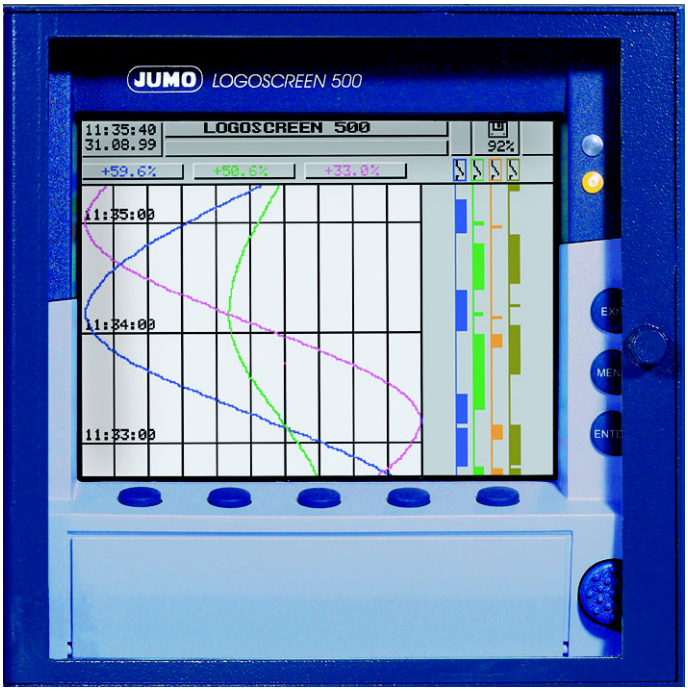


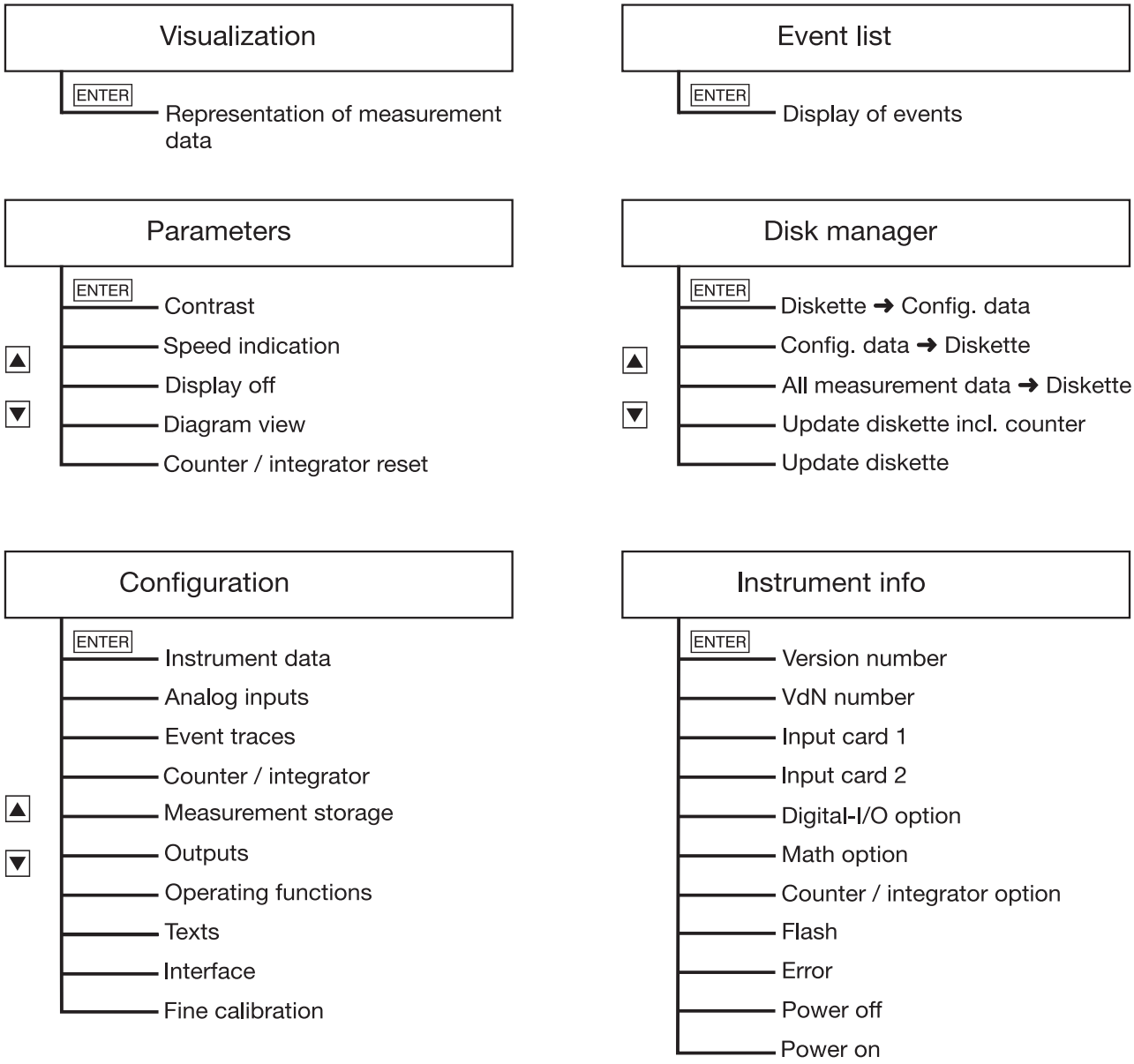
JUMO LOGOSCREEN 500

Paperless Recorder

B 70.6500.0

Operating Instructions

02.05/00378469


Visualization
ENTER
Representation of measurement data
Event list
ENTER
Display of events
Parameters
ENTER
Contrast
Speed indication
Display off
Diagram view
Counter / integrator reset
Disk manager
ENTER
Diskette ➜ Config. data
Config. data ➜ Diskette
All measurement data ➜ Diskette
Update diskette incl. counter
Update diskette
Configuration
ENTER
Instrument data
Analog inputs
Event traces
Counter / integrator
Measurement storage
Outputs
Operating functions
Texts
Interface
Fine calibration
Instrument info
ENTER
Version number
VdN number
Input card 1
Input card 2
Digital-I/O option
Math option
Counter / integrator option
Flash
Error
Power off
Power on

Contents

Contents

Contents

1.1 Preface

Please read these Operating Instructions before commissioning the instrument. Keep the operating instructions in a place which is accessible to all users at all times.

Please assist us to improve these operating instructions where necessary.

Your suggestions will appreciated.

Phone +49 661 6003-0
Fax +49 661 6003-607

All necessary settings are described in this manual. If any difficulties should still arise during commissioning, you are asked not to carry out any manipulations that could endanger your rights under the instrument warranty!

Please contact the nearest subsidiary or the head office in such a case.

When returning modules, assemblies or components, the regulations of EN 61340-5-1 and EN 61340-5-2 “Protection of electronic devices from electrostatic phenomena” must be observed. Use only the appropriate **ESD** packaging for transport.

Please note that we cannot accept any liability for damage caused by ESD (electrostatic discharge).

1.2 Arrangement of the documentation

The documentation for this instrument consists of the following parts:

Operating Instructions B 70.6500.0

These operating instructions are included in the delivery. They are addressed to the equipment manufacturer (OEM), and to the user with appropriate technical expertise.

In addition to installation and electrical connection, they contain information on commissioning, operation and parameter setting on the instrument, as well as on the optional PC setup programm and the optional PC evaluation program (PCA).

Interface Description B 70.6500.2

It provides information on the serial interfaces (RS232 and RS485), which can be supplied as an extra. Using the interface description, it is possible to develop specific programs which can, for instance, read out current measurement data.

1.2.1 Structure of these Operating Instructions

These operating instructions are arranged in a way which permits the user to enter directly into the operation and configuration of the instrument. Consequently, chapters dealing with items that normally arise only once are placed at the end of the manual. These include instrument description, type designation, installation and electrical connection.

1.3 Typographical conventions

1.3.1 Warning signs

The signs for **Danger** and **Caution** are used in this manual under the following conditions:

Danger

This sign is used when there may be **danger to personnel** if the instructions are disregarded or not followed accurately!

Caution

This sign is used when there may be **damage to equipment or data** if the instructions are disregarded or not followed accurately!

Caution

This sign is used where special care is required when handling **electrostatically sensitive components**.

1.3.2 Note signs

Note

This sign is used where your **special attention** is drawn to a remark.

Reference

This sign refers to **further information** in other handbooks, chapters or sections.

abc[1]

Footnote

Footnotes are notes which **refer to certain points** in the text.
Footnotes consist of two parts:

Marking in the text and the footnote text.

The marking in the text is arranged as continuous superscript numbers.

Action

*

This sign marks the description of a **required action**.

The individual steps are indicated by this asterisk, e. g.:

* Press the ▲ key

* Confirm with ENTER

1.3.3 Representation

Keys

▲ + ENTER

Keys are shown **in a frame**. Both **symbols or text** are possible. Where a key has multiple functions, the text shown corresponds to the function which is **currently active**.

Screen text

Program manager

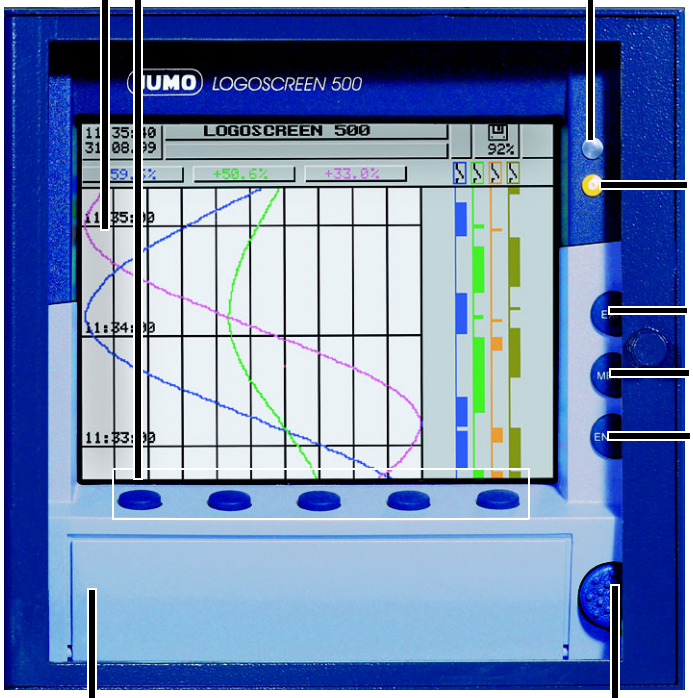
Texts displayed in the setup program are shown in **italics.**

Menu items

Edit ➔ Instrument data

Menu items of the setup program, which are referred to in this manual, are shown in italics. Menu item and sub-menu item are each separated by "➔".

2.1 Display and controls

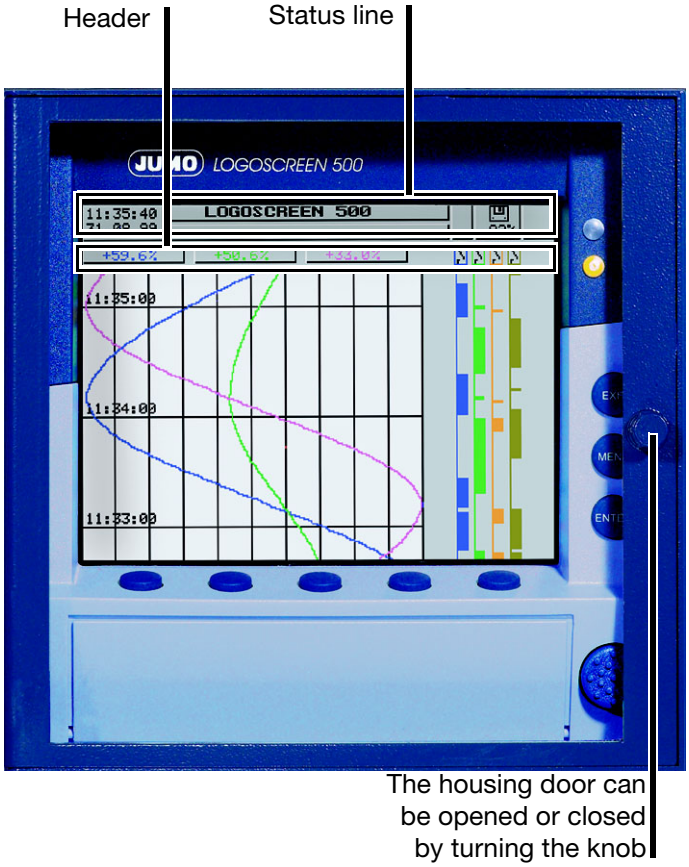


1. not from the configuration level,
   if a parameter has already been altered there.

The life of the background illumination can be prolonged by using the screen saver.

⇨ Chapter 4 “Configuration parameters”,
Parameters ➔ Display off

Opening and closing the housing door



2.2 Operating principle and graphic elements

Keys

The recorder is operated from eight keys. Three of these have fixed functions, the other five (softkeys) have menu-dependent functions.

⇨ Chapter 2.1 “Display and controls”

Softkeys

The softkey functions appear in the bottom line of the display, as symbols or in plain language.

Status line

The status line is shown in the upper part of the display. It provides information on important actions and states.

The status line is always visible, irrespective of the level (operation, parameters, configuration).

Alarm
If an alarm has occured (e. g. out-of-limit), the (alarm) bell flashes in this field

Diskette / internal memory
Indicates the free storage capacity of the diskette or the internal memory in percent. If there is a diskette error, the diskette symbol flashes. The error message can be checked in the disk manager. In the event of a "memory alarm", the field is shown with a yellow background.
⇨ Chapter 3.6 "Disk manager"

Storage capacity of diskette 

available internal memory 

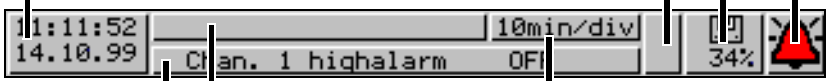

The egg timer appears whenever the instrument is busy and can therefore not be operated.

The "H" informs you that the indicated measurements are derived from the past (history). The data saved in the FLASH memory are shown.


In the event of an error, an "i" flashes here. The cause of the error can be read out from the instrument info window (⇨ Chapter 3.7 "Instrument info").


If the keys are inhibited, a key flashes in this position

Time & Date
shows the actual time and date



Current diagram speed
Background color:
gray = normal operation,
blue = timed operation,
orange = event operation

Instrument name (16 characters max.)

shows last entry in event list

Channel line (channel representation)

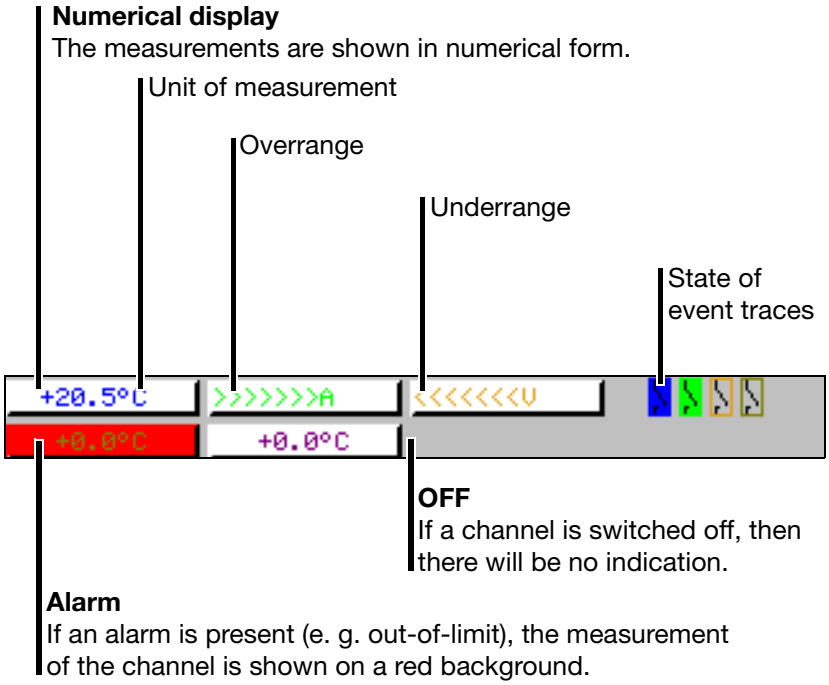
The channel line shows the measurements of the active channels and their unit as

- measurement
- scaling or
- bargraph.

Alternatively, the header can be switched off altogether.

In addition, alarms and out-of-limit conditions are made directly visible, according to the display mode.

Example: Measurement (meas. small)



The selection and visual presentation of the channel line can be controlled by using the parameter *Parameters* ➔ Diagram view ➔ *Channel representation.*

2.3 Analog inputs

Internal analog inputs

The paperless recorder can be equipped with 3 or 6 analog inputs. When configuring the analog inputs (Chapter 4.2 “Table of configuration parameters”), these are designated **analog input 1 — 3 (1 — 6)**.

2.4 Event traces

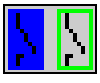
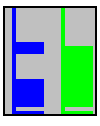
Signal types

In addition to the four logic inputs (extra code), digital signals generated by the instrument itself can also be displayed in the six event traces:

Signal	Description
Logic input 1 — 4	Four logic inputs present in hardware (extra code)
Logic channel 1 — 6	Channels which are created by using the math and logic module (instrument software version 133.03.xx or higher and extra code are required)
Low alarm 1 — 6	Underlimit of channels
Low combination alarm	OR linkage of all low alarms
High alarm 1 — 6	Overlimit of channels
High combination alarm	OR linkage of all high alarms
Counter/integrator alarm 1 — 6	Limit infringements of counter/integrator channels (instrument software version 133.03.xx or higher and extra code are required)
Counter/integrator combination alarm	OR linkage of all counter/integrator alarms (instrument software version 133.03.xx or higher and extra code are required)
Combination alarm	OR linkage of all low and high alarms
Memory alarm	Alarm is triggered when the residual capacity of the diskette, or the available internal storage space, falls below a certain value. Chapter 3.6 “Disk manager”
Error	Alarm when the battery is discharged, or the time has to be reset. Chapter 3.7 “Instrument info”
Modbus-Flag	Control flag which can be activated through the serial interface.

Representation

Representation on the screen is as follows:

Representation	
as symbol	On/Off represented as switch: 
as diagram	Representation as time sequence: 

Outputs

The digital signals can be used to operate the three relays (extra code). It is possible to configure the action as n.c. (break) or n.o. (make) (*Configuration* ➔ *Outputs*).

External texts

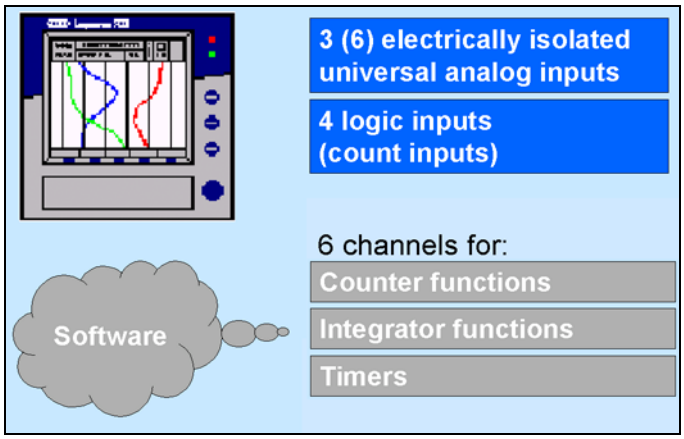
So-called “external texts” can be arranged through four logic inputs. Either a *standard text* or one of the 18 definable texts can be used. The instrument automatically supplements the texts in order to distinguish between the appearance and disappearance of the signal. The external texts are configured on the instrument under *Configuration* ➔ *Operating functions*.

⇨ Chapter 3.5 “Event list”

Event operation

The digital signals can be used to activate event operation. In event operation, the measurements are stored at a storage rate which is different from that in normal operation.

2.5 Counters / Integrators / Timers



Counters, integrators and timers are available as extras from instrument software 133.03.xx.

These are **not** electrical measurement inputs (hardware), but channels which are calculated by the recorder (software).

Counters

Counter inputs

- logic inputs
- logic channels
- alarms
- errors
- Modbus-Flag (signal via serial interface)

Counter frequency

30 Hz max.

Weighting

The count pulses can be evaluated (weighted). A down counter can be implemented by entering a negative weighting (e.g. weighting factor -1).

Each count change can be documented with an entry in the event list. The new count is attached to the message.

Integrators

Integrator inputs

- analog inputs 1 — 3 (6)

Integrator time base

- sec, min, hr and day

Weighting

You can also enter a weighting for the integrators.

