



## Operating manual

### Ultrasonic label and splice sensor with one or two switching outputs with IO-Link interface

- esf-1/CF/A
- esf-1/CDF/A
- esf-1/7/CDF/A
- esf-1/15/CDF/A

### Functional principle

An ultrasonic transmitter in the lower leg of the fork transmits a fast sequence of pulses through the backing material. The sound pulses cause the backing material to vibration, so that a weakened sound wave is transmitted from the opposite side. The receiver in the upper leg of the fork receives and evaluates this sound wave. The esf-1 sensor can be used as a label sensor and/or a splice sensor. The backing material transmits a different signal level than the backing material with label or web material with splice. The difference between the backing material and backing with label or the web material and splice can be very subtle. To ensure reliable detection, the esf-1 sensor must therefore initially learn the signal level for the backing or web material. With its three Teach-in methods, the esf-1 sensor can be optimally adjusted to any task configuration. With QuickTeach, there is also a simplified Teach-in procedure available.

### Product description

- Reliable detection of labels made of paper, metal or (transparent) plastic
- Detection of splices of paper-, plastic- or metal webs
- Detection of materials with gram-mages from <math><20 \text{ g/m}^2</math> to >>><math>400 \text{ g/m}^2</math>; sheet metals and plastic films up to 0.2 mm thickness
- Three standard Teach-in methods and optional QuickTeach.
- Configurable via LinkControl and IO-Link
- Response time of 300  $\mu\text{s}$  for label/splice detection
- Three fork depths of 70 mm, 86 mm and 165 mm

### IO-Link

The esf-1 sensor is IO-Link-capable in accordance with IO-Link specification V1.1 and supports Smart Sensor Profile like Digital Measuring Sensor. The sensor can be monitored and parameterized via IO-Link.

The latest IODD file and informations about start-up and configuration of esf-1 sensors via IO-Link, you will find online at:

- [www.microsonic.de/en/esf](http://www.microsonic.de/en/esf).

### Safety Notes

- Read the operating manual prior to start-up.
- Connection, installation and adjustments may only be carried out by qualified staff.
- No safety component in accordance with the EU Machine Directive, use in the area of personal and machine protection not permitted.

### Proper Use

esf-1 ultrasonic sensors are used for non-contact detection of labels and splices.

### Installation

- Install the esf-1 in such a way that the leg with the button is on top. This mounting position permits you to keep the measuring track optimally clean.
- Connect the sensor with the 4-pin M8 initiator plug as shown in Fig. 1, and with 5-pin M12 initiator plug as shown in Fig. 2.

### Start-up

- Connect the power supply.
- Insert web material into the fork without the material touching the fork.
- Carry out one of the three standard Teach-in methods or QuickTeach.

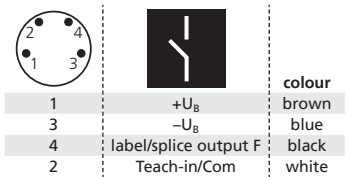


Fig. 1: Pin assignment of esf-1/CF and colour coding for microsonic connection lines

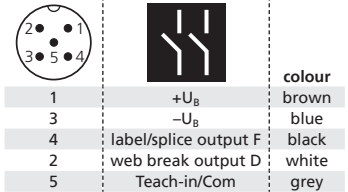


Fig. 2: Pin assignment of esf-1../CDF/A and colour coding of the microsonic connection lines

### Teach-in via push-button and control input

The Teach-in procedure can be carried out via the button on the top leg of the fork or with the Teach-in/Com input on pin 5 on the M12 connector or pin 2 on the M8 connector.

### Notes using Teach-in

- The Teach-in/Com control input is parallel with the push-button.
- +U<sub>B</sub>/-U<sub>B</sub> connected to the control input corresponds to a key press.
- A Teach-in using the control input can also be carried out with active synchronisation.
- A failed teach-in is indicated by the flashing of the 3 LEDs.

