

SM512 Series Convergent Mode Sensors

DC sensors with metal housings: SM512C1, SM512CV1, SM512DBC



Banner SM512 Series dc convergent mode sensors are designed for reliable performance in especially hostile industrial environments. These sensors have totally-encapsulated circuitry within a rugged Delrin® or die-cast metal housing for superior resistance to moisture and physical abuse. Models include: SM512C1, SM512CV1, and SM512DBC

The SM512CV1 and SM512C1 have a fixed focus point 1.25 inches from the sensor face and a .040" and .025" diameter sensing spot, respectively. The "CV1" has a visible sensing beam for easy alignment in precise positioning control applications. The "C1" has an infrared light beam with higher gain for difficult applications. The "DBC" has a visible sensing spot only .010" in diameter for applications requiring a higher degree of precision. See page 3.

SM512 Series sensors have complementary NPN transistor outputs (one normally open and the other normally closed), which connect directly to Banner MICRO-AMP and MAXI-AMP logic modules, as well as to most logic gates, small relays, and other similar dc loads.



SPECIFICATIONS, SM512 Series Convergent Sensors

- RANGE:** See excess gain curves in individual sensor descriptions.
- SUPPLY VOLTAGE:** 10-30V dc. Maximum allowable ripple 10%; supply current is typically less than 40mA (exclusive of load).
- OUTPUT CONFIGURATION:** Complementary open-collector NPN transistors (one normally open and one normally closed), with continuous short-circuit protection. All models have reverse polarity protection.
- OUTPUT RATING:** Each output transistor is capable of sinking up to 250mA continuously. On-state saturation voltage less than 2 volts at full load and less than 1 volt at signal levels. Off-state leakage current less than 100 microamps. Outputs are reverse-polarity protected.
- RESPONSE TIME:** 1 millisecond on/off. Response time is independent of signal strength.
- REPEATABILITY:** 0.3 millisecond. Repeatability is independent of signal strength.
- OPERATING TEMPERATURE:** -40 to +70 °C (-40 to +158 °F).

CONSTRUCTION: Delrin® (CV1, C1 models) or die-cast metal (DBC model) housing; stainless steel legend plate. Totally encapsulated; lens assemblies fully gasketed. NEMA 1, 2, 3, 3S, 4, 4X, 12, and 13. Cables .15-inch dia., PVC covered, shielded (4 conductor, 6 ft. long).

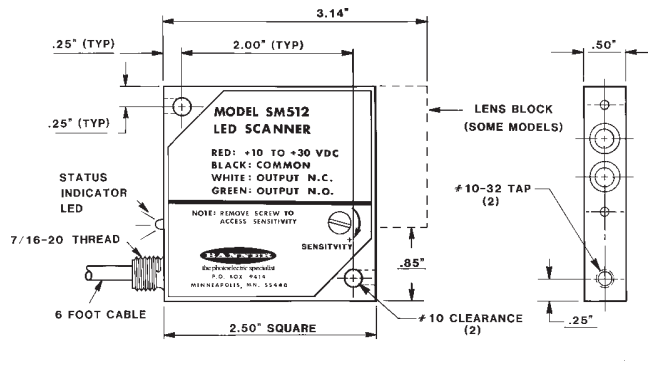
INDICATOR LED: Red LED indicator at rear of sensor (above cable exit) lights when the sensor is receiving a "light" signal.

SENSITIVITY ADJUSTMENT: Single-turn adjustment, accessible by removing the nylon screw on the side of the sensor.

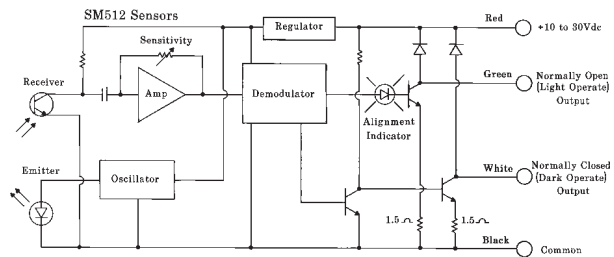
APPLICATION WARNINGS:

Outputs will not directly interface TTL logic, due to the reverse-polarity protection diode. Contact the factory for TTL interfacing instructions. The short-circuit protection may de-energize the outputs with certain incandescent light bulb or capacitive loads. Contact the factory if these loads are anticipated.

