



Operating Instructions

Millimar C 1245





Safety instructions

This unit complies with the relevant safety provisions. However, the following instructions must be strictly observed to ensure the safety of operating personnel and third parties!

1. **Before** connecting the unit to the power supply, check that the supply voltage given on the type plate corresponds to the local mains voltage. If it does not, do not connect the unit under any circumstances.
2. This unit is equipped with a safety-approved power cable and may only be connected to shockproof power sockets which are **grounded in accordance with requirements**. Any extension cables must comply with VDE regulations or equivalent.
3. Any modification to or intervention in the unit requires the express written approval of Mahr GmbH and may only be performed by trained personnel. Before opening the unit, disconnect the plug from the power outlet and ensure it is not connected to a power supply.
4. Any unauthorized opening of the unit or unauthorized intervention invalidates the warranty and frees Mahr GmbH from all liability.
5. Disconnect the unit from the mains before cleaning it. Do not allow liquids to get inside the unit! Never use cleaning agents which are harmful to plastics.
6. **Before** putting the unit into service, read the operating instructions carefully and pay particular attention to the notes they contain.
7. Only use the unit **for the purpose intended**.
8. If a unit fuse needs to be replaced, it is important to use a fuse of the same type, with the **same** rating and characteristics as specified in the operating instructions.

Table of Contents

Order N°	Last modified	Version
3755937	2010/01/13	valid from V 1.39

1	Introduction	5	6.4	"PROCES" main menu	29
2	Control and functional elements	6	6.4.1	"MEASURE" submenu	29
2.1	Front	6	6.4.2	"MASTER" submenu	30
2.2	Rear	9	6.4.3	"DELAY" submenu	30
2.2.1	Jack for inductive probes ...	10	6.5	"SETUP" main menu	31
2.2.2	Jacks for incremental probes	11	6.5.1	"LANGUAG" submenu	31
2.2.3	Jacks for air gages	11	6.5.2	"UNIT" submenu	31
2.2.4	Jacks for meas. devices with analog output	12	6.5.3	"LUMINCE" submenu	31
3	Putting into operation	13	6.5.4	"PASSWRD" submenu	32
3.1	Switch-on	13	6.5.5	"COM" submenu	34
3.2	Password protection	14	6.5.6	"I/O" submenu	36
4	Standard mode	15	6.6	"SETTING" main menu	39
4.1	Configuration	15	6.6.1	"ZEROING" submenu	39
4.2	Master measurement	16	6.6.2	"CALIB." submenu	39
4.3	Measurement	16	6.6.3	"M-CALIB" submenu	39
4.4	Delete last measurement	17	6.6.4	"TESTS" submenu	39
5	Calibration mode	18	6.6.5	"DIAL" submenu	39
5.1	Zero point setting	18	7	Appendix	40
5.2	Calibration	18	7.1	RS232 interface	40
5.3	Resetting factory calibration	19	7.1.1	Connecting a printer	41
5.4	Tests	19	7.1.2	Connecting a PC	41
5.5	Dial-type instrument	19	7.1.3	ASCII protocol	42
6	Setting mode	20	7.1.4	M1240 protocol	42
6.1	"DISPLAY" main menu	20	7.1.5	OPTO-RSS protocol	44
6.1.1	"ANALOG" submenu	20	7.1.6	OPTO-RSD protocol	44
6.1.2	"DIGITAL" submenu	21	7.2	Interface for auxiliary units	45
6.2	"CHANNEL" main menu	22	7.3	Maintenance	46
6.2.1	FILTER parameter	22	7.3.1	Cleaning	46
6.2.2	CHA FACT submenu	23	7.3.2	Changing the fuse	46
6.3	"FEATURE" main menu	24	7.3.3	Opening the unit	46
6.3.1	"FACTOR" submenu	24	7.4	Scope of delivery and accessories	47
6.3.2	"FNCTION" submenu	25	7.5	Overview of the Setting menu	48
6.3.3	"FORMULA" submenu	26	7.6	Technical data	50
6.3.4	"TOLRNCE" submenu	27			
6.3.5	"NOMINAL" submenu	28			
6.3.6	"MASTER" submenu	28			
6.3.7	"CLAS. NB" submenu	28			

The following symbols are used in these operating instructions:



General instruction.



Important note. Failure to do this can lead to faulty results or damage to the unit!

1 Introduction

i These operating instructions describe the instrument and its function. The description of the Windows software is contained in the respective online help.

The Millimar C 1245 is an electronic length measuring instrument for use in the production environment. It is employed in conjunction with up to 8 inductive probes or 1 or 2 air gages in simple applications or measuring units.

The Millimar C 1245 is an easy-to-use compact measuring instrument. It consists of a basic unit, which can be supplemented with up to two plug-in modules.

The plug-in modules contain either four inductive probe inputs (Mahr, Mahr/Federal, Tesa or Marposs), four analog voltage inputs (+/- 5 V, +/- 10 V or 4 - 20 mA), two incremental probe inputs (Heidenhain, 1 V_{pp}) or a Mahr or Mahr/Federal air/electronic converter. All inputs can be linked digitally with each other.

The Millimar C 1245 offers:

- Operation with 8 function keys
- Static or dynamic measurements
- Analog results display on an easy-to-read dial-type measuring instrument
- Digital results display on a two-line LCD
- Simple setting of all parameters using 8 function keys
- Convenient programming facility using MarTalk and a connectable Windows PC
- RS232 interface for process control or to tie in a quality assurance system
- Statistics functions in the M1240 protocol
- Parallel interface for auxiliary units with 3 opto-coupled inputs and 6 outputs
- 1 analog output
- Storing the 5000 most recent measuring values and reading them out via RS232
- Factory and customer calibration

2 Control and functional elements

2.1 Front

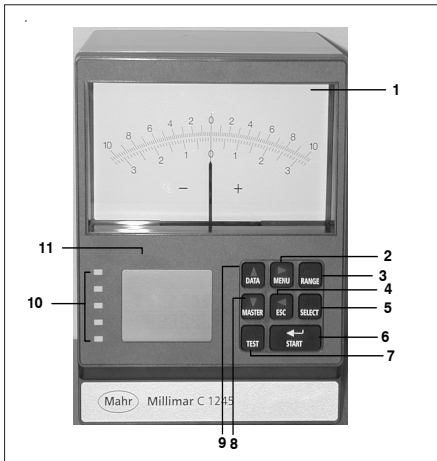


Figure 1
Front

- 1 Dial-type measuring instrument for analog results display
- 2 Button **MENU** (▶)
- 3 Button **RANGE**
- 4 Button **ESC** (◀)
- 5 Button **SELECT**
- 6 Button **START**
- 7 Button **TEST**
- 8 Button **MASTER** (▼)
- 9 Button **DATA** (▲)
- 10 If the tolerance and warning limits are exceeded, this is displayed via the status lights. The color of the status light depends on the location of the result relative to the tolerance limits (see menu "FEATURE / TOLRNCE / COLOR").
- 11 LCD for digital results display

Standard mode functions

- Button **MENU**
Switches to Setting mode.
- Button **ESC**
Deletes the most recent measurement.
- Button **START**
Starts dynamic measurement.
- Button **TEST**
Displays raw probe value.
- Button **MASTER**
Starts master measurement.
- Button **DATA**
Sends the results via the RS232 interface.
- Button **RANGE**
Sets the display range.
- Button **SELECT**
Selects the displayed feature.

Setting mode functions

- Button **MENU** (▶)
Pages to the right in the menu or switches to the next submenu. If there is no further submenu available, the change to the displayed parameter is initiated.
- Button **ESC** (◀)
Pages to the left in the menu or moves to the next highest menu level. If the button is pressed while a main menu is being displayed, Setting mode will be terminated and Standard mode will be initiated.
- Button **DATA** (▲)
Pages upwards on a menu level. Pressing the button selects a menu or parameter, depending on the menu level.
- Button **MASTER** (▼)
Pages downwards on a menu level. Pressing the button selects a menu or parameter, depending on the menu level.
- Button **START**
Confirms your selection.
Press this button to adopt the parameter setting as displayed. If the button is pressed while a main menu or submenu is being displayed, Setting mode will be terminated.

