

ALC 2000

ENGLISH

**USER'S GUIDE
AND
TECHNICAL REFERENCE**

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	Page
1 BEFORE USING THE INSTRUMENT FOR THE FIRST TIME	5
2 INSTALLATION	6
2.1 Scope of the delivery	6
2.2 Installing the equipment	6
2.2.1 Selection of the correct power voltage	6
2.2.2 Mains connection	7
2.2.3 Connecting the compressed air	7
2.2.4 Compressor	7
2.2.5 Printer connection	7
2.2.6 Print results and client label	7
3 OPERATION	8
3.1 Overview	8
3.2 ALC 2000 Starting Up and Setup	9
3.2.1 Language selection	9
3.2.2 Selecting a compressor	10
3.2.3 Display numerical(measured) results	10
3.2.4 Entering client label	10
3.2.5 Return to Main Menu	10
3.3 Switching on the ALC 2000	11
3.4 Programming the ALC 2000	11
3.4.1 Standard Program	11
3.4.2 Overview of the Measuring Programs	12
3.4.3 Testing under pressure and vacuum	12
3.4.4 Testing under pressure	12
3.4.5 Testing under vacuum	13
3.4.6 Customer specific test programs (P1- P10)	13
3.5 Programming example for user programs	14
3.5.1 User program selection	15
3.5.2 Lower pressure	15
3.5.3 Higher pressure	16
3.5.4 Measuring time	16
3.5.5 Tight limit	16

3.5.6 Case analysis	17
3.5.7 Save parameters	17
3.6 Measurements - General Comment	18
3.6.1 Prerequisite for reliable testing	18
3.7 Testing a watch	19
3.7.1 Placement of the watch	19
3.7.2 Program selection	20
3.8 System Error Messages	23
3.8.1 Power failure	23
3.8.2 Chamber not closed	23
3.8.3 Chamber not tight	23
3.8.4 Sensor out of range	23
3.8.5 No air / no vacuum	24
3.8.6 The Chamber remains closed	24
4 INTERPRETATION OF RESULTS	25
4.1.1 Big leakage	25
4.1.2 Important leakage	25
4.1.3 Test 1(2) rejected -x.x%	25
4.1.4 Test 1(2) okay \pm x.x %	26
4.1.5 Test 1(2) okay / rejected ? \pm x.x	26
5 TECHNICAL DESCRIPTION	27
5.1 Measurement principle	27
5.2 Seal criterion	27
5.3 Interpretation of the results	28
5.3.1 Negative percentage	28
5.3.2 Positive percentage	28
5.4 Relationship to the ISO standard	29
6 MEASUREMENTS	30
6.1 Measurement procedure	30
6.1.1 Deformation initial value	30
6.1.2 Pressure build-up	30
6.1.3 Stabilization	30
6.1.4 Minimum and maximum	30
6.1.5 Pressure changes	30

6.1.6	Measurement.....	31
6.1.7	Pressure release.....	31
7	APPENDIX	32
7.1	Typical deformation curves.....	32
7.1.1	Ideal case.....	32
7.1.2	Test 1(2) okay \pm x.x%.....	32
7.1.3	Test 1 and/or 2 rejected.....	33
7.1.4	Important leakage.....	33
7.1.5	Big leakage.....	34
7.1.6	Deformation relief in plastic watches.....	34
7.2	Table of Pressures.....	35
7.3	Vacuum in dependence on the Altitude.....	36
8	TECHNICAL DATA	37
9	ACCESSORIES	39
10	MAINTENANCE.....	39
10.1	Cleaning.....	39
10.2	Calibration.....	39

Congratulations!

You have made an excellent choice.

By buying the **ALC 2000** you have chosen a test instrument which combines the highest of technical standards with an operating convenience specifically designed for practical applications.

If you operate it correctly, your new instrument will give you many years of service. We wish you much pleasure and success in its application.

1 BEFORE USING THE INSTRUMENT FOR THE FIRST TIME



Please carefully read all the information given in this User's Guide. It provides you with important instructions about the use, safety and maintenance of your instrument. Keep this manual in a safe place and if the occasion should arise, pass it on to subsequent users.

