

Installation Instructions—PHOTOSWITCH® Series 9000 Diagnostic Photoelectric Sensors

All Sensors		Standard Diffuse	Retroreflective	Polarized Retroreflective	Transmitted Beam		
					Receiver	Light Source 1 	Light Source 2 
1	Sensor Type				Diagnostic		
2	Sensing Distance	1.5m (5ft)	—	—	—	61m (200ft)	152m (500ft)
	78mm (3in) Reflector	—	9.1m (30ft)	4.9m (16ft)	—	—	—
	32mm (1.25in) Reflector	—	3.6m (12ft)	2m (6.5ft)	—	—	—
	16mm (0.625in) Reflector	—	3m (10ft)	0.9m (3ft)	—	—	—
3	Transmitting LED	Infrared 880nm		Visible Red 660nm	—		Infrared 880nm
4	Indicators			Yellow: Power, Green: Output, Red: Stability, Flashing Green: 0.7 < Margin < 1.0, Flashing Yellow: 1.0 < Margin < 1.5			
5	Field of View	3.5°			1.5°		
6	Sensitivity Adjustment			Single Turn Potentiometer			
7	Operating Temperature			0°C to +70°C (0°F to +158°F)			
8	Relative Humidity			5% to 95%			
9	Housing / Lens Material			Valox®/Acrylic			
10	Operating Environment			NEMA 3, 4X, 6P, 12, 13, IP67			
11	Approvals			UL listed, CSA certified, CE marked for all applicable directives			
12	Protections			All Versions: False Pulse, Solid State Output Versions: Short Circuit, DC Versions: Reverse Polarity and Overload			
13	Vibration			10-55 Hz, 1 mm amplitude, Meets or exceeds IEC 947-5-2			
14	Shock			30G with 1 ms pulse duration, Meets or exceeds IEC 947-5-2			

10-30V DC Sensors—Selectable NPN/PNP N.O./N.C. Dynamic/Static

Catalog Number—2m 300V cable	42GDP-9000	42GDU-9000	42GDU-9200	42GDR-9000	42GRL-9000	42GRL-9040
Catalog Number—4-pin DC micro QD	42GDP-9000-QD	42GDU-9000-QD	42GDU-9200-QD	42GDR-9000-QD	42GRL-9000-QD	42GRL-9040-QD
Catalog Number—4-pin mini QD	42GDP-9000-QD1	42GDU-9000-QD1	42GDU-9200-QD1	42GDR-9000-QD1	42GRL-9002-QD	42GRL-9042-QD
16	Supply Current	30mA			15mA	
17	Output Energized	Light/Dark Selectable			—	—
18	Load Current	100mA			—	—
19	Leakage Current	10µA			—	—
20	Power Consumption		1 watt max			
21	Response Time	2ms		5ms	—	—

90-264V AC, 95-264V DC Sensors—N.O. Relay, Diagnostic: SPST Relay, N.O./N.C. Selectable

15	Catalog Number—2m 300V cable	42GDP-9004	42GDU-9004	42GDU-9204	42GDR-9004	—	—
	Catalog Number—5-pin mini QD	42GDP-9004-QD	42GDU-9004-QD	42GDU-9204-QD	42GDR-9004-QD	—	—
16	Supply Current		15mA				
17	Output Energized	Light/Dark Selectable			—	—	—
18	Load Current	Sensor: 2A@120V AC, Diagnostic: 1A@120V AC, 0.5A@240V AC			—	—	—
19	Leakage Current	—					
20	Power Consumption	4 watts/4VA max					
21	Response Time	15ms			—	—	—

90-264V AC, 95-264V DC Sensors—N.C. Relay, Diagnostic: SPST Relay, N.O./N.C. Selectable

15	Catalog Number—2m 300V cable	42GDP-9005	42GDU-9005	42GDU-9205	42GDR-9005	—	—
	Catalog Number—5-pin mini QD	42GDP-9005-QD	42GDU-9005-QD	42GDU-9205-QD	42GDR-9005-QD	—	—
16	Supply Current		15mA				
17	Output Energized	Light / Dark Selectable			—	—	—
18	Load Current	Sensor: 2A@120V AC, Diagnostic: 1A@120V AC, 0.5A@240V AC			—	—	—
19	Leakage Current	—					
20	Power Consumption	4 watts/4VA max					
21	Response Time	15ms			—	—	—

① Transmitted Beam Source rated 10-264V AC/DC.