### Standard Teach-in

- There are three Teach-in methods available (see Diagram 1):
  - Dynamic Teach-in of labels
  - Separate Teach-in for backing material and labels
  - Splice sensor

### QuickTeach

With QuickTeach (see Diagram 2), you have optional a simplified Teach-in procedure. QuickTeach must be enabled once before use.

### Notes using QuickTeach

- To use QuickTeach, you have to decide whether the sensor will act as a label or a splice detector.
- Once QuickTeach is enabled, you can't switch between NCC/NOC any more.

### Operation

The esf-1 continually performs measurements and sets the switching outputs based on its results. An overview of the operating modes with the associated LED displays is shown in Fig. 3.

operation mode	LED green	LED yellow	LED red
ready for use	on	-	-
backing material	on	off	off
label/splice	on	on	off
web break	on	off	on
error in Teach-In	flash	flash	flash

Fig. 3: LED display

### Factory setting

The esf-1 sensor is delivered factory made with the following settings:

### esf-1/CF/A

- Label/splice output F on NOC
- QuickTeach is disabled

### esf-1../CDF/A

- Label/splice output F on NOC
- Output D on web break display
- Output web break on NOC
- QuickTeach is disabled

The sensor can be reset to its factory setting (see »Further settings«, Diagram 3).

### Synchronisation

- If multiple esf-1 sensors are operated in tight space, they can influence one another. To avoid this, the esf-1 sensors can be synchronised.
  - To do this, connect all Teach-in/Com control inputs together.
  - See Fig. 1 and Fig. 2 for the pin assignment.

### Configuration via LinkControl

Using the LinkControl adapter (optional accessory) and the LinkControl software for Windows®, all Teach-in and additional sensor parameter settings can be optionally adjusted.

### Operation with LinkControl

- Install LinkControl-software at your PC.
- Connect the adapter to your PC using the usb cable.
- Connect the power supply cable at the T-connector of the LCA-2.
- Start the LinkControl-Software and follow the instructions on the screen.
- To connect the esf-1/CF/A with the LinkControl-Adapter you need an adapter cable M8 to M12 (see Fig. 4).

	pin (esf-1)	colour adapter cable	pin (LCA-2)
+U <sub>B</sub>	1	brown	1
-U <sub>B</sub>	3	blue	3
Com	2/5	grey	5

Fig. 4: Connection of the esf-1 to the LCA-2

You can make the following settings:

