ENGLISH

OPERATIVE MANUAL

PressKAL

Release 3.9

*Application software
for Manometer Calibration*

www.aep.it

AEP transducers s.r.l. holds the right to make any change, when necessary, without notice.
The data contained in this manual are just indicative and the manufacturer declines any responsability for errors or discrepancies with respect to this manual.

WARNING

The program comes on a USB key in which resides the program to be installed on the PC and the permanent protection that protects the program from any claims of piracy.

DO NOT use the USB key for other purposes. If you accidentally deleted some files hidden protection system will be damaged irreparably by blocking the program.

The USB key must always be inserted into the PC

System requirement

PC: Pentium III 300 MHz 128 MB RAM or upper
Windows XP (Professional or Home) with Service Pack 3 and .NET 3.5 installed
Windows 2000
Windows Vista
Windows 7, 8, 10

Windows: International options

For the proper functioning of the program, you must use (.) as the decimal point regardless of the conventions of the country where this program is used otherwise several settings can cause errors in calculation.
Modify or check your decimal separator setting in the Windows Control Panel.

INTRODUCTION

The program is designed to facilitate calibration and metrological confirmation of gauges that measure in both positive and vacuum in accordance with International Standard **EN ISO 9001.**

The calibration procedure and calculations are made in accordance with the requirements of the **EURAMET cg-17** "Guidelines on the Calibration of Electromechanical and Mechanical Manometers".

To perform the calibration is necessary to generate 5 pressure measurements increasing, 5 points decreasing scale and another 2 points to 50% on the scale to check the repeatability of the gauge being calibrated.

At each of the pressure generated is necessary to wait 30 seconds to stabilize the measurement.
When completed, the program calculates various types of errors and in particular:
   a) Read error in units of pressure.
   b) Error reading in percentage of full scale.
   c) Expanded uncertainty U in units of pressure.
   d) Expanded uncertainty U' in units of pressure.

 All certificates are then printed and stored in a database that keeps the historian of calibrations performed.
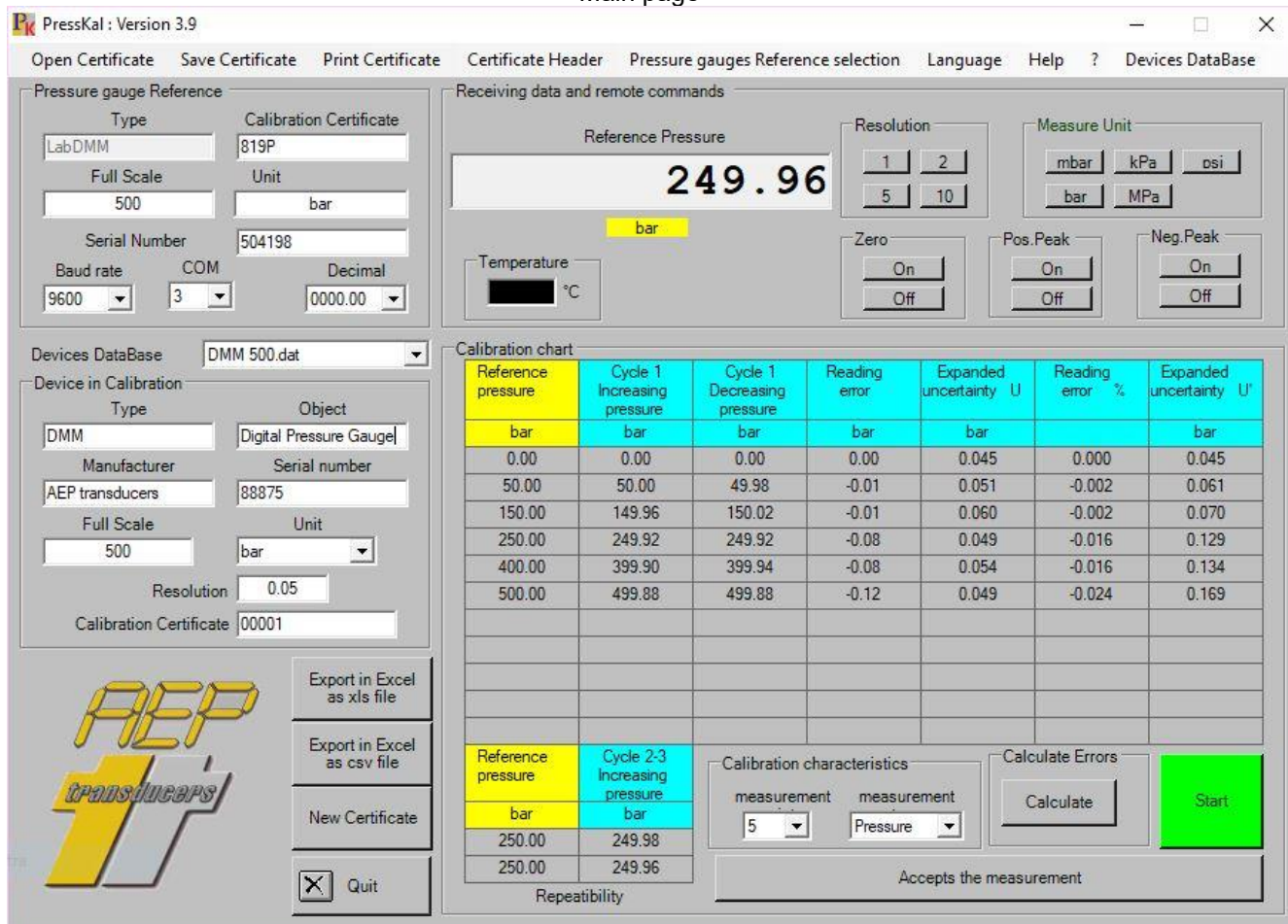
The program maintains a database of additional AEP indicators **MP10, MP10Plus, MP2plus, MP4plus, MP6plus, STAR** and pressure gauges series **LabDMM, LabDMM2, IDROSCAN, JET, PGE BIT02 e Bit02B** connected to a PC via RS232 or USB serial communication to ensure the acquisition of instantaneous pressure measurement.

