

## Portable data recorder HMG 2500

**Operating instructions**  
(Translation of original Manual)





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# 1 Tasks and Functions of the HMG 2500

## 1.1 Standard functions of the HMG 2500

The HMG 2500 portable data recorder is a hand-held unit for measurement and data acquisition tasks on hydraulic and pneumatic systems. Applications are mainly in maintenance and servicing, troubleshooting and test rigs.

The HMG 2500 can monitor signals from up to four sensors simultaneously.

In addition to the three analogue measurement inputs, the HMG 2500 features one digital input (e.g. for measuring frequency or speed), thus expanding the unit's range of potential applications.

When taking measurements of rapid, dynamic machine processes, each of the three analogue input signals can be recorded simultaneously at a rate of 0.5 ms.

Additionally, the HMG 2500 has a virtual measuring channel.

The virtual measuring channel enables a differential measurement or a performance measurement by means of the sensors connected to the measuring channels "A" and "B".

HYDAC ELECTRONIC offers HSI sensors (HYDAC Sensor Interface) for pressure, temperature and flow rate which are automatically recognised and set to their respective measurement ranges and units by the HMG 2500.

You also have the option of connecting SMART sensors to the HMG 2500. These represent a sensor generation from HYDAC which can output several different measured variables. These sensors are also automatically recognized by the HMG 2500 via HSI, and the measured values including the measurement unit are shown in the display.

The HMG 2500 can render up to 32 measurement channels in total.

Depending on the sensor type, the sensor has an internal memory for the storage of recorded measurement data on a long-term basis. In addition, depending on the sensor type, pre-set parameters can be changed and stored in the internal memory as a sensor configuration.

The operator can access all of the unit's functions and settings by means of clearly presented selection menus. The HMG 2500 has a combination keypad for entering numeric values and text, similar to a mobile phone.

The HMG 2500 is designed in particular for recording typical measurements (pressure, temperature, flow rate) in hydraulic and pneumatic systems. In addition, it is also possible to determine differential values between the measured values of individual sensors.

One special feature of the HMG 2500 is its ability to also monitor highly dynamic processes in a machine. For this purpose, an input channel can detect measured values values at a rate of 0.1 ms. This function of course requires suitable fast sensors to be used.

The most impressive feature of the HMG 2500 is its ability to record the dynamic processes of a machine in the form of a measurement curve and render them as a graph - and, moreover, online and in real time.

The HMG 2500 is equipped with specially developed software providing for fast data collection and processing. A measurement curve can consist of up to 500,000 measured values. The HMG 2500 memory is capable of storing at least 100 of such measurement curves.

In addition to enabling simple measurement curves to be recorded, the HMG 2500 also has other functions enabling event-driven measurements to be taken and event logs to be recorded. Various trigger options are available for triggering events.

Apart from measurement curves, the HMG 2500 can store user-specific settings (user profiles). The main advantage of this is to enable identical measurements of various equipment items to be repeated for the purpose of preventive maintenance. All the user has to do is retrieve the relevant user profile from the HMG 2500's memory.

The HMG 2500 has a 3.5" colour display with graphics capabilities, which can show the measured values either as text or as measurement curve. Individual measured values can be displayed in a large format (7-segment format), enabling them to be read from far away.

The HMG 2500 also provides a variety of user-friendly features for displaying, evaluating and processing measured values:

- Table
- Graph
- Scaling
- Ruler
- Tracker
- Zoom

The HMG 2500 communicates with a computer via a USB or serial port. HYDAC software **HMGWIN** which is specific to the HMG 2500, is supplied for convenient post-processing, rendering and evaluation of measurements on your computer. It also enables the HMG 2500 to be operated directly from your computer.

The HYDAC software **CMWIN** is also supplied as standard with the unit. This software enables you to communicate directly from your computer with SMART sensors connected to the HMG 2500.

## 2 About Your HMG 2500

### 2.1 Scope of delivery

- HMG 2500
- Power supply for 90 ... 230 V connection
- User Manual
- CD-ROM containing USB drivers and HMGWIN and CMWIN software (software for analyzing measurement data and sensor communication) in addition to other product information
- USB connector cable

### 2.2 Power supply

The HMG 2500 has an internal NiMH battery. To charge the battery, simply connect the power supply with the HMG 2500 (see HMG 2500 connections). The battery is fully charged after approx. 2 hours.

A direct current supply (12 ... 30 V DC) can be connected to the power input socket to operate the HMG or charge the battery.

When connecting the power supply to the input socket make sure that  $+U_B$  is applied to the inner contact of the plug and 0 V to the outer contact. A "JEITA RC 5320-5" plug, for example, is suitable for this purpose and is available in most electrical/electronics shops.

## 3 Disposal



*This product may not be disposed together with the household waste.*

You may return your electric and electronic devices which are no longer usable, as well as batteries and battery packs, back to the relevant HYDAC subsidiaries or directly to:

**HYDAC SYSTEMS & SERVICES GMBH**  
**Friedrichsthaler Str. 15**  
**66540 Neunkirchen / Germany**

If the disposal is carried out by your company, the respective applicable country-specific regulations have to be observed.

## 4 Technical Safety

The individual components of the HMG 2500 portable data recorder and the assembled unit are subject to strict quality assurance inspection and testing. Each HMG 2500 undergoes a final test. This ensures that upon delivery, the unit is free from defects and complies with the designated specifications.

The series HMG 2500 portable data recorders are maintenance-free and work perfectly when used under the conditions specified. If, however, you do encounter problems, please contact your HYDAC representative. Any tampering with the switch will cause all warranty claims to become null and void.

### Compliance with European Standards

The HMG 2500 series portable data recorders have the CE mark and thus comply with all current German regulatory requirements and European standards relating to the operation of these units. This ensures compliance with the applicable directives relating to electromagnetic compatibility and the safety provisions according to the low-voltage directive.

This product complies with the provisions of the following European directives: EN 61000-6-1 / 2 / 3 / 4.

We reserve the right to make technical modifications.

### 4.1 Safety Instructions

The HMG 2500 series Portable Data Recorder can be operated safely provided it is used in accordance with its proper, designated use. Please maintain strict adherence to the following safety guidelines in order to preclude hazards to the user and damage to property and surroundings as the result of improper use:

- The HMG 2500 may not be used unless it is in perfect condition/working order.
- The instructions for use must be strictly adhered to. Functions which involve adjusting the zero point in particular can lead to hazardous situations. For more information, please refer to Point 6.1.3 "Zeroing of Measurement Channels".
- If sensors and interfaces are used simultaneously (online measurement), please ensure equipotential (see chapter 6.1.4 "Change default settings / PC Connection").
- The information on the type code label must be noted.
- Troubleshooting and repair work may only be carried out at the HYDAC Service Department.
- All relevant and generally recognised safety requirements must be adhered to.

## 5 Commissioning

### 5.1 Operating Elements

- 1** On/Off button
- 2** Brightness setting of the display
- 3** ESC key  
To cancel an entry or go **Back** step by step
- 4** Shift key (↑)  
Switches the number-pad to a text pad when pressed; the text pad is active only as long as the Shift key is pressed.
- 5** Text/number keypad  
Numbers and letters can be entered via the combination keypad similar to that of mobile phones.



**Numerals:** 0 to 9; "." (decimal separator) and "-" (minus)

**Text entry:** a, b, c, ... x, y, z and A, B, C, ... X, Y, Z; ins = insert; del = delete;

**To insert special characters:** shift (↑) + "1" (if necessary, several times for /, %, \$ ...)

**To insert spaces:** shift (↑) + ins (simultaneously)

**To delete characters:** shift (↑) + del (simultaneously)

**Line break:** shift (↑) + OK (simultaneously)

Tip:

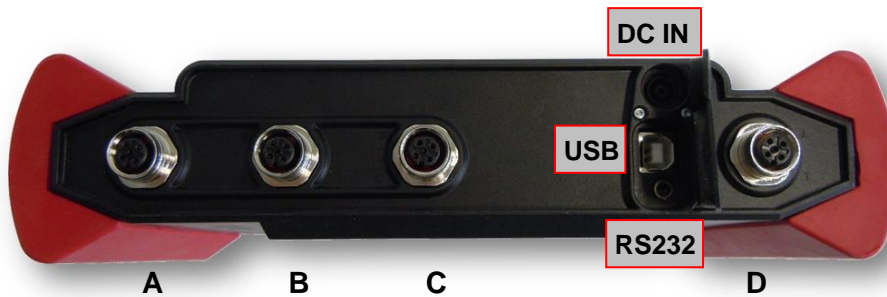
- To accept characters:  
release the Shift key (↑) or press the right arrow (▶) of the 5-way navigation key.
- To jump directly to the function line:  
simultaneously press the Shift key (↑) and the down arrow (▼) of the 5-way navigation key.

- 6** **Graphic display**  
Display of the menu and operating functions, measured values and curves

- 7** **5-way navigation key**  
To navigate step by step in the display: **OK** key for inputting, finishing, accepting or storing an entry



## 5.2 Ports



**A** 3 Sensor input female connectors with one measuring channel each for the connection of up to 3 HSI or SMART sensors.

**B**

**C**

**D** 1 input female connector for digital signals, e.g. for frequency or speed measurements

**DC IN** Female jack for power supply

**USB** 1 USB connector for PC communication

**RS232** 1 serial interface for PC communication

### 5.3 Switching on the instrument

When starting the unit up for the first time the **Welcome** start-up screen appears. Select your language using the 5-way navigation key (select or checkmark your option by pressing **OK**) and set the date and time. Select the desired format, and then enter the current date and time via the **keypad**. Save your entries by pressing **OK**, followed by **Next**.

The following appears in the display when starting the unit up in normal operation:

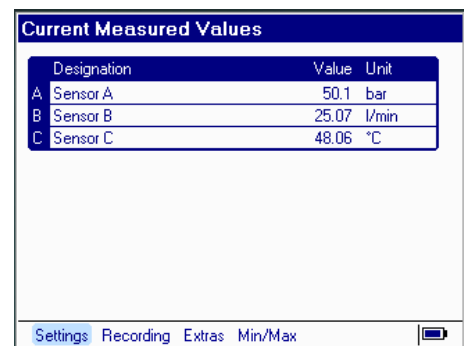
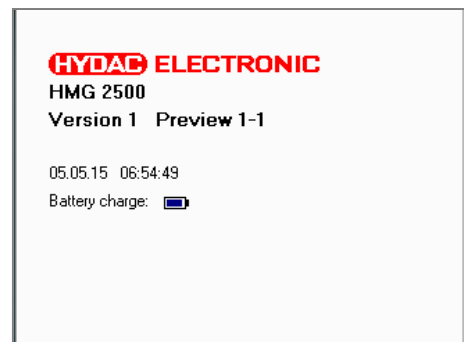
- Manufacturer
- Designation of the unit
- HMG version
- Date and time
- Battery charge status

The screen switches to measured value display mode in a few seconds. If sensors are already connected, the current measured values are shown in the **Current Measured Values** menu (see title bar at top of display). To skip through the start-up screen more quickly and proceed directly to the measured values menu, press **Esc** or **OK**.

The following is listed in the measured values screen (see screenshot): Input channel – Designation – Value – Unit (of measurement)  
The menu bar at the bottom of the screen (function bar) displays the main menu and next to that, on the right, the battery charge status. The main menu contains the following functions which you can access using the navigation key (arrow key) plus the **OK** key. aufrufen können.

**Settings** — for entering or retrieving setting data used for performing measurements

**Recording** — for recording a measurement and graphically rendering measurement data, e.g. as a curve



#### **Note:**

As a rule, functions which can be selected and executed are in **blue**.

Functions which can't be selected or altered are in **black**.

Warnings appear in **red** when input data are incorrect.

**Extras** — for other functions, plus a function for displaying the **Min/Max** values.

Measuring the **Min/Max** values has a special significance and is explained in detail below.

Apart from the current measured values, the HMG records the minimum and maximum values (Min/Max values) too, except when plotting a measurement curve. The minimum value is the lowest value to which a measured variable has dropped during the time period under consideration, the maximum value being the highest value achieved by a measured variable during this period. Resetting causes the Min/Max values to be set to the actual measured value at the time. This will reset all sensors.

The time period always begins when the Min/Max values are reset. The values are reset in the following situations:

- Switching the unit on
- Selecting and activating **Reset** function in the menu bar (only if **Min/Max** is active)
- Connecting or removing an HSI sensor
- Altering the sensor settings
- While recording an event log
- When finishing recording

Before resetting the Min/Max values it is frequently necessary to determine when the Min/Max values were last reset. To do this, go to **Extras** in the function bar and then **About HMG 2500**.

Current Measured Values		
Designation	Value	Unit
A Sensor A	50.6	bar
B Sensor B	25.71	l/min
C Sensor C	48.41	°C

Settings Recording Extras **Min/Max**



**Note:**

Even when the Min/Max values are not shown in the display, the HMG is nevertheless recording them in the background.

Current Measured Values				
Designation	Value	Unit	Min	Max
A Sensor A	50.9	bar	0.0	100.0
B Sensor B	25.71	l/min	0.00	49.50
C Sensor C	40.24	°C	0.00	79.92

Settings Recording Extras Min/Max **Reset**

About HMG 2500	
0% Total usage:	0 KB / 31996 KB
<b>Min/max Values</b>	
since 05.05.15 07:05:39	
1 min., 19 sec.	
<b>Address</b>	
HYDAC ELECTRONIC GmbH	
Hauptstrasse 27	
66128 Saarbrücken, Germany	
<a href="#">Back</a>	

## 6 Getting Started Guide

This Getting Started Guide outlines the basic steps for conducting a simple measurement (measured values shown in display) and plotting a measurement curve (graph of measured values). The examples involve pressure measurement using 2 pressure transmitters with sensor detection (HSI sensors). For a detailed description of all the settings, see **Detailed Operating Instructions**.

The examples are based on the factory settings of the HMG 2500. Simply follow the steps described here. If you don't know the status of your HMG 2500 because there might be more than one user in your company using the HMG, you can simply restore the unit to its "as supplied" condition (see Manage Settings — Restore Factory Settings).

### Preparation for Performing a Measurement

First charge the batteries or connect the power supply as described in **Power Supply**. Two HYDAC HDA 4748-H-0100-000 pressure transmitters with automatic sensor detection are used in the following example.

### Example of a Simple Measurement Using Two Pressure Transmitters

Connect the two pressure transmitters hydraulically to your machine and connect the two pressure transmitters using the sensor connector cables, e.g. to sockets A and B of the HMG 2500.

After the HMG 2500 is switched on it jumps to the **Current Measured Values** menu. The function bar contains various functions providing quick access to the three main menus:

- **Settings**
- **Recording**
- **Extras**

and to the display of the

- **Min/Max values.**

gelangen.

#### Title bar

Designation	Value	Unit
A Sensor A	71.4	bar
B Sensor B	34.7	bar

#### Function bar

When HSI sensors with automatic sensor detection are used, the HMG automatically detects the measurement range and the unit of measurement of the two connected pressure transmitters and shows them in the display with the actual measured values. You can also display the minimum and maximum values for the sensors.

To hide or show the Min/Max display, press the right arrow of the 5-way navigation key until **Min/Max** is highlighted in blue and then press the **OK** key. The Min/Max values of the sensors are now also displayed. Press the **OK** key again to hide the Min/Max display.

When the Min/Max values are shown, **Reset** appears in the function bar, enabling you to reset the Min/Max values as required. Select **Reset** using the arrow keys (blue highlight) and then press the **OK** key to reset the Min/Max values.

The measured values can also be displayed in a **7-segment pane**. To do this, go to Settings in the function bar and then press **OK**. In the **Settings** menu, navigate to **Change display settings** using the 5-way navigation key, and then confirm with **OK** (see screenshot of two-pane display on the next page).

Now select the second item, **Measured value rendering**. **Measured value table** is the default setting here. Press **OK**. A **drop-down list** appears in which you navigate to **2 display panels** using the arrow keys, followed by confirming with **OK**. To return to the measured value display press **Esc** twice.

Current Measured Values				
Designation	Value	Unit	Min	Max
A Sensor A	49.7	bar	0.0	100.0
B Sensor B	25.1	bar	4.5	49.5

Settings Recording Extras **Min/Max** Reset

Settings
Change settings of measurement channels
<b>Change display settings</b>
Zero measurement channels
Change initial setup
Administer settings (save, load, ...)
Back

Display Settings
Measured value display Medium
Measured value rendering <b>2 display panels</b>
Show bar
<ul style="list-style-type: none"> <li>Measured value table</li> <li>1 display panel</li> <li><b>2 display panels</b></li> <li>2x2 display panels</li> <li>3x2 display panels</li> <li>Set automatically</li> </ul>
Back

The HMG now shows the measured values in the 7-segment display panes. Depending on the setting, the Min/Max values are shown in addition to the current measured values.

The **Recording menu** is used for recording measurement curves. During recording, the measured values are recorded for a certain period of time, stored and then shown as a graph.

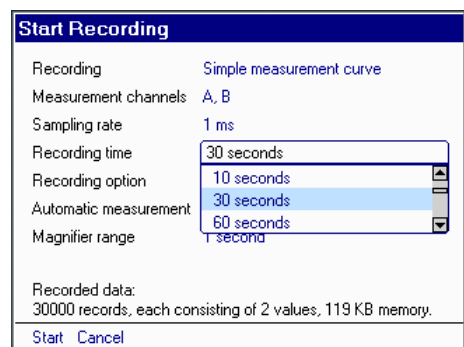
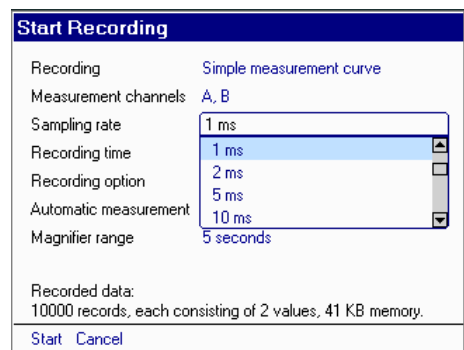
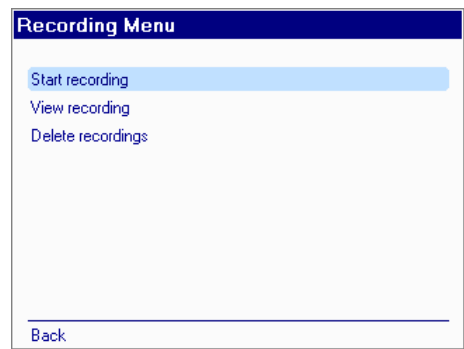
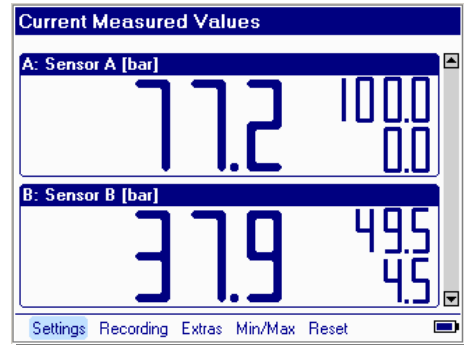
### Example of Recording a Measurement Curve:

The function bar of the **Current Measured Values** menu contains the item **Recording**. Select it using the 5-way navigation key, followed by **OK**. In the **Recording** menu that follows, select **Start recording** and confirm with **OK**.

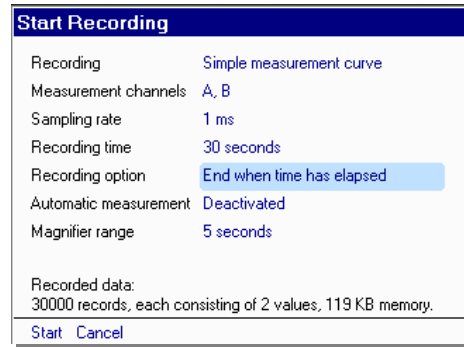
In the menu that follows, **Start Recording**, you are shown the default settings for recording a measurement curve. In our example, we want to generate a **Simple measurement curve** with **two sensors** at channels A and B with a **sampling rate** of **1 ms** and a **Recording time** of **30 s**. Then **measurement** must be **finished**.

