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## Instruction Manual

# KAL 84 Calibration Device

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## Table of Contents

1	Safety precautions .....	4
1.1	Appropriate use .....	4
1.2	Shipping, assembly, electrical connections and startup.....	4
1.3	Troubleshooting, maintenance, repairs, disposal .....	4
1.4	Symbols .....	5
2	Instrument description.....	6
2.1	Features .....	6
2.2	User interfaces.....	6
2.2.1	The 4 ½ digit LCD .....	7
2.2.2	ON/OFF .....	7
2.2.3	Backlighting .....	7
2.2.4	Analog output.....	7
2.2.5	Units of pressure.....	7
2.2.6	Pressure ports .....	7
2.2.7	Purge valves .....	7
2.2.8	Automatic zero-point calibration .....	7
2.2.9	Time constants .....	8
2.2.10	Pressure transducer dial .....	8
3	Start-up.....	8
4	Pneumatic connections .....	9
5	Replacing the battery .....	9
6	Calibration.....	10
7	Troubleshooting .....	10
8	Technical data.....	11
8.1	Appendix A: Parts in contact with measurement medium.....	12
9	Dimension drawing.....	13

## Purpose of instruction manual

This instruction manual describes the features of the KAL 84 calibration device and provides guidelines for its use.

Improper use of this instrument or failure to follow these instructions may cause injury or equipment damage. All individuals responsible for operating this instrument must therefore be properly trained and aware of the hazards, and must carefully follow these operating instructions and the safety precautions detailed within. **Contact the manufacturer if you do not understand any part of this instruction manual.**

Handle this manual with care:

- It must be readily available throughout the lifecycle of the instrument.
- It must be provided to any individuals who assume responsibility for operating the instrument at a later date.
- It must include any supplementary materials provided by the manufacturer.

The manufacturer reserves the right to continue developing this instrument model without documenting such development in each individual case. The manufacturer will be happy to determine whether this manual is up-to-date.

## Conformity

This instrument corresponds to the state of the art and meets all legal requirements set forth in EC directives as evidenced by the CE label.



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The manufacturer owns the copyright to this instruction manual. This manual contains data, instructions and drawings pertaining to the features and usage of this instrument; copying this manual in part or in full or distributing it to third parties is prohibited.

# 1 Safety precautions

## 1.1 Appropriate use

The KAL 84 calibration device is used for testing and calibrating pressure sensors.

Always observe the operating requirements—particularly the permissible supply voltage—indicated on the rating plate and in the "Technical data" section of this manual.

Use only an IEC 6F22 rechargeable battery (9 V). Do not use non-rechargeable batteries as these can destroy the instrument.

The instrument may only be handled as indicated in this manual. Modifications to the instrument are prohibited. The manufacturer is not liable for damages caused by improper use or failure to follow these instructions. Violations of this type render all warranty claims null and void.

## 1.2 Shipping, assembly, electrical connections and startup

Do not close the pressure inputs when shipping, as changes in barometric pressure could damage instruments with low measuring ranges.

Only technical personnel who are appropriately trained and authorized by the operator of the facility may assemble the instrument and set up its electrical connections.

The instrument may only be operated by appropriately trained individuals who have been authorized by the operator of the facility.

Pressurized air or breath is not to be used for performance tests, as this could damage instruments with low measurement ranges.

Measurement errors may occur if the instrument is not kept protected from sunlight.

Specific safety precautions are given in individual sections of this manual.

## 1.3 Troubleshooting, maintenance, repairs, disposal

The individual responsible for the electrical connections must be notified immediately if the instrument is damaged or if errors occur that cannot be corrected as indicated in section 7.

This individual must take the instrument out of service until the error has been corrected and ensure that it cannot be used unintentionally.

**Always unplug the power cord before opening the instrument!**

This instrument requires no maintenance.

Only the manufacturer may perform repairs that require the housing to be opened.

The electronic components of the instrument contain environmentally hazardous materials and materials that can be reused. For this reason the instrument must be recycled in accordance with the environmental guidelines of the jurisdiction in question once it has been taken permanently out of service.

#### 1.4 Symbols

The symbols given below are used throughout this manual to indicate instances when improper operation could result in the following hazards:



**WARNING!** This warns you of a potential hazard that could lead to bodily injury up to and including death if the corresponding instructions are not followed.



**WARNING:** This warns you of a potential hazard that could lead to significant property damage if corresponding instructions are not followed.