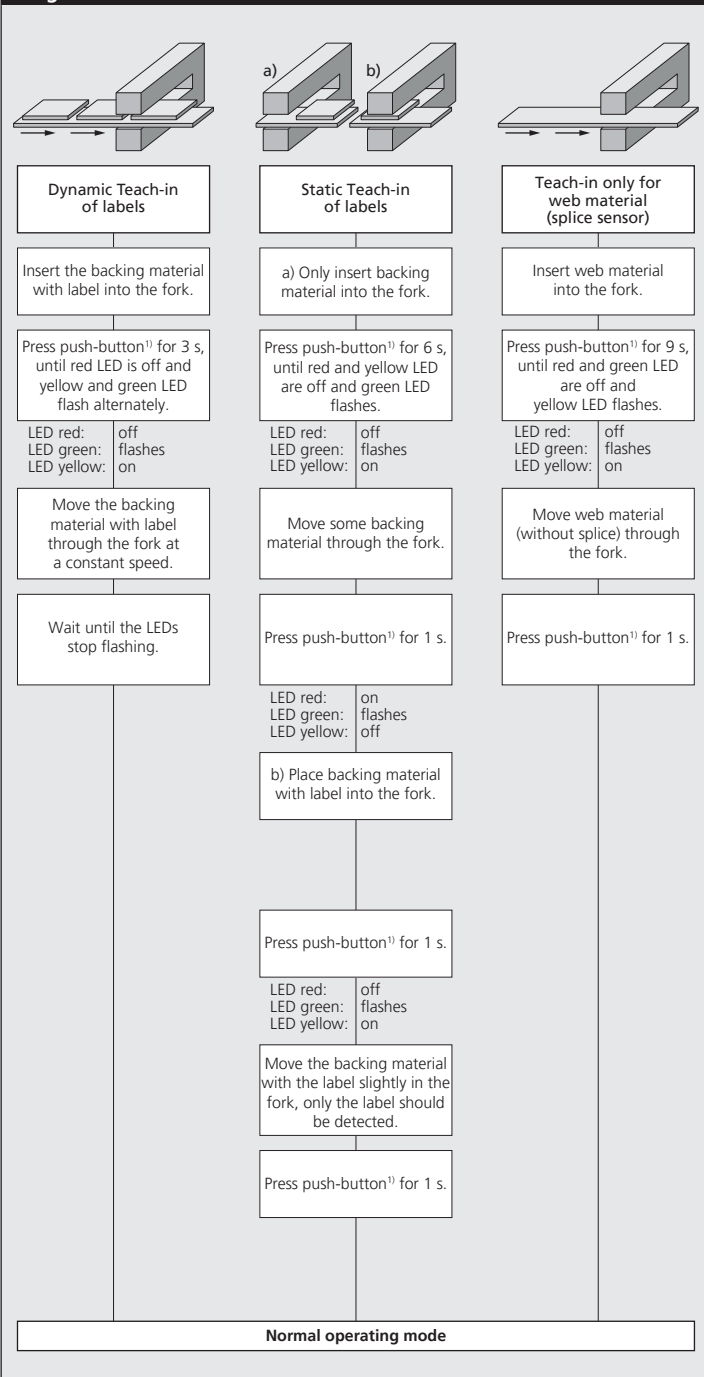
- NC/NO function of the switching outputs
- Function of the switching output D
- Teach-in procedure
- Enable/disable QuickTeach

In addition, the measurement data are shown in a graph.

