

User manual

MSR 12

MSR® [operating instructions](#)



MSR® **Instructions**

MSR® [PC software](#)

[Setup](#)

Setup

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Reader

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Online

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PC...

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MSR® **Modules**


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Important notes regarding this user manual

In this manual notes of particular importance are presented as follows:

 WARNING	Indicates that equipment may suffer damage or that there is a risk of injury to the operator or user should the instructions not be followed correctly.
--	---

 CAUTION	Indicates that equipment may suffer damage or that data loss may occur should the instructions not be followed correctly.
--	---

Conventions

Term / Symbol	Description	Example
Commands, menu items, functions, field names	Commands, menu items, functions, field names are shown in bold.	Record
⬅️ ➡️ ⬇️ ⬆️	Press the symbols on the arrow keypad in the direction shown.	➡️ Press right arrow on the arrow keypad.
⬆️	Press the arrow keypad in the centre, without pressing the arrows. This functions as the Enter key.	⬆️ Press the arrow keypad in the centre.
Setup	Selected function	
Menu > Record > Start	Select the Record function by pressing ⬇️ and ⬆️, open the Record menu using ⬆️, select Start and press ⬆️.	
-> X	See page X	-> 5
🔍	<ul style="list-style-type: none"> •Reference to further information •Further information 	

Safety instructions and warnings



WARNING

- Read the operating instructions carefully before using the MSR12 or the MSR software. This will protect you personally and avoid damage to the unit.
- The MSR12 is a unit for recording and displaying measurement parameters and may not be used for safety-related applications.
- Before using the MSR12 check the unit itself and all cables for visible signs of damage and never operate a damaged MSR12. A damaged MSR12 can endanger operator safety! Should the MSR12 not function perfectly or appear to be damaged, send it to MSR Electronics GmbH for repair.
- Ensure that no fluids enter the MSR12's casing. Fluids cause corrosion damage and short-circuits inside the MSR12.
- The MSR12 casing, sensors, cables and mains adapter must never be opened or modified. The manufacturer cannot be held liable for damage resulting from use other than that for which the unit is intended, or from improper operation of the unit.
- Use only original MSR12 sensors, cables and mains adapters.
- Never use an MSR12 with a leaking battery. Should a battery leak be detected ensure that the electrolyte does not come into contact with the skin, the eyes or the mouth. Should this occur, thoroughly rinse the affected area with water for at least 15 minutes. Consult a doctor. Do not breathe in any vapours emitted. Immediately clean the electrolyte from the MSR12 using a soft cloth and dispose of the cloth subsequently.



CAUTION

- Turn off the MSR12 before connecting any plugs or sensors.
- The mains voltage stated on the mains adapter must not be exceeded.
- Observe the type plate on the mains adapter.
- Ensure the proper disposal of an obsolete MSR12, together with the cable and mains transformer ->15.

Operating Instructions

MSR 12



Overview

The MSR 12 Modular Signal Recorder is a modular unit for measuring, displaying and recording various physical measurement parameters. Measurements may be carried out concurrently or using different measurement frequencies.

Due to its modular design the MSR 12 can easily be customised by adding or replacing modules to provide the required functionality.

Each module has a range of sensors – mostly of a similar type. For test purposes the gradient curve and the actual measurement parameters for the selected sensor may be shown on the unit's display. The readings are processed by the module's own processor and saved in the module's memory.



MSR 12

The base module of the MSR 12 includes a temperature sensor, a pressure sensor and three accelerometers (X, Y and Z-axes). A list of additional modules and sensors may be found at www.msr.ch.



Mains adapter

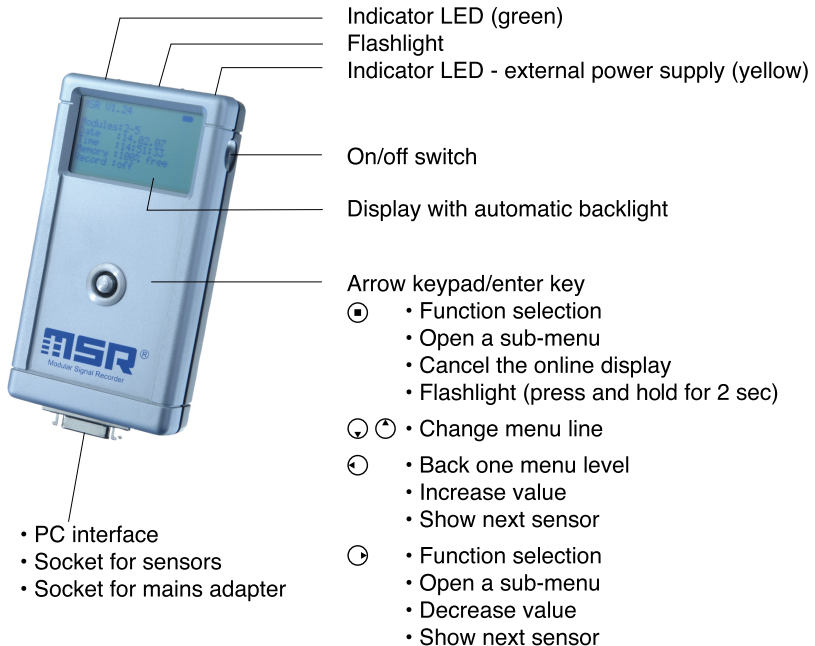


PC connection cable



CD with MSR software

Controls



Connecting external sensors

Connect all the required sensors to the MSR 12 using the cables supplied.

The MSR 12 only recognises sensors that are connected when the unit is switched on.



Socket for sensors

Turning the unit on

Connect all the required sensors before turning on the MSR 12.

Press down the on / off switch and wait until the MSR 12 display turns on:



On/off switch

The following information appears on the display:

Software version	MSR VX.XX 0	█	◀
Battery symbol, battery level			
Number of modules and sensors connected	Modules: 2-5		
Current date	Date: 21.03.03		
Current time	Time: 09:49:28		
Memory available	Memory: 96% free		
Recording on / off	Record: off		
Using mains power			

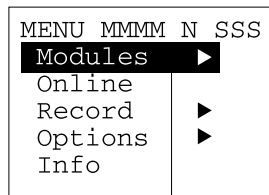
Note: The MSR 12 automatically reverts to this display after 30 seconds idle time.

Selecting the main menu

Press **⏏** after the unit has been turned on to open the main menu.

The following instructions assume that the MSR 12 is displaying the main menu and that all sensors are connected.

Pressing **⏏** will return to the initial display that appears when the unit is turned on.



▶ Opens the selected menu item.

Displaying modules and sensors

Selecting the module

Open the list of all available modules by pressing **Modules** \odot (one module consists of several sensors, which are usually of the same type). Select the required module using \uparrow and \downarrow and open the list of sensors by pressing \odot .

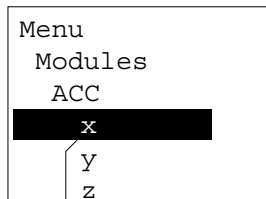


Selected module

Selecting the sensor to display

Press \uparrow and \downarrow to select the sensor for which you wish to display measurement parameters and curves and confirm your selection by pressing \odot .

Note: The online display can be turned on by pressing **Online** \odot .



Selected sensor

Displaying an online measurement

In addition to recording measurement parameters to memory the MSR 12 can also display the reading and gradient across a sensor for test purposes.

Turning the online measurement mode on

Turn the **Online** measurement function on by pressing \blacksquare , select the desired sensor with \odot and \ominus and adjust the display mode to your requirements.

Adjusting the display mode

Select the display mode using \odot and \ominus . The display mode options can be changed by pressing \odot and \ominus .

- **Entering the sampling rate Δt**

Select the display mode option $\Delta t = \dots$ using \odot and \ominus , then use \odot and \ominus to set the sampling rate that you want to display.