**INFORMATION** This indicates that the corresponding information is important for operating the instrument properly

## 2 Instrument description

### 2.1 Features

The KAL 84 is a portable device for calibrating pressure gauges. Typical applications include calibrations of medical devices such as blood pressure meters, ventilators and infusion pumps. The halstrup-walcher KAL 84 pressure calibration device is also used in the manufacture of pressure sensors and pressure switches. Its sturdy construction and rechargeable battery also make this instrument ideal for use in assembling pressure transducers, as it allows the transducers to be calibrated on site. Use of the KAL 84 for quality assurance purposes, e.g., as a transfer standard for test equipment monitoring, is also becoming increasingly important.

The KAL 84 pressure calibrator consists of a pressure sensor, a liquid crystal display and a transducer used to generate the desired pressure.

### 2.2 User interfaces

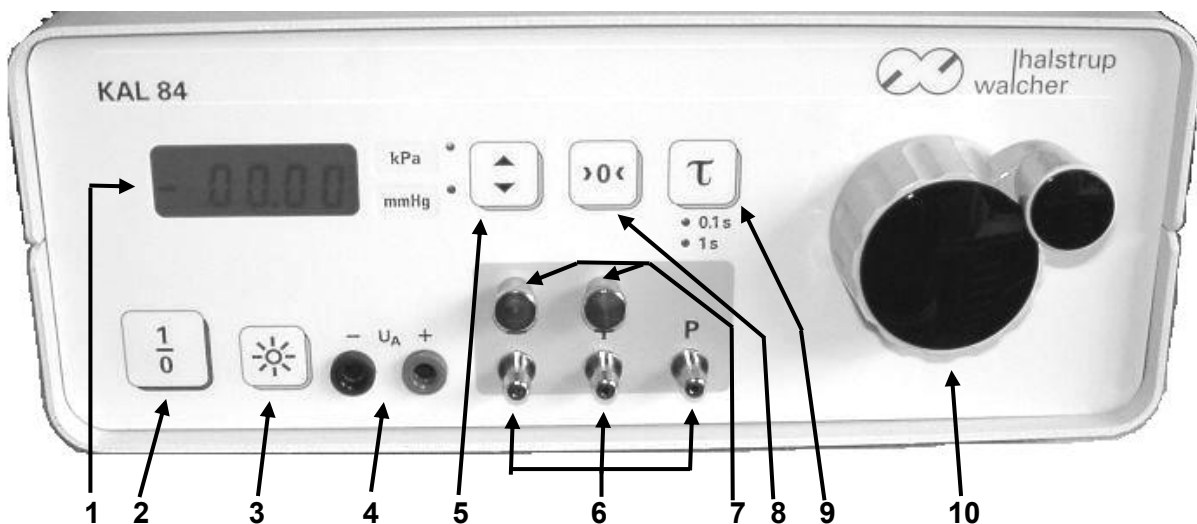


Fig. 1

1	4 ½ digit, backlit LCD
2	ON/OFF
3	Backlighting for display
4	Analog output
5	Pressure units (kPa/mmHg)
6	Pressure ports
7	Purge valves
8	Automatic zero-point calibration
9	Time constants: 0.02 s / 0.1 s / 1 s
10	Pressure transducer dial

### 2.2.1 The 4 ½ digit LCD with “Low battery”- function

The 4 ½ digit LCD displays the pressure measured by the internal reference sensor. If a test object has been connected to the instrument, the actual value displayed will agree with that of the test object after the settling time of the instrument.

In case of “Low-battery” showed on the display, recharge or replace the battery. The displayed values do not agree with the system-pressure in that case.

### 2.2.2 ON/OFF

Pressing this key once turns the instrument on. Pressing this key a second time turns the instrument off.

### 2.2.3 Backlighting

Pressing this key once turns the backlighting on. Pressing this key a second time turns the backlighting off.

### 2.2.4 Analog output

The analog output—connected via common banana plugs (d = 4mm) with at least 2 kΩ of resistance—generates an output voltage proportional to the pressure.

### 2.2.5 Units of pressure

This feature allows the operator to toggle between 2 units of pressure, e.g., Pa and mmHg. A red LED indicates the units used.

### 2.2.6 Pressure ports

These ports are for connecting the test object to the KAL 84 (inner diameter of tubing = 5 mm)

### 2.2.7 Purge valves

Purge valves are used to vent any overpressure that results when the test object is connected to the system. Turn the purge valves to the left to open. The purge valves should also be opened if the transducer dial has been turned as far as it will go in only one direction and then returned to its starting position when the test object has been connected.

