home

CAL95 MICRO MANOMETER CALIBRATOR

- Extreme low pressure sensitivity
- Built in rotary hand pump
- LCD Display 3 1/2 and 4 1/2 digit
- Purge valves on + and - port
- Fine zero adjustment
- Slow and fast response switch
- Display back light on/off switch
- +/- 0-2V output signal on BC connector
- Battery operated by 4 x 1.5V AA
- Auto switch off if no change in pressure
- Calibrated to national standards
- 24 month warranty
- 10 years operational experience

CAL95 Calibrator without carrying case

GENERAL

The CAL95 is a high precision portable air pressure manometer which is battery operated by 4 x 1.5V AA batteries which are fitted into special compartments on the rear of the instrument. A separate power supply for 230VAC is available for bench work to save battery power as optional. It comes complete with shoulder carrying case.

The unit has been designed to calibrate all CMR pressure or velocity transmitters and it incorporates a manual hand wheel pressure pump to pressurize the test transmitter. A silicone tube is connected to the CAL95 and the test transmitter and a pressure is generated by hand. The LCD display of the CAL95 indicates the actual pressure generated and it can then be compared with the test transmitter so that both read the same. A purge valve is fitted to both + and - port which eliminate the removal of the tubing every time the zero pressure is checked.

The calibrator has been designed for many different applications where accuracy and fast response is required, ie. differential pressure measurement, velocity pressure measurement and long term monitoring using the 0-2V output signal for computer scada systems. A fast and slow output signal or display can be achieved by a change over switch on the front panel. The Display has a back light for dark areas which can be toggled to on/off. A zero potentiometer is also situated on the front panel. The instrument can be zeroed by opening all purge valves to drain the remaining pressure from the transducer. An ideal commissioning instrument.

THE TRANSDUCER

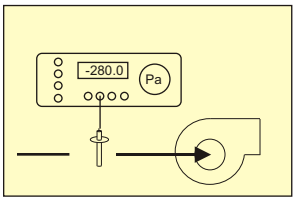
The transducer is manufactured by CMR and consists of precision engineered components, high quality metals and SMD electronics. The principle of the transducer is the measurement of the displacement of the linear diaphragm by means of a push and pull variable reluctance transducer which is not affected by Humidity, hence it can be used in many Industrial and Chemical applications even when using a very high concentration of Formaldehyde.

CMR Transducer

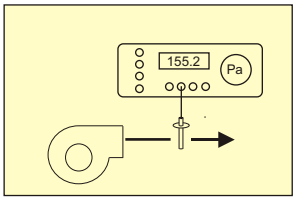
There are no mechanical connections to any of the sensing coils and the diaphragm, hence extreme low pressures can be measured at excellent repeatability and minimal hysterisis. The movement of the diaphragm is so small that no air volume is required to measure the air pressures over a distance of 200m.

The zero drift is uniquely minimized by the measuring coils which provide excellent self compensation. One coil measures positive and the other negative drift and therefore balances any excessive drift between two tolerance limits in its life cycle. The CMR Transducer has a proven track record of over 20 years. Finally, all CAL95 Calibrators are temperature compensated in a computerised climate chamber and go through an ageing burn in cycle.