Weighting example

- flow measurement
- input signal from 0 — 20 mA (corresponds to 0 — 1000 l/sec)
- time base 1 sec
- weighting 0.001
- display of the integration value (quantity) in m^3

Minimum size of input signal

Entering a threshold value (amount of threshold value) has the effect that integration takes place only when the value has been exceeded. No integration will occur on falling below the value. The advantage of integration with a threshold value larger than 0 is that possible noise from a transducer can be suppressed in this way.

Timers

The timer will count for as long as the selected logic input or one of the digital signals is closed (set). The time can be displayed in sec, min, hr and days.

2.5.1 Reporting periods of counts

After an adjustable time period (reporting period) the counts are stored for all counters/integrators/timers. The counts of the most recently concluded reporting period can be graphically displayed. The following counter/integrator types are possible:

- periodic
  The time period (between 1 min and 12 hrs) must additionally be selected in the parameter *Period*.
- external
  The counter/integrator is updated here only when the selected operating signal is active (e.g. logic input is closed). When the operating signal is deactivated (e.g. logic input is open), the counter/integrator value is stored and reset to 0.
- daily
- weekly
- monthly
- yearly
- total
- daily from-to
  In addition, the period has to be selected, by means of the parameters “Daily start time” and “Daily end time”. The counter/integrator will then be updated from the start time only. When the end time has been reached, the counter/integrator value is stored and reset to 0.

2.5.2 Resetting the counters / integrators / timers

Periodic reset

There is a reporting period for each counter/integrator/timer. At the end of this period, the current data (value and time) are stored and the value is reset to 0. Subsequently, the next period can be recorded.

An exception is the totalizer/integrator value. It is stored whenever any count/integration has been completed, but it is not reset to 0. This enables the totalizer to be evaluated also in the PCA evaluation software.

External reset

You can configure an operating signal for all 6 channels together, with the result that the counters/integrators are reset to 0 **without storing** the previous values. The period for the counter/integrator summation will be restarted at this point. This means that after the test run of an installation, for instance, the recording can be freshly started, thereby eliminating the test run values, which are not required.

⇨ See “Reset generation” on page 63.

Reset from keys

Another option of resetting the counter/integrator values is provided at the parameter level. After entering the password, you can define a value for each of the 6 channels. The counter/integrator will then be set to this value. When, after editing, a value is accepted, a message with the new and the old count is entered in the event list.

The time period for the counter/integrator summation will not be freshly started. The previous counter/integrator values will also not be saved.

If you wish to save the previous counter/integrator values, you have to execute the function “Update diskette incl. counters” in the *Disk manager* menu before resetting.

In this way, you can restart the recording of individual counters/integrators, for example, after the test run of an installation; the values of the test run, which are not required, can thus be eliminated.
You can select a password other than that for accessing the configuration. The password can be set under *Configuration ➔ Instrument data ➔ Code No.(Password) ➔ Counter/Int.reset.*

Reset via the “Disk manager” menu

If the function *Update diskette incl. counters* is executed in the “Disk manager” menu, the counts will also be stored and reset.

⇨ See “Disk manager” on page 41.

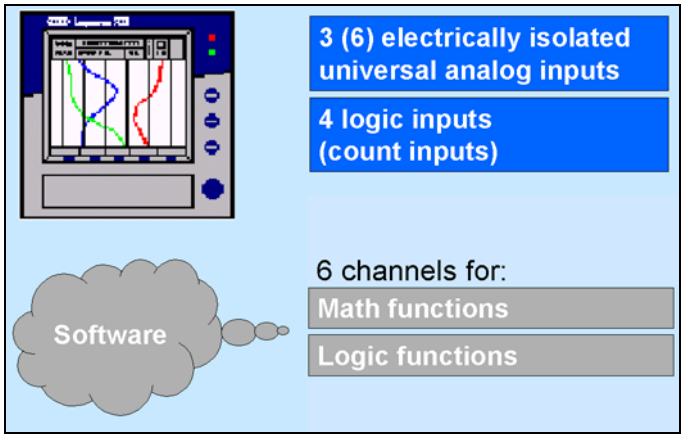
2.5.3 Behavior on instrument reconfiguration

When the instrument is reconfigured, the current counter/integrator reporting periods remain unaffected. The counter/integrator values will not be reset to 0 and the reporting period will not be restarted.

The values can be deliberately reset via the “Parameters” menu.

2.6 Math / logic module

The math and logic module is available as an extra from instrument software 133.03.xx. As is the case with the counters/integrators/timers, the math and logic module, too, are channels that are not available in hardware, but are calculated through the instrument software.



The math and logic module consists of 2 parts:

- the math module for calculating analog values and
- the logic module for calculating boolean values (0 or 1).

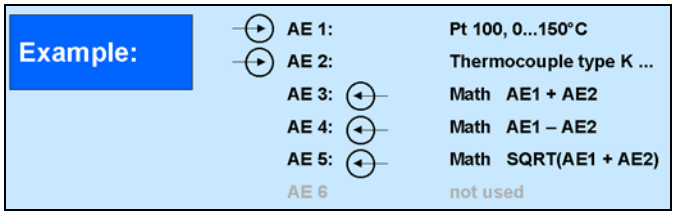
Math module

Using the math module, measurement inputs can be used to calculate new “virtual” channels.

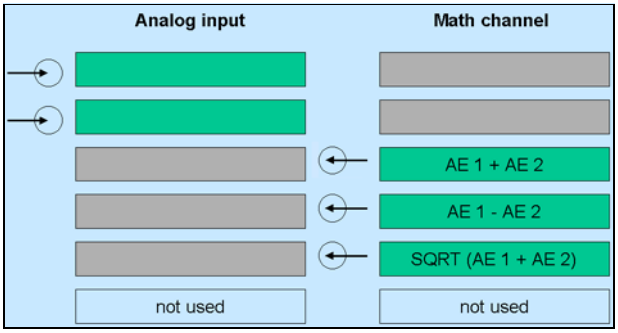
There are no separate math channels for the calculated channels, the existing analog channels 1 — 3 (6) are used instead. In configuration, you have to select the *Mathematics* option under the parameter “Sensor” for the required channel.

Configuration ➔ *Analog input x* ➔ *Sensor* = *Mathematics*

Each of the 6 channels can either be used for recording the corresponding channel, or as a math channel. With a 3-channel instrument, three additional “virtual” channels can thus be created.



When the measurement inputs AE1 and AE2 are mathematically linked, the measurement inputs AE3 — AE5 in the example above are not available as sensor inputs.



The channel number of a math channel indicates which analog input is being used by the math channel.

The following variables are used for the formulae:

- analog inputs (AE1 — AE6)
- counter/integrator channels (ZI1 — ZI6)
- logic inputs (BE1 — BE4)
- alarms
- errors
- Modbus-Flag (signal via serial interface)
- instrument-specific data (only after consultation with the manufacturer)

If counter/integrator values are used for calculation, please note the reduction in accuracy, since, in this case, two different data formats have to be used for calculation. The counters/integrators are calculated in the double-float format, whereas the math module employs the single-float format to the IEEE 754 standard. Nevertheless, these values can still be integrated into the math module.

Available as fixed functions are:

- difference
- ratio
- humidity
- moving average

For the moving average, it is necessary to enter the reference channel (in most cases, the analog input no.) and the time (in minutes), which are used for calculating the moving average.

The following operators and functions are available for the formulae:
+, -, *, /, (,), SQRT(), MIN(), MAX(), SIN(), COS(), TAN(), **, EXP(), ABS(), INT(), FRC(), LOG(), LN().

On going above or falling below the scaleable values, the math channel is treated as for “out-of-range".

The formulae are entered in the PC, in the setup program. The mathematical formulae cannot be edited on the instrument by using the keys.

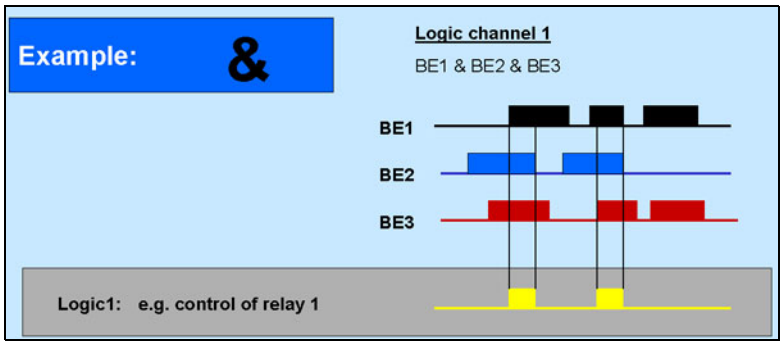
Additional information can be found in Chapter 5.4 “Math and logic module”

Logic module

There is also a maximum of 6 logic channels.

As is the case with all the other digital signals, the calculated digital (boolean) values can be used for different functions:

- recording in the event traces,
- as an operating signal for display switch-off,
- time synchronization,
- timer,
- externally operated counters / integrators,
- counter/integr. reset,
- event operation and key inhibit,
- for output to a relay and
- as count input for a counter.



The following variables are available for the formulae:

- logic inputs
- logic channels
- alarms
- errors
- Modbus-Flag (signal via serial interface)
- TRUE
- FALSE
- instrument-specific data (only after consultation with the manufacturer)

The functions below can be used for the formulae:

- ! (NOT)
- & (AND)
- | (OR)
- ^ (XOR)
- / (rising edge)
- \ (falling edge)
- ((open bracket)
-) (close bracket)

For additional information, see
Chapter 5.4 “Math and logic module”

2.7 Operating modes

3 operating modes

The instrument has 3 operating modes:

- normal operation
- timed operation
- event operation

The following settings can, among others, be made for each of the three operating modes:

- stored value
- storage rate

Stored value

The stored value determines whether the average, minimum, maximum or instantaneous value of the time interval between two storage cycles or the peak values (envelope) are stored. When “peak value” is set, then the minimum and maximum values of the last storage cycle are stored.

Storage rate

The storage rate determines the time interval between two stored values. The diagram speed corresponds to the storage rate, which means that at a storage rate of 5sec, for example, the stored value is entered in the diagram every 5 sec.

Normal operation

Normal operation is active whenever event or timed operation is not active.

Timed operation

For timed operation, a period of time can be determined (24 hrs max.) within which a specific stored value and a specific storage rate are active.

Event operation

Event operation is active as long as its operating signal (⇨ Chapter 4.2.6 “Configuration - Measurement storage”) is active. Event operation can be used, for example, to shorten the storage rate when an alarm is present.

Priority

The respective priorities of the operating modes are allocated as follows:

Operating mode	Priority
Normal operation	low
Timed operation	average
Event operation	high

Active operating mode

The active operating mode is indicated in the diagram by the background color for the diagram speed:

Operating mode	Color
Normal operation	gray
Timed operation	turquoise
Event operation	orange

⇨ Chapter 2.2 “Operating principle and graphic elements”

2.8 Data storage

Recording capacity

- internal memory: approx. 350,000 measurements
  (with option: “Memory expansion to 2 MB”: approx. 850,000 measurements)
- diskette: approx. 650,000 measurements

The recording capacity is reduced when many event messages are also stored.

Storage rate

Different storage rates, ranging from 1 sec to 32767 sec, can be configured for normal, event and timed operation under “configuration”.

The storage rate determines the time intervals at which the measurements are stored.

Stored value

Under this parameter, the value to be stored (average, instantaneous, minimum, maximum or peak value) is configured separately for normal, event and timed operation.

Recording format

The data are recorded encoded in a proprietary format.

Recording duration

The recording duration depends on various factors:

- number of analog channels and event traces being recorded
- storage rate
- number of events in the event list

The setup program calculates the recording duration for the current configuration.

Optimization of recording duration

The recording duration can be optimized by process-oriented selection of the storage rate.

In normal operation (no fault, no alarm, ...), a storage interval as long as possible (e.g. 60 sec, 180 sec, …) should be selected, depending on the specific application.

In the event of an alarm or a fault, the storage rate can be shortened via event operation, which ensures that the measurement data are recorded with a high time resolution.

After starting up the paperless recorder by switching on the supply (power ON), the start logo (company logo) appears.

During the screen build-up, the recorder is initialized with the data of the last configuration.

☞ After the initialization phase, the measurement diagram (visualization level) is displayed.

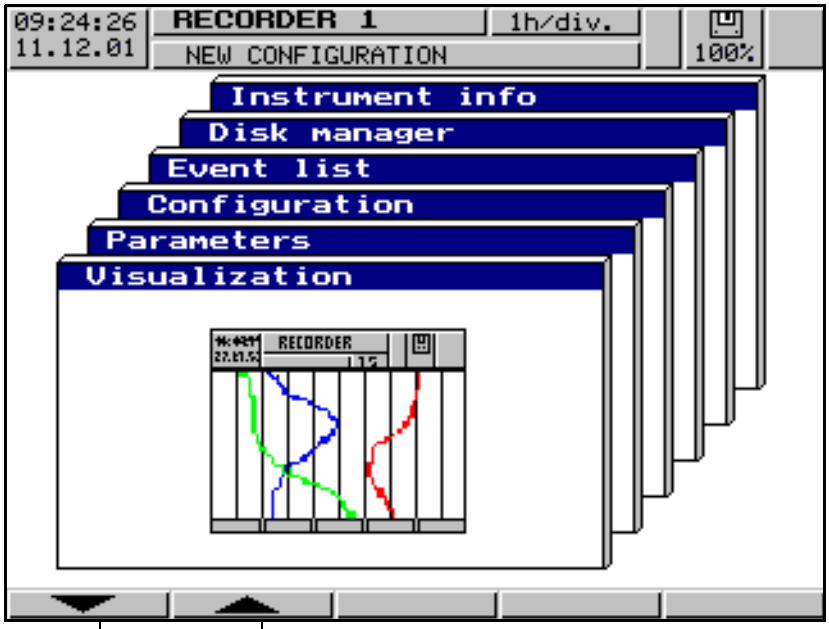
3 Operation and visualization

3.1 Basic menu

The basic menu is the central point from which the various levels of the instrument branch out.

The following levels are available:

- Visualization
- Parameters
- Configuration
- Event list
- Disk manager
- Instrument info



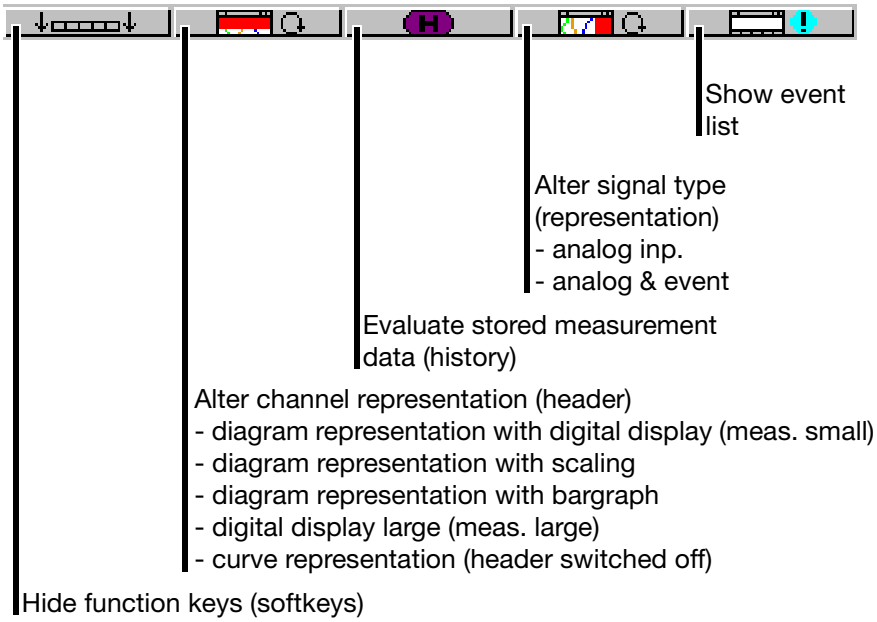
* Select the required level
* Confirm selection with ENTER

The basic menu is displayed after pressing the MENU key[1].

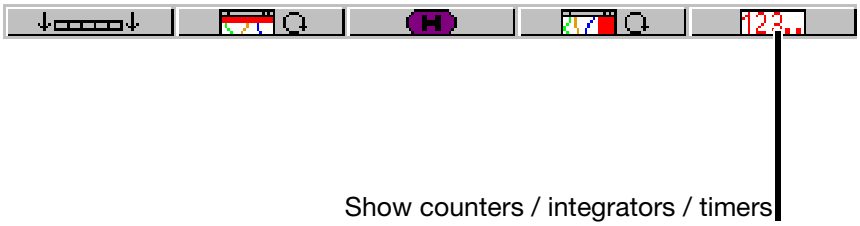
1. not from configuration level,
   if a parameter has already been altered there.

3.2 Visualization

As has already been mentioned in Chapter 2.2 “Operating principle and graphic elements”, the softkeys can be found at the bottom of the screen. They change their function according to the menu and are indicated as symbols or in plain language.



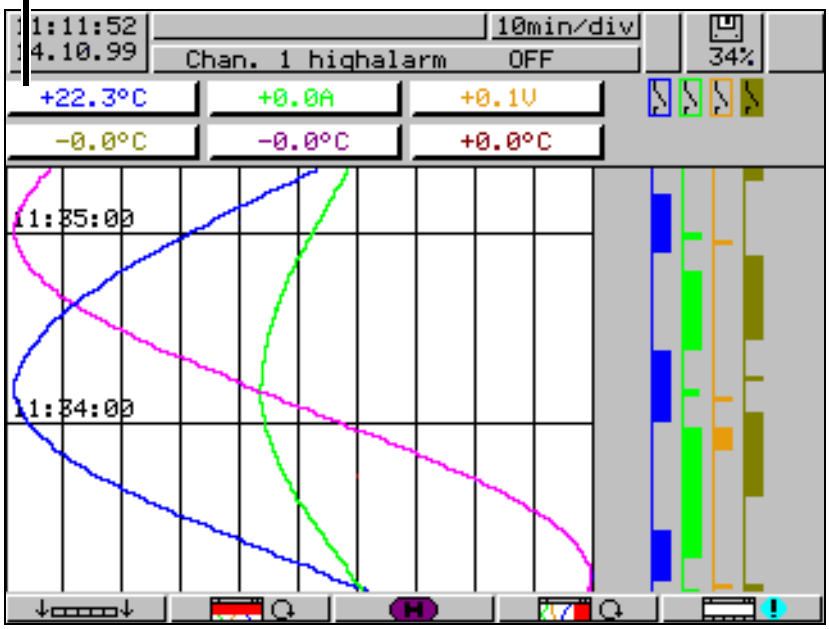
With instrument software version 133.03.xx (or higher), it is possible to equip the recorder with “Counters/integrators” (extra code). In this case, the symbol for indicating the counts will appear below the softkey on the right, the symbol for showing the event list is shifted to the counter display.



3.2.1 Diagram representation with digital display (small measurement)

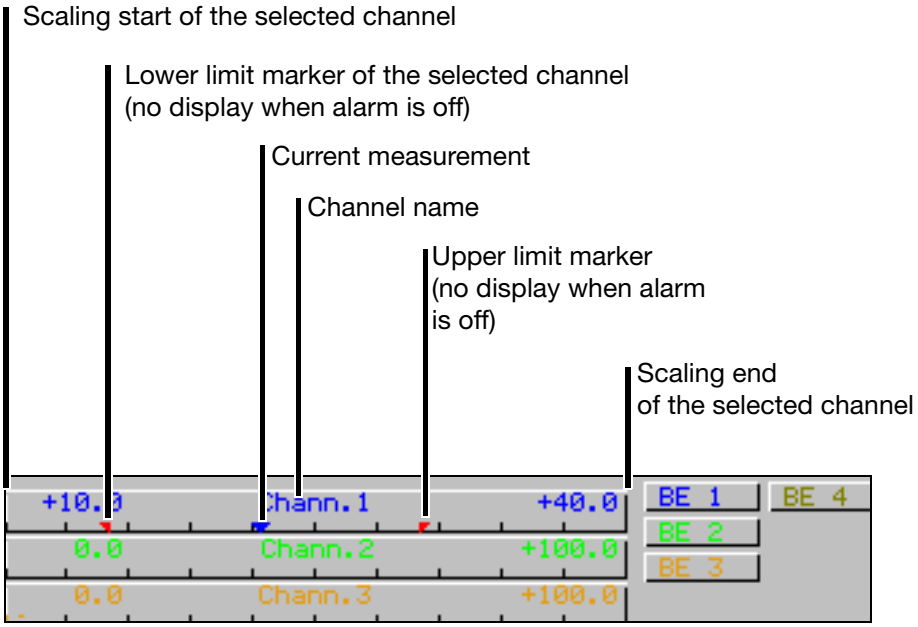
Diagram representation can be reached from the basic menu by calling up the “visualization” menu, or by pressing the EXIT key.

