

## Function principle

Proximity switches with dynamic diagnostics allow monitoring of the sensor functions including the cable.

To accomplish this, the oscillator state is changed using a pulse generator while the sensor is operating. As soon as the sensor head is damaged or the oscillator becomes electrically defective, the pulse generator is no longer able to change the oscillator state and the test pulses will be missing from the output.

The pulse frequency is  $f \sim 160 \text{ Hz}$  and the pulse duration  $t \sim 300 \mu\text{s}$ . The pulse-pause ratio of  $t \sim 5\%$  selected is small enough

that the test pulses can be filtered out by the input filter of a controller, or for example a relay can be directly driven.

The information "proximity switch damped or undamped" can therefore be processed in the usual fashion.

## Function monitoring

The test pulses and thereby the function of the proximity switch are monitored by additional electronics which signal error-free function by means of a High level on the "Status/Output" message output.

For this Balluff offers a function diagnostics unit which can be easily installed in a controller:

Function diagnostics unit see page 1.5.19  
 – BES 113-FD-1 (for 1 Sensor)

The unit is compatible with:

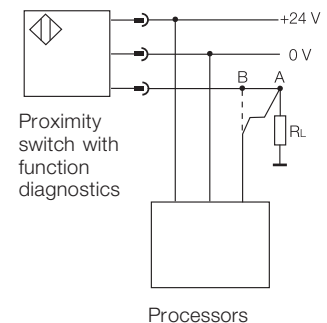
Inductive Sensors see page 1.5.18  
 – BES 113-356-SA6-S4 Normally open  
 – BES 113-356-SA31-S4 Normally open  
 – BES 113-3019-SA1-S4 Normally closed

Capacitive sensor see page 4.15  
 – BCS 20MG10-XPA1Y-8B-03 complementary.

Single faults are detected when monitoring for the entire system.

## Installation notes

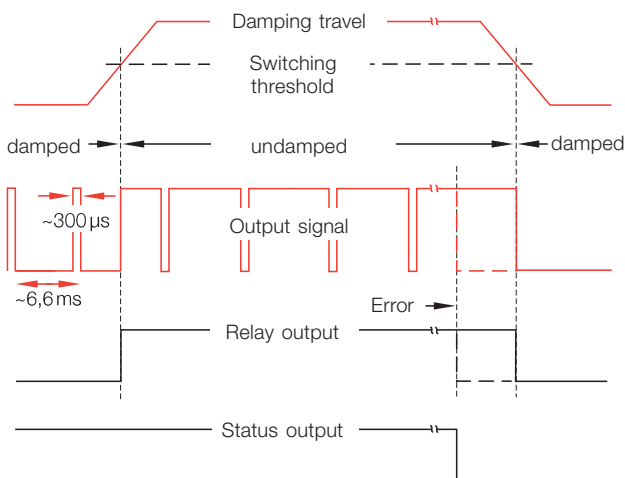
The signal line for the function diagnostics unit should be connected as closely as possible to the load  $R_L$  (Point A). When Point B is connected the cable segment between B and load  $R_L$  is not monitored.



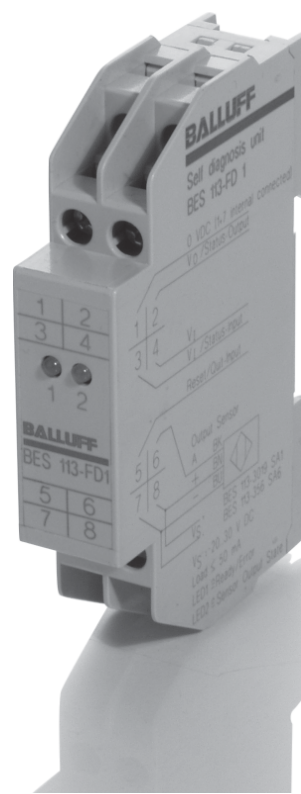
### Note!

**The system described here is not suitable for systems with personal protection.**

For additional information please request a device description.



Pulse diagram of a proximity switch with function diagnostics (NC).



# 1.5

- Factor 1
- Weld immune
- Magnetic field immune
- Diagnostics**
- Steelface
- Pressure rated**
- Pressure rated Ex
- Namur Ex
- Temperature rated
- PROXINOX®
- Ring Sensors
- Extended switching distance

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- Connectors, Holders ...
- Page 5.2 ...

