microsonic

IO-Link

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 grammages from <20 g/m² to >>400 g/m²; 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 µs 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.

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.
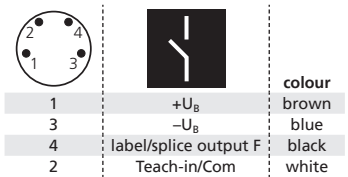→ Carry out one of the three standard Teach-in methods or QuickTeach.

		colour
1	+U_B	brown
3	−U_B	blue
4	label/splice output F	black
2	Teach-in/Com	white

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

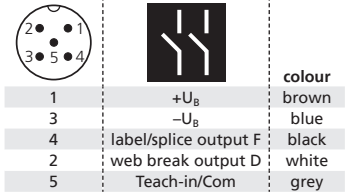|		colour
1	+U_B	brown
3	−U_B	blue
4	label/splice output F	black
2	web break output D	white
5	Teach-in/Com	grey

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_B/−U_B 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_B	1	brown	1
−U_B	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.

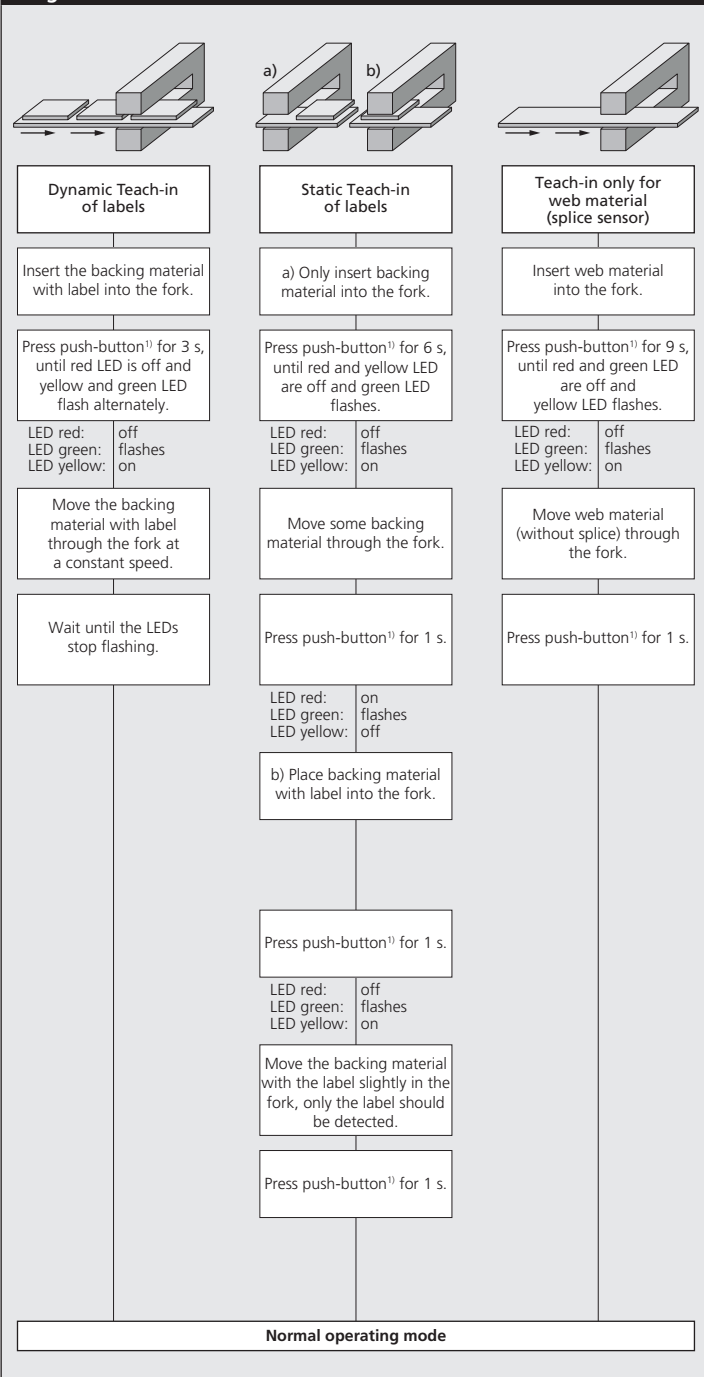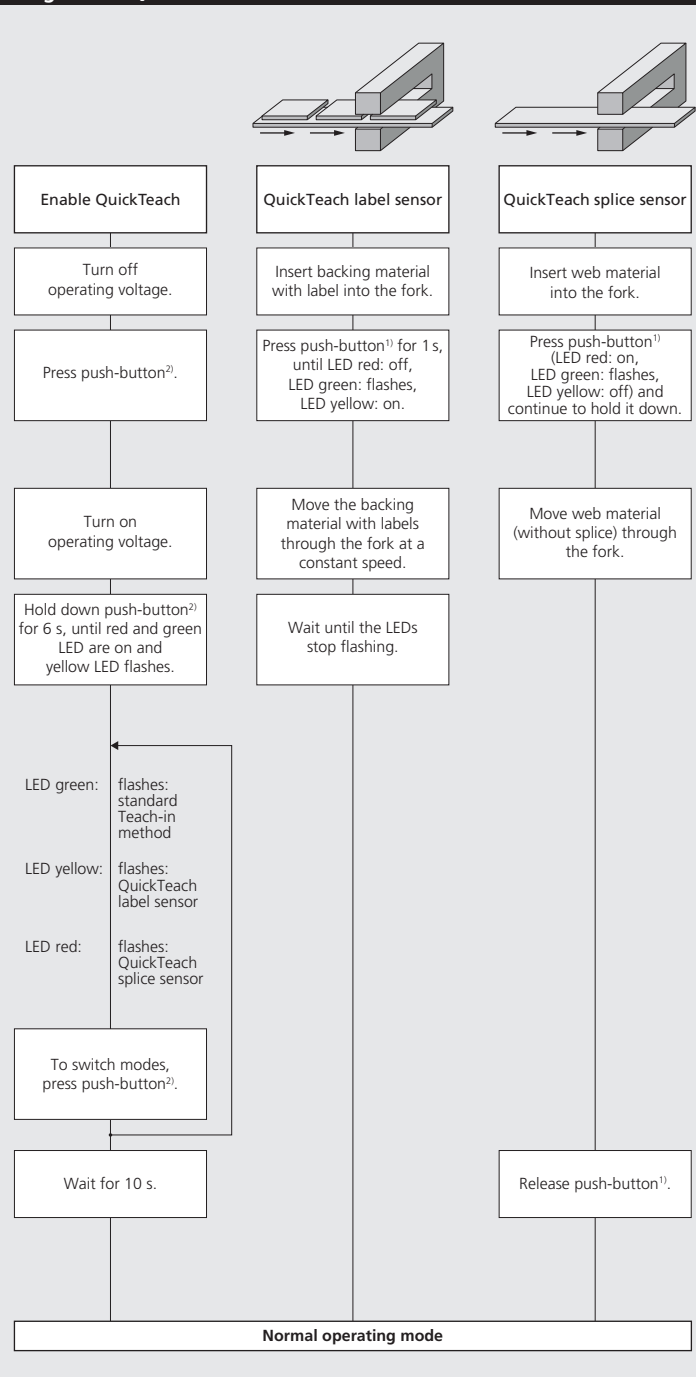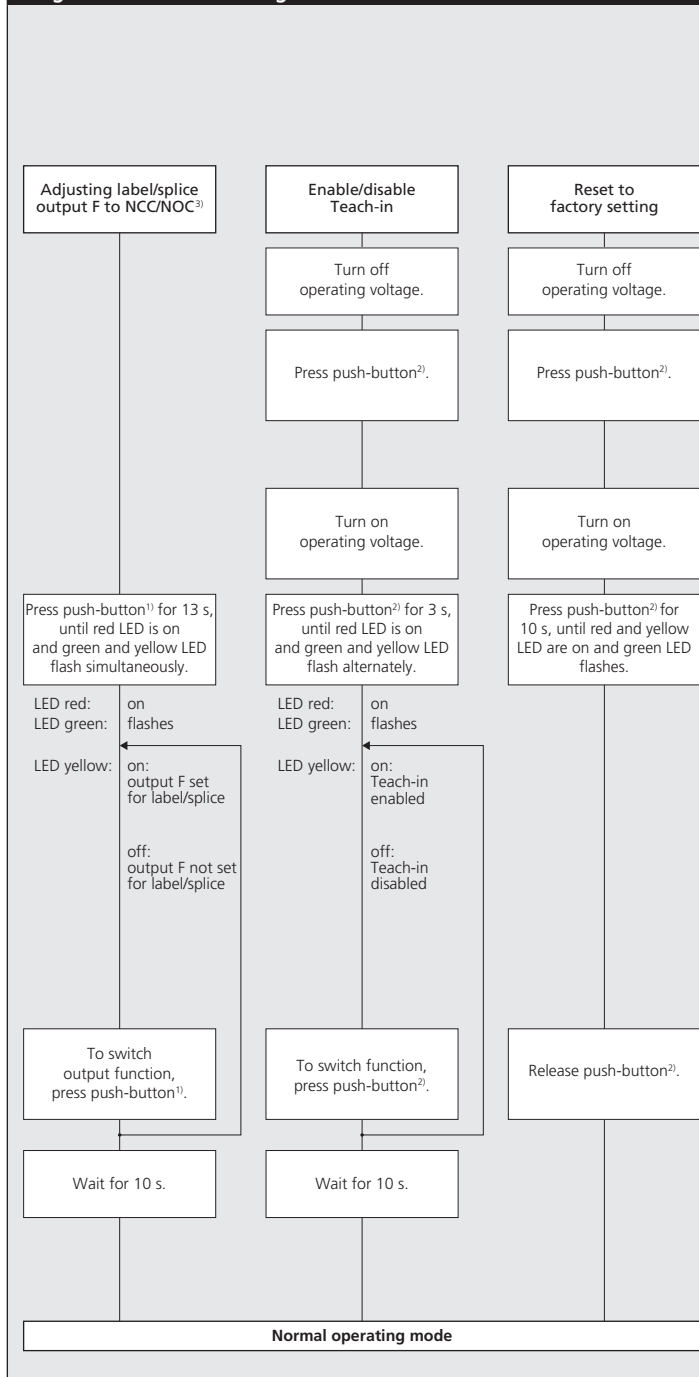## Diagram 1: Standard Teach-in methods

