



MANO RECORD MR2

FOR HAZARDOUS APPLICATIONS

OPERATING MANUAL



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KELLER

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GENERAL DESCRIPTION

The KELLER *Intelligent Manometer* is a precise pressure measuring instrument. Its high accuracy, solid construction and its long battery life make it to an ideal measuring instrument, especially for measuring tasks where independence and flexibility are required.

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

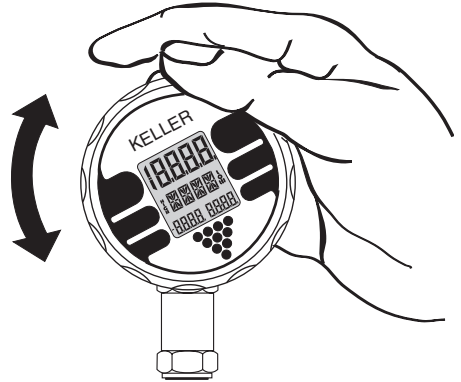
Mounting:

Screw the male port of the *Intelligent Manometer* into the female pressure port and tighten using the lower hexagon of the transducer.

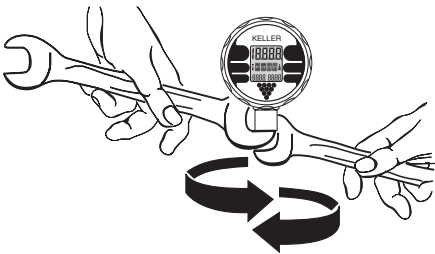
Adjusting the face:

Loosen the upper hexagon of the counter nut and rotate the *Intelligent Manometer* to the desired position. Retighten.

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



The splash-proof cover of the *Intelligent Manometer* 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” in Chapter “Notes” on page 8).

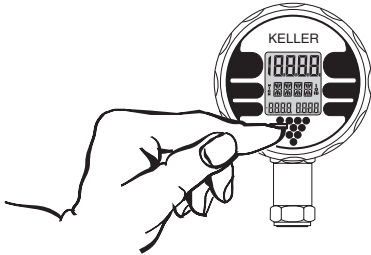


Depressing the front key (marked by a pointed triangle) sets the *MANO RECORD MR2* into operation.

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

It is possible that the intrinsically safe Intelligent Manometer will not start up completely by pressing the button the first time. This is shown by several beams on the display. In this case please press the front key once again! After that, the unit will start up correctly.

This behaviour is determined by the intrinsically safe version of the Intelligent Manometer. The unit is not defective.



Between the segment tests, the *MANO RECORD MR2* displays:

- the measuring range on the upper display (i.e. 20.00)
- the software program number on the middle display (MR2)
- the year and calendar week of the program version (i.e. 97:36) on the lower right display

All commands are selected with the front key. When the front key is depressed and held, all commands appear in succession.

Releasing the front key executes the displayed command. This cycle (constantly depressing the front key and letting go the key at a desired command) is subsequently called **activation**.

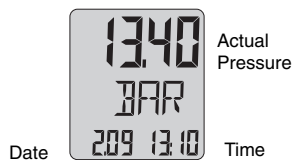
Attention: In hazardous areas, the connection to the interface (on the back side of the instrument) must not be plugged in or unplugged!

The MANO-Mode is the standard mode of the *MANO RECORD MR2*. In this mode, the values of the display can be selected from three different display configurations as shown on the right side. Activating DISP leads from one configuration to the next.

Date and Time in the first configuration are supplied by a Real-Time-Clock-module and have to be set new by PC when battery was disconnected. The values shown on the display will automatically be the values to be stored in the RECORD-Mode.

Within the MANO-Mode, the command EXE can only be activated when max.- and min. values are displayed. EXE resets the max.- and min. values, meaning that they are reset to the actual pressure.