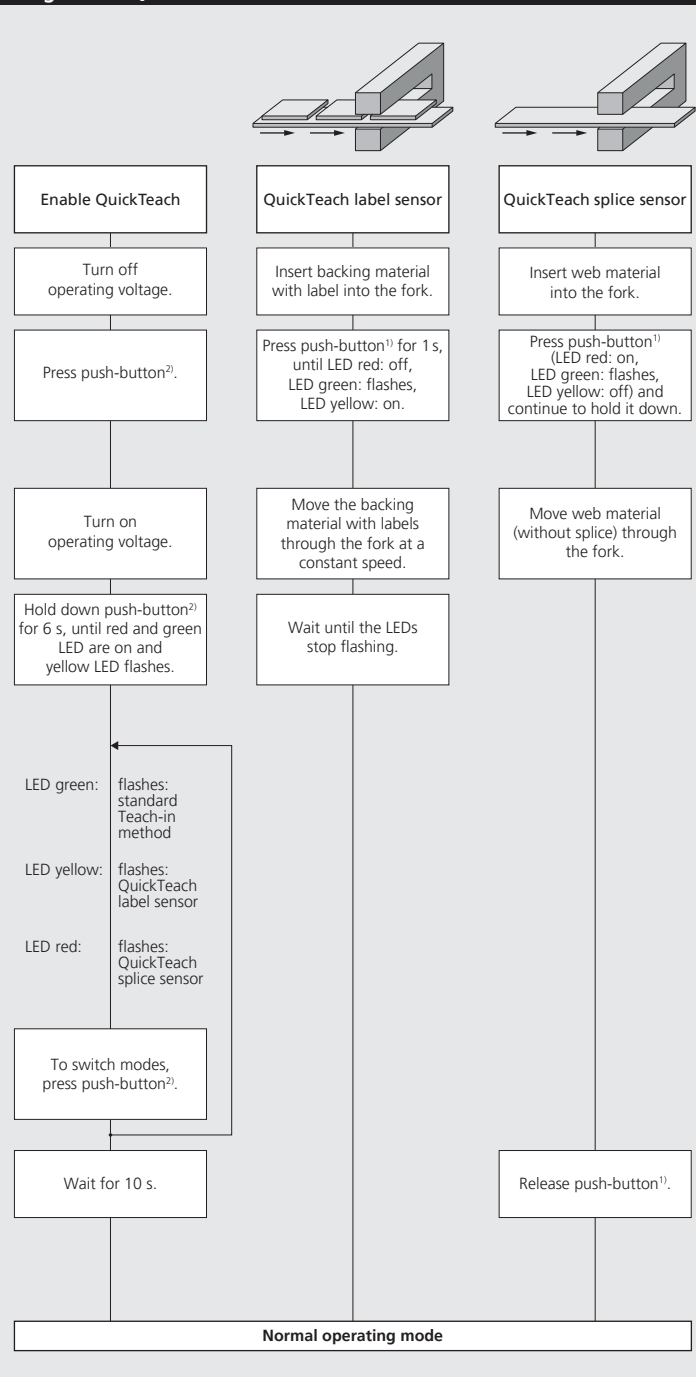
### Maintenance

The esf-1 is maintenance-free. For significant deposits of dirt, we recommend carefully blowing out the measuring track with clean, oil-free compressed air.

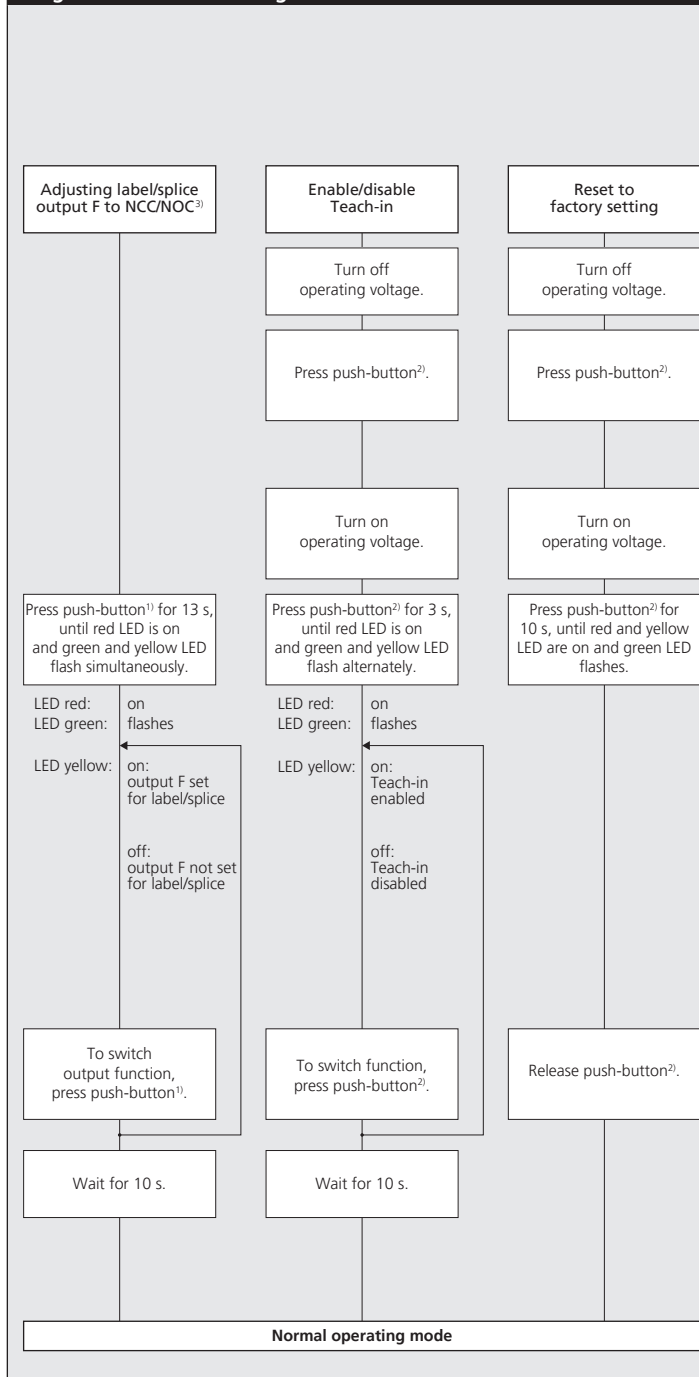
**Diagram 1: Standard Teach-in methods**



