

Trace₂O

HydroTest Photometer HT1000



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1.0 Introduction

The HT1000 is part of the HydroTest range of instruments based on optical measurement technology for the analysis of a range of chemical parameters in aqueous samples.

The HT1000 is a photometric analyser using 6 individual selective wavelengths to measure the colour change produced by a reagent when reacted with the analyte of interest.

The photometer employs the methods defined in the American Standard Methods for water analysis.

This instruction manual outlines the functions and operations of the photometric instrument only. Instructions specific to each test are included with the reagent packs as purchased from Trace2o Ltd. The instrument has been designed and optimized to work solely with Trace2o reagents. A complete list of available parameters is included in Appendix 1.0

The instrument has been designed for use in an outdoor environment and is rugged and waterproof however the optical system should also be checked for cleanliness before use particularly condensation build up in the cell chamber.



2.0 Operation

2.1.1 Set up

Before working with the photometer it may be necessary to insert the batteries if supplied separately. See chapter 2.1.2 Saving data – Important information, 2.1.3 Replacement of batteries.

Before using the photometer perform the following settings in the Mode-Menu:

- MODE 10: select language
- MODE 12: set date and time
- MODE 34: perform “Delete data“
- MODE 69: perform “User m. init“ to initialise the userpolynomial system

See chapter 2.4 Photometer settings.

2.1.2 Saving data – Important Information

During replacement of the battery the data in the HT1000 is saved for 2 minutes. If the change time exceeds 2 minutes all stored data and settings are lost. It is recommended to have the replacement batteries to hand to expediate fitment.

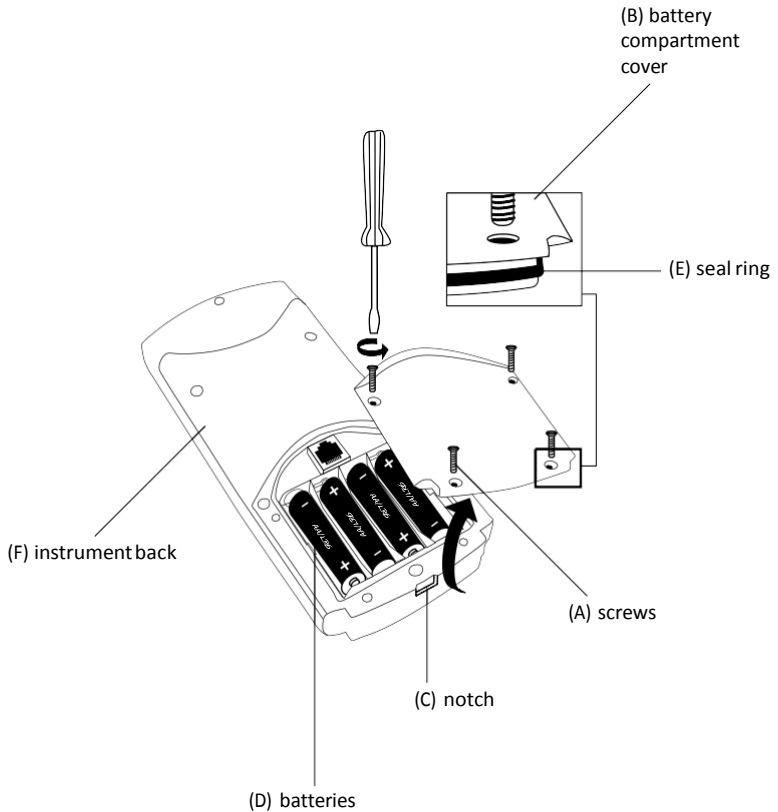
2.1.3 Replacement of batteries

See chapter 2.1.2 "Saving data - important Information" before replacing batteries.

1. Switch the instrument off.
2. If necessary remove vial from the sample chamber.
3. Place the instrument upside down on a clean and even surface.
4. Unscrew the four screws (A) of the battery compartment cover (B).
5. Lift off battery compartment cover at the notch (C).
6. Remove old batteries (D).
7. Insert 4 new batteries ensuring the correct polarity!
8. Replace the battery compartment cover.
Check the seal ring (E) of the notch to make sure it is a tight fit. If the seal appears stretched or damaged then a replacement should be obtained to ensure the waterproof seal is maintained.
9. Tighten the screws carefully.

2.1.4 Instrument (exploded drawing):

- (A) screws
- (B) battery compartment cover
- (C) notch
- (D) batteries: 4 batteries (AA/LR6)
- (E) seal ring
- (F) instrument back



CAUTION:

To ensure that the instrument is water proof:

- seal ring (E) must be in position
- battery compartment cover (B) must be fixed with the four screws

2.1 Overview of function keys

2.1.1 Overview



Switching the photometer on or off



Press shift key to achieve figures key 0-9.
Keep the shift key depressed and press desired figures key.
e.g.: [Shift] + [1][1]



Returning to selection of methods or previous menu

Function key: description in the text if key available

Function key: description in the text if key available

Function key: description in the text if key available



Confirming



Menu of photometer settings and further functions



Moving the cursor up or down



Storing of displayed test result



Performing Zero



Performing Test



Displaying date and time / user countdown



Decimal point

2.1.2 Displaying time and date:



Press [“clock”] key.

19:30:22 2012-06-15

The display shows:



After 15 seconds the photometer reverts to the previous display automatically

or press [↵] key or [ESC].

2.1.3 User countdown

With this function the operator is able to define his own countdown.



Press [“clock”] key.

19.30.20 2012-06-15

The display shows time and date:



Press [“clock”] key.

Countdown
mm : ss
99 : 99

The display shows:

Either press [↵] key to accept the last used user countdown.

or

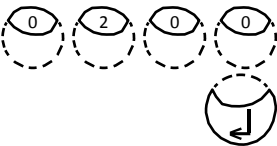
press any number key to start entering a new value

The entry comprises two digits each.

Enter minutes and seconds,

e.g.: 2 minutes, 0 seconds = [Shift] + [0][2][0][0].

Confirm with [↵] key.



The display shows:

Start countdown with [↵] key.

Countdown
02:00
start: ↵

After countdown has finished the photometer reverts to the previous display automatically.