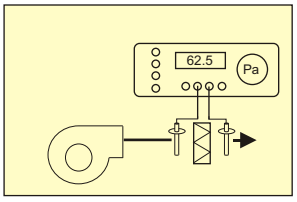
TYPICAL MEASUREMENT APPLICATIONS



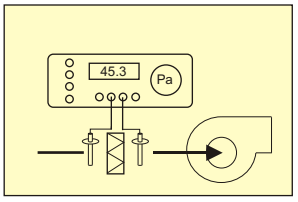
Suction Static Pressure



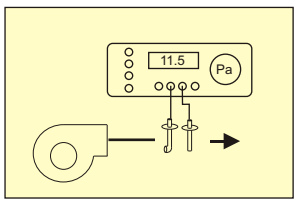
Supply Static Pressure



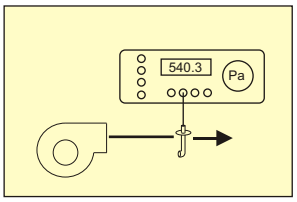
Filter Pressure on Supply



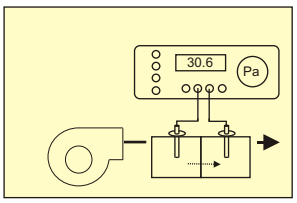
Filter Pressure on Extract



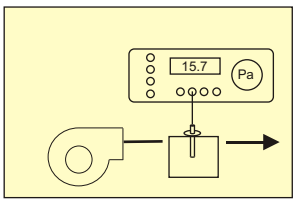
Velocity Pressure Supply



Total Pressure Supply



Chamber Differential Pressure



Chamber Static Pressure

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CAL95 OPERATING INSTRUCTION

OPERATING DESCRIPTION

BATTERY INSTALLATION
The CAL95 has two battery compartments fitted onto the rear plate. There is also a rear external power connector. When used with the CMR power supply, the connector will switch off the battery automatically. The power supply is not a battery charger.

SLOW OR FAST RESPONSE
The top left hand switch can be switched to the left which provides dampening of the display and the output signal.

BACK LIGHT ON - OFF
The LCD is fitted with a back light which is useful when measuring in dark areas. Just move the switch to the right and the LCD illuminates.

ZERO ADJUSTMENT
It is advisable to switch the response switch to fast and open all the purge valves, if the positive and negative port is connected to any pressure source. Adjust the zero potentiometer until the LCD reads 0.0 Pa. If in doubt remove all tubes and check the zero again.

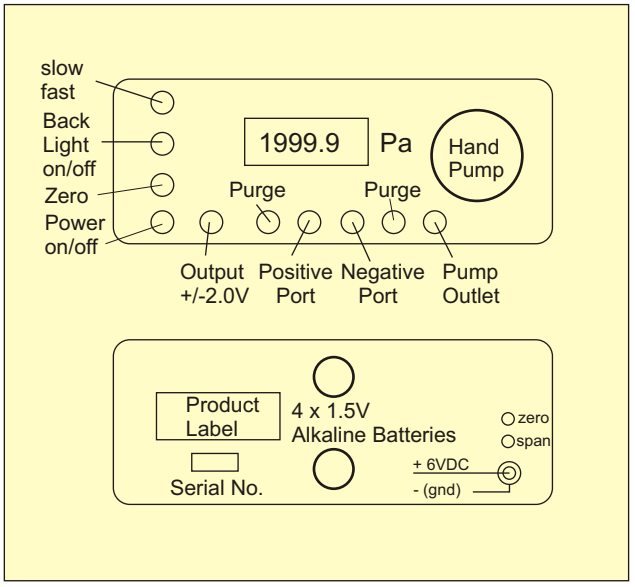
POWER ON - OFF
The power on switch can be moved to the right to switch the CAL95 on. The calibrator is set up to switch off automatically, if the pressure does not change for some time, which means it saves battery power. For monitoring applications where the power must always be on, the CAL95 can be configured to run continuously. In this case an external power supply would be moresuitable.

OUTPUT SIGNAL ON BNC CONNECTOR
A signal of the measured pressure by the internal transducer of the calibrator is provided on the BC connector on the front panel. The range of the calibrator is normally +/-0...199.9 Pa or +/- 0...1999.9 Pa. The signal is in both cases +/- 2.0Volt for the full range.

PUMP PRESSURE GENERATOR
The outlet 'Pump' provides a positive air pressure generated by turning the hand wheel clock wise and negative pressure by turning the hand wheel anti clockwise.