The function diagnostics unit BES 113-FD-1 monitors a proximity switch and its cable using dynamic function diagnostics. A logic circuit polls the sensor signals for the presence of test pulses and also monitors for proper function of the processor. For the machine controller it emits a High level signal on the "Status/Output" line when there is no fault and a Low signal when a fault is present. LED's indicate the switching state of the sensor.

Recurring faults are stored by the device. They must be reset using a reset function (Low signal on 5).

If the BES 113-FD-1 is used as a single unit, terminals  $V_1$  (3 and 4) must be jumpered together.

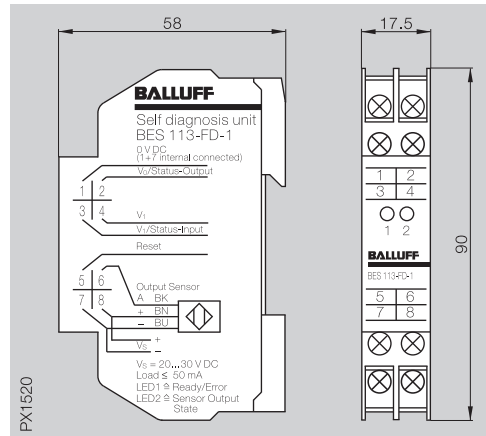
### Cascading

When cascading several BES 113-FD-1 the output (2) must be connected to the input (3) of the following device. The jumper between  $V_1$  is not needed except for the first device.

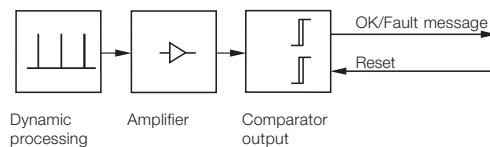
When there is a malfunction, the message appears on the last device. The defective sensor is indicated by the first weakly illuminated LED in the cascade.

Small and space-saving, the BES 113-FD-1 can be attached to a DIN rail per DIN EN 50022-35.

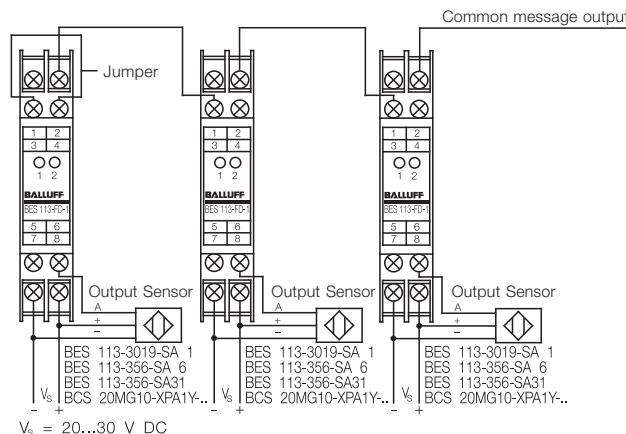
Description	<b>Function diagnostics unit with electronic output</b>
Use	For function diagnostic sensors BES 113-... (see page 1.5.18) or BCS 20... page 4.15



Ordering code	BES 113-FD-1
Supply voltage $U_B$	20...30 V DC
Ripple	$\leq 15\%$
No-load current	approx. 20 mA
Output voltage $U_0$ (referenced to 0 V)	low $0 \dots (0.1 \times U_B)$ high $(0.5 \times U_B) \dots U_B$
Output current max.	50 mA
Ambient temperature range	$0 \dots +60^\circ\text{C}$
LED 1 green	"Ready/Error" – in error-free state the LED is bright on. For defects (fault) the LED is very dim.
LED 2 yellow	"Sensor Output State" indicates the switching state of the sensor.
Housing attachment	Rail mount per DIN EN 50022-35
max. conductor cross-section	$2 \times 2.5 \text{ mm}^2$
Degree of protection per IEC 60529	Housing IP 40, terminals IP 20



### Cascading



**1.5**

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Magnetic field immune  
**Diagnostics**  
Steelface  
Pressure rated  
Pressure rated Ex  
Namur Ex  
Temperature rated  
PROXINOX®  
Ring Sensors  
Extended switching distance

**5**

Connectors, Holders ...  
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