- **Entering the ΔY range**

Select the display mode option $\Delta Y = \dots$ using \odot and \ominus , then use \odot and \ominus to set the range that you want the MSR 12 to display.

- **Entering the lowest value Y_{min}**

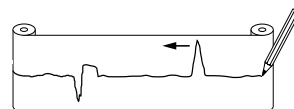
Select the display mode option $Y_{min} = \dots$ using \odot and \ominus , then change the value using \odot and \ominus .

Selecting the graphical representation mode

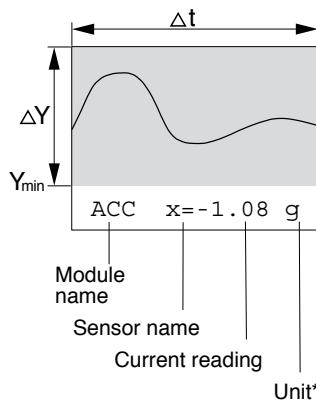
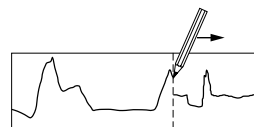
The MSR 12 can display graphic curves in either **Rolling** or **Scrolling** mode.

Rolling and **Scrolling** is accessed via **Setup** \odot > **Display** \odot . Select the required graphical representation mode and confirm by pressing \blacksquare .

With the **Scrolling** option – in the style of a traditional data recorder – a “paper roll” is traced on the right-hand edge of the screen. The “paper” transits the display from right to left



With the **Rolling** option the “trace” transits the display from left to right. Once it has reached the right-hand edge it returns to the left and begins to overwrite the old curve.



* Can be changed via the MSR Setup. -> 10

Exiting the online measurement mode

Exit the online measurement mode by pressing \blacksquare . The display returns to the main menu.

Recording measurement parameters

Each module incorporated into the MSR12 has its own dedicated memory in which the measurement parameters of the sensors attached to that module are recorded.

Starting data recording (Record)

From the main menu select **Record** (⌂) > **Start** (▶).

During the recording process the green LED flashes.

Cancelling data recording

From the main menu select **Record** (⌂) > **Stop** (◀).

Turning the MSR 12 off will also stop data recording.

If the memory is full then this can also stop data from being recorded. See also [->14](#) (troubleshooting)

Notes on recording data

The data recording process is not affected by the status of the online display.

Using the MSR PC **Setup** software (->23) it is possible to select the modules from the PC for which the MSR 12 is to record the measurement parameters. In addition, the frequency of measurement and recording can be set and the behaviour of the memory controlled.

The measurement parameters can be transferred to a PC once the data recording process is complete (MSR PC software > **Reader**).(->24)

Adjustments

Measurement units

The measurement unit of the selected sensor can be adjusted to suit requirements.

From the main menu select **Options** (⌂), **Units** (⌂).

Select the required unit by pressing (⌂) and (⌂).

The measurement unit set then applies to all similar sensors connected to the currently active module.

Confirm your selection by pressing (▶).

Maintenance

User checks

- Check the MSR 12 before each use.
- Before using the MSR 12 check both the unit itself and all cables for visible signs of damage.
- Check the functions of the MSR 12.
- Never use an MSR 12 that is damaged or not functioning perfectly. Never use damaged accessories.
- Ensure that the battery is sufficiently charged for the required period of use.

Should the MSR 12 not function perfectly or should damage become apparent send the unit to MSR Electronics GmbH for repair. Repairs may only be carried out by MSR Electronics GmbH or an authorised dealer. Defective or damaged components may only be replaced with manufacturer's original parts.

Cleaning



CAUTION

- Ensure that no fluids enter the MSR 12's casing. Fluids will cause corrosion damage and short circuits.

- Never use corrosive or abrasive cleaning agents or polishes.
- Cleaning agents containing additives such as alcohol will cause the case to become matt and/or brittle.


- Clean the MSR 12 when necessary.
- Before cleaning, turn the unit off and disconnect it from the mains supply.
- Use a cleaning agent suitable for plastic or a cloth dampened with water and soap.

Charging the battery



Before first use:

The battery is not fully charged on delivery and should be charged for approx. 5 hours before using the MSR 12 for the first time.

Use the mains adapter supplied and charge the MSR 12:

- Before each use
- When the battery level indicator shows 
- At least every two months

Method:

- Turn the MSR 12 off and remove the plugs for the sensor and the PC cable.
- Connect the mains adapter to the MSR 12 and plug the adapter into a mains out-let. The yellow LED and the arrow next to the battery symbol  indicate that the MSR 12 is using mains power.
- Charging is complete when the battery symbol indicates full .
- Unlock and unplug the mains adapter once charging is complete.

Notes:

- Please observe also the type plate on the mains adapter.
- Recorded data is non-volatile and remains in the unit's memory even when the battery is exhausted.

Battery and mains operation

The MSR 12 is powered by its built-in batteries. When charging the batteries, the mains adapter supplied is connected to the unit in place of the external sensors.



WARNING

For medical applications the MSR 12 may not be powered using the mains adapter.

Using an optionally available plug, the unit may be powered by the mains adapter even when external sensors are attached.

Specifications

Size: MSR 12: (L x H x W) ca. approx. 137 x 74 x 27mm
Connecting cable: approx. 50cm

Weight: MSR 12: approx. 180g

Power supply: Battery*: 3.6V 880mAh NiMH

Battery life (unit turned off): approx. 2 months

Backup battery*: 3.0V LiMn

* Not user replaceable.

Classification: Class III equipment

For information relating to the modules and sensor specifications, please refer to the module chapter.

Operating, transport and storage conditions

- Protect the MSR 12 from excessive exposure to the sun and other sources of heat. Avoid heavy impacts.
- Do not place heavy objects on top of the MSR 12.
- Only store the MSR 12 in a dry, dust-free environment.
- Operating temperature: 0 °C to 50 °C
- Storage temperature: -20 °C to 70 °C
- Avoid contact with water and moisture.
- Relative humidity: 30% to 95% max. (Storage and transport 10-95%).

Troubleshooting

Problem	Possible cause	Possible solution
Data recording stops automatically	The memory of at least one module is full.	<ul style="list-style-type: none"> • Back-up data. • Check the overwrite mode and measurement frequency of all modules (MSR PC software ->Setup). ->23
“No channel” appears on the MSR 12 display.	<ul style="list-style-type: none"> • MSR 12 does not recognise the sensors. 	<ul style="list-style-type: none"> • Check the sensor’s connections • Turn the MSR 12 off and back on again.

Packing list

- MSR
 - User manual
 - Mains adapter
 - MSR RS232 cable
 - Warranty card
 - MSR PC software
- Options:
- Protective case
 - Additional sensors
 - Adapter for connecting further sensors
 - RS232-USB converter
 - RS232 optical coupler

Warranty

See warranty card.

Disposal

Take the MSR12 to a municipal waste disposal centre or return it to MSR Electronics GmbH. The MSR12 must not be disposed of in normal domestic waste.

MSR[®] PC software

Setup

Setup

Reader

Reader

Viewer

Viewer

Online

Online

Other MSR[®] PC software

PC...

MSR[®] PC software

Overview

External processing of MSR12 data is carried out using the MSR PC software programs **Setup**, **Reader**, **Viewer** and **Online**. The MSR PC programs can be used for all MSR types.

The **Setup** enables the properties of the MSR12 and attached modules to be customised to user's requirements.

The **Reader** allows the user to transfer measurement parameters to a Windows PC. The **Viewer** is used to display data graphically or in table form or to export it as a text file (*.csv).

With the help of **Online** users can view measurement parameters and curves "live" on a PC.


