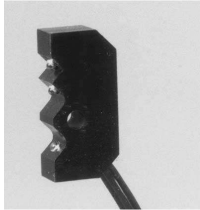


SP100FF Fixed-Field Sensor



Datasheet

Fixed-Field Convergent Mode Sensor



- Optical design ensures an exact range limit, regardless of the surface reflectivity of the objects to be sensed
- Powerful infrared light source and modulated amplification provide reliable sensing of objects with low surface reflectivity
- Sensor response to background objects is completely suppressed
- Miniature size fits easily into tight areas of machines
- Requires the MA3A or MPC3A Banner MICRO-AMP® Series amplifier for operation



WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

| Model | Sensing Mode / LED | Connection |
|---------|--|--|
| SP100FF | Fixed-field convergent, infrared, 880 nm | Integral 2 m (6.5 ft) 4-wire PVC cable |

Overview

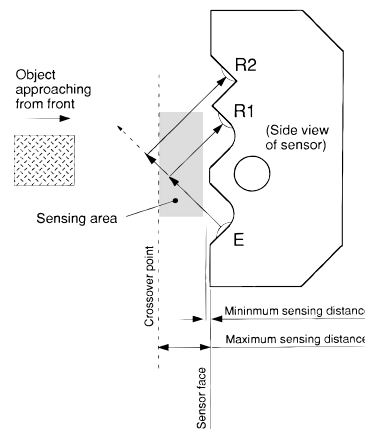
SP100FF is a fixed-field convergent mode sensor that detects objects directly by reflection of light from the object's surface. The light is sensed at two receive points and compared to define a precise limit to the maximum sensing range. Objects in the background are ignored, regardless of their surface reflectivity. This sensing response feature makes the SP100FF ideal for detecting a part or a surface that is only a small fraction of an inch in front of another surface. The SP100FF is highly reliable for semiconductor wafer sensing. Wafers of all reflectivities are sensed without mechanical or system sensitivity adjustment. Other applications include cut-to length control, double-thickness detection, and precision edge guiding. The SP100FF is an excellent choice for precise position control (For example, as a robotic end effector).

The SP100FF works in conjunction with Banner MICRO-AMP modulated amplifier model MA3A or MPC3A. Model MA3A is powered by +10 V dc to 30 V dc and uses a model RS8 socket. Model MPC3A is powered by +5 V dc and is designed for mounting directly onto PC boards. With a typical excess gain of 100 times at the peak signal point (referenced to a 90% reflectance white test card), the SP100FF has enough optical energy to reliably sense material of very low reflectivity such as nitride-coated semiconductor wafers. The typical peak signal point is 3.05 mm (0.12 inch) from the sensor face. Excess gain falls off sharply beyond the peak signal point (see excess gain curve).

Theory of Operation

The SP100FF uses two photoelements that operate with the modulated amplifier in a differential mode. The photoelements are mechanically convergent with the LED light source at two different distances from the sensor face. The inner photoelement (R1) produces a positive-going pulse which turns the output of the amplifier on. The outer photoelement (R2) produces a negative-going pulse that works to turn the amplifier off. A target is sensed whenever the amount of light reaching receiver R1 is equal to or greater than the amount of light seen by R2. The output of the amplifier is cut off as soon as the amount of light at R2 becomes greater than at R1. The location of this crossover point is dictated by the geometry of the photoelement configuration, and remains the same regardless of the target's reflectivity. Reflections even from highly-polished mirror-like surfaces are ignored if the reflections originate from beyond the crossover point.

Modulated LED design offers very high excess gain at the convergent point of R1 (see excess gain curve). As a result, even objects of very low reflectivity may be sensed. The rapid fall-off in signal strength over a very short distance (as seen in the excess gain curve) accounts for the highly repeatable distance-sensing accuracy of the SP100FF, independent of target surface reflectivity.



Specifications

Crossover Point

3.8 mm to 6.4 mm (0.15 inch to 0.25 inch)
5.1 mm (0.20 inch) nominal referenced from sensor face

Peak Signal Point

2 mm to 4 mm (0.08 inch to 0.16 inch)
3 mm (0.12 inch) nominal referenced from sensor face

Response Speed

A function of the amplifier (see specific amplifier specifications)

