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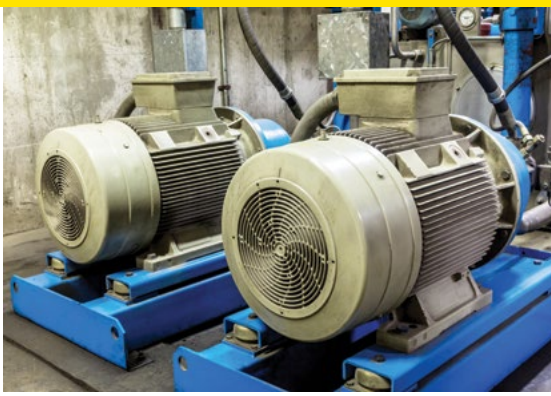
Wireless Products



Contents

Powerful Capabilities Sophisticated Functionality Engineered Simplicity

Reliable

Good signal strength assures uninterrupted communication. Banner offers an integrated site survey capability to evaluate and ensure good radio signal strength prior to installation.

Scalable

Banner wireless networks grow with your needs. Simple wire replacement products are preconfigured to support up to six Nodes and can be expanded to accommodate as many as 47 Nodes using the configuration software.

Long Range

Designed for long distance applications, Banner wireless networks are capable of up to six miles of line-of-sight coverage, making them an ideal solution for applications in remote and difficult to access locations or where running wire or conduit is impractical or too expensive.

Easy-to-Use

Banner's Simple Wire Replacement product line provides flexible networks that are easy to set up without software. Setting up a basic point-to-point network is as easy as pairing a cell phone to a headset.

Secure

Binding radio Nodes in a network locks them to a specific Gateway. After the devices are bound, each Gateway only accepts data from the Nodes that are bound to it.

Sensors, Lighting and Indicators

Wireless sensors, lighting, and indicators allow you to remotely monitor and diagnose systems quickly, which reduces downtime, increases productivity, and provides data to optimize your operation. They are easy to install and set up, eliminate expensive cable runs, and can integrate machines that were not previously network capable.

Temperature and Humidity Sensor

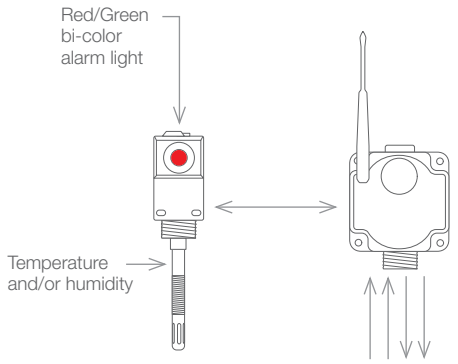
M12FTH4Q and M12FT4Q

A simple way to verify conditions in locations that were once too difficult to access via traditional monitoring methods. With no software required, you can replace cables and extend the range of temperature and humidity signals with minimal effort.

Key Features:

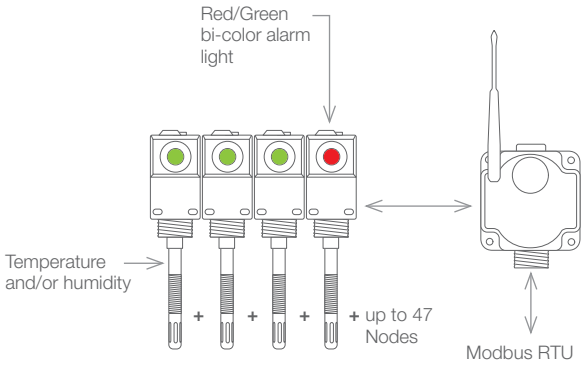
- Achieves temperature accuracy of ± 0.3 °C and humidity accuracy of ± 2% relative humidity
- Temperature and relative humidity sensing elements housed in a robust metal housing
- Traceable to NIST standards
- Temperature and Humidity or Temperature-only Sensor to choose from
- Each sensor comes with a Certificate of Factory Calibration
- Reduces labor costs by obviating manual checks and reducing error

Simple Wire Replacement



- Sourcing Discrete In for red alarm indicator light
- Sourcing Discrete In for green alarm indicator light
- 4 to 20 mA Analog Out for scaled temperature
- 4 to 20 mA Analog Out for scaled humidity

Host Controlled via Modbus RTU (up to 47 Nodes)



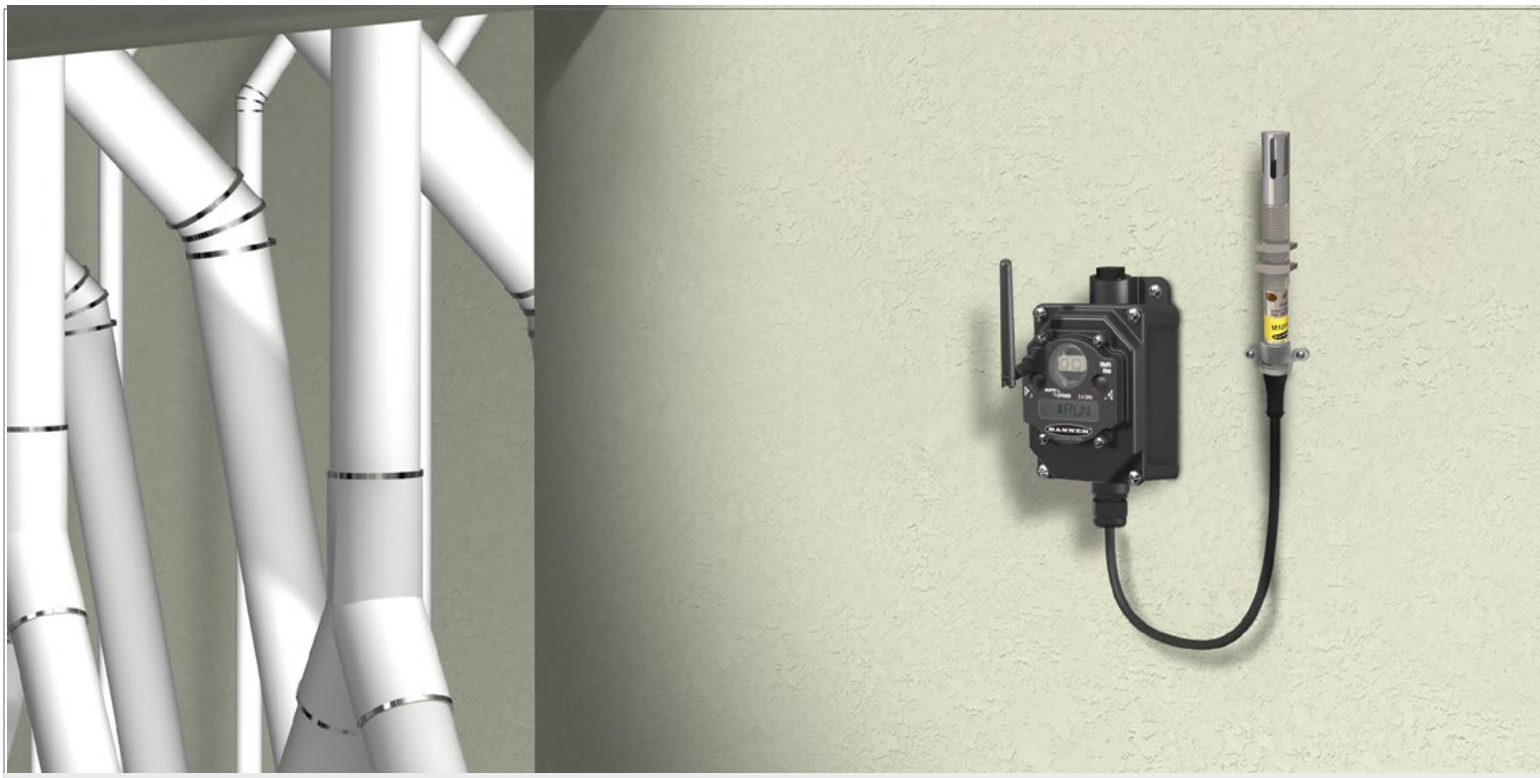
Models	Description
M12FTH4Q	Temperature and relative humidity via a 1-wire Serial Interface
M12FT4Q	Temperature via a 1-wire Serial Interface

Use with		
DX80N9Q45TH DX80N2Q45TH	Q45 Temperature/Humidity Node with integrated batteries	see page 16
DX80N9Q45U DX80N2Q45U	Q45 Universal Node with integrated batteries	
DX80N9X1S-P6 DX80N2X1S-P6	1-wire Serial Performance Node with integrated battery	see page 50
DX80N9X6S-P6 DX80N2X6S-P6	1-wire Serial Performance Node	
DX80DR9M-H6 DX80DR2M-H6	1-wire Serial Modbus MultiHop Slave with integrated battery	see page 58

M12FTH4Q and M12FT4 Specifications

Supply Voltage	3.6 to 5.5 V dc	
Current	Default sensing: 28 µAmps Disabled sensing: 15 µAmps Active comms: 4.7 mA	
Mounting Threads	M12 x 1	
Indicators	Green flashing: Power ON	Red flicker: Serial Tx
Communication Hardware	Interface: 1-wire Serial Interface Baud rates: 9.6k, 19.2k (default), or 38.4k	Data format: 8 data bits, no parity (default), 1 stop bit (even or odd parity available)
Communication Protocol	Sure Cross® DX80 Sensor Node 1-wire Serial Interface	
Communications Line	Level Receive ON: Greater than 2 V Level Receive OFF: Less than 0.7 V	Level Transmit ON: 2.7 to 3 V Level Transmit OFF: 0 V (pulldown resister of 10 kOhm)
Humidity	Measuring Range: 0 to 100% relative humidity Resolution: 0.1% relative humidity Accuracy: ±2% relative humidity at 25 °C NOTE: Humidity measurements are only available with the M12FTH4Q model. The M12FT4Q model does not include the humidity sensor.	
Temperature	Measuring Range: –40 to +85 °C (–40 to +185 °F)[2] Resolution: 0.1 °C Accuracy: ±0.3 °C at 25 °C	
Environmental Rating	NEMA 6, IEC IP67	
Operating Conditions	–40 to 85 °C (–40 to 185 °F)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	

Temperature and Humidity Sensor



M12FTH3Q and M12FT3Q

This temperature and humidity solution works in a variety of environments to wirelessly provide temperature and humidity measurements via Modbus RTU, RS-485.

Key Features:

- Achieves humidity accuracy of ±2% relative humidity and temperature accuracy of ± 0.3 °C
- Manufactured with a robust metal housing
- Traceable to NIST standards
- Functions as a Modbus slave device via RS-485

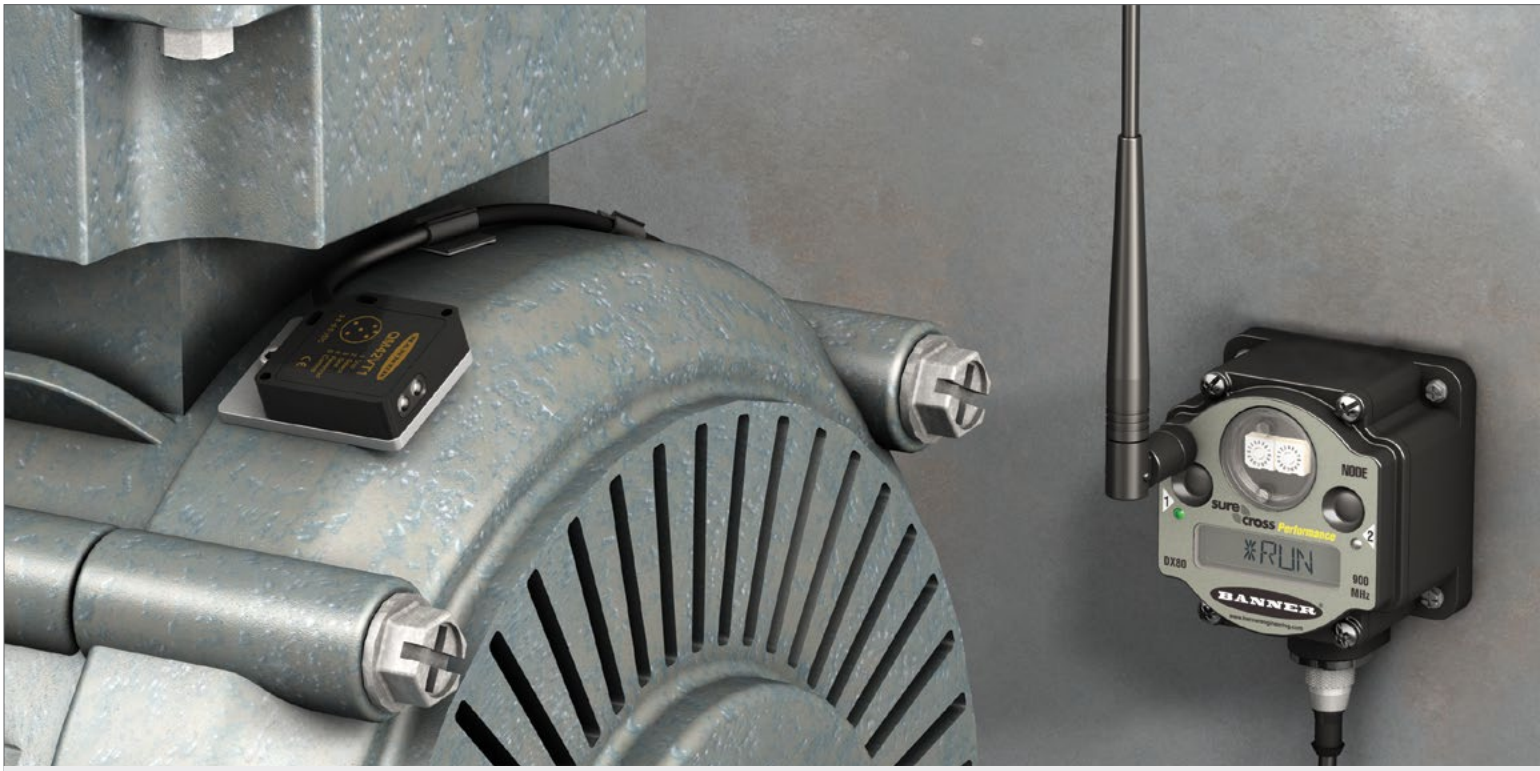
Models	Description
M12FTH3Q	Temperature and humidity sensor with Modbus RTU, RS-485 Interface
M12FT3Q	Temperature sensor with Modbus RTU, RS-485 Interface

Used with		
DX80DR9M-H1 DX80DR2M-H1 DX80DR9M-H1E DX80DR2M-H1E	Inputs: Four discrete, two 0 – 20 mA analog, one thermistor, one counter Outputs: Two NMOS discrete Switch Power Outputs: Two Serial Interface: RS-485	see page 58
DX80DR9M-H2 DX80DR2M-H2	Inputs: Four discrete, two 0-20 mA analog Outputs: Four sourcing discrete, two 0-20 mA analog Serial Interface: RS-485	
DX80DR9M-HB1 DX80DR2M-HB1	Inputs: Two NPN discrete, two 0-20 mA analog Outputs: Two NMOS discrete Switch Power Outputs: Two	
DX80DR9M-HB2 DX80DR2M-HB2	Inputs: Two PNP discrete, two 0-20 mA analog Outputs: Two PNP discrete, two 0-20 mA analog	
DX80SR9M-H DX80SR2M-H	Serial Interface: RS-232, RS-485	

M12FTH3Q and M12FT3Q Sensors Specifications

Supply Voltage	12 to 24 V dc or 3.6 to 5.5 V dc low power option	
Current	Default sensing: 45 µAmps Disabled sensing: 32 µAmps Active comms: 4 mA	
Mounting Threads	M12 x 1	
Indicators	Green flashing: Power ON	Red flicker: Serial Tx
Communication Hardware	Interface: RS-485 Serial Baud rates: 9.6k, 19.2k (default), or 38.4k	Data format: 8 data bits, no parity (default), 1 stop bit (even or odd parity available)
Communication Protocol	Modbus RTU	
Humidity	Measuring Range: 0 to 100% relative humidity Resolution: 0.1% relative humidity Accuracy: ±2% relative humidity at 25 °C NOTE: Humidity measurements are only available with the M12FTH3Q model. The M12FT3Q model does not include the humidity sensor.	
Temperature	Measuring Range: –40 to +85 °C (–40 to +185 °F)[2] Resolution: 0.1 °C Accuracy: ±0.3 °C at 25 °C	
Environmental Rating	NEMA 6, IEC IP67	
Operating Conditions	–40 to 85 °C (–40 to 185 °F)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	

Vibration and Temperature Sensor

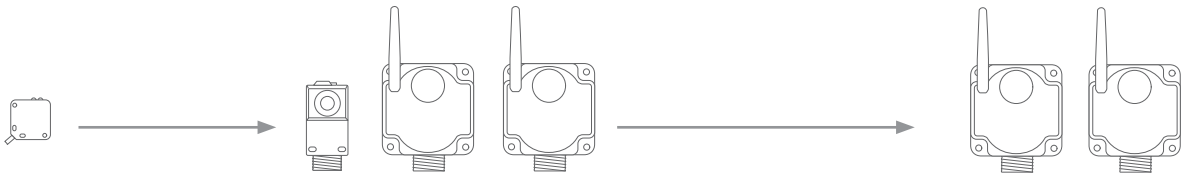


QM42VT

The QM42VT Vibration and Temperature Sensor makes it easy to monitor a machine's health. It measures RMS velocity (among other vibration characteristics) and temperature so that problems can be detected before they become too severe and cause additional damage or result in unplanned downtime. Paired with a Banner wireless Node, it can provide local indication, wirelessly send the signal to a central location, and send the vibration and temperature data to the Gateway for collection and trending.

Key Features:

- Easily monitor machine health by sending info wirelessly to wherever you need it
- Avoid machine failures and delays by detecting problems early
- Reduce downtime and plan maintenance more efficiently
- Monitor a variety of machines to suit your needs
  - Motors
  - Pumps
  - Compressors
  - Fans
  - Blowers
  - Gear Boxes



Select Node: one sensor per Node

Select Gateway:
(up to 47 sensors/Nodes) or Data Radio (up to 50+ sensors/Nodes per Master Radio)

Model	Description
QM42VT1	Vibration and temperature via a 1-wire Serial Interface
QM42VT2	Vibration and temperature that functions as a modbus slave device via RS-485

QM42VT1—Use with		
DX80N9Q45VT DX80N2Q45VT	Q45 Vibration/Temperature Node with integrated batteries	see page 16
DX80N9Q45U DX80N2Q45U	Q45 Universal Node with integrated batteries	
DX80N9X1S-P6 DX80N2X1S-P6	1-wire Serial Performance Node with integrated battery	see page 50
DX80N9X6S-P6 DX80N2X6S-P6	1-wire Serial Performance Node	
DX80DR9M-H6 DX80DR2M-H6	1-wire Serial Modbus MultiHop Slave with integrated battery	see page 58

QM42VT2—Use with		
DX80DR9M-H1 DX80DR2M-H1 DX80DR9M-H1E DX80DR2M-H1E	Inputs: Four discrete, two 0 – 20 mA analog, one thermistor, one counter Outputs: Two NMOS discrete Switch Power Outputs: Two Serial Interface: RS-485	see page 58
DX80DR9M-H2 DX80DR2M-H2	Inputs: Four discrete, two 0-20 mA analog Outputs: Four sourcing discrete, two 0-20 mA analog Serial Interface: RS-485	
DX80DR9M-HB1 DX80DR2M-HB1	Inputs: Two NPN discrete, two 0-20 mA analog Outputs: Two NMOS discrete Switch Power Outputs: Two	
DX80DR9M-HB2 DX80DR2M-HB2	Inputs: Two PNP discrete, two 0-20 mA analog Outputs: Two PNP discrete, two 0-20 mA analog	
DX80SR9M-H DX80SR2M-H	Serial Interface: RS-232, RS-485	

QM42VT Vibration and Temperature Sensor Specifications

Supply Voltage	3.6 to 5.5 V dc	
Current	Active comms: 11.9 mA at 5.5 V dc	
Communication Hardware	Interface: 1-wire Serial Interface Baud rates: 9.6k, 19.2k (default), or 38.4k Data format: 8 data bits, no parity (default), 1 stop bit (even or odd parity available)	
Communication Protocol	QM42VT2: Modbus RTU	QM42VT1: 1-wire Serial Interface
Communications Line	Level Receive ON: Greater than 2 V Level Receive OFF: Less than 0.7 V	Level Transmit ON: 2.7 to 3 V Level Transmit OFF: 0 V (pulldown resister of 10 kOhm)
Vibration Sensor	Mounted base resonance: 5.5 kHz nominal Measuring Range: 0–65 mm/sec or 0–6.5 in/sec RMS	Frequency Range: 10–1000 Hz Accuracy: ±10% and 25 °C
Connector	3 m cable with 5-pin M12 fitting	
Indicators	Green flashing: Power ON	Amber flicker: Serial Tx
Temperature Sensor	Measuring Range: –40 °C to +105 °C (–40 °F to +221 °F)	Resolution: 0.1 °C Accuracy: ± 3 °C
Environmental Rating	NEMA 6P, IEC IP67	
Operating Conditions	–40 to 85 °C (–40 to 185 °F)	
Shock and Vibration	400G	

Wireless Ultrasonic Sensor

K50U

The Sure Cross® U-GAGE® K50U Ultrasonic Sensor works in a variety of environments to provide a measurement of the distance between the target and the sensor. It is designed for plug-and-play use with the Q45U wireless node, creating a cost-effective and easy-to-use solution for monitoring mobile or remote tanks and totes.

Key Features:

- Provides a distance measurement from the target to the sensor
- Three meter sensing range with a 300 mm dead zone
- Built-in temperature compensation
- Rugged design for demanding sensing environments; rated IEC IP67, NEMA 6P
- Two sensor models available; one with a 1-wire Serial Interface and one that functions as a Modbus slave via RS-485

Model	Description	
K50UX1RA	Ultrasonic sensor with 1-wire Serial Interface	
K50UX2RA	Ultrasonic sensor that functions as a modbus slave device via RS-485	

K50UX1RA—Used with		
DX80N9Q45U DX80N2Q45U	Q45 Wireless Node with integrated battery	see page 16
DX80N9X1S-P6 DX80N2X1S-P6	1-wire Serial Performance Node with integrated battery	see page 50
DX80N9X6S-P6 DX80N2X6S-P6	1-wire Serial Performance Node	
DX80DR9M-H6 DX80DR2M-H6	1-wire Serial Modbus MultiHop Slave with integrated battery	see page 58

K50UX2RA—Used with		
DX80DR9M-H1 DX80DR2M-H1 DX80DR9M-H1E DX80DR2M-H1E	Inputs: Four discrete, two 0 – 20 mA analog, one thermistor, one counter Outputs: Two NMOS discrete Switch Power Outputs: Two Serial Interface: RS-485	see page 58
DX80DR9M-H2 DX80DR2M-H2	Inputs: Four discrete, two 0-20 mA analog Outputs: Four sourcing discrete, two 0-20 mA analog Serial Interface: RS-485	
DX80DR9M-HB1 DX80DR2M-HB1	Inputs: Two NPN discrete, two 0-20 mA analog Outputs: Two NMOS discrete Switch Power Outputs: Two	
DX80DR9M-HB2 DX80DR2M-HB2	Inputs: Two PNP discrete, two 0-20 mA analog Outputs: Two PNP discrete, two 0-20 mA analog	
DX80SR9M-H DX80SR2M-H	Serial Interface: RS-232, RS-485	

K50U Specifications

Supply Voltage	3.6 to 5.5 V dc or 10 to 30 V dc	
Current	K50UX2RA: Active comms–11.3 mA at 30 V dc	K50UX1RA: Default sensing–180 µA Disabled sensing–40 µA Active comms–3.3 mA
Indicators	Green flashing: Power ON	Amber flicker: Serial Tx
Performance	Sensing range: 300 mm to 3 m (11.8 in to 118 in) Ultrasonic frequency: 114 kHz Temperature effect: 0.02% of distance/°C Resolution: 0.1% of distance (1.5 mm minimum)	
Discrete Inputs	One Sinking Rating: 3 mA max current at 30 V dc ON Condition: Less than 0.7 V OFF Condition: Greater than 2 V or open	
Communication Protocol	K50UX2RA: Modbus RTU	K50UX1RA: 1-wire Serial Interface
Environmental Rating	NEMA 6, IEC IP67	
Operating Conditions	–40 to 70 °C (–40 to 158 °F)	
Construction	Housing: PBT polyester Transducer: epoxy/ceramic composite	
Connector	Integral 5-pin M12/Euro-style male quick disconnect (QD)	
Communication Hardware	K50UX2RA: RS-485 Serial K50UX1RA: 1-Wire Serial Interface Baud Rates: 9.6k, 19.2k (default), or 38.4k Data Format: 8 data bits, No parity (default), even parity, or odd parity 1 stop bit Do not use a termination resistor.	
Communications Line	Level Receive ON: Greater than 2 V Level Receive OFF: Less than 0.7 V	Level Transmit ON: 2.7 to 3 V Level Transmit OFF: 0 V (pulldown resister of 10 kOhm)
Shock and Vibration	All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 Hz to 60 Hz max., double amplitude 0.06 inch, maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 ms duration, half sine wave	
Certifications	CE	

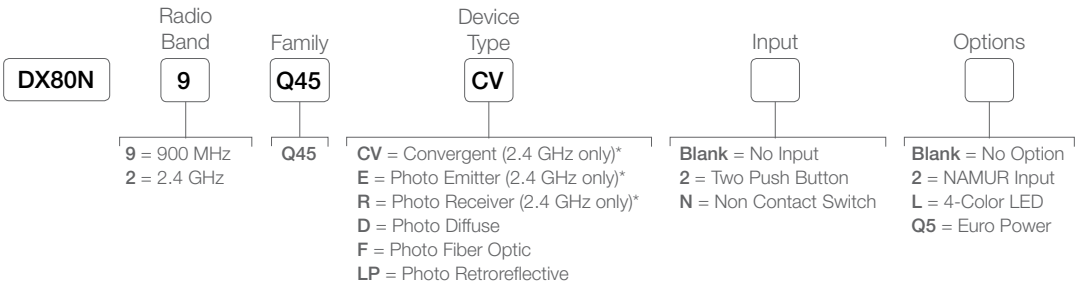
Photoelectric Q45 Sensors

Q45 Sensors

The Sure Cross® Q45 is the first self-contained wireless standard photoelectric solution for the most challenging control and monitoring needs. Easily add a scalable wireless sensor network to improve efficiency by monitoring and coordinating multiple machines and processes without pulling cables.

Key Features:

- True self-contained wireless with no cables, cordsets or external power
- 1 km line-of-sight
- Built-in antenna
- Retroreflective and Diffuse models are preconfigured to count up to 960 parts per minute



* Emitter and Receiver (E/R) are normally specified in pairs

Photoelectric Q45 Sensor Specifications

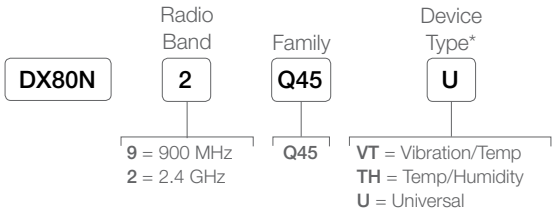
Radio (2.4 GHz)	Range: Up to 1000 m (3280 ft) with line of sight Transmit Power: 65 mW EIRP
2.4 GHz Compliance	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)
Construction	Molded reinforced thermoplastic polyester housing, oring-sealed transparent Lexan® cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown.
Typical Battery Life	Up to 2 years, typical A typical battery life assumes an average of 10 seconds between sensor changes of state and the default 62.5 millisecond sample rate. Battery life is reduced to 1 year with an average of 1 second between changes of state.
Default Sensing Interval	62.5 milliseconds
Adjustments	Multi-turn sensitivity control (allows precise sensitivity setting - turn clockwise to increase gain.
Sensing Range	Retroreflective: 0.15 m to 6 m (6 in to 20 ft) Diffuse: 101 mm to 300 mm (4 in to 12 in) Opposed: Up to 30 m (100 ft) depending on Excess Gain requirements Glass Fiber Optic: 1½-in focal point
Report Rate	On Change of State
Indicators	Red and green LEDs (radio function); amber LED (only for alignment mode)
Environmental Rating	NEMA 6P, IEC IP67
Operating Conditions	–40 °C to 70 °C (–40 °F to 158 °F); 90% relative humidity at 50 °C (non-condensing)

Q45 1-Wire Serial Models

Q45U, Q45VT and Q45TH

The Q45 1-wire serial nodes are designed to pair with Banner 1-wire serial sensors. The compact size, integrated lithium batteries, and built-in LED indicator light make remote monitoring easy to do.

- The Q45U is a universal 1-wire serial node that reads any Banner 1-wire serial sensor and determines an efficient power setting accordingly. It includes a red/green/yellow/blue LED to provide local indication.
- The Q45VT is designed to pair with the QM42VT1 vibration and temperature sensor; vibration thresholds can be set using dip switches and a built-in LED is pre-mapped to illuminate when a threshold has been exceeded.
- The Q45TH connects directly to the M12FTH4Q temperature and humidity sensor; sample rates can be set using DIP switches, and a red/green LED can be used to provide local indication.

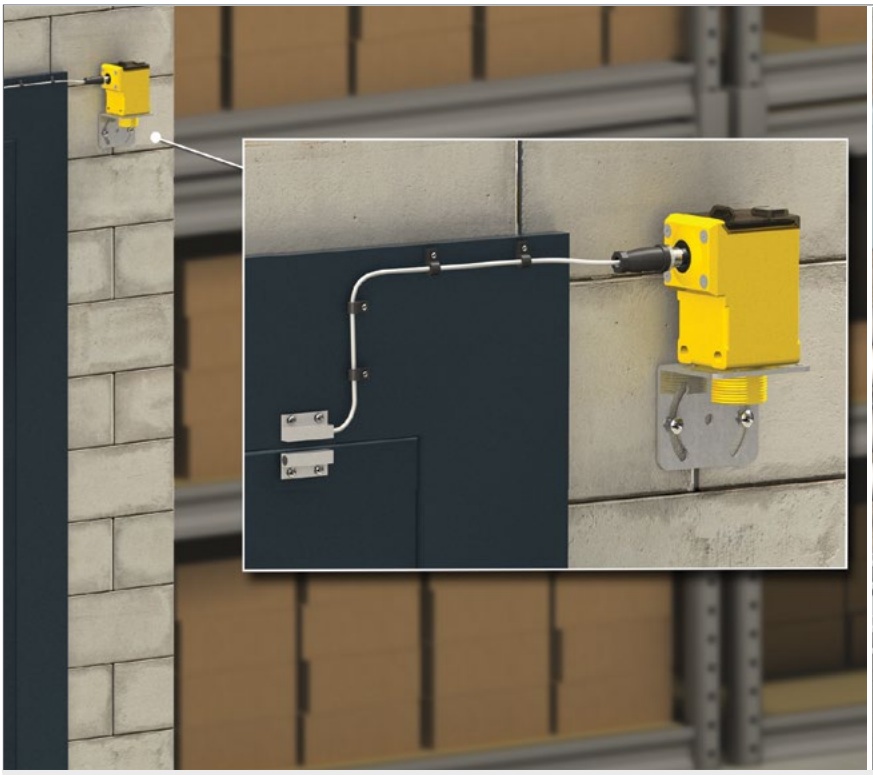


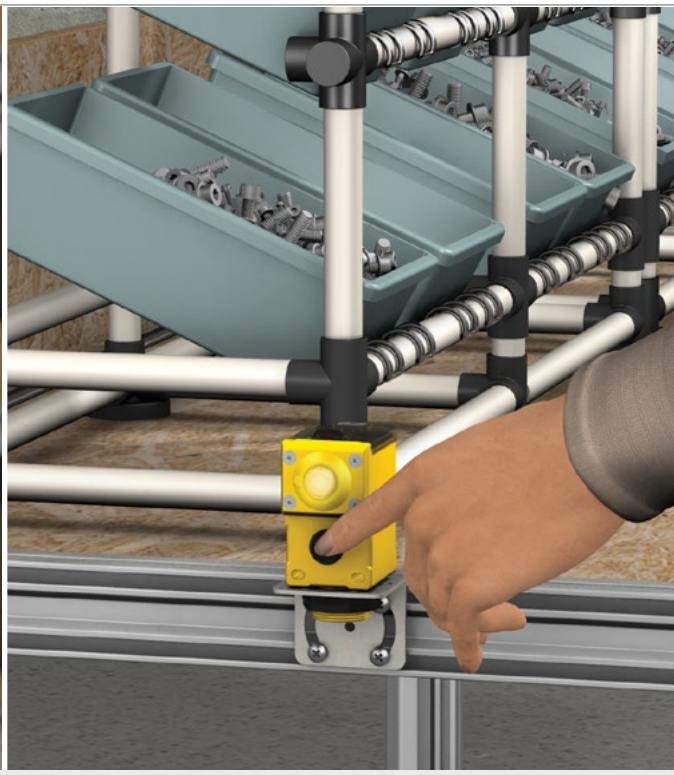
* Sensor units must be ordered separately

Q45VT, Q45TH, Q45U Specifications

	900 MHz	2.4 GHz
Radio Range	Up to 3.2 Km (2 miles) with line of sight	Up to 1000 m (3280 ft) with line of sight
Minimum Separation Distance	4.57 m (15 ft)	0.3 m (1 ft)
Transmit Power	1W (25 dBm)	65 mW
Compliance	FCC ID UE3RM1809 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI EN 300 328 V1.8.1 IC: 7044A-RM1809	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI EN 300 328 V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Default Sensing Interval	Q45VT: 5 minutes Q45TH: 64 seconds Q45U: 5 minutes	
Temperature Sensor	Measuring Range: –40 °C to +85 °C (–40 °F to +185 °F) Resolution: 0.1 °C Accuracy: ±0.3 °C	
Humidity Sensor	Measuring Range: 0% to 100% relative humidity Resolution: 0.1% relative humidity Accuracy: ±2% relative humidity at 23 °C	
Indicators	Red and green LEDs (radio function)	
Connection	One 5-pin threaded M12/Euro-style female quick-disconnect	
Construction	Molded reinforced thermoplastic polyester housing, oring-sealed transparent Lexan® cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown.	
Typical Battery Life at Default Sensing Interval	Q45VT: Up to 2.5 years Q45TH: Up to 1.5 years Q45U: 2+ years	Q45VT: Up to 3 years Q45TH: Up to 2 years Q45U: 3+ years
Environmental Rating	NEMA 6P, IEC IP67	
Operating Conditions	–40 °C to 70 °C (–40 °F to 158 °F); 90% relative humidity at 50 °C (non-condensing)	

Q45 Switches and Pushbuttons

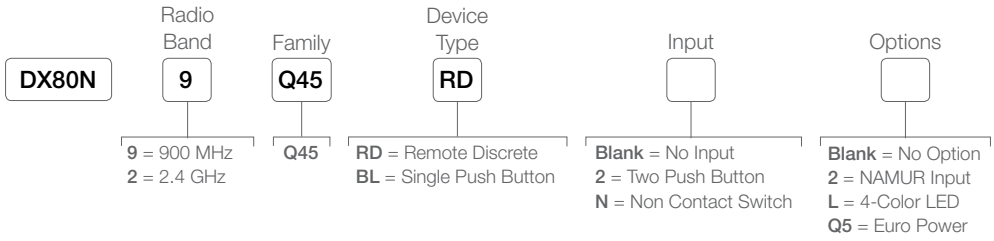




Q45RD and Q45BL

This Q45 family of products is designed to accept remote dry contact, NAMUR and discrete non-contact switch inputs to be used in many factory automation, remote monitoring and IIoT applications.