- Current measurements of the analog inputs including unit
- Measurement on red background ⇒ overlimit



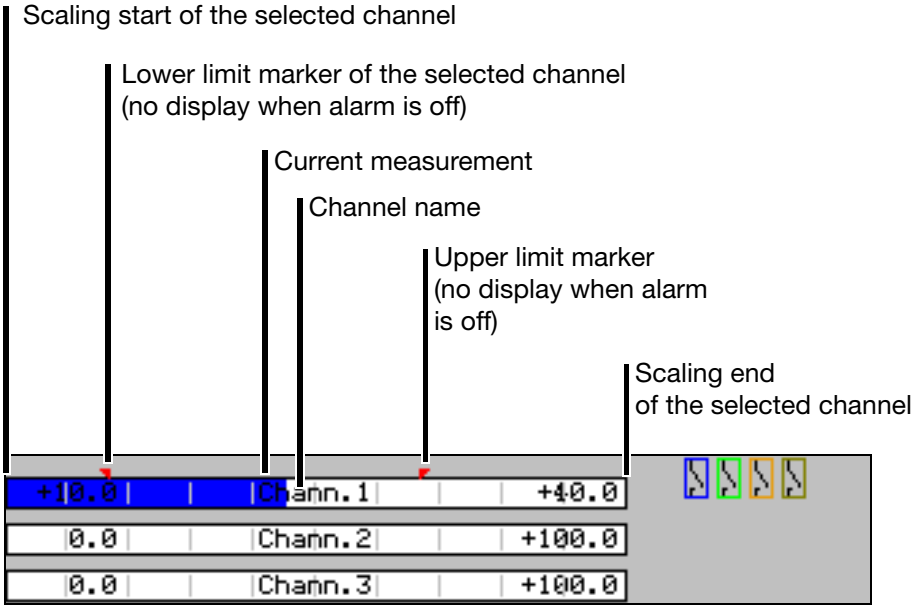
Using the parameter *Parameters* ➔ *Diagram view* ➔ *Signal type* (or the button), it is possible to select whether, in addition to the analog channels, the event traces are also to be displayed. The contents of the header is determined by using the parameter *Parameters* ➔ *Diagram view* ➔ *Channel representation* (or the button).

3.2.2 Diagram representation with scaling



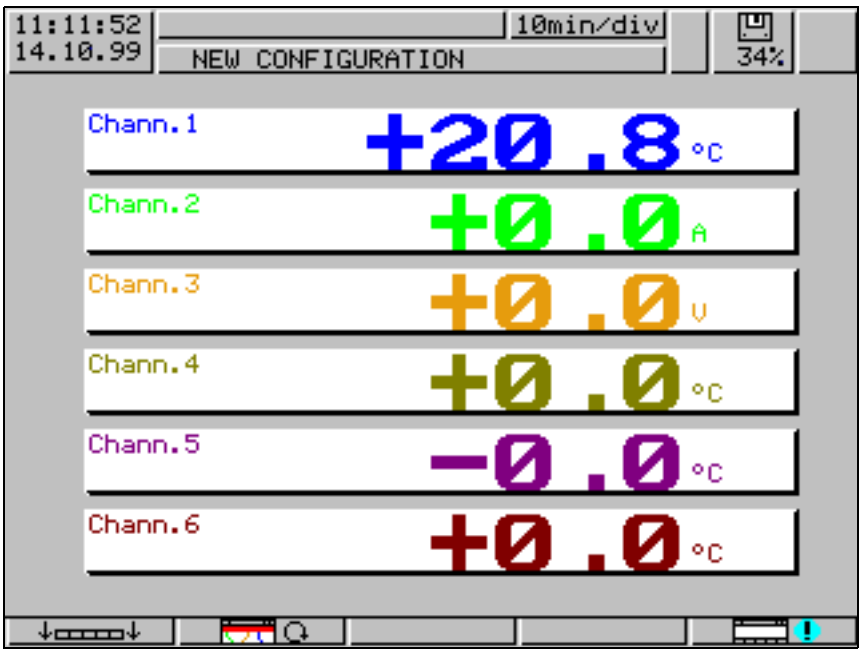
The parameter *Parameters* ➔ *Diagram view* ➔ *Channel indication* is available for selecting which scaling (on which channel) is the be indicated.

3.2.3 Diagram representation with bargraph



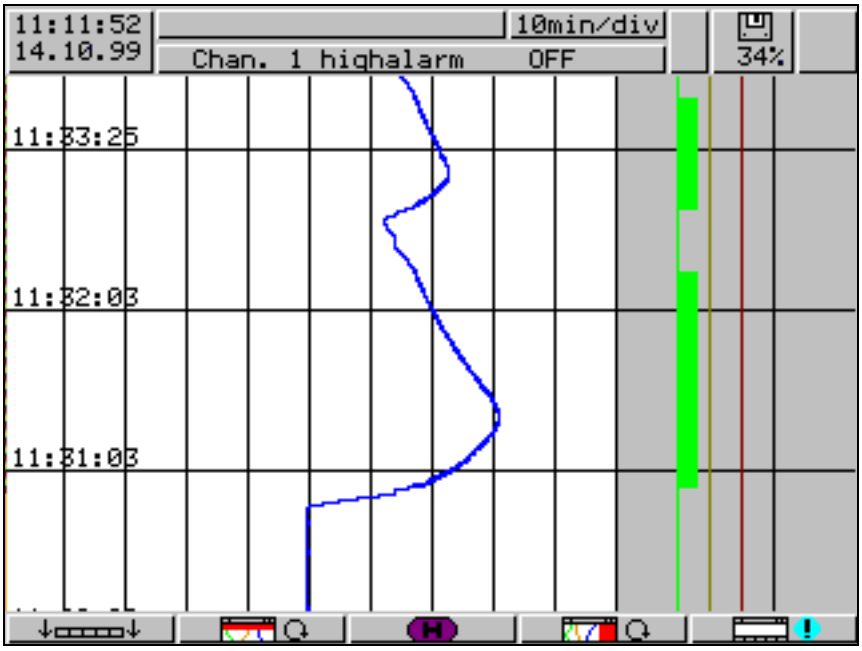
Using the parameter *Parameters* ➔ *Diagram view* ➔ *Channel indication*, it is possible to select which bargraph (on which channel) is to be indicated.

3.2.4 Large digital display (large measurement)



This display type is limited to the digital display.

3.2.5 Curve representation (header switched off)



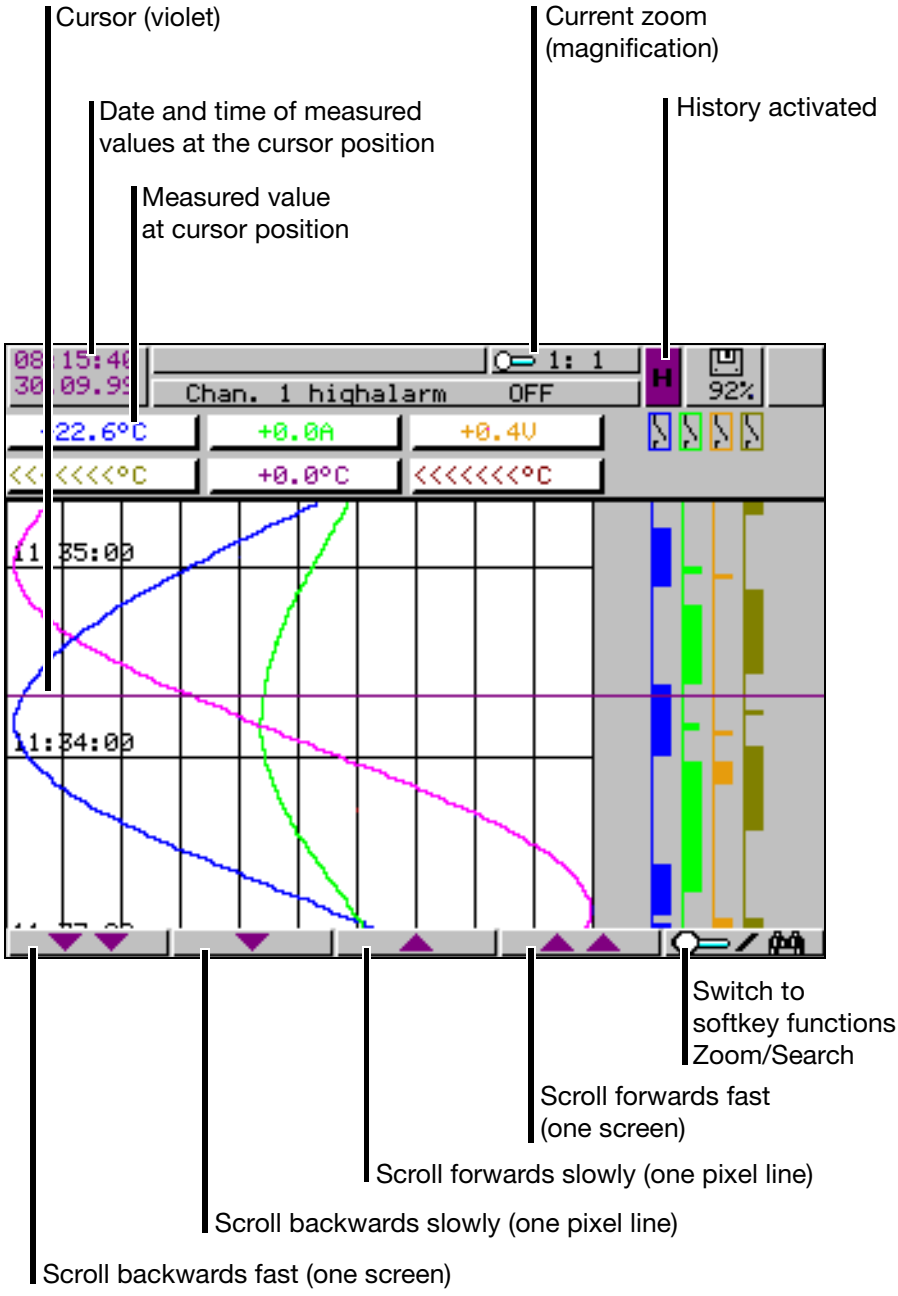
This display type is limited to the representation of curves.

3.2.6 Evaluating the stored measurement data

History

The softkey function changes during evaluation and, additionally, the current zoom factor and the cursor position (date and time) are displayed.

Scroll operation



Using these softkeys, the measurement data display can be scrolled (shifted) on the screen within the measurement data that are stored in the internal memory.

☞ Measurement acquisition remains active during history representation.

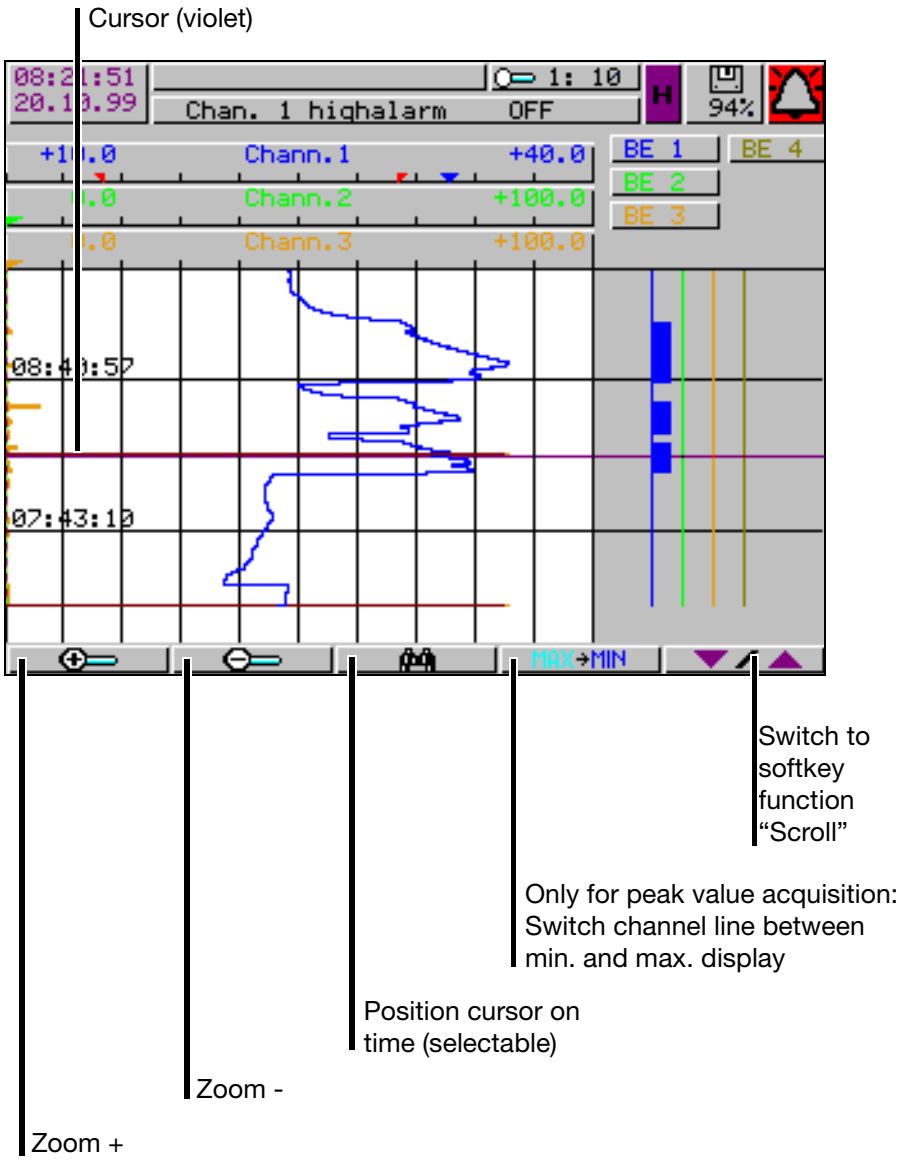
Zoom

If the zoom factor has to be adjusted, or specific times are to be searched for, then it is necessary to switch the softkey functions.

* Press  softkey

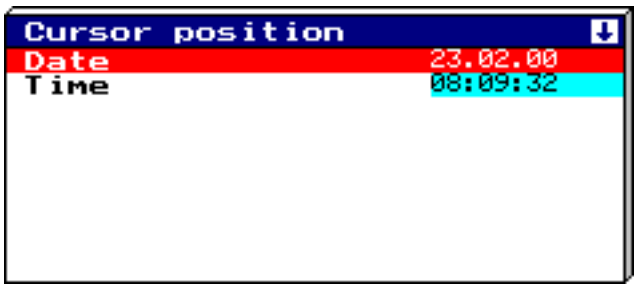
The degree of compression of the measurement data on the screen is given as a ratio in steps (1:1, 1:2, 1:5, 1:10, 1:20, 1:50 and 1:100).

For instance, 1:100 means that 1 screen pixel corresponds to 100 measurements, which signifies that only every hundreth stored measurement is displayed.



Positioning the cursor

After pressing the key, the following dialog is available for positioning the cursor on a specific time:



After the date and time have been entered and the START key has been pressed, the cursor is positioned on the selected time.

If no measurement data have been stored for the selected time, then the cursor is positioned on the next possible time.

Peak value acquisition

If the data have been recorded in the “peak value” mode, then two different measurements (one minimum and one maximum value) may be displayed graphically for one instant of time (storage rate). Using the MAX←MIN key, it is possible to switch between minimum and maximum value display within the display mode “measurement”.

	Function key	Channel line
Minimum	MAX←MIN	+31.9°C
Maximum	MAX→MIN	+32.2°C

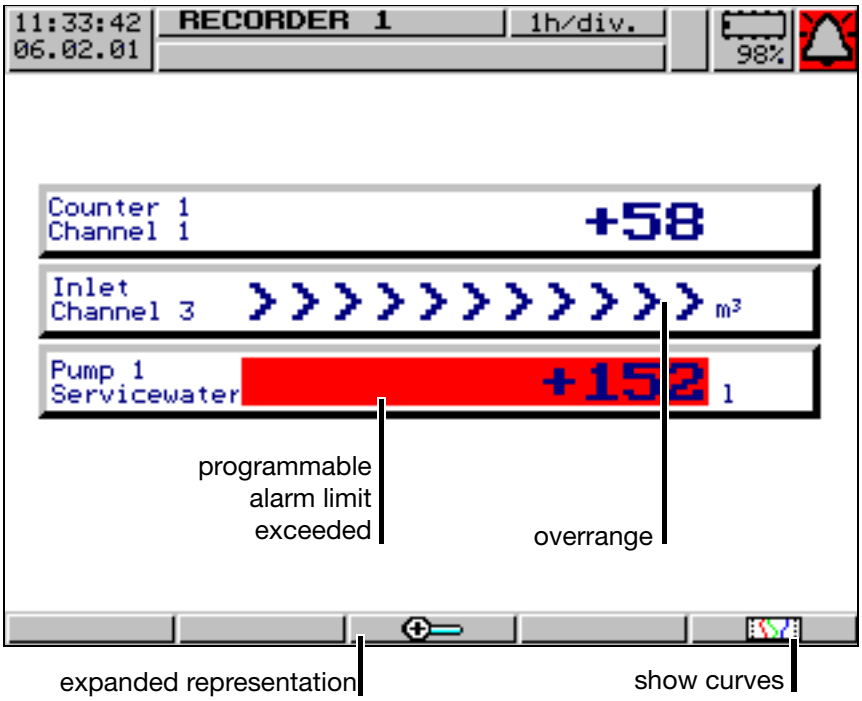
Peak value acquisition is programmed (activated) by the parameters:

- *Configuration* ➔ *Measurement storage* ➔ *Normal display* ➔ Stored value
- *Configuration* ➔ *Measurement storage* ➔ *Event operation* ➔ Stored value
- *Configuration* ➔ *Measurement storage* ➔ *Timed operation* ➔ Stored value

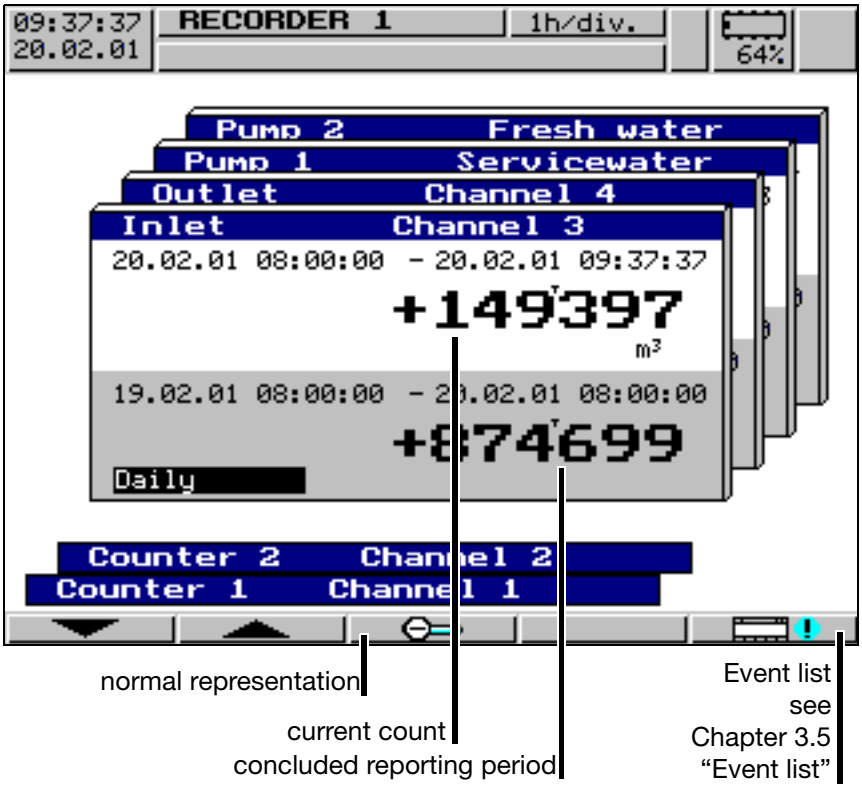
Further information on the “Measurement” display mode can be taken from Chapter 3.2.1 “Diagram representation with digital display (small measurement)” and Chapter 3.2.4 “Large digital display (large measurement)”.

