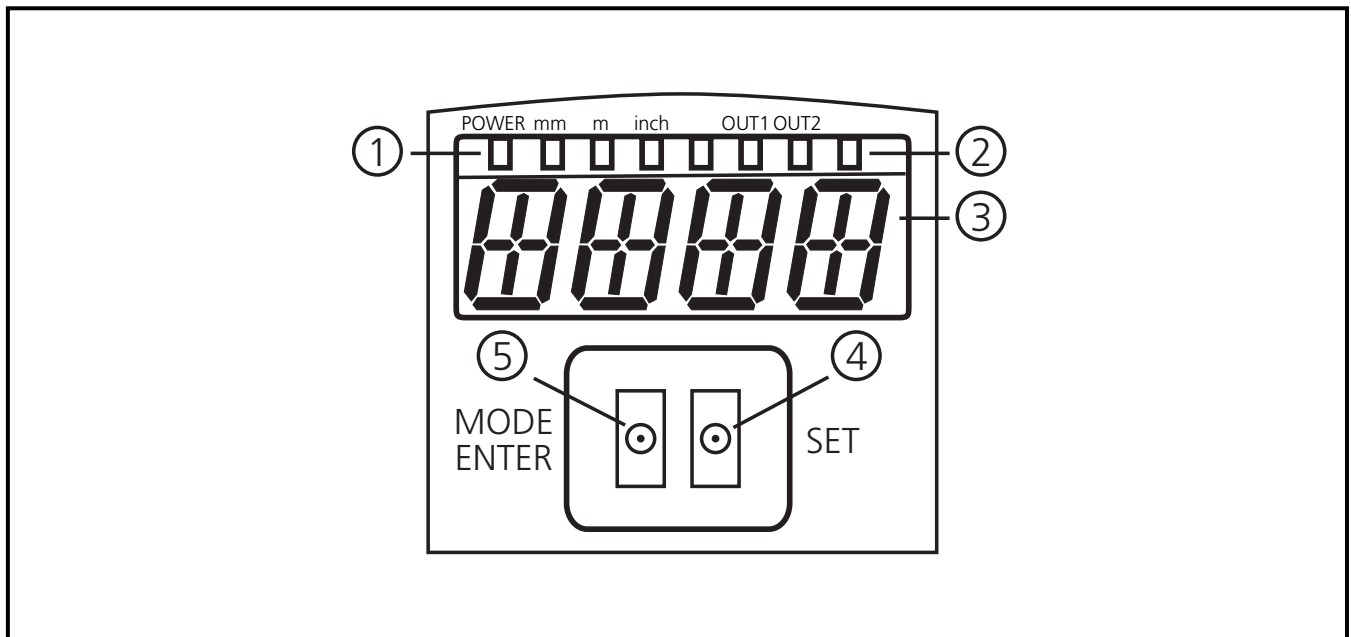


## Functions and features

The optical distance sensor

- measures distances of 0.2...10 m
- indicates the measured value on the 10-segment display
- generates 2 output signals according to the set output function

## Operating and indicating elements



①	4 x LED green	Lighting LED = power and set display unit (mm, m, inch)
②	4 x LED yellow (two not used)	Indication of the switching status, lights if the corresponding output is switched.
③	4-digit alphanumeric display	Indication of the measured distance, the parameters and parameter values.
④	Programming button Set	Setting of the parameter values (scroll by holding down, increment by pressing briefly).
⑤	Programming button Mode / Enter	Selection of the parameters and acknowledgement of the parameter values

## Switching functions

The outputs 1 and 2 can be set separately as normally open / normally closed, output 2 can also be configured as 4...20 mA analogue output.

	Output 1	Output 2
Analogue output (only output 2)	—	I: 4 ... 20mA
Switching function (output 1 and output 2; function can be set separately per output)	normally open ( <b>Hno</b> ) normally closed ( <b>Hnc</b> )	
Switching logic (applies to both switching outputs)	p-switching ( <b>PnP</b> )	