Selecting menu or parameter

1. Press **MENU** (▶) to switch to Setting mode.
2. Press **DATA** (▲) and **MASTER** (▼) to select the required main menu.
3. Press **MENU** (▶) to confirm your selection.
4. Press **DATA** (▲) and **MASTER** (▼) to select the required submenu or, if no additional submenus exist, to select the required parameter.
5. Press **MENU** (▶) to confirm your selection and, if necessary, switch to the next menu level or initiate the parameter change.
6. Perform steps 4 and 5 again until the required submenu or the required parameter can be selected.

i To change to the previous menu level, press button **ESC** (◀). Element "—" indicates by the number of dashes how many times **ESC** must be pressed to terminate Setting mode.

As soon as the character "*" disappears from the LCD, the parameter input level has been reached.

Selecting parameter settings

- Press **MENU** (▶) to switch to Setting mode.
- Change to the required submenu and select the required parameter.
- Press **DATA** (▲), **MASTER** (▼), **MENU** (▶) to select the parameter values.
- The parameter value which is currently set flashes.
- Press **START** to adopt the parameter value as the current setting, this then being displayed flashing.
- Press **ESC** (◀) or press **START** again to terminate parameter selection and display the selected submenu.

Entering parameter values

- Press **MENU** (▶) to switch to Setting mode.
- Change to the required submenu.
- Press **DATA** (▲) and **MASTER** (▼) to page through the parameters.
- The first digit or sign in front of the parameter will be displayed flashing.
- Press **MENU** (▶) or **ESC** (◀) to select the digit to be changed.
- Press **DATA** (▲) or **MASTER** (▼) to change the value of the digit.
- Press **START** to adopt the value as displayed, and press **START** again to display the selected submenu.

2.2 Rear

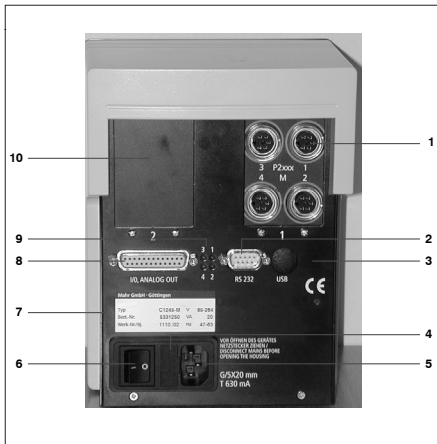


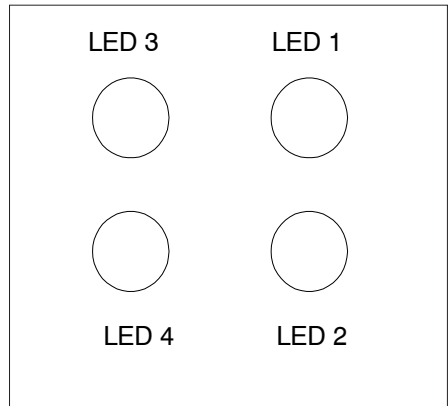
Figure 2

Rear

- 1 Inductive module
- 2 Serial RS232 interface (9-pin D-Sub)
- 3 USB interface (optional; not yet available)
- 4 Fuse
- 5 Mains supply
- 6 Mains switch
- 7 Type plate
- 8 Interface for auxiliary units (25-pin D-Sub)
- 9 Status lights
- 10 Cover

i The rear view of the Millimar C 1245 may differ depending on the number and type of plug-in modules used. When a plug-in module is replaced, the replacement module must be calibrated anew.

Arrangement of the status lights



Function of the status lights

- LED 1: No function
- LED 2: Instrument is ready to communicate with the PC (flashes)
- LED 3: Lights up on receiving a command via RS232
- LED 4: POWER ON

2.2.1 Jack for inductive probes

The plug-in module for inductive probes contains four input channels for inductive probes.

i The probe jacks are identified by a colored ring to highlight their different compatibilities. The jacks are labelled for original Mahr probes from the P20xx series.

Probe	Ring color	Desig.
Mahr	red	M1 to M4
Mahr/Federal	white	F1 to F4
Tesa	gray	T1 to T4
Marposs	blue	U1 to U4

Other probes can naturally also be connected. These include, though this list is not necessarily complete:

	Mahr	Federal	Tesa	Marposs
Carrier frequency [kHz]	19,4	5	13	7,5
Amplitude [V]	5	2	3	3,5
Sensitivity [mV/V/mm]	192	78,74	73,75	115
Compatible with	1300		GT21	AH 100
	1301/1303		GT22	AH 250
			Hirt 101	
	P2001		Solartron:	
	P2004		AX2.5/SH	
	P2010*		AX1.5/SH	
	1318			
	1310*			

Other sensitivities are possible depending on a suitable choice of CHANNEL/CHA FACT in accordance with the manufacturer's instructions.

i If several plug-in modules for inductive probes are used, use only modules for the same type of probe. Do not connect probes with varying compatibility to the same module.

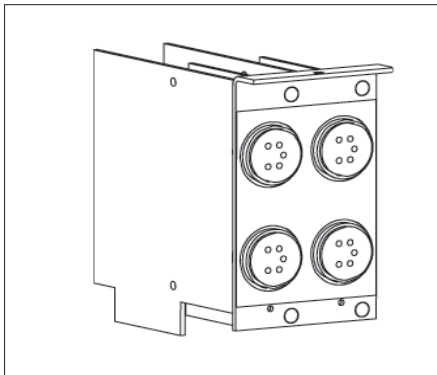


Figure 3
Input module for "Inductive probes"

* CFACTOR = 10

2.2.2 Jacks for incremental probes

The plug-in module for incremental probes contains two input channels for Millimar 1508, 1514 or 1526 incremental probes.

Signal voltage:	1 V _{pp} sinusoidal
Increment:	4 μm (adjustable 1 to 100)
Interpolation:	50x
Measuring range:	± 999.999 mm
Supply voltage:	5V

2.2.3 Jacks for air gages

The plug-in module for air gages contains an input channel for pneumatic recorders and a compressed air connection for the air supply (precision pressure reducing device required).

i The supply pressure should be set with a suitable precision pressure reducing device to 2 bar (Mahr) or 2.1 bar (Federal) (± 5%). Only compressed air which is free from oil or contamination should be used.

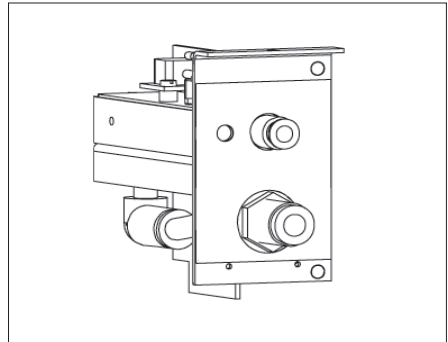


Figure 4
Input module for "Air gages"

Depending on the converter version, ratios of 2500:1, 5000:1 or 10000:1 (as per labelling) can be used.

Ratio	MR* Mahr	MR* Federal
2500:1	± 50 μm	± 38 μm
5000:1	± 25 μm	± 19 μm
10000:1	± 12.5 μm	± 7.6 μm

* MR = measuring range

2.2.4 Jacks for measuring devices with analog output

The plug-in module for measuring devices with analog output contains four input channels for DC voltage signals.

Input range: $\pm 5\text{ V}$, $\pm 10\text{ V}$,
4 to 20 mA

Probe power supply: + 5 V, 200 mA

Pin assignment:

- 1 Probe power supply + 5 V
- 2 Current input I +
 $I_{\text{max}} = 80\text{ mA}$, reverse-bias protected
- 3 Voltage input $\pm 10\text{ V}$, $8\text{ M}\Omega$
- 4 Ground GND
- 5 Voltage input $\pm 5\text{ V}$, $4\text{ M}\Omega$
- 6 Current input I -
 $I_{\text{max}} = 80\text{ mA}$, reverse-bias protected

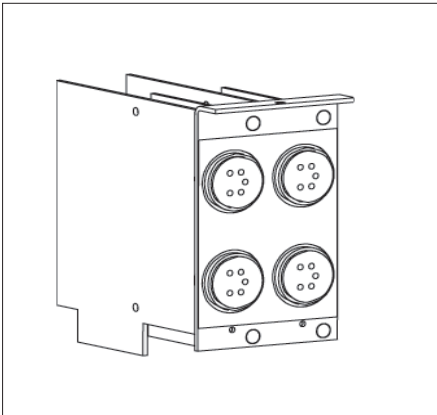


Figure 5
Input module for "DC voltage signals"

3 Putting into operation

3.1 Switch-on

- Connect the Millimar C 1245 to the local supply network using the mains cable (voltage range 90 to 264 V).
- Connect the probe to the input channels of the respective plug-in module.

i When connecting inductive and incremental probes as well as measuring instruments with analog output, make sure that the connectors are tightly screwed onto the jacks.
When air gages are used, make sure that the compressed air is connected properly.