3.2.7 Counters / integrators / operating time

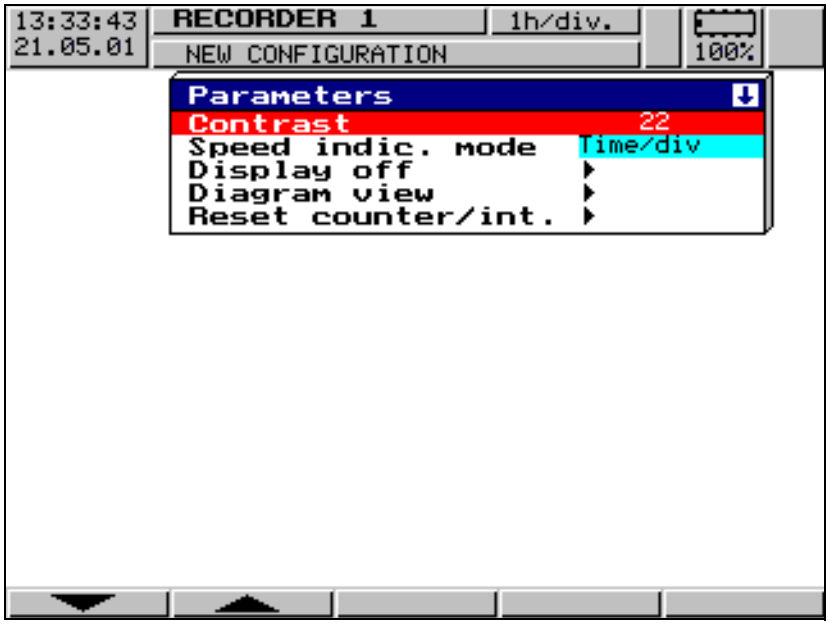
Count display is available from instrument software 133.03.xx (extra code). If available, the screen below, for example, appears after pressing the softkey, which shows the current counts in numerical form.



Expanded representation is activated by pressing the softkey.



3.3 Parameter setting



The “Parameter” level is available to set

- contrast,
- speed indication,
- display off,
- diagram view and
- counter/integrator reset.

☞ All parameters are selected using the ▼ and ▲ or ◄ and ► keys.

Contrast

The contrast of the screen can be set here. This ensures that the screen is always legible, even under difficult light conditions.

Speed indication

Here, “mm/h”, “time/div” or “storage rate” is selected for the speed display in the diagram.

Example: A diagram speed of 1 h/div corresponds to approx. 22 mm/hr.

Display off

Switch-off event = waiting time

For screen saving, a time between (0 and 32767 min) can be set under the parameter “Waiting time”. If no recorder key is operated during this time, then the screen goes dark. The power LED blinks during screen saving.
Screen saving (display off) is canceled by pressing any key on the recorder.

If 0 min is set, then screen saving is deactivated.

Switch-off event = operating signal

In this case, screen saving is performed by using one logic input (extra code) or a different operating signal. The logic input is selected via the “Operating signal” parameter.

As long as the signal is present, the display remains off. No waiting time is being taken into account.

Screen saving is deactivated when “Off” is selected.

Only one type of screen saving can be active at a time.

Diagram view

Diagram view → Signal type

Here, the representation mode of the measurement and event traces is determined:

- analog inputs
- analog inputs and event traces

Diagram view → Channel representation

The contents of the channel bar is selected here:

- small measurement
- scaling
- bargraph
- large measurement
- switched off

Diagram view → Channel display

The channels which are displayed in the channel line, in the representation mode “Scaling” and “Bargraph”, are selected here.

Diagram view → Paper perforations

Can only be selected if the analog channels only and **no** event traces are displayed. When *yes* is set, paper perforations appear in the diagram, thus giving the picture the appearance of a conventional chart recorder.

Counter/ integrator reset

After the password has been successfully entered, the counts for each of the 6 channels can be set to 0 or a defined value in this menu.

When a value has been input (confirm with ENTER), a message with the new and the old count is entered in the event list. The time period for the counter/ integrator summation will not be freshly started. The recent counter/integrator values will also not be stored. If this is required, you have to execute the *Update diskette incl. counter* function in the *Disk manager* menu before resetting.

In this way, the recording of the counters/integrators can be restarted, for example, after the test run of an installation; the test run values, which are not required, can thus be eliminated.

You can set a password which is different from that for accessing the configuration. The default value is also 9200. The password can be set in the menu *Configuration* ➔ *Instrument data* ➔ *Code No. (Password)* ➔ *Counter/Int. reset*.

3 Operation and visualization

3.4 Configuration

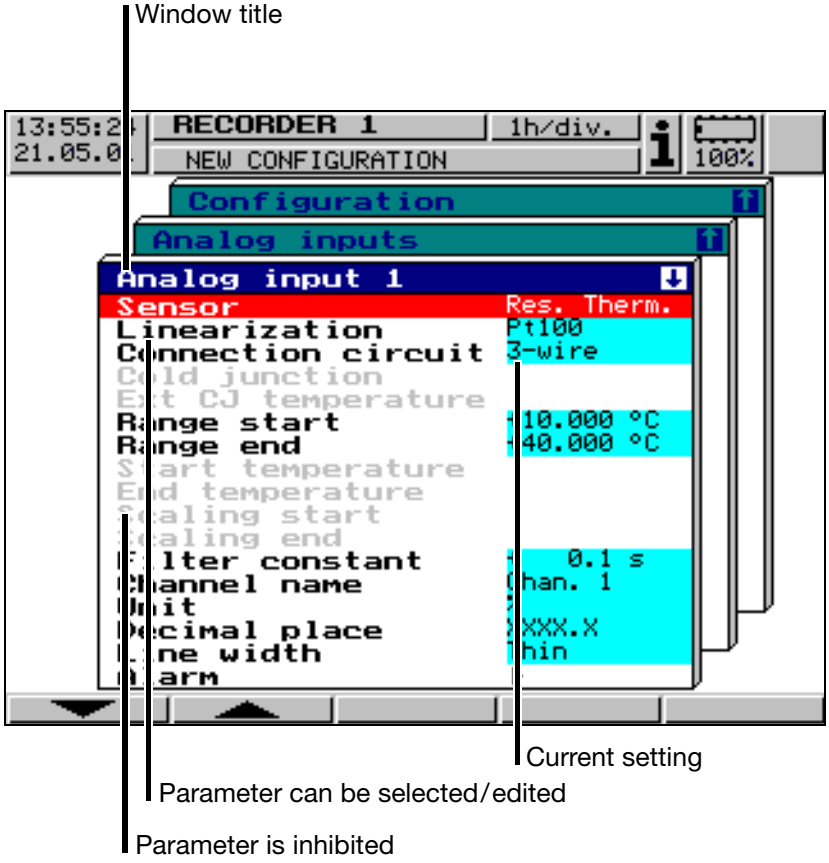
On calling up the configuration level, the password is requested (factory-set: 9200). It also serves to prevent unauthorized alteration of the configuration.

⇨ Chapter 3.9 “Code number (password entry)”

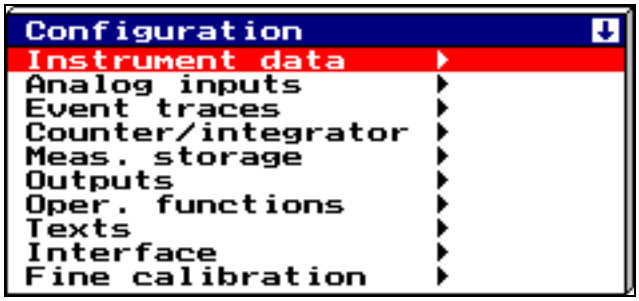
Window technology

Like for the other levels, the principle of configuration is also based on menu-led window technology. Individual menu items can be selected in the windows. The window title describes the contents of the window.

When a menu item has been selected, a further window is opened with new menu items, until the required parameter is finally reached. If several windows are open, the window title assists in orientation.



The configuration of the paperless recorder is sub-divided into the following levels:



⇨ Chapter 4 “Configuration parameters”

3.5 Event list

Events

Various events can initiate texts which are included in the event list and saved in the internal memory or on diskette. Events may include:

- alarms triggered by out-of-limit conditions on individual channels,
- external texts triggered through logic inputs,
- system messages (e. g. power ON/OFF, summer/winter time changeover),

Event definition

Foll all events, except for system messages, it is possible to configure whether

- the message text is to be included in the event list,
- the standard text internal to the instrument
- or one of the texts (see below) is used.

Text assignment

The texts (standard texts or 18 freely definable texts) are assigned to the events at the operating level “Configuration”
(⇨ Chapter 4 “Configuration parameters”).

Freely definable texts

18 texts can be freely defined, up to a length of 20 characters.

Standard texts

The instrument offers standard texts as listed in the following table:

Standard text	Note
Chan*x* low alarm ON Chan*x* low alarm OFF Chan*x* high alarm ON Chan*x* high alarm OFF Alarm counter/int. *x* ON Alarm counter/int. *x* OFF Logic input *y* ON Logic input *y* OFF Logic channel *y* ON Logic channel *y* OFF	*x* = channel number *y* = input number
Counter *x*: *y*	*x* = counter channel number *y* = counter value (9 digits)
Power ON Power OFF Data lost Summer time start Summer time end New configuration Counter/int. *x* from *y* reset to *z*	*x* = counter/int. channel number *y* = old counter/int. value (9 digits) *z* = new counter/int. value (9 digits)
„Text 1 — 18“	18 freely definable texts with 20 characters each

Supplementary text

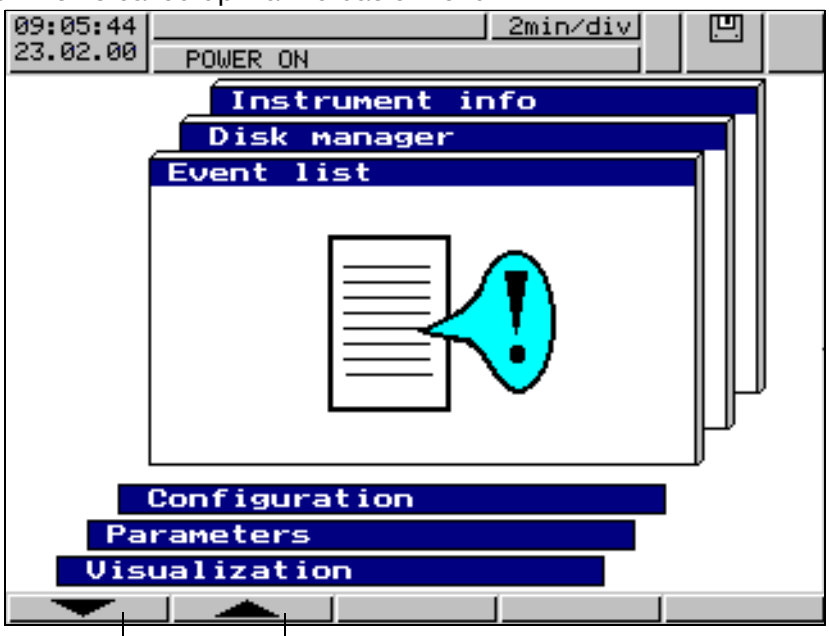
The instrument automatically supplements the texts by “ON” or “OFF”, to enable the distinction between appearance and disappearance of the signal.

Example:

Standard text	Supplementary text	Entry in event list
Logic input 2	ON	Logic input 2 ON
Logic input 2	OFF	Logic input 2 OFF

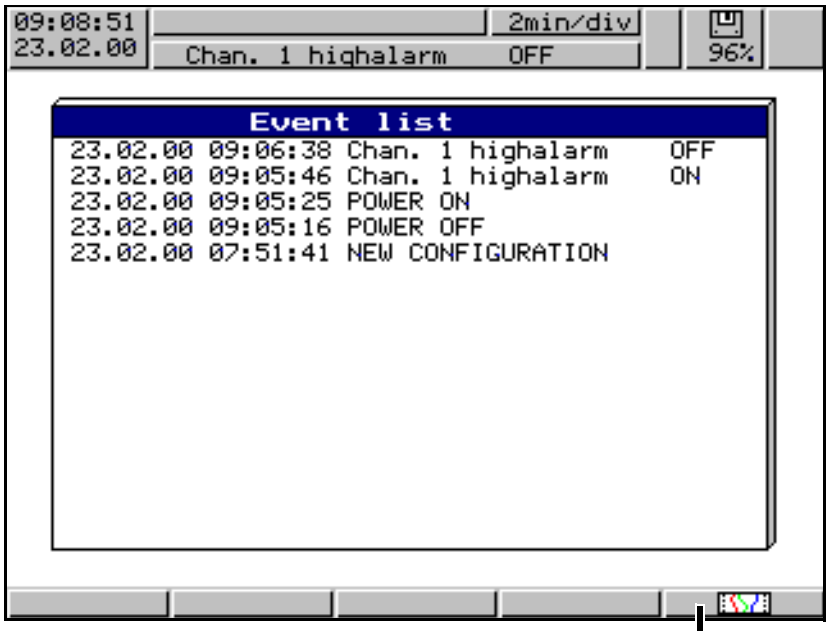
Basic menu → Event list

The event list is called up via the basic menu:



* Select operating level *Event list*
* Confirm selection with ENTER

Event list



jump back directly into diagram presentation

3.6 Disk manager

Automatic storage of measurement data

The data stored in the measurement data memory (FLASH) of the recorder are saved at regular intervals to the diskette in the instrument. The evaluation program of the PC (⇨ Chapter 6 “PC evaluation program”) reads the data from the diskette and provides convenient functions for evaluation.

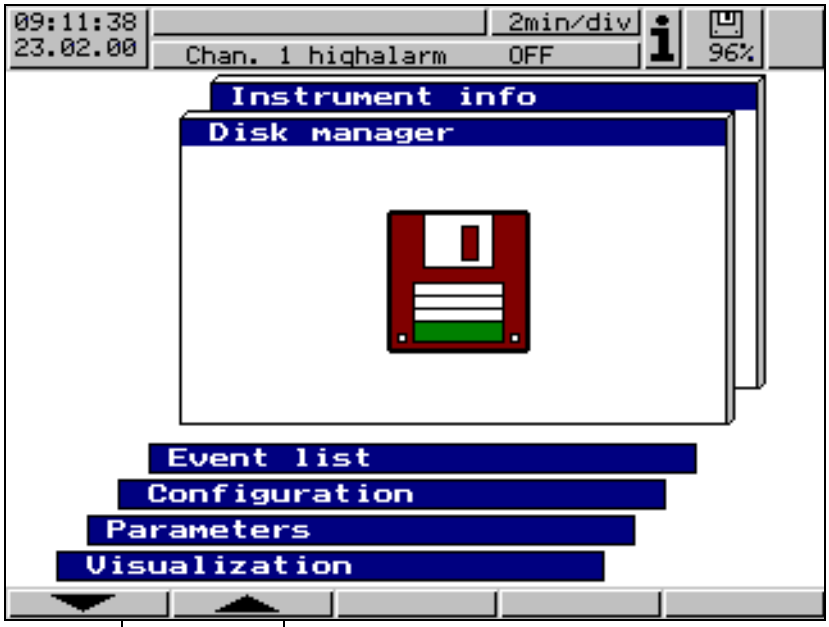
The stored data on the diskette and in the FLASH memory are deleted when the configuration is changed.

Loading and saving the configuration data

The configuration data can be downloaded from and saved to diskette. A configuration can thus be copied from one instrument to another, or it can be transferred from and to the PC setup program.

Basic menu → Disk manager

The disk manager is called up via the basic menu.

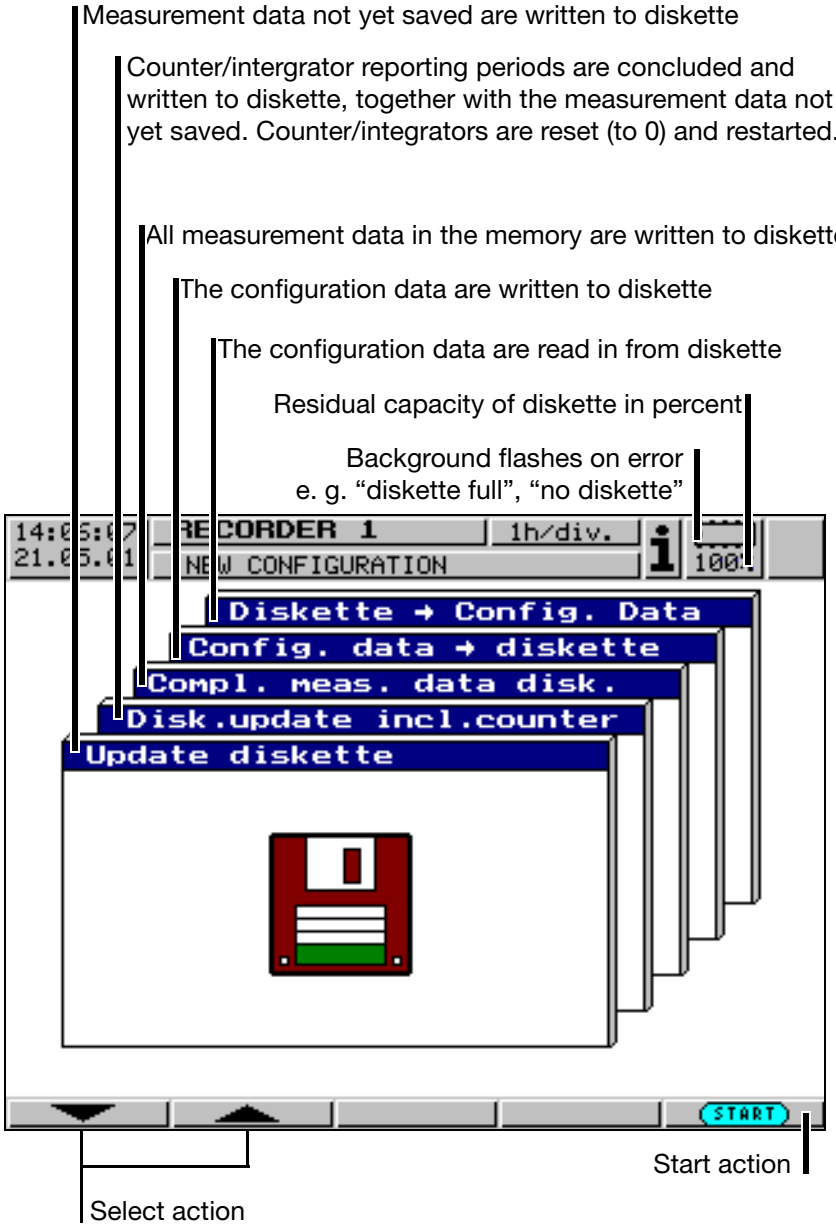


* Select operating level *Disk manager*
* Confirm selection with ENTER

The functions
- *Update disk. incl. counter* ...,
- *Compl. meas. data → Disk.*,
- *Config. data → Diskette* and
- *Diskette → Config. data*

are protected against unauthorized access by a password (factory-set: 9200).

Disk manager



The function “Compl. measurement data ➔ Disk.” serves to salvage data when the original diskette is no longer available.

Memory alarm

At the configuration level, a percentage (residual capacity of diskette) can be specified under *Instrument data* ➔ *Memory alarm.* When the residual capacity of the inserted diskette reaches this percentage, the signal “Memory alarm” is activated. It can, for instance, be used to operate a relay or to switch over to event operation.

⇨ Chapter 2.8 “Data storage”
Chapter 2.4 “Event traces”
Chapter 4 “Configuration parameters”

Status messages

Status messages of the disk manager are displayed in the corresponding action window. The following status messages are possible:

Status message	Description
DISKETTE UPDATED	Directly before removing the diskette from the instrument, it is necessary to call up *Update diskette,* so that all the measurement data up to the time of removal are contained on the diskette. The data not yet saved since the last automatic save are written to diskette.
DISKETTE NOT UPDATED	An error has occurred during updating. This message may have several causes. Remedy: Repeat procedure
INITIALIZING DISKETTE	The instrument recognizes when new or foreign diskettes are inserted.  New or foreign diskettes are overwritten **without** a security check.
NO DISKETTE	If there is no diskette in the instrument, the diskette symbol flashes in the status line.
DISKETTE WRITEPROTECTED	The inserted diskette cannot be written to because it is write protected. Remedy: Remove write protection.
DISKETTE FAULTY	An error has occured while writing to diskette. The diskette is faulty. Remedy: Insert new (DOS-formatted) diskette.
DISKETTE FULL	If the diskette is full, the diskette symbol flashes in the status line. No more data are written to diskette. Remedy: Insert a blank diskette before the measurement data memory of the recorder is also full. If this is not done, then measurement data will be lost.
PROGRAM DISKETTE	This message appears when a program diskette is inserted in the disk drive and measurement data have to be written. Remedy: Insert the correct diskette, or a blank one.
CONFIG. DISKETTE	This message appears when a configuration diskette is inserted in the disk drive and measurement data have to be written. Remedy: Insert the correct diskette, or a blank one.