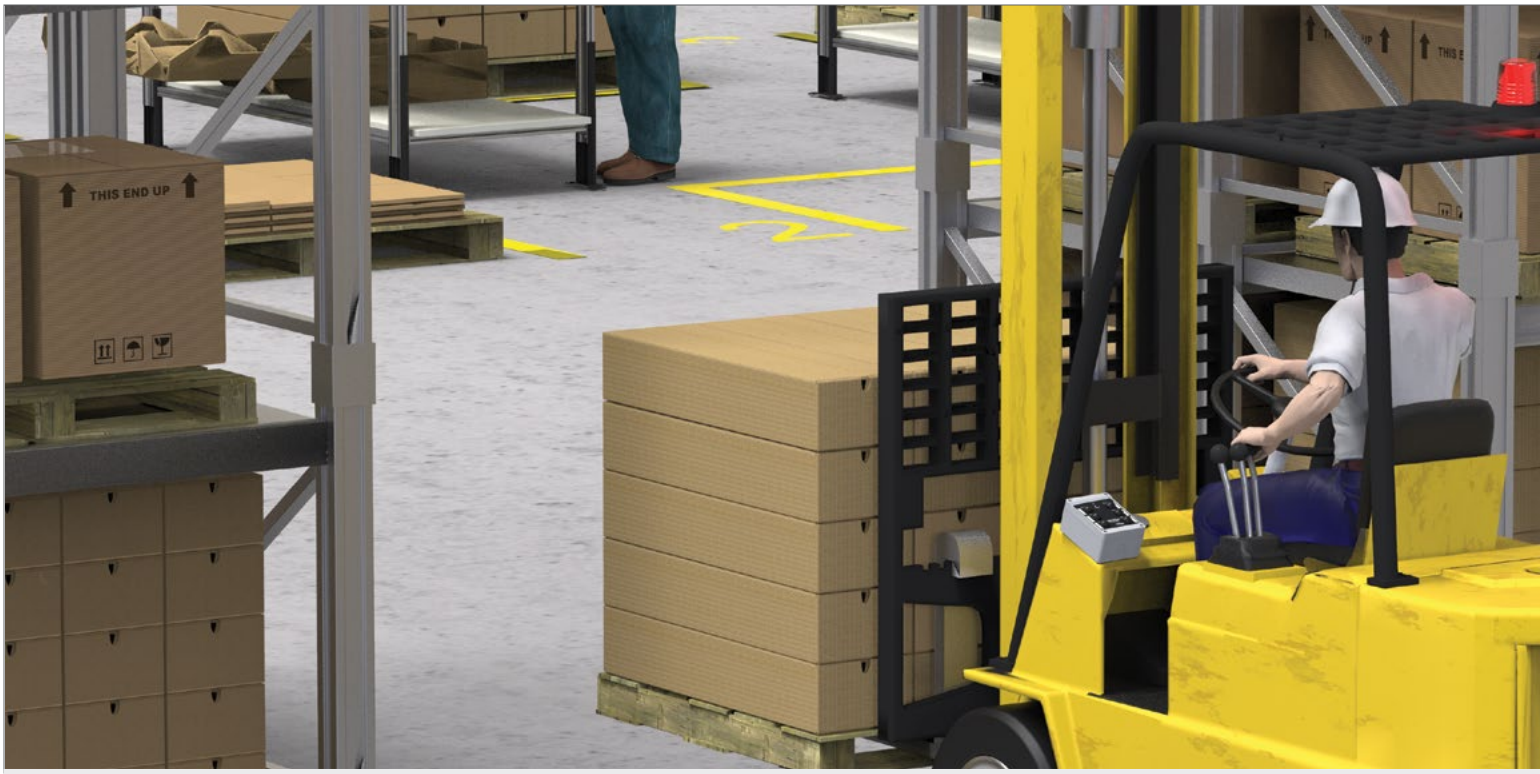
- Remote device models are designed to interface with isolated dry contact inputs or NAMUR inductive proximity sensors.
- Button and light models have independently controlled push button inputs and a multi-color LED indicator light.
- Remote discrete non-contact switch models use a magnet to sense the position of mechanical devices, such as doors, levers, valves, and other actuators.



Q45RD and Q45BL Specifications

	900 MHz	2.4 GHz
Radio Range	Up to 3.2 Km (2 miles) with line of sight	Up to 1000 m (3280 ft) with line of sight
Minimum Separation Distance	1W: 4.57 m (15 ft) 150/250 mW: 2 m (6 ft)	0.3 m (1 ft)
Transmit Power	1W (25 dBm)	65 mW EIRP
Compliance	FCC ID UE3RM1809 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI EN 300 328 V1.8.1 IC: 7044A-RM1809	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Externally Powered Sourcing Sensors (Q45RD models)	ON Condition: 2 V to 5 V OFF Condition: Less than 1 V	
Button Input (Q45BL models)	Sample Rate: 62.5 milliseconds Report Rate: On change of state	ON Condition: Button pressed OFF Condition: Button not pressed
Construction	Molded reinforced thermoplastic polyester housing, oring-sealed transparent Lexan® cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown.	
Indicators	Red and green LEDs (radio function); amber LED indicates when input 1 is active	
Environmental Rating	NEMA 6P, IEC IP67	
Battery Life	See Datasheet	
Default Sample Rate	62.5 milliseconds (dry contact) or 125 milliseconds (NAMUR)	
Report Rate	On Change of State	
Operating Conditions	–40 °C to 70 °C (–40 °F to 158 °F); 90% relative humidity at 50 °C (non-condensing)	
Certifications	CE	

6-Button Pendant



Q120

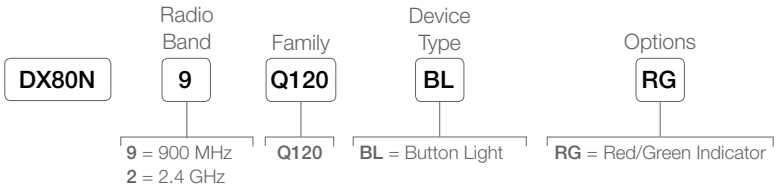
The Sure Cross® Wireless Q120 button and light pendant is an autonomous wireless Node that enables two-way communication between an operator and up to six remote and/or mobile devices. Six independently controlled push-button inputs allow operators to wirelessly send status updates, acknowledgements, initiate processes, and actuate devices.

Key Features:

- DIP switch configurable
- Six push-button inputs with momentary or toggle operation
- Six sets of red and green LED indicator lights with solid or flashing operation
- Reliable, field-proven wireless architecture operates in the globally accepted 2.4 GHz frequency band or the long-range 900 Mhz frequency band, depending upon model

Applications:

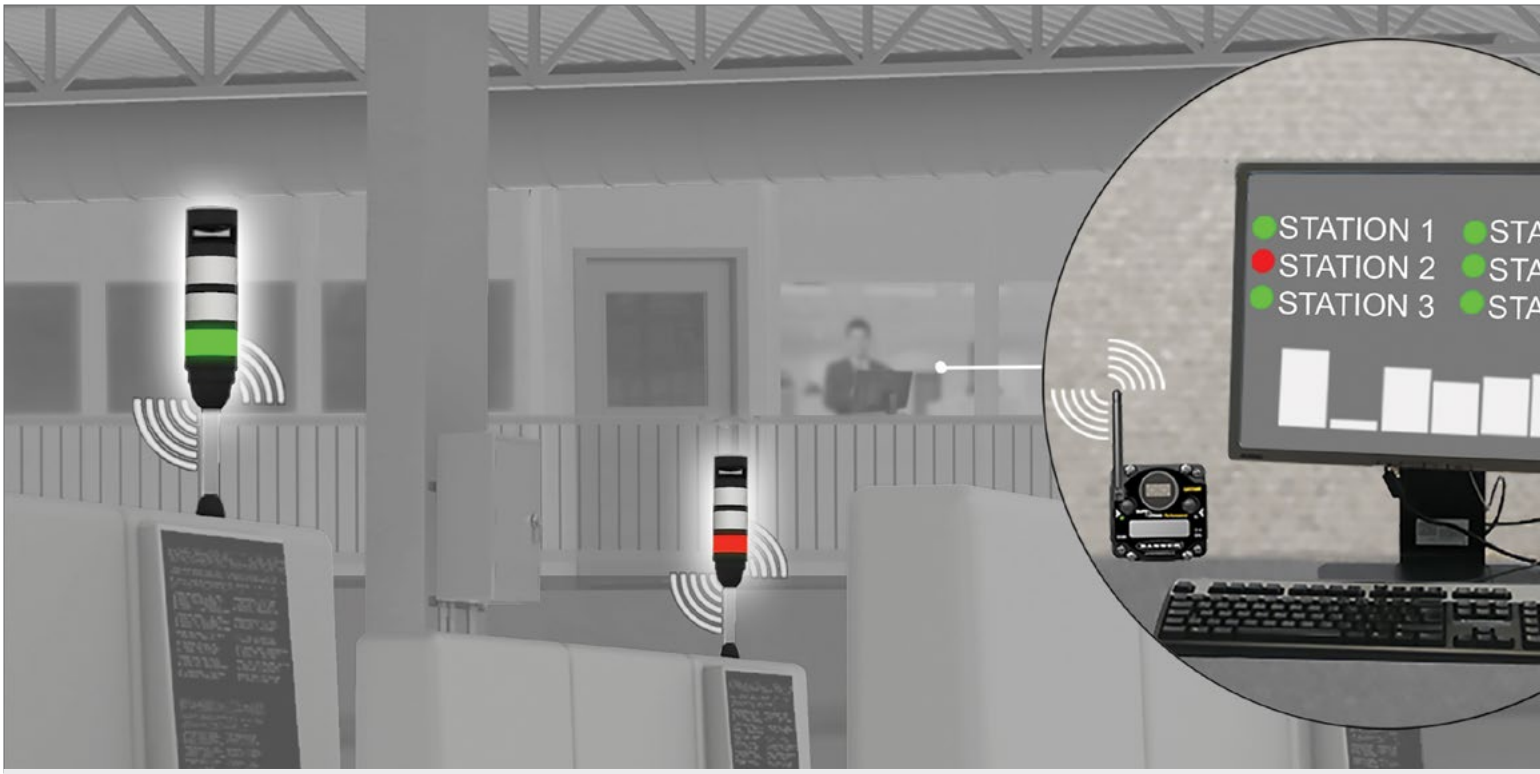
- Call for parts, service, or pick up
- Motor, fan, pump control and status indication
- Light control



Q120 Specifications

	900 MHz	2.4 GHz
Radio Range	Up to 3.2 Km (2 miles)	Up to 1000 m (3280 ft)
Minimum Separation Distance	4.57 m (15 ft)	0.3 m (1 ft)
Compliance	FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI EN 300 328 V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Construction	Polycarbonate housing; polyester labels; EDPM rubber cover gasket; nylon buttons Weight: 0.39 kg (0.85 lbs) Maximum Tightening Torque: 0.56 N·m (5 lbf·in)	
Indicators	Red and green LEDs (radio function)	
Environmental Rating	NEMA 6, IEC IP67	
Battery Life	See Datasheet	
Operating Conditions	–40 °C to 70 °C (–40 °F to 158 °F); 90% relative humidity at 50 °C (non-condensing)	

Wireless Tower Light



TL70

Easily add wireless communication and networking capabilities to your tower lights by using Banner's Wireless Base or Wireless Communication Segment.

Key Features:

- Easily add IIoT remote monitoring capabilites
- Enable Overall Equipment Effectiveness (OEE) data collection to optimize your operation
- Receive timely status information and remote notifications of problems
- Simplify installation by not having to run control wires
- Rugged, water-resistant IP65 housing with UV-stablilized material allows for use in harsh environments

Two options to add wireless communication to tower lights

Wireless Base

The Wireless Base provides full bi-directional communication, plus event counter inputs. It can be configured into preassembled tower lights,

Buy this if:

- You want to buy a preassembled tower light with wireless connectivity
- You can supply constand power to the light
- Your machines have PNP outputs to the tower light
- Your sole intent is to control light segements via the wireless radio

Wireless Communication Segment

The Communication segment adds wireless communication and networking capabilities to any standard TL70 Base, without requiring constant power or expensive wiring.

Buy this if:

- You want to add wireless connectivity to an existing TL70 Tower Light
- You can not supply constant power to the light
- Your machines have both NPN and PNP inputs
- You have a TL70 ac base

	Segment	Base
Requires Constant Power	—	√
PNP Inputs	√	√
NPN Inputs	√	—
AC Power Capable	√	—
900 MHz and 2.4 GHz	√	√
Event Counting Input	√	√
Bidirectional Communication	√	√
Remote Control of Light Segments	√*	√

* Requires constant power

Build your Own

Wireless Base

Housing	Radio Band	Connection	Housing Color
B-TL70	DXN2	Q5	

Base Segment

DXN2 = Node 2.4 GHz
DXN9 = Node 900 MHz

Blank = Black
C = Gray

5 = 2 m, 5-wire Integral Cable
8 = 2 m, 8-wire Integral Cable
Q5 = 5-pin Euro Integral QD (1-4 modules)
Q8 = 8-pin Euro Integral QD (5+6 modules)
QP5 = 5-pin Euro Pigtail (1-4 modules)
QP8 = 8-pin Euro Pigtail (5+6 modules)

QD models require mating cordset

Standard Base

Housing		Housing Color
B-TL70	Q5	

Base Segment

Blank = Black
C = Gray

5 = 2 m, 5-wire Integral Cable
8 = 2 m, 8-wire Integral Cable
Q5 = 5-pin Euro Integral QD (1-4 modules)
Q8 = 8-pin Euro Integral QD (5+6 modules)
QP5 = 5-pin Euro Pigtail (1-4 modules)
QP8 = 8-pin Euro Pigtail (5+6 modules)

QD models require mating cordset

AC Base

Housing		Housing Color
B-TL70Z	Q5	

Base Segment

Blank = Black
C = Gray

5 = 2 m, 5-wire Integral Cable (1-4 modules)
7 = 2 m, 7-wire Integral Cable (5+6 modules)
Q = 1/2-20/Micro-style Integral QD (1-4 modules)

QD models require mating cordset

Single Color Segments

Housing		Color	Housing Color
SG-TL70	–	R	

Light Segment

G = Green **R** = Red **W** = White
Y = Yellow **B** = Blue **O** = Orange
RGB14 = 14 color options*

Blank = Black
C = Gray

* Green, Yellow, Red, Blue, White, Cyan, Magenta, Orange, Amber, Lime Green, Spring Green, Sky Blue, Violet and Rose

Audible Segments

Housing		Alarm	Housing Color
SG-TL70	–	A	

Audible Segment

A = Audible (92 dB)
AL = Louder Audible (85 -101 dB)
ALM = Multi-tone Audible (75 - 101 dB)
AP = Programmable Audible

Blank = Black
C = Gray

Multicolor Segments

Housing		Color 1	2	3	Housing Color
SG-TL70	–	G	Y	R	

Light Segment

G = Green **R** = Red **W** = White
Y = Yellow **B** = Blue **O** = Orange

Blank = Black
C = Gray

Communication Segment

Housing	Radio Band	Housing Color
SG-TL70	DXN2	

Communication Segment

DXN2 = Node 2.4 GHz
DXN9 = Node 900 MHz

Blank = Black
C = Gray

Preassembled

Housing	Radio Band	Color/Position 1	2	3	4	5	Audible Alarm	Housing Color	Connection
TL70	DXN2	W	B	G	Y	R			Q

DXN2 = Node 2.4 GHz
DXN9 = Node 900 MHz

G = Green, **B** = Blue, **Y** = Yellow, **W** = White, **R** = Red

Blank = None
A = Audible (92 dB)*
AL = Louder Audible (101 dB)*

* For audible only, leave colors blank

Blank = Black
C = Gray

Blank = 2 m Integral Cable
T = Terminal Wired
Q = Euro Integral QD
QP = Euro Pigtail QD

QD models require mating cordset

TL70 Wireless Tower Light Specifications

Supply Voltage	12 to 30 V dc (Outside the USA: 12 to 24 V dc, ± 10%)	
Supply Protection Circuitry	Protected against transient voltages	
Indicator Response Time	OFF Response: 150 µs (maximum) at 12 to 30 V dc ON Response: 180 ms (maximum) at 12 V dc; 50 ms (maximum) at 30 V dc	
Audible Alarm	2.6 KHz ± 250 Hz oscillation frequency; maximum intensity 92 dB (Audible) and 101dB (Louder Audible) at 1 m (3.3 ft) (typical)	
Indicators	1 to 5 colors depending on model: Green, Red, Yellow, Blue, and White Flash rates: 1.5 Hz ±10% and 3 Hz ±10% LEDs are independently selected	
Construction	Bases, segments, covers: polycarbonate	
Operating Conditions	–40 °C to +50 °C (–40 °F to +122 °F) 95% at +50 °C maximum relative humidity (non-condensing)	
Environmental Rating	IEC IP65	
Vibration and Mechanical Shock	Vibration 10 to 55 Hz 0.5 mm p-p amplitude per IEC60068-2-6 Shock 15G 11 ms duration, half sine wave per IEC60068-2-27	
Radio Range	900 MHz, 1 W: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz 1 W: 4.57 m (15 ft)	2.4 GHz 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 W: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, ≤ 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI EN 300 328 V1.8.1 (2012-06) IC: 7044A-DX8024
Radiated Immunity HF	10 V/m (EN 61000-4-3)	
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software	Node: Defined by Gateway
Certifications	CE UL LISTED	

Wireless Indicator

K70

Wireless K70 Indicators are bright, 70 mm multicolored indicators offering increased communication possibilities and greater versatility in deployment.

Key Features:

- Models are available with up to five colors in one device
- Rugged, water-resistant IP65 housing
- SureCross wireless node built into the base
- 900 MHz and 2.4 GHz wireless options
- Input wires can be configured as auxiliary sourcing inputs from external devices or as a 20 Hz, 32-bit event counter

Applitcations:

- Clean room status indication
- Loading dock status
- High traffic forklift crossing status

Series	Model	Color					Input	Connection
K70	DXN2	W	B	G	Y	R	P	Q

DXN2 = Wireless 2.4 GHz
DXN9 = Wireless 900 MHz

G = Green
Y = Yellow
R = Red
B = Blue
W = White

P = PNP
N = NPN
Blank = Wireless

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

QD models require mating cordset

K70 Wireless Indicator Light Specifications

Supply Voltage	12 to 30 V dc (Outside the USA: 12 to 24 V dc, ± 10%)	
Supply Protection Circuitry	Protected against transient voltages	
Indicator Response Time	OFF Response: 150 µs (maximum) at 12 to 30 V dc ON Response: 180 ms (maximum) at 12 V dc; 50 ms (maximum) at 30 V dc	
Audible Alarm	2.6 KHz ± 250 Hz oscillation frequency; maximum intensity 92 dB (Audible) and 101dB (Louder Audible) at 1 m (3.3 ft) (typical)	
Indicators	OFF Response: 150 µs (maximum) at 12 to 30 V dc ON Response: 180 ms (maximum) at 12 V dc; 50 ms (maximum) at 30 V dc	
Construction	Bases and cover: polycarbonate	
Operating Conditions	–40 °C to +50 °C (–40 °F to +122 °F) 95% at +50 °C maximum relative humidity (non-condensing)	
Environmental Rating	IEC IP65	
Vibration and Mechanical Shock	Vibration 10 to 55 Hz 0.5 mm p-p amplitude per IEC60068-2-6 Shock 15G 11 ms duration, half sine wave per IEC60068-2-27	
Radio Range	900 MHz, 1 W: Up to 3.2 km (2 miles)	2.4 GHz, 65 mW: Up to 1000 m (3280 ft)
Minimum Separation Distance	900 MHz 1 W: 4.57 m (15 ft)	2.4 GHz 65 mW: 0.3 m (1 ft)
Compliance	FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI EN 300 328 V1.8.1 (2012-06) IC: 7044A-DX8024
Radiated Immunity HF	10 V/m (EN 61000-4-3)	
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software	Node: Defined by Gateway
Certifications	CE UL LISTED	

Wireless Touch Button

K70

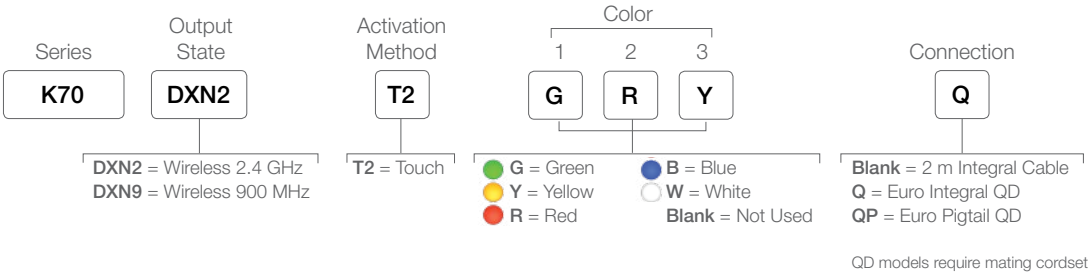
The K70 Wireless Touch Button is an ergonomic solid-state switch with integrated multicolor indication functions and a wireless Node. Bidirectional wireless communication provides a simple operator interface for many industrial applications.

Key Features:

- Bidirectional wireless communication
- Ergonomically designed to eliminate hand, wrist, and arm stresses associated with repeated switch operation; requires no physical force to operate
- Can be actuated with bare hands or in gloves
- Up to three colors in one touch button; momentary and latching versions available
- Excellent immunity to false triggering by water spray, detergents, oils, and other foreign materials

Applications:

- Pick-to-light
- Call button
- General industrial applications



K70 Wireless Touch Button Specifications

Supply Voltage	12 to 30 V dc (Outside the USA: 12 to 24 V dc, ± 10%)	
Supply Current	< 220 mA maximum current at 12 V dc < 110 mA maximum current at 30 V dc	
Supply Protection Circuitry	Protected against transient voltages	
Indicators	1 to 3 colors depending on model: Green, Red, Yellow, Blue, and White LEDs are independently selected	
Indicator Response Time	OFF Response: 150 µs (maximum) at 12 to 30 V dc ON Response: 180 ms (maximum) at 12 V dc; 50 ms (maximum) at 30 V dc	
Construction	Bases and cover: polycarbonate	
Operating Conditions	–40 °C to +50 °C (–40 °F to +122 °F) 95% at +50 °C maximum relative humidity (non-condensing)	
Environmental Rating	IEC IP65	
Vibration and Mechanical Shock	Vibration 10 to 55 Hz 0.5 mm p-p amplitude per IEC60068-2-6 Shock 15G 11 ms duration, half sine wave per IEC60068-2-27	
Radio Range	900 MHz, 1 W: Up to 3.2 km (2 miles)	2.4 GHz, 65 mW: Up to 1000 m (3280 ft)
Minimum Separation Distance	900 MHz 1 W: 4.57 m (15 ft)	2.4 GHz 65 mW: 0.3 m (1 ft)
Compliance	FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI EN 300 328 V1.8.1 (2012-06) IC: 7044A-DX8024
Radiated Immunity HF	10 V/m (EN 61000-4-3)	
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software	Node: Defined by Gateway
Certifications	CE UL LISTED	

Controllers

Industrial wireless controllers that facilitate industrial Internet of Things (IIoT) applications.

DXM100 Wireless Controller

The DXM100 Controller is an industrial wireless controller developed to facilitate Ethernet connectivity and Industrial Internet of Things (IIoT) applications. Available with an internal DX80 Gateway or a MultiHop Data Radio, this powerful Modbus communications device connects local wireless networks with the internet and/or host systems.

Key Features:

- ISM radios available in 900 MHz and 2.4 GHz for local wireless network
- Converts Modbus RTU to Modbus TCP/IP or Ethernet I/P
- Logic controller can be programmed using action rules and text language methods
- Cellular connectivity
- Micro SD card for data logging
- Email and text alerts
- Local I/O options: universal inputs, NMOS outputs, and analog outputs
- Powered by 12 to 30 V dc, 12 V dc solar panel, or battery backup
- RS-232, RS-485, and Ethernet communications ports; and a USB configuration port
- LCD display for I/O information and user programmable LEDs

point-to-point

point-to-multipoint

star

tree

Series: **DXM100** – Base: **B1** – Activation Method: **R1**

B1 = Modbus controller for data aggregation of sensors and wireless networks
Power: 12–30 V dc/ Solar/ Battery
Comms: RS-485, CAN, RS-232 w/flow or secondary RS-485
Inputs: (4) universal IN
Outputs: (4) NMOS OUT, (2) analog OUT (0–10 V or 4–20 mA)
Power Out: (2) Selected 5 V or 16 V switched power, (1) 5 V courtesy power

B2 = Smart valve control, SDI-12 data collection
Power: 12–30 V dc/Solar/Battery
Comms: RS-485, (1) SDI-12 sensor interface
Inputs: (4) universal IN
Outputs: (4) NMOS OUT, (2) 0-10 V analog, (2) DC Latching
Power Out: (2) Adjustable 5 V to 24 V switched power, (1) SDI switched power, and (1) 5 V courtesy power

S1* = Modbus slave I/O device for MultiHop wireless networks or wired networks
Power: 12–30 V dc/Solar/Battery
Comms: RS-485
Inputs: (4) Universal IN
Outputs: (4) NMOS OUT, (2) Analog OUT (0–10 V or 4–20 mA)
Power Out: (2) Selectable 5 V or 16 V switched power, (1) 5 V courtesy power

S2* = Modbus slave device for valve control, SDI-12 data collection for MultiHop wireless networks or wired networks
Power: 12–30 V dc/Solar/Battery
Comms: RS-485, (1) SDI-12 sensor interface
Inputs: (4) universal IN
Outputs: (4) NMOS OUT, (2) 0–10 V analog, (2) DC Latching
Power Out: (2) Adjustable 5 V to 24 V switched power, (1) SDI switched power, and (1) 5 V courtesy power

Blank = None
R1 = 900 MHz, 1 W PE5 Performance Radio (North America)
R2 = 900 MHz, 1 W HE5 MultiHop Data Radio (North America)
R3 = 2.4 GHz, 65 mW PE5 Performance Radio (Worldwide)
R4 = 2.4 GHz, 65 mW HE5 MultiHop Data Radio (Worldwide)
R5 = 900 MHz, 65 mW HE5L MultiHop Data Radio (Used for M-GAGE networks)
R8 = 900 MHz, Performance Radios approved for Australia/New Zealand
R9 = 900 MHz, MultiHop Radio approved for Australia/New Zealand

* For S1 and S2 models, only order the R2, R4, R5, and R9 radio configurations

Cellular Communication
Controllers accept Banner GSM and LTE modems only. Cellular modems are ordered separately as accessories under the following part numbers:

- GSM/3G (HSPA) – **SXI-GSM-001**
- LTE – Verizon – **SXI-LTE-001**

DXM100 Controllers Specifications

Supply Voltage	12 to 30 V dc use only with a suitable Class 2 power supply (UL) or 9 SELV (CE) powers supply or 12 V dc solar panel and 12 V sealed lead acid battery	
Power Consumption	B1 and B2 models: 35 mA average at 12 V	S1 and S2 models: 20 mA average at 12 V
Solar Power Battery Charging	1 Amp maximum with 20 Watt solar panel	
Radio (ISM Band) Transmit Power	900 MHz at 1 Watt	2.4 GHz at 65 mW
Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft) 900 MHz, 150/250 mW: 2 m (6 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 Watt) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW EIRP)
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Logging	8 GB maximum; removable Micro SD card format	
Protocols	Modbus RTU Master/Slave, Modbus TCP, and Ethernet/IP	
Construction	Polycarbonate; DIN rail mount option	
Communication Hardware (RS-232)	2-wire full duplex; flow control –15 to +15 Volts signaling Baud rates: 9.6k, 19.2k (default), or 38.4k Data format: 8 data bits, no parity, 1 stop bit	
Communication Hardware (RS-485)	2-wire half duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k Data format: 8 data bits, odd, even or no parity, 1 stop bit	
Universal Inputs	Discrete sinking/sourcing, 4 to 20 mA analog, 0 to 10 V analog, 10k thermistor, counter	
Courtesy Power	One output at 5 volts, 500 mA maximum	
Switched Power Outputs	B1 and S1 models: Two selectable 5 V or 16 V outputs 5 V: 400 mA maximum 16 V: 125 mA maximum	B2 and S2 models: Two adjustable 5 V or 24 V outputs One SDI-12 adjustable 5 V to 24 V output 5 V: 400 mA maximum 16 V: 125 mA maximum 24 V: 85 mA maximum
Environmental Rating	IEC IP20	
Operating Conditions	–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m, 80-2700 MHz (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: .5 mm p-p, 10 to 60 Hz	
Analog Outputs	0 to 20 mA or 0 to 10 V dc output Accuracy: 0.1% of full scale +0.01% per °C Resolution: 12 bit	
Certifications	CE	

DXM150 Wireless Controller

The DXM150 Controller is an industrial wireless controller developed to facilitate Ethernet connectivity and Industrial Internet of Things (IIoT) applications. Available with an internal DX80 Gateway or a MultiHop Data Radio, this powerful Modbus communications device has expanded I/O options and connects local wireless networks with the internet and/or host systems.

Key Features:

- ISM radios available in 900 MHz and 2.4 GHz for local wireless network
- Converts Modbus RTU to Modbus TCP/IP or Ethernet I/P
- Logic controller can be programmed using action rules and text language methods
- Cellular connectivity
- Micro SD card for data logging
- Email and text alerts
- Local I/O options: 8 universal inputs, NMOS outputs, and relay and analog outputs
- Powered by 12 to 30 V dc, 12 V dc solar panel, or battery backup
- RS-232, RS-485, and Ethernet communications ports; and a USB configuration port
- LCD display for I/O information and user programmable LEDs

point-to-point

point-to-multipoint

star

tree

Series: **DXM150** – Base: **B1**

B1 = Modbus controller designed for applications with high I/O count, isolated inputs or integrated relays
Power: 12–30 V dc/ Solar/ Battery
Comms: RS-485 and RS-232 / CAN or secondary RS-485
Inputs: (2) Isolated discrete, (8) Universal
Outputs: (2) Relay, (4) NMOS, (2) Analog
Power Out: (2) Jumper selectable between 2.7 V or battery, 4.2 V or incoming power

B2 = Modbus controller for high I/O count applications
Power: 12-30 V dc/Solar/Battery
Comms: RS-485 and RS-232 w/flow control or secondary RS-485
Inputs: (2) Isolated discrete, (8) Universal
Outputs: (8) PNP/NPN Selectable, (2) Analog
Power Out: (2) Courtesy power out; (2) jumper selectable between 2.7 V or battery, 4.2 V or incoming power

S1* = Modbus slave with high I/O count for MultiHop wireless networks or wired networks
Power: 12–30 V dc/Solar/Battery
Comms: RS-485
Inputs: (2) Isolated discrete, 8 Universal
Outputs: (2) Relay, (4) NMOS Discrete, (2) Analog
Power Out: (2) Jumper selectable between 2.7 V or battery, 4.2 V or incoming power

S2* = Modbus slave with high I/O count for MultiHop wireless networks or wired networks
Power: 12–30 V dc/Solar/Battery
Comms: RS-485
Inputs: (2) Isolated discrete, (8) Universal
Outputs: (8) PNP/NPN Selectable, (2) Analog
Power Out: (2) Courtesy power out; (2) Jumper selectable between 2.7 V or battery, 4.2 V or incoming power
Outputs: (4) NMOS OUT, (2) 0–10 V analog, (2) DC Latching
Power Out: (2) Adjustable 5 V to 24 V switched power, (1) SDI switched power, and (1) 5 V courtesy power

* For S1 and S2 models, only order the R2, R4, R5, and R9 radio configurations

Activation Method: **R1**

Blank = None
R1 = 900 MHz, 1 W PE5 Performance Radio (North America)
R2 = 900 MHz, 1 W HE5 MultiHop Data Radio (North America)
R3 = 2.4 GHz, 65 mW PE5 Performance Radio (Worldwide)
R4 = 2.4 GHz, 65 mW HE5 MultiHop Data Radio (Worldwide)
R5 = 900 MHz, 65 mW HE5L MultiHop Data Radio (Used for M-GAGE networks)
R8 = 900 MHz, Performance Radios approved for Australia/New Zealand
R9 = 900 MHz, MultiHop Radio approved for Australia/New Zealand

Cellular Communication
Controllers accept Banner GSM and LTE modems only. Cellular modems are ordered separately as accessories under the following part numbers:

- GSM/3G (HSPA) – **SXI-GSM-001**
- LTE – Verizon – **SXI-LTE-001**

DXM150 Controllers Specifications

Supply Voltage	12 to 30 V dc or 12 V dc solar panel and 12 V sealed lead acid battery	
Power Consumption	B1 and B2 models: 35 mA average at 12 V	S1 and S2 models: 20 mA average at 12 V
Solar Power Battery Charging	1 Amp maximum with 20 Watt solar panel	
Radio (ISM Band) Transmit Power	900 MHz at 1 Watt	2.4 GHz at 65 mW
Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 Watt) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW EIRP)
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Logging	8 GB maximum; removable Micro SD card format	
Protocols	Modbus RTU Master/Slave, Modbus TCP, and Ethernet/IP	
Construction	Polycarbonate; DIN rail mount option	
Communication Hardware (RS-232)	Interface: 2-wire RS-232 Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Tool Data format: 8 data bits, no parity, 1 stop bit	
Communication Hardware (RS-485)	Interface: 2-wire half-duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Tool Data format: 8 data bits, no parity, 1 stop bit	
Switched Power Outputs	5 Volts/400 mA maximum; 16 V/125 mA maximum	
Environmental Rating	IEC IP20	
Operating Conditions	–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: .5 mm p-p, 10 to 60 Hz	
Selectable (Jumper) Power Out	Output on pin 45, jumper selects 2.7 V or battery Output on pin 35, jumper selects 4.2 V or incoming power 100 mA maximum	
Discrete Inputs	Optically isolated AC input type Input to output isolation: 2.5 kV	
Counters, Synchronous	32-bits unsigned 10 ms clock rate minimum	
Universal Inputs	Sinking/Sourcing discrete, 4–20 mA analog, 0–10 V analog, counter, and temperature 10 kOhm thermistor	
Indicators	Four LEDs, four control buttons, one LCD	
Security Protocols	VPN, SSL, and HTTPS	
Analog Outputs	0 to 20 mA or 0 to 10 V dc output Accuracy: 0.1% of full scale +0.01% per °C Resolution: 12 bit	
Discrete Output Rating (NMOS)	Less than 1 A max current at 30 V dc ON-state saturation: less than 0.7 V at 20 mA ON condition: Less than 0.7 V Off condition: Open	
Relay Outputs	One; output at 5 volts , 500 mA maximum	
Certifications	CE	

Industrial Wireless Radios

Banner's network radios provide the backbone of a very flexible and highly expandable wireless network for industrial environments. Simple wire replacement products easily replace discrete, analog, Serial, and Ethernet signal wires with no setup software needed. The Performance Series centers around a Gateway and up to 47 remotely located Nodes with multiple I/O options. The MultiHop Series uses repeaters to extend the range of the network using multiple "hops" to cover larger distances or to circumvent obstacles (trees, buildings, topology, etc.).

