input values second calibration solution

Here you enter the pH value of the second calibration solution (normally 4.00). This function is protected. For data input please proceed as follows:



press



The display shows the value of the momentarily entered calibration solution.



press

The cursor blinks under the last number. Normally this value is 4.00.

To change the number please refer to CHAPTER 1, page 21.

Press keys  and  to return

ATTENTION!

The two calibration solutions should cover the range in which measurements are taken.

Special function 8

Adjustment and output of firmware data

Special function 8 is divided into several functions for adjusting the firmware (internal software of the pH*K21). You should not carry out any adjustments here without consulting your service.

This function is protected. For data input please proceed as follows:



press

The display shows **special 8**.



press

special 8 and **No.:0** appears.

You can now select the function number.

To change the number please refer to CHAPTER 1, page 21.

Description of special function 8 subfunctions

Subfunction 0. No execution of special function

This function returns to **special fun. special 8** (see Adjustment and output of firmware data, page 31).

Subfunction 1. Printing of a pH*K21 status record

This function is only possible if a printer is connected. The adjustments of the pH*K21 are output. This output is needed for service.

Subfunction 2. Adjustment interface speed

Here you can change the interface speed (Baudrate) of your pH*K21. The following values are possible:

Number	Baudrate
0	600
1	1200
2	2400
3	4800
4	9600 (Default!)
5	19200

Subfunction 50. Adjustment lifetime electrode

With this function you fix the control data for the lifetime of an electrode.

The first input is the number of insertions which can be carried out with the electrode.



The number is input in "1000 insertions" which means that the input 5 is equal to 5000 insertions.

The display shows **30** (here 30000 insertions).

After pressing the key , for example **180** appears.

This is the lifetime of the electrode in days.

To change the number please refer to CHAPTER 1, page 21.


Press  and  to return

Subfunction 65. Receiving addresses or customer data from the PC)

With this special function and a special software for PC customer-specific data can be transferred to the pH*K21.

For data transfer:

1. Connect your PC to the pH*K21.
2. Start your PC software.
3. Select special function 8, subfunction 65.

The display shows **addresses receive, start**  The pH*K21 is now waiting for data from the PC.

4. Start data transfer at the PC.

Subfunction 68: Printout of addresses (customer data)

This function is only possible if a printer is connected. Addresses which were transferred to the pH*K21 with special function 65 (please see Subfunction 65. Receiving addresses or customer data from the PC, page 32) can be printed out with this function.

Subfunction 70: Printout of an error and calibration report

This function is only possible if a printer is connected. You can print out an error and calibration record as follows:

Instrument data

Number of instrument : 2
 Number of technician : 3
 Number of customer : 1
 Date of shipment : 22.02.94 15:00:00 (OK)
 Date of repair : 22.02.94 15:00:00 (OK)
 Change accumulator : 22.02.94 15:00:00 (OK)
 Change electrode : 22.02.94 15:00:00 (OK)
 Total measurements : 64

Calibration record

E1: ----
 E2: ----
 E3: ----
 E4: ----
 E5: ----
 RE: 22.02.94 16:51:30 (OK)

Explanation

Number of instrument: Serial number of the instrument
 Number of technician: Number of the responsible technician
 Number of customer: Number of the customer the instrument was shipped to
 Date of shipment: Date and time of the first shipment of the instrument
 Date of repair: Date and time of the last repair
 Change of electrode: Date and time of the last electrode change
 Total measurements: Number of measurements carried out with this electrode

E1 - E5: Date, time and status of the last calibrations
 RE: Date, time and status of the last "firmware reset"

Subfunction 76: Deletion of addresses (customer data)

Addresses which were transferred to the pH*K21 with special function 65 (see Subfunction 65. Receiving addresses or customer data from the PC, page 32) can be deleted completely.

Subfunction 80: Adjustment of data transfer record for PC

Here you can fix the data transfer record for the PC.

- 0 Normal data transfer record.
(as described under Data transfer of the pH*K21 to a PC, page 49). This is the standard adjustment.
- 1 Customer-specific data format. Instead of the ACK/NAK confirmation the current number is used for "handshake".

Subfunction 83: Change language of the pH*K21

With your pH*K21 you can choose among 5 languages.

- 0 German
- 1 English
- 2 French
- 3 Italian
- 4 Spanish
- 5 Polish

Subfunction 99: “View analog digits”

This function is only for service purposes and must not be activated by the user.

Subfunction 102: “START LOAD 180”

This function is only for service purposes and must not be activated by the user.

