EMX INDUSTRIES, INC.

Brite·X 1000S

Sugar color sensor

Operating Instructions

CAUTIONS AND WARNINGS

WARNING:

1. The Brite-X is not intended for use in personal safety applications.
2. The Brite -X is not an explosion-proof enclosure. Do not use in an environment where flammable materials are present.
3. The Brite -X sensor uses a high intensity, blue LED, do not look directly into this light source.

CAUTION: The discrete output must not be connected to outputs from other sensors (i.e. outputs from multiple sensors must not be connected in parallel). Parallel connections may damage sensor output circuitry.

IMPORTANT:

This product is an accessory or part of a system. Always read and follow the manufacturer's instructions for the equipment before connecting this product. Comply with all applicable codes and safety regulations. Failure to do so may result in damage, injury or death.

CERTIFICATIONS: CE, CSA, UL

Standard for Industrial Control Equipment – ANSI/UL 508:2024 Ed. 19, Certified to CAN/CSA C22.2#14:2018 Ed.13

PRODUCT OVERVIEW

Brite-X 1000S sensor was designed to measure the brightness of raw or refined sugar, which is an indication of sugar color. The brightness is a reflectance factor of diffused blue light (457nm) as defined by ISO 2470. Brite-X 1000S uses a blue LED to emit modulated light projected on to a sample surface. This light is then reflected back to the Brite-X 1000S optics and measured by the sensor software.

The output is provided as an analog, 0 – 5 V signal with high, 20mV resolution. A PLC or a computer can process the analog output, or the reflected level can be set on the Brite-X 1000S to trigger a discrete output.

The Brite-X 1000S is a compact sensor with a range of operation exceeding 36 inches. Two seven segment displays provide visual representation of the relative brightness from 00 to 99. The calibration feature, and 3 LED intensity settings provide for flexible operation over wide range of distances and materials.

The BriteX is intended to provide an economical method of on-line monitoring of sugar color. The sensor uses a reflectance measurement (which varies with color) to allow the control system to access the process in real-time. This measurement is output as an analog signal that is proportional to the amount of light reflected from the sugar and collected by the sensor optics. This analog output is used by the control system to determine whether variations are within acceptable limits (i.e. sugar color is consistent).

Since the amount of light collected by the sensor will vary with distance, it is important to maintain a relatively fixed sensor-to-target distance. The sensor is placed at a distance that provides a mid-scale reading around the target sugar color using a sample with a known IU*, for example 1200 IU. By monitoring the analog output signal from the BriteX a change in color can be detected. For example, if the target is 1200 IU, and the sensor is set-up to produce an analog output of 2.5V using a 1200 IU sample. The sensor output is then correlated to the IU, 2.5V = 1200IU. When the sugar becomes slightly darker the voltage will drop and if it becomes lighter the output voltage will increase. The magnitude of the change between 1200 and 1000 IU, can be determined by measuring a known sample of 1000 IU sugar. Since changes in IU due to process fluctuations do not occur quickly (in a second) it is useful for the control system that is monitoring the BriteX output to average multiple readings to "smooth" the measurement data.

Therefore, each specific IU range will require establishing a suitable set-up, with sensor distance and internal LED settings to allow monitoring and correlation to IU when necessary. Installation tips are provided in a subsequent section.

Specifications

Blue Light source	457nm LED, min.100,000 hours
LED Intensity	3 levels
Relative Brightness Display Range	00 to 99
Sensitivity	Adjustable
Detection Range	Up to 36 inches (900mm)
Switching Frequency	5 kHz
Brightness level	Two 7 segment digits
Brightness threshold	Two 7 segment digits
Analog Output	0 – 5 V (20mV resolution)
Digital Output	Auto-Detect PNP / NPN
Extend Output Pulse	0 - 90 mS (10 steps)
Output Function	NO/NC selectable
On/Off Delay	<150 uS
Detect indicator	Red LED
Programming indicator	Yellow LED
Data retention	EEPROM non–volatile memory
Dimensions	2” (51mm) x 4” (100mm) x 1” (25mm)
Weight	.26 lbs. (117g)
Supply Voltage	10…24 VDC
Operating Current	60 mA
Short Circuit Protection	Yes (Outputs)
Overload / Reverse Polarity Protection	Yes (Supply Voltage)
Operating temperature	-20ºC…55ºC
Storage temperature	-20ºC…70ºC
Housing	Metal alloy
Mechanical protection	IP65 NOT FOR PRESSURE WASHDOWN
Connector	M12 5 pin

