



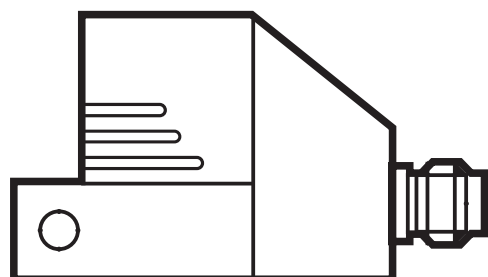
CE

Operating instructions  
Vibration sensor

UK

VNB001

80270675/00 12/2017



# Contents

1	Preliminary note.....	4
1.1	Notes on this document.....	4
1.2	Symbols used.....	4
2	Safety instructions.....	4
2.1	General.....	4
2.2	Installation and connection.....	4
2.3	Tampering with the device.....	5
3	Functions and features.....	5
4	Installation.....	6
5	Electrical connection.....	6
5.1	M8/USB interface.....	7
5.2	History values.....	7
5.3	Real-time clock.....	7
6	Functions.....	8
6.1	Input function.....	8
6.2	Output function.....	8
6.2.1	Switching output and analogue output.....	8
6.2.2	Lower limit monitor.....	8
6.2.3	Output logic.....	9
6.3	Measuring function.....	9
7	Operating and display elements.....	10
7.1	LED display.....	10
7.2	7-segment display.....	11
7.3	Operating mode.....	11
7.3.1	Examples in the operating mode.....	11
7.4	Operating mode external process value.....	12
7.4.1	Example display option ( $v_{rms}$ - external process value).....	12
8	Parameter setting.....	13
8.1	Vibration velocity.....	13
8.2	External process value.....	13
8.3	Self-test.....	13
8.4	Averaging.....	14
8.4.1	Calculation.....	14

8.4.2 Settings.....	14
8.4.3 Diagram averaging .....	14
9 Menu.....	15
9.1 Explanation of the menu .....	15
9.2 Parameter setting in general .....	17
9.2.1 Change from menu level 1 to the submenu.....	18
9.2.2 Locking / unlocking .....	18
9.3 Menu structure.....	19
9.3.1 Menu level 1 .....	19
9.3.2 Submenu extended functions .....	20
9.3.3 Submenu external sensor.....	21
10 Maintenance, repair and disposal.....	22
11 Scale drawing .....	22
12 Time diagrams .....	23
12.1 Switch-on delay for the upper limit monitor .....	23
12.2 Switching delay for the lower limit monitor .....	24
12.3 Averaging for the lower limit monitor.....	25
13 Factory setting .....	26

# 1 Preliminary note

Technical data, approvals, accessories and further information at [www.ifm.com](http://www.ifm.com).

## 1.1 Notes on this document

This document applies to devices of the type "vibration sensor" (art. no.: VNB001). It is part of the device and contains information about the correct handling of the product.

This document is intended for qualified electricians. These specialists are people who are qualified by their training and their experience to recognise and to avoid possible hazards that may be caused during operation of the device.

- ▶ Read this document before using the device.
- ▶ Keep this document during the service life of the device.

## 1.2 Symbols used

- ▶ Instruction
- > Reaction, result
- Cross-reference
- LED on
- ⊗ LED flashes



Important note

Non-compliance can result in malfunction or interference.



Information

Supplementary note.

# 2 Safety instructions

## 2.1 General

- ▶ Observe these operating instructions.
- ▶ Observe the warning notes in these instructions.

Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or incorrect handling can affect the safety of operators and machinery.

## 2.2 Installation and connection

The unit must only be installed, connected and put into operation by a qualified electrician as the safe function of the device and machinery is only guaranteed

when installation is correctly carried out. The installation and connection must comply with the applicable national and international standards. Responsibility lies with the person installing the device.



This is a class A product which is intended for use in industrial applications. The unit may cause radio interference in domestic areas. In this case it can be necessary for the user to take appropriate measures.

## 2.3 Tampering with the device

Tampering with the device is not allowed and will lead to an exclusion of liability and warranty. Tampering with the device can affect the safety of operators and machinery.

UK

## 3 Functions and features

Monitoring of

- vibration velocity  $v_{\text{rms}}$  or  $v_{\text{peak}}$
- process value above or below the permissible value

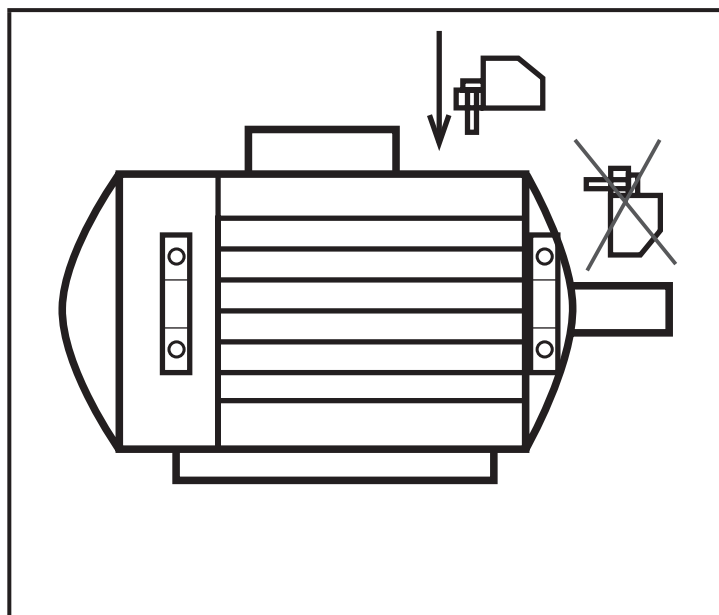
Visualisation of

- process values
- switching states

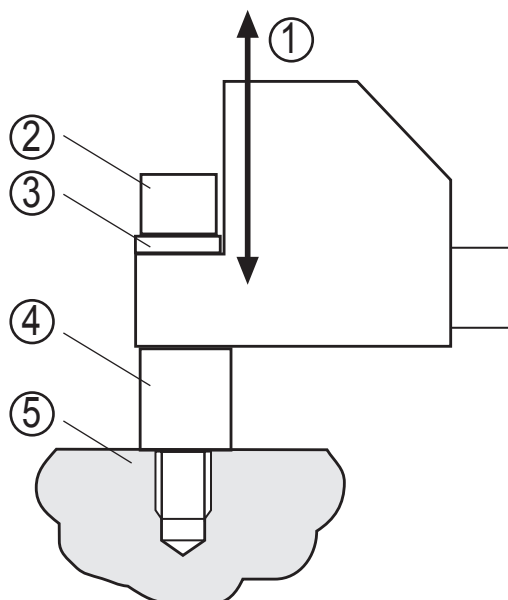
## 4 Installation

Please note the following points when installing the unit:

- Mount only in a thick housing wall (e.g. crane hook thread).
- Mount vertically to the machine surface using the spacer adapter in the direction of the strongest vibrations. This is usually the radial direction.
- Tighten the M5 screw with a tightening torque of 7 Nm.



- Ensure a reliable vibration transmission. Avoid any elastic intermediate layers.



- 1: measurement axis  
2: M5 screw  
3: spring washer  
4: M8 x M5 adapter  
5: machine surface

## 5 Electrical connection

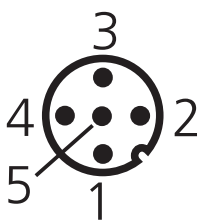
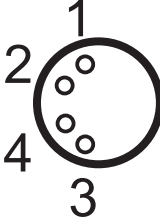


The unit must be connected by a qualified electrician.

The national and international regulations for the installation of electrical equipment must be adhered to.

Voltage supply to EN 50178, SELV, PELV.

Disconnect power before connecting the unit.

