

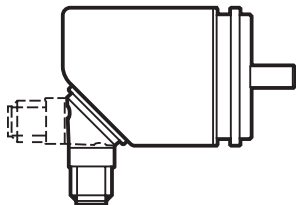


Operating instructions  
Encoder PerformanceLine

UK

**RxP5xx**

80276893/00 07/2018



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# 1 Preliminary note

## 1.1 Notes on this document

This document applies to encoders of the following types:

- PerformanceLine encoders with display and magnetic detection system, order numbers RXP5xx.

It is part of the unit 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 unit.

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

## 1.2 Symbols used

- ▶ Instructions
- > Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference



Important note

Non-compliance may result in malfunction or interference.



Information

Supplementary note

# 2 Safety instructions

## 2.1 General

- ▶ Observe these operating instructions.
- ▶ Adhere to the warning notes on the product.

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 unit 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 unit.

Attention: This product complies with the standard EN61000-6-4. The unit may cause radio interference in domestic areas. The user must take appropriate measures to avoid this interference, if necessary.

### 3 Functions and features

The unit can be configured as encoder, speed monitor or counter.

The encoder converts rotary movements into digital numerical values. Each angular position of the revolutions is provided as a numerical value.

These values allow angular movements to be measured and positions to be determined.

- The unit generates output signals according to the operating mode and the parameter setting.
- The unit displays the current settings.
- It moreover provides the process data via IO-Link.
- The unit is laid out for fully bidirectional communication. So, the following options are possible:

IO-Link

- Remote display: reading and displaying the current settings.
- Remote parameter setting: reading and changing the current parameter setting.
- IO-Link parameter setting



Products from ifm electronic gmbh are usually individual components of larger installations. These applications require tests of the entire installation and do not only depend on the specification of these components. The notes in these instructions apply only to the product from ifm electronic and not to the entire installation. If the product is used in a non-intended way, this will be at your own risk.

### 4 Installation

- ▶ Disconnect power.
- ▶ Ensure that the machine stands still.
- ▶ The drive must not be started during installation.
- ▶ Do not hit the shaft; do not use a file or similar tool on the shaft: risk of destruction!



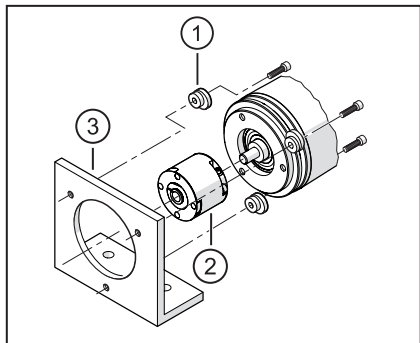
This product is a precision measuring unit. Therefore it has to be handled with care by trained staff. The following warnings apply to influences outside the limit values indicated in the product data sheet.

Damage to the product can be caused by:

- too high forces on the shaft
- humidity and chemical liquids (do not connect any cables oriented upwards)
- extreme temperatures
- too high vibrations and shocks
- short circuit or too high an operating voltage
- impact, shock or any other physical forces

## 4.1 Mounting drawings

### 4.1.1 Type with synchro flange

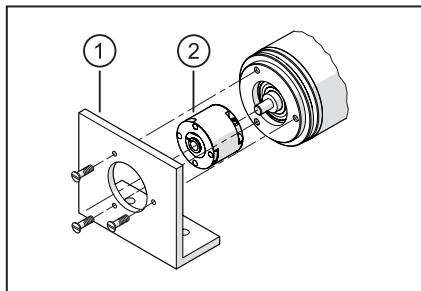


1: fastening clamp (3 pieces) E60041

2: coupling

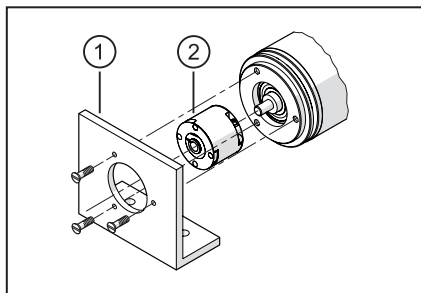
3: angle bracket

## 4.1.2 Type with synchro flange



- 1: angle bracket  
2: coupling

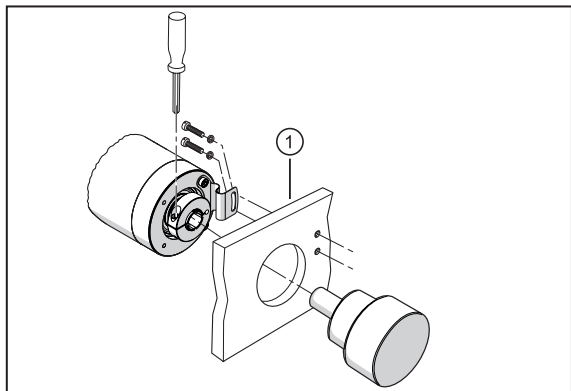
## 4.1.3 Type with clamp flange



- 1: angle bracket  
2: coupling

- ▶ Minimise the displacement between the two shafts.
- ▶ Avoid the following mistakes:
  - radial displacement
  - angular displacement
  - axial movement
- ▶ To minimise the forces on the shaft use a flexible shaft coupling with guiding slot for the installation.