QUICK START GUIDE

1. The display range is 00 through 99. The decimal points indicate the LED intensity level. The RED LED above the display indicates that the intensity level exceeds the threshold setting.
2. Connect cable to power supply observing correct polarity. Reference wiring diagram.
3. Apply power; sensor will initialize and perform its power up sequence.
4. The relative intensity will be displayed. By aiming the sensor away from any objects the display will indicate 00. Aim the sensor at a white piece of paper and the display will indicate an intensity measurement. Move the paper further away from the sensor to decrease the intensity level.
5. Various adjustments may be made to increase or decrease sensitivity; refer to the Sections Calibration Adjustment and LED Intensity Level. Refer to Section: Threshold, to alter threshold setting.
6. User programmable parameters are discussed in detail in the following sections.

Operation

Power up

Upon power up, the sensor initializes by turning on all segments on the display and sequencing through red, amber and green on the status LED located above the display.

Intensity display mode

During normal operation the sensor display will indicate the relative intensity of a target its field of view. The range of the relative intensity display is 00 through 99. The decimal points on the display indicate the LED output intensity. No decimal points indicate low, one decimal point indicates medium and two decimal points indicate high intensity.

Calibration Adjustment

The calibration feature allows the displayed measurement to be adjusted to the desired value by the user.

Adjusting the measured value:

1. Place target in sensor's field-of-view. The sensor will display the current reading.
2. Press either key (for less than 3 seconds); while the current reading is displayed the value is flashed slowly indicating that the sensor is in the adjustment mode.
3. Press T/+ to increment the reading and P/- to decrement the reading.
4. Stop pressing either key and sensor returns to normal operating mode in 3 seconds.

Note:

- While adjusting the reading, when a limit is reached the display flashes at a faster rate.
- The selected gain is stored in memory and is retained when power is removed.

Local Lock

The local lock feature allows the sensor to be locked out, preventing adjustments by unauthorized personnel. To lock the sensor, press the **P/-** and **T/+** buttons for 3 seconds until **LL** is displayed. To un-lock the sensor, press the **T/+** and **P/-** for 3 seconds until **LL** is not displayed. While the sensor is locked, pressing either **P/-** or **T/+** will result in **LL** (**L**ocal **L**ock) indication on the display.

Programmable Parameters

All adjustments made to these parameters are stored in memory and are retained when power is removed. To enter programming mode press and hold the **P/-** key for several seconds, the current threshold setting will be displayed. Press and release the **P/-** key to scroll through the various settings. Press and release the **T/+** key to change a particular setting. Press and hold the **P/-** for several seconds to return to the normal intensity display mode. The user programmable items are described below.

Threshold

When the relative intensity level exceeds the threshold setting the red status LED will turn on and the discrete output will activate, indicating detection of the target. When the relative intensity level drops below the threshold (as determined by the hysteresis setting), the red LED will extinguish and the discrete output will de-activate. The threshold setting allows the user to select the detection level. The default setting is 15.

To adjust the threshold, enter programming mode, press and hold the **P/-** key for several seconds, the current threshold setting will be displayed. Press and release the **T/+** key to increase the threshold level, to decrease the threshold level, continue to hold the **T/+** key until the value approaches 99 then wraps around to 00.

LED Intensity Level (U)

The LED intensity is indicated on the display as U1, U2 and U3 for low, medium and high intensity. Press and release the **T/+** key to toggle through the 3 intensity levels. The default setting is U2, medium intensity.