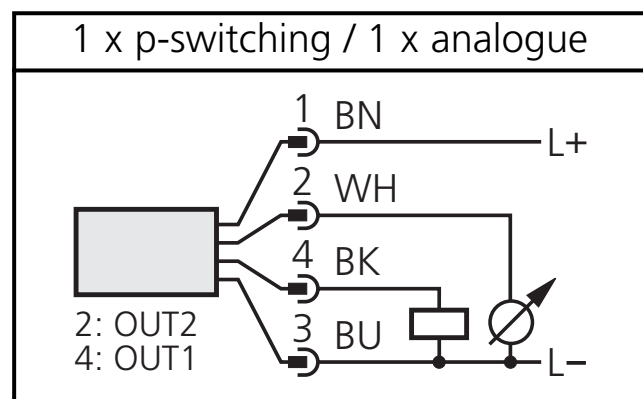
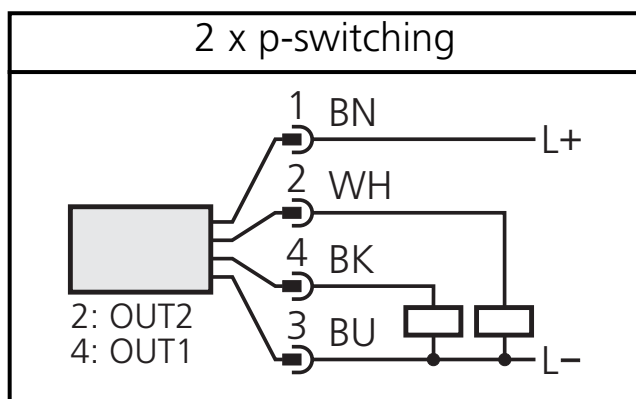
## Electrical connection



The unit must only be connected by a skilled electrician. The national and international regulations for the installation of electrical equipment must be adhered to.

Voltage supply to EN50178, SELV, PELV.

Disconnect power before connecting the unit.



Core colours of ifm sockets:

1 = BN (brown), 2 = WH (white), 3 = BU (blue), 4 = BK (black).

# Operating modes

## Run mode

Normal operating mode

After power on the unit is in the Run mode. It carries out its monitoring function and generates output signals according to the set parameters.

The display indicates the current distance, the yellow LEDs signal the switching status of the outputs.

## Display mode

Indication of the parameters and the set parameter values

After a short press of the "Mode/Enter" button the unit goes to the Display mode. Internally it remains in the operating mode. Irrespective of this the set parameter values can be read:

- Press the "Mode/Enter" button briefly to scroll the parameters.
- Press the "Set" button briefly to indicate the corresponding parameter value for 15 s. After another 15 s the unit returns to the Run mode.

## Programming mode

Setting of the parameter values

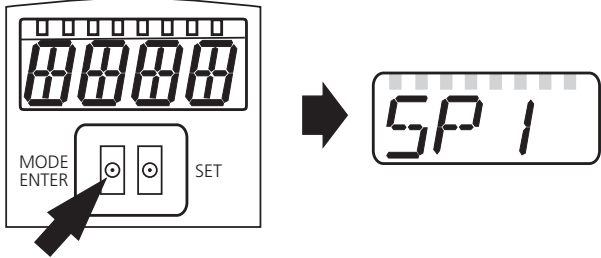
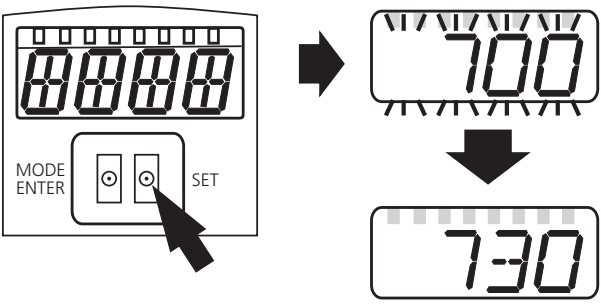
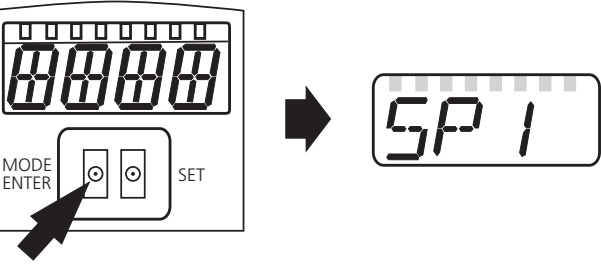
The unit goes to the programming mode when a parameter has been selected and the "Set" button is then pressed for over 5 s (the indicated parameter value flashes and is then incremented continuously). Internally the unit remains in the operating mode. It continues its monitoring function with the existing parameters until the change has been terminated.

You can change the parameter value by pressing the "Set" button and confirm it by pressing the "Mode/Enter" button. The unit returns to the Run mode if no button is pressed for over 15 s.

# Programming

The sensor is programmed using the two buttons "Mode/Enter" and "Set".

First call a parameter with the "Mode/Enter" button, select the requested value with the "Set" button and confirm it pressing again the "Mode/Enter" button.

