esp-4

Label and splice sensor compact in a single unit, optionally with M12 sensor head.

HIGHLIGHTS

- 3 Teach-in methods › to be able to configure the sensor individually for any task
- Response time < 300 µs › for use at high web and label speeds
- Splice detection even for thick band materials
- Variant with very compact transmitter and receiver in the M12 threaded sleeve

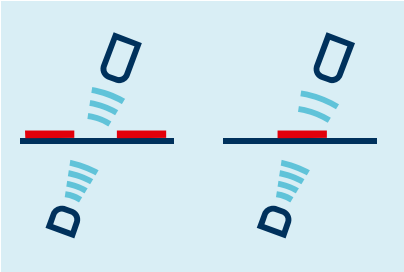
BASICS

- Label and splice sensor in a single unit
- 2 switching outputs › for label/splice detection and web break monitoring
- LinkControl › as optional assistance for installation and commissioning

esp-4 – one unit for all cases: label and splice sensor in one appliance

With a rapid pulse sequence, an ultrasonic transmitter beams upwards against the backing material. The effect of the sound pulses inducing the backing material to vibrate is for a markedly weakened sonic wave to be emitted on the opposite side.

The receiver receives this sonic wave and analyses it. The backing material signal level is different to that of the label or splice. And this difference in signal is analysed by the esp-4. The difference between backing material and a label or between sheeting and splice can be very slight indeed. In order to differentiate, the esp-4 sensor has to learn the signal level for the backing material or sheeting.



Backing material with label provides an attenuated signal level

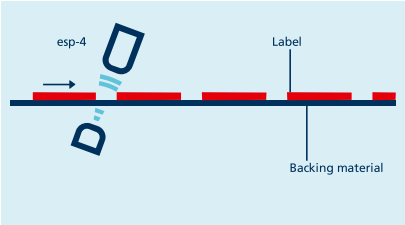
The esp-4 sensors can be used as a label and splice sensor. The three Teach-in methods permit the esp-4 sensor to be optimally set for each and every assignment.

A) Dynamic Teach-in of backing material and label

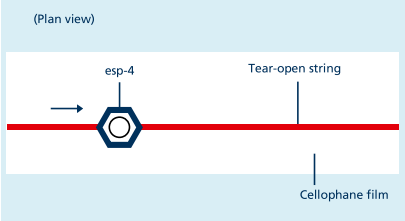
During Teach-in, the backing material with the labels is led at a constant speed through the esp-4 sensor.

The esp-4 sensor automatically learns signal levels for the labels and for the gaps between them.

This Teach-in method is also suitable for Teach-in of a tear-open string on a cellophane film. Here, during Teach-in, the tear-open string on the cellophane film is moved a number of times through the sensor. This enables the esp-4 to gauge the changing between cellophane film and tear-open string.



esp-4 as label sensor



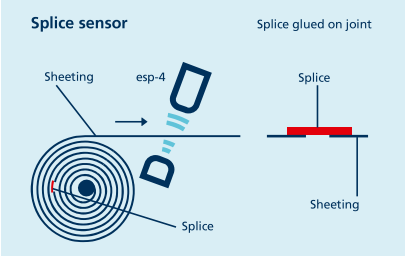
esp-4 as thread sensor

B) Separate Teach-in for backing material and labels

The signal level difference for the backing material and labels might be very slight. In order to still scan labels with very little difference in signals, Teach-in for the signal levels is done separately: Teach-in is first done for the backing material and then for the label on it. The switching threshold then lies between these two signal levels.