**The purge valves should always be closed when taking measurements!**

### 2.2.8 Automatic zero-point calibration

Press the “>0<” key to calibrate the zero point (typically performed before each measurement). **The purge valves must be opened before calibrating the zero point.**



**The final place on the display reading may be off by a few digits after calibrating the zero point. This is within the acceptable range of tolerance. The display is not lit while the zero point is being calibrated and may need to be switched on again afterwards.**

### 2.2.9 Time constants

Pressing this key toggles between three different time constants (response times) for the KAL 84 pressure sensor. A red LED indicates the time constant selected. The default time constant (20 ms) is used if no LED appears.

### 2.2.10 Pressure transducer dial

Turning the dial generates pressure—left for negative pressure, right for positive pressure. The pressure transducer must be brought to its middle position before generating negative pressure. This is done by turning the dial to the right several times with the pressure ports open.

**Never force the dial!**

## 3 Start-up

Before plugging in the power adapter, make sure the correct supply voltage is available. The rechargeable battery (included) will charge up when the instrument is run from the power adapter, even if the KAL 84 is not turned on. Because the battery may or may not be fully charged upon delivery, we recommend charging the battery before start-up. The KAL 84 will only run on battery power if the power adapter is unplugged.



**If the battery has reached the end of its lifecycle and is no longer usable, it must be replaced with a 9 V, IEC 6F22 rechargeable battery.**

**The power adapter should never be connected if non-rechargeable batteries have been installed, as this could destroy the instrument.**



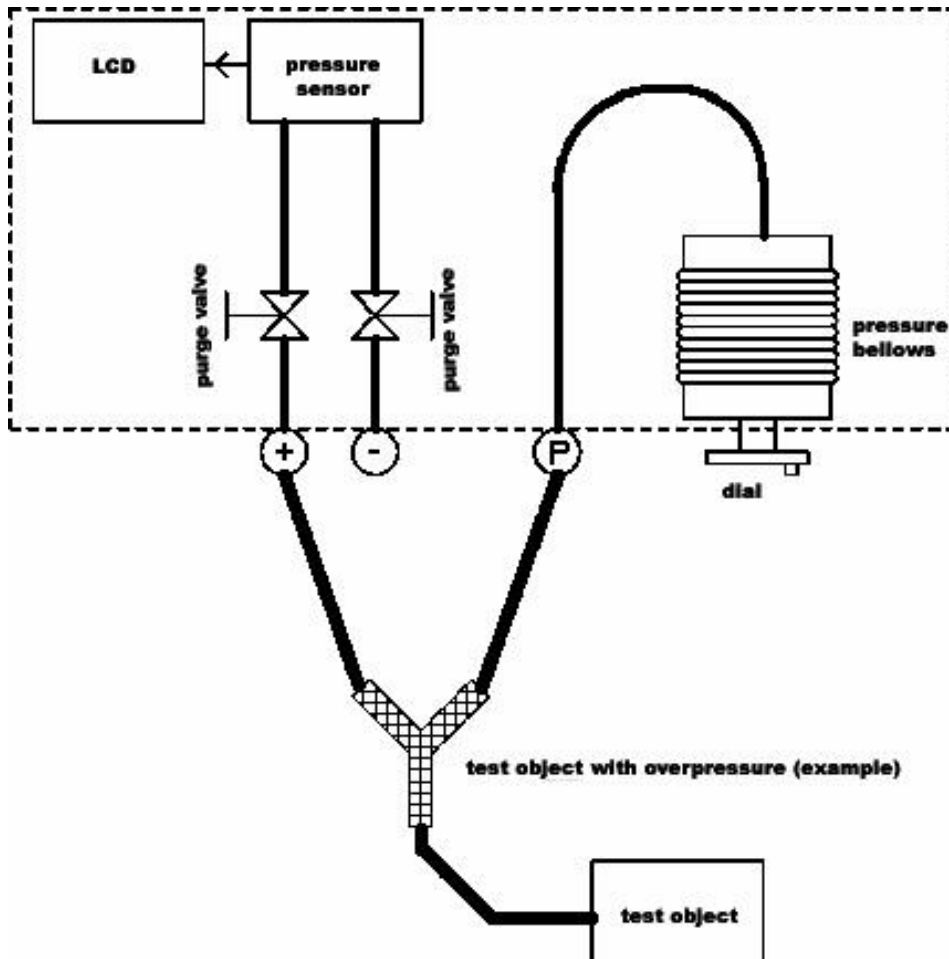
**Only use the included power adapter! For replacement please contact the manufacturer.**

Pressing the “0/1” switch places the instrument in operating mode. Please remember that it takes roughly 30 minutes for the pressure sensor to warm up. During this period, the zero point can fluctuate, particularly if the instrument is subject to changes in temperature. The automatic zero-point calibration feature should be activated numerous times during this period.