1		<p>Press the Mode/Enter button until the requested parameter is displayed.</p>
2		<p>Press the Set button and keep it pressed. The indicated current parameter value flashes for 5 s, <b>then it is increased*</b> (incremental by pressing briefly or scrolling by holding pressed).</p>
3		<p>Press the <b>Mode/Enter</b> button <b>briefly</b> (= acknowledgement). The parameter is displayed again, the new <b>parameter value becomes effective</b>.</p>
4	<p><b>Change more parameters:</b> Start again with step 1.</p>	<p><b>Finish programming:</b> Wait for 15 s or press the Mode/Enter button until the current measured value is displayed again.</p>

\* Decrease the value: Let the display move to the maximum setting value. Then the cycle starts again at the minimum setting value.

Select the display unit (Unit) **before** you define the values for the parameters SP1, SP2, ASP, AEP. This avoids rounding errors during internal conversion to other units and enables exact setting of the values. When delivered: mm.

If no button is pressed for 15 s during the setting procedure, the unit returns to the Run mode with unchanged values.

The unit can be electronically locked to prevent unwanted adjustment of the set parameters: Press the two programming buttons in the Run mode until *Loc* is displayed. For unlocking press the buttons until *uLoc* is displayed.

On delivery: Unlocked.

When the unit is locked, *Loc* is briefly displayed when you try to change parameter values.

## Set-up / Operation

After mounting, wiring and programming check whether the unit operates correctly.

Align the unit (laser beam) to the object to be detected. If correctly set up, the distance to the object is indicated.

Faults displayed during operation:

++	too much light, e.g. reflective surfaces
--	not enough light
far	measured object outside the measuring range > 10m
near	measured object outside the measuring range < 0.2m
SC1	short circuit in switching output 1
SC2	short circuit in switching output 2
SC	short circuit in both switching outputs

Life of the laser diode: 50000 hours.

# Technical information / Operation / Parameters

## Adjustable parameters

<p><b>SP 1</b> <b>SP 2</b></p>	<p><b>Switch point 1 / 2</b> Limit values at which the outputs change their switching status. SP2 is only active if <b>OU2 = Hno</b> or <b>Hnc</b>.</p>
<p><b>OU 1</b></p>	<p><b>Configuration for output 1</b> 2 switching functions are adjustable: - <b>Hno</b> = hysteresis function / normally open - <b>Hnc</b> = hysteresis function / normally closed</p>
<p><b>OU 2</b></p>	<p><b>Configuration for output 2</b> 2 switching functions and 1 analogue signal can be set: - <b>Hno</b> = hysteresis function / normally open - <b>Hnc</b> = hysteresis function / normally closed - <b>I</b> = analogue output 4 ... 20 mA</p>
<p><b>ASP</b></p>	<p><b>Analogue start point</b> Measured value at which 4 mA is provided. ASP is only active if <b>OU2 = I</b>.</p>
<p><b>AEP</b></p>	<p><b>Analogue end point</b> Measured value at which 20 mA is provided. Minimum distance between ASP and AEP = 100 mm. AEP is only active if <b>OU2 = I</b>. The error message "SIZE" is displayed if you try to enter a distance which is below the minimum distance.</p>
<p><b>TEAC</b></p>	<p><b>Teach</b> Selection "sampling rate" or "repeatability" <b>Setting ranges:</b>     → Sampling rate 1...50 Hz                               → Accuracy 1...100 mm  The sampling rate influences the accuracy and vice versa. High sampling rate → low accuracy. High accuracy → low sampling rate.</p>
<p><b>EF</b></p>	<p><b>Extended functions</b> This menu point includes a submenu with more parameters. Press the Set button briefly to access these parameters which will be explained on the following pages.</p>

**dS 1**  
**dS 2**  
**dr 1**  
**dr 2**

### Delay for the switching outputs

**dSx** = switch-on delay; **drx** = switch-off delay.

The output does not immediately change its switching status when the switching condition is met but only after the delay has elapsed. If the switching condition is no longer met after the delay has elapsed, the switching status of the output does not change.

- Setting range: 0 / 0.1 ... 5 s in steps of 0.1 s (0 = delay is not active);
- Indication in seconds

**dS2** and **dr2** are **not** effective if **OU2 = I**.

**d 5**

### Display setting

7 settings can be selected:

**d1** = update of the measured value every 50 ms

**d2** = update of the measured value every 200 ms

**d3** = update of the measured value every 600 ms

The update of the measured value only refers to the display. It has no effect on the outputs.