**Diagram 2: QuickTeach**



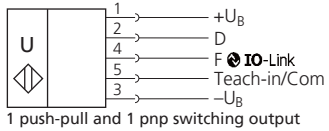
**Diagram 3: Further settings**



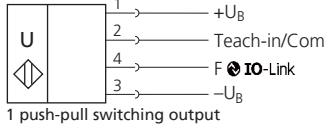
<sup>1)</sup> All settings via push-button can alternatively be made by connecting the Teach-in/Com input to +U<sub>B</sub>.  
<sup>2)</sup> All settings via push-button can alternatively be made by connecting the Teach-in/Com input to -U<sub>B</sub>.  
<sup>3)</sup> Only available in standard Teach-in methods.

# Technical Data

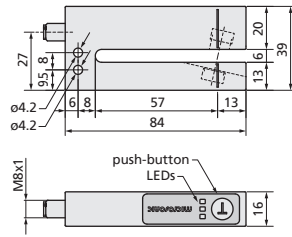
esf-1/CDF/A; esf-1/7/CDF/A; esf-1/15/CDF/A



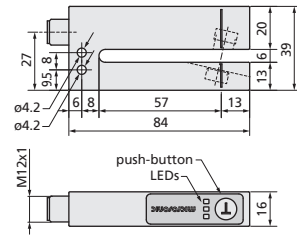
esf-1/CF/A



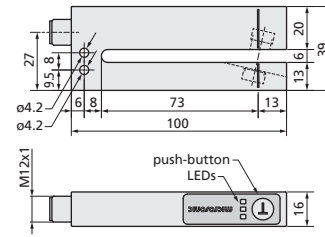
esf-1/CF/A



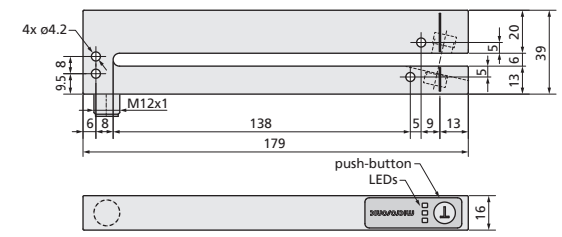
esf-1/CDF/A




esf-1/7/CDF/A



esf-1/15/CDF/A



<b>fork width</b>	6 mm	6 mm	6 mm	6 mm
<b>fork depth</b>	70 mm	70 mm	70 mm	86 mm
<b>transducer frequency</b>	500 kHz	500 kHz	500 kHz	500 kHz
<b>working range</b>	web material with grammages of <math><20 \text{ g/m}^2 \text{ to } >>400 \text{ g/m}^2</math>, metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	web material with grammages of <math><20 \text{ g/m}^2 \text{ to } >>400 \text{ g/m}^2</math>, metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	web material with grammages of <math><20 \text{ g/m}^2 \text{ to } >>400 \text{ g/m}^2</math>, metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	web material with grammages of <math><20 \text{ g/m}^2 \text{ to } >>400 \text{ g/m}^2</math>, metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material
<b>operating voltage <math>U_B</math></b>	20 to 30 V DC, reverse polarity protection (Class 2)	20 to 30 V DC, reverse polarity protection (Class 2)	20 to 30 V DC, reverse polarity protection (Class 2)	20 to 30 V DC, reverse polarity protection (Class 2)
<b>operating voltage ripple</b>	$\pm 10 \%$	$\pm 10 \%$	$\pm 10 \%$	$\pm 10 \%$
<b>no-load current consumption</b>	$\leq 50 \text{ mA}$	$\leq 50 \text{ mA}$	$\leq 50 \text{ mA}$	$\leq 50 \text{ mA}$
<b>type of connection</b>	4-pin M8 initiator plug	5-pin M12 initiator plug	5-pin M12 initiator plug	5-pin M12 initiator plug
<b>controls</b>	Teach-in push-button, control input Pin 2	Teach-in push-button, control input Pin 5	Teach-in push-button, control input Pin 5	Teach-in push-button, control input Pin 5
<b>scope of settings</b>	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl
<b>response time</b>	300 $\mu\text{s}$ to 2 ms, depending on the material	300 $\mu\text{s}$ to 2 ms, depending on the material	300 $\mu\text{s}$ to 2 ms, depending on the material	300 $\mu\text{s}$ to 2 ms, depending on the material