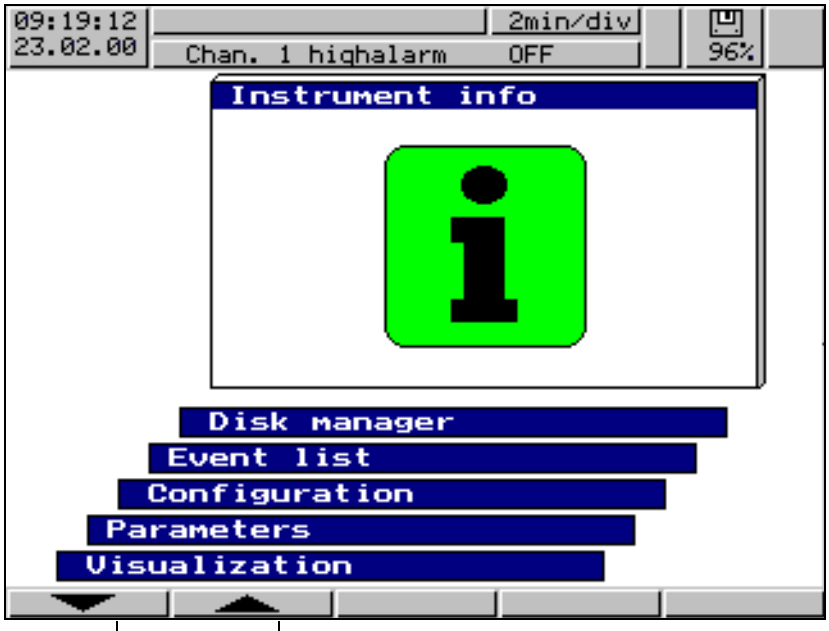
Status message	Description
GOLDCAP WAS EMPTY	This message appears when a capacitor is built into the recorder for memory buffering and the instrument has remained switched off for such a long time that the capacitor has become discharged. Caution: This will falsify the measurement data.
WRONG VERSION NO.!	An attempt was made to read in a configuration from diskette, but the version numbers of instrument software and configuration are different. Remedy: Convert configuration diskette via the PC setup program and create a new one.

3.7 Instrument info

The instrument info window displays general information about the instrument. It also includes errors “Battery empty” and “Data lost”. If one of these instrument errors is present, the info symbol flashes in the status line.

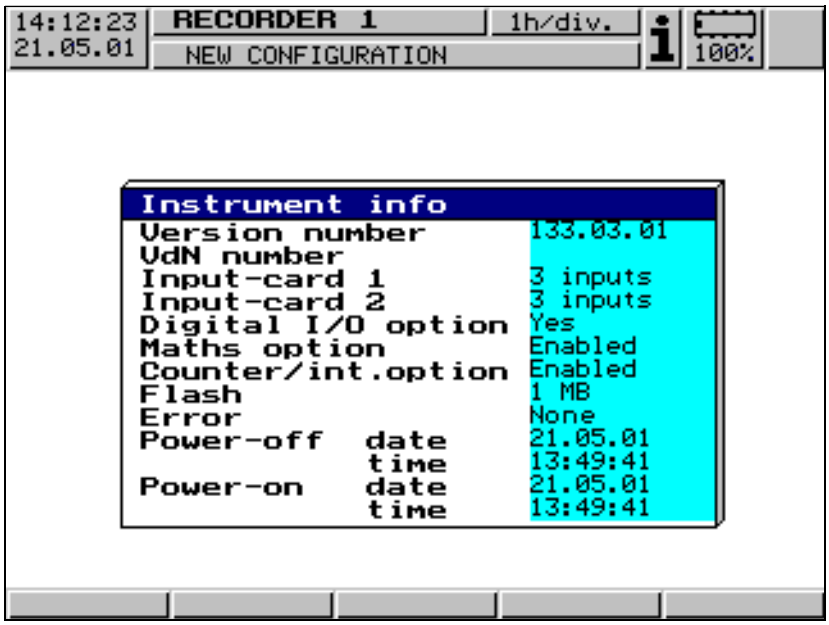
Basic menu → Instrument info

The instrument info is called up from the basic menu:



* Select operating level *Instrument info*
* Confirm selection with ENTER

Instrument info



- This menu also includes the version number (e.g. 133.01.01), i.e. the version number of the instrument software. It is important because some functions are only available from a certain version number onwards.
- If the “Digital-I/O“ is available (Yes), then the recorder also contains an RS232/RS485 interface.

Error

The following errors are possible:

Error	Description
none	Instrument o.k.
Data lost	A discharge of the battery/storage capacitor occured during the last lengthy supply interruption. The clock was set to 01.01.97 00:00:00. Remedy: Reset the time (⇨ Chapter 4.2.2 “Configuration - Instrument data”) and use a new diskette for data storage.
Battery empty	This message appears on instruments with lithium battery when the time was reset after a data loss. Please return the instrument to the supplier for a change of battery.

☞ Data can be lost after separating the instrument from the supply voltage after more than 10 years on instruments with a lithium battery, and after more than 2 weeks (15 — 25°C ambient temperature) on instruments with a storage capacitor.

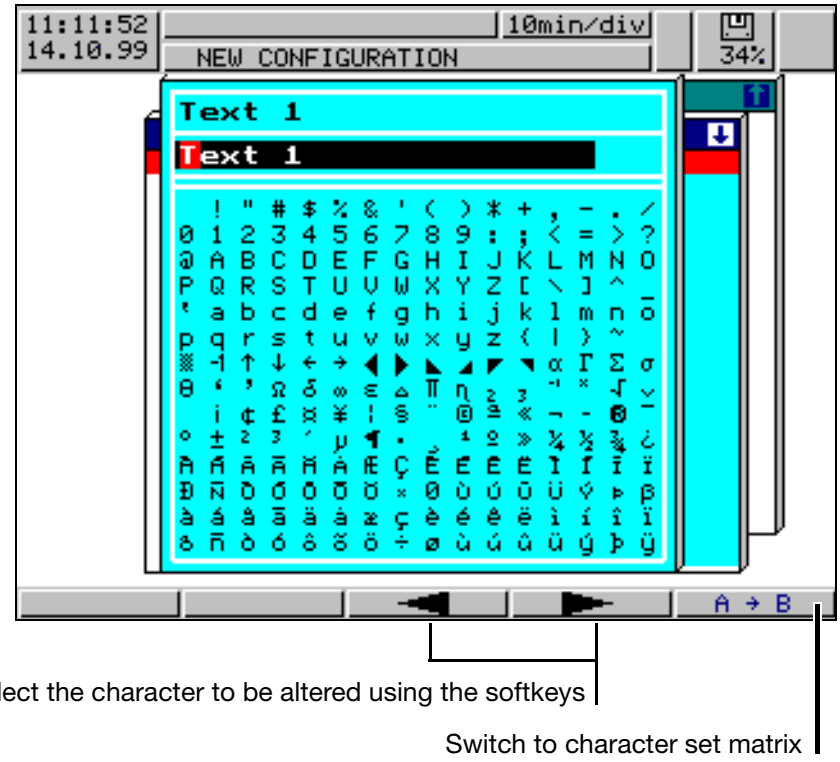
3.8 Text input

Input options

The configurable texts can be input either through the setup program or directly on the instrument. This section describes the input on the instrument.

Character selection

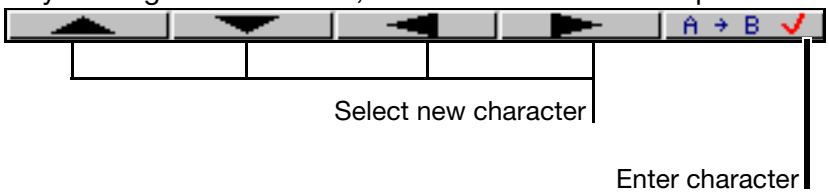
The display below is shown when a text (e. g. *Configuration* ➔ *Texts*) is selected at the configuration level for editing by using ENTER.



After the character to be altered has been selected and the switch made to character set matrix, the cursor is positioned on the current character in the character set matrix.

Character input

The softkeys change their function, as can be seen from the picture below:



After the entire text has been input, it can either be entered or all alterations cancelled:

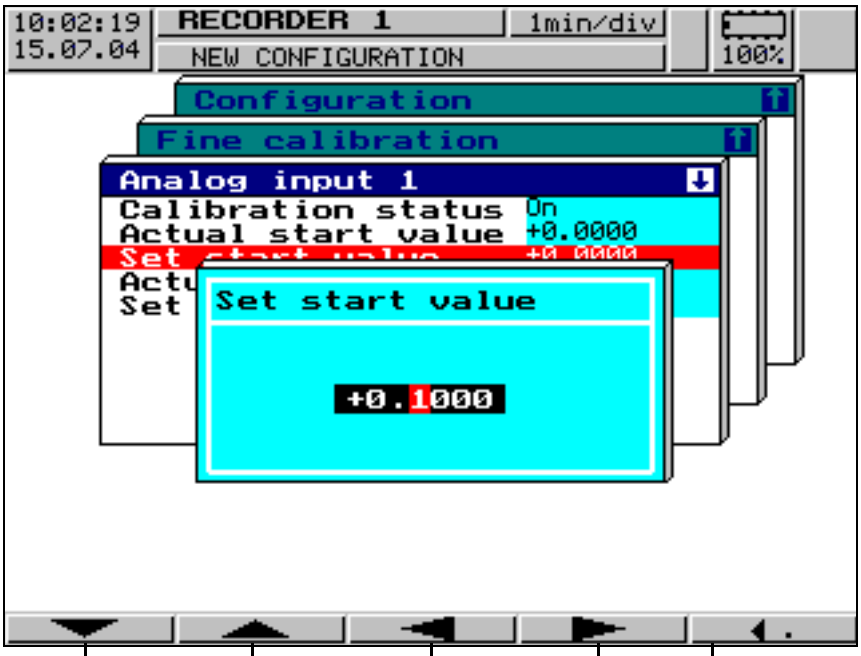
* Confirm text with ENTER

or

* cancel text input with EXIT

3.9 Value input

The softkeys can also be used to enter values on the instrument (shown here during fine calibration).



☞ The sign can only be altered if the value is not equal to “0”, which means that, when entering values, you cannot start with altering the sign if the present value is “0”.

Use ENTER to confirm the entry or EXIT to cancel it.

3 Operation and visualization

3.10 Code number (password entry)

The following functions are protected ex-factory from unauthorized access by a password request:

- the *Configuration* menu
- parts of the *Disk manager* menu
- the *Parameters* ➔ *Counter/Int. reset* menu

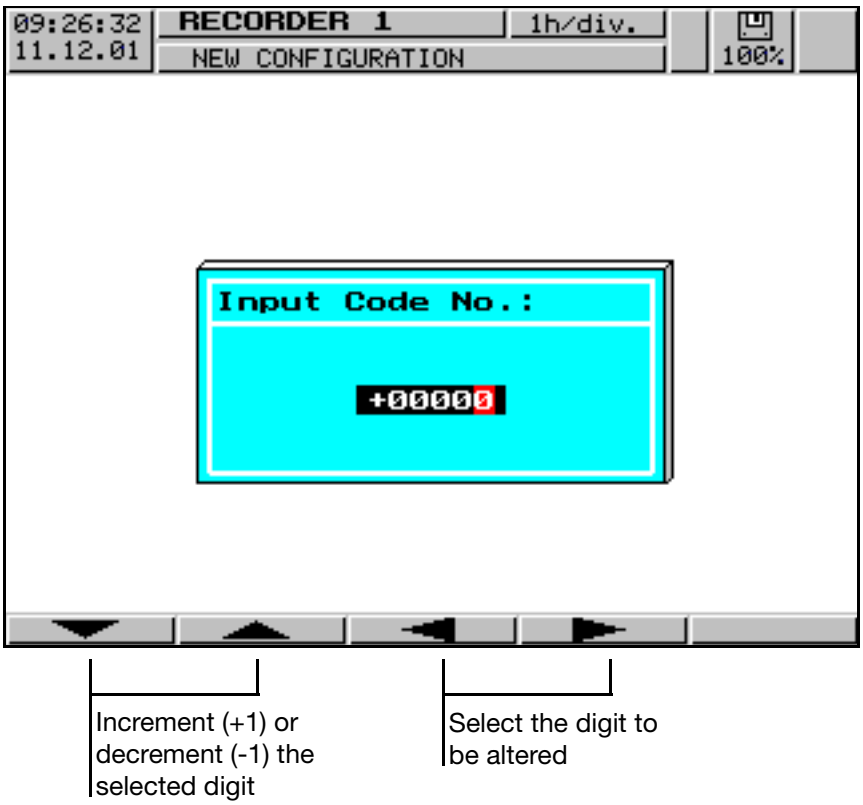
The **factory default setting** is **9200**.

A password can also be used to secure access to the recorder via the serial interface. In this case, however, the factory setting is 0 (no password request). If you enter a value unequal to 0, please take into account that this number must also be sent to the recorder by an attached communication program.

Additional information on password request for the serial interface can be found in the Interface Description B 70.6500.2.

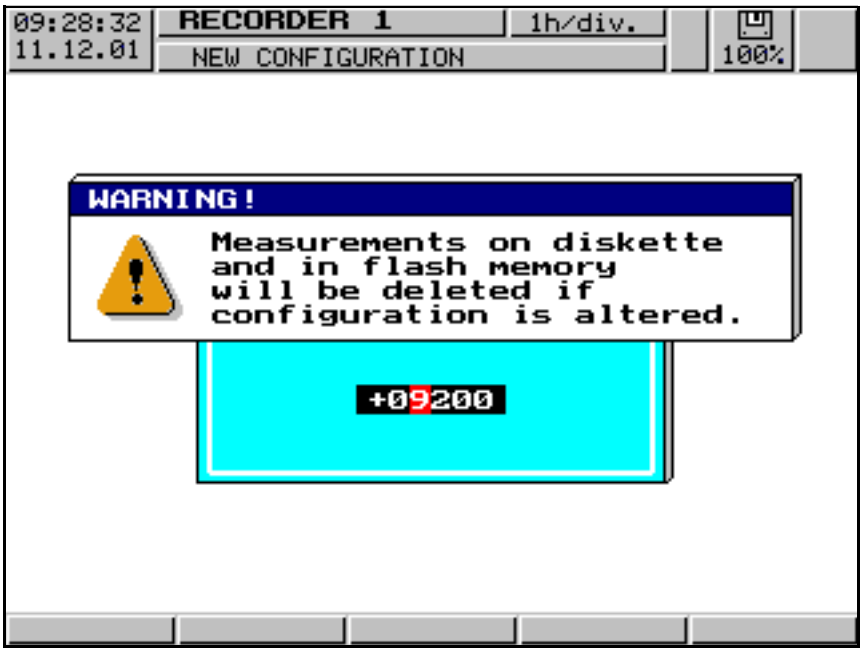
All passwords can be programmed differently (see Chapter 4.2.2 “Configuration - Instrument data”).

Password request



After the entry has been completed (+09200), it can be confirmed by using the ENTER key. Using EXIT, the password request will be stopped and the menu left.

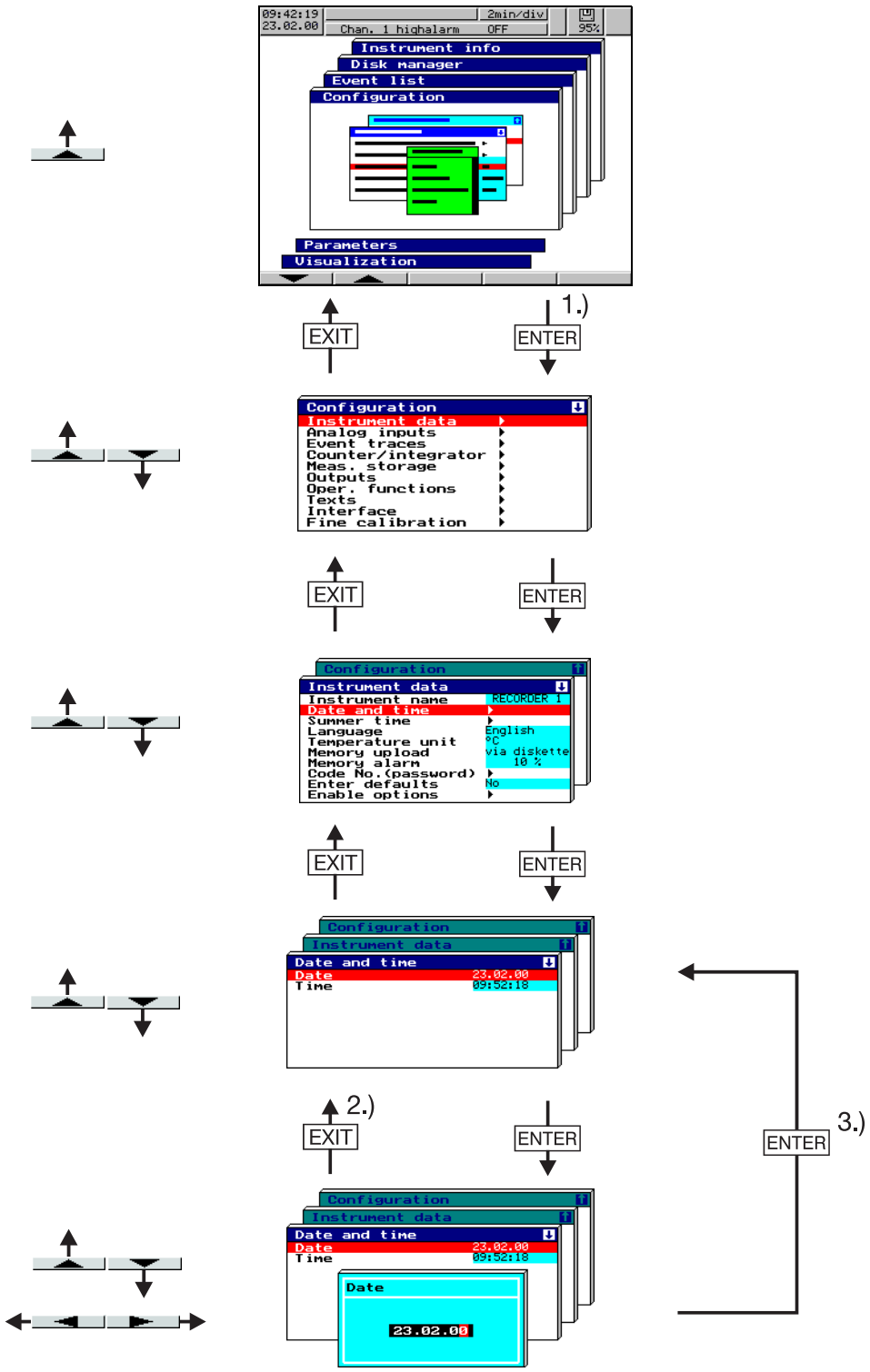
Password request in the *Configuration* menu



After the password has been entered in the *Configuration* menu, an additional security query will appear. You will only be able to access the parameters when you have confirmed the query with ENTER.

3 Operation and visualization

4.1 Operating example



1.) if applicable, the code number must also be entered here (factory setting: 9200)
2.) cancel entry; the old settings are retained
3.) confirm entry

4 Configuration parameters

4.2 Table of configuration parameters

The table below lists all the instrument parameters. The order in which the parameters are explained corresponds to the order in which they appear on the instrument (in the menu structure).

The first column describes the path via the menus and windows to the particular parameter.

The second column lists the possible settings for the parameter or the possible selections. The factory default setting in this column is always shown **bold**.

The third column contains a description of the parameter, or the possible selections, if the parameter and its function or its selection is not self-evident.

4.2.1 Parameter setting

	Parameter	**Value/selection**	**Description**
Contrast	Parameters ➔Contrast	0 — **16** — 31	Contrast of display
Speed indication	Parameters ➔Speed indication	in mm/h, **Time/div**, Storage rate	The selected display mode is shown in the diagram representation
Switch-off event	Parameters ➔Display off ➔ Switch-off event	**Waiting time**, Operating signal	The type of display switch-off is selected here
Waiting time	Parameters ➔Display off ➔ Waiting time	**0** — 32767 min	Time after which the display is switched off. Any key stroke will re-activate the display. The parameter can only be entered when the parameter *Switch-off event* is set on “Waiting time”. 0 = no switch-off
Operating signal	Parameters ➔Display off ➔ Operating signal	**Off**, Logic inp1 — 4	If one of the 4 logic inputs (extra code) is set to “off” and operated, then the display will be switched off. The parameter can only be entered when the parameter *Switch-off event* is set on “Operating signal”.
Signal type	Parameters ➔Diagram view ➔ Signal type	Analog input **Analog&Event**	Determines which measurements are graphically displayed
Channel representation	Parameters ➔Diagram view ➔ Channel representation	**Meas. small**, Scaling, Bargraph, Meas. large, Off	Determines the contents of the channel line (header)

Channel indication	Parameters ➔Diagram view ➔ Channel indication ➔ Analog input 1 — 6	**Yes**, No	“Yes” means that the selected channels are shown in the header
Paper perforations	Parameters ➔Diagram view ➔ Paper perforations	**No**, Yes	“Yes” means that paper perforations are shown within the graphic display, on the left and right margins of the screen. Paper perforations can only be activated and shown if no event traces have been selected (signal type = analog input).
Counter/Int. reset	Parameters ➔Counter/Int. reset ➔ Channel 1 — 6	-999999999 — **0** — +999999999	The start value for the counter or integrator can be entered here. The current value is not saved. Count changes are documented in the event list. ⇨ Chapter 3.3 “Parameter setting” If password request is active, (password “Counter/ Int. reset” > 0), the start values can only be set if the password has been entered correctly.