Installation of the MSR PC software on a PC

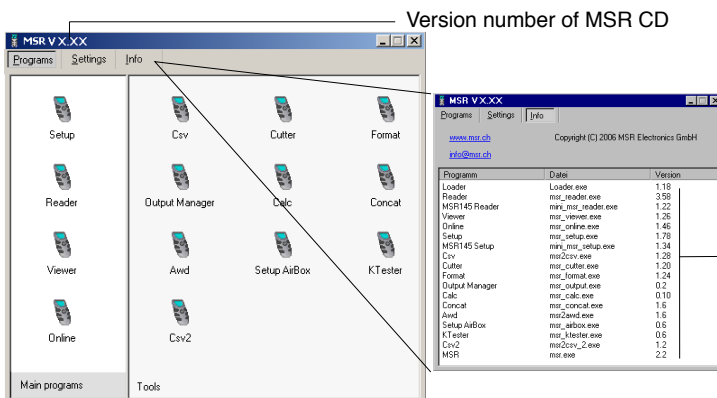
Insert the CD containing the MSR PC software into the computer's CD-ROM drive. The installation procedure starts automatically*.

During installation select: **Run MSR Modular Signal Recorder now**.

The MSR symbol  appears on screen.

If the PC is not set up for automatic installation, proceed as follows:

1. Click **Start > Run**
2. Click **Find > Look in:** (set to CD drive).
3. Select the file **Install_MSR.exe** and **Open**.
4. In the **Run dialog box** click **OK**.
5. The installation process will begin.
6. Follow the instructions and select: **Run MSR Modular Signal Recorder now**.
7. The MSR software may be started by clicking on the MSR symbol  or via **Start > Programs > MSR > MSR**.



MSR program window

* The program "Inno Setup" for installing the MSR PC programs was written by Jordan Russell (www.jrsoftware.org, copyright Jordan Russell).

Setup
Reader
Viewer
Online
PC...

Uninstalling

The software is uninstalled via the computer's operating system (Programs > MSR > Uninstall MSR).

System Requirements

- Windows 95 or higher
- Serial port RS 232 or USB port with RS 232 converter

Setup

Reader


Viewer

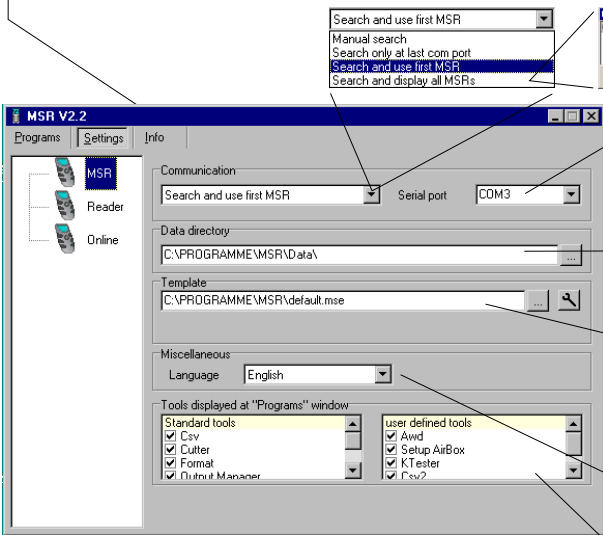
Online

PC...

Preparation

Before using the MSR PC programs **Setup**, **Reader** and **Online**, the following preparations must be completed:

- Use the connecting cable to connect the MSR 12 with the PC (serial port).
- Switch the MSR 12 on.
- Ensure that the MSR 12 is not recording any measurement parameters (**Record > Stop**) during data transfer (**Reader**, **Setup**).
- Before first use: Using  open the **MSR program window**, select **Settings > MSR**.
- Select the rule by which the **Setup**, **Reader**, **Online** and **Format** programs are to search for the required MSR*. Default: **Search and use first MSR**.



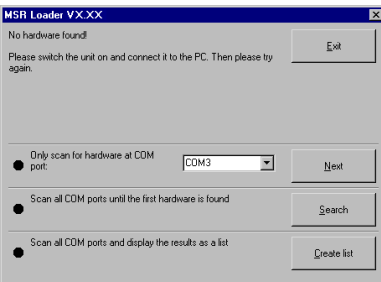
The screenshot shows the MSR V2.2 program window with the following settings and callouts:

- Communication:** Search and use first MSR (dropdown), Serial port: COM3 (dropdown).
- Data directory:** C:\PROGRAMME\MSR\data\ (text field with browse button).
- Template:** C:\PROGRAMME\MSR\default.mee (text field with browse button).
- Miscellaneous:** Language: English (dropdown).
- Tools displayed at "Programs" window:**
 - Standard tools: Csv, Cutter, Format, Output Manager.
 - User defined tools: Awd, Setup AirBox, KTester, Csv2.

Callouts from the text above point to these settings:

- Select the port used by **Reader**, **Online** and **Setup**.
- Enter the path to the directory.
- See following page for template.
- Select the required language.
- Customer-specific programs

MSR program window



The MSR Loader Vx.XX dialog box shows the following options:

- No hardware found (with an Exit button).
- Please switch the unit on and connect it to the PC. Then please try again.
- Only scan for hardware at CDM port: COM3 (dropdown) (with a Next button).
- Scan all CDM ports until the first hardware is found (with a Search button).
- Scan all CDM ports and display the results as a list (with a Create list button).

Loader Dialog

* This window will appear if a connection to an MSR cannot be established using the current rule.

Setup

Reader

Viewer

Online

PC...





Template

The template, selected via **Setting > MSR (*.mse)**, defines which sensors the **Reader** reads out as standard or are displayed in **Online**. The template sets the colour of the trace, the positioning of its axis (left, right) and gives the sensors a name ("HUM, T1" is required to be displayed as "outside temperature", for example). Templates can be produced on the basis of examples contained in **Viewer** (->26).

Example

The temperature curves are required to be blue and oriented on the right hand axis in all display modes.

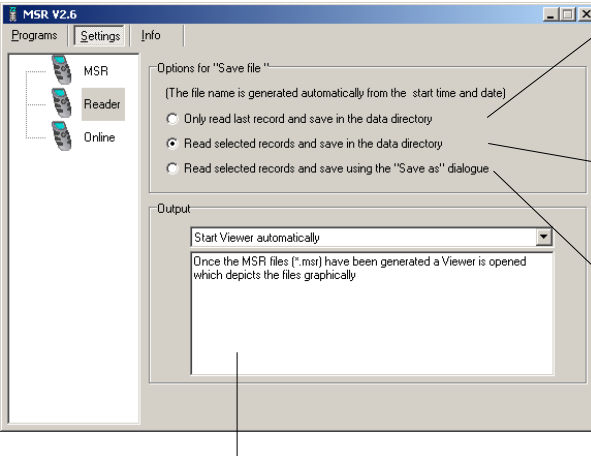
1. Assign right hand axis and blue colour shades to temperature in **Viewer**.
2. Save as template (Bluetemp.mse).
3. Generate new templates for **Reader** and **Online**: Select MSR program window, **Settings MSR > Template** , enter new name and path (Temperature.mse), then **Open**.
4. Open the still blank template (Temperature.mse) using .
5. **Import** the template that was created in **Viewer** (Bluetemp.mse). Select the required sensors (tick in checkbox) in the **Module** column and confirm with **Accept**.
6. Edit the displayed list: First select a sensor in the **Module** column and then choose **Edit**.
7. Change the name "HUM, T1" to "Outside temperature", and **Accept**.
8. Continue to make the necessary adjustments and confirm them with **Accept**.

Pre-adjustments - Reader

Enter the required options for the **Reader**** via **Settings > Reader**.

Data records are transferred from the MSR 12 to a PC using the **Reader.

Once data transfer is complete the **Reader** creates a data record (*.msr) from each logged record, names it and saves it in the corresponding directory. The bottom-most option allows the user to alter the suggested filename and location.



Transfer only the most recent data record logged with the MSR 12 to the PC.

User defines which records are transferred to the PC.

User defines which records are transferred to the PC, their filenames and their location.

Once the data has been transferred to the PC various options are available to the user. Details may be found in the text window.