Operation

Series 9000 Diagnostic photoelectric sensors provide additional information about the operation of the sensor and application. A separate discrete output signal is provided when a failure has been detected or when there is insufficient application quality. The exact nature of the failure or application problem is communicated through a series of LED indicators on top of the sensor.

Other standard Series 9000 features are built into these sensors, see page 1-33 of the C112 Sensor catalog for a description.

Diagnostic Output

The Diagnostic Output signals that the sensor may be operating in an unstable state or that a sensor output is shorted/overloaded.

Insufficient Application Quality

The sensor measures margin values to determine application quality. If the operating margin for an application is too high or too low, the diagnostic output will change state.

In a diffuse application, the peak margin when detecting the target may be too low (operating margin 1.0 to 1.5), or the margin when detecting the background may be too high (operating margin 0.7 to 0.99). In a retroreflective or polarized retroreflective application the margin when detecting the reflector or reflective tape may be too low (operating margin 1.0 to 1.5) or the margin when target is detected may be too low (operating margin 0.7 to 0.99).

The LED indicators will identify the specific application problem. Refer to *Indicators* for a description.

Overload or Short Circuit at Outputs

10-30V DC sensors have a single output that is switch selectable for NPN or PNP and Light Operate or Dark Operate. If a short circuit or overload is detected in the output, the diagnostic output will change state. The LED indicators will provide information about this condition, refer to *Indicators* for a description.

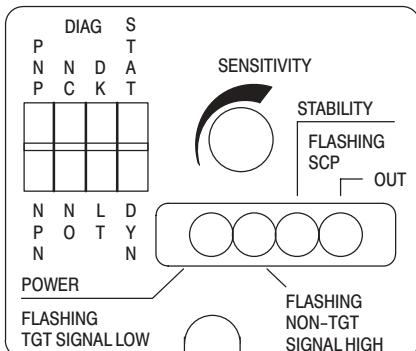
Adjustments and Indicators

Refer to the Top View illustrations on the right.

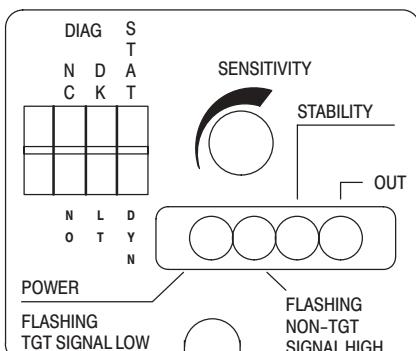
Switch Selectable Features

- NPN/PNP (DC sensors only)—Select NPN or PNP Sensor and Diagnostic Outputs
- NC/NO—Configure Diagnostic Output for Normally Open or Normally Closed operation
- DK/LT—Configure Sensor output for Dark Operate (DK) or Light Operate (LT)
- STAT/DYN—Select Static or Dynamic Diagnostic Output Operation (see below)

Top View Detail (DC)



Top View Detail (AC/DC)



Indicators

The function of the LED indicators is shown in the table in the last column on this page (from left to right). Whenever the Yellow indicator is On steady, the sensor is operating in a stable condition and there are no faults. Whenever the sensor is powered, but the Yellow indicator is off or flashing, the flashing indicators will show the source of the problem.

Static and Dynamic Diagnostic Operating Modes

Static or Dynamic diagnostic sensing modes are switch selectable.

The Static mode is designed for web sensing or other applications in which an immediate diagnostic output is required when an unstable sensing condition occurs (operating margin is greater than 0.7 and less than 1.5).

