

ColorMax Discrete

COLOR SENSORS

Verify the presence of targets that can be differentiated by color faster and with greater control. The ColorMax™ employs our field-proven, patented technology to provide an easy-to-use system for measuring color in a wide variety of applications. Fast response makes the ColorMax suitable for high-speed automation processes such as printing, packaging and sorting operations. Accurate color measurement and reliable performance makes the ColorMax the perfect choice for automotive, pharmaceutical and plastics industries.

The ColorMax discrete models provide 1, 4, or 7 programmable color recognition channels with PNP/NPN outputs for direct connection to PLC for easy integration into your automation systems.

ColorMax Application Program provides a comprehensive approach to sensor set-up, color channel management and real-time sample analysis display. Low color variation of 0.5% and a 20kHz switching frequency are the best specs in the industry, providing the performance required by demanding applications. The metal alloy case and glass lens provide robust construction expected in an industrial environment.

COLORMAX

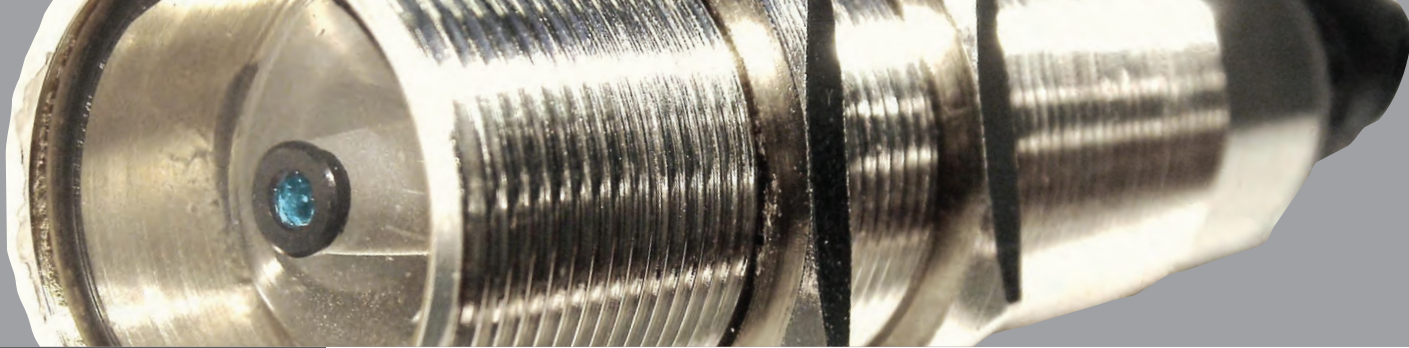


EMX Industries, Inc.

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Sales Inquiries: salesupport@emxinc.com **Technical Support:** technical@emxinc.com
www.emxinc.com



Applications

- Automotive assembly, parts
- Packaging, pharmaceutical, food
- Plastic and rubber parts
- Electronic components
- Paper labels, printing

Design & Features

- Fastest response time
- Highest resolution
- Auto-teach and manual functions
- Sophisticated algorithms that ignore luster
- PC-based configuration
- USB / RS232 Interface
- Lock out operator from changing settings

Ordering Information



Model	outputs	spot size (mm)
CM1000-1-4	1	4
CM1000-4-4	4	4
CM1000-7-4	7	4
CM1000-1-8	1	8
CM1000-4-8	4	8
CM1000-7-8	7	8
CM1000-7-25	7	25

Accessories



CM1000-KIT2

Functions

COLOR RECOGNITION
AVERAGING
TEACH
TOLERANCE
EXTERNAL TRIGGER
ILLUMINATION
RGB VALUE DISPLAY
DISCRETE OUTPUT

Up to 7 channels
 1 to 64 readings
 RGB values 1 to 100%
 0.5% to 50%
 Level, Edge, Free Run
 0 to 100%
 Bar graph - absolute value, Pie chart - relative value
 High or Low (V_ or ground)

Specifications

Detection Range

4mm spot 30mm-50mm
 8mm spot 30mm-100mm
 25mm spot 30mm-150mm

Recommended Operating Distance Spot Diameter

50mm
 4,8 or 25mm @ 50mm
 target distance

Light Source
Switching Frequency
Receiver
Discrete Outputs
Power
External Trigger
Communication
Protection Circuitry

White LED
 20 kHz
 RGB photodiode
 1, 4 or 7
 12-30 VDC
 12-30 VDC
 RS-232C / USB
 Reverse polarity, over current
 (PTC thermal resettable fuse)
 (length, diameter) 110mm x 30mm
 180g (.4lbs)
 316 stainless steel
 IP67 NOT FOR PRESSURE WASH DOWN
 -10 to 55°C
 -20 to 70°C
 12-pin, IP67
 Mounting bracket, jam nuts (two), interface
 cable assembly, 12 VDC power supply,
 application software, I/O board with status
 indicators

Dimensions
Weight
Housing
Type of Protection
Operating Temperature
Storage Temperature
Connector Circular
Accessories



- Exclusive PC-based configuration.
- Operator lockout prevents operators from changing the sensor settings in order to avoid reporting manufacturing quality issues.
- Software driven control of discrete output logic



WARRANTY EMX INC. the product described herein for a period of 2 years under normal use and service from the date of manufacture. The product will be free from defects in material and workmanship. This warranty does not cover ordinary wear and tear, abuse, misuse, overloading, altered products, or damage caused by the purchaser from incorrect connections, or lightning damage. There is no warranty of merchantability. There are no warranties expressed, implied or any affirmation of fact or representation which extend beyond the description set forth herein. EMX Inc. sole responsibility and liability, and purchaser's exclusive remedy shall be limited to the repair or replacement at EMX's option of a part or parts not so conforming to the warranty. In no event shall EMX Inc. be liable for damages of any nature, including incidental or consequential damages, including but, not limited to any damages resulting from non-conformity defect in material or workmanship.