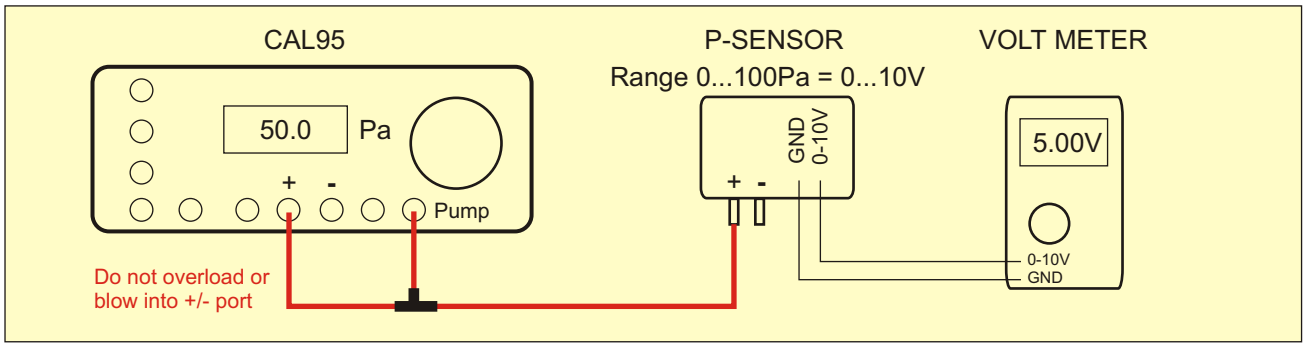
CAUTION DO NOT OVERLOAD
Use the CAL95 only within its published range. The pump can generate more pressure. Make sure you do not overload the test transducer. Do not block any port as the Barometric pressure built up can also overload both the CAL95 and the test transmitter. You will find the CAL95 continuously changes pressure. This is normal as temperature and Barometric pressure has an influence.

CAL95 is used to calibrate 33 Panel Mount DPM50 Sensors



CAL95 Front and rear panel operating functions

TYPICAL CALIBRATION APPLICATION USING THE CAL95



The CAL95 is used to calibrate the P-Sensor. The reference pressure is generated by the hand pump and fed into the CAL95 as well as the P-Sensor. A Voltmeter is connected to the P-Sensor. The Display of the CAL95 indicates the actual pressure generated.

The Voltmeter should indicate the pressure measured by the P-Sensor in Volts. If the P-Sensor is not equal to the CAL95 adjust the zero and span of the P-Sensor using the P-Sensor instructions and repeat a few times. Issue a final Calibration Certificate.

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CAL95 MEASURES VELOCITY PRESSURE

VELOCITY PRESSURE

The CAL95 is a high precision micro manometer which can measure differential pressure. A Pitot tube can be connected to the positive and negative port and a the static as well as the impact pressure is measured. The result is velocity pressure. The velocity pressure must be square rooted and multiplied by the air density to obtain m/s of air velocity. A look up table is shown below to convert velocity pressures into m/s. I.e. if 60.0 Pa is measured on the Pitot tube it would convert to 10.0 m/s.

The CAL95 has no square root function as it was intended to be a pressure calibrator for field instruments, but it can easily be used for accurate velocity readings using the quick look up table below or calculating the velocity pressure in m/s.

Here are some simple formulae:

$$\sqrt{60.0\ \text{Pa}} \times 1.291\ (\text{density factor}) = 10.0\ \text{m/s}$$

$$\text{or}\ \triangle\ \text{P}\ \ 100\text{Pa} = 1.2 \times 10.0\ \text{m/s}^2 / 2$$

AIR VOLUME MEASUREMENT

The CAL95 can measure accurate air volumes as the velocity pressures can be measured. In order to calculate the air volume it is necessary to know the duct sizes and duct shape. There are rectangular, circular and flat oval ducts.

RECTANGULAR DUCT VOLUMES

The internal duct height and width dimensions must be measured. I.e. the internal dimensions are:

$$1.000\text{m (h)} \times 0.500\text{m (w)} = 1.5\ \text{m}^2 \times 10.0\ \text{m/s} = 15.0\ \text{m}^3\text{/s}$$

CIRCULAR DUCT VOLUMES

The duct area of a circular duct is ¶r^2 and the following example can be used using a 200mm duct diameter / 2 = 100mm Radius.

$$0.100\text{m} \times 0.100\text{m} \times 3.142 = 0.03142\text{m}^2 \times 10\text{m/s} = 0.3142\text{m}^3\text{/s}$$

ROUND OVAL DUCT VOLUMES

The round oval ducts are a combination of a rectangular duct in the middle and two half circular ducts on the outside.