The instrument may only be used for the designed purpose in accordance with this Operating Instructions.

THE MANUFACTURER,

Witschi Electronic Ltd in CH - 3294 BÜREN a.A., Switzerland,

**ACCEPTS ABSOLUTELY NO RESPONSIBILITY FOR POSSIBLE DAMAGE TO THE
TEST INSTRUMENT, TO WATCHES OR PERSONS WHICH RESULTS FROM
IMPROPER OPERATION!**

2 INSTALLATION

2.1 SCOPE OF THE DELIVERY

The basic equipment consists of the following components:

- The ALC 2000
- Compressor air hose Ø 6 - 4 mm with nipple.
- 3 carrier for watches.
- Power cable.
- Protective dust cover.
- Operating instructions.

2.2 INSTALLING THE EQUIPMENT

2.2.1 SELECTION OF THE CORRECT POWER VOLTAGE



BEFORE CONNECTING THE ALC 2000 TO THE POWER FOR THE FIRST TIME, CHECK THAT THE RED FUSE CARRIER IS PLACED IN THE SOCKET WHICH CORRESPONDS TO THE LOCAL POWER SUPPLY. SOCKET 230V FOR 230 V~ AND SOCKET 115V FOR 115 V~.

Place the red fuse carrier with the fuse in the socket 230V for a 230 V~ supply and the black carrier with the insulator in the socket 115V. Place the red fuse carrier in the socket for a 115 V~ supply and the black carrier with the insulator in the socket 230 V~.

Note: There is an insulator in the black fuse carrier. There is a **T250mA** slow-blow fuse in the red fuse carrier.



Rear panel ALC 2000

2.2.2 MAINS CONNECTION

Plug the mains cable supplied into the connector **230/115V~50/60Hz** and then the other end into a mains outlet.

2.2.3 CONNECTING THE COMPRESSED AIR

Insert the open end of the compressed air hose supplied firmly into the quick coupling **air pressure max. 11 bar**.

To extract the compressed air hose, press the (black) ring on the quick coupling towards the rear panel of the instrument while pulling the hose out of the aperture.

Connect the end of the hose fitted with a nipple to the compressor. The connecting nipple and the coupling are matched to one another when the compressor is supplied by Witschi Electronic Ltd.

2.2.4 COMPRESSOR

The ALC 2000 needs only compressed air to operate since the vacuum is generated within the unit. The unit can be connected to various compressed air sources but attention must, however, be paid to the following important points:



- Maximum input pressure **11 bar**.
- Use only oil-free, dry and dust-free air (use a filter).
- The input pressure must be **1 bar** higher than the test pressure.
- The compressor must be equipped with a reservoir having a minimum volume of **4 liters** for the vacuum test.

Connect the compressor (with or without reservoir) to the power supply (check for the correct voltage, 115 V~ or 230 V~) to the outlet labeled **air pressure max. 11 bar**.

2.2.5 PRINTER CONNECTION

Before connecting the printer (available as an option), remove the protection from the connector **printer**. The appropriate interconnection cable is supplied with the printer.

2.2.6 PRINT RESULTS AND CLIENT LABEL

NOTE: Printing of results and 'client label' is automatic if the printer is connected.

At the end of each test the numerical value (measurement) is automatically printed.

The 'client label' is printed at the top of the paper strip on two lines in bold text with each output, for either the measured results or the selected test parameters.

The 'client label' is programmed in the setup mode (refer to section 3.2.4, page 10).

3 OPERATION

The following information will help you understand how to operate the **ALC 2000**. This chapter is organized into three sections: Overview, Programming the ALC 2000 and Testing a watch with the ALC 2000.

3.1 OVERVIEW

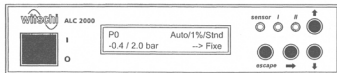


Figure 2
Front panel ALC 2000

Just four buttons on the front panel of the ALC 2000 is all that is necessary to operate the instrument. The buttons perform the following functions:

- **I/O** Switching ON / OFF the ALC 2000.
- **escape** Use this button to return to the main menu or to the **P0** standard measurement program from anywhere else in the program. **escape** is the help-button on the ALC 2000 with which you can *always* find your way back to the main menu from any of the sub-menus.
- **→** Parameter selection button.
- **↑ ↓** Buttons to enter the required value (↑ for +, ↓ for -).