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ColorMax FLEX

COLOR SENSORS

Verify the presence of targets that can be differentiated by color faster and with greater control. The ColorMax™ employs our field-proven, patented technology to provide an easy-to-use system for measuring color in a wide variety of applications. Fast response makes the ColorMax suitable for high-speed automation processes such as printing, packaging and sorting operations. Accurate color measurement and reliable performance makes the ColorMax the perfect choice for automotive, pharmaceutical and plastics industries.

The ColorMax FLEX models provide 4 programmable color recognition channels with PNP/NPN outputs, red, green and blue analog outputs, serial data output and Communications Protocol for high level integration into your control systems.

ColorMax Application Program provides a comprehensive approach to sensor set-up, color channel management and real-time sample analysis display. Low color variation of 0.5% and a 20kHz switching frequency are the best specs in the industry, providing the performance required by demanding applications. The metal alloy case and glass lens provide robust construction expected in an industrial environment.

COLORMAX

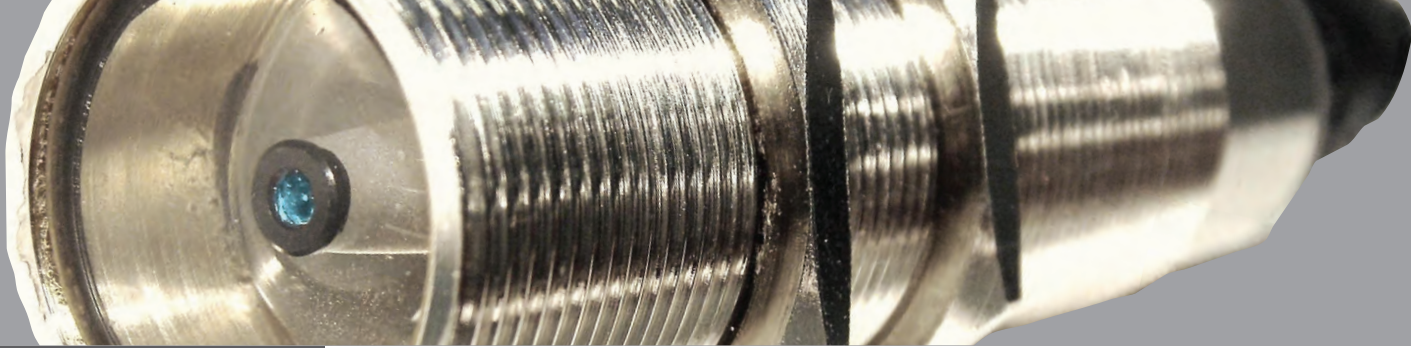


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Applications

- Automotive assembly, parts
- Packaging, pharmaceutical, food
- Plastic and rubber parts
- Electronic components
- Paper labels, printing

Design & Features

- Fastest response time
- Highest resolution
- Auto-teach and manual functions
- Sophisticated algorithms that ignore luster
- PC-based configuration
- USB / RS232 Interface
- Lock out operator from changing settings

Ordering Information



Model	spot size (mm)
CM1000-4FLEX-4	4
CM1000-4FLEX-8	8
CM1000-4FLEX-25	25

Accessories



CM1000-KIT2

Functions

COLOR RECOGNITION
AVERAGING
TEACH
TOLERANCE
EXTERNAL TRIGGER
ILLUMINATION
RGB VALUE DISPLAY
DISCRETE OUTPUT

4 channels
 1 to 64 readings
 RGB values 1 to 100%
 0.5% to 50%
 Level, Edge, Free Run
 0 to 100%
 Bar graph - absolute value, Pie chart - relative value
 High or Low (V_ or ground)

Specifications

Detection Range

4mm spot 30mm-50mm
 8mm spot 30mm-100mm
 25mm spot 30mm-150mm
 50mm

Recommended Operating Distance Spot Diameter

4,8 or 25mm @ 50mm
 target distance

Light Source Switching Frequency

White LED

Receiver

RGB photodiode

Discrete Outputs

4

Analog Outputs

Red, green blue (3 channels 0...5V)

Power

12-30 VDC

External Trigger

12-30 VDC

Communication

RS-232C / USB

Protection Circuitry

Reverse polarity, over current
 (PTC thermal resettable fuse)

Dimensions

(length, diameter) 110mm x 30mm
 180g (.4lbs)

Weight

316 stainless steel

Housing

IP67 NOT FOR PRESSURE WASH DOWN

Type of Protection

-10 to 55°C

Operating Temperature

-20 to 70°C

Storage Temperature

12-pin, IP67

Connector Circular

Mounting bracket, jam nuts (two), interface cable
 assembly, 12 VDC power supply, application
 software, I/O board with status indicators



- Exclusive PC-based configuration.
- Operator lockout prevents operators from changing the sensor settings in order to avoid reporting manufacturing quality issues.
- Software driven control of discrete output logic



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ColorMax HEX

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The ColorMax HEX models provide 15 programmable color recognition channels encoded on 4 discrete PNP/NPN outputs for direct connection to PLC and Communications Protocol for high-level integration into your control systems.

ColorMax Application Program provides a comprehensive approach to sensor set-up, color channel management and real-time sample analysis display. Low color variation of 0.5% and a 20kHz switching frequency are the best specs in the industry, providing the performance required by demanding applications. The metal alloy case and glass lens provide robust construction expected in an industrial environment.



