HUBER INSTRUMENTE

PRESSURE measure very simple

CONSULTING DEVELOPMENT PRODUCTION CALIBRATION

MADE SWISS

Operating Manual – GM40

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Thank You

For choosing a SWISS MADE high-precision pressure measurement instrument, made by HUBER INSTRUMENTE AG.

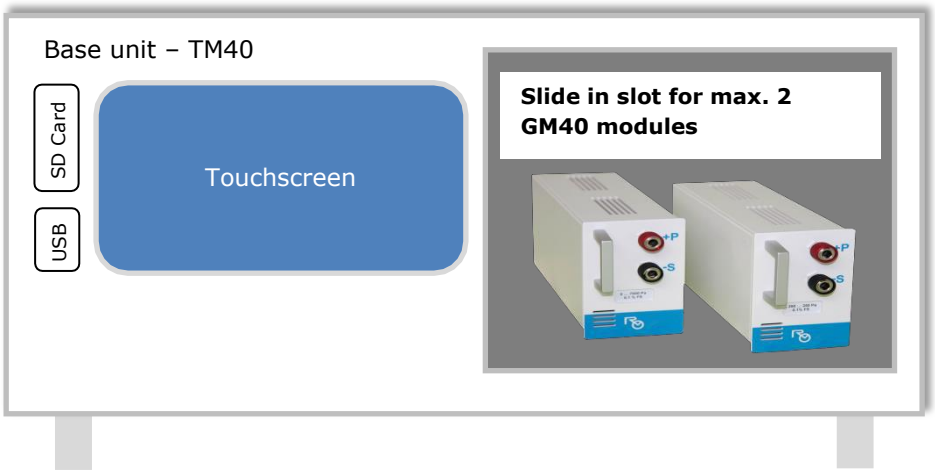
We maintain an SAS accredited calibration laboratory (identification number SCS 0018), thus we're obliged to ensure a high and steady level of quality.
This level of quality is audited on a regularly basis, resulting in giving you the security of a precise and comparable measurement data. Every GM40 that leaves HUBER Instrumente AG comes with an internationally acknowledged SCS-calibration certificate.

Introduction

The GM40 is designed as a slide in module for the TM40 base unit. In combination, they represent a modular measuring system, that's suitable for various adjustment-, verification- and calibration- applications with inert or dry gases. Regardless of whether you want to generate or measure pneumatic pressure.

All inputs are conducted via the graphical touchscreen. Only a 9-pole DSub plug connects the module with the base unit (for communication and voltage supply). The pneumatic pressure conditioning and measuring takes place in the corresponding module directly.

For the features of the TM40 base unit, please refer to the separately available TM40 base unit manual.



Features

- ☐ Pneumatic pressure generation
- • Differential and gauge pressure for non-corrosive gases and dry air
- ☐ Min. / Max. measurement
- ☐ Graphical measurement display
- ☐ Data logger either via micro SD card or via USB connection to a PC

Security and Warning Icons

Please note the symbols in this manual!

- The GM40 must be operated only in connection with the TM40 base unit.
  Please also note the security and warning information for the TM40 base unit.
- The GM40 must not be operated with a damaged or broken casing.
- The GM40 must not be opened or modified.

Please read this manual and the manual of the TM40 base unit carefully before putting the device into operation. Make sure, the operator of this device has read and understood the manuals and the security information. In case of questions or uncertainties, please contact the supplier or the manufacturer of the device.

CE Declaration of Conformity

We declare under our sole responsibility, that this product is in conformity with the following standards:

☐ IEC 61000-6-1 (EMC Immunity)
☐ EN 61000-6-3 (EMC Emission)
☐ EN/IEC 61326-1 (EMC Requirements)

RoHS Declaration of Conformity

We declare herewith, that the GM40 and the corresponding components used for it are in conformity with the rules of the guideline **2011/65/EU** of the European parliament to restrict the usage of certain dangerous substances in electronic devices.

Copyright ©

Disposal

Please ensure a proper disposal of the device, in accordance with statutory regulations for electronic devices or send the device back to the manufacturer with the reference to dispose the unit.

Maintenance / Cleaning and Storage

The GM40 is maintenance-free.
There are no batteries or leaking components built-in.

For cleaning the housing, we recommend using a moist cloth with sparsely applied soap or a suitable plastic cleaner.
Do not use solvent-based cleaners.

No cleaner must penetrate the housing. In case it nevertheless happens, make sure the device has sufficient time to dehumidify before putting it into operation again.

To ensure the most accurate measurement results, we recommend having the device calibrated periodically at HUBER INSTRUMENTE AG.

Putting Into Operation

Acclimatisation

In the event of a transport from a cold-zone into a warm-zone, condensate may probably have formed into the device and cause malfunctions. Therefore the device should have sufficient time to acclimatise to the new ambient temperature, before putting it into operation

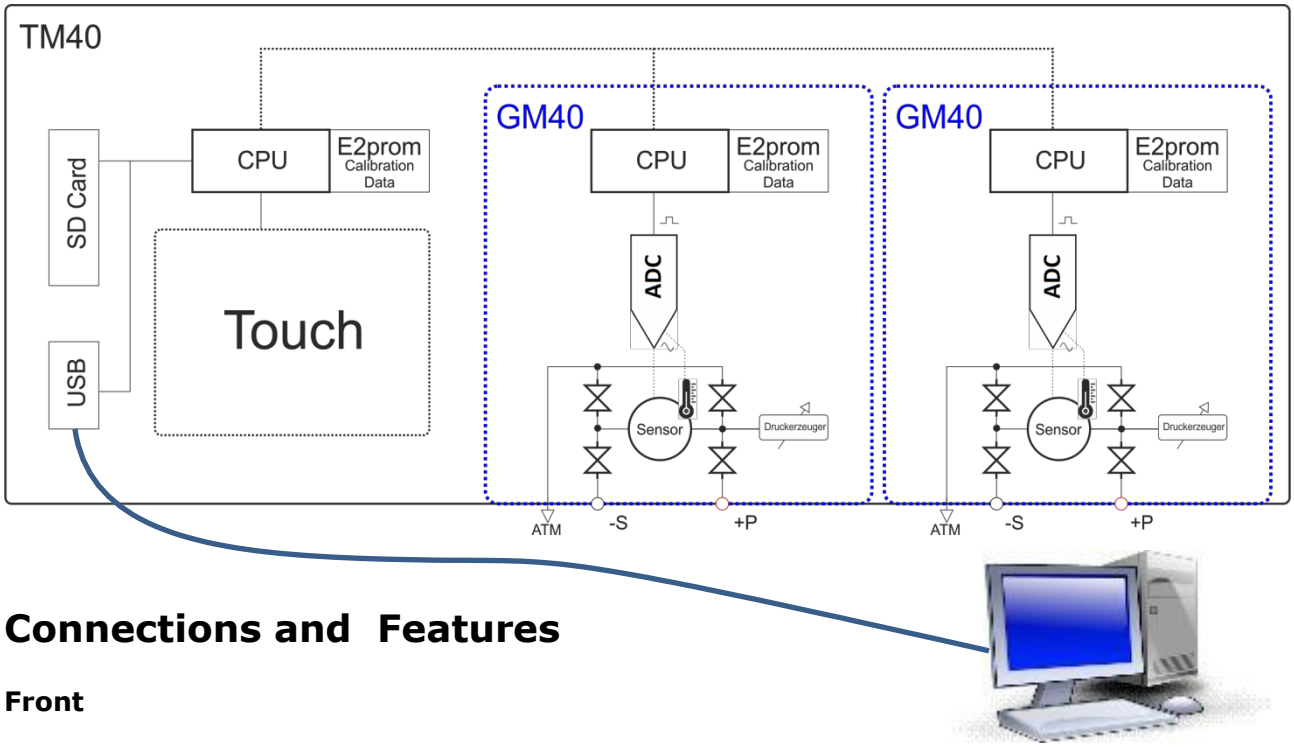
Unboxing

Please carefully keep the original packaging.
In order to ensure a secure transport and to preserve the warranty of the device, we kindly ask to use the original packaging or a suitable packaging with sufficient padding for shipment purposes.

Placement

Protect the device of direct sunlight. Ideally, a location should be chosen, where no significant temperature changes or any strong draft can interfere you measurements.