4.2.2 Configuration - Instrument data

	Parameter	**Value/selection**	**Description**
Instrument name	Configuration ➔Instrument data ➔ Instrument name	16 characters	⇨ Chapter 3.8 “Text input”
Date	Configuration ➔Instrument data ➔ Date and time ➔ Date	any data	Input of current date
Time	Configuration ➔Instrument data ➔ Date and time ➔ Time	any time	Input of current time

Synchronization of time	Configuration ➔Instrument data ➔ Date and time ➔ Time synchronization	**Off**, Logic inp1 — 4	Using this parameter (function), the system clocks of several recorders can be simultaneously synchronized. When a logic input has been selected and is operated (transition from “Low to ”High”), then the time can be synchronized. The seconds are decisive in the time change. They are used for rounding the time up or down. Example: 12:55:29 -> 12:55:00 12:55:30 -> 12:56:00
Summer time (switch)	Configuration ➔Instrument data ➔ Summer time ➔ Switch	Off, User timed, **Automatic**	Automatic: 2:00 hrs or 3:00 hrs on the last Sunday in March or October
Summer time (start date)	Configuration ➔Instrument data ➔ Summer time ➔ Start date	any date	can only be configured if the changeover (switch) is set to “User timed”
Summer time (start time)	Configuration ➔Instrument data ➔ Summer time ➔ Start time	any time	can only be configured if the changeover (switch) is set to “User timed”
Summer time (end date)	Configuration ➔Instrument data ➔ Summer time ➔ End date	any date	can only be configured if the changeover (switch) is set to “User timed”
Summer time (end time)	Configuration ➔Instrument data ➔ Summer time ➔ End time	any time	can only be configured if the changeover (switch) is set to “User timed”
Language	Configuration ➔Instrument data ➔ Language	**German**, English, French, Dutch, Spanish, Italian, Hungarian, Czech, Swedish, Polish, Danish, Finnish, Portuguese, Russian	
Temperature unit	Configuration ➔Instrument data ➔ Temperature unit	**°C**, °F	
Memory readout	Configuration ➔Instrument data ➔ Memory readout	**with diskette**, via RSxxx	Determine here how data are mainly to be read out. Depending on the selection, a different value is made visible via the free capacity in the status line.

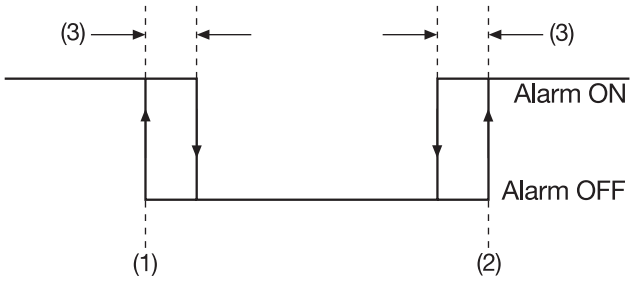
Memory alarm (diskette reserve)	Configuration ➔Instrument data ➔ Memory alarm	1 — **10** — 100 %	The signal is activated when the residual capacity of the diskette, or of the internal memory, has fallen to this value. The parameter *Memory readout* can be used to determine whether the alarm was initiated by the diskette or the memory. ⇨ Chapter 2.4 “Event traces”
Code number of configuration	Configuration ➔Instrument data ➔ Code No. (password) ➔ Configuration	0000 — **9200** — 9999	Code number for configuration level; 0000 = off **The data saved on diskette and in the FLASH memory are deleted when the configuration is changed.**
Code number of disk manager (Disk Code No.)	Configuration ➔Instrument data ➔ Code No. (password) ➔ Disk manager	0000 — **9200** — 9999	Code number for functions in the “File manager” menu; 0000 = off
Code number Counter/Int. reset	Configuration ➔Instrument data ➔ Code No. (password) ➔ Counter/Int. reset	0000 — **9200** — 9999	Code number to delete the individual counts; 0000 = off
Code number RS232/RS485	Configuration ➔Instrument data ➔ Code No. (password) ➔ RS232/RS485	**0000** — 9999	Code number to protect from unauthorized access to data via the serial interface; 0000 = off
Factory setting	Configuration ➔Instrument data ➔ Enter defaults	**No**, Yes	*Yes* = enter factory default setting (when entered, the parameter returns automatically to *No*)
Enable options	Configuration ➔Instrument data ➔ Enable options		The parameter is available for enabling additional functions, such as the math/logic module or counter/integrator. The parameter is not available if all recorder functions have been enabled.
Enable options Code No. determined	Configuration ➔Instrument data ➔ Enable options ➔ Code No. determined	(display of Code No.)	The manufacturer has to be informed about the value displayed here and will issue the enabling code.

Enable options **Enabling code**	Configuration ➔Instrument data ➔ Enable options ➔ Enabling code	Enter enabling code	Enter the enabling code you have received here.

4.2.3 Configuration - Analog inputs

	Parameter	Value/selection	Description
Sensor	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Sensor	Off, Res. therm., Thermocouple, **Current**, Voltage, Math	Depending on the selected sensor, only the relevant parameters can be selected for configuring the analog input.
Linearization	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Linearization	**Linear**, Pt100, Pt100 JIS, Ni100, Pt500, Pt1000, Pt50, Cu50, Fe-Con J, NiCrCon E, Ni-CrNi K, NiCrSi N, Cu-Con T, PtRhPtRh B, PtRh-Pt R, PtRh-Pt S, Cu-Con U, Fe-Con L, W3W25Re, W5W26Re	
Connection circuit	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Connection circuit	2 — 4 wire	
Cold junction	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Cold junction	Internal Pt100, External const	
External CJ temperature	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Ext. CJ temp.	-50 to +150°C	External cold junction temperature for thermocouples
Range start	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Range start	any value **0mA**	
Range end	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Range end	any value **20mA**	
Start temperature	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Start temperature	any value	Only for sensor types: current, voltage with linearization for resistance thermometer, thermocouple. Only for signals which are not yet linearized.

	Parameter	Value/selection	Description
End temperature	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ End temperature	any value	Only for sensor types: current, voltage with linearization for resistance thermometer, thermocouple. Only for signals which are not yet linearized.
Scaling start	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Scaling start	-99999 to **0** to +99999	
Scaling end	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Scaling end	-99999 to **+100** to +99999	
Filter constant	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Filter constant	0.0 to **0.1** to 10.0s	
Channel name	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Channel name	7 characters **Inp. 1**	Short designation. It is shown in the channel line (header) with bargraph and scaling. ⇨ Chapter 3.8 “Text input”
Unit	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Unit	5 characters **%**	⇨ Chapter 3.8 “Text input”
Decimal place	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Decimal place	Automatic, X.XXXX, XX.XXX, XXX.XX, **XXXX.X,** XXXXX.	Automatic: representation with max. resolution
Line width	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Line width	**Thin**, Thick	Line width of the measurement curve within the graphical display
Alarm	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Alarm ➔ Alarm	**Off**, Activated	
Low limit	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Alarm ➔ Low limit	-99999 to **0** to +99999	
High limit	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Alarm ➔ High limit	-99999 to **0** to +99999	

	Parameter	Value/selection	Description
Differential	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Alarm ➔ Differential	-99999 to **0** to +99999	
	(1) = Low limit (2) = High limit (3) = Differential		
Text low alarm	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Alarm ➔ Text low alarm	**Standard text**, Text 1 — 18, No text	⇨ Chapter 3.5 “Event list” ⇨ Configuration ➔ Texts, page 65
Text high alarm	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Alarm ➔ Text high alarm	**Standard text**, Text 1 — 18, No text	
Alarm delay	Configuration ➔Analog inputs ➔ Analog input 1—6 ➔ Alarm ➔ Alarm delay	**0** — 32767s	Alarm delay is activated at a value of > 0. When activated, an alarm will only be generated when it has been present for at least as long as it takes for the set time to elapse.

4.2.4 Configuration - Event traces

	Parameter	Value/selection	Description
Input signal	Configuration ➔Event traces ➔ Event traces 1 — 4 ➔ Input signal	Off, **Logic inp1 — 4,** Logic channel 1 — 6, Low alarm 1 — 6, Low comb. al., High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. al., Comb. alarm, Memory al., Error, Modbus-Flag	The event (digital signal) which is to be recorded is assigned to an event trace.

Trace designation	Configuration ➔Event traces ➔ Event traces 1 — 4 ➔ Trace designation	7 characters **BE 1 —4**	⇨ Chapter 3.8 “Text input”
Input signal	Configuration ➔Event traces ➔ Event traces 5 — 6 ➔ Input signal	**Off**, Logic inp1 — 4, Logic channel 1 — 6, Low alarm 1 — 6, Low comb. al., High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. al., Comb. alarm, Memory al., Error, Modbus-Flag	The event (digital signal) which is to be recorded is assigned to an event trace
Trace designation	Configuration ➔Event traces ➔ Event traces 5 — 6 ➔ Trace designation	7 characters **xxxx**	⇨ Chapter 3.8 “Text input”

4.2.5 Configuration - Counter/Integrator (option)

	Parameter	**Value/selection**	**Description**
Channel	Configuration ➔Counter/Integrator ➔ Counter/In. channs.	1 — 6	Select channel for which the subsequent parameters are to be configured.
Function	Configuration ➔Counter/Integrator ➔ Counter/Int. channs. ➔ Channel 1 — 6 ➔ Function	**Off**, Counter, Integrator, Oper. time	Select the desired function here. ⇨ Chapter 2.5 “Counters / Integrators / Timers”
Type	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Type	Periodic, External, **Daily**, Weekly, Monthly, Yearly, Total, Daily from-to	Reporting period. Select here when the count is to be stored and reset.

Input signal	Configuration ➔Counter/Integrator ➔ Count/In. channs. ➔ Channel 1 — 6 ➔ Input signal	Off, Logic inp1 — 4, Logic channel 1 — 6, Low alarm 1 — 6, Low comb. al., High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. al., Comb. alarm, **Memory al.**, Error, Modbus-Flag	The parameter is only programmable when “Counter” or “Operating time” has been selected under *Function*. Please select which event is to be counted.
Input signal	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Input signal	**Analog inp1 — 3 (6)**	The parameter is only programmable when “Integrator” has been selected under *Function*. Select which input is to be integrated.
Weighting (evaluation)	Configuration ➔Counter/Integrator ➔ Counter/Int. channs. ➔ Channel 1 — 6 ➔ Weighting	-99999 to +1 to +99999	Select the weighting factor here. If, for instance, 0.001 is entered, a conversion from l/sec to m^3/sec can be achieved. If a negative weighting factor is entered (e.g. -1), the counter will count down.
Time base	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Time base	**Second**, Minute, Hour, Day	The parameter is only programmable when “Integrator” or “Operating time” has been selected under *Function*. Integrator: Select the time base for integrating the selected channel (e.g. second when your sensor generates a signal in liters/sec). Operating time: Select the unit used for counting the time.
Threshold value	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Threshold value	0 — 99999	The parameter is only programmable when “Integrator” has been selected under *Function*. Enter the threshold value which has to be exceeded for integration.

Channel name (line 1)	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Channel name	7 characters **Counter/**	The text that has been entered appears together with line 2 and the current count on the recorder screen (visualization and event list). ⇨ Chapter 3.2.7 “Counters / integrators / operating time”
Channel name (line 2)	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Channel name	7 characters **Integr*x***	The text that has been entered appears together with line 1 and the current count on the recorder screen (visualization and event list).
Unit	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Unit	5 characters	Enter the unit which is displayed on the recorder screen, together with the entered text and the current count.
Decimal place	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Decimal place	Automatic, X.XXXX, XX.XXX, XXX.XX, XXXX.X, **XXXXX.**	Specify the decimal place for displaying the count on the recorder screen.
Counter text	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Counter text	Standard text, Text 1 — 18, **No text**	If the counter is incremented (decremented), the text selected here will appear in the status line and the event list.
Alarm	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Alarm ➔ Alarm	**Off**, Activated	
Limit value	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Alarm ➔ Limit value	-99999 to **100** to +99999	An alarm is triggered when the limit is infringed. Using the parameter *Weighting,* it is possible to differentiate between going above or going below the limit (positive weighting factor = alarm on going above the limit)
Alarm text	Configuration ➔Counter/Integrator ➔ Counter/In. channs. ➔ Channel 1 — 6 ➔ Alarm ➔ Alarm text	**Standard text**, Text 1 — 18, No text	On going above or below the limit, the text selected here will appear in the status line and the event list.

Synchronization time	Configuration ➔Counter/Integrator ➔ Synchronizat. time	any time **(00:00:00)**	Please enter the time at which the daily, weekly, monthly or yearly counter/ integrator value is to be saved.
Period	Configuration ➔Counter/Integrator ➔ Period	1min, **2min**, 3min, 4min, 5min, 10min, 15min, 30min, 1h, 2h, 3h, 4h, 6h, 8h, 12h	Only programmable when the parameter *Type* is set to “periodic” for at least one counter/integrator. The counter/integrator values are saved at the selected interval.
Ext. operating signal	Configuration ➔Counter/Integrator ➔ Ext. operating signal	Logic inp1 — 4, Logic channel 1 — 6, Low alarm 1 — 6, Low comb. al., High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. alarm, Comb. alarm, **Memory al.**, Error, Modbus-Flag	Only programmable when the parameter *Type* is set to “external” for at least one counter/integrator. Summation of the counter/ integrator values will only take place if the selected digital signal is set to “1”. On a change to “0”, the values are saved and reset.
Weekday	Configuration ➔Counter/Integrator ➔ Weekday	**Monday**, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	Only programmable when the parameter *Type is* set to “weekly” for at least one counter/ integrator. The counter/integrator values are stored on the selected day on reaching the synchronization time.
Daily start time	Configuration ➔Counter/Integrator ➔ Daily start time	any time **(06:00:00)**	Only programmable when the parameter *Type* is set to “daily from-to” for at least one counter/integrator.
Daily end time	Configuration ➔Counter/Integrator ➔ Daily end time	any time **(18:00:00)**	Only programmable when the parameter *Type* is set to “daily from-to” for at least one counter/ integrator.

Reset generation	Configuration ➔Counter/Integrator ➔ Reset generation	**Off**, Logic inp1 — 4, Logic channel 1 — 6, Low alarm 1 — 6, Low comb. al., High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. al., Comb. alarm, Memory al., Error, Modbus-Flag	Determine the event which will reset **all counter and integrator counts** (without storing). ⇨ See “External reset” on page 18.

4.2.6 Configuration - Measurement storage

	Parameter	**Value/selection**	**Description**
Store status normal operation	Configuration ➔Meas. storage ➔ Normal operation ➔ Store status	Off, **On**	
Stored value normal operation	Configuration ➔Meas. storage ➔ Normal operation ➔ Stored value	Average val., Instant. val., Minimum, Maximum, **Peak value**	⇨ Chapter 2.7 “Operating modes” Chapter 2.8 “Data storage”
Storage rate normal operation	Configuration ➔Meas. storage ➔ Normal operation ➔ Storage rate	1 — **60** — 32767 s	⇨ Chapter 2.7 “Operating modes” Chapter 2.8 “Data storage”
Operating signal event operation	Configuration ➔Meas. storage ➔ Event operation ➔ Operating signal	**Off**, Logic inp1 — 4, Logic channel 1 — 6, Low alarm 1 — 6, Low comb. al., High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. alarm, Comb. alarm, Memory al., Error, Modbus-Flag	When the configured signal is active, the instrument switches to event operation.
Stored value event operation	Configuration ➔Meas. storage ➔ Event operation ➔ Stored value	Average val., Instant. val., Minimum, Maximum, **Peak value**	⇨ Chapter 2.7 “Operating modes” Chapter 2.8 “Data storage”
Storage rate event operation	Configuration ➔Meas. storage ➔ Event operation ➔ Storage rate	1 — **5** — 32767 s	⇨ Chapter 2.7 “Operating modes” Chapter 2.8 “Data storage”

Start time timed operation	Configuration ➔Meas. storage ➔ Timed operation ➔ Start time	any time	Off when start time = end time
End time timed operation	Configuration ➔Meas. storage ➔ Timed operation ➔ End time	any time	
Stored value timed operation	Configuration ➔Meas. storage ➔ Timed operation ➔ Stored value	Average val., Instant val., Minimum, Maximum, **Peak value**	⇨ Chapter 2.7 “Operating modes” Chapter 2.8 “Data storage”
Storage rate timed operation	Configuration ➔Meas. storage ➔ Timed operation ➔ Storage rate	1 — **5** — 32767 s	⇨ Chapter 2.7 “Operating modes” Chapter 2.8 “Data storage”

4.2.7 Configuration - Outputs (option)

	Parameter	**Value/selection**	**Description**
Action outputs	Configuration ➔Outputs ➔ Relay K1 ➔ Action	Off, n.o. (make), **n.c. (break)**	
Operating signal outputs	Configuration ➔Outputs ➔ Relay K1 ➔ Operating signal	Off, Logic inp1 — 4, Logic channel 1 — 6, Low alarm 1 — 6, Low comb. alarm, High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. al., Comb. alarm, Memory al., **Error**, Modbus-Flag	The configured signal is output to the relay.
Action outputs	Configuration ➔Outputs ➔ Relay K2 — K3 ➔ Action	**Off**, n.o. (make), n.c. (break)	If *n.o. (break)* or *n.o. (make)* is selected, the parameter *Outputs* is automatically set to *Low alarm 1* or *Low alarm 2*.

Operating signal outputs	Configuration ➔Outputs ➔ Relay K2 — K3 ➔ Operating signal	**Off**, Logic inp1 — 4, Logic channel 1 — 6, Low alarm 1 — 6, Low comb. al., High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. al., Comb. alarm, Memory al., Error, Modbus-Flag	The configured signal is output to the relay.

4.2.8 Configuration - Operating functions

	Parameter	Value/selection	Description
External texts logic input 1 — 4	Configuration ➔Operating functions ➔ External texts ➔ Logic input 1 — 4	Standard text, Text 1 — 18, **No text**	⇨ Chapter 3.5 “Event list” ⇨ Chapter 4.2.9 “Configuration - Texts”
External texts logic channel 1 — 6	Configuration ➔Operating functions ➔ External texts ➔ Logic channel 1 — 6	Standard text, Text 1 — 18, **No text**	Can only be used if the “Math/Logic module” option is available. ⇨ Chapter 3.5 “Event list” ⇨ Chapter 4.2.9 “Configuration - Texts”
Key inhibit	Configuration ➔Operating functions ➔ Key inhibit	**Off**, Logic inp1 — 4, Logic channel 1 — 6, Low alarm 1 — 6, Low comb. al., High alarm 1 — 6, High comb. al., Counter/I al. 1 — 6, C/I comb. al., Comb. alarm, Memory al., Error, Modbus-Flag	As soon as the selected signal is activated, the keys are inhibited.

4.2.9 Configuration - Texts

	Parameter	Value/selection	Description
Texte	Configuration ➔Texts ➔ Text1 — 18	20 characters **Text 1 — 18**	⇨ Chapter 3.8 “Text input”

4.2.10 Configuration - Interface

	Parameter	Value/selection	Description
Interface type	Configuration ➔Interface ➔ Interface type	RS232, **RS485**	Selection of the serial interface (extra code)
Protocol	Configuration ➔Interface ➔ Protocol	**MODBUS**, JBUS	
Baud rate	Configuration ➔Interface ➔ Baud rate	9600 baud, 19200 baud, **38400 baud**	
Data format	Configuration ➔Interface ➔ Data format	**8-1-none**, 8-1-odd, 8-1-even, 8-2-none	
Instrument address	Configuration ➔Interface ➔ Instrument address	**1** — 255	
Minimum response time	Configuration ➔Interface ➔ Min. response time	**0** — 500 ms	

4.2.11 Configuration - Fine calibration

	Parameter	Value/selection	Description
Calibration status	Configuration ➔Fine calibration ➔ Analog input 1 — 6 ➔ Calibration status	**Off**, On	A calibration (adjustment) of the analog measurements can be activated here. The adjustment is carried out using a linear equation.
Actual start value	Configuration ➔Fine calibration ➔ Analog input 1 — 6 ➔ Actual start value	-99999 to **0** to +99999	Start value of the actual line. Only active when calibration status = On.
Set start value	Configuration ➔Fine calibration ➔ Analog input 1 — 6 ➔ Set start value	-99999 to **0** to +99999	Start value of the set line. Only active when calibration status = On.
Actual end value	Configuration ➔Fine calibration ➔ Analog input 1 — 6 ➔ Actual end value	-99999 to **1000** to +99999	End value of the actual line. Only active when calibration status = On.
Set end value	Configuration ➔Fine calibration ➔ Analog input 1 — 6 ➔ Set end value	-99999 to **1000** to +99999	End value of the set line. Only active when calibration status = On.