- Switch the unit on.
 - After performing a self-test, the unit is ready for operation, the type of installed plug-in module (e.g. "Mahr") and the software version number are displayed on the LCD.
 - Depending on the setting, the measuring results or, if necessary, the classification results are displayed on the analog display or the LCD.

During the switch-on process, a plausibility test is carried out. Should an error occur, the text "VAR NB" and the corresponding error number are displayed on the LCD:


Error no.	Description
1	Mode implausible
2	Filter value implausible
5	Output mode greater than 10
6	Brightness implausible
7	Language not available
8	Unit of measurement not available
10	Baud rate implausible
11	RS232 format not available
12	Channel factor too small
13	Channel factor too large
14	Calibration implausible
15	Calibration factor too large
16	Calibration factor too small
20	Class number less than 1
22	Display / measuring range exceeded

3.2 Password protection

To rule out the possibility of the user making changes to the default settings, password protection can be incorporated. When password protection is activated, the password must be entered in order to change to Setting mode.

To define the password:

- Change to Setting mode.
- Select the "PASSWRD" submenu in the "SETUP" main menu.
- Enter an up to 7-digit number as the password.

 The final digit should always be "0" in order to activate the general password protection (see Chap. 6.5.4 "PASSWRD" submenu) Password protection will be disabled if you only enter zeros, i.e. no password will be requested.

To invoke Setting mode using the password:

- Enter the up to 7-digit number and confirm with **START**.

4 Standard mode

4.1 Configuration

Press the **TEST** button to switch to Configuration mode.

The raw values of the connected probes or measuring instruments are displayed. The analog display is thus set to the measuring range that is briefly displayed.

The number of the input shown is displayed in the top LCD line, and the current measuring value is displayed in the bottom line. Further inputs can be selected by pressing the **TEST** button again.

i This function is only required for ensuring that the probes are clamped correctly into the measuring device or for checking that they are functioning correctly. The zero position which is displayed identifies the electrical zero point of the probe.

To display the raw values :

- Press the **TEST** button.
 - **CONFIG.** and the display range appear on the display for approx. 1 second.

The number of the input and the raw value of the probe are then displayed.

- Press **DATA** (**▲**) or **MASTER** (**▼**) to change the display range.
- Press **TEST** to display the values of the other inputs.
- Press **START** or **ESC** (**◀**) to terminate Configuration mode.

4.2 Master measurement

The master measurement is initiated by pressing the **MASTER** (▼) button. When performing the master measurement, the unit can be set to a definable master value. The current feature result is saved as the actual master value (see menu "FEATURE / MASTER").

The **ACTIVAT** parameter (see menu "PROCES / MASTER") determines the mode in which master measurement is performed.

- **COMBINE** mode: The master measurement takes place for all features in one run.
- **INDIVID** mode: The master measurement takes place "individually" for each feature, one after the other.

To start a master measurement:

- Press the **MASTER** (▼) button.
- Press **START** to adopt the measuring value for the first feature (**COMBINE** mode) or for all features (**INDIVID** mode).
 - If several features are available, and if **INDIVID** mode is selected, then the features are displayed individually, one after the other. The measuring value is adopted by pressing **START**.
- Press **ESC** (◀) to cancel the master measurement without adopting the current probe values.

4.3 Measurement

Two types of measurement can be selected in the "FEATURE / FNCTION" menu:

1. **Static measurement (NORMAL):**
The current value is displayed.
2. **Dynamic measurement (e.g. AVERAGE):**
The dynamic measuring result is displayed, e.g. average value.

i The dynamic measurement is started, depending on the setting (see menu "PROCES", submenu "COM" or "I/O") via either the **START** button, the interfaces for auxiliary units or the RS232 interface.

i Depending on the setting, the measurement terminates automatically after a specified time (see menu "PROCES / MEASURE / TIMER") or in response to a STOP signal (**START** button, I/O or RS232 interface).

To send the current measured value via the RS232 interface:

- Press the **DATA** (▲) button.

The protocol had to be selected as described in Chapter 6.5.5.

4.4 Delete last measurement

The results of all dynamic measurements are stored internally.

To delete the last measurement:

- Press **ESC** (▶).

5 Calibration mode

5.1 Zero point setting

The display value can be changed and set to zero by means of the "ZEROING" menu. To do this:

- Change to Setting mode.
- Select the "SETTING" main menu.
- "ZEROING" appears on the LCD.
- Press **MENU** (▶) again.
- Press **DATA** (▲) or **MASTER** (▼) to select the channel and then press **MENU** (▶) again.
- Press **DATA** (▲) and **MASTER** (▼) to increase and decrease the displayed value respectively step by step
or press **MENU** (▶) to set the current probe value to zero.
- Press **START** to adopt the setting.
- Press the **ESC** (◀) button or press the **START** button again to exit the menu.

5.2 Calibration

The "CALIB." menu can be used to calibrate a connected probe or air/electronic converter. To do this:

- Change to Setting mode.
- Select the "SETTING" main menu.
- "ZEROING" appears on the LCD.
- Press the **MASTER** (▼) button.
- "CALIB." appears on the LCD.
- Press the **MENU** (▶) button again.
- Enter the password 1 000 000 and confirm with **START**.



Please note that the user may only access customer calibration if the corresponding main menu is available to him/her. In case the user cannot access the main menu in question, another user with the corresponding access rights must perform the calibration.

- Use **DATA** (▲) or **MASTER** (▼) to select the module or the channels of the corresponding module, and press **MENU** (▶) again.
 - Initialization is carried out.

- Enter the zero point, the upper and lower calibration limits of the probe and confirm each entry with **START**

or

Select the ratio, the upper and lower setting limits of the air/electronic converter and confirm with **START**.

- A self-test is conducted automatically.
- Press the **ESC** (◀) button or press the **START** button again to exit the menu.

5.3 Resetting the factory calibration

The "M-CALIB" menu can be used to reset every single input channel to the factory calibration. To do this:

- Press **DATA** (▲) or **MASTER** (▼) to select the channel, and confirm with **START**.

5.4 Tests

The "TESTS" menu contains programs for putting the unit into operation, and is accessible only to Mahr GmbH employees or other authorized individuals.

5.5 Dial-type instrument

In order to set the zero point and the positive and negative limit stops of the dial-type measuring instrument:

- Press **DATA** (▲) or **MASTER** (▼) to set the value and confirm with **START**.

6 Setting mode

The Millimar C 1245 can be configured in Setting mode.

- Press the **MENU** (▶) to switch to the setting mode.

i When password protection is activated, the password must be entered in order to change to Setting mode.

6.1 "DISPLAY" main menu

Selection of the display mode.

- ANALOG / DIGITAL

6.1.1 "ANALOG" submenu

- "FEAT NB" parameter
Selection of the feature to be displayed on the analog display.

i The analog display always displays the deviation from the nominal dimension. The resolution is determined by the display range (RANGE button).

6.1.2 "DIGITAL" submenu

This allows settings for the digital display to be made.

"LINE 1" submenu

The first line can display either the display range of the dial-type measuring instrument or a feature.

"FEATURE" submenu

- "FEAT NB" parameter
Selection of the feature to be displayed in the first line.

"FORMAT" submenu

Selection of the display format for the first line.

"LINE 2" submenu

A feature is displayed in the lower line.

"FEATURE" submenu

- "FEAT NB" parameter
Selection of the feature to be displayed in the second line.

"FORMAT" submenu

Selection of the display format for the second line.