2.1.4 Display backlight



Press the [Shift] + [F1] key to turn the display backlight on or off. The backlight is switched off automatically during the measurement.

2.3 Operation mode



Switch the photometer on by pressing the [ON/OFF] key.

selftest ...

The photometer performs an electronic self-test.

2.3.1 Automatic switch off

The instrument switches off automatically after 20 minutes. This is indicated 30 seconds before by a beeper. Press any key to avoid the instrument switching off.

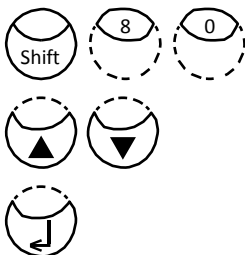
As long as the instrument is working (for example countdown or printing) the automatic switch off is inactive.

2.3.2 Selecting a method

```
>> 35 Alkalinity-p
    40 Aluminium
```

The display shows a selection:

There are two possibilities to select the required method:



a) enter method-number directly
e.g.: [Shift]+[8][0] to select Bromine

b) press arrow key [▼] or [▲] to select the required method from the displayed list.

Confirm with [↵] key.

2.3.2.1 Method Information (F1)

Use [F1] key to switch between the compact and the detailed list for method selection.

```
100 Chlorine
0.02-6 mg/l Cl2
Tablet
24 mm
DPD No 1
DPD No 3
```

Example:

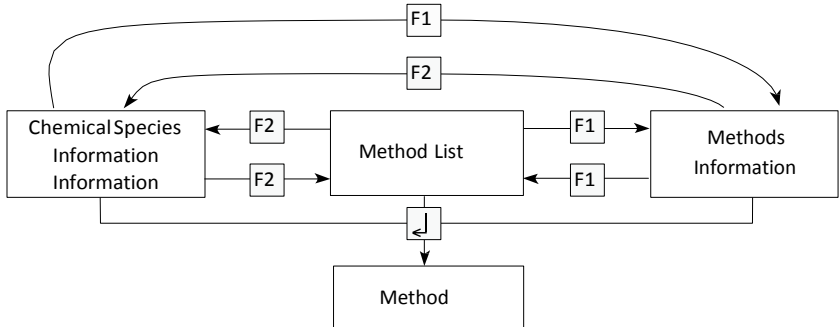
```
Line 1: Method number, Method name
Line 2: Range
Line 3: Kind of reagent
Line 4: Vial
Line 5-7: Used reagent
tube = reagent vial contained in tube test
```

2.3.2.2 Chemical Species Information

Pressing the [F2] key the display shows a list with available chemical species and corresponding ranges. Changing chemical species see chapter 2.3.5 page 12.

320 Phosphate LRT 0.05-
4 mg/l PO₄
0.02-1.3 mg/l P
0.04-3 mg/l P₂O₅

Line 1: Method number, Method name
Line 2: Range with chemical species 1
Line 3: Range with chemical species 2
Line 4: Range with chemical species 3



2.3.3 Differentiation

Chlorine
>> diff
free
total

Differentiation is possible in some methods (e.g. Chlorine). The photometer then requires the type of determination.



Press a **▼** key [] or [] to select the required determination.



Configure with [] key.

2.3.4 Overview of test procedure

prepareZero
press ZERO

The display shows:



Prepare a clean vial as described in "Method" and place the vial in the sample chamber making sure that the marks are aligned.

Press [ZERO] key.

Zero accepted
prepare Test
press TEST

The display

shows:

2.3.5 Changing chemical species

For some methods there is a possibility to change the chemical species of the test result. If the test result is displayed press arrow key [▲] or [▼].

Example:

320 Phosphate LR T	-----[▼]----->	320 Phosphate LR T	<---- [▼] ---->	320 Phosphate LR T
0.05-4 mg/l PO ₄		0.02-1.3 mg/l P		0.04-3 mg/l P ₂ O ₅
	<---- [▲] ---->		----- [▲] ----->	
1.00 mg/l PO ₄		0.33 mg/l P		0.75 mg/l P ₂ O ₅

If the species of a test result is changed the displayed range is adjusted automatically. For an already stored result it is not possible to change the chemical species. The last displayed chemical species is kept by the instrument and will be displayed if this method is used the next time. If there is the possibility to change the chemical species for a method it is described in the manual. The arrows indicate the possible chemical species and are printed below the notes of the method:

- ▲ PO₄
- P
- ▼ P₂O₅

2.3.8 Storing results



Press [STORE] key while the test result is displayed.

Code-No.:

The display shows:



- We advise you to enter a numeric code (up to 6 places). (A Code No. can contain references to the operator or the sampling location.)



After entering confirm with [↵] key.



- If a code number is not necessary confirm by pressing [↵] directly. (The assignment for the Code No. is then 0 automatically.)

The entire data set is stored with date, time, Code No., method and test result.

Stored!

The display shows:

The test result is then shown again.

Storage: 900
free records left

Note:

The display shows the number of free data sets.

Storage: only 29
free records left

If there are less than 30 data sets free the display shows:

Clear the memory as soon as possible (see "Deleting stored results"). If memory capacity is used up it is impossible to save additional test results.

2.3.9 Printing results (T2o PC-Link) (optional)

If the PC-Link module (see chapter 2.5) is switched on and the printer is connected, it is possible to print out the test results (without saving it beforehand).



Press [F3] key.

The entire data set is printed with date, time, Code No., method and test result. Printing example:

```
100 Chlorine T
0.02-6 mg/l Cl2
Profi-Mode: no
2009-07-01 14:53:09
Test No.: 1
Code-Nr.: 007
4.80 mg/l Cl2
```

The test No. is an internal number that is set automatically if a test result is stored. It appears only on the print out.

2.3.10 Perform additional measurements



Zero accepted
prepare Test
press TEST

To perform additional tests using the same method:

- Press [TEST] key

The display shows:



Confirm with [TEST] key

or



- Press [ZERO] key to perform a new zero calibration.

prepareZero
pressZERO

The display shows:

2.3.11 Selecting a new method



Press [ESC] key to return to method selection.



Or enter the required method number directly,
e.g. [Shift] + [1][6][0] for CyA-TEST (Cyanuric acid).