**Simple measurement curve** is already set in the menu. For the other settings, proceed as follows:

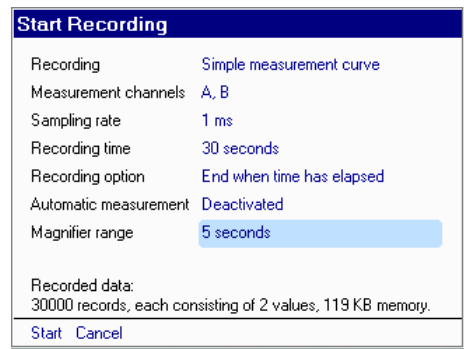
Using the arrow keys of the 5-way navigation key, select the third item, **Sampling rate**. **OK** opens up a **drop-down list** where you select a sampling rate of **1 ms**, confirm with **OK**. This takes you automatically to the **Recording time** line. Press **OK**. Scroll down the list using the arrow keys to **30 seconds**, and confirm with **OK**.



In the **Recording option** line, select **End when time has elapsed** in the same manner.

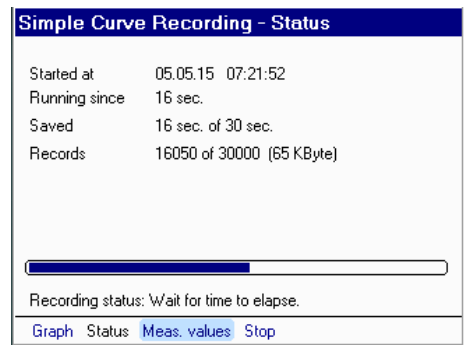


In the **Automatic operation** line, select the **Deactivated** option and in the **Magnified section** the **5 second** option.



Your display now shows the settings you made for recording measured values (see screenshot). To double-check your settings, refer to the recorded data selected by you above the function bar.

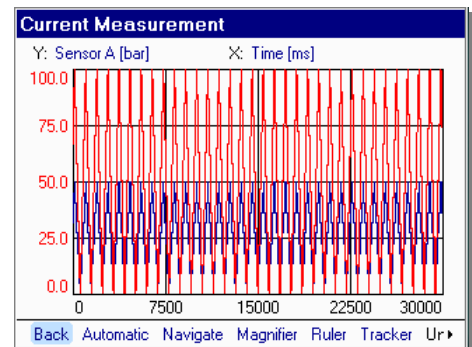
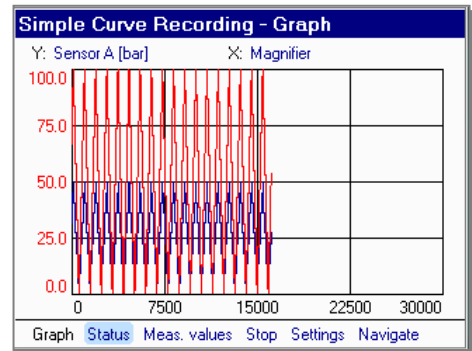
Now you can start recording by pressing **Start** in the function bar + **OK**. A **progress bar** shows you the status of your measurement. The function bar offers you the option of having the measurement curve plotted or the current value shown while recording.



**Graphic rendering** provides a faster visual impression of the changes in the measured values. To have the measurement curve displayed while recording, select **Graph + OK**. The screenshot on the right shows you the curve plotted for our example.

When recording is finished, you have the option of saving or discarding the measurement. To save the recording, select **Save** and confirm with **OK**. The HMG automatically assigns a name and a consecutive number, which can also be renamed by you. In our example, accept the name suggested by the HMG and save with **OK**.

You can view any stored recording again or delete it as you like. For more information on this, refer to Detailed Operating Instructions.



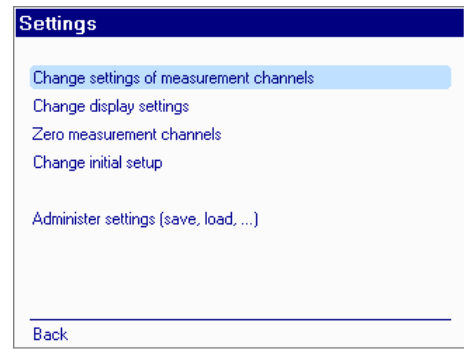


## 7 Detailed Operating Instructions

### 7.1 Settings Menu

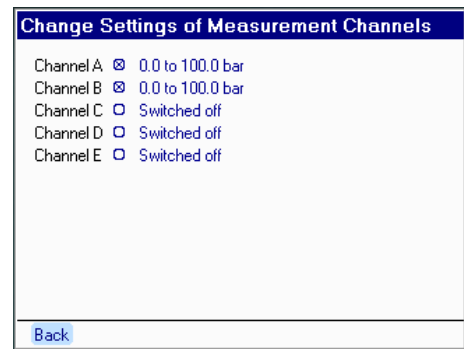
Submenus of the Settings menu:

- Change settings of measurement channels
- Change display settings
- Zero measurement channels
- Change initial setup
- Administer settings (save, load, ...)
- Administer sensor configuration  
(not visible unless the configuration of a SMART sensor has been read out, see section 6.4.2.5)



#### 7.1.1 Change settings of measurement channels

Select **Change settings of measurement channels** to obtain a list of all the channels available in the HMG (see screenshot). There is a checkbox next to each of the channels on the right side, enabling you to switch the input on or off (+ **OK** key). **Activated channels** are marked by an "X". To the right of the checkbox is the **measurement range setting**, the **unit** of measurement, and, as applicable, a **designation** for the sensor, e.g. "System pressure".



The various options available for channels A to C are demonstrated here using channel A as an example. Select the **measurement range entry** on the right of the channel using the navigation keys and press **OK**. This takes you to the menu window for the selected channel.

Channel A	
Designation	System pressure
Mode	Automatic detection (HSI)
Back Information	

To enter a **designation**, press **OK** again and then enter it in the box using the combination keypad, followed by **OK**.

In the **Mode** menu you now have the option of **Automatic detection (HSI)** and **Manual**. The **Automatic detection (HSI)** option is used for HYDAC sensors which have automatic sensor detection.

Channel A	
Designation	System pressure
Mode	Automatic detection (HSI) Automatic detection (HSI) Manual
Back Information	

However, there are applications for which it is useful to enter settings manually, also in the case of HSI sensors with sensor recognition. For example, by entering settings manually for a pressure measurement, you can have physical variables displayed which are proportional to the pressure, e.g. force.

**Manual** mode also provides the following further settings:

- **Lower measurement range**
- **Upper measurement range**
- **Unit**
- **Decimal format**

As soon as you select one of these items, a drop-down list appears or a box appears for entering your settings.

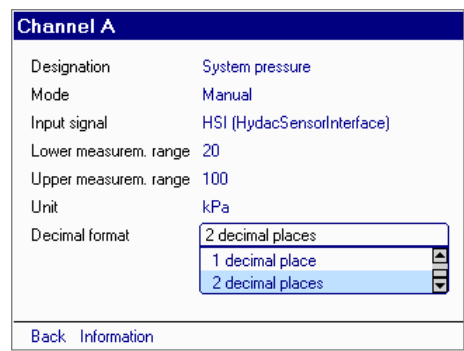
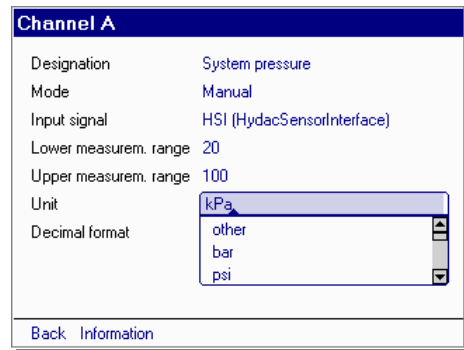
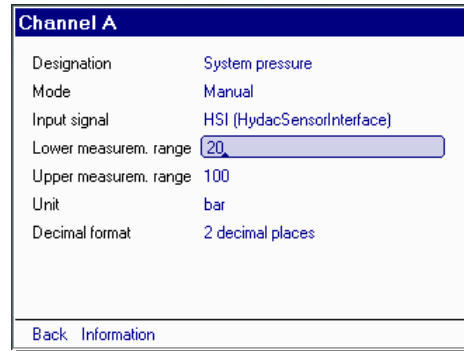
Channel A	
Designation	System pressure
Mode	Manual
Input signal	HSI (HydacSensorInterface)
Lower measurement range	0
Upper measurement range	100
Unit	bar
Decimal format	1 decimal place
Back Information	

To set the **Lower** and **Upper measurement range**, enter the relevant limits via the combination keypad.

A drop-down list is also provided for selecting the **Unit** (of measurement). You also have the option of defining your own unit with **other** (top line of the drop-down list). The cursor then jumps to the **input box** and a small **triangular arrow** appears as the **insertion point**. Enter the new unit using the combination keypad, e.g. "kPa" for kilopascal.

To enter additional characters, move the triangle insertion point to the desired position and enter the characters. Confirm your entry with **OK** so that your unit of measurement is stored.

**Decimal format:** Here you can specify with how many decimal places the measured values are recorded and displayed.



The input channel "D" is intended for digital and not for analogue signals.

As the input signal you can choose between **Count pulses** and **Frequency signal**. There are many possibilities for this, e.g. speed sensors, proximity switches, pulse generators, flow rate measuring instruments with a frequency signal, HYDAC HDS 1000, to name only a few. As in the case of the analogue sensor inputs, settings can be manually entered for the input signal, unit of measurement and decimal format.

In addition to these settings, a **factor** has to be entered which is required for conversion to the desired unit of measurement.

Another special feature is that the **Upper measurement range** must be input. By means of channel "D", frequencies of up to 30000 Hz can be measured, and consequently, a scale from 0 to 30000 can be depicted in the graphical display. If, for example, you record a speed of up to 1450 rpm, an awkward Y-axis scale will result in the graph. If you enter "1500" as the **Upper measurement range** for this speed measurement, for example, the Y-axis in the graph will be scaled from 0 to 1500 rpm.

In this case the reason for inputting the upper measurement range is just a means of limiting the scale of the Y-axis in the graphical display. You should set this value as close as possible to that of the expected measured value in order to get the best possible graphical display.

If there are measured values higher than the upper measurement range, these are not lost. The scale of the Y-axis can be changed again in the graph at any time later on.

Channel D	
Designation	
Input signal	Frequency signal
Unit	Count pulses
Factor	Frequency signal
Upper measurement range	100
Decimal format	1 decimal place
Back	

Channel D	
Designation	
Input signal	Frequency signal
Unit	/min
Factor	kHz
Upper measurement range	/min
Decimal format	1 decimal place
Back	

Channel D	
Designation	
Input signal	Frequency signal
Unit	Hz
Factor	1
Upper measurement range	1500
Decimal format	1 decimal place
Back	



#### Note!

The measurement range of the frequency input is 1 Hz to 30000 Hz. If, for example, the rpm of a motor are recorded and this motor stops abruptly, the last rpm can still be shown in the display for up to 2 seconds, depending on the measurement system, before 0 is displayed.

### Examples of frequency measurements:

1) You would like to measure a frequency up to 1000 Hz. Frequencies are recorded by the HMG per minute. Enter "60" as the **Factor** to display the frequency in **Hz**, enter "1000" for the **Upper measurement range** to scale the Y-axis from 0 to 1000 in the graphical display.

Channel D	
Designation	Frequency
Input signal	Frequency signal
Unit	Hz
Factor	60
Upper measurement range	1000
Decimal format	No decimal places
<a href="#">Back</a>	

2) You would like to measure the speed of a machine from 0 to 2900 rpm, the speed sensor supplies 2 pulses per revolution. Enter "2" as the **Factor** and "2500" as the **Upper measurement range**. The display is then in revolutions per minute; for the graphical display, the Y-axis is scaled from 0 to 3000.

Channel D	
Designation	Speed
Input signal	Frequency signal
Unit	/min
Factor	2
Upper measurement range	3000
Decimal format	No decimal places
<a href="#">Back</a>	

3) A flow rate measurement transmitter in a measurement range up to 450 l/min with a frequency output supplies 8 pulses per litre. Enter "8" as the **Factor** and "500" as the **Upper measurement range**. The display is then in l/min; for the graphical display, the Y-axis is scaled from 0 to 500.

Channel D	
Designation	Flow rate
Input signal	Frequency signal
Unit	l/min
Factor	8
Upper measurement range	500
Decimal format	No decimal places
<a href="#">Back</a>	

### Examples of count pulses:

1) The switching output of a proximity switch detecting passing pieces on a conveyor belt is connected to the frequency input of the HMG 2500. Enter "1" as the **Factor** and the expected maximum quantity to be counted (maximum 30000) as the **Upper measurement range**.

Channel D	
Designation	Counter
Input signal	Count pulses
Unit	pcs.
Factor	1
Upper measurement range	30000
Decimal format	No decimal places
<a href="#">Back</a>	

2) A gear flow meter supplies 250 pulses per liter. Enter "250" as the **Factor** and as the **Upper measurement range**, the maximum no. of litres expected (maximum 30000).

Channel D	
Designation	Counter
Input signal	Count pulses
Unit	ltr.
Factor	250
Upper measurement range	30000
Decimal format	No decimal places
<a href="#">Back</a>	

If you have selected counter pulses as the input signal, and have returned to the normal measurement value display, you will find on the far right of the function bar a **symbol**, as shown in the screenshot. The counter is currently stopped. If you select the **symbol** using the arrow key and confirm with **OK**, the counter is reset and will start again. To stop it, select the **symbol** again using the arrow keys and confirm again with **OK**.

Designation	Value	Unit
A Sensor A	51.6	bar
B Sensor B	26.36	l/min
C Sensor C	49.5	bar
D Counter	0	ltr.

In addition to the input channels (channels A to channel D) there is also one virtual channel **Channel E** available.

This channel can be used to display a differential between 2 input channels, or to calculate a power.

Channel E

Designation

Mode: Power p\*Q

Back

When set to **Differential** the HMG 2500 calculates the differential of channel A - channel B for channel D.

For differential measurement, it is required to use sensors set to the same measuring range, unit and decimal places for each input channel. These parameters are then automatically adapted to channel E, i.e. there are no further settings necessary.

Channel E

Designation

Mode: Differential

Back

Change Settings of Measurement Channels

- Channel A  0.0 to 100.0 bar
- Channel B  0.0 to 100.0 bar
- Channel C  0.0 to 100.0 l/min
- Channel D  Switched off
- Channel E  -100.0 to 100.0 bar "Channel A-B"

Back

If you would like to measure **Power (P\*Q)**, via channel E, the pressure must be measured at channel A and the flow rate must be measured at channel B.

You can then select kW, PS or hp as the **unit (of measurement)**.

Entering the **upper measurement range** merely limits the scale of the Y-axis in the graphical display.

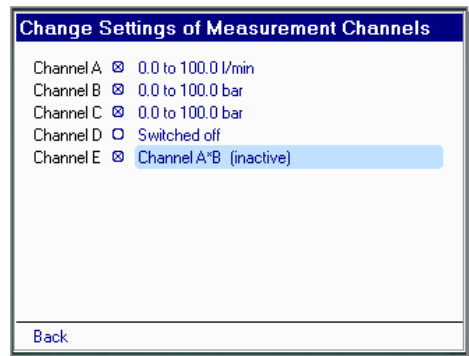
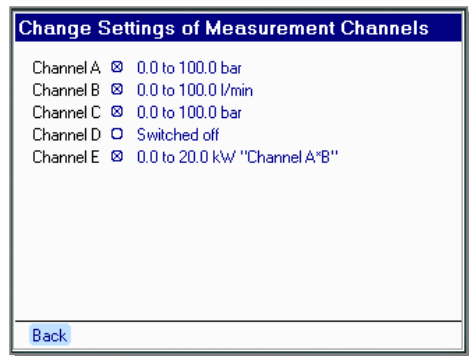
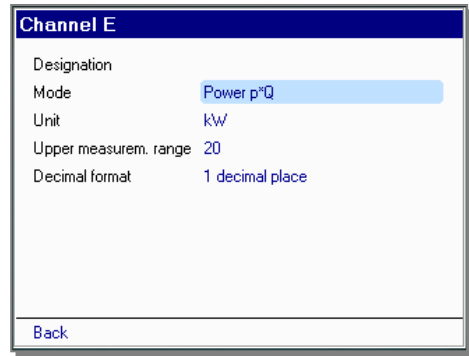
You should set this value as close as possible to that of the expected power value in order to get the best possible graphical display. If there are measured values which are higher than the upper measurement range, these are not lost. The scale of the Y-axis can be changed again in the graph at any time later on.

This brings you back again to the display shown on the right.

If you have made an invalid setting, or you have connected 2 sensors with different measurement ranges for the differential, for example, the relevant calculated channel is deactivated.

In this example, the sensors were exchanged for the power measurement, e.g. the flow rate sensor was connected to channel A and the pressure transmitter was connected to channel B.

Therefore channel E would be automatically deactivated.



### 7.1.2 Change display settings

The next submenu of the **Change Display Settings** item enables you to make settings affecting the display and rendering of measured values and the display size in keeping with your measurement task. Select the item using the arrow keys, followed by **OK**.

When selecting **Measured value display**, a drop-down list appears enabling you to choose the rendering speed:

- Fast
- Middle
- Slow
- Delayed

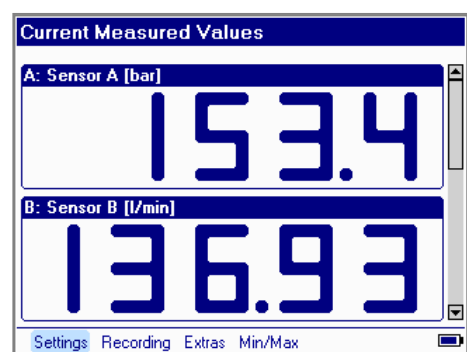
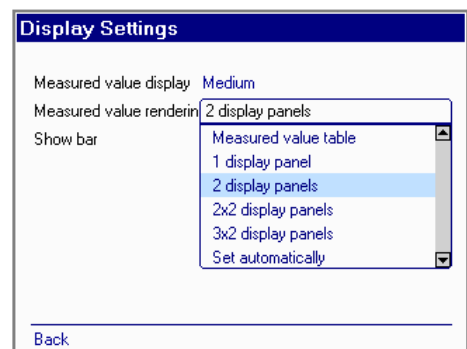
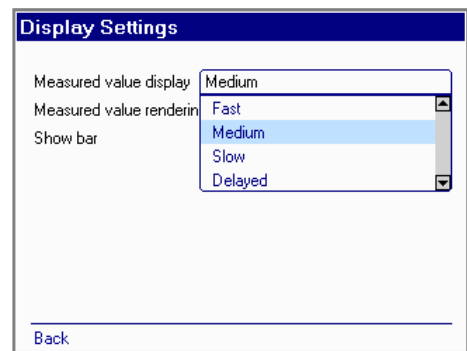
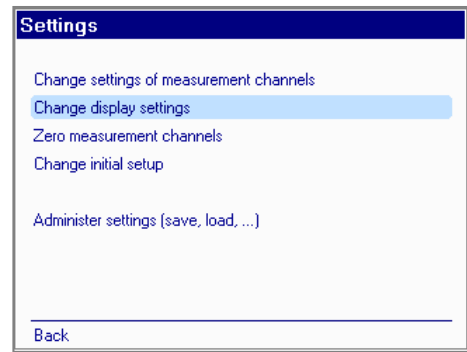
Make your selection, followed by **OK**.

#### **Note!**

The settings for displaying the measured value has no impact on the measurement itself. It is just to make the display easier to read, e.g. during pulsations.

For **Measured value rendering** you can choose between the measured value table and various 7-segment display formats (*1 display panel, 2 display panels, ..., Set automatically*). , Automatisch festlegen) ausgewählt werden.

When selecting **Set automatically**, the HMG automatically searches for the optimal rendering. When two sensors are connected and activated, the display looks like this screenshot.