Sure Cross® PM Series

An I/O Radio network that combines long range line-of-sight coverage with ease of deployment and use.

Banner's PM Series provides a flexible network that easily sets up without software. Setting up a basic point-to-point network is as easy as pairing a cell phone to a headset. You can replace cables and extend the range of digital and analog signals with minimum effort.

Key Features:

- Menu-driven LCD user interface
- No software needed
- IP67-rated housing for demanding environments
- One Gateway is preconfigured to support up to six Nodes
- Choose from two I/O configurations
- Select from multiple I/O maps

point-to-point

point-to-multipoint

	Device	Radio	Host Comms	Power	Antenna		I/O	Housing Options
DX80	N	9	X	6	S	–	PM2	

- **G** = Gateway, **N** = Node, **K** = Kit
- **9** = 900 MHz, **2** = 2.4 GHz
- **X** = None, **M** = Modbus
- **6** = 10 to 30 V dc
- **S** = External, **Blank** = Kit
- **PM2** = Pre-mapped, 4 Discrete OUT, 2 Analog IN, 2 Analog OUT; **PM8** = Pre-mapped, 12 Discrete IO
- **Blank** = IP67, **C** = IP20 housing (external wiring access), **L** = No LCD, no rotary dials*

* Available on PM8 models only

Sure Cross® PM Kit

Simple wire replacement is even simpler with Banner's fully integrated kit.

Plug-and-play with one Gateway and one Node, pre-bound and mapped to solve your first wireless challenge, and provide the start of a flexible network that can be expanded as production needs change.

Key Features:

- Pre-bound and mapped expandable bi-directional radios
- Eight LCD menu selectable I/O mapping options
- IP67-rated housing for demanding environments
- One Gateway is preconfigured to support up to six Nodes

PM2 and PM8 Gateways and Nodes Specifications

Radio Range	900 MHz (1 W): Up to 9.6 kilometers (6 miles)* 2.4 GHz (65 mW): Up to 3.2 kilometers (2 miles)* *Line of sight with included 2 dB antenna
Minimum Separation Distance	900 MHz (1 W): 4.57 m (15 ft) 2.4 GHz (65 mW): 0.3 m (1 ft)
Transmit Power	900 MHz (1 Watt): 30 dBm (1 W) conducted (up to 36 dBm EIRP) 2.4 GHz: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
900 MHz Compliance	FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809
2.4 GHz Compliance	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)
Linked Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway
Communication Hardware (RS-485) - Gateways Only	Interface: 2-wire half duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k Data format: 8 data bits, no parity, 1 stop bit NOTE: Battery life is reduced to 1 year when the sample/report rate is increased to 16 seconds
Communication Protocol	Modbus RTU
Supply Voltage	10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%) 900 MHz Consumption: Maximum current draw is < 100 mA and typical current draw is < 50 mA at 24 V dc (2.4 GHz consumption is less)
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.26 kg (0.57 lbs) Mounting: #10 or M5 (SS M5 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD
Wiring Access	Two 1/2-in NPT ports
Environmental Rating	PM2 and PM8 Models: IEC IP67; NEMA 6 PM2C and PM8C Models: IP20; NEMA 1
Operating Conditions	Temperature: –40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) Humidity: 95% max. relative (non-condensing) Radiated Immunity: 10 V/m, 80-2700 MHz (EN61000-4-3)
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz
Certifications	CE

Performance Board Modules

Sure Cross® Performance Embeddable Board Modules were specifically designed for the needs of industrial users to provide connectivity where traditional wired connections are not possible or cost prohibitive. Performance Embeddable Board Modules communicate with all Sure Cross Performance radios.

Key Features:

- Simple yet highly expandable
- Supports Point-to-Point and Star network topologies
- DIP switch mapping for up to two Nodes

point-to-point

point-to-multipoint

star

	Device	Radio	Host Comms	Power	Antenna		I/O
DX80	N	9	X	6	S	–	PB2
	G = Gateway **N** = Node	**9** = 900 MHz **2** = 2.4 GHz	**X** = None	**2** = FlexPower (PB1) **6** = 10 to 30 V dc (PB2)	**S** = External		**PB1** = Board Module, FlexPower, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN **PB2** = Board Module, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN, 2 Analog OUT

PB2 Gateway and Node Specifications

Radio Range	900 MHz (1 Watt): Up to 9.6 kilometers (6 miles)* 2.4 GHz (65 mW): Up to 3.2 kilometers (2 miles)* *Line of sight with included 2 dB antenna
Minimum Separation Distance	900 MHz (1 Watt): 4.57 m (15 ft) 2.4 GHz (65 mW): 0.3 m (1 ft)
Transmit Power	900 MHz (1 Watt): 30 dBm (1 W) conducted (up to 36 dBm EIRP) 2.4 GHz: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
900 MHz Compliance	FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809
2.4 GHz Compliance	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)
Supply Voltage	10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%) 900 MHz Consumption: Maximum current draw is < 100 mA and typical current draw is < 50 mA at 24 V dc (2.4 GHz consumption is less)
Current Draw (at 24 V dc)	900 MHz, 1 Watt: Approx. 3.5 mA 900 MHz, 250 mW: Approx. 1.5 mA 2.4 GHz, 65 mW: Approx. 3.5 mA
Interface	Indicators: One bi-color LEDs Buttons: One
Wiring Access	Terminal block
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms; Max Tightening Torque: 0.45 N·m (4 lbf·in) U.FL-R-SMT.(01); Use cable BWA-HW-030 (U.FL to RP-SMA) or the equivalent
Linked Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway
Operating Conditions	Temperature: –40 °C to +85 °C (–40 °F to +185 °F) Humidity: 95% max. relative (non-condensing)
Radiated Immunity	10 V/m, 80-2700 MHz (EN61000-4-3)

Serial Data Radio

Sure Cross® MultiHop Serial Data Radios are wireless industrial communication devices used to extend the range of Serial communication networks.

Key Features:

- DIP switches select operational modes: master, repeater or slave
- No software required for deployment
- Serial communication style (RS-232 or RS-485) is user-selectable

point-to-point

point-to-multipoint

star

tree

	Device	ISM Band	Host Comms		I/O
DX80	SR	9	M	–	H
	SR = Serial	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus		**H** = No I/O

Serial Data Radio Specifications

Radio Range	900 MHz (1 Watt): Up to 9.6 kilometers (6 miles)* 2.4 GHz (65 mW): Up to 3.2 kilometers (2 miles)* *Line of sight with included 2 dB antenna
Minimum Separation Distance	900 MHz (1 Watt): 4.57 m (15 ft) 2.4 GHz (65 mW): 0.3 m (1 ft)
Transmit Power	900 MHz (1 Watt): 30 dBm (1 W) conducted (up to 36 dBm EIRP) 2.4 GHz: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
900 MHz Compliance	FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809
2.4 GHz Compliance	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.7.1 (2006-05) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)
Supply Voltage	10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%)
Current Draw	Idle: At 30 V dc: 0.011 A At 24 V dc: 0.012 A At 10 V dc: 0.020 A Transmitting: At 30 V dc: 0.007 A At 24 V dc: 0.008 A At 10 V dc: 0.011 A
Housing	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.26 kg (0.57 lbs) Mounting: #10 or M5 (SS M5 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)
Interface	Indicators: Two bi-color LEDs Buttons: One (under small round cover)
Wiring Access	4-position terminal
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)
Hardware (Serial Data Radio SRxM-H)	Interface: 2-wire half-duplex RS-485 (default) or RS-232 Baud rates: 1200, 2400, 9600, 19.2k (default), 38.4k, 57.6k, 115.2k Data format: 8 data bits, 1 stop bit, no parity (default), even parity, odd parity
Packet Size (Serial Data Radio)	1500 bytes maximum
Wireless Data Transfer Rate	900 MHz: 300 kbps 2.4 GHz: 250 kbps
Environmental Rating	IEC IP67; NEMA 6
Operating Conditions	Operating Temperature: –40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) Operating Humidity: 95% max. relative (non-condensing) Radiated Immunity: 10 V/m, 80-2700 MHz (EN61000-6-2)
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz

Ethernet Data Radio

Sure Cross® MultiHop Ethernet Data Radios are wireless industrial communication devices used to create point-to-multipoint configurations of wireless Ethernet networks.

Key Features:

- No IP address configuration is required
- Self-healing, auto-routing RF network with multiple hops extends the network's range
- DIP switches select operational modes: master, repeater or slave
- Built-in site survey mode enables rapid assessment of a location's RF transmission properties

point-to-point

point-to-multipoint

star

tree

	Device	ISM Band	Host Comms		I/O
DX80	ER	9	M	–	H
	ER = Ethernet	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus		**H** = No I/O

Ethernet Data Radio Specifications

Radio Range	900 MHz (1 Watt): Up to 9.6 kilometers (6 miles)* 2.4 GHz (65 mW): Up to 3.2 kilometers (2 miles)* *Line of sight with included 2 dB antenna
Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP) 2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Receive Sensitivity	900 MHz: –104 dBm at 300 kbps; –107 dBm at 200 kbps; –108 dBm at 100 kbps 2.4 GHz: –104 dBm at 250 kbps
Minimum Separation Distance	900 MHz (1 Watt): 4.57 m (15 ft) 2.4 GHz (65 mW): 0.3 m (1 ft)
900 MHz Compliance	FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-RM1809
2.4 GHz Compliance	FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.7.1 (2006-05) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)
Communication	Ethernet: 10/100 baseT Ethernet RJ45 connection Radio: 200kbps to 300kbps Encyrption: AES (Advanced Encryption Standard) using a 256-bit cryptographic key
Supply Voltage	10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%) on the brown wire, or 3.6 to 5.5 V dc low power option on the gray wire
Current Consumption	Idle: 50 mA at 24 V; 100 mA at 12 V; 170 mA at 5 V Transmit 250 mW: 60 mA at 24V ; 120 mA at 12 V; 200 mA at 5 V Transmit 1 Watt: 70 mA at 24 V; 130 mA at 12 V; 240 mA at 5 V
Housing	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.26 kg (0.57 lbs) Mounting: #10 or M5 (SS M5 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD
Environmental Rating	IEC IP20; NEMA 1
Operating Conditions	–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz

DXER9 Ethernet Data Radio

Sure Cross® Ethernet Radio is an industrial grade, long range, 900 MHz radio used to create point-to-multipoint configurations of wireless Ethernet networks.

Key Features:

- DIP switches select operational modes
- FHSS radios operate and synchronize automatically
- RF transmission rate of 1.536 Mb/s and a throughput of 935 Kb/s
- 128 bit AES encryption for Ethernet data packets
- Point-to-multipoint configurations with up to 16 subscriber units

point-to-point

point-to-multipoint

star

Models	Range	Transmit Range	Environmental Rating
DXER9	Up to 3 mile range	125 mW	IP55

Ethernet Data Radio Specifications

RF Transmission Rate	1.536 Mb/s
Ethernet Throughput	935 Kb/s
Output Power	+21 dBm (4 Watts EIRP used with 15 dBi antenna)
Receive Sensitivity	–97 dBm at 10e-4 BER (–112 dBm with 15 dBi antenna)
Radio Link Budget	148 dB with 15 dBi antenna
Range	Up to 3 miles
Radio Channels/Bandwidth	12 non-overlapping with 2.0833 MHz spacing and 1.75 MHz occupied bandwidth
Spread Spectrum Technology	Direct Sequence Spread Spectrum
Manual Frequency Select	Channel selected with DIP switch or via Web browser interface
Connector Types	Ext. Reverse Polarity SMA / 10-100 baseT Industrial Ethernet / 5-pin or 4-pin M12/Euro-style power connection
Status LEDs	Power, Ethernet Link, RF RX, RF TX, 4/Channel, and 6/Link Quality
Error Correction Technique	Sub-block error detection and retransmission
Adjacent-Band Rejection	SAW receiver filter attenuates cellular and pager interference
Regulator Type	Switching regulator
Browser Management Tools	QoS Statistics, Network Settings, Spectrum Analyzer, and Firmware Upgrading
Power Consumption	Transmit: 1.7 Watts Receive: 0.8 Watts
Voltage	Apply power using one of the following connections: Euro-style connector: 5 to 48 V dc with pin 1 positive and pin 3 ground
Temperature Range	–40 °C to 70 °C (–40 °F to +158 °F)
Mounting	#10 or M5 (M5 hardware included)
M5 Fasteners Max Tightening Torque	0.56 N·m (5 in·lbf)
Material	Case: PBT
Environmental Rating	IEC IP65; NEMA 4X
Certifications	UL LISTED IND. CONT. EQ. 447Y Maximum ambient temperature: 70 °C Power rating: UL Class 2 Enclosure environmental rating: UL Type 1

Performance Series—Gateways

Create point-to-multipoint networks that distribute I/O over large areas. Input and output types include discrete (dry contact, PNP/NPN), analog (0 to 10 V dc, 0 to 20 mA), temperature (thermocouple and RTD), and pulse counter.

Key Features:

- Enhanced Gateways offer increased range in the 900 MHz frequency band
- High density I/O capacity provides up to 12 discrete inputs or outputs or a mix of discrete and analog I/O
- Universal analog inputs allow current or voltage to be selected in the field


Low Profile


IP67 Housing


IP20 Housing


point-to-point


point-to-multipoint


star

DX80 Performance Gateways

Device	Radio	Host Comms	Power	Antenna		I/O
DX80	G	9	M	6	S	–	P2

G = Gateway

9 = 900 MHz
2 = 2.4 GHz

M = Modbus

2 = FlexPower
6 = 10 to 30 V dc

S = External

P = Serial RS485/RS232
P2 = 4 Discrete IN, 4 Discrete OUT, 2 Analog IN, 2 Analog OUT
P7 = FlexPower, 12 NPN Discrete IO
P8 = 12 PNP Discrete IO

DX80 Performance Gateways, Board Models

Device	Radio	Host Comms	Power	Antenna		I/O
DX80	G	9	M	6	S	–	PB2

G = Gateway

9 = 900 MHz
2 = 2.4 GHz

M = Modbus

6 = 10 to 30 V dc

S = External

PB2 = Board Module, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN, 2 Analog OUT

DX80 Performance Gateway Specifications*

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	

Communication Hardware	Interface: 2-wire half-duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches Data format: 8 data bits, no parity, 1 stop bit
Communication Protocol	Modbus RTU
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway
RTD Inputs	Sample Rate: 1 second Report Rate: 16 seconds Accuracy: 0.1% of full scale Resolution: 0.1 °C, 15-bit
Operating Conditions	–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz
Supply Voltage	DX80 and “C” Housing Models:10 to 30 V dc or 3.6 to 5.5 V dc low power option (Outside the USA: 12 to 24 V dc, ±10% or 3.6 to 5.5 V dc low power option) 900 MHz Consumption: Maximum current draw is < 40 mA and typical current draw is < 30 mA at 24 V dc. (2.4 GHz consumption is less)
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.26 kg (0.57 lbs) DX80 and “C” Housing Models: Mounting: #10 or M5 (SS M5 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD
Wiring Access	DX80 Housing Models: Four PG-7, One 1/2-in NPT, One 5-pin threaded M12/Euro-style male quick-disconnect “C” Housing Models: External terminals
Environmental Rating	DX80 models: IEC IP67; NEMA 6 “C” Housing Models: IEC IP20; NEMA 1
Certifications	CE

* See datasheet for model specific details

Performance Series—Nodes

Create point-to-multipoint networks that distribute I/O over large areas. Input and output types include discrete (dry contact, PNP/NPN), analog (0 to 10 V dc, 0 to 20 mA), temperature (thermocouple and RTD), and pulse counter.

Key Features:

- Enhanced Nodes offer increased range in the 900 MHz frequency band
- High density I/O capacity provides up to 12 discrete inputs or outputs or a mix of discrete and analog I/O
- Universal analog inputs allow current or voltage to be selected in the field


Low Profile


IP67 Housing


IP20 Housing


point-to-point


point-to-multipoint


star

DX80 Performance Nodes

DX80	Device	Radio	Host Comms	Power	Antenna		I/O	Housing Options
DX80	N	9	X	6	S	–	P2	

N = Node

X = None

1 = Internal battery (P1E, P3E, P4E, P6)
2 = FlexPower (P1, P3, P4, P5, P7)
6 = 10 to 30 V dc (P2, P6, P8)

S = External

Blank = IP67
C = IP20 housing (external wiring access)
E = Environmental housing
L = No LCD, no rotary dials

9 = 900 MHz
2 = 2.4 GHz

P1 = FlexPower, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN, Boost Voltage
P2 = 4 Discrete IN, 4 Discrete OUT, 2 Analog IN, 2 Analog OUT
P3 = FlexPower, Thermocouple
P4 = FlexPower, RTD
P5 = FlexPower, 2 Disc IN, 2 Disc OUT, 4 Analog IN
P6 = Serial interface
P7 = FlexPower, 12 NPN Discrete IO
P8 = 12 PNP Discrete IO
P14 = 1 Configurable Discrete IN, 1 Configurable Analog IN, 1 Thermistor, 1 Async Counter, 1 SP
P15 = 2 Selectable Discrete IN, 2 0–10V Analog IN, 2 AC/DC Relay (SPDT), 2 PNP Disc OUT, 2 0–10V Analog OUT
P16 = 2 Configurable Disctete IN, 2 Async Counters, 4 NMOS OUT
DCLATCH = 1 Discrete IN, 1 Event Counter, 1 DC Latching (H-Bridge) OUT

DX80 Performance Nodes, Board Models

DX80	Device	Radio	Host Comms	Power	Antenna		I/O
DX80	N	9	X	6	S	–	PB2

N = Node

9 = 900 MHz
2 = 2.4 GHz

X = None

2 = FlexPower
6 = 10 to 30 V dc

S = External
W = Internal

PB1 = Board Module, FlexPower, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN
PB2 = Board Module, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN, 2 Analog OUT

DX80 Performance Nodes Specifications*

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway	
Operating Conditions	–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) “E” Housing Models–40 °C to +65 °C (–40 °F to +149 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Supply Voltage	DX80 and “C” Housing Models:10 to 30 V dc or 3.6 to 5.5 V dc low power option (Outside the USA: 12 to 24 V dc, ±10% or 3.6 to 5.5 V dc low power option) “E” Housing Models: 3.6 V dc low power option from an internal battery or 10 to 30 V dc 900 MHz Consumption: Maximum current draw is < 40 mA and typical current draw is < 30 mA at 24 V dc. (2.4 GHz consumption is less)	
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.26 kg (0.57 lbs) DX80 and “C” Housing Models: Mounting: #10 or M5 (SS M5 hardware included) “E” Housing Models: Mounting: 1/4-in or M7 (SS M7 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Wiring Access	DX80 Housing Models: Four PG-7, One 1/2-in NPT, One 5-pin threaded M12/Euro-style male quick-disconnect “C” Housing Models: External terminals “E” Housing Models: Two 1/2-in NPT	
Environmental Ratingw	DX80 models: IEC IP67; NEMA 6 “C” Housing Models: IEC IP20; NEMA 1 “E” Housing Models: IEC IP65; NEMA 4X	
Certifications	CE	

* See datasheet for model specific details

Performance Series–P6 Nodes

The -P6 Performance Node is an industrial radio device with a 1-wire Serial Interface that is designed to transmit data from 1-wire Serial sensors, such as the Banner Temperature and Humidity (M12FTH4Q), Vibration and Temperature (QM42VT1), or Ultrasonic (K50UX1RA) sensors.

Key Features:

- 1-wire Serial Interface
- Battery-powered models for a completely wireless solution
- Line-powered models for continuous sampling

point-to-point

point-to-multipoint

star

	Device	Radio	Host Comms	Power	Antenna		I/O	Housing Options
DX80	N	9	X	6	S	–	P6	
	N = Node	**9** = 900 MHz **2** = 2.4 GHz	**X** = None	**1** = Internal battery **6** = 10 to 30 V dc	**S** = External **W** = Internal		**P6** = Serial interface	**Blank** = IP67 **L** = No LCD, no rotary dials

Used with		
M12FTH4Q	Temperature and relative humidity via a 1-wire Serial Interface	see page 6
M12FT4Q	Temperature via a 1-wire Serial Interface	
QM42VT1	Vibration and temperature via a 1-wire Serial Interface	see page 10
K50UX1RA	Ultrasonic sensor with a 1-wire Serial Interface	see page 12

DX80 Performance P6 Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway	
Operating Conditions	–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Supply Voltage	Integrated battery models: 3.6 V dc low power option from an internal battery Non-battery models: 10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%)	
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Integrated battery models: Weight: 0.30 kg (0.65 lbs) Non-battery models: Weight: 0.26 kg (0.57 lbs) Mounting: #10 or M5 (SS M5 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Wiring Access	Integrated battery models: One 5-pin threaded M12 Euro-style female quick-disconnect Non-battery models: One 5-pin threaded M12 Euro-style female quick-disconnect and one 5-pin threaded M12 Euro-style male quick-disconnect	
Environmental Rating	IEC IP67; NEMA 6	
Certifications	CE	

Performance Series–P14 Nodes

The -P14 Performance Node is an industrial radio device that makes it easy to add a remote monitoring point to a wireless network. Simply select one I/O from multiple options, then wire a sensor into the easily accessible wiring terminals inside the Node. The integrated D-cell lithium battery makes it easy to deploy, even where power is not readily available.

Key Features:

- Inputs include: One configurable discrete, one configurable analog, one thermistor, one asynchronous counter
- Battery-powered models for a completely wireless solution
- Field-wireable terminal for wiring I/O

Applications:

- Door monitoring
- Tank level monitoring
- High speed counting
- Flow monitoring
- RPM monitoring
- Non-contact temperature monitoring
- Pressure monitoring

point-to-point

point-to-multipoint

star

	Device	Radio	Host Comms	Power	Antenna		I/O	Housing Options
DX80	N	9	X	1	S	–	P14	
	N = Node	**9** = 900 MHz **2** = 2.4 GHz	**X** = None	**1** = Internal battery	**S** = External **W** = Internal		**P14** = 1 Configurable Discrete IN, 1 Configurable Analog IN, 1 Thermistor, 1 Async Counter, 1 SP	**Blank** = IP67 **L** = No LCD, no rotary dials

Used with	
T30UX	Long-range ultrasonic sensor
QT50ULB	Long-range ultrasonic sensor
M18T	Non-contact temperature sensor
TL70	Wireless modular tower light

DX80 Performance P14 Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway	
Operating Conditions	–40 to +85 °C (–40 to +185 °F) (Electronics); –20 to +80 °C (–4 to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Discrete Input	Rating: 3 mA max current at 30 V dc Sample / Report Rates: DIP switch configurable	
Discrete Input ON Condition	PNP: Greater than 8 V NPN: Less than 0.7 V	
Discrete Input OFF Condition	PNP: Less than 5 V NPN: Greater than 2 V or open	
Supply Voltage	3.6 V dc low power option from an internal battery	
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Integrated battery models: Weight: 0.30 kg (0.65 lbs) Non-battery models: Weight: 0.26 kg (0.57 lbs) Mounting: #10 or M5 (SS M5 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Wiring Access	Two 1/2-inch NPT	
Switch Power Outputs	Analog configuration: one (SP1) Discrete configuration: one (SP1)	
Thermistor Input	Model: 44006, 44016, or 44031 Series of 10 kOhm thermistors Sample Rate: 16 seconds Report Rate: 64 seconds Accuracy: 0.4 °C (10 °C to 50 °C); Up to 0.8 °C (–40 °C to 85 °C)	
Counter Input	Event counter: Input rating 1 Hz to 10 kHz (For battery powered devices, the recommended input rating is less than 1 kHz) Rate (frequency) counter: 1 Hz to 10 kHz Threshold: 1.7 V	
Environmental Rating	IEC IP67; NEMA 6	
Certifications	CE	

Performance Series–P15E Nodes

The P15E Performance Node enables users to wirelessly power and control any connected devices and easily monitor device status and performance. It is easy to deploy and a simple way to remotely control lights, fans, motors, and other AC-powered devices without the trouble or expense of running cable.

Key Features:

- Switch AC loads up to 10 amps
- AC-power field-wireable
- No separate power supply required
- Supply voltage of 100 to 277 V AC at 50/60 Hz

Applications:

- Remotely control lights, dimming levels, fans, and motors
- Provide power and control connectivity to remote I/O devices

point-to-point

point-to-multipoint

star

DX80	N	9	X	7	S	–	P15	E
	Device	Radio	Host Comms	Power	Antenna		I/O	Housing Options

N = Node

9 = 900 MHz
2 = 2.4 GHz

X = None

7 = 100 to 277 V ac

S = External

P15 = 2 Selectable Discrete IN, 2 0 to 10 V Analog IN, 2 AC/DC relay (SPDT), 2 PNP Discrete OUT, 2 0 to 10 V Analog OUT

E = Environmental housing with internal battery

Used with	
WLB92ZC1100ACT	Large, ultra-bright LED work light
WLB32ZC1130QM	Adjustable LED workstation light
K50LGRYA120Q	50 mm colored domed indicator

DX80 Performance -P15E Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-06) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway	
Supply Voltage	Nominal voltage: 120–277 V ac at 60 Hz in North America Nominal voltage: 100–277 V ac at 50/60 Hz outside North America Maximum supply current: 0.37 A Maximum power consumption: 25 W	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.51 kg (1.13 lbs) Mounting: 1/4-inch or M7 Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Wiring Access	Two 1/2-inch NPSM ports, 14 threads/inch (1/2-14 NPSM)	
Analog Input	0 to 10 V Input Rating: 10 V Impedance: Approximately 220 Ohms Sample Rate: 62.5 milliseconds Report Rate: 1 second or On Change of State (1% change in value) Accuracy: 0.2% of full scale +0.01% per °C Resolution: 12-bit	
Output State Following Timeout	De-energized (OFF)	
Relay Outputs	SPDT (Form C) relay 277 V ac, 10 A Minimum Mechanical Life: 10,000,000 Surge breakdown voltage (Between contacts and coil) (Initial): 10,000 V	
Analog Output	0 to 10 V Update Rate: 125 milliseconds Accuracy: 1.0% of full scale +0. 01% per °C Resolution: 12-bit	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Operating Conditions	–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Environmental Rating	IEC IP65	
Certifications	CE c UL us LISTED	

MultiHop Modbus Radios

MultiHop Modbus Data Radios extend the range of Modbus or other Serial communication networks. Each radio may be set to act as either a master, repeater or slave. Models are available with built in discrete and analog I/O, which can be accessed using the Modbus protocol.

Key Features:

- Self-healing, auto routing RF network with multiple hops extends the network's range
- Flexible: DIP switch selectable to be a master, repeater or slave
- User-selectable communication between RS-485 and RS-232

MultiHop Modbus Radios

	Device	ISM Band	Host Comms		I/O
DX80	DR	9	M	–	H
	DR = Modbus	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus		**H** = No I/O

point-to-point

point-to-multipoint

star

tree

MultiHop Modbus Radios with I/O

	Device	ISM Band	Host Comms		I/O	Housing Options
DX80	DR	9	M	–	H2	
	DR = Modbus	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus			**Blank** = IP67 **C** = IP20 housing (external wiring access) **E** = Environmental housing with internal battery **L** = No LCD, no rotary dials **D** = 10 to 30 V dc power

H1 = FlexPower, 4 Discrete IN, 2 Discrete OUT, 4 Analog IN, 1 thermistor IN, 1 Counter IN
H2 = 4 Discrete IN, 4 Discrete OUT, 2 Analog IN, 2 Analog OUT
H3 = FlexPower, Thermocouple
H4 = FlexPower, RTD
H5 = FlexPower, 4 Discrete IN, 2 Discrete OUT, 4 Analog IN
H6 = Serial interfaceH12 = FlexPower, SDI-12, Bridge, Counter, Discrete, Analog
H12 = FlexPower, SDI-12, Bridge, Counter, Discrete, Analog
H14 = 1 Configurable Discrete IN, 1 Configurable Analog IN, 1 Thermistor, 1 SDI-12, 1 Async Counter, 1 SP
H15 = 2 PNP Discrete IN, 2 0 to 20 mA Analog IN, 2 AC/DC Relay (SPDT), 2 PNP Discrete OUT, 2 0 to10 V Analog OUT
DCLATCH = 2 Discrete IN, 2 Event Counters, 1 DC Latching (H-Bridge) OUT

MultiHop Modbus Radios with I/O — Board Models

	Device	ISM Band	Host Comms		I/O
DX80	DR	9	M	–	HB1
	DR = Modbus	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus		**HB1**= FlexPower board module, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN **HB2** = Board module, 2 Discrete IN, 2 Discrete OUT, 2 Analog IN, 2 Analog OUT

MultiHop Modbus Radios with I/O Specifications*

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Power	*Flex*Power models: 10 to 30 V dc (Outside the USA: 12 to 24 V dc, ±10%) on the brown wire, or 3.6 to 5.5 V dc low power option on the gray wire 6 Integrated battery models: 3.6 V dc low power option from an internal battery or 10 to 30 V dc Master radio consumption (900 MHz): Maximum current draw is < 100 mA and typical current draw is < 30 mA at 24 V dc (2.4 GHz consumption is less) Repeater/slave radio consumption (900 MHz): Maximum current draw is < 40 mA and typical current draw is < 20 mA at 24 V dc (2.4 GHz consumption is less)	
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Communication Hardware (MultiHop RS-485)	Interface: 2-wire half-duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Tool Data format: 8 data bits, no parity, 1 stop bit	
Packet Size (MultiHop)	900 MHz: 175 bytes (85 Modbus registers)	2.4 GHz: 75 bytes (37 Modbus registers)
Intercharacter Timing (MultiHop)	3.5 milliseconds	
Housing	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.26 kg (0.57 lbs) M-Hx and M-HxC models: Mounting: #10 or M5 (SS M5 hardware included) M-HxE models: Mounting: 1/4-in or M7 (SS M7 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Wiring Access	M-Hx models: Four PG-7, One 1/2-in NPT, One 5-pin threaded M12/Euro-style male quick-disconnect M-HxC models: External terminals M-HxE models: Two 1/2-in NPT ports	
Environmental Rating	M-Hx: IEC IP67; NEMA 6 “C” Housing Models: IEC IP20; NEMA 1 “E” Housing Models: IEC IP65; NEMA 4X	
Operating Conditions	M-Hx and M-HxC models: –40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) M-HxE models: –40 °C to +65 °C (–40 °F to +149 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Certifications	CE	

* See datasheet for model specific details

MultiHop Modbus–H6

The -H6 MultiHop Modbus Data Radio has a 1-wire Serial Interface that is designed to transmit data from 1-wire Serial sensors, such as the Banner Temperature and Humidity (M12FTH4Q), Vibration and Temperature (QM42VT1), or Ultrasonic (K50UX1RA) sensors.

Key Features:

- 1-wire Serial Interface
- Battery-powered models for a completely wireless solution
- Tree topology allows for multiple hops to cover longer distances and circumvent obstacles

point-to-point

point-to-multipoint

star

tree

Device	ISM Band	Host Comms		I/O
DX80	N	9	X	–	H6
	DR = Modbus	**9** = 900 MHz **2** = 2.4 GHz	**M** = Modbus		**H6** = Serial interface

Used with		
M12FTH4Q	Temperature and relative humidity via a 1-wire Serial Interface	see page 6
M12FT4Q	Temperature via a 1-wire Serial Interface	
QM42VT1	Vibration and temperature via a 1-wire Serial Interface	see page 10
K50UX1RA	Ultrasonic sensor with a 1-wire Serial Interface	see page 12

MultiHop -H6 Modbus Radio Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Supply Voltage	3.6 V dc low power option from an internal battery	
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Communication Hardware (MultiHop RS-485)	Interface: 2-wire half-duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Tool Data format: 8 data bits, no parity, 1 stop bit	
Packet Size (MultiHop)	900 MHz: 175 bytes (85 Modbus registers)	2.4 GHz: 75 bytes (37 Modbus registers)
Intercharacter Timing (MultiHop)	3.5 milliseconds	
Housing	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.26 kg (0.57 lbs) Mounting: #10 or M5 (SS M5 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Wiring Access	One 5-pin threaded M12/Euro-style male quick-disconnect	
Environmental Rating	IEC IP67; NEMA 6	
Operating Conditions	–40 °C to +65 °C (–40 °F to +149 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Certifications	CE	

MultiHop Modbus–H14

The -H14 MultiHop Modbus Data Radio makes it easy to add a remote monitoring point to a wireless network. Simply select one I/O from multiple options, then wire a sensor into the easily accessible wiring terminals inside the Node. The integrated D-cell lithium battery makes it easy to deploy, even where power is not readily available.

