microsonic

Operation manual

Ultrasonic label and splice sensor with 2 switching outputs

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

Functional principle

With a rapid pulse sequence, an ultrasonic transmitter beams upwards against the backing material. The sound pulses causes the backing material to vibrate, so that a greatly weakened sonic wave is 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 label and/or between sheeting and splice can be very slight. In order to ensure reliable detection, the esp-4 sensor has to learn first the signal level of the backing material/sheeting.
The esp-4 sensors can be used as a label and splice sensor. The 3 Teach-in methods and QuickTeach allow the esp-4 sensor to be optimally set for each and every assignment.

Product description

- Reliable detection of labels made of paper, metal or (transparent) plastic.
- Reliable detection of splices of paper web, plastic web or metal web.
- Detection of web break.
- Detection of material weights from <20 g/m^2 to >>600 g/m^2; sheet metals and plastic films up to 0.6 mm thickness.
- 3 Teach-in methods and QuickTeach.
- Synchronisation.
- Parametrisation via LinkControl.
- Response time of 300 µs until label/splice is detected.
- Transmitter - receiver spacing can be selected from 20 to 40 mm (or 30 mm with esp-4/M12/...E+S).

Safety Notes

- Read the operation manual before start-up.
- Connection, installation and settings should be carried out by expert personnel only.
- No safety component in accordance with the EU Machine Directive.

Proper use

The esp-4 sensors are used for non-contact detection of labels and splice as well as web break.

Installation

- Mount transmitter and receiver as shown in figure 1 at the recommended spacing of 40 mm ± 3 mm (or 20 mm ± 2 mm with esp-4/M12/...E+S).
- Connect the transmitter to the receiver using the M8 connector.
- Connect the receiver 7-strand control line as shown in figure 2.

	Colour
+U_B	Brown
-U_B	Blue
label/splice output D1	White
web break output D2	Black
control input C1	Violet
control input C2	Pink
control input C3	Grey

Fig. 2: Colour coding of the connection line

Notes

- The coaxiality of transmitter and receiver must be ≤ 0.5 mm.
- Transmitter and receiver should not incline more than 2° to each other.
- In case of thicker plastic films the esp-4 has to be mounted at a 27° inclination to sheet normal (see figure 1b).
- Other materials may need a special fitting position. If you work with these special materials, please do not hesitate to contact the technical support team of microsonic.
- The max. torque of the nuts is 15 Nm for the M18 and 8 Nm for the M12 sleeves respectively.
- The drill hole in a sheet guide must be ≥ 18 mm given that the transmitter is recess-mounted or a sheet guide is envisaged between transmitter and receiver.

Start-up

- For normal operating mode leave all the 3 control inputs open (see figure 3).
- Switch on the esp-4 voltage supply.

Input	Function	Setting procedure
C1	Teach-in	See »Teach-in« and »QuickTeach«
C2	Automatic tracking	+U_B on C_2
C3	Synchronisation/ communication	**Sync**: C3 connect with each other **Com**: Connect with LCA-2 *

1) C3 must not be connected to -U_B or +U_B

Fig. 3: Function of control inputs

Teach-in

Teach-in is carried out via control input C1.
There are 3 Teach-in methods:

- Dynamic Teach-in of backing material and label
- Separate Teach-in for backing material and labels
- Teach-in only for sheeting
- Place the web material between transmitter and receiver of the esp-4 and carry out one of the three Teach-in methods.

QuickTeach

With QuickTeach, you have a simplified Teach-in process that you have to activate once via LinkControl before initial commissioning. You can teach-in the material via control input C1.

- Set in LinkControl software, whether the esp-4 should work as label or splice sensor.
- Place the web material between transmitter and receiver. Run QuickTeach via control input C1 according the flowcharts QuickTeach.

Notes

- Every Teach-in should be performed with at least 0.5 m of label or web material to ensure that the sensor is able to detect the whole range of the material inhomogeneities.
- A failed Teach-in is indicated by the red flashing of both LEDs. Meanwhile the sensor keeps former settings in normal operating mode.

Logic level	Voltage level
0	< -U_B + 13 V
1	> -U_B + 18 V

Fig. 4: Voltage level of the logic levels at the control inputs

Operation

The esp-4 continually performs measurements and sets the switching outputs based on its results.

The automatic tracking can be activated/deactivated via control input C2 during normal operating mode.

	LED 1	LED 2
Normal operating mode	Green	Green
backing material	Green	Green
label/splice	Red	Green
web break	Green	Flashing red
Teach-in	See »Teach-in methods«	
Teach-in dismissed	Flashing red*	Flashing red*

**) LEDs flashes for 3 seconds.*

Fig. 5: LED displays

The conditions of LED 1 and 2 are shown in figure 5.

Factory setting

The esp-4 are delivered with the following factory settings:

- Output label/splice output D1 on NOC.
- Output D2 on function web break.
- Output web break on NOC.
- 40 or 20 mm spacing.
- Operating mode automatic tracking on/off via control input C2.
- QuickTeach is deactivated.

