Specifications

SUPPLY VOLTAGE
- 12 to 24 VDC
- Polarity Protected
- Intended for use in Class 2 circuits

CURRENT REQUIREMENTS
- TCS-1S: 110mA@12VDC, 80mA@24VDC
- TCS-2S: 140mA@12VDC, 85mA@24VDC

PERFORMANCE
- TCS-1S: Effective Resolution: Min. 12 bit, Max. 16 bit
- TCS-2S: Effective Resolution: 14 bit

OPTICAL CHARACTERISTICS
- Light emitter: White LED
- Optical axis: TCS-1S: Coaxial; TCS-2S: Convergent
- Receiving spectrum: 400nm to 700nm

DIGITAL OUTPUTS
- Selectable NPN or PNP open collector outputs
- 75mA capacity
- Short circuit & transient voltage protected
- Residual voltage: NPN, 1.35 max.; PNP, 2.05 max.

OUTPUT SELECTION
- LO (Light On or Color Match)
- DO (Dark On or No-Match)

REMOTE CAPTURE INPUT
- Input time: 25mS (ON) / 25mS (OFF) minimum
- Selectable (sinking or sourcing)
- Contact or solid-state input 1mA
- Transient suppression

GATE/LATCH INPUT
- Selectable NPN/Sinking or PNP/Sourcing
- Selectable EDGE or GATE trigger for latch reset or inhibit for windowing
- Contact or solid-state input 1mA
- Transient suppression

TIMER
- On delay, off delay, one shot, and latch
- Duration: 1mS to 10 seconds ±1%

DETECTION MODE
- Color or color + intensity

ALPHA NUMERIC DISPLAY
- Alpha-Numeric Display for Available Options

RESPONSE TIME
- Color-to-color: TCS-1S: 75 µs (Uspd), 150µs (Hspd), and 300µs (Hres); TCS-2S: 600 µs
- Shade-to-shade: TCS-1S: 100 µs (Uspd), 200µs (Hspd), and 800µs (Hres); TCS-2S: 800 µs

DIAGNOSTIC INDICATORS
- Output Indicator – (Amber)
- Four Character Alpha-Numeric Display – (Green)

AMBIENT LIGHT IMMUNITY
- Responds to sensor's pulsed modulated light source – immune to most ambient light including indirect sunlight

HUMAN INTERFACE
- Pushbutton control: Select, Next

AMBIENT TEMPERATURE
- -5°C to 55°C (23°F to 131°F) No ice, frost, or fogging allowed

STORAGE TEMPERATURE
- 5°C to 90°C (41°F to 104°F)

RELATIVE HUMIDITY
- 35% to 85%

VIBRATION
- 10 to 55 Hz, 0.5mm, 30 minutes each axis

SHOCK
- Half-sine wave, 30g, 11µs 6 time 3 axis

CERTIFICATIONS
- CE - Complies with IEC 60947-5-2 edition 3.0 2007-10

LENS MATERIAL
- Acrylic or glass

RUGGED CONSTRUCTION
- Chemical resistant, high impact polycarbonate housing
- Waterproof ratings: NEMA 4, IP65.

CE
RoHS Compliant
Product subject to change without notice

Connections and Dimensions

Rear Door Made of Smoked Clear Polycarbonate Plastic

Extended 22° Window Is Exclusive To Short Range

True Color Sensor
TCS-1S
CE Made In USA

6' Cable For Cabled Models

6" Pigtail w/ M12 Connector

POS — Red / Brown* [1]
(1) LOAD CH 1 — Green / Black* [2]
12 TO 24 VDC
(2) GATE — White / White* [4]
NEG — Black / Blue* [3]
(2) REMOTE SET — Blue / Gray* [5]

[ ] REPRESENTS PIN #

(1) - NPN (Sinking) Output Load Terminated To Positive
PNP (Sourcing) Output Load Terminated To Negative