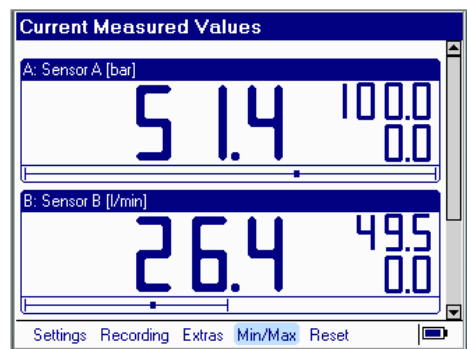
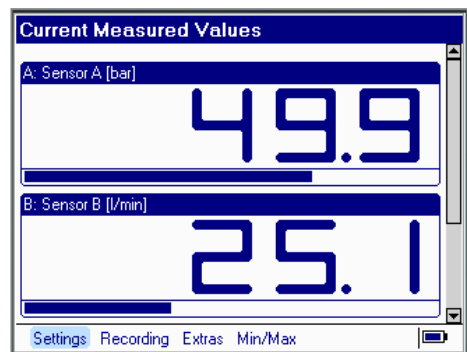
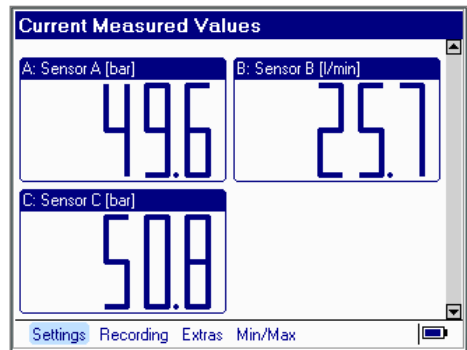
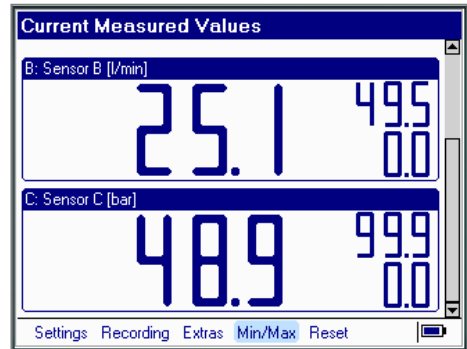
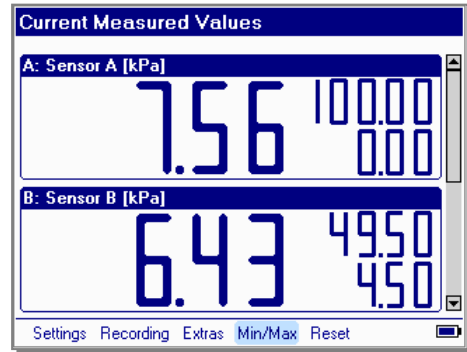
The screenshots on the right show the measured values of **three sensors** when the **2 display panels** option is selected and the Min/Max display is activated. Consequently, the display only shows the measured values of two sensors at a time. Use the arrow keys (**▲**) and (**▼**) to go to the measured values of the third sensor.

In order to display the measured values of **3 sensors** simultaneously, you need to select the **2x2 display panels** option (cf. screenshot).

In the third line of the **Display Settings** menu there is a **Yes/No** option next to **Show progress bar**. Yes causes the progress bar to be shown in the measured value display. The appearance of the display may vary according to what settings have been made for rendering the measured values.

The overall width of the respective progress bar corresponds to 0% ... 100% of the measurement range. The progress bar shows the position of the current measured value in the overall measurement range. Showing the Min/Max values causes the display to be altered. The current measured value is now shown by a dot and the length of the progress bar shows the range from Min to Max. No causes the progress bar to be switched off.

**Back** takes you back to the **Settings** menu.



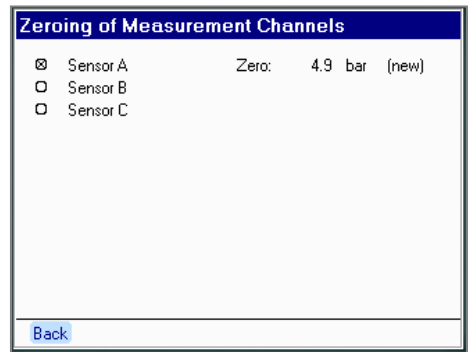
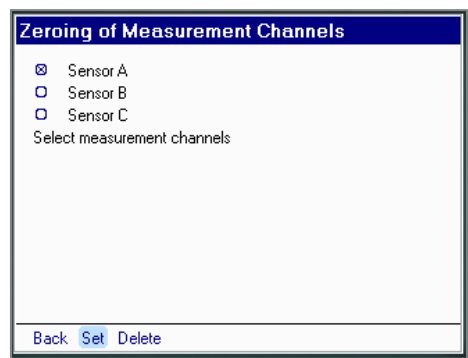
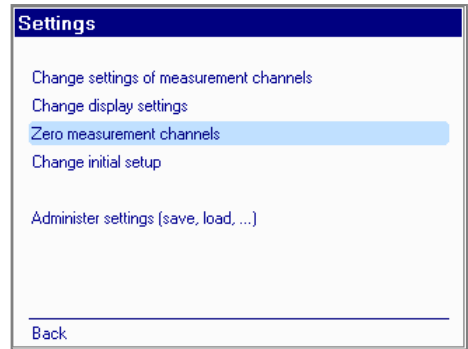
### 7.1.3 Zeroing Measurement Channels

You can re-zero the measurement channels in the Settings menu. This function is used to mask out backpressure buildups present in the system. For example, if a pressure of 3 bar is present at a pressure transmitter despite the fact that the system has been switched off, this value can be used as the new zero point for display purposes.

Re-zeroing can be done at any point throughout the measurement range of a measurement channel.

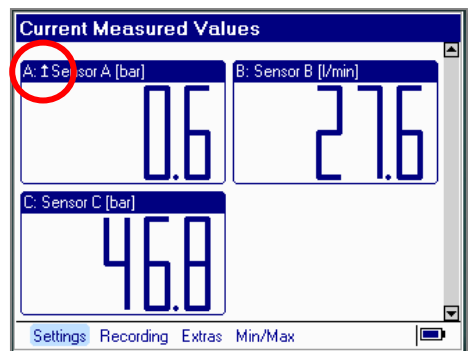
In the **Settings** menu, select **Zero measurement channels**, and then confirm with **OK**. The screen on the right appears. You are now prompted to select a measurement channel. Select the channel (checkbox) which you would like to zero using the arrow keys, and then confirm with **OK**. Then select **Set** followed by **OK** — you have zeroed the channel. You can delete the changed zero point by pressing **Delete**.

**All measurement channels which have been re-zeroed are indicated by an arrow in front of their designation for safety reasons (see screenshot).**



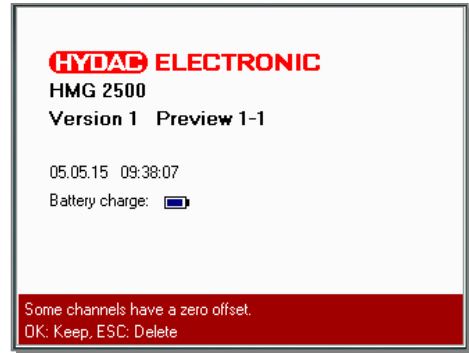
**Note!**

A high pressure may still be present in a measurement channel marked by an arrow even though the display shows **0 bar**. When removing a sensor or other system components make sure the system has been **depressurized** first. Failure to do so may result in serious injury or death!

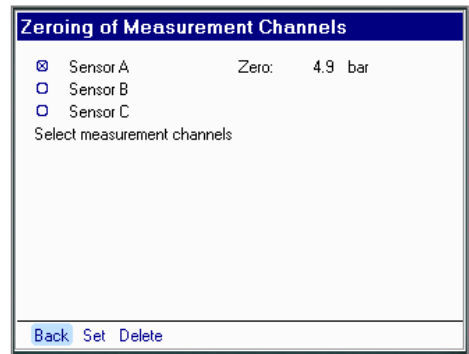


Switching the HMG unit or measurement channels OFF/ON doesn't automatically delete the newly set zero point. The following message is shown when switching the HMG off and then back on:

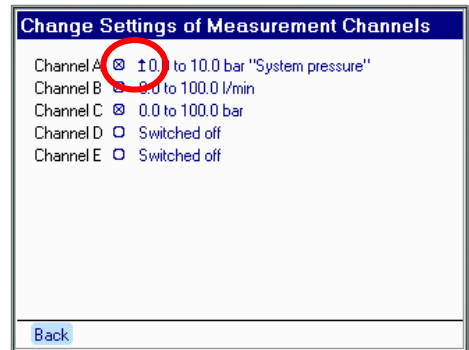
**"Some channels have a zero offset. Press OK to retain the zero offset or "Esc" to delete it.**



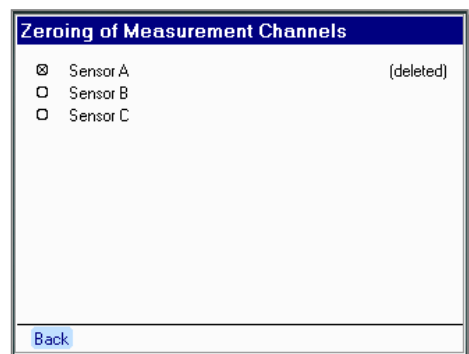
To determine the extent of a zero offset which has been set, go to the **Settings** menu (**OK**) and select **Zero measurement channels (OK)**. This brings up a list of all the channels which are active. Channels with a zero point adjustment are **checkmarked**. The value of the **zero offset** is shown on the right.



Any zero offset is also shown in the measurement channel list by way of a small arrow in front of the measurement range. To find it, go to the **Settings** menu (**OK**), then **Change Settings of Measurement Channel (OK)**.



There is one exception where the zero offset is automatically deleted. This happens when a sensor is connected to the channel and this sensor has a different measurement range to the one for which the zero offset was set. This means that the zero offset is not retained unless the lower and upper measurement limit, the number of decimal places, and the unit of measurement of the newly connected sensor are identical.



When the zero offset is automatically deleted, a message to this effect appears in the display for two seconds.

### 7.1.4 Change initial setup

**Change initial setup** is a submenu of the **Settings** menu.

To make changes to the initial setup, press **OK**. You can now change the following items:

#### Language

You can choose between German, English and French.

- Select your language using the arrow keys, followed by **OK**.

**Setting/Correcting the Date and Time** Various format options are offered depending on the language selected by you and the associated regional formatting applicable to the date and time. Make your selection, followed by pressing **OK**. Then enter the current date and time via the **numerical keypad** and save your entries via **OK**.

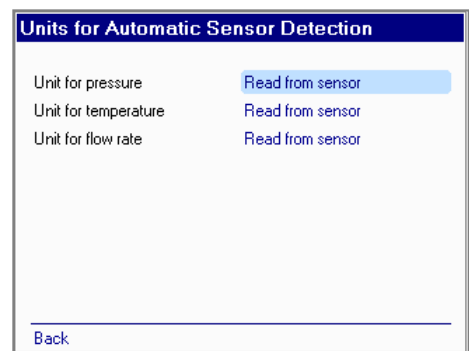
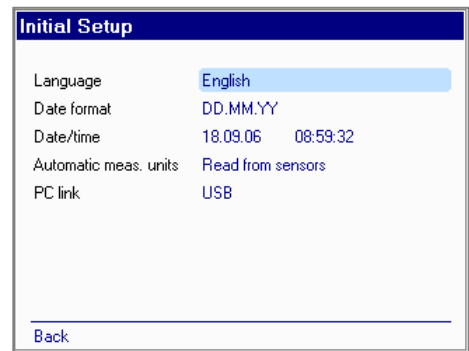
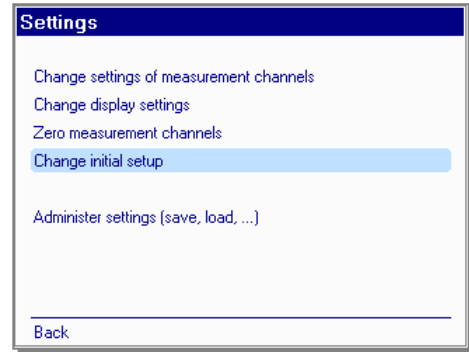
- Save by pressing **OK**.

#### Automatic Measurement Units

This subitem refers only to HSI sensors with automatic sensor detection. When the sensors are connected, the unit of measurement of the sensor is read out and automatically adopted.

If, for example, you want all pressure transmitters with automatic sensor detection to show psi readings, you can make this setting here.

For a connected 0 ... 100 bar pressure transmitter, the HMG then shows the measured values in a measurement range of 0 ... 1450 psi, i.e. the measurement range and the unit of measurement are automatically converted.





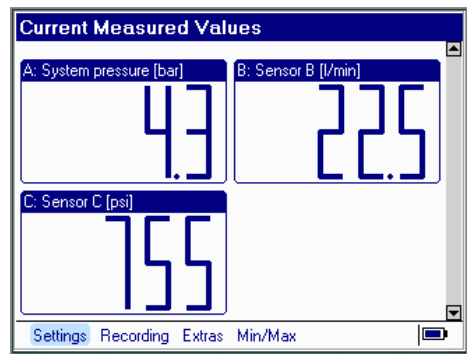
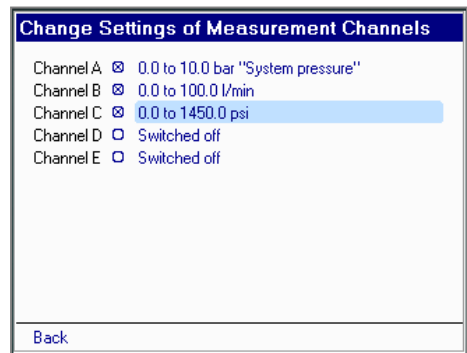
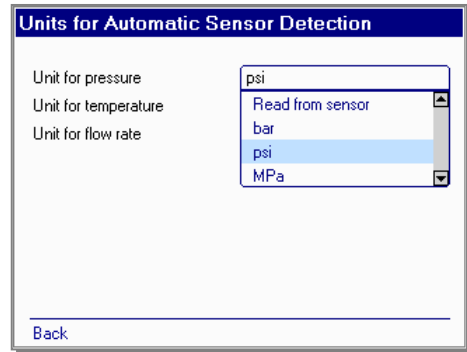
**Note!**

Automatic conversion of measured values to the selected unit of measurement will not work unless **Automatic detection (HSI)** mode is selected under **Settings – Measurement Channel Settings**.

Select the unit of measurement to be changed, followed by **OK**. Select the new unit of measurement desired from the drop-down list by pressing **OK**.

In the list of measurement channels, the measurement range for this channel is now shown in 0 ... 1450 psi instead of in 0 ... 100 bar, for instance.

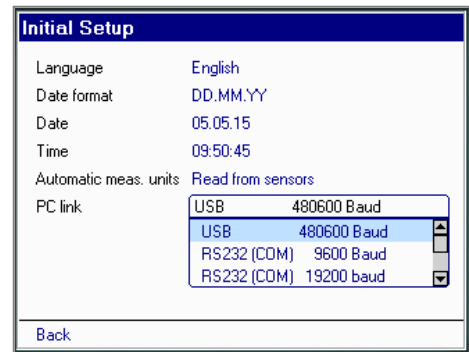
In the **current measured values display** the measured values show psi readings (listed after the channel or sensor designation).



## PC Link

The **HMGWIN** and **CMWIN** software enables you to make online measurements and settings in the HMG 2500, in addition to further processing, archiving, documenting and updating etc. Data transfer generally takes place via the USB port.

You can also transfer data to the PC via the HMG's serial port. To do this, select the **RS232(COM)** setting along with the requisite baud rate.



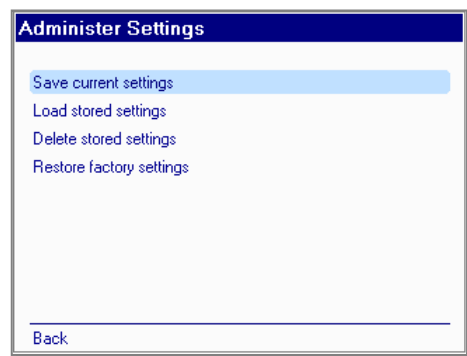
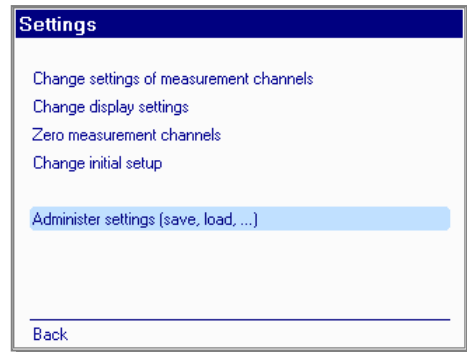
Ground potential of the sensor ports and interfaces (USB/serial) are connected galvanically. If sensors and interfaces are used simultaneously (online measurement), please ensure equipotential bonding to avoid transient currents between the electricity grids with different ground potential via HMG, as the device could be destroyed.

### 7.1.5 Administer settings (save, load, ...)

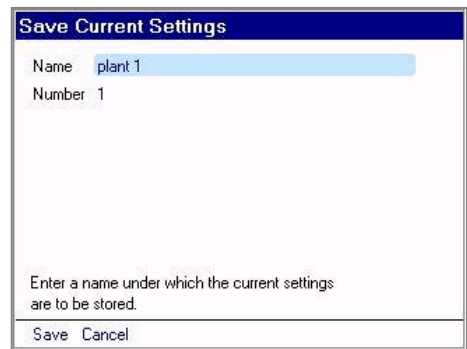
All of the measurement channel settings made by you in the HMG for the last measurement can be saved and then reloaded later in order to be able to repeat the same measurement periodically, for example.

You can also delete individual stored settings or restore the factory settings.

Select **Settings (save, load, ...)**, press **OK**, and now proceed to the **Settings** menu with its four submenus (see screenshot).

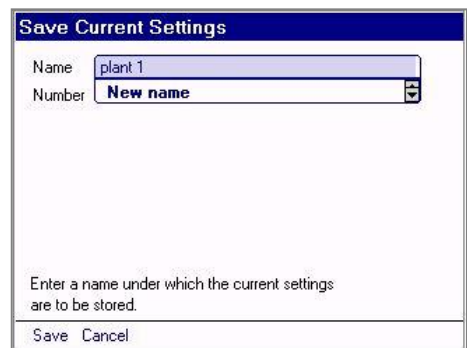


When you confirm **Save current settings** with **OK**, you see the name of the setting saved last, or **No Name** if nothing was saved. Confirm with **OK**, and you are shown a list of all the saved settings and/or the option of entering a new name. Select **New Name** and enter a name using the combination keypad.



Press **OK** x 2 to save the new name and to return to the **Settings** menu.

The HMG automatically assigns a consecutive number, which can also be changed by you.



The HMG automatically assigns the next highest unused consecutive number, which is always unique. Any gaps in the list of numbers are not filled.

In the submenus **Load stored settings** or **Delete stored settings**, you are shown a list of all the saved settings from which you can **Load** or **Delete** individual settings.