Subfunction 103: “START LOAD 0”

This function is only for service purposes and must not be activated by the user.

Subfunction 104: “RESTART AKKU”

This function is only for service purposes and must not be activated by the user.


Subfunction 193: “SEND FIRMWARE DATA”

This function is only for service purposes and must not be activated by the user.

Subfunction 194: “RECEIVE FIRMWARE DATA”

This function is only for service purposes and must not be activated by the user.

 **A T T E N T I O N !**

If you get stuck in your selection or if you don't know what you want to select, please wait one minute without pressing any key and the pH*K21 automatically switches off. By pressing the key  you can start the input again.

 **A T T E N T I O N !**

There are more special functions not described because of security reasons. They are only for service purposes and are of no significance for the user.

Do not call any other subfunctions other than those described above!

special function 9

Calibration of the pH*K21

Before starting calibration the following conditions must be fulfilled:

1. Important note:
To calibrate the pH*K21 it is necessary to use the protective case. During calibration the pH-tip must be put in the calibration solution (standard buffer solution) together with the metallic casing of the glass electrode.
2. There must not be any deposition on the electrode. (if necessary the electrode must be cleaned).
3. The pH-values of the calibration solution must have been entered correctly.
See special function 6, page 29 and special function 7, page 29.
4. The calibration solution must be filled in an appropriate receptacle.
5. The calibration solution should have room temperature (approx. 20°C - 25°C).



press as long as **special fun.** appears on the display.



press **select**



press 8 times as long as **calibrate** appears.



press 1 time **select** appears.



press 1 time

electrode new? No. 0 appears.

If you put in a **new** electrode and this is the first calibration you can communicate this to your pH*K21 by entering the number **523**. The number of insertions and the date of the electrode change are also backspaced. For controlling electrodes, this number should only be entered when using an electrode for the first time.

To change the number please see CHAPTER 1, page 21.



press 1 time

The calibration value set, normally **solution 1 6.88** is displayed



press 1 time

A number is displayed at the bottom left. Now the probe has to be put into the first calibration solution.

Please wait until the number stops changing.

With pH 7.00 this value is theoretically 0.

With pH 6.88 this value is theoretically 32.

The value can differ by +/- 270.



press 1 time

and keep pressed until the display shows **calibrate please wait**. The first measuring point is now calibrated.

Afterwards **solution 2** appear with the value adjusted under special function 7. Normally **4.00**



press 1 time

A number is now displayed at the bottom left. Now the probe has to be put into the second calibration solution (normally **4.00**).

Please wait until the number stops changing.

With pH 4.00 the value is theoretically 804.

The value must not differ by more than +/- 160 plus calibration value 1.



press 1 time

and keep pressed until **calibrate please wait** is displayed. The second measuring point is now calibrated.

Possible errors during calibration

1. The pH-electrode was put out of the standard buffer solution during measuring.
Repeat calibration according to the user manual.


2. The standard buffer solution is polluted and therefore not uniform.
Renew calibration solution and calibrate again.

3. The pH-electrode is damaged because of
- mechanical destruction
- natural ageing

Renew the pH-electrode.

4. The measuring electronic doesn't work correctly.
Please call your service and send the pH*K21 for inspection.

ATTENTION!

If you get stuck in your selection or if you don't know what you want to select, please wait one minute without pressing any key and the pH*K21 automatically switches off. By pressing the key  you can start the input again.

To guarantee 100 per cent functionality of your instrument, the pH*K21 is calibrated before using. The calibration solutions should have room temperature (approx. 20°C - 25°C).

Changing of the electrode

1. Removing the electrode:

- Please remove the protective cap at the top of the electrode
- Please remove the protective case of the electrode (screwed).
- Please remove the slit screws at the flange ring of the steel case (3 screws).
- Now you can carefully remove the steel case from the electrode.
- **Attention!** Do not tilt when removing the steel case, as the electrode can break.
- Now the electrode can be removed from the screwing.
- Now you should clean the surface of the flange ring from corrosion deposition.

2. Inserting the electrode:

- First you have to screw the electrode into the thread.
- **Important!** The electrode must not be screwed too tight, as the socket at the instrument can break. Furthermore there must not be any dirt between the electrode and the socket at the instrument.
- Now the steel case can be put over the electrode. Attention! Do not tilt.
- Please fasten the steel case with the slit screws at the flange ring.
- The steel case can now be screwed.

