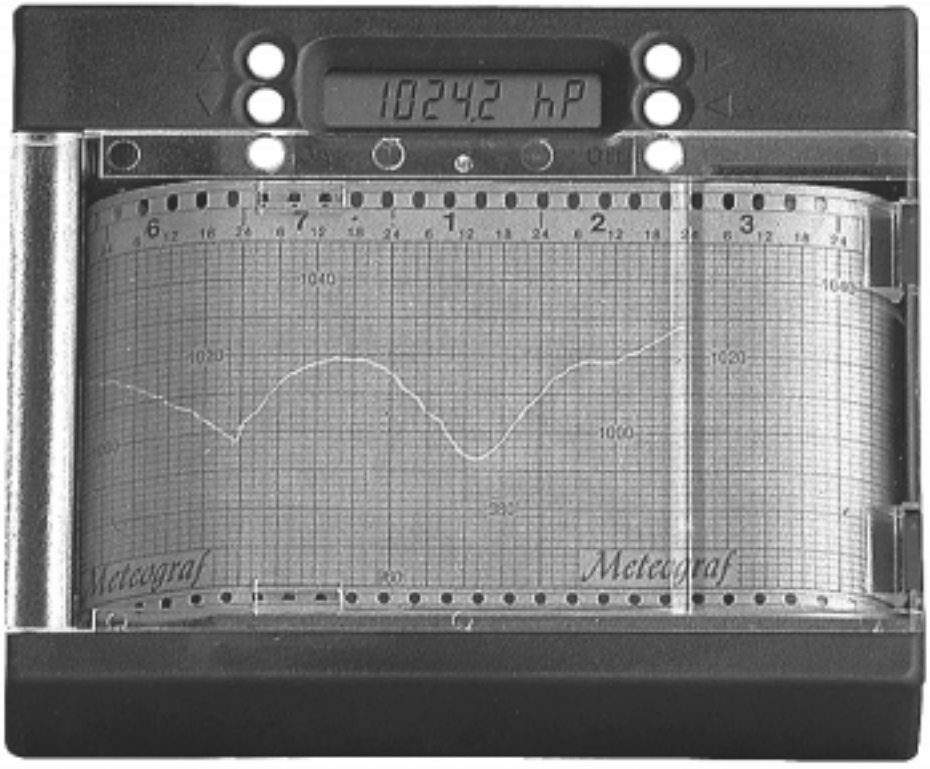
Meteograf

Electronic Precicion Barograph



Operating Instructions

Contents

Safety Notice

The **Meteograf** is an aid for prediction of weather conditions. It cannot replace a professional weather forecast, or make the correct preparations for adverse weather conditions unnecessary!
Other indicators of approaching weather such as clouds, wind strength and direction, etc. should also not be ignored!

Description

The Meteograf is a precise electronic barograph designed for the observation and recording of climatic pressure changes. The scriber point engraves the fluctuating pressure onto the reverse side of the waxed indicating paper roll. The resulting mark is immediately visible in the main display window as a clear, clean, linear indication. The continuous rectilinear record is therefore produced without using felt-tip markers or pens. (There is no dirtying of the fingers or of the apparatus itself, and no requirement to replace or replenish markers or pens.) Because the scriber is behind the paper a new paper roll can be loaded into the apparatus as easily as a film into a camera.

In addition, the Meteograf has a numerical LCD-Display. This normally shows the current air pressure, but is also used to select and adjust the Meteograf''s operating functions.

The LCD can be used to observe short-term pressure changes which would be indiscernible on the main display. This is called the 'Zoom' function.

A microprocessor controls all the functions of the Meteograf. An analogue signal from the internal pressure sensor is amplified in a signal processor, digitalised and input to the microprocessor, which calculates and outputs the air pressure. Linearity and temperature correction factors for the pressure sensor are pre-programmed into the microprocessor, thus making the installation of trim potentiometers unnecessary. This guarantees an extremely high accuracy over the whole operating temperature and pressure range, as well as optimal long-term stability.

To reduce power consumption. the microprocessor is automatically switched to an energy-saving mode between measurements, with only the LCD display and other basic functions operating continously.