 <p>M12</p>	Pin 1:	L+	9.6...30 V DC
	Pin 2:	Out 1	switching output or current output 4...20 mA (configurable)
	Pin 3:	L -	
	Pin 4:	Out 2	switching output
	Pin 5:	IN	current input 4...20 mA
 <p>M8</p>	Pin 1:	VCC (5 V)	
	Pin 2:	USB D-	
	Pin 3:	L-	
	Pin 4:	USB D+	

UK

## 5.1 M8/USB interface

- ▶ First connect the interface cable to the device and then to the USB interface of the computer.
- The units have a serial number which can be read out using the PC software.
- The sensor can also be supplied via the USB interface.
- Read out and reset the history values.



Switching and analogue outputs are not supported if an USB power supply is used.

## 5.2 History values

The unit records history values. The memory interval is 5 min., the maximum  $V_{rms}$  value in this time range is recorded with a time stamp.

Recording period about 3 years, the oldest values will then be overwritten (ring memory).

The history can be read out and reset using the software VES004.

## 5.3 Real-time clock

The unit has an integrated real-time clock including a buffer battery for the time stamp in the history memory. The time is synchronised with the system clock via the PC software when the history is reset.

# 6 Functions

## 6.1 Input function

Parameter setting via the Mode/Enter and Set buttons.

- External sensor for any process value (typically temperature (°C, °F))
- Scaleable input (4...20 mA)

Evaluation of the measurement results as for vibration objects

- Switch points early warning and main alarm adjustable
- For main alarm < early warning → lower limit monitor
- Adjustable hysteresis

## 6.2 Output function

### 6.2.1 Switching output and analogue output

Parameter setting via the Mode/Enter and Set buttons.

OU1	Analogue output	<ul style="list-style-type: none"><li>- 4...20 mA scaleable measuring range of the vibration velocity</li><li>- averaging adjustable</li><li>- 22 mA in case of a system error</li></ul>
	Switching output	<ul style="list-style-type: none"><li>- early warning</li><li>- SP 1</li><li>- NO / NC adjustable</li><li>- switch-on and switch-off delays adjustable</li><li>- 1 Hz pulsing in case of a system error</li></ul>
OU2	Switching output	<ul style="list-style-type: none"><li>- main alarm</li><li>- SP 2</li><li>- NO / NC adjustable</li><li>- switch-on and switch-off delays adjustable</li></ul>

### 6.2.2 Lower limit monitor

If the SP1 switch point early warning has a higher value than the SP2 switch point main alarm, these are set as lower limit monitor.

If a lower limit monitor is set, early warning OU1 and main alarm OU2 are influenced as follows:

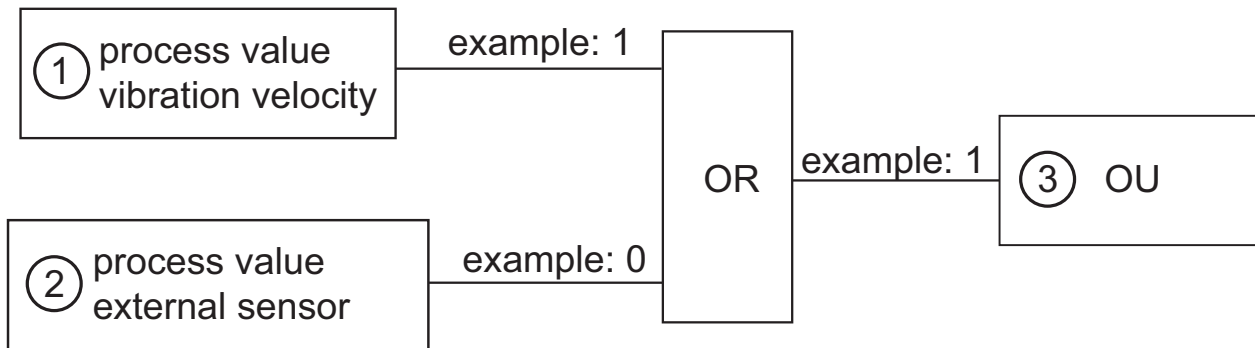
- If the value is greater than SP1, OU1 and OU2 are not active.
- If the value is between SP1 and SP2, only OU1 is active.
- If the value is below SP2, OU1 and OU2 are active.

The same applies to the external sensor.



### 6.2.3 Output logic

The process values "vibration velocity" and "external sensor" are combined via a logic OR and provided at the switching output.



1: process value vibration velocity

2: process value external sensor

3: switching output

### 6.3 Measuring function

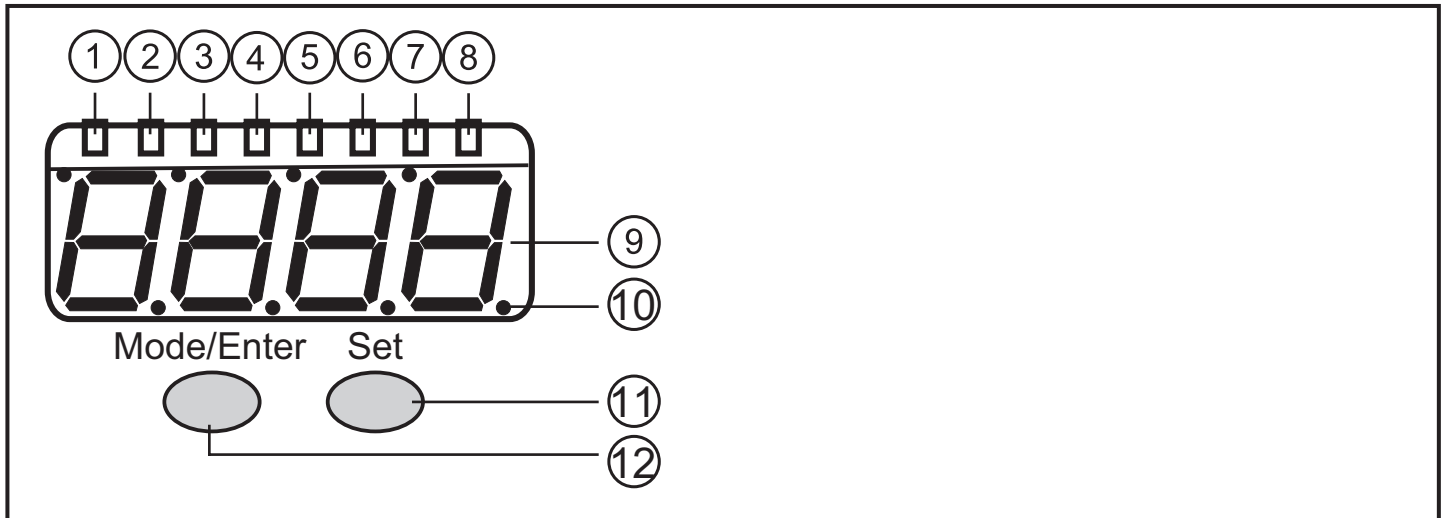
The device can be set to the measurement mode via the VES004 software. In this mode, you have access to the raw data (time signal) of the acceleration or of the external input (4...20 mA). The data can be visualised, recorded, analysed and processed in the software.

If the device remains connected to the software, the user has to actively (manually) finish the time signal monitoring. If the device is separated from the software, it automatically returns to the monitoring function.

If the unit is in the measurement mode, there is no monitoring. "rSc3" is displayed on the unit.

# 7 Operating and display elements

## 7.1 LED display



### 1...8: LED display / bar graph

- 1: LED green a = not used
- 2: LED green v = vibration velocity v [mm/s] or [in/s]
- 3: LED green d = not used
- 4: LED green RMS = average value
- 5: LED green Pk = peak value
- 6: LED green Ext = process value of the external sensor
- 7: LED yellow OU1 = early warning active \*)
- 8: LED red OU2 = main alarm active \*)

\*) The LED indicates the current alarm state (warning alarm, damage alarm). The configuration of the corresponding output (OU1, OU2) as "normally closed" or "normally open" is ignored.

### 9: 7-segment display green, yellow and red, 4 digits

- Display of the measured values

### 10: Points

- Lower points as decimal separators

### 11: Set button

Parameter setting mode

- Setting of the parameter values
- Display option "external process value" or "vibration velocity"

### 12: Mode/Enter button

- Selection of the parameters and acknowledgement of the parameter values

## 7.2 7-segment display

- Displays the damage level (green, yellow, red)

If the segment display changes the colour, the switch-on and switch-off delays or the hysteresis are not considered.