Block Diagram



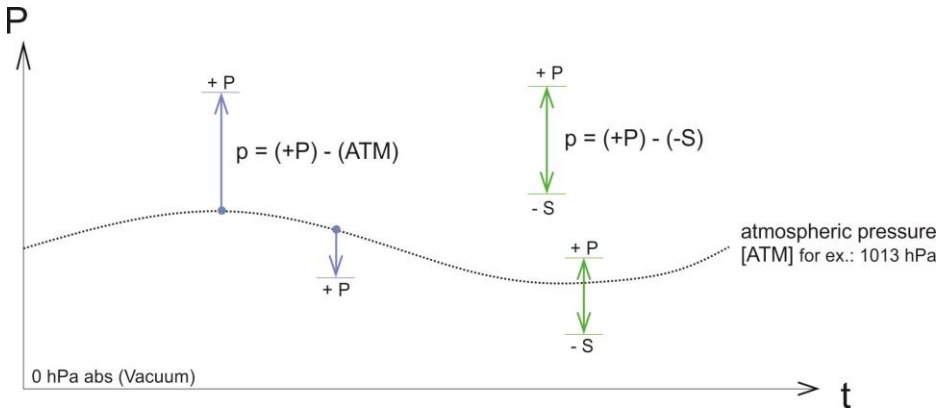
Connections and Features

Front

The GM40 is suitable for measuring gauge or differential pressure. There are no settings to be performed on the device for selecting either one.

- When measuring gauge pressure, the pressure measurement relates to the **+P** connector and the actual environmental pressure. The **–S** connector is not connected in doing so.

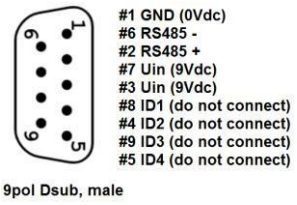
- When measuring differential pressure the measurement relates to the measured difference between **+P** and **–S**



Information: The front mounting VEBO quick couplings are not self-closing.

Back

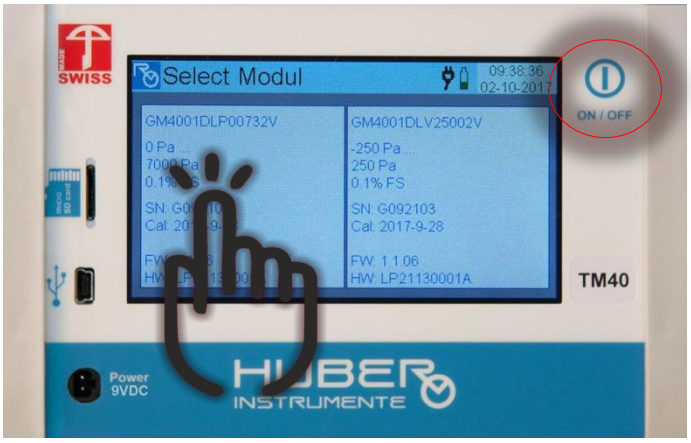
The 9Pole DSub connector at the back is not accessible for the end-user.



Start and Select Module

After pressing the ON / OFF button shortly, the TM40 starts and searches for all available modules. Please type on the corresponding field of the module, to select it. Subsequently, all operation relevant data will be read.

Startscreen



- The modules are only recognised within the start-up procedure (no hot swapping).
- Shut down the TM40 before connecting or disconnecting modules.
- The slide-in slot for the modules can be randomly selected by the operator.

Information of the Connected Modules

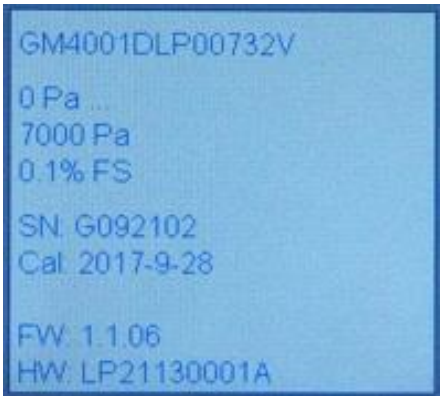
The start-screen shows various information, in regard to the connected module
An example:

Model code (GM40…)

Measuring range …
Max in Pascal
Tolerance

Serial number
Last calibration

Firmware- version
Hardware- version



Functions

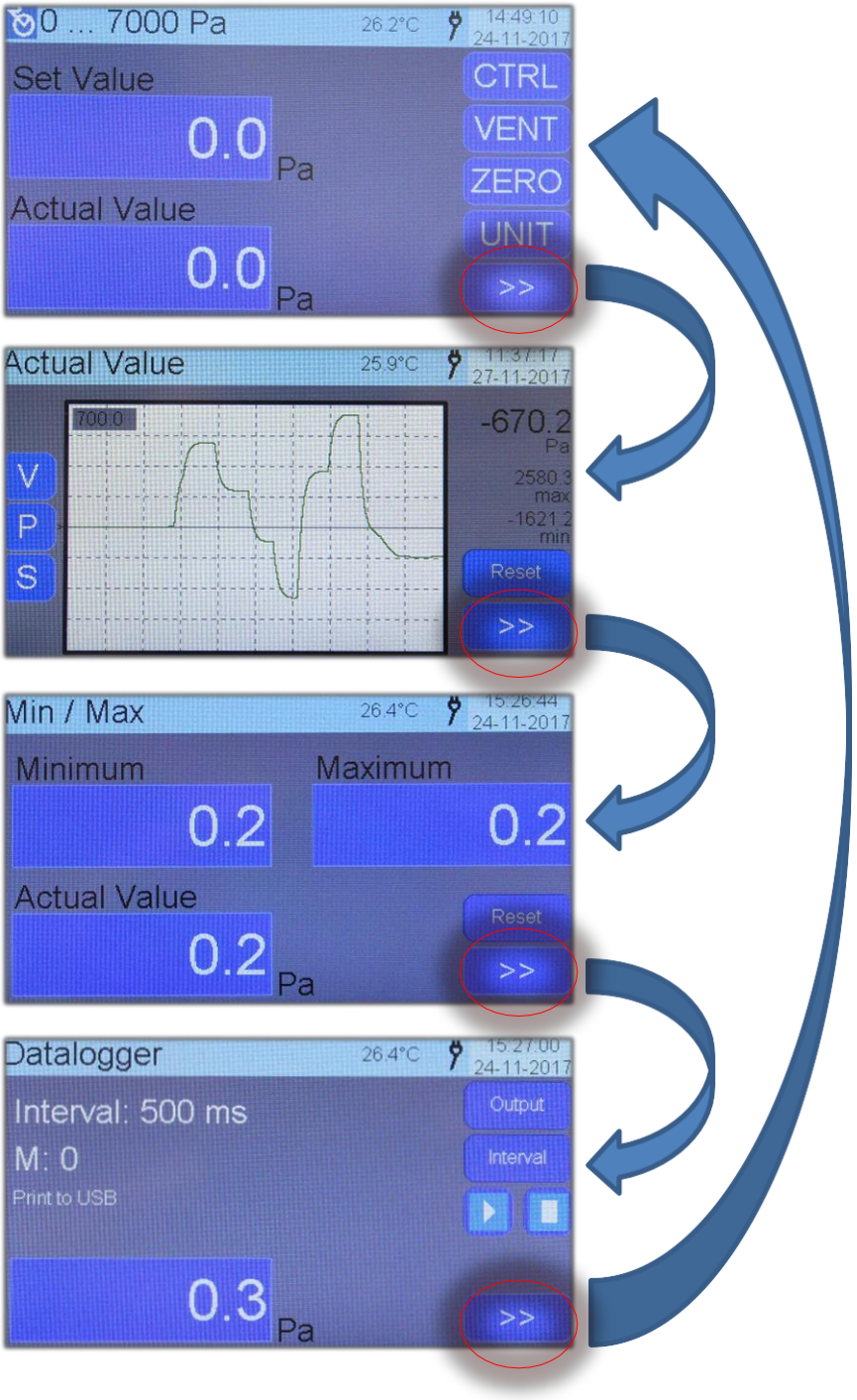
The >> Button allows, navigating to the different functions.
Four different main-functions are available:

1) Pressure regulator and measurement

2) Graphical display

3) Minimum and Maximum

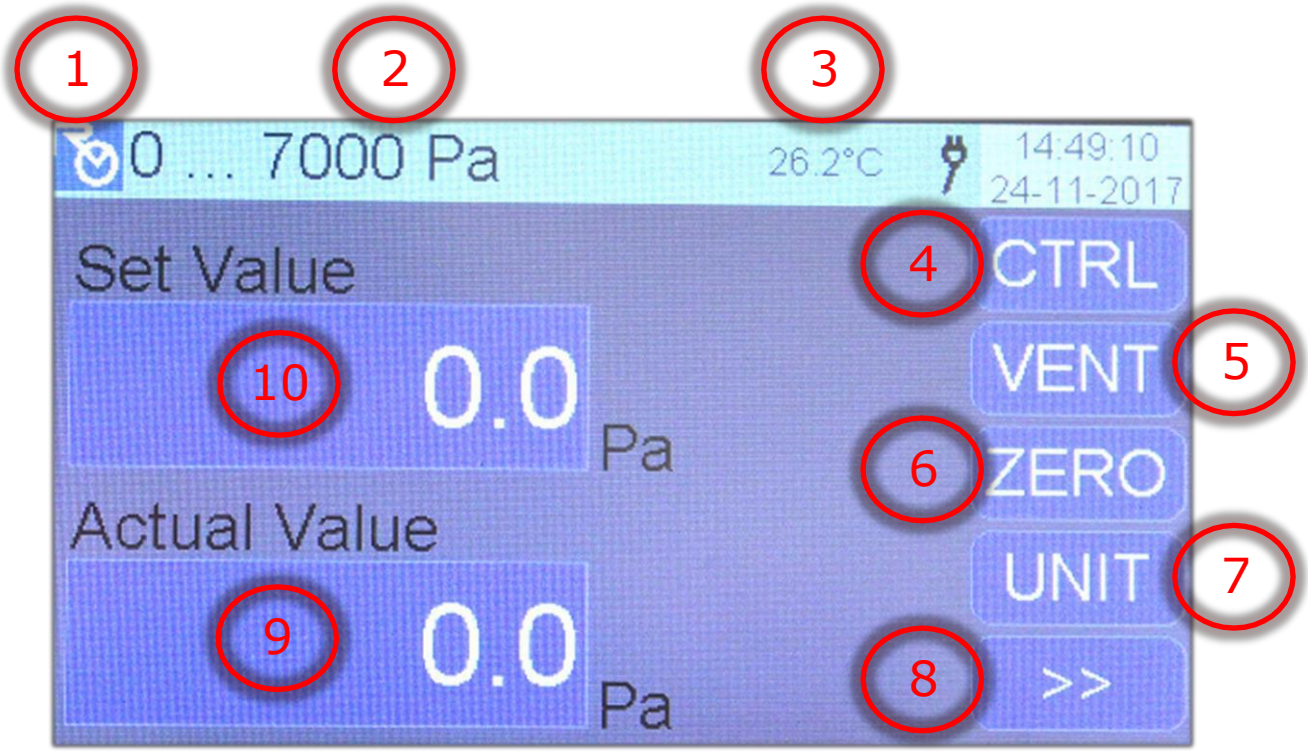
4) Datalogger



Function – Pressure Regulator and Measurement

Controls

1 Make settings for the generator module (refer to *Settings for Generator Module GM40)*
2 Display of the maximum possible measurement and control range
3 Temperature display (measurement conducted at the sensor (measurement medium)
4 Pressure regulator on / off
5 Ventilate connecting lines (when pressure regulator is on, this button is inactive)
6 Zero actual value (the button has to be pressured for more than 2 seconds)
7 Switch measurement unit
8 Jump to next function
9 Actual value
10 Set point value display and button for defining set point value

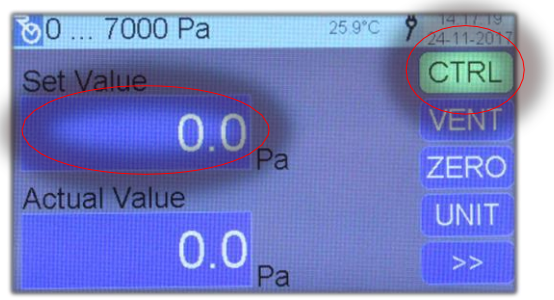


Functional Matrix

Button	active (green)	inaktive (blue)
CTRL	The pressure regulator is switched on and regulates the defined set value. The measured pressure is simultaneously shown in the actual value display	The pressure regulator is turned off. The actual pressure is shown in the actual value display.
VENT	The connecting ports +P and –S are vented internally via atmosphere. When pressure regulator is active, pressure regulation is stopped immediately.	Venting is not active
ZERO	Sets the actual value to zero. This button has to be pressed for longer than 2 seconds. Information: If pressure regulation is switched on, zeroing is not possible.	

Switch on Pressure Regulator

Press **CTRL.**
If the button is highlighted in green, the device will regulate the pressure to the set value.

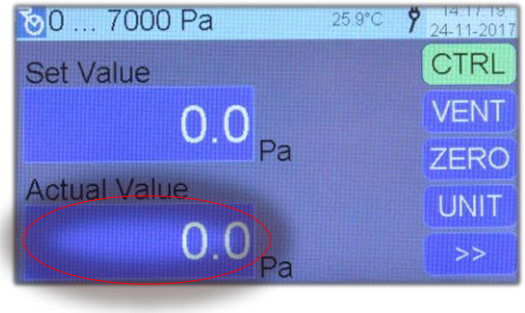


Switch off Pressure Calibrator

Press **CTRL** again.
If the button is not highlighted in green any longer, pressure control is stopped.

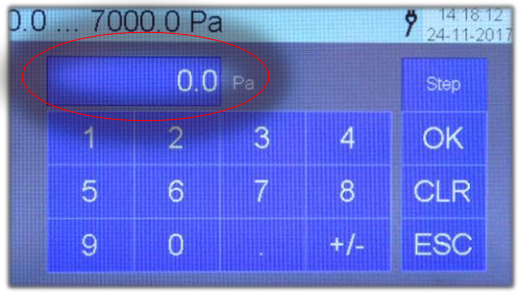
Actual Value Display

The actual value is measured continuously and displayed permanently.



Set Value Input Mask

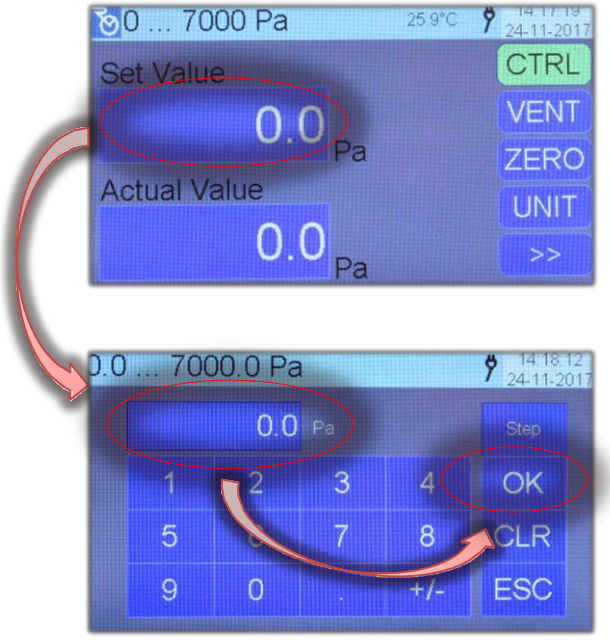
OK stores the input from input field as set value
CLR deletes the entry of the input field
ESC leaves the input mask without storing set value input
Step set a step value.



The header shows the selectable pressure range.
Also refer to:
Settings *– Thresholds for pressure regulator*

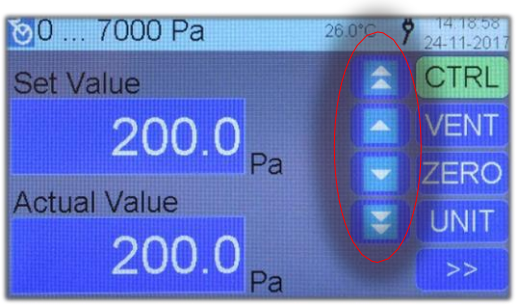
Adjust Set Value

1. Press set value.
2. Enter new set value and press **OK**.



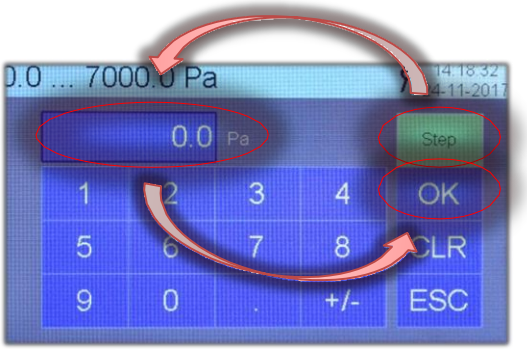
Use the Step Generator

When step value is set and pressure regulator is active, set value can be easily modified (+10%, +1%, -1%, -10%) by using the 4 arrow buttons.