(2) - NPN (Sinking) Input Activated By Connecting To Negative
PNP (Sourcing) Input Activated By Connecting To Positive

* Color Code For M12 Connector Models

60.mm TCSx-1x(Short Range)
55.5mm TCSx-2x(Long Range)
23mm
56mm TCSx-2x(Long Range)
62mm TCSx-1x (Short Range)

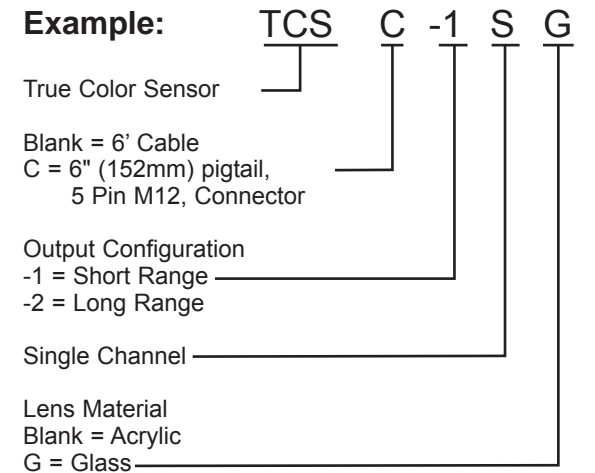# TRUE COLOR SENSOR

Single Channel Model

The True Color Sensor is the most feature packed color sensor available. Designed to work as well as an instrument or spectrometer, this sensor can solve the most difficult color applications at higher speeds than color cameras or the closest priced competitive product. The Color Monitor provides a visual confirmation of performance without touching the sensor in any way. Providing a choice in speed versus resolution, the True Color Sensor puts the controls of the performance of the sensor in the hands of the operator; allowing for more application solutions, and removing the limits that either speed or resolution alone can offer.