For each pressure gauges is necessary to introduce all the identification data, accredited certificates (ACCREDIA or equivalent) reference for the different uncertainties and broken down the different points of pressure.

The program automatically advices the operator if the used reference instrument has a certificate date expired.

KEYS FUNCTION DESCRIPTION

Main page

In the main menu you can manage the following operational functions such as:

- **Open Certificate**: This button opens the dialog box to select and open a certificate from the archive.
- **Save Certificate**: This button saves the certificate on file with. The operator should select the path and the name of the certificate.
- **Print Certificate**: This button opens the dialog box for printing the certificate.
- **Header Certificate**: This button opens the page where you enter the header data of the certificate. Footer notes that may be entered too.
- **Pressure Gauge Reference Selection**: This button opens the page where you have to enter the data and the uncertainties of your standard instrument. To properly use this program is necessary to fill all fields required.
- **Language:** This button opens a dialog where select the desired language.
- **Help**: This button opens this file.
- **?**: This button provides information about the program.

- **Devices DataBase:** Allows to create a database of devices in calibration. In this way it is possible to recall the manometer data very fast

To exit the program using the **Quit** button placed next to the logo AEP.

In the **Open Certificate** and **Save Certificate** dialog boxes, you can choose the path and folder where to open or save files your certificates. As usual using the right mouse button, you can access the menu with the standard Windows functions such as: Create a new folder, rename, copy, delete a file or folder, etc.
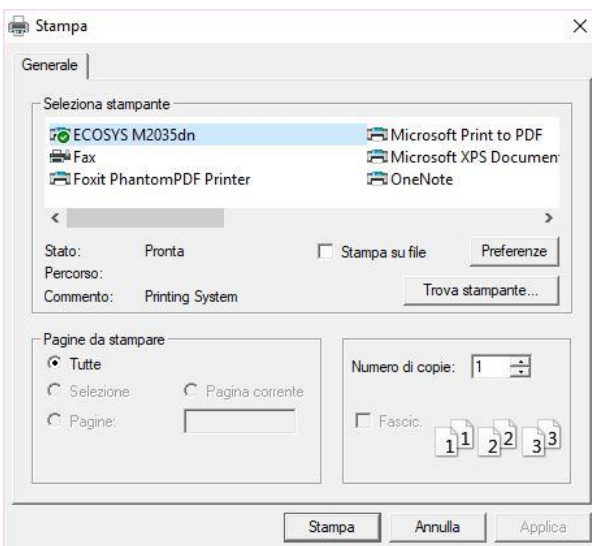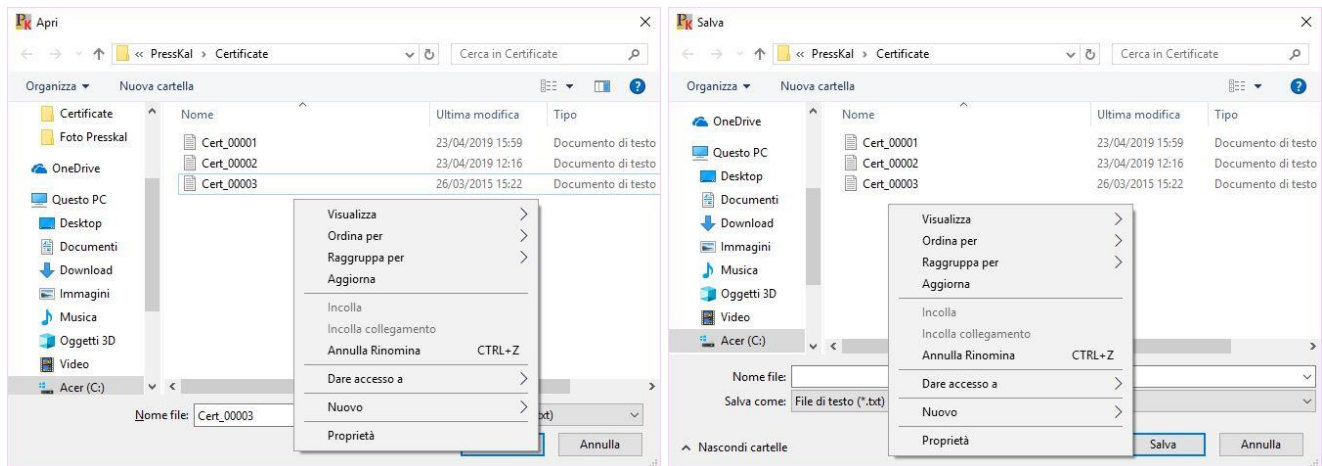
The **Print Certificate** dialog box allows you to print your certificate.

Serial communication

From the main menu you can select your Reference Instrument using the **Select Reference Instrument** selection**.**

For your comfort the main data of the selected Reference Instrument are replicated in the main Window.

To establish a proper serial communication between the PC and the instrument you have to set :