#### 4.1.4 Type with hollow shaft



1: angle bracket



- ▶ Verify the radial displacement after installation and with slow rotation. The displacement must not be larger than 0.5 mm since otherwise the life cycle of the encoder may be shortened or the system accuracy impaired.

## 5 Electrical connection



- ▶ Disconnect power.
- ▶ Connect the unit according to the indications on the type label. Voltage supply to EN50178, SELV, PELV

- ▶ For the wiring please see the type label
- ▶ Keep potential interfering sources (magnets, heat sources etc.) at a distance.



- For frequency converters on asynchronous motors use a screened cable for perfect data transmission, e.g. ifm socket E12403 (5 m) or E12404 (10 m)  
Screened cable length: min. 4 m
- ▶ Ensure grounding via the screen.

Ensure that the cable length does not exceed the value indicated in the data sheet.

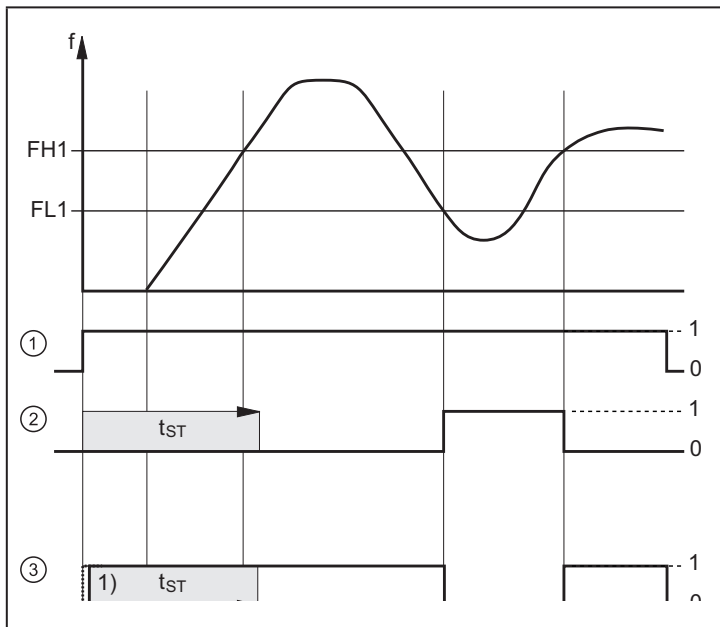


## 6 Start-up delay

The start-up delay suppresses an error signal as long as the machine is in the process of starting and has not yet reached its nominal speed.

After application of the operating voltage the start-up delay is active only once. If the drive is often turned on and off, couple the supply voltage of the drive and the device. By doing so, the start-up delay is active every time the machine is turned on.

### 6.1 Function diagram for switching functions



1: Voltage supply of device

2: Setting window function rpm [Fno]

3: Setting window function rpm [Fnc]

1) Power-on delay time /  $t_{ST}$  = start-up delay /

$f$  = frequency /  $FL+FH$  window function low/high

## 7 Technical data

### 7.1 Data sheets



Data sheets are available at [www.ifm.com](http://www.ifm.com).

### 7.2 Accessories



You will find matching accessories at [www.ifm.com](http://www.ifm.com).

## 8 Maintenance, repair and disposal

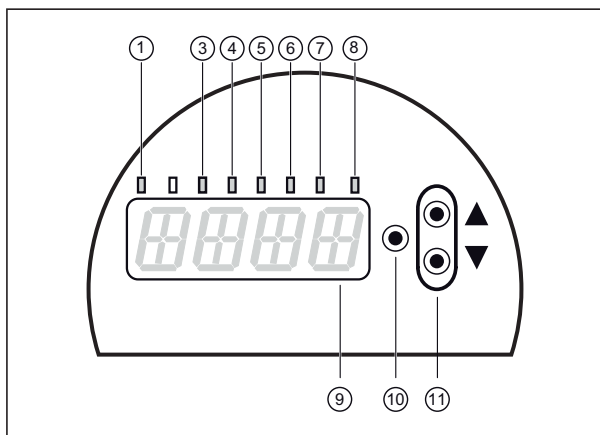
- ▶ Dispose of the unit in accordance with the national environmental regulations.

## 9 Approvals/standards



The EC declaration of conformity and approvals can be found at [www.ifm.com](http://www.ifm.com).

## 10 Operating and display elements



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### 1 to 8: Indicator LEDs

LED 1 yellow lights	switching status OUT1 (lights when output 1 is switched).
LED 2 green lights	not used
LED 3 green lights	encoder mode ENC
LED 4 green lights	speed monitor mode RPM
LED 5 green lights	counter mode CNT
LED 6 green lights	display [Hz] in speed monitor mode
LED 7 green flashes	display for negative input values (e.g. -5)
LED 8 yellow lights	switching status OUT2 (lights when output 2 is switched).