Confirm with [↵] key.

2.3.12 Measure absorbance

Range: -2600 mAbs to +2600 mAbs

Method-No.	Title
900	mAbs 430 nm
910	mAbs 530 nm
920	mAbs 560 nm
930	mAbs 580 nm
940	mAbs 610 nm
950	mAbs 660 nm

Select the desired wavelength from the method list or by entering the corresponding method number directly.

900 mAbs 430 nm
-2600mAbs - +2600mAbs
prepare Zero
press ZERO

The display shows e.g.:

Always carry out zeroing using a filled (e.g. deionised water) vial.

Zero accepted
prepare Test
press TEST

The display shows:

Carry out measurement of the sample.

500 mAbs

The display shows e.g.:

TIP: To ensure complete reaction times the user countdown may be helpful (chapter 2.2.3, page 290).

2.4 Photometer settings: Table of Mode Functions

MODE-Function	No.	Description	Page
Calibration	40	Special method calibration	30
Clear calibration	46	Deleting user calibration	32
Clock	12	Setting date and time	17
Countdown	13	Switching the countdown on/off to ensure reaction times	18
Delete data	34	Deleting all stored results	29
Key beep	11	Switching the acoustic signal on/off to indicate key-pressing	17
Langelier	70	Calculation of Langelier saturation Index (Water Balance)	37
Language	10	Selecting language	16
LCD contrast	80	Setting the display contrast	39
LCD brightness	81	Setting the display brightness	39
Method list	60	User method list, adaption	35
M list all on	61	User method list, switching on all methods	36
M list all off	62	User method list, switching off all methods	36
OTZ	55	One Time Zero (OTZ)	34
Print	20	Printing all stored results	20
Print, code no.	22	Print only results of a selected Code No. range	22
Print, date	21	Print only results of a selected time period	21
Print, method	23	Print only results of one selected method	23
Printing parameters	29	Setting of printing options	24
Profi-Mode	50	Switching the detailed operator instructions on/off	33
Signal beep	14	Switching the acoustic signal on/off to indicate end of reading	19
Storage	30	Displaying all stored results	25
Stor., code	32	Displaying only results of a selected Code No. range	27
Stor., date	31	Displaying only results of a selected time period	26
Stor., method	33	Displaying only results of one selected method	28
System info	91	Information about the instrument e.g. current software version	40
Temperature	71	Selection of °C or °F for Langelier Mode 70	38

MODE-Function	No.	Description	Page
User calibration	45	Storage of user calibration	31

The selected settings are kept by the photometer even when switched off. To change photometer settings a new setting is required.

2.4.1 Instrument basic settings 1

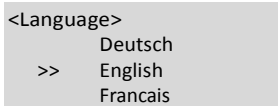
Selecting a language



Press [MODE], [Shift] + [1][0] keys.



Confirm with [↵] key.



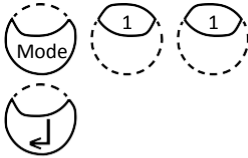
The display shows:

Press arrow key [▼] or [▲] to select the required language from the displayed list.



Confirm with [↵] key.

Key beep

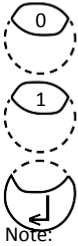


Press [MODE], [Shift] + [1][1] keys.

Confirm with [↵] key.

```
<Key-Beep>
ON: 1    OFF: 0
```

The display shows:



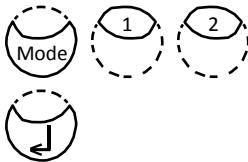
- Press [Shift] + [0] keys to switch the key beep off.
- Press [Shift] + [1] keys to switch the key beep on.

Confirm with [↵] key.

Note:

In the case of methods with reaction periods, an acoustic signal still sounds during the last 10 seconds of the countdown even if the key beep is switched off.

Setting date and time



Press [MODE], [Shift] + [1][2] keys.

Confirm with [↵] key.

```
<clock>
yy-mm-dd      hh:mm
--:--:--      -::-
```

The display shows:

The entry comprises two digits each.

```
yy-mm-dd      hh:mm
09-05-14  _: _:
```

Enter year, month and day,

e.g.: 14. May 2009 = [Shift] + [0][9][0][5][1][4]

```
yy-mm-dd      hh:mm
09-05-14  15:07
```

Enter hours and minutes

e.g.: 3.07 p.m. = [Shift] + [1][5][0][7]



Confirm with [↵] key.

Note:

While confirming date and time with [↵] key the seconds are adjusted to zero automatically.

Countdown (Ensuring reaction periods)

Some methods require a reaction period. This reaction period is incorporated in the method as standard with the countdown function.

It is possible to switch the countdown off for all methods:



Press [MODE], [Shift] + [1][3] keys.



Confirm with [↵] key.

<Countdown>
ON:1 OFF:0

The display shows:



• Press [Shift] + [0] keys to switch the countdown off.



• Press [Shift] + [1] keys to switch the countdown on.



Confirm with [↵] key.

Notes:

1. It is possible to interrupt the working countdown by pressing the [↵] key (application e.g. serial analysis).
The "user countdown" is also available if the countdown is switched off.
2. If the countdown function is switched off, the operator is responsible for ensuring the necessary reaction period.
Non-compliance with reaction periods leads to incorrect test results.

Signal beep

Performing a zero or a measurement takes 8 seconds. The photometer indicates the end of zeroing or measuring by a short beep.



Press [MODE], [Shift] + [1][4] keys.



Confirm with [↵] key.

```
<Signal-Beep>  
ON:1   OFF:0
```

The display shows:



- Press [Shift] + [0] keys to switch the signal beep off.



- Press [Shift] + [1] keys to switch the signal beep on.



Confirm with [↵] key.

Note:

In the case of methods with reaction periods, an acoustic signal still sounds during the last 10 seconds of the countdown even if the key beep is switched off.

2.4.2 Printing of stored results

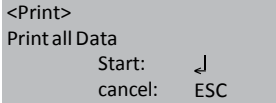
Printing all results



Press [MODE], [Shift] + [2][0] keys.



Confirm with [↵] key.



The display shows:

Press [↵] key for printing out all stored test results.