6.2 "CHANNEL" main menu

The signals applied at the inputs (inductive probes, incremental probes, analog voltages or air/electronic converters) are processed by A/D converters. The common **FILTER** parameter is used to smooth the measuring signals.

For extensive evaluations, the filter is, if necessary, automatically set to the maximum attainable value.

6.2.1 FILTER parameter

This parameter acts on all inputs.

Selection of the width of a running average filter. At 1 measuring value/s, over 300 measuring values per input channel are averaged; at 300 measuring values/s, no averaging takes place (maximum sample rate).

6.2.2 CHA FACT submenu

This submenu includes parameters which are to act on a certain channel only:

CHA FACT
PLAUS. +
PLAUS. -
PERIOD (incremental probes only)

The number of the channel in question (**CAN NB.**) must be entered before selecting the parameters. The channel number is composed of the number of the module slot and the number of the input on the respective module; for example, in module slot 1, input 3, the channel number is 13.

Parameter CHA FACT

Entering a correction factor

The measured values supplied by the probes are individually multiplied by the correction factor. Sensitivity deviations of the probes are thus compensated for and lever factors of reversing levers are taken into consideration in the measuring device. The default setting is 1.0. The factor is taken into account prior to the evaluation of the formula.

PLAUS. + parameter

Entry of the positive limit value for the plausibility range.

PLAUS. - parameter

Entry of the negative limit value for the plausibility range.

i Plausibility range = value range of the measured values which have not been corrected by the correction factor. If the value is outside the plausibility range, an "OVERFLW" message is output in the upper LCD. The data output via the RS232 interface is not affected by this event.

PERIOD parameter

(only for incremental probes)

Enter the period (increment) of the incremental probe being used (default value: 4 μm).

6.3 "FEATURE" main menu

Definition of the features (evaluation functions) and their representation.

All parameters of the "FEATURE" main menu must be entered correctly in order to ensure a perfect match to the measuring task.

The measured values of the probe channels are digitally linked to a feature. A feature can be displayed as a measuring result (see **DISPLAY** main menu).

Up to 16 features can be determined with the aid of a feature number (**FEAT. NB**) that must be defined. Enter the feature number before selecting the parameters:

FACTOR	FNCTION
FORMULA	TOLRNCE
NOMINAL	MASTER
CLAS. NB	

A feature is calculated using the following formula:


$M = \text{FACTOR} \times \text{FUNCTION (FORMULA)}$

6.3.1 "FACTOR" submenu

Definition of the formula multiplier.

6.3.2 "FNCTION" submenu

Selection of the function for calculating measured values.

- **NORMAL / MAXIMUM / MINIMUM / MAX-MIN / MAX+MIN / AVERAGE / SQ.ROOT / ATAN / MINSORT / MAX-SORT**
 - **NORMAL** parameter
Result of a static individual measurement combination.
 - **MAXIMUM** parameter
Largest value of a dynamic measured value combination.
 - **MINIMUM** parameter
Smallest value of a dynamic measured value combination.
 - **MAX-MIN** parameter
Difference between the largest and smallest values.
 - **MAX+MIN** parameter
Total of the largest and smallest values.
 - **AVERAGE** parameter
Mean value from the individual results acquired during the measuring period.
 - **SQ.ROOT** parameter
Square root of a measured value combination.
If the combined result is a negative value, then the square root is calculated from the absolute value.
 - **ATAN** parameter
Arc tangent of a measured value combination (result in degrees with decimals after the point)
-  When a dynamic measurement is performed, the measured values are recorded during a measuring period to be entered or during the period specified by the START and STOP signals (see menu "PROCES / MEASURE / TIMER").
- **MINSORT** parameter
determines the feature with the smallest result from a list of features and displays the number.
 - **MAXSORT** parameter
determines the feature with the largest result from a list of features and displays the number.

6.3.3 "FORMULA" submenu

Enter the combination in a formula editor (up to 80 characters).

- Permissible characters:
+ - * / . < > M C 1 2 3 4 5 6 7 8 9 0
- Use "C" to specify the number of the input channel. Enter the two-digit number of an available channel directly after "C" (without a space); for example, C11.
Depending on the device configuration (plug-in modules), the following channel numbers are possible:
Module 1: C11 to C14
Module 2: C21 to C24 (by default only C23 for air/electronic plug-in module)
- Use "F" to specify the number of a feature. Enter the number of a feature between 1 and 16 directly after "F" (without a space), for example, F5.
- For formulas that do not contain any input channels, no master measurement is required.
- Do not mix input channels and features in one formula, because the rules for a master measurement are not unambiguously defined in this case.

- Up to 4 levels of parentheses are possible.
- A feature is deleted by entering two spaces at the start of a formula.

The following errors are recognized and displayed with the corresponding messages:

Error	Description
ERROR 1	Syntax error
ERROR 2	Nonpermissible recursion

6.3.4 "TOLRNCE" submenu


Definition of the limit values and their color representation in the status lights

- COLOR / TOLER. + / TOLER. - / ALARM + / ALARM -

"COLOR" submenu

Selection of the status light color when the tolerance limits are exceeded.

- **WARNING** parameter
Selection of the status light color when the alarm limits are exceeded (W YELLOW / W GREEN).
- **TOLER. +** parameter
Selection of the status light color when tolerance exceeded in positive direction (>T RED / >T YELLOW).
- **TOLER. -** parameter
Selection of the status light color when tolerance exceeded in negative direction (<T RED / <T YELLOW).

 For the tolerance limits, a yellow status light indicates rework and a red one rejection (see "PROCES / I/O / OUTPUT" menu).

"TOLER. +" submenu

Entry of the upper tolerance limit ("upper allowance") relative to the nominal dimension.

"TOLER. -" submenu

Lower tolerance limit.

- **TOLER. -** parameter
Entry of the lower tolerance limit ("lower allowance") relative to the nominal dimension.

"ALARM +" submenu

Entry of the upper alarm limit relative to the nominal dimension.

"ALARM -" submenu

Entry of the lower alarm limit relative to the nominal dimension.

6.3.5 "NOMINAL" submenu

Entry of the nominal dimension in the form of an absolute value.

6.3.6 "MASTER" submenu


Definition of the master actual value (the "workpiece reference") for the master measurement on a setting master.

Enter the actual measurement as an absolute value.

6.3.7 "CLAS. NB" submenu

Defining the number of equally large classes into which the tolerance range of the feature is to be divided. The result can be displayed in the LCD or via the interface for auxiliary units as long as the number of classes does not exceed the selections specified in the "I/O" submenu (see Chap. 6.5.6).

- **CLAS. NB** parameter
Enter the number of classes
The number of classes must be between 2 and 998. Results that lie below the tolerance limit fall into class 0. Results higher than the upper tolerance limit fall into the number of classes +1, e.g. in the case of 998 classes into class 999.
- **HYSTERE** parameter
Enter a value by which a class limit must be exceeded in order to switch into a class number. This suppresses any change in class when there are small coincidental changes of the measuring result which lies on the boundary between two classes.

 The hysteresis is limited to the maximum half class range, and it proceeds symmetrically to the limit (half-value of the hysteresis, e.g. ± 0.05 for 0.1).

6.4 "PROCES" main menu

Definition of the measurement mode of a dynamic measurement.

- MEASURE / MASTER / DELAY

6.4.1 "MEASURE" submenu

Definition of the measurement mode parameters.

- MEASMOD / TIMER / REPEAT

"MEASMOD" submenu

Select the measurement mode.

- **NORMAL** parameter
The measurement runs continuously; measuring periods are ignored. Peak-value memories are reset when **START** is pressed.
- **AUTOM.** parameter
If T-Timer and T-Pause are both zero, the **START** button both starts and stops the measurement.
If T-Timer > 0, the measurement is started with the **START** button and is terminated after the measuring time (**T-TIMER**) has expired.
When a pause is defined in the "REPEAT" menu (T-PAUSE), no measuring value will be recorded for the duration of the pause once the measuring time has expired. After the pause, the measuring period starts again. This cycle will be repeated until measurement is terminated by pressing the **START** button.

"TIMER" submenu

Defining the measuring period.