Adjustment of the output equipment (printer or PC)



press

until **out. device** appears. You are now in the selection mode for special functions for the output.



press 1 time

Activate output adjustment.

None = Measurement without output device

PC/EDP = Measurement with PC/EDP

PRINTER = Measurement with printer

To change the number please refer to CHAPTER 1, page 21.


Adjustment of date and time




press until DATE or TIME appears.




press the display shows **date input**. You can now change the day.
To change the number see CHAPTER 1, page 21.

Press the key 


You can now change the calendar month.
To change the number see CHAPTER 1, page 21.

Press the key 


You can now change the calendar year.
To change the number see CHAPTER 1, page 21.

Press the key 


to display **time**.
You can now change the hour to 24 hour format.
To change the number see CHAPTER 1, page 21.

Press the key 

You can now change the minutes.
To change the numbers see CHAPTER 1, page 21.

Press the key 

You can now change the seconds.
To change the seconds see CHAPTER 1, page 21.

Press 

to display **start clock.start**



press to set the time adjusted.

ATTENTION!

You can stop adjusting date and time by pressing the keys   together at any time.

Error treatment in the pH*K21

In the pH*K21 errors are described by the display **Error** which blinks followed by the error number (for example **20**).

Error numbers, causes and clearing

The following error numbers are defined in the pH*K21:

<u>Error number</u>	<u>description</u>
0	no error
10	<p>error data input.</p> <p>cause: Incorrect date. For example 02.30.1994.</p> <p>clearing: Enter a valid date.</p>
20	<p>printer inoperable.</p> <p>cause: Data output shows PRINTER and printout should be released.</p> <p>Printer is not connected. Printer is not switched on. Printer has no paper. The printer cable is defective.</p> <p>clearing: Clear the causes mentioned above. If the error message is still given, please call your service.</p>
30	<p>PC/EDP not connected.</p> <p>cause: Data output shows PC/EDP and data should be output.</p> <p>PC is not connected. PC is not switched on. PC-software didn't start. PC-cable is defective.</p> <p>clearing: Clear the causes mentioned above. If the error message is still given, please call your service.</p>
31	<p>PC/EDP: no response or incorrect response.</p> <p>cause: Data output shows PC/EDP and data should be output.</p> <p>PC is not connected. PC is not switched on. PC-software didn't start. Data transfer to PC is not adjusted correctly. PC-cables defective.</p> <p>To adjust the data transfer rate please see Subfunction 2. Adjustment interface , page 32.</p> <p>clearing: Clear the causes mentioned above. If the error message is still given, please call your service.</p>

<u>Error number</u>	<u>description</u>
40	<p>Marked as used, but not found.</p> <p>cause: Error in the pH*K21 memory.</p> <p>clearing: Delete all data stored in the pH*K21. see CHAPTER 7, page 26.</p>
50	<p>pH*K21 is full.</p> <p>cause: No more free memory capacity.</p> <p>clearing: Delete all data stored in the pH*K21. see CHAPTER 7, page 26.</p>
60	<p>Error during calibration of the first value.</p> <p>cause: During calibration the measured values fluctuate in non-permissible tolerances.</p> <p>clearing: Clean the probe. If the error message is still given, please call your service.</p>
61	<p>Error during calibration of the second value.</p> <p>cause: During calibration the measured values fluctuate in non-permissible tolerances.</p> <p>clearing: Clean the probe. If the error message is still given, please call your service.</p>
70	<p>Error during reading in of addresses.</p> <p>cause: Data transfer between PC and pH*K21 is disturbed, PC is not in transmit mode, the wrong programme has been started on the PC.</p> <p>clearing: Clear the causes mentioned above. If the error message is still given, please call your service.</p>
71	<p>Reading in of addresses.</p> <p>cause: Data transfer between PC and pH*K21 is disturbed, PC is not in transmit mode, the wrong programme has been started on the PC.</p> <p>clearing: Clear the causes mentioned above. If the error message is still given, please call your service.</p>