The display shows e.g.:

After printing the photometer goes back to <Mode-Menu> automatically.

Note:

It is possible to cancel the entry by [ESC].

All stored data are printed out.

See chapter 2.5.1 Data Printing.

Printing results of a selected time period



Press [MODE], [Shift] + [2][1] keys.



Confirm with [↵] key.

```
<Print>
sorted: date
from yy-mm-dd
- -
```

The display shows:

Enter year, month and day for the first day of the required period, e.g.: 14 May 2009 = [Shift] + [0][9][0][5][1][4]



Confirm with [↵] key.

```
to yy-mm-dd
- -
```

The display shows:

Enter year, month and day for the last day of the required period, e.g.: 19 May 2009 = [Shift] + [0][9][0][5][1][9]



Confirm with [↵] key.

```
from 2009-05-14
to 2009-05-19
Start: ↵
cancel: ESC
```

The display shows:

Press [↵] key and all stored results in the selected date range are printed.

After printing the photometer goes back to mode menu automatically.

Note:

It is possible to cancel the entry by [ESC].

If you want to print only results of one day enter the same date twice to determine the period.

Printing results of a selected Code No. range



Press [MODE], [Shift] + [2][2] keys.



Confirm with [↵] key.

```
<Print>
sorted: Code-No.
from _____
```

The display shows:

Enter numeric code number (up to 6 places) for the first required Code No., e.g.: [Shift] + [1].



Confirm with [↵] key.

```
to _____
```

The display shows:

Enter numeric code number (up to 6 places) for the last required Code No., e.g.: [Shift] + [1][0].



Confirm with [↵] key.

```
from    000001
to      000010
Start:  ↵
cancel: ESC
```

The display shows:

Press [↵] key and all stored results in the selected code number range are printed.

After printing the photometer goes back to mode menu automatically.

Note:

It is possible to cancel the entry by [ESC].

If you want to print only results of one code number enter the same code number twice.

If you want to print all results without code no. (code no. is 0) enter Zero [0] twice.

Printing results of one selected method



Press [MODE], [Shift] + [2][3] keys.



Confirm with [↵] key.

```
<Print>
>>20 Acid demand
 30 Alkalinity-tot
 40 Aluminium T
```

The display shows:

Select the required method from the displayed list or enter the method-number directly.



Confirm with [↵] key.

In case of differentiated methods select the required kind of determination and confirm with [↵] key.

```
<Print>
method
30 Alkalinity-tot
Start:  ↵
cancel:ESC
```

The display shows:

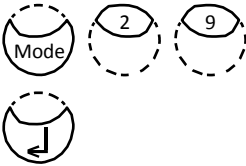
Press [↵] key and all stored results of the selected method are printed.

After printing the photometer goes back to mode menu automatically.

Note:

It is possible to cancel the entry by [ESC].

Printing Parameter



Press [MODE], [Shift] + [2][9] keys.

Confirm with [↵] key.

```
<printing parameter>
2: Baud rate
```

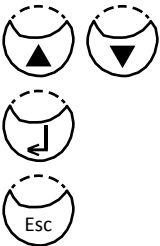
```
cancel:          ESC
```

The display shows:

Press [Shift] + [2] keys to select "Baud rate".

```
<Baud rate>
is: 19200
select:  [▲][▼]
save:    [↵]
cancel:  ESC
```

The display shows:



Press arrow key [▼] or [▲] to select the required baud rate.
(1200, 2400, 4800, 9600, 14400, 19200)

Confirm with [↵] key.

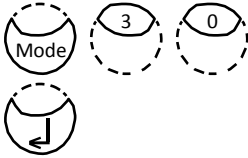
End with [ESC] key.

Back to Mode Menu with [ESC] key.

Back to method selection with [ESC] key.

2.4.3 Recall / delete stored results

Recall all stored results



Press [MODE], [Shift] + [3][0] keys.

Confirm with [↵] key.

```
<Storage>
display all data
Start:  ↵ cancel: ESC
print:  F3
print all: F2
```

The display shows:

The stored data sets are displayed in chronological order, starting with the latest stored test result. Press [↵] key and all stored results are displayed.

- Press [F3] key to print the displayed result.
- Press [F2] key to print all results.
- End with [ESC].
- Press arrow key [▼] to display the following test result.
- Press arrow key [▲] to display the previous test result.



```
no data
```

If there are no test results in memory the display shows:

Recall results of a selected time period



Press [MODE], [Shift] + [3][1] keys.



Confirm with [↵] key.

```
<Storage>
sorted: date
from yy-mm-dd
- -
```

The display shows:

Enter year, month and day for the first day of the required period, e.g.: 14 May 2009 = [Shift] + [0][9][0][5][1][4]



Confirm with [↵] key.

```
to yy-mm-dd
- -
```

The display shows:

Enter year, month and day for the last day of the required period, e.g.: 19 May 2009 = [Shift] + [0][9][0][5][1][9]



Confirm with [↵] key.

```
from 2009-05-14
to 2009-05-19
Start:      ↵ cancel: ESC
print: F3
print all: F2
```

The display shows:

- Press [↵] key and all stored results in the selected date range are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

Note:

It is possible to cancel the entry by [ESC].

If you want to recall only results of one day enter the same date twice to determine the time period.

Recall results of a selected Code No. range



Press [MODE], [Shift] + [3][2] keys.



Confirm with [↵] key.

```
<Storage>
sorted: Code-No.
from _____
```

The display shows:

Enter numeric code number (up to 6 places) for the first required Code No., e.g.: [Shift] + [1].



Confirm with [↵] key.

```
to _____
```

The display shows:

Enter numeric code number (up to 6 places) for the last required Code No., e.g.: [Shift] + [1][0].



Confirm with [↵] key.

```
from 000001
to 000010
Start: ↵ cancel:ESC
print: F3
print all: F2
```

The display shows:

- Press [↵] key and all stored results in the selected Code No. range are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

Note:

It is possible to cancel the entry by [ESC].

If you want to recall only results of one code number enter the same code number twice.

If you want to recall all results without code no. (code no. is 0) enter Zero [0] twice.

Recall results of one selected method



Press [MODE], [Shift] + [3][3] keys.



