

MANO CALI

OPERATING MANUAL



RANGE	SERIAL-No.	PROGRAM-VERSION	DATE

KELLER

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GENERAL DESCRIPTION

The KELLER MANO CALI is a precise pressure measuring instrument. Its high accuracy, solid construction and its long battery life make it an ideal measuring instrument, especially for measuring tasks where stand alone operation and flexibility are required.

In the standard version, the pressure transducer is built into the housing as shown below. The transducer is retained with a counternut.

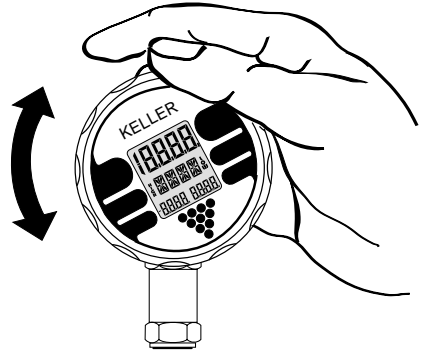
Mounting:

Screw the male port of the MANO CALI into the female pressure port and tighten using the lower hexagon of the transducer.

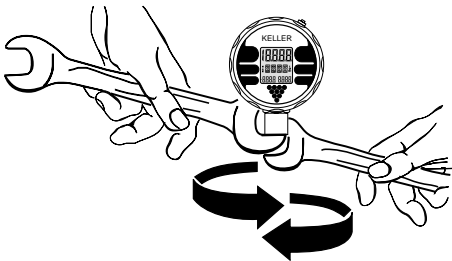
Adjusting the facing direction:

Loosen the upper hexagon of the counternut and rotate the MANO CALI to the desired position. Do not turn through more than 360°C. Retighten.

The face of the MANO CALI can be rotated through 355°. This feature allows the MANO CALI to be mounted in all possible positions; vertical, horizontal or upside down.



The splash-proof cover of the MANO CALI is sealed with an O-ring and may easily be removed by hand by turning the display ring beyond the limit stop (see "Battery Change" on page 12).



Depressing the function-key (marked by a pointed triangle) sets the MANO CALI into operation.

After turning on the instrument, all segments of the display flash three times for operational test.

Between the segment tests, the MANO CALI displays:

- the measuring range on the upper display (i.e. 20.00)
- the software program number on the middle display (CALI)
- the year and calendar week of the program version (i.e. 94:23) on the lower right display

After this test, the instrument will lead into the function from which the instrument was previously turned off.

All commands are selected with the function-key. When the function-key is depressed and held, all commands appear in succession. Releasing the function-key executes the displayed command. This cycle (constantly depressing the function key and letting go the key at a desired command) is subsequently called **activation**.

For a better understanding, the two operation elements and their functionality are explained once again:

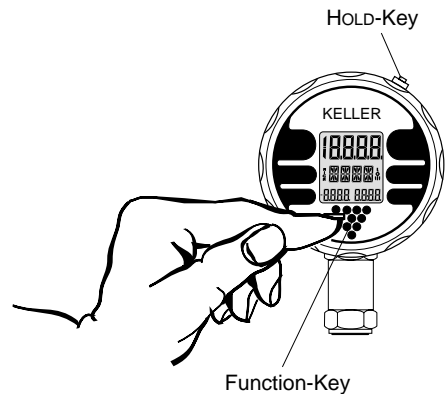
FUNCTION-KEY

The function-key on the front of the instrument serves to operate the instrument.

Within specific functions, the function-key may execute additional commands (EXE, STEP, RESET).

HOLD-KEY

The HOLD-key freezes the measured values during the MANO-Mode. It has additional functions in other modes (see following pages).



DESCRIPTION OF THE FUNCTIONS

COMMAND STRUCTURE

When keeping the function-key depressed, the functions EXE, OFF, MANO, TARA, UNIT, LEAK, REC, ZERO, RESO and ascending numbers appear successively on the display.

Releasing the function-key at a displayed function activates and leads into the function (i.e. to activate MANO --> Press function-key until display shows MANO --> Release the function-key).