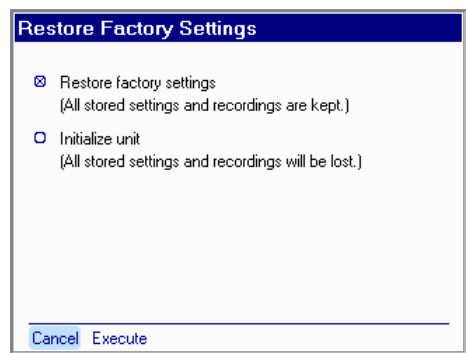
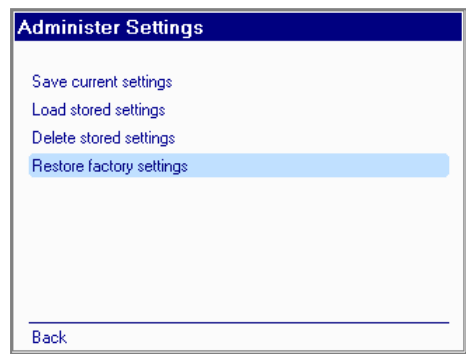
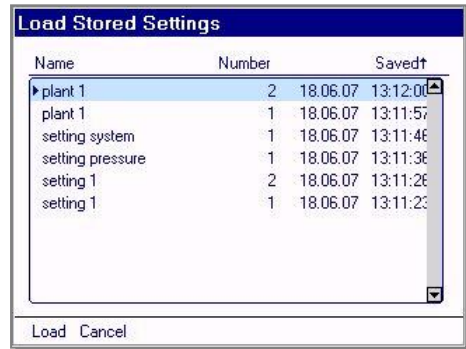
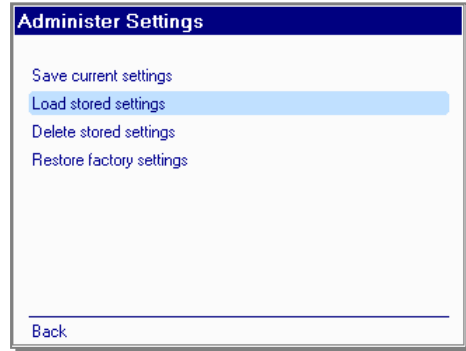
Navigate to a setting using the arrow keys and highlight using **OK**. The item "activated" jumps into the function bar, enabling you to accordingly **Load** or **Delete** the setting.

You can restore your HMG to the original factory settings by selecting **Restore factory settings** (see right).

Confirm **Restore factory settings** with **OK** and the menu following offers you two options. Select the required function (checkbox) followed by **OK** and execute the option via the **Execute** command in the function bar.

**CAUTION**

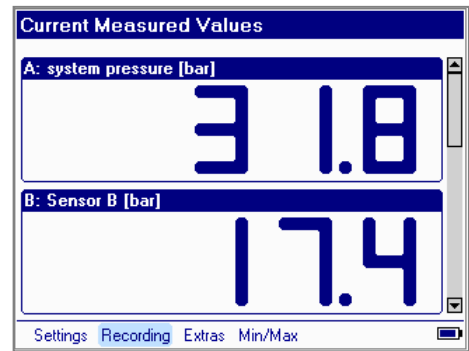
*Initialise unit* will delete all of the stored settings and recordings; the **Welcome** startup screen appears, similar to when turning the unit on for the first time.





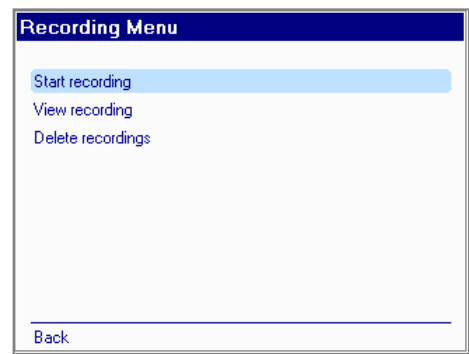
## 7.2 Recording Menu

Here the HMG enables you to perform a measurement for a specific period of time and save it. This recording can be rendered as a graph or a table. To do this, proceed as follows: To access the recording menu, go to the **Current Measured Values** menu, then select **Recording** in the function bar at the bottom. In the **Recording** menu that follows, select **Start recording**, **View recording** or **Delete recordings**, using navigation keys and confirm with **OK**.



### 7.2.1 Starting a Recording

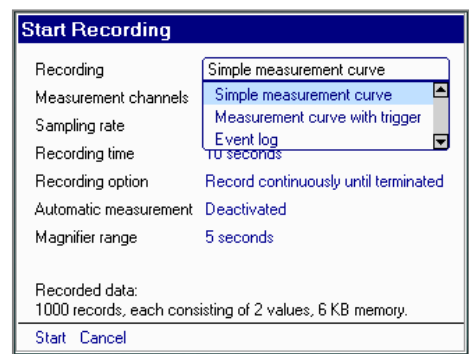
The **Start recording** option takes you to a menu which lists the individual measurement parameters which can be set for making a recording. When selecting the first item, **Recording**, a drop-down list appears in which you can choose between **Simple measurement curve**, **Measurement curve with trigger** or **Event log**. Select appropriate recording option followed by **OK**.



Select **Simple measurement curve** to make additional parameter settings:

#### Measurement channels

The active measurement channels are shown here. Confirm with **OK**. You now proceed to the **Change Settings of Measurement Channels** menu. All of the settings you can make here are described in detail in the **Changing the Settings of the Measurement Channels** section of **Settings Menu**. Before starting your recording you can now also decide whether you want to switch off individual channels (X = "off").



#### Note!

Don't forget to reactivate the measurement channels after completing your measurement, assuming they are still needed.

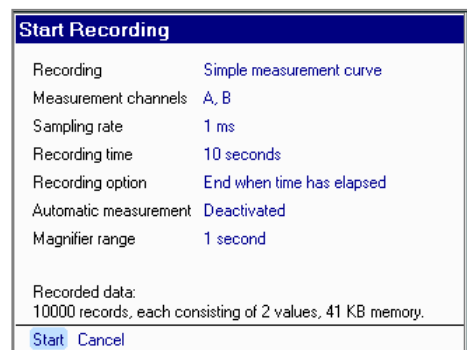
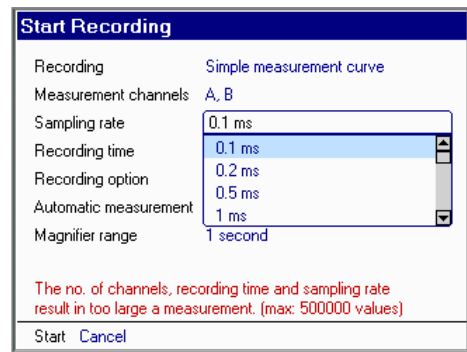
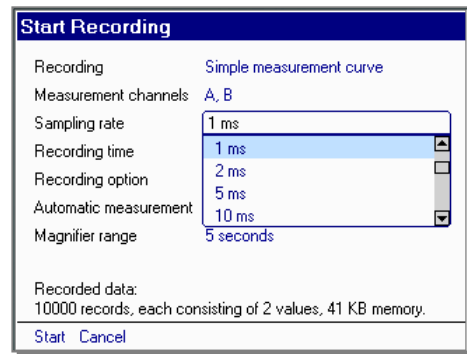
### Sampling rate

This item enables you to set the rate at which the HMG reads a measured value from the sensors and saves it in the internal memory. A measurement curve may comprise up to 500,000 measured values. Selecting 1 ms, for example, means that 1000 measured values per second are taken and saved for each connected measurement channel.

Use the arrow keys ( ▲ ) and ( ▼ ) to scroll through the various settings for the sampling rate. At the bottom of the display you see information on the resulting recorded data (number of data records and memory usage). If you select an invalid setting, meaning that the sampling rate selected by you would exceed the 500,000 maximum, you are shown a message in lieu of the recorded data describing the invalid setting made by you.

The sampling rate selected depends primarily on the measurement task at hand. A sampling rate of 1 s is probably sufficient for monitoring the temperature in a hydraulic tank, as temperature changes generally progress slowly. If, however, you want to track extremely rapid system-induced pressure surges, which generally occur in the millisecond range, you have to work with a sampling rate of 1 ms or less. HYDAC HSI pressure transmitters with automatic sensor detection are capable of tracking rectangular pressure pulses (theoretically occurring in a time of 0 s) less than 0.5 ms apart.

This means that simply setting a sampling rate of 0.1 ms is not sufficient to capture pressure surges occurring faster than 0.5 ms apart. A suitable dynamic pressure transmitter also has to be used.



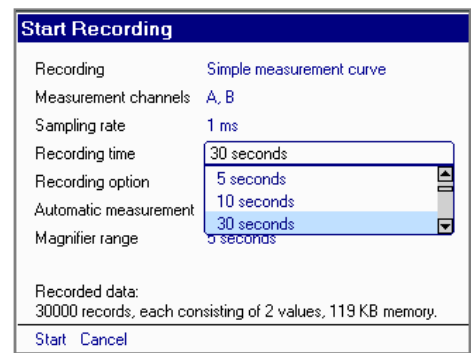
The sampling rate which can be set is also dependent on the active measurement channels:

- 0.1 ms max. 1 input channel
- 0.2 ms max. 2 input channels
- 0.5 ms all 3 input channels
- 1.0 ms for SMART sensors

### Recording time

A drop-down list appears when this item is selected. Using the arrow keys (▲) and (▼) you can select a recording time of between 1 second and 24 hours, followed by **OK**.

Similar to when changing the Sampling rate, information is shown at the bottom of the display pertaining to the recorded data showing you the result of your setting.

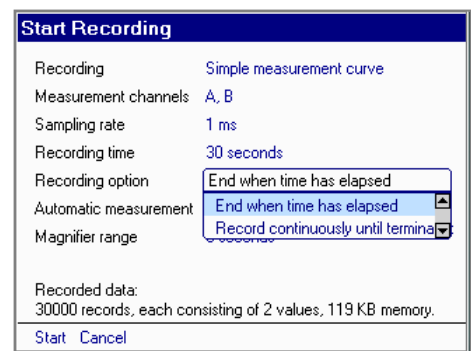


### Recording option

The options available here are **End when time has elapsed** and **Record continuously until terminated**.

**End when time has elapsed** means that recording is discontinued when the time entered in **Recording time** has elapsed.

**Record continuously until terminated** causes the oldest measured values to be deleted when new measured values are added upon the time entered in Recording time elapsing. The time entered in Recording time remains as the "past" in relation to the current time in the measured value memory until the Stop command is given (**Stop + OK** or actuate the **Esc** key).



**Automatic mode**

In this menu point, you define whether the recording (using the settings previously set) is to be started just once or at regular intervals.

**Deactivated** means that the recording is started as predefined, and is ended once the stop condition occurs and is saved.

**Activated** means that once the stop condition occurs, the current recording is ended and saved, and a new recording is started immediately with the same conditions. When the stop condition occurs again, it is saved under a consecutive number.

This continues until the (automatic) recording is ended with **Autostop** and subsequent stop condition or the memory is full.

The automatic operation reverts automatically to "deactivated" each time a recording is stopped, and must be "activated" again as required.

**Zoomed area**

With the "zoomed area", an additional display area can be created during the recording in the graphic mode.

In other words, with the **Magnifier** setting, the x-axis is scaled to the time span preset in this menu point (5 seconds / 10 seconds). (The setting options for the zoomed area are dependent on the preset sampling rate and the specified recording time.)

**Start Recording**

Recording: Simple measurement curve  
 Measurement channels: A, B  
 Sampling rate: 1 ms  
 Recording time: 30 seconds  
 Recording option: End when time has elapsed  
 Automatic measurement: **Activated**  
 Magnifier range: **Deactivated**

Recorded data: 30000 records, each consisting of 2 values, 119 KB memory.

Start Cancel

**Simple Curve Recording - Status**

Started at: 05.05.15 09:58:30  
 Running since: 3 sec.  
 Saved: 2 sec. of 10 sec.  
 Records: 2840 of 10000 (13 KByte)  
 Automatic mode: Activated (stop with autostop)

Recording status: Wait for time to elapse.

Graph Status Meas. values Stop Autostop

**View Stored Recording**

Name	Number	Recording started†
Series1	13	05.05.15 09:58:50
Series1	12	05.05.15 09:58:40
Series1	11	05.05.15 09:58:30
Series1	10	05.05.15 09:58:20
Series1	9	05.05.15 09:58:10
Series1	8	05.05.15 09:58:00
Series1	7	05.05.15 09:57:50
Series1	6	05.05.15 09:57:40

Simple measurement curve (10 sec.)  
 2 Measurement channels, 1 ms Sampling rate, 42 KB memory.

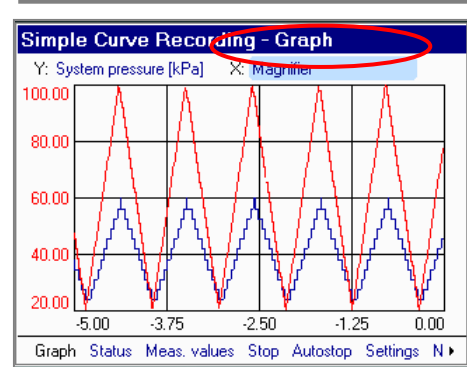
Graph Table Cancel

**Start Recording**

Recording: Simple measurement curve  
 Measurement channels: A, B  
 Sampling rate: 10 ms  
 Recording time: 10 seconds  
 Recording option: End when time has elapsed  
 Automatic measurement: Activated  
 Magnifier range: **5 seconds**

Recorded data: 1000 records, each consisting of 2 values, 42 KB memory.

Start Cancel



Example of recording a *Simple Measurement Curve*

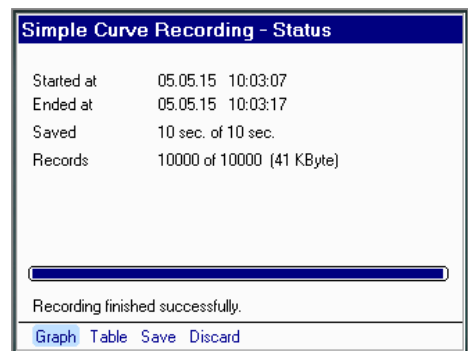
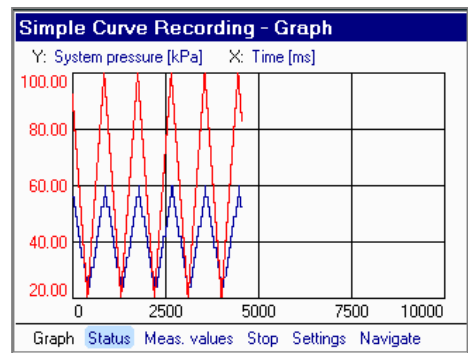
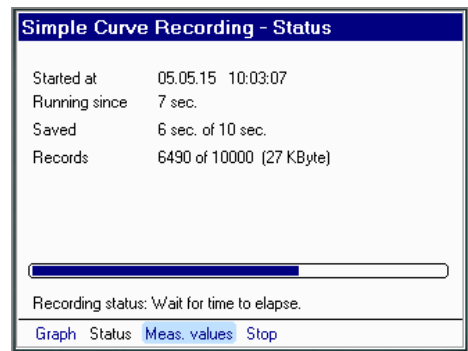
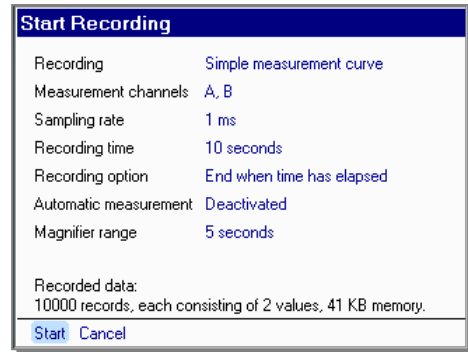
The settings made for the example shown on the right mean that the measured values of channels A and B are recorded with a sampling rate of 1 ms (i.e. 1000 measured values per second, referred to as **data records** under **recorded data**), and that recording is automatically discontinued after 10 seconds. You see the following brief summary under **Recorded data**:  
 10,000 records each consisting of 2 values (1 x channel A, 1 x channel B), memory usage: 41 kB.

Now you can either **start** or **cancel** (or **Esc**) the recording from the function bar. The following appears in the display (see right) after starting a recording. You see a list showing the start time, date & time, the time elapsed, and the number of data records recorded. A progress bar shows you the status of your recording.

The function bar offers you the option of having the measurement curve plotted (graph) or the current measured values displayed. Graphic rendering provides a faster visual impression of the changes in the measured values. To have the measurement curve plotted while recording, select **Graph** + **OK**. The screenshot at the right shows you what the plotted measurement curve might look like.

**Information**  
 When plotting a measurement curve, recording of the Min/Max values is switched off as all the measured values are rendered in the curve for the period under consideration.

Recording can be discontinued at any time by selecting **Stop** or pressing the **Esc** key. When recording is concluded, the measurement must be **saved** or **discarded**.



Before doing this, you can have the measurement shown again as a curve (**Graph + OK**) or as a measured value table (**Table + OK**).

When doing this, other tools are offered for analyzing the chart or table. For more information on how you can retrieve recordings and view them as a curve or table, please refer to **Viewing Recordings**.

**Back/Esc** enables you to return to the

**Simple Curve Recording – Status** screen.

To save the recording, select **Save** and confirm with **OK**. The HMG automatically assigns a name and a consecutive number, both of which can be subsequently changed by you. Select the appropriate item + **OK** and make your entries using the combination keypad.

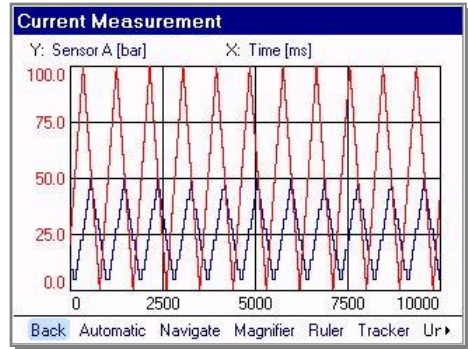
The **Comment** item enables you to enter text, e.g. a description indicating the operational status of the unit or facility while the recording was being made.

To save the recording, select **Save** and confirm with **OK**. The HMG saves the measurement settings together with each recording so that a detailed measurement log is created.

Generally speaking, the following applies:

**Each measurement is given a number.**

The HMG automatically assigns the next highest unused consecutive number, which is always unique. Any gaps in the list of numbers are not filled.



	system pre [bar]	Sensor B [bar]
0ms	25.3	18.0
1ms	25.1	18.0
2ms	24.8	18.0
3ms	24.6	18.0
4ms	24.4	18.0
5ms	24.2	18.0
6ms	24.0	18.0
7ms	23.7	18.0

**Save Current Recording**

Name: plant pressure  
 Number: 7  
 Comment: pressure peaks in the range of

Note: The next number was assigned automatically.  
 Save Back

**Save Current Recording**

Name: plant pressure  
 Number: 8  
 Comment:

Note: The next number was assigned automatically.  
 Save Back

### Measurement Curve with Trigger

Measurement curve with trigger is another recording option. "Trigger" means that a measurement curve can be started automatically when one or more specific events occur. "Trigger" means that a measurement curve can be started automatically when one or more specific events occur. Events can be a limit being exceeded or fallen short of or a measurement window being departed from.

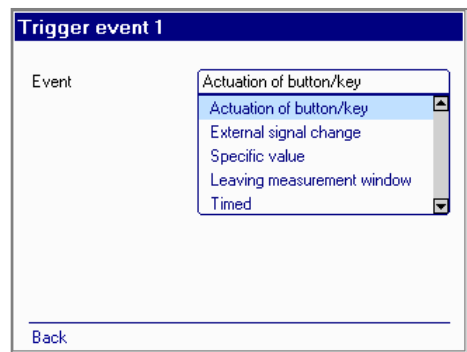
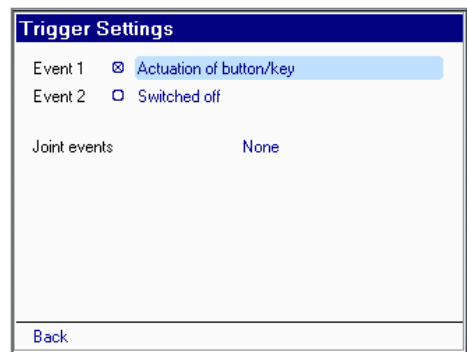
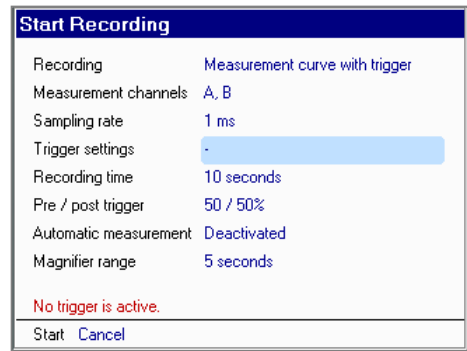
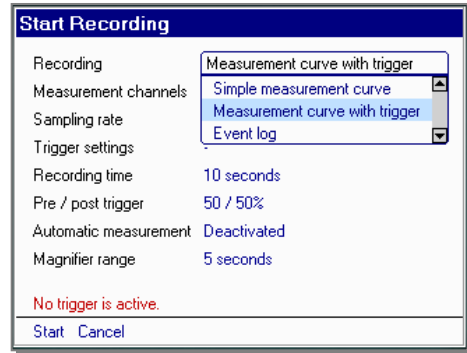
When selecting **Measurement curve with trigger**, you see other parameters which can be set in addition to the setting parameters available for **Simple measurement curve** (Measurement channels, Sampling rate, and Recording time, Automatic operation and Zoomed area). The additional settings are **Trigger settings** and **Pre/Post trigger**.