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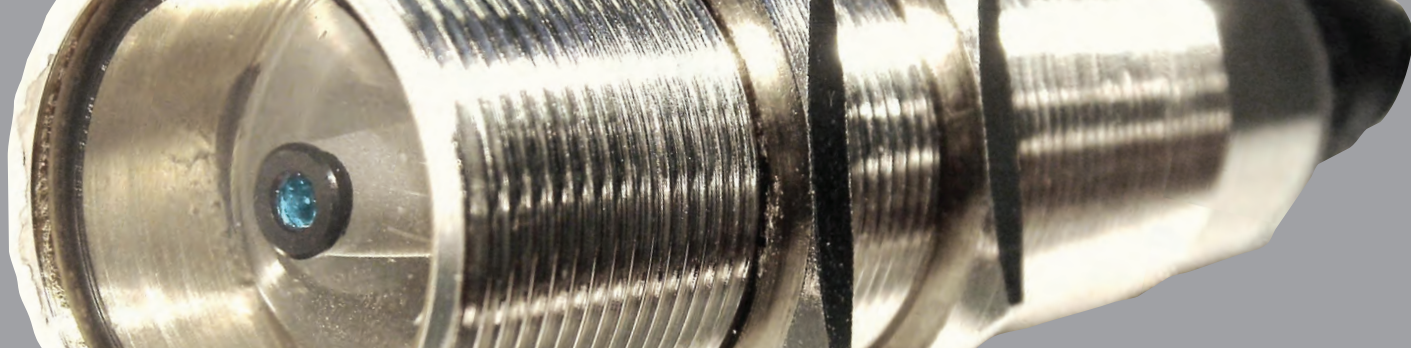
INDUSTRIES

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- Automotive assembly, parts
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- Plastic and rubber parts
- Electronic components
- Paper labels, printing

Design & Features

- Fastest response time
- Highest resolution
- Auto-teach and manual functions
- Sophisticated algorithms that ignore luster
- PC-based configuration
- USB / RS232 Interface
- Lock out operator from changing settings

Ordering Information



Model	spot size (mm)
CM1000-15HEX4	4
CM1000-15HEX8	8
CM1000-15HEX25	25

Accessories



CM1000-KIT2

Functions

COLOR RECOGNITION
AVERAGING
TEACH
TOLERANCE
EXTERNAL TRIGGER
ILLUMINATION
RGB VALUE DISPLAY
DISCRETE OUTPUT

15 channels
 1 to 64 readings
 RGB values 1 to 100%
 0.5% to 50%
 Level, Edge, Free Run
 0 to 100%
 Bar graph - absolute value, Pie chart - relative value
 High or Low (V₋ or ground)

Specifications

Detection Range

4mm spot 30mm-50mm
 8mm spot 30mm-100mm
 25mm spot 30mm-150mm
 50mm

Recommended Operating Distance Spot Diameter

4,8 or 25mm @ 50mm
 target distance

Light Source
Switching Frequency
Receiver
Discrete Outputs
Power
External Trigger
Communication
Protection Circuitry

White LED
 20 kHz
 RGB photodiode
 4 (binary encoded for 15 channels)
 12-30 VDC
 12-30 VDC
 RS-232C / USB
 Reverse polarity, over current
 (PTC thermal resettable fuse)
 (length, diameter) 110mm x 30mm
 180g (.4lbs)
 316 stainless steel
 IP67 NOT FOR PRESSURE WASH DOWN
 -10 to 55°C
 -20 to 70°C
 12-pin, IP67
 Mounting bracket, jam nuts (two), interface cable
 assembly, 12 VDC power supply, application
 software, I/O board with status indicators

Dimensions
Weight
Housing
Type of Protection
Operating Temperature
Storage Temperature
Connector Circular
Accessories



- Exclusive PC-based configuration.
- Operator lockout prevents operators from changing the sensor settings in order to avoid reporting manufacturing quality issues.
- Software driven control of discrete output logic



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ColorMax RGB

COLOR SENSORS

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The ColorMax RGB models provide 4 programmable color recognition channels with PNP/NPN outputs, red, green and blue analog outputs for direct connection to PLC and Communications Protocol for high-level integration into your control systems.

ColorMax Application Program provides a comprehensive approach to sensor set-up, color channel management and real-time sample analysis display. Low color variation of 0.5% and a 20kHz switching frequency are the best specs in the industry, providing the performance required by demanding applications. The metal alloy case and glass lens provide robust construction expected in an industrial environment.

COLORMAX

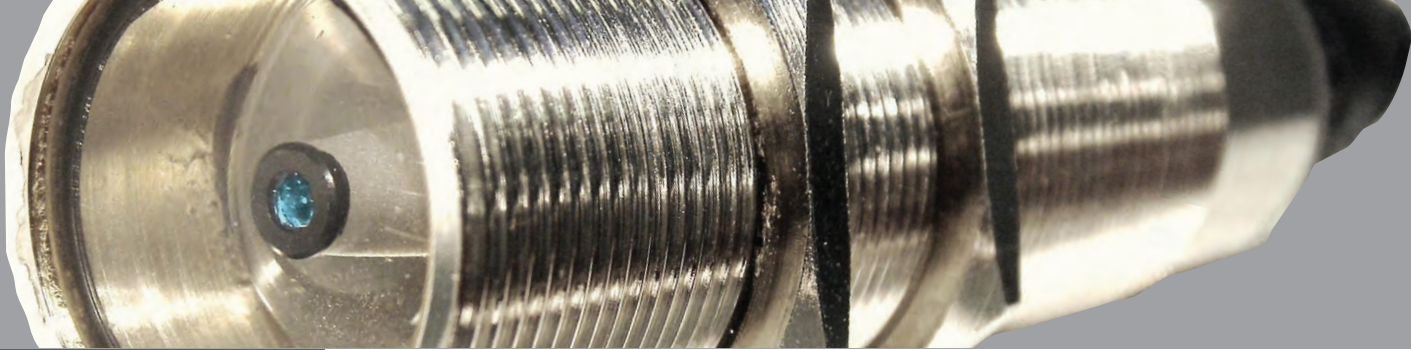


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Applications

- Automotive assembly, parts
- Packaging, pharmaceutical, food
- Plastic and rubber parts
- Electronic components
- Paper labels, printing

Design & Features

- Fastest response time
- Highest resolution
- Auto-teach and manual functions
- Sophisticated algorithms that ignore luster
- PC-based configuration
- USB / RS232 Interface
- Lock out operator from changing settings
- Red, green and blue analog outputs