Dynamic Teach-in of labels	Static Teach-in of labels	Teach-in only for web material (splice sensor)
Insert the backing material with label into the fork.	a) Only insert backing material into the fork.	Insert web material into the fork.
Press push-button[1] for 3 s, until red LED is off and yellow and green LED flash alternately.	Press push-button[1] for 6 s, until red and yellow LED are off and green LED flashes.	Press push-button[1] for 9 s, until red and green LED are off and yellow LED flashes.
LED red: off / LED green: flashes / LED yellow: on	LED red: off / LED green: flashes / LED yellow: on	LED red: off / LED green: flashes / LED yellow: on
Move the backing material with label through the fork at a constant speed.	Move some backing material through the fork.	Move web material (without splice) through the fork.
Wait until the LEDs stop flashing.	Press push-button[1] for 1 s.	Press push-button[1] for 1 s.
	LED red: on / LED green: flashes / LED yellow: off	
	b) Place backing material with label into the fork.	
	Press push-button[1] for 1 s.	
	LED red: off / LED green: flashes / LED yellow: on	
	Move the backing material with the label slightly in the fork, only the label should be detected.	
	Press push-button[1] for 1 s.	

Normal operating mode

Diagram 2: QuickTeach

Enable QuickTeach	QuickTeach label sensor	QuickTeach splice sensor
Turn off operating voltage.	Insert backing material with label into the fork.	Insert web material into the fork.
Press push-button[2].	Press push-button[1] for 1 s, until LED red: off, LED green: flashes, LED yellow: on.	Press push-button[1] (LED red: on, LED green: flashes, LED yellow: off) and continue to hold it down.
Turn on operating voltage.	Move the backing material with labels through the fork at a constant speed.	Move web material (without splice) through the fork.
Hold down push-button[2] for 6 s, until red and green LED are on and yellow LED flashes.	Wait until the LEDs stop flashing.	
LED green: flashes: standard Teach-in method		
LED yellow: flashes: QuickTeach label sensor		
LED red: flashes: QuickTeach splice sensor		
To switch modes, press push-button[2].		Release push-button[1].
Wait for 10 s.		

Normal operating mode

Diagram 3: Further settings

Adjusting label/splice output F to NCC/NOC[3]	Enable/disable Teach-in	Reset to factory setting
	Turn off operating voltage.	Turn off operating voltage.
	Press push-button[2].	Press push-button[2].
	Turn on operating voltage.	Turn on operating voltage.
Press push-button[1] for 13 s, until red LED is on and green and yellow LED flash simultaneously.	Press push-button[2] for 3 s, until red LED is on and green and yellow LED flash alternately.	Press push-button[2] for 10 s, until red and yellow LED are on and green LED flashes.
LED red: on / LED green: flashes	LED red: on / LED green: flashes	
LED yellow: on: output F set for label/splice	LED yellow: on: Teach-in enabled	
off: output F not set for label/splice	off: Teach-in disabled	
To switch output function, press push-button[1].	To switch function, press push-button[2].	Release push-button[2].
Wait for 10 s.	Wait for 10 s.	

