**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 $f \approx 160$ Hz and the pulse duration $t \approx 300$ $\mu$s. The pulse-pause ratio of $t \approx 5\%$ 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

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.

![Pulse diagram of a proximity switch with function diagnostics (NC).](image)

**Note!**

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

For additional information please request a device description.

www.balluff.com
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 V₁ (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 V₁ 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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Use</th>
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