Systematic errors, such as those caused by an unsuitable probe mounting, for example, can be compensated using fine calibration.

Example:

A probe covers a temperature range from 200 to 300°C. It has been fitted in a tunnel oven so unfavorably as to always indicate 10°C less than the temperature of the charge. The incorrect measurement can be corrected through fine calibration.

Actual start value	: 200°C
Set start value	: 210°C
Actual end value	: 300°C
Set end value	: 310°C

4 Configuration parameters

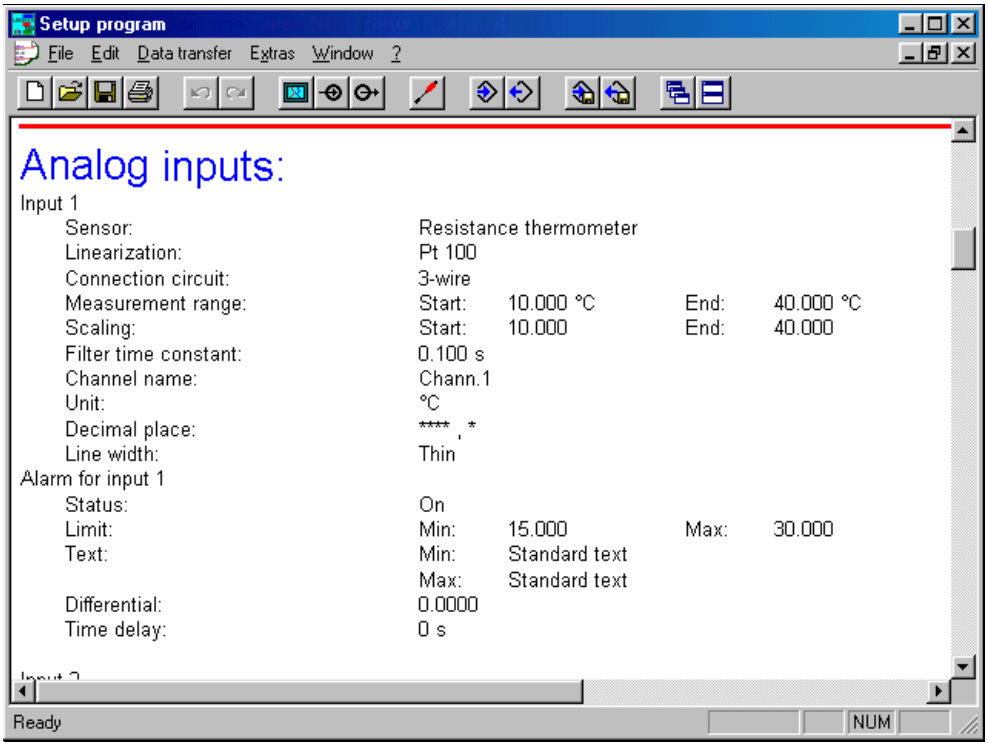
5.1 Hardware and software requirements

A setup program for Windows® (from Version 95 or from NT4.0) is available for the easy configuration of the paperless recorder.

Hardware requirements

- PC-486DX-2-100
- 16 Mbyte RAM
- 15 Mbyte available on hard disk
- CD-ROM
- 3.5" disk drive

The program shows the current configuration as a list in the background. The corresponding input template is called up by a double click on the list, or via the menus.



5 Setup program

5.2 Installing the setup program

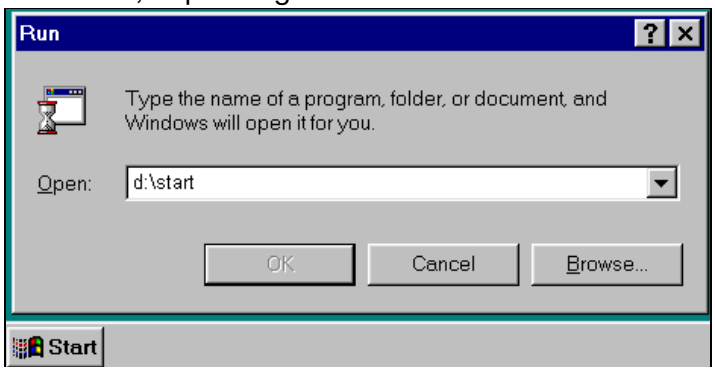
Running the installation program

* Start Microsoft Windows®

If Microsoft Windows has already been started, all Windows programs have to be shut down before installing the setup program.

* Insert CD
* Select *Start* ➔ *Run*…

* Input e.g. “d:\start”, depending on drive



* Click on *OK*

The installation program will lead you through the rest of the installation with screen messages.

5.3 Data exchange between paperless recorder and PC

The exchange of configuration data between the recorder and a PC (setup program) is carried out via a 3.5" diskette, or data transfer using the setup interface.

5.3.1 Data transfer via diskette

PC→paperless recorder

* Make the settings in the setup program.
* Write the settings to diskette by using the *Data transfer* ➔ *Data export to diskette* menu, or by activating the button.
  Caution: Do **not** use the menu item *File* ➔ *Save (as)*.
* Insert the diskette into the recorder
  (remove the measurement data diskette first, if necessary).
* Call up the *Disk manager* menu on the recorder.
* Select function *Diskette* ➔ *Config. data* and activate START .

After the configuration has been successfully read in, the recorder will be automatically reset. If the measurement data diskette has been removed, a new diskette should be inserted.

The measurement data on the diskette will be overwritten by a new configuration.

Do **not** use the menu function "*File* ➔ *Save as...*".
It cannot be used to create a valid diskette for the recorder.

Paperless recorder→PC

* Insert diskette into the recorder
* Call up the *Disk manager* menu on the recorder.
* Select function *Config. data* ➔ *Diskette* and activate START .
* After a successful transfer, the diskette can be inserted into the PC.
* Using the menu *Data transfer* ➔ *Data import from diskette* menu or by activating the button, the data can be read into the setup program.

Import/export errors

If errors during transfer from and to diskette occur on the recorder side, these will be indicated in the disk manager menu and will remain so until the error has been rectified or is overwritten with fresh error messages.

A diskette containing configuration data must not have other files on it.

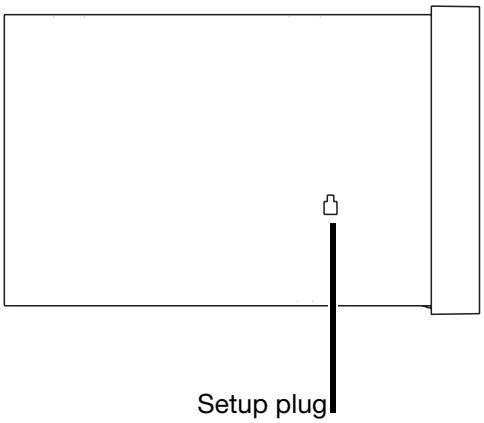
Diskettes

The diskette has to be formatted before use (**no** fast format). It must not contain any data or faulty sectors. If this is disregarded, a fault-free data exchange cannot be ensured.

5.3.2 Data transfer via setup interface

PC→paperless recorder

* Connect the setup cable to the serial interface of the PC (COM1, COM2, ...) and plug it into the recess on the left side of the recorder housing.



* In the setup program, select the required serial interface on the PC by using the *Data transfer* ➔ *Data transfer settings* menu
* Transfer the settings to the recorder using the *Data transfer* ➔ *Data transfer to instrument* menu, or by activating the button.

Paperless recorder →PC

* Connect the setup cable to the serial interface of the PC (COM1, COM2, ...) and plug it into the recess on the left side of the recorder housing.
* In the setup program, select the required serial interface of the PC by using the *Data transfer* ➔ *Data transfer settings* menu
* Transfer the settings to the PC by means of the *Data transfer* ➔ *Data transfer from instrument* menu, or by activating the button

5.4 Math and logic module

The math and logic module is available as an extra from instrument software 133.03.xx.

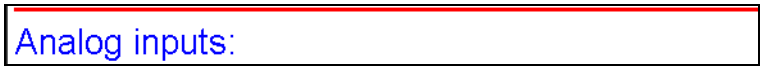
The math and logic module are channels that are not available as hardware but are calculated by the instrument software.

If a math channel is used (e.g. math channel 3), the corresponding analog channel (e.g. AE3) is no longer available.

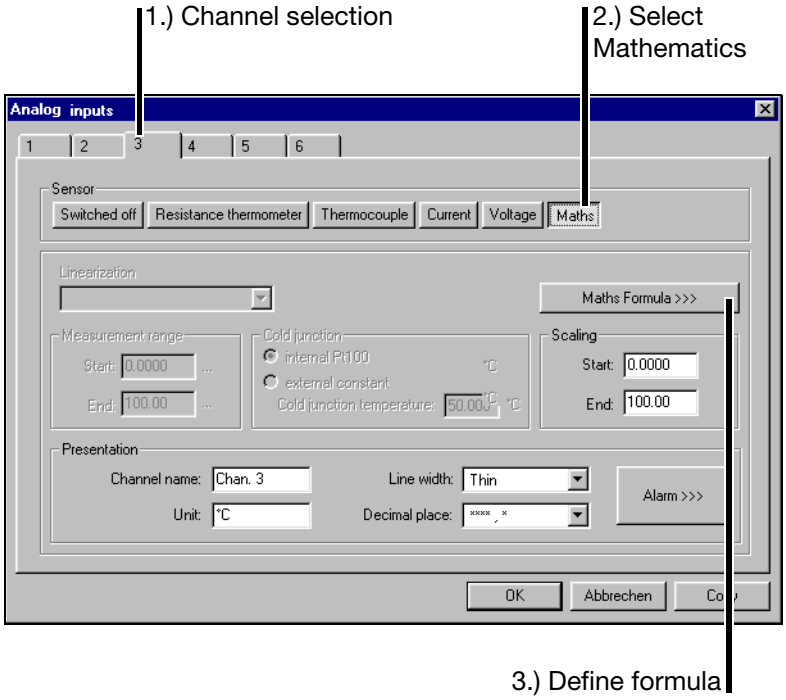
This does **not** apply to the logic channels.

Mathematics

You can activate math channels in the setup program under “Analog inputs” (or via *Menu ➔Edit analog inputs*).



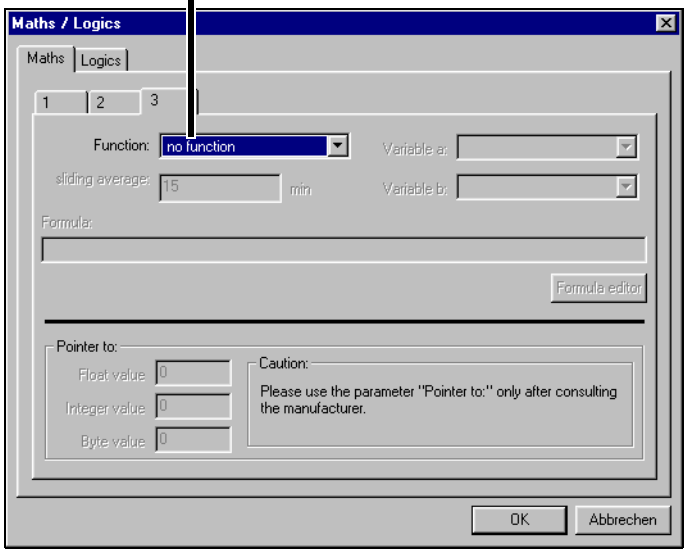
In the example below, channel 3 is being used as math channel:



After carrying out steps 1.) and 2.), you have to start the math formula editor 3.).

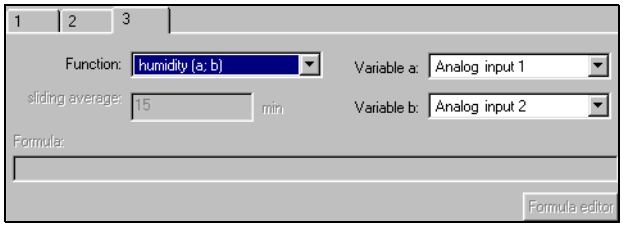
4.) Function selection

The function is selected here. All other fields can subsequently be edited according to the function.



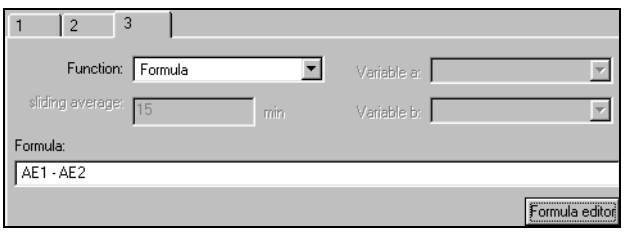
The input fields “Variable a”, “Variable b” or “Moving average” have to be edited when one of the standard functions (difference, ratio, humidity, moving average) has been set.
If the “Formula” function has been selected, the input field “Formula” must be edited. Entry can either be direct, or via a (Formula editor) dialog.

Example: humidity



With humidity measurement, the channel for the dry-bulb temperature has to be specified as variable A, the channel for the wet-bulb temperature as variable B.

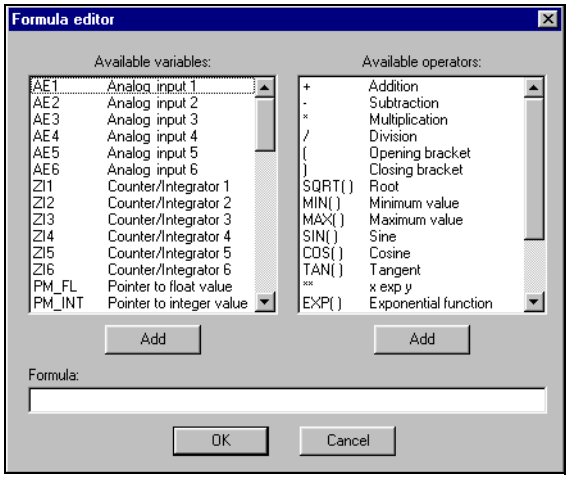
Example: formula



As as already been mentioned, the formula can be entered either directly from the PC keys or by calling up the Formula editor function.

Formula editor

On calling up the function, this dialog box will appear:



In the left window you can select the desired signal, in the right window the required operator, and enter them into the formula by activating the corresponding Add button. Instead of Add, the selection can also be entered by a double-click with the left mouse button.

For functions ending with ( ), you will have to add the closing bracket yourself.

Example: 1. add SQRT() --> **SQRT(**
2. add AE1 --> SQRT(**AE1**
3. add) --> SQRT(AE1**)**

Overview of operators

Operator	Explanation	Example
+	addition	AE1 + AE2
-	subtraction	AE1 - AE2
*	multiplication	AE1 * AE2
/	division	AE1 / AE2
(	opening bracket	(
)	closing bracket	)
SQRT()	root	SQRT (AE1)
MIN()	minimum value	MIN (AE1, AE2)
MAX()	maximum value	MAX (AE1, AE2, AE3)
SIN()	sine	SIN (AE1)
COS()	cosine	COS (AE1)
TAN()	tangent	TAN (AE1)
**	x to the power of y	AE1 ** AE2
EXP()	exponential function	EXP (AE1)
ABS()	absolute value	ABS (AE1)
INT()	integer portion	INT (AE1)
FRC()	decimal fraction	FRC (AE1)
LOG()	logarithm	LOG (AE1)
LN()	natural logarithm	LN (AE1)

Operator priorities

Math symbols and functions

Priority	Math symbol/function	Note
high	( )	brackets
▼	SQRT, MIN, MAX, LOG, LN, SIN, COS, TAN, ABS, EXP, INT, FRC	functions
▼	**	exponent (x^y)
▼	+, -	sign
▼	*, /	multiplication, division
low	+, -	addition, subtraction

Logic operators

Priority	Operator	Note
high	( )	brackets
▼	NOT, !	negation
▼	AND, &	AND logic
▼	XOR, ^	exclusive OR logic
low	OR, ¦	OR logic

5.5 Character set

032		080	P	0162	¢	0210	Ò
033	!	081	Q	0163	£	0211	Ó
034	"	082	R	0164	¤	0212	Ô
035	#	083	S	0165	¥	0213	Õ
036	$	084	T	0166	¦	0214	Ö
037	%	085	U	0167	§	0215	×
038	&	086	V	0168	¨	0216	Ø
039	’	087	W	0169	©	0217	Ù
040	(	088	X	0170	ª	0218	Ú
041	)	089	Y	0171	«	0219	Û
042	*	090	Z	0172	¬	0220	Ü
043	+	091	[	0173	-	0221	Ý
044	,	092	\	0174	®	0222	Þ
045	-	093	]	0175	¯	0223	ß
046	.	094	^	0176	°	0224	à
047	/	095	_	0177	±	0225	á
048	0	096	‘	0178	²	0226	â
049	1	097	a	0179	³	0227	ã
050	2	098	b	0180	´	0228	ä
051	3	099	c	0181	µ	0229	å
052	4	0100	d	0182	¶	0230	æ
053	5	0101	e	0183	·	0231	ç
054	6	0102	f	0184	¸	0232	è
055	7	0103	g	0185	¹	0233	é
056	8	0104	h	0186	º	0234	ê
057	9	0105	i	0187	»	0235	ë
058	:	0106	j	0188	¼	0236	ì
059	;	0107	k	0189	½	0237	í
060	<	0108	l	0190	¾	0238	î
061	=	0109	m	0191	¿	0239	ï
062	>	0110	n	0192	À	0240	ð
063	?	0111	o	0193	Á	0241	ñ
064	@	0112	p	0194	Â	0242	ò
065	A	0113	q	0195	Ã	0243	ó
066	B	0114	r	0196	Ä	0244	ô
067	C	0115	s	0197	Å	0245	õ
068	D	0116	t	0198	Æ	0246	ö
069	E	0117	u	0199	Ç	0247	÷
070	F	0118	v	0200	È	0248	ø
071	G	0119	w	0201	É	0249	ù
072	H	0120	x	0202	Ê	0250	ú
073	I	0121	y	0203	Ë	0251	û
074	J	0122	z	0204	Ì	0252	ü
075	K	0123	{	0205	Í	0253	ý
076	L	0124	|	0206	Î	0254	þ
077	M	0125	}	0207	Ï	0255	ÿ
078	N	0126	~	0208	Ð		
079	O	0161	¡	0209	Ñ		

Input of special characters

(Special) characters which cannot be input directly from the keys of the PC are input by using the Alt key and the number combination shown in the table.

Example

The special character © has to be input:

* Position the cursor with the mouse, or by using the cursor keys, on the insertion point of the character
* Press the Alt key **and hold it down**
* Enter the number combination 0169 in the number block (on the right side of the keys) (the leading zero **must** be input as well)
* Release Alt key

The character © will be inserted at the cursor position.

6.1 Program description

Das PC evaluation program (PCA) is described in more detail in the Operating Instructions B 70.9708.0.

The PC evaluation program (PCA) can be run from Windows95 and is available for managing, archiving, visualization and evaluation of the recorder data saved on diskette.

