



Remote Digitally Controlled Sensor  
Highest Resolution of Any Model



DCS®

# SMARTEYE® DCS®

DIGITALLY CONTROLLED  
SMARTEYE® SENSOR

## Solve Your Sensing Problems

- Icons Simplify Setup
- Unlimited Product Memory Settings
- Graphical Performance Monitor
- Configurable Performance Options
- Multiple Timer Options
- Tamperproof

Many of today's photoelectric sensors are equipped with limited features that are both confusing and difficult to control. The operator can find it difficult to implement even a simple setup procedure or monitor the diagnostic indicators. By combining the power of the computer with the SMARTEYE® DCS® sensor, setup procedures are simplified, performance options are easily configured, and the operator is provided a unique, graphic display.

Without a doubt, the SMARTEYE® DCS® (Digitally Controlled Sensor) is equipped with the greatest variety



(Patent No. 6,950,778)



of performance enhancing options ever offered in a single photoelectric sensor. Because this sensor offers so many features and benefits, it would be easy to assume that it would be difficult for a machine operator to adjust. Frankly, the opposite is true. While viewing a simple, easy-to-use graphic display, all that's required is for the operator to point and click on the specific icon depicting the sensing mode in use, i.e., Beam Make (proximity) or Beam Break (retroreflective or opposed). Another setup option is to go to the product memory screen to store or recall previous settings, based upon specific product descriptions.

After initiating the AUTOSET™ routine, the operator has the option of monitoring the response of the sensor to contrasting light levels on either a bargraph contrast indicator or a unique oscilloscope-style Contrast Deviation Analyzer (Patent Pending). The analyzer charts the signal level deviation against the background of the dynamic range of the sensor while monitoring on-going events. Now the operator, while viewing the contrast analyzer on the screen, can

From your Control Display Screen, you can...

## ADJUST THE SENSOR

- A. Click on the icon depicting the sensing mode in use to initiate the automatic setup routine. (AUTOSET™)
- B. Recall prior settings from product memory. *NOTE:* Both the stored settings and the configured options will be instantly recalled.
- C. While viewing the oscilloscope-style Contrast Deviation Analyzer, the adjustments can be tweaked to obtain the setting that absolutely guarantees the most reliable performance.



## CONFIGURE THE SENSOR

The following options are automatically configured by using selectable icons or can be manually configured.

- A. ACT™ (Automatic Contrast Tracking)
- B. Response Time
- C. Hysteresis
- D. AUTOSET™ Mode
- E. AUTOSET™ Point
- F. Output Mode
- G. Adjustable Signal Conditioning Timer Options
  - 1. Signal Conditioning
    - a. Leading Edge Debounce
    - b. Trailing Edge Debounce
    - c. Blind/Inhibit Timer
  - 2. Motion Control Function (traditional On/Off delays)



## MONITOR THE SENSOR *(Unique to the Industry)*

- A. Indicators
  - 1. Contrast Indicator
  - 2. Output Status
  - 3. Dynamic Range
  - 4. RS-232 Communications Error
  - 5. Product Serial Number
  - 6. Sensor Change Indicator (sensor in use is not original sensor)
- B. Oscilloscope-Style Contrast Deviation Monitor (charts actual signal level response to input events)
  - 1. Screen number *one* displays signal level response while monitoring actual output switching
  - 2. Screen number *two* charts signal level deviation against the background of the dynamic range of the sensor



*While viewing the display, the operator can "tweak" the adjustment to obtain the most ideal setting that guarantees reliable sensing. In addition, the signal conditioning timers can be properly adjusted.*

The following options are automatically configured by using selectable icons, or they can be manually configured.

## ACT™ AUTOMATIC CONTRAST TRACKING

ACT™ automatically adjusts the sensor as conditions change. This can include dirty lenses or reflectors, damaged fiberoptics or lenses, LED light source or thermal drift, and target variations such as position, orientation, or color. It can also compensate for signal shift or deterioration caused by high-speed input events. The DCS® continues to operate requiring far less maintenance than other sensors, making it *the choice* in tough sensing applications.

In applications where conventional photoelectric sensors require constant adjustments, the digitally controlled sensor is the answer. The ACT™ system is event driven, *i.e., the sensor monitors each input and makes appropriate adjustments*. This results in the truly unique ability of the sensor to track with gradual deterioration of contrasting light levels in dynamic conditions, while input events are ongoing.

Without question, the ACT™ system has proven to be extremely useful and should be activated as the default setting. It may be advantageous to turn the ACT™ off when performing product inspection or extremely low contrast sensing tasks.