- Displays the current vibration velocity or the current external process value

## 7.3 Operating mode

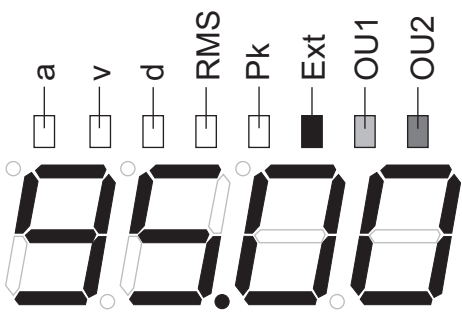


The user must be familiar with the units used in the vibration sensor ([mm/s] or [in/s]) and in the external sensor (°C, °F, mBar).

UK

### 7.3.1 Examples in the operating mode

<p>Colour segment display: yellow</p>	
	<p>Current measured value of the vibration velocity  <math>v_{\text{rms}} = 17.35 \text{ mm/s}</math>.</p> <p>Parameters</p> <ul style="list-style-type: none"> <li>- Early warning SP1 = 10 mm/s</li> <li>- Main alarm SP2 = 20 mm/s</li> </ul> <p>&gt; Output OU1 is active</p> <p>If the segment display changes the colour, the switch-on and switch-off delays are not considered.          For OU1 and OU2 the switch-on and switch-off delays are considered.</p>
<p>Colour segment display: red</p>	
	<p>Current measured value imbalance (<math>v_{\text{peak}}</math>) has reached          1.252 in/s.</p> <p>Parameters</p> <ul style="list-style-type: none"> <li>- Unit uni = in/s</li> <li>- Early warning SP1 = 0.5 in/s</li> <li>- Main alarm SP2 = 1 in/s</li> </ul> <p>&gt; Outputs OU1 and OU2 are active</p>

Colour segment display: red	
	<p>The external sensor has reached 95 °C.</p> <p>Parameters</p> <ul style="list-style-type: none"> <li>- Early warning ESP1 = 50 °C</li> <li>- Main alarm ESP2 = 90 °C</li> </ul> <p>&gt; Outputs OU1 and OU2 are active</p> <p>If the segment display changes the colour, the hysteresis is not considered.</p> <p>For OU1 and OU2 the hysteresis is considered.</p>



The LEDs OU1 and OU2 indicate the alarm condition, not the voltage level (high, low) at the output.

The level can be inverted via the parameters OU1 and OU2 (NC, NO).

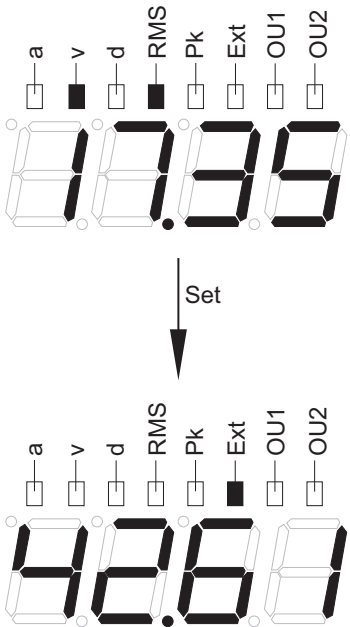
## 7.4 Operating mode external process value

In the operating mode "External process value" measured values are displayed, e.g. pressure values (mBar, hPa...), temperatures (°C, °F).

The detected values are transferred via the measured value input (pin 5).

> LED "Ext" lights.

### 7.4.1 Example display option ( $v_{rms}$ - external process value)

	<p>Operating mode vibration velocity 17.35 mm/s <math>v_{rms}</math> [Set]</p> <p>Operating mode external process value e.g. temperature 42.61 °C [Set]</p> <p>Operating mode vibration velocity 17.35 mm/s <math>v_{rms}</math></p>
--	--



In the event of an alarm the display changes automatically to the value last exceeded.

## 8 Parameter setting

Vibration velocity, external process value and self-test parameters can be set via the Mode/Enter and Set buttons.

### 8.1 Vibration velocity

For the operating mode vibration velocity the following parameters can be set:

- Measurement method (rms or peak)
- Display in mm/s or in/s
- Switch points
- Lower limit frequency (2 Hz or 10 Hz) configurable
- Averaging
- Switch-on and switch-off delays
- Switching outputs (NO, NC or analogue for OU1)



If OU1 is selected as analogue:

- ▶ Scale current output.

### 8.2 External process value

For the operating mode external process value the following parameters can be set:

- Scaling 4 mA (EASP), 20 mA (EAEP)
- Switch points
- Hysteresis
- Switching outputs (NO or NC)

### 8.3 Self-test

Trigger and carry out a self-test.

The self-test is carried out when the sensor is switched on and can also be triggered manually → [tES<sub>t</sub>].

Self-test passed → [PASS], self-test failed → [FAIL]

- > LED OU1 pulsing (flashes)
- > Output OU1
  - pulsing if digital (NC, NO)
  - supplies 22 mA if analogue

## 8.4 Averaging

### 8.4.1 Calculation

Formula to determine the new diagnostic value:

$$(\text{"previous diagnostic value"} \times (1 - \text{averaging})) + (\text{"new measurement"} \times \text{averaging}) = \text{new diagnostic value}$$

Example

Averaging 0.25; "previous diagnostic value" 17.3 mm/s;

"new measurement" 14.7 mm/s

$$(17.3 \text{ mm/s} \times (1 - 0.25)) + (14.7 \text{ mm/s} \times 0.25) = 16.65 \text{ mm/s}$$



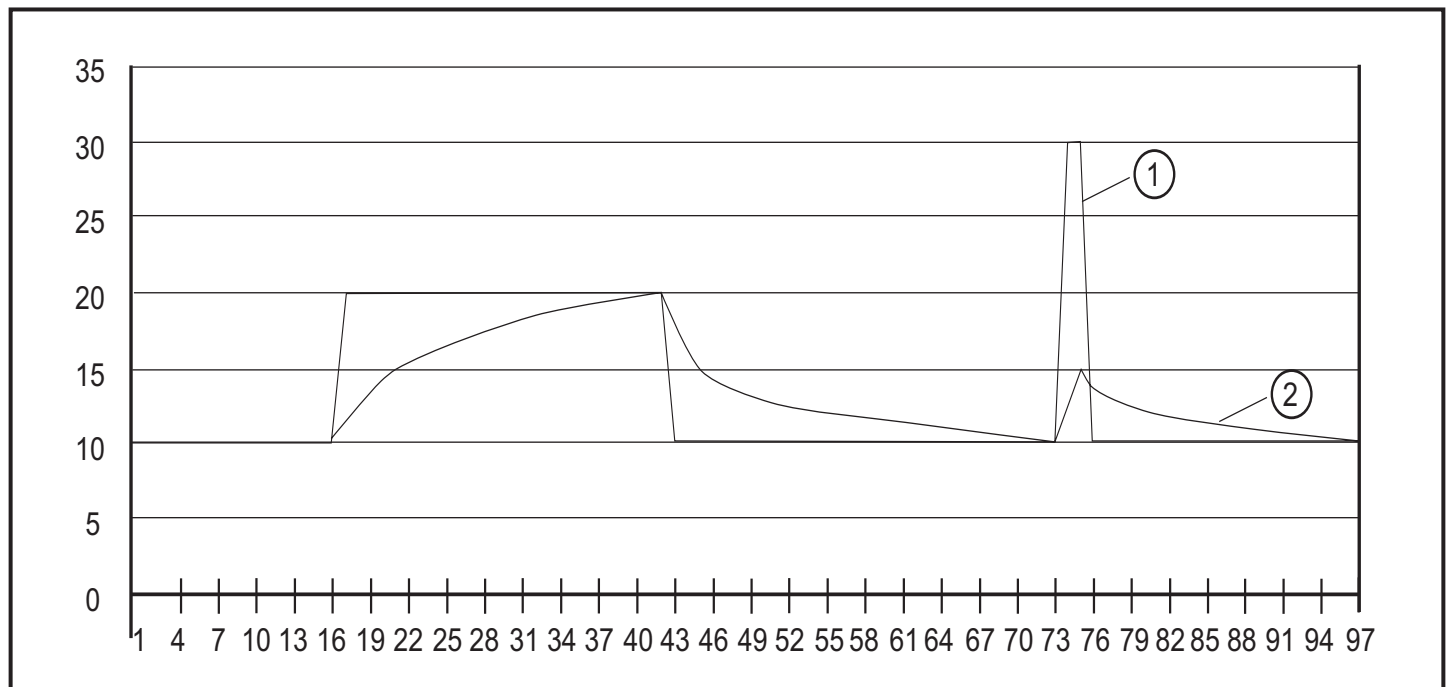
For the VNB001 the measured time between "previous diagnostic value" and "new measurement" is 0.25 s.