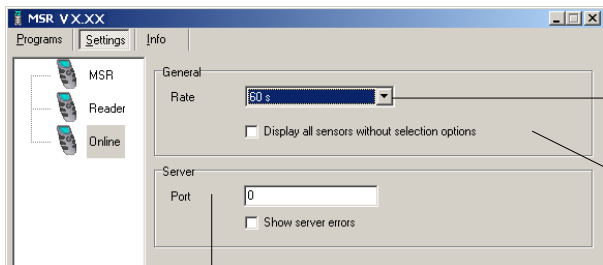
- **Example "Automatically generate a text file"**

In addition to the MSR format file, the **Reader** creates a text file (*.csv), which can be opened with programs such as e.g. Microsoft Word or Excel.

Pre-adjustments - Online

Enter the required options for **Online*** via **Settings > Online**.

* **Online** allows the user to view the progress of the measurement process directly on-screen and to save recorded parameters on the PC.



- Select the desired frequency with which measured parameters are to be transferred to the PC.
- Once **Online** is started the measured parameters of all available sensors are displayed onscreen.
- **Online** can be used as a server. This allows the measurement parameters to be accessed across a network.

Completion of the preparatory measures

Upon exiting Settings (**Einstellungen**) the PC saves the settings that were last entered. The default settings can be reinstated by selecting **Settings > MSR > Default**.

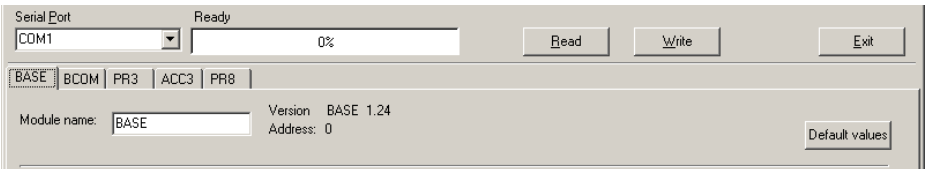
Once entry of the settings is complete, select **Programs** and start the required program.

Note: The following instructions assume that the preparations for using the MSR PC programs have been completed.


Setup

From a PC, **Setup** is used to select the modules for which the MSR 12 is required to save measurement parameters, to enter the measurement frequency, modify sensor and module names and to set the behaviour of the MSR's memory.

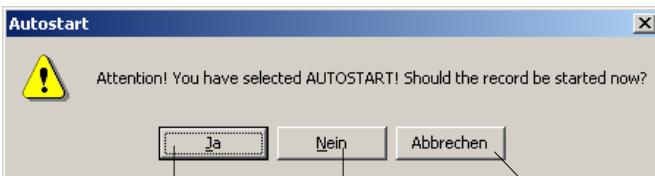
- Complete the preparations (->19).
- Start **Setup** (Setup symbol)
- Use **Read** to access the configuration saved in the MSR12. The **BASE** configuration screen then appears on the monitor. Further configuration screens can be selected by clicking on the tabs.
The **Configuration*** display appears on the MSR 12.



A section of the **BASE** configuration screen

 Each of the MSR 12's modules has its own configuration screen. The modules **BASE**, **BCOM**, **ACC3** and **PR3** together with their respective sensors are MSR 12 standard components.

- Select the configuration screen requiring modification and make the required changes. Further information on the configuration screens may be found in the **Module** chapter ->42.
- Transfer the new configuration to the MSR 12 with **Write**. The main menu appears on the MSR 12's display.
- If **Start recording automatically upon power on** has been selected in **Setup** (**BASE** configuration screen), the following window appears:



Yes: The configuration is transferred to the MSR12. Recording then starts.
To cancel: See **Module** > **BASE** ->43

No: The configuration is transferred to the MSR12. Recording is not started.

Cancel: Stops configuration transfer.


- * **Configuration** remains visible on the display until the configuration is transferred to the MSR 12 with **Write** or the MSR 12 is turned off.

Reader

With the **Reader** users can selectively transfer data records logged with the MSR12 to a PC. The transfer process does not delete any measurement records saved on the MSR12.

Transferring data records to a PC

- Complete the preparations (->19).
- Start the **Reader** (Reader symbol)

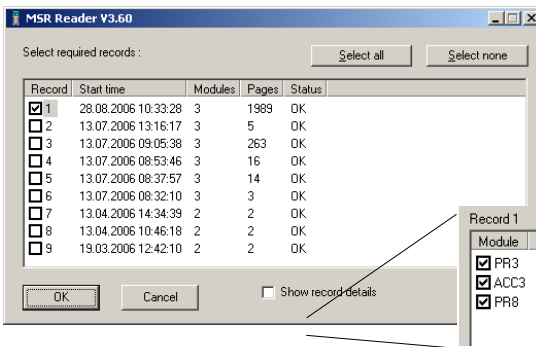

CAUTION

Once data transfer has started (**Start**) all data records saved on the MSR12 can be overwritten if required (circular buffer).


- Begin data transfer with **Start**.
(In the case of protected data records the password* must first be entered.)
The **Read Data** display appears on the MSR12.

The options selected under **Settings > Reader** (->21) influence the next steps:

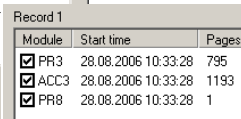
- Under the option **Read selected records** the following data entry dialog box appears:




- Select the data records to be transferred and the corresponding module.

 ->25

- Click **OK**.



 ->25

- With the option **Read selected records and save with "Save dialog as"** under **Settings > Reader** (->21) the filenames and locations suggested by **Reader** can be overwritten.

Once the data records have been saved on the PC a list of files created appears.

```
Files generated:
C:\Programme\MSR\Data\MSR2 0025_060726_143917_7.msir
C:\Programme\MSR\Data\MSR2 0025_060726_130000_3.msir
```

— Filenames allocated by the **Reader**

Serial number
Date (YYMMDD)
Recording start time (HHMMSS)
Copy number

*Forgotten your password?
See **Format** ->35.



More on the selective list

Select required records :

Record	Start time	Modules	Pages	Status
<input checked="" type="checkbox"/> 1	28.08.2006 10:33:28	3	1989	OK
<input type="checkbox"/> 2	13.07.2006 13:16:17	3 / 4	5	OK
<input type="checkbox"/> 3	13.07.2006 09:05:38	3	263	t
<input type="checkbox"/> 4	13.07.2006 08:53:46	3	16	OK

3 of the 4 modules of the record are transferred to the PC. Modify the selection with:

Show record details

Record 1

Module	Start time	Pages
<input checked="" type="checkbox"/> PR3	28.08.2006 10:33:28	795
<input checked="" type="checkbox"/> ACC3	28.08.2006 10:33:28	1193
<input checked="" type="checkbox"/> PRR	28.08.2006 10:33:28	1

OK The modules of this record have the same start time.

t The modules of this record have different start times.

Number of recorded pages (record size)

Viewer

Records created in **Reader** or **Online** may be viewed and edited on a PC with the **Viewer**. The measurement parameters may be displayed either in graph or in table form.

- Start the **Viewer** (Viewer symbol).
- Open a record (*.msr) via **File > Open**.



X and Y values:

Cross-hair 1, cross-hair 2
(The displayed Y value always relates to the left-hand axis)

Difference between cross-hairs 1 & 2

Viewer

Move traces

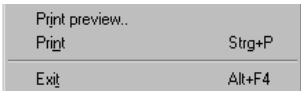
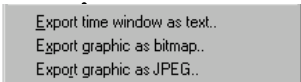
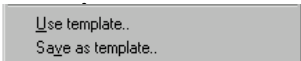
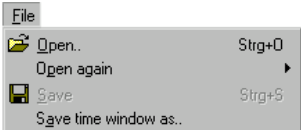
With right mouse button held down.

Enlarge section



Mark the required section with the left mouse button held down. See also **Graphics > Fixed axis**.

Cross-hair Move axis:
Move centre:

Grab the axis, move with left mouse button.
Grab the centre, move with left mouse button.