<u>Error number</u>	<u>description</u>
80	<p>Error analogue module.</p> <p>cause: The measured value cannot be stored.</p> <p>clearing: Please call your service.</p>
90	<p>Remote control, no network.</p> <p>cause: You changed to remote control operation and didn't connect the power supply.</p> <p>clearing: Connect the power supply. If the error message is still given, please call your service.</p>
91	<p>Remote control not initialised.</p> <p>cause: You changed to remote control operation and the probe is not calibrated, the firmware is not initialised.</p> <p>clearing: Calibrate the pH*K21. (see special function 9, page 37). If the error message is still given, please call your service.</p>
100	<p>Electrode: Lifetime passed.</p> <p>cause: The electrode in the instrument is older than the lifetime entered (please see subfunction 50. Adjustment lifetime of the electrode, page 31).</p> <p>clearing: Change the electrode.</p>
101	<p>Electrode: more than 75 % of the insertions have been carried out.</p> <p>cause: More than 75 % of the possible insertions have been carried out with the electrode in the instrument. This is only a warning.</p> <p>clearing: Please observe that you have a new electrode on stock. If so, please ignore this message.</p>
102	<p>Electrode: 100 % of the insertions.</p> <p>cause: There have been carried out more than the adjusted number of measurements. The electrode has to be changed.</p> <p>clearing: Change the electrode.</p>
103	<p>Electrode: error steepness.</p> <p>cause: You have a wrong calibration solution or the electrode or the measured value amplifier/repeater are defective.</p> <p>clearing: Control the calibration solutions. If the error message is still given, please change the electrode. If the error message still appears, please call your service.</p>
104	<p>Electrode: zero error.</p> <p>cause: You have a wrong calibration solution or the electrode or the measured value amplifier/repeater are defective.</p> <p>clearing: Control the calibration solutions. If the error message is still given, please change the electrode. If the error message still appears, please call your service.</p>

Error: *Blinking display*

The left side of the display is blinking

- cause 1: The pH*K21 is in remote control mode.
clearing: This is not an error. It only indicates that the pH*K21 is in remote control mode.
- cause 2: Part of the firmware data is not initialised.
clearing: Please call your service.

The whole display is blinking

No further measurements are possible.

- cause 1: Calibration got lost.
clearing: Please carry out a new calibration according to the user manual.
- cause 2: The pH-electrode is damaged.
 a. because of mechanical destruction.
 b. because of natural ageing.
clearing: Renew the pH-electrode.
- cause 3: The measuring electronic is not working correctly.
clearing: Please call your service.

Errors which appear in practice

What happens if calibration is not possible?

Errors could be caused because of the following reasons:

- incorrectly adjusted values special function 6 and/or 7.
- polluted calibration solution.
- defective tip/probe because of mechanical destruction.
- polluted tip/probe.
- measuring electronic doesn't function correctly.

What happens if the current number isn't counted upwards after each measurement?

Errors could be caused because of the following reasons:

- the output device wasn't adjusted correctly.
- cable connection is defective.

(To clear these errors please refer to CHAPTER 5, page 24)

What happens if data transfer to printer or PC doesn't function?

Errors could be caused because of the following reasons:

- the output device wasn't adjusted correctly.
- data transfer velocity wasn't adjusted correctly.
- cable connection is defective (or any other technical reasons which affect the instrument) and therefore printer or PC do not response.

(To clear these errors please refer to CHAPTER 5, page 24 Subfunction 2. Adjustment interface , page 32)

What happens if the whole display is blinking?

That means that no more measurements can be carried out.

Errors could be caused because of the following reasons:

- calibration data has been cleared.
(Carry out a new calibration to eliminate this error)
- measuring tip is defective because of mechanical destruction
(Please contact your service)

What happens if the display is inversed (light fonts on dark background)?

- no firmware reset has been carried out.
(Please contact your service)

What happens if the display shows record used

The display indicates that you have already carried out a measurement under this number.

What happens if the display shows full

The display indicates that you have already carried out the 4000 possible measurements. These measurements will be kept until storage.

(To clear this error please refer to CHAPTER 7, page 26)

Technical description of data transfer to PC/EDP

Data transfer of the pH*K21 to a PC

Legend:

sign	decimal	hexadecimal
SOH	1	01h
STX	2	02h
ETX	3	03h
EOT	4	04h
ENQ	5	05h
ACK	6	06h
BEL	7	07h
NAK	21	15h
ESC	27	1bh

BCC Block Control Check

Compilation data transmission record:

STX Data ETX BCC

Explanation	Number signs
Start sign STX	1 Byte
Data	different (Variable data record length)
End sign ETX	1 Byte
Checksum BCC (Block Control Check)	1 Byte

Compilation data record:

All data record entries are separated by a comma.

One data record consists of the following data items:

A, K, F, LFNR, KENN, pH1, pH2, DATUM1, UHRZEIT1, DATUM2, UHRZEIT2
 9, 2, 0, 123, 4321, 596, 571, 120394, 145520, 130394, 150020 (e.g.)