Select **Trigger setting + OK**. In the menu which follows you can specify up to 2 different trigger events (event 1 to 2). To activate an event, select the relevant box by pressing **OK** so that a checkmark appears. The event used last is shown next to the checkbox. (What appears in the display varies according to the event used last.) Use the arrow keys to navigate to the right to the event box, and confirm with **OK**.

In **Trigger event ...**, confirm with **OK**. The following list of trigger events is displayed:

- Actuation of button/key
- External signal change
- Specific value
- Leaving measurement window
- Timed

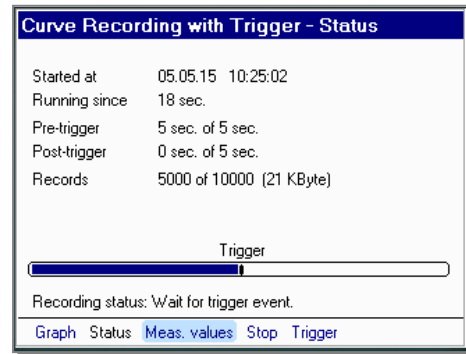
Select the appropriate option for your measurement task.





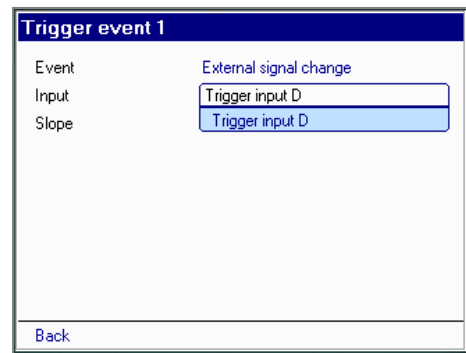
**Event: Actuation of button/key**

This setting is designed to trigger a measurement when a button is specifically actuated. After starting the recording, you can trigger measurement by selecting **Trigger** in the function bar (+ **OK**).

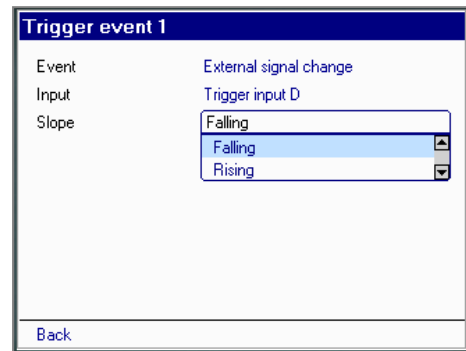


**Event: External signal change**

An external signal change means that you apply a direct current signal to **frequency input D**, e.g. via a push button (**NC or NO contact**). A measurement can then be started when the voltage is switched on via an **NO contact (rising signal edge)** or **NC contact (falling signal edge)**.



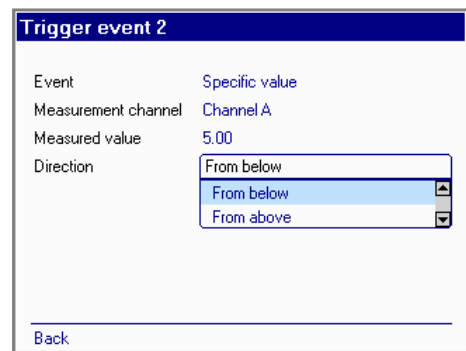
In the settings menu (see screenshot), you specify the **trigger input** under **Input**. In this menu, the digital input **D** is the only available input.



Next you set the **Slope** to **rising** or **falling** and confirm with **OK**.

**Event: Specific value**

Use the trigger event **Specific value** to locate pressure peaks or pressure troughs in a machine. Pressure peaks always occur in a rising direction (measured value increases), whereas pressure troughs occur in a falling direction (measured value drops). First determine the measurement channel and sub-channel for which you wish to set the trigger, then enter the measured value (via the numerical keypad) at which you want to trigger a recording. Finally, select the direction (**From below** or **From above**).



Note:

Sub-channel setting only required for SMART sensors (see Section 6.4)



**Event: Leaving measurement window**

This trigger event is very similar to **Specific value**. You can specify a **Lower Limit** and an **Upper Limit**. The trigger is activated when the measured value enters the measurement window. However, recording is not started until the measured value leaves the measurement window in a rising or falling direction.

Note:

Sub-channel setting only required for SMART sensors (see Section 6.4)

**Event: Timed**

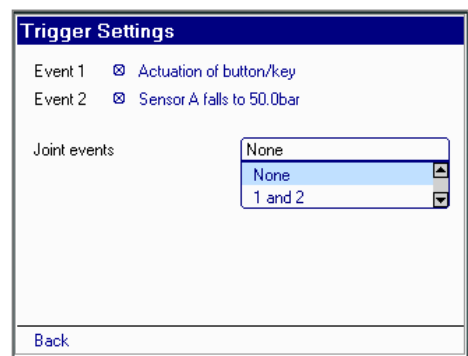
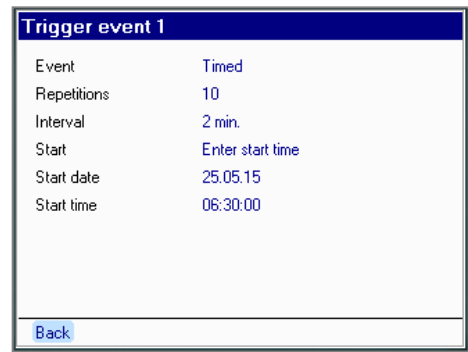
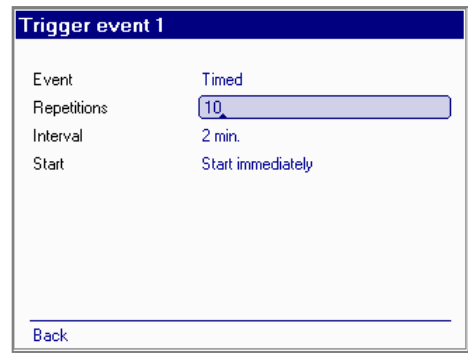
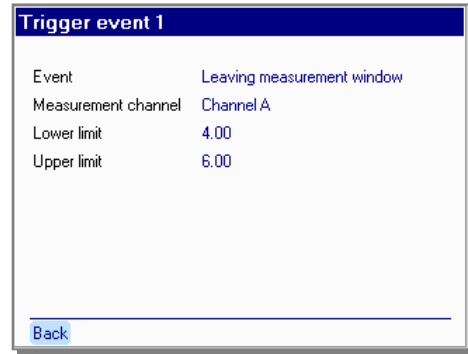
The event setting using a time function (*Timed*) is useful for measurements which must be repeated at specific intervals. In the Settings menu you can specify the number of **Repetitions** (max. 30,000), the **Interval** and the **Starting time**. In the **Start** item you can specify whether this event must be activated immediately (**Start immediately**) or not until after a certain **Start date** and **Start time**.

In the example shown on the right

**– Event: Timed –**

a measurement is started 10 times every 30 minutes. The trigger becomes active for the first time on 2015/04/25 at 06:30.

As mentioned, max. 2 events can be specified for recording triggered measurements. After making each of the settings, return to the **Trigger Settings** menu via **Back**. The menu now provides an overview of all the events and settings for you to check.

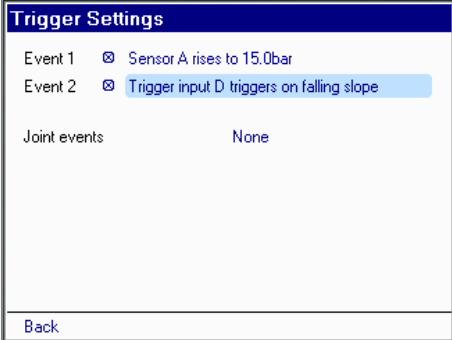


## Linking Events

You also have the option of linking events. Without linking, each of the two events acts alone and independently as a trigger for a measurement recording.

In the line **Joint events** (options shown to the right) a drop-down list gives you the **option of linking the events 1 and 2**. This means that the recording is triggered by the simultaneous occurrence of events 1 and 2 (the measured value at channel A rises to 15.0 bar or higher, and at the same time, a voltage signal with a falling signal edge is detected at trigger input D).

In the **1 and 2** option, all events have to occur simultaneously in order for a recording to be triggered.

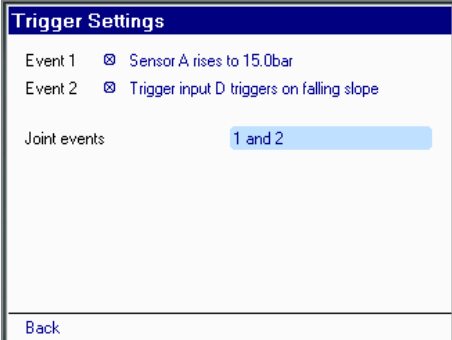


**Trigger Settings**

Event 1  Sensor A rises to 15.0bar  
Event 2  Trigger input D triggers on falling slope

Joint events: None

[Back](#)



**Trigger Settings**

Event 1  Sensor A rises to 15.0bar  
Event 2  Trigger input D triggers on falling slope

Joint events: 1 and 2

[Back](#)

The next setting parameter for recording a triggered measurement curve is **Pre/post trigger**. After starting a triggered measurement curve the HMG begins to record the measured values for the recording time set (e.g. 30 seconds). If the trigger event does not occur during this time, the oldest measured values are replaced with new measured values in the measured value memory. This means that you always have the set recording time as the "past" in the measured value memory.

The **Pre/post trigger** option enables you to specify how much of this "past" is to remain in memory when the event occurs and how much "future" you would like to record after the event.

A **Pre/post trigger** setting of 50 / 50% means that for a recording time of 30 s the "oldest 15 s" are discarded, 15 s remain before the occurrence of the event, and recording is done for another 15 s after the trigger event occurs.

With **Automatic mode** you define whether you wish to make just one recording (**Deactivated**) or whether, after recording one measurement curve, another curve is to be recorded using the same settings (**Activated**). For a **Simple triggered measurement**, select the **Deactivated** automatic measurement option.

### Zoomed area

With the "zoomed area", an additional display area can be created during the recording in the graphic mode.

In other words, with the **Magnifier** setting, the x-axis is scaled to the time span preset in this menu point (5 seconds / 10 seconds). (The setting options for the zoomed area depend on the pre-set sampling rate and the specified recording time.)

Start Recording	
Recording	Measurement curve with trigger
Measurement channels	A, B, C
Sampling rate	10 ms
Trigger settings	T1
Recording time	10 seconds
Pre / post trigger	50 / 50%
Automatic measurement	40 / 60%
Magnifier range	50 / 50%
Recorded data:	60 / 40%
1000 records, each consisting of 3 values, 8 KB memory.	
Start Cancel	

Start Recording	
Recording	Measurement curve with trigger
Measurement channels	A, B, C
Sampling rate	10 ms
Trigger settings	T1
Recording time	10 seconds
Pre / post trigger	50 / 50%
Automatic measurement	Deactivated
Magnifier range	Deactivated
Recorded data:	Activated
1000 records, each consisting of 3 values, 8 KB memory.	
Start Cancel	

Start Recording	
Recording	Measurement curve with trigger
Measurement channels	A, B, C
Sampling rate	10 ms
Trigger settings	T1
Recording time	10 seconds
Pre / post trigger	5 seconds
Automatic measurement	10 seconds
Magnifier range	30 seconds
Recorded data:	5 seconds
1000 records, each consisting of 3 values, 8 KB memory.	
Start Cancel	

### Event Log

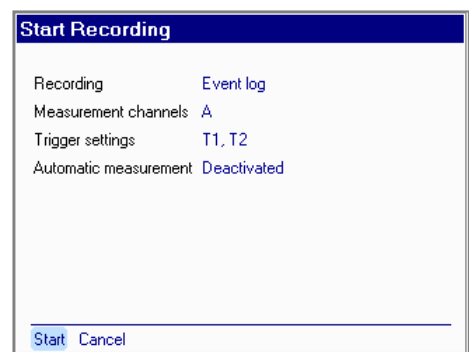
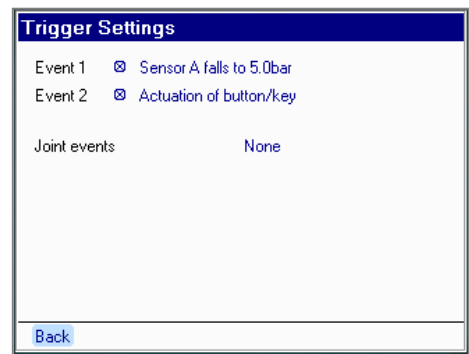
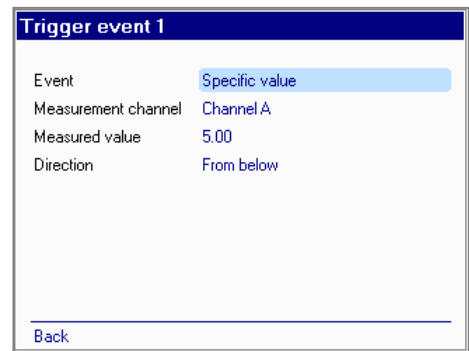
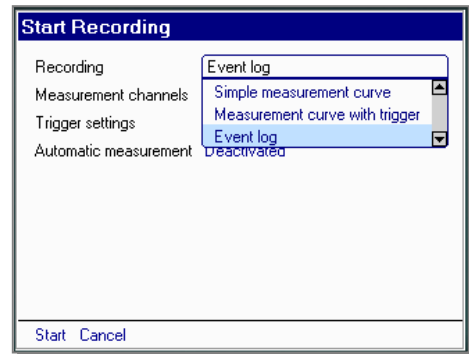
The Event Log option enables you to store measured values as a table. A line in the table contains the current measured value, in addition to the Min and Max value of each active channel.

The trigger settings enable you to specify which event is to create a new line in the event log once the measurement has been started (e.g. Actuation of button/key, Specific value). As soon as a new measured value line is saved, the Min and Max values are always automatically reset.

Similar to the recording option **Measurement curve with trigger**, in automatic measurement you can also choose whether you would like to make just one recording or whether an event log is to be recorded again afterwards using the same settings.

To make the recording, proceed as follows:

- From **Start recording** menu, **Recording** item: select **Event log**.
- **Activate required measuring channels**
- **Define Trigger settings**
- In order to also manually generate a measured value line, set a second event to **Actuation of button/key**.
- Automatic measurement: **Deactivated**



- When measurement starts, a new menu window **Event Log Recording — Status** opens, enabling you to track the measurement on the basis of the settings. Data are recorded only when an event occurs.

• The sampling rate for the event log is automatically determined by the HMG in keeping with the number of active measurement channels:

- 0.1 ms 1 input channel
- 0.2 ms 2 input channels
- 0.5 ms 3 input channels
- 1.0 ms for SMART sensors

The function bar offers you the option of having the current measured values displayed (**Measured Values**) or a **Table** shown.

The **Table** option will list the data records of **each individual event line by line**. Apart from the date and time of the respective recording, the trigger event and the Min and Max values for the active sensors are shown. The **most recent data record** is shown in the **bottom line** of the table.

**Event Log Recording - Status**

Started at 05.05.15 10:51:29  
 Running since 21 sec.  
 Triggered at 05.05.15 10:51:50  
 Records 230 (3 KByte)

Recording status: Wait for trigger event.

Table Status Meas. values Stop Trigger

**Event Log Recording - Meas. values**

Designation	Value	Unit	Min	Max
A Sensor A	51.3	bar	0.0	100.0
B Sensor B	26.4	l/min	4.5	49.5
C Sensor C	55.8	bar	0.0	99.9

Table Status Meas. values Stop Trigger

**Event Log Recording - Table**

	Trigger	Sensor A [bar]	Min [bar]	Max [bar]
10:54:51	1	4.8	0.0	100.0
10:54:51	1	4.8	0.0	100.0
10:54:51	1	4.8	0.0	100.0
10:54:52	1	4.8	0.0	100.0
10:54:52	1	4.8	0.0	100.0
10:54:52	1	4.8	0.0	100.0
10:54:52	1	4.8	0.0	100.0
10:54:52	1	4.8	0.0	100.0

Table Status Meas. values Stop Trigger

**Event Log Recording - Status**

Started at 05.05.15 10:57:20  
 Triggered at 05.05.15 10:57:43  
 Ended at 05.05.15 10:57:43  
 Records 130 (3 KByte)

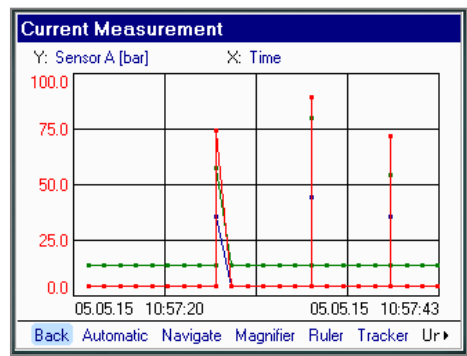
Recording finished successfully.

Graph Table Save Discard

By means of the arrow keys of the 5-way navkey, you can select the arrows next to the scroll bar. After confirming with OK, you can scroll up/down and left/right in the table. A single arrow ▲ means scrolling line by line, a double arrow ▲▲ means screen by screen, ▲▲ means "jump to the beginning or end of the table".

	Trigger	Sensor A [bar]	Min [bar]	Max [bar]
10:57:21	1	4.8	0.0	100.0
10:57:21	1	4.8	0.0	100.0
10:57:21	1	4.8	0.0	100.0
10:57:21	1	4.8	0.0	100.0
10:57:21	1	4.8	0.0	100.0
10:57:21	1	4.8	0.0	100.0
10:57:22	1	4.8	0.0	100.0
10:57:22	1	4.8	0.0	100.0

You can **end the event log** recording with **Stop** in the function bar. In the next menu you are shown an overview of the event log and are prompted to **Save** your recording or **Discard** it (function bar).



Before doing this, the measurement can be shown again as a curve (**Graph + OK**) or table (**Table + OK**). Other tools are also available. For more information, please refer to the next section **Viewing Recordings**. It provides a detailed description of the options available and how to use the tools and other features for analysing each saved recording, whether as a table or a graph.

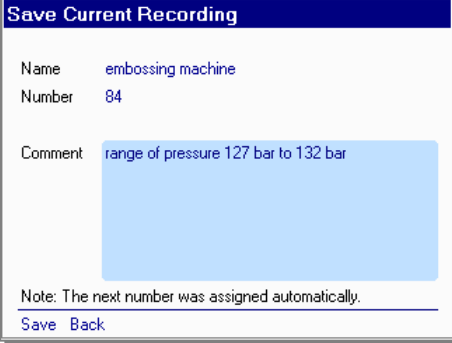
Started at	05.05.15 10:57:20
Triggered at	05.05.15 10:57:43
Ended at	05.05.15 10:57:43
Records	130 (3 KByte)

Recording finished successfully.

Graph Table Save Discard

To save the recording, select **Save** and confirm by pressing **OK**. The HMG automatically assigns a name and a consecutive number, both of which can be subsequently changed by you. Select the appropriate item + **OK** and make your entries using the combination keypad.

The **Comment** item enables you to enter a text, e.g. a description indicating the operational status of the unit or system while the recording was being made. The HMG saves the measurement settings together with each recording so that a detailed measurement log is created.