Hysteresis Level (H)

The hysteresis setting is indicated by H0 through H9. The hysteresis level is how far below the threshold the signal must fall to de-activate or un-detect. The hysteresis can be set from 0 to 9. For example, if the threshold is set at 25 and the intensity exceeds 25, the sensor will detect and activate its output. With the hysteresis set to 5, the signal must drop to 20 to un-detect. This feature is useful in cases where there may be variation within a target that might cause the intensity to drop below the threshold slightly; the hysteresis allows the output to remain activated until the level drops significantly. Press and release the **T/+** key to change the hysteresis setting. The default setting is 2.

Discrete Output Configuration

This setting allows the user to select either normal open (no) or normally closed (nc) configuration. The normally open configuration de-activates the output during normal un-detect operation, and activates the output upon detect. The normally closed configuration activates the output during normal un-detect operation, and de-activates the output upon detect. Press and release the **T/+** key to toggle through the selections. Default is normally open.

Extend Output Pulse (P)

This feature allows extending the minimum length of time that the discrete output remains active following target detection. The sensor response can be in the 100uS (microsecond) range, i.e. a target can move through the sensing range in 100uS and the discrete output would active for only that duration. A slower acquisition system (PLC) may not sample its inputs at a fast enough rate to capture the signal. The discrete output pulse can be extended from 0 to 90mS (milliseconds) in 10 mS increments as indicated by P0 though P9 on the display. Press and release the **T/+** key to toggle through the selections.

Null Offset (nu)

The null feature allows the sensor to be “zeroed”. For example, when the target is not in view and there is a background that causes a reading above zero, the null feature allows this level to be subtracted out, allowing the display to indicate 00. Press and hold the **T/+** key to null the sensor. The display will flash the value that is being subtracted. To set the sensor back to a true zero, aim the sensor away from any target and repeat the null process.

Output Signals

Discrete Output

The discrete output is a PNP/NPN configuration allowing the user to provide a load on this output that is either pulled high to VDC or low to ground. The sensor monitors this level and automatically determines whether to operate the PNP/NPN driver. This output 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.

CAUTION:	The discrete output must not be connected to outputs from other sensors (i.e. outputs from multiple sensors must not be connected in parallel). Parallel connections may damage sensor output circuitry.

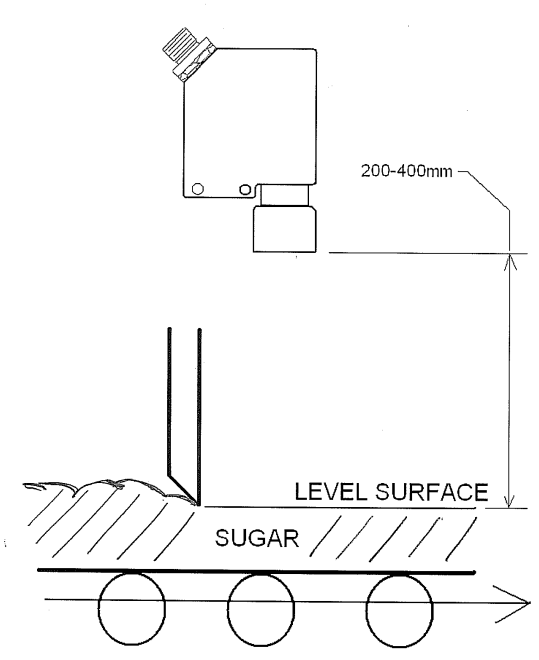
Analog Output

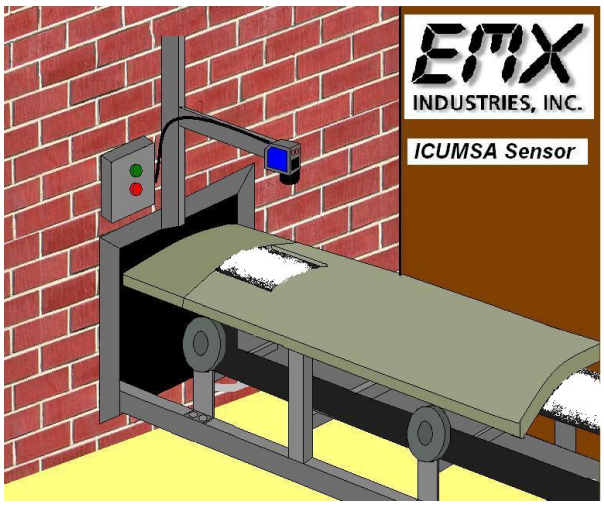
The analog output is 0-5V with 20mV resolution (8-bit). Any standard analog input channel typically available on a PLC may monitor this output. The analog output signal is useful in applications where simply triggering on the threshold is insufficient. For example, constant real-time monitoring of intensity in process allows minor fluctuations or trends to be detected permitting corrective action to be taken. In applications where minor differences in color are to be detected, variations in brightness producing discernable level changes in the analog output can be used to differentiate between similar colors.