## 4 Pneumatic connections

Connect the device to be calibrated to the KAL 84 using a Y connector as shown below:



If the volume of the test object is high enough that the pressure bellows cannot generate enough pressure, use an additional manual pump (included with the calibrator upon request) and hook it up to the instrument with a Y connector.



**Exercise caution when using the manual pump. A manual pump can quickly generate high levels of pressure, which can destroy the instrument. Caution is particularly advised when using instruments with low measurement ranges.**

## 5 Replacing the battery

The LCD will read “Low Battery” if available power falls below that required to operate the instrument. When this happens, either replace the battery or recharge it using the charger included with the calibrator. To replace the battery, open the cover of the battery compartment located on the rear of the instrument.



**Do not put defective batteries in the garbage. They must be taken to the waste collection site specified by local authorities.**

## 6 Calibration

Please keep in mind that part I of DIN 16 005 requires reference instruments to be at least four times as precise as the device being calibrated.

Equipment used to test halstrup-walcher pressure calibration devices are monitored continuously and our instruments are themselves calibrated using reference pressures based on national standards.

In order to maintain this high level of quality over a long period of time, we recommend sending your pressure calibration device to the manufacturer for recalibration at least once a year. A halstrup-walcher certificate of linearity or a calibration certificate from a testing facility accredited by Germany's National Accreditation Body (DAkkS) is available upon request.


**Please note when the next calibration is due (indicated on the rear of the instrument).**

## 7 Troubleshooting

Problem	Cause	Corrective Action
KAL 84 will not switch on	power adapter is not plugged in (to electrical outlet)	→ plug the adapter into the outlet
	power adapter is not plugged in (to the KAL 84)	→ connect the adapter to the KAL 84
	incorrect supply voltage	→ provide correct supply voltage
	dead battery	→ recharge or replace battery
Set pressure does not remain constant	purge valve is open	→ close purge valve
	leak in tubing	→ inspect tubing
	low battery	→ recharge or replace battery