Ordering Information



Model	spot size (mm)
CM1000-4RGB4	4
CM1000-4RGB8	8
CM1000-4RGB25	25

Accessories



CM1000-KIT2

Functions

COLOR RECOGNITION
AVERAGING
TEACH
TOLERANCE
EXTERNAL TRIGGER
ILLUMINATION
RGB VALUE DISPLAY
DISCRETE OUTPUT

4 channels
 1 to 64 readings
 RGB values 1 to 100%
 0.5% to 50%
 Level, Edge, Free Run
 0 to 100%
 Bar graph - absolute value, Pie chart - relative value
 High or Low (V₋ or ground)

Specifications

Detection Range

4mm spot 30mm-50mm
 8mm spot 30mm-100mm
 25mm spot 30mm-150mm
 50mm

Recommended Operating Distance Spot Diameter

4,8 or 25mm @ 50mm
 target distance

Light Source
Switching Frequency
Receiver
Discrete Outputs
Analog Outputs
Power
External Trigger
Communication
Protection Circuitry

White LED
 20 kHz
 RGB photodiode
 4
 Red, green blue (3 channels 0...5V)
 12-30 VDC
 12-30 VDC
 RS-232C / USB
 Reverse polarity, over current
 (PTC thermal resettable fuse)
 (length, diameter) 110mm x 30mm
 180g (.4lbs)
 316 stainless steel
 IP67 NOT FOR PRESSURE WASH DOWN
 -10 to 55°C
 -20 to 70°C
 12-pin, IP67
 Mounting bracket, jam nuts (two), interface cable
 assembly, 12 VDC power supply, application
 software, I/O board with status indicators

Dimensions
Weight
Housing
Type of Protection
Operating Temperature
Storage Temperature
Connector Circular
Accessories



- Exclusive PC-based configuration.
- Operator lockout prevents operators from changing the sensor settings in order to avoid reporting manufacturing quality issues.
- Software driven control of discrete output logic



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CMYX

COLOR MARK SENSOR

Increase process throughput with high-speed, accurate and reliable color mark detection. The CMYX™ employs our field-proven, patented technology, combining a broad-spectrum light source, small spot size and fast response to achieve high-speed mark detection capable of detecting standard one-track PHARMA-CODE (0.5mm thin bar width) at 2000ft/min. The metal alloy case and glass lens provide robust construction expected in an industrial environment.

Whether you need to verify color mark presence or measure the position of the print-to-cut triangle, the CMYX provides the accuracy and precision for reliable process control.

The CMYX features a 2-digit display that provides an indication of signal strength making set-up and integration quick and easy. The versatile sensor provides user set-up parameters including light source intensity adjustment, detection threshold and gain selection making the CMYX useful in a wide range of applications.

The CMYX includes a discrete PNP/NPN output that is automatically set for PNP or NPN operation.

CMYX



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Applications

- Color verification
- Printing processes
- Registration mark detection
- Print-to-cut control, folder gluer applications
- Pharma code
- Small part detection

Design & Features

- 0.4mm spot size
- 25uS response time
- Display range 00-99
- Broad spectrum white LED
- Adjustable gain
- Programmable discrete output
- Automatic and manual threshold adjustment
- Small size

Ordering Information



CMYX
Color Mark Sensor

Accessories



UVX-300B
Bracket



UVX-300C
Cable 5P, 5M, M12, F

Functions

NORMAL OPERATING MODE
CALIBRATION
THRESHOLD
LED INTENSITY
HYSTERESIS LEVEL
DISCRETE OUTPUT
SECURITY
TEACH MODE

Displays relative reflection intensity
User sensitivity adjustment
Set detection level
Set LED, LO, MED, HI
Set undetect level 1-9 steps below threshold
Set normally open or normally closed
Lock/unlock pushbutton controls
Auto-set detection threshold

Specifications

White light source	LED, min. 100,000 hrs.	Indicators	LED
Sensing distance	25mm	7-Segment display	Power
Spot size	0.4mm dia.	Green LED	Detect
Distance Variation Sensitivity	<3% @ +/- 1mm from focal point	Red LED	Program
Response time	25uS	Yellow LED	
Switching Frequency	40kHz		
LED intensity	3 levels	Connector M12	
Relative intensity display range	00 to 99	Pin 1	Power to 24VDC
Sensitivity	Adjustable	Pin 2	Discrete output
Signal level	Two 7 segment digits	Pin 3	PNP/NPN NO/NC
Detection threshold	Two 7 segment digits	Pin 4	Ground
Digital Output	Auto-Detect NPN/PN	Pin 5	Not used
Output Function	NO/NC selectable		Remote LOCK/
Security	LOCK / UN-LOCK keypad		UNLOCK input
Power indicator	Green LED		
Detect indicator	Red LED		
Programming indicator	Yellow LED		
Data retention	EEPROM non—volatile memory		
Dimensions	51mm (2.0") x 61mm (2.4") x 25mm (1.0")		
Weight	95 g (0.21 lbs.)		
Supply Voltage	10-24 VDC		
Operating Current	60 mA		
Short Circuit Protection	Discrete output		
Overload / Reverse Polarity Protection	Supply voltage		
Operating temperature	-20°C...55°C		
Storage temperature	-20°C...70°C		
Housing	Metal alloy		
Mechanical Protection	IP65 NOT FOR PRESSURE WASHDOWN		

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CNTX

ADVANCED CONTRAST SENSOR

Increase process throughput with high-speed, accurate and reliable contrast differentiation. The CNTX™ combines a broad-spectrum light source, small spot size and fast response to achieve high-speed contrast differentiation of both neutral and color targets. The CNTX employs our field-proven, patented technology, for effective detection of registration marks, glossy surfaces, cap inserts, date codes and sorting of product by color in many industrial applications. The metal alloy case and glass lens provide robust construction expected in an industrial environment.

The CNTX features a 2-digit display that provides an indication of signal strength making set-up and integration quick and easy. The versatile sensor provides user set-up parameters including light source intensity adjustment, detection threshold and gain selection making the CNTX useful in a wide range of applications.

The CNTX includes both a discrete PNP/NPN output and an analog output. The discrete output is automatically set for PNP or NPN operation. The analog output signal may be used to access targets based on their reflectance characteristics.