Emitter Characteristics

Infrared LED, 880 nm

Connection

Integral 2 m (6.5 ft) 4-wire PVC cable

Construction

Completely encapsulated, glass lenses
Black acetal housing

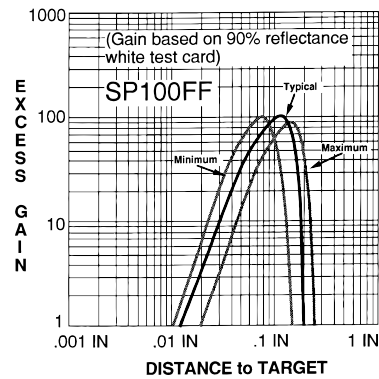
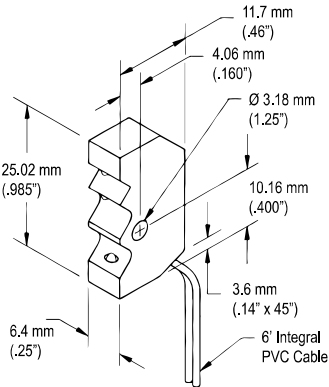
Environmental Rating

NEMA 1, 3, 4, 12, and 13

Operating Temperature

0 °C to +70 °C (+32 °F to +158 °F)

Dimensions and Excess Gain Curve



Amplifiers

MA3A MICRO-AMP Amplifier

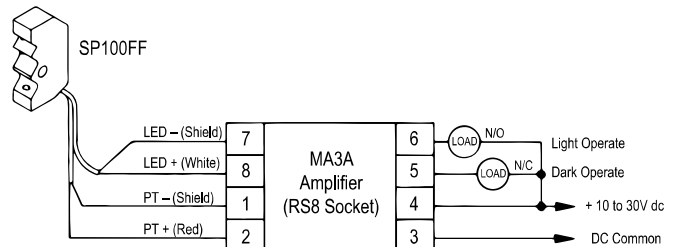


MICRO-AMP modulated amplifier MA3A is used with the SP100FF sensor. Model MA3A has the same specifications as standard MICRO-AMP model MA3, with the exceptions of response speed and sensor wiring.

Model MA3A offers complementary NPN outputs. Each output has sufficient capacity to switch small electromechanical devices, such as relays, and will directly interface logic inputs. Connections are made using the optional RS8 socket and wiring base, or the MA3A may be mounted directly to a PC board. Power supply model MPS-15 is available, and includes its own board-mounted socket for the MA3A and a built-in SPDT output relay.

Model MA3A features the patented Banner Alignment Indicator Device (AID™) signal strength indicator system. Adjust the sensor's sensitivity using the gain potentiometer on top of the amplifier module.

To view or download the latest technical information about this product, including specifications, dimensions, accessories, and wiring, see www.bannerengineering.com. Search p/n 03340.



Power Supply Requirements

+ 10 V dc to 30 V dc at less than 20 mA
10% maximum ripple
Power may be obtained from Banner power supply model MPS-15, CP12C, CP12RC, or PS120-15

Output Configuration

Two open-collector NPN transistor solid-state switches, one normally open, one normally closed.
150 mA maximum, each output

Response Speed

2 milliseconds (typical)

Construction

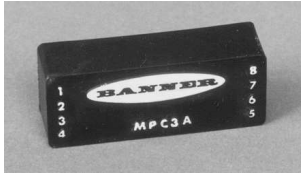
Circuitry: epoxy-encapsulated
Housing: PBT

Maximum Sensor Lead Length

4.5 m (15 ft)

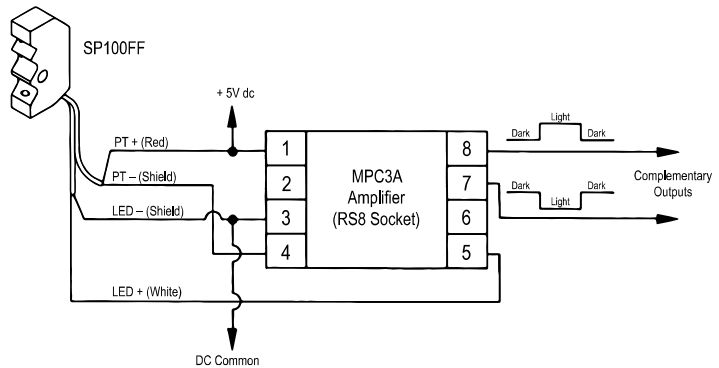
Operating Temperature

0 °C to +70 °C (+32 °F to +158 °F)

MPC3A MICRO-AMP Amplifier

Amplifier model MPC3A is configured for use with sensor model SP100FF. Model MPC3A is a miniature component amplifier that is designed for mounting directly to a PC board. The MPC3A is powered by +5 V dc, and outputs are conventional buffered (complementary) CMOS gates.

To view or download the latest technical information about this product, including specifications, dimensions, accessories, and wiring, see www.bannerengineering.com. Search p/n 03336.

**Power Supply Requirements**

+ 5 V dc \pm 10 V dc
10% maximum ripple

Output Configuration

Conventional buffered (complementary) CMOS gates

Response Speed

Less than 1.5 milliseconds, adjustable for faster response

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