Dimension Drawing



Functional Schematic



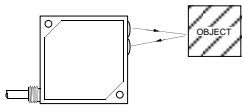
WARNING These photoelectric presence sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in either an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious injury or death.

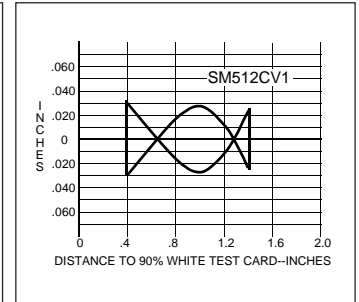
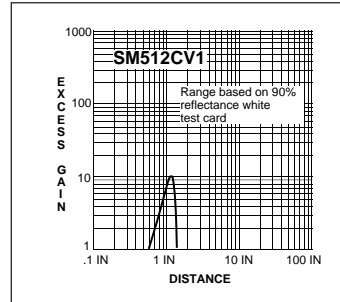
Only MACHINE-GUARD and PERIMETER-GUARD Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.

SM512 Series Convergent Mode Sensors

SM512CV1 Convergent mode



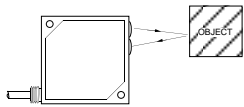
VOLTAGE: 10-30V dc
RANGE: focus at 1.25 inches (32mm)
RESPONSE TIME: 1 millisecond
REPEATABILITY: 0.3 millisecond
SENSING BEAM: visible red, 650nm



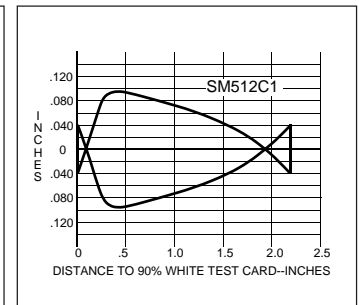
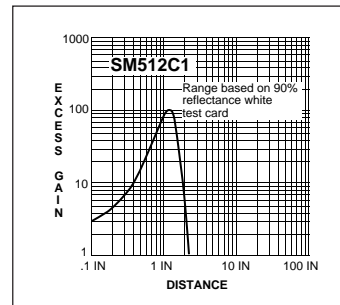
Model **SM512CV1** is a convergent sensor with a **fixed focus point 1.25 inches from the sensor face**. The SM512CV1 uses a visible red beam with a precise .040 inch diameter spot at the focal point. It is used in positioning control applications such as edge-guiding, cut-to-length, or register mark sensing (dark colored marks only). Repeatability when approaching from the side is $\pm .005$ inch, and when approaching from the front is $\pm .050$ inch. The SM512CV1 has a Delrin® case and totally encapsulated electronics.

Note: the SM512CV1 does not have a threaded cable entrance.

SM512C1 Convergent mode

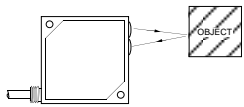


VOLTAGE: 10-30V dc
RANGE: focus at 1.25 inches (32mm)
RESPONSE TIME: 1 millisecond
REPEATABILITY: 0.3 millisecond
SENSING BEAM: infrared, 940nm

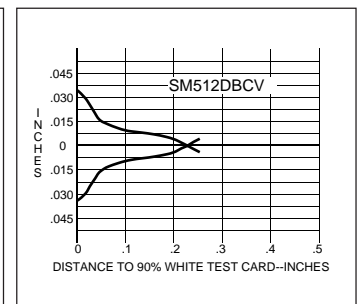
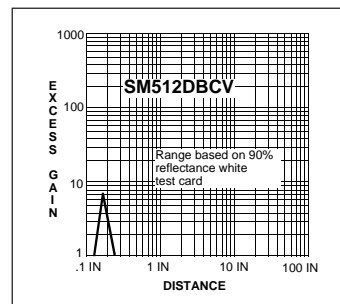


Model **SM512C1** is a convergent sensor with a **fixed focus point 1.25 inches from the sensor face**. The SM512C1 uses a powerful infrared beam with a 1/8" diameter spot, and is used when large amounts of excess gain are required and/or where background objects prevent reliable operation of conventional proximity mode sensors. Typical situations include reflective sensing in dirty environments, sensing clear glass or plastic, and sensing extremely non-reflective materials such as black rubber or rusted metal. The SM512C1 has a Delrin® case and totally encapsulated electronics. Note: model SM512C1 does not have a threaded cable entrance.