Remote Lock/Unlock Input

The remote lock feature allows the user to lock out the local controls (keys) to prevent operators from making unauthorized adjustments. This signal line must be connected to VDC to lock the sensor. This line may be left unconnected if the lock feature is not used. While the sensor is locked, pressing either **P/-** or **T/+** will result in **rL** (**r**emote **L**ock) indication on the display.

Installation guidelines





The BriteX is intended to provide relative measurements for the purpose of detecting variations in color indicative of a process shift.

It is important to maintain a fixed distance from the target surface to the sensor for optimum performance. Since the sensor uses reflected light from the sugar to determine relative variations in color, it is important to place the sensor in a location where the distance variation is minimal.

The BriteX monitors the light reflected from the target and provides this information in the form of a 0-5V analog signal. The sensor output will vary based on the whiteness (reflected light) of the target.

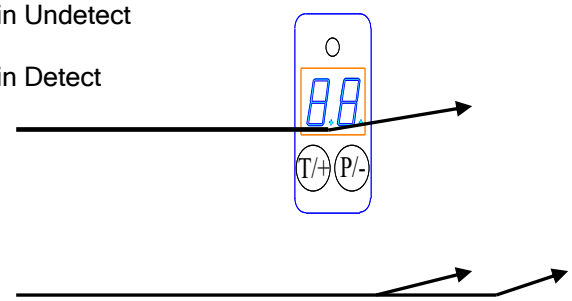
Generally, it is best to maintain a fixed sensor to target distance. When this is not possible, a distance-measuring device such as an ultrasonic distance sensor may be used to indicate to the control system when the target is in range. When the target is in range the control system can read the output from the BriteX, average the readings while the target is in range, and analyze the results and determine if the sugar color is within acceptable limits.

Below is a BriteX installation showing the customer designed mounting apparatus and sugar leveling wedge providing a fixed measurement distance between the sensor and the sugar surface. Please note that EMX Industries provides only the sensor, mounting and leveling hardware is the customer's responsibility.

Display Indicators

Indicators

- Green LED Threshold Mode while in Undetect
- Red LED Detect
- Yellow LED Threshold Mode while in Detect

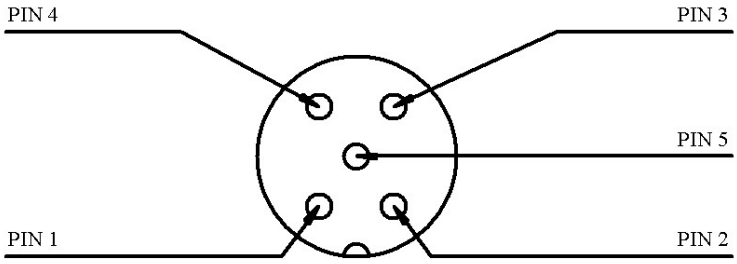


Display decimal points

- None illuminated LED low intensity
- One illuminated LED medium intensity
- Two illuminated LED high intensity

M12 connector pin assignments

M12 Connector	Wire Color	Description
Pin 1	Brown	Power 10 to 24VDC
Pin 2	White	Discrete output, PNP/NPN, NO/NC
Pin 3	Blue	Ground
Pin 4	Black	Analog output 0 to 5V DC
Pin 5	Yellow	Remote lock