- **T-TIMER** parameter
Entry of the measuring period in seconds after which the measurement is to be stopped.

"REPEAT" submenu

Definition of the pause for the cyclical measurement mode.

- **T-PAUSE** parameter
Entry of a pause in seconds during which no measured values are to be recorded. If a time is entered, the measurement cycle must be terminated with the **START** button.

6.4.2 "MASTER" submenu

Definition of the time between two master measurements.

- **MINUTE** parameter
Entry of the period in minutes.
After the set period has expired, a master measurement must be performed.
During the measurement, "MASTR.N" is displayed, whereby N represents the feature number.
- **ACTIVAT** parameter
Selection of the master measurement as global or individual. Either all features together or individually, one after the other, can be adopted.
(COMBINE / INDIVID)

6.4.3 "DELAY" submenu

Definition of a delay between the time when a measurement is initiated and the start of measured values being acquired.

- **DELAY** parameter
Entry of the period in seconds.
If a cyclical measurement mode is selected (T-PAUSE > 0), measured values are recorded for the duration of the measuring period only after the pause has expired.

6.5 "SETUP" main menu

Definition of the basic settings.

- LANGUAG / UNIT / LUMINCE /
PASSWRD / COM / I/O

6.5.1 "LANGUAG" submenu

Selection of the language for the menu texts.


The following languages (parameters) are available:

- German, English, French, Spanish, Portugese, Italian and Swedish.

6.5.2 "UNIT" submenu

Selection of the unit of measurement for the display.

- **MM** parameter
Display in mm.
- **INCH** parameter
Display in inch.
- **MICRO-M** parameter
Display in μm .

 The unit of measurement currently set is always displayed on the LCD.

6.5.3 "LUMINCE" submenu

Selection of the contrast of the LCD.
8 levels of contrast are available.

6.5.4 "PASSWRD" submenu

Definition of the access right for Setting mode.

- **PASSWRD** parameter
Entry of a password which can consist of seven digits.

Password with "0" as the final digit*

i If a password is assigned, the password must be entered every time Setting mode is invoked. The request "PASSWRD" appears on the LCD.

Password with "1" or "6" as the final digit

i If the last digit of the password is between 1 and 6, this enables a different menu depending on which digit is selected. The other menus are blocked.

When Setting mode is invoked, the enabled menu is displayed first and can be accessed.

The table below shows which digit corresponds to which menu.

Last digit	Enabled menu
0	All menus are blocked
1	DISPLAY
2	CHANNEL
3	FEATURE
4	PROCES
5	SETUP
6	SETTING

* all menus are blocked

6.5.5 "COM" submenu


Definition of the communication parameters for outputting measured values via the RS232 interface.

- PROTOCL / FORMAT / HANDSHK / BAUD / TRANSM


"PROTOCL" submenu

Selection of the protocol for outputting measured values.


- **OFF** parameter
No measured values are output.
- **ASCII** parameter
Measured values are output in ASCII format.
- **M1240** parameter
Measured values are output in M1240 protocol format.

 The Millimar C 1245 must be connected to a PC to enable control as per the M1240 protocol.

- **OPTO-RSS** parameter
Output of the measured values in OPTO-RSS format.
- **OPTO-RSD** parameter
Output of the measured values in OPTO-RSD format.

 The Millimar C 1245 must be connected to a PC to enable control as per the OPTO-RSD protocol.

- **MARTALK** parameter
Transfer of parameter values.

 The Millimar C 1245 must be connected to a PC to be able to upload and download with MarTalk.

- **PR RES** parameter
Output of the measured values in a clear ASCII printer protocol.
- **PR STAT** parameter
Output of the measured values in a clear printer protocol.

"FORMAT" submenu

Selection of the data format.

- **8-N-1** parameter
8 bits, no parity check, 1 stop bit
- **7-O-2** parameter
7 bits, odd parity, 2 stop bits
- **7-E-2** parameter
7 bits, even parity, 2 stop bits

"HANDSHK" submenu

Selection of the protocol for controlling data transfer (handshake).

- **None** parameter
No control.
- **XON/XOF** parameter
Software control.
- **RTS/CTS** parameter
Hardware control.

"BAUD" submenu

Selection of the transfer rate in bit/s. The following baud rates are available:

300	600	1200	2400
4800	9600	19200	38400

"TRANSM." submenu

Selection of the measured value transfer.

- **MANUAL** parameter
The measuring results are transferred by pressing the **DATA** (▲) button.
- **AUTOM.** parameter
The measuring results are transferred automatically after the measurement has ended.

i The measured values are only transferred if the protocol (ASCII, M1240, OPTO-RSS, OPTO-RSD) is enabled (see menu "SETUP / COM / PROTOCL").

- **SCANN.** parameter
The measuring results are transferred automatically during the measurement with as many values per second as possible.

i The measured values are only transferred if the protocol (ASCII, M1240, OPTO-RSS, OPTO-RSD) is enabled (see menu "SETUP / COM / PROTOCL").

6.5.6 "I/O" submenu

Definition of the input and output signals for the auxiliary equipment interfaces.

- INPUT / OUTPUT / U-OUT 1

i To activate communication by means of input and output signals, select parameter **AUTOM.** in the "PROCES / MEASURE / MEASMOD" menu.

"INPUT" submenu

Selection of the input signals.

- **MODE 0** parameter
Signals at the inputs are ignored.
- **MODE 1** parameter
I1 = Measuring period*
I2 = Start signal for master measurement**
I3 = Adopt signal for master measurement**
- **MODE 2** parameter
I1 = Start signal**
I2 = Stop signal**
I3 = Reset signal to clear the MAX-MIN memory**
- **MODE 3** parameter
I1 = Measuring period*
I2 = Signal to send a measured value**
I3 = Start and adopt signal for master measurement**
- **MODE 4** parameter
For connecting the Millimar S 1840/SG control unit.
I1 = Measuring period*
I2 = Start signal for master measurement**
I3 = Adopt signal for master measurement**

i If the **MODE 4** parameter is selected for the input signals, **MODE 4** is automatically set for the output signals as well.
In Automatic operation, the **START** button causes a measurement to be canceled. The **DATA** button is also active.

* state controlled
** pulse controlled

"OUTPUT" submenu

Selection of the static output signals.

- **MODE 0** parameter
No signals are fed to the outputs.
- **MODE 1** parameter
O1 = Signal "Measurement in progress"
O2 = Signal "Measurement finished"
O3 = Signal "Measurement OK"
- **MODE 2** parameter
O1 = Signal "Measurement OK"
O2 = Signal "Measurement outside warning limits"
O3 = Signal "Measurement outside tolerance"
O4 = Signal "Measurement in progress"
O5 = Signal "Measurement finished"
- **MODE 3** parameter
O1 = Signal "GO"
O2 = Signal "Rework"
O3 = Signal "NO GO"
O4 = Signal "Measurement in progress"
O5 = Signal "Measurement finished"
- **MODE 4** parameter
For connecting the Millimar S 1840/SG control unit.
O1 = Signal "GO"
O2 = Signal "Rework"
O3 = Signal "NO GO"
O4 = Signal "Measurement in progress"
O5 = Signal "Measurement finished"



If the **MODE 4** parameter is selected for the output signals, **MODE 4** is automatically set for the input signals as well.