**Save Current Recording**

Name **embossing machine**

Number **84**

Comment **range of pressure 127 bar to 132 bar**

Note: The next number was assigned automatically.

Save Back

Note:

For the same example, if you select automatic measurement **Activated** and start the measurement with **Start**, you are asked to allocate a **Name** and a **Number** to the measurement. The measurement is then stored under this name with the next consecutive number. In the function bar on the screen you also see the **Autostop** function. The measurement currently running can be ended by selecting **Stop**. This measurement will then be saved and a new measurement will start automatically. To end automatic measurement, select **Autostop** followed by **OK**. The measurement that was just running is resumed and can be ended again by selecting **Stop**.

### 7.2.2 Viewing Recordings

The **View recording** item in the **Recording** menu will display a list of the recordings stored in the HMG. Use the arrow keys to select the measurement you wish to view. The selected recording is indicated by an arrowhead and is blue-highlighted. The associated recorded data appear above the function bar.

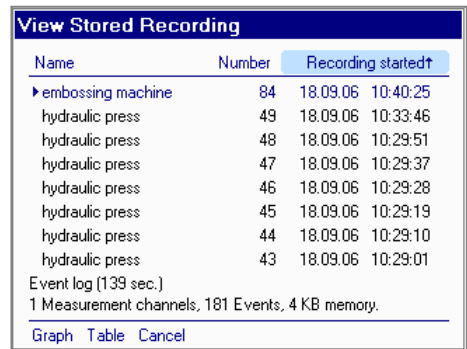
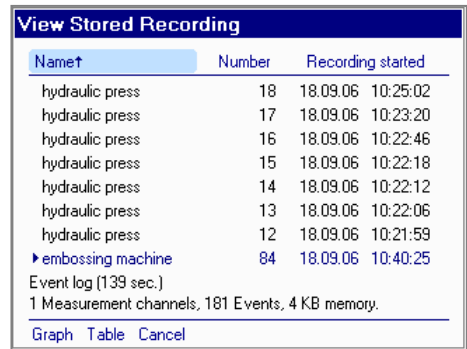
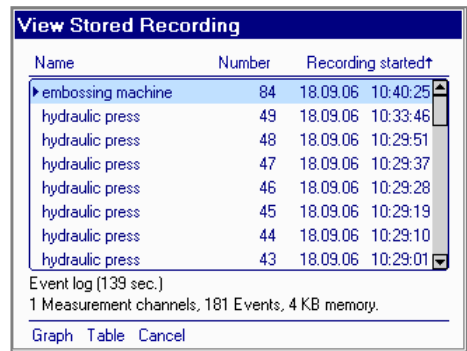
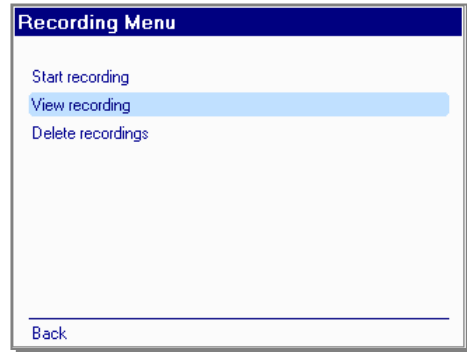
Before selecting a measurement, this list can be sorted according to

- **Name**
- **Number**
- **Recording started**

and in ascending (▲) or descending order (▼) in each case.

Hit **Esc** to change from the selection list to the menu in the next level up. The arrow key (▲) enables you to access the header row. The list can be sorted accordingly by pressing **OK**. To do this, select Name, Number or Recording started in the header row. To sort in ascending or descending order, click in the relevant **column header** with **OK** (pressing OK more than once will reverse the sorting order). An arrow next to the column header indicates whether sorting is in ascending (▲) or descending (▼) order. To return to the selection list, press (▼) + **OK**.

In the list of the stored recordings, select a measurement followed by **OK**. You are now in the **function bar** and can now decide whether you want to view the measurement as a **Graph** or a **Table**. This applies to measurement curves and event logs.





### Graph

A measurement can also be rendered as a measurement curve. To do this, select **Graph + OK** in the function bar. The screenshot on the right shows what appears next in your display. The measurement is scaled throughout the entire **time range** (x-axis) and **measurement range** (y-axis). Above the y-axis you can see which channel is currently scaled along the y-axis.

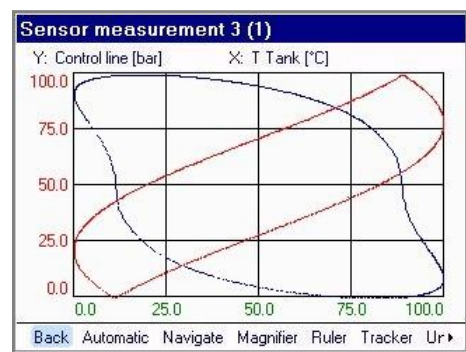
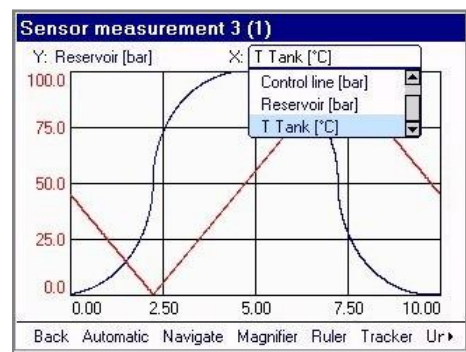
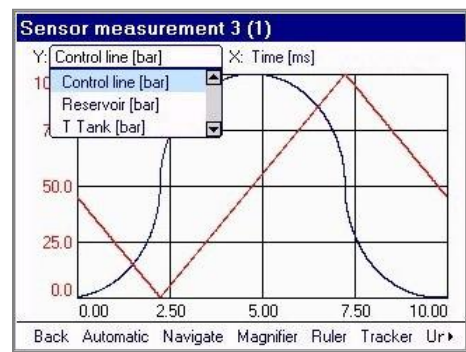
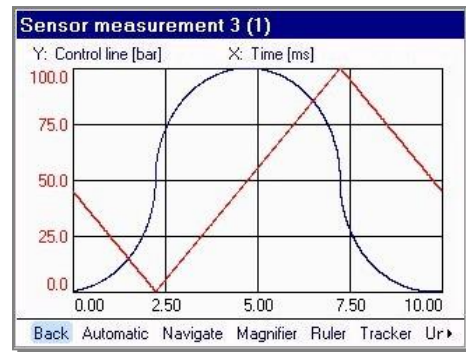
If you have recorded the measurement using more than one channel, you can select the channel or sensor to be rendered in the y-axis. Press **Arrow Up** „(▲)“ followed by **OK** to change the **scaling** of the **y-axis** to another channel activated for display. This causes a drop-down box to open, in which all channels are listed. Select one channel followed by **OK** to specify y-axis display. (The axis is now displayed in the same colour as its measured values curve - see below).

Press (▶) to go to the setting field for the x-axis. Here you can change the **Scaling** for the **x-axis** in the same way.

As a general rule, the **x-axis** is the **time axis**. A measurement channel can be assigned to the x-axis, for example, to render the performance curve of a pump (**P-Q graph**). In the example shown at the right, rendering as a **P-T graph** has been selected for the control line and reservoir curves.

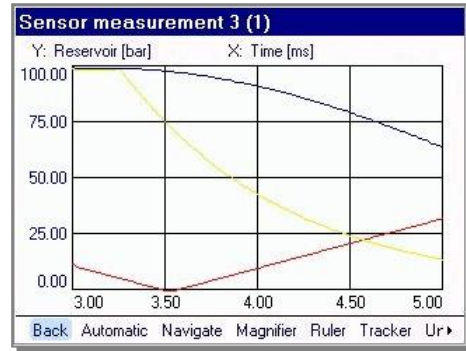
The following options are available to you in the function bar of the Graph menu:

**Back, Automatic, Navigate, Magnifier, Ruler, Tracker, Undo, Display all, Settings and Info.**



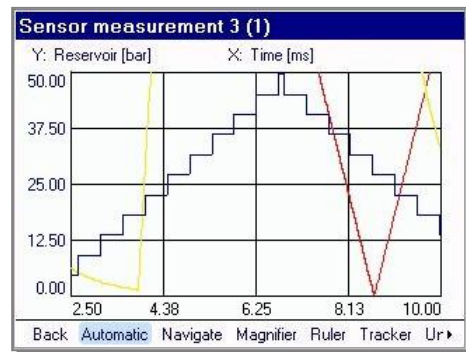
**Back:**

**Back/Esc** enables you to return to the previous menu.



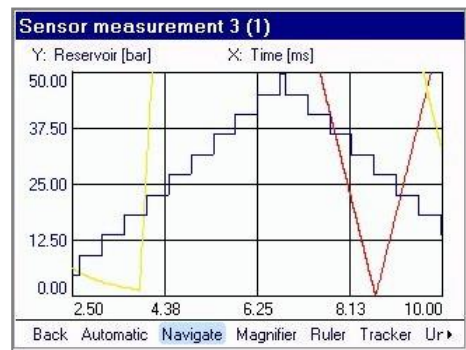
**Automatic:**

**Automatic** renders all individual curves optimally "automatically". When selecting **Automatic** (+ OK) the y-scaling is automatically adapted for each active channel separately, i.e. the y-scaling is zoomed to its maximum size.



**Navigate:**

**Navigate** is used to evaluate a measurement curve quickly and accurately or to render parts of it. It enables the **size** of the **curve** to be **changed** or the **measurement curve** to be **shifted**, so that details can be rendered more accurately and analyzed more easily.

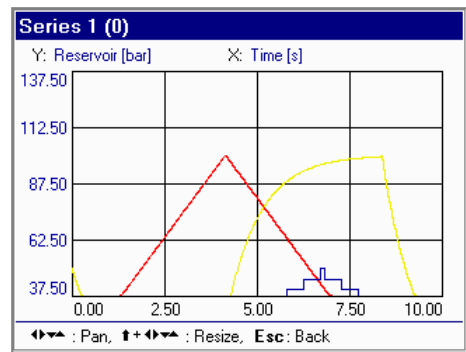


**Shift:** use arrow keys

When selecting **Navigate** you are shown information in the function bar about the activities possible here, including graphical tips for using them.

Use the **arrow keys** of the 5-way navkey to **shift** the curve or the section of the curve in the direction of the arrow.

If you also **press and hold** the **Shift** key (↑), you can change the size of the rendering.



Use the ► and ▲ arrow keys while holding the Shift key (⇧) down to **enlarge a portion** of the measurement in the x- or y-axis.

Conversely use the ◀ and ▼ arrow keys while holding the Shift key down to **decrease** or "squash" the curve in the x- or y-axis. (cf. screenshot)

**Zoom:**

To explore a specific section of the curve and zoom into it, use the **Magnifier (+ OK)**. The function bar contains similar functions for shifting and resizing as the Navigate feature (see previous page).

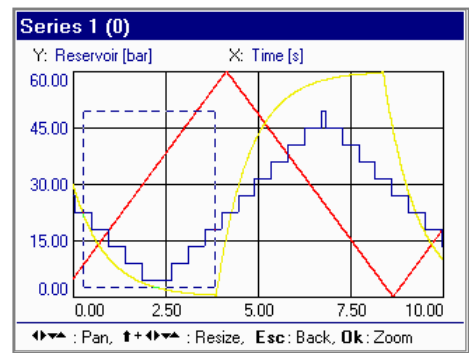
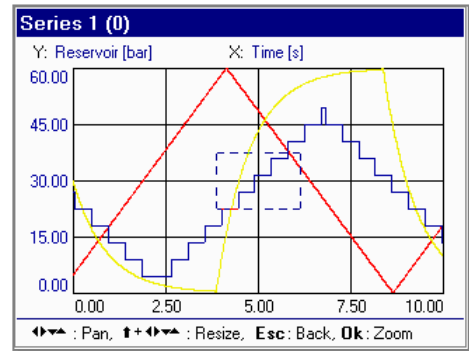
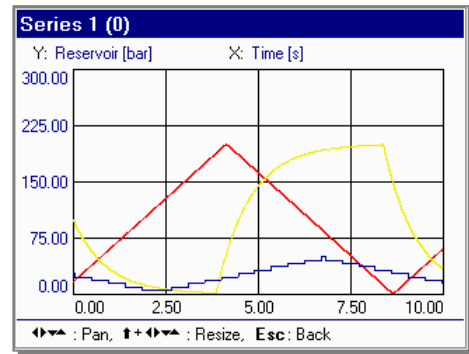
A frame, or zoom window, appears in the middle of the graph. The **position** and **size** of the zoom can be changed using the **5-way navkey** and the **Shift key (⇧)**, similar to Navigate.

Use the arrow keys ◀ & ▶ and ▼ & ▲ to shift the zoom window to any place in the graph.

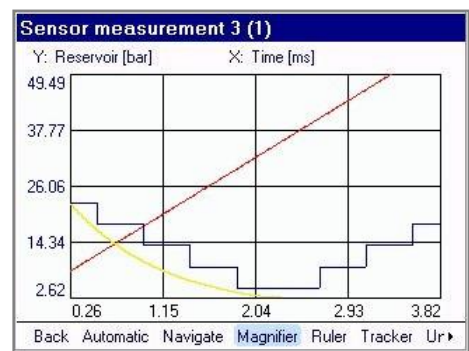
To **resize** the zoom window, in addition to shifting it using the **arrow keys**, hold the **Shift key (⇧)** down.

When the zoom is set and positioned in the zooming section, **OK** activates the **zoom** and the selected area is enlarged.

You also have the option of zooming several times in several steps, with the rendering being further enlarged each time.



**Shift:** use arrow keys  
**Decrease/Increase:**  
 Shift key + arrow keys



Zoom rendering of\_graph

**Ruler:**

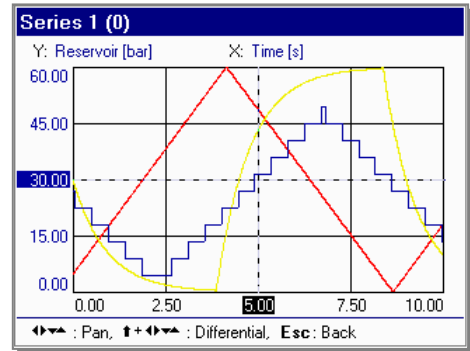
When the **Ruler** is activated, the screen appears as shown in the screenshot. The function bar contains the commands which can be accessed for the ruler.

Using the arrow keys by themselves enables you to determine the pressure at a particular point in time. If you move the ruler using the arrow keys parallel to the x- and y-axis to a specific measurement point in the curve, the associated x- and y-values are shown along the axis, colour-highlighted with the colour of the measurement curve.

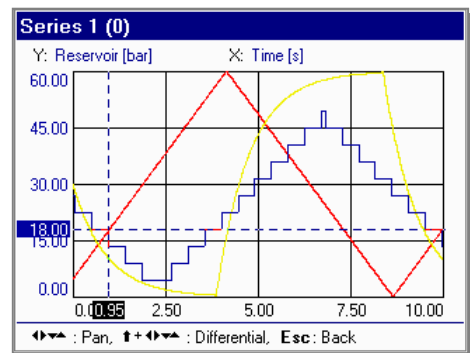
To measure a **pressure pulse in time and amplitude**, for example, use the **Differential** function. Proceed as follows:

First shift the x- and y-ruler to the starting point of the pressure pulse using the arrow keys. Then press the **Shift** key in addition to the arrow keys and hold it down. As soon as you actuate one of the arrow keys, a second x- and y-ruler appears, which you can move to the end point of the pressure pulse using the arrow keys (continue to press the **Shift** key).

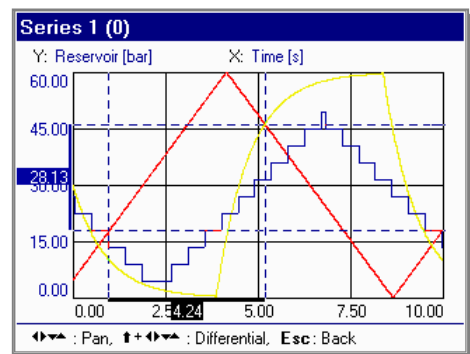
Now you can release the **Shift** key. The value of the pressure differential is shown relative to the starting value along the y-axis; the duration of the pressure pulse (now colour-highlighted) is shown along the x-axis. To exit the Ruler, press **Esc**.



Determining measurement values



Determining differential values



**Tracker:**

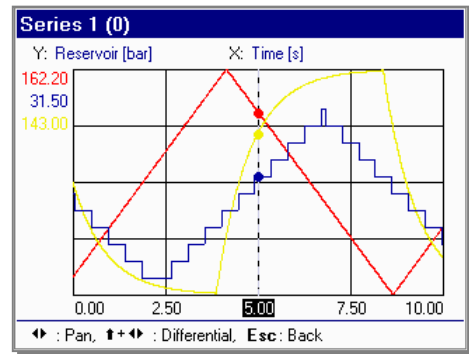
Using the **Tracker** is similar to using the ruler. The difference is that each **value** actually measured is **rendered by a point**. A ruler only appears for the purpose of "tracking" the curve in time. The tracker "jumps" from one measurement point to the next, with the respective measured value of each measurement channel shown along the y-axis to this point x in time (x-axis).

Here, too, the differential between a selected starting and end point of a particular curve section (e.g. of a pressure pulse) can be rendered and measured.

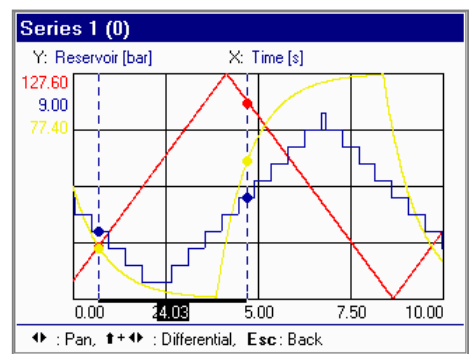
To exit the **Tracker**, press **Esc**.

**Undo:**

**Undo** enables you to undo any changes (e.g. **Automatic**, **Navigate**, **Zoom**) you have made, step by step.



Performing measurements using the tracker



**Display all:**

**Display all** renders the recording throughout the entire recording period with all the measured values. This option is used, for example, to restore the original condition of a recording. **Display All + OK** restores the measurement throughout the entire time period along with the complete measurement range scaling if the ranges had been previously limited.

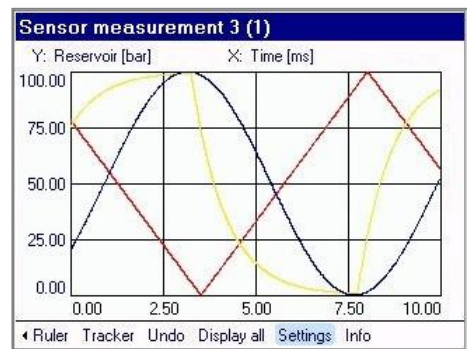
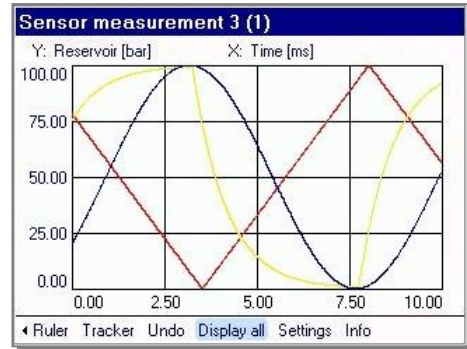
**Settings:**

**Settings** will display the measurement channels which have been used to make the recording. The channel rendered along the y-axis in the measurement curve is additionally labelled with "(Y)".

For rendering as a graph you can activate or deactivate a channel by checking or unchecking the box in front of it using the **arrow keys + OK** (checkmarked means that the channel will be shown). This enables you to specify whether all measurement channels are to be shown, or only one or two at a time. This feature enables you to keep track when several measurement channels are used (cf. example on left: "Tank" is deactivated).

For **curve rendering**, there are additional settings apart from which **channels or sensors** are to be shown (on/off), e.g.