Set Step Value

1. **Press the Step** button.
   Button starts to blink and indicates, an entry is expected.
2. Enter step value and press **OK**.
3. The **Step** button is highlighted permanently now and indicates that the step value is accepted.
   The input field shows the last entered set value.
4. Now a new set value can be entered.
   The input mask can be left by pressing the **OK** button.
   Alternatively, the input mask can be left immediately by pressing **OK**, without entering a new set value.



Turn off Step Value

1. Press the **Step** Button. The button blinks and signalises, an entry is awaited.
2. Enter **0** as a step value and quit by pressing **OK.**
3. The **Step** Button isn't highlighted any longer. The input mask shows the last entered set value.
4. Now a new set value can be entered, or the input mask can be left by pressing OK.

Function – Measurement

Is the monitoring of the threshold limit is activated; the actual value will be displayed in red colour, if the threshold is exceeded. If the monitoring of the threshold limit is deactivated, the actual value will be displayed in red, as soon as the nominal pressure range is exceeded by ±10%.
Also a buzzer sound will be notices (if activated in the setup).

To activate the threshold, refer to *Setup – threshold for pressure regulator*

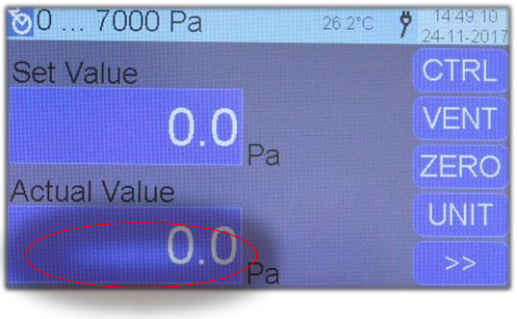
How to turn the buzzer on or off is described in the separate manual of the TM40 base unit.

Actual Value Display

The actual value is measured permanently and correspondingly displayed.

Standard resolution: 5 digits
Refer also to *Setup - Resolution*

The resolution may vary from module to module. Detailed information is available in the corresponding data sheets.

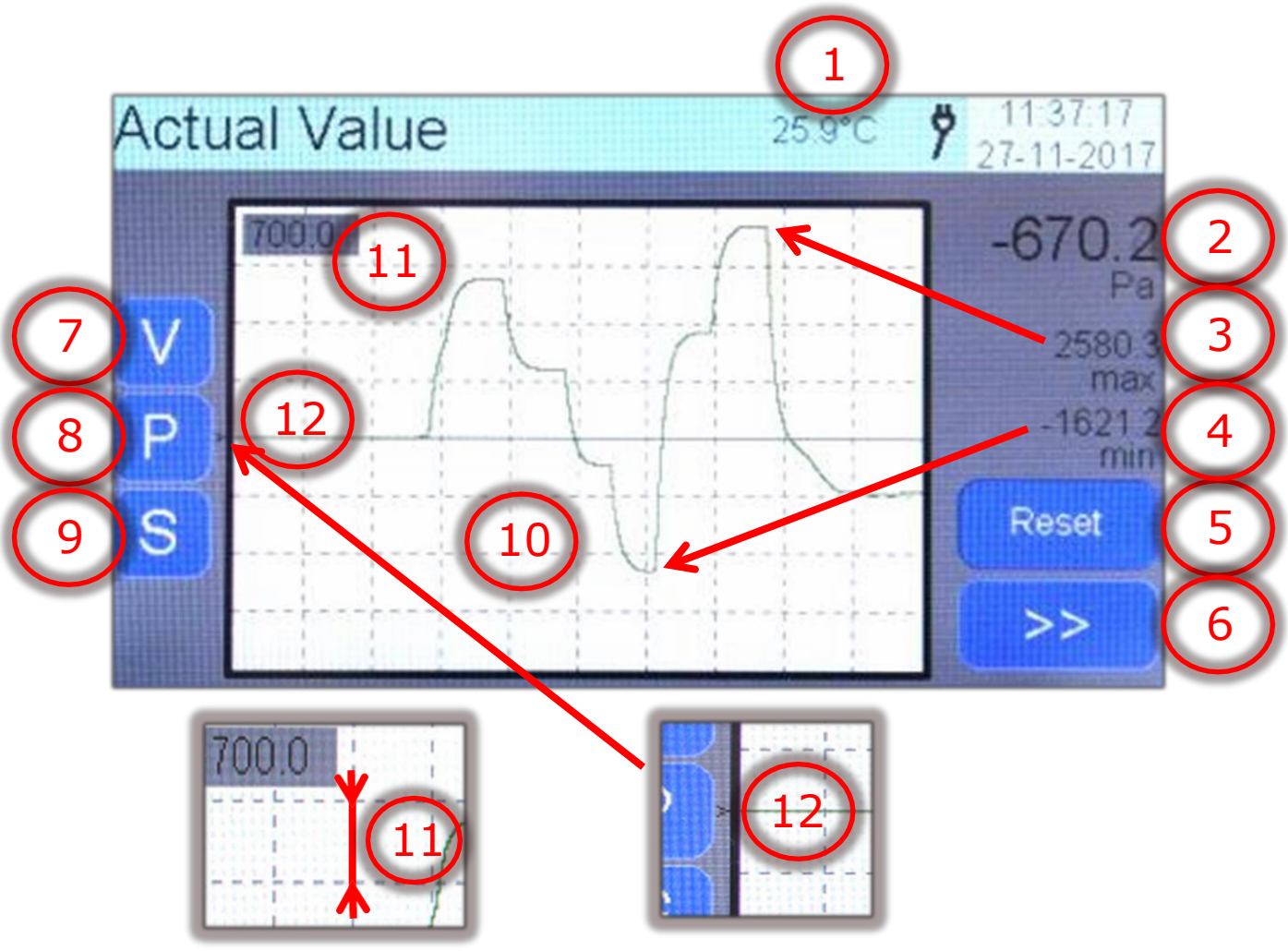


Function – Graphical Display

The graphical display is a comfortable way of visualizing the actual value over a limited time span. Fast pressure changes are visually recognizable. Besides that, maximum and minimum values are shown.
The display can comfortably be adjusted to the current measuring range, in the vertical perspective. The graphic is recorded in roll-mode and finite.
Parallel to the graphic display, the data logger is able to record the measured data, to have them evaluated by a computer later. Please also refer to *Function – Data Logger*

Controls

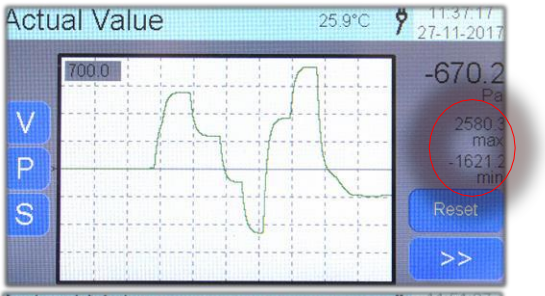
1 Temperature display measured at the sensor (measured medium)
2 Actual value
3 Maximum value since last reset
4 Minimum value since last reset
5 Delete graphical display and reset min / max display.
6 Go to next function
7 Adjust vertical scaling
8 Adjust vertical positioning
9 Set logger interval
10 Graphic display
11 Display of the vertical scaling per division. Picture: 3500.0 Pa / Div.
12 Vertical deflection position-null-pointer



Maximum and Minimum Value Display

Both displays store and show the measured max/min values until they are reset with the **Reset** button.

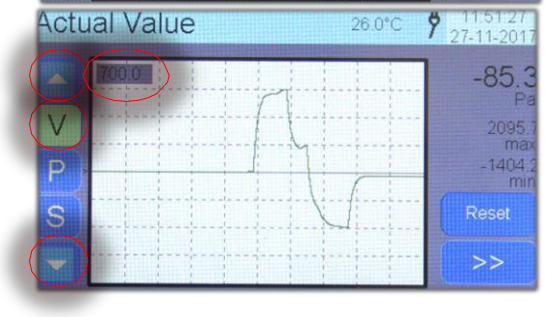
Both displays are not to be misinterpreted as a marker. They remain stored, even if the is graphic rolling out of the display.



Setup Vertical Scaling

Press the **V** button and set the vertical scaling with the **up** and **down** buttons.