With control over Tolerance, Light Intensity, Output Configuration (NPN or PNP), Timers, Input Configuration (Edge or Gate), the True Color Sensor provides a tailored and customized solution for the most difficult color sensing, or inspection problems facing today's packaging and production lines.
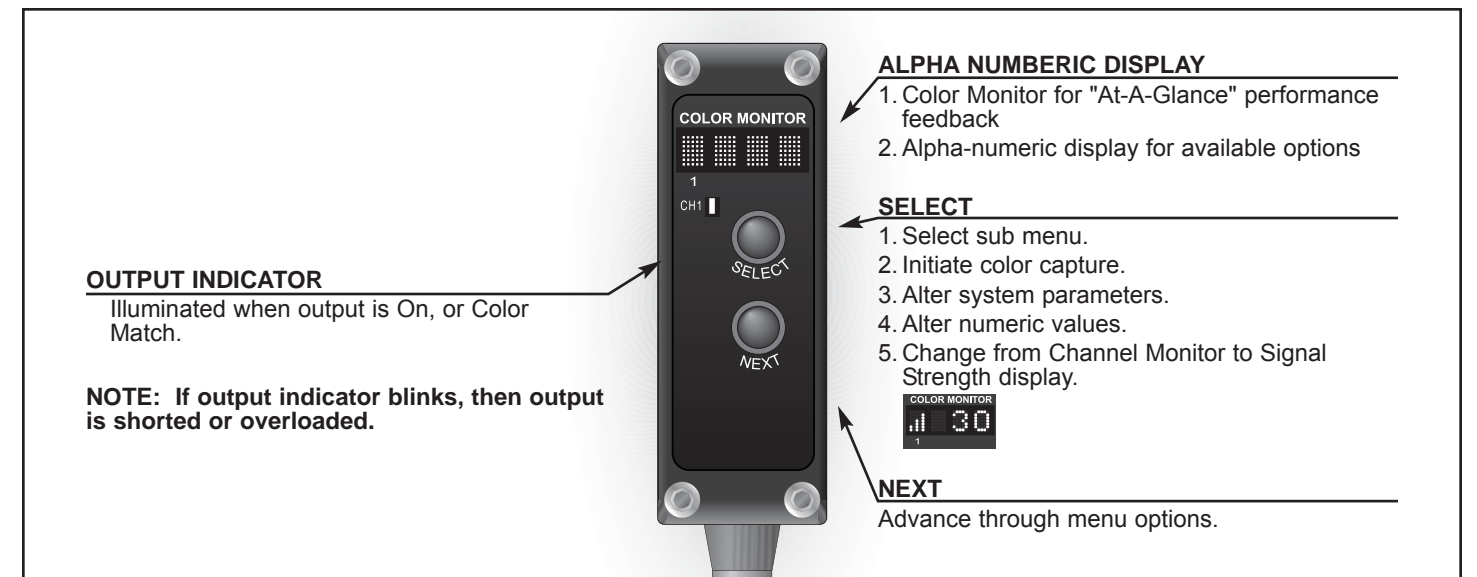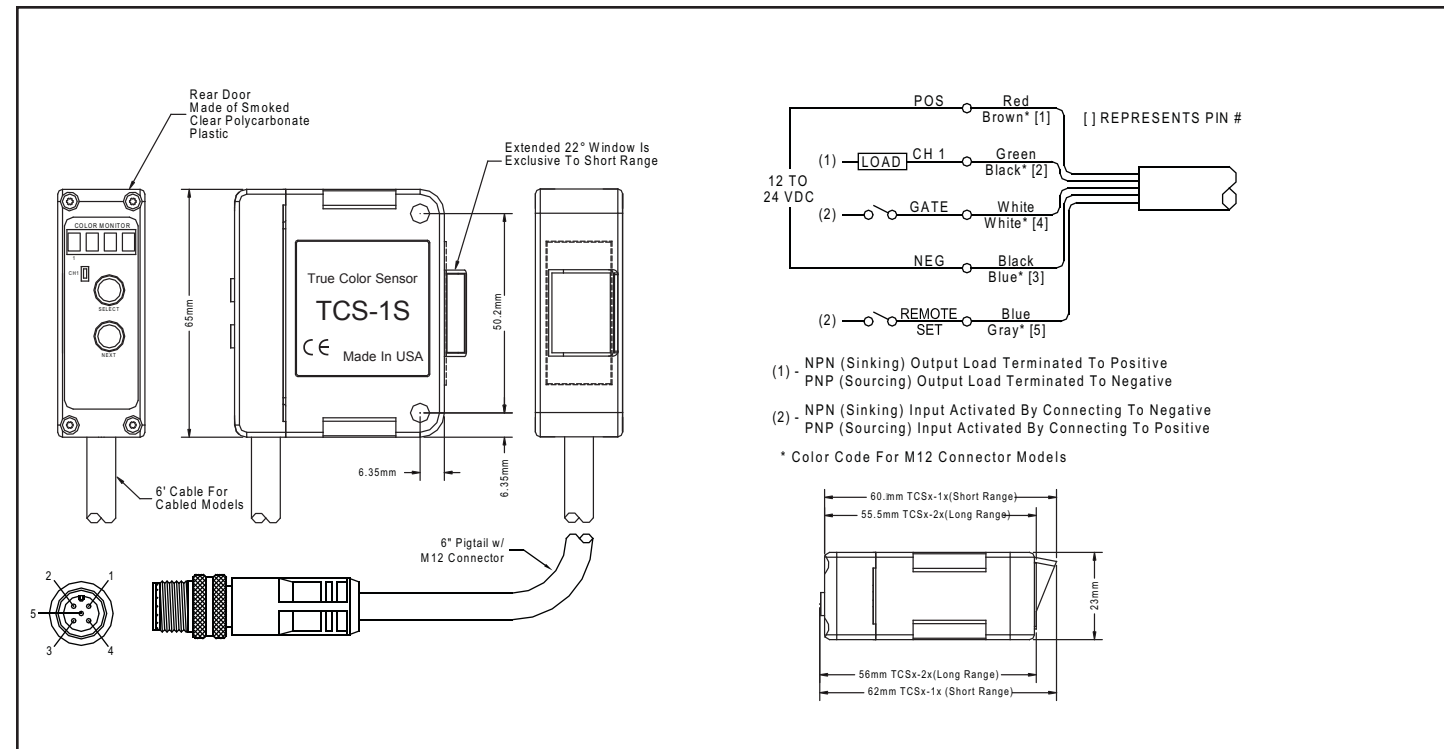
How to Specify