## RESPONSE TIME

In general, it is advantageous to have a high speed of response from the sensor that triggers an electro-mechanical response required to perform a machine operation or function *i.e., drill it, cap it, fill it, label it, print it, etc.* As a result, the location of the performed operation remains consistent, independent of variations in the velocity of the moving target. Therefore, for the vast majority of applications, the 125-microsecond response time is your best choice and should be considered the default setting. However, in some situations it may be advisable to slow down the response time of the sensor to 500 microseconds. For example, when attempting to respond to printed registration marks on paper or “web” materials, you may elect to desensitize the sensor to avoid responding to minor surface blemishes that pass rapidly through the sensor’s light beam. Selecting a slower speed of response is also useful to prevent the sensor’s output from chattering due to extreme electrical noise.



## HYSTERESIS

The DCS® sensor has *two* switch point signal levels as displayed on the Contrast Indicator that determine when the output of the sensor will switch. When the signal level passes through the upper, or light state switch point, the sensor will switch to the light state condition. When the signal level drops below the dark state switch point, the output will switch to the dark state condition. The difference between the light state and dark state switch points defines the hysteresis of the sensor.

It is common for all photoelectric sensors to have a level of hysteresis to prevent the output of the sensor from inadvertently switching or “chattering” due to, for example, electrical interference or minute changes in the level of light received caused by vibrating objects partially in view of the sensor’s light beam. The DCS® sensor is unique in that two levels of hysteresis are available. The low *hysteresis* setting is from 4 to 6 (3 bars as displayed on the Contrast Indicator). This is generally more than enough to provide for clean output switch transitions and prevents an output response on both the leading edge and trailing edge of the passing object. The low setting should be considered the default setting.

The high hysteresis setting of 2 to 8 (7 bars as displayed on the Contrast Indicator) can be used in applications when there is severe vibration of the objects stopped in front of the sensor.



The Operator can tweak the adjustments from the monitor for any sensing purpose.

## AUTOSET™ MODE

### *The Light State AUTOSET™ Routine*

On command, it automatically adjusts the sensor to a light state set point slightly above 10 on the Contrast Indicator. Best choice when operating in the Proximity (reflected light) mode. Provides a near perfect adjustment that prevents the sensor from responding to objects in the background at the sensing site. NOTE: The light state AUTOSET™ routine is the best choice for both Beam Make (Proximity) or Beam Break (Retroreflective) sensing modes and should be considered the default setting.

### *The Dark State AUTOSET™ Routine*

On command, it automatically adjusts sensor to a dark state set point slightly below 1 (zero) on the Contrast Indicator. It can be useful to obtain the longest possible sensing range when operating in the Proximity (Beam Make) mode and can only be useful when there are no objects in the immediate background. Use with care.

## AUTOSET™ POINT

The level to which the sensor sets itself when an AUTOSET™ command is implemented. The automatic set point (Excess Gain) can be optimized to a high or low contrast sensing task. Therefore, we have built into the sensor two possible AUTOSET™ points, one for high contrast applications and one for low contrast applications. For general purpose sensing tasks, the high contrast AUTOSET™ switch point is the default setting.

## OUTPUT MODE

In the *Light "ON"* mode the output transistor will turn "ON" when the signal level is above the mid-scale switch point on the Contrast Indicator. When operating in the Proximity (Beam Make mode), the *Light "ON"* mode will result in the output transistor turning "ON" when the leading edge of the object moves into the sensor's light beam.

In the *Dark "ON"* mode the output transistor will turn "ON" when the signal level is below the mid-scale switch point on the Contrast Indicator. When operating in the Beam Break Mode (Opposed mode), the *Dark "ON"* mode will result in the output transistor turning "ON" when the leading edge of the object breaks the light beam.

## ADJUSTABLE SIGNAL CONDITIONING TIMER OPTIONS

### Timer #1

Leading edge "Debounce" timer can be selected to prevent the output from chattering as the leading edge of an object enters the sensor's effective light beam. NOTE: When in use, this timer will delay an output response for the adjustable timed period.

### Timer #2

"Blind" or "Inhibit" timer can be selected to prevent the output from returning to the non-detection state *during* an input event. This timer function can be used to ignore short duration response to undesired target or object conditions that can return the output to the non-detection state prior to the trailing edge clearing the sensor's light beam, *i.e. can be used to ignore a hole in the middle of an object as it passes through the sensor's light beam.*

### Timer #3

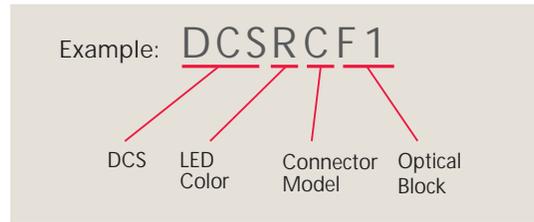
Trailing edge "Debounce" timer can be selected to prevent the output from chattering as the trailing edge of an object exits the sensor's effective light beam. NOTE: When in use, the output will be delayed from returning to the non-detection state for the adjustable time period after the trailing edge of the object has cleared the sensor's effective light beam.