Activating OFF turns off the instrument. When starting the instrument again, the display will automatically lead into the function from which the instrument was previously turned off.

Activate MANO if normal operation is desired.

- EXE:** In MANO-Mode: To reset peak- and trough-pressure.
- OFF:** To turn off the instrument.
- MANO:** To display the actual pressure generated, the units, peak- and trough pressure.
- TARA:** To set a new, *volatile* reference for the zero point (TARE).
- UNIT:** To display the pressure in different units (BAR, PSI, KPA, mWC...).
- LEAK:** To measure the pressure changes over a programmable time.
- REC:** To record the measured values in programmable intervals.
- ZERO:** To write a new zero point into the *non-volatile* memory.
- RESO:** To reduce the resolution by factor 10 or to return to the original resolution.
- 28, 29...** Ascending numbers (have no function).

MANO-MODE

The MANO-Mode is the standard mode of the MANO CALI. In this mode, the instrument shows on the upper display the actual pressure generated. The smaller displays below indicate the peak- and trough values. The measured values on the smaller displays always appear with a reduced resolution. Activating EXE resets the peak- and trough values, meaning that they are reset to the actual pressure.

Pressing the HOLD-key freezes the measured values. The actual changing pressure is now shown on the lower right display. Pressing the HOLD-key again leads back into the MANO-Mode with the peak- and trough values reset to the actual pressure (same as EXE).

MANO-MODE



↓
Activate EXE



↓
Press HOLD-Key

HOLD-MODE



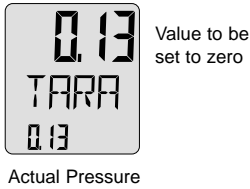
↙
With HOLD-key back to MANO-Mode



The arrow with a flashing minus sign represents a "1", i.e. at 100 bar in the overpressure range (here 133.41 bar).

The TARA-Mode serves to set a temporary zero reference. Unlike to the ZERO-Mode, this new zero reference will not remain after the instrument has been turned off.

Activate TARA :



Activate EXE

MANO-MODE



With the command EXE the new zero is determined and stays as a reference until a new TARA is executed or until the instrument is turned off.

The programme returns to the MANO-Mode.

The UNIT-Mode allows the selection of one of four pressure units.

ACTIVATE UNIT:



Activate EXE



Activate EXE



Activate EXE



Activate MANO to return to the MANO-Mode with the new selected unit.

Please note that, depending on pressure range, the units can differ from the above.

LEAK-MODE

The LEAK-Mode serves to measure a pressure change over a programmable time.

Setting the Test Time:

Activate LEAK:



Actual
Pressure

Test Time



Activate SEL



Flashing. EXE changes
to hr (hours),
EXE again to day.



Activate STEP



First digit is flashing,
EXE increases digit.
With STEP to next digit.



Activate STEP



Second digit is flashing,
EXE increases digit...
With STEP to next digit.

When the test time is set, activate PREP. The display is now back in PREP-Mode.



The test time is now programmed (35:00). The start of the leak-test is described on the next page.

Start of the Leak-Test

After setting the test time, the display is in the PREP-Mode:



↓
*Press HOLD-key
or activate RUN*

After the test, the measured values are frozen in. Activate PREP to return to the PREP-Mode from the END display.

A new test can be started as follows (also when measurements are running).

- **Press the HOLD-key or**
- **Activate RUN with the F-Key**

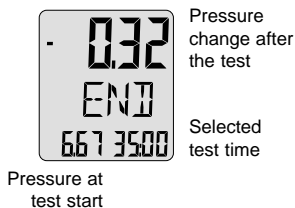
At any time, you may return to the MANO-Mode by activating MANO.

Activating MANO interrupts a running leak-test.

During Test:



After Test:



In the REC- (or Record) Mode, the measured values are stored. The number of measurements and the interval (in minutes and seconds) are programmable.

Subsequently, one storage cycle over the number of measurements is called a "recording".

After setting the number of recordings, set the recording interval in min:sec in the same way. The adjustment of the storage parameters can be terminated by activating PREP.