1. Select Sensor:
True Color Sensor

2. Select Cable:
Blank = 6 foot, 5 conductor, 26AWG Cable
C = 6 inch pigtail with 5-pin, M12 connector

3. Select Range:
-1S = Short Range
-2S = Long Range

4. Select Lens Material:
Blank = Acrylic
G = Glass

Example: TCS C -1 S G

True Color Sensor

Blank = 6' Cable
C = 6" (152mm) pigtail, 5 Pin M12, Connector

Output Configuration
-1 = Short Range
-2 = Long Range

Single Channel

Lens Material
Blank = Acrylic
G = Glass

OUTPUT INDICATOR
Illuminated when output is On, or Color Match.

NOTE: If output indicator blinks, then output is shorted or overloaded.

ALPHA NUMERIC DISPLAY
1. Color Monitor for "At-A-Glance" performance feedback
2. Alpha-numeric display for available options

SELECT
1. Select sub menu.
2. Initiate color capture.
3. Alter system parameters.
4. Alter numeric values.
5. Change from Channel Monitor to Signal Strength display.

NEXT
Advance through menu options.

Setup Instructions

Color Monitor
(FACTORY DEFAULT SETTING)

PRESS SELECT (TOGGLES)

The Color Monitor indicates color match quality as follows:

Full Bars = Perfect color match

At Least One Bar = Color inside tolerance

No Bars = Outside of tolerance; no match.

Returned light level too low. Reposition sensor or adjust Light Intensity.

Returned light level too high. Reposition sensor or adjust Light Intensity.

PRESS | NEXT

Signal Strength

The Signal Strength display indicates total signal strength as a number from 0 (low) to 100 (high). This is a useful setup tool for sensor positioning.

Adjust Signal Strength by repositioning the sensor, or adjusting Light Intensity, "L", in System Parameters.

The higher the Signal Strength, the better the color detection.

Signal Strength, returned light level, too low. Reposition sensor or adjust Light Intensity.

Signal Strength, returned light level, too high. Reposition sensor or adjust Light Intensity.

1 Capture Color
`CAPT`

Aim the sensor at the desired color and press SELECT to capture color.
If display flashes "HIGH" or "LOW" this indicates an out of range condition.

PRESS | NEXT

2 Tolerance
`T:01` Through `T:50` `T:10` *

Fine tune tolerance by pressing/holding SELECT (1-50). The lower the number the greater the sensitivity.

PRESS | NEXT

3 Color / Color + Intensity Mode
`M:C` * `M:CI`

Pressing SELECT toggles between Color (C) and Color + Intensity (CI) mode. Color + Intensity is used for shade-to-shade applications.

PRESS | NEXT

4 Output Mode
`Lo` * `Do`

Pressing SELECT toggles LO (Light On or Color Match); DO (Dark On or No Match).

PRESS | NEXT

5 Timer Mode
`Toff` * `OffD` `OnD` `Shot` `Ltch`

Pressing SELECT changes timer mode: Timer off (Toff), Off Delay (OffD), On Delay (OnD), One Shot (Shot), and Latch (Ltch).

PRESS | NEXT

Adjust Time (ms)
`0001` Through `9999`

Pressing/holding SELECT increases timer in milliseconds.
Note: Only displayed when timer is enabled.

6 `SYS>`

See next page for System Parameters.