Key Features:

- Inputs include: One configurable discrete, one configurable analog, one thermistor, one asynchronous counter, and one SDI-12
- Battery-powered models for a completely wireless solution
- Tree topology allows for multiple hops to cover longer distances and circumvent obstacles
- Field-wireable terminal for wiring I/O

Applications:

- Door monitoring
- Tank level monitoring
- High speed counting
- Flow monitoring
- RPM monitoring
- Non-contact temperature monitoring
- Pressure monitoring

point-to-point

point-to-multipoint

star

tree

DX80	DR	9	M	–	H14
	Device	ISM Band	Host Comms		I/O

DR = Modbus

9 = 900 MHz
2 = 2.4 GHz

M = Modbus

H14 = 1 Configurable Discrete IN, Configurable Analog IN, 1 Thermistor, 1 SDI-12, 1 Async Counter, 1 SP

Used with	
T30UX	Long-range ultrasonic sensor
QT50ULB	Long-range ultrasonic sensor
M18T	Non-contact temperature sensor
TL70	Wireless modular tower light

DX80 Performance H14 Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Supply Voltage	3.6 V dc low power option from an internal battery	
Current Draw at 3.6 V dc	900 MHz, 1 Watt Approximately 1 mA 900 MHz, 250 mW: Approximately 0.5 mA 2.4 GHz, 65 mW: Approximately 0.3 mA	
Communication Hardware (MultiHop RS-485)	Interface: 2-wire half-duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Tool Data format: 8 data bits, no parity, 1 stop bit	
Packet Size (MultiHop)	900 MHz: 175 bytes (85 Modbus registers) 2.4 GHz: 75 bytes (37 Modbus registers)	
Intercharacter Timing (MultiHop)	3.5 milliseconds	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Integrated battery models: Weight: 0.30 kg (0.65 lbs) Non-battery models: Weight: 0.26 kg (0.57 lbs) Mounting: #10 or M5 (SS M5 hardware included) Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Wiring Access	Two 1/2-inch NPT	
Operating Conditions	–40 to +85 °C (–40 to +185 °F) (Electronics); –20 to +80 °C (–4 to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Discrete Input	Rating: 3 mA max current at 30 V dc Sample Rate: 40 milliseconds ON Condition (NPN): Less than 0.7 V OFF Condition (NPN): Greater than 2 V or open	
Analog Input	Rating: 24 mA Impedance: Approximately 220 Ohms Sample Rate: 1 second Accuracy: 0.1% of full scale +0.01% per °C Resolution: 12-bit	
Thermistor Input	Model: 44006 or 44031 Series of 10 kOhm thermistors Sample Rate: 1 second Report Rate: 64 seconds Accuracy: 0.4 °C (10 °C to 50 °C); Up to 0.8 °C (–40 °C to 85 °C)	
Counter Input	Event counter: Input rating 1 Hz to 10 kHz (For battery powered devices, the recommended input rating is less than 1 kHz) Rate (frequency) counter: 1 Hz to 10 kHz Threshold: 1.7 V	
Environmental Rating	IEC IP67; NEMA 6	
Certifications	CE	

MultiHop Modbus–H15E

The H15E MultiHop Modbus Data Radio enables users to wirelessly power and control any connected devices and easily monitor device status and performance. It is easy to deploy and a simple way to remotely control lights, fans, motors, and other AC powered devices without the trouble or expense of running cable.

Key Features:

- Switch AC loads up to 10 amps
- AC power field wireable
- No separate power supply required
- Supply voltage of 100 – 277 V AC at 50/60 Hz

Applications:

- Remotely control lights, dimming levels, fans, and motors
- Provide power and control connectivity to remote I/O devices
- Use as an AC powered repeater to extend the range of the wireless network

point-to-point

point-to-multipoint

star

tree

MultiHop Modbus Radio

Models	I/O	Frequency
DX80DR9M-H15E	Inputs: Two selectable discrete, two 0 to 10 V analog Outputs: Two AC/DC relay (SPDT), two PNP discrete, two 0 to 10 V analog	900 MHz
DX80DR2M-H15E		2.4 GHz

Used with	
WLB92ZC1100ACT	Large, ultra-bright LED work light
WLB32ZC1130QM	Adjustable LED workstation light
K50LGRYA120Q	50 mm colored domed indicator

MultiHop -H15E Modbus Radio Specifications

Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 150 mW and 250 mW: 2 m (6 ft) 900 MHz, 1 Watt: 4.57 m (15 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 1 Watt: 30 dBm (1 W) conducted (up to 36 dBm EIRP)	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance (1 Watt) FCC ID UE3RM1809: This device complies with FCC Part 15, Subpart C,15.247 IC: 7044A-RM1809	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Radio Packet Size	900 MHz: 175 bytes (85 Modbus registers)	2.4 GHz: 75 bytes (37 Modbus registers)
Communication Hardware (RS-485)	Interface: 2-wire half-duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Tool Data format: 8 data bits, no parity, 1 stop bit	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway	
Supply Voltage	Nominal voltage: 120–277 V ac at 60 Hz in North America Nominal voltage: 100–277 V ac at 50/60 Hz outside North America Maximum supply current: 0.37 A Maximum power consumption: 25 W	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Construction	Polycarbonate housing and rotary dial cover; polyester labels; EDPM rubber cover gasket; nitrile rubber, non-sulphur cured button covers Weight: 0.51 kg (1.13 lbs) Mounting: 1/4-inch or M7 Max. Tightening Torque: 0.56 N·m (5 lbf·in)	
Wiring Access	Two 1/2-inch NPSM ports, 14 threads/inch (1/2-14 NPSM)	
Analog Input	0 to 20 mA Input Rating: 24 mA Impedance: Approximately 100 Ohms Sample Rate: 1 second Accuracy: 0.1% of full scale +0.01% per degree C Resolution: 12-bit	
Output State Following Timeout	De-energized (OFF)	
Relay Outputs	SPDT (Form C) relay 277 V ac, 10 A Minimum Mechanical Life: 10,000,000 Surge breakdown voltage (Between contacts and coil) (Initial): 10,000 V	
Analog Output	0 to 10 V Update Rate: 125 milliseconds Accuracy: 1.0% of full scale +0. 01% per °C Resolution: 12-bit	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Operating Conditions	–40 °C to +85 °C (–40 °F to +185 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Environmental Rating	IEC IP65	
Certifications	CE c UL us LISTED	

Intrinsically Safe Nodes

Hazardous area radios are a state-of-the-art combination of wireless communication, battery technology and intrinsically safe electronics. Networks are formed using DX80 Preformance Gateways installed beyond the hazardous area and one or more Nodes operating in the same frequency band.

Key Features:

- The DX99 is a state-of-the-art combination of wireless communication, battery technology and intrinsically safe electronics
- All models are certified for operation in Class I, Division 1 and ATEX Zone 0 locations
- Networks formed using DX80 Performance Gateways installed beyond the hazardous area and one or more Nodes operating in the same frequency band
- Both 900 MHz 150 mW and 2.4 GHz 63 mW models are available

star

Models	I/O	Power Boost	Frequency
DX99N9X1S2N0M2X0D1	Discrete: Two inputs Analog: Two inputs (0-20 mA)	10 V	900 MHz
DX99N9X1S2N0M2X0D2		18 V	
DX99N9X1S2N0V2X0D1	Discrete: Two inputs Analog: Two inputs (0-10 V)	10 V	
DX99N9X1S2N0V2X0D2		18 V	
DX99N2X1S2N0M2X0D1	Discrete: Two inputs Analog: Two inputs (0-20 mA)	10 V	2.4 GHz
DX99N2X1S2N0M2X0D2		18 V	
DX99N2X1S2N0V2X0D1	Discrete: Two inputs Analog: Two inputs (0-10 V)	10 V	
DX99N2X1S2N0V2X0D2		18 V	
DX99N9X1S2N0T4X0D0	Thermocouple: Three inputs, one thermistor input Discrete: Two (NPN) inputs	n/a	900 MHz
DX99N2X1S2N0T4X0D0			2.4 GHz
DX99N9X1S0N0R4X0D0	RTD: Four inputs	n/a	900 MHz
DX99N2X1S0N0R4X0D0			2.4 GHz
DX99N9X1S2N0B2X0D0	Bridge: Two inputs Discrete: Two inputs	n/a	900 MHz
DX99N2X1S2N0B2X0D0			2.4 GHz
DX99N9X1S1S0V2X0D4	Inputs (Modbus Mode): One RS-485 Inputs (Voltage Mode): Two analog, one discrete	13 V	900 MHz
DX99N2X1S1S0V2X0D4			2.4 GHz
DX99N9X1S1N0M3X0D5	Inputs: One analog input with a 29 second warm-up time; one sinking discrete Additional Input Configurations: One 3-wire 100-Ohm Platinum RTD, one sinking discrete, and two analog (0-20 mA)	19 V	900 MHz
DX99N2X1S1N0M3X0D5			2.4 GHz

DX99 *Flex*Power Node Specifications

Radio Range	900 MHz, 150 mW: Up to 4.8 km (3 miles)	2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Minimum Separation Distance	900 MHz, 150 mW: 2 m (6 ft)	2.4 GHz, 65 mW: 0.3 m (1 ft)
Radio Transmit Power	900 MHz, 150 mW: 21 dBm (150 mW) conducted	2.4 GHz, 65 mW: 18 dBm (65 mW) conducted, less than or equal to 20 dBm (100 mW) EIRP
Compliance	900 MHz Compliance FCC ID TGUDX80 - This device complies with FCC Part 15, Subpart C, 15.247 IC: 7044A-DX8009	2.4 GHz Compliance FCC ID UE300DX80-2400 - This device complies with FCC Part 15, Subpart C, 15.247 ETSI/EN: In accordance with EN 300 328: V1.8.1 (2012-04) IC: 7044A-DX8024
Spread Spectrum Technology	FHSS (Frequency Hopping Spread Spectrum)	
RS-485 Inputs	Interface: 2-wire half-duplex RS-485 Baud Rates: 9.6k, 19.2k (default), or 38.4k Data Format: 8 data bits, no parity, 1 stop bit (even and odd parity selection are available)	
Communication Hardware (MultiHop RS-485)	Interface: 2-wire half-duplex RS-485 Baud rates: 9.6k, 19.2k (default), or 38.4k via DIP switches; 1200 and 2400 via the MultiHop Configuration Tool Data format: 8 data bits, no parity, 1 stop bit	
Link Timeout	Gateway: Configurable via User Configuration Tool (UCT) software Node: Defined by Gateway	
Supply Voltage	3.6 V dc low power option from an internal battery	
Power Consumption	Consumption: Application dependant	
Housing	Glass and cast aluminium with chromating and chemically-resistant paint (outside only)	
Antenna Connection	Ext. Reverse Polarity SMA, 50 Ohms Max Tightening Torque: 0.45 N·m (4 lbf·in)	
Interface	Indicators: Two bi-color LEDs Buttons: Two Display: Six character LCD	
Wiring Access	Two 1/2-in NPT ports, one 3/4-in NPT port (internal threads)	
Environmental Rating	IEC IP68	
Operating Conditions	–40 °C to +65 °C (–40 °F to +149 °F) (Electronics); –20 °C to +80 °C (–4 °F to +176 °F) (LCD) 95% maximum relative humidity (non-condensing) Radiated Immunity: 10 V/m (EN 61000-4-3)	
Shock and Vibration	IEC 68-2-6 and IEC 68-2-27 Shock: 30g, 11 millisecond half sine wave, 18 shocks Vibration: 0.5 mm p-p, 10 to 60 Hz	
Certifications	CSA: Class I, Division 1, Groups A, B, C, D; Class II, Division 1, Groups E, F, G; Class III, Division 1 (Ex ia IIC T4 / AEx ia IIC T4) Certificate: 2008243 LCIE/ATEX: Zone 0 (Category 1G) and 20 (Category 1D), Temperature Class T4 (II 1 GD / Ex ia IIC T4/Ex iaD 20 IP68 T82°C) Certificate: LCIE 08 ATEX 6098 X Special Conditions for Safe Use imposed by Intrinsic Safety Certificate LCIE 08 ATEX 6098 X: Ambient temperature range is –40 to 70 °C. Sure Cross® DX99 *Flex*Power devices can only be connected to Intrinsically Safe certified equipment or simple apparatus as defined by EN 60079-11. All connected equipment must comply with the Entity Parameters (Safety Parameters) listed in the Control Drawings (p/n 141513). The device must only use a lithium battery manufactured by XENO, type XL-205F.	

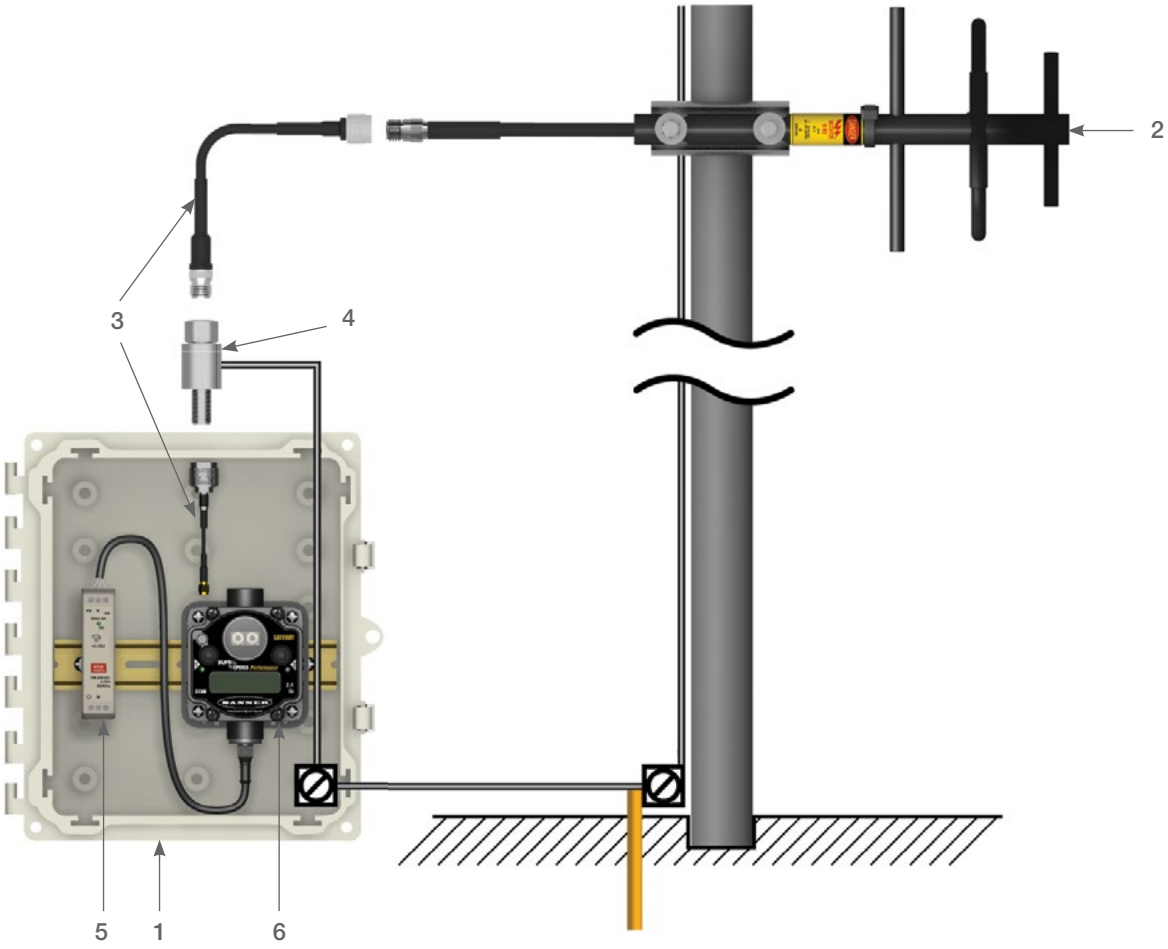
K50 and K30 Hazardous Indicators

Banner's K50 and K30 Indicator Lights for hazardous areas have a smooth 50 or 30 mm diameter dome that provides uniform illumination from all directions.

- Up to three colors in one device and five colors to choose from
- Models rated to IP67 and IP69K for use in harsh environments
- Unique design appears gray when OFF, eliminating false indication from ambient light
- Easy mounting and configuration
- Worldwide IECEx approval for quicker access into countries outside Europe and North America

Accessories

Accessories



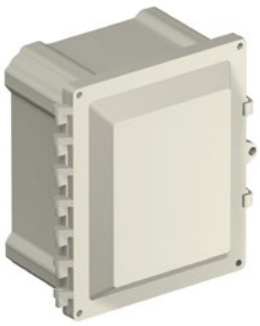
NOTE: The Sure Cross® Radio installation shown includes wireless accessories available from Banner. It is for illustration purposes only. Installations may vary.

6 × 6 in:
Fits a single DX80.

10 × 8 in:
Fits a power supply, surge suppressor, a single DX80, and a few relays. This is a popular size but can get cramped.

12 × 10 in:
This is the recommended size; provides ample room for multiple radios and accessories.

(1) Enclosures



Polycarbonate Enclosures

BWA-AH664	Enclosure, Polycarbonate, with Opaque Cover, 6 × 6 × 4 in
BWA-AH864	Enclosure, Polycarbonate, with Opaque Cover, 8 × 6 × 4 in
BWA-AH1084	Enclosure, Polycarbonate, with Opaque Cover, 10 × 8 × 4 in
BWA-AH12106	Enclosure, Polycarbonate, with Opaque Cover, 12 × 10 × 6 in
BWA-AH14126	Enclosure, Polycarbonate, with Opaque Cover, 14 × 12 × 6 in
BWA-AH16148	Enclosure, Polycarbonate, with Opaque Cover, 16 × 14 × 8 in
BWA-AH181610	Enclosure, Polycarbonate, with Opaque Cover, 18 × 16 × 10 in
BWA-AH664C	Enclosure, Polycarbonate, with Clear Cover, 6 × 6 × 4 in
BWA-AH864C	Enclosure, Polycarbonate, with Clear Cover, 8 × 6 × 4 in
BWA-AH1084C	Enclosure, Polycarbonate, with Clear Cover, 10 × 8 × 4 in
BWA-AH12106C	Enclosure, Polycarbonate, with Clear Cover, 12 × 10 × 6 in
BWA-AH14126C	Enclosure, Polycarbonate, with Clear Cover, 14 × 12 × 6 in
BWA-AH16148C	Enclosure, Polycarbonate, with Clear Cover, 16 × 14 × 8 in
BWA-AH181610C	Enclosure, Polycarbonate, with Clear Cover, 18 × 16 × 10 in

Swing Panel Kits

BWA-AH66SPK	Swing Panel Kit, 6 × 6 in, Includes Mounts, Screws, and Panel
BWA-AH86SPK	Swing Panel Kit, 8 × 6 in, Includes Mounts, Screws, and Panel
BWA-AH108SPK	Swing Panel Kit, 8 × 10 in, Includes Mounts, Screws, and Panel
BWA-AH1210SPK	Swing Panel Kit, 12 × 10 in, Includes Mounts, Screws, and Panel
BWA-AH1412SPK	Swing Panel Kit, 14 × 12 in, Includes Mounts, Screws, and Panel
BWA-AH1614SPK	Swing Panel Kit, 16 × 14 in, Includes Mounts, Screws, and Panel
BWA-AH1816SPK	Swing Panel Kit, 18 × 16 in, Includes Mounts, Screws, and Panel

Back Panel Kits

BWA-BP66A	Back Panel, aluminum, 6 × 6 in
BWA-BP86A	Back Panel, aluminum, 8 × 6 in
BWA-BP108A	Back Panel, aluminum, 8 × 10 in
BWA-BP1210A	Back Panel, aluminum, 12 × 10 in
BWA-BP1412A	Back Panel, aluminum, 14 × 12 in
BWA-BP1614A	Back Panel, aluminum, 16 × 14 in
BWA-BP1816A	Back Panel, aluminum, 18 × 16 in

(1) Enclosures, continued

DIN Rail Kits (with self-threading screws)

BWA-AH6DR	Din Rail Kit 6 in (Includes 2 Tribolar Screws and DIN Rail)
BWA-AH8DR	Din Rail Kit 8 in (Includes 2 Tribolar Screws and DIN Rail)
BWA-AH10DR	Din Rail Kit 10 in (Includes 2 Tribolar Screws and DIN Rail)
BWA-AH12DR	Din Rail Kit 12 in (Includes 2 Tribolar Screws and DIN Rail)
BWA-AH14DR	Din Rail Kit 14 in (Includes 2 Tribolar Screws and DIN Rail)
BWA-AH16DR	Din Rail Kit 16 in (Includes 2 Tribolar Screws and DIN Rail)
BWA-AH18DR	Din Rail Kit 18 in (Includes 2 Tribolar Screws and DIN Rail)

Enclosure Accessories

BWA-AHAK	Accessory Kit, Includes all screws, inserts, and mounting feet (Replacement Only)

Fiberglass Enclosures

BWA-EF1086	Enclosure Fiberglass Hinged 10 × 8 × 6 in
BWA-EF866	Enclosure Fiberglass Hinged 8 × 6 × 6 in
BWA-PANEL108	Panel, 10 × 8 in
BWA-PANEL86	Panel, 8 × 6 in

(2) Antennas

Select your antenna based on your specific application needs. There are three basic antenna solutions:

- Use the supplied rubber duck antenna inside the enclosure. DX80 products come with a 2 dBi rubber duck antenna. Often simply attaching the supplied antenna to the radio provides enough radio range to meet your needs.
- Mount a dome antenna to the enclosure. The -D antennas can be mounted directly on the enclosure.
- Use an N-type pole-mounted antenna, with surge suppressor. The -A and -AS antennas can be mounted remotely from the enclosure and require the BWC-LFNBMN-DC surge suppressor.

Omni-Directional Antennas with RP-SMA Male Connections

BWA-9O2-C	900 MHz	2 dBi, Rubber swivel (ships with 900 MHz radios)
BWA-9O5-C		5 dBi, Rubber swivel
BWA-2O2-C	2.4 GHz	2 dBi, Rubber swivel, 3 1/4 in (ships with 2.4 GHz radios)
BWA-2O5-C		5 dBi, Rubber swivel, 6 1/2 in
BWA-2O7-C		7 dBi, Rubber swivel, 9 1/4 in
BWA-9O2-RA	900 MHz	2 dBi, Rubber fixed right-angle
BWA-9O2-RA2	900 MHz	2 dBi 1/2 wave, Rubber fixed right-angle, 160 mm tall
BWA-2O1-001	2.4 GHz	1 dBi, Rubber, 1 in tall

(2) Antennas, continued

Omni-Directional Dome Antennas

BWA-9O2-D	900 MHz	2 dBi, 18 inch cable	RP-SMA Box Mount
BWA-2O2-D	2.4 GHz	2 dBi, 18 inch cable	RP-SMA Box Mount

Other

BWA-205-M	2.4 GHz	5 dBi, Magnetic whip antenna, 12 ft cable	RP-SMA Male

Omni-Directional Fiberglass Antennas with N-Type Female Connections

BWA-9O6-A	900 MHz	2 dBi, Rubber swivel (ships with 900 MHz radios)
BWA-2O8-A	2.4 GHz	8.5 dBi, Fiberglass, 24 in
BWA-206-A		6 dBi, Fiberglass, 16 in (shown)
BWA-9O6-AS	900 MHz	6 dBi, Fiberglass, 1/4 Wave, 23.6 in (1.3 inch diameter)
BWA-9O8-AS		8 dBi, Fiberglass, 3/4 Wave, 63 in (1.5 inch diameter)

Directional (Yagi) Antennas with N-Type Female Connection

BWA-9Y6-A	900 MHz	6.5 dBd, 6.8 × 13 inches Outdoor
BWA-9Y10-A	900 MHz	10 dBd, 6.8 × 24 inches Outdoor

Cellular (CDMA multi band)

BWA-CDMA-002	RP-SMA male connection	2 dBi, 6.3 in blade style

(3) Antenna Cables

Antenna Cables: RP-SMA to RP-SMA

BWC-1MRSFRSB0.2	RG58, RP-SMA Male to RP-SMA Female Bulkhead, 0.2 m
BWC-1MRSFRSB1	RG58, RP-SMA Male to RP-SMA Female Bulkhead, 1 m
BWC-1MRSFRSB2	RG58, RP-SMA Male to RP-SMA Female Bulkhead, 2 m
BWC-1MRSFRSB4	RG58, RP-SMA Male to RP-SMA Female Bulkhead, 4 m
BWC-2MRSFRS3	LMR200, RP-SMA Male to RP-SMA Female, 3 m
BWC-2MRSFRS6	LMR200, RP-SMA Male to RP-SMA Female, 6 m
BWC-2MRSFRS9	LMR200, RP-SMA Male to RP-SMA Female, 9 m
BWC-2MRSFRS12	LMR200, RP-SMA Male to RP-SMA Female, 12 m

Antenna Cables: RP-SMA to N-Type

BWC-1MRSMN05	LMR100 RP-SMA to N-Type Male, 0.5 m
BWC-1MRSMN2	LMR100 RP-SMA to N-Type Male, 2 m

Antenna Cables: N-Type

BWC-4MNFN3	LMR400 N-Type Male to N-Type Female, 3 m
BWC-4MNFN6	LMR400 N-Type Male to N-Type Female, 6 m
BWC-4MNFN15	LMR400 N-Type Male to N-Type Female, 15 m
BWC-4MNFN30	LMR400 N-Type Male to N-Type Female, 30 m

(4) Surge Suppressors

BWC-LFNBMN-DC	Surge Suppressor, bulkhead, N-Type Female, N-Type Male, dc Blocking
BWC-LMRSFRPB	Surge Suppressor, bulkhead, RPSMA to RP-SMA

(5) Power Supplies

DC Power Supplies

PSW-24-1	DC Power Supply, 100-240 V ac 50/60 Hz input, 24 V dc 1 A output, UL Listed Class 2
PSD-24-4	DC Power Supply, 90-264 V ac 50/60 Hz input, 24 V dc output, US-style wall plug input, 4-pin M12/Euro-style output; 2 m (6 ft) cable, UL Listed Class 2
PSDINP-24-06	DC Power Supply, 0.63 Amps, 24 V dc, with DIN Rail Mount, Class I Division 2 (Groups A, B, C, D) Rated
PSDINP-24-13	DC Power Supply, 1.3 Amps, 24 V dc, with DIN Rail Mount, Class I Division 2 (Groups A, B, C, D) Rated
PSDINP-24-25	DC Power Supply, 2.5 Amps, 24 V dc, with DIN Rail Mount, Class I Division 2 (Groups A, B, C, D) Rated

*Flex*Power Supplies and Replacement Batteries

DX81-LITH	Battery Supply Module with mounting hardware
DX81H	Battery Supply Module with mounting hardware, for DX99 polycarbonate housing
DX81P6	Battery Supply Module, six “D” cells, with mounting hardware

Solar Panels

BWA-SOLAR PANEL 3W	Solar Panel, 12 V, 3 W, Multicrystalline, 188 × 195 × 15, Wall/ Pole clamp style mounting bracket included
BWA-SOLAR PANEL 5W	Solar Panel, 12 V, 5 W, Multicrystalline, 270 × 222 × 17, Wall/ Pole clamp style mounting bracket included
BWA-SOLAR PANEL 20W	Solar Panel, 12 V, 20 W, Multicrystalline, 573 × 357 × 30, “L” mounting bracket included
BWA-SOLAR CNTRL-12V	Solar Controller, 6 A Load Current 12 V System Voltage, recommended for 20 watts or less solar panel AND Sealed Lead Acid Battery (SLA)

(5) Power Supplies, continued

Replacement Batteries

BWA-BATT-001	Lithium “D” cell, single, for DX81-LITH and DX81H Battery Supply Module
BWA-BATT-006	Lithium “AA” cell, single, for Wireless Q45 Sensors for DX81x models

Relays

IB6RP	Interface Relay Box, 18 to 26 V dc inputs, isolated relay outputs (not shown)
BWA-RELAY-12V	Relay, Blade Style with Base, 12 V
BWA-RELAY-24V	Relay, Blade Style with Base, 24 V
BWA-RH1B-UDC12V	Relay, Blade Style, No Base, 12 V (replacement part)
BWA-RH1B-UDC24V	Relay, Blade Style, No Base, 24 V (replacement part)
BWA-SH1B-05	Relay Base Only (replacement part)

(6) Brackets and Mounting Options

Mounting Kit

BWA-HW-001	• Screw, M5-0.8 x 25 mm, SS (4) • Screw, M5-0.8 x 16 mm, SS (4) • Hex nut, M5-0.8 mm, SS (4) • Bolt, #8-32 x 3/4-in, SS (4)

Brackets

SMBDX80DIN	• Black reinforced thermoplastic bracket for mounting on a 35 mm DIN rail

BWA-HW-034	• DIN rail clip, black plastic • Used with the M-HBx MultiHop and -PBx Performance board modules

SMBAMS18RA	• Right-angle SMBAMS series bracket with 18 mm hole • Articulation slots for 90+° rotation • 12-ga. (2.6 mm) cold-rolled steel

Hole center spacing: A = 26.0, A to B = 13.0
Hole size: A = 26.8 × 7.0, B = ø 6.5, C = ø 19.0

BWA-BK-001	• Use to mount vibration sensor models QM42VT1 and QM42VT2 • Includes magnetic mounting bracket SMB42FLM12 and 2 mounting screws
BWA-BK-004	• Mounts both the K50U Ultrasonic sensor and a Wireless Q45U Node or DX80 Node
BWA-BK-005	• Mounts both the K50U Ultrasonic sensor and a Wireless Q45U Node
BWA-BK-008	• QM42 Center-mount magnetic bracket for round objects
BWA-HW-057	• 3M™ Thermally Conductive Adhesive Transfer Tape 8820 • Provides a heat-transfer path between heat-generating components and heat sinks or other cooling devices • 3 pieces per pack • Tape is 20 mils (0.50 mm) thick; liner is 1.5-2 mil (37.5-50 µm) thick • Thermally conductive ceramic filler • Dual liner using silicone-treated polyester: easy-release PET

Hole center spacing: 35.1
Hole size: 25.4 x 5.3

DIN-35-70 = 70 mm **DIN-35-105** = 105 mm **DIN-35-140** = 140 mm	• 35 mm DIN Rail

Ethernet Cables

Use a crossover cable to connect the GatewayPro or DX83 Ethernet Bridge to a host system without using an Ethernet switchbox or hub. When using a switchbox or hub, use a straight cable.

BWA-E2M	Ethernet cable, RSCD RJ45 440, 2 m
BWA-E8M	Ethernet cable, RSCD RJ45 440, 8 m
BWA-EX2M	Ethernet cable, crossover, RSCD RJ45CR 440, 2 m

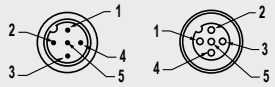
Adaptor Cables

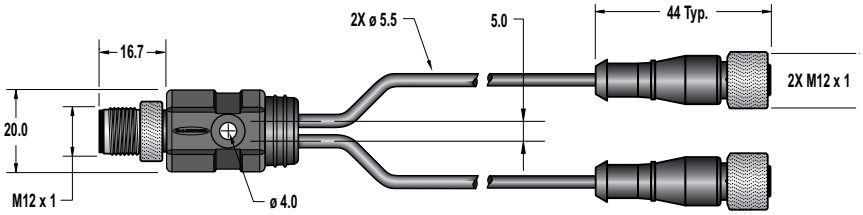
BWA-HW-006	Adapter cable, USB to RS-485, for use with the User Configuration Tool software (UCT)
BWA-UCT-900 (shown)	Adapter cable with power, USB to RS-485, for use with the User Configuration Tool software (UCT), supplies power to 1 Watt radios
BWA-USB1WIRE-01	PC USB to 1-wire Serial Interface converter. Use with the Sensor Configuration Tool software to communicate directly with 1-wire Serial Interface sensors

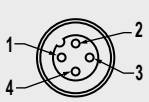
Splitter Cables

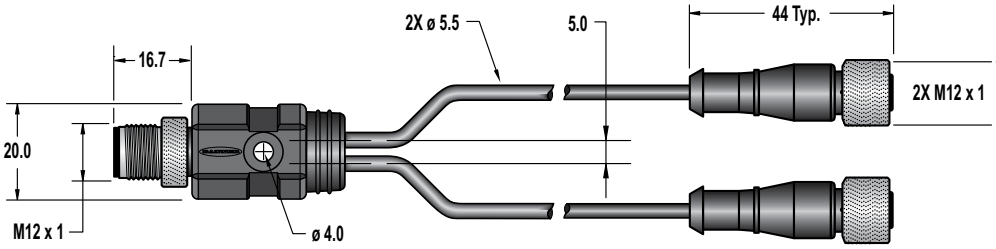
Use **CSRB-M1250M125.47M125.73** to split power between two *Flex*Power® or solar powered devices. DO NOT use this cable to connect a FlexPower devices to a 10 to 30 V dc powered device.

Use **CSRB-M1253.28M1253.28M1253.28** to connect one *Flex*Power device (data radio, FlexPowered Gateway, etc) to two power sources, such as the *Flex*Power Solar Supply and DX81P6 Battery Pack.

Model	Length	Style	Pinout
CSRB-M1250M125.47M125.73	Trunk: 0 m (male) Branches: 0.14 m and 0.22 m (female)	Straight	Male / Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow
CSRB-M1253.28M1253.28M1253.28	Trunk: 1 m (female) Branches: 1 m (male)		



Model	Branches	Trunk	Pinout
CSB-M1240M1240	No branch	No trunk	Female  Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
CSB-M1240M1241	2 x 0.30 m (1 ft)	No trunk	
CSB-M1241M1241	2 x 0.30 m (1 ft)	0.30 m (1 ft)	
CSB-M1248M1241		2.50 m (8 ft)	
CSB-M12415M1241		4.57 m (15 ft)	
CSB-M21425M1241		7.60 m (25 ft)	
CSB-UMT425M1241		7.60 m (25 ft) Unterminated	

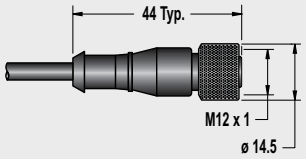
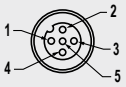
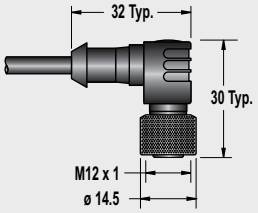


Cordsets

Euro-Style — Single-Ended

Right-angle cordsets are not compatible with the DX70 devices. When facing the Node or Gateway toward you and the quick-disconnect connection is facing down, the right-angle cables exit to the right.

When using the *Flex*Power® Node with integrated battery, use a double-ended cordset. When using a *Flex*Power Node with external power supply, use a single-ended cordset. If using the communication lines, the cable length cannot exceed 3 meters (10 ft).

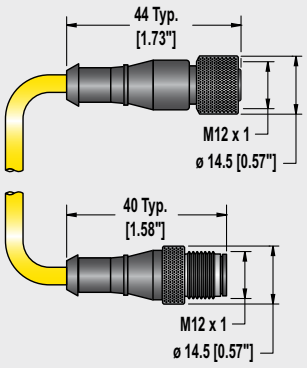
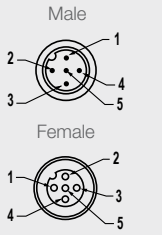
Model	Length	Style	Dimensions	Pinout
MQDC1-501.5	0.50 m (1.5 ft)	Straight		Female  1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDC1-506	1.83 m (6 ft)			
MQDC1-515	4.57 m (15 ft)			
MQDC1-530	9.14 m (30 ft)			
MQDC1-506RA	1.83 m (6 ft)	Right-Angle		
MQDC1-515RA	4.57 m (15 ft)			
MQDC1-530RA	9.14 m (30 ft)			

Cordsets, continued

Model	Length	Style	Description
BWA-QD5.5	—	—	Prewired 5-pin Euro connector, 1/2-14 NBSM
BWA-QD8.5	—	—	Prewired, 8-pin Euro connector, 1/2-14 NBSM
BWA-QD12.5	—	—	Prewired 12-pin Euro connector, 1/2-14 NBSM
FIC-M12F4	—	Straight	Euro-Style Field-Wireable Connector 4-pin Female Straight
MQDMC-401	0.5 m	Straight	Cordset, 4-pin Euro-style, single ended, male, longer pigtails for DX80…C models

Euro-Style — Double-Ended

When using the *Flex*Power® Node with integrated battery, use a double-ended cordset. When using a *Flex*Power Node with external power supply, use a single-ended cordset. If using the communication lines, the cable length cannot exceed 3 meters (10 feet).