C) Learn sheeting only

Sheeting is usually processed from the roll. Then the splice to be detected for setting the esp-4 is somewhere inaccessible in this roll. A separate Teach-in method is available here in which the Teach-in only applies to the sheeting. The esp-4 detects the splice from this difference in sound level and sets its output.



esp-4 as splice sensor

Two housing designs with different ultrasonic frequencies

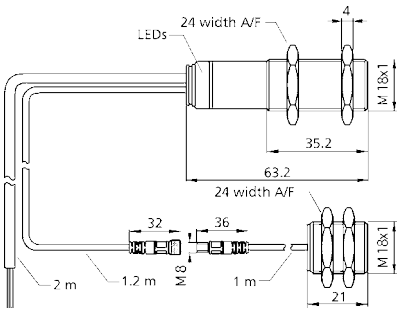
The esp-4/3CDD/M18 E+S as a receiving transducer integrated directly into the evaluation electronics is typically used for the detection of splices in thick sheeting.

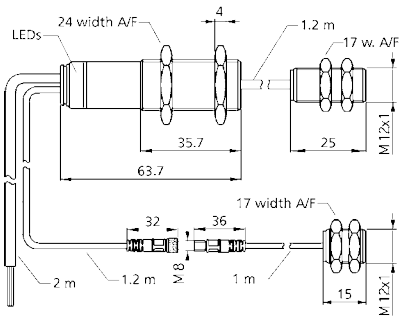
The esp-4/M12/3CDD/M18 E+S has an external receiving transducer. The transmitter and receiver are each housed in M12 threaded sleeves. The variant with M12 sensor heads is preferred for the detection of labels.

With LinkControl

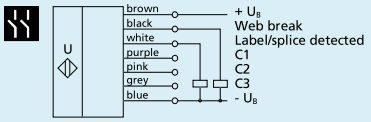
the esp-4 can optionally be parameterised. Measured values can also be shown graphically.

	esp-4	esp-4
	esp-4/3CDD/M18 E+S **esp-4/3BEE/M18 E+S**	**esp-4/M12/3CDD/M18 E+S** **esp-4/M12/3BEE/M18 E+S**

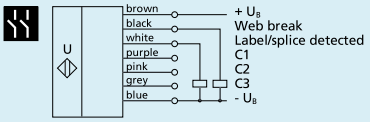




transmitter/receiver spacing	20 – 40 mm; optimal: 40 mm ± 3 mm	20 – 30 mm; optimal: 20 mm ± 2 mm
blind zone	7 mm in front of transmitter and receiver	5 mm in front of transmitter and receiver
permissible angular deviation	recommended mounting angle: ± 15° (± 10° to ± 27°) from the normal line to the material	recommended mounting angle: ± 15° (± 10° to ± 27°) from the normal line to the material
transducer frequency	400 kHz	500 kHz
working range	sheeting with weights of < 20 g/m² to >> 600 g/m², metal-laminated sheets and films up to 0.6 mm thick, self-adhesive films, labels on backing material	sheeting with weights of < 20 g/m² to >> 600 g/m², metal-laminated sheets and films up to 0.6 mm thick, self-adhesive films, labels on backing material
operating voltage U_B	20 V to 30 V DC	20 V to 30 V DC
no-load current consumption	≤ 50 mA	≤ 50 mA
type of connection	2 m PUR cable, 7 x 0.25 mm²	2 m PUR cable, 7 x 0.25 mm²
transmitter cable	at the receiver: 1.2 m PUR cable, at the transmitter: 1 m PUR cable with M8 plug	at the receiver: 1.2 m PUR cable, at the transmitter: 1 m PUR cable with M8 plug; to the swapped out receiving transducer: 1.2 m PVC cable
controls	3 control inputs: C1 to C3	3 control inputs: C1 to C3
scope for settings	• Teach-in via control inputs • LCA-2 with LinkControl	• Teach-in via control inputs • LCA-2 with LinkControl
indicators	duo-LED; green: working, red: label/splice detected, flashing red: web break	duo-LED; green: working, red: label/splice detected, flashing red: web break
housing	brass sleeve, nickel-plated, plastic parts: PBT, PA; ultrasonic transducer: polyurethane foam, epoxy resin with glass content	brass sleeve, nickel-plated, plastic parts: PBT, PA; ultrasonic transducer: polyurethane foam, epoxy resin with glass content
class of protection according to EN 60529	IP 65	IP 65
operating temperature	+5°C to +60°C	+5°C to +60°C
storage temperature	-40°C to +85°C	-40°C to +85°C
weight	130 g	160 g
response time	300 µs to 2.25 ms, depending on material	300 µs to 2.25 ms, depending on material
release delay	300 µs to 2.25 ms, depending on material	300 µs to 2.25 ms, depending on material
delay prior to availability	< 300 ms	< 300 ms
order number	**esp-4/3CDD/M18 E+S**	**esp-4/M12/3CDD/M18 E+S**
output label/splice detected	pnp, U_B-2 V, I_{max} = 200 mA NOC/NCC adjustable, short-circuit-proof	pnp, U_B-2 V, I_{max} = 200 mA NOC/NCC adjustable, short-circuit-proof
output web break	pnp, U_B-2 V, I_{max} = 200 mA NOC/NCC adjustable, short-circuit-proof	pnp, U_B-2 V, I_{max} = 200 mA NOC/NCC adjustable, short-circuit-proof

