

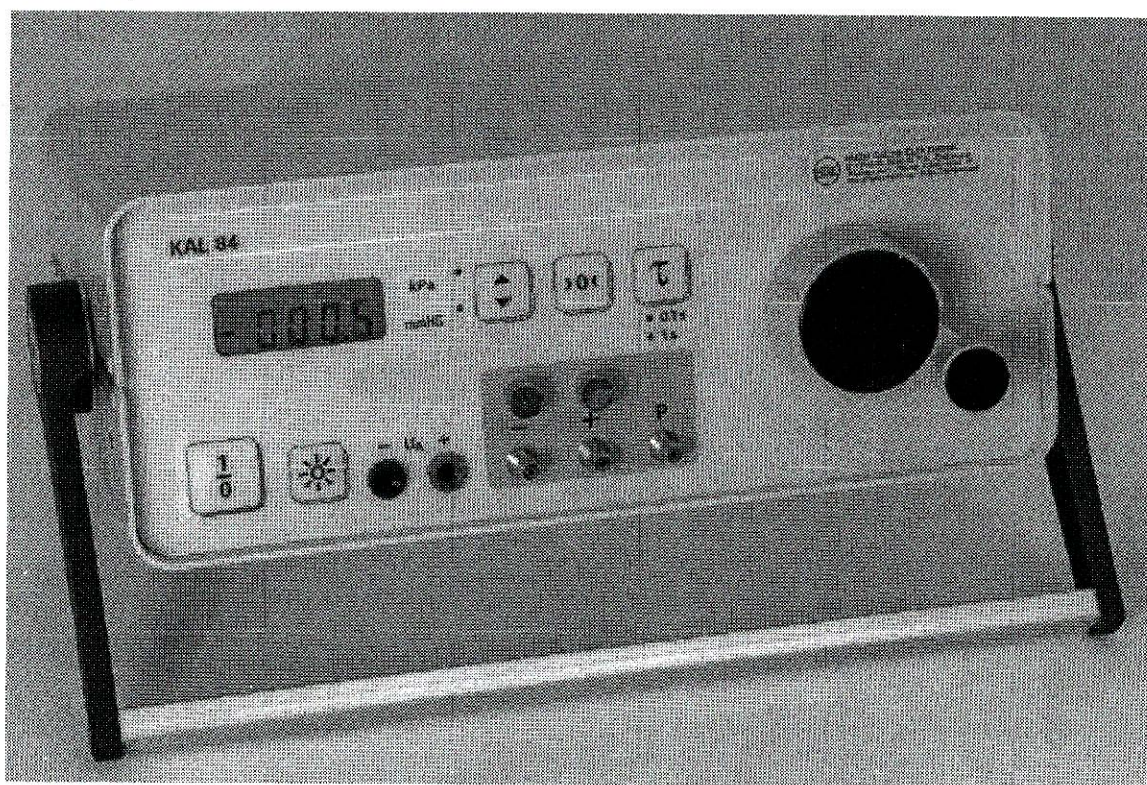


USER GUIDE

Pressure Calibration Instrument

new version with selectable unit

models:	KAL 84 L	0 -10.00 mmH ₂ O	or	98.1 Pa
	KAL 84 M	0 -100.0 mmH ₂ O	or	981.1 Pa
	KAL 84 H	0 -199.9 mmH ₂ O	or	26.65 kPa
	KAL 84 SH	0 -300.0 mmH ₂ O	or	40.00 kPa



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User Guide

Pressure Calibration Instrument KAL 84

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1. General

The portable pressure calibration instrument KAL 84 has been designed to calibrate instruments used for the measurement of pressure. Typical applications include the calibration of medical instruments such as blood pressure measuring instruments, ventilators and infusion pumps. Further applications of the KAL 84 from Halstrup® are also found in the manufacturing of pressure sensors and switches. On account of its robust construction and a power supply from the rechargeable battery this instrument is ideal for the installation of pressure sensors where they have to be calibrated on site. The KAL 84 is likewise gaining more and more of a significant role in the quality assurance where the instrument is used as a reference standard for monitoring purposes.