Model	Length	Style	Dimensions	Pinout
DEE2R-51D	0.31 m (1 ft)	Female Straight/ Male Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Green/Yellow
DEE2R-53D	0.91 m (3 ft)			
DEE2R-58D	2.44 m (8 ft)			

Other Cordsets

BWA-RIBBON-001	Ribbon cable, 20-pin DBL socket
BWA-HW-010	Cable, *Flex*Power Current Monitoring

DX85 Modbus RTU Remote I/O Devices

IP67 Housing

IP20 Housing

Model	Description
DX85M6P6	DX85 Modbus RTU Remote I/O, 6 Discrete IN, 6 Discrete OUT
DX85M4P4M2M2	DX85 Modbus RTU Remote I/O, 4 Discrete IN, 4 Discrete OUT, 2 Analog IN, 2 Analog OUT (0 to 20 mA)
DX85M4P8	DX85 Modbus RTU Remote I/O, 4 Discrete IN, 8 Discrete OUT
DX85M8P4	DX85 Modbus RTU Remote I/O, 8 Discrete IN, 4 Discrete OUT
DX85M0P0M4M4	DX85 Modbus RTU Remote I/O, 4 Analog IN, 4 Analog OUT (0 to 20 mA)
DX85M-P7	DX85 Modbus RTU Remote I/O, Up to 12 sinking inputs or up to 12 NMOS sinking outputs (for a total of 12 I/O)
DX85M-P8	DX85 Modbus RTU Remote I/O, Up to 12 sourcing inputs or up to 12 sourcing outputs (for a total of 12 I/O)

NOTE: Add a “C” to the end of any DX85 model to order that I/O mix with an IP20 housing. The IP20 models are Class I, Division 2 certified when installed in a suitable enclosure.

Cable Glands and Plugs

Model	Description
BWA-HP.5-10	Dummy Hole Plugs, 1/2-in NPT, 10 pieces
BWA-HW-031	Vent Plug, 1/2-in NPT, IP67
BWA-HW-059	Vent Plug, Plastic, 1/2-inch NPT, Strain-relief fitting, with o-ring, for 0.2 to 0.35 dia cable
BWA-HW-053	Plug Conduit, Plastic Hex, 1/2-14 NPT, for 1.2 to 2.5 mm dia
BWA-HW-052	Cable Gland Pack: 1/2-inch NPT gland, 1/2-inch NPT multi-cable gland, and 1/2-inch NPT vent plug
BWA-CG.5-10	Cable Glands, 1/2-in NPT, Cordgrip for 3 holes of 2.8 to 5.6 mm diameter, 10 Pack
BWA-CG.5-3X5.6-10	Cable Glands, 1/2-inch NPT, Cordgrip for 3 holes of 2.8 to 5.6 mm diam, 10 Pack
BWA-CG.5-2X2.5-10	Cable Glands, 1/2-in NPT, Cordgrip for 2 holes of 1.2 to 2.5 mm diameter, 10 Pack
BWA-CG.5-6X4.0-10	Cable Glands, 1/2-in NPT, Cordgrip for 6 holes of 2 to 4 mm diameter, 10 Pack
BWA-CG.5-6X3.0-10	Cable Glands, 1/2-in NPT, Cordgrip for 6 holes of 1.5 to 3 mm diameter, 10 Pack

Hardware and Replacement Parts

Model	Description
BWA-HW-002	DX80 Access Hardware Kit: Plastic threaded plugs, PG-7 (4) Nylon gland fittings, PG-7 (4) Hex nuts, PG-7 (4) Plug, 1/2-in NPT Nylon gland fitting, 1/2-in NPT
BWA-HW-003	PTFE Tape, 1/4-in wide, 600-in long
BWA-HW-004	Replacement Seals: O-ring, rotary access cover, PG21 (2) O-ring, body gasket (2) Access cover, rotary dials, clear plastic (2)
BWA-HW-009	Solar assembly hardware pack, includes brackets, bolts, and set screws
BWA-HW-007	Housing Kit, DX80, top and bottom, 10 pieces
BWA-HW-008	Housing Kit, DX81, top and bottom, 10 pieces
BWA-HW-044	Terminal header for the MultiHop Ethernet Data Radio
BWA-HW-011	Terminal Block Headers, IP20, 2 pack
BWA-HW-012	DX99 Antenna Extension Pack: Screw, M4-0.7 x 20, pan head, black steel Flexible Antenna Cable, 12 in, SMA male to SMA female
BWA-HW-032	Access hardware for the E housing, one 1/2-in plug, one 1/2-in gland
BWA-HW-037	Clear plastic retaining ring for DX99 metal housings, 10 pack

Metal Housing Accessories

Model	Description
BWA-HW-016	Antenna Feedthrough, Stainless Steel, 1/2-in NPT
BWA-HW-017	Antenna Feedthrough, Stainless Steel, 3/4-in NPT
BWA-HW-012	DX99 Antenna Extension Pack (M4-0.7 × 20 black steel pan head screw, flexible antenna cable 12-in SMA male to SMA female)
BWA-HW-037	Clear plastic retaining ring for DX99 metal housings (10 pack)
BWA-AXFS0130	AXF™ Explosion-Proof Antenna Coupler

Omni-Directional Dome Antennas

Models	Frequency	Description	Connection
BWA-9O2-001	900 MHz	2 dBi, 18 inch cable	1/2-in SS NPT Port
BWA-9O2-002			3/4-in SS NPT Port
BWA-2O2-001	2.4 GHz		1/2-in SS NPT Port
BWA-2O2-002			3/4-in SS NPT Port

Additional Devices and Sensors

DX85 Modbus RTU Remote I/O Devices

These remote I/O devices have a Modbus Interface and are used to expand the I/O of the Gateway or the Modbus host.

IP67 Housing

IP20 Housing

Models	I/O
DX85M6P6	DX85 Modbus RTU Remote I/O, 6 Discrete IN, 6 Discrete OUT
DX85M4P4M2M2	DX85 Modbus RTU Remote I/O, 4 Discrete IN, 4 Discrete OUT, 2 Analog IN, 2 Analog OUT (0 to 20 mA)
DX85M4P8	DX85 Modbus RTU Remote I/O, 4 Discrete IN, 8 Discrete OUT
DX85M8P4	DX85 Modbus RTU Remote I/O, 8 Discrete IN, 4 Discrete OUT
DX85M0P0M4M4	DX85 Modbus RTU Remote I/O, 4 Analog IN, 4 Analog OUT (0 to 20 mA)
DX85M-P7	DX85 Modbus RTU Remote I/O, Up to 12 sinking inputs or up to 12 NMOS sinking outputs (for a total of 12 I/O)
DX85M-P8	DX85 Modbus RTU Remote I/O, Up to 12 sourcing inputs or up to 12 sourcing outputs (for a total of 12 I/O)

NOTE: Add a "C" to the end of any DX85 model to order the I/O mix with an IP20 housing. The IP20 models are Class I, Division 2 certified when installed in a suitable enclosure.

Sensors Optimized for Use with *Flex*Power® Devices

Models	I/O
SM312LPQD-78447	MINI-BEAM®, Low Power, 5 V, polarized retroreflective, 3 m
SM312DQD-78419	MINI-BEAM®, Low Power, 5 V, diffuse, 38 cm
QT50ULBQ6-75390	Ultrasonic, QT50U, 200 mm to 8 m range
QS30WEQ	WORLD-BEAM® Photoelectric Emitter, QS30 (Max Range: 100 ft, 10x excess gain at 50 ft), 1-wire Serial Interface
QS30WRQ	WORLD-BEAM® Photoelectric Receiver, QS30 (Max Range: 100 ft, 10x excess gain at 50 ft), 1-wire Serial Interface

GPS50M GPS Module

Low power consumption, ability to withstand harsh environments, flexible power supply requirements and Modbus RTU communications makes this module ideal for the industrial market.

- Self-contained GPS Module for industrial use.
- Flexible Power Requirements: 5 to 30 V dc with power consumption as low as 100 mW
- Positional error of less than 2.5 meters
- Self-contained for harsh environment; IP69K-rated

GPS50M GPS Module Specifications

Power Requirements	5 to 30 V dc	
Current	Maximum: < 0.5 W Power Save Mode ON Typ. Average: 4 mA at 24 V dc Power Save Mode OFF Tye. Average: 10 mA at 24 V dc	
Indicators	Green flashing: Power ON	Amber flashing: Modbus communication active
Indicators	Green flashing: Power ON	Red flicker: Serial Tx
Operating Temperature	-40 to +85 °C (-40 to +185 °F)	
GPS Features	• SiRF Star IV GPS chip • Satellite-based augmentation systems: WAAS, EGNOS, MSAS, GAGAN	• High sensitivity navigation engine (PVT) tracks as low as –163 dBm • Update Rate: 1 Hz
Communication	• Interface: RS-485 Serial • Baud rates: 9.6k, 19.2k (default), or 38.4k • Data format: 8 data bits, no parity (default), 1 stop bit (even or odd parity available)	• Do not use termination resistor • Protocol: Modbus RTU
Shock and Vibration	• IEC 68-2-6 and IEC 68-2-27 • Shock: 30g, 11 millisecond half wave, 18 shocks • Vibration: 0.5 mm p-p, 10 to 60 Hz	
Accuracy	• Positional error of less than 2.5 m (8') with augmentation • Positional error of less than 10 m (33') with no augmentation	

Other Sensors or Sensor Components

Models	I/O
BWA-THERM-PROBE-001	Temperature sensor with thermistor PS103G2 Operating Temperature Range -20 ºC to +105 ºC Maximum Power Rating 30 mW Accuracy +/- 0.2%; Plated nickel finish
BWA-S612-30-100	NoShok Series 612 Submersible Level Transmitter, model 612-30-1-1-N-100, 0 to 30 psig, 100' cable
BWA-S612-15-100	NoShok Series 612 Submersible Level Transmitter, model 612-15-1-1-N-100, 0 to 15 psig, 100' cable
BWA-625-5000-1-1-8-25	NoShok Series 625 Intrinsically Safe Pressure Transmitter, model 625-5000-1-1-8-25, 0 to 5000 psig, 1/2-in NPT,4–20mA, M12 QD
BWA-625-10000-1-1-8-25	NoShok Series 625 Intrinsically Safe Pressure Transmitter, model 625-10000-1-1-8-25, 0 to 10000 psig, 1/2-in NPT, 4–20mA, M12 QD
BWA-P-RKGV 5.33T-1727-2.0	Cable, female M12 4-pin, blue PVC, SS connector, for NoShok Series 625 IS Pressure Transmitter
BWA-ACC-SEN-SDI	Acclima SDI-12 Soil Moisture Transducer

Reference

Data Security

Binding the radios in a network (similar to pairing a phone to a headset, but more secure) locks them to a specific master radio by teaching them the master radio's access code. After the devices are bound, the radios only accept data from that master radio and the master radio only accepts data from the radios that are bound to it.

The proprietary protocol used in Banner's wireless networks provides a high level of data security.

A pseudo-random frequency hopping table is used to provide noise immunity and data security. Each time a message is sent a new frequency is chosen, which makes it almost impossible for any system listening at a given time to hear more than a few messages out of hundreds.

Generic data transfer without context also keeps data secure. Even if a hacker managed to crack the data packet format, all they would see is a set of 16-bit numbers with no reference as to what the numbers mean.

Deterministic System

Determinism is the ability to predict and control network behavior by establishing default states for specific conditions. Banner's deterministic system defines how network endpoints behave during the loss of communications. The network identifies when the communications link is lost and sets relevant outputs to user defined conditions. Once the radio signal is reestablished, the network returns to normal operations.

Example: If a tank level sensor is being used to turn a pump on to refill the tank, the deterministic system will allow you to set the default output state as "OFF" if the wireless signal is lost. With the output set at "OFF", the pump will not be able to over fill the tank in the event of a loss of communications.

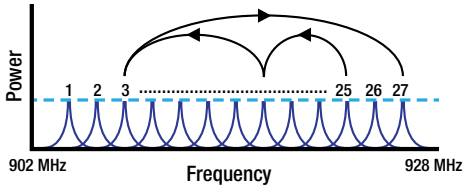
Frequency

Banner's wireless products operate in the license free ISM band with products that operate at the 900 MHz and 2.4 GHz frequencies.

- 2.4 GHz radios transmit data packets faster and require less power. They are primarily used outside North America.
- 900 MHz radios have a longer range and a better ability to penetrate walls and other obstacles. It is typically used in North America.

Frequency Hopping Spread Spectrum (FHSS)

Frequency Hopping Spread Spectrum is a radio communication technology where the frequency spectrum is divided into channels. Data packets are split up and transmitted on these channels in a random pattern known only to the transmitter and receiver (e.g., Gateway and Node). Because colocated networks follow different random patterns, or hop code tables, multiple networks can operate in close proximity without interfering. If interference is present on one channel, data transmission is blocked. The transmitter and receiver hop to the next channel in the hop table and the transmitter resends the data packet.



Intrinsically Safe

The Sure Cross® DX99 product line is classified as intrinsically safe (IS), not explosion proof, and is certified for a variety of hazardous locations. Intrinsically safe products limit electrical and thermal energy to levels below that required to ignite a flammable or combustible atmospheric mixture in hazardous areas. Each product's datasheet lists the specific certifications for that product.

Network Interference

The Banner wireless system can be installed within any existing 802.11b (Wi-Fi) environment. The low data rates and narrow frequency band of the Banner wireless system make it essentially silent to existing Wi-Fi networks. Additionally, Banner's Gateways and Nodes exchange a binding code that prevents radios outside the network from communicating with it. Finally, they also use multiple frequency hops to eliminate data collisions.

Network Security

The Banner wireless systems use a proprietary protocol and are designed to completely eliminate all Internet Protocol (IP) based security threats. Open protocols, such as Wi-Fi, can route malicious TCP/IP packets that can cause security breaches; however, the Banner wireless systems can not. The Banner protocol only carries sensor data values. It is not possible to gain access to the organization's main network through the Sure Cross wireless system and it is not possible to receive a web page or executable file over the wireless communication layer. Only I/O data is transmitted in the Banner wireless network.

Network Topologies

Point-to-Point

The most basic form of a radio network is called point-to-point. As the name implies, there are only two radios in this network, one Gateway and one Node.

Point-to-Multipoint

Point-to-multipoint is a relatively simple network with one Gateway and a few Nodes. Banner's PM Series is preconfigured to handle up to six Nodes.

Star

This network is formed by connecting multiple Nodes to a single Gateway. The Gateway maintains a communications connection with each Node on a separate communications path. If the communication between one of the Nodes and the gateway fails, the rest of the network remains unaffected.

Tree

This network involves several slaves that transmit information to repeaters, which ultimately transmit to the master radio. The use of repeaters can greatly extend the range of the network. This network must have a host controller that controls the master radio.

Network Scalability

Banner's Simple Wire Replacement products come preconfigured to handle up to 6 Nodes (PM8) so that it is easy to set up your network without software. The DX80 Performance Series offers Gateways that support multiple host communication protocols and up to 47 Nodes. Data Radios can handle up to 50 slave radios, and MultiHop Radios can handle up to 100 slave radios.

MultiHop

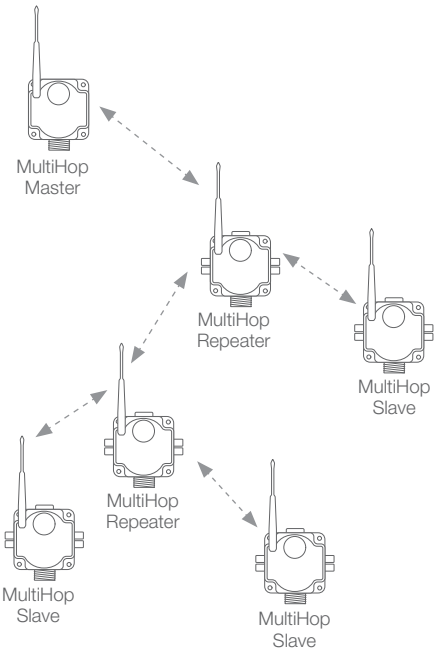
A MultiHop network uses repeaters to extend the range of the network with multiple “hops” to cover longer distances or to circumvent obstacles (trees, buildings, topology, etc.). MultiHop networks are also self-forming (all radios added to the network will automatically connect to the master or a repeater within its range) and self-healing (if a repeater is removed from the network, the radios connected to it can find a new path back to the master radio).

At the root of the MultiHop network is the master radio. All radios within range of the master (whether slave or repeater) connect to it. The master serves as the parent (controls the timing of the network), repeaters and slaves connect as children.

MultiHop Master Radio: Within a MultiHop network, there is only one master radio. It controls the overall timing of the network and is always the parent device. The master radio must be controlled by a host system.

MultiHop Repeater Radio: The repeater acts as a child to the master radio and a parent a slave radio. It retransmits data packets between the master radio and slave radios.

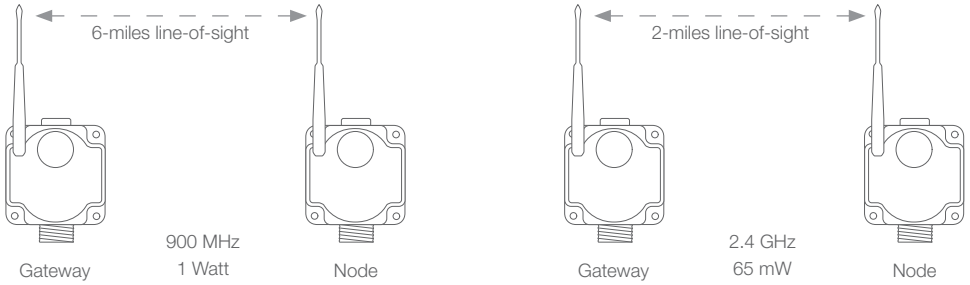
MultiHop Slave Radio: The slave radio is the end device of the network. A radio in slave mode does not retransmit data packets on the radio link.



Radio Range

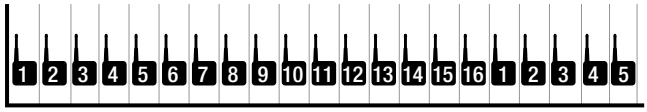
Banner’s wireless network is designed for long distance applications. The signal for 900 MHz, 1 Watt radios will travel up to 6 miles and 2.4 GHz, 65 mW radios will travel up to 2 miles line-of-sight.
Line-of-sight is the unobstructed path between radio antennas; however, signals can penetrate walls, floors and other indoor obstructions. Buildings, trees and large metal objects will impact signal strength in outdoor applications.

To verify range, Banner integrates a site survey tool into each Gateway and Node that displays real time signal quality results. Always conduct a site survey prior to installing a wireless network.



Time Division Multiple Access (TDMA)

TDMA provides a specific communication time slot for each device in the network, eliminating data collisions. The master radio “requests” data from each node during its time slot, and the node then sends the data. A TDMA architecture also lends itself to efficient power management procedures. When each device knows the time period to receive or send, the radio doesn’t have to ‘listen’ all the time. Power usage can be managed efficiently, allowing radio devices to operate from 3.6 V lithium batteries when necessary.



Electronic Industry Solutions


BANNER

Table of Contents

Industry 4.0

Industry 4.0, IoT, and IIoT

The technologies of **Industry 4.0** make data readily available and automate the communication between industrial automation equipment and systems. This enables predictive analysis for machines as well as process optimization across the factory floor.

The **Internet of Things (IoT)** describes the technologies that connect objects—from consumer electronics to industrial components—to the internet.

The **Industrial Internet of Things** (or IIoT) refers specifically to the impact of this innovation on industrial applications.

The key benefits include:

- Visibility and Remote Access to the operational status of machine components (both historically and in real-time)
- Predictive Analytics for more accurate planning of machine maintenance
- Interconnectivity for seamless communication among machines, components, and people

What Does IIoT Mean For Factories?

Visibility and Remote Access Increase Efficiency
In order to ensure efficient processes throughout the factory, machine operators must quickly and easily determine the status of machines. The greater the visibility, the easier it is to identify and resolve problems and keep operations running smoothly.

Traditional tower lights provide visibility wherever they can be physically seen. However, tower lights equipped with wireless communication capabilities both display a visual indication of an event and transmit wireless alerts. This helps ensure that operational problems are identified and addressed immediately, regardless of whether a machine operator is physically present to see the visual indicator.

An additional benefit of wireless indicators is data logging for use in OEE (Overall Equipment Effectiveness) calculations. Not only can operators respond to alerts quickly as they occur, but a history of alerts can also be stored and analyzed offline. This historical data can be used to track machine uptime, production volume, rejected parts, and other key metrics to make more informed decisions over time.

Predictive Maintenance Increases Machine Uptime and Availability
In addition to real-time status monitoring, IIoT technologies can also be used to help avoid machine failures thanks to predictive maintenance.

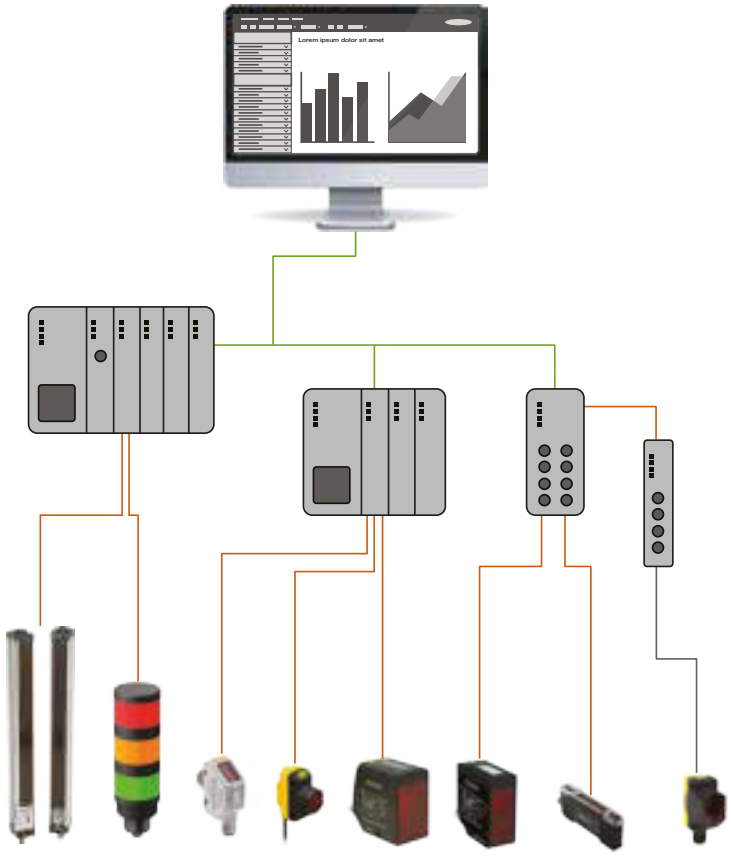
By monitoring machine components in real-time for increases in vibration and temperature, problems can be detected and resolved before they become too severe and cause additional damage or result in unplanned downtime. Over time, the historical data creates a valuable machine performance log that can be used to make more informed maintenance decisions down the line.

Interconnectivity Streamlines Factory Communications
Wireless technologies also enable seamless interaction among human workers, and can have a significant impact on the efficiency of manual production lines. For example, instead of requiring machine operators to walk over to the manager area for assistance with a technical issue, a wireless system utilizing connected pushbuttons or switches and tower lights can be used to alert managers when assistance is needed on the line.

Is Your Business IIoT-Ready?

From keeping machines running smoothly to enabling seamless communication among machines, components, and people, the benefits of IIoT technologies are tangible. It can be challenging knowing where to start and how to use these technologies to their fullest advantage. Answering the following questions can help manufacturing facilities identify the best technologies to meet their immediate business needs and start taking advantage of the long-term benefits of IIoT.

- What are the inefficiencies in your operations?
- What kind of data would help you overcome these inefficiencies?
- What communication processes need to be in place in order to utilize data in a meaningful way?



5 Advantages of IO-Link

1. Standardized and Reduced Wiring

   IO-Link devices do not require any special or complicated wiring, but can be connected using the same cost-effective standard unshielded 3-wire cables as conventional discrete I/O. In addition, IO-Link also eliminates the need for analog sensors and reduces the variety of cord sets required for sensors, which saves inventory costs. IO-Link also supports a master-slave configuration with passive connection points, which further reduces wiring requirements.

2. Increased Data Availability

   Access to sensor-level data helps ensure the smooth operation of system components, streamlines device replacement, and enables optimized machine maintenance schedules—all of which save costs and reduce the risk of machine downtime.

   This wealth of valuable data made available through IO-Link is integral for the Industrial Internet of Things (IIoT) and Industry 4.0 initiatives.

3. Remote Configuration and Monitoring

   With IO-Link, users can read and change device parameters through the control system software, enabling fast configuration and commissioning that saves time and resources. In addition, IO-Link allows operators to dynamically change the sensor parameters from the control system as needed—such as in the case of product changeover—which reduces downtime and allows machines to accommodate greater product diversity.

   In addition, the ability to monitor sensor outputs, receive real-time status alerts, and adjust settings from virtually anywhere allows users to identify and resolve problems that arise on the sensor level in a timely manner. This capability reduces costly downtime and improves overall efficiencies.

4. Simple Device Replacement

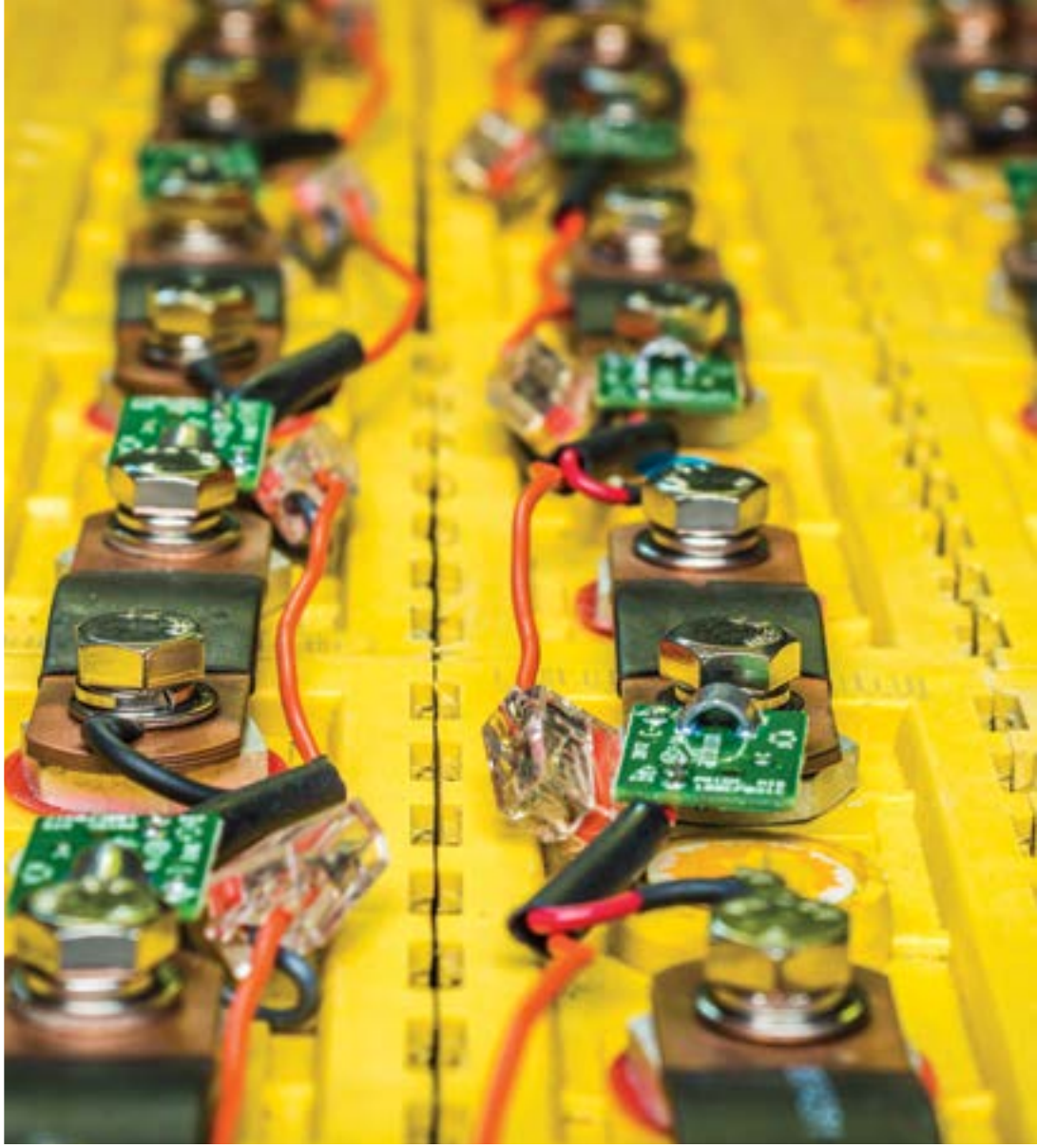
   In addition to the ability to remotely adjust sensor settings, IO-Link's data storage capability also allows for automated parameter reassignment in case of device replacement (also known as Auto-Device Replacement or ADR). Users can import existing sensor parameter values into a replacement sensor for seamless replacement, getting the new device up and running as quickly as possible.

5. Extended Diagnostics

   IO-Link provides users with visibility into errors and health status from each device. This means that users can see not only what the sensor is doing but also how well it is performing—a valuable insight into a machine's efficiency. In addition, extended diagnostics allow users to easily identify when a sensor is malfunctioning and diagnose the problem without shutting down the line or machine.

   The combination of real-time and historic data not only reduces troubleshooting efforts as issues arise but also allows for optimization of machine maintenance schedules, saving costs and increasing efficiency in the long term.

Nominal Voltage: 3.7V
Limited Voltage: 4.2V
3500 mAh



Lithium Ion Battery Production

From precise edge guiding and roll diameter monitoring to glue and tape detection, lithium ion battery production processes require a variety of presence detection, measurement, and inspection solutions to ensure quality control within tight tolerances. Banner Engineering offers an extensive portfolio of fiber optic sensors, photoelectric and laser measurement sensors, and machine vision products for reliable error-proofing in this industry.

Solutions for Lithium Ion Battery Production

see page 45

Tape Detection

Challenge

- Detect tape used to identify damaged film
- Low optical contrast between tape and film
- High speed processing: 1.5 meters per second
- Hard-to-access deployment area with very limited space

Featured Solution

- DF-G2 Series High-Speed Fiber Optic Amplifier and plastic fiber optic sensors

Key Features

- White, green, blue, and infrared LED sensing
- Best-in-class response speeds: up to 10 µs
- Very small, very flexible fiber optic sensors
- IO-Link models available

Key Benefits

- Detect low-contrast, multicolored, reflective, and other difficult targets
- Reliable performance in challenging high-speed applications
- Easily fits in tight, confined spaces and can be precisely positioned to perform inspections
- Advanced diagnostics, remote monitoring, teaching, and configuration

see page 42

Roll Diameter Monitoring

Challenge

- Control diameter of lithium ion battery film
- Continuous measurement on high-speed roll
- Hard to detect reflective material
- Machine vibration

Featured Solution

- T30UX Series Ultrasonic Sensor

Key Features

- Available ranges of 100 mm to 1 m, 200 mm to 2 m, or 300 mm to 3 m
- Provides continuous 0-10 V dc or 4-20 mA analog output
- Detects targets using 114 kHz, 174 kHz, or 224 kHz ultrasonic frequencies
- Built-in temperature compensation

Key Benefits

- Reliable monitoring of rolls regardless of size
- Reduced machine downtime and product damaged by incorrect tension control
- Immune to target reflectivity and variations in color
- Provides more reliable measurements to minimize waste left on the roll

see page 44

Edge Guiding

Challenge

- Monitor position of film edge on winding machine
- Minute detection of variation in edge position needed
- High-speed winder: up to 1.5 meters of film per second
- Hard-to-access deployment area with very limited space

Featured Solution

- DF-G3 Series Long-Range Fiber Optic Amplifier and heavy-duty shielded fiber array

Key Features

- Heavy-duty shielded fibers
- Detects 500 µm variation in edge position
- High-power amplifier with world-class long-range sensing capability
- IO-Link models available

Key Benefits

- Resists kinking, cutting, and snagging as well as chemicals and other environmental hazards
- Detects tiny misalignments, enabling precise adjustments to prevent winding errors and reduce material waste
- Advanced diagnostics, remote monitoring, teaching, and configuration

see page 66

Glue Detection

Challenge

- Verify presence and consistency of adhesive on the outer casing of a battery
- Crowded production area with limited deployment space
- Frequent product changeover

Featured Solution

- iVu Series Image Sensor

Other Solutions

- VE Series Smart Camera

Key Features

- All-in-one solution with camera, controller, lens, and light included in one package
- PC, remote or integrated touchscreen operation
- EtherNet/IP™, Modbus/TCP, PROFINET®, PCCC and Serial RS-232 communication
- Full runtime editing capability

Key Benefits

- Simplifies installation and eliminates the expense of purchasing additional components
- Setup, manage, and monitor inspections on the device or from a convenient location
- Enables seamless integration with existing equipment
- Reduces costly downtime by changing inspection parameters while inspections are in progress

see page 36

Thickness Monitoring

Challenge

- Maintain consistent thickness battery film
- High-speed production process
- Hard-to-access, space-constrained deployment area

Featured Solution

- LM Series Laser Measurement Sensor

Key Features

- 0.002 mm resolution and repeatably
- Fast 0.5 ms response speed and 0.25 ms sampling rate
- Best in class thermal and mechanical stability
- Optional Remote Sensor Display (RSD)

Key Benefits

- Precise measurements for reliable quality and process control
- Reliably solves high-speed applications with fast-moving targets
- Superior thermal stability for more accurate and reliable measurements
- Simplifies setup and monitoring of sensors in difficult-to-access locations

see page 50

Monitoring Safety Doors

Challenge

- Monitor multiple guard doors
- Staff need to frequently access the protected area
- Prevent staff from bypassing safety functions

Featured Solution

- SI-RF Series RFID safety switches

Other Solutions

- SI-MAG Series magnetic safety switches

Key Features

- Achieves Cat 4, PL e, or SIL CL 3 safety ratings alone or in a cascade chain
- Cascade up to 32 switches together in a series
- No contact between switch and actuator
- Unique, high, and low code tamper resistance
- In-Series Diagnostics (ISD)

Key Benefits

- Operates at the highest levels of safety (PL e) without the possibility of fault masking
- Simplifies installation and wiring and frees space on the safety controller
- Allows easy access and minimizes wear and tear
- Ensures that safety functions cannot be bypassed
- Makes it easy to identify and resolve issues, minimizing downtime

see page 44

Presence of Liquid

Challenge

- Detect presence of liquid at a collection site
- Potential exposure to oil and chemicals
- Below ground deployment area
- Provide indication if sensor is non-functional

Featured Solution

DF-G3 Series fiber optic amplifier

Key Features

- Small, flexible and chemically resistant fiber optics
- High-performance sensing for low-contrast application
- Intuitive user interface and easy-to-read dual digital display

Key Benefits

- Reliable detection in challenging environments
- Detects very small amounts of liquid
- Provides output for detection of liquid or damaged fibers
- Simplifies setup, programming, and application monitoring

see page 44

Liquid Detection in a Tube

Challenge

- Detect the presence of liquid in a tube
- Low optical contrast between the tube and liquid
- Multiple inspection points in hard-to-access areas

Featured Solution

DF-G3LIR Infrared water sensor

Other Solutions

DF-G1 Series general purpose fiber optic amplifier

Key Features

- High-performance sensing in low-contrast application
- Expert TEACH and SET methods
- Cross talk avoidance algorithm
- Easy-to-use mounting straps

Key Benefits

- Reliably detects liquids inside translucent or semi-opaque plastic and glass tubing
- Ensures optimal gain and threshold for all applications, including challenging high-speed and low-contrast applications
- Amplifiers can be deployed in close proximity to each other
- Simplifies setup, programming, and application monitoring

see page 68

Liquid Level Detection

Challenge

- Monitor fill levels of tanks to ensure steady supply and prevent overfills
- Hard-to-access equipment
- No wired infrastructure

Featured Solution

Q45UA all-in-one ultrasonic sensor and wireless node

Other Solutions

K50U ultrasonic sensor
QT50U with Performance Series -P14 Node

Key Features

- Combines ultrasonic sensor, wireless node, and battery power supply in one device
- Secure, robust Sure Cross® wireless network
- Immune to variations in target color, reflectivity, and transparency
- Plug-and-play compatibility with Wireless Solutions Kit for tank monitoring

Key Benefits

- Installs easily and can be deployed permanently or redeployed without altering infrastructure
- Eliminates the hassle and expense of running communication cable to connect devices
- Can be used to monitor a wide range of wet or dry materials
- Provides access to real time and historical data and makes it easy to create visualization tools, warnings, and alarms to ensure maximum uptime

Film Slicing Machine

Safety Monitoring

see page 46

Challenge

- Safeguard multiple safety devices
- Complex logic and multiple safety scenarios
- Communicate with HMI to display machine status

Featured Solution

XS26 Series expandable safety controllers with Ethernet

Other Solutions

SC26 Series safety controllers

SC10

Key Features

- Powerful software offering intuitive icon-based, drag-and-drop operation
- Base controller with 26 inputs and two dual-channel safety outputs supports up to eight expansion I/O modules
- Can be configured for virtual non-safety status outputs and virtual non-safety inputs

Key Benefits

- Configure safety program in minutes and test configuration prior to implementation
- Scalable solution can be expanded to fit changing machine requirements
- Two-way communication between the safety controller and PLC, HMI, and other devices for advanced functionality and diagnostic

Access Protection

see page 49

Challenge

- Safeguard access to film slicing area
- Requires redundant, self-checking outputs
- Limited space for deployment

Featured Solution

LP Basic Series compact Type 4 safety light curtain

Other Solutions

LP Series full feature compact Type 4 safety light curtain

SLC4

Key Features

- Low-profile, compact design
- Provides basic functionality auto start/restart (trip output)
- Zone and status indicators plus digital display to indicate number of beams blocked and detailed diagnostics

Key Benefits

- Fits easily into small spaces without interfering with operations or processes
- Cost-effective safety device for simple applications
- Minimizes downtime by making it easy to troubleshoot and quickly resolve issues

Cabinet Illumination

see page 53

Challenge

- Illuminate interior of a machine control panel
- Space-constrained deployment area
- DC powered equipment

Featured Solution

WLS15 Series Low Profile, Low Power LED Strip Light

Key Features

- Bright LED strip light with diffuse window
- Slim, space-saving 15 mm profile
- Flexible mounting options
- Operates on 12 V dc or 24 V dc in one model

Key Benefits

- Provides bright, even illumination with no hot spots
- Installs easily in confined areas without disrupting the work environment or obstructing sightlines
- Integrates easily into existing equipment

Solar Cell Production

Printed circuit board (PCB) manufacturing lines include several types of equipment and conveyors that all can benefit from the broad product offering provided by Banner Engineering. From presence detection in high temperatures to ultra-precise measurements to machine safety, Banner Engineering has solutions to critical challenges for PCB and IC chip production lines.