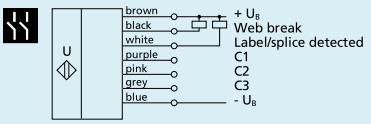


2 pnp switching outputs

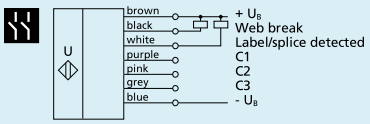


2 pnp switching outputs

order number	**esp-4/3BEE/M18 E+S**	**esp-4/M12/3BEE/M18 E+S**
output label/splice detected	npn, -U_B+2 V, I_{max} = 200 mA NOC/NCC adjustable, short-circuit-proof	npn, -U_B+2 V, I_{max} = 200 mA NOC/NCC adjustable, short-circuit-proof
output web break	npn, -U_B+2 V, I_{max} = 200 mA NOC/NCC adjustable, short-circuit-proof	npn, -U_B+2 V, I_{max} = 200 mA NOC/NCC adjustable, short-circuit-proof



2 npn switching outputs



2 npn switching outputs

esf-1

The esf-1 fork sensor can detect labels reliably even at high label speeds.

HIGHLIGHTS

- 3 Teach-in methods › for the detection of labels even outside the standard
- Response time < 300 µs › for use at high web speeds
- Housing in fork format with very compact dimensions
- QuickTeach
- IO-Link interface › for support of the new industry standard

BASICS

- Label and splice sensor as a fork sensor
- 2 switching outputs › for label/splice detection and web break monitoring
- 3 LEDs and 1 button on the top of the housing
- Teach-in optionally via button or pin 5
- LinkControl › as optional assistance for installation and commissioning

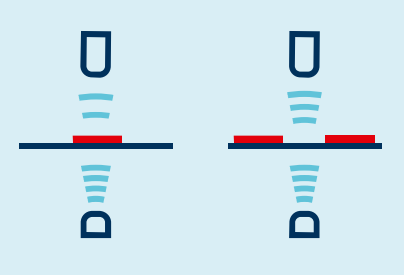
IO-Link integrated

Also see the chapter "Function and advantages"

The functional principle

Labels are guided through the fork. An ultrasonic transmitter in the lower leg of the fork beams a fast sequence of pulses through the backing material. The sound pulses cause the backing material to vibrate such that a greatly attenuated sound wave is beamed from the opposite side. The receiver in the upper leg of the fork receives this sound wave.

The backing material transmits a different signal level from the label. This signal difference is evaluated by the esf-1. The signal difference between the backing material and the label can be very slight. To ensure a reliable distinction, the esf-1 has to learn the label.



Backing material with a label provides an attenuated signal level.

The esf-1

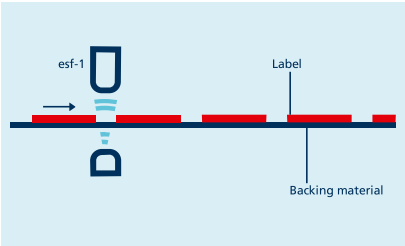
can be used as a label sensor or as a splice sensor. With its three Teach-in methods or QuickTeach, the esf-1 sensor can be optimally adjusted to any task configuration.