### 9: Alphanumeric display, 4 digits

- indication of the parameters and parameter values.

### 10: Enter button [●]

- selection of the parameters and acknowledgement of the parameter values.

### 11: Arrow keys up [▲] and down [▼]

- setting of the parameter values (scrolling by holding pressed with acceleration function; incremental by pressing briefly).

## 11 Communication, parameter setting and evaluation

ou1 (pin 5)	<ul style="list-style-type: none"> <li>switching signal for limit values Sp1 and Rp1 in the speed monitor mode</li> <li>counting pulses in the counter mode</li> </ul>
ou2 (pin 2)	direction of rotation CW clockwise (looking at the shaft). direction of rotation CCW counter clockwise (looking at the shaft).
IO-Link (pin 4)	communication via IO-Link

### 11.1 Switching function in the speed monitor mode RPM

ou1 changes its switching state if the current value is above or below the set switching limits (Sp1, rP1). The following switching functions can be selected:

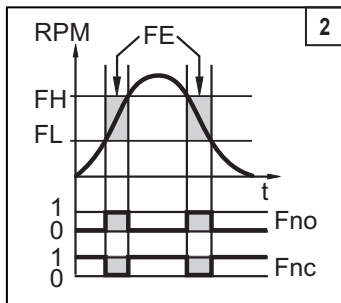
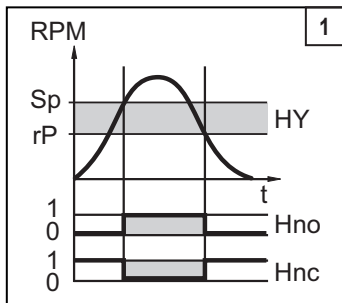
- Hysteresis function / normally open: [ou1] = [Hno] (→ fig. 1).
- Hysteresis function / normally closed: [ou1] = [Hnc] (→ fig. 1).

First the set point (Sp1) is set, then the reset point (rP1).

The resulting hysteresis remains even if Sp1 is changed again.

- Window function / normally open: [ou1] = [Fno] (→ fig. 2).
- Window function / normally closed: [ou1] = [Fnc] (→ fig. 2).

The width of the window can be set by means of the difference between FH1 and FL1. FH1 = upper value, FL1 = lower value.



RPM = rotational speed; HY = hysteresis; FE = window


## 11.2 IO-Link

### General information

This unit has an IO-Link communication interface which requires an IO-Link-capable module (IO-Link master) for operation.

The IO-Link interface enables direct access to the process and diagnostic data and provides the possibility to set the parameters of the unit during operation. In addition communication is possible via a point-to-point connection with a USB adapter cable.

You will find the IO-DDs necessary for the configuration of the IO-Link unit and detailed information about process data structure, diagnostic information, device-specific information, parameter setting tools and parameter addresses at [www.ifm.com](http://www.ifm.com).

 Preferably use the ifm LINERECORDER SENSOR software for parameter setting and setting up IO-Link sensors.

### 11.3 Process value - Transfer via IO-Link


The unit is programmed in a way that all process values are continuously transmitted to the PLC. After the basic parameter setting, the PLC thus always interprets the real value correctly.

This ensures that a subsequent parameter setting via the buttons or via a separate IO-Link programming unit is detected correctly and does not lead to any error.

 During programming of the PLC, the Cnt process value in the software must be divided by '4' to obtain the real counter value.

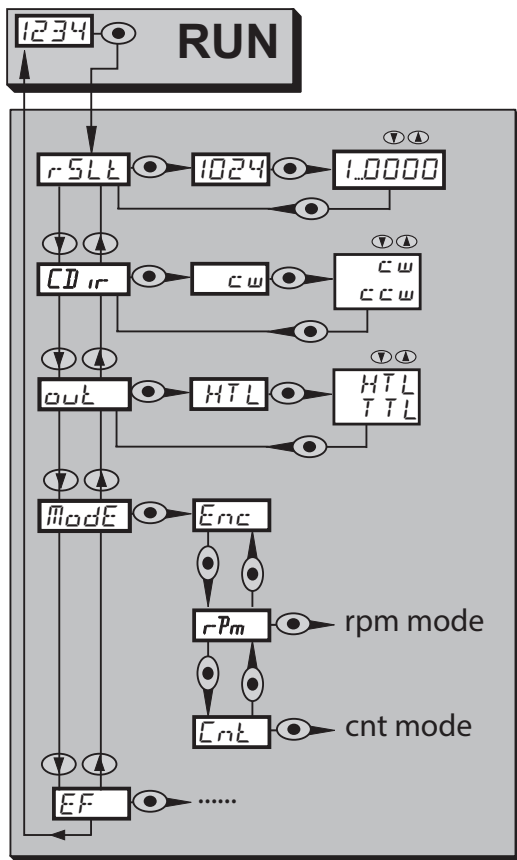
### 11.4 Error message in case of incorrect programming

If a programmed value in the unit is to be overwritten via IO-Link, an error message may result in the software (representation with the example of the LINERECORDER, the representation may vary depending on the software used).