<b>indicators</b>	LED green: working/backing material LED yellow: label/splice LED red: web break LEDs flash: Teach-in dismissed	LED green: working/backing material LED yellow: label/splice LED red: web break LEDs flash: Teach-in dismissed	LED green: working/backing material LED yellow: label/splice LED red: web break LEDs flash: Teach-in dismissed	LED green: working/backing material LED yellow: label/splice LED red: web break LEDs flash: Teach-in dismissed
<b>IO-Link housing</b>	V1.1 aluminium anodized; plastic parts: PBT, PA; ultrasonic transducer: polyurethane, epoxy resin with glass content	V1.1 aluminium anodized; plastic parts: PBT, PA; ultrasonic transducer: polyurethane, epoxy resin with glass content	V1.1 aluminium anodized; plastic parts: PBT, PA; ultrasonic transducer: polyurethane, epoxy resin with glass content	V1.1 aluminium anodized; plastic parts: PBT, PA; ultrasonic transducer: polyurethane, epoxy resin with glass content
<b>class of protection to EN 60529</b>	IP 65	IP 65	IP 65	IP 65
<b>operating temperature</b>	+5 to +60 °C	+5 to +60 °C	+5 to +60 °C	+5 to +60 °C
<b>storage temperature</b>	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C
<b>weight</b>	80 g	80 g	90 g	160 g
<b>norm conformity</b>	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
<b>time delay before availability</b>	<300 ms	<300 ms	<300 ms	<300 ms
<b>order no.</b>	<b>esf-1/CF/A</b>	<b>esf-1/CDF/A</b>	<b>esf-1/7/CDF/A</b>	<b>esf-1/15/CDF/A</b>
<b>label/splice output F</b>	push-pull, $+U_B-3 \text{ V}$ , $-U_B+3 \text{ V}$ , $I_{\text{max}} = 100 \text{ mA}$ , short-circuit-proof, switchable NOC/NCC	push-pull, $+U_B-3 \text{ V}$ , $-U_B+3 \text{ V}$ , $I_{\text{max}} = 100 \text{ mA}$ , short-circuit-proof, switchable NOC/NCC pnp, $+U_B-3 \text{ V}$ , $I_{\text{max}} = 100 \text{ mA}$ , short-circuit-proof, switchable NOC/NCC	push-pull, $+U_B-3 \text{ V}$ , $-U_B+3 \text{ V}$ , $I_{\text{max}} = 100 \text{ mA}$ , short-circuit-proof, switchable NOC/NCC pnp, $+U_B-3 \text{ V}$ , $I_{\text{max}} = 100 \text{ mA}$ , short-circuit-proof, switchable NOC/NCC	push-pull, $+U_B-3 \text{ V}$ , $-U_B+3 \text{ V}$ , $I_{\text{max}} = 100 \text{ mA}$ , short-circuit-proof, switchable NOC/NCC pnp, $+U_B-3 \text{ V}$ , $I_{\text{max}} = 100 \text{ mA}$ , short-circuit-proof, switchable NOC/NCC
<b>web break output D</b>				


 Enclosure Type 1  
 For use only in industrial machinery NFPA 79 applications.

The proximity switches shall be used with a Listed (CYJ/V7) cable/connector assembly rated minimum 32 Vdc, minimum 290 mA, in the final installation.