Solutions for Solar Cell Production

see page 38

Solar Wafer Detection

Challenge

- Detect the presence/absence of a solar wafer
- Low reflectivity from light absorbing material
- Minimize interference with processes

Featured Solution

Q4X Series Laser Distance Sensor

Key Features

- Dual teach mode measures distance and light intensity changes compared to a background reference condition
- Reliable sensing range from 25 up to 610 mm

Key Benefits

- Reliably detects across a variety of target colors, materials, and surfaces
- No reflector required for detection
- Can be installed in a convenient location away from the line

see page 40

Solar Wafer Flipping

Challenge

- Detect the presence/absence of a solar wafer
- Low reflectivity from light absorbing material
- Minimize interference with processes

Featured Solution

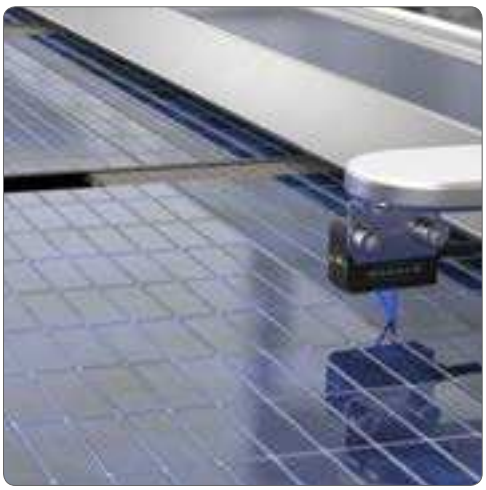
QS18 Series Photoelectric Sensors

Key Features

- Universal housing with an 18 mm threaded lens or side mounts
- Wide operating range up to 20 m
- Bright LED operating status indicators visible from 360°
- IO Link models available

Key Benefits

- Quick, easy installation
- Real-time feedback simplifies operation and troubleshooting
- Easy installation, wiring, preventative maintenance, and sensor backup



see page 40

Solar Wafer Counting

Challenge

- Detect the presence/absence of a solar wafer
- Low reflectivity from light absorbing material
- Space constrained deployment area

Featured Solution

VS8 Series miniature sensors

Key Features

- Ultra-miniature housing (22 x 8 x 12 mm)
- High switching frequency
- Blue LED models reliably detect dark, reflective, and transparent objects
- Electronic push button or remote teach

Key Benefits

- Fits easily in very small spaces
- Reliable performance in high-speed applications
- Detects challenging targets without requiring a reflector
- Quick, easy setup enables rapid deployment

see page 39

Solar Wafer Counting

Challenge

- Detect the presence/absence of a solar cell
- Light absorbing solar cell reflects very little light
- Reflective surface of the metallic trace between cells

Featured Solution

Q3X Series Laser Contrast Sensor

Key Features

- High-speed detection as fast as 250 us, capturing up to 2,000 events per second
- Reliable sensing range up to 300 mm
- Clear intensity readout from angled three-digit display
- Superior resistance to ambient light interference
- Two-point teach can easily detect the metal trace versus the light absorbing material

Key Benefits

- Reliable performance in high-speed applications
- Sensor can be deployed off the line to avoid interfering with processes
- Easy-to-see feedback simplifies operation and troubleshooting
- Resists nuisance output trips caused by changing light conditions

see page 70

Pressure Monitoring

Challenge

- Ensure pressure levels remain within recommended range
- Identify system problems before failure can occur
- Monitor large, complex system with multiple hard-to-access inspection points

Featured Solution

Performance Series All-in-One Pressure Sensor and Wireless Node

Key Features

- Combines pressure sensor, wireless node, and battery power supply in one device
- Field-proven Sure Cross® wireless architecture

Key Benefits

- Compact, one-piece design simplifies installation and eliminates the need for ordering multiple components
- Integrates easily in applications where infrastructure makes wired solutions impractical, ineffective, or cost-prohibitive
- Collect data from one or multiple points and monitor system performance from any network-enabled location

see page 43

Presence Detection on a Buffer Machine

Challenge

- Maintain a steady stream of wafers
- Inconsistencies in color of cell magazines
- Space constrained deployment area

Featured Solution

Q12 Series Miniature Sensors

Other Solutions

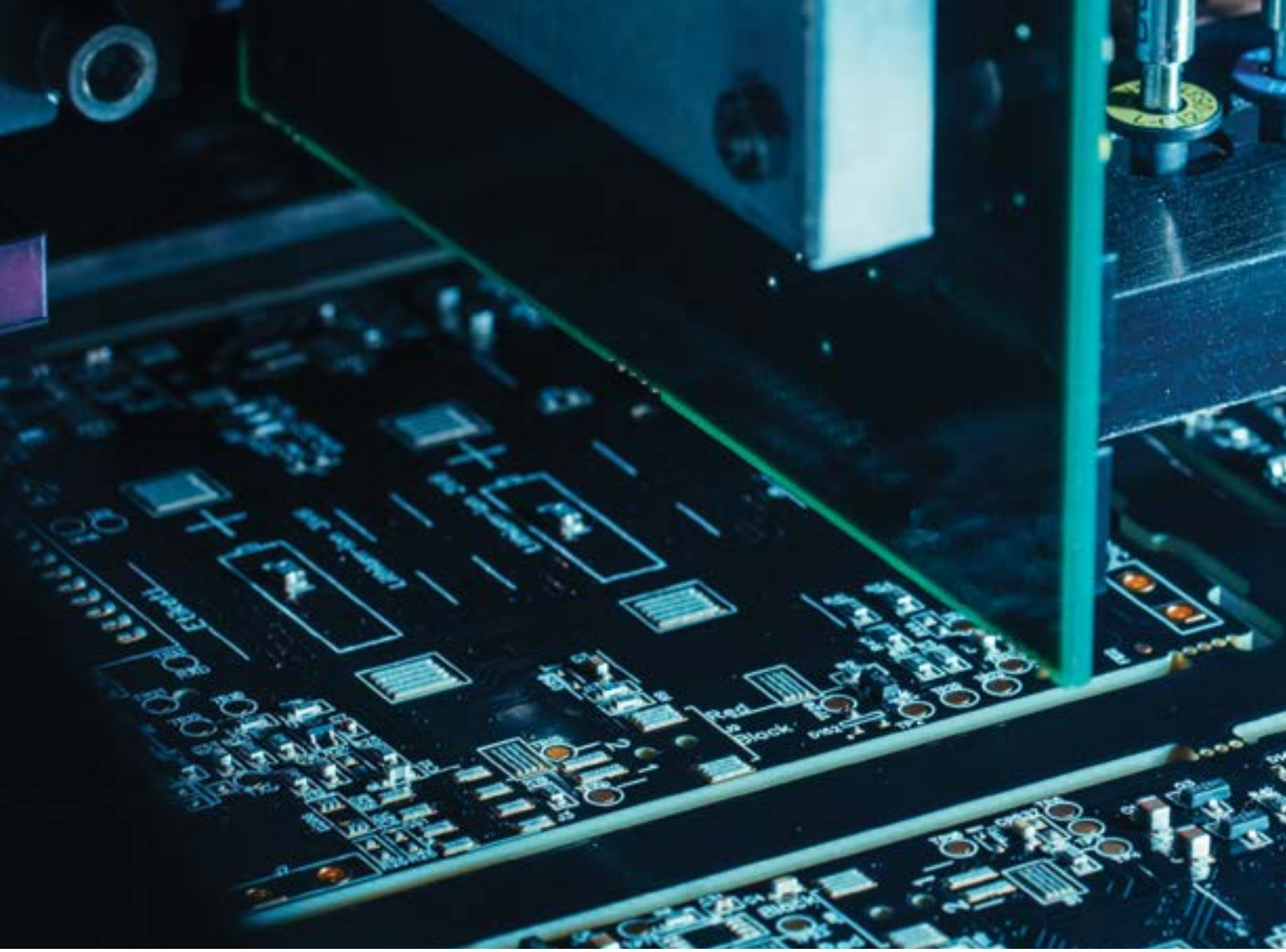
VS8 Series Miniature Sensors for Precise Detection

Key Features

- Ultra-miniature housing (22 x 8 x 12 mm)
- Superior resistance to fluorescent light interference
- Rugged design withstands exposure to extreme vibration

Key Benefits

- Fits easily in very small spaces
- Resists nuisance output trips caused by light interference
- Reliable performance in challenging environment
- Long operational life with only routine maintenance


Red
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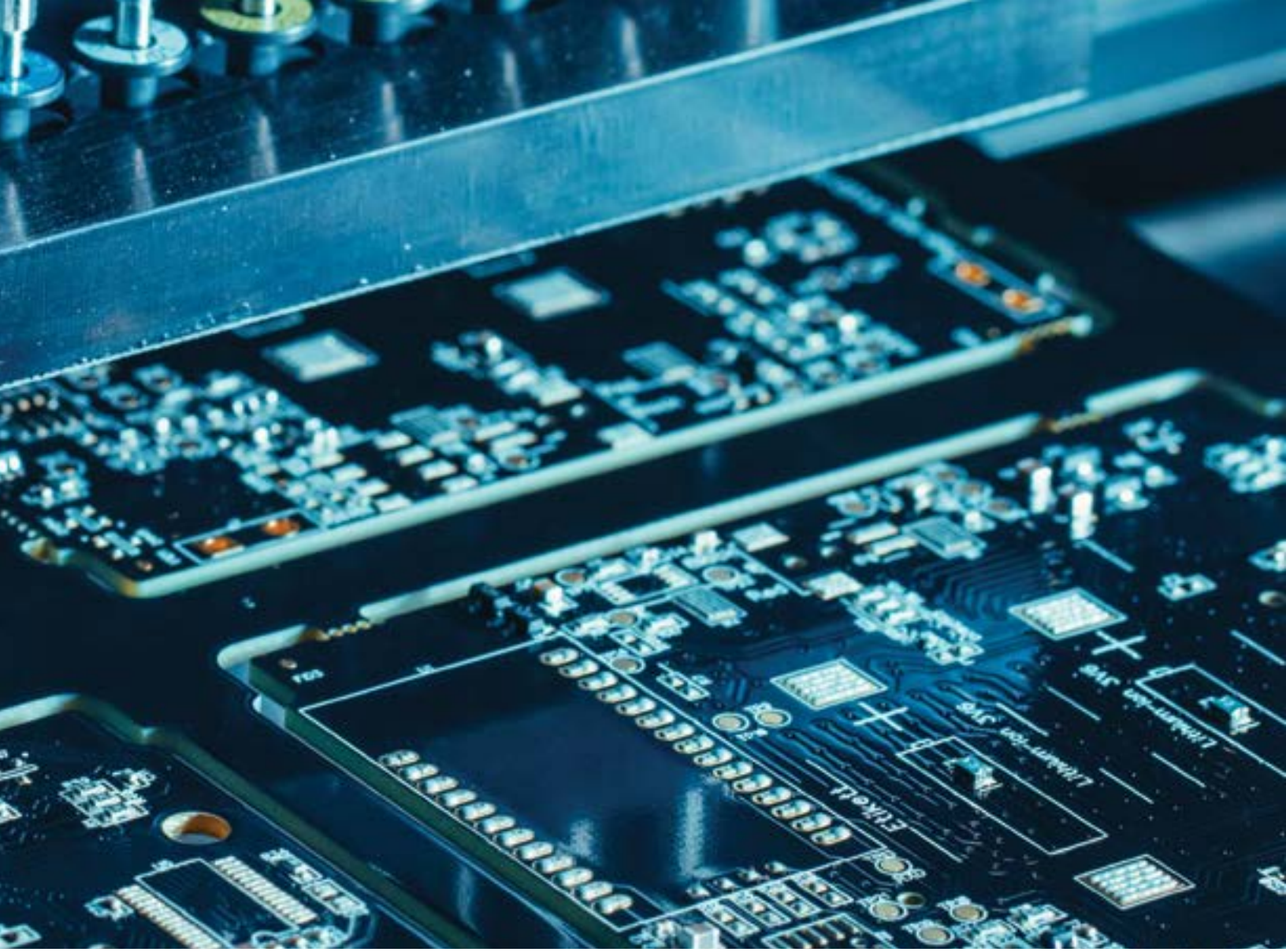
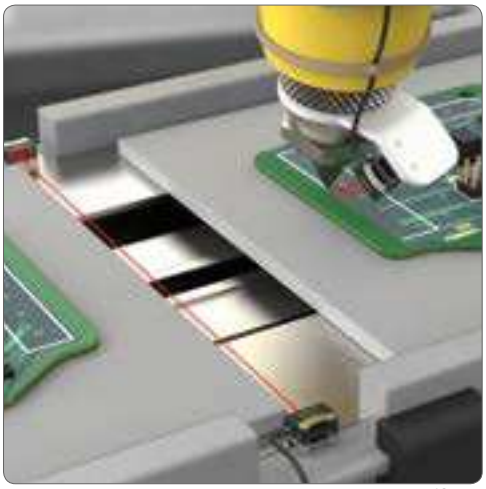


IC Chips and Printed Circuit Boards

Printed circuit board (PCB) manufacturing lines include several types of equipment and conveyors that all can benefit from the broad product offering provided by Banner Engineering. From presence detection in high temperatures to ultra-precise measurements to machine safety, Banner Engineering has solutions to critical challenges for PCB and integrated circuit (IC) chip production lines.

Solutions for Printed Circuit Boards and Integrated Circuit (IC) Chips



see page 40

Leading Edge And Adhesive Detection

Challenge

- Detect leading edge of printed circuit board (PCB)
- Verify that adhesive has been properly applied to PCB
- Very high levels of precision required for both inspections
- Tight-space constrained deployment area

Key Features

- Space-saving form factor (21.1 x 14.6 x 8 mm)
- Bright, precise spot for precise detection
- High switching frequency

Featured Solution

VS8 Series miniature sensors

Other Solutions

DF-G1 Series fiber optic amplifier with plastic fiber optic sensors

Key Benefits

- Will not interfere with equipment or movement of the PCB on the line
- Precision inspections reduce rework and wasted product
- Minimizes machine downtime for refilling the glue gun
- Reliable performance in high-speed applications

see page 36

Integrated Circuit (IC) Chip Presence

Challenge

- Detect missing, tilted, and multiple IC chips in a nest
- Small, low-profile target
- High-speed inspections

Featured Solution

LM Series precision measurement sensor

Other Solutions

Q4X Series laser distance sensor

Key Features

- Precise 0.002 mm - 0.004 mm resolution and ±0.02 - ±0.07 mm linearity
- Best-in-class thermal and mechanical stability
- Fast 0.5 ms response speed and 0.25 ms sampling rate
- Optional Remote Sensor Display (RSD)

Key Benefits

- Ensures parts meet tight tolerances with fewer failures
- Achieves high levels of accuracy in challenging environments
- Reliable performance in high-speed application
- Simplifies setup and monitoring of sensors

see page 45

Leading Edge Detection for Pick-and-Place Machine

Challenge

- Complex, multi-step pick-and-place process
- High level of precision required
- Space-constrained deployment area

Featured Solution

DF-G2 Series High Speed Amplifier

Other Solutions

DF-G1 Series General Purpose Amplifier

Key Features

- Small, precise spot
- Cross talk avoidance algorithm
- Very small, very flexible fiber optic sensors

Key Benefits

- Precise leading edge detection ensures proper placement of SMT components
- Multiple amplifiers can operate in close proximity to each other
- Amplifiers can be installed in a convenient location

see page 66

Integrated Circuit (IC) Chip Orientation

Challenge

- Confirm correct orientation of IC chips on pocket tape
- Space-constrained deployment area
- Frequent product changeover

Featured Solution

iVu Series image sensor with integrated touch screen and light

Other Solutions

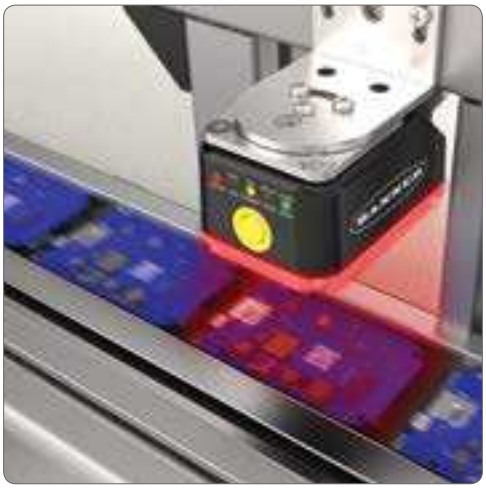
VE Series Smart camera

Key Features

- All-in-one solution with camera, controller, lens, and light included in one compact package
- Setup and manage inspections using Vision Manager PC software, remote touchscreen, or integrated touchscreen
- EtherNet/IP™, Modbus/TCP, PROFINET®, PCCC and Serial RS-232 communication
- Full runtime editing capability

Key Benefits

- Simplified installation without the expense of purchasing additional components
- Setup, manage, and monitor inspections on the device or from a convenient location
- Seamless integration with existing equipment and IIoT data collection
- Change inspection parameters while inspections are in progress



see page 35

Data Matrix Code Reading

Challenge

- Small, complex 2D code on a printed circuit board (PCB)
- Printing errors leading to unreadable codes
- High-speed processes

Featured Solution

ABR Series Imager-Based Barcode Reader

Other Solutions

iVu BCR Series Barcode Reader

Key Features

- High-resolution 1.3 MP (1280 x1024 pixels) imager
- Integrated red or multicolor LED lights
- Barcode manager software
- Web interface capability

Key Benefits

- Detects very fine details on small, complex, and challenging barcodes
- Optimizes the contrast between the Data Matrix code and the PCB
- Intuitive flowchart programming simplifies inspection setup
- Setup, manage, and monitor multiple ABR Series barcode readers from any network-enabled location

see page 67

Clean Room Monitoring

Challenge

- Monitor the status of each clean room
- Signal personnel when it is safe to enter and exit the clean room
- Alert maintenance personnel of alarm conditions via text or email

Featured Solution

DXM700 Wireless Controller and K70 Series Wireless LED Indicators

Key Features

- Indicator provides bright, easy-to-see indication and wireless connectivity
- Controller supports two-way communication with up to 47 wireless nodes
- Controller combines wireless gateway with a logic controller offering advanced capabilities

Key Benefits

- Monitor clean room status from a convenient location
- Activate an indication light and lock/unlock doors from a convenient location
- No additional wiring or alterations to infrastructure required

see page 68

Temperature and Humidity Monitoring at a Chip Shooter

Challenge

- Monitor temperature and humidity levels in multiple locations throughout a facility
- Maintain consistent temperature and humidity levels to suppress electrostatic discharge (ESD)
- Automate the collection of temperature and humidity information
- Minimize downtime during installation

Featured Solution

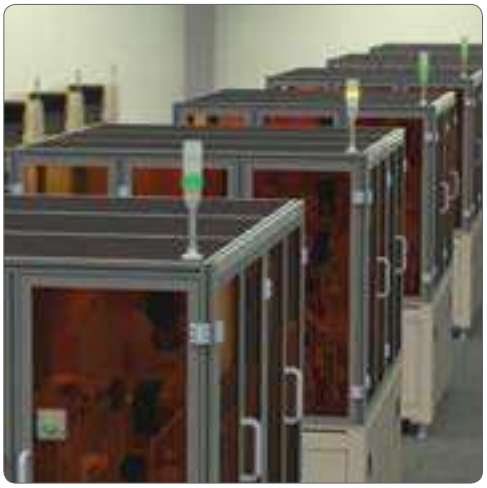
Q45 Series Nodes for Predictive Maintenance and M12 Series Temperature and Humidity Sensor

Key Features

- Humidity accuracy of ± 2% relative humidity and temperature accuracy of ± 0.3 °C
- Wireless node is battery powered and preconfigured to work with M12 Series sensor
- Secure, robust Sure Cross® wireless network

Key Benefits

- Real-time monitoring ensures consistent temperature and humidity levels
- Quick, easy device setup and deployment
- Eliminates the hassle and expense of running communication cable
- Monitors environmental conditions in hard-to-access locations



see page 59

Monitoring Machine Status

Challenge

- Monitoring multiple machines
- View machine status from all angles
- Bright ambient light conditions
- Machines use AC and DC power sources

Featured Solution

TL50 Pro Series Tower Lights

Other Solutions

TL50 Basic Tower Lights
TL50 Core Series Tower Lights
TL70 Series Modular Tower Lights

Key Features

- Features white windows with high intensity LED lights
- AC and DC power options available
- Audible options
- Preassembled models

Key Benefits

- At-a-glance visibility of machine status
- Versatile powering options enable use with a wide range of machines
- No assembly required for rapid deployment

PCB Automated Assembly Station

Monitor Safety Devices

see page 47

Challenge

- Monitor multiple safety devices on a small assembly station
- Display machine status on an HMI
- Limited space on the machine control panel

Featured Solution

SC10 Series Compact Safety Controller/Relay Hybrid

Other Solutions

SC26 Series safety controller

Key Features

- Supports a wide range of safety devices
- Intuitive, icon-based programming with drag-and-drop PC configuration
- Two-way industrial Ethernet communication enables 256 virtual non-safe status outputs and 80 virtual non-safe inputs (reset, on/off, cancel off-delay, mute enable)

Key Benefits

- Consolidates the functionality of multiple safety relays into one compact device
- Eliminates the need to buy and stock dedicated relay modules
- Simplifies device setup and management
- Integrates multiple non-safety input and output devices without using additional IO terminals

Safeguard Machine Access Points

see page 51

Challenge

- Safeguard point of access on a small assembly station
- Prevent attempts to bypass safety system

Featured Solution

SI-MAG Series Magnetic Safety Switches

Other Solutions

SI-RF Series RFID Safety Switches

Key Features

- Achieves category 4/PLe safety rating with a single sensor
- Two-piece, non-contact safety system
- Coded magnets for tamper resistance
- 3-5 mm tolerance to misalignment

Key Benefits

- Operates at the highest level of safety
- Provides a long operational life, even in applications with persistent use
- Resists attempts to bypass safety functions
- Minimizes machine downtime caused by nuisance trips

Initiate Manual Reset

see page 62

Challenge

- Initiate manual reset on assembly station
- Provide status indication
- Unobtrusive operation

Featured Solution

S22 Pro Series Multicolor Touch Button

Other Solutions

K50 Core Series Illuminated Touch Buttons

Key Features

- Multicolor illuminated touch surface
- Ergonomic design requires no physical force to actuate
- Flush mount device with terminal connector options
- Solid state electronics

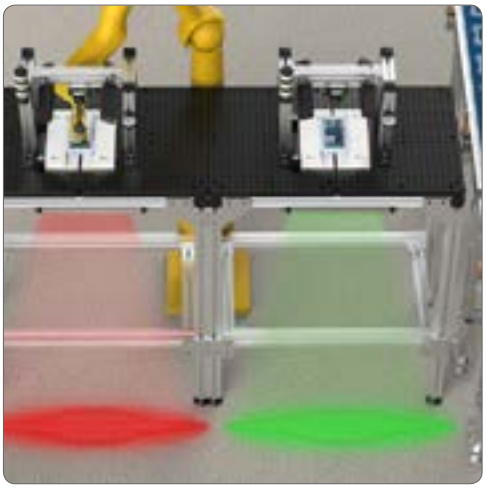
Key Benefits

- Clear, at-a-glance display of status to quickly resolve issues
- Easy actuation with no hand, wrist, and arm stresses
- Quick, easy installation in panels
- Long operational lifespan

Mobile Device Production

Mobile device production requires assembling and inspecting very small parts in tight spaces. Machines in this industry require reliable and compact equipment that does not get in the way of the process and allows machines and workers to complete tasks effectively. Banner Engineering offers a wide variety of compact machine safety equipment, lighting and indication, and sensor and vision products to ensure the safety, quality, and efficiency of production processes.

Solutions for Mobile Device Production



see page 56

Operator Guidance at Robotic Assembly Station

Challenge

- Quickly identify assembly errors
- Maintain a continuous workflow
- Operate in challenging environment

Featured Solution

WLS28 Series LED Strip Lights with EZ-STATUS®

Other Solutions

WLS15 Series Low-Profile LED Strip Lights with EZ-STATUS®

Key Features

- Combines brilliant, bright illumination and high-visibility indication in one device
- Three- and five-color models available
- Rugged, water-resistant IP66, IP67 and IP69K construction

Key Benefits

- Simplifies installation, operation, and troubleshooting
- Allows operators to focus tasks without diverting attention to monitor status
- Reliable operation in challenging environmental conditions

see page 38

Part Positioning on a Robotic Assembly Station

Challenge

- Verify the presence and position of cell phone board in a nest
- Low optical contrast between target and background
- Small, low-profile target requires high level of precision to verify position
- Minimize interference with processes

Featured Solution

Q4X Series Laser Distance Sensor

Other Solutions

Q5X Series High Power, Mid-Range Laser Measurement Sensor

Key Features

- Reliable sensing range from 25 up to 610 mm
- Immune to variations in target color, reflectivity, and transparency
- Dual teach mode (intensity + distance) sensing,
- Detects height changes as small as 0.5 mm

Key Benefits

- Enables installation in a convenient location away from the line
- Precise measurements ensures proper position
- Detects across a variety of target colors, materials and surfaces based on distance

see page 63

Part Inspection at a Robotic Assembly Station

Challenge

- Confirm presence and orientation of components on a cell phone board
- Complex inspection area with many similar looking components
- Inspection of fine details requires higher resolution camera

Featured Solution

VE Series Smart Camera

Other Solutions

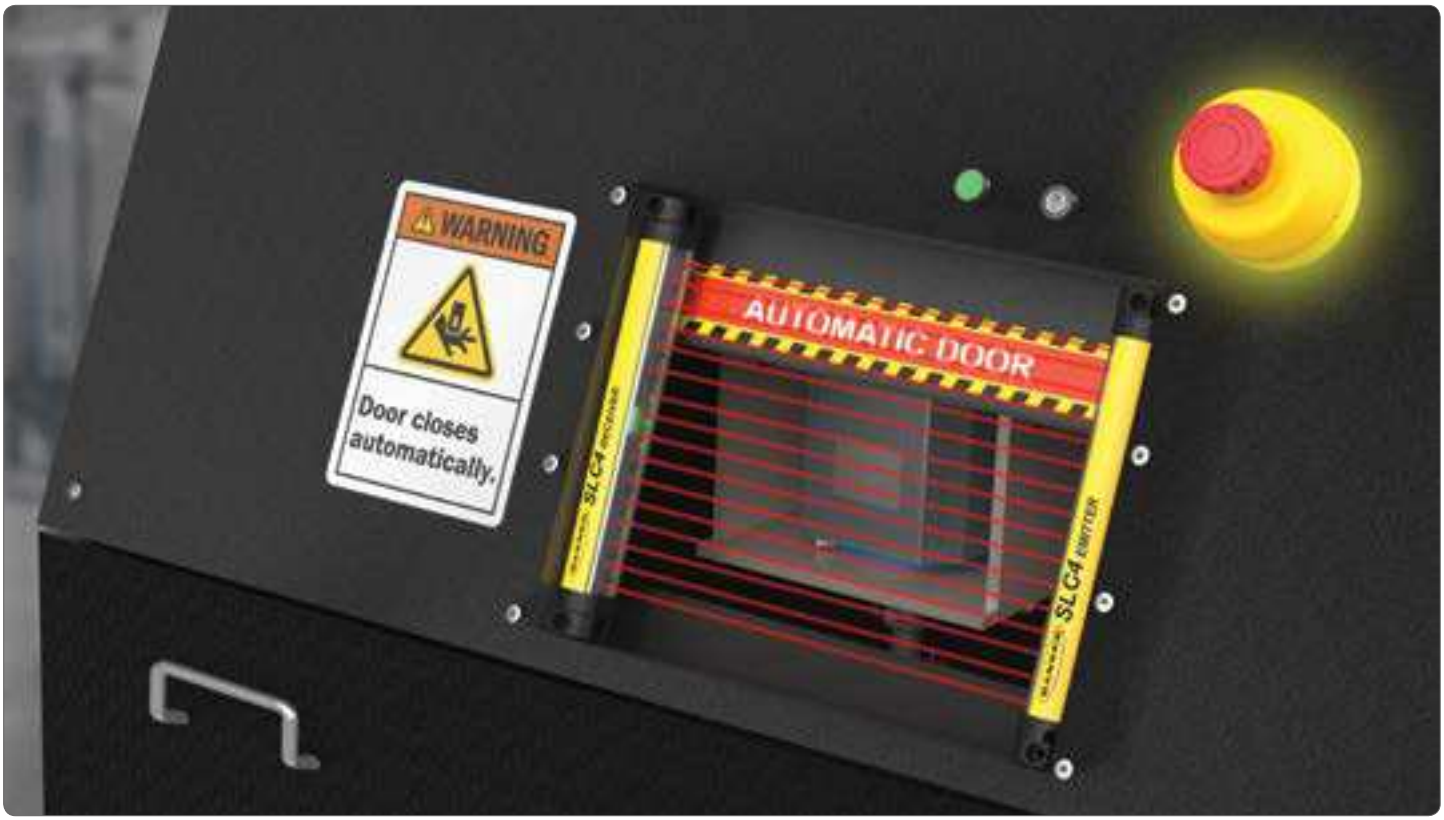
iVu Series Image Sensor

Key Features

- Available with a high resolution 5MP imager
- Full runtime editing capability
- Software emulator
- EtherNet/IP™, Modbus/TCP, PROFINET®, and Serial RS-232 communication

Key Benefits

- Detects very small details to verify that all components are correctly placed and positioned
- Minimize downtime by changing inspection parameters while inspections are in progress
- Build and troubleshoot inspections offline prior to implementation
- Supports seamless integration with existing equipment and IIoT data collection



Electronics Final Test

Safeguard Machine Access Point

see page 48

Challenge

- Safeguard access point on a small test machine
- Very fine levels of protection required
- Unobtrusive integration in small area

Featured Solution

SLC4 Series Compact, Low-Profile Type 4 Safety Light Curtains

Other Solutions

LP Series Low-Profile Safety Light Curtains

Key Features

- Defined area heights of 160 mm, 240 mm, and 320 mm
- 0.1 m to 2 m sensing range
- 14 mm or 24 mm resolution models available
- End-to-end sensing design

Key Benefits

- Fits easily in small spaces
- Will not interfere with machine access or operation
- Detects objects as small as a finger or a hand
- Eliminates detection blind zones

Emergency Stop Actuation

see page 52

Challenge

- Provide emergency stop actuation on a small test machine
- Indicate actuator status

Featured Solution

30 mm Mount Emergency Stop Buttons

Key Features

- Pre-assembled one-piece, fully enclosed design with 8-pin quick-disconnect
- Illuminated base: one color solid red or two-color solid yellow with flashing red display