- **Baud rate**: same as the one selected on your instrument. For the MP10Plus indicator this field is meamimgless;
- **COM PORT**: (*COM1, COM2* ...) if you don't know it please check in the Windows Control Panel;
- **Decimal**: the point position for the acquired data.

If the PC does not have a serial input please use a RS232C➡USB adapter.

Data receiving and remote commands

In the window **Receiving Data and Remote Commands,** you can see the Pressure Value transmitted from the instrument in real Time.

It is possible to act on some commands (zero, resolution etc) to better operate on your instruments remotely.

The keys Peak, Resolution and Units are disabled in case of MP10 Indicator.

In some kind of tests can be useful to use the peak function.

Device in Calibration

The window Device in Calibration allows you to set the main data of your instrument in calibration.

All these information will be stored and printed in the report.

It is possible to create a database of devices in calibration. In this way, it is possible to recall the manometer data very fast.

Object: Generic field normally used to define the Manometer type.

Type: Set the pressure gauge model (e.g. "PGE).

Serial Number: indicate the serial number of the pressure gauge.

Manufacturer: Here you have to set the data of the Manometer.

Full Scale: This is the max Pressure allowed for the manometer or, if during calibration you want to reach a lower pressure,   the maximum pressure during calibration.

Unit: The pressure unit used. If this unit is different from the reference unit the necessary conversions are applied.

Resolution: Set the best resolution you can obtain from the device in calibration.

Calibration Certificate: Set here the number assigned to the certificate. This is a free text field.

Pressure gauges Reference

On this page are stored all data on standard instruments that can be used during the calibration.

For the proper functioning you should fill all the following fields easily recovered by an accredited calibration certificate (ACCREDIA or equivalent document).

The function keys on this page allow you to perform the following steps:
- **New**: This button clears all fields to a new data entry.
- **Open**: This button opens a dialog box that lets you open a file with the data of a standard instrument previously saved.
- **Save:** This button opens a dialog box that allows you to save files on the instrument data sample selected at that time.