The ALC 2000 communicates with you in clear-text. It is equipped with a back-lit LCD display for 2 rows of 20 characters. In addition, three LED's keep you informed of the measurement results at a glance as well as the sensor status. The functions of the three LED's are:

- **sensor** Lights up yellow to indicate when the watch has been correctly placed on the sensor.
- **I** Indicator Test 1 good (green), defective (red) or unsure (yellow).
- **II** Indicator Test 2 good (green), defective (red) or unsure (yellow).

3.2 ALC 2000 STARTING UP AND SETUP

When switching the unit on for the first time, keep the **→** button pressed in and switch the unit on by means of the **I/O** switch. This will enable you to enter the first part of setup mode **Change language**.

Change language
* E N G L I S H *

3.2.1 LANGUAGE SELECTION

The following languages are available:

Vael Sprog * D A N S K *
Sprache wechseln * D E U T S C H *
Change language * E N G L I S H *
Cambiar lengua * E S P A N O L *
Changer langue * F R A N C A I S *
Cambiare lingua * I T A L I A N O *
Velg Sprak * N O R S K *
Vallitse Kieli * S U O M I *
Välj Sprak * S V E N S K A *

Select the required language by means of the **↑ ↓** buttons. All the texts will now be displayed and be printed-out in the selected language. Return to the previous menu by pressing the **escape** button or:

after pushing the **→** key you go to the next setup mode.

Compressor type Reservoir?	Yes
-------------------------------	-----

If a compressor **without** a reservoir has been connected, select **No** by means of the \uparrow or \downarrow buttons and then press the **escape** button, or the \rightarrow key to continue setup. The factory default setting is for a compressor with reservoir. Measurements under vacuum are **not** possible using a compressor without a reservoir.

After pushing the \rightarrow key you go to the next setup mode.

3.2.3 DISPLAY NUMERICAL(MEASURED) RESULTS

You can, additionally, switch the display and print-out of the tightness value on or off. Proceed as follows:

Display numerical results?	Yes
-------------------------------	-----

Select either **Yes** or **No** with the \uparrow or \downarrow buttons and then press the **escape** button, or: after pushing the \rightarrow key you go to the next setup mode.

3.2.4 ENTERING CLIENT LABEL

Witschi Electronic Buren a.A.

There will be a cursor under the first character. You may select one of the printable characters by pushing the \uparrow or \downarrow keys. After pushing the \rightarrow key the cursor moves to the next character which you may select like the previous one, etc. After entering your label (max. 2 x 20 characters) you may push the **escape** key to save it and to return to the LANGUAGE SELECTION mode. This text will not be displayed on the LCD screen when you later turn on the unit, but will print out on the printer when you need to provide printed results.

3.2.5 RETURN TO MAIN MENU

This is the end of the setup mode. Now push **escape** to save changed parameters and return to the Main Menu.

3.3 SWITCHING ON THE ALC 2000

Switch the unit on with the **I/O** switch. The following display is presented for about 3 seconds once power has been applied:

Witschi Electronic ALC 2000 Serie Vx.x

Vx.x = Software release

The unit carries out the following functions during this time:

The actuating mechanism makes an opening movement and opens the chamber in case it was closed before the unit was powered-up. Finally the same program as that which was in use when the unit was last switched off is shown again, for example:

P0	Auto/1.0%/Std
-0.2/2.0 bar	Fix

3.4 PROGRAMMING THE ALC 2000

The ALC 2000 can be programmed for specific test situations. Watches are made with water resistant values of anywhere from 10 to 100+ meter pressures. You may want to program a test for each of the most common types of water resistant watches. With the 10 programs in the ALC 2000 you can change the parameters as needed. The 10 existing programs (P1-P10) contain factory default values.