 In case of an error message, please check and if necessary correct the set values first.

## 12 Menu

### 12.1 Menu structure in the encoder mode (Enc)



## 12.1.1 Explanation of the menu level 1 (encoder mode)

rSLt	Resolution Setting resolution
CDir	Direction (looking at the shaft) Direction of rotation CW (clockwise) . Direction of rotation CCW (counter clockwise).
out	Output function HTL or TTL
Mode	Application area of the unit - Enc encoder - rPm speed monitor - Cnt counter
EF	Extended functions

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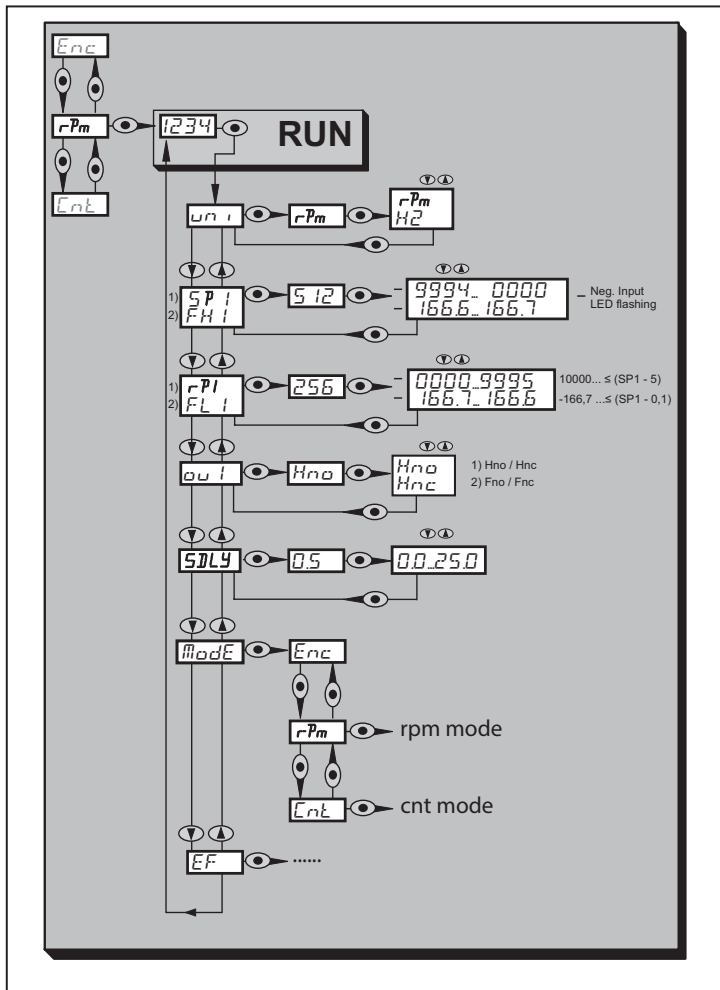
In the encoder mode, a resolution of 1...9999 can be set. If a resolution of '1' is set, 1 pulse per revolution is provided via the outputs 'A' and 'B' with a total of 4 edges (plus the negative edges).

### Note

When the resolution is '1', the display always shows '0' because of its "slow triggering" since directly after the pulse the encoder returns to position '0'.

Only when the resolution is '2' (= 2 pulse packages per revolution), there are 2 sufficiently long position periods that the display can indicate.