Automatic tracking

After a Teach-in the esp-4 can track the switching threshold automatically. In this way variations in the material to be scanned and fluctuation in the ambient temperature can be compensated.

- With the start of moving material change control input C2 on logic level 1.
- With stop of moving material change control input C2 on logic level 0.

Notes

- If the material movement stops, it is mandatory to deactivate the automatic tracking via control input C2.
- During Teach-in procedure, the automatic tracking must be deactivated via control intput C2.

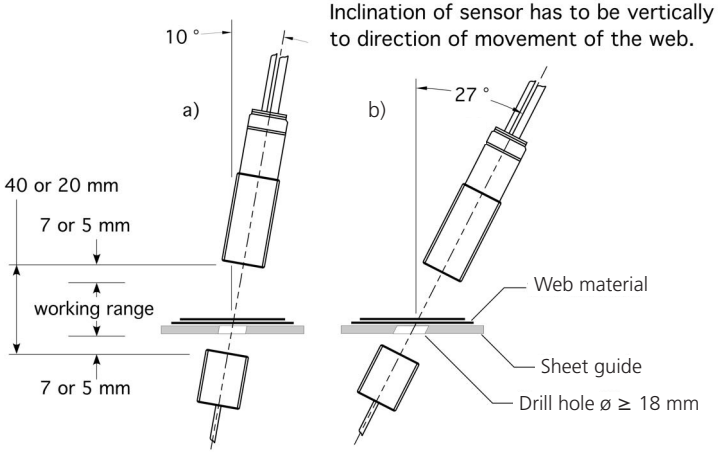
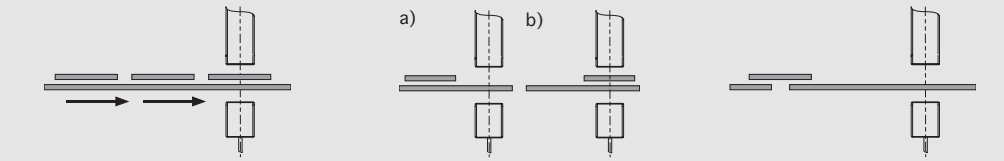


Fig. 1: Mounting and installation positions

Teach-in



Teach-in label dynamic

Place backing material with label between transmitter and receiver.

Place control input C1 on logic level 1 for 3 s until both LED flash alternately.

one LED flashes green, one LED is static green

Pull backing material with labels through transmitter and receiver with constant speed.

one LED flashes green, one LED is static green

Place control input C1 on logic level 1 for 1 s.

one LED is static green, one LED flashes green

Teach-in label static

a) Place only backing material between transmitter and receiver.

Place control input C1 on logic level 1 for 6 s until one LED turns off and one LED flashes green.

one LED flashes green, one LED is static green

Pull only backing material through transmitter and receiver.

one LED flashes green, one LED is static green

Place control input C1 on logic level 1 for 1 s.

one LED is static green, one LED flashes green

b) Place backing material with label between transmitter and receiver.

one LED flashes green, one LED is static red

Place control input C1 on logic level 1 for 1 s.

one LED is static green, one LED flashes green

Move backing material with label between transmitter and receiver.

one LED flashes green, one LED is static green

Place control input C1 on logic level 1 for 1 s.

one LED is static green, one LED flashes green

Teach-in only for sheeting (splice sensor)

Place web material between transmitter and receiver.

Place control input C1 on logic level 1 for 9 s until both LEDs turn off.

one LED flashes green, one LED is static green

Pull web material through transmitter and receiver.

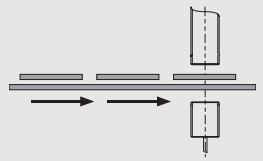
one LED flashes green, one LED is static green

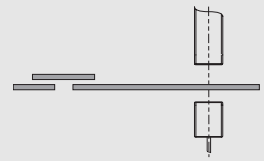
Place control input C1 on logic level 1 for 1 s.

one LED is static green, one LED flashes green

Normal operating mode

QuickTeach





Activate QuickTeach

Connect esp-4 to the LCA-2 and via USB cable to PC. Start LinkControl software.

Read all parameters from esp-4.

Activate QuickTeack and select label or splice sensor in the QuickTeach menu.

Write all parameters to esp-4.

QuickTeach label sensor

Place backing material with labels between transmitter and receiver.

Place control input C1 on logic level 1.

one LED flashes green, one LED is static green

Pull the backing material with labels through transmitter and receiver at a constant speed.

one LED flashes green, one LED is static green

Place control input C1 on logic level 0.

QuickTeach splice sensor

Place web material between transmitter and receiver.

Place control input C1 on logic level 1.

one LED flashes green, one LED is static green

Pull web material without splice through transmitter and receiver.

one LED flashes green, one LED is static green

Place control input C1 on logic level 0.

Normal operating mode

Synchronisation

If two or more esp-4 shall work close together they may influence one another. To avoid this the esp-4 can be synchronised. To do this all contol inputs C3 have to be connected with each other.

Parameterisation via LinkControl

The esp-4 can be extensively parameterised under LinkControl. Here you need the optionally available LinkControl adapter LCA-2 and the LinkControl software for Windows©.