3.4.1 STANDARD PROGRAM

The ALC 2000 contains 1 fixed standard program. This is labeled in the LCD display as P0. It cannot be changed. The display looks like the following:

P0	Auto/1.0%/Std
-0.2/2.0 bar	Fix

The display parameters are explained later, but have the basic meaning as follows:

- Auto** = The measuring time is automatically selected based on the amount of deformation measured.
- 1.0%** = The tight limit.
- Std** = The type of watch case; Standard or Hard.
- 0.2** = The vacuum pressure in bar.
- 2.0** = The air pressure in bar.
- bar** = The atmospheric pressure of 1 bar = 1.02 kg/cm².
- Fixed** = The program is fixed, cannot be changed.

The P0 program will display when you turn on the ALC 2000, if it was the last program you used, or if you at any time push the **escape** button. P0 is a standard program which can be used for all types of watches, without risk to be damaged.

3.4.2 OVERVIEW OF THE MEASURING PROGRAMS

Each program, P1 to P10 can be individually programmed for customer specific applications. The following diagram shows you the overview of the programs contained in the ALC 2000:

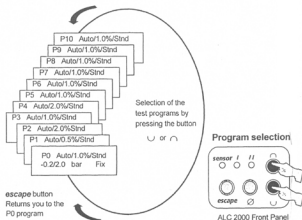


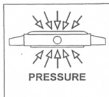
Figure 3 ALC 2000 Program Selection

3.4.3 TESTING UNDER PRESSURE AND VACUUM

A leak is most likely to be detected through a combined test using both vacuum and pressure in which the watch is subjected once to expansion and once to compression.

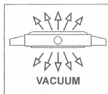
3.4.4 TESTING UNDER PRESSURE

Do not test a watch at too high a pressure. This is particularly true for watches with plastic cases which could be so greatly compressed that the mechanism is damaged. Normal, water resistant wristwatches may be tested with a maximum pressure of 2 bar. Watches that are designated with a maximum pressure or a maximum depth of water may be tested at a pressure up to the specified limit (10 m depth of water = 1 bar pressure).



3.4.5 TESTING UNDER VACUUM

The **greatest care** is called for when testing decorative dress-watches or very thin watches under vacuum! The rear cover and, depending on the construction, even the glass could be lifted by the vacuum. We recommend that such watches are first tested under a **low** pressure or vacuum. If your ALC 2000 is equipped with a compressor having no reservoir then the measurement programs under vacuum are inoperative.



A leak is most likely to be detected through a combined test using both vacuum and pressure in which the watch is subjected once to expansion and once to compression.

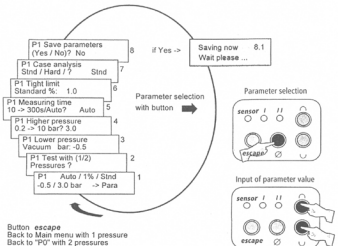
3.4.6 CUSTOMER SPECIFIC TEST PROGRAMS (P1 - P10)

The possibility to input and store product-specific test programs is one of main advantages of the ALC 2000. The 10 measurement programs (P1 to P10) can be set up to match your requirements by changing the parameters of a program. (The parameters shown in the following examples are arbitrary, and may not be the factory installed values appearing on your unit.)

The following combinations for the test sequence and the parameters can be entered for each of the P1-P10 programs:

- Test with vacuum
- Test with 1 pressure
- Test with 2 pressures
- Test with vacuum and 1 pressure
- Values for vacuum and pressure
- Measuring time and tight limit
- Storing of the programs
- Print-out of parameters

When the P1 or other Px program is displayed you may change parameters by pressing the → key. Upon pressing this key the following series of displays will be shown.



NOTE: Depending on the selection of one or two pressures the display sequence will be different

Figure 4
P1-P10 Programming

3.5 PROGRAMMING EXAMPLE FOR USER PROGRAMS

A large number of watches has one of the following or a similar marking on the back of the case:



How is a program for this category of watch created? The following example shows you how you can input and store a suitable program.

Example: P1

First test with vacuum **-0.5 bar**, then test with pressure of **3 bar**.