- **MODE 5** parameter
 - O1 = Signal "Measurement F1 < lower tolerance limit"
 - O2 = Signal "Measurement F1 >= lower tolerance limit, <= lower warning limit"
 - O3 = Signal "Measurement F1 OK"
 - O4 = Signal "Measurement F1 >= upper warning limit, <= upper tolerance limit"
 - O5 = Signal "Measurement F1 > upper tolerance limit"
 - O6 = Signal "Measurement finished"
- **MODE 6** parameter
 - O1= Signal "Measurement F1 < lower tolerance limit"
 - O2= Signal "Measurement F1 in Class1"
 - O3= Signal "Measurement F1 in Class2"
 - O4= Signal "Measurement F1 in Class3"
 - O5= Signal "Measurement F1 in Class4"
 - O6= Signal "Measurement F1 > upper tolerance limit"
- **MODE 7** parameter
 - O1 = Signal "Measurement F1 OK"
 - O2 = Signal "Measurement F1 Rework"
 - O3 = Signal "Measurement F1 NO GO"
 - O4 = Signal "Measurement F3 OK"
 - O5 = Signal "Measurement F3 Rework"
 - O6 = Signal "Measurement F3 NO GO"
- **MODE 10** parameter
 - Feature numbers of MAXSORT or MINSORT functions are output in BCD format.
 - O1 = Signal "Measurement in progress"
 - O2 = Signal "Measurement finished"
 - O3 = Signal "Measurement OK (all the features)"
 - O4 = Signal "Measurement Mx with MAXSORT or MINSORT : Feature number BCD1"
 - O5 = Signal "Measurement Mx with MAXSORT or MINSORT : Feature number BCD2"
 - O6 = Signal "Measurement Mx with MAXSORT or MINSORT : Feature number BCD4"

"U-OUT 1" submenu

- **"FEATURE"** parameter
Selection of the feature whose measured value is to be output via analog output 1. If feature 0 is selected, the analog output is switched off.
Outputting an analog measured value can reduce the maximum measured value acquisition rate.
- **"SENSITI"** parameter
Input of sensitivity of analog output 1 in Volt / mm. The analog output produces voltages of up to +/-4V.

6.6 "SETTING" main menu

Definition of further basic settings.

- ZEROING / CALIB. / M-CALIB / TESTS / DIAL

6.6.1 "ZEROING" submenu

See Chapter 5.1

6.6.2 "CALIB." submenu

See Chapter 5.2

6.6.3 "M-CALIB" submenu

Resets the device to the factory calibration.

6.6.4 "TESTS" submenu

See Chapter 5.4

6.6.5 "DIAL" submenu

Definition of the zero point as well as the positive and negative ends of the scale of the dial-type measuring instrument.

Setting is performed by pressing the **DATA** (▲) and **MASTER** (▼) buttons. A correction factor is displayed in the lower line.

- **"CAL 0.0"** parameter
Setting of the zero point of the dial-type measuring instrument.
- **"CAL 1.0"** parameter
Setting of the positive end of the scale of the dial-type measuring instrument.
- **"CAL -1.0"** parameter
Setting of the negative end of the scale of the dial-type measuring instrument.

7 Appendix

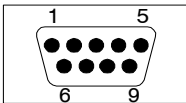
7.1 RS232 interface

The serial RS232 interface is used to

- output results to a printer,
- exchange data with a PC,
- configure the Millimar C 1245 via a PC.

Assignment of the socket

(9-pin D-Sub)



Pin	Desig.	Function
1	NC	Not assigned
2	RxD	Data input
3	TxD	Data output
4	DTR	Handshake output
5	Gnd	Ground connection, 0 V
6	NC	Not assigned
7	RTS	Send
8	CTS	Ready to send
9	OUT	+ 5 V max. 300 mA

To set the interface parameters:

- Change to Setting mode.
- In the menu "SETUP / COM", define the protocol type, data format, protocol method and the transfer rate.
To transfer the measuring results, select one of the available protocols.

Types of transfer:

- Manually after pressing the **DATA** button, when the **MANUAL** parameter is selected in the "SETUP / COM / TRANSM." menu.
- Automatically at the end of a measurement, when the **AUTOM.** parameter is selected in the "PROCES / MEASURE / MEASMOD" menu and in the "SETUP / COM / TRANSM." menu.
- Automatically during measurement at maximum speed, when the **SCANN.** parameter is selected in the "SETUP / COM / TRANSM" menu.

i During navigation in the menus and at the prompt for master measurement, no measuring results are sent via the RS232 interface.

7.1.1 Connecting a printer

Measuring results can be printed out on all Epson printers (and compatible devices) equipped with a serial interface.



Do not **under any circumstances** connect the printer to the 25-pin D-Sub jacks for auxiliary equipment.

Depending on the protocol type selected in the "SETUP / COM" menu, the measured values are printed out in the appropriate protocol format.

7.1.2 Connecting a PC

When a PC is connected to the serial interface, the Millimar C 1245 can be configured or controlled from the PC.

During the configuration process, protocol type MarTalk must be selected in the "SETUP / COM" menu.



The parameters of the Millimar C 1245 are archived as a parameter file by the PC and can be transferred via the RS232 interface.

MarTalk comes with a software handshake of its own. When selecting MarTalk (see menu "SETUP / COM"), the protocol type for controlling the data transmission is deactivated.

The protocol type selected in the "SETUP / COM" menu is used for control purposes.

7.1.3 ASCII protocol

After pressing the **DATA** button, all the features are sent:

- 1245: xxx.xxx <CR><LF>

i The data format corresponds to that of the digital display.

7.1.4 M1240 protocol

An acknowledgement is given when a command is executed. The following commands can be used:

- Interrogation of the equipment setting
PC: <CR>
1245: MAHR GMBH,M1245<CR>
- Activation of the interface
PC: I<CR>
1245: I,MAHR
GMBH,M1245,Vn.nn<CR>
where Vn.nn = version number
- Deactivation of the interface
PC: X<CR>
1245: X<CR>
- Starting the measurement with set measuring period (T-TIMER)
PC: F1<CR>
1245: F1<CR>
- Starting the measurement
PC: F2<CR>
1245: F2<CR>
- Terminating the measurement
PC: F3<CR>
1245: F3<CR>
- Switching to basic status (RESET)
PC: R<CR>
1245: R<CR>

- Starting the master measurement
PC: Z<CR>
1245: Z<CR>
- Request current measured values*
PC: M<CR>
1245: M1, xxx.xxx<CR>
- Request the current measured values of a specific feature "n".*
PC: Mn<CR>
1245: Mn, xxx.xxx<CR>
- Request all stored measured values
PC: M70<CR>
1245: nnnnn,-xxxx.xxx<CR>

i Up to 5000 values are stored and output with "F70". The memory is cleared by reading the values out with "F70" or by switching off the unit. The feature number and then the measured value are transferred in the data format of the digital display. The oldest measured value is transferred first.

- Setting the nominal value of a feature "n" where n = 1 to 16
PC: P8,Mn=1.0<CR>
1245: P8,Mn=1.0<CR>

* The data format corresponds to that of the digital display.

- Setting the master value of a feature "n" where n = 1 to 16
 PC: P91,Mn=1.001<CR>
 1245: P91,Mn=1.001<CR>
 - Reading the master value of a feature "n" where n = 1 to 16
 PC: P91,Mn<CR>
 1245: P91,Mn, 1.0010<CR>
 - Request the standard deviations of all measuring values with feature numbers
 PC: P60,86<CR>
 1245: nnnnn,-xxxx.xxx<CR>
 - Request the ranges of all measuring values with feature numbers
 PC: P60,88<CR>
 1245: nnnnn,-xxxx.xxx<CR>
 - Request/Set the master value
 PC: Request P8,Mn<CR>
 1245: nnnnn,-xxxx.xxx<CR>
 PC: Set P8,Mn,xxx.xxx<CR>
 1245: nnnnn,-xxxx.xxx<CR>
- Statistics functions**
- Deleting the statistics
 PC: P82,3<CR>
 - Request the quantity of all measuring values with the number of the first feature used
 PC: P60,80<CR>
 1245: nnnnn, xxxx.xxx<CR>
 - Request the mean values of all measuring values with feature numbers
 PC: P60,82<CR>
 1245: nnnnn,-xxxx.xxx<CR>
 - Request the minimum values of all measuring values with feature numbers
 PC: P60,83<CR>
 1245: nnnnn,-xxxx.xxx<CR>
 - Request the maximum values of all measuring values with feature numbers
 PC: P60,84<CR>
 1245: nnnnn,-xxxx.xxx<CR>
- i** The master value must consist of at least two characters e.g. P8,M1,1.0<CR>. The command P8,M1,1<CR> is invalid.
- Request/Set the nominal dimension
 PC: Request P91,Mn<CR>
 1245: nnnnn,-xxxx.xxx<CR>
 PC: Set P91,Mn,xxx.xxx<CR>
 1245: nnnnn,-xxxx.xxx<CR>

7.1.5 OPTO-RSS protocol

After pressing the DATA key, all the features are sent.