A) Learn both backing material and label dynamically

During the Teach-in process, the backing material and its labels are guided through the fork at a constant speed.

The esf-1 sensor automatically learns the signal level for the labels and for the gaps between the labels.

This is the standard Teach-in for labels.



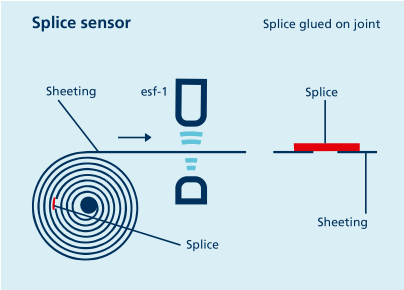
esf-1 as label sensor

B) Separate Teach-in for backing material and labels

The signal level difference for the backing material and labels might be very slight. In order to still scan labels with very little difference in signals, Teach-in for the signal levels is done separately: Teach-in is first done for the backing material and then for the label on it. The switching threshold then lies between these two signal levels.

C) Learn sheeting only

Web material is generally processed from a roll. The splice to be detected is hidden somewhere in the roll. There is a separate Teach-in method available for this purpose, in which only the sheeting is learned. The esf-1 detects the level difference at the splice and sets its output.



esf-1 as splice sensor

The Teach-in procedure

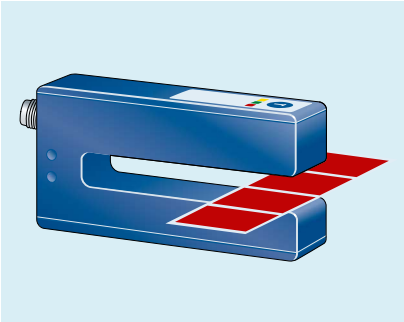
can optionally be carried out with the button on the top of the housing or with pin 5 on the unit's connector.

For QuickTeach

the esf-1 learns the material for the duration that the button is pushed or pin 5 is controlled.

With LinkControl

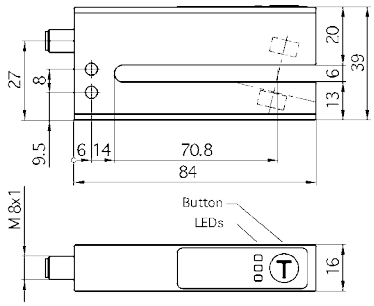
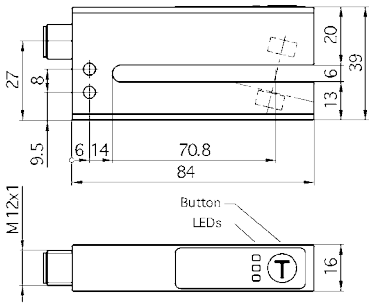
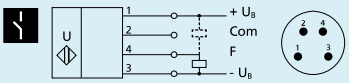
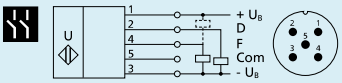
the esf-1 can optionally be parameterised. Measured values can also be shown graphically.



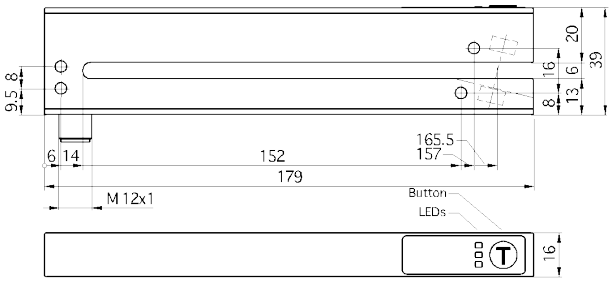
Labels are guided through the fork. The esf-1 reacts to the signal difference between the backing material and the label.