The display is now in the PREP-Mode. The recently set storage parameters are shown on the display:

Setting the Storage Parameters:

Activate REC:



Activate SEL



First digit is flashing;
EXE increases digit.
With STEP to next digit.



Activate STEP



Second digit is flashing;
EXE increases digit.
With STEP to next digit...

- The start of the recording is described on the next page.

Start the Recording:

After the setting of the storage parameters, the display is in the PREP-Mode:



The display END indicates the end of the recording. Activate PREP to return to the PREP-Mode from the END display.

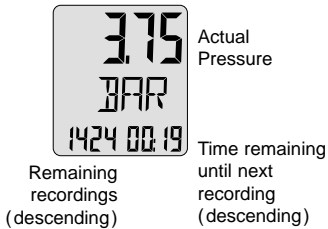
At any time, a record can be prematurely terminated by activating RES.

In the REC-Mode you may also display the temperature.

Pressing the HOLD-key at PREP display indicates the temperature on the lower right display.

To quit the REC-Mode, activate PREP, followed by the activation of any function.

During Recording:



After Recording:



RESO-Mode:

The activation of RESO reduces the resolution by factor 10 (or sets the display back to the original resolution).



Activate Reso



Activate Reso



ZERO-Mode:

Ambient pressure changes, the influence of temperature or position can result in zero shifts.

These shifts can be permanently corrected as follows.

Activate ZERO :



Actual Zero



Activate EXE



The new zero is set and permanently stored. This zero will be maintained when turning off the instrument.

The program automatically returns to the MANO-Mode after setting the new zero.

DATA TRANSFER TO PC

(only with Logger-Option)

In order to transfer the data from the MANO CALI into the PC, the special cable K101 and special software is required. The transfer of the data is accomplished over an RS232 serial interface connected to a socket on the rear of the MANO CALI housing.

LOGGER-SOFTWARE

This software serves to transfer the data to a PC, offering many further processing possibilities of the read-out data.

The LOGGER-Software meets all the requirements of modern Windows-Software:

- Graphical Display
- Tabulated Display
- Export into other Windows-Programs
- Storage into Files



The transfer of the data always starts at the last recording and can be extended to read out the entire memory. The memory may be read out as many times as needed.

TIME ALLOCATION

After each recording, MANO CALI writes the status of MANO CALI's time meter into the memory. When transferring, the absolute time-axis is calculated from the time set in the PC, the time meter of MANO CALI and the recorded time. MANO CALI should therefore not be turned off between the recording and the transfer.

During the recording process, five additional recording locations for the storage of time are used for each complete recording cycle.

MEMORY

The function *REC* fills the memory. New data is always archived after the last recorded value, continuously filling the memory. Since MANO CALI features a ring-memory, new data will only overwrite the oldest data. This ensures that the maximum amount of the most recent data is always at your disposal when the memory is full.

TOTAL STORAGE LOCATIONS

Standard: 900

Extended: 8000 (extended memory option)

BATTERIES

MANO CALI is battery powered (located behind the display). It does not indicate battery low. If the display starts to fade, it's an indication that the battery is weakening. At this point, we recommend changing the battery. The batteries can be acquired from KELLER.

BATTERY CHANGE

Turn the display ring beyond the limit stop. It will detach from the main housing. Disconnect the battery connections and remove the old battery. Insert the new battery. Set the display ring back in place.

RESTARTING MANO CALI

If the program becomes locked, meaning that the instrument does not react anymore when operating the function-key, in most cases an interruption of the power supply can activate the instrument again.

Just follow the procedure described for the battery change and disconnect the instrument from the battery for at least 20 seconds. After re-connection, start the instrument again.

OVERFLOW/OVERPRESSURE LIMIT

MANO CALI displays the pressure up to 5 to 10% above the indicated pressure range. If this range is being exceeded, the display indicates "OVFL" (overflow). Do not increase the applied pressure any further!

If the pressure exceeds the indicated pressure range by more than 20%, the sensor may be destroyed.