Range and Spot Size

Short Range – CW-1S

Distance (Min to Max Range)	Spot Size (Circular)
10mm/.394"	5.00mm/0.197"
15mm/.590"	4.75mm/0.187"
20mm/.787"	5.75mm/0.226"
25mm/.984"	7.75mm/0.305"

Long Range – CW-2S

Distance (Min to Max Range)	Spot Size (Square)
51mm/2"	19.1mm/0.752"
154mm/6"	31.8mm/1.252"
254mm/10"	41.3mm/1.624"
305mm/12"	47.6mm/1.874"
406mm/16"	60.3mm/2.374"

Remote Capture

Pulse the Remote Capture wire to Negative or Positive, dependent upon IN> setting; NPN or PNP, respectively.
NOTE: Pulse on for 40ms to 400ms. The idle time between pulses is 40ms to 400ms.

System Parameters

Press SELECT to enter System Parameters menu.

`SYS>`

PRESS | NEXT

1 Unlock / Lock
`ULOC` `LOCK`

Pressing SELECT enables and disables button Lockout (ULOC, LOCK).

PRESS | NEXT

2 Light Intensity (Emitter)
`L:10` Through `L:100` *

Pressing SELECT increases intensity (10-100).

PRESS | NEXT

3 Response Time *(CW-1 models only)*
`HSpd` `USpd` `HRes`

Pressing SELECT changes: 75µs Ultra High Speed (Uspd), 150µs High Speed (Hspd), and 300µs High Resolution (Hres). See specs on page 4 for details.

PRESS | NEXT

4 Adjust Input
`IN>` Press SELECT to adjust Input.

4a Gate/Edge
`Gate` `Edge`

Pressing SELECT switches between Gate and Edge mode.
Note: Edge is a momentary trigger; gate is a window trigger or inhibit/reset.

4b NPN/PNP Input
`NPN` `PNP`

Pressing SELECT switches gate and remote set inputs to sinking (NPN) or sourcing (PNP).
Note: Sensor resets after a change.
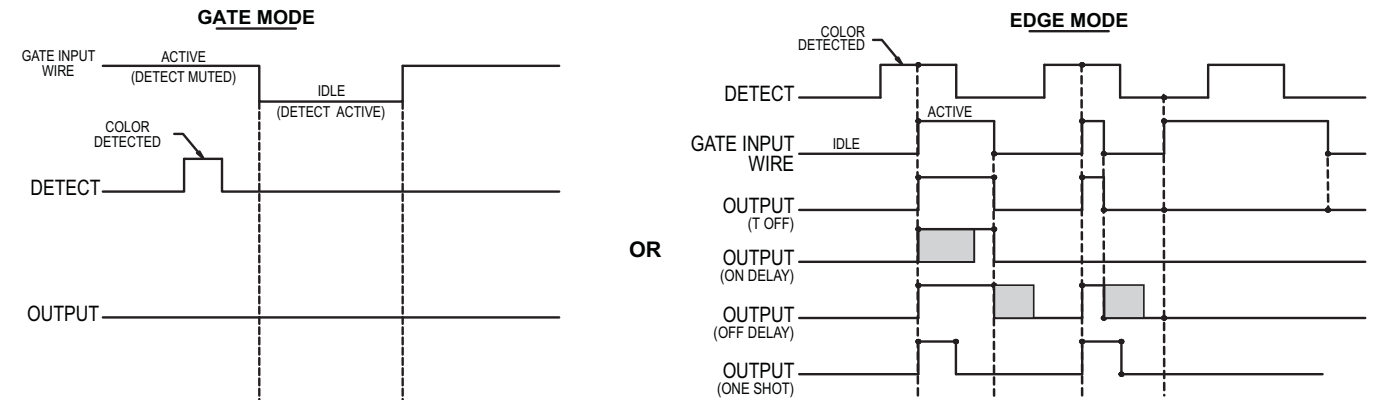
PRESS | NEXT