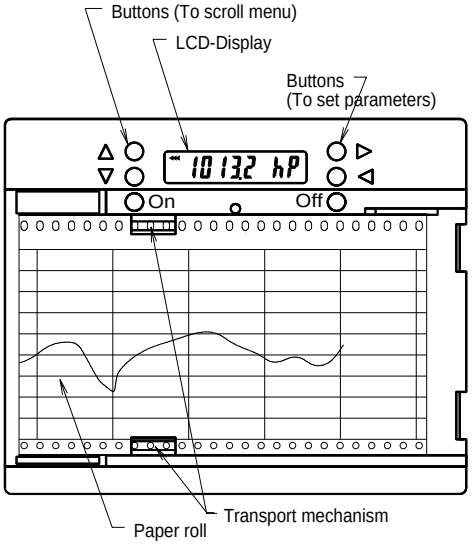
An electronic filter cancels out fluctuations in indicated air pressure caused by operation in rough water.

The paper movement is controlled to extremely high tolerances by a small servo motor. A second servo motor controls, via a spindle, the movement of the scriber.

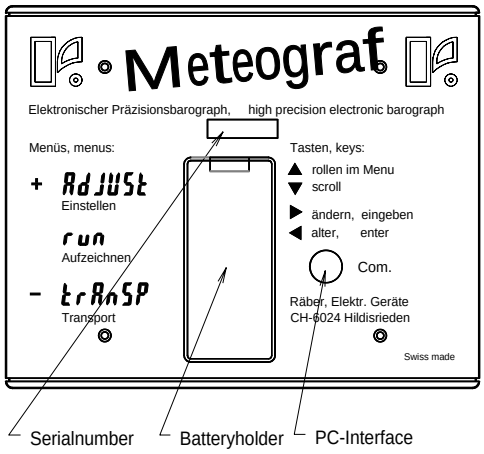
An aural and visual alarm makes the user aware of dangerously rapid pressure changes, which give warning of a forthcoming storm.

To ensure maximum reliability and durability, the Meteograf uses high quality gold-plated electrical contacts throughout. For the battery connections, these are duplicated.

The Meteograf



Front face



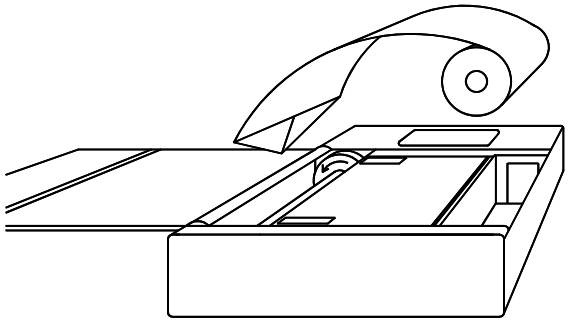
Reverse face

Set - Up

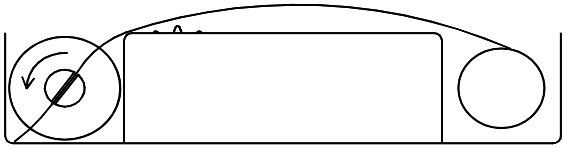
Fitting the Battery

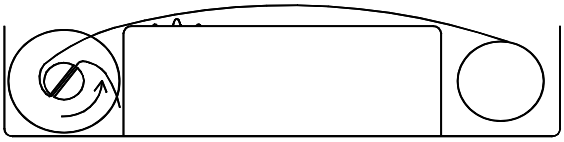
The **Meteograf** requires a single Alkali Manganese 1.5V battery (Typical sizes: AM2, LR14) with a diameter of 26 mm and a length of 50 mm. With this battery the **Meteograf** will operate at room temperature for up to one year.
When fitting the battery, ensure that its polarity is correct.

Fitting the paper roll



Fold a 90° point in the end of the paper roll. Fit the paper roll into the right side of the chamber and push the point as far as possible into the slot in the transport spindle on the left side of the chamber. Wind the spindle one or two complete turns in the direction indicated in the sketch, ensuring that the 'teeth' of the transport mechanism mesh cleanly with the holes in the edge of the paper. The time axis on the paper roll is marked with days of the week ('Monday' through to 'Sunday'), each of which is sub-divided into 24 one-hour segments. Align the paper with the current time and day of the week **approximately 20 mm right of the scriber point**. This ensures that only a minimal correction will be required when the paper is positioned. (See below.)