VELOCITY PRESSURE IN Pa CONVERTED TO m/s

m/s	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	0.00	0.01	0.02	0.05	0.10	0.15	0.22	0.29	0.38	0.49
1	0.60	0.73	0.86	1.01	1.18	1.35	1.54	1.73	1.94	2.17
2	2.40	2.65	2.90	3.17	3.46	3.75	4.06	4.37	4.70	5.05
3	5.40	5.77	6.14	6.53	6.94	7.35	7.78	8.21	8.66	9.13
4	9.60	10.09	10.58	11.09	11.62	12.15	12.70	13.25	13.82	14.41
5	15.00	15.61	16.22	16.85	17.50	18.15	18.82	19.49	20.18	20.89
6	21.60	22.33	23.06	23.81	24.58	25.35	26.14	26.93	27.74	28.57
7	29.40	30.25	31.10	31.97	32.86	33.75	34.66	35.57	36.50	37.45
8	38.40	39.37	40.34	41.33	42.34	43.35	44.38	45.41	46.46	47.53
9	48.60	49.69	50.78	51.89	53.02	54.15	55.30	56.45	57.62	58.81
10	60.00	61.21	62.43	63.65	64.90	66.15	67.42	68.69	69.98	71.29
11	72.60	73.93	75.26	76.61	77.98	79.35	80.74	82.13	83.54	84.97
12	86.40	87.85	89.30	90.77	92.26	93.75	95.26	96.77	98.30	99.85
13	101.40	102.97	104.54	106.23	107.74	109.35	110.98	112.61	114.26	115.93
14	117.60	119.29	120.98	122.69	124.42	126.15	127.90	129.65	131.42	133.21
15	135.00	136.81	138.62	140.45	142.30	144.15	146.02	147.89	149.78	151.69
16	153.60	155.53	157.46	157.46	159.41	161.38	163.35	165.34	167.33	169.34
17	173.40	175.45	177.50	179.57	181.66	183.75	185.86	187.97	190.10	192.25
18	194.40	196.57	198.74	200.93	203.14	205.35	207.58	209.81	212.06	214.33
19	216.60	218.89	221.18	223.49	225.82	228.15	230.50	232.85	235.22	237.61
20	240.00	242.41	244.82	247.25	249.70	252.15	254.62	257.09	259.58	262.09
21	264.60	267.13	269.66	272.21	274.78	277.35	279.94	282.53	285.14	287.77
22	290.40	293.05	295.70	298.37	301.06	303.75	306.46	309.17	311.90	314.65
23	317.40	320.17	322.94	325.73	328.54	331.35	334.18	337.01	339.86	342.73
24	345.60	348.49	351.38	354.29	357.22	360.15	363.10	366.05	369.02	372.01
25	375.00	378.01	381.02	384.05	387.10	390.15	393.22	396.29	399.38	402.49
26	405.60	408.73	411.86	415.01	418.18	421.35	424.54	427.73	430.94	434.17
27	437.40	440.65	443.90	447.17	450.46	453.75	457.06	460.37	463.70	467.05
28	470.40	473.77	477.14	480.53	483.94	487.35	490.78	494.21	497.66	501.13
29	504.60	508.09	511.58	515.09	518.62	522.15	525.70	529.25	532.82	536.41
30	540.00	543.61	547.22	550.85	554.50	558.15	561.82	565.49	569.18	572.89
31	576.60	580.33	584.06	587.81	591.58	595.35	599.14	602.93	606.74	610.57
32	614.40	618.25	622.10	625.97	629.86	633.75	637.66	641.57	645.50	649.45
33	653.40	657.37	661.34	665.33	669.34	673.35	677.38	681.41	685.46	689.53
34	693.60	697.69	701.78	705.89	710.02	714.15	718.30	722.45	726.62	730.81
35	735.00	739.21	743.42	747.65	751.90	756.15	760.42	764.69	768.98	773.29
36	777.60	781.93	786.26	790.61	794.98	799.35	803.74	808.13	812.54	816.97
37	821.40	825.85	830.30	834.77	839.26	843.75	848.26	852.77	857.30	861.85
38	866.40	870.97	875.54	880.13	884.74	889.35	893.98	898.61	903.26	907.93
39	912.60	917.29	921.98	926.69	931.42	936.15	940.90	945.65	950.42	955.21
40	960.00	964.81	969.62	974.45	979.30	984.15	989.02	993.89	998.78	1003.69