5 Adjust Output
`OUT>` Press SELECT to adjust Output.

5a
`1:NPN` `1:PNP`

Press SELECT to alter outputs: NPN to PNP
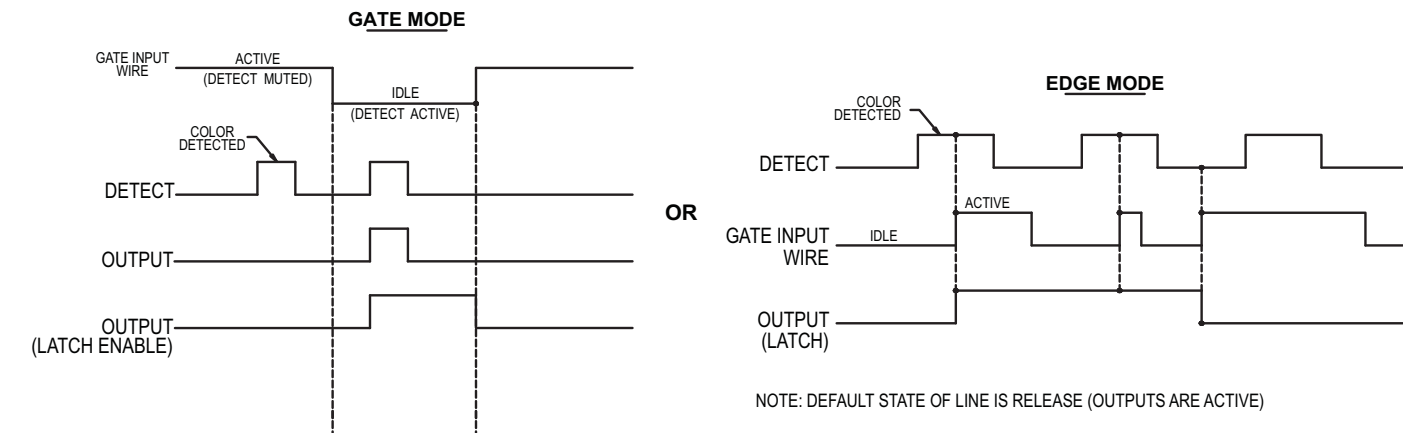*Note: Do not change IN> or OUT> selections while connected to input device or damage may occur to input device.*

GATE INPUT FUNCTIONALITY - LATCH DISABLED
GATE MODE OR EDGE MODE SET IN SYSTEM MENU

GATE MODE

GATE INPUT WIRE — ACTIVE (DETECT MUTED) — IDLE (DETECT ACTIVE)
COLOR DETECTED
DETECT
OUTPUT

OR

EDGE MODE

COLOR DETECTED
DETECT — ACTIVE
GATE INPUT WIRE — IDLE
OUTPUT (T OFF)
OUTPUT (ON DELAY)
OUTPUT (OFF DELAY)
OUTPUT (ONE SHOT)

NOTE: DEFAULT STATE OF LINE IS RELEASE (OUTPUTS ARE ACTIVE)
NOTE: IN EDGE MODE: 1. SAMPLE ON GATE INPUT TRANSITION TO ACTIVE
2. RESET OUTPUT ON GATE INPUT TRANSITION TO IDLE

NOTE: Output can extend beyond idle to active transition for off-delay & one shot.

GATE INPUT FUNCTIONALITY - LATCH ENABLED
GATE MODE OR EDGE MODE SET IN SYSTEM MENU

GATE MODE

GATE INPUT WIRE — ACTIVE (DETECT MUTED) — IDLE (DETECT ACTIVE)
COLOR DETECTED
DETECT
OUTPUT
OUTPUT (LATCH ENABLE)

OR

EDGE MODE

COLOR DETECTED
DETECT
GATE INPUT WIRE — ACTIVE — IDLE
OUTPUT (LATCH)

NOTE: DEFAULT STATE OF LINE IS RELEASE (OUTPUTS ARE ACTIVE)