Confirm with [↵] key.

```
<Storage>
>>20 Acid demand
  30 Alkalinity-tot
  40 Aluminium T
```

The display shows:

Select the required method from the displayed list or enter the method number directly.



Confirm with [↵] key.

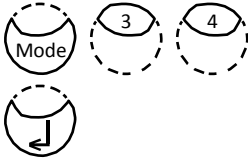
In case of differentiated methods select the required kind of determination and confirm with [↵] key.

```
<Storage>
method
30 Alkalinity-tot
Start: ↵ cancel: ESC
print: F3
print all: F2
```

The display shows:

- Press [↵] key and all stored results of the selected method are displayed.
- Press [F3] key to print the displayed result.
- Press [F2] key to print all selected results.
- End with [ESC].

Delete stored results



Press [MODE], [Shift] + [3][4] keys.

Confirm with [↓] key.

```
<Delete data>
Delete all data?
YES : 1  NO : 0
```

The display shows:



- Press [Shift] + [0] keys to retain the data sets in memory.
- After pressing keys [Shift] + [1] the following acknowledgment is displayed:

```
<Delete data>
Delete data ↓
Do not delete: ESC
```

Press [↓] key to delete.

ATTENTION:

All stored test results are deleted

or cancel without deleting data by pressing [ESC] key.

Note:

All stored test results are deleted.

User Calibration

If a test method is user calibrated the method name is displayed inverse.

Procedure:

- Prepare a standard of known concentration and use this standard instead of the sample according to the test procedure.
- It is recommend to use well known standards which are formulated according to DIN EN, ASTM or other international norms or to use certified standards which are commercially available.
- After measuring this standard solution it is possible to change the displayed results to the required value.
- If a method uses a mathematic equation for the calculation of the result, it is only possible to calibrate the basic tests since all the other tests use the same polynomial.
- The same applies for some test procedures which use a polynomial from another test procedure.

Return to factory calibration:

If the user calibration is deleted the factory calibration is automatically activated.

Remarks:

The method "Fluoride" cannot be calibrated with mode 45 since the test requires a calibration related to the batch of the liquid reagent (SPADNS)

Table

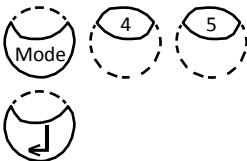
No.	Method	Recommended range for user calibration
35	Alkalinity-p	100–300 mg/l CaCO ₃
30	Alkalinity-total	50–150 mg/l CaCO ₃
31	Alkalinity-total HR T	50–300 mg/l CaCO ₃
40	Aluminium T	0.1–0.2 mg/l Al
60	Ammonia T	0.3–0.5 mg/l N
85	Boron	1 mg/l B
80	Bromine T	Calibration with basic test 100 Chlorine free
90	Chloride T	10–20 mg/l Cl ⁻
100	Chlorine T	0.5–1.5 mg/l Cl
103	Chlorine HR T	0.5–6 mg/l Cl
120	Chlorine dioxide T	Calibration with basic test 100 Chlorine free
125	Chromium	1 mg/l Cr
130	COD LR	100 mg/l O ₂
131	COD MR	500 mg/l O ₂
132	COD HR	5 g/l O ₂ = 5000 mg/l O ₂
204	Colour	operating range
150	Copper T	0.5–1.5 mg/l Cu
157	Cyanide	0.1–0.3 mg/l CN
160	CyA-TEST	30–60 mg/l CyA
170	Fluoride	Calibration with 0 and 1 mg/l F through
210	H ₂ O ₂ T	Calibration with basic test 100 Chlorine free
190	Hardness, Calcium	100–200 mg/l CaCO ₃
200	Hardness, total T	15–25 mg/l CaCO ₃
205	Hydrazine P	0.2–0.4 mg/l N ₂ H ₄
215	Iodine	Calibration with basic test 100 Chlorine free

220	Iron T	0.3–0.7 mg/l Fe
222	Iron PP	0.1–2 mg/l Fe
240	Manganese T	1–2 mg/l Mn
250	Molybdate T	5–15 mg/l Mo
251	Molybdate LR PP	1.5–2.5 mg/l Mo
257	Nickel T	6–8 mg/l Ni
260	Nitrate LR T	0.5–0.7 mg/l N
265	Nitrate TT	10 mg/l N
270	Nitrite T	0.2–0.3 mg/l N
300	Ozone (DPD)	Calibration with basic test 100 Chlorine free
290	Oxygen, active	Calibration with basic test 100 Chlorine free
329	pH-Value LR	6.0–6.6
330	pH-Value T	7.6–8.0
332	pH-Value HR	8.6–9.0
320	Phosphate LRT	1–3 mg/l PO ₄
321	Phosphate HR T	30–50 mg/l PO ₄
340	Potassium	3 mg/l K
350	Silica	0.5–1.5 mg/l SiO ₂
212	Sodium hypochlorite	8 %
355	Sulfate T	50 mg/l SO ₄
365	Sulfide	0.2–0.4 mg/l S
370	Sulfite	3–4 mg/l SO ₃
384	Suspended Solids	operating range
386	Turbidity	operating range
390	Urea	1–2 mg/l CH ₂ N ₂ O
400	Zinc	0.2–0.4 mg/L Zn

Store user calibration

100 Chlorine T
0.02-6 mg/l Cl₂
0.90 mg/l free Cl₂

Perform the required method as described in the manual using a standard of known concentration instead of the water sample.



If the test result is displayed press [MODE], [Shift] + [4] [5] keys and confirm with [←] key.

```
<user calibration>
100 Chlorine T
0.02-6 mg/l Cl2
0.90 mg/l free Cl2
up: ↑, down: ↓
save: ↵
```

The display shows:

Pressing the arrow key [▲] once increases the displayed result.

Pressing the arrow key [▼] once decreases the displayed result.

Press keys till the displayed result corresponds to the value of the standard.

Confirm with [↵] key to store the new calibration factor.
Cancel user calibration by pressing [ESC] key.



```
Jus Factor
saved
```

The display shows:

```
100 Chlorine T
0.02-6 mg/l Cl2
1.00 mg/l free Cl2
```

Now the method name is displayed inverse and the test result is calculated with the new calibration factor.