File

The **File** menu is used to **Open** records , to Reopen (**Open again**) the most recently used records and to **Save** the currently open record as displayed .

With **Save time window as** the measurement parameters of the displayed time window are saved. (The measurement parameters of the hidden traces are also saved). For further options see **Cutter** ->34.

Templates help to standardise the displays, enable easy repetition when reselecting the same sensors and the same printing format.


Creating templates: Adjust the display with **Graph** and **Configuration**  and save via **File > Save as template** (file type: *.mse).

Apply a template to the displayed record: **File > Use template** then select the required template (*.mse).

Export Time window as text exports the measurement parameters of the displayed time window in *.csv format. The measurement parameters of the hidden traces are also exported.

The trace can be exported in **Bitmap** (*. bmp) or as **JPEG** format.

Print preview opens a preview of the trace/graph.

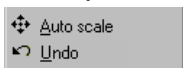
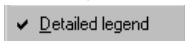
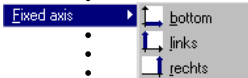
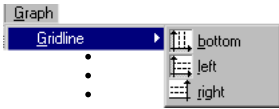
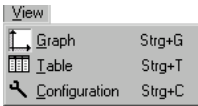
Print  opens the print dialog box.

Exit closes the **Viewer**. If changes were made the user is asked whether the changes should be saved.




Note:

The program saves changes as “Template” (*.mse). The template is automatically saved in the record’s directory. Template (*. mse) and record (*.msr) have the same name.

Upon **Opening** a record the **Viewer** searches for the template associated with that record. Should the template not be located in the same directory as the record then the standard format will be opened.





View

The **View** menu allows measurement parameters to be displayed as a **Graph**  or **Table** . Alternatively, using **Configuration**  the display method can be customised to the user's requirements.


Graph

Gridlines can be shown for each axis (bottom, left, right).

Fixed axis simplifies the amount of detail shown within a time window or range of values.


- Select the required section with the left mouse button held down. The section is displayed enlarged.
- For closer viewing, lock the time window () or range of values to the left or right axis (). Several axes can be locked.
- With the left mouse button held down, select the required detail. The enlargement is displayed without altering the time segment or range of values of the locked axes.


A further click releases the lock.




Auto scal  clears all locked axes.

Using the two **Crosshairs** values can be measured on the X and Y traces. X and Y differences can be evaluated with the second cross-hair. The Y values displayed are always associated with the left axis.

With **Detailed legend** traces can be turned on and off in the list of sensors.

The complete record is displayed by selecting **Auto scale** .

Auto scale  clears all locked axes.

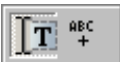
Undo  undoes the last enlargement. As long as the **Configuration** dialog  is not quitted, **Undo**  allows the last changes made to the displayed configuration screen to be undone.

Table

- Go to time..
- Go to beginning of graph

Configuration

- Undo





Delete

-
-
-
-



- Insert X1, Y1
- Insert X2, Y2
- Insert X2-X1, Y2-Y1

Table (Tabelle)

Go to time  allows users to jump straight to the line in the table with the required time.


Jump to beginning of graph  causes the table to jump to the first measurement values displayed in the graph.

Configuration


As long as the **Configuration**  dialog is not quit- ted, **Undo**  allows the last changes made to the configuration screen to be undone.

Text mode

Using the text mode you can insert texts at any place.

By clicking on  you can activate and deactivate the text mode.


Insert text:

- Click on . The viewer displays "Text 1" in the upper left corner.
- Drag the text field to the desired place.
- Double click on the text field and enter your required text.

Delete text:

- Click with the right mouse button on the text field and select **Delete**.

Text field with X and Y values:

- place the crosshairs  on your chosen position to adopt the X and Y values you would like to use in the text field.
- Create a text field (see above) and click on the right mouse button. Select the desired representation.

Configuration Strg+C

General Curves Time axis X left Y axis right Y axis Crosshairs

General


Curves


Time axis X

left Y axis

right Y axis


Crosshairs

Configuration  allows the display method of the measurement parameters to be set with the help of the configuration screens.


Entering title and footer information is achieved via **Configuration**  > **General**.


The associated sensor name, assignment to the left or right axis, the colour, line weight and style can be set for each curve.

Axis > inactive allows the graph curve to be shown or hidden as required.




CAUTION

Depiction of the curves using points (**Configuration**  > **Points/Curves** > **Yes**) requires more computing power, possibly leading to problems.

Using **Configuration**  > **Time axis X**, the time axis can be annotated, the time segment to be displayed can be set, and the **Increment** for the lettering and ruled lines, together with the **Format** for numbers can be entered.

Automatic axis annotation with an **Increment** of 0 (zero).

The number **Format** for the displayed X and Y values is entered via **Configuration**  > **Crosshairs**. The displayed Y value always relates to the left axis.

As long as **Configuration** is not quitted, users can undo the last changes made to the displayed configuration screen with .

Quit **Configuration**  via **Graph** , or **Table** . Upon quitting, the **Viewer** saves the configuration.

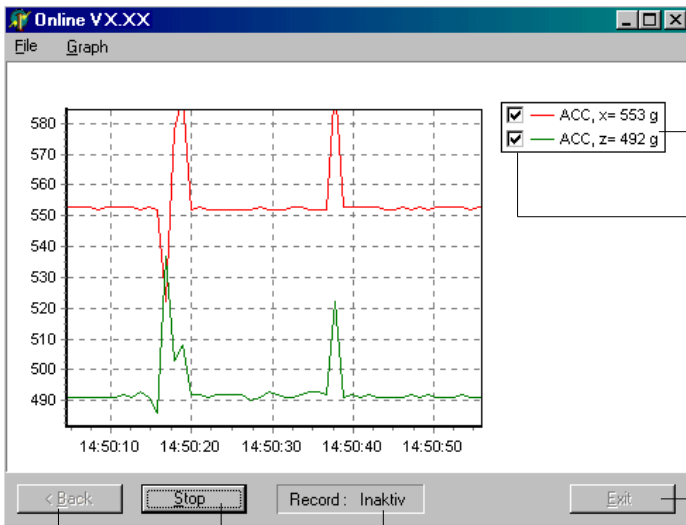
Viewer

Online

Online allows users to view the progress of the measurement parameters directly on-screen and save the logged values on a PC. Saved records can be opened and edited using the **Viewer**.

Procedure:

- Complete the preparations ->19.
- Start **Online** (Online symbol).
- Select the sensors for which the measurement parameters are to be transferred to the PC and displayed on-screen.
- Upon clicking **Next** the measurement parameters are presented graphically and numerically.



Turn trace on and off

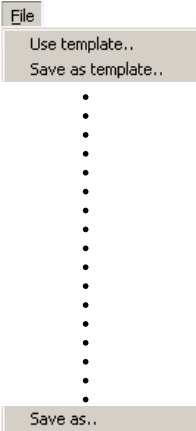
Exit **Online**

Back to sensor selection

The MSR 12 is not currently recording measurement parameters (MSR 12: Record > ● Stop).

Pauses the transmission of measured parameters. With **Continue**, transmission is resumed.

Select	Modul	Sensor	Unit	
<input checked="" type="checkbox"/>	1	PR3	pb1	mbar
<input checked="" type="checkbox"/>	2	PR3	T1	°C
<input checked="" type="checkbox"/>	3	ACC3	x	g
<input type="checkbox"/>	4	ACC3	y	g



For recurring applications in **Online**, **Templates** assist in selecting the required sensors and adjusting the display to suit.

Create template: Start **Online** and select the required sensors. Select **Next**. With **Graph > Properties** and **Graph > Gridlines**, change the display properties of the traces. Via **Back** return to the trace display. Interrupt recording with **Stop**. Save the template via **File > Save as template**.

Apply the template to Online: **File > Use template** and select the required template (*mse).

Once recording has finished by clicking on **Stop**, the recorded measurement parameters can be saved via **File > Save as**.