- **Upper and lower limit**
- **Colouring and rendering** of curves and values
- **Time range**



**Sensor measurement 3 (1)**

- Control line (0 .. 100 bar)/(0 .. 100 bar) — (—)
- Reservoir (0 .. 100 bar)/(0 .. 100 bar) — (Y)
- T Tank (0 .. 100 °C)/(0 .. 100 °C) — (—)

Time range 0.00 to 10.00 seconds

Graph

**Sensor measurement 3 (1)**

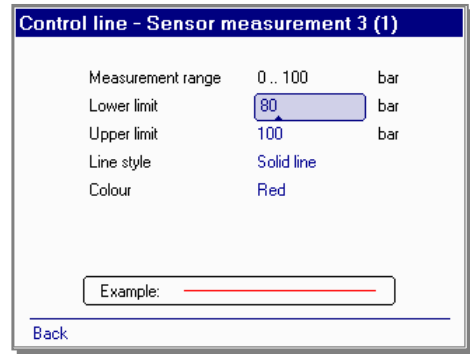
- Control line (0 .. 100 bar)/(0 .. 100 bar) — (—)
- Reservoir (0 .. 100 bar)/(0 .. 100 bar) — (Y)
- T Tank (0 .. 100 °C)/(0 .. 100 °C) — (—)

Time range 0.00 to 10.00 seconds

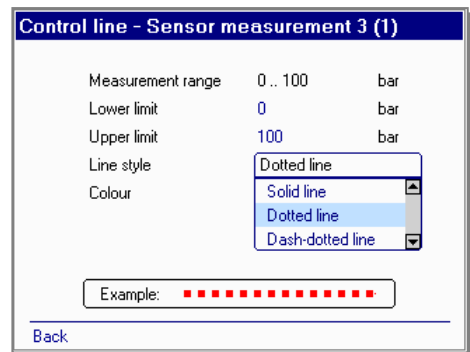
Graph



In the list of channels, select a channel to the right next to the box, and confirm with **OK**. In the next menu you see an overview of the **measurement range**, current **scaling** (upper and lower limit) of the y-axis, **line style** and **colour** in which the measured values of this sensor is shown. You can re-set all the parameter settings except for the measurement range.

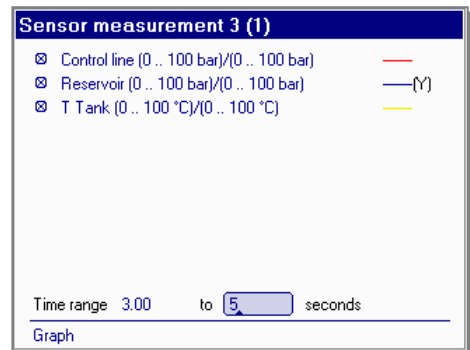


The default **scaling** (upper and lower limit) can be manually changed here via the keypad. This is one of the various options offered by the HMG 2500 to enlarge interesting parts of graphs. After confirming the **Lower limit** line with **OK**, you can change the value.



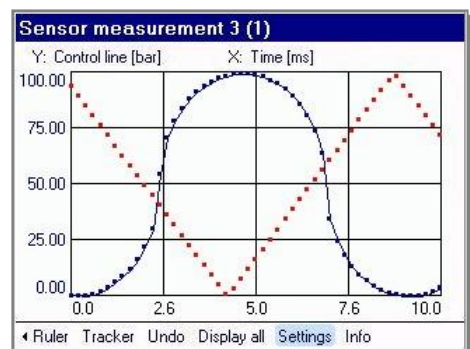
Conclude your entry via **OK**. You are now in the next line in the menu. Follow the same steps here to specify another upper limit, if necessary.

For **Line style** a drop-down list appears offering you a choice of **Solid line**, **Dotted line**, and **Dash-dotted line**. Make your selection, confirming with **OK**.



**Colour**: use the arrow keys to select various colours from a list (confirming with **OK**). This enables the rendering of every channel to be adapted according to your preferences.

**Back** takes you back to the list containing the measurement channels. The **Time range** is shown above the function bar; it can also be adapted manually as needed. Select a value and enter another time period of interest to you via the keypad (+ OK).



Curve rendering: "Dotted line" and "Dotted and solid"

After selecting **Graph** in the function bar, press **OK** to return to the graph.

Entering the following new settings for "**Sensor measurement 3(1)**" would result in the curve shown right:

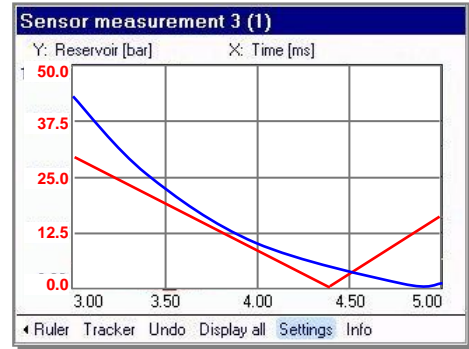
Scaling (lower and upper limit) of y-axis:

**0 - 50 bar - Control line**

Time range of x-axis:

**3.00 - 5.00 s - Time**

results in the curve shown in the picture.



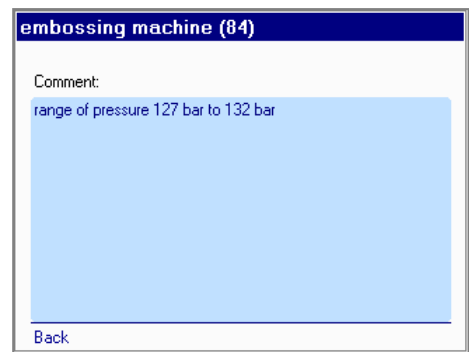
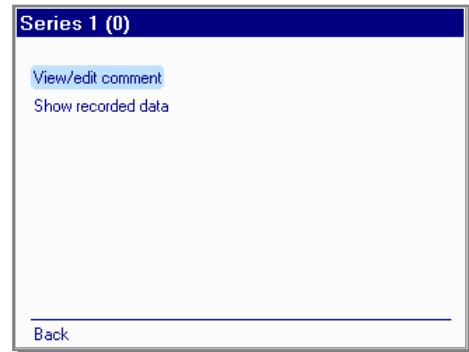
Curve: control line and tank

**Info:**

The last item **Info** in the graph screen is used to view and modify comments entered by you (comments are entered using the combination keypad). You can also have the recording data for a measurement displayed.

To exit the **Info** menu, use **Back**.

To exit the graph, use **Back** or **Esc**.





**Table**






Tables are useful for displaying individual measured values. Select **Table (+ OK)** in the function bar to select a stored recording and have its values displayed.

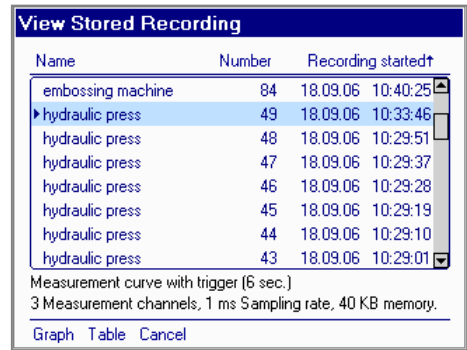
For a simple measurement curve recording you are shown a measured values table listing the measured values of the active channels in columns and the associated recording time in rows. No Min/Max values are shown here as they are not captured while recording the measurement curve.

If, however, you select the measurement of an event log, the measured values table looks like this:

A complete data record is shown per row for each event. Each individual data record consists of the date, time, trigger event and the associated measured values of the individual channels including the Min and Max values. The data record of **the event recorded last** is contained in the **bottom line** of the table.

When more than one channel are used, the tables of measurements in general, and event logs in particular, feature a series of columns and rows which don't become visible until the respective scroll bar is moved. Use the arrow keys of the 5-way navkey to select the arrows next to the scroll bar. After confirming via OK, you can scroll in the table up/down and left/right.

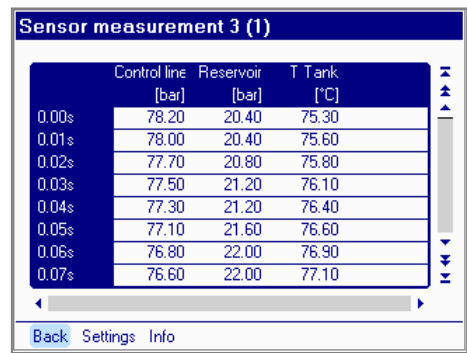
A single arrow  means scrolling line by line or column by column, a double arrow   means screen by screen, and   means "jump to the beginning or end of the table".



Name	Number	Recording started†
embossing machine	84	18.09.06 10:40:26
▶ hydraulic press	49	18.09.06 10:33:46
hydraulic press	48	18.09.06 10:29:51
hydraulic press	47	18.09.06 10:29:37
hydraulic press	46	18.09.06 10:29:28
hydraulic press	45	18.09.06 10:29:19
hydraulic press	44	18.09.06 10:29:10
hydraulic press	43	18.09.06 10:29:01

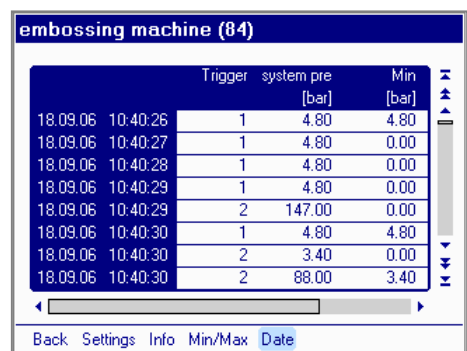
Measurement curve with trigger (6 sec.)  
3 Measurement channels, 1 ms Sampling rate, 40 KB memory.

Graph Table Cancel



	Control line [bar]	Reservoir [bar]	T Tank [°C]
0.00s	78.20	20.40	75.30
0.01s	78.00	20.40	75.60
0.02s	77.70	20.80	75.80
0.03s	77.50	21.20	76.10
0.04s	77.30	21.20	76.40
0.05s	77.10	21.60	76.60
0.06s	76.80	22.00	76.90
0.07s	76.60	22.00	77.10

Back Settings Info



	Trigger	system pre [bar]	Min [bar]
18.09.06 10:40:26	1	4.80	4.80
18.09.06 10:40:27	1	4.80	0.00
18.09.06 10:40:28	1	4.80	0.00
18.09.06 10:40:29	1	4.80	0.00
18.09.06 10:40:29	2	147.00	0.00
18.09.06 10:40:30	1	4.80	4.80
18.09.06 10:40:30	2	3.40	0.00
18.09.06 10:40:30	2	88.00	3.40

Back Settings Info Min/Max Date

The date and Min/Max values can be hidden so as to make tables easier to read. You can **hide** or **display Min/Max** and the **Date** directly in the function bar with **OK**.

You can also hide or display individual channels for display in the table using the **Settings** function (a checkmark means that the channel is displayed; activate/deactivate with **OK**). You can also jump to a specific place in the table via the date and time setting in the column next to the beginning of the table. Select with **OK**, enter the desired time using the combination keypad, and finish with **OK**. Select **Table** to take you back to table display.

	Trigger	system pr [bar]	Min [bar]	Max [bar]
10:40:26	1	4.80	4.80	200.00
10:40:27	1	4.80	0.00	200.00
10:40:28	1	4.80	0.00	200.00
10:40:29	1	4.80	0.00	200.00
10:40:29	2	147.00	0.00	200.00
10:40:30	1	4.80	4.80	147.00
10:40:30	2	3.40	0.00	4.80
10:40:30	2	88.00	3.40	88.00

Back Settings Info Min/Max Date

Series 1 (1)

- Sensor A (0.00 .. 100.00 bar)
- Sensor B (0.00 .. 100.00 bar)
- Sensor C (0.00 .. 100.00 bar)

Beginning of table 0.00 seconds

Table

**Info** is used to view and modify comments you have previously entered (make your entries using the combination keypad). It also enables you to display the recorded data for a measurement. To exit the **Info** menu, use **Back**.

To exit the table view of a recording, use **Back** or **Esc**. You are now back in the selection list of stored recordings. To exit it, press **OK** or **Esc**.

To exit the **View Recording** menu, use **Cancel** or **Esc**.

Series 1 (1)

Recording Measurement curve with trigger

Measurement channels: 3

Records: 1000

Memory used: 8 KB

Started at: 18.09.06 11:58:47

Ended at: 18.09.06 11:58:59

Triggered at: 18.09.06 11:58:49

Trigger activated: 1

PreTriggerCount: 0

Back

### 7.2.3 Deleting Recording

Any recording can be deleted when no longer needed. To do this, select **Delete recording** in the **Recording** menu + **OK**. You are now shown a list of all the stored recordings. Now select the recording to be deleted. A small arrowhead to the left of the file name shows you what you have selected.

Before selecting a recording, you can sort the list by:

- **Name**
- **Number**
- **Recording started**

and in ascending (▲) or descending order (▼) in each case.

Hit **Esc** to change from the recording list to the menu in the next level up. The arrow key (▲) enables you to access the **header row**. Press **OK** to sort the list according to Name, Number or Recording started. To do this, select Name, Number or Recording started in the header row using the **arrow keys**. To sort in ascending or descending order, click in the relevant **column header** with **OK** (pressing OK more than once will reverse the sorting order). An arrow next to the column header indicates whether sorting is in ascending (↑) or descending (↓) order. To return to the selection list, press (▼) + **OK**. Select the measurement to be deleted and confirm with **OK**. Several recordings can be selected in one go by simultaneously pressing the **Shift** key. Confirm with **OK**, you now have access to the **Delete** function. Hit **OK** again and the selected recordings are deleted.



**Caution!**

At this stage, there is no "last chance" dialogue to check if you really want to delete the recording.

Delete Stored Recordings			
Name	Number	Recording started	
Sensor measurement 3	3	18.09.06	12:04:13 ▲
▶ Sensor measurement 3	2	18.09.06	12:03:46
Sensor measurement 3	1	18.09.06	12:03:17
Series 1	0	18.09.06	12:02:19

Simple measurement curve (10 sec.)  
5 Measurement channels, 10 ms Sampling rate, 11 KB memory.

Delete Cancel

Delete Stored Recordings			
Name↑	Number	Recording started	
▶ Series 1	0	18.09.06	12:02:19
Sensor measurement 3	3	18.09.06	12:04:13
Sensor measurement 3	2	18.09.06	12:03:46
Sensor measurement 3	1	18.09.06	12:03:17

Measurement curve with trigger (10 sec.)  
3 Measurement channels, 10 ms Sampling rate, 8 KB memory.

Delete Cancel

Delete Stored Recordings			
Name	Number	Recording started	
▶ hydraulic press	50	18.09.06	12:16:29
hydraulic press	49	18.09.06	12:15:28
hydraulic press	48	18.09.06	12:10:37
hydraulic press	47	18.09.06	12:08:59
hydraulic press	46	18.09.06	12:07:50
hydraulic press	45	18.09.06	12:07:32
hydraulic press	44	18.09.06	12:07:14
hydraulic press	43	18.09.06	12:07:04

Event log (52 sec.)  
1 Measurement channels, 184 Events, 4 KB memory.

Delete Cancel

Delete Stored Recordings			
Name	Number	Recording started	
hydraulic press	50	18.09.06	12:16:29
hydraulic press	49	18.09.06	12:15:28
▶ hydraulic press	48	18.09.06	12:10:37
hydraulic press	47	18.09.06	12:08:59
hydraulic press	46	18.09.06	12:07:50
hydraulic press	45	18.09.06	12:07:32
hydraulic press	44	18.09.06	12:07:14
hydraulic press	43	18.09.06	12:07:04

Event log (286 sec.)  
1 Measurement channels, 953 Events, 13 KB memory.

Delete Cancel

### 7.3 Extras Menu

The following options are available to you in the function bar of the **Extras** menu:

- **Stopwatch**
- **About HMG 2500.**  
The stopwatch offers you the following functions: **Start**, **Stop**, **Interim reading** and **Reset**.
- **SMART sensors**
- **Update Instrument Software.**  
(only after downloading new firmware)

#### Stopwatch

To record the time you needed to trouble-shoot an error (locate it), you can start the stopwatch. Use **Back** or **Esc** to switch back to normal measurement mode. The stopwatch continues to run in the background. As soon as you have completed troubleshooting, call up the **Stopwatch** menu again and stop the clock using the **Stop** command. Use **Reset** to set the stopwatch back to zero.

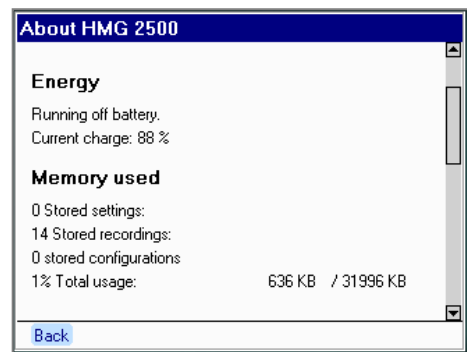
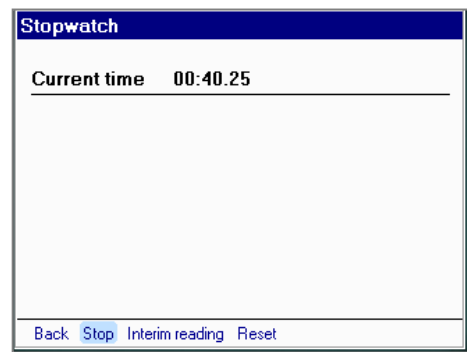
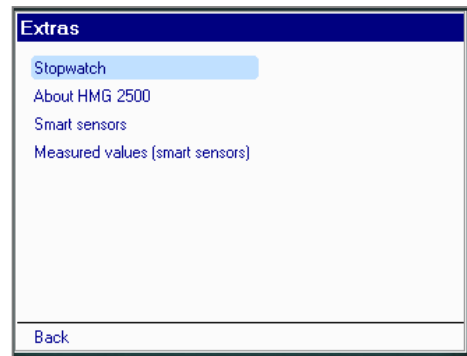
#### About HMG 2500

The About HMG 2500 menu provides an overview of available **power supply**, **how much memory** is still free, when the **Min and Max** values were reset last, and the **address of HYDAC ELECTRONIC**.

#### SMART sensors

##### Measured values (SMART sensors)

The menu points **SMART sensors** and **Measured values (SMART sensors)** are described in more detail in the next section (6.4).



## Update Instrument Software

If a firmware update has been transferred to your HMG 2500 via the HMGWIN software, you will still see the **Update Instrument Software** item in the **Extras** menu. This means that an update is present which you can now activate in the HMG 2500.

### **CAUTION:**

All data stored in the HMG 2500 (measurements, settings, ...) are deleted when the update is imported. Back up this data to a PC using HMGWIN before starting the update. Connect the power supply to the HMG 2500 to ensure a secure voltage supply during the update.

To activate the update, select **Update Instrument Software** and then **Start + OK**. Once the update has been carried out, the HMG 2500 switches off automatically. After the unit is re-started again you can continue working.

## 7.4 SMART sensors

SMART sensors are HYDAC sensors, capable of outputting several different measured variables which are displayed as sub-channels of one measurement channel on the HMG. Depending on the sensor type, these variables are stored for an extended period in the unit's internal memory. Regardless of the sensor used, its parameters can be set.

**CAUTION:** To connect SMART sensors to HMG 3010 see “Connection requirements” and “Wiring diagrams” in each sensor user manual.

The following details refer to the SMART sensor HYDACLab® HLB 1300, however they can apply equally to other sensors.

The measured value display of SMART sensors is shown in the screenshot on the right (example: HLB 1300).

The display settings and measured value renderings can be changed as described in section 6.1.2 above.

Since every SMART sensor goes through an initialization phase until the actual measured values are displayed, we recommend resetting the Min and Max values after this phase has completed.

### 7.4.1 Connecting SMART Sensors

To connect SMART sensors with the HMG 2500, select the **SMART Sensors** option in the **Extras** menu.

Then enter the **connector** to which the SMART sensor is connected.

You also have the option of entering a **sensor bus address**. The default setting is **No address**.

Bus addresses must be assigned when the SMART sensor is operated in a bus system. *(This function is not described further here).*

After selecting **Connect** you see some information about the connected SMART sensor above the function bar. Click **Continue** to access the options menu of the SMART sensor.