The fields to be filled are:
- **Object** : Field of general use to indicate the type of instrument (eg "digital Indicator");
- **Type**: Select the name of the instrument (eg "LabDMM");
- **Manufacturer**: Enter the manufacturer of the instrument (eg "AEP transducers");
- **Serial Number**: enter the serial number of the standard instrument;
- **Full Scale**: indicate the maximum capacity of the reference manometer;
- **Certificate Number**: Indicate the number of the SIT certificate or equivalent instrument;
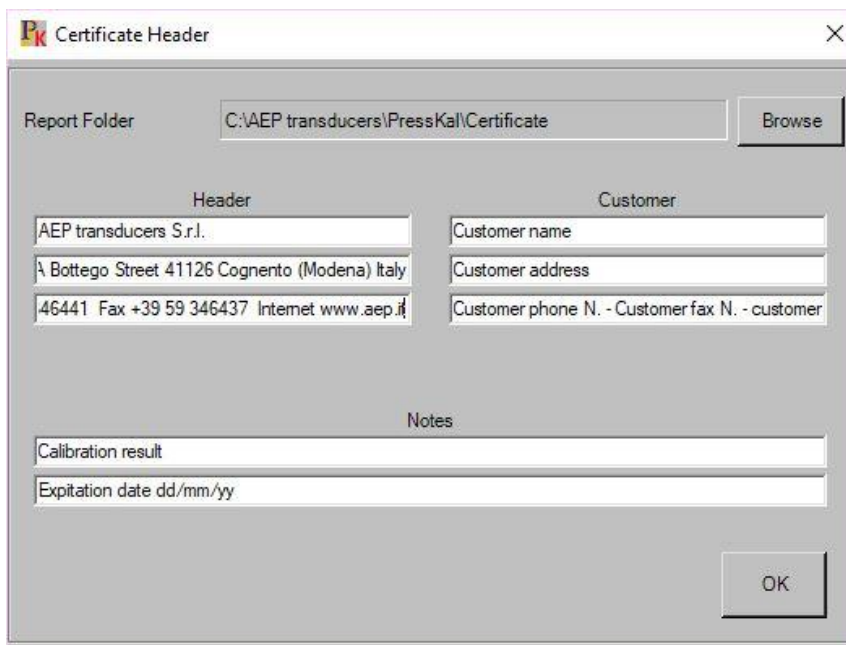
- **Expiration date**: Set the date (dd / mm / yy) the expiration of the standard instrument, the program will warn the operator of the expiration of the certificate;

- **Uncertainty Pressure**: In this table, the operator must introduce in the first column the calibration points on the certificate SIT in pressure unit, and in the column, the uncertainty associated with each point in vacuum;

  The table can accept up to 10 different points, but if necessary the operator can set 5, 7 or more depending on the certificate in his possession;

- **Vacuum Uncertainty**: In this table, the operator must introduce in the first column the calibration points on the certificate SIT in pressure unit, and in the column, the uncertainty associated with each point of strength in tension. The vacuum calibration points should be placed with a minus sign (-)
  The table can accept up to 10 different points, but if necessary the operator can set 5, 7 or more depending on the certificate in his possession.

WARNING:
The introduction of incorrect data affect the calculation of the uncertainty on the manometer in calibration.

Heading Certificate

On this page you can enter some data of interest when the certificate will be printed.

Header: You can enter up to 3 lines of free text to indicate the company details that runs the certificates. This text is placed next to the logo.

Client: You can enter up to 3 lines of free text to indicate the details of the client company owns the device calibrated

Note: You can enter up to 2 lines of free text to show general information. (eg expiry of the certificate, if your machine is or is not within calibration specifications, operator name, etc. ..). This text is inserted in the footer of the certificate.

Custom logo:

By default on the report the AEP Instruments logo will be printed.

If you want to change the AEP logo with your own brand please substitute the file logo2.jpg in the PressKal Installation folder.

This file should be a JPEG image (max size 80x22mm)

CALIBRATION Procedure

Calibration chart

Reference pressure	Cycle 1 Increasing pressure	Cycle 1 Decreasing pressure	Reading error	Expanded uncertainty U	Reading error %	Expanded uncertainty U'
bar	bar	bar	bar	bar		bar
0.00	0.00	0.00	0.00	0.045	0.000	0.045
50.00	50.00	49.98	-0.01	0.051	-0.002	0.061
150.00	149.96	150.02	-0.01	0.060	-0.002	0.070
250.00	249.92	249.92	-0.08	0.049	-0.016	0.129
400.00	399.90	399.94	-0.08	0.054	-0.016	0.134
500.00	499.88	499.88	-0.12	0.049	-0.024	0.169

Reference pressure	Cycle 2-3 Increasing pressure
bar	bar
250.00	249.98
250.00	249.96
Repeatibility	

Calibration characteristics

measurement [5 ▼] measurement [Pressure ▼]

Calculate Errors — Calculate

Start

Accepts the measurement

"Calibration Characteristics " setting:

- **Measurement Points**: *set the number of points of measurement (eg "5" maximum "10");*
- **Measurement Type**: *set "pressure" if the calibration is performed with increasing pressure, set "Vaccum" if the calibration is performed in depression.*
- Select the pressure gauges from the list available, with **Pressure gauge reference selection** button.