The pressure calibration instrument KAL 84 consists of a pressure transducer, a liquid crystal display as well as a means of producing the required pressure.

2. Safety notes



Please read before use

Observe the stated power supply (see equipment label)

Only use 9V rechargeable batteries type IEC 6F22. The use of non-rechargeable batteries can damage the instrument.

The instrument is not suitable for use outdoors, in humid or in dust laden conditions.

Permitted pressure ranges (measuring range) must be observed. Excessive pressure can damage the instrument.

Observe the permitted storage, transport and operating temperatures.

Do not expose the instrument to direct sunlight as measurement errors caused by sunlight can occur.

The measuring sensor is not suitable for use with aggressive gases.

The pressure inlets should not be closed during transport (barometric pressure changes can damage low pressure instruments).

Please do not carry out functional tests with external pressure sources or breath.

Misuse, opening of the instrument, use of force as well as failure to comply with the user guide render the guarantee null and void.

3. Working with the KAL 84

3.1. Setting up

Observe the stated supply voltage before plugging in the mains adapter. The rechargeable battery which is supplied with the KAL 84 will be charged up when the instrument is connected to the mains supply. It is not necessary that the instrument be switched on for this to occur. Before using for the first time it is recommended that the battery be recharged as the state of charge on delivery cannot be defined. Powering from the rechargeable is only possible when the mains adapter is unplugged from the KAL 84.



If the rechargeable battery becomes unusable due to old age it should only be replaced by another 9V rechargeable battery of the type IEC 6F22. The use of non-rechargeable batteries can damage the instrument.

The instrument is ready for use when switched on at „0/1“. Please observe the pressure sensor's settling time of about ½ an hour to pass. During this time it is possible that large fluctuations around the zero point occur, particularly when the instrument has been subjected to large changes in temperature. During this time it is recommended that the automatic zero set is carried out several times.

3.2. Pneumatic Connections

The instrument to be calibrated is to be connected to the KAL 84 via a T-piece in the following way:

Type of calibrating pressure	Connection of P at
Positive gauge pressure	+ Inlet
Negative gauge pressure	- Inlet

Table 1

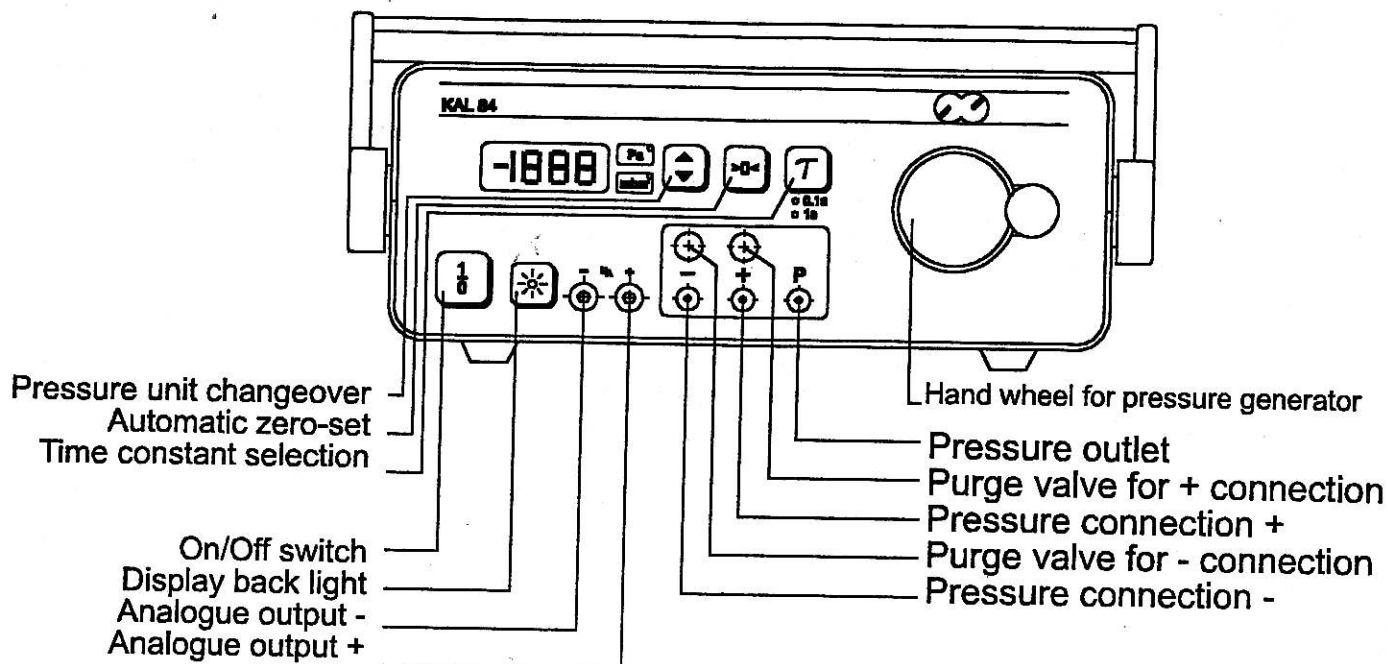
If the pressure bellows is not capable of generating the required pressure on account of the large volume of the test piece then it is possible to use an optional hand pump in conjunction with another T-piece.