Once recording has finished by clicking on **Stop**, the recorded measurement parameters and traces can be deleted via **Clear**.

The display properties can be changed via **Properties** and **Gridline**.

Select the frequency (**Refresh rate**) with which measurement parameters are to be transferred to the PC.

Notes

- The MSR's arrow keypad is locked during data transmission and for 10 seconds thereafter.
- **Online** may also be used while the MSR 12 is recording measurement parameters.
- Measurement parameters can be polled via a server in **Online**.

CSV

The **CSV** utility creates text files (*.csv) from data records (*.msr). These may subsequently be opened and edited in a word processing or spreadsheet application.

Creating a text file

- Start **CSV (MSR Program window > Tools > Csv)**.
- Click on **Start** and select the data record from which the text file is to be created. **CSV** creates a text file (*.csv) and saves it in the corresponding directory for that data record. Text file (*.csv) and data record (*.msr) have the same name.

Note: If a template (*.mse) exists for the data record in question, **CSV** takes this into account when creating the text file.

Example: Opening a CSV text file with Excel

- Start the word-processing or spreadsheet program.
- Open the CSV file via **File > Open**.
- Under **File type**, select **Text Files**.

	A	B	C	D	E
1	*CREATOR				
2	mst_cutter.e	[V1.12]			
3	mst2csv.exe	[V1.12]			
4					
5	*MSR				
6	Name	Pilatus			
7	SN	100013			
8	Revision	0			
9					
10	*STARTTIME				
11	12.05.2004	9:53:48			
12					
13	*MODUL				
14	NAME	PR3	PR3	ACC3	ACC3
15	ID	[C2 V1.20]	[C2 V1.20]	[C3 V1.16]	[C3 V1.16]
16					
17	*CHANNEL				
18	TIME	p1	T1	x	y
19					
20	*UNIT				
21	s	mbar	°C	g	g
22					
23	*DATA				
24	129	961	21	-0.252	0.359
25	129.0498	961			
26	129.05961	961		-0.283	0.328
27	129.14941	961			
28	129.19922	961		-0.315	0.374
29	129.24902	961			
30	129.29883	961		-0.298	0.312

Data source

MSR 12 name

Serial number

MSR 12 revision number

Record start time:

Date (Day.Month.Year) and time of day (Hr:Min:Sec)

Modules for which measurement parameters were recorded

Module version

Channel and sensor names

Unit for the displayed value

Measured parameters (data) in chronological order

Time of recording

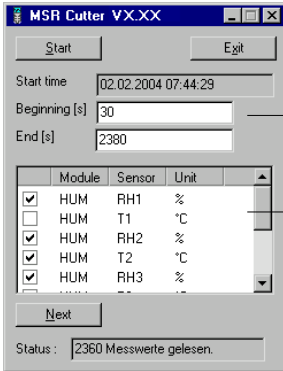
Excel file with measured data

Cutter

The **Cutter** utility creates an extract from a data record (*.msr).

Creating an extract from a data record

- Start the **Cutter** utility (**MSR Program window > Tools > Cutter**).



- Click on **Start** and select the data record from which the extract is to be created.
- Select the time window. **Beginning / End**.
- Select the sensors for which the measurement parameters are to be exported to a new data record and click **Next**.
- Enter the name and directory for the new data record. Click on **Save**.

Format



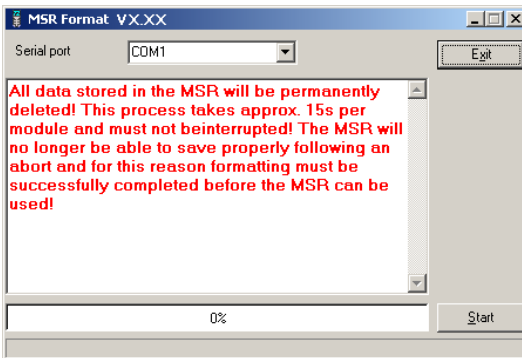
CAUTION

Format deletes all data records saved in the MSR 12 and the password!

Format deletes all data records saved in the MSR 12. Setup settings are not deleted.

Delete all data records saved in the MSR 12 and the password

- Start **Format** (**MSR Program window > Tools > Format**).
- Connect the MSR 12 with the PC using the connecting cable (serial port).
- Switch the MSR 12 on.
- Ensure that the MSR 12 is not recording any measurements during the deletion process (**Record > Stop**).
- Click **Start**.
- Read the caution messages.



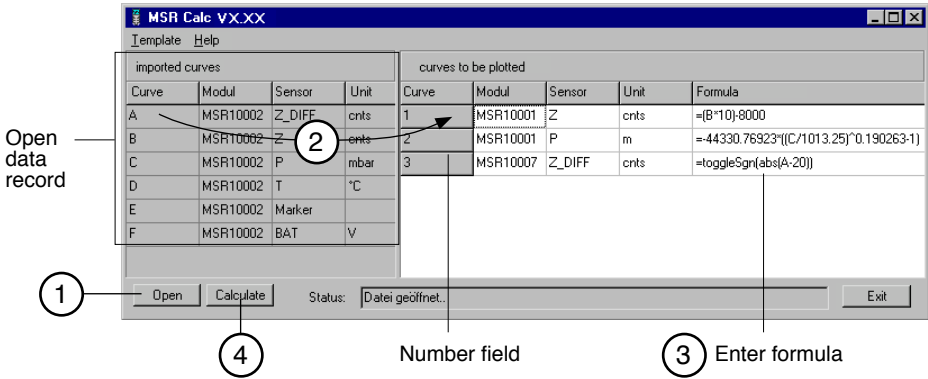
- If it is certain that all data records saved in the MSR, together with the password, are to be deleted, select **Start**.

Calc

With **Calc** curves from existing data records can be linked to each other using formulae and saved as a data record (*.msr). The saved data record can be displayed and processed in the form of curves or as a table using the **Viewer**. Templates simplify the processing of recurring tasks.

Computing new curves

- Start **Calc** (MSR program window > Tools > Calc)



- 1 Open data record (data origin)**
Click on **Open** to open the data record for which you want to perform calculations on the curve. It is possible to open multiple data records.
- 2 Create new curves**
From **imported curves** select the curve that you want to use for your calculations and drag it – with the left mouse button pressed – to the right into the field for curves to be plotted. Repeat this procedure until the required number of curves is shown on the right.
- 3 Enter formula**
Enter the formula to be used for the new curve into the **Formula** column. For this, use the capital letters on the left. Example for a subtraction: A-C

You will find a list of the available functions at the end of this section or under **Help**.

Modify the text for the new curves

The entries in the columns **Module**, **Sensor** and **Unit** can be modified.

Modify the order of the new curves

With the left mouse button pressed, drag the number field to the required position.

Template

.

Delete plotted curve

Delete new curves

Click inside the number field of the curve to be deleted and then press the delete key. Via **Template > Delete plotted curve**, all new curves can be simultaneously deleted.

4

Calculating and saving the new curves

Click on **Calculate** then enter the name and set the directory for the new data record. Click on **Save**.

Note:

The curves are saved as data records (*.mrs). The saved measurement parameters can be displayed and processed as a curve or as a table by the Viewer. Intermediate values are interpolated.

Only curves that overlap timewise can be calculated.

Template

.

.

Write

.

.

Read

Creating a template for processing recurring tasks

Once you have created the new curves you can save their labels and formulae as a template (*.mse). (**Template > Write**).

Creating new curves using templates

Open the required template (*.mse) via **Template > Read**. This will automatically generate a number of new curves. Multiple templates may be used to generate new curves. Each template generates a number of new curves.