The prerequisites for the procedure specified are:

- The test unit is switched on and initialized (see chapter 3.2, section 3.2.1 to 3.2.4, page 9 -10).
- The ALC 2000 is in the input mode for program selection.

Note: You can always return to the first standard program **P0** by briefly pressing the **escape** button.

Use the **→** key when P1 is displayed to select which parameters to change. Then use the **↑** or **↓** keys to change the values. When you push **escape** the new values are automatically saved. If you turn off the unit while the P1 is displayed it will return after turning on the unit later. The following will be a step by step clarification:

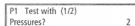
3.5.1 USER PROGRAM SELECTION

Use the **↑** **↓** buttons to select **P1**. The program will be displayed with any previously stored parameters.



The shaded area contains factory default values, or values you programmed previously.

Press the **→** button to go into the input mode. The following display appears:

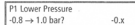


Use the **↑** **↓** buttons to select two pressures.

Proceed to the next menu item by pressing the **→** button.

3.5.2 LOWER PRESSURE

Display for the **Lower pressure** input:



Selectable values for the vacuum are: **-0.2 / -0.3 / -0.4 / -0.5 / -0.6 / -0.7** and **-0.8 bar** (a pressure of 0.2 to 9.0 bar can also be chosen). The input is made by means of the **↑** **↓** buttons. Input the value **-0.5 bar**.

Proceed to the next menu item by pressing the **→** button.

3.5.3 HIGHER PRESSURE

Display for the **Higher pressure** input:

P1 Higher Pressure 0.2 → 10 bar?	x.x
-------------------------------------	-----

Values available for the pressure selection from **0.2** to **1.0 bar** in steps of **0.1 bar**, from **1.0** to **2.0 bar** in steps of **0.2 bar**, from **2.0** to **5.0 bar** in steps of **0.5 bar** and from **5.0** to **10.0 bar** in steps of **1.0 bar**. The input is made by means of the **↑ ↓** buttons. Input the value **3.0 bar**.

Proceed to the next menu item by pressing the **→** button.

3.5.4 MEASURING TIME

Display for the **Measuring time** input:

P1 Measuring time 10 → 300s/ Auto?	Auto
---------------------------------------	------

Here you can input the required measuring period. Use the **↑ ↓** buttons to select a value between **10 s** and **300 s** or **AUTO**. If you choose **AUTO** the ALC 2000 calculates the measuring time automatically according to the deformation measured.

Proceed to the next menu item by pressing the **→** button.

3.5.5 TIGHT LIMIT

Display for the **Tight limit** input:

P1 Tight limit Value % ?	1.0
-----------------------------	-----

Sets the limiting value for the classification of the watch as being either **water resistant** or **not water resistant**. Possible input values are **0.5, 1.0, 1.5, 2.0, 2.5** and **3.0%**. The standard value of **1.0%** should be selected for normal applications. This corresponds to the criteria of the ISO 2281 Standard (50 µg/min) for watches having an average housing volume.

Extremely small or large watches, customer-specific setting

The deformation limit is the tolerance limit on which the ALC 2000 evaluates the measured amount of deformation. If the deformation relief exhibited by a watch exceeds the specified value then the watch is classified as being **poor**.

Should you wish to adjust the evaluation tolerance to suit your requirements, then:

- a lower %-value gives the result **poor** with an even smaller amount of relief.
- a higher %-value tolerates a larger amount of deformation relief.

We recommend the following values for watches with a particularly small or large volume cases:

- 1.5 % for very small watches
- 0.5 % for very large watches

The values 0.5, 1.0 (default), 1.5, 2.0, 2.5 and 3% can be selected with the **↑ ↓** buttons (see the section on Relationship to the ISO-Standard on page 29).

Proceed to the next menu item by pressing the **→** button.

3.5.6 CASE ANALYSIS

Display for the **Case analysis** input:

P1 Case analysis (Std/Hard)?	Std
---------------------------------	-----

Use the **↑ ↓** buttons to choose **Std** or **Hard**. We propose the following:

- **Hard** if the deformation of the watch is less than 1.5 µm but minimum 0.35 µm.
- **Std** for tests with low pressures or vacuum. For measurements with vacuum or pressures which are lower than 1 bar the deformation limit is 0.35 µm.