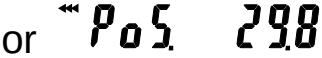


Switching on the device. Closing the cover

After pressing the "ON" button, close the perspex cover. The LCD display will then indicate "+8.8.8.8.8.8.8.8.", to test that all elements of the display are functioning correctly. The scriber point moves to indicate a pressure of 1010 mBar or 29.8 inHg. The paper will be indexed forward by approximately 5 mm, and the LCD display changes to " PoS 1010 or pos 29.8".To change the unit used to denote barometric pressure (hPa or inHg), select the required unit using the 'ADJUST' Menu (ref. Sheet 5.) Afterwards, the barograph should be switched Off and then On again.

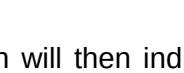
Note: If no button is pressed for the next 30 seconds, the **Meteograf** will automatically switch to the 'Adjust' mode. (" PoS 1010 or PoS 29.8 " and " PAPEr " (see below) can be reset only by switching the device off, then on again.)

Adjusting the scriber



In the event that the scriber point does not lie exactly on the 1010 mBar or 29.8 inHg line, the scriber can be adjusted using the buttons to the right of the LCD display. (⇨ moves the point up, ⇦ down.) If necessary, press the left button ⇩ to change the display to "PAPEr", and move the paper slightly, to determine the exact position of the scriber point, before resetting the diplay to "POS 1010 or Pos 29.8". Any corrections made at this time will be repeated automatically the next time the device is switched on.

Adjusting the paper position



Press the button ⇩ to the left of the display, which will then indicate "PAPEr". With the right button ⇨ the paper can be indexed to a position corresponding to the current day and time. **Note that backwards indexing of the paper is not possible**. Once the position of both the scriber and the paper has been correctly set up, press the button ⇩ (to the left of the display), to change to the "AdJUSt" mode.

Adjustment + AdJUSt

The 'Adjust' mode is indicated by the flashing '+' symbol on the LCD display. The left-hand buttons (⇧ ⇩) are used to 'scroll' through the various menu options. The right-hand buttons (⇨⇦) are used to set the required values, or to confirm the required input. If no button is pressed for 30 seconds, the **Meteograf** automatically switches to the Display mode, "run".

Setting air pressure from a known altitude ALt. 539

In the event that the exact local air pressure (reduced to Sea Level) is not known, the local altitude (above mean sea level) can be input. The **Meteograf** then calculates the appropriate air pressure in accordance with the ICAO Standard Atmosphere. Because the Standard Atmosphere only seldom corresponds exactly to local conditions, all future pressure measurements will be subject to a small, constant error. This error will increase with altitude. In the majority of applications, however, this error can be accepted.

- The LCD display will show "ALt 0000", the approximate elevation above Sea Level. Using the right-hand buttons (⇨⇦) change the display to correspond to the actual elevation (in metres.)
- Using the left-hand buttons, select another menu option, or switch to the Display mode.

Setting air pressure directly + 1013.2 hP or + 29.998 in

In the event that the exact local air pressure (reduced to Sea Level) is known, it can be input directly into the **Meteograf**.

- The LCD display should show the air pressure, e.g. "1013.2 hP". . Using the right-hand buttons (⇨⇦) change the display to correspond to the actual air pressure (in mBar / hPa.)

(The altitude display, see above, will be automatically adjusted to correspond to this air pressure.)

- Using the left-hand buttons, select another menu option, or switch to the Display mode.

Setting the storm warning + GALE 2hP or + GALE 0.06

When the LCD display shows "GALE 2hP" the rate of change of pressure required to activate the storm warning, in mBar per hour, can be set.

- Using the right-hand buttons (⇨⇦) set the indicated value to 1 - 5 "hP",0.03 – 0.15 inHg or to "Off".
- Using the left-hand buttons, select another menu option, or switch to the Display mode.