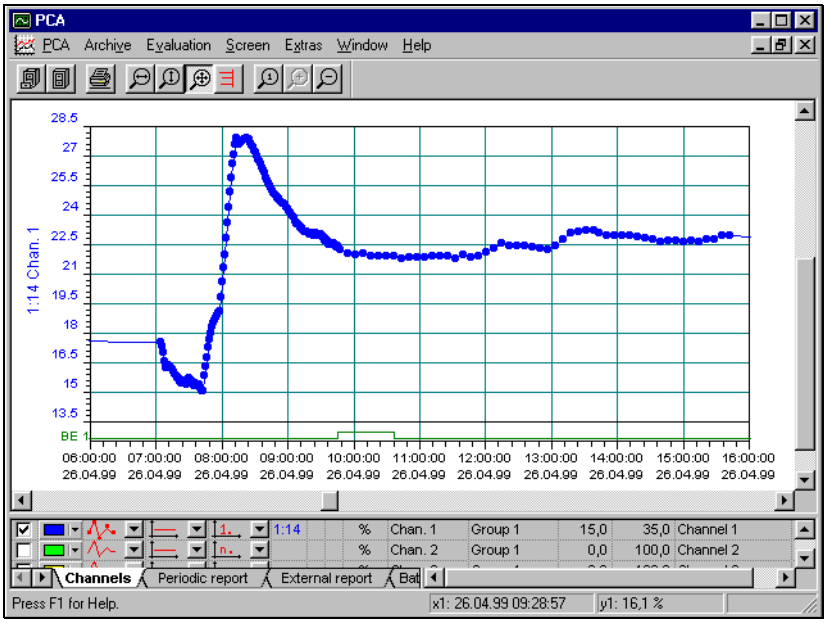
Hardware and software requirements

The following hardware and software requirements have to be met for the operation and installation of the evaluation program:

- IBM-PC or compatible PC from 486 processor
- 16 MB main memory
- 3.5" disk drive
- CD-ROM drive
  (for installation and to create a set of diskettes)
- mouse
- VGA graphics
- Windows 95/98/NT4.0

Recommended minimum configuration

- Pentium 133
- 32MB main memory
- 100MB available on hard disk



6 PC evaluation program

Features

Some features in brief:

- The data from differently configured instruments are recognized by the PCA evaluation program and stored in an archive database. The entire management is performed automatically. Only an identifier (supplementary description) has to be manually provided by the user.
- The user has at any time access to certain data sets, which can be distinguished by the identifier. In addition, it is possible to restrict the periods of time to be evaluated.
- Any analog and digital channels of the paperless recorder can subsequently be combined in PCA to PCA groups.
- Operation via mouse or from the keys
- By means of the export filter it is possible to export the stored data (CSV format) for processing in different programs (Excel, …)
- Using the additional program “Communication server”, the data can be read out of the recorder via the serial interface (RS232/RS485). They can be read out manually or automatically (e.g. daily at 23 hrs).
  It is recommended to use a baud rate of 38400 bps when transferring data. On the recorder, the baud rate is set via the parameter *Configuration ➔ Interface ➔ Baud rate*.
- The PCA evaluation program supports the network capability, which means that several users can obtain data from the same database, independently of each other.
- Data diskettes can be read out and stored in the database via the rapid start function of the evaluation program. After archiving, the evaluation software will be automatically terminated.

PCA3000

From October 2004 you can use the new PCA3000 PC evaluation software for analyzing and archiving data from the paperless recorder. Further information on the PCA3000 software is contained in the Operating Manual B 70.9701.0.

7.1 Type designation

Paperless recorder for capturing,
visualizing, storing and evaluating measurement data

(1) Basic version

706500/14	paperless recorder with 3 analog inputs
706500/24	paperless recorder with 3 analog inputs incl. setup and PCA evaluation program
706500/15	paperless recorder with 6 analog inputs
706500/25	paperless recorder with 6 analog inputs incl. setup and PCA evaluation program

(2) Inputs 1 — 3 (programmable)

888	factory-set

(3) Inputs 4 — 6 (programmable)

000	not assigned
888	factory-set

(4) Supply

22	20 — 53 V AC/DC 48 — 63 Hz
23	110 — 240 V +10/-15 % AC 48 — 63 Hz

(5) Extra codes

020	lithium battery for memory backup (ex-factory)
021	storage capacitor for memory backup (on request)
260	integrators and counters / math and logic module[1]
261	4 logic inputs, 3 relay outputs, serial interface RS232/RS485
264	memory expansion to 2 MB[2]
265	Door with lock (IP54)
266	IP65 seal, wide mounting brackets
350	universal carrying case TG-35

	(1)		(2)		(3)		(4)		(5)	
Order code		-		-		-		/		,...
Order example	706500/14	-	888	-	000	-	23	/	020[3]	

1. The math and logic module can only be used in conjunction with the setup program.
2. Memory expansion is only possible with new orders (not for retrofitting).
3. Extra codes are listed one after another, separated by commas.

7 Identifying the instrument version

7.2 Standard accessories

- 1 Operating Instructions B 70.6500.0
- 2 mounting brackets
- cable-tie with foot (can be released)
  for strain relief of the connected sensor leads

7.3 Optional accessories

- setup program on CD-ROM, multilingual
- PC interface cable with TTL/RS232 converter and adapter
- PC evaluation program on CD-ROM, multilingual
- PCA communication server on CD-ROM, multilingual
- configuration of inputs to customer specification

8.1 Location and climatic conditions

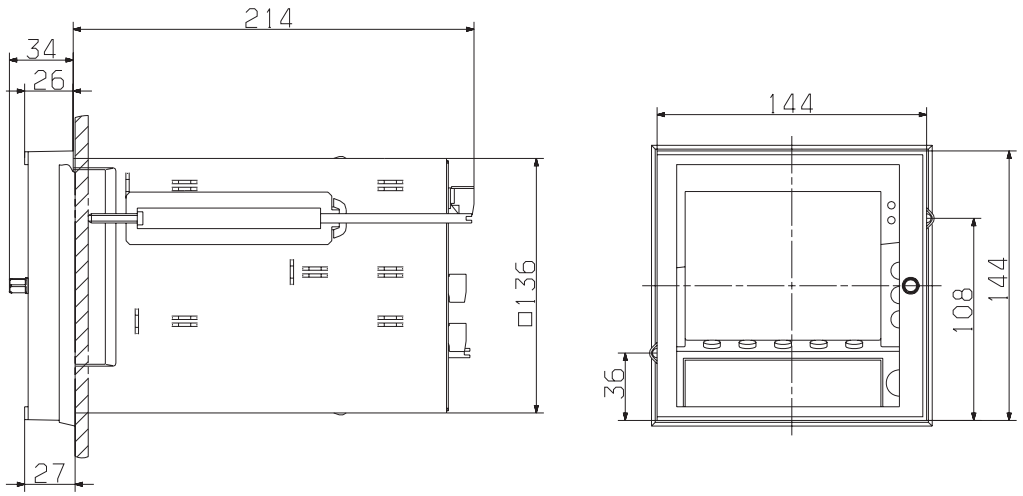
The location should as far as possible be free from vibration. Stray electromagnetic fields, e. g. from motors, transformers etc. should be avoided.

The ambient temperature at the location can be between 0 and +45°C, at a relative humidity of ≤ 75%, no condensation.

⇨ Chapter 9.1 “Installation notes”

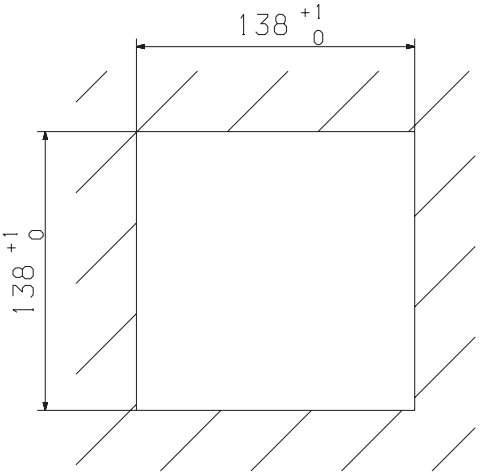
8.2 Mounting in position

Outline drawings



The 26 mm dimension is increased to 27 mm if the IP65 sealing is used.

Fitting into the panel



8 Installation

Fitting in position

* Insert the paperless recorder from the front into the panel cut-out
* From the back of the panel, hook the two mounting brackets into the recesses on the sides of the housing. The flat sides of the brackets must be against the housing.
* Place the mounting brackets against the rear of the panel and tighten them evenly.

9.1 Installation notes

- The choice of the cable, the installation and the electrical connection must conform to the requirements of VDE 0100 “Regulations on the Installation of Power Circuits with nominal voltages below 1000V”, or the appropriate local regulations.
- Work inside the instrument must only be carried out to the extent described and, like the electrical connection, only by qualified personnel.
- If contact with live parts is possible while working on the instrument, it must be isolated from the supply on both poles.
- The electromagnetic compatibility (EMC) conforms to the standards and regulations listed under Technical Data.

  ⇨ Data Sheet T 70.6500
- Run the input, output and supply cables separately, not parallel to one another.
- All input and output cables that are not connected to the mains supply must be arranged as twisted and screened cables. Ground the screen at one end on the instrument.
- Earth the instrument at terminal PE to the earth conductor. This cable must have the same cross-section as the supply cable. Earthing cables must be run in a star configuration, to a common earthing point which is connected to the earth conductor of the supply. Do not loop the earthing cables, i.e. do not run them from one instrument to another.
- Do not connect any additional loads to the supply terminals of the instrument.
- The instrument is not suitable for installation in hazardous (Ex) areas.
- Inductive loads close to the instrument, such as contactors or solenoid valves, should have RC modules fitted for interference suppression.

9.2 Technical data

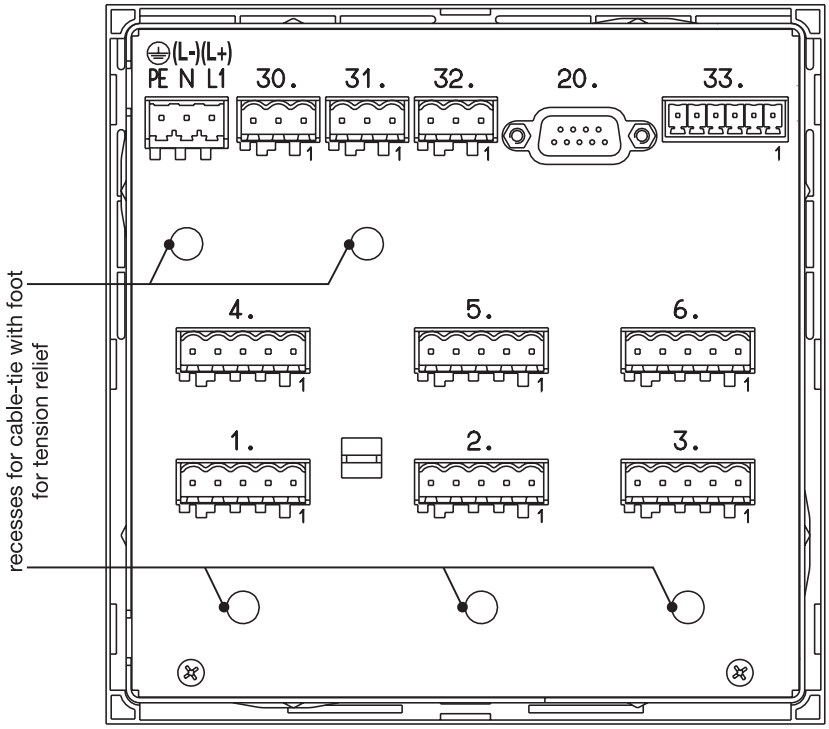
⇨ Data Sheet T 70.6500

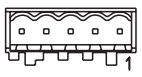
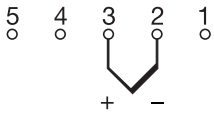
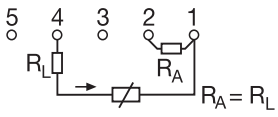
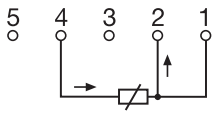
9 Electrical connection

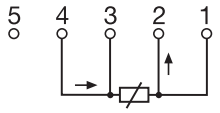
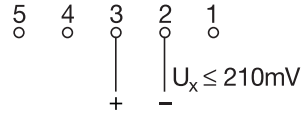
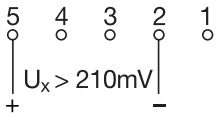
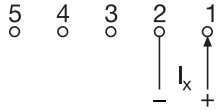
9.3 Connection diagram

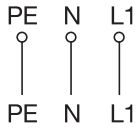
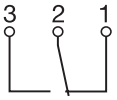
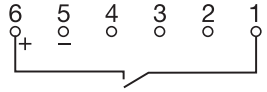
The electrical connection must only be carried out by qualified personnel.

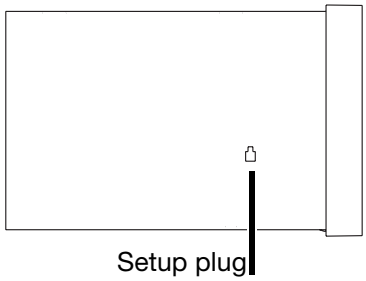
Rear view



Terminals (for screw-clamp connectors) 3/6 channel paperless recorder		**Connection symbol**
Analog inputs	Connector	
Thermocouple	1 to 6	
Resistance thermometer in 2-wire circuit	1 to 6	
Resistance thermometer in 3-wire circuit	1 to 6	

Resistance thermometer in 4-wire circuit	1 to 6	
Voltage input ≤ 210 mV	1 to 6	
Voltage input > 210 mV	1 to 6	
Current input	1 to 6	

Supply		
Supply voltage	PE ⏚ N (L-) L1 (L+)	
Interfaces (extra code)		
RS232C 9-pin SUB-D	20.	2 RxD receive data 3 TxD transmit data 5 GND ground
RS485 9-pin SUB-D	20.	3 TxD+/RxD+ transmit/receive data + 5 GND ground 8 TxD-/RxD- transmit/receive data -
Relay outputs (extra code)		
Relay K1, K2, K3 (changeover)	30, 31, 32	
Logic inputs (extra code)		
Supply 24 V 50 mA Logic inputs voltage-operated LOW = DC -3 to +5 V HIGH = DC 12 to 30 V	33 6 +24 V 5 GND 4 logic input 1 3 logic input 2 2 logic input 3 1 logic input 4	 Example: Logic input 4, operated from internal supply voltage

Setup interface		
The setup interface can be found on the left side of the housing (seen from the front)		

TÜV PRODUCT SERVICE

TECHNICAL REPORT ON DATA-MANIPULATION SECURITY

Paperless recorder series
LOGOSCREEN

Manufacturer

M.K.Juchheim
Moltkestraße 13-31
D-36039 Fulda

Report-No.: MF58870
Revision 1.0 of 11th February 2000

Test and Certification Body:

TÜV Product Service GmbH
Automation, Software and Electronics - IQSE
Ridlerstraße 65
D-80339 Munich

TÜV PRODUCT SERVICE

Technical report on the data-manipulation security of the LOGOSCREEN series of paperless recorders

Contents **Page**

1 Subject of Testing

This technical report describes the performance and the individual results of the test of the LOGOSCREEN series of paperless recorders with regard to data-manipulation security.

The test was instigated by the company M. K. Juchheim in November 1999.

2 Scope of Testing

2.1 Test specimen

The LOGOSCREEN series of paperless recorders includes the types LOGOSCREEN and LOGOSCREEN 500. These are electronic X-t recorders for the acquisition, visualization, storage and evaluation of analog and digital measurement data. The instruments are controlled by microprocessors, and can be configured through various interfaces. The instruments are intended to replace the usual pen and dot-matrix chart recorders. The design is suitable for mounting in equipment cabinets. Data are archived on diskettes, instead of on paper chart rolls. As an alternative, the data can be read out via a serial interface and archived on PCs. In this case, available media include not only diskettes, but also CDROM, magneto-optical disks etc. The measurement signals are applied to plug-in screw terminals on the back panel of the instrument, and are digitalized and stored at adjustable intervals. The further processing can be determined by configuration. For instance, a selection may be made between continuous storage, storage in a time-slot (window) and event-controlled storage.

2.2 Scope of test specimen

The test specimen comprised the following listed components:

- LOGOSCREEN instrument
- user documentation

2.3 Tests

The product was investigated in the following test stages:
- Data security
  - Definition of the security objectives
  - Threat analysis
  - Penetration tests
- Test of fault avoidance measures
- Security instructions in the product documentation

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3 Testing principles

In view of the area of application of the LOGOSCREEN series of paperless recorders and the main theme of the test – data-manipulation security – the tests performed were derived from the following guidelines:

GSH98	IT Basic Security Manual 1998 („Grundschutzhandbuch")

3.1 Quality management during the test

QSH (Version 2)	Quality Assurance Manual of TÜV Product Service GmbH
QSH IQSE (Version 1.4)	Quality Assurance Manual of IQSE
EN 45001 (05.90)	General Criteria for the Operation of Test Laboratories

4 Test material

The following documents and test samples were used as material for the test:

[U1]	LOGOSCREEN instrument type: 955010 (6-channel) SN# 0040528301099450008
[U2]	PC evaluation program (PCA Version 108.02.04, Prg.Ver. 3.02) on CD-ROM
[U3]	Operating Manual B95.5010.0.1
[U4]	Operating Manual B95.5010.2.2
[U5]	high-level data flowcharts and functional overviews
[U6]	various test plans and test records for LOGOSCREEN and the evaluation software

5 Test documentation

The following documents containing the individual test results have been prepared by the test agency:

[P1]	Report of the meeting with the company M. K. Juchheim on 8th December 1999
[P2]	Threat analysis / System-FMEA for the paperless recorder LOGOSCREEN, Version 0.2 on 3.1.2000
[P3]	Penetration tests on the paperless recorder LOGOSCREEN, Version 1.0 on 25th January 2000

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Report No.:MF58870, Revision 1.0
Order-Nr.:10053052
Engineer: Reiner Heilmann
11th February 2000
Page 4 of 7

6 Performance and result of test

6.1 Data security

6.1.1 Definition of the security objectives

Security objectives for the LOGOSCREEN series of paperless recorders were laid down jointly with M. K. Juchheim, (see also document [P1]). These have been listed in the following table.

6.1.2 Threat analysis

A threat analysis was carried out for the defined securityobjectives, on the basis of the system structure as presented. The safety measures that were identified are divided into technical and organizational measures, as well as measures for the avoidance of errors during development.

	Security objective	Threat	Measures
1	Correct and reproducible recording of the measurement signals that are applied, in accordance with the user-defined configuration.	Data may be incorrectly recorded (e.g incorrect scaling, wrong sampling rate etc.)	A defined, practised and proven systematic software development procedure, with verification and validation steps laid down to achieve a correct implementation.
2	Recognition of gaps in the recording and/or recognition that data have been deleted.	Removal of the storage media, switch-off of the recorder, deletion of data	All recordings have a corresponding current date and time mark attached. The evaluation software permits the display of all stored data. The operator can use this software to search for gaps in the recordings. Assistance is provided by recorded events, such as power on/off.
3	Recognition that data have been altered without authorization	Data recordings may be wholy or partly manipulated at a later date.	Data are stored in an unpublished binary format. Intentional alteration is therefore not possible. A blockwise signature secures all stored data.
4	Protection of the instrument configuration from unobserved changes.	Unauthorized changes to protocol parameters or the date.	A 5-character password protects access to the configuration menu. The instruments are delivered with a preset active access protection. All changes to the configuration are recorded.

Test result:

The threat analysis showed that measures are identified to protect against each of the threats to the defined security objectives and that the measures are sufficient to secure the correctness of the implementation and provide effective security against manipulation of data. The results are recorded in the document [P2].

6.1.3 Penetration tests

The technical measures were investigated for vulnerabilities by penetration tests on an series instrument in working condition, see [U1]. The extensive master test plans and test records provided by M. K. Juchheim were inspected.

Test result:

The performed penetration tests revealed no vulnerabilities in the data format and the corresponding error-detection routines. These results are recorded in document [P3]. The tests that were carried out and documented by M. K. Juchheim also failed to show any indication of a deficiency.

6.2 Testing of fault avoidance measures

The European methodology for certificates of conformity (93/465/EEC „Decision of the Council on 22nd July 1993 on the modules to be applied in the technical harmonization guidelines for the various phases of the conformity evaluation procedure, and the rules for application and use of the CE-conformity mark") attach importance to the manufactuer's quality ensurance in production and maintenance. The company M. K. Juchheim fulfils these requirements through a certified and monitored quality management system according to (DIN) ISO 9001. Furthermore, the company operates an accredited calibration laboratory.

The documentation [P3] that has been presented testifies that the quality management system is applied to the LOGOSCREEN and includes the measures required for the first security objective.

6.3 Security instructions in the product documentation

The inspection of the technical documentation was made on the Operating Manual (see document [U3]) and the Interface Description (see document [U4]). Only the data security aspect was considered. The documentation does not include explicit notes on data security. The use of the password protection for the configuration is described. Details on the significance of diskette characteristics and diskette storage for data integrity are not provided.

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7 Summary

The concept and properties of the LOGOSCREEN series of paperless recorders make them into a possible electronic replacement for pen or dot-matrix chart recorders, with additional mechanisms to ensure the integrity of the data and security against manipulation. The effectiveness of the implemented mechanisms secures the envisaged application reliably, provided that the storage conditions and archive duration for diskettes or the selected backup media are respected. The user must take care that the evaluation software to read the measurement data and the operating system that is required are available for the required duration of the archiving of his measurement data.

on behalf of

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