Please exercise caution when using the hand pump, high pressures can be generated very quickly which may result in the instrument's sensor being damaged. Great caution must be exercised when the handpump is used for instruments with small pressure ranges.

3.3. Operating controls and their functions

figure 1



Hand wheel of the pressure generator

The pressure can be produced with the aid of the hand wheel. Turning to the left produces a negative pressure and turning to the right a positive one. If a negative pressure is required it is first of all necessary to bring the hand wheel into the central position by rotating it several turns to the right whilst the pressure ports are open.

Do not use excessive force on the hand wheel.

Purging valves

Any pressure built up due to the connection of the test piece can be removed by purging the system. This is achieved by turning the appropriate purging screw to the left. It will also be necessary to open these valves when the hand wheel reaches its stop whilst producing pressure, simply crank the hand wheel back again with the test piece still connected.

The purge valves must always be closed when measurements are being made.

Automatic zero set

The zero point is normally reset before every measurement by pushing the button labelled „>0<“. The purging valves must be opened before resetting the zero point.



A difference of some digits at the last position in the display apparent after the zero set has been carried out is still within the tolerance. The back light is not active during the zero set and has to be switched on again.

Measurement range changeover

With this function it is possible to switch between two ranges for example "Pa" and "mmHg". The range selected is indicated by a red LED.

Selection of the time constant

By operating this switch it is possible to select three various time constants (response times) of the KAL 84 pressure sensor. The selected time constant is indicated by a LED. If the LED is not illuminated then the pre adjusted time constant of 20 ms is set.

Analogue output

The analogue output provides a pressure proportional voltage output. Connection is made via the usual banana plug with a \varnothing of 4 mm. The output load must not be lower than 2 k Ω .

4. Changing the rechargeable battery

As soon as the voltage falls below the permitted voltage supply the message "Low Battery" will appear in the display window. Should this occur then the rechargeable battery must be either recharged or replaced. The battery compartment located at the rear of the instrument is accessible by lifting the compartment cover.



Only 9 V rechargeable batteries of the type IEC 6F22 are to be used. The fitting of non-reusable batteries can lead to permanent damage of the instrument. Do not dispose of the accumulators in domestic refuse, instead please bring them to the appropriate collection points. Consult your local authorities for further information.

5. Hints for calibration

Please note that in accordance with DIN 16 005 part 1 the reference instrument must be at least 4 times more accurate than the instrument requiring calibration.

The pressure calibration instruments from Halstrup® are produced using regularly proved test means and calibration references which are traceable to national standards.