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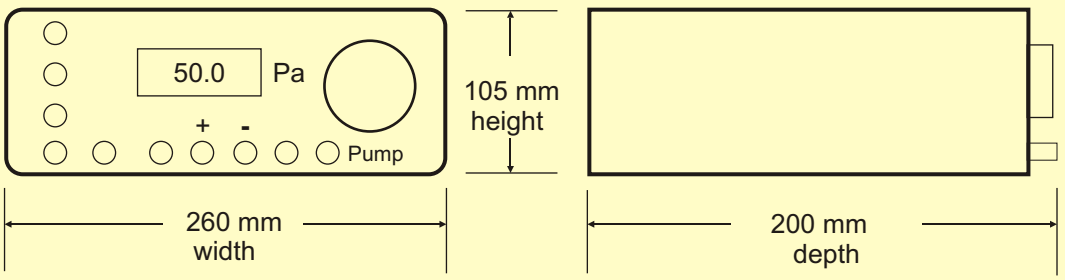
CAL95 TECHNICAL AND ORDER DETAILS

Measurement Range	+/- 199.9 Pa and +/- 1999.9 Pa
Optional Range	Special units can be manufactured by CMR on request
Overload Capacity	Ranges +/- 199.9 up to max 3000Pa. Ranges from +/- 1999.9 Pa 5 times of range
Media	Non Corrosive Gases such as Air,N2,O2,CO2,N2 O, inert Gases
Diaphragm Unit	Bronze Beryllium Copper suitable for high concentration of Formaldehyde - All Stainless on request
AC Power Supplies	Mains power supply is complete with lead and 9V plug to fit into rear power connector. (Optional)
	When the external power supply is connected, the internal batteries are not used
	The 230V power supply does not work as a battery charger
DC Power Supplies	4 x 1.5V AA Alkaline Batteries (approx 200h intermittent use)
	The battery compartments are on the rear of the CAL95
Voltage Output Signal	+/- 2.000V for +/- 0... 199.9 Pa
from BNC socket	+/- 2.000V for +/- 0...1999.9 Pa
Hysteresis/Repeatability	0.1% Typical
Linearity (Accuracy)	+/- 0.5% of Full Scale +/- 1 digit on positive range
Zero Drift	0.05%/K (+10°C to +50°C)
Span Shift	< 0.02%/k (+10°C to +50°C)
Response Time	Transducer response time to changing pressure 0.3s
Display	Liquid Crystal display 3 1/2 digit for +/- 199.9 Pa and 4 1/2 digit for +/- 1999.9 Pa with Back Light
Operating Temperature	-10°C to +70°C
Operating Position	Vertical or Horizontal
Weight	approx 3 kg
Air Tube Connections	Positive and Negative Pressure Barbed Nipple 6.5mm O/D x 15mm long
Purge Valves	A purge valve is fitted to both positive and negative ports to drain pressure
Enclosure	Sheet Metal coated black and aluminum front and rear plates complete with silk screen legends
Conformity	EN61326-1 EMC EN61010-1 SAFETY
Calibration Certificate	Supplied with Certificate traceable to any National Standards

HOW TO ORDER

PART NUMBER	DESCRIPTION
45A-1	CAL 95 +/- 0... 199.9 Pa Range 3 1/2 digit LCD Display with carrying case and 230VAC power adaptor
45A-2	CAL 95 +/- 0...1999.9 Pa Range 4 1/2 digit LCD Display with carrying case and 230VAC power adaptor
45UK	Power Adaptor 230VAC to 9V with moulded UK Plug
45EU	Power Adaptor 230VAC to 9V with moulded Continental Europe Plug

CAL95 DIMENSIONS



Dimension of carrying case 290mm (width) 220mm (depth) 125mm (height)
Power adaptor is supplied as separate item and not in the carrying case

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