Operators / brackets

+ - * / ^ Plus, minus, multiply, divide, to the power of
() Open brackets, close brackets

Functions

sqrt(no.) Square root of the number
ln(no.) Natural logarithm of the number (base e)
exp(no.) Raise basis e to the power of the number

abs(no.) Absolute value of the number
sgn(no.) no. >0: sgn = 1
no. =0: sgn = 0
no. <0: sgn = -1

cos(no.) Cosine of the number
sin(no.) Sine of the number
tan(no.) Tangent of the number
ctg(no.) Cotangent of the number

arcsin(no.) Arc sine of the number
arccos(no.) Arc cosine of the number
arctan(no.) Arc tangent of the number
arcctan(no.) Arc cotangent of the number

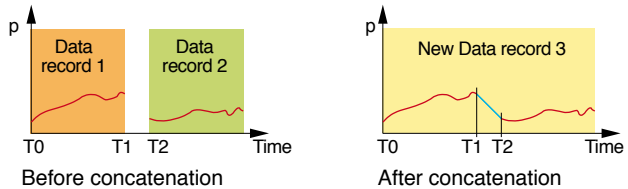
sinh(no.) Hyperbolic sine of the number
cosh(no.) Hyperbolic cosine of the number
tanh(no.) Hyperbolic tangent of the number
ctgh(no.) Hyperbolic cotangent of the number

toggleSgn(no.) Changes every second measurement parameter sign (plus/minus)

Further functions on request

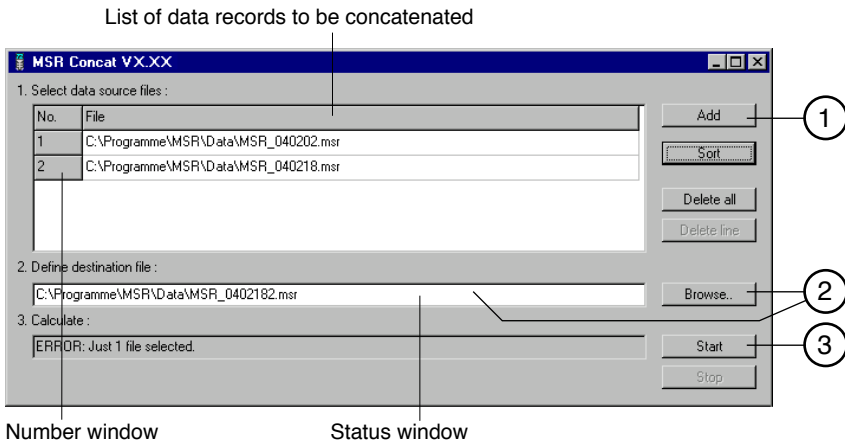
Concat

With **Concat** (concatenate = to link) data records can be linked together and saved as a new data record (*.msr). The newly created data record can be displayed and processed in the form of curves or as a table using the **Viewer**.



Concatenating several data records

Start **Concat** (MSR program window > Tools > Concat)



1 Select the data records to be concatenated

Open the data records that you want to concatenate by clicking **Add**. Note that the list must be in chronological order such that the oldest data record is at the top. Therefore either open the oldest data record first or sort the list afterwards (see below).

Sort the list alphabetically

Use **Sort** to sort the list alphabetically.

Data records that have automatically generated filenames (->21) can be chronologically sorted using **Sort**.

Modify the data record order

With the left mouse button pressed, drag the number field to the required position.

Delete all data records from the list

Use **Delete all** to remove all data records from the list.

Delete one data record from the list

Select the data record to be deleted and click **Delete line**.

2 Enter the name and directory for the new data record

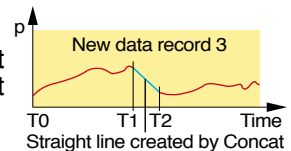
Set the path to the directory using **Browse** and enter the filename, or use the input window to do this.

3 Calculating the new data record

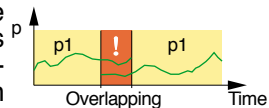
Start the calculation process with **Start**. Cancel the calculation with **Stop**.

Note:

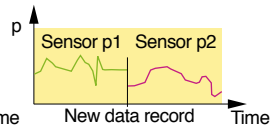
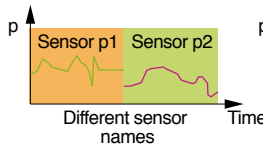
- Concat creates a straight line between the last data record of the first curve (T1) and the first data record of the second curve (T2).



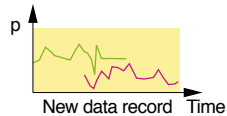
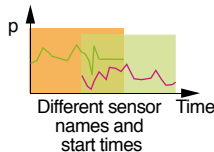
- If, for the data records to be concatenated, there are curves that overlap timewise and these have the same name (same module and sensor names with the same units), the calculation will be aborted and a corresponding message* will appear in the status window.



- If the module names, sensor names or units of the curves to be concatenated do not correspond Concat will be unable to join the curves and will create two curves.**

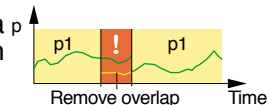


- With **Concat** you can superimpose curves with different module or sensor names.



* Remove overlap

Use the **Cut** utility to create an excerpt from a p data record that does not overlap timewise with the next data record.

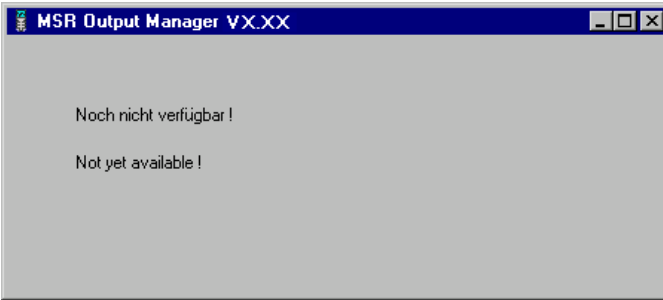


** Modify module names, sensor names and units

Use the **Calc** utility to match the module names, sensor names and units for the curves.

Output Manager

The **Output Manager** is currently not available.



Modules

A selection of sensors – mostly of the same type – is attached to each module. Signals from these sensors are converted into measurement parameters by the module's on-board processors and saved in the module's memory. The modules **BASE** and **BCOM** have no sensors.

The following modules and sensors are part of the MSR's standard hardware:

Module name	Measured parameters / function
BASE	Saves the setup parameters and measurement behaviour of the MSR
BCOM	PC/MSR 12 communication module, capacity display
PR3	Ambient air pressure and temperature (See page 45 for more details)
ACC3	Acceleration in the X, Y and Z axes (See page 47 for more details)

By adding modules, the MSR 12 can be adapted to record a variety of different parameters.

A list of modules and sensors may be found at www.msr.ch.

Each of the MSR's modules has its own configuration screen with which users can customise the module's behaviour to their exact requirements.

The way in which configuration screens are displayed and modified is explained in the **Setup** chapter.

The following pages describe the modules and their configuration screens.

BASE standard module

The standard module is incorporated into each MSR 12. It stores the parameters for **Setup** and the measurement performance settings of the MSR 12.

BASE configuration screen

Data records may only be transferred from the MSR 12 to a PC upon entering a password*.

* Forgotten the password? See **Format** ->35.

Module name (max. 4 characters)

Identifying character for the MSR 12 in use.

MSR 12 device name

Replaces the displayed values with default values.

The screenshot shows the BASE configuration interface with the following sections and settings:

- Module name:** BASE
- Version Address:** BASE XXX
- Autostart:** Automatically start recording upon power on. Sub-options: At any time, Only during countdown. Countdown: 3 sec.
- Identification:** MSR name (max 16 chars): Test MSR; Last character in Date/namen: XX; Serial no.: 5000; Update: 0; Record data password protected.
- Display:** Brightness: Dark Medium Light; Contrast: Low Medium High; Backlight. Note: Pulse measurements using Polar does not work when display backlight is switched on!
- Clock:** Synchronise MSR clock with PC clock with a time shift of 0 hours. Current PC time: 28.08.2006 15:00:13; MSR time: 28.08.2006 14:53:52.
- Display of memory capacity during record:** Field: 10 seconds; Free pages in %; No. of free pages; Current page of module no.: 0.