RECALIBRATION

A recalibration of the instrument is not required.

Total Accuracy of displayed Pressure ⁽¹⁾	±0,1 % FS (Full Scale), from 0...50 °C ±0,1 % FS ±1 Digit
Overpressure	FS + 20 %
Selectable Pressure Units	BAR / PSI / kPA / mWC (others on request)
Measurement Cycle	2 Measurements per Second
Displayed Temperature	Temperature of Reference Sensor in °C (±1°C)
Storage Temperature	-20...60 °C
Operating Temperature	0...50 °C
Compensated Temperature Range	0...50 °C
Air Humidity	5...95 % Relative Humidity
Memory	900 Storage Places (8000 optional)
Power Supply of MANO CALI-Electronics	Lithium-Battery 3,6 V (not rechargeable)
Lithium-Battery-Life	> 200 Days at continuous Operation
Total Weight, including Batteries	≈ 250 g
Media Compatibility	Pressure transducer: 316L Stainless Steel Diaphragm. Electronics sealed with Gel.
Protection	IP 65

⁽¹⁾ Includes linearity, repeatability, hysteresis, temperature error and resolution of the display.

DECLARATION OF CONFORMITY



Herewith we declare, that the following products or product range

MANO CALI
according to drawing 80424

meet the basic requirements for the electromagnetic compatibility, which are established in the guidelines of the European Community (89 / 336 / EWG).

This declaration is valid for all MANO CALI's, of which a drawing, marked with the CE sign, exists, and which are produced according to this drawing. This explanation has no validity without such a drawing.

As criteria for the electromagnetic compatibility, the following norms are applied:

EN - 50081 - 1
EN - 50082 - 1

This declaration is given for the manufacturer

KELLER AG für Druckmesstechnik
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SWITZERLAND

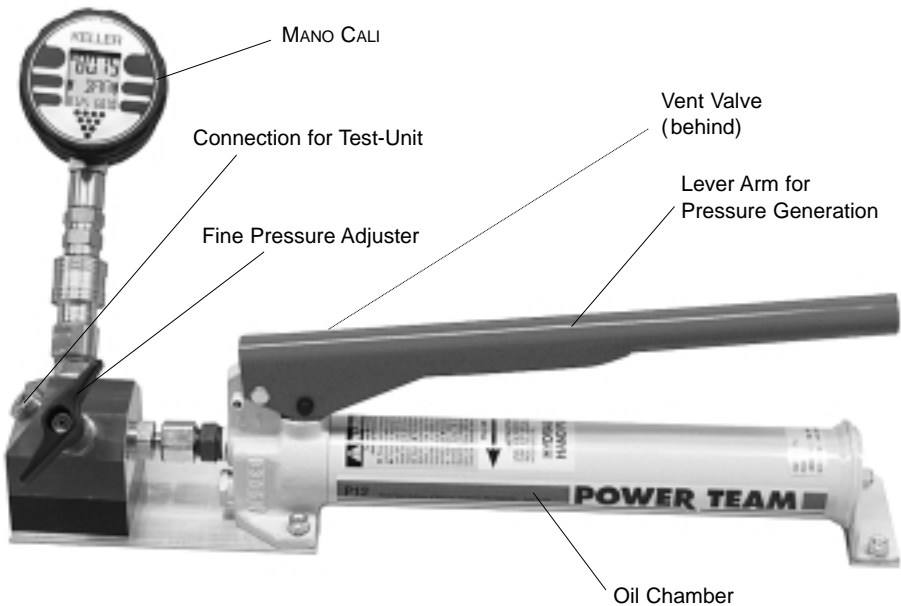
in full responsibility by

KELLER GmbH
Schwarzwaldstrasse 17
D - 79798 Jestetten
GERMANY

Jestetten / September 19, 1996

H.W. Keller
Geschäftsführer
with legally effective signature

HIGH PRESSURE PUMP P12 WITH MANO CALI



GENERAL NOTES:

This pump allows easy pressure generation up to 700 bar. The pressure media is hydraulic oil. The oil chamber volume of 148 cm³ will fill even big dead volumes.