Resetting the time scale + -2 h

When the LCD display shows "0 h", the time scale can be changed. (For example, when changing between summer and winter time, or moving across an international time zone.) If it is required to move forward, the paper roll is advanced by the required amount on leaving the 'Adjust' mode. If it is required to move backwards, the paper is held stationary for the required time.

- Using the right-hand buttons (⇨⇦) set the required change in the time scale.
- Using the left-hand buttons, select another menu option, or switch to the Display mode.

To select the required unit + ALt. MEt. / + ALt. FEEt or + P hP / + P inHG

- Using the left-hand button, set the display to either "ALt" (for altitude – in metres or feet) or "P" (for barometric pressure – in hectopascals (hPa) or inches of mercury (inHg).) Then use the right-hand button to select the required unit.

Leaving the 'Adjust' mode

- Using the left-hand buttons (⇧ ⇩) change the display to "run" . Using the right-hand buttons (⇨⇦) confirm the menu change.

Display rUn

In the 'Display' mode the **Meteograf** shows the variation in air pressure as a function of time. The left-hand buttons (⇧ ⇩) may be used to 'scroll' through the menu.

Air pressure indication 1015.8 hP or 29.998 in

The LCD display shows the current recorded air pressure in mBar / hPa. (e.g. 1013.2 hP) or inHg. The display is updated at 1-minute intervals.

- Using the right-hand buttons, (⇨⇦) the aural storm warning may be switched off after it has been triggered. It will sound again if the preset rate of change of pressure is exceeded again.

Zoom function

1015.8 hP ⇔ 30-0.2 hP or 29.998 in ⇔ 30-.006 in

The **Meteograf** zoom function enables relatively small pressure changes to be indicated.

- Using the left-hand button ⇩ move from the standard air pressure display. Current air pressure (as previously) will then be displayed alternating with the pressure change in the previous 1, 5, 15, 30 and 60 minute periods. The display will automatically scroll through the above sequence, with each step being displayed for 2 seconds.

The indicated data will be updated at 1-minute intervals.

- Using the right-hand buttons, (⇨⇦) the aural storm warning may be switched off after it has been triggered. It will sound again if the preset rate of change of pressure is exceeded again.

Activation and de-activation of storm warning CALL 3

When the LCD display shows "CALL X", the level of the aural storm warning (set as described in the 'Adjust' mode) can be set. If "OFF" is selected, the aural warning will be switched off, leaving only a visual warning - a blinking "hP" display. If "On" is selected, the warning tone is given once every minute for as long as the rate of change of pressure is above the preset limit, or until it is switched off using one of the right-hand buttons, (⇨⇦). If a digit between 1 and 9 is set, the warning tone will sound for the specified number of times, before automatically switching itself off. (e.g. if "4" is selected, the warning tone will sound four times at one-minute intervals.)

- The right-hand buttons (⇨⇦) are used to set the required values.

Leaving the 'Display' mode

The 'Display' mode can be changed to either the 'Adjust' mode ("AdJUST") or to the 'Transport' mode ("trAnSP") if required.

- Using the left-hand buttons (⇧ ⇩) change the display to either "AdJUST" or "trAnSP. Using the right-hand buttons (⇨⇦) confirm the menu change.

- Note that, on leaving the 'Display' mode, the data record required for the 'Zoom' function will be cancelled. New data storage will begin only when the 'Display' mode is re-selected!

Transport trAnSP

Transporting the **Meteograf** usually results in a change in altitude, which in turn produces a change in air pressure unrelated to any meteorological effects.

In the 'Transport' mode it is assumed that no weather-related changes in air pressure occur during the relocation of the device. This assumption is naturally more valid if weather conditions are relatively stable during the transport phase, and if the transport phase is of short duration.

'Transport' mode is selected when in 'Display' mode by using the left-hand buttons (⇧ ⇩) to show "trAnSP" on the LCD display, and then using the right-hand buttons (⇨⇦) to confirm the selected mode.

During the 'Transport' mode, the scriber will be locked into its current position. A horizontal line will therefore be marked onto the indicating roll for the duration of the transport. The LCD display will blink, showing either the air pressure or the altitude.