Delete user calibration

This chapter only applies for methods which can be user calibrated.

```
100 Chlorine T
0.02-6 mg/l Cl2
```

Select the required method.

```
prepare ZERO
press ZERO
```

Instead of zeroing the instrument press [MODE], [Shift] + [4] [6] keys and confirm with [↵] key.



```
<user calibration>
100 Chlorine T
0.02-6 mg/l Cl2
clear user
calibration?
YES: 1, NO: 0
```

The display shows:



Press [Shift] + [1] keys to delete user calibration.



Press [Shift] + [0] keys to keep the valid user calibration.

The instrument goes back to Zero-query automatically.

2.4.4 Lab function

Reduced operator guidance => "Profi-Mode"

This function may be used for routine analyses with many samples of one method.
The following information is always stored in the methods:

- a) Method
- b) Range
- c) Date and time
- d) Differentiation of results
- e) Detailed operator instruction
- f)) Compliance with reaction periods

If the Profi-Mode is active, the photometer provides only a minimum of operator instructions.
The criteria specified above in d, e, f are no longer included.



Press [MODE], [Shift] + [5][0] keys in succession.



Confirm with [↵] key.

<Profi-Mode>
ON : 1 OFF : 0

The display shows:



- Press [Shift] + [0] keys to switch the Profi-Mode off.



- Press [Shift] + [1] keys to switch the Profi-Mode on.

switched off

The display shows:

or

switched on



Confirm with [↵] key.

Note:

Storage of test results is possible. When results are stored the display also shows "Profi-Mode".

The selected settings are kept by the photometer even when it is switched off. To change photometer setting a new setting is required.

One Time Zero (OTZ)

OneTimeZero is available for all methods where Zero is performed in a 24 mm Ø round vial with sample water (see chapter 1.1 Table of Methods).

OneTimeZero can be used for different tests providing the tests are performed with the same sample water and under the same test conditions. When changing the method, it is not necessary to perform a new Zero. The test can be carried out straight away.

When the instrument is first being used for an OTZ compatible method and OneTimeZero is activated, the instrument will request a new Zero with “prepare OT-Zero”. Perform Zero as described in the method. This Zero will be stored and used for all methods with OTZ function until the instrument is switched off.

If necessary, a new Zero can be performed by pressing [Zero] key at any time.

Switching the “OTZ-Function“ on and off:



Press [MODE], [Shift] + [5][5] keys.



Confirm with [↵] key.

<OneTimeZero>
ON : 1 OFF : 0

The display shows:



- Press [Shift] + [0] keys to switch the OTZ off.



- Press [Shift] + [1] keys to switch the OTZ on.

switched off

The display shows:

or

switched on



Confirm with [↵] key.

The instrument goes back to mode menu automatically.

Note:

The specified accuracy is valid for all test results when Zero is performed for each test (OneTimeZero function is switched off).

2.4.5 User operations

User method list

After switching on the instrument a scroll list of all available methods is automatically shown in the display. To shorten this list according to the requirements of the user it is possible to create a user defined scroll list.

The program structure requires that this list must have at least one active (switched on) method. For this reason it is necessary to activate first all required methods and then to switch off the automatically activated one if this method is not required.

User-method list, adaptation



Press [MODE], [Shift] + [6][0] keys.



Confirm with [↘] key.

```
<Method list>
selected: •
toggle: F2
save: ↘
cancel: ESC
```

The display shows:

Start with [↘] key.

```
<Method list>
>> 30 •Alkalinity-tot
    40 •Aluminium
    50 •Ammonium
....
```

The complete method list is displayed.

Methods with a point [•] behind the method number will be displayed in the method selection list. Methods without a point will not be displayed in the method selection list.

```
>> 30 •Alkalinity-tot
```



Press key [▲] or [▼] to select the required method from the displayed list.

```
>> 30 Alkalinity-tot
```

Switch with [F2] key between "active" [•] and "inactive" [].



```
>> 30 •Alkalinity-tot
```

Select next method, activate or inactivate it and continue.



Confirm with [↘] key.

Cancel without storing by pressing [ESC] key.

Recommendation:

If only a few methods are required it is recommended to perform Mode 62 first, followed by Mode 60.

All user Polynomials (1-25) and Concentrations (1-10) are displayed in the method list, although they are not programmed by the user. Non-programmed user methods can't be activated!

User method list, switch all methods on

This mode function activates all methods. After switching on the instrument a scroll list of all available methods is automatically shown in the display.



Press [MODE], [Shift] + [6][1] keys.



Confirm with [↵] key.

```
<Mlist all on>
switch on all
methods
YES: 1, NO: 0
```

The display shows:



- Press [Shift] + [1] keys to display all methods in the method selection list.



- Press [Shift] + [0] keys to keep the valid method selection list.

The instrument goes back to mode menu automatically.

User method list, switch all methods off

The program structure requires that the method list must have at least one active (switched on) method. For this reason the instrument activates one method automatically.



Press [MODE], [Shift] + [6][2] keys.



Confirm with [↵] key.

```
<Mlist all off>
switch off all
methods
YES: 1, NO: 0
```

The display shows:



- Press [Shift] + [1] keys to display only one method in the method selection list.



- Press [Shift] + [0] keys to keep the valid method selection list.

The instrument goes back to mode menu automatically.

2.4.6 Specialfunctions

Langelier Saturation Index (Water Balance)

For calculation the following tests are required:

- pH-value
- Temperature
- Calciumhardness
- Total Alkalinity
- TDS (Total Dissolved Solids)

Run each test separately and note the results.

Calculate the Langelier Saturation Index as described:

Calculation of Langelier Saturation Index



With Mode 71 (see below) it is possible to select between degree Celsius or degree Fahrenheit.

Press [MODE], [Shift] + [7][0] keys.



Confirm with [↵] key.