The pump with its fine pressure adjuster and vent valve allows precise pressure settings, which makes it to an ideal test equipment for manometers and pressure transmitters.

Further information and a detailed operational guide for this high pressure pump are given in the manufacturer's manual (included in delivery).

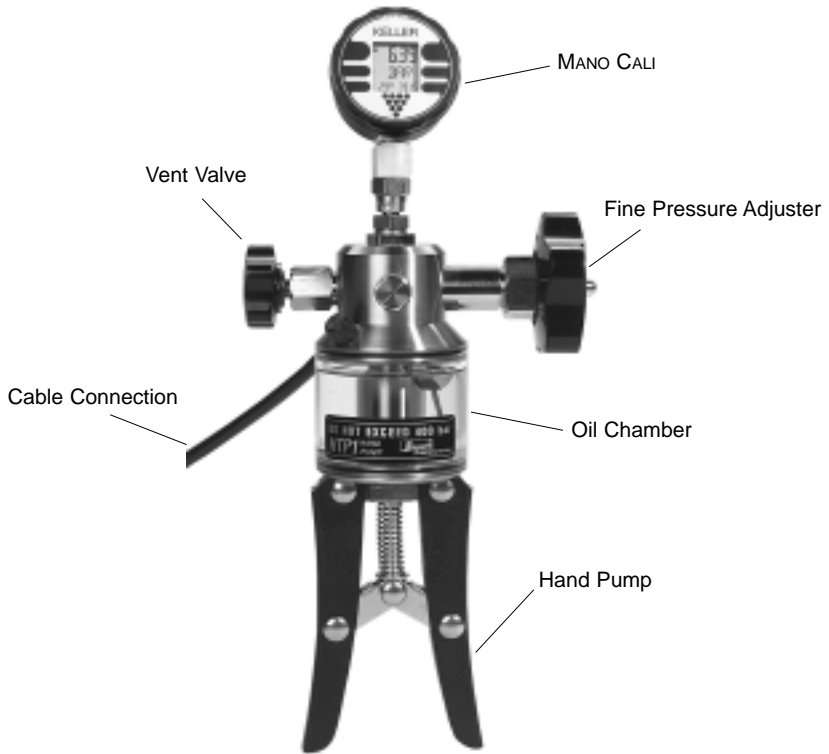
PRESSURE GENERATION:

For rough pressure setting, generate pressure with the lever arm. Increase or decrease pressure with the fine pressure adjuster.

DECREASING THE PRESSURE:

To return pressure to zero, open vent valve.

HIGH PRESSURE HAND PUMP HTP1 WITH MANO CALI



GENERAL NOTES:

This pump allows easy pressure generation up to 700 bar. Suitable pressure media are hydraulic oil or water. The oil chamber volume of 100 cm³ will fill large dead volumes.

The pump with its fine pressure adjuster and vent valve enables precise pressure settings, which makes it to an ideal test equipment for manometers and pressure transmitters.

Further information and a detailed operational guide for this high pressure hand pump are given in the manufacturer's manual (included in delivery).

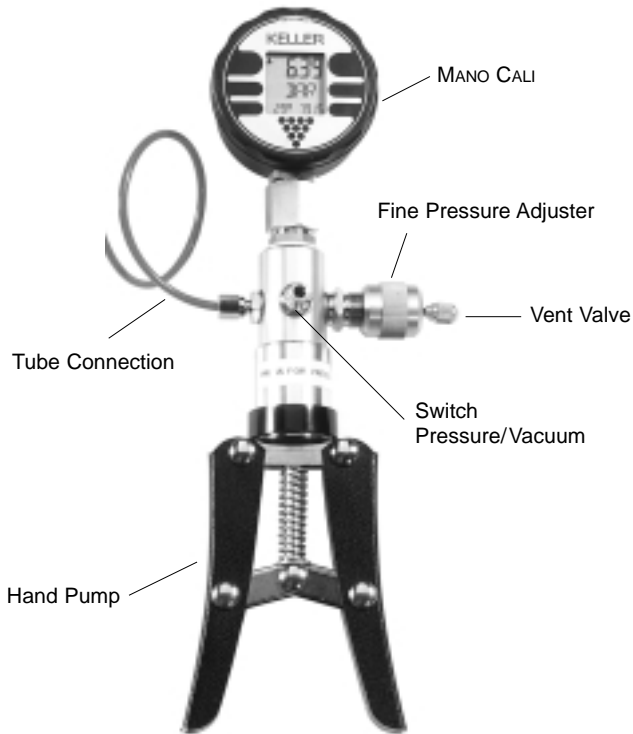
PRESSURE GENERATION:

For rough pressure setting, generate pressure with the hand pump. Increase or decrease pressure with the fine pressure adjuster.

DECREASING THE PRESSURE:

To return pressure to zero, open fine pressure adjuster and completely screw back the vent valve.

HAND PUMP K/P WITH MANO CALI



GENERAL NOTES:

This pump allows easy pressure generation with air, both for negative pressures and pneumatic pressures up to 20 bar.

The pump with its fine pressure adjuster and vent valve enables precise pressure settings, which makes it to an ideal test equipment for manometers and pressure transmitters.

Further information and a detailed operational guide for this hand pump are given in the manufacturer's manual (included in delivery).

PRESSURE GENERATION:

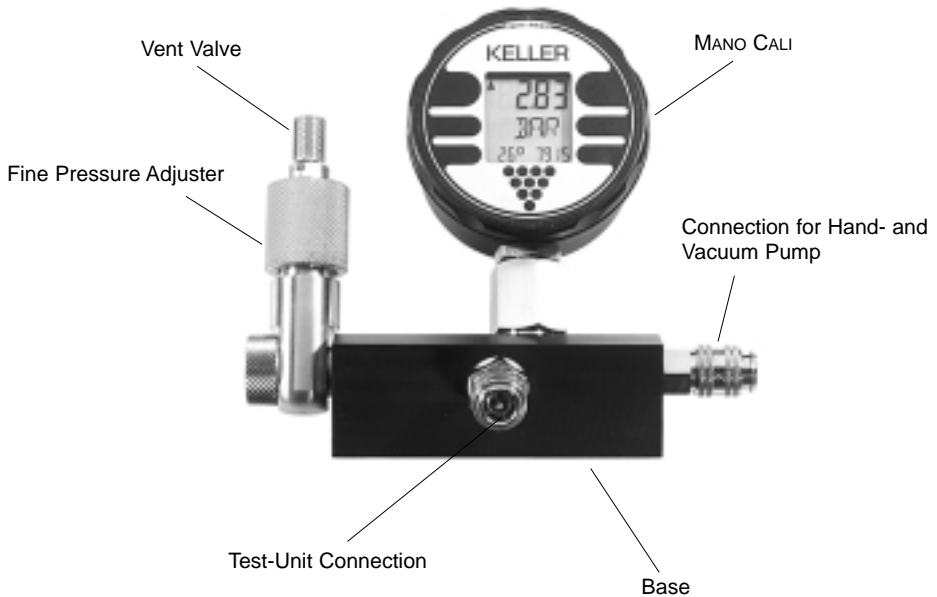
For rough pressure setting, generate pressure with the hand pump. Increase or decrease pressure with the fine pressure adjuster.

Press vacuum switch for negative pressure (down to -850 mbar)

DECREASING THE PRESSURE:

To return pressure to zero, open vent valve.

LOW PRESSURE BASE WITH MANO CALI



GENERAL NOTES:

This low pressure base allows pressure generation of up to 20 bar or negative pressure down to -850 mbar.

An air pump and vacuum pump are included in delivery.

The pressure can precisely be set via integrated fine pressure adjuster.

PRESSURE GENERATION:

For rough pressure setting, generate pressure with the hand- or vacuum pump. Increase or decrease pressure with the fine pressure adjuster.

DECREASING THE PRESSURE:

To return pressure to zero, open vent valve. Do not turn back the vent valve beyond the red mark.