## 12.2 Menu structure in the speed monitor mode (rPm)



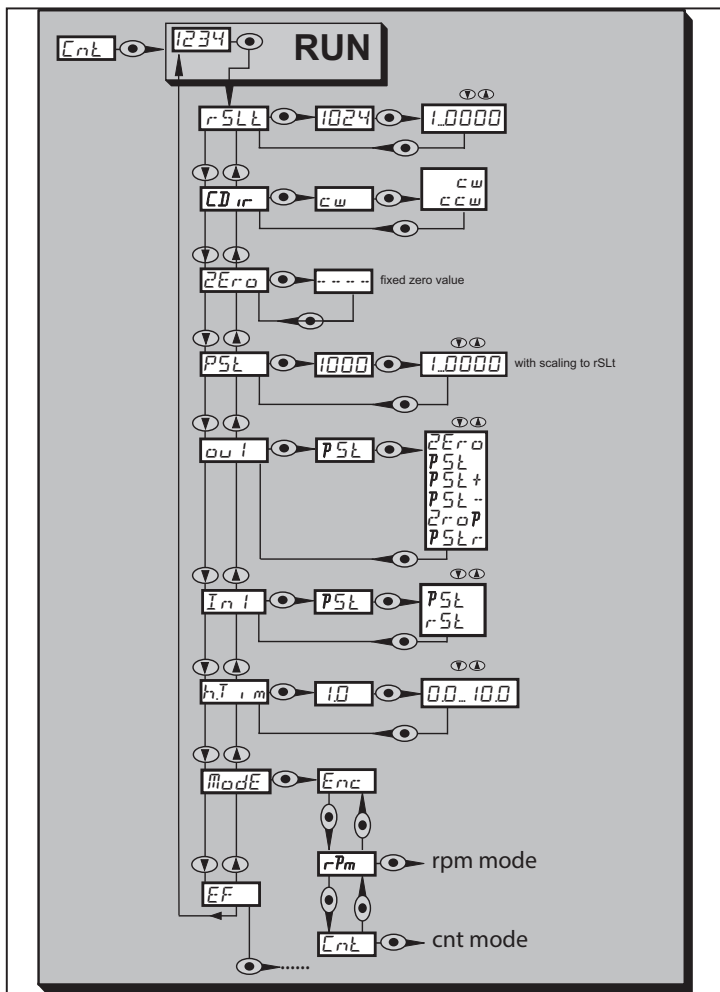


## 12.2.1 Explanation of the speed monitor menu

uni	Standard unit of measurement for the speed: revolutions per minute [U/min] / frequency [Hz]
ou1	Output function for OUT1: • switching signal for the speed limit values: hysteresis function [H ..] or window function [F ..], either normally open [. no] or normally closed [. nc].
Sp1	Set point (for hysteresis function at the output) Note display for negative input values (e.g. -5): green LED 7 flashes, the display does not indicate any minus sign
rp1	Reset point (for hysteresis function at the output) Note display for negative input values (e.g. -5): green LED 7 flashes, the display does not indicate any minus sign
FH1	Set point (for window function at the output)
FL1	Reset point (for window function at the output)
SDLy	Start-up delay

UK

## 12.3 Menu structure in the counter mode (Cnt)



## 12.3.1 Explanation of the counter menu

rSLt	Resolution Setting resolution
CDir	Direction (looking at the shaft) Direction of rotation CW (clockwise) Direction of rotation CCW (counter clockwise)
ZEro	Counter value 0, fixed
PSt	Preset value for the counter, adjustable
ou1	Output function for OUT1: • switching signal if the zero value or the preselected value has been reached
In1	Evaluation of the input pulse signal via pin 2 Selection: • pSt = preset, sets the counter value to the preset value • rSt = reset, sets the counter value to 0
h.Tim	duration of the output pulse, for '0' toggle function

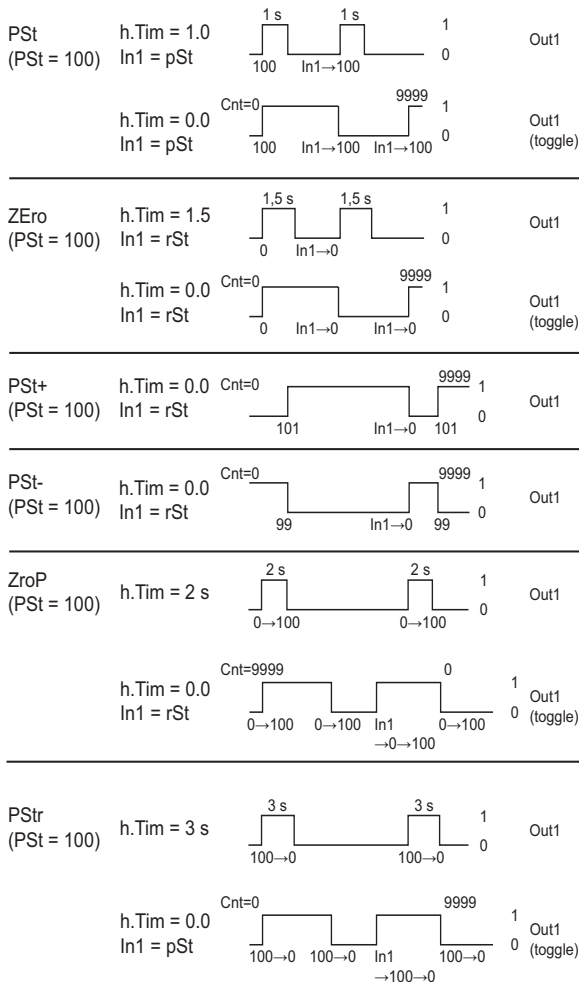


In the counter mode the unit counts up to a maximum of 9999.

For this, the rising edge of an input pulse with a length of at least 2 ms is evaluated.

The input pulse influences the counter value, the counter value influences the output.

## 12.3.2 Diagram output functions counter



### 12.3.3 Explanation of the diagram output functions counter

ZEr0

A reset input enables toggling of the output between 1 and 0 for  $h.Tim = 0$ .

PSt

A preset input enables toggling of the output between 1 and 0 for  $h.Tim = 0$ .

PSt +

$h.Tim$  is set to 0 by the unit.

PSt -

$h.Tim$  is set to 0 by the unit.