- 1245: xxx.xxx <Unit><CR><LF>

i The data format corresponds to that of the digital display. Only the first feature is output.

7.1.6 OPTO-RSD protocol

The following commands can be used:

- Requesting the current measuring value of the first feature *
PC: ?<CR>
1245: xxx.xxx >Unit><CR><LF>
- Carrying out the master measurement
PC : PRE<CR>
- Requesting the name of the manufacturer and unit
PC : ID?<CR>
1245: Millimar C 1245<CR><LF>
- Requesting the software version number
PC: VER?<CR>
1245: Version 1.39<CR><LF>
- Requesting the unit of measurement
PC: UNI?<CR>
1245: mm <CR><LF>
- Requesting the serial number
PC: SER?<CR>
1245: xxxx/xx<CR><LF>
- Setting the unit of measurement to millimeters
PC: mm<CR>
- Setting the unit of measurement to inches
PC: in<CR>
- Setting the unit of measurement to micrometers
PC: um<CR>
- Entering a text of 7 characters in line 1 of the Millimar C 1245
PC: DIS <Text><CR>

* The data format corresponds to that of the digital display.

7.2 Interface for auxiliary units

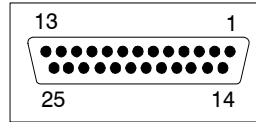
The interface for auxiliary equipment designated with "I/O, ANALOG OUT" (Figure 2) enables the transfer of data between the Millimar C 1245 and other units from the Millimar program.

To set the signals for the interface inputs and outputs:

- Change to Setting mode.
- In submenu "INPUT" or "OUTPUT" of the "SETUP / I/O" menu, define the mode.

Assignment of the jack

(25-pin D-Sub)



Pin	Desig.	Function
1	Outp.1	TTL output O1*
2	Outp.2	TTL output O2
3	Outp.3	TTL output O3
4	GND	Ground connection
5	IN-2	Opt. input I3 (+)
6	IN-2	Opt. input I3 (-)
7	V _{out}	Internal power supply, 12 V
8	IN-1	Opt. input I2 (+)
9	IN-1	Opt. input I2 (-)
10	OUT-5	Opt. output O6 (+)
11	IN-0	Opt. input I1 (+)
12	IN-0	Opt. input I1 (-)
13	A _{out}	Analog output
14	GND	Analog ground
15	OUT-5	Opt. output O6 (-)
16	OUT-4	Opt. output O5 (+)
17	OUT-4	Opt. output O5 (-)
18	OUT-3	Opt. output O4 (+)
19	OUT-3	Opt. output O4 (-)
20	OUT-2	Opt. output O3 (+)
21	OUT-2	Opt. output O3 (-)
22	OUT-1	Opt. output O2 (+)
23	OUT-1	Opt. output O2 (-)
24	OUT-0	Opt. output O1 (+)
25	OUT-0	Opt. output O1 (-)

* Depending on the switching state either +5 V or GND

7.3 Maintenance

Care taken during the development and manufacturing stages coupled with meticulous quality control in the production plant ensure that the Millimar C 1245 is able to offer the specified features. A relatively small amount of care can ensure that this status is retained for many years ahead.



Improper use can result in signs of wear and tear which may have an impact on measuring accuracy.

7.3.1 Cleaning

The housing can be cleaned with a damp cloth. Acetone or acetone compounds must **not** be used.

7.3.2 Changing the fuse

- Detach the mains cable from the socket on the rear of the unit.
- Reach into the socket and pull out the fuse housing.
- Replace the faulty fuse with a fuse of the same type:
250 V: 630 mA, slow-blow
- Fit the fuse housing back into position and re-connect the mains cable.