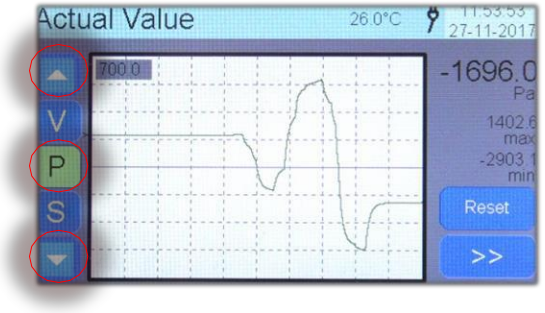
The current scaling is displayed in the upper left corner of the graphical display. The example shows a scaling of 700.0 pascal per division. Thus a graph of max. +/- 2800 pascal can be captured (+/- 4 x 700Pa).
(In case the position null pointer is situated in the middle)



Setup Vertical Position

Press **P** and setup the vertical position by using the **up** and **down** buttons.
The position null pointer on the left of the graphic display marks the zero line.

The graph will not be rebuilt.

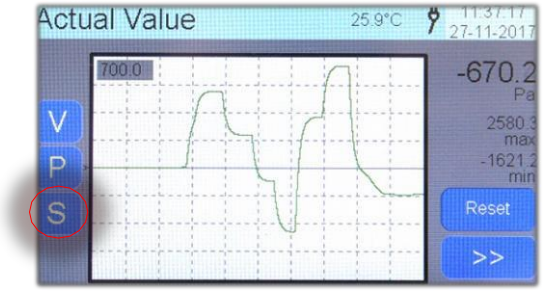


Setup Recording Speed

The **S** button opens the entry field for entering the desired recording speed.

The recording speed is in accordance to the sampling speed of the measured value.
Thus it determines how fast the measurement data is scanned by the module.

Please also refer to:
Setup – Log Interval



Function – Minimum and Maximum

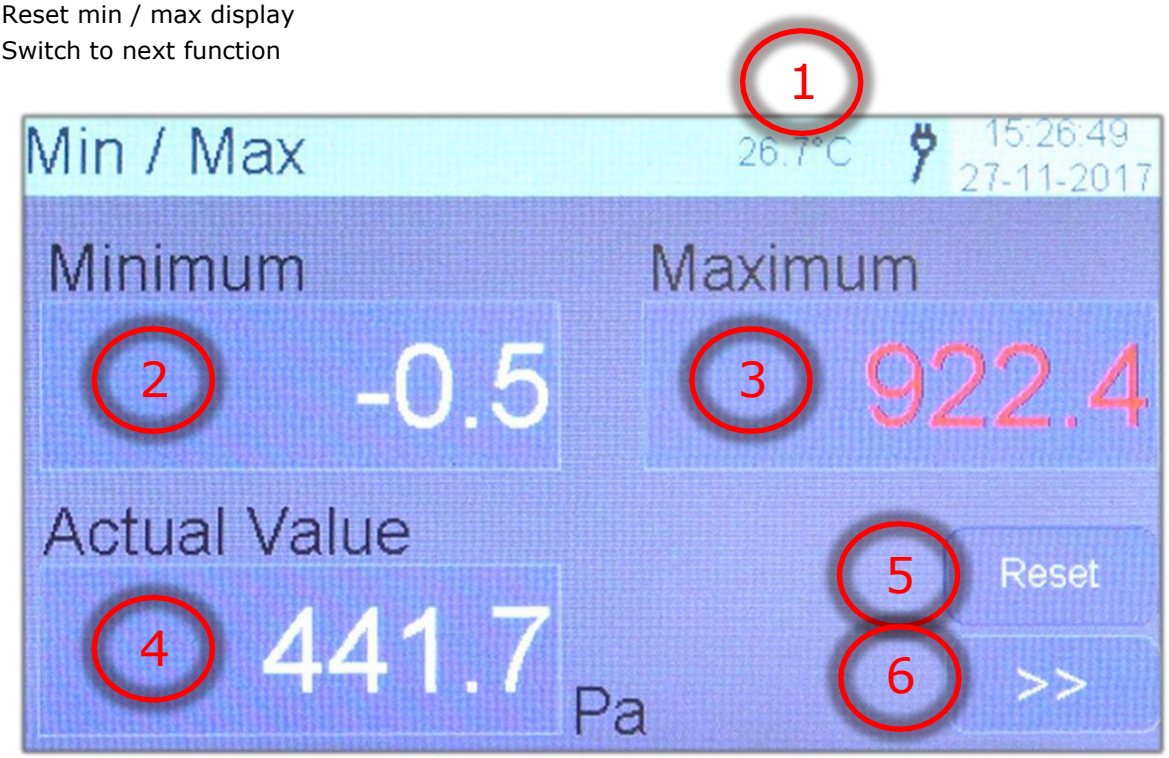
The min / max display is for visualising the minimum and maximum of the measured value on a large display. By pressing **Reset,** both displays can be reset.

If monitoring of the limit threshold is activated, minimum, maximum and actual value displays are highlighted in red, if the threshold is exceeded. If monitoring of the limit threshold is deactivated, the corresponding displays are highlighted in red, as soon as the nominal pressure range of the module is exceeded or undercut by 10%.
(The beneath picture shows a exceedance of the maximum value with a limit threshold set up to 922 Pa)

To activate the thresholds, please refer to: *Setup – Thresholds for Pressure Regulator*

Controls

1 Temperature display, measured at the sensor (measured medium)
2 Minimum value since last reset
3 Maximum value since last reset
4 Actual value
5 Reset min / max display
6 Switch to next function



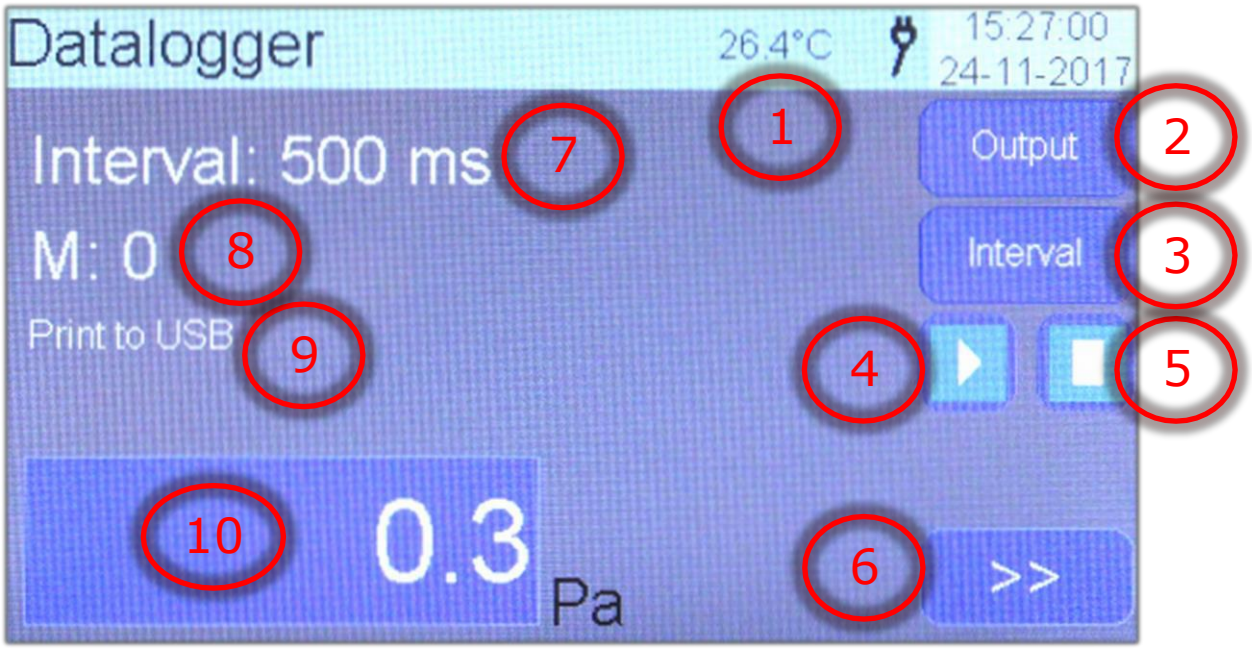
Function – Data Logger

The data logger function is able to record the pressure value simultaneously and the temperature cyclic. The measured data can be issued directly via the USB interface or written as text file on the SD-card, situated on the front.

The text based file format on the SD-card, allows a comfortable integration of the measured data in an Excel spread sheet or into other programs. For direct output via USB, various terminal programs are suitable (for ex. Docklight, HTerm or HyperTerminal).