### 8.4.2 Settings

Averaging = 1: averaging deactivated

Averaging = 0.01: strong averaging

### 8.4.3 Diagram averaging



1: Diagnosis

2: AVE (1/8)

# 9 Menu

## 9.1 Explanation of the menu

Menu level 1	
EUAL	Evaluation - selection of the measurement method rms "r" or peak "P"
uni	Unit - in/s or mm/s
SP1	Switch point early warning If the switch point is exceeded, - OU1 switches if it is digital "no", "nc", - the yellow LED "OU1" lights - the measured value display changes to yellow
SP2	Switch point main alarm If the switch point is exceeded, - OU2 switches - the red LED "OU2" lights - the measured value display changes to red
The displayed values for the switch points SP1 and SP2 change if the unit or the measurement method is changed subsequently.	
EF_i	Submenu extended functions
Eht_i	Submenu external sensor
tEst	Self-test (PASS or FAIL) is automatically carried out when the sensor is switched on
Submenu extended functions EF_i	
LFCO	Setting of the lower limit frequency (2 Hz or 10 Hz)
AUER	Averaging → chapter 8.4
dS1	Switch-on delay for OU1 (0...60 s)
dr1	Switch-off delay for OU1 (0...60 s)
dS2	Switch-on delay for OU2 (0...60 s)
dr2	Switch-off delay for OU2 (0...60 s)
ou1	Output logic OU1 no, nc, I (normally open, normally closed, current output)
ASP	Scaling of the current output with respective parameter setting (mm/s or in/s) at 4 mA. rms or peak is considered. Only relevant for OU1 = "I"
AEP	Scaling of the current output with respective parameter setting (mm/s or in/s) at 20 mA. rms or peak is considered. Only relevant for OU1 = "I"

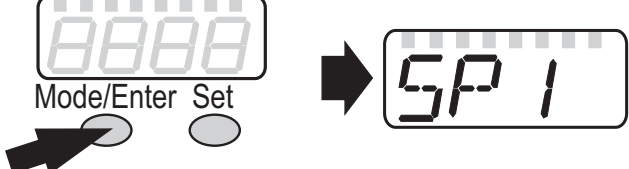
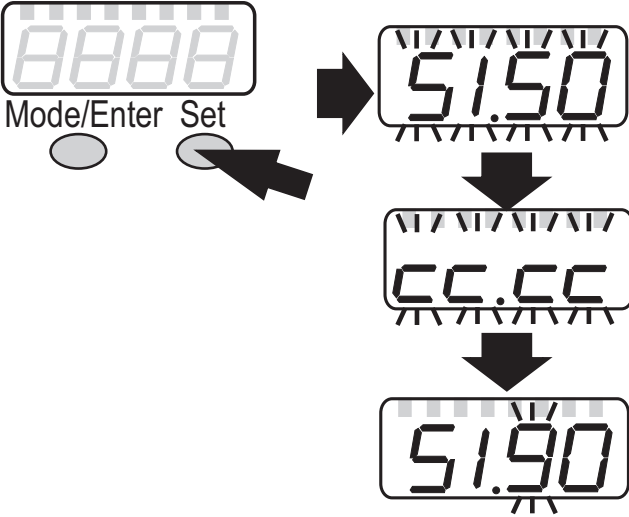
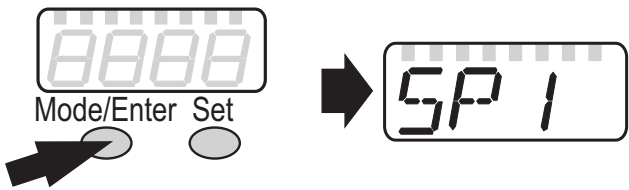
ou2	Output logic OU2 no, nc (normally open, normally closed)
Submenu external sensor EHT_i	
EASP	Scaling of the external sensor, initial value of the measuring range at 4 mA
EAEP	Scaling of the external sensor, final value of the measuring range at 20 mA
ESP1	Switch point early warning If the switch point is exceeded, - OU1 switches if it is digital "no", "nc" - the yellow LED "OU1" lights - the measured value display changes to yellow
Eh1	Hysteresis early warning Absolute distance between set and reset point
ESP2	Switch point main alarm If the switch point is exceeded, - OU2 switches - the red LED "OU2" lights - the measured value display changes to red
Eh2	Hysteresis main alarm Absolute distance between set and reset point
Error message	
Err1	The value to be displayed is less than -999 or greater than 9999. ▶ Check the scaling of the current output (ASP, AEP) and set again.



## 9.2 Parameter setting in general

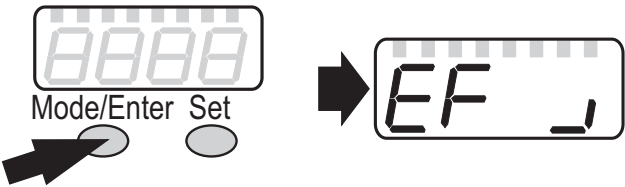
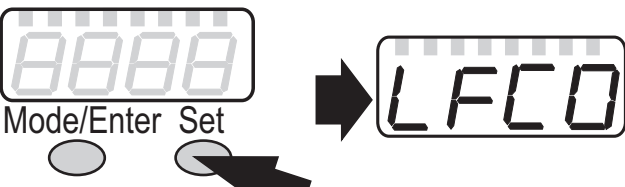
During the parameter setting process the monitoring function of the unit is maintained. It continues to monitor with the existing parameters until the parameter setting has been completed.

3 steps must be taken for each parameter setting:

<p><b>1</b></p>	<p><b>Select the parameter</b></p> <ul style="list-style-type: none"> <li>▶ Press [Mode/Enter] until the requested parameter is displayed.</li> </ul>	
<p><b>2</b></p>	<p><b>Set the parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Press [Set].</li> <li>&gt; The current setting value of the parameter is displayed.</li> <li>▶ Press [Set] for 3 s.</li> <li>▶ Setting of the decimal point (cc. cc) and the sign by pressing [Set] several times.</li> <li>▶ Press [Mode/Enter] to confirm.</li> <li>▶ Set an individual digit with [Set] and confirm with [Mode/Enter].</li> <li>▶ Repeat with all digits.</li> </ul>	
<p><b>3</b></p>	<p><b>Confirm the parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Press [Mode/Enter].</li> <li>&gt; The parameter is displayed again. The new setting value is saved.</li> </ul>	
<p><b>Set other parameters</b></p> <ul style="list-style-type: none"> <li>▶ Start again with step 1.</li> </ul>		
<p><b>Change the operating mode</b></p> <ul style="list-style-type: none"> <li>▶ Press [Mode/Enter] several times until the current measured value is displayed.</li> <li>&gt; The unit returns to the operating mode.</li> </ul> <p>If no button is pressed within 30 s, the unit automatically returns to the operating mode.</p>		