Recording starts automatically when the MSR 12 is switched on.

Not accessible to users.

The MSR12 display can be adjusted to the user's preferences with the **brightness** and **contrast** controls.

When the option **At any time** is enabled the automatic recording function of the MSR 12 can be cancelled with **Record > Stop**.

When the option **Only during countdown** is enabled it is possible to prevent the start of recording with **⏸** and then **⏹**. Once the countdown has ended the MSR 12 records the measurement parameters. Recording can be cancelled by switching the MSR 12 off.



BCOM communication module

The BCOM communication module is incorporated as standard into each MSR 12. It regulates the transfer of data between a PC and the MSR 12.

BCOM configuration screen

Module name (max. 4 characters)

Replaces the displayed settings with default values.

The screenshot shows the BCOM configuration interface. At the top, there is a 'Module name' field containing 'BCOM', a 'Version' field with 'BCOM XXX', and an 'Address' field with '1'. A 'Default values' button is located in the top right corner. The main area is divided into several sections:

- Charging parameters:** Includes 'Charging current' (500 mA) and 'Trickle charge' (30 mA).
- Power consumption:** Includes 'Self-discharge' (20 uA), 'Not recording' (5000 uA), 'Recording' (10000 uA), and 'Communication' (15000 uA).
- Capacity display:** Includes 'Fully charged above' (770 mAh), '4 bars above' (616 mAh), '3 bars above' (462 mAh), '2 bars above' (308 mAh), and '1 bar above' (154 mAh).
- Voltage for:** Includes 'Recharging' (3598 mV) and 'Powering down' (3047 mV).

There is an 'Accept new parameters' checkbox and an attention note: 'ATTENTION: The new parameters only take effect if the MSR battery is fully recharged after writing!'.

These settings influence the MSR's remaining battery charge display.

PR3 pressure module

The PR3 pressure module is incorporated as standard into each MSR12. It measures the ambient air pressure and temperature. Two external pressure sensors can be connected to the PR3.

Sensor specifications:

Sensor type:	MS5534A	
Measured parameters:	Ambient air pressure	Ambient air temperature
Working range:	300 to 1100 mbar abs.	0 to 50 °C
Resolution:	0.1 mbar	0.015 °C
Accuracy:	± 1.5 mbar abs.	± 0.8 °C
Dimensions:	Integral MSR 12 component	
Weight:	Integral MSR 12 component	
Operating conditions:	Temperature: 0 °C to 50 °C	
Storage and transport conditions:	Temperature: -20 °C to 70 °C	

Number of sensors: 1 (standard hardware), max. 3 sensors (of which 2 external)

MSR 12 specifications:

Display resolution: 1 mbar / 1 °C

Measurement frequency *: 20/Sec., 10/Sec., 2/Sec., 1/Sec., every 10, 30, 60 Secs.

Storage rate *: Measurement frequency / frequencies (n=1-256)


Mode of operation: Parallel polling of the sensors

*Can be set via **Setup > PR3**.

PR3 configuration screen

Pressure sensors

Select the frequency with which the MSR 12 is to save values measured by this module.

The measurement parameters of this module will be saved in the MSR 12. (MSR: **Record > Start** or **Autostart**)
See also 

The MSR 12 saves every tenth measurement.

Pressure sensors also measure temperature. Select the required storage properties.

- Save pressure only
- Save pressure and temperature alternately
- After X pressure measurements save one temperature measurement

Module name (max. 4 characters)

Replaces the displayed settings with default values.

The screenshot shows the configuration interface for a PR3 module. At the top, it displays 'Module name: PR3', 'Version: PR3 X00X', and 'Address: 2'. A 'Default values' button is in the top right. The 'Measurement' section includes a 'Measurement rate' dropdown set to '10/s (102/1024)', a 'Record' section with 'Module saves after 10 measurement(s)', and a 'Memory capacity' of '1 Mio. Messwerte'. There are radio buttons for 'Only save pressure', 'Save pressure and temperature alternately', and 'Follow' (selected). Below this is an 'Action when memory full' section with radio buttons for 'continues (oldest data is overwritten)' and 'stops and also halts all other modules'. The 'Channels' section has two columns: 'Pressure' and 'Temperature'. Under 'Pressure', 'Name' is 'p', 'Unit' is 'mbar', 'Minimum' is '0', 'Maximum' is '2000', and 'Decimal point' is '00000'. Under 'Temperature', 'Name' is 'T', 'Unit' is '°C', 'Minimum' is '0', 'Maximum' is '100', and 'Decimal point' is '00000'. A 'Show sensor type in name (2nd character)' checkbox is checked. At the bottom, there are three columns for 'Sensor Active' with checkboxes for sensors 1, 2, and 3, all of which are checked.

Sensor names

Maximum number of sensors

- 1 Sensors installed as standard
- 2, 3 External sensors

The MSR 12 is to operate with this sensor.

Explanations

The oldest measurement parameters of this module will be overwritten as required – even if they have not been uploaded using the **Reader**.

To ensure that no measurement parameters for this module are lost, the MSR 12 stops data recording before overwriting measurement parameters that have not been uploaded with the **Reader**. The MSR 12 stops data storage for all modules.



The image shows a 'Record' section with a checkbox labeled 'Module saves' which is currently unchecked.

Even when the displayed module is not saving measurement parameters it saves the recording start time. This may cause the oldest measurement parameters to be overwritten.

ACC3 accelerometer module

The ACC3 accelerometer module is incorporated as standard into each MSR 12. Its three sensors measure the acceleration of the MSR12 in the X, Y and Z axes.

Sensor specifications:

Sensor type: ADXL210AE
Measured parameters: Acceleration
Working range: From -10 to +10 g

Resolution: 0.010 g
Accuracy: ± 0.200 g

Dimensions: Integral MSR 12 component
Weight: Integral MSR 12 component



Operating conditions: Temperature: 0 °C to 50 °C
Storage and transport conditions: Temperature: -20 °C to 70 °C

Number of sensors: 2 sensors for 3 axis measurement

MSR 12 specifications:

Display resolution: 0.001 g

Measurement frequency *: 50/Sec., 20/Sec., 10/Sec., 1/Sec., every 2, 5, 10, 30 Secs.

Storage rate *: Measurement frequency / frequencies (n=1-256)

Mode of operation: Serial, asynchronous polling of the sensors

*Can be set via **Setup > ACC3**

ACC3 configuration screen

Module name (max. 4 characters)

Replaces the displayed settings with default values.

Select the frequency with which the MSR 12 is to save values measured by this module.

The measurement parameters of this module will be saved in the MSR 12. (MSR: **Record > Start** or **Autostart**) See also

The MSR 12 saves every tenth measurement.

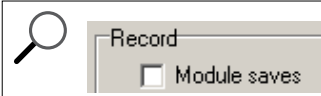
The screenshot shows the ACC3 configuration interface. At the top, the 'Module name' is 'ACC3'. Below it, 'Measurement rate' is set to '10/s (102/1024)'. The 'Record' section has 'Module saves' checked and 'after' set to '10 measurement(s)'. Under 'Action when memory full', the 'Record' option is selected with 'stops and also halts all other modules'. The 'Channels' section shows X, Y, and Z axis settings for Name, Unit, Minimum, Maximum, Decimal point, and Calibration values (Zero point and Sensitivity).

Sensor names

Calibration values set at the factory can be changed.

The oldest measurement parameters of this module will be overwritten as required – even if they have not been uploaded using the **Reader**.

To ensure that no measurement parameters for this module are lost, the MSR 12 stops data recording before overwriting measurement parameters that have not been uploaded with the **Reader**. The MSR 12 stops data storage for all modules.



Even when the displayed module is not saving measurement parameters it saves the recording start time. This may cause the oldest measurement parameters to be overwritten.

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