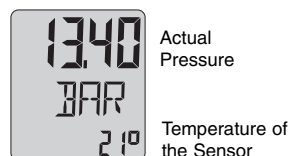
Display Structure:



↓ **Activate DISP**



↓ **Activate DISP**



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:



MANO-MODE:

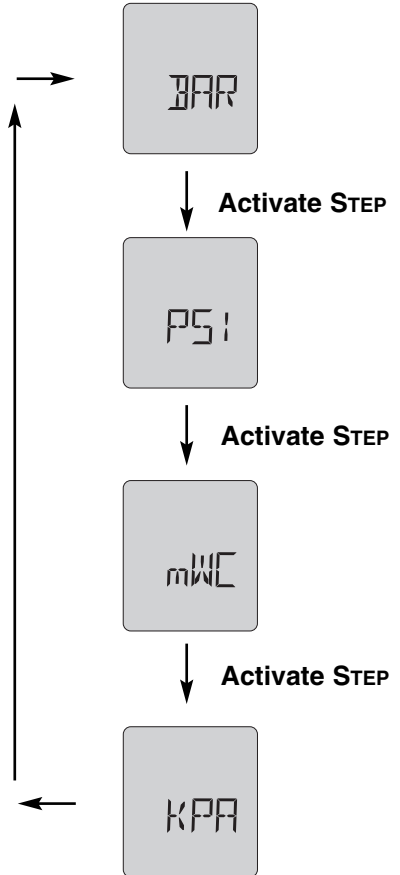


With the command EXE the new zero is determined and stays as a reference until a new TARA is executed or until the instrument is turned off. Activating anything else than EXE has no effect on the zero reference.

The program returns to the MANO-Mode.

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

Activate UNIT:



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

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

Setting the Test Time:

Activate LEAK:



The first digit is flashing,
EXE increases digit,
With STEP to the next digit.



Activate STEP



The second digit is flashing,
EXE increases digit.
With STEP to the next digit etc.

The time can be set from 1 minute to a maximum of 59 minutes and 59 seconds.

When the test time is set, activate RES. The test time is now programmed.



Activate RES



Actual Pressure

Programmed
Test Time

Start the Leak-Test:

Before Test:



Actual Pressure

Programmed
Test Time



Activate RUN

During Test:



Pressure Change

Pressure at
Start

Time counting down



Activate STEP

At any time you may terminate the test by activating END. The LEAK-function will then return to the point "Before Test".

After Test:



Pressure Change
after Test

Pressure at
Test Start

Selected Test Time

After the test, the measured values are frozen in. A new test can be started by activating RUN again.

REC-Mode:

In the REC-Mode, the configuration from the MANO-Mode is taken over, meaning that the values displayed in the MANO-Mode are stored.

After activating REC:



ZERO-Mode:

Ambient pressure changes can result in zero shifts.

These shifts can be permanently corrected as follows.

Activate ZERO:



After Recording:



The display END indicates the end of the recording.

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

↓ **Activate EXE**



The new zero is now 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.

The REC-SEL-Mode allows to set the interval for the RECORD-Mode.

The interval can be set from 1 second up to a maximum of 59 minutes and 59 seconds.

Setting the interval:

Activate RECS:



The first digit is flashing,
EXE increases digit.
With STEP to the next digit.



Activate STEP



The second digit is flashing,
EXE increases digit.
With STEP to the next digit, etc.

When the interval is set, activate RES. The interval is now programmed. The start of the recording is described on page 6.

More information also to find in the "Operating Manual 3.1 for Windows" (also loadable under www.keller-druck.ch).

Attention: In hazardous areas, the connection to the interface (on the back side of the instrument) must not be plugged in or unplugged!

RESTARTING THE *INTELLIGENT MANOMETER*

If the *Intelligent Manometer* program appears to be locked (the instrument will not respond to front key operations). This can be rectified by disconnecting the battery for a period of longer than 20 seconds. Follow the procedure for changing the battery. Then restart the instrument.

OVERFLOW/OVERPRESSURE LIMIT

The *Intelligent Manometer* displays the pressure until 5 to 10% above the rated pressure range. If this range is being exceeded, the display indicates "OVFL" (overflow). Do not increase the applied pressure any more!

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

BATTERY CHANGE

Turn the display ring beyond the limit stop. It will detach from the main housing. Remove the screws that hold the print for the batteries in place and change the batteries ensuring that the polarity of the batteries VARTA (2x CAAA 3 V Lithium 2 Ah) is correct. Set the display ring back in place.