Mount the pressure gauges and the pressure gauge being calibrated on the generator pressure.

If you use a generator to purge the hydraulic circuit, the air can affect the results of the two gauges.

Run 3 preloading to full scale of the gauge being calibrated.

Open the circuit by putting the gauges in conjunction with the atmospheric pressure and wait 30 seconds.

Press the **Start** button to begin the acquisition.

If the two gauges are digital, reset the pressure reading with the appropriate key "ZERO" and press the "Accept measures" or press the spacebar on the keyboard.
Close the circuit and generate the first point bringing the pressure gauge being calibrated to the exact measurement (eg "100 bar")
Wait 30 seconds and press the "Accept measures.
In this way the program stores the pressure gauge Reference value for the first point of the gauge being calibrated.

Perform the same way all points increasing progressively until you return to zero pressure.

Open the circuit by putting the gauges in conjunction with the atmospheric pressure, wait 30 seconds and press the "Accept measures".

Perform the two repeatability points at 50% of the maximum calibration pressure, in the same way as described above.

At the end of the sequence, the program will automatically calculate the errors and uncertainties in the calibration device.

You can stop the test at any time by pressing the Stop button highlighted in red and then start over the procedure by pressing Start.

Calibration Simulation

It is possible to simulate a calibration table by filling in all the fields manually.

Program the calibration Characteristics as usual.

The simulation starts by pressing the **Start** button highlighted in green, the program automatically calculates the points to be controlled by dividing the maximum capacity of the device being calibrated by the number of steps to be performed.
Insert manually the measured values in the table.
At the end press **Calculate** to calculate the errors and uncertainties

ERRORS and UNCERTAINTIES CALCULATION

Average Reading, e_m: it is calculated for each measurement point:

e_m = ((nominal pressure value) - (half-cycle average))

where:
- The nominal value is that reached on the pressure gauge in calibration;
- The average of the half-cycles is the value resulting from the average of the readings on the sample pressure gauge for increasing and decreasing pressures.

Reading Error %, e_m%: it is computed according to the following formula

e_m% = ((e_m*100)/Full Scale)

Expanded Uncertainty $U(e_m)$: it is computed in pressure unit for each measurement point. Keep in count the uncertainty of the reference pressure, the hysteresis measurement uncertainty, the uncertainty of the resolution of the device being calibrated and the uncertainty of the repeatability of measurement:

$U(e_m) = k*u(e_m)$

Where k = 2

$u(e_m)$ = standard uncertainty

Expanded Uncertainty $U'(e_m)$: it is calculated according to the following formula

$U'(e_m) = U(e_m) + |e_m|$

where:

$|e_m|$ = absolute value of the average reading error

Certificate Example

AEP transducers S.r.l.

Via Bottego, 33/A   41126 Cognento (MO) Italy
Tel. 059 346441   Fax 059 346437   e-mail aep@aep.it

Customer:

CERTIFICATE Nr.: CT00001

Date: 03/05/2019
Hour: 10:39:52

REFERENCE SYSTEM

Type:	IDROSCAN	Serial number:	927100
Object:	Manometro Digitale	Full Scale:	350 bar
Manufacturer:	AEP transducers	Certificate n°:	123419P

SYSTEM in CALIBRATION

Type:	DMM	Serial number:	88875
Object:	Manometro Digitale	Full Scale:	350 bar
Manufacturer:	AEP transducers	Resolution:	0.1

PRESSURE MEASUREMENTS

Reference pressure bar	Cycle 1 increasing bar	Cycle 1 decreasing bar	Reading error bar	Expanded Uncertainty U bar	Reading error %	Expanded Uncertainty U' bar
0.0	0.0	0.0	0.0	0.08	0.00	0.08
35.0	35.0	35.0	0.0	0.70	0.00	0.70
105.0	104.9	104.8	0.2	0.71	0.04	0.86
175.0	174.7	174.5	0.4	0.71	0.11	1.11
280.0	279.7	279.5	0.4	0.71	0.11	1.11
350.0	349.6	349.4	0.5	0.71	0.14	1.21
175.0	174.8	Repeatability				
175.0	174.8					

The calibration procedure and calculations are made in accordance with the : Guide EURAMET cg-17

Signature _____