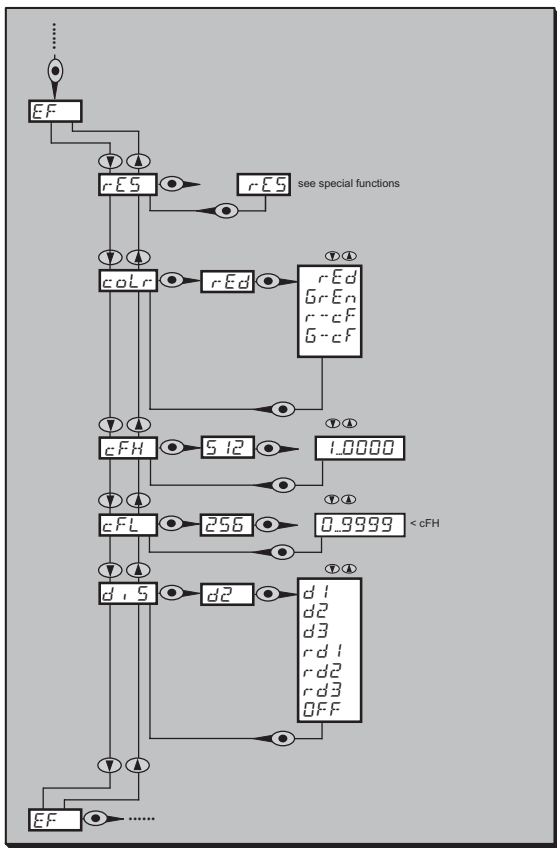
ZroP

For  $h.Tim = 0$  the output toggles without input signals. Input signals cause shifted output pulses with regard to the "old" counter values, counting direction  $9999 \rightarrow 0$ .

PSt

For  $h.Tim = 0$  the output toggles without input signals. Input signals cause shifted output pulses with regard to the "old" counter values, counting direction  $0 \rightarrow 9999$ .

## 12.4 Menu Extended functions



## 12.4.1 Explanation of the menu Extended functions

EF	Menu Extended functions
rES	Special functions - reset the unit (factory reset) - without operating mode via the buttons (small factory reset) - with operating mode only via IO-Link (big factory reset)
coLr	Assignment of the display colours "red" and "green" within the measuring range.
cFL / cFH	Lower / upper value for colour change. Parameter only active after selection of a freely definable colour window in the coLr parameter: [r-cF] or [G-cF].
diS	Update rate and orientation of the display.

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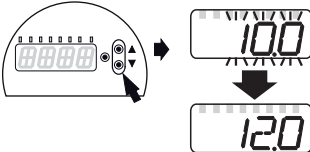
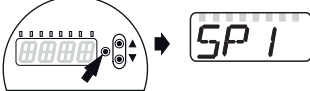
## 13 Parameter setting


During parameter setting the unit remains in the operating mode. It continues its monitoring functions with the existing parameters until the parameter setting has been completed.


### 13.1 Parameter setting in general

3 steps must be taken for each parameter setting:

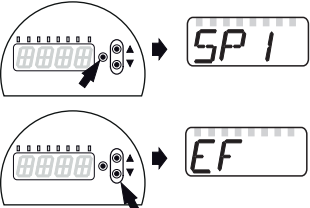
<b>1</b>	<b>Select parameter</b> <ul style="list-style-type: none"><li>▶ Press [•] to get to the menu.</li><li>▶ Press [▲] or [▼] until the required parameter is displayed.</li></ul>	
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<p><b>2 Set parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Press [●] to edit the selected parameter.</li> <li>▶ Press [▲] or [▼] for min. 1 s.</li> <li>&gt; After 1 s: setting value is changed: incrementally by pressing the button once or continuously by keeping the button pressed.</li> </ul>	
<p>Numerical values are incremented continuously with [▲] or decremented with [▼].</p>	
<p><b>3 Acknowledge parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Briefly press [●].</li> <li>&gt; The parameter is displayed again. The new setting value is saved.</li> </ul>	
<p><b>Setting of other parameters</b></p> <ul style="list-style-type: none"> <li>▶ Press [▲] or [▼] until the required parameter is displayed.</li> </ul>	
<p><b>Finish parameter setting</b></p> <ul style="list-style-type: none"> <li>▶ Press [▲] or [▼] several times until the current measured value is displayed or wait for 30 s.</li> <li>&gt; The unit returns to the process value display.</li> </ul>	

 If [C.Loc] is displayed when an attempt is made to modify a parameter value, an IO-Link communication is active (temporary locking).

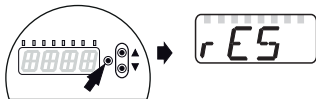
 If [S.Loc] is displayed, the sensor is permanently locked via software. This locking can only be removed with a parameter setting software.

Change from menu level 1 to menu level 2:

<ul style="list-style-type: none"> <li>▶ Press [●] to get to the menu.</li> <li>▶ Press [▲] or [▼] until [EF] is displayed.</li> </ul>	
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- ▶ Press [•].
- > The first parameter of the submenu is displayed (here: [rES]).