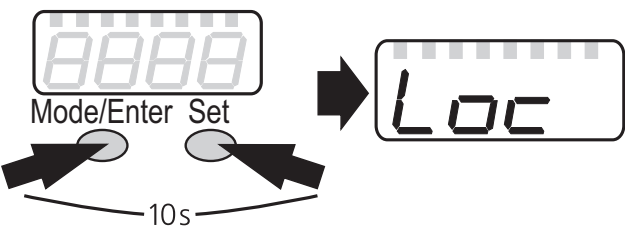
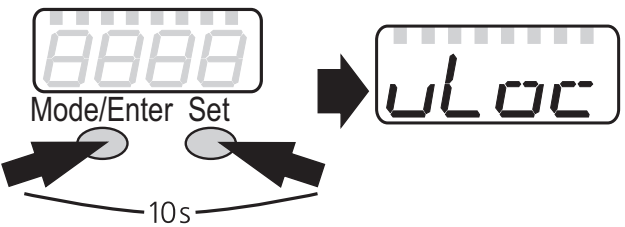
UK

## 9.2.1 Change from menu level 1 to the submenu

<ul style="list-style-type: none"><li>▶ Press [Mode/Enter] until [EF┘] is displayed.</li></ul>	 <p>The diagram shows a digital display with '8888' and two buttons labeled 'Mode/Enter' and 'Set'. An arrow points to the 'Mode/Enter' button, and another arrow points to the resulting display 'EF┘'.</p>
<ul style="list-style-type: none"><li>▶ Press [Set] briefly.</li><li>&gt; The first parameter of the submenu is displayed (here: [LFCO]).</li></ul>	 <p>The diagram shows a digital display with '8888' and two buttons labeled 'Mode/Enter' and 'Set'. An arrow points to the 'Set' button, and another arrow points to the resulting display 'LFCO'.</p>

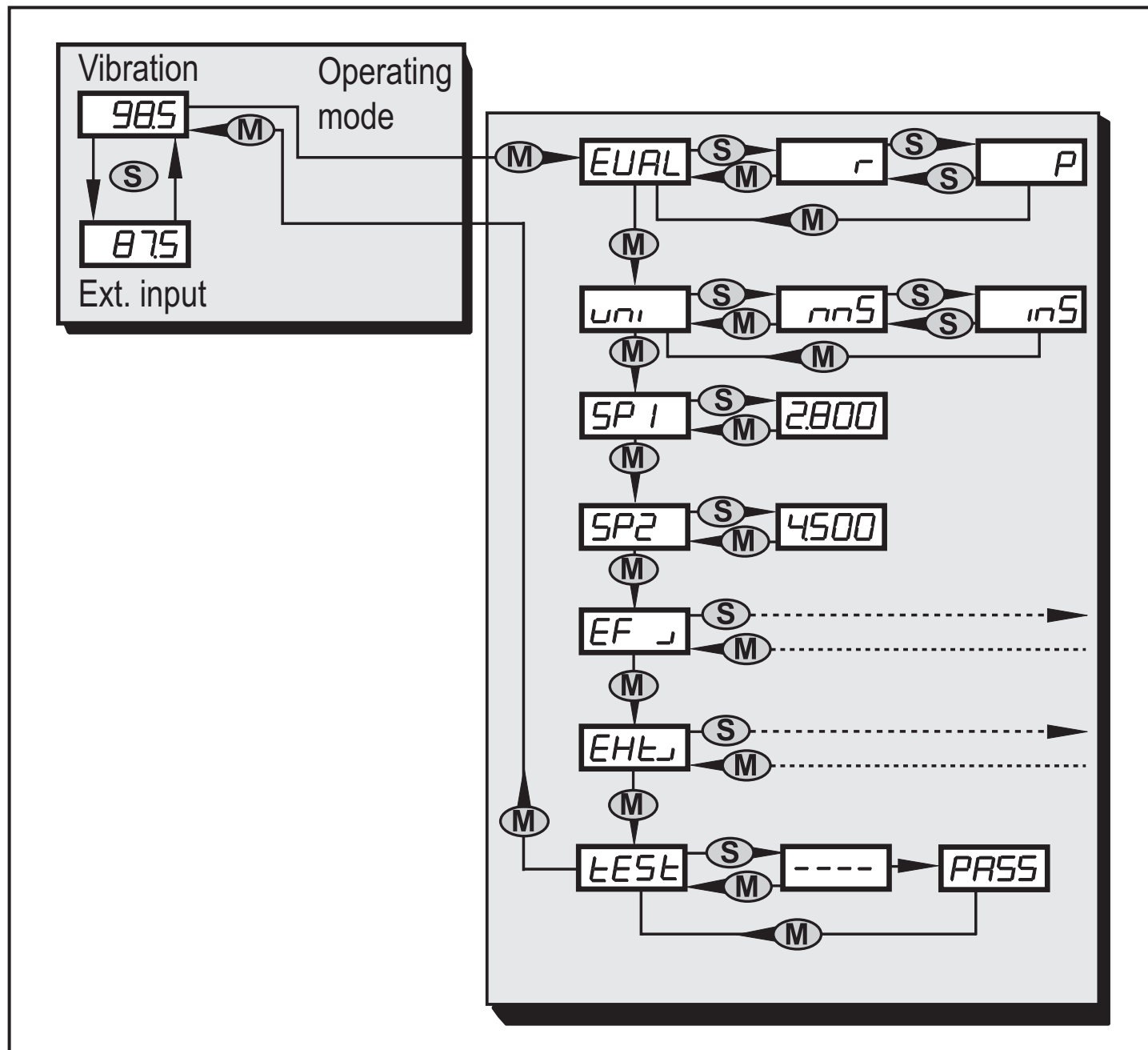
## 9.2.2 Locking / unlocking

The unit can be locked electronically to prevent unintentional settings.

<ul style="list-style-type: none"><li>▶ Make sure that the unit is in the normal operating mode.</li><li>▶ Press [Mode/Enter] + [Set] for 10 s.</li><li>&gt; [Loc] is displayed.</li></ul>	 <p>The diagram shows a digital display with '8888' and two buttons labeled 'Mode/Enter' and 'Set'. Two arrows point to both buttons, with a curved arrow below them labeled '10s'. An arrow points to the resulting display 'Loc'.</p>
During operation: [LOC] is briefly displayed if you try to change parameter values.	
<p>For unlocking:</p> <ul style="list-style-type: none"><li>▶ Press [Mode/Enter] + [Set] for 10 s.</li><li>&gt; [uLoc] is displayed.</li></ul>	 <p>The diagram shows a digital display with '8888' and two buttons labeled 'Mode/Enter' and 'Set'. Two arrows point to both buttons, with a curved arrow below them labeled '10s'. An arrow points to the resulting display 'uLoc'.</p>
Factory setting: not locked.	