<Langelier>
temperature °C:
3°C <=T<=53°C
+ ____

The display shows:

Enter the temperature value (T) in the range between 3 and 53°C and confirm with [↵] key. If °F was selected, enter the temperature value in the range between 37 and 128°F.



calcium hardness
50<=CH<=1000
+ ____

The display shows:

Enter the value for Calcium hardness (CH) in the range between 50 and 1000 mg/l CaCO₃ and confirm with [↵] key.



tot. alkalinity
5<=TA<=800
+ ____

The display shows:

Enter the value for Total Alkalinity (TA) in the range between 5 and 800 mg/l CaCO₃ and confirm with [↵] key.



total dissol. solids
0<=TDS<=6000
+ ____

The display shows:

Enter the value for TDS (Total Dissolved Solids) in the range between 0 and 6000 mg/l and confirm with [↵] key.



pH value
0<=pH<=12
+ _ _ _



The display shows:

Enter the pH-value in the range between 0 and 12 and confirm with [↵] key.

<Langelier>
Langelier
saturation index
0.00
Esc ↵

The display shows the Langelier Saturation Index.

Press [↵] key to start new calculation.

Return to mode menu by pressing [ESC] key.

Operating error:

Examples:

CH<=1000 mg/l CaCO3!

Values out of defined range:

The entered value is too high.

CH>=50 mg/l CaCO3!

The entered value is too low.



Confirm display message with [↵] key and enter a value in the defined range.

Selection of temperature unit

Entering the temperature value is possible in degree Celsius or degree Fahrenheit. Therefore the following preselection is (once) required.



Press [MODE], [Shift] + [7][1] keys.



Confirm with [↵] key.

<temperature>
1: °C 2: °F

The display shows:



Press [Shift] + [1] keys to select degree Celsius.



Press [Shift] + [2] keys to select degree Fahrenheit.

The instrument goes back to mode menu automatically.

2.4.7 Instrument basic settings 2

Adjusting display contrast



Press [MODE], [Shift] + [8][0] keys.



Confirm with [↘] key.

<LCD contrast>

The display shows:

1 1



- Press arrow key [▲] to increase contrast of the LCD display about one unit.



- Press arrow key [▼] to decrease contrast of the LCD display about one unit.

10 10



- Press [Store] key to increase contrast of the LCD display about ten units.



- Press [Test] key to decrease contrast of the LCD display about ten units.



Confirm with [↘] key.

Adjusting display brightness



Press [MODE] [8] [1] keys.



Confirm with [↘] key.

<LCDbrightness>

The display shows:

1 1



Press [▲] key to increase brightness of the display about one unit.



Press [▼] key to decrease brightness of the display about one unit.

10 10



Press [Store] key to increase brightness of the display about ten units.



Press [Test] key to decrease brightness of the display about ten units.

0...254 : 200

The display shows:

The brightness can be selected between 0 and 254 units, e.g.:200.



Confirm with [↵] key.

2.4.8 Instrument special functions /service

Photometer-Information



Press [MODE], [Shift] + [9][1] keys.



Confirm with [↵] key.

```
<System-Info>
Software:
V201.001.1.001.002
more: ↓, cancel: Esc
```

This method informs you about the current software version, about the number of performed tests and free memory capacity.



Press arrow key [▼] to display the number of performed tests and free memory capacity.

```
<System-Info>
Number of Tests:
139
free records left
999
cancel: Esc
```

Finish with [ESC] key.

2.5 Data transfer

To print data or to transmit to a PC the optional T2o PC-Link infra-red module is required.

2.5.1 Data Printing

Besides the PC-Link module the following printer is required to print data directly using the USB Interface of the module: HP Deskjet 6940.

2.5.2 Data transfer to a personal computer

Besides the PC-LINK a transfer program, is required to transmit test results.

Please find detailed information in the PC-LINK manual or at our homepage in the download-area.

2.5.3 Internet Updates

To connect the instrument to the serial interface of a computer the optional connection cable with integrated electronic system is required.

It is possible to update new software applications and additional languages via the internet.

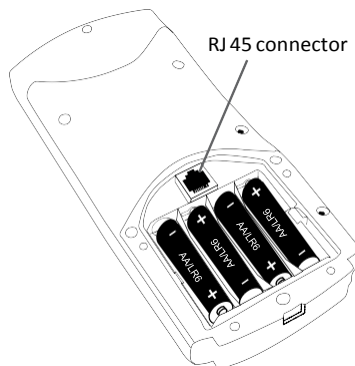
Please find detailed information at our homepage in the download-area (as soon as available).

How to open and close the battery compartment cover see chapter 2.1.3!

Please Note:

To prevent loss of stored test results store or print them out before performing an Update.

If the update procedure is interrupted (eg. interruption of connection, LoBat., etc.) the instrument isn't able to work (no display). The instrument will only work again after completing the data transfer.



Part 3

Enclosure

3.1 Unpacking

Carefully inspect all items to ensure that every part of the list below is present and no visible damage has occurred during shipment. If there is any damage or something is missing, please contact your local distributor immediately.

3.2 Delivery contents

Standard contents for HT1000:



1 Photometer



4 batteries (Type AA/LR 6)



1 Instruction manual



1 Certificate of



compliance

Round vials with cap, height 48 mm, \varnothing 24

mm

Reagent sets, PC-LINK module and connection cable with integrated electronic system are not part of the standard scope of delivery. Please see the General Catalogue for details of available reagent sets.

3.3 Technical data

Display	Graphic Display with backlight
Serial Interface	IR interface for data transfer RJ45 connector for internet updates (see chapter 2.5.3)
Light source	light-emitting diode – photosensor – pair arrangement in a transparent measurement chamber Wavelength ranges: $\lambda_1 = 530 \text{ nm IF } \Delta \lambda = 5 \text{ nm}$ $\lambda_2 = 560 \text{ nm IF } \Delta \lambda = 5 \text{ nm}$ $\lambda_3 = 610 \text{ nm IF } \Delta \lambda = 6 \text{ nm}$ $\lambda_4 = 430 \text{ nm IF } \Delta \lambda = 5 \text{ nm}$ $\lambda_5 = 580 \text{ nm IF } \Delta \lambda = 5 \text{ nm}$ $\lambda_6 = 660 \text{ nm IF } \Delta \lambda = 5 \text{ nm}$ IF = Interference filter
Wavelength accuracy	$\pm 1 \text{ nm}$
Photometric accuracy*	2% FS (T = 20°C – 25°C)
Photometric resolution	0.005 A
Measuring range of absorbance	-2600 - 2600 mAbs
Protection	conforming to IP 68 (1 h, 0.1 m)
Operation	Acid and solvent resistant touch-sensitive keyboard with integral beeper as acoustic indicator.
Power supply	4 batteries (Type AA/LR 6); lifetime: approx. 26 hours continuous use or 3500 tests
Auto off	20 minutes after last function, 30 seconds acoustical signal before switch off
Dimensions	approx. 210 x 95 x 45 mm (unit) approx. 395 x 295 x 106 mm (case)
Weight (unit)	approx. 450 g
Working condition	5 – 40°C at max. 30–90% relative humidity (without condensation)
Language options	English, German, French, Spanish, Italian, Portuguese, Polish; further languages via Internet Update
Storage capacity	ca. 1000 data sets