SM512DBC1 Convergent mode



VOLTAGE: 10-30V dc
RANGE: focus at .170 inches (4,32mm)
RESPONSE TIME: 1 millisecond
REPEATABILITY: 0.3 millisecond
SENSING BEAM: visible red, 700nm



Model **SM512DBC1** is a **very precise convergent beam sensor** that is ideal for detecting small black marks (such as UPC codes) or miniature parts such as the individual leads of an IC chip. It will also differentiate between heights of objects with an accuracy of better than .030 inches. The SM512DBC1's **visible sensing spot is only .010 inches in diameter**, making it possible to resolve printed marks on .020-inch spacings.

As can be seen from the excess gain curve, the signal falls off very rapidly to the front and rear of the .170-inch focal distance, so it is imperative that the distance from the sensor to the objects being detected be precisely maintained. It is best if this sensing distance is held to within $\pm .020$ inches. This sensor has a die-cast metal housing.

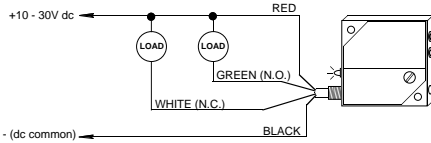
NOTE: Delrin® is acetal homopolymer and is a registered trademark of Dupont plastics.

SM512 Series Convergent Mode Sensors

Hookup Diagrams

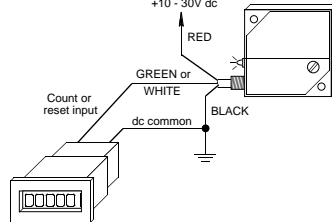
Hookup of SM512 Series Sensor to Relay or Solenoid

SM512 Series sensors offer two open collector NPN outputs in a complementary configuration (one normally open and one normally closed). The green output wire switches the load when the receiver "sees" its modulated light source (LIGHT operate). The white output wire switches in the dark condition (DARK operate). Both output circuits can switch up to 1/4 amp.



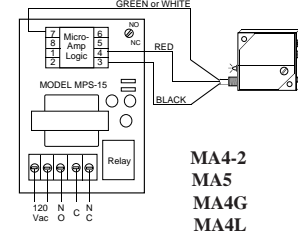
Hookup of SM512 Series Sensor to Counter

Most counters, totalizers, rate meters, etc. accept either output of the SM512s. Hookup to a battery-powered LCD type is shown here. For other types, follow the counter's hookup instructions for an NPN or current sinking input device.



Hookup to MICRO-AMP Logic (MPS-15 Chassis)

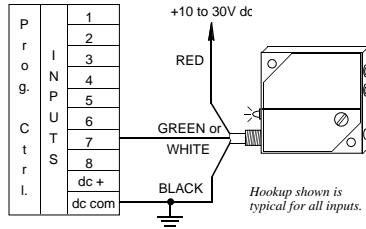
The output (green or white wire) of SM512 Series sensors connects directly to any input of Banner MICRO-AMP logic-only modules. These MICRO-AMP logic modules may be used:



- MA4-2 One-shot
- MA5 Delay
- MA4G 4-input "AND"
- MA4L Latch

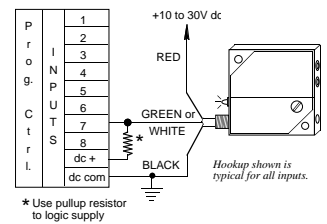
Hookup of SM512 Series Sensor to Programmable Controller requiring current sink

Either sensor output is wired directly to any input of the PLC. Also, connect the negative of the sensor power supply to the negative of the PLC (input card) power supply (if they are separate supplies).