• The left-hand buttons (⇧ ⇩) are used to scroll through the menu. In the 'Transport' mode, they are not used to set any required values.

Selection of other modes

If the air pressure has not changed during the transport of the **Meteograf** the 'Transport' mode is simply left by selecting the 'Display' mode. (The LCD display should show "run".)

If the air pressure has changed during the transport of the **Meteograf** the 'Adjust' mode should first be selected, so that the new air pressure can be input. (The LCD display should show "ADJUST".)

• Using the left-hand buttons (⇧ ⇩) select either the 'Display' or the 'Adjust' mode as required. Confirm the choice using one of the right-hand buttons (⇨⇦).

Trouble-shooting

Problem	Possible cause
No display or other functions.	Battery flat, or incorrectly fitted.
Irregularities in displayed or indicated air pressure.	Air conditioning or similar system is influencing local air pressure. The **Meteograf** is being transported, without first selecting 'Transport' mode. Local electro-magnetic transmissions are interfering with the electronic devices inside the **Meteograf**.
Display is blinking. Scriber leaves a horizontal line on the indicating paper.	'Transport' mode has been selected by mistake.

PC-interface (only applicable to units fitted with this feature)

Description

The 'Meteograf' contains a memory in which the barometric pressure data recorded over the last ten days is stored. The data is recorded to a tolerance of 0.1 hP. (Equivalent to 0.1 mBar.)
Using the data transfer cable supplied, this data can be downloaded to a PC for permanent storage or for further manipulation.
The software is compatible with Microsoft 'Windows' Versions 95, 98, NT, 2000 and XP. Using the 'Excel' program, the data downloaded can be automatically displayed graphically using a Macro function.
As this software is freely available, it can be customised by the operator to suit his or her individual data processing requirement.

Software installation

- Close all open applications.
- Insert CD. The installation procedure should then automatically start.
- If required, the program file may be changed.

Download

On the Microsoft 'Setting - Control Panel', select 'Regional Settings' / 'Date' / '**DD.MM.YY'**
Connect the 'Meteograf' to the PC and start the Download program.
Under COM, select the applicable PC interface.
Select "New Excel chart" if you wish an Excel chart showing the data to be automatically created. (It is assumed that your PC already has 'Excel' installed.)

Confirm your download requirement with the command “Download”. The data will then be transferred to the PC. As the ‘Meteograf’ does not have an internal clock, the downloaded data will be stored in a Text File under the current date and time on your PC. ‘Excel will then be started and one ore two charts, will be created.
The data in the Text File may be further manipulated or copied to another location. *If this is not done, it will be overwritten during the next download*.
If no chart is required, or if you do not ‘Excel’ installed, the command “New Excel chart” should not be selected. The data will still be stored in the PC in a Text File as described above.

Important information

Battery

The **Meteograf** is designed to operate with one Alkali-Manganese Battery. Thanks to its low power consumption, the device will run from a single 1.5V battery (typical size: AM2, LR14) for between 9 and 12 months, at room temperature.
As with many types of battery, the Alkali-Manganese battery will increase its discharge rate at high temperatures, which results in a reduced battery life. At low temperatures, the battery is incapable of releasing its full charge. To maximise the battery life, operation of the **Meteograf** in extreme temperatures should therefore be avoided if possible, as should the use of batteries which have been stored for an excessively long time. Note also that excessive use of the buttons alongside the LCD display, or of the aural storm alarm, will run down the battery more quickly.

Paper and Battery change

Before turning the device off, or removing the battery, record the current altitude indicated by the **Meteograf** (ALt. ....). When the **Meteograf** is re-started, this altitude may be input when in the ‘Adjust’ mode. The corresponding air pressure will then be automatically recalculated.