**rd1, rd2, rd3** = display like d1, d2, d3, but rotated by 180°.




**OFF** = The measured value display is deactivated in the Run mode.

Press one of the buttons to indicate the current measured value for 15 s. If the Mode/Enter button is pressed once again, the display mode is activated. The LEDs remain active even if the display is deactivated.

**AL16**

### Indication of the signal strength in %

Check the sensor alignment, if necessary.

	<p><b>Display unit</b>  Measured value and values for SP1, SP2, ASP, AEP can be indicated in the following units:</p> <ul style="list-style-type: none"> <li>• mm, m, inch</li> </ul> <p>Select the display unit <b>before</b> you define the values for the parameters SP1, SP2, ASP, AEP. This avoids rounding errors during internal conversion to other units and enables exact setting of the values.</p> <p>When delivered: <b>mm</b>, the selected unit is indicated by a green LED on the display.</p>
	<p><b>Restore basic settings (factory settings)</b></p> <ul style="list-style-type: none"> <li>- Press the "Mode/Enter" button until <b>rES</b> is displayed.</li> <li>- Press the "Set" button and keep it pressed until "- - - -" is displayed.</li> <li>- Press the "Mode/Enter" button briefly (→ the unit passes into the Run mode).</li> </ul> <p>The unit is delivered with the following factory settings:</p> <ul style="list-style-type: none"> <li>• Unit of measurement mm</li> <li>• Sp1: 1000 mm</li> <li>• Sp2: 2000 mm</li> <li>• OU1: Hno (normally open)</li> <li>• OU2: Hno (normally open)</li> <li>• ASP: 0 mm</li> <li>• AEP: 9999 mm</li> <li>• Sampling rate: 50 Hz</li> <li>• Delay: 0 s</li> <li>• Display update d3 (600 ms)</li> </ul>
	<p><b>Display of the software version number</b></p>



## Hysteresis function:

The hysteresis is calculated from the repeatability (see table below) with a safety factor 1.5.

Example: Sampling rate 50 Hz, distance to the object 1200 mm, grey value (18 % remission):

Repeatability according to the table 20 mm x factor 1.5 = 30 mm

→ Reset point 1200 mm + (30 mm / 2) = **1215 mm**

→ Set point 1200 mm - (30 mm / 2) = **1185 mm**

The reset point is always greater than the set point.

For sensing ranges up to 6000 mm the hysteresis is calculated for a 18 % remission, for sensing ranges over 6000 mm for a 90 % remission.

Table for sampling rate 50 Hz:

Distance [mm]	Repeatability		Accuracy	
	white 90% remission	grey 18% remission	white 90% remission	grey 18% remission
200...1000	10 mm	15 mm	± 15 mm	± 18 mm
1000...2000	11 mm	20 mm	± 15 mm	± 20 mm
2000...4000	35 mm	45 mm	± 25 mm	± 32 mm
4000...6000	55 mm	80 mm	± 35 mm	± 50 mm
6000...10000	120 mm		± 70 mm	