Hookup of SM512 Series Sensor to Programmable Controller requiring current source

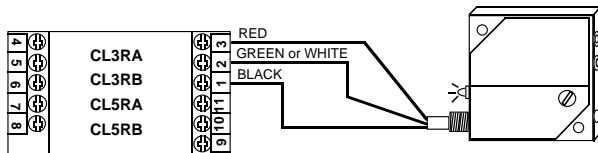
Either sensor output is wired to any input of the PLC. An external "pullup" resistor is connected between the input and +V of the PLC (input card) power supply. The value of the resistor is not critical: values from 1KΩ to 10KΩ, 1/4 watt or larger, will satisfy most inputs. Also, connect the negative of the sensor power supply to the negative of the PLC (input card) power supply (if they are separate supplies).



* Use pullup resistor to logic supply

Hookup to MAXI-AMP Logic (CL Series modules)

The output of an SM512 series sensor may be used as an input to Banner MAXI-AMP CL Series logic modules. The MAXI-AMP, when powered by AC voltage, offers a DC supply with enough capacity to power one SM512 Series sensor. An SM512 Series sensor may also be used as an input to the auxiliary input of a CL5 module.



The wiring scheme inverts the LIGHT and DARK output configuration (as seen by the PLC input). The white output becomes LIGHT operate, while the green output is used for DARK operate.

Modification Information for SM512 series Sensors

These modifications are available for SM512 Series sensors. They are not stocked, but are available on a "quote" basis:

HIGH SPEED Modification (model Suffix "MHS")

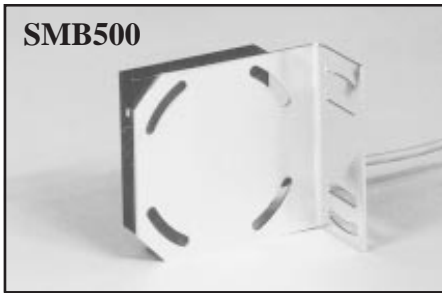
SM512 Series sensors with normal response speed of 1 millisecond may be modified for faster response. Modification "MHS" offers 300 microsecond (0.3 millisecond) on and off response time. This modification is most often used when very small targets must be sensed. **Repeatability** of "MHS" models is 0.1 millisecond.

CABLE LENGTH Modification (30-foot cable)

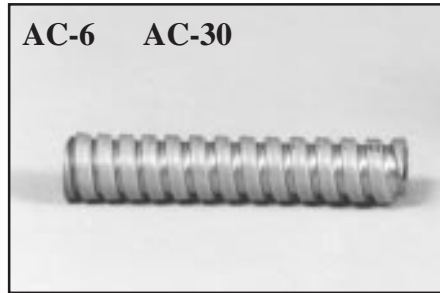
Any of the SM512 Series sensors may be built with a cable longer than the standard 6-foot length. The most readily available length is 30 feet. Lengths longer than 30 feet may also be quoted.

SM512 Series Convergent Mode Sensors

Accessories and Modifications for SM512 Convergent Sensors



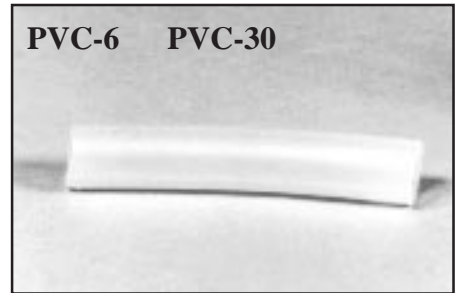
Universal steel mounting bracket for 512 Series sensors permits adjustment in both axes. Also available in stainless steel (order model SMB500SS).



These are 6 and 30-foot lengths of flexible steel conduit and may be used with any of the 512 Series sensors and the CF7-16 fitting to provide protection to the sensor cable.

Size: I.D. = 5/16"; O.D. = 7/16".

Note: does not attach to models SM512C1 or SM512CV1.



These are 6 and 30-foot lengths of plastic (PVC) flexible tubing for use with the 512 Series sensors and the CF7-16 in food applications where flexible steel conduit is not allowed.

Size: I.D. = 1/4"; O.D. = 3/8".

Note: does not attach to models SM512C1 or SM512CV1.



Aluminum compression fitting for the cable entrance at the rear of the 512 Series sensors. May be used with either plastic or flexible steel conduit (PVC-6 or AC-6). Note: does not attach to models SM512C1 or SM512CV1.

WARRANTY: Banner Engineering Corporation warrants its products to be free from defects for one year. Banner Engineering Corporation will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.