Change from menu level 1 to menu level 2 when a parameter setting software is used:

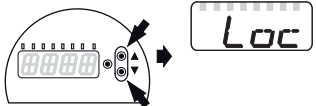
- ▶ Activate the [EF] button.

## Locking / unlocking

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The unit can be locked electronically to prevent unintentional settings.

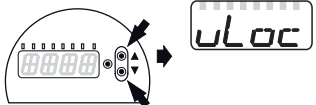
- ▶ Make sure that the unit is in the normal operating mode.
- ▶ Press [▲] + [▼] simultaneously for 10 s.
- > [Loc] is displayed.



During operation: [Loc] is briefly displayed if you try to change parameter values.

For unlocking:

- ▶ Press [▲] + [▼] simultaneously for 10 s.
- > [uLoc] is displayed.



On delivery: not locked.

## Timeout

If no button is pressed for 30 s during parameter setting, the unit returns to the operating mode with unchanged values.

## 13.2 Configure display (optional)

- ▶ Select [Uni] and set the unit of measurement:
  - [rpm]
  - [Hz]

uni

<p>▶ Select [diS] and set the update rate and orientation of the display:</p> <ul style="list-style-type: none"> <li>- [d1]: update of the measured values every 50 ms.</li> <li>- [d2]: update of the measured values every 200 ms.</li> <li>- [d3]: update of the measured values every 600 ms.</li> <li>- [rd1], [rd2], [rd3]: display as for d1, d2, d3; rotated by 180°.</li> <li>- [OFF] = the measured value display is deactivated in the Run mode (the measured value display switches off after 30 s).</li> </ul> <p>The LEDs remain active even if the display is deactivated. Error messages are displayed even if the display is deactivated.</p>	
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### 13.3 Set output signals

#### 13.3.1 Set output functions

<p>▶ Select [ou1] and set the switching function:</p> <ul style="list-style-type: none"> <li>- [Hno] = hysteresis function/NO,</li> <li>- [Hnc] = hysteresis function/NC,</li> <li>- [Fno] = window function/NO,</li> <li>- [Fnc] = window function/NC.</li> </ul>	
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#### 13.3.2 Define switching limits for the hysteresis function

<p>▶ [ou1] must be set as [Hno] or [Hnc].</p> <p>▶ Select [Sp1] and set the value at which the output switches.</p>	
<p>▶ Select [rp1] and set the value at which the output is reset. rp1 is always lower than Sp1. The unit only accepts values which are lower than SP1.</p>	

#### 13.3.3 Define switching limits for the window function

<p>▶ [ou1] must be set as [Fno] or [Fnc].</p> <p>▶ Select [FH1] and set the upper limit value.</p>	
<p>▶ Select [FL1] and set the lower limit value. FL1 is always lower than FH1. The unit only accepts values which are lower than the value for FH1.</p>	

## 13.4 User settings (optional)

### 13.4.1 Reset all parameters to factory setting

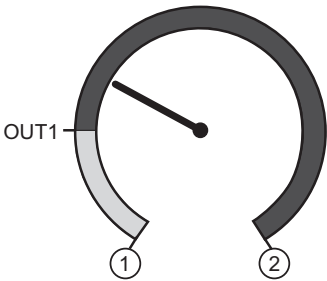
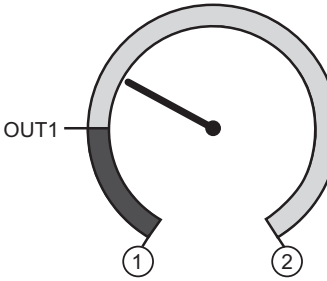
<ul style="list-style-type: none"><li>▶ Select [rES].</li><li>▶ Press [•].</li><li>▶ Press and hold [▲] or [▼] until [----] is displayed.</li><li>▶ Briefly press [•].</li></ul> <p>We recommend noting down your own settings before carrying out a reset (→ 12 Factory setting).</p>	<i>rES</i>
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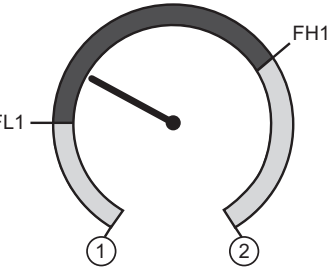
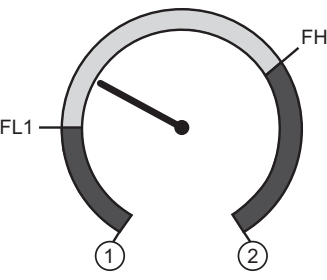
### 13.4.2 Set colour change of the display