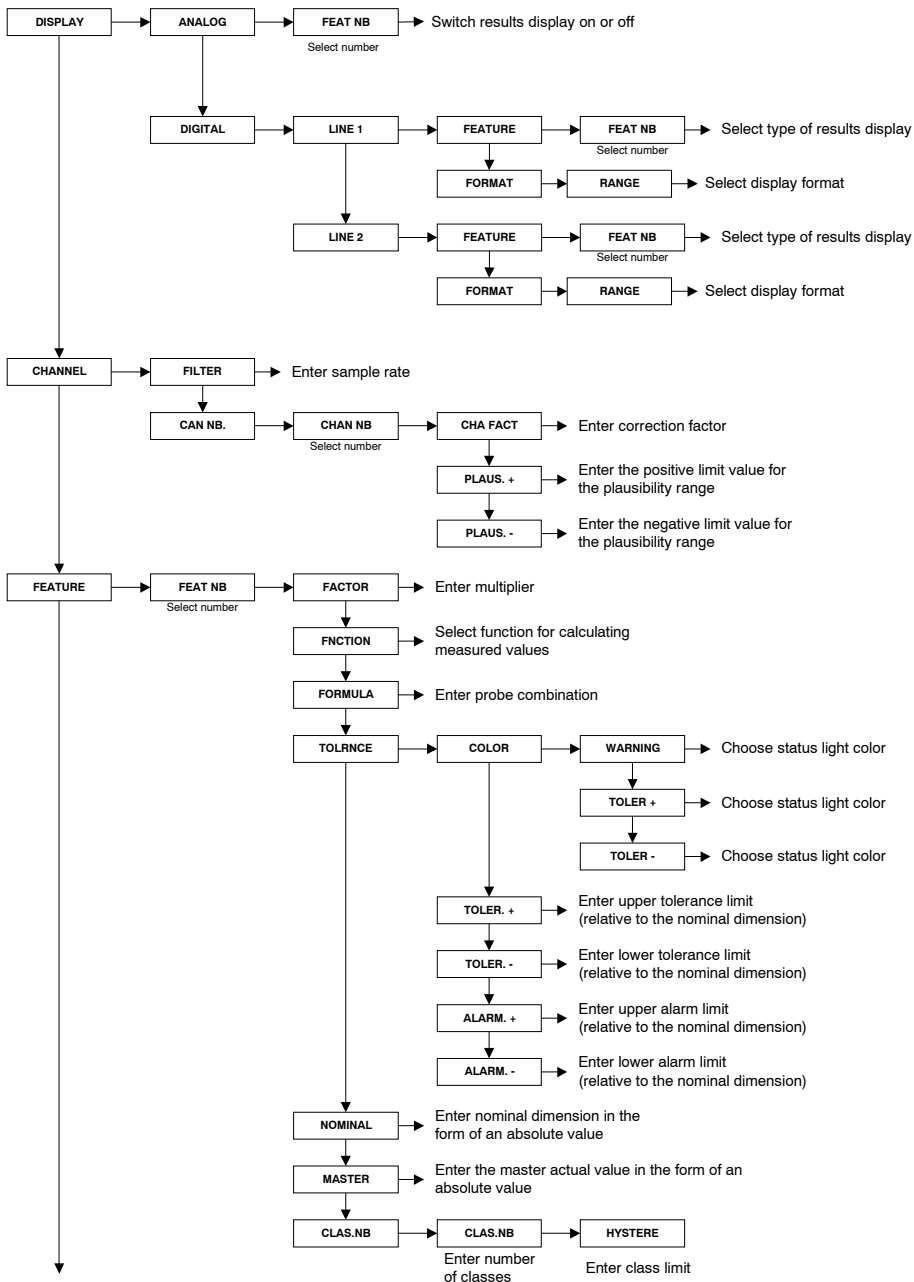
7.3.3 Opening the unit

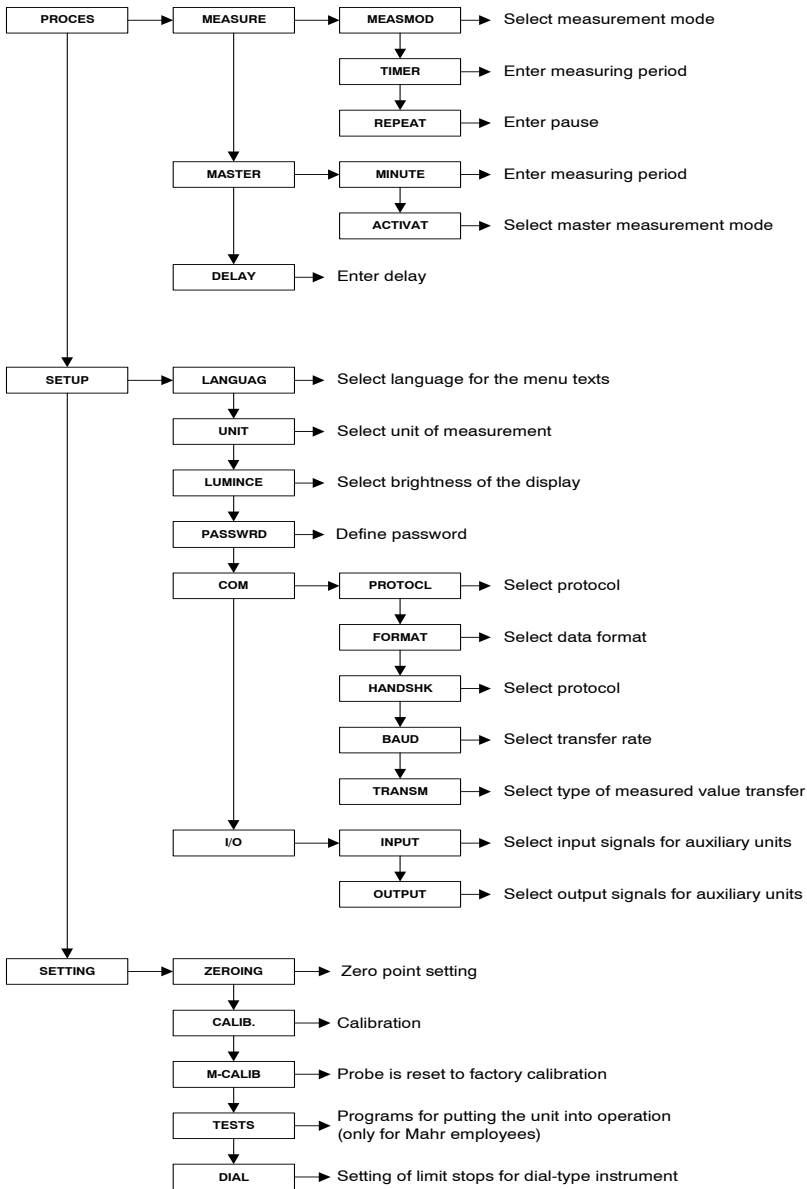
Any intervention in the unit must be performed by qualified personnel and only with the written agreement of Mahr GmbH. Any contravention will render invalid any warranty claims against Mahr GmbH.

7.4 Scope of delivery and accessories

	Order number
Basic unit	5331250 - 272
Cover plate to be attached on the rear, for one module	5331009
Input module for "Inductive probes"	
Carrier frequency 19.4 kHz (Mahr)	5331010
Carrier frequency 13 kHz (Tesa)	5331011
Carrier frequency 7.5 kHz (Marposs)	5331012
Carrier frequency 5 kHz (Federal)	5331013
Input module for "Incremental probes"	5331015
Input module for "Air gages"	
Ratio 2500:1 (Mahr)	5331020
Ratio 2500:1 (Federal)	5331024
Ratio 5000:1 (Mahr)	5331021
Ratio 5000:1 (Federal)	5331025
Ratio 10000:1 (Mahr)	5331022
Ratio 10000:1 (Federal)	5331026
Input module for "DC voltage signals"	5331017
Control unit 1840SG	5330950

7.5 Overview of the Setting menu





7.6 Technical data

General

Power supply	90 to 264 VAC / 47 to 63 Hz
Power consumption	Max. 30 VA
Fuse	630 mA, slow-blow
Working temperature range	0 °C to 40 °C
Operating temperature range	0 °C to 40 °C
Storage temperature range	- 15 °C to + 55 °C
Maximum relative humidity	80% without condensation
Type of protection	IP53 (IP43 for conductive dust), IEC 60529
Weight	8.5 kg
Dimensions (H × L × W)	487 mm × 245 mm × 225 mm
Compliance	EN61010-1, EN55011, EN50082-2 Low-voltage guideline 73/23/EEC EMC guideline 89/336/EEC
Units	mm / μm / inch
Carrier frequency	Mahr / Tesa / Marposs / Federal
Limit frequency	40 Hz (-3 dB)
Setting time	
– Measured value memory (\cong sample rate)	0.003 s to 0.05 s
– Scale display	≤ 0.3 s
– Numeric display	≤ 0.25 s
– Analog output	≤ 0.02 s
– Digital output (RS232 and digital IO)	≤ 0.1 s
Holding time of the numeric display	≤ 0.250 s
Error limits	
– Scale display	$\leq 1\%$
– Numeric display	≤ 1 digit
– Analog output	0.1%
– Digital output (RS232 and digital IO)	± 1 digit
Repeatability limit of the display	1 digit
Switching repeatability limit	$\leq 0.1 \mu\text{m}$
Switching hysteresis	Adjustable
Temperature coefficient	$\leq \pm 0.005\% / ^\circ\text{C}$

Display

Dial-type indicator

7 ranges:

0.01 mm to 10 mm

10 mm to 10000 mm

0.0003 inch to 0.3 inch

LCD

7 decades

Minus sign

7-segment display

Field size: Approx. 38 × 35 mm

Inputs and outputs

Number of connectable recorders

Maximum of 2 input modules of the following types:

4 × Inductive probes made by Mahr, Tesa, Marposs or Federal

2 × Incremental probes made by Heidenhain 1 V_{pp}

2 × Pneum. inputs made by Mahr or Federal

Control input

3 optocoupler inputs, 24 V / 10 mA, 25-pin D-Sub.

Control output

6 optocoupler outputs, 24 V / 100 mA, 25-pin D-Sub.

PC or printer

RS232, PC compatible, 9-pin D-Sub.

Analog output

– Voltage range

± 4 V

– Sensitivity

Adjustable

– Load resistance

≥ 1 KOhm

– Cutoff frequency

5 to 80 Hz, depending on the sample rate



CE - Konformitätserklärung

Declaration of Conformity / Déclaration de conformité / Atestado de conformidad / Dichiarazione di conformità

Wir We Nous Nosotros Noi	Mahr GmbH Carl-Mahr-Str. 1 D- 37073 Göttingen Germany	erklären in alleiniger Verantwortung, dass das Produkt declare under our sole responsibility that the product déclarons sous notre seule responsabilité que le produit declaramos con responsabilidad exclusiva que el producto dichiariamo con la responsabilità esclusiva che il prodotto
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Bezeichnung: Längenmessgerät
name: / nom: / nombre: / nome:

Typ: Millimar C1245M / C1245T / C1245U / C1245F und/and
type: / type: / tipo: / tipo: Millimar C1245PE/M / C1245PE/F

ab Lieferdatum oder Serien-Nr.: 1101/02
from delivery date or serial number:
à partir de date de livraison ou n° de série:
a partir de fecha de entrega o núm. de serie:
da data di consegna o numero di serie:

mit folgenden Normen übereinstimmt: is in conformity with the following standards: est conforme aux normes: está conforme con las normas siguientes: è conforme alle norme seguenti:	DIN EN 61010-1: 2002-08+B1/B2 DIN EN 55011: 2003-08; group 1, class B DIN EN 61000-6-2: 2006-03, level C
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gemäß der Richtlinie(n): following the Directive(s): conformément à la Directive: con arreglo a la Directiva: secondo alla Direttiva:	Niederspannungsrichtlinie 73/23/EWG, i.d.F. 93/68/EWG Richtlinie Elektromagnetische Verträglichkeit 89/336/EWG, i.d.F. 93/68/EWG
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Ort u. Datum: Göttingen 29.7.08
Place and date:
Lieu et date:
Lugar y fecha:
Luogo e data:

Unterschrift:
Signature:
Signature:
Firma:
Firma:

S. A. Kochta
Gerhard Kochta

Prüfbeauftragter
Inspector
Contrôleur en chef
Ingegnere collaudatore
Verificador jefe

Dokument-Id.-Nr.:
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Göttingen
Registergericht
HRB 2507
UST-IDNR. DE115299942

Längenmess- und Steuer-
geräte, Präzisions- Längen-
messtechnik, Form- und
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optische/taktile 3D Mess-
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