Key Benefits

- Quick easy installation with no assembly or wiring required
- Clear, at-a-glance display of status to quickly resolve issues
- 360° visible indication of E-Stop actuation

Process Initiation

see page 62

Challenge

- Initiate test processes
- Unobtrusive actuation
- Operator strain from repeated actuation

Featured Solution

S22 Pro Series Programmable Multicolor Panel Touch Button

Other Solutions

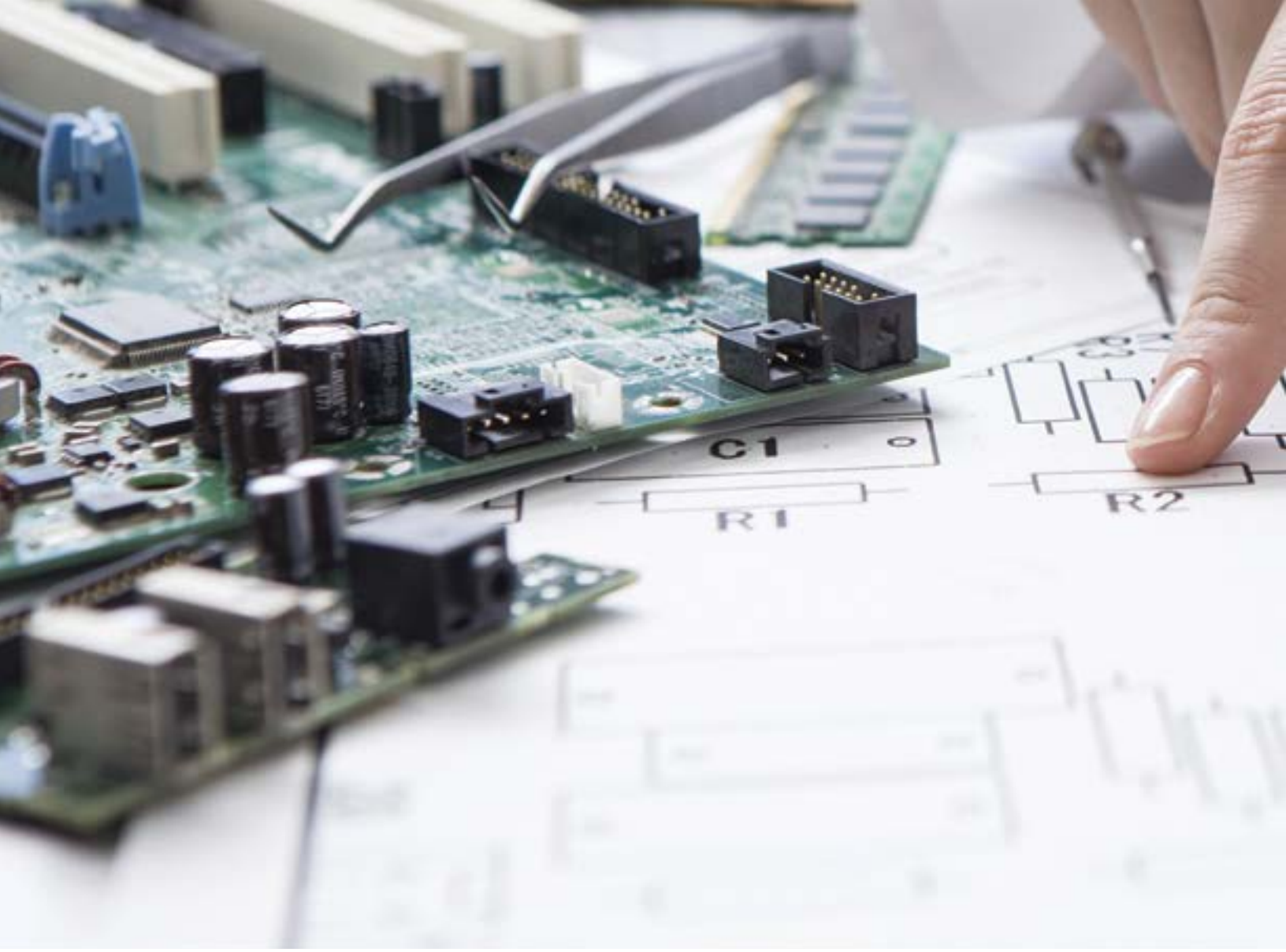
K30 Core Series Illuminated Touch Buttons

Key Features

- Bright, colorful illuminated display
- Smart capacitative sensing technology
- Terminal connector options
- Solid state electronics

Key Benefits

- At-a-glance display of status to quickly resolve issues
- Requires no physical force to actuate, eliminating hand, wrist, and arm stresses
- Quick, easy installation in panels
- Long operational lifespan with minimal maintenance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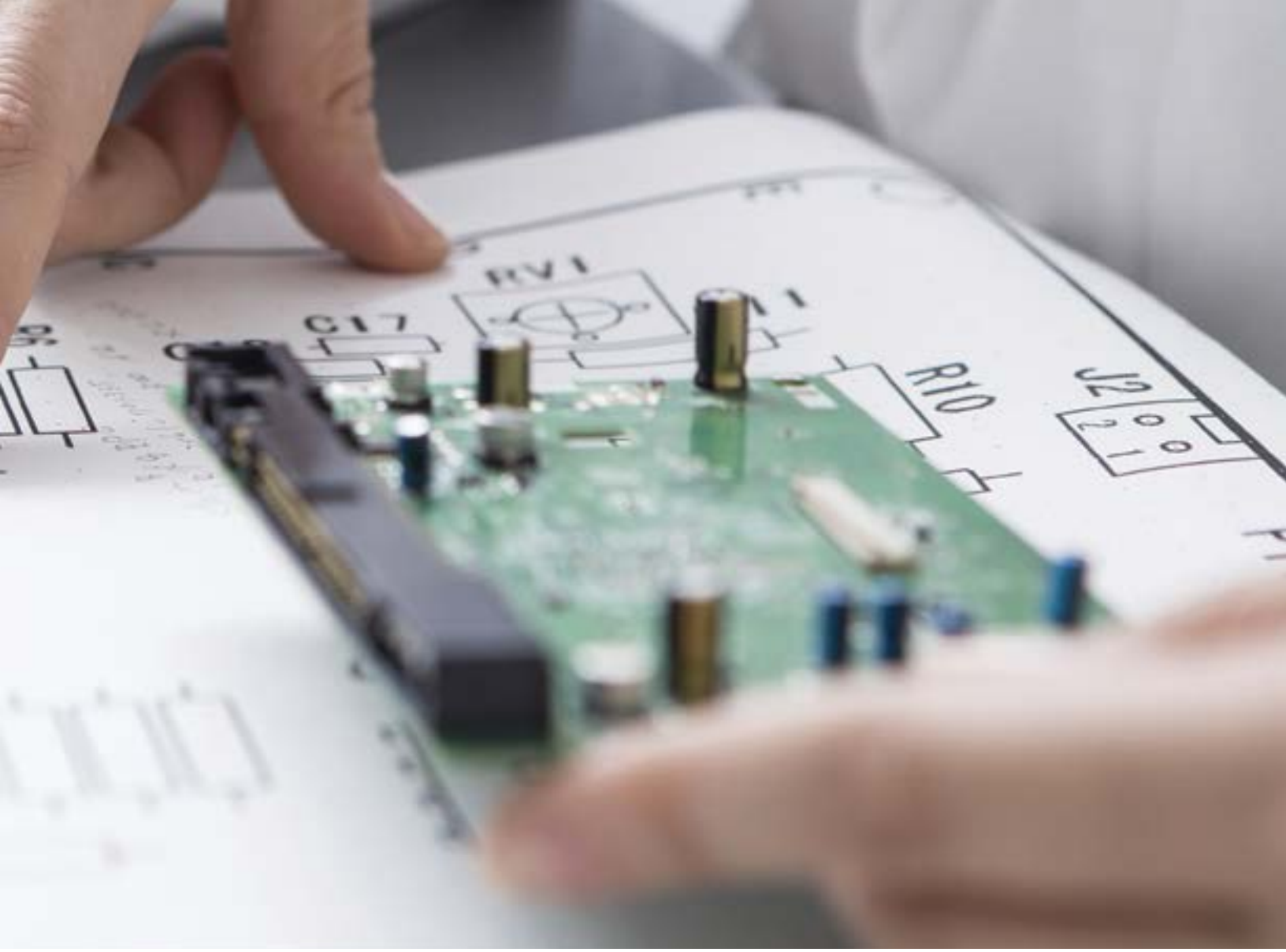


Contract Manufacturing (EMS)

Banner Engineering's broad offering of products and solutions enable electronics equipment manufacturers and electronics manufacturing services (EMS) companies throughout the world to solve their most challenging applications. From energy efficient LED work lighting to a comprehensive offering of safety products, Banner Engineering has the electronics industry experience necessary to solve a variety of applications.

Solutions for Contract Manufacturing (EMS)

see page 60

Monitoring Machine Status

Challenge

- Provide status indication on legacy equipment
- Monitor multiple machines spread out over a wide area
- Improve overall equipment effectiveness
- Maintain a steady workflow

Featured Solution

TL70 Series Modular Tower Lights with Sure Cross® Wireless Communication Segment

Other Solutions

TL70 Series Modular Tower Lights with Sure Cross Wireless Base

Key Features

- Bright, high-visibility illuminated segments
- Modular design with color, audible, and wireless segments available
- Secure, robust Sure Cross wireless network with up to two miles line of sight signal range

Key Benefits

- Provides at-a-glance status indication
- Users can customize functionality adding segments as desired
- Wireless connectivity enables remote monitoring and access to machine performance data
- Quick, easy installation requiring no communication cables to connect devices to the network

see page 43

Verify Presence and Position of Disk

Challenge

- Ensure disk is present and properly properly positioned in a specific location
- Shiny, reflective surface
- Minimize interference with processes

Featured Solution

Q20 Series Sensors and Q4X Series Analog Laser Measurement Sensor

Other Solutions

Q3X Series Laser Contrast Sensor and Q4X Series Laser Measurement Sensor

Key Features

- Reliable sensing range up to 150 mm (Q20) and 600 mm (Q4X)
- Small spot size for precise leading edge detection (Q20 and Q4X)
- Dual teach mode sensing measures the distance to and light intensity from a background condition (Q4X)
- Detects height changes as small as 0.5 mm (Q4X)

Key Benefits

- Enables installation in a convenient location
- Precise measurements ensures proper position
- Detects across a variety of target colors, materials and surfaces based on distance
- Detects a wide range of objects regardless of target color, reflectivity, and transparency

see page 68

Vibration and Temperature Monitoring on a Motor

Challenge

- Off-line motor testing requires costly downtime and can miss changes between tests
- On-line or dynamic testing may neglect key symptoms that indicate motor decline

Featured Solution

Q45VA All-in-One Vibration and Temperature Sensor and Wireless Node and DXM Series Wireless Controller

Other Solutions

QM30VT Series Vibration and Temperature Sensor, MultiHop Modbus Radio or 1-Wire Serial Node, and DXM Series Wireless Controller

Key Features

- Continuously monitor a variety of vibration characteristics and temperature to identify machine problems early
- Communicates data over a secure, reliable Sure Cross® wireless network
- Combines a vibration and temperature sensor, wireless node, and battery power supply in one compact and completely wireless device

Key Benefits

- Monitor multiple machines in real-time from a convenient location
- Identify errors before a failure can occur by creating real-time alerts to notify operators when vibration thresholds have been exceeded
- All-in-one design eliminates the time and expense of installing separate sensors and nodes

see page 70

Vibration and Current Monitoring on a Motor

Challenge

- Expose machine performance issues
- Identify equipment requiring full spectrum analysis
- Establish more strategic scheduling of equipment maintenance

Featured Solution

CM Series Condition Monitoring Node, Current Transformer, and QM30VT Vibration and Temperature Sensor

Key Features

- Combines a wireless radio, antenna, and battery power supply in one compact device
- Preconfigured to work with current transformer and a QM30VT Series vibration and temperature sensor
- Includes 20 amp and a 150 amp current transformer
- Full compatibility with Wireless Solutions Kits and Connected Data Solutions cloud software

Key Benefits

- Quick, easy deployment: simply connect one or both devices and begin communicating
- Eliminates the hassle and expense of running communication cable to connect devices
- Provides access to real time and historical data and makes it easy to create visualization tools, warnings, and alarms to ensure maximum uptime
- Monitors general health and performance, specific components, and can be used to verify that equipment is ON or OFF, track energy use, and identify power surges

see page 55

Operator Guidance for Electronic Assembly

Challenge

- Assemble multiple parts at one station
- Simplify complicated assembly processes
- Improve assembly accuracy
- Increase product output

Featured Solution

PTL110 Series Pick-to-Light devices

Key Features

- Bright, multi-color indication with animation options provide clear communication to guide staff through assembly
- Easy-to-see digital display indicates part count or instructions
- Optical sensor detects hands as they pick pieces
- Very fast response speed for indication of next step in assembly process
- Compatible with DXM700 wireless controller for use on carts and mobile picking stations

Key Benefits

- Simplifies the build of parts and ensures a high level of quality assurance
- System keeps pace with the speed of the assembler
- Precise picking system supports multiproduct assembly, allowing one assembler to work on different components at the same station
- Monitor for speed and accuracy, production and inventory levels, and respond quickly to quality issues

see page 37

Roll Diameter Measurement

Challenge

- Monitor roll of shrink wrap to alert when product is running out
- Splice new roll on to old roll with minimal downtime
- Ensure proper roll tension to prevent breakage

Featured Solution

Q5X Series High Power, Mid-Range Laser Measurement Sensor

Other Solutions

LE Series Laser Displacement Sensor

LTF Series Long-Range Laser Sensor

Key Features

- Dual teach mode sensing measures the distance to and light intensity of the background condition
- 0.1 to 2 m sensing range
- Optional Remote Sensor Display (RSD)

Key Benefits

- Reliable detection regardless of object color, translucence, or reflectivity
- Accurate measurement reduces waste left on the core
- Simplifies setup and monitoring of sensors in difficult-to-access locations
- Reduces downtime between product changeover

Automated Tray Handling System

Reading Barcodes on JEDEC Trays

see page 35

Challenge

- Create record for IC chips being processed
- Space-constrained deployment area
- High-speed process

Featured Solution

ABR Series Imager-Based Barcode Reader

Other Solutions

iVu BCR Series Barcode Reader

Key Features

- Available in models with a WVGA imager or a 1.2 MP imager with standard or polarized windows
- Barcode Manager software with intuitive flowchart programming and advanced capabilities
- Ultracompact housing for even the tightest of spaces
- Factory communication options include Ethernet or USB

Key Benefits

- Reliably reads small, complex, and challenging barcodes
- Quick, easy device setup, management, and monitoring of multiple barcode readers from network-enabled location
- One-piece, ultracompact device fits easily in very small spaces
- Seamless integration with existing equipment and IIoT data collection

Safeguarding Machine Access Points

see page 49

Challenge

- Safeguard access to tray processing area
- Requires redundant, self-checking outputs
- Limited space for deployment

Featured Solution

LP Basic Series compact Type 4 safety light curtain

Other Solutions

LP Series full feature compact Type 4 safety light curtain

Key Features

- Low-profile, compact design and multiple mounting options
- Available in nickel-plated housings for ESD-safe applications
- Zone and status indicators plus digital display to indicate number of beams blocked and detailed diagnostics
- End-to-end sensing design

Key Benefits

- Installs easily in very small spaces
- Device can be installed within the machine frame
- Minimizes downtime by making it easy to easy troubleshoot and quickly resolve issues
- Eliminates detection blind zones

Illuminating Work Area

see page 55

Challenge

- Illuminate machine and work area
- Consistent, even illumination over a wide area
- Reduce service and maintenance on light fixtures

Featured Solution

WLB72 Series LED Task Light

Other Solutions

WLB92 Series LED Task Light

Key Features

- Ultra-bright white light with even light distribution
- Rugged metal housing with shatterproof cover
- Robust electronics and circuit design for long product lifetime
- Plug-and-play operation out of the box

Key Benefits

- Increased safety and productivity
- No bulb replacement or other maintenance
- Low installation costs, quick install time
- Fewer fixtures needed to illuminate the whole area

Displays (Clear Object Detection)

A challenging but critical aspect of electronics manufacturing is the ability to reliably and cost-effectively detect clear objects like transparent film, plastic, or glass and other targets with low optical contrast. Banner Engineering offers a wide variety of solutions to clear object detection challenges, including economical photoelectric sensors, versatile fiber optic sensors, and high-power laser sensors to meet any application requirements

Solutions for Display Production

see page 40

Detecting Clear Plastic Material

Challenge

- Detect clear plastic waste material in a bin
- Prevent overfill of material
- Low optical contrast

Featured Solution

QS18E Clear Object Detection Sensor

Key Features

- Polarized lens with coaxial optics
- Three user-selectable thresholds
- Universal housing design with 18 mm threaded lens and multiple mounting options
- Compensates for dust build up and ambient temperature changes

Key Benefits

- Reliably detects a wide range of clear, translucent, or opaque objects
- Detects at any distance from the face of the sensor out to the reflector with no dead zone
- Optimize performance to the type of object being detected
- Versatile, cost-effective and easy-to-use sensor
- Long operational life with only routine maintenance

see page 41

Monitoring Tote Fill Levels

Challenge

- Detect high and low fill levels
- Low optical contrast between waste water and container
- Challenging environmental conditions

Featured Solution

QS30H2O Series Water Sensor

Other Solutions

DF-G3LIR Long-Range Infrared Water Sensor with Glass Fiber Optic Bundle

Key Features

- Emits a 1450 nm sensing beam that is attenuated by water-based liquids
- Long-range sensing of up to 8 m between emitter and receiver
- Rugged IP67 (NEMA 6) housing and encapsulated electronics

Key Benefits

- Reliably detects the presence of any water-based liquid
- Detects liquids in a wide range of different sized containers
- Resists harsh environments

see page 38

Detecting Clear Plastic Film

Challenge

- Detect clear, thin glass sheet
- Low optical contrast
- Machine vibration

Featured Solution

Q4X Series Laser Distance Sensor

Key Features

- Dual teach mode measures distance and light intensity changes compared to a background reference condition
- Robust IP69K-rated stainless steel housing
- Clear intensity readout from angled three-digit display

Key Benefits

- Detects a wide range of objects regardless of color, reflectivity, and transparency
- Easy-to-see feedback simplifies operation and troubleshooting
- Resists aggressive cleaning, mechanical impact, and extreme vibration
- No reflector required

Products

LM Series

Compact Precision Laser Measurement Sensor

IO-Link®

- Precise measurements with 0.002-0.004 mm analog resolution
- Fast 0.5 ms response speed and 0.25 ms sampling rate
- Compact housing designed to fit into small spaces
- Thermally stable housing and secure mounting for real-world stability
- IP67 and Grade 316 stainless steel for chemical compatibility
- Optional Remote Sensor Display (RSD) for remote monitoring and setup

SMBLML1

SMBLML2

Series	Range (mm)	Output	Connector
LM	**150**	**KI**	**QP**
	150 = 50–150 **80** = 40–80	**KI** = Discrete with IO-Link and 4 to 20 mA analog	**QP** = PVC M12 Euro Pigtail QD

5- Pin M12 Euro-Style with Shield

MQDEC2-515
MQDEC2-515RA
5 m (15')

5-Pin Double-Ended M12 Euro-Style with Shield (Male/Female)

MQDEC3-515SS
5 m (15')

IO-Link®

LE Series

Laser Measurement Sensor

- Precise measurements with 0.02 mm resolution
- Ready to measure right out of the box with simple setup
- Two-line, eight-character intuitive display for easy adjustments
- Small spot, visible laser for simple alignment
- Repeatability and accuracy for challenging targets, from metal to black rubber

Family	Range	Output	Laser Class	Connector
LE	**550**	**I**		**Q**
	550 =100-1000 mm **250** =100-400 mm	**I** = 4 to 20 mA analog and (1) NPN/PNP discrete **U** = 0 to 10 V analog and (1) NPN/PNP discrete **D** = (2) NPN/PNP discrete **K** = Dual Discrete with IO-Link	**Blank** = Class 2 **C1** = Class1	**Blank** = 2 m Integral Cable **Q** = Rotatable M12 Euro QD **QP** = PVC M12 Euro Pigtail QD **W/30** = 9 m Integral Cable

NOTE: Discrete NPN/PNP is user configurable

SMBLEFA

SMBLEL

SMBLEU

5-Pin M12 Euro-Style with Shield

MQDEC2-515
MQDEC2-515RA
5 m (15')

SMBAMSLEIP
full assembly with plate and protective windows

RWAMSLE
replacement windows

SMBAMSLTFP
mounting plate

IO-Link®

Q5X Series

High Power, Mid-Range Laser Measurement Sensor

- Reliable detection of black targets against a black background, black targets against a shiny metal background, clear and reflective objects, multicolor packaging, and targets of all colors
- Dual teach mode measures both distance plus light intensity to solve the most challenging applications
- 270-degree rotatable M12 QD to meet a variety of mounting constraints
- Rated IP67 for reliable performance in wet environments
- Optional Remote Sensor Display (RSD) for remote monitoring and setup

Series	Output	Emitter	Mode	Range (mm)		Connector
Q5X	K	L	AF	2000	–	Q8
	K = Configurable Dual Discrete with IO-Link on all models	**L** = Laser	**AF** = Adjustable Field Background Suppression	**2000** = 2000 (max. specified & settable switch point detection range)		**Q8** = Integral Swivel M12 connector

SMBQ5XFAM10

SMBQ5XDT

SMBQ5XM4F

SMBAMSQ5XIPRA

Double-Ended Euro-Style with 5-pin straight male to 4-pin straight female connectors

Required for use between RSD and sensor

MQDC-4501SS 0.3 m (1')
MQDC-4506SS 1.83 m (6')

5-Pin M12 Euro-Style

MQDC-415
MQDC-415RA 5 m (15')

Q4X Series

Rugged Laser Measurement Sensor

- Save time and money with the Q4X which is ready to measure right out of the box
- A simple user experience from installation to setup
  - Bright spot alignment
  - Three push buttons simplify setup
  - Intuitive menus
- Four-digit display shows distance to target in mm
- FDA-grade stainless steel is suitable for IP69K washdown environments

Threaded

Family	Housing Style	Output	Mode	Range		Connector
Q4X	T	B	LAF	300	–	Q8
	T = 18 mm Threaded Barrel	**B** = Bipolar Discrete NPN & PNP† **K** = Dual Discrete with IO-Link **U** = 0 to10 V Analog **I** = 4 to 20 mA Analog	**LAF** = Laser Adjustable-Field **COD** = Clear Object	**600** = 25-600 mm* **500** = 25-500 mm** **300** = 25-300 mm†† **100** = 25-100 mm		**Q8** = Integral QD

Flush

Family	Housing Style	Output	Mode	Range		Connector
Q4X	F	N	LAF	310	–	Q8
	F = Flush face	**P** = PNP **N** = NPN **K** = Dual Discrete with IO-Link **U** = 0 to10 V Analog **I** = 4 to 20 mA Analog	**LAF** = Laser Adjustable-Field	**610** = 35-610 mm* **310** = 35-310 mm **110** = 35-110 mm		**Q8** = Integral QD

* Only available in Dual Discrete with IO-Link models

** Not available in Dual Discrete with IO-Link models

† Clear Object models only available with bipolar output

†† Clear object only this range

SMBQ4XFA
includes 3/8" bolt for mounting

SMBQ4XFAM10
includes 10 mm bolt for mounting

SMBQ4XFAM12
clamps directly onto industry standard bracket systems of 1/2" or 12 mm rods

SMB18A

SMBAMS18P

5-pin Euro-Style
Used with: Analog models

MQDEC2-515
MQDEC2-515RA
5 m (15')

5-Pin Washdown Euro-Style
Used for: Analog Washdown

MQDCWD-506
2 m (6.5')

4-pin Euro-Style
Used with: NPN, PNP, Dual Discrete

MQDC-415
MQDC-415RA
5 m (15')

5-pin Euro-Style
Used with: Bipolar

MQDC1-515
MQDC1-515RA
5 m (15')

4-Pin Washdown Euro-Style
Used for: NPN, PNP, Dual Discrete

MQDC-WDSS-0415
5 m (15')

5-Pin Washdown Euro-Style
Used for: Bipolar

MQDC-WDSS-0515
5 m (15')

Q3X Series

Laser Contrast Sensor

- High-speed part detection as fast as 250 us, capturing up to 2,000 events per second
- Reliable sensing range up to 300 mm
- Used for challenging presence/absence or orientation detection for applications with small contrast differences
- Rugged, nickel-plated zinc housing suitable even for environments with cutting fluids and oils
- Clear intensity readout from angled three-digit display
- Fixed background suppression models allow for contrast detection in a fixed range while ignoring a background

Family	Housing Style	Output	Mode		Connector
Q3X	T	B	LD	–	Q8
	T = 18 mm Threaded Barrel	**B** = Bipolar Discrete NPN & PNP	**LD** = Laser Diffuse, 300 mm **LD50** = Laser Diffuse, 50 mm (60 mm background suppression) **LD100** = Laser Diffuse, 100 mm (120 mm background suppression) **LD150** = Laser Diffuse, 150 mm (190 mm background suppression) **LD200** = Laser Diffuse, 200 mm (280 mm background suppression)		**Q8** = 5-pin integral QD

SMBQ4XFA
includes 3/8" bolt for mounting

SMBQ4XFAM10
includes 10 mm bolt for mounting

SMBQ4XFAM12
clamps directly onto industry standard bracket systems of 1/2" or 12 mm rods

SMB18A

SMBAMS18P

5-Pin M12 Euro-Style	**MQDC1-515** **MQDC1-515RA** 5 m (15')
5-Pin M12 Euro-Style Washdown - Stainless Steel	**MQDC-WDSS-0515** 5 m (15')

QS18 Series

All-Purpose Photoelectric Sensor

- Features a universal housing with an 18 mm threaded lens or side mounts
- Meets IP67 and NEMA 6 standards for harsh environments
- Available in opposed, polarized and non-polarized retroreflective, convergent, regular and wide-angle diffuse, small spot diffuse, laser, ultrasonic, plastic or glass fiber optic, fixed-field and adjustable-field sensing modes
- Offers easy push-button TEACH-mode setup in Expert QS18E and ultrasonic models
- Available in models with IO-Link communication for simplified wiring, installation, preventative maintenance, and sensor backup

Family	Output	Power	Sensing Mode		Connector
QS18	**VP**	**6**	**LLP**	–	**Q8**
	VN = NPN **VP** = PNP	**6** = DC power	**LLP** = Polar retro		**Blank** = 2 m Integral Cable **Q8** = M12 4-pin Euro QD

Family*	Output	Power	Sensing Mode		Connector
QS18E	**P**	**6**	**XLPC**	–	**Q8**
	N = NPN **P** = PNP **K** = Programmable PNP or NPN with IO-Link	**6** = DC power	**XLPC** = Polar retro with coaxial optics for clear objects		**Blank** = 2 m Integral Cable **Q** = M8 4-pin Pico Pigtail QD **Q5** = M12 4-pin Euro Pigtail QD **Q7** = M8 4-pin pico QD **Q8** = M12 4-pin Euro QD

* All models require a reflector

SMB312S

SMB18A

4-Pin M12 Euro-Style — **MQDC-415** 5 m (15')

4-Pin Pico-Style Straight Right-angle — **PKG4M-5** **PKW4M-5** 5 m (15')

VS8 Series

Miniature Sensor for Precise Detection

- Miniature sensor for installation in the smallest of spaces
- Red laser models provide bright, precise laser light spot for optimum small part detection
- Models with a blue LED reliably detect challenging targets, including dark, reflective, and transparent objects without requiring a reflector
- High switching frequency for detection in even the fastest processes
- Robust, glass-fiber-reinforced plastic housing

Sensing Mode → Blue LED	Range	Output Type	Connection	Model
Blue LED, Fixed 30 mm Background Suppression	2 to 30 mm (0.08 to 1.18 in)	PNP NPN	2 m (6.5 ft) unterminated 4-wire PUR cable	**VS8APFF30B*** **VS8ANFF30B***

* To order the 200 mm (7.8 in) PUR cable model with a 3-pin M8/Pico-style quick disconnect, add suffix "Q3" to the model number. For example, VS8APFF15Q3

SMBVS8DT

SMBVS8RA

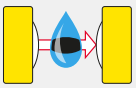
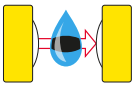
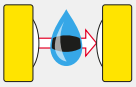
4-Pin M12 Euro-Style — **MQDC-415** 5 m (15')

	3-Pin	4-Pin
Pico-Style Straight Right-angle	**PKG3M-5** **PKW3M-5** 5 m (15')	**PKG4M-5** **PKW4M-5** 5 m (15')

QS30 Water Detection

DC-Operated Long-Range Sensors

- Detects waterbased liquids in translucent and opaque bottles
- Ability to work reliably in low contrast applications
- 1450 nm infrared wavelength to enhance contrast of clear liquids

Sensing Mode ⇨ Infrared LED	Range	Connection	Output Type	Model
 OPPOSED WATER DETECTION	4 m	2 m 5-pin Euro Pigtail QD 2 m 5-pin Euro Pigtail QD 2 m 5-pin Euro Pigtail QD 2 m 5-pin Euro Pigtail QD	— Bipolar NPN/PNP LO Bipolar NPN/PNP DO Analog 0-10 V	**QS30EXH2O Emitter** **QS30EXH2OQ5 Emitter** **QS30ARXH2O** **QS30ARXH2OQ5** **QS30RRXH2O** **QS30RRXH2OQ5** **QS30RXH20U** **QS30RXH20UQ5**
 OPPOSED WATER DETECTION	2 m	2 m 5-pin Euro Pigtail QD 2 m 5-pin Euro Pigtail QD	Bipolar NPN/PNP LO Bipolar NPN/PNP DO	**QS30ARH2O** **QS30ARH2OQ5** **QS30RRH2O** **QS30RRH2OQ5**
SUPER HIGH-POWER  OPPOSED WATER DETECTION	8 m	2 m 5-pin Euro Pigtail QD 2 m 5-pin Euro Pigtail QD 2 m 5-pin Euro Pigtail QD	— Bipolar NPN/PNP LO Bipolar NPN/PNP DO	**QS30EXSH2O Emitter** **QS30EXSH2OQ5 Emitter** **QS30ARXSH2O** **QS30ARXSH2OQ5** **QS30RRXSH2O** **QS30RRXSH2OQ5**

SMBQS30L

SMBQS30LT

SMBQS30Y

SMB30SC

5-Pin M12 Euro-Style | **MQDC1-515** 5 m (15')

T30UX Series

Right-Angle, Long-Range Ultrasonic Sensors

- Built-in temperature compensation for high-accuracy across a wide range of ambient temperatures
- Resists harsh environments with rugged IP67 (NEMA 6) housing and fully encapsulated electronics
- Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience

Range	Frequency	Connection	Response Time	Output	Models*
100 mm to 1 m	224 kHz	2 m 4-Pin Euro QD	45 ms	**Discrete:** NPN, PNP, NO, NC, Selectable	**T30UXDA** **T30UXDAQ8**
200 mm to 2 m	174 kHz	2 m 4-Pin Euro QD	92 ms	**Discrete:** NPN, PNP, NO, NC, Selectable	**T30UXDB** **T30UXDBQ8**
300 mm to 3 m	114 kHz	2 m 4-Pin Euro QD	135 ms	**Discrete:** NPN, PNP, NO, NC, Selectable	**T30UXDC** **T30UXDCQ8**
100 mm to 1 m	224 kHz	2 m 4-Pin Euro QD	Selectable 45 or 105 ms	**Analog:** 0 to 10 V dc	**T30UXUA** **T30UXUAQ8**
100 mm to 1 m	224 kHz	2 m 4-Pin Euro QD	Selectable 45 or 105 ms	**Analog:** 4 to 20 mA	**T30UXIA** **T30UXIAQ8**
200 mm to 2 m	174 kHz	2 m 4-Pin Euro QD	Selectable 92 or 222 ms	**Analog:** 0 to 10 V dc	**T30UXUB** **T30UXUBQ8**
200 mm to 2 m	174 kHz	2 m 4-Pin Euro QD	Selectable 92 or 222 ms	**Analog:** 4 to 20 mA	**T30UXIB** **T30UXIBQ8**
300 mm to 3 m	114 kHz	2 m 4-Pin Euro QD	Selectable 135 or 318 ms	**Analog:** 0 to 10 V dc	**T30UXUC** **T30UXUCQ8**
300 mm to 3 m	114 kHz	2 m 4-Pin Euro QD	Selectable 135 or 318 ms	**Analog:** 4 to 20 mA	**T30UXIC** **T30UXICQ8**

SMB30A

SMB30FA..