Range on black (6 % remission) ≥ 4000 mm

The values apply at

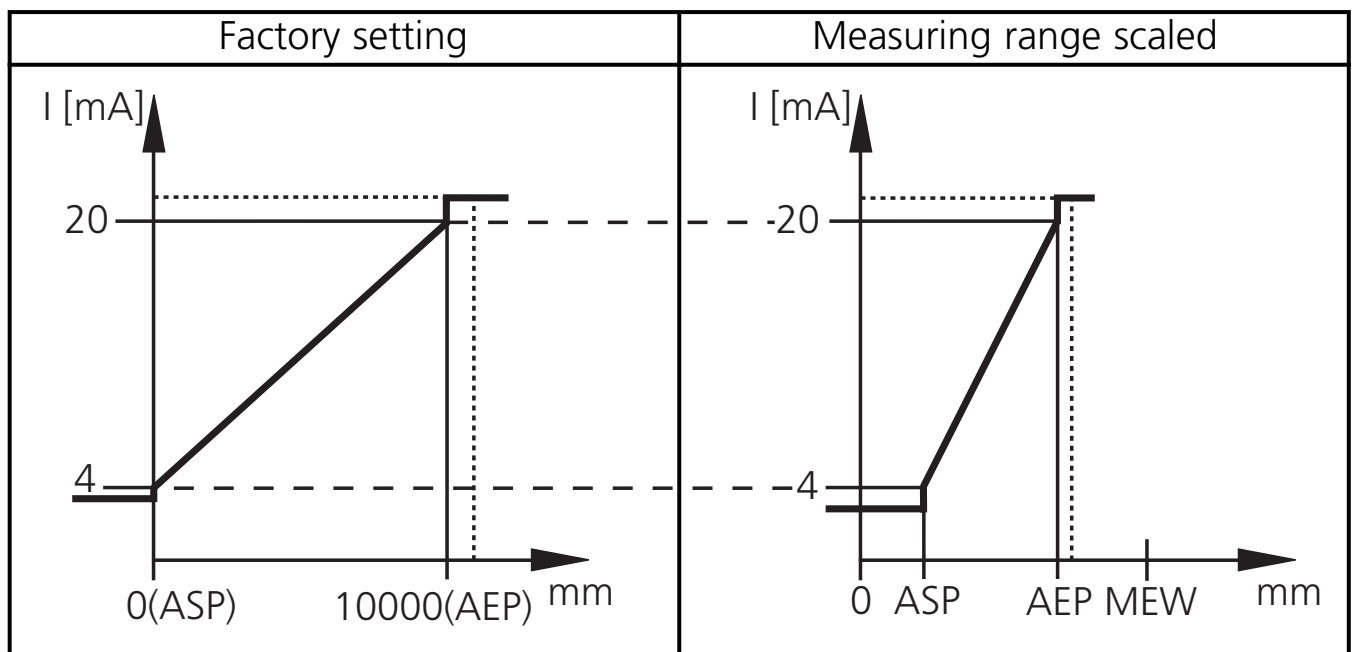
- constant ambient conditions (23° C / 960 hPa)
- extraneous light of max. 8 klx
- only after unit powered up for 10 minutes.

## Scaling of the measuring range (analogue output)

- With the parameter analogue start point (**ASP**) you define at which measured value the output signal is 4 mA.
- With the parameter analogue end point (**AEP**) you define at which measured value the output signal is 20 mA.

The analogue end point (AEP) can be selected so that it is located before the analogue start point (ASP). This implements a falling edge.

### Current output 4 ... 20 mA



MEW = final value of the measuring range

In the set measuring range the output signal is between 4 and 20 mA.

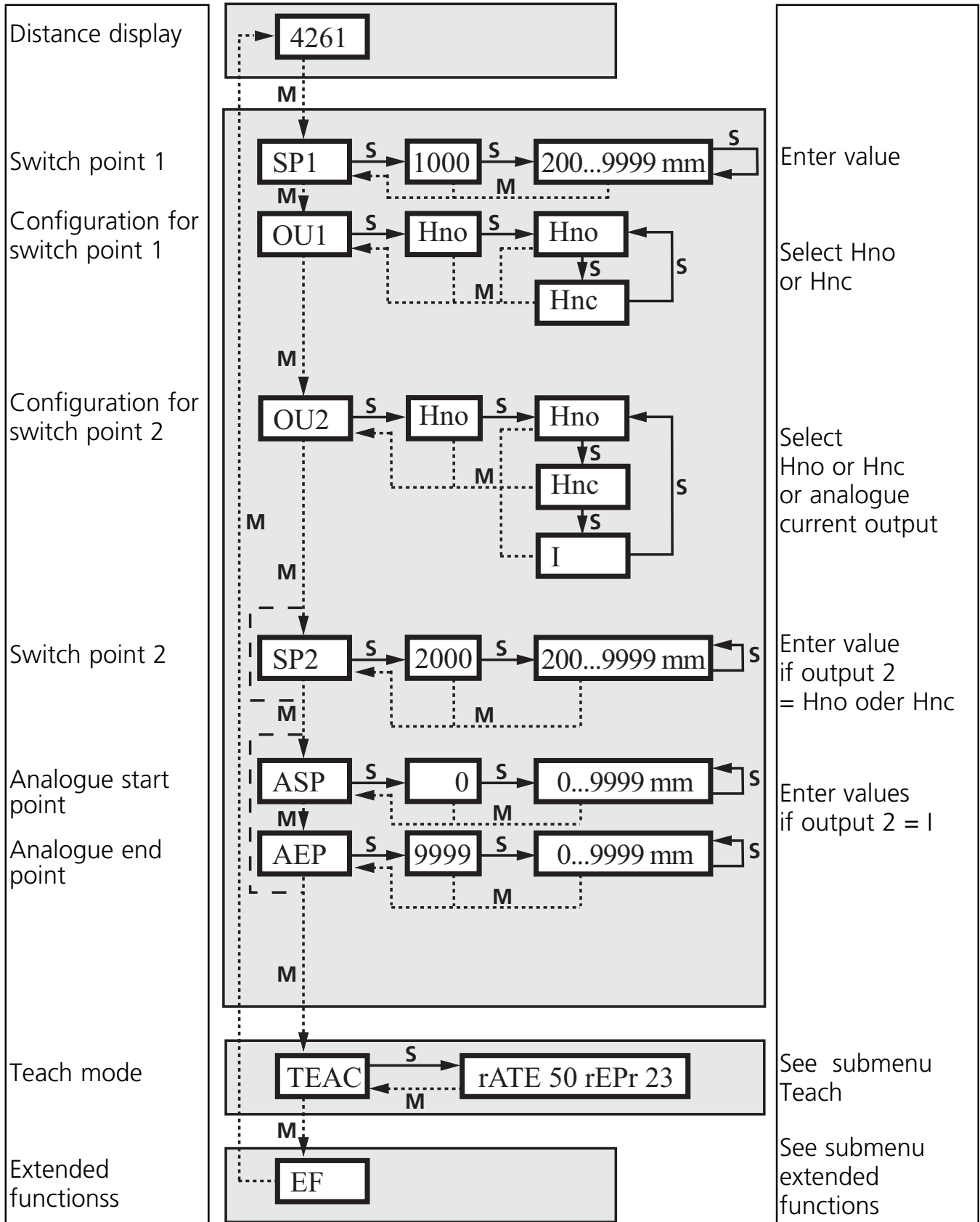
It is also signalled:

- Distance value outside the analogue start point (ASP): 3.5 mA
- Distance value outside the analogue end point (AEP): 20.5 mA

# Overview main menu

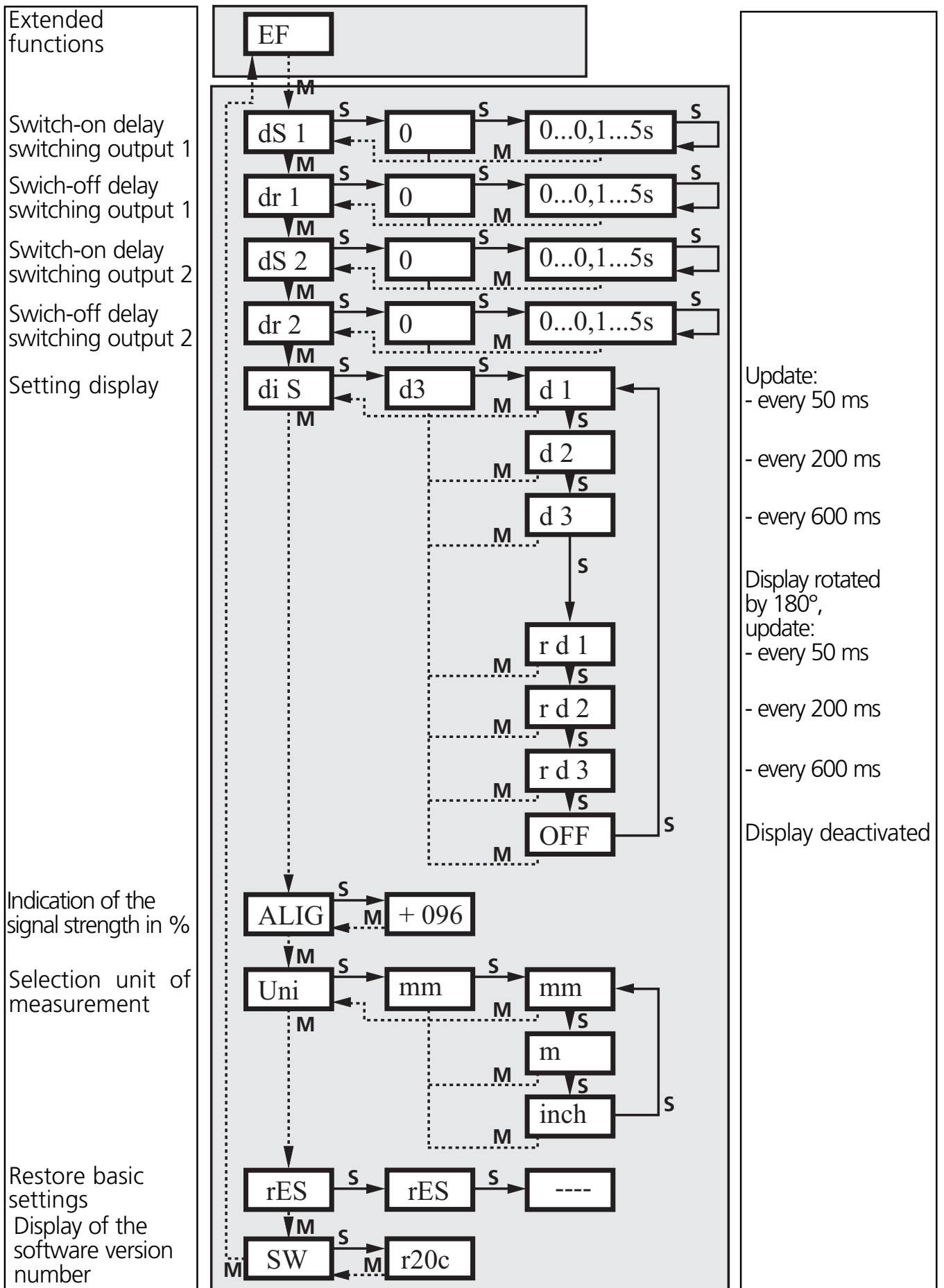
(for programming see page 6)