CNTX



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Applications

- Sort products by color
- Detect registration marks
- Confirm presence of date codes
- Detection of glossy surfaces
- Detects cap inserts

Design & Features

- 0.5mm or 3.0mm spot size
- 25µs response time
- Display range 00-50
- Broad spectrum white LED
- Adjustable LED intensity
- Two gain settings
- Programmable discrete output
- Threshold adjustment
- Analog output

Ordering Information



CNTX-30-0
Advanced Contrast Sensor
3.0mm light spot



CNTX-05-0
Advanced Contrast Sensor
0.5mm light spot

Accessories



UVX-300B
Bracket



UVX-300C
Cable 5P, 5M, M12, F

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Functions

NORMAL OPERATING MODE
SENSITIVITY
THRESHOLD
LED INTENSITY
HYSTERESIS LEVEL
DISCRETE OUTPUT
OUTPUT PULSE STRETCH
SECURITY
TEACH MODE

Displays relative reflection intensity
X1 and X10
Set detection level
Set LED, LO, MED, HI
Set undetect level 1-9 steps below threshold
Set normally open or normally closed
Set minimum output period 10...90ms
Lock/unlock pushbutton controls
Auto-set detection threshold

Specifications

White light source	Broad spectrum LED, min. 100,000 hours	Indicators	LED
Sensing distance	28mm	7-Segment display	Power
Spot size	0.5mm or 3.0mm dia.	Green LED	Detect
Depth of field	+/- 3mm	Red LED	Program
Response time	25µs	Yellow LED	
Switching Frequency	40kHz	Connector M12	
LED intensity	3 levels	Pin 1	Power to 24VDC
Relative intensity display range	00 to 50	Pin 2	Discrete output PNP/NPN NO/NC
Sensitivity	1X, 10X	Pin 3	Ground
Signal level	Two 7 segment digits	Pin 4	Analog output 0 to 5V DC
Detection threshold	Two 7 segment digits	Pin 5	Remote LOCK/ UNLOCK input
Digital Output	Auto-Detect NPN / PNP		
Output Function	NO/NC selectable		
Security	LOCK/UNLOCK keypad		
Power indicator	Green LED		
Detect indicator	Red LED		
Programming indicator	Yellow LED		
Data retention	EEPROM non-volatile memory		
Dimensions	2.0" (51mm) x 2.4" (61mm) x 1.0" (25mm)		
Weight	0.21 lbs. (95g)		
Supply Voltage	10-24 VDC		
Operating Current	60 mA		
Short Circuit Protection	Discrete output		
Overload / Reverse Polarity Protection	Supply voltage		
Operating temperature	-20°C...55°C		
Storage temperature	-20°C...70°C		
Housing	Metal alloy		
Mechanical Protection	IP65 NOT FOR PRESSURE WASH DOWN		

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CNTX-30-T

CONTRAST SENSOR

Increase process throughput with high-speed, accurate and reliable contrast differentiation. The CNTX™ combines a broad-spectrum light source, small spot size and fast response to achieve high-speed contrast differentiation of both neutral and color targets. The CNTX employs our field-proven, patented technology, for effective detection of registration marks, glossy surfaces, cap inserts, date codes and sorting of product by color in many industrial applications. The metal alloy case and glass lens provide robust construction expected in an industrial environment.

The CNTX provides simple, two-button teach with mark and background keys. The flexibility of the CNTX makes it easy to set-up in a wide variety of printing, packaging and converting applications. The CNTX is a perfect fit for many applications that require the ability to differentiate between two conditions that vary in contrast.

The CNTX includes both a discrete PNP/NPN output and an analog output. The discrete output is automatically set for PNP or NPN operation. The analog output signal may be used to access targets based on their reflectance characteristics.

CNTX



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Sales Inquiries: salesupport@emxinc.com **Technical Support:** technical@emxinc.com
www.emxinc.com

Applications

- Sort products by color
- Detect registration marks
- Confirm presence of date codes
- Detection of glossy surfaces
- Detects cap inserts

Design & Features

- 3.0mm spot size
- 25uS response time
- Two-button teach
- Broad spectrum white LED
- Automatic LED intensity adjustment
- PNP/NPN
- Discrete output
- Analog output
- Small size

Ordering Information



CNTX-30-T
Contrast Sensor

Accessories



UVX-300B
Bracket



UVX-300C
Cable 5P, 5M, M12, F

NOT INTENDED FOR USE IN
PERSONAL SAFETY APPLICATIONS.

Functions

OPERATING MODE
MARK
BACKGROUND
RED LED ON
GREEN LED ON
YELLOW LED ON
RED FLASHING
GREEN FLASHING
YELLOW FLASHING

The CNTX-30-T is in operating mode in detect or undetect state
Sets mark level
Sets background level
Mark detected
Background detected
Mark or background measurement in progress
Background set, measure mark
Mark set, measure background
Insufficient contrast

Specifications

White Light source

Sensing distance
Spot size
Depth of field
Response time

Switching Frequency
LED intensity
Sensitivity
Digital Output
Security

Background indicator
Detect indicator

Programming indicator
Data retention
Dimensions
Weight

Supply Voltage

Operating Current

Short Circuit Protection

Overload / Reverse Polarity Protection

Operating temperature

Storage temperature

Housing

Mechanical Protection

Broad spectrum LED,
min. 100,000 hours
28mm
3.0mm dia.
+/- 3mm
25uS
40kHz
3 levels
1X, 10X
Auto-Detect NPN/PNP
LOCK/UN-LOCK keypad
Green LED
Red LED
Yellow LED
EEPROM non—volatile memory
2.0" (51mm) x 2.4" (61mm) x 1.0" (25mm)
0.21 lbs. (95g)
10-24 VDC
60 mA
Discrete output
Supply voltage
-20°C...55°C
-20°C...70°C
Metal alloy
IP65 NOT FOR PRESSURE WASH DOWN