Battery charge indicator

The battery voltage is regularly monitored and indicated on the LCD display by three small arrows in the upper left corner of the display:

Constant	Voltage greater than	1.15	Volt, Battery O.K.
Blinking (slowly)	Voltage between	1.15 and 1.0	Volt, Battery change required soon
Blinking (rapidly)	Voltage between	1.0 and 0.9	Volt, Battery change required urgently
“Lo bAt“	Voltage below	0.9	Volt, Device accuracy cannot be guaranteed

If the battery voltage sinks below 0.9 Volt, the LCD display will, as shown above, change to **“Lo bAt“** and the air pressure will no longer be displayed. Operation of the various menu functions will no longer be possible. The scriber, however, will continue to mark the indicator roll until the battery is completely flat

The battery charge indicator is designed to be compatible with Alkali-Manganese batteries only. Other types of battery, such as rechargeable Nickel-Cadmium cells, have a completely different discharge characteristic and are incompatible with the - **Meteograf** battery charge indicator.

Storm warning (Flashing “hP“ display and aural tone, if selected)

The weather, and most critically the wind, are dependent on the rate at which atmospheric pressure changes. For every geographical latitude, a rate of change of air pressure is defined which is considered to indicate forthcoming storm conditions. Hence the following settings are suggested for the **Meteograf** storm warning:

From 1 mBar (hPa) / h at 20° to 40° latitude
From 2 mBar (hPa) / h at 40° to 60° latitude (i.e. Europe)
From 3 mBar (hPa) / h at 60° to 80° latitude.

The optimal setting of the storm warning should be decided by the individual user. Too low a setting will obviously result in a number of false alarms, whilst too high a setting will result in no warning being given of impending storm conditions. Setting of the storm warning is described in the instructions covering the ‘Adjust’ mode (Display showing “GALE“,) with setting of the aural warning being covered in the ‘Display’ mode, (Display showing “CALL“.)

The pressure change (a) in a 60-minute interval, or (b) twice the pressure change in a 30-minute interval, or (c) four times the pressure change in a 15-minute interval will set off the storm warning if it exceeds the setting of the storm warning input in the 'Adjust' mode.

Filter

In order to prevent rough seas from causing fluctuations in the indicated pressure, the micro-processor program calculates the average pressure from a number of separate measurements.

Location

The **Meteograf** must have a fixed location. Relatively small changes in elevation (such as carrying the device from the ground floor to the cellar of a building, or, on inland waterways, passing through a lock) will influence the pressure measurement. (e.g. At Sea Level, an elevation change of 1 m corresponds to a pressure change of c. 0.12 mBar.)

Indicating paper

The barogram is inscribed onto a special waxed paper. One paper roll is sufficient for one year's operation. The paper is of high quality and may be stored for many years with no degradation. Note, however, that like all documentation it should be stored in a cool, dry place.

The paper can easily be marked-up using non-soluble felt-tip pens. It is also possible to open the **Meteograf**'s perspex cover and mark-up the paper roll whilst the device is operating. Note that when re-closing the cover it is important to make sure that the holes in the paper roll are still engaged with the cogs of the transport mechanism.

The barogram can be easily photocopied, or input into a Personal Computer using a Scanner.

Maritime installation

When installing the **Meteograf**, ensure that it will not break free during stormy weather. It should be mounted in a dry position, and where it is protected from spray. It should not be located in the immediate vicinity of a transmitter antenna, as the signals could interfere with the **Meteograf**'s operation.

Storage

If the **Meteograf** is not used for any length of time, ensure that the battery is removed. Even the highest quality batteries can, after prolonged storage, leak and damage the inside of the **Meteograf**. The **Meteograf** should be stored in a dry place!

Maintenance

The **Meteograf** should be cleaned using a soft cloth or tissue, if necessary soaked in ethanol. **No cleaning solvents should be used,** as they could damage the plastic components.