Ordering information

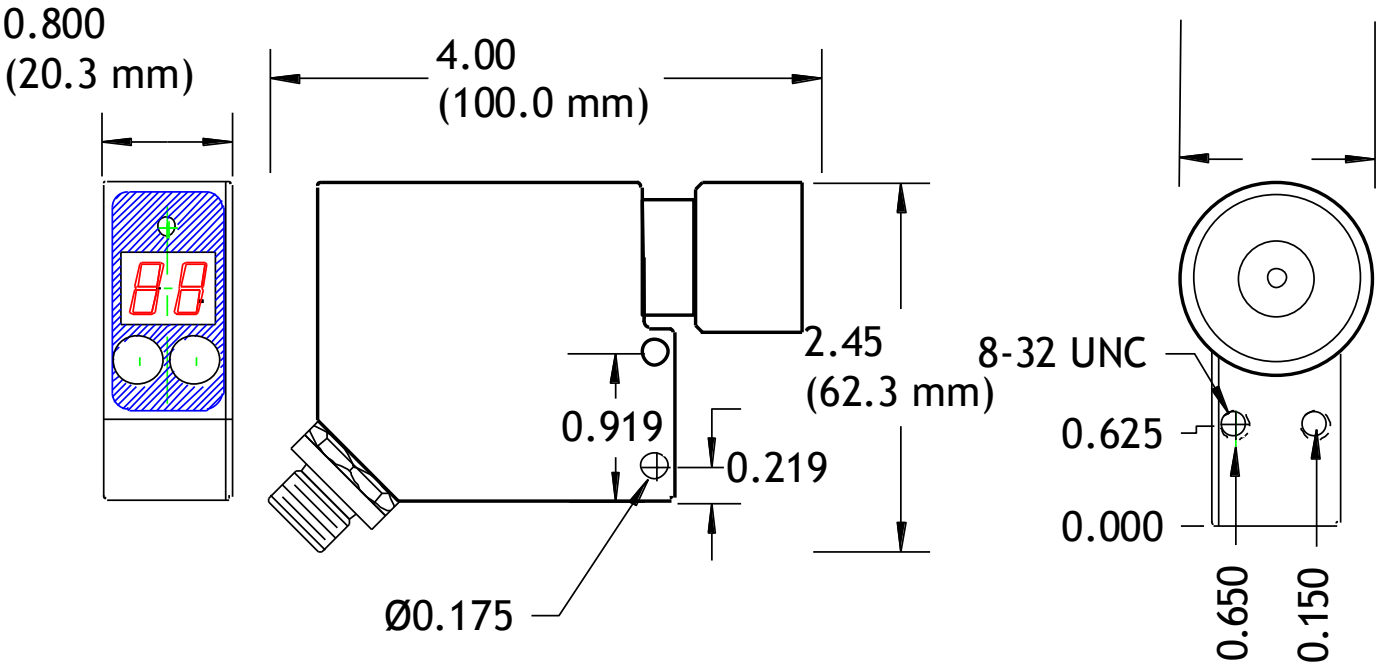
BX 1000S	**Sugar color sensor, 457nm**

Accessories

UVX300-BRKT
Bracket

UVX 300-C
5-meter cable with M12
5 pin connector

Dimensional Details



WARRANTY

EMX Industries Incorporated warrants all products to be free of defects in materials and workmanship for a period of two years under normal use and service from the date of sale to our customer. This warranty does not cover normal wear and tear, abuse, misuse, overloading, altered products, damage caused by incorrect connections, lightning damage, or use other than intended design.

There is no warranty of merchantability. There are no warranties expressed or implied or any affirmation of fact or representation except as set forth herein.

EMX Industries Inc. sole responsibility and liability, and the purchaser's exclusive remedy shall be limited to the repair or replacement at EMX Industries option of a part or parts found not conforming to the warranty. In no event shall EMX Industries Inc. be liable for damages of any nature, including incidental or consequential damages, including but not limited to damages resulting from non-conformity, defect in material or workmanship.

effective date January 1, 2002

EMX
INDUSTRIES, INC.

5660 Transportation Blvd,
Garfield Heights, OH 44125
United States of America
WEB http://www.emxinc.com

Technical Support: (216) 518-9889
E-mail: technical@emxinc.com

Sales: (216) 518-9888
Fax (216) 518-9884
E-mail salessupport@emxinc.com

Revision 3.0
8.9.26