In order to maintain this high quality over a long period of time we recommend that the calibration instruments are at least once a year returned to the manufacturer for calibration. A choice a certificate of linearity from Halstrup® or a certificate of calibration from an accredited DKD (German Calibration Service) testing facility is available.

Please observe the recommended date for the next calibration shown on the reverse of the instrument.

6. What to do in the event of faults

Description of fault	possible cause	Solution
KAL 84 cannot be switched on	<ul style="list-style-type: none"> • mains supply not plugged in (at socket) • mains supply not plugged in (at KAL 84) • incorrect supply voltage • rechargeable battery flat 	<ul style="list-style-type: none"> • plug into mains at the socket • connect mains to KAL 84 • connect the correct voltage supply • charge battery or replace
set pressure does not remain constant	<ul style="list-style-type: none"> • purge valves open • hoses not air-tight 	<ul style="list-style-type: none"> • close purge valves • check hoses

Table 2

7. Technical data (in accordance with DIN 16086)

Manufacturer:	Erwin Halstrup Multur GmbH
Model:	KAL 84
Types of calibrated pressure:	Positive and negative gauge pressure of non-aggressive gases.
Principle of measurement:	Deflection of a CuBe diaphragm with displacement registered via an inductive transducer
Display:	4 ½ digit LCD with switched back lighting height of characters 13 mm

Input parameters of the pressure sensor

Measurement range:	0... 100 Pa to 0... 100 kPa or ± 100 Pa to ± 100 kPa (others available on request) the standard measurement ranges can be exceeded by 99 %
excess pressure capability:	10 times the end of scale value (for ranges ≤ 20 kPa) 2 times the end of scale value (for ranges > 20 kPa)
maximum system pressure:	100 kPa
for parts that come into contact with measurement medium see annex A	

Output parameters of the pressure sensor

Temperature coefficient of the zero signal:	0,4%/10K (within the range +10°C...+50°C) zero point, however, has to be reset
Temperature coefficient of the output span:	0,4%/10K (within the range +10°C...+50°C)

Deviation of the characteristic curve: (initial point setting)	1% of the output span for ranges < 250 Pa 0,5% of the output span for ranges ≥ 250 Pa 0,2% of the output span for ranges ≥ 250 Pa (option)
Hysteresis:	< 0,1% of the output span
Warm up time:	approx. 30 min
Response time:	20 ms, 100 ms and 1 s adjustment via switch
Load resistance R_L :	$R_L \geq 2 \text{ k}\Omega$
Power supply:	9 V rechargeable unit with mains adapter 230V~ 50...60Hz/9V- , others available on request
Power consumption:	max. 0,2 W

Ambient conditions

Nominal temperature range:	+10°C...+50°C
Operating temperature range:	0°C...+60°C
Storage temperature range:	-10°C...+70°C

EMC:	Complies with EN 50 081 part 1 and EN 50 082 part 1
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Mechanical specifications

Pressure connections:	Ø 6,5 mm for hose with a NW of 5 mm
Weight:	approx. 3 kg

Annex A: parts which come into contact with measured medium

- Beryllium bronze CuBe2	- Araldite CY236 / HY988
- Mu-metal (nickel compound)	- Loctite 242e
- Brass CuZn39Pb3	- Carbonised iron
- Aluminium AlCuMgPb / AlMg3	- Vepuran Vu 4457/51
- Silicon (hose)	- UHU-Plus endfest 300
- Crastin (PTBP)	

Options

- Certificate of linearity/DKD (German calibration service) certificate
- Robust carrying case
- Hand pump