Proceed to the next menu item by pressing the **→** button.

3.5.7 SAVE PARAMETERS

Display for the **Save parameters** input:

P1 Save parameters (Yes/No)?	No
---------------------------------	----

Use the **↑ ↓** buttons to choose **Yes** or **No** to specify whether to save the parameters or not. If the parameters **are not saved** then they are only valid until the unit is switched off. In this case, if the unit is switched off and then on again then the parameters that were saved **before the changes were made** will again be taken as being valid.

Once the parameters have been **saved** they remain stored even **after** the unit has been switched off. When the unit is switched on again the now newly entered and saved parameters are taken as being valid.

The following display is presented for a period of about 1 second after you have selected **Save parameters Yes** and then pressed the **→** button:

Saving now Wait please ...

The parameters are written to the EEPROM. After this the unit goes to the main menu.

3.6 MEASUREMENTS - GENERAL COMMENT

When taking measurements with the ALC 2000 it must be borne in mind that the deformation being measured is extremely small and even minimal influences can affect the accuracy of the measurement.

A robust watch (diving watch) will deform by about 3 μm (3 thousandths of a millimeter) under a pressure of 0.5 bar. This watch would be rejected as being poor if the deformation relaxed by more than 0.06 μm (0.06 thousandths of a millimeter) after 1 minute.

The more robust the watch is and the lower the test pressure that is selected, the smaller the resultant deformation and the trickier the measurement. The deformation must be at least 1.5 μm after the pressure has been applied for a satisfactory measurement to be taken (at least 0.35 μm for the **Hard Case Test** program). If the deformation is less than this figure, the test is terminated and the message **large leakage** or **not compressible watch** is displayed. Usually such a watch has a large leak which results in an instantaneous pressure equalization.

The measured deformation can also be too small to be evaluated in the case of a robust watch being subjected to a test pressure that is too low. The test must be conducted at a higher pressure in such cases.

3.6.1 PREREQUISITE FOR RELIABLE TESTING

The following conditions can falsify the measurement:

- **Watch poorly inserted.**

A reliable measurement is not possible, for example, if the watch is laid on one side of the wrist strap since the strap will deform during the measurement in an unpredictable manner. The sensing table should be set up high for watches with wrist straps so that the strap interferes with the measurement as little as possible. The case of the watch to be tested must rest on all three contact points on the sensing table.

- **Adhesive label or protective foil under the watch casing**

An adhesive label on the underside of the watch casing leads to an increased plastic deformation during the measurement because the layer of adhesive is slowly indented by the contact points when the pressure is applied. This effect can give the impression of a leak when a measurement is made with a vacuum or a small leak can be obscured in measurements using pressure. Labels and protective foils must therefore be removed before a measurement is taken. A thinly applied coating of protective lacquer on the underside of the watch normally has no significant effect on a measurement.

- **The temperature of the watch is not the same as the ambient temperature.**

A watch will deform in an unpredictable manner as it warms or cools which can completely falsify the results of a measurement. A watch that has been worn on the arm must hence be allowed to cool to the ambient temperature before being tested.

- **Shock during the measurement.**

A watch can move slightly on the sensor table if it is subjected to shock which would falsify the result of the measurement.

- **Previous test at a higher pressure.**

A watch must be allowed to recover for a few minutes following a test performed at high pressure to permit the deformation to relax and, in the case of a leaky watch, for the pressures to equalize. The result is unreliable if a test is conducted with a low pressure or a vacuum shortly after a test at high pressure. (In the case of measurement programs using two different pressures the first one must always be lower than the second pressure that is applied).

3.7 TESTING A WATCH

3.7.1 PLACEMENT OF THE WATCH

First, move the sensor upwards using the knob **A**. The support table **B** can be adjusted in height by pressing the knobs on the side. It should be set as high as possible for watches with an arm-band.

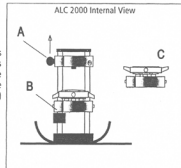


Figure 5
Placing the watch