* measured with standard solutions

Subject to technical modification!




To ensure maximum accuracy of test results, always use the reagent systems supplied by the instrument manufacturer.

3.4 Abbreviations

Abbreviation	Definition
°C	degree Celsius (Centigrade)
°F	degree Fahrenheit °F = (°C x 1.8) + 32
°dH	degree German Hardness
°fH	degree French hardness
°eH	degree English Hardness
°aH	degree American Hardness
Abs	Absorption unit (Δ Extinction E) 1000 mAbs = 1 Abs Δ 1A Δ 1E
μ g/l	(= ppb) Microgram per litre
mg/l	(= ppm) Milligram per litre
g/l	(= ppth) gram per litre
KI	Potassium iodide
K _{s4.3}	Acid demand to pH 4.3 – this method is similar to Total Alkalinity but converted into the unit “mmol/l”, as the German DIN 38409 demand.
TDS	Total Dissolved Solids
LR	Low Range
MR	Medium Range
HR	High Range
C	Reagents from Chemetrics®
L	Liquid reagent
P	Powder (reagent)
PP	Powder Pack
T	Tablet
TT	Tube Test
DEHA	N,N-Diethylhydroxylamine
DPD	Diethyl-p-phenyldiamine
DTNB	Ellmans reagent
PAN	1-(2-Pyridylazo)-2-naphthol
PDMAB	Paradimethylaminobenzaldehyde
PPST	3-(2-Pyridyl)-5,6-bis(4-phenylsulfonic acid)1,2,4-triazine
TPTZ	2,4,6-Tri-(2-Pyridyl)-1,3,5-triazine

3.5 Troubleshooting

3.5.1 Operating messages in the display / error display

Display	Possible Causes	Elimination
Overrange	reading is exceeding the range water sample is too cloudy too much light on the photo cell	if possible dilute sample or use other measuring range filtrate water sample seal on the cap? Repeat measurement with seal on the cap of the vial.
Underrange	result is under the detection limit	indicate result with lower x mg/l x = low end of measuring range; if necessary use other analytical method
Storagesystem error use Mode 34	mains power fails or is not connected	insert or change battery. Delete data with Mode 34
Battery warning  	warning signal every 3 minutes warning signal every 12 seconds	capacity of the battery is too low; change the batteries
	warning signal, the instrument switches itself off	change the batteries
Jus Overrange E4	The user calibration is out of the accepted range	Please check the standard, reaction time and other possible faults. Repeat the user calibration.
Jus Underrange E4		
Overrange E1	The concentration of the standard is too high/too low, so that during user calibration the limit of the range was exceeded	Perform the test with a standard of higher/lower concentration
Underrange E1		
E40 user calibration not possible	If the display shows Overrange/ Underrange for a test result a user calibration is not possible	Perform the test with a standard of higher/lower concentration
Zero not accepted	Light absorption is too great or too low	Refer to chapter 2.3.4 Performing Zero. Clean sample chamber. Repeat zeroing.

Display	Possible Causes	Elimination
<p data-bbox="115 185 165 217">???</p> <p data-bbox="109 312 199 336">Example 1</p> <p data-bbox="109 363 300 448">0,60 mg/l free Cl ??? comb Cl 0,59 mg/l total Cl</p> <p data-bbox="109 560 199 584">Example 2</p> <p data-bbox="109 611 300 703">Underrange ??? comb Cl 1,59 mg/l total Cl</p> <p data-bbox="109 855 199 879">Example 3</p> <p data-bbox="109 906 300 999">0,60 mg/l free Cl ??? comb Cl Overrange</p>	<p data-bbox="328 177 594 248">The calculation of a value (e.g. combined Chlorine) is not possible</p>	<p data-bbox="622 177 826 225">Test procedure correct? If not – repeat test</p> <p data-bbox="622 312 902 496">Example 1: The readings for free and total Chlorine are different, but considering the tolerances of each reading they are the same. For this reason the combined Chlorine is most likely zero.</p> <p data-bbox="622 568 908 775">Example 2: The reading for free Chlorine is under the detection limit. The instrument is not able to calculate the combined Chlorine. In this case the combined Chlorine is most likely the same as the total Chlorine.</p> <p data-bbox="622 855 913 1038">Example 3: The reading for total Chlorine is exceeding the range. The instrument is not able to calculate the combined Chlorine. The test should be repeated with a diluted sample.</p>
<p data-bbox="109 1102 258 1150">Error absorbance e.g.: T2>T1</p>	<p data-bbox="328 1102 572 1150">Fluoride calibration was not correct</p>	<p data-bbox="622 1102 779 1126">Repeat calibration</p>

3.5.2 General

Finding	PossibleCauses	Elimination
Test result deviates from the expected.	Chemical species not as required.	Press arrow keys to select the required chemical species.
No differentiation: e.g. for the Chlorine test there is no selection between differentiated, free or total.	Profi-Mode is switched on.	Switch Profi-Mode off with Mode 50.
The pre-programmed countdown is not displayed.	Countdown is not activated and/or the Profi-Mode is activated.	Switch the countdown on with Mode 13 and/or switch the Profi-Mode off with Mode 50.
It seems that a method is not available.	Method is not activated in the user method list.	Activate the required method in the user method list with Mode 60.



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