Operation with LinkControl

- Install the LinkControl software onto your PC.
  Connect the LinkControl adapter to your PC with the USB cable.
- Connect esp-4 to the LCA-2 as shown in figure 6 table. For this, use the adapter cable in the LCA-2 case.
- Connect the voltage supply cable to the LCA-2 on the other side of the T connector.
- Start the LinkControl software and follow the instructions on the screen.

	Colour esp-4	Colour adapter cable	Pin (LCA-2)
$+U_B$	Brown	Brown	1
$-U_B$	Blue	Blue	3
C3	Grey	Grey	5

Fig. 6: Connecting esp-4 to the LCA-2

The following settings can be adjusted:

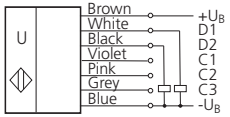
- Teach-in of web or label material.
- Spacing between transmitter and receiver.
- NOC/NCC function of the switching outputs.
- Function of switching output D2.
- Activate QuickTeach

There is also a graphic display of hte live measured values available.

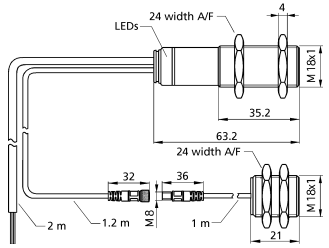
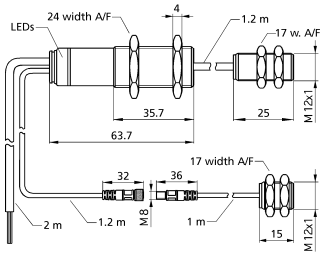
Maintenance

The esp-4 works maintenance-free. Small amounts of dirt on the surface do not influence sensor function. Thick layers of dirt or caked-on dirt affect sensor function and therefore has to be removed.

Technical data



2 pnp switching outputs

	esp-4/3CDD/M18 E+S	esp-4/M12/3CDD/M18 E+S
		
spacing transmitter-receiver	20 to 40 mm	20 to 30 mm
optimum spacing transmitter-receiver	40 mm ± 3 mm	20 mm ± 3 mm
blind zone (in front of transmitter and receiver)	7 mm	5 mm
permissible angular deviation	10°-27° from the perpendicular of the sheet	10°-27° from the perpendicular of the sheet
ultrasonic frequency	400 kHz	500 kHz
working range	web material with grammages of < 20 g/m^2 to	web material with grammages of < 20 g/m^2 to
	>> 600 g/m^2; paper, metal, plastic	>> 400 g/m^2; paper, metal, plastic
operating voltage U_B	20 V to 30 V DC	20 V to 30 V DC
voltage ripple	± 10 %	± 10 %
no-load current consumption	≤ 50 mA	≤ 50 mA
type of connection	2 m PUR cable, 7 x 0.25 mm^2	2 m PUR cable, 7 x 0.25 mm^2
transmitter-receiver connection	At receiver: PUR, 1.2 m;	At receiver: PUR, 1.2 m;
	at transmitter: 1 m, PUR; both with M8 connector	at transmitter: 1 m, PUR; both with M8 connector
		Connection cable to external ultrasonic transducer:
		PVC, 1.2 m
controls	3 Control inputs: C1 to C3	3 Control inputs: C1 to C3
programmable	Teach-in, LinkControl, QuickTeach	Teach-in, LinkControl, QuickTeach
response time	300 µs - 2.25 ms, depending on the grammages	300 µs - 2.25 ms, depending on the grammages
indicator	Green: working/backing material	Green: working/backing material
	Red: label/splice	Red: label/splice
	Red flashing: web break	Red flashing: web break
housing	Brass sleeve, nickel-plated; plastic parts: PBT, PA;	Brass sleeve, nickel-plated; plastic parts: PBT, PA;
	Cable: PUR; ultrasonic transducer:	Cable: PUR/PVC; ultrasonic transducer:
	Polyurethane, epoxy resin with glass content	Polyurethane, epoxy resin with glass content
max. tightening torque of nuts	M18: 15 Nm	M18: 15 Nm; M12: 8 Nm
class of protection 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
norm conformity	EN 60947-5-2	EN 60947-5-2
order no.	esp-4/3CDD/M18 E+S	esp-4/M12/3CDD/M18 E+S
label/splice output D1[1)]	pnp, +U_B-2 V, I_{max} = 200 mA, short circuit proof,	pnp, +U_B-2 V, I_{max} = 200 mA, short circuit proof,
	switchable NOC/NCC	switchable NOC/NCC
web break output D2[1)]	pnp, +U_B-2 V, I_{max} = 200 mA, short circuit proof,	pnp, +U_B-2 V, I_{max} = 200 mA, short circuit proof,
	switchable NOC/NCC	switchable NOC/NCC
U_E at control inputs C_1-C_3	> -U_B+18 V: logic level 1	> -U_B+18 V: logic level 1
	< -U_B+13 V or control input open: logic level 0	< -U_B+13 V or control input open: logic level 0
time delay before availability	< 300 ms	< 300 ms

[1)] Can be programmed via LinkControl

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