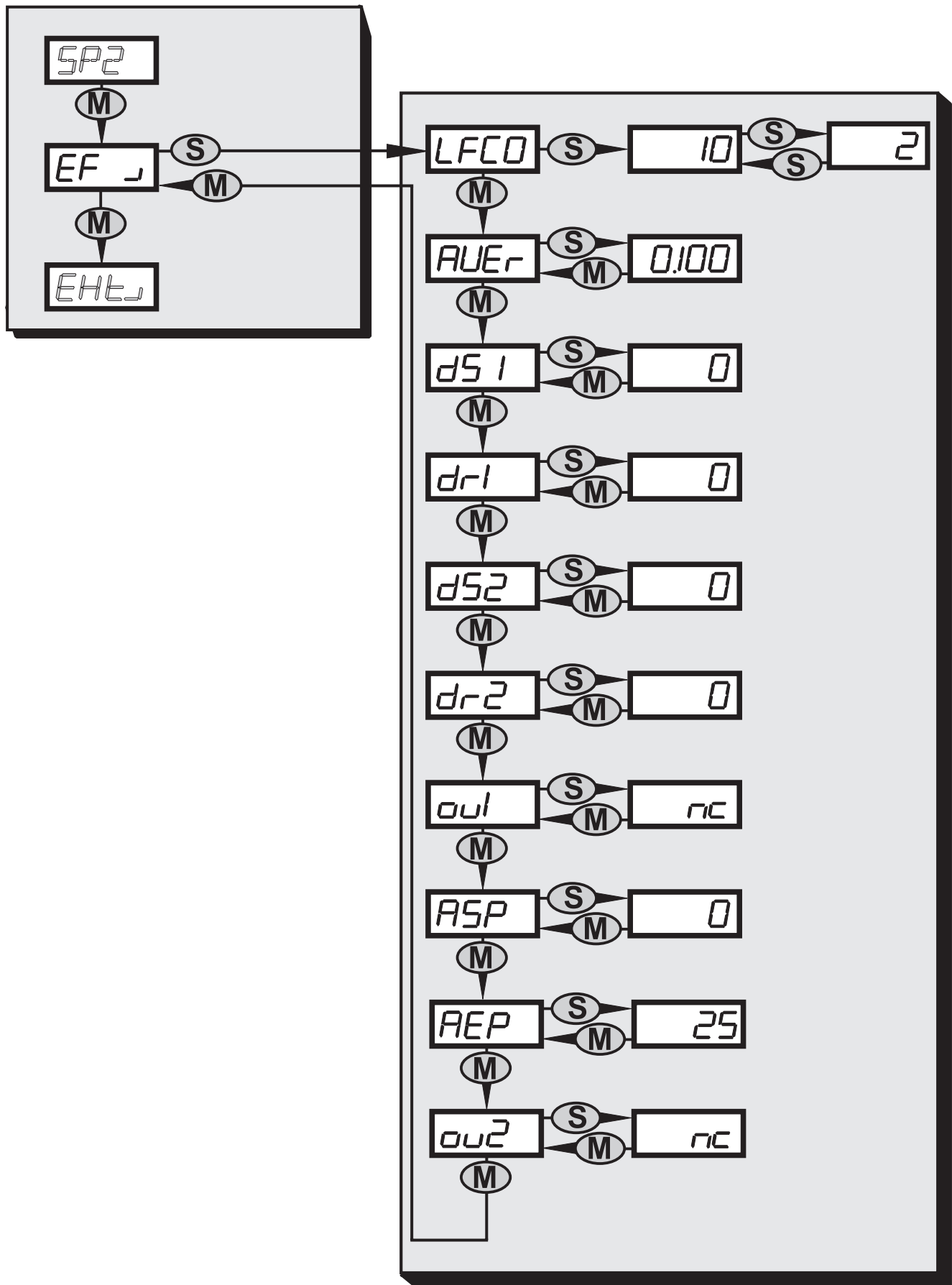
## 9.3 Menu structure

### 9.3.1 Menu level 1

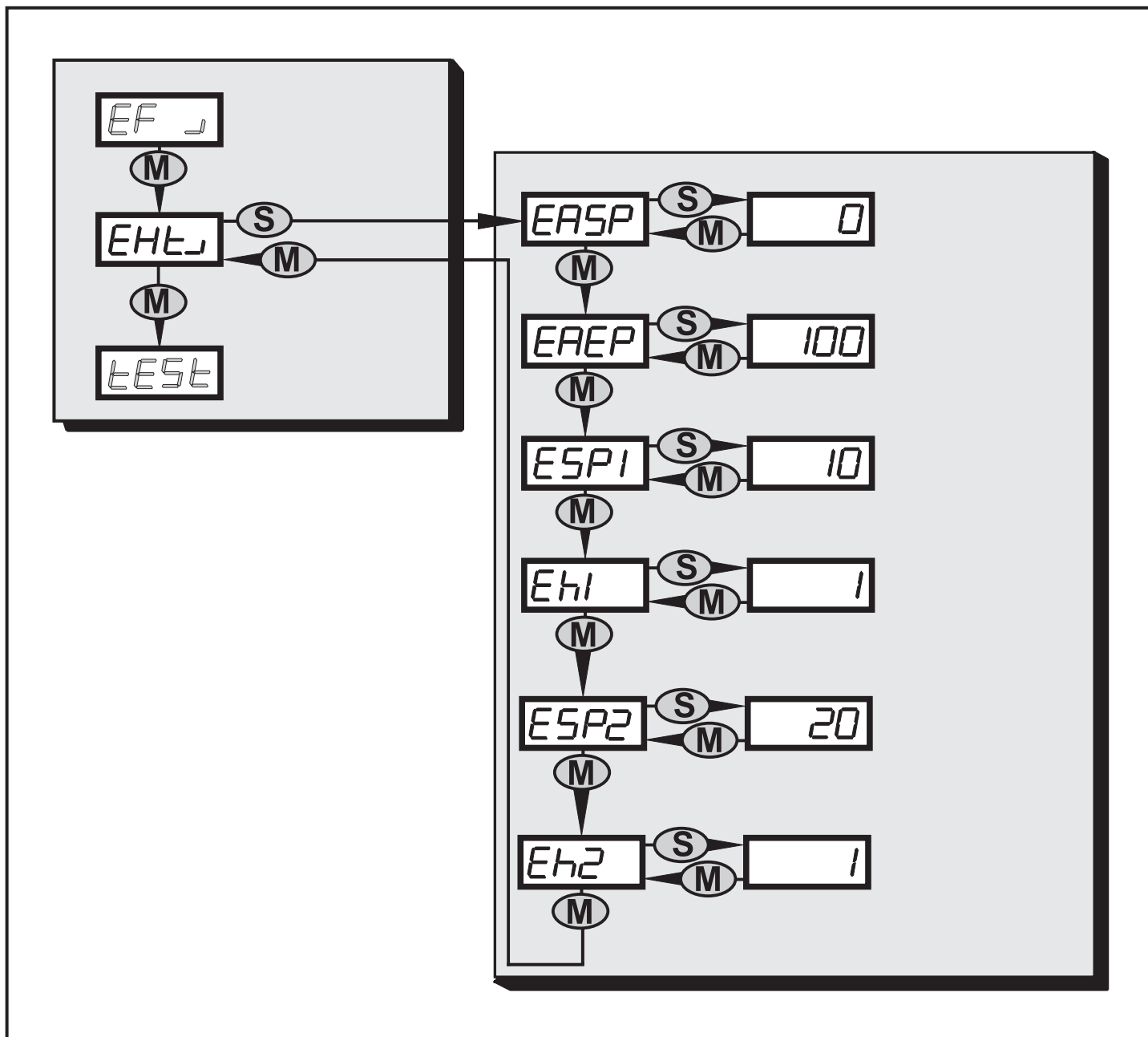


UK

### 9.3.2 Submenu extended functions



### 9.3.3 Submenu external sensor

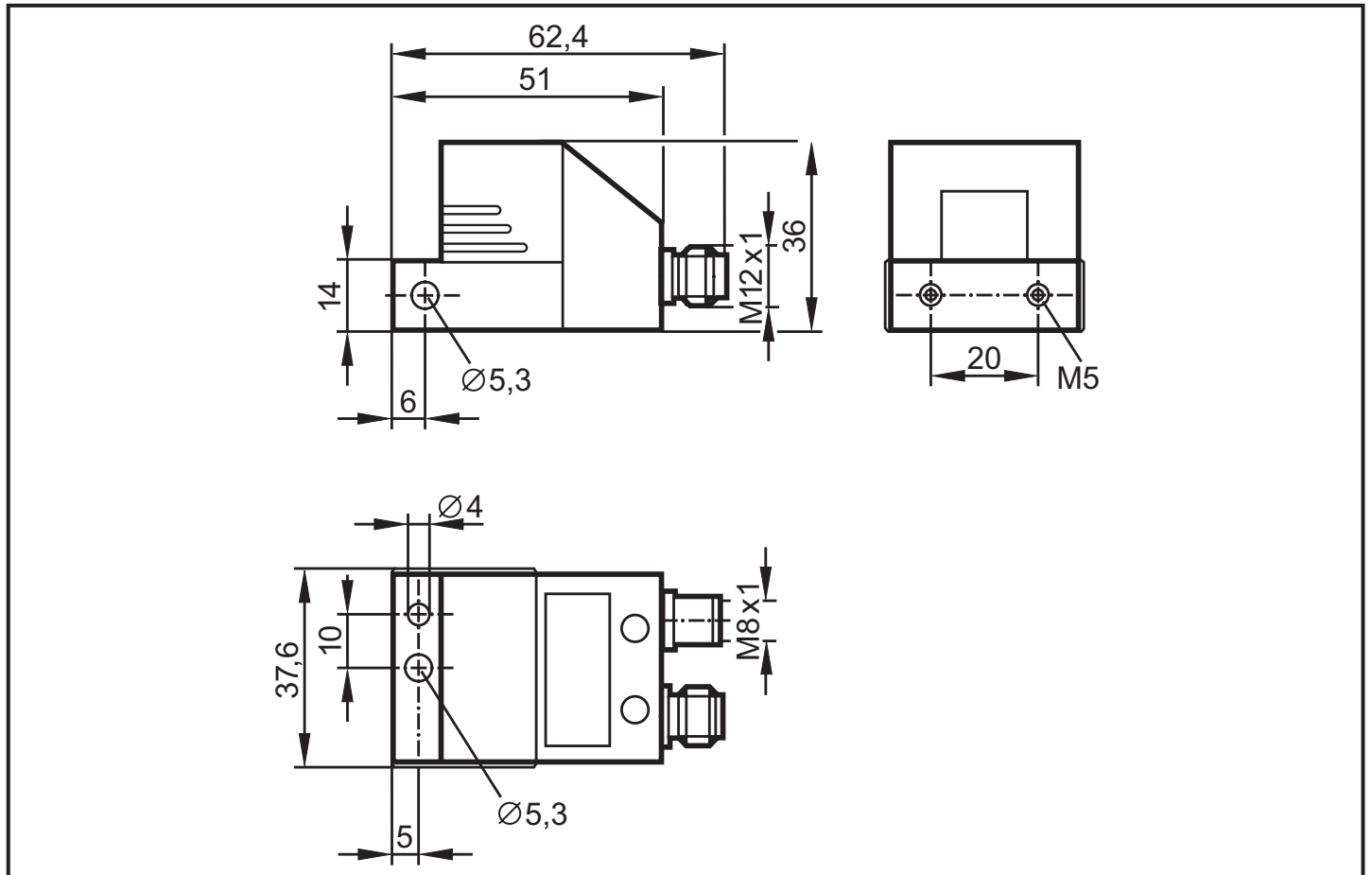


UK

## 10 Maintenance, repair and disposal

- ▶ Dispose of the device in accordance with the national environmental regulations.

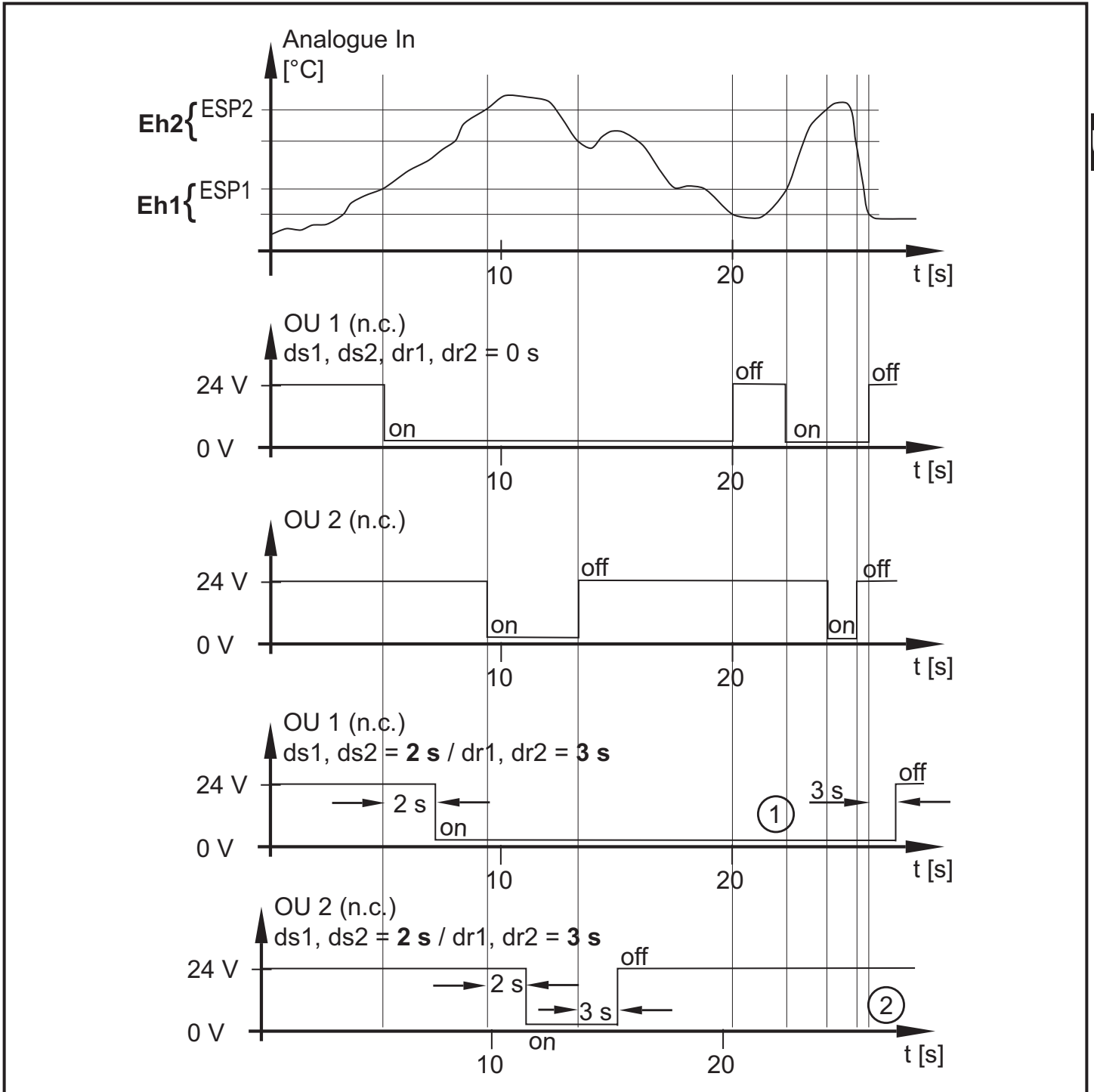
## 11 Scale drawing



# 12 Time diagrams

## 12.1 Switch-on delay for the upper limit monitor

The time diagram shows the effect of the switching delay on the analogue input for an upper limit monitor ( $ESP1 < ESP2$ ). The outputs are set as normally closed ( $OU1$  and  $OU2 \rightarrow nc$ ).



1: Not switched off because the selected switching delay is too short ( $< 3$  s).