**M** = Mode/Enter    **S** = Set

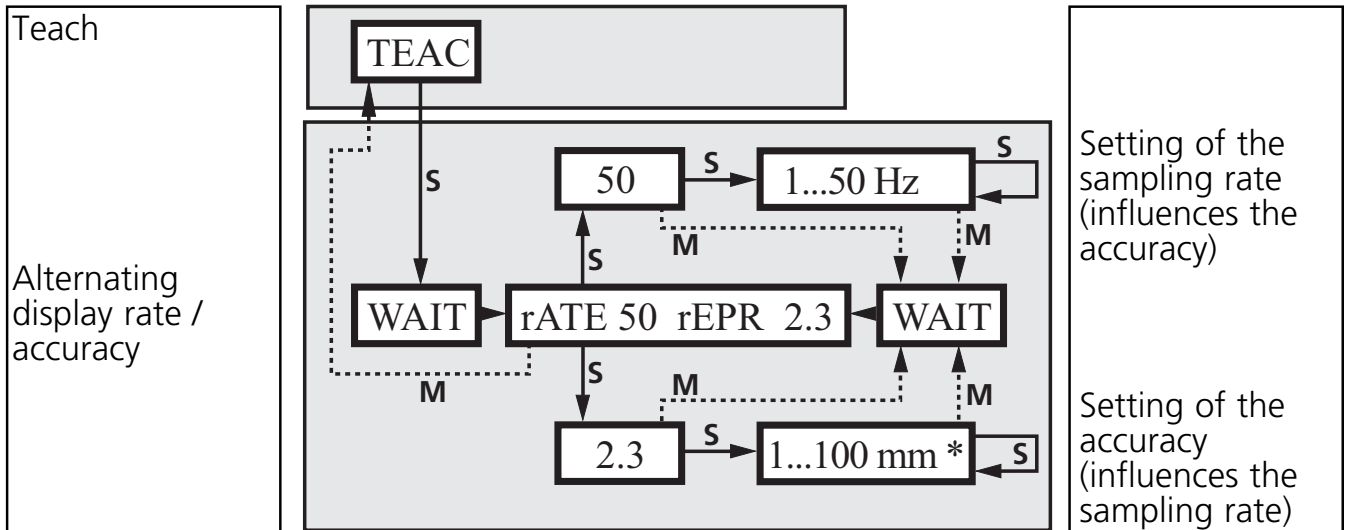


**ENGLISH**

# Overview submenu "extended functions"

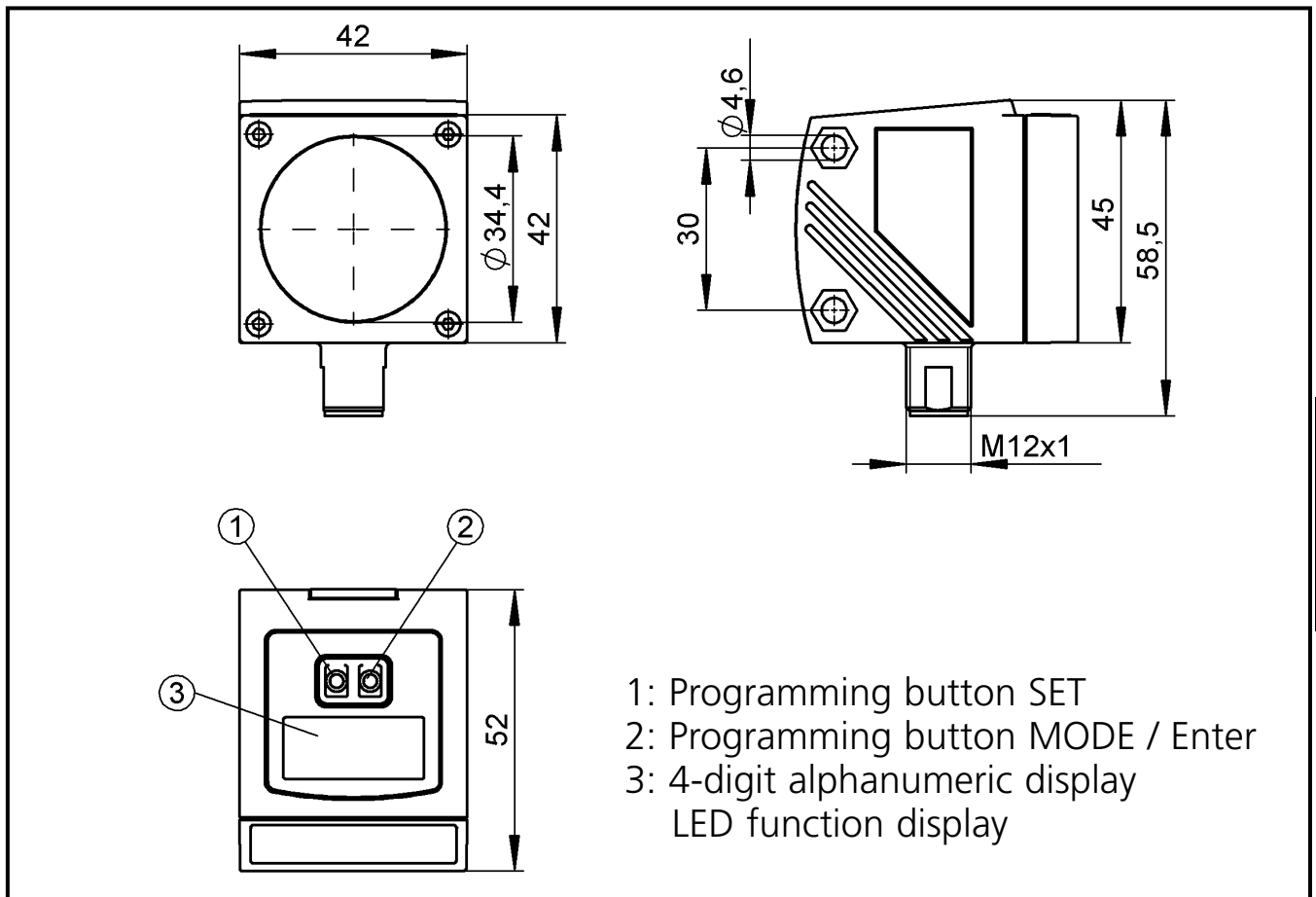


## Overview submenu 'Teach' accuracy / sampling rate



\* Repeatabilities are selectable that can be achieved in the current situation (depending on the object)  
 The repeatability must be calculated internally before the alternating display. If this calculation has not yet been completed, WAIT appears.

## Scale drawing



ENGLISH

## Remarques sur la sécurité

**Avant la mise en service de l'appareil, veuillez lire la description du produit. Assurez-vous que le produit est approprié pour l'application concernée sans aucune restriction d'utilisation.**

**Le non-respect des remarques ou des données techniques peut provoquer des dommages matériels et/ou corporels.**



**Lumière laser visible; classe de protection laser 2.**

**Ne pas regarder le faisceau laser!**

**Les étiquettes jointes (avertissement laser) doivent être affichées à proximité immédiate de l'appareil. Veuillez prendre en compte les avertissements sur l'étiquette du produit.**

## Contenu

Remarques sur la sécurité . . . . .	30
Caractéristiques et fonctionnement . . . . .	31
Éléments de service et d'indication . . . . .	31
Raccordement électrique . . . . .	32
Modes de fonctionnement . . . . .	33
Programmation . . . . .	34
Mise en service / Fonctionnement . . . . .	35
Informations techniques / fonctionnement / paramètres	
Paramètres réglables . . . . .	36
Tableau taux de mesure / précision / répétabilité . . . . .	39
Menu principal . . . . .	41
Sous menu fonctions étendues . . . . .	42
Sous menu Teach . . . . .	43
Schéma d'encombrement . . . . .	43