Indicators

Green LED Power
Red LED Detect
Yellow LED Program

Connector M12

Pin 1 Power 10 to 24VDC
Pin 2 Analog output 0 to 5V DC
Pin 3 Ground
Pin 4 Discrete output PNP/NPN
Pin 5 Remote LOCK/ UNLOCK input

WARRANTY EMX INC. the product described herein for a period of 2 years under normal use and service from the date of manufacture. The product will be free from defects in material and workmanship. This warranty does not cover ordinary wear and tear, abuse, misuse, overloading, altered products, or damage caused by the purchaser from incorrect connections, or lightning damage. There is no warranty of merchantability. There are no warranties expressed, implied or any affirmation of fact or representation which extend beyond the description set forth herein. EMX Inc. sole responsibility and liability, and purchaser's exclusive remedy shall be limited to the repair or replacement at EMX's option of a part or parts not so conforming to the warranty. In no event shall EMX Inc. be liable for damages of any nature, including incidental or consequential damages, including but, not limited to any damages resulting from non-conformity defect in material or workmanship.

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CNTX-30-TP

CONTRAST SENSOR

Increase process throughput with high-speed, accurate and reliable contrast differentiation. The CNTX™ combines a broad-spectrum light source, small spot size and fast response to achieve high-speed contrast differentiation of both neutral and color targets. The CNTX employs our field-proven, patented technology, for effective detection of registration marks, glossy surfaces, cap inserts, date codes and sorting of product by color in many industrial applications. The durable plastic case and polycarbonate lens provide robust construction expected in an industrial environment.

The CNTX provides simple, two-button teach with mark and background keys. The flexibility of the CNTX makes it easy to set-up in a wide variety of printing, packaging and converting applications. The CNTX is a perfect fit for many applications that require the ability to differentiate between two conditions that vary in contrast.

The CNTX includes both a discrete PNP/NPN output and an analog output. The discrete output is automatically set for PNP or NPN operation. The analog output signal may be used to access targets based on their reflectance characteristics.

CNTX



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Applications

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- Detection of glossy surfaces
- Detects cap inserts

Design & Features

- 3.0mm spot size
- 25uS response time
- Two-button teach
- Broad spectrum white LED
- Automatic LED intensity adjustment
- PNP/NPN
- Discrete output
- Analog output
- Small size

Ordering Information



CNTX-30-TP
Contrast Sensor, 3mm spot



CNTX-35-TP
Contrast Sensor, 0.5mm spot

Accessories



130-10140362
Bracket

Functions

OPERATING MODE
MARK
BACKGROUND
RED LED ON
GREEN LED ON
YELLOW LED ON
RED FLASHING
GREEN FLASHING
YELLOW FLASHING

The CNTX-30-TP is in operating mode in detect or undetect state
Sets mark level
Sets background level
Mark detected
Background detected
Mark or background measurement in progress
Background set, measure mark
Mark set, measure background
Insufficient contrast

Specifications

White Light source

Broad spectrum LED,
min. 100,000 hours
28mm

Sensing distance Spot size

CNTX-30-TP 3.0mm dia.
CNTX-35-TP 0.5mm dia.

Depth of field Response time

+/- 3mm
25uS

Switching Frequency

40kHz

LED intensity

3 levels

Gray Scale

0 to 50

Digital Output

Auto-Detect NPN/PNP

Analog Output

0...5V (20mV resolution)

Security

LOCK/UN-LOCK keypad

Background indicator

Green LED

Detect indicator

Yellow LED

Data retention

EEPROM non—volatile memory

Dimensions

2.0" (51mm) x 2.4" (61mm) x 1.0" (25mm)

Weight

0.21 lbs. (95g)

Supply Voltage

10-24 VDC

Operating Current

60 mA

Short Circuit Protection

Discrete output

Overload / Reverse Polarity Protection

Supply voltage

Operating temperature

-20°C...55°C

Storage temperature

-20°C...70°C

Housing

Plastic

Mechanical Protection

IP65 NOT FOR PRESSURE WASH DOWN

Indicators

Green LED

Power

Yellow LED

Detect

Connector M12

Pin 1

Power 10 to 24VDC

Pin 2

Analog output 0 to

5V DC

Pin 3

Ground

Pin 4

Discrete output

PNP/NPN

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Pharmaceutical Container Opacity and Color Sensing Applications



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MANAGE YOUR
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INTRODUCTION

Pharmaceutical manufacturers – and companies producing packaging for them – rely on automated equipment for efficient, cost-effective operations. Frequently, this automation requires light sensing systems to screen products for acceptable quality – and to help control equipment.

*Two types of sensors are commonly used for these purposes:
opacity sensors and color sensors.*

Opacity sensors typically work with an infrared special light source, and can be used for applications such as verifying the opacity of containers and packaging films, checking the turbidity or clarity of solutions, and measuring relative light transmission for other purposes. These sensors allow high-speed in-line measurements in real time, providing output responses spaced as little as 100 microseconds apart. Adequate opacity ensures, for example, that a container will block enough light to protect the contents from deterioration due to light absorption.

Color sensors are used in similar pass/fail applications where the product characteristic being measured is its color. For this purpose a white light source is used, which allows the red, green, and blue components of a product's color to be measured. The relative magnitudes of these three color values determine how the product's color appears to the human eye. A typical application is verifying the proper color of a translucent container, which helps identify the manufacturer or product.

A variety of products require packaging materials that block or reduce the transmission of light to prevent deterioration of the package contents. These products include pharmaceuticals, nutritional supplements, and personal care consumables. The types of packaging materials include blow-molded bottles, blown films, and composite films. For example, many types of plastic films are used to wrap medical devices or to create blister packs, which must block UV light to avoid deterioration of the products. Similarly, opaque bottles are necessary to protect pills and solutions.



U.S. Food and Drug Administration (FDA) regulations specify the required properties of pharmaceutical and nutritional supplement containers, which include light resistance. Required container properties are covered by product monographs published in *The United States Pharmacopeia/National Formulary (USP/NF)*. Such containers must be qualified and meet the requirements of the USP 661 general standard for containers and the USP 671 standard for containers designed to block light.