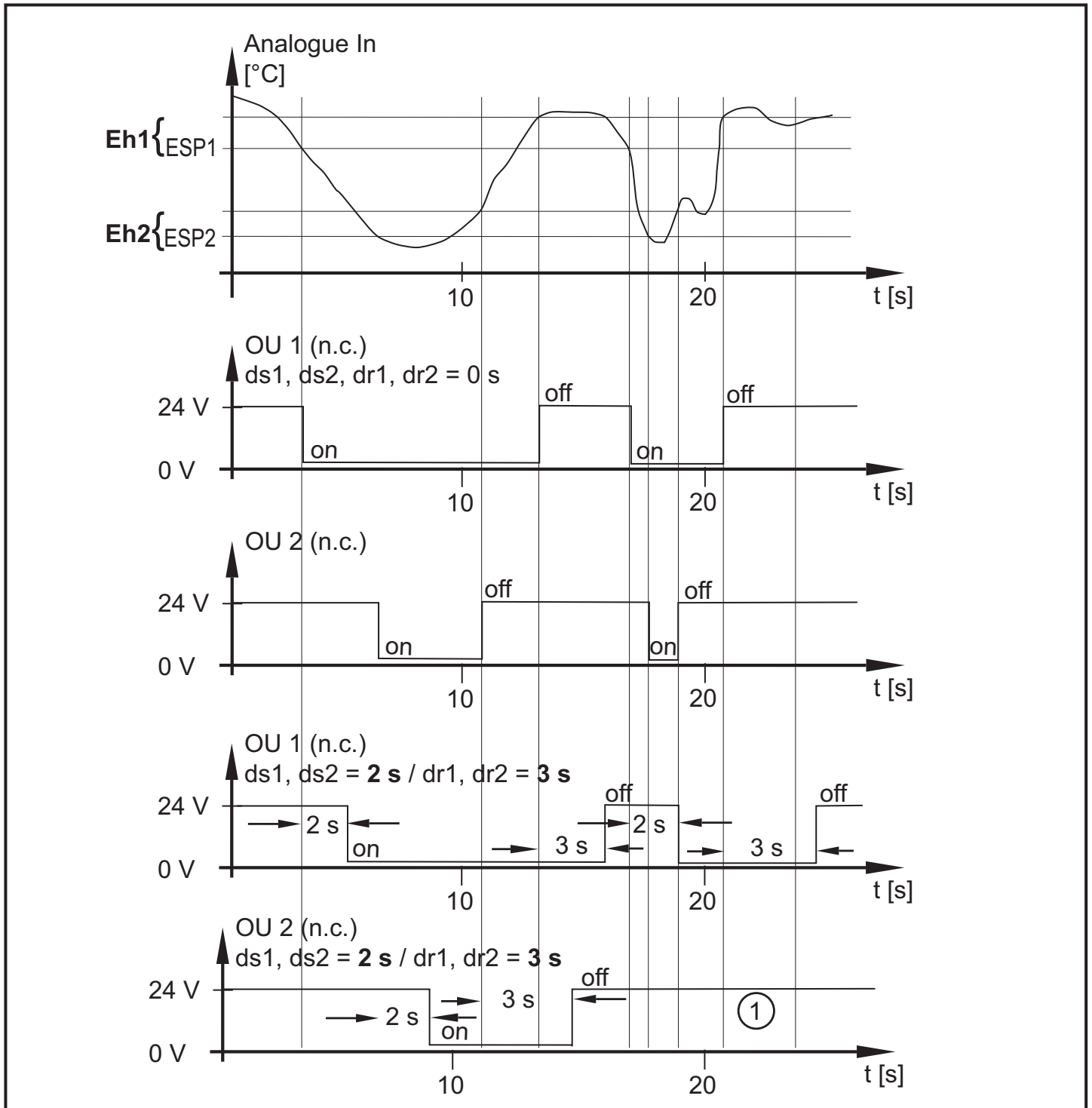
2: Not switched on because the selected switching delay is too short ( $< 2$  s).



If the switching delays of early warning and main alarm are set differently:  
- main alarm already switched on, early warning not yet switched on  
- early warning already switched off, main alarm not yet switched off

## 12.2 Switching delay for the lower limit monitor

The time diagram shows the effect of the switching delay on the analogue input for a lower limit monitor ( $ESP1 > ESP2$ ). The outputs are set as normally closed (OU1 and OU2  $\rightarrow$  nc).

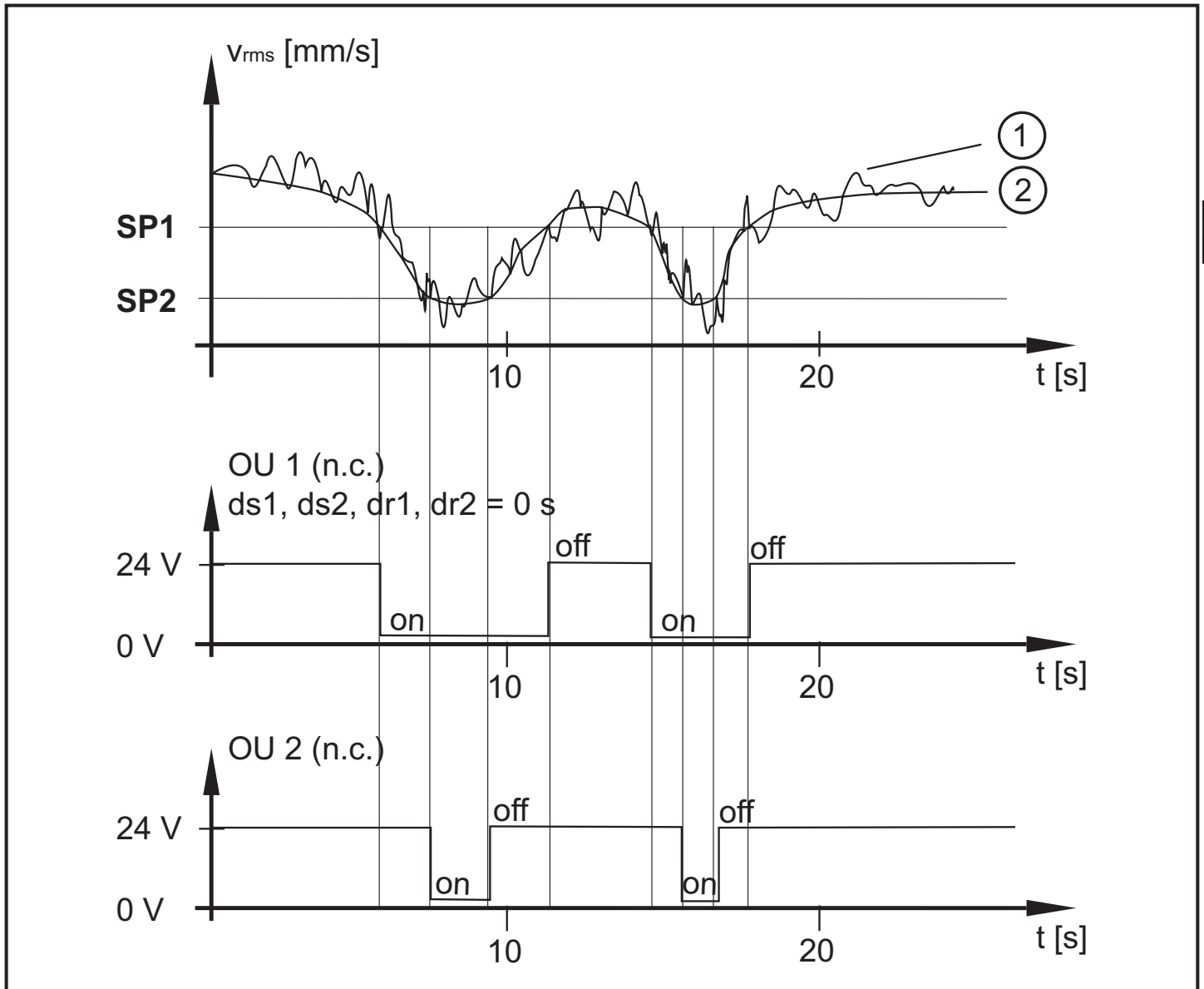


1: Not switched on because the selected switching delay is too short.



## 12.3 Averaging for the lower limit monitor

The time diagram shows the effect of averaging for a lower limit monitor (SP1 > SP2). The outputs are set as normally closed (OU1 and OU2 → nc), AUER = 0.25 averaging



1: raw signal

2: averaged signal

# 13 Factory setting

	Factory setting	User setting
EUAL	rms	
uni	mm/s	
SP1	2.8 [mm/s] <sub>rms</sub>	[mm/s or in/s]
SP2	4.5 [mm/s] <sub>rms</sub>	[mm/s or in/s]
LFCO	10 [Hz]	[Hz]
AUER	0,125	
dS1	0 [s]	[s]
dr1	0 [s]	[s]
dS2	0 [s]	[s]
dr2	0 [s]	[s]
ou1	nc	
ASP	0 [mm/s] <sub>rms</sub>	[mm/s or in/s]
AEP	25 [mm/s] <sub>rms</sub>	[mm/s or in/s]
ou2	nc	
EASP	0 example: [°C]	[ ]
EAEP	100 example: [°C]	[ ]
ESP1	10 example: [°C]	[ ]
Eh1	1 example: [°C]	[ ]
ESP2	20 example: [°C]	[ ]
Eh2	1 example: [°C]	[ ]