Normal operating mode
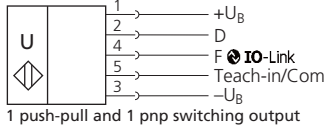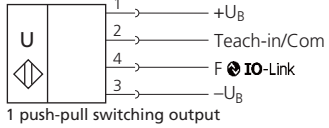
[1] All settings via push-button can alternatively be made by connecting the Teach-in/Com input to +U_B.
[2] All settings via push-button can alternatively be made by connecting the Teach-in/Com input to –U_B.
[3] Only available in standard Teach-in methods.
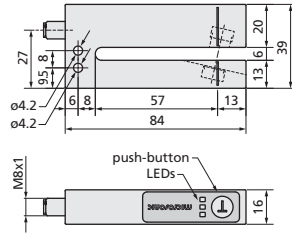
Technical Data
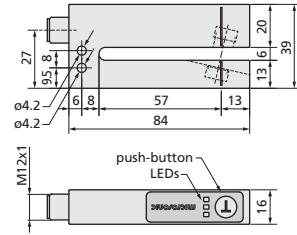
esf-1/CDF/A; esf-1/7/CDF/A; esf-1/15/CDF/A

1 +U_B
2 D
4 F ● IO-Link
5 Teach-in/Com
3 −U_B

1 push-pull and 1 pnp switching output

esf-1/CF/A

1 +U_B
2 Teach-in/Com
4 F ● IO-Link
3 −U_B

1 push-pull switching output

	esf-1/CF/A	esf-1/CDF/A	esf-1/7/CDF/A	esf-1/15/CDF/A
fork width	6 mm	6 mm	6 mm	6 mm
fork depth	70 mm	70 mm	86 mm	165 mm
transducer frequency	500 kHz	500 kHz	500 kHz	500 kHz
working range	web material with grammages of <20 g/m² to >>400 g/m², metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	web material with grammages of <20 g/m² to >>400 g/m², metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	web material with grammages of <20 g/m² to >>400 g/m², metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material	web material with grammages of <20 g/m² to >>400 g/m², metal-laminated paper and films up to 0.2 mm thick, self-adhesive films, labels on backing material
operating voltage U_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)
operating voltage ripple	±10 %	±10 %	±10 %	±10 %
no-load current consumption	≤50 mA	≤50 mA	≤50 mA	≤50 mA
type of connection	4-pin M8 initiator plug	5-pin M12 initiator plug	5-pin M12 initiator plug	5-pin M12 initiator plug
controls	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
scope of settings	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl	Teach-in, IO-Link, LinkControl
response time	300 µs to 2 ms, depending on the material	300 µs to 2 ms, depending on the material	300 µs to 2 ms, depending on the material	300 µs to 2 ms, depending on the material
indicators	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
IO-Link	V1.1	V1.1	V1.1	V1.1
housing	aluminium anodized; plastic parts: PBT, PA; ultrasonic transducer: polyurethane, epoxy resin with glass content	aluminium anodized; plastic parts: PBT, PA; ultrasonic transducer: polyurethane, epoxy resin with glass content	aluminium anodized; plastic parts: PBT, PA; ultrasonic transducer: polyurethane, epoxy resin with glass content	aluminium anodized; plastic parts: PBT, PA; ultrasonic transducer: polyurethane, epoxy resin with glass content
class of protection to EN 60529	IP 65	IP 65	IP 65	IP 65
operating temperature	+5 to +60 °C	+5 to +60 °C	+5 to +60 °C	+5 to +60 °C
storage temperature	−40 to +85 °C	−40 to +85 °C	−40 to +85 °C	−40 to +85 °C
weight	80 g	80 g	90 g	160 g
norm conformity	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
time delay before availibility	<300 ms	<300 ms	<300 ms	<300 ms
order no.	esf-1/CF/A	esf-1/CDF/A	esf-1/7/CDF/A	esf-1/15/CDF/A
label/splice output F	push-pull, +U_B−3 V, −U_B+3 V, I_max. = 100 mA, short-circuit-proof, switchable NOC/NCC	push-pull, +U_B−3 V, −U_B+3 V, I_max. = 100 mA, short-circuit-proof, switchable NOC/NCC	push-pull, +U_B−3 V, −U_B+3 V, I_max. = 100 mA, short-circuit-proof, switchable NOC/NCC	push-pull, +U_B−3 V, −U_B+3 V, I_max. = 100 mA, short-circuit-proof, switchable NOC/NCC
web break output D		pnp, +U_B−3 V, I_max. = 100 mA, short-circuit-proof, switchable NOC/NCC	pnp, +U_B−3 V, I_max. = 100 mA, short-circuit-proof, switchable NOC/NCC	pnp, +U_B−3 V, I_max. = 100 mA, short-circuit-proof, switchable NOC/NCC

c UL us LISTED

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

The proximity switches shall be used with a Listed (CYJV/7) cable/connector assembly rated minimum 32 Vdc, minimum 290 mA, in the final installation.

UK CA   C E   2014/30/EU

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