Controls

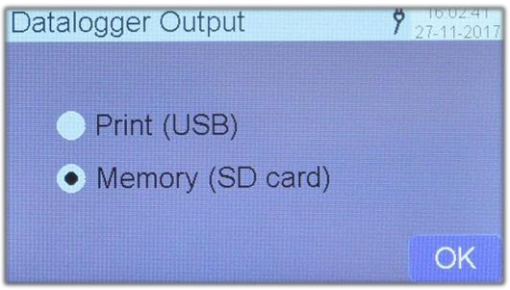
1 Temperature display, measured at the sensor (measured medium)
2 Select output channel (USB or SD-card)
3 Sample interval
4 Start data logger
5 Stop data logger
6 Switch to next function
7 Display of the set time interval
8 Measured value counter
9 Selected output channel
10 Actual value



Select Output Channel

By pressing **Output,**
2 different output channel can be chosen.

a) Print (USB)
b) Memory (SD card)

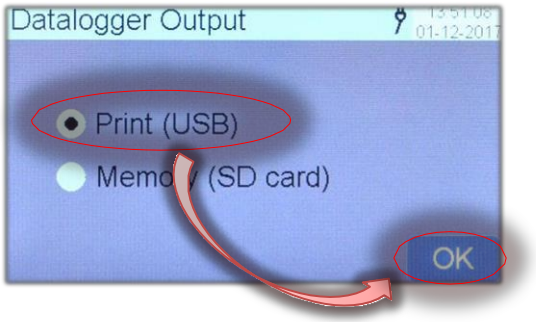


Output Channel – Print (USB)

After starting, the TM40 sends the measured data in the selected interval, via USB interface to the connected pc.

The USB Driver for the TM40 has to be installed previously.
Please also refer to: *Driver Installation*

Select **Print (USB)** as output channel and start the data logger accordingly.



Setting Sample Interval

By pressing **Interval** the input mask opens.
The sample interval can be set.
Confirm your input with **OK.**

Start Measurement

After starting, the measured values will be sent to the connected pc.

The counter shows how much samples have been sent to the pc yet. (Picture shows 20 values)

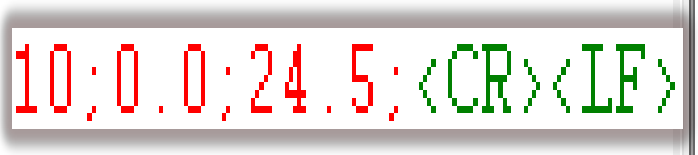
Information

By pressing **UNIT**, the current measurement unit may be changed anytime.
The data logger output however, will maintain the initially set unit for the corresponding session.
The new unit only will be recognised after a restart.

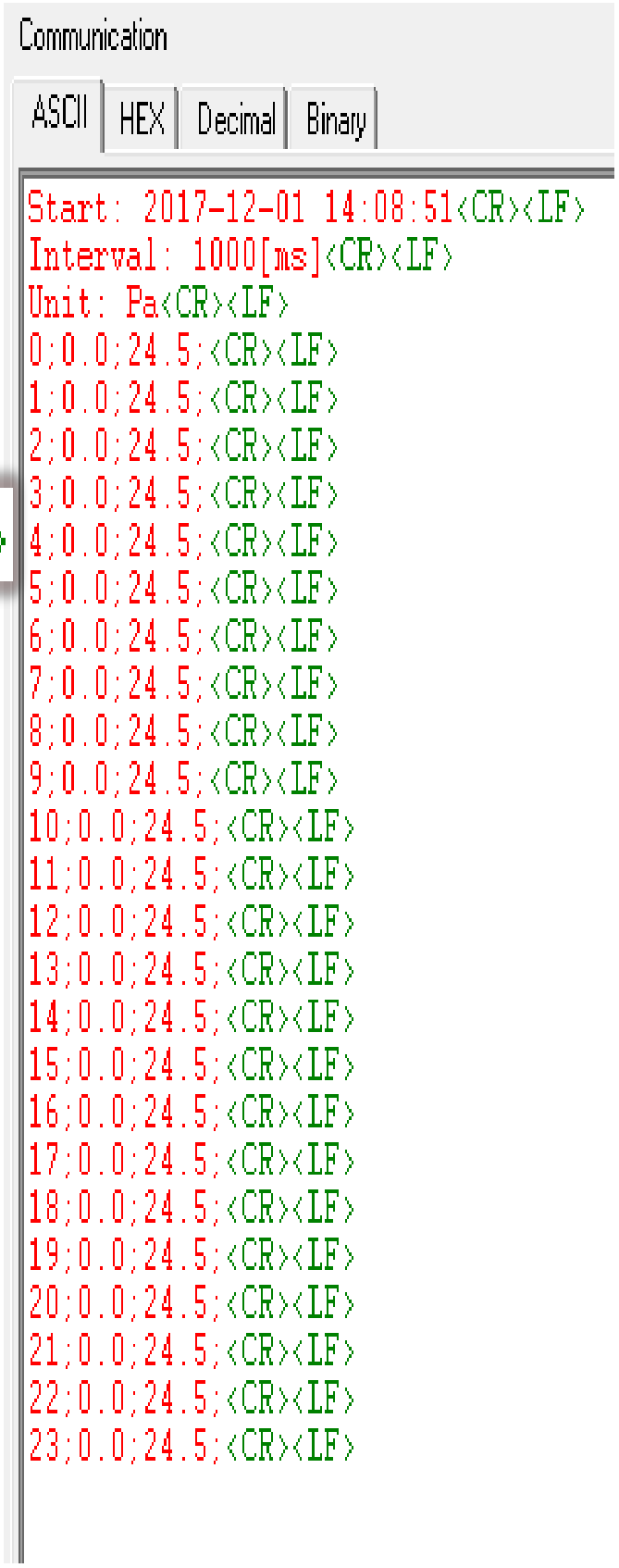
Example Output – Print (USB)

The measurement in the example was started on the 1st of December in 2017 at 14:08:51 pm.
Sample interval: 1000 ms
Measuring unit: Pascal

Example:
Measuring point 10; measured 0.0 Pascal; at 24.5 °C



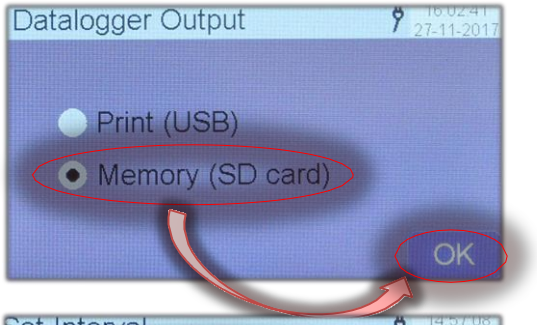
The measurement was stopped after 23 Samples.



Output Channel – Memory (SD-card)

After starting, the TM40 sends the measured values (in the selected interval) directly to the micro SD-card (FAT32), situated on the front of the device. The measured data can be read out by a pc.

Select **Memory (SD card)** as output channel and confirm with **OK**.



Setup Measurement Interval

By pressing **Interval** an input mask opens.
The desired sample interval can be set accordingly by confirming the entry with **OK.**

Start Measurement

After starting, the measured values will be directly written on the micro SD-card.

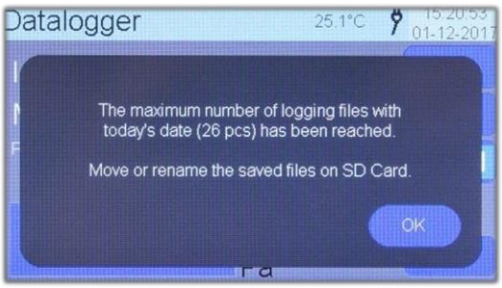
The counter shows, how much samples have been logged yet. (Picture shows 245 values)

The file name will be automatically assigned by the system.

Art **M[YYMMTT]x.txt**

YY = *Year*
MM = *Month*
TT = *Day*
X = *continuous index -,A,B,....Z*

Picture shows: 245 measurements
on the 28th of November 2017

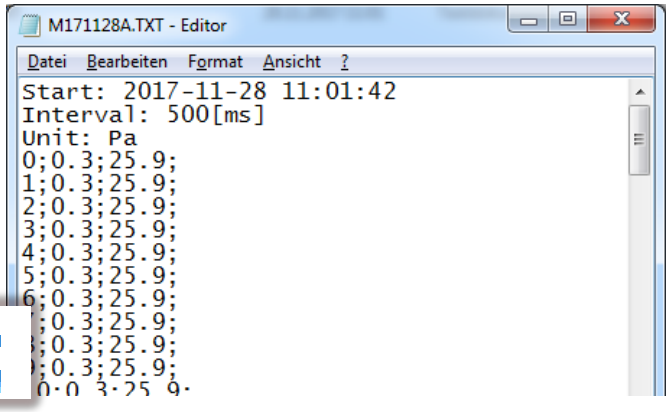


Maximum Amount of Measurements per Day

On the same day, a maximum amount of 26 measurement sessions can be stored on the SD-card, without renaming it or removing it into a separate folder.