## IMPORTANT:

When both of the Debounce timers are set to the same time duration, the sensor's response will be delayed and will be representative of the actual input duration.

# How to Specify

- |                  |                              |
|------------------|------------------------------|
| 1. SELECT SENSOR | 2. SELECT OPTICAL BLOCK      |
| DCSIC Infrared   | F1 Fiber Optic               |
| DCSRC Red        | V1, V1G Convergent 2 – 4"    |
| DCSWLC White     | R1 Retroreflective           |
|                  | O1, O1G Long Range Proximity |
|                  | O2 Wide Beam Proximity       |



## SMARTEYE® DCS®



4-Wire, M12 (for TJC-2)

BSEC-6  
6' (1.8 m) cable with connector

BSEC-15  
15' (4.6 m) cable with connector

BSEC-25  
25' (7.6 m) cable with connector

5-Wire, M12 (for TJC-3)

GSEC-6  
6' (1.8 m) cable with connector

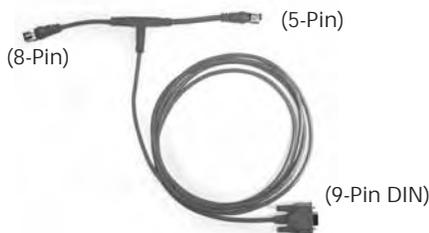
GSEC-15  
15' (4.6 m) cable with connector

GSEC-25  
25' (7.62 m) cable with connector

## Accessories



TJC-2  
"T" Junction Splitter Cable,  
4-Pin Output



TJC-3  
"T" Junction Splitter Cable,  
5-Pin Output



DCS8-2M  
Cable, 8-wire, M12



004-0097  
EYEWARE CD  
(Free)



FMB-1 (8.4 mm diam.)  
Standard Fiberoptic  
Mounting Bracket



FMB-2 (5.1 mm diam.)  
FMB-3 (3.1 mm diam.)  
Miniature Glass or Plastic  
Fiberoptic Mounting  
Brackets

### Range Guidelines

Convergent/Proximity/Retroreflective

OPTICAL BLOCKS	IR	RED	WHITE
O1, O1G	6 ft.	5.5 in.	N/A
O2	3.5 in.	3.5 in.	1.5 in.
V1, V1G	4 in.	4 in.	2 in.
R1	35 ft.	30 ft.	N/A

NOTE: Proximity test utilized a 90% reflective white target. Retro-reflective tests utilized a 3" diam. round reflector, Model AR-3

### Glass Fiberoptics Opposed Mode

F1	6 ft.	5.5 in.	N/A
F1 w/lens	20+ ft.	20+ ft.	9 ft.

### Glass Fiberoptics Proximity Mode

F1	6 in.	4.5 in.	1.75 in.
F1 w/lens	1 ft.	1 ft.	1 ft.

NOTE: Range tests utilized a .125" diam. fiberoptic bundle

# Specifications

## SUPPLY VOLTAGE:

- 10 to 16 VDC
- Polarity Protected

## CURRENT REQUIREMENTS:

- 65 mA (exclusive of load)

## OUTPUTS:

- (1) NPN and (1) PNP open collector output transistors
- Sensor outputs can sink or source up to 150 miliamps (current limited)
- All outputs are continuously short circuit protected

## COMMUNICATIONS PORT:

- RS-232 I/O
- Baud Rate 19.2k

## LED LIGHT SOURCE:

- Options: Infrared = 880nm, Red = 660nm, or White = Broadband Spectrum

## LIGHT IMMUNITY:

- Responds to sensor's pulsed modulated light source resulting in high immunity

## INDICATORS:

- Red LED output indicator illuminates when the sensor's output transistor is "ON", NOTE: If Output LED flashes, a short circuit condition exists.
- Yellow ACT™ indicator – illuminates when contrast deviation fails to rise above "8" in the light state condition or fails to go below "2" in the dark state condition. Indicates performance approaching marginal level.
- 10 LED Contrast Indicator – displays scaled readings of sensor's response to contrasting light levels (light vs. dark)

## AMBIENT TEMPERATURES:

- -40° C to +70° C (-40° F to +158° F)

## RUGGED CONSTRUCTION:

- Chemical resistant high impact polycarbonate plastic housing
- Waterproof rating: NEMA 4X, 6, IP-67
- Conforms to heavy industrial grade CE requirements



The DCS® Sensors are compatible with computers, PLC's, imbedded controllers, or any controlling device equipped with an RS-232 serial port.

EYEWARE software and ASCII command set available online (free).

(Patent No. 6,950,778)

Product subject to change without notice. Consult Factory for RoHS Compliance.

## Connections and Dimensions

## SMARTEYE® DCS®