The Dynamic mode is useful in repetitive applications where targets are constantly moving into and out of the sensor's field of view. These applications could include packages moving on a conveyor, material on a moving product line, etc. To minimize "nuisance" diagnostic outputs due to occasional, random fluctuations in operating margin, sensors set in the Dynamic mode provide a diagnostic output only after detection of seven successive "unstable" signals.

Indicators (Left to Right)

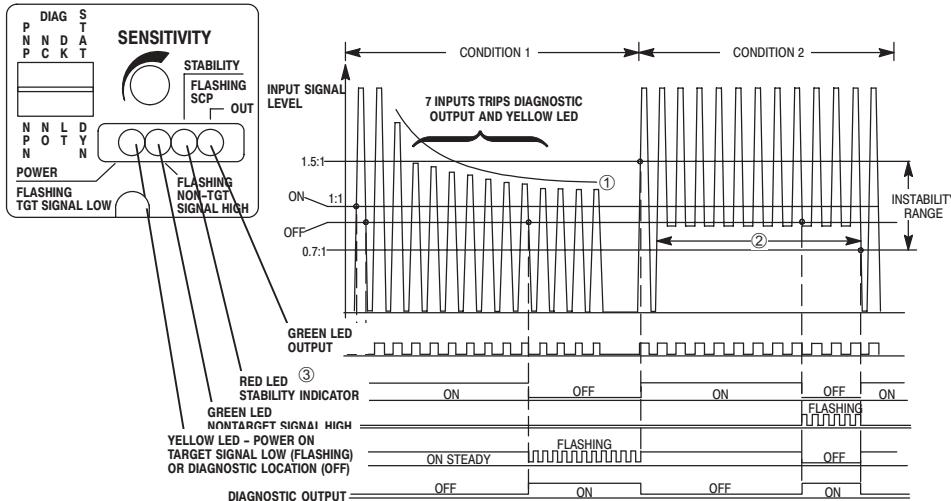
Label	Color	State	Diagnostic Operating Mode	
			Static	Dynamic
POWER	Yellow	On Steady		Sensor Power On
FLASHING TGT SIGNAL LOW		Flashing	Unstable operation (0.7 < Margin < 1.5)	1.0 < Margin > 1.5 for seven successive operations
			Diffuse: Target margin too low	Retro / Polarized Retro: Reflector margin too low
				Transmitted Beam unbroken beam margin too low
FLASHING NON-TGT SIGNAL HIGH	Green	Flashing	Unstable operation (0.7 < Margin < 1.5)	0.7 < Margin < 1.0 for seven successive operations
			Diffuse: Background margin too high	Retro / Polarized Retro: Target margin too high
				Transmitted Beam broken beam margin too high
STABILITY(1)	Red	On Steady		Stable operation (Margin < 0.7 or Margin > 1.5)
FLASHING SCP		Off		Unstable operation (0.7 < Margin < 1.5)
		Flashing(2)		Overload or short circuit at sensor output
OUTPUT	Green	On		Output energized

(1) To prevent potentially confusing indications during rapid signal transitions, the red STABILITY indicator has a typical delay of 100ms before it turns off.