<ul style="list-style-type: none"><li>▶ Select [coLr] and set the function:<ul style="list-style-type: none"><li>- [rEd] = display colour red (independent of the measured value).</li><li>- [GrEn] = display colour green (independent of the measured value).</li><li>- [r1ou] = display colour red when OUT1 switches.</li><li>- [G1ou] = display colour green when OUT1 switches.</li><li>- [r-cF] = display colour red when the measured value is between the freely definable limit values [cFL]* and [cFH]*).</li><li>- [G-cF] = display colour green when the measured value is between the freely definable limit values [cFL]* and [cFH]*).</li></ul></li></ul> <p>*) The parameters [cFL] and [cFH] can only be selected in the menu tree when [r-cF] or [G-cF] were activated.</p>	<i>coLr</i> <span style="font-weight: bold; font-size: small;">UK</span>
<ul style="list-style-type: none"><li>▶ Select [cFL] and set the lower limit value (only possible if [r-cF] or [G-cF] has been activated).</li><li>&gt; The setting range corresponds to the measuring range and its maximum limit is [cFH].</li></ul>	<i>cFL</i>
<ul style="list-style-type: none"><li>▶ Select [cFH] and set the upper limit value (only possible if [r-cF] or [G-cF] has been activated).</li><li>&gt; The setting range corresponds to the measuring range and its minimum limit is [cFL].</li></ul>	<i>cFH</i>

### 13.4.3 Graphical depiction of the colour change of the display

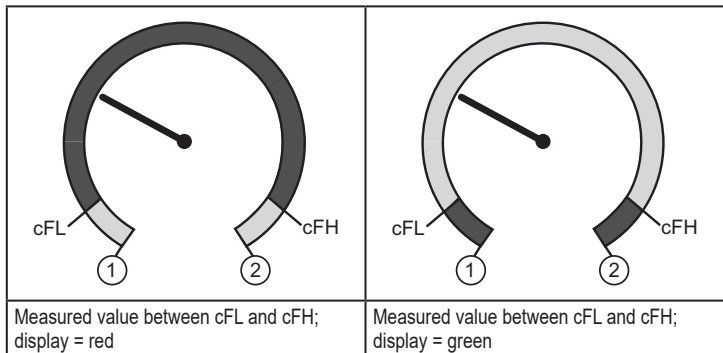
Display colour change for the parameter [r1ou], mode <b>hysteresis function</b>	Display colour change for the parameter [G1ou], mode <b>hysteresis function</b>
---	---



 <p>OUT1</p> <p>1 2</p>	 <p>OUT1</p> <p>1 2</p>
<p>Measured value &gt; switch point OUT1; display = red</p>	<p>Measured value &gt; switch point OUT1; display = green</p>

<p>Display colour change for the parameter <b>[r1ou]</b>, mode <b>window function</b></p>	<p>Display colour change for the parameter <b>[G1ou]</b>, mode <b>window function</b></p>
 <p>FL1 FH1</p> <p>1 2</p>	 <p>FL1 FH1</p> <p>1 2</p>
<p>Measured value between FL1 and FH1; display = red</p>	<p>Measured value between FL1 and FH1; display = green</p>

	<p>Colour change display green</p>
	<p>Colour change display red</p>
<p>1</p>	<p>Initial value of the measuring range</p>
<p>2</p>	<p>Final value of the measuring range</p>

<p>Display colour change with parameter <b>[r-cF]</b> independent of OUT1.</p>	<p>Display colour change with parameter <b>[G-cF]</b> independent of OUT1</p>
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	Colour change display green
	Colour change display red
1	Initial value of the measuring range
2	Final value of the measuring range
cFL	Lower limit value (independent of the output function)
cFH	Upper limit value (independent of the output function)

## 14 Operation

After power on, the unit is in the Run mode (= normal operating mode). It carries out its measurement and evaluation functions and provides output signals according to the set parameters.

Operation indication → chapter 9 Operating and display elements.

### 14.1 Read set parameters

- ▶ Press [●].
- ▶ Press [▲] or [▼] until the required parameter is displayed.
- ▶ Briefly press [●].
- > The unit displays the corresponding parameter value for approx. 30 s; then it changes to the process value display.

## 14.2 Self-diagnosis / error indications

The unit provides self-diagnostic options.

- It monitors itself automatically during operation.
- Warnings and faults are displayed (even if the display is deactivated), in addition they are available via IO-Link.

Display	Type of fault	Corrective measures
C.Loc	Parameter setting locked via push-buttons, parameter setting is active via IO-Link communication.	▶ Wait until parameter setting via IO-Link is finished.
S.Loc	Setting buttons locked via parameter software. Parameter change is rejected.	▶ Unlocking only possible via IO-Link interface / parameter software.
OL	Rotational speed too high. (measuring range exceeded)	▶ Reduce the rotational speed, avoid overload of the unit.

## 15 Factory setting

	Factory setting	User setting
<b>Encoders</b>		
rSLt	1024	
CDir	cw (clockwise)	
out	HTL	
Mode	Enc (encoder)	
coLr	red	
cFH	512	
cFL	256	
diS	d2	
<b>Speed monitors</b>		
uni	rpm	
SP1 / FH1	512	
rP1 / FL1	256	
ou1	Hno	
SDLy	0.5 s	
<b>Counters</b>		
PSt	1000	
ou1	pSt	
In1	pSt	
h.Tim	1 s	

More information at [www.ifm.com](http://www.ifm.com).