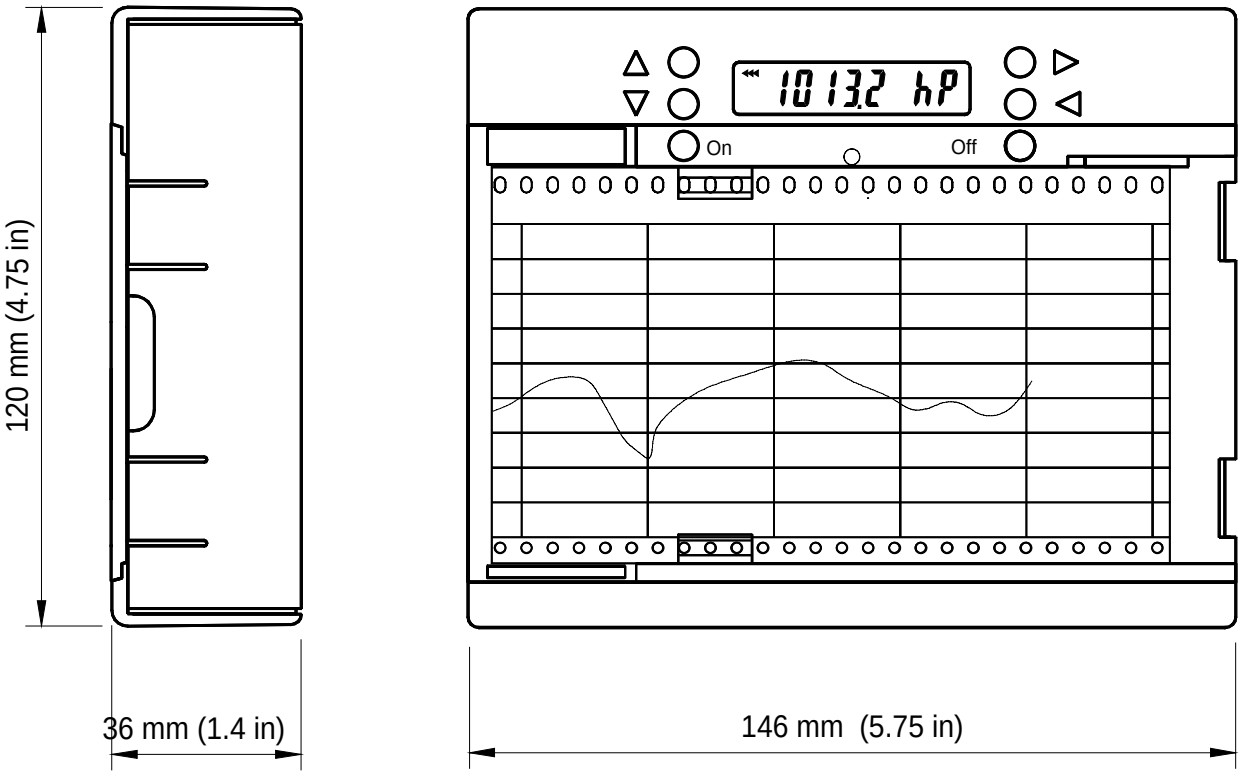
Apart from changing of the battery and the indicating paper, the **Meteograf** requires no maintenance. The device also contains no adjustable parts.

The interior of the device contains no components (trim potentiometers, etc.) which can be adjusted. There is therefore no requirement to open up or dismantle the device, and any attempt to open the **Meteograf** will invalidate the manufacturer's guarantee!