**Disconnect** enables you to break the connection to the SMART sensor.

Current Measured Values		
Designation	Value	Unit
Temp	27.32	°C
RelVisco	0.00	%
RelDk	0.00	%
RelHum	35.66	%

Settings Recording Extras Min/Max

Extras	
Stopwatch	
About HMG 2500	
Smart sensors	
Measured values (smart sensors)	

Back

Smart sensors	
Port	Sensor port A
Sensor bus address	No address

Back Connect

Smart sensors	
Port	Sensor port A
Sensor bus address	No address

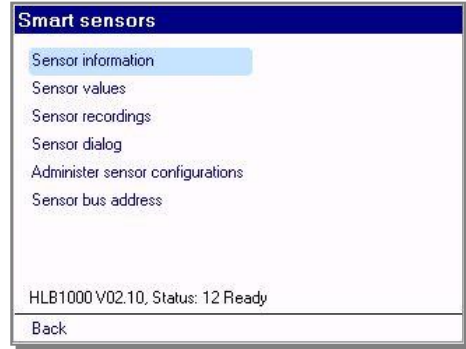
HLB1000 V02.10, Status: 12 Ready

Back Disconnect Continue

### 7.4.2 SMART Sensors Menu

You are now in the SMART Sensors menu and can enter settings to adapt the sensor to your requirements.

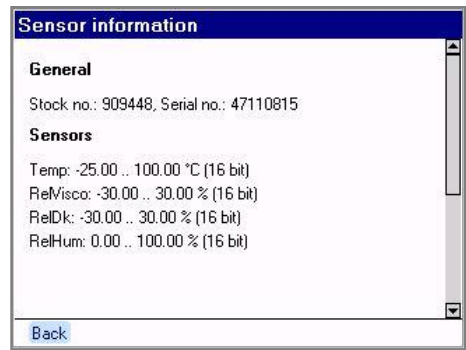
The items contained in the menu vary in accordance with the sensor type connected, i.e. not all of the menu items described below may be available.



#### 7.4.2.1 Sensor Information

This menu provides the following information about the connected SMART sensor:

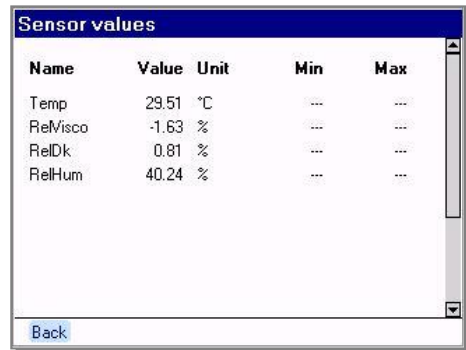
- Part number
- Serial number
- Information about the various measurement channels with regard to their type and measurement range.



#### 7.4.2.2 Sensor Values

The actual measured values along with the associated units of measurement of the connected SMART sensor are shown here.

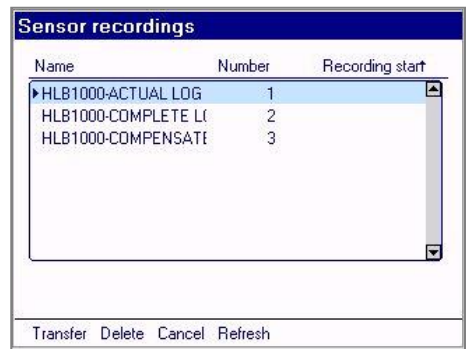
If the SMART sensor records Min/Max values internally, they are also shown; if not, a dotted line is shown.



#### 7.4.2.3 Sensor Recordings

In this menu you can transfer long-term recordings created by the SMART sensor to the HMG 2500, or delete them from the SMART sensor's memory.

**Refresh** enables you to check whether new recordings are present.



After selecting a recording and the **Transfer** option, you see the following screen: Now you can determine whether the selected recording is to be stored in the HMG 2500 under the combination of name+number, or whether you would like to assign a new designation.

#### 7.4.2.4 Sensor Dialogue

This menu enables you to modify the configuration of the SMART sensor.

Note that what is shown in this menu depends on the SMART sensor connected. For detailed information on the possible settings, please refer to the particular sensor documentation.

#### 7.4.2.5 Administer Sensor Configuration

Here you have the possibility of reading the current configuration of the SMART sensor, or transferring saved settings into the SMART sensor.

You can also have a saved configuration displayed or deleted.

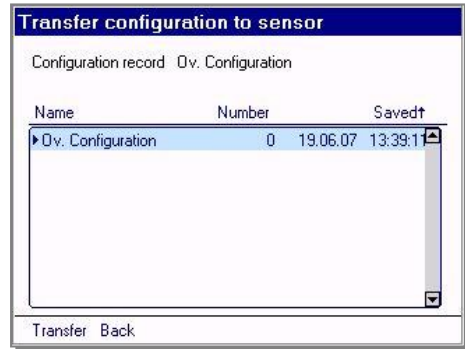
#### Read configuration from sensor

This menu item enables you to read the configuration of the SMART sensor and transfer it to the HMG 2500. You can accept the suggested name+number combination, or enter a new one.



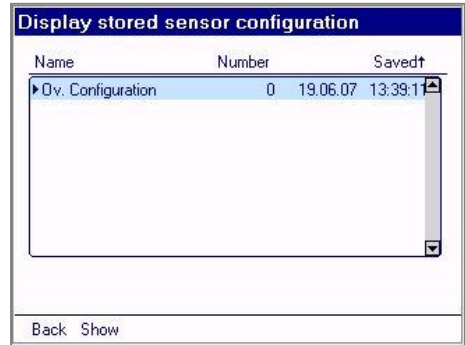
**Transfer configuration to sensor**

This menu enables you to transfer existing SMART sensor configurations to the SMART sensor. This is particularly useful when you want to put new SMART sensors into operation and want to reuse settings previously entered for other SMART sensors.

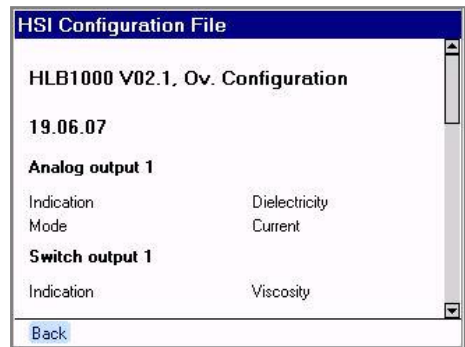


**Display stored sensor configuration**

This enables you to display a configuration which is stored in the HMG 2500.

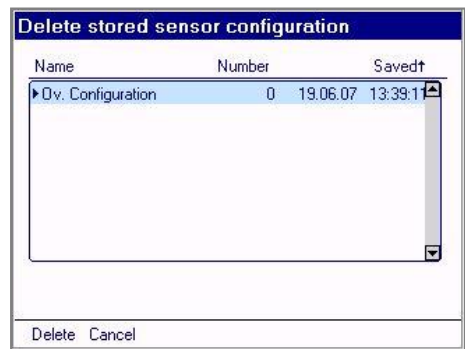


You are then shown detailed information on the sensor configuration.



**Delete stored sensor configuration**

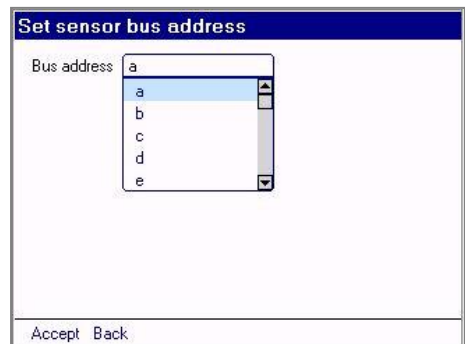
This menu enables you to delete a sensor configuration. Select the configuration concerned and select **Delete** on the function bar.



**7.4.2.6 Set sensor bus address**

This menu enables you to assign a bus address to a sensor. To do this, select a value from the list and click on **Apply** on the function bar.

Bus addresses must be assigned when the SMART sensor is operated in a bus system.  
 (This function is not described further here).



## 7.5 Technical Details

### Sensor inputs

The HMG features:

- 3 sensor input jacks (channel A – C) for up to 3 HYDAC HSI or SMART sensors and
- 1 input jack with a digital input (channel D).

The sensors are connected using an standard M12x1 male connector (5 pole).

Kanal A bis C:

- Automatic detection for HSI sensors (pressure, temperature, flow rate transmitters and SMART sensors)
- Input accuracy:  $\leq \pm 0.1$  % FS max.

Channel D:

- Frequency channels (speed (rpm) measurement, counting function)  
Frequency range: 1 30,000 Hz  
Switching threshold / switch-back threshold: 2V/1V  
Max. input voltage: 50 V; display delay max. 2 s.
- Input accuracy:  $\leq \pm 0.1$  % FS max.

Channel E (virtual):

- Differential measurement channel A-B
- Power measurement channel A\*B

### Battery life (from fully charged)

- HMG 2500 without sensors                      approx. 11 hours
- HMG 2500 with 2 sensors                      approx. 9 hours
- HMG 2500 with 4 sensors                      approx. 7 hours

### Sampling rates

- Sampling rate:                      0.1 ms .. 1 min  
(other sensor inputs inactive); e.g. for pressure peak measurements

The sampling rate which can be set is dependent on the active measurement channels. The following applies:

- 0.1 ms                      1 input channels
- 0.2 ms                      2 input channels
- 0.5 ms                      3 input channels
- 1.0 ms                      for SMART sensors

### Measured value memory

- Single recording:                      up to 500,000 measured values
- Archive memory:                      128 MB  
(for min. 100 individual recordings)

**PC link interfaces**

- USB port
- Serial interface (RS 232)

For communication and evaluation using the HYDAC **HMGWIN** or **CMWIN** software and using HSP log.

**Dimensions and weight**

- Dimensions: 246 x 174 x 58 mm
- Weight: 1100 g

**Operating and environmental conditions**

- Operating temperature: 0 ... 50 °C
- Storage temperature: -20 ... 60 °C
- Relative humidity: 0 ... 70 %

**Technical standards**

- EMC: EN 61000-6-1/2/3/4
- Safety: EN 61010
- Protection class: IP 40

**Voltage supply**

- 12 ... 30V DC

## 8 Cleaning

The HMG 2500 must not be cleaned with aggressive agents (e.g. alcohol, screen cleaner,...). For cleaning we recommend using a slightly damp cloth.

## 9 Accessories

- **Pressure Transmitter** (with HSI-interface) of the measuring ranges:  
 - 1 ... 9 bar, 0 ... 16 bar, 0 ... 100 bar, 0 ... 250 bar, 0 ... 400 bar, 0 ... 600 bar  

Part no. 909429	Part descr.	HDA 4748-H-0009-000 (- 1 ... 9 bar)
Part no. 909425	Part descr.	HDA 4748-H-0016-000
Part no. 909554	Part descr.	HDA 4748-H-0060-000
Part no. 909426	Part descr.	HDA 4748-H-0100-000
Part no. 909337	Part descr.	HDA 4748-H-0250-000
Part no. 909427	Part descr.	HDA 4748-H-0400-000
Part no. 909428	Part descr.	HDA 4748-H-0600-000
  
- **Temperature Transmitter** (with HSI-interface)  

Part no. 909298	Part descr.	ETS 4548-H-000 (-25 to +100 °C)
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- **Flow Rate Transmitter** (with HSI-interface)  

Part no. 909293	Part descr.	EVS 3100-H-1 (006 - 060 l/min)
Part no. 909403	Part descr.	EVS 3100-H-2 (040 - 600 l/min)
Part no. 909404	Part descr.	EVS 3100-H-3 (015 - 300 l/min)
Part no. 909405	Part descr.	EVS 3100-H-5 ( 1.2 - 020 l/min)
Part no. 909406	Part descr.	EVS 3110-H-1 (006 - 060 l/min)
Part no. 909407	Part descr.	EVS 3110-H-2 (040 - 600 l/min)
Part no. 909408	Part descr.	EVS 3110-H-3 (015 - 300 l/min)
Part no. 909409	Part descr.	EVS 3110-H-5 ( 1.2 - 020 l/min)
  
- **Rpm Probe**  

Part no. 909436	Part descr.	HDS 1000-002 (male M12x1)
Part no. 904812	Part descr.	HDS 1000 reflective foil set (quantity 25)
  
- **Sensor Simulator for 2 HSI Transmitters**  

Part no. 909414	Part descr.	SSH 1000-H-3 (simulator for HMG 2500) ideal for training purposes
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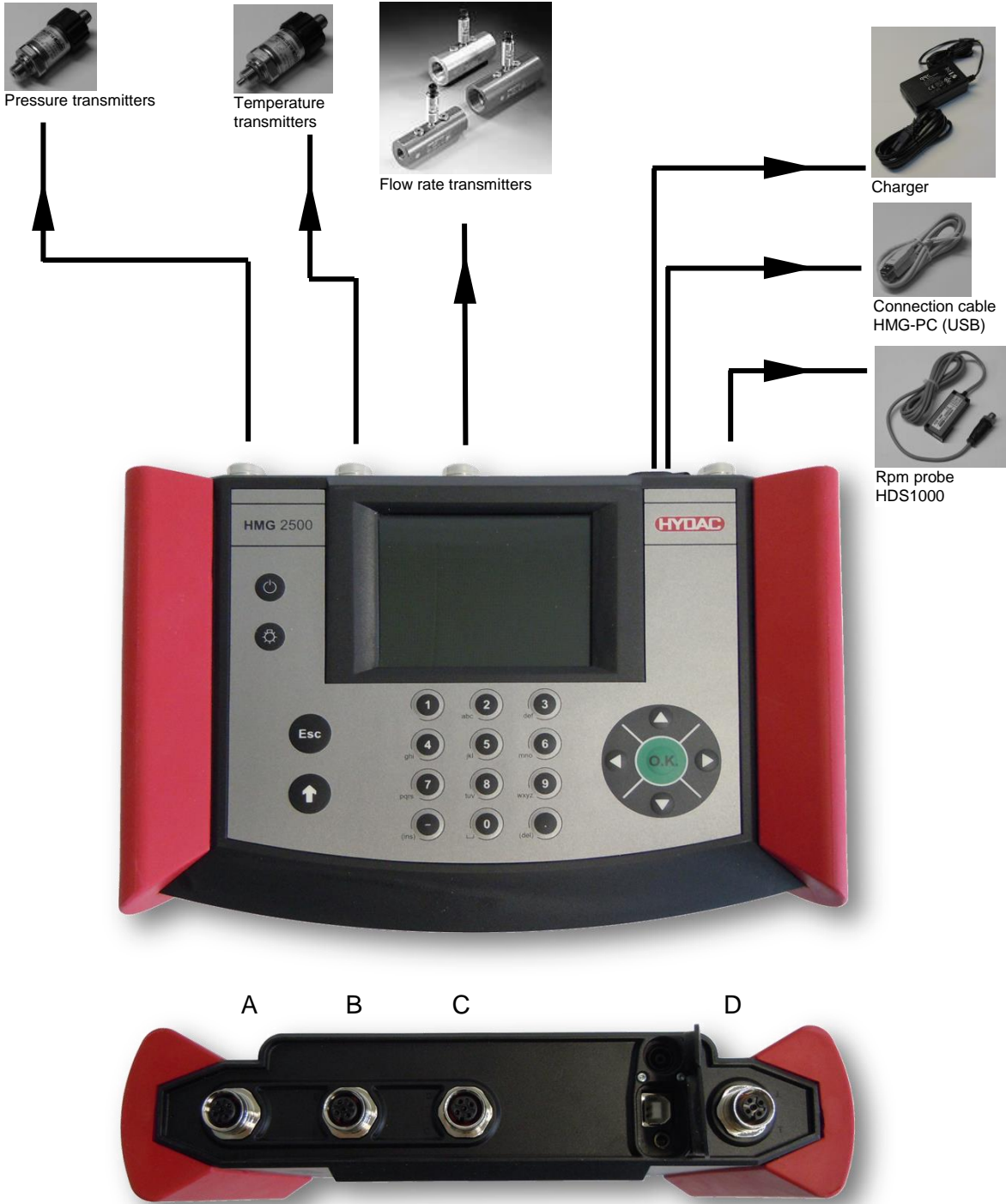
- **Other accessories**

Part no.	6042959	Part descr.	Case for HMG 30x0 / 2500 & accessories
Part no.	909795	Part descr.	Bag with carrying strap for HMG 30x0 / 2500
Part no.	909739	Part descr.	ZBE 31 (car charger for HMG 30X0 / 2500)
Part no.	3304374	Part descr.	ZBE 26 (Y adapter blue for HLB 1000)
Part no.	909737	Part descr.	ZBE 36 (connection adapter for AS 1000)
Part no.	910000	Part descr.	ZBE 41 (Y adapter yellow for CS 1000)
Part no.	6040851	Part descr.	ZBE 30-02 (sensor cable M12x1, 5-pole) 2m
Part no.	6040852	Part descr.	ZBE 30-05 (Sensorkabel M12x1, 5-polig) 5m
Part no.	903083	Part descr.	Hydraulic adapter kit for the HMG
		Contents:	
		2 adapter hoses DN 2 / 400 mm	1620 / 1620
		2 adapter hoses DN 2 / 1000 mm	1620 / 1620
		2 pressure gauge direct connection adapters	1620 / G 1/4
		2 adapters	1615 / 1620
		2 bulkhead couplings	1620 / 1620

- **Spare parts**

Part no.	6054296	Part descr.	Power supply for HMG 30X0 / 2500
Part no.	6040585	Part descr.	Connection cable HMG 30X0 / 2500 – PC (USB)

### 10 Examples of Connections



**Power supply connector:**

JEITA RC-5320 A

Pin 1 (outer contact): 0V (GND)

Pin 2 (inner contact): +12 .. 30 V DC

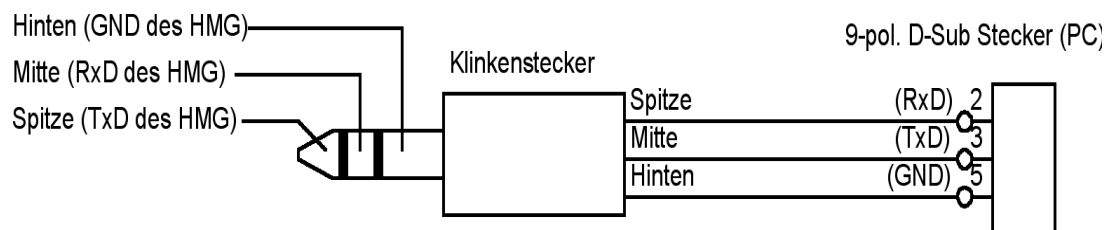
**USB end device connector:**

Standard USB end device connector for standard USB end device connector cable.

**Jack socket 3.5 mm (RS 232):**

For connecting the HMG to the serial port (RS 232) of PC.

Connecting diagram/pin assignment:



Ground potential of the sensor ports and interfaces (USB/serial) are connected galvanically. If sensors and interfaces are used simultaneously (online measurement), please ensure equipotential bonding (see chapter 6.1.4 "PC Connection") to avoid transient currents between the electricity grids as the device could be destroyed.

**HYDAC ELECTRONIC GMBH**

Hauptstr. 27  
D-66128 Saarbruecken  
Germany

Web: [www.hydac.com](http://www.hydac.com)

E-Mail: [electronic@hydac.com](mailto:electronic@hydac.com)

Tel.: +49-(0)6897-509-01

Fax: +49-(0)6897-509-1726

**HYDAC Service**

If you have any questions concerning repair work, please do not hesitate to contact HYDAC Service:

**HYDAC SERVICE GMBH**

Hauptstr. 27  
D-66128 Saarbruecken  
Germany

Tel.: +49-(0)6897-509-1936

Fax: +49-(0)6897-509-1933

**Note**

The information and particulars provided in this manual apply to the operating conditions and applications described herein. For applications and operating conditions not described, please contact the relevant technical department.

If you have any questions, suggestions, or encounter any problems of a technical nature, please contact your Hydac representative.

Subject to technical modifications.