IO-Link

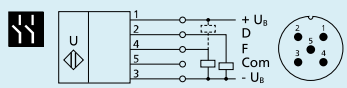
esf ultrasonic label and splice sensors have a Push-Pull switching output and support IO-Link in version 1.1.

	esf-1/CF/A	esf-1/CDF/A
		
fork width	6 mm	6 mm
fork depth	67 mm	67 mm
transducer frequency	500 kHz	500 kHz
working range	sheeting with weights of < 20 g/m²	sheeting with weights of < 20 g/m²
	to >> 400 g/m², metal-laminated sheets and films	to >> 400 g/m², metal-laminated sheets and films
	up to 0.2 mm thick, self-adhesive films,	up to 0.2 mm thick, self-adhesive films,
	labels on backing material	labels on backing material
operating voltage U_B	20 V to 30 V DC	20 V to 30 V DC
no-load current consumption	≤ 50 mA	≤ 50 mA
type of connection	4-pin M8 initiator plug	5-pin M12 initiator plug
controls	button und com input (pin 2)	button und com input (pin 5)
scope for settings	• Teach-in via push-button	• Teach-in via push-button
	• Teach-in via com input on pin 2	• Teach-in via com input on pin 5
	• LCA-2 with LinkControl	• LCA-2 with LinkControl
	• IO-Link	• IO-Link
indicators	3 LEDs: green: working, yellow: label/splice detected,	3 LEDs: green: working, yellow: label/splice detected,
	red: web break	red: web break
housing	anodised aluminium; ultrasonic transducer:	anodised aluminium; ultrasonic transducer:
	polyurethane foam, epoxy resin with glass content	polyurethane foam, epoxy resin with glass content
class of protection according to EN 60529	IP 65	IP 65
IO-Link	V 1.1	V 1.1
IO-Link SIO mode support	yes	yes
IO-Link min. cycle time	4 ms	4 ms
Smart Sensor Profile	yes	yes
operating temperature	+5°C to +60°C	+5°C to +60°C
storage temperature	-40°C to +85°C	-40°C to +85°C
weight	80 g	80 g
response time	300 µs to 2.25 ms, depending on material	300 µs to 2.25 ms, depending on material
release delay	300 µs to 2.25 ms, depending on material	300 µs to 2.25 ms, depending on material
delay prior to availability	< 300 ms	< 300 ms
order number	**esf-1/CF/A**	**esf-1/CDF/A**
output F label/splice detected	Push-Pull, U_B-3 V, -U_B+3 V, I_{max} = 100 mA	Push-Pull, U_B-3 V, -U_B+3 V, I_{max} = 100 mA
	NOC/NCC adjustable, short-circuit-proof	NOC/NCC adjustable, short-circuit-proof
output D web break		pnp, U_B-2 V, I_{max} = 100 mA
		NOC/NCC adjustable, short-circuit-proof
		
	1 Push-Pull switching output	1 Push-Pull and 1 pnp switching output

esf-1/15/CDF/A



6 mm
149.5 mm
500 kHz
sheeting with weights of < 20 g/m²
to >> 400 g/m², metal-laminated sheets and films
up to 0.2 mm thick, self-adhesive films,
labels on backing material
20 V to 30 V DC
≤ 50 mA
5-pin M12 initiator plug
button und com input (pin 5)
• Teach-in via push-button
• Teach-in via com input on pin 5
• LCA-2 with LinkControl
• IO-Link
3 LEDs: green: working, yellow: label/splice detected,
red: web break
anodised aluminium; ultrasonic transducer:
polyurethane foam, epoxy resin with glass content
IP 65
V 1.1
yes
4 ms
yes
+5°C to +60°C
-40°C to +85°C
160 g
300 µs to 2.25 ms, depending on material
300 µs to 2.25 ms, depending on material
< 300 ms
esf-1/15/CDF/A
Push-Pull, U_B-3 V, -U_B+3 V, I_{max} = 100 mA
NOC/NCC adjustable, short-circuit-proof
pnp, U_B-2 V, I_{max} = 100 mA
NOC/NCC adjustable, short-circuit-proof



1 Push-Pull and 1 pnp switching output