Storage Example – Memory (SD card)

The measurement was started on the 8th of November 2017 at 11:01:42 am.
Sample interval: 500 ms
Measuring unit: Pascal



Measurement point 7; measured 0.3 Pascal; at 25.9 °C

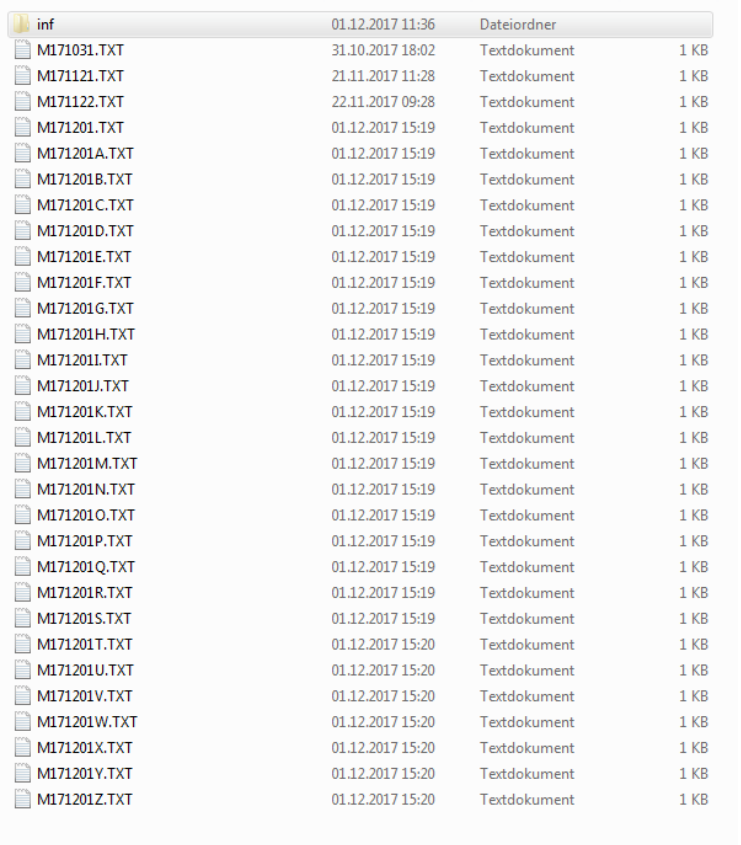
Information

By pressing **UNIT**, the current measurement unit may be changed anytime.
The data logger output however, will maintain the initially set unit for the corresponding session.
The new unit only will be recognised after a restart.

Organisation - SD-card

The SD-card saves all measurements in a root directory. Data can be renamed or filed in self-created folders randomly.

The file name ***inf*** *is hidden and includes the USB driver.* The content of this folder must not be deleted.



Settings for Generator Module GM40

The menu is only accessible through the functional level regulate / measure. Press the **R**- symbol on the upper left corner to make the settings for the module.

The following parameters can be adjusted:

- Thresholds for pressure regulator
- Damping oft he measured values
- Sample interval
- Display resolution
- Exit module

To exit the setup menue, press **OK**.

Setup thresholds for pressure regulator

Thus allows the input for the pressure regulator threshold to be limited.
The test item is protected from too excessive pressure.

The access is password protected.
Type in „123" and confirm with **OK**.

If the **ON/OFF** button is active, the input for the set value is limited to those amounts correspondingly. (Here 0 … 2000 Pa).

If the **ON/OFF** button is deactivated, the nominal pressure range plus 10% will be taken as threshold.

In the example the upper threshold is set to 2000 Pa. In the set value input mask appears the reduced input range of 0…2000 Pa. Without activated ON/OFF button, the nominal range of 0…7000 Pa of the corresponding module appears.

The input mask shows „Out of range" as soon as the input is not in accordance with the permitted input range.

Setup – Damping

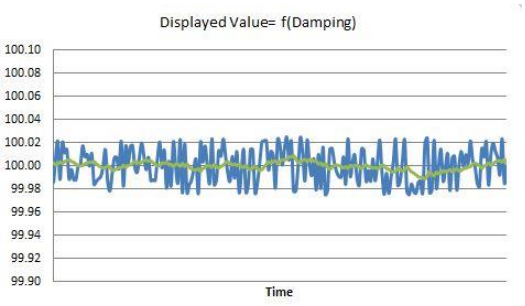
The damping function is stabilizing the displayed value. The damping factor stabilizes the display of the measured value and determines the gliding arithmetical mean value of the measured values on the module. It balances displayed values at instable pressure conditions or air pressure fluctuations.

The damping factor can be set between 1 and 10.
This setup is not fleeting and will also be active after a restart.

The characteristic curves show measured values with different damping factors.

Blue: Damping factor = 1

Green: Damping factor = 10



Information

The arithmetic mean value formation is calculated in the module and independent of the sample interval between the display of the TM40 and the generator module GM40.
Please also refer to *Setup – Measurement Interval*

Setup – Measurement Interval

The measurement interval determines how fast the data is collected from the module and displayed on the TM40.

Select the desired interval and confirm by pressing **OK**.

The Interval is fleeting and will be reset after a restart of the device, to the standard preset of 500ms.

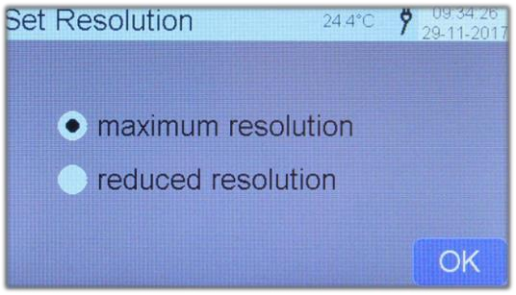
Setup - Resolution

The amount of decimal places for the set value and actual value displays are able to be set in two different tiers.

a) Maximum resolution
b) Reduced resolution

Maximum resolution shows the full resolution of the module. Normally that is 5 digits.

With reduced resolution, it is one decimal place less.



This setting is not fleeting and stays active, even after a restart of the device.

Information

This setting does not influence the measurement accuracy itself.
Decimal places may vary, depending on what module is used.

USB Communication

The TM40 has a USB 2.0 (Mini-B) interface on its front. This interface serves, inter alia, as a transmitter of logged data. The interface is designed as a VCP. VCP stands for virtual COM port. For applications that support a serial interface, a serial interface is accordingly emulated. The access on application level happens like on a physical present interface. Most operating systems will install the VCP-driver automatically, once the computer is connected.

Eventually, the CDC driver (CDC = Communication Device Class) has to be installed on your pc.
Please also refer to *USB Driver*.

Transfer Protocol / Coding

The characters are transferred, as ASCII-characters.

COM- Port Settings

No COM- Port settings have to be performed.
The CDC driver works in the bulk transfer mode.

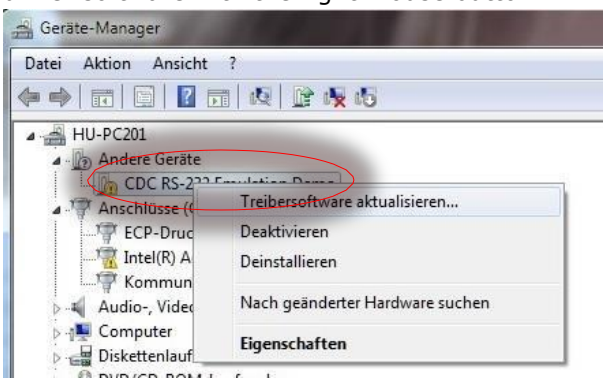
USB Driver

For installation, possibly administrator rights are needed.