Summary of Menu Options

Mode	Display	Description
Set-up: ⇧⇩ **Scrolling through the Menu using the left-hand (LH) buttons.**	8.8.8.8.8.8.8.8	Press 'On' button,➔ Display test ➔ Scriber point moves to 1010 mBar or 29.8 inHg line ➔ Paper indexes forward 5 mm ➔ Display automatically changes to "Pos. 1010 or Pos 29.8".
	PoS 1010 PoS 29.8	Use the right-hand (RH) buttons to correct the scriber point position to 1010 mBar or 29.8 inHg. This correction is stored in the device memory, and is automatically incorporated the next time the unit is switched on.
	PAPEr	Use the RH button ⇨ to move the paper to the correct position. (Note: The paper cannot be moved backwards!)
	AdJUSt	Use the RH buttons to change to the ADJUST mode.
Adjust: AdJUSt **+ Display blinking** ⇧⇩ **Scrolling through the Menu using the LH buttons.** ⇧⇩ If no button is pressed for a period of 30 seconds, the **Meteograf** will automatically switch to "run".	ALt. 1537	Use the RH buttons to set the correct altitude. The air pressure is automatically adjusted to suit this altitude.
	1013.2 hP 29.998 in	Use the RH buttons to set the correct air pressure. The altitude is automatically adjusted to suit this air pressure.
	GALE 2hP GALE 0.06	Use the RH buttons to set the pressure change rate at which the Storm Warning alarm will be triggered. (1 - 5 hPa/h ; 0.03 – 0.15 inHg/h or 'Off')
	- 2 h	Use the RH buttons to set the required Time Change. (e.g. Changing from summer to winter time, crossing a time zone.)
	ALt. MEt. ALt. FEEt	select the required unit for altitude – in metres or feet
	P hP P inHG	select the required unit for barometric pressure – in hectopascals (hPa) or inches of mercury (inHg)
	run	Use the RH buttons to change to the DISPLAY mode.
Display: run ⇧⇩ **Scrolling through the Menu using the LH buttons.**	1013.2 hP 29.998 in	Main display records the air pressure, the Secondary display shows the current air pressure.
	30-0.2 hP 30-.006 in	Main display records the air pressure, the Secondary display shows the current air pressure alternating with the change in pressure over the previous 1, 5, 15, 30 and 60 minutes.
	CALL 3	Use the RH buttons to set the number of aural alarm calls (1-9, On, Off), given when the Storm Warning is triggered. (Alarm sounds for 2 seconds every minute.)
	AdJUSt	Use the RH buttons to change to the ADJUST mode.
	trAnSP	Use the RH buttons to change to the TRANSPORT mode.
Transport: trAnSP **+ Display blinking** ⇧⇩	ALt. 539	Only the paper moves, the scriber point is locked. The last altitude is displayed on the Secondary display. (Blinking)
	1013.2 hP 29.998 in	Only the paper moves, the scriber point is locked. The last air pressure reading is displayed on the Secondary display. (Blinking)
	run	Use the RH buttons to change to the DISPLAY mode.
	AdJUSt	Use the RH buttons to change to the ADJUST mode.

Display dimensions



Technical Data

Pressure Range Display, memory	940 to 1070 mBar	(27.76 to 31.60 in Hg)
Pressure Range paper record	960 to 1055 mBar	(28.35 to 31.15 in Hg)
Altitude Range	-500 to 6,000 m	(-1,600 to 20,000 ft)
Resolution	0.1 mBar	(0.003 in Hg)
Linearity	< ± 0.5 mBar *	(< ± 0.0015 in Hg)*
Temperature Error	< ± 0.02 mBar / °C *	(< ± 0.0006 in Hg / °C)
Temperature Range	- 15°C to + 50°C	(14°F to 120°F)
Index Rate	1 mm / h = 24 mm / Tag	
Display (Main)	Shows recorded pressure from previous 4 days	
Recording Method	Rectilinear. Maintenance-free	
Paper Capacity	1 Year	
Display (Secondary)	8-digit, 7 mm LCD (Liquid Crystal Display)	
Filter	Mean value averaging (for compensation of high sea states)	
Storm Warning	Auraland visual. Set point adjustable	
Electricity Supply	1 Alkali Manganese 1.5 V battery (1 year's * operation)	
Dimensions **	146 x 120 x 36 mm (5.75" x 4.75" x 1.4")	
Weight **	500 g (inc. battery and paper.)	(1.10 lb)

* Typical values

** Not applicable to unit in wooden casing.

The manufacturer reserves the right to make changes to the unit specification

Accessories available

- **Indicating paper, Pressure hPa.** Set of 5 Rolls.
- **Indicating paper, Pressure inHg.** Set of 5 Rolls.
- **Replacement battery** (Available from any electrical goods dealer)
- **Wooden housing Cherry**
- **Wooden housing Mahogany**
- **Wooden housing Walnut**
- **Wooden housing Black**
- **Chrome steel carriage**
- **Wooden casing, Casing black, fitting mirror black**
- **Wooden casing, Casing Mahogany, fitting mirror gold**
- **Wooden casing, Casing Walnut, fitting mirror gold**
- **Installation panel, Black, dim**
- **Installation panel, Mirror, Black**
- **Installation panel, Mirror, Silver**
- **Installation panel, Chrome-plated steel, dim**
- **Installation panel, Mirror, Gold**

The latest information can be found on our Homepage under:

www.p-raeber.ch

28.12.2005

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