Table 2

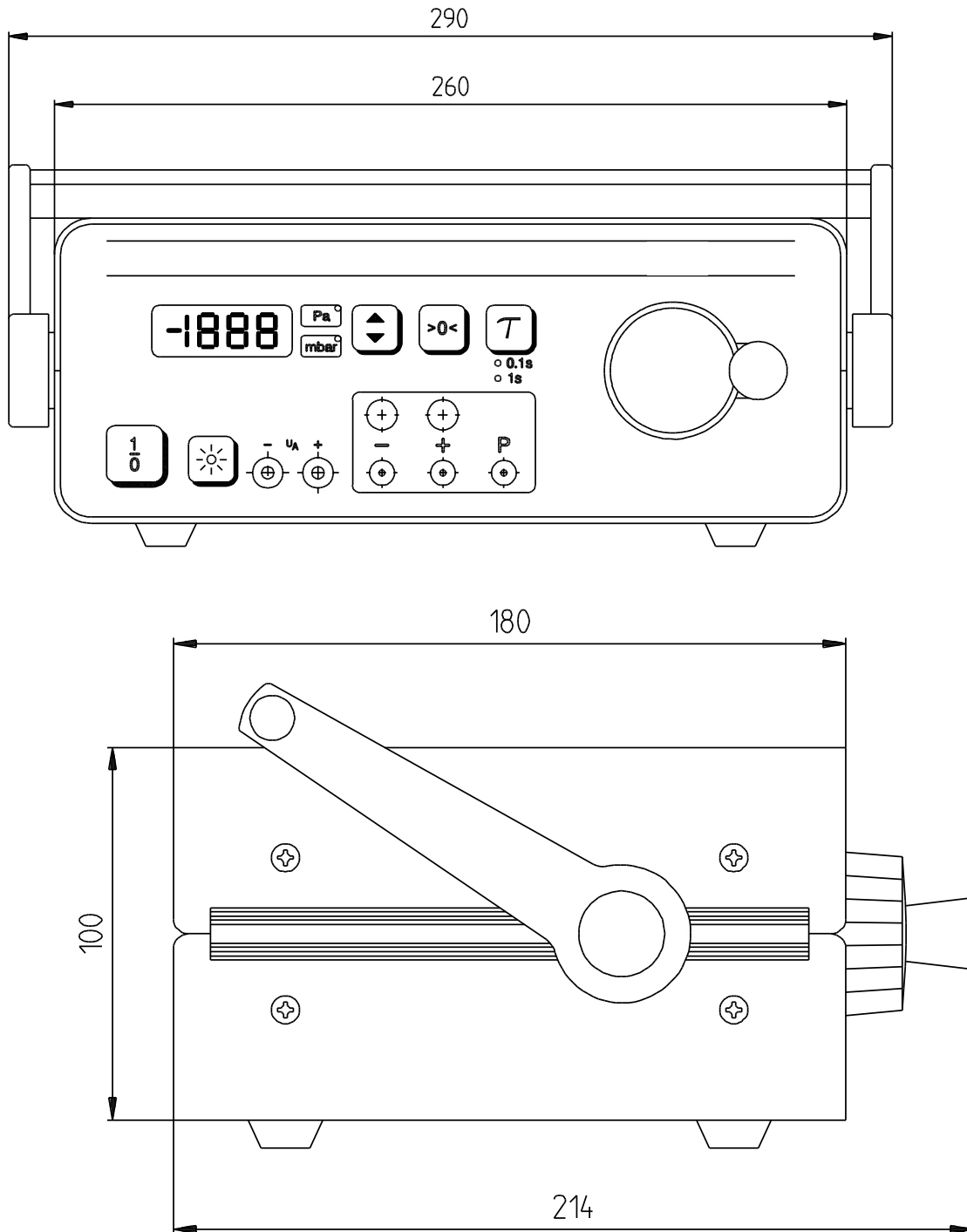
## 8 Technical data

<b>Measurement Data</b>	
measurement ranges	from 0 - 100 Pa to 0 - 100 kPa, or ±100 Pa to ±100 kPa (others available upon request)
overpressure range	99 %
overload capacity	10x for measurement ranges ≤ 20 kPa 2x for measurement ranges > 20 kPa
maximum system pressure	100 kPa
hysteresis	<0.1 % of the starting range
warm-up time	approx. 30 min.
temperature-dependent drift in zero point	0.4 %/10 K (at +10° C...+50° C) offset by running zero-point calibration
temperature-dependent drift in measurement range	0.4 %/10 K (at +10° C...+50° C) calibration temperature: 22° C
deviation from characteristic curve (starting point setting)	0,2 % ± 1 Digit for 1kPa ≤ measurement range ≤ 50kPa or 0.5 % ± 1 Digit
<b>Ambient conditions</b>	
medium	air, all non-aggressive gases
operating temperature	10 °C to +40 °C
storage temperature	-10 °C to +70 °C
relative humidity	0...80 %
EMC standards	EN 50081 part 1 and EN 50082 part 1
conformity	 declaration of conformity available upon request
<b>Electrical data</b>	
power consumption	max. 0.2 W
supply voltage	9 V rechargeable battery with 230 VAC 50...60 Hz / 9 VDC adapter others available upon request
setting time	20 ms, 100 ms, 1 s; set from keys on front panel
load resistance $R_L$	$R_L \geq 2 \text{ k}\Omega$
display	4 ½ digit, LCD with backlighting that can be toggled on and off, character height = 10 mm
<b>Physical data</b>	
pressure connections	Ø 6.5 mm for NW6 tubing (interior tubing diameter = 5 mm)
dimensions (w x h x d)	290 x 100 x 214 mm
weight	3 kg
operating position	horizontal

## 8.1 Appendix A: Parts in contact with measurement medium

- beryllium bronze CuBe2
- Mu metal (nickel alloy)
- Brass CuZn39Pb3
- Aluminum AlCuMgPb / AlMg3
- Silicon (tubing) optional: Viton
- Crastin (PTBP)
- Araldite CY236 / HY988
- Loctite 242e
- Carbonyl iron
- KEL (FPM: fluorinated rubber)
- Vepuran Vu 4457/51
- UHU-Plus endfest 300 binder

## 9 Dimension drawing



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