Explanation of the data items:

- A Number of data items in this data record including this item. The data record is now limited to 9 data items. Because of expansion this number should be evaluated, as the number of data items can be increased without announcement.
 (This item can have 1 to 3 digits.)

- K Key for pH-data (1). For the LT*K21 the key is 2.
 (This item can have 1 to 3 digits.)
 (In the example: 1)

- F Error code probe. Here an error code can appear, so that the EDP can check if the pH*K21 is still OK
 (This item can have 1 to 4 digits.)
 (In the example: 0, no error)

- NUMBER Current number measurement.
 (This item can have 1 to 4 digits.)
 (In the example: 123)

- MARK Marking of measurement (tattoo/complaint).
 (This item can have 1 to 4 digits.)
 (In the example: 4321)

pH1	The value of measurement pH1 (hundredth pH without decimal point.) (this item can have 1 to 4 digits.) (in the example: 5,96)
pH2	The value of measurement pH2 (hundredth pH without decimal point.) (this item can have 1 to 4 digits.) (in the example: 5,71)
DATE1	Date of measurement pH1 in the format MMDDJJ . TT = day, MM = month, JJ = year. (This item always has 6 digits) (In the example: 12 March 1994)
TIME1	Date of measurement pH1 in the format HHMMSS . HH = hour, MM = minute, SS = second. (This item always has 6 digits) (In the example 14hour 55minutes and 20 seconds)
DATE2	Date of measurement pH2 in the format MMDDJJ . TT = day, MM = month, JJ = year. (This item always has 6 digits) (In the example: 30.06.97)
TIME2	Date of measurement pH2 in the format HHMMSS . HH = hour, MM = minute, SS = second. (This item always has 6 digits) (In the example 15hour 00minutes and 20 seconds)

Please note:

If a measured value (pH1 or pH2) cannot be found, the measured value, date and time have been set to 0.

Data transfer

Example for a data record to be transmitted:

ASCII:

[STX] 11,1,0,123,4321,596,571,120394,145520,130394,150020[ETX][BCC]

HEX:

02	STX
31 31 2C	11,
31 2C	1,
30 2C	0,
31 32 33 2C	123,
34 33 32 31 2C	4321,
35 39 36 2C	596,
35 37 31 2C	571,
31 32 30 33 39 34 2C	120394,
31 34 35 35 32 30 2C	145520,
31 33 30 33 39 34 2C	130394,
31 35 30 30 32 30	150020
03 3C	ETX,BCC

Set up of BCC (Block Control Check)

BCC is an "EXCLUSIV ODER" (XOR) connection of all byte of a data record.
(STX and ETX, which stand for the beginning and the end of the text are not regarded).

Example:

Character BCC;

BCC = 0

BCC = BCC XOR 31h(1)

BCC = BCC XOR 31h(1)

BCC = BCC XOR 2ch(,)

BCC = BCC XOR 31h(1)

.

.

BCC = BCC XOR 30h(0)

Transmission of a record:

PC	<->	Probe
	<--	STX
	<--	Data
	<--	ETX
	<--	BCC
ACK	-->	(reception OK)
NAK	-->	(otherwise error)

Explanation:

The pH*K21 sends a complete data packet to the PC. The PC is decoding the data received according to the rules mentioned above and detects if they can be read as a message or as a complete data record. If this is the case, the computer sends an receipt confirmation to the pH*K21 and the next record can be sent. The positive response is an ACK, the negative one a NAK.

If the pH*K21 doesn't receive an ACK, but another sign, the record is sent again.

If the pH*K21 doesn't receive any response, the data record is sent again.

The data record is sent up to a maximum of three times. If there doesn't come any positive response from the PC by then, an error message is given.

If the initial response was an ACK, the next measurement can be carried out. **With out. device** and the command **PC** data can be transmitted without interruption.

Transmission of complete data to PC:

The last data record consists of only one parameter.

for example: [STX]1[ETX][BCC]

For the PC this means the end of the data transmission.

Technical requirements:

Baud rate: 9600 baud (or bit per second)
Parity: none
Data bits: 8
Stop bits: 1
Handshake: no (or DTR/DSR)

Apart from 9600 the following values can be chosen for baud rate:

600
 1200
 2400
 4800
 19200

The initial adjustment 9600. It should only be changed in an emergency, as all instruments known by us have no problem with this initial adjustment. If there are problems with peripheral devices, the reason is in most cases another one.