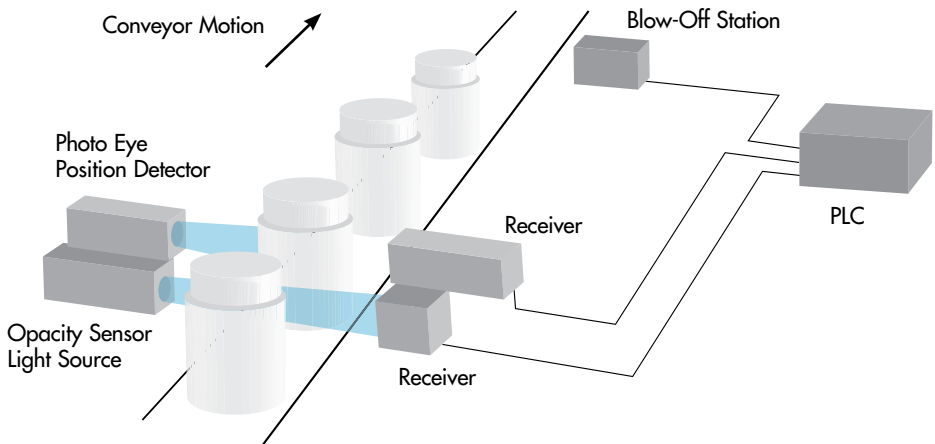


Because, for example, high-density polyethylene (HDPE) or polyethylene terephthalate (PET) used for blow-molded containers are not naturally opaque, they must be rendered so with an additive. Typically, titanium oxide is added to make these materials opaque before they are blow-molded into the finished container shape.

INLINE OPACITY VERIFICATION DURING PRODUCTION

The production of blow-molded plastic bottles is typically an automated high-speed process, which may be done by the end-product manufacturer – or by an independent container maker. In either case, to verify the opacity of pharmaceutical and related containers, the production process requires an inline measurement method that can do 100% opacity inspections.

Opacity measurements can be conducted by directing a light source at each container as it passes an inspection station on the production line, and measuring light transmission with a sensor on the opposite side of the container. In addition to the appropriate light source and sensor, a position detector is needed to tell the system when a bottle is in the proper location for a measurement.



The ideal light source is an infrared (IR) LED emitter. This type of LED emits wavelengths above 800nm, which are strong enough to penetrate an opaque container to a certain degree. This provides enough IR light at the sensor to establish a reference signal for the opacity measurements. This would not be the case for an LED that emits a different color or broad spectrum white light. For some products, the main concern is blockage of ultraviolet (UV) light that can cause rapid product degradation. In that case, a UV sensor and light source emitting wavelengths around 300–400nm are used.

OPACITY SENSING HARDWARE APPLICATION

The opacity sensor, light source, and position detector used in pharmaceutical container production must integrate easily with the existing process automation system. Important features of these components are I/O interfaces and signal characteristics that make it easy to link them with process computers or PLCs for making pass/fail decisions. In the case of an opacity sensor, appropriate onboard firmware can further simplify setup and pass/fail decision-making.



EMX designed its opacity sensing components to minimize the time it takes for installation, setup and commissioning. Its OPAX™ opacity sensor combines an NIR light source emitting at the optimum wavelength, and a fast-response photodiode receiver with all required cabling. This combination allows high-speed measurements of relative opacity in on-line applications. The EMX Model IMX-300 Laser Marks and Contrast Sensor can be used to tell the PLC or process computer when a container is in the correct position for an opacity measurement. Various types of mounting brackets are also available for these components to simplify their installation.

The OPAX effectively evaluates container opacity with a user-adjustable threshold setting. The modulated NIR light source in the OPAX is directed through a container as it passes the inspection station. The diffused light at the receiver is measured. When the measured level meets or exceeds the user programmed threshold, the discrete output changes state, telling the PLC or computer a container has passed or failed. The user can also program a hysteresis setting that determines how far below the user's threshold measured opacity must drop to de-activate the output.



OPACITY INSPECTION LINE OPERATION

The fast response of the OPAX allows it to perform high-speed opacity inspections. It has a response time of less than 100µs and a sampling frequency of 6kHz. Three LED light intensities can be programmed by the user, and sensor sensitivity is also adjustable. Sensing distances from 50mm to 200mm can be accommodated.

The discrete pass/fail output of the OPAX is typically connected to a PLC. The output remains active as long as the intensity level exceeds the threshold. In high-speed applications it may be useful to use the Extend Output Pulse feature to lengthen the signal duration to meet acquisition requirements of the PLC.



*Scan code to
view the video.*

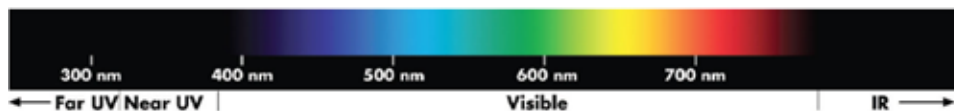
In addition to the discrete OPAX output for pass/fail decision-making, a 0–5V analog output is also available for applications where simply triggering on the threshold is insufficient. One example would be applications where it is desirable to perform real-time opacity trending analysis so adjustments can be made to the process. An LED display of the OPAX also shows relative opacity as a value from 00 to 99. Data are retained in first-in/first-out non-volatile EEPROM memory.



A final step in the opacity inspection process is to remove containers that fail. Typically, this is done at a “blow-off” station, where a blast of air controlled by the process computer blows the failed container off the process line into a reject bin.

PHARMACEUTICAL APPLICATIONS FOR COLOR SENSING

There are two basic types of applications for color sensors: reflected light and transmitted light. In either case, white light is used as a source, because it is a mixture of all the visible light wavelengths from violet (about 420nm) to red (about 750nm).



In the pharmaceutical industry, reflected light sensing might be used to spot check the color of pills or do 100% inspection of colored opaque liquids in a clear bottle. Such colors are used to help identify the product for consumers and healthcare providers.