The *Intelligent Manometer* will not indicate a battery low. If the display starts to fade, it's an indication that the battery charge is weakening. At this point, we recommend changing the battery. The batteries can be acquired from KELLER.

After a battery change, it is possible that the recorded values cannot be interpreted correctly by the Logger-Software! We therefore recommend that all data is downloaded and safely stored on a PC before changing the battery.

Special conditions for safe use in hazardous applications: The Mano Record MR2 is an “intrinsically safe apparatus”; it can be mounted in explosive atmospheres.

When the apparatus is mounted in dangerous area, equipment must not be connected to the terminal block.

When the apparatus is mounted in non dangerous area, the terminal block can be only connected to a certified intrinsically safe equipment which the electrical parameters do not exceed the following values:

$U \leq 6,5 \text{ V}$ $I \leq 100 \text{ mA}$

Operating ambient temperature:

T5: $-10 \text{ }^\circ\text{C}$ to $+80 \text{ }^\circ\text{C}$ T6: $-10 \text{ }^\circ\text{C}$ to $+65 \text{ }^\circ\text{C}$

Service: KELLER Digital Manometers are maintenance-free. The cycle for recalibration depends on the application conditions.
Recommended recalibration cycle:
1 year.

When installing and operating the digital manometer, attention should be paid to the corresponding national safety regulations and to the relative country regulations concerning the Ex-application.

Only mount the digital manometer onto unpresurized systems.

On pressure ranges $> 30 \text{ bar}$, the pressure connections could show residual hydraulic oil. Also note the corresponding data sheet.

Please note that temperatures outside of $0 \dots 50 \text{ }^\circ\text{C}$ could impair the readability of the display.

DECLARATION OF CONFORMITY



Herewith we declare, that the following products...

Intrinsically Safe Digital Manometer "Mano Record MR2"

meet the basic requirements, which are established in the guidelines of the European Community:

Directive EMC 89/336/EEC
Directive ATEX 94/9/CE

As criteria, the following norms for this Intrinsically Safe Manometer are applied...

EN - 50081 - 1 / EN - 50081 - 2
EN - 50082 - 1
EN - 50014 (1997)
EN - 50020 (1994)

and the EC examination certificate under LCIE 01 ATEX 6001 X is given.

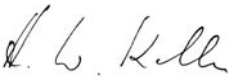
This declaration is given for the manufacturer:

Keller AG für Druckmesstechnik
St. Gallerstrasse 119, CH-8404 Winterthur

in full responsibility by:

KELLER GmbH
Schwarzwaldstrasse 17, D - 79798 Jestetten

Jestetten, 31.1.02


H. W. Keller
Geschäftsführer / CEO (with legally effective signature)

TECHNICAL DATA

| | |
|---|--|
| Total Accuracy of displayed Pressure (incl. linearity, repeatability, hysteresis, temperature error and resolution of the display) | typ. $\pm 0,1\%$ FS, ± 1 Digit (at 20 °C) max. $\pm 0,2\%$ FS, ± 1 Digit (from 0...50 °C) |
| Overpressure | FS + 50 % |
| Measurement Cycle | 1 Measurement per Second |
| Displayed Temperature | Temperature of Reference Sensor in °C |
| Storage Temperature | -20...60 °C |
| Operating Temperature | 0...50 °C |
| Compensated Temperature Range | 0...50 °C |
| Air Humidity | 5...95 % Relative Humidity |
| Memory | 16'000 |
| Power Supply of Electronics | 2 x VARTA CRAA 3 V Lithium 2 Ah (or acc. to EN 50020) |
| Total Weight, including Batteries | 270 g |
| Media Compatibility | Pressure Transducer: Stainless Steel Diaphragm. |
| Protection | IP 65 |

KELLER AG CH- 8404 Winterthur Tel. +41 (0)52 - 235 25 25 Fax +41 (0)52 - 235 25 00
KELLER EUROPE (GmbH) D- 79798 Jestetten Tel. +49 (0)7745 - 9214 0 Fax +49 (0)7745 - 9214 50