(see Subfunction 2. Adjustment interface , page 32)

Pin configuration for the pH*K21:



Pin 1: RXD brown
Pin 2: TXD grey
Pin 3: +12 red
Pin 4: GROUND yellow/green (GND)
Pin 5: CTS pink
Pin 6: GND blue
Pin 7: RTS white

Remote control of the pH*K21

Technical description remote control

Remote control operation

Please put the pH*K21 in remote control operation, so that the display shows **special fun. remote ctrl.** (see Remote control mode, page 29). The PC should now start remote control operation by an [ESC L] command. Eventually a string can be displayed ([ESC A]). After sending the command the LCD display shows the normal measured value (pH-value) with the difference that the left digit position is blinking. Now the user or the PC can release measurements. They are stored by the pH*K21. The PC can call these measurements with [ESC S] if necessary (also more times). If the measurements of one “measuring group” are finished and transmitted, the PC should send an [ESC L] command. The measurements carried out until this time are marked as “sent” (pseudo deleted) and will not be transmitted with the next [ESC S] command. After terminating the remote control operation the PC should send an [ESC E] command to return to the normal measuring mode.

If the remote control operation should need to be left without a PC, please press  and  together.

Commands in the remote control mode

The remote control mode does offer the following commands:

- | | |
|---------|--|
| [ESC A] | Display text string. The LCD display shows a character string which has to be confirmed with a key or the command [ESC X]. During the display of a string no measurements can be carried out. In case of other commands than [ESC A] or [ESC X] from the PC during display, the PC responds with EOT (command understood, but not carried out!). |
| [ESC E] | End of remote control operation. Herewith the remote control mode of the pH*K21 is left and the instrument returns to the normal measuring mode. |
| [ESC L] | Data marked as sent. All measurements starting from the last [ESC L] command are marked as sent and are not transmitted any more with the [ESC S] command. A new series of measurements can be started now. Data remain stored in the pH*K21 and can be transmitted afterwards at any time. |
| [ESC M] | Release measurement. With this command the PC can release a measurement. |
| [ESC T] | Measurement without storage and direct transfer of the data record. |
| [ESC B] | Measurement without storage and direct transfer of the pH-value only. |
| [ESC S] | Send data measured up to now. |
| [ESC X] | End of display. If an [ESC A] command was sent, the display of the character string can be stopped. |

Transmission of a command to the pH*K21

The data record for a command transmission to the pH*K21 is structured as follows:

[ESC] [command letter (E,L,M,S,X)] [BCC] or
 [ESC] [command letter (A)] [length of string] [string] [BCC]

The BCC includes all characters of the data record (apart from the BCC itself). To calculate the BCC please see Set up of BCC (Block Control Check), page 50.

<u>PC</u>	<u><-></u>	<u>Probe</u>
Command	->	
	<-	ACK (Command understood and executed) or
	<-	NAK (Command not understood) or
	<-	EOT (Command understood but not executed)

After the [ESC S] command the pH*K21 sends all data measured up to now. The format of data transferred is described under Data transfer of the pH*K21 to a PC, page 49.

After the [ESC M] command the pH*K21 releases a measurement (without storing it) and sends the measured value (pH-1) to the PC. The format of data transferred is described under Data transfer of the pH*K21 to a PC, page 47.

After the [ESC B] command the pH*K21 releases a measurement (without storing it) and sends only the measured value (with protocol) to the PC. The data record then is the following:
 STX Data ETX BCC.

In this case the data record only consists of the pH-value measured right now * 100 (for example, `588` for pH 5.88).

Running time of the accumulator - continuous operation

The accumulator has a running time of approx. 8-10 hours without recharging. After that time it has to be recharged over the interface hub with the help of the power supply. This process takes about 12 hours; the accumulator can not be overloaded. If necessary, the pH*K21 can be permanently used with the power supply.

Watchdog timer

The pH*K21 does have a watchdog timer which checks the function of the instrument. If the instrument shouldn't turn off at any time (**no power supply connected**) please put the plug of the power supply in the hub of the pH*K21 without putting the power supply in the socket of the network. The instrument does turn off now.

☞ IMPORTANT NOTICE!

The instrument should be cleaned after use.

Technical data

measuring range pH:	pH 2 to 14
measuring precision:	+/- 0,03 pH
temperature compensation:	automatically
serial interface:	600 - 19200 baud
number of storable measurement:	4000
operation temperature range:	0°C - 80°C
storage temperature range:	-20°C - 80°C
CPU:	16 Bit microcontroller

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