A more common application is doing 100% inspection of translucent colored bottles or wrapping films during production. This could be done by an independent bottle or film manufacturer – or by the pharmaceutical company, depending on quality control protocols. Polyethylene terephthalate (PET) is naturally colorless with a high transparency that will typically be tinted with a wide variety of color additives available. Container and film colors are used as an identifying characteristic, such as a pharmaceutical company's brand identity, or otherwise to help users recognizing the product.



Although a bottle or wrapping film may be translucent (lets some light pass through), it may block enough to help protect the contents from light-induced deterioration. As discussed in this handbook's section on opacity sensors, colored translucent containers are covered by product monographs published in *The United States Pharmacopeia/National Formulary* (USP/NF).

The procedure for inspecting colored translucent containers is similar to that used for opaque containers, using a position sensor to detect the presence of a bottle and trigger a measurement. As a container passes the inspection station, a light source (a white LED in this case) is directed through it to a sensor on the other side. There are two possible measurements that can be made: color and luminosity.



Luminosity is measured as a relative value compared to the luminosity with no container between the light source and the sensor. This provides an indication of the amount of colorant and other additives in the container material and their light reduction capability. This property may be important in protecting the contents from excessive deterioration due to light absorption. Luminosity is important for another reason, as explained below.

Color detection is a bit more complex. A colored translucent container basically acts as a color filter as white light passes through it. The sensor receives only a portion of the full white light spectrum. As in the case of an image presented by color TV, any given color transmission through the container can be represented by a combination of red, green, and blue (RGB) color values. Therefore, the sensor is actually a combination of red, green, and blue sensors.

The luminosity or brightness (intensity) of each RGB input to the sensor can be represented by a relative value from zero to 100. The absolute luminosity of each RGB input will depend on the intensity of the light source, but that is less important than the relative RGB values for any given source emission level. The combination of RGB values determines the color perceived by the human eye.

Prior to the advent of smart color sensors like the EMX ColorMax VIEW™, making a pass/fail decision on a translucent container's color was a subjective human determination, or required expensive photometric measurements in a lab on production samples. Now, firmware in the ColorMax VIEW allows this sensor to make objective pass/fail color decisions on high-speed production lines based on RGB values programmed into color recognition channels by the user. With its high sensitivity and fast sampling rate, it can make these decisions in less than 330µs – more than sufficient for the fastest container lines. Its discrete pass/fail signal output can be used to reject a container by controlling a blast of air at a "blow-off" station, where container rejects are ejected into a recycling bin.



Scan code to view the video.



Furthermore, the ColorMax VIEW can output a 0–5V analog signal with 10-bit resolution for each RGB value measured. The advantage is that an external PC or PLC can analyze the data, allowing a virtually unlimited number of colors to be recognized. In addition to allowing the PC or PLC to make pass/fail decisions, it allows continuous monitoring and trend analysis of a process. Corrective action can then be taken before containers have to be rejected for not matching a programmed color. Sensor measurement data are retained in a first-in/first-out non-volatile EEPROM memory buffer.

A color sensor needs onboard firmware that provides a wide range of functions and programmability. To ease the sensor's integration with a user's automation system, it should also come with application software that runs on a PC to reduce configuration and start-up time. Recognizing these needs, EMX supplies its ColorMax VIEW sensor with Windows® compatible software, plus RS232 and USB ports for data communications with the PC. Once installed from the EMX CD, all the software functions are just a mouse click away.

When a ColorMax sensor is connected to the PC, the application program reads its setting parameters and updates the display. When changes are made to these settings, the new settings can be easily downloaded to the sensor by selecting the Send ColorMax Settings button on the application GUI. Here is a brief description of the most important setting parameters:

- **Read ColorMax Settings** – This GUI button causes the application program to read the current settings from the sensor and display them in the Sensor Settings section.
- **Teach ColorMax Channel** – This button initiates a sequence of sampling the input signals, resulting in current values, tolerances and other specific channel parameters being stored in the sensor.
- **Measurement Averaging** – This drop box allows the user to select the number of measurements that are averaged (1, 2, 4, 8, 16, 32, or 64) to obtain a reading that is checked for a match to programmed channels.
- **Triggering** – Options include Free Run, Level and Edge. Free Run is the most common, which programs the sensor to measure continuously. Level and Edge triggering require the use of the External Trigger input on the sensor I/O connector.
- **Minimum Output Duration (ms)** – When "0" delay is selected and a color match occurs, the appropriate channel's discrete output becomes active (i.e., changes state). Other values from 10ms to 100ms in 10ms increments can be set, which is useful for PLCs or data acquisition systems that have slower polling cycle times.
- **Illumination** – Settings from 0% to 100% allow the user to optimize the sensitivity of the sensor while avoiding saturation.
- **Send ColorMax Settings** – When changes are made in the Sensor Settings section, this button must be selected to transmit the settings to the sensor.
- **Sensor Communications** – The Sensor Communications section provides user control of PC COM port selection (RS232 or USB) and displays specific sensor information.
- **Communications Status** – The status box shows the ColorMax model and the connection status, either on-line (normal) or lost communications.

The ColorMax VIEW provides two methods collecting readings from the sensor via the serial port to external devices. One method is to use the external trigger to transmit data to the external device, which occurs when the trigger is in the appropriate state. A second method is to use the application program's data-logging feature, which saves readings to a CSV (comma-separated variable) file. Communications with the sensor via the application program occurs 3–4 times per second.

EMX PHOTOELECTRIC SENSORS REDUCE PRODUCTION COSTS

As manufacturing has evolved, automation systems are requiring faster and more sensitive photoelectric sensors to accommodate increased line speeds. This includes opacity and color sensors, which can drastically reduce costs by eliminating manual/visual inspections. EMX color and opacity sensors are supplied with firmware and application programs that allow their use with a wide range of colors and opacities without complicated reprogramming of process controllers and computers. Moreover, these EMX products provide tighter process control and less scrap by supplying trend data that allows timely correction of process variables.