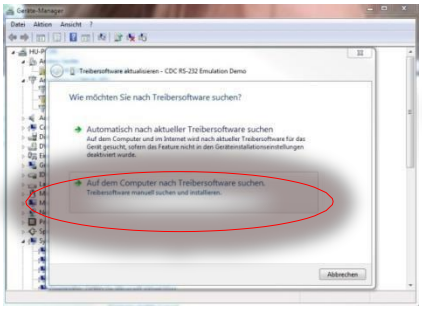
Installing the CDC driver

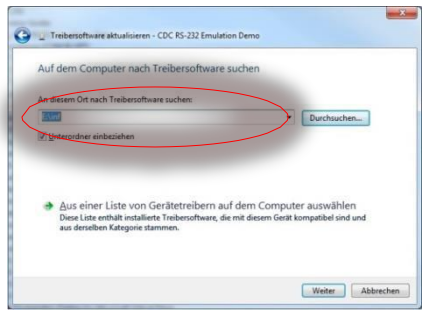
Open the device manager on your pc. System control > system and security > system

1. Turn on the TM40 and connect the USB cable to the pc.
2. Cancel an automatic installation, mark the not recognised device „CDC RS- 232…" and select update driver software with the right mouse button.

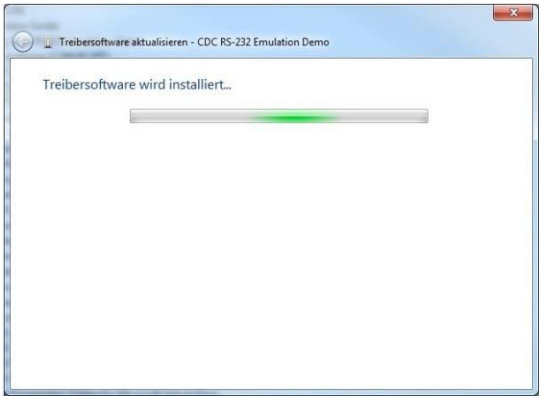


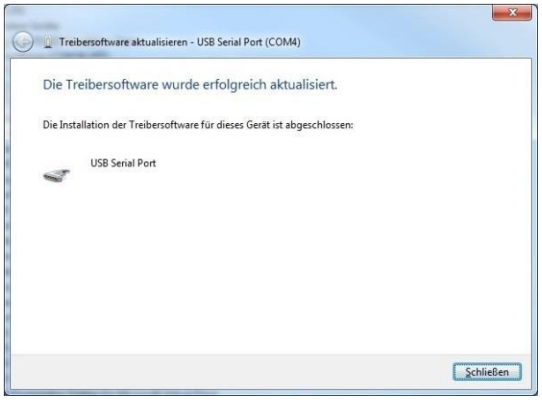
3. Do not let the search for the driver software be conducted automatically.
   Select the driver on the SD-card. Possibly the drive letter of the SD-card has to be changed.
   (Here E:\)





4. Accordingly the driver will be installed.





5. After successful installation, the connection will be listed with assigned COM-number.
   Here: USB Serial Port (COM4)

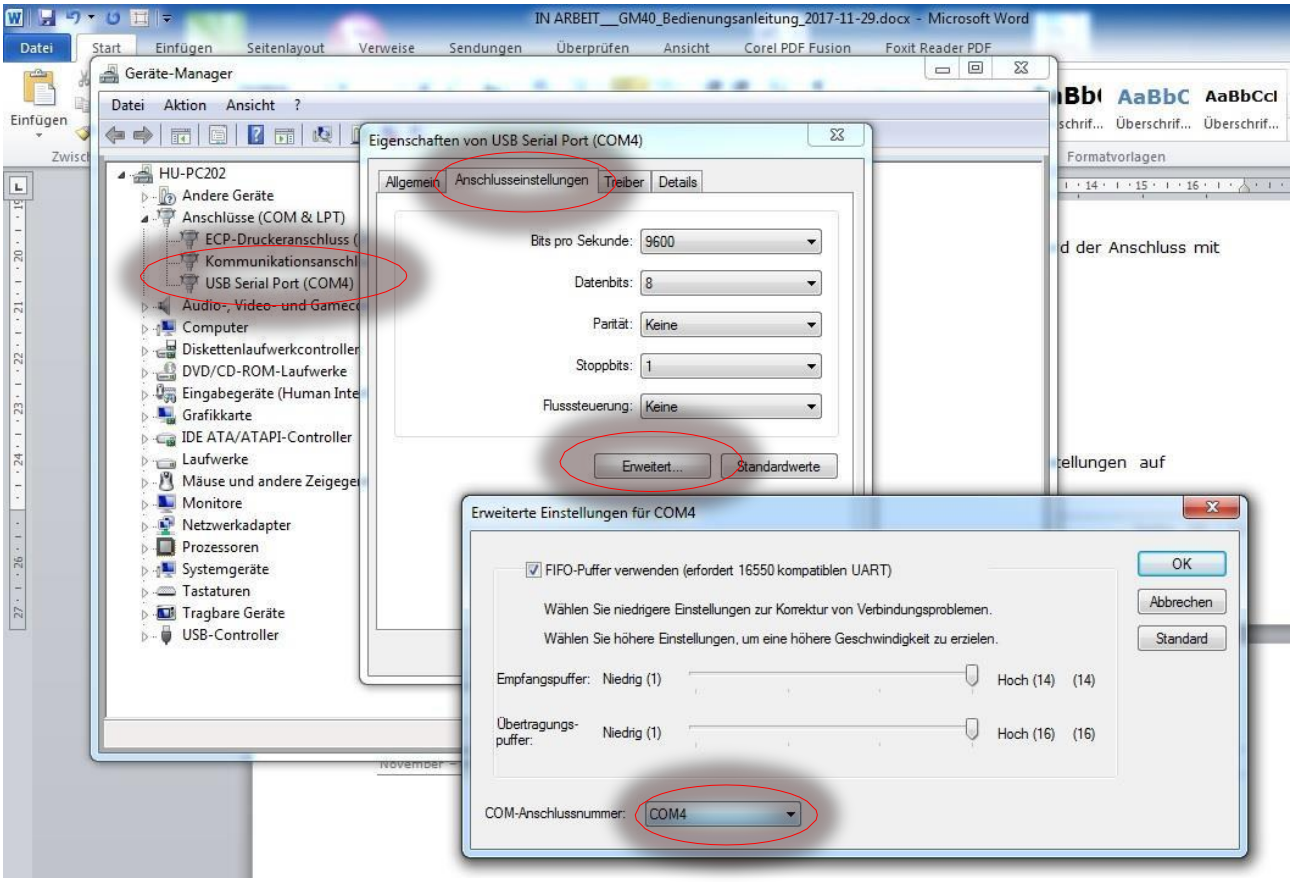
Change Com- Port Number

When installing, the system will assign the port number automatically.
A port number may be changed as follows:

1. Start the TM40 and connect it via USB to your pc.
2. Open the device manager.

3. The connection will be shown with the corresponding port number.
   (Here: COM4)

4. Mark the row and press the left mouse button. > Properties.
5. Click on extended in the tab „connection settings"
   Select the desired COM number in the dropdown menu.



Warning Messages and Errors

Error / Message	Probable causes	Corrective measures
No module detected	• Modul not inserted correctly	• Insert module correctly • Tighten locking screws • Use a different socket
Measured value fluctuates	• Unfavourable measuring site selection • High air pressure fluctuation • Damping to low	• Chose a mechanically stable position • Turn of resource of the draft • Wait for more stable weather with less air pressure fluctuation • Increase damping
Measured value rises or drops permanently	• Too little acclimatisation time	• Module has to be acclimatised for a longer time when switched on
Data logger doesn't save measurements	• SD-card not placed properly • SD-card is improperly formatted	• Insert SD-card properly • Information screen indicated if the SD-card is inserted properly • Format card to FAT32
Terminal program shows no data from data logger	• TM40 not connected to the pc • Device manager does not list the port	• Connect the TM40 with the USB cable to the computer • Install driver software • Check COM-port number

Technical Data

Max number of generator modules per TM40: 2

Operating temperature:	15...35 °C (optional 0 … 50 °C)
Storage temperature:	-20...70 °C
Air humidity:	< 95%, not condensing
Protection class:	IP20
Supply voltage:	internal ->TM40
Power consumption:	ca. 4.5 W (VA)
Interface:	RS485 (Bus signal between TM40 and modules. No external access)
Dimensions:	222 x 65 x 100 mm (LxWxH)
Net weight:	650 g

For further technical data, please refer to the data sheet.

Accessories

Hard Case – TM 40

The TM40 hard case is the ideal companion for the mobile use of the TM40.
This case ensures, the TM40 and its accessories are well protected when using the TM40 in the field.