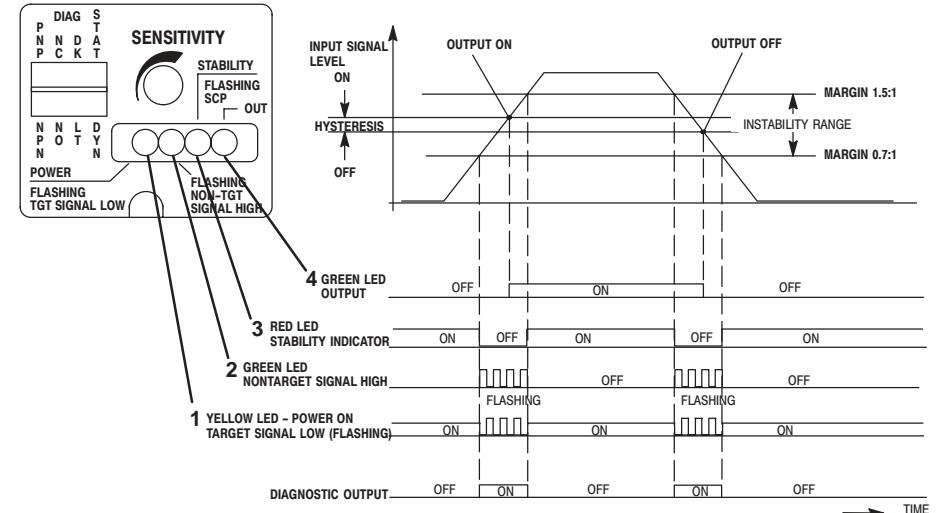
As a result, the indicator will not turn off for quick, brief events. (The Diagnostic Output has no delay.)

(2) 10-30V DC sensors only.

DYNAMIC Operating Mode



STATIC Operating Mode

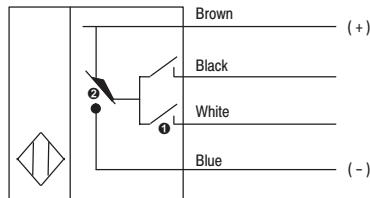


Wiring Diagrams

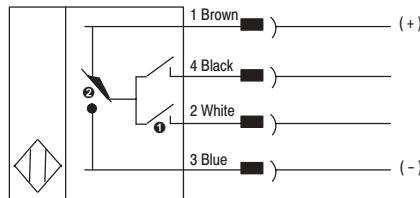
DC Sensors

Cable Version:

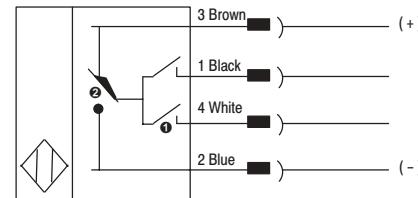
Models: 42G __-9xx0



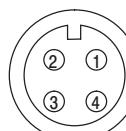
Models: 42G __-9xx0-QD



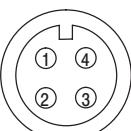
Models: 42G __-9xx0-QD1



QD



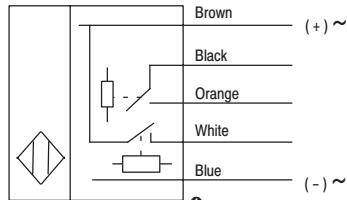
QD1



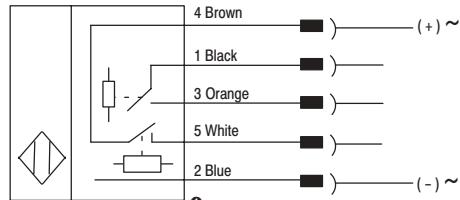
AC/DC Sensors

Cable Version:

Models: 42G __-9x04

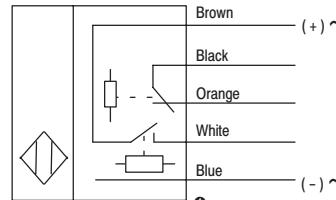


Models: 42G __-9x04-QD

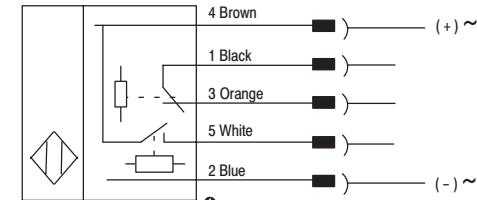


Cable Version:

Models: 42G __-9x05



Models: 42G __-9x05-QD



① NO/NC Selectable

② PNP/NPN Selectable

Note: Details regarding connection of Allen-Bradley Series 9000 photoelectric sensors to Allen-Bradley Programmable Controllers can be found in Publication 42GR-7.4.

All wire colors shown refer to Allen-Bradley quick-disconnect cables.