8. Diagrams (not to scale)

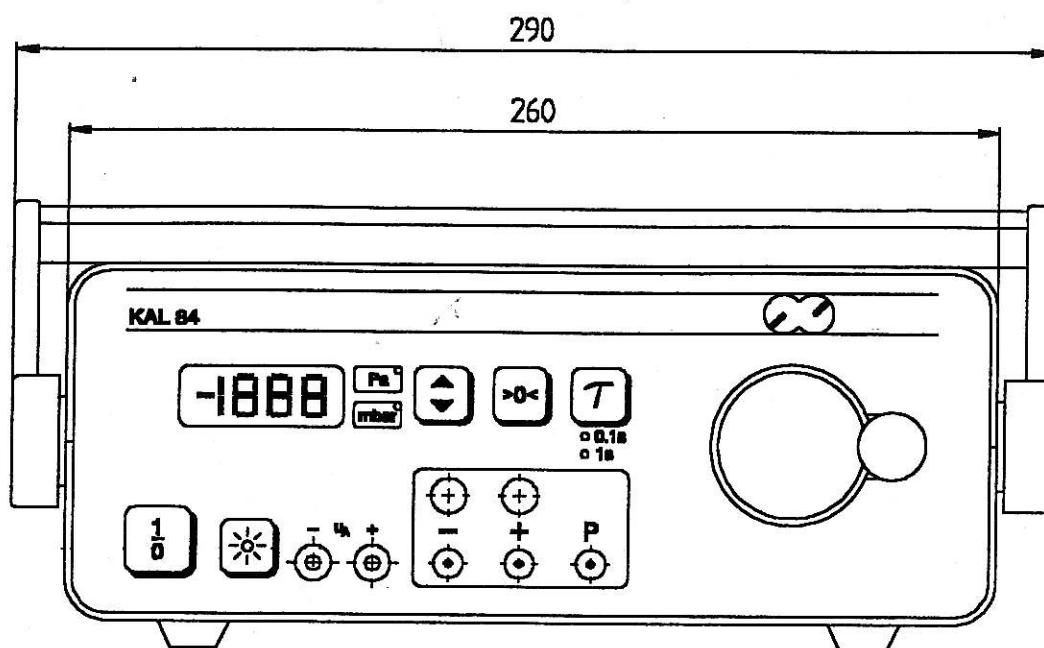


figure 2

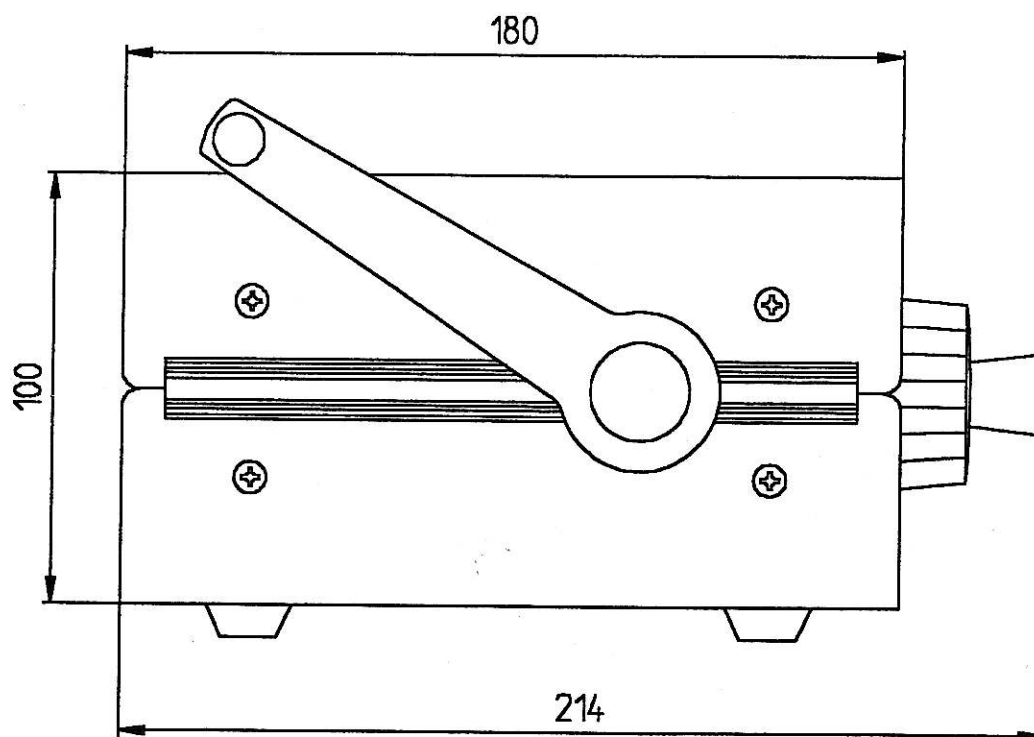


figure 3

-Subject to technical alterations-

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KAL84_E.DOC

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Umrechnungstabelle für DRUCK-EINHEITEN / Conversion Table for PRESSURE units

mmHg (Torr)	kPa (kN/m ²)	mmH ₂ O (mmWS)	mbar	at (kg/cm ²)	PSI (lb/in ²)
1	0,133	13,6	1,33	0,0014	0,019
2	0,267	27,2	2,67	0,0027	0,039
3	0,400	40,8	4,00	0,0041	0,058
4	0,533	54,4	5,33	0,0054	0,077
5	0,667	68,0	6,67	0,0068	0,097
6	0,800	81,6	8,00	0,0082	0,116
7	0,933	95,2	9,33	0,0095	0,135
8	1,067	108,8	10,67	0,0109	0,155
9	1,200	122,4	12,00	0,0122	0,174
10	1,333	136,0	13,33	0,0136	0,193
20	2,666	271,9	26,66	0,0272	0,387
30	4,000	407,9	40,00	0,0408	0,580
40	5,333	543,8	53,33	0,0544	0,773
50	6,666	679,8	66,66	0,0680	0,967
60	7,999	815,7	79,99	0,0816	1,160
70	9,333	951,7	93,32	0,0952	1,354
80	10,666	1087,6	106,66	0,1088	1,547
90	11,999	1223,6	119,99	0,1224	1,740
100	13,332	1359,5	133,32	0,1360	1,934
120	15,999	1631,4	159,98	0,1631	2,320
140	18,665	1903,3	186,65	0,1903	2,707
160	21,332	2175,2	213,31	0,2175	3,094
180	23,998	2447,1	239,98	0,2447	3,481
200	26,664	2719,0	266,64	0,2719	3,867
250	33,331	3398,8	333,30	0,3399	4,834
300	39,997	4078,5	399,96	0,4079	5,801

mmH ₂ O (mmWS)	cmH ₂ O (cmWS)	mmHg	Pa (N/m ²)	kPa (kN/m ²)	PSI (lb/in ²)
1	0,1	0,07	9,8	0,0098	0,0014
2	0,2	0,15	19,6	0,0196	0,0028
3	0,3	0,22	29,4	0,0294	0,0043
4	0,4	0,29	39,2	0,0392	0,0057
5	0,5	0,37	49,0	0,0490	0,0071
6	0,6	0,44	58,8	0,0588	0,0085
7	0,7	0,51	68,6	0,0686	0,0100
8	0,8	0,59	78,5	0,0785	0,0114
9	0,9	0,66	88,3	0,0883	0,0128
10	1	0,74	98,1	0,0981	0,0142
20	2	1,47	196,1	0,1961	0,0284
30	3	2,21	294,2	0,2942	0,0427
40	4	2,94	392,3	0,3923	0,0569
50	5	3,68	490,3	0,4903	0,0711
60	6	4,41	588,4	0,5884	0,0853
70	7	5,15	686,5	0,6865	0,0996
80	8	5,88	784,5	0,7845	0,1138
90	9	6,62	882,6	0,8826	0,1280
100	10	7,36	980,7	0,9807	0,1422
120	12	8,83	1176,8	1,1768	0,1707
140	14	10,30	1372,9	1,3729	0,1991
160	16	11,77	1569,1	1,5691	0,2276
180	18	13,24	1765,2	1,7652	0,2560
200	20	14,71	1961,3	1,9613	0,2845
220	22	16,18	2157,5	2,1575	0,3129
240	24	17,65	2353,6	2,3536	0,3414
260	26	19,13	2549,7	2,5497	0,3698
280	28	20,60	2745,8	2,7458	0,3982
300	30	22,07	2942,0	2,9420	0,4267



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