SMB1815SF

4-Pin M12 Euro-Style with Shield

MQDEC2-415
MQDEC2-415RA
5 m (15')

Q12 Series

Miniature Self-Contained Sensor

- Delivers powerful sensing performance in extremely confined areas
- Rated IP67 for use in the widest range of locations and applications
- Available in models with rugged, sealed housing or PFA chemical-resistant jacket
- Uses unique overmolded design for enhanced durability and shieldingvv

Family*	LO/DO	Output	Power	Sensing Mode	Connector**
Q12	A	B	6	LP	
	Blank = Emitter **A** = Light Operate (LO) **R** = Dark Operate (DO)	**Blank** = Emitter **B** = Bipolar **P** = PNP **N** = NPN	**6** = DC power	**E** = Emitter **R** = Receiver **LP** = Polarized Retro **LV** = Retroreflective **FF15** = Fixed-field (15 mm cutoff) **FF30** = Fixed-field (30 mm cutoff) **FF50** = Fixed-field (50 mm cutoff)	**Blank** = 2 m Integral Cable **Q** = 4-pin Euro pigtail QD **Q3** = 3-pin Pico pigtail QD **Q5** = 4-pin Euro pigtail QD

* For black housing, add prefix D to the model number, for example DQ12AB6FF15
** For 9 m (30 ft) cable, add suffix W/30 to the model number, for example, Q126E W/30

SMBQ12T

SMBQ12A

4-Pin Euro-Style (for Q5 models)

MQDC-415
MQDC-415RA
5 m (15')

Pico-Style
Straight
Right-angle

3-Pin	4-Pin
PKG3M-5 **PKW3M-5** 5 m (15')	**PKG4M-5** **PKW4M-5** 5 m (15')

Q20 Series

Industry Standard Global Housing

- Versatile sensor with a universal rectangular housing and multiple mounting options, making it ideal for global manufacturing
- Rated to 1200 psi for use in washdown environments
- Enhanced design for noise immunity and crosstalk avoidance
- Visible red beam for easy alignment on most models

Family	Output	Sensing Mode*	Range	Connector
Q20	N	FF	50	Q8
	N = NPN **P** = PNP	**FF** = Fixed Field	**50** = 0-50 mm cutoff **100** = 0-100 mm cutoff **150** = 0-150 mm cutoff	**Blank** = 2 m Integral Cable **Q5** = M12 4-pin Euro Pigtail QD

*

SMBQ20H

SMBQ20LV

SMBQ20L

SMBQ20U

4-Pin Euro-Style (for Q5 models)

MQDC-415
MQDC-415RA
5 m (15')

4-Pin Pico-Style
Straight
Right-angle

PKG4M-5
PKW4M-5
5 m (15')

4-Pin Pico-Style Snap-On (for Q7 models)
Straight
Right-angle

PKG4-2
PKW4Z-2
2 m (6.5')

DF-G3 Series

Long-Range Fiber Optic Amplifiers

- World-class long-range sensing capability, more than 3 m (10 ft) with opposed mode fibers
- Easy to read dual digital displays show both signal level and threshold simultaneously
- Cross-talk avoidance function allows seven inspections in dense sensing point applications
- Models with IO-Link enable a point-to-point communication link between a master device and a sensor, facilitating remote monitoring, teaching, and configuration
- Operator control of the sensitivity (hysteresis) provides additional detection sensitivity, or a stabilized output depending on the application details

IO-Link

Sensing Beam Color	Range	Connection	Output	Models
Visible Red, 635 nm	3,000 mm	2 m	Channel1: IO-Link, push/pull Channel2: PNP only output, or input	**DF-G3-KD-2M**
Infrared, 850 nm	6,000 mm	2 m	Channel1: IO-Link, push/pull Channel2: PNP only output, or input	**DF-G3IR-KD-2M**

Analog

Sensing Beam Color	Range	Connection	Analog Output	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	Voltage: 0-10 V DC	**DF-G3-NU-2M**	**DF-G3-PU-2M**
			Current: 4-20 mA	**DF-G3-NI-2M**	**DF-G3-PI-2M**
Infrared, 850 nm	6,000 mm	2 m	Voltage: 0-10 V DC	**DF-G3IR-NU-2M**	**DF-G3IR-PU-2M**
			Current: 4-20 mA	**DF-G3IR-NI-2M**	**DF-G3IR-PI-2M**

Single Output

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	**DF-G3-NS-2M**	**DF-G3-PS-2M**
Infrared, 850 nm	6,000 mm	2 m	**DF-G3IR-NS-2M**	**DF-G3IR-PS-2M**

Dual Output

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	**DF-G3-ND-2M**	**DF-G3-PD-2M**
Infrared, 850 nm	6,000 mm	2 m	**DF-G3IR-ND-2M**	**DF-G3IR-PD-2M**

* Only 2 m (6.5 ft) PVC cable models are listed. To order M8 Pico pigtail, change suffix "**2M**" to "**Q3**" (for example, **DF-G3-NU-Q3**).
To order M12 Euro pigtail, change suffix "**2M**" to "**Q5**" (for example, **DF-G3-NU-Q5**).

DF-G2 Series

High-Speed Fiber Optic Amplifier

- Best in class response speeds of 10 µs, 15 µs, 50 µs, 250 µs, 500 µs, and 1000 µs
- Easy-to-read dual digital displays show signal level and threshold values
- Simple user interface ensures easy sensor set-up and programming via displays and switches/buttons or remote input teach wire
- Expert TEACH and SET methods ensure optimal gain and threshold for all applications, especially for high speed or low contrast applications
- Thermally stable electronics shortens start-up time and maintains signal stability during operation
- Economy display mode reduces amplifier power consumption by 25%
- Cross talk avoidance algorithm allows two sensors to operate in close proximity

IO-Link

Sensing Beam Color	Range**	Connection*	Channel 1 Output	Channel 2 Output	Model*
Visible red	1100 mm	150 mm (6 in) PVC pigtail, M12 Euro, 5-pin	IO-Link, push/pull	PNP only, or input	**DF-G2-KD-Q5**
Infrared†	2100 mm	150 mm (6 in) PVC pigtail, M12 Euro, 5-pin	IO-Link, push/pull	PNP only, or input	**DF-G2IR-KD-Q5**

DF-G2: High-Speed Single Discrete Output

Sensing Beam Color	Range	Connection	NPN Model	PNP Model
Visible red	Range varies by response speed used, gain setting, target light source intensity, ambient light level and with fiber optics used.	2 m	**DF-G2-NS-2M**	**DF-G2-PS-2M**
		9 m	**DF-G2-NS-9M**	**DF-G2-PS-9M**
		150 mm (6 in) PVC pigtail, M8 Pico connector, 4-pin	**DF-G2-NS-Q3**	**DF-G2-PS-Q3**
		150 mm (6 in) PVC pigtail, M12 Euro QD connector, 4-pin	**DF-G2-NS-Q5**	**DF-G2-PS-Q5**
		Integral M8 Pico, 4-pin	**DF-G2-NS-Q7**	**DF-G2-PS-Q7**

DF-G2 Color LED

Sensing Beam Color	Range	Connection*	NPN Models	PNP Models
Infrared†	190% of Visible Red Range	2 m	**DF-G2IR-NS-2M**	**DF-G2IR-PS-2M**
Broad spectrum white	50% of Visible Red Range	2 m	**DF-G2W-NS-2M**	**DF-G2W-PS-2M**
Visible green	60% of Visible Red Range	2 m	**DF-G2G-NS-2M**	**DF-G2G-PS-2M**
Visible blue	70% of Visible Red Range	2 m	**DF-G2B-NS-2M**	**DF-G2B-PS-2M**

* Only 2 m (6.5 ft) PVC cable models are listed. To order M8 Pico pigtail, change suffix "**2M**" to "**Q3**" (for example, **DF-G3-NU-Q3**). To order M12 Euro pigtail, change suffix "**2M**" to "**Q5**" (for example, **DF-G3-NU-Q5**).

** Excess gain = 1, Long Range response speed, opposed mode sensing. PIT46U plastic fiber used for visible LED models, IT.83.3ST5M6 glass fiber used for IR model

† IR models require T5 terminated glass fiber optic cables

DIN-35..

SA-DIN-BRACKET

SA-DIN-CLAMP
Mounting Clamp

4-pin Euro QD for Q8 or Q5 models

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

4- pin Pico QD for Q7 models
Straight snap-on connector

Right-angle snap-on connector

PKG4-2
2 m (6')
PKW4Z-2
2 m (6')

XS26-2

Expandable Safety Controller

- PC Configurable: Flexible and easy-to-use
- Safety Inputs: 26 (base unit) up to 154
- Independently controlled Safety Outputs: up to 68, 0.5A to 6A each
- Convertible Safety Inputs: 8 (Base Unit) up to 40
- LCD Display for easy troubleshooting
- Industrial Ethernet

Modbus PROFINET EtherNet/IP PCCC

Model*	Description	Inputs/ Convertible	Independently Controlled Safe Outputs	Max.Safety Output Rating
XS26-2d XS26-2de 	Base Controller with LCD	26/8	2	0.5A PNP @24 V dc
XS26-2 XS26-2e 	Base Controller	26/8	2	0.5A PNP @24 V dc
XS8si 	Safety Input Module	8/2	NA	NA
XS16si 	Safety Input Module	16/4	NA	NA

Model*	Description	Inputs/ Convertible	Independently Controlled Safe Outputs	Max.Safety Output Rating
XS2so 	Safety Output Module	NA	2	0.75A PNP @24 V dc
XS4so 	Safety Output Module	NA	4	0.5A PNP @24 V dc
XS1ro 	Safety Relay Output Module	NA	1	6A; 2 NO, 1 NC aux
XS2ro 	Safety Relay Output Module	NA	2	6A; 2 NO, 1 NC aux

* Models operate at 24 V dc +/- 20%

SC-XM3
Memory Card

SC-XMP2
Programming Tool for SC-XM2

SC-USB2
USB Cable for PC configuration of SC26/XS26

SC10

Hybrid Safety Controller plus 2 Safety Relays

- PC Configurable: Flexible and easy-to-use
- Safety Inputs: up to 10; up to 14 using Automatic Terminal Optimization (ATO)
- Independently controlled Safety Outputs: 2, 6A each
- Convertible Safety Inputs: 4
- Terminal LEDs for easy troubleshooting
- Industrial Ethernet

Modbus PROFINET EtherNet/IP PCCC

Model*	Description	Inputs/Convertible	Independently Controlled Safe Outputs	Max.Safety Output Rating
SC10-2roe 	Base Controller	10/4	2	6A; 3 NO

* Models operate at 24 V dc +/- 20%

Store SC-XM3 memory card directly on SC10

SC-XM3

Fast Programming and Swapout

- Backup copy of configuration, password, network settings
- Download configuration without a PC; Save time during panel build
- Fast swapout to minimize downtime at swapout

SC-USB2
USB Cable for PC configurtion of SC10

SC-XM3
Memory Card

SLC4 Series

Basic Feature, Very Compact Type 4 Safety Light Curtain

- Basic models with limited options for additional value on simple applications
- Very compact aluminum housing with IP65 polycarbonate enclosure for smaller production machines
- End-to-end sensing (no blind zone)
- Highly visible alignment and dianostic indicators
- Available in 14 or 24 mm resolutions (detection capability)
- Defined areas of 160, 240 and 320 mm
- 2 m maximum sensing range
- Integral 300 mm M12 QD Pigtail included

Family	System Type	Resolution		Defined Area	Termination
SLC4	P	14	–	160	P44
	P = Pair (Emitter and Receiver) **E** = Emitter only **R** = Receiver only	**14** = 14 mm **24** = 24 mm		**160** = 160 mm **240** = 240 mm **320** = 320 mm	**P4** = 300 mm pigtail, 4-Pin M12 QD (individual Emitter or Receiver models) **P44** = 300 mm pigtail, 4-Pin M12 QD pigtails (Pair)

SLC4A-MBK-10

SLC4A-MBK-11

SLC4A-MBK-12

LP Basic

Basic Feature, Very Compact Type 4 Safety Light Curtain

- 4 meter range
- 14 and 25 mm resolution
- IP54 rated
- Defined areas from 270 to 690 mm in 140 mm increments
- Basic functionality auto start/restart (trip output)
- “RD” M12 pigtail and brackets ordered separately

Family	System Type	Resolution		Defined Area	Termination
SLPVA	P	14	—	410	
	P = Pair (Emitter and Receiver) **E** = Emitter only **R** = Receiver only	**14** = 14 mm **25** = 25 mm		**270** = 270 mm **410** = 410 mm **550** = 550 mm **690** = 690 mm	**Blank** = No pigtail, RD connection

"RD" to M12 Pigtail
Euro-Style M12 Male QD to LP Custom "RD" Connector

DELPE-51D (5-pin)
0.3 m (1 ft)
DELPE-81D (8-pin)
0.3 m (1 ft)

LPA-MBK-10

LPA-MBK-16

LPA-MBK-11

LPA-MBK-12

8-PIN RD Cordsets

RDLS-815
4.6 m (15')

8-pin M12 Euro-Style

QDE-850D
15.2 m (50')

5-pin M12 Euro-Style

QDE-550D
15.2 m (50')

RFID Switches

Non-Contact

- Single and cascade models available to protect one or multiple entry points
- Status and performance data from each sensor in a cascade chain is available using In-Series Diagnostics (ISD) and can be accessed with an HMI or similar device
- On-sensor LED indicator provides at-a-glance status information
- Cascade up to 32 sensors in a series using a standard 4-wire cable with M12 connectors, T-adapters, and an end plug
- Tamper resistance to meet the needs of any application with unique, high, and low code models
- Achieves Cat 4, PL e, or SIL CL 3 safety ratings alone or in a cascade chain
- Rugged, IP69 construction withstands exposure to high-pressure, high-temperature washdown
- High tolerance (10 mm) to misalignment enables reliable performance in challenging industrial environments where machine vibration and impact are possible

Family	System Type	Reset		Coding*	Connector
SI-RF	**P**	**T**	–	**U**	**P8**
	P = Single **S** = Cascade **D** = Cascade with (ISD)	**T** = Automatic (Trip) **L** = Manual (Latch)		**L** = Low **H** = High **U** = Unique	**P8** = 250 mm pigtail, M12 8-pin QD **2M** = 2 m cordset** **P5** = 250 mm, M12 5-pin QD**

QD models require mating cordset

NOTE: SI-RF-A Actuator is required to complete a sensor solution. Ordered separately.

* Tamper Resistant Coding
Low (L)—The SI-RF Safety Switch accepts any SI-RF-A actuator
High (H)—The SI-RF Safety Switch only accepts the last taught-in actuator, a maximum of 12 teach-in processes are possible
Unique (U)—The SI-RF Safety Switch only accepts the taught-in actuator, and only one teach-in process is possible

** Available on single models only

In-Series Diagnostics (ISD) provides users with status and performance data from each sensor in a cascade chain. The ISD data collected is converted to IO-Link so it can be accessed with an HMI or similar device. Users receive notification when an event has occurred as well as where in the series the event occurred. Events include the opening or closing of a door, door misalignment, wrong actuator, and a number of sensor health attributes.

ISD to IO-Link Module

Access comprehensive diagnostic information for each sensor and for the entire system (string of switches) directly via IO-Link or an IO-Link Master with gateway or via a laptop with USB interface.

- Time and cost savings during commissioning, maintenance and fault investigation
- Protection against unexpected machine stops through pre-fault detection
- Basic information, such as switch safety input and safety output status, can be quickly obtained
- Extended diagnostic information and fault information can also be obtained as needed

Model	Output	Interface
SI-RFA-DM1	8 digital outputs; 1 diagnostic circuit	IO-LINK and USB 2.0

SI-RFA-TS
T-Adapter for series connecting switches
4-pin to 8-pin to 4-pin

SI-RFA-P
Termination plug

SI-RFA-TK
T-Adapter for local reset button
8-pin to 4-pin to 8-pin

MQDEC-4xxSS
4-pin Male/Female M12 double-ended cable (straight to straight)

MQDEC-4xxRS
4-pin Male/Female M12 double-ended cable (right-angle to straight)

MQDC-4xx
4-pin female M12 to flying lead cable

USB-USBM-1
1M USB configuration cable for the SI-RFA-DM1

Magnetic Switches

Non-Contact

- Cost-effective non contact solution minimizes device wear and tear, even in applications with persistent use
- 3 to 5 mm misalignment tolerence
- A single magnetic pair can achieve up to Category 4/PLe safety rating
- Coded magnets minimize the potential for intentional defeat
- Available in cable or QD models

Family	Housing	Device Type	Connection Orientation	Connection
SI-MAGB	1	SM		
	1 = Rectangular **2** = Square **3** = Round	**SM** = Sensor **MM** = Magnet	**Blank** = Standard **CO** = Opposite	**Blank** = 3 m cable **QD** = 4-pin QD **-W/30** = 9 m cable

NOTE: When ordering housing **1** or **2** with a QD connection, you will receive an M8 Pico connector. When ordering housing **3** with a QD connection you will receive an M12 Euro connector.

QD models require mating cordset

Hinge Switches

One-Piece Sensor and Actuator with Hinge Function

- Mounts at the axis of a swinging guard where the possibility of misalignment is at its lowest, minimizing the opportunity for nuisance trips
- Achieves Category 4/PLe safey rating with two switches deployed
- Once set, the switch point setting mechanism is fully concealed within the switch, preventing access and complicating any attempts to bypass safety functions
- Available in stainless steel, IP69-rated models that resist high-pressure, high-temperature washdown and similar challenges
- Hinge switches are similar in appearance to standard door hinges, making them completely inconspicuous once installed
- One piece device installs quickly with no need to align the switch and actuator

Family	Material	Contact Configuration	Connection	Switch Position	Connection Exit	Washdown Rating
SI-HG63		F	QD	R		-W
	Blank = Stainless Steel **Z** = Zinc Die-cast	**F**	**QD** = 6-pin Micro-style QD	**R** = Switch mounted on right side of hinge **L** = Switch mounted on left side of hinge **B** = Switches mounted on both sides of hinge*	**Blank** = Inline QD/Cable **R** = Right angle QD/Cable	**Blank** = IP67 **-W** = IP69 Washdown*

* Stainless steel models only

SI-LS31HG
Lever Hinge Switch

SI-LS3R
Rotary Hinge Switch

SI-HG63A
Satainless Steel Blank Hinge

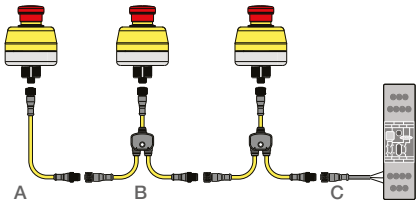
SI-HGZ63A
Zinc Blank Hinge

E-Stop Button

Illuminated 30 mm Mount

- Illumination allows for easy identification of which E-stop has been activated
- Easy installation and no assembly or individual wiring required
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- Incorporate with OTB/STB optical touch button for a simplified operator station that does not require an additional enclosure.
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Internal electronics automatically change the color from the on state to the off state when the button is pressed

Description	Illumination	Models
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	**SSA-EB1PLYR-12ECQ8**
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	**SSA-EB1PLGR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	**SSA-EB1PLXR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, with 60 mm button	**SSA-EB2PLXR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	**SSA-EB1PL-12ECQ8**
2NC – Safety BUS node compatible	YEL/RED-Flash	**SSA-EB1PLYR-02ECQ5A**
2NC – Safety BUS node compatible	OFF/RED-Flash	**SSA-EB1PLXR-02ECQ5A**
2NC – Safety BUS node compatible	OFF/RED-Soild	**SSA-EB1PL-02ECQ5A**
2NC – Safety BUS node compatible	Illuminated button, OFF (armed), RED (solid, PUSH ON)	**SSA-EB1PL2-02ECQ5A**
2NC – Safety BUS node compatible	YEL/RED-Flash	**SSA-EB1PLYR-02ECQ5B**
2NC – Safety BUS node compatible	OFF/RED-Flash	**SSA-EB1PLXR-02ECQ5B**
2NC – Safety BUS node compatible	OFF/RED-Solid	**SSA-EB1PL-02ECQ5B**
2NC – Safety BUS node compatible	Illuminated button, OFF (armed) RED (solid, PUSH ON)	**SSA-EB1PL2-02ECQ5B**



SSA-MBK-EEC1

SSA-MBK-EEC2

SSA-MBK-EEC3

SSA-EB1P-ECWC
Washdown cover

(A) Euro-Style Double-ended male/female

5-Pin	8-Pin
DEE2R-53D 0.9 m (3')	**DEE2R-83D** 0.9 m (3')

(B) Euro-Style Straight splitter

4-Pin	8-Pin
CSS-M12F43M12M41M12F41 0.9 m (3')	**CSS-M12F83M12M81M12F81** 0.9 m (3')

(C) M12/Euro-Style Shielded

4-Pin	8-Pin
MQDC-415 5 m (15') **MQDC-415RA** 5 m (15')	**MQDC2S-815** 5 m (15') **MQDC2S-815RA** 5 m (15')

M12/Euro-Style Straight female, non-shielded

	SXA-815D 5 m (15')

WLS15 Series

Low Profile LED Strip Light

- Improves visibility, safety, and efficiency
- 15 mm low profile fits in tight spaces that other lights cannot
- Installs in minutes without impacting existing application framework
- Single-color and dual-color with EZ-STATUS® available
- EZ-STATUS® combines illumination and multiple indication capabilities in a single device

Single-Color Models

Family	Cascadable	Color	Length (mm)	Window	Construction	Connector
WLS15	X	DW	0360	D	S	C2
	C = Cascadable **X** = Non Cascadable	**DW** = Daylight White **WW** = Warm White	**0220** **0640** **0360** **0920** **0500** **1200**	**D** = Diffuse	**S** = Sealed (IP66, IP67)	**C2** = 2 m Integral **QP** = 150 mm Integral Euro QD **QS** = 150 mm Integral cable with Deutsch DTM

Models with a QD or Deutsch DTM connector require a mating cordset

Dual-Color Models

Family	Cascadable	Color 1	Color 2	Length (mm)	Window	Construction	Connector
WLS15	X	W	R	0360	D	S	C2
	C = Cascadable **X** = Non Cascadable	**W** = Daylight White **B** = Blue **G** = Green	**R** = Red **Y** = Yellow **A** = Amber	**0220** **0640** **0360** **0920** **0500** **1200**	**D** = Diffuse	**S** = Sealed (IP66, IP67)	**C2** = 2 m Integral **QP** = 150 mm Integral Euro QD

Models with a QD connector require a mating cordset

LMBWLS15-150S

LMBWLS15

LMBWLS15MAG

LMBWLS15TF (Tape)

PSW-24-1
Power Supply (Adapters included)

4-Pin Euro-Style

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

4-Pin Euro-Style
Double-ended

Straight/Straight

MQDEC-412SS
3 m (12')

Straight/Right-Angle

MQDEC-412RS
3 m (12')

2-Pin Deutsch
Single-ended cordset with straight connectors for single-colored models

DTMC-215
5 m (15')

2-Pin Deutsch
Double-ended cordset with straight connectors

DTMEC-206
2 m (6')

WLB32 Series

LED Light Bar

- Banner's WLB32 is an ultra-bright LED fixture that features an even light output for a no glare 'glow'
- Highly energy efficient for overall cost savings
- High/Low/OFF switch
- Daisy chain power to multiple lights
- Metal housing, shatterproof window
- Easy installation with snap clips, or a choice of magnetic or angle brackets

Family	Power	Cascadable	Lighted Length (mm)	Shield	Control	Connector	Plug Type**
WLB32		C	285		PB	Q	
	Blank = DC **Z** = AC	**C** = Cascadable	**285** **850** **570** **1130**	**Blank** = No shield **E** = Eye shield	**Blank** = None **M** = Motion Switch **PB** = Hi/Lo/OFF Switch	**Blank** = 2 m Integral Cable (dc) **Q** = Integral Euro QD (dc) **QM** = AC	** Only needed for AC models **B** = North & Central America, Japan, Taiwan **D** = India, Sri Lanka, Nepal, Namibia **EF** = France, Belgium, Slovakia, Tunisia, Germany, Austria, Netherlands, Spain, S. Korea, Turkey, Poland **G** = UK, Ireland, Cyprus, Malta, Malaysia, Singapore, Hong Kong, Vietnam **I** = Australia, New Zealand, Papua New Guinea, Argentina, China **N** = Brazil, South Africa **C** = AC connector with flying leads **Blank** = AC (no power cord)

DC Cascadable

AC Cascadable

Hi/Low/Off Switch

Motion Detection

Eye Shield

LMBWLB32

LMBWLB32-180S

LMBWLB32U

LMBWLB32UT

LMBWLB32MAG

Cordsets for DC Models

4-pin Euro-Style

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

4-pin Euro-Style QD Double-Ended
Straight/Straight or Straight/Right-angle

MQDEC-403SS
1 m (3')
MQDEC-403RS
1 m (3')

4-pin Euro-Style QD Splitter

Branches	Trunk
0.3 m	0.3 m

CSB-M1241M1241

Cordsets for AC Models

Double-Ended
NEMA 5-15 grounded (IEC Type B)

LQMAC-306B
2 m (6.5')

Double-Ended
For Cascading Straight/Straight

LQMAEC-312SS
3 m (12')

PTL110

Scalable, Versatile Pick-to-Light Solution

- Achieve fast picking speeds in large scale systems with PICK-IQ™ serial communication
- Optimize application performance with options including optical sensor, touch button and display
- Reduce system costs with simple mounting and direct device connection

Family	Housing	Control		Sensor	Touch	Display	Connection
PTL	110	S	–	FF100	T	D3	QP150
		S = PICKIQ® Serial Communicaton		**FF100** = 100 mm fixed-field **FF200** = 200 mm fixed-field **Blank** = No sensor input	**T** = Touch with Indicator **L** = Indicator only	**D3** = 3-digit LED display **Blank** = No display	**QP150** = Dual 150 mm PVC cable with M12 Euro-style QD

LMBPTL110F

LMBPTL110A45

For slotted extrusion and flat rail mounting

LMBPTL110C

For 28 mm tubular racking

	**4-pin Euro-Style**	**MQDC-415** 5 m (15') **MQDC-415RA** **5 m (15')**
	5-Pin M12/Euro-Style Shielded Straight connector models listed	**MQDC-STP-515** 5 m (15')
	**4-pin Euro-Style QD** Double-Ended Female Straight/Male Straight	**MQDEC-406SS** 2 m (6.5')
	**4-pin Euro-Style QD** Double-Ended Male Straight/Male Straight	**MQDEC-401SS-MM** 0.3 m (1')
	**4-pin Euro-Style QD** Double-Ended Female Straight/Female Straight	**MQDEC-401SS-FF** 0.3 m (1')

WLB72

Industrial LED Strip Light

- Improve visibility with bright, uniform illumination
- Reduce costs through high-efficacy, low-maintenance design
- Simplify installation and wiring with versatile, reliable hardware

Family	Tier	Voltage	Cascadable	Color	Lighted Length (mm)	Window	Control	Connector
WLB72	B	Z	C	W	1200	D	A	CT
	B = Basic	**Z** = AC	**C** = Cascadable	**W** = Daylight White	**1200**	**D** = Diffuse	**A** = 0-10 V Analog Dimming	**CT** = Conduit Entry

LMBWLB72HK5

LMBWLB72F

LMBWLB72RAS

WLS28-2 Series

LED Light Strip

- Compact, space-saving design
- Rugged, water-resistant IP69K option
- Available in 8 lengths from 145 mm to 1130 mm
- Lensed models, or choice of clear or diffuse window
- Cascadable models available for connecting multiple lights end-to-end
- Low power consumption less than 9 watts per foot
- Optional snap clips for easy installation and repositioning

Single-Color

Family	Cascadable	LED Color	Lighted Length (mm)	Window	Construction	Control	Connector
WLS28-2	C	W	145		X		Q

Cascadable: **C** = Cascadable; **X** = Non Cascadable

LED Color: **W** = Cool White; **WW** = Warm White; **R** = Red; **G** = Green; **B** = Blue; **Y** = Yellow

Lighted Length (mm): **145** **285** **430** **570** **710** **850** **990** **1130**

Window: **Blank** = Clear Plastic; **D** = Diffused Plastic; **L25** = 25° Lensed Window

Construction: **S** = Sealed*; **X** = Not Sealed

Control: **Blank** = None; **M** = Motion Switch; **PB** = Hi/Lo/OFF Switch; **PWM** = Pulse width Modulation Dimming

Connector: **Blank** = 2 m Integral Cable; **Q** = Integral Euro QD

QD models require mating cordset

* Sealed models not available with ON/OFF Switch (PB) or Motion Switch (M)

UV Models

Family	Cascadable	Wavelength	Lighted Length (mm)	Window	Construction	Control	Connector
WLS28-2	C	UV395	– 285		X	PB	Q

Cascadable: **C** = Cascadable; **X** = Non Cascadable

Wavelength: **UV365** = 365 nm; **UV395** = 395 nm

Lighted Length (mm): **285** **570** **850*** **1130***

Window: **Blank** = Clear Acrylic (UV395 models); **G** = Clear Glass (UV365 models); **L25** = 25° Lensed Window (UV395 models)

Construction: **S** = Sealed†; **X** = Not Sealed*

Control: **Blank** = None; **PB** = Hi/Lo/OFF Switch; **PWM** = Pulse Width Modulation Dimming

Connector: **Blank** = 2 m Integral Cable; **Q** = Integral Euro QD

* Not available in UV365 models

† Sealed models not available with ON/OFF Switch (PB)

Dual Colors Models

Family	Cascadable	Colors (C) C1	D1	Colors (C) C2	D2	Lighted Length (mm)	Window	Construction	Control	Connector
WLS28-2	X	W		R	2	– 285	D	X	PB	Q

Cascadable: **C** = Cascadable; **X** = Non Cascadable

Colors (C) C1 / C2: **W** = Daylight White; **WW** = Warm White; **R** = Red; **G** = Green; **B** = Blue; **Y** = Yellow

Density (D1 / D2): **Blank** = 100%; **2** = 50%; **3** = 33%

Lighted Length (mm): **145** **285** **430** **570** **710** **850** **990** **1130**

Window: **Blank** = Clear Plastic; **D** = Diffused Plastic; **L25** = 25° Lensed Window

Construction: **S** = Sealed*; **X** = Not Sealed

Control: **Blank** = None; **PB** = Color 1/OFF/Color 2

Connector: **Blank** = 2 m Integral Cable; **Q** = Integral Euro QD

QD models require mating cordset

* Sealed models not available with ON/OFF Switch (PB)

Multicolor with EZ-STATUS® Models

Family	Cascadable	Colors 1-5 and Control		Lighted Length (mm)	Window	Construction	Voltage	Connector
WLS28-2	X	WGRXX3	–	0285	D	S	24	Q

Cascadable
- **C** = Cascadable
- **X** = Non Cascadable

Colors 1-5 and Control
- **WGRXX3** = White, Green, and Red with override control
- **WYRXX3** = White, Yellow, and Red with override control
- **GYRXX3** = Green, Yellow, and Red with override control
- **WGRYB5** = White, Green, Red, Yellow, and Blue with binary control
- **WGRXX6** = White, Green, and Red with I/O Block control
- **WYRXX6** = White, Yellow, and Red with I/O Block control
- **GYRXX6** = Green, Yellow, and Red with I/O Block control

Lighted Length (mm)
- **0285**
- **0570**
- **0850**
- **1130**

Window
- **Blank** = Clear Plastic
- **D** = Diffused Plastic
- **L25** = 25° Lensed Window

Construction
- **X** = Not Sealed
- **S** = Sealed

Voltage
- **24** = 24 V

Connector
- **Blank** = 2 m integral cable
- **Q** = Integral 4-pin M12/Euro-style quick disconnect

QD models require mating cordset

Compact, space-saving design available in eight lengths from 145 to 1130 mm

Lensed models or choice of clear or diffuse window

Optional switch for local intensity or color control

IP69K sealed model options available

Top Mount

SMBWLS28RA
(included with light)

Side Mount

SMBWLS28SM

Magnetic Mount

SMBWLSMAG
SMBWLSMAGR
Protective cover for magnet sold separately

Snap Mount

SMBWLS28SP

WLS28-2MQ
In-Line Motion Detection Switch with M12 Connectors

WLS28-2PBQ
In-Line Switch with M12 Connectors

PSD-24-4 Class 2 Power Supply
Input: 90-264 V ac 1.5A
Output: 24 V dc 3.9A
2 m (6.5') 4-Pin Euro Connector

4-pin Euro-Style

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

4-pinEuro-Style QD Double-Ended Straight/Straight

MQDEC-403SS
1 m (3')

LASER MARKING AVAILABLE

TL50 Tower Lights

Preconfigured Tower Lights

- Exceptionally bright, highly visible from a distance
- Install quickly and easily with no assembly required
- Clearly evident on/off status
- Versatile mounting options
- Compact, sleek, rugged design with IP67 models available
- Audible alert: continuous, pulsed and staccato models available

Audible
max. intensity 92 db
@ 1 meter (typical)

Sealed
max. intensity 94 db
@ 1 meter (typical)

Sealed Omni-Directional
max. intensity 99 db
@ 1 meter (typical)

Standard and High-Brightness

Housing	Brightness	Supply Voltage	Color Position 1	2	3	4	5	6*	7*	Audible Alarm	Housing Color	Connector
TL50	H		G	Y	R							Q

Brightness
Blank = Standard
H = High Brightness
C = Compact

Supply Voltage
Blank (1 to 5 colors) = 18 to 30 V dc or 21 to 27 V ac
Blank (6 or 7 colors) = 12 to 30 V dc or 21 to 26 V ac
Z = 100 to 240 V ac

Color Position
G = Green, **R** = Red, **W** = White
Y = Yellow, **B** = Blue, **Blank** = Audible Only

Audible Alarm
Blank = None (IP67)
A = Audible (IP50)
ALS = Sealed Audible Continuous Tone
ALS3 = Sealed Audible Pulsed Tone
ALS4 = Sealed Audible Staccato Tone
AOS = Omni-Directional Sealed Audible Continuous Tone
AOSI = Omni-Directional Sealed Audible Continuous Tone with Intensity Adjust
AOS3 = Omni-Directional Sealed Audible Pulsed Tone
AOS3I = Omni-Directional Sealed Audible Pulsed Tone with Intensity Adjust
AOS4 = Omni-Directional Sealed Audible Staccato Tone
AOS4I = Omni-Directional Sealed Audible Staccato Tone with Intensity Adjust

Housing Color
Blank = Black
C = Gray

Connector
Blank = 2 m Integral Cable
Q = Euro Integral QD (dc only)
QP = Euro Pigtail QD (Available with Micro Pigtail QD for ac models if 4 segments or less)

QD models require mating cordset

* Positions 6 and 7 not available in high brightness or AC models
Position 7 not available with audible

SMB30A

SMB30MM

SMBAMS30P

SMB30RAVK

3 Segments/ 4-Pin Euro-Style for use with DC models
MQDC-415 5 m (15')
MQDC-415RA 5 m (15')

4 Segments/ 5-Pin Euro Style for use with DC models
MQDC1-515 5 m (15')
MQDC1-515RA 5 m (15')

5+ Segments/ 8-Pin Euro Style for use with DC models
MQDC2S-815 5 m (15')
MQDC2S-815RA 5 m (15')

3 Light Segments/ 4-Pin Micro-Style for use with AC models
MQAC-415 5 m (15')
MQAC-415RA 5 m (15')

4 Lights/5-Pin Micro-Style for use with AC models
MQDAC2-515 5 m (15')
MQDAC2-515RA 5 m (15')

TL50 Pro Tower Lights

Programmable Tower Lights

- Up to ten segments (depending on model) for advanced status signaling and high-resolution process details
- Full control of color, flashing, rotation and intensity settings
- Advanced animations like level, timer, counter and action mode provide dynamic visual response
- Parameter and process data options on IO-Link models enable fast and complete control of functionality
- Discrete models are programmable using Banner's Pro Editor software and Pro Converter Cable

PRO

Family	Style	Housing	Number of Segments	Audible Alarm	Housing Color	Connector
TL50	P	C	3	A		Q
	P = Pro	**Blank** = Standard **C** = Compact **BL** = Beacon	**1** = 1 Segment **2** = 2 Segments **3** = 3 Segments **4** = 4 Segments **5** = 5 Segments **6** = 6 Segments **7** = 7 Segments*	**Blank** = None **A** = Audible **ALS** = Sealed Audible Continuous Tone **AOS** = Omni-Directional Sealed Audible Continuous Tone **AOSI** = Omni-Directional Sealed Audible Continuous Tone with Intensity Adjust	**Blank** = Black **C** = Gray	**Blank** = 2 m Integral Cable **Q** = Euro Integral QD **QP** = Euro Pigtail QD QD models require mating cordset

*Not available with audible

IO-Link®

Housing	Number of Segments	Audible Alarm	Control	Housing Color	Connector
TL50	3	A	K		Q
TL50 = Standard **TL50C** = Compact **TL50BL** = Beacon	**1** = 1 Segment **2** = 2 Segments **3** = 3 Segments **4** = 4 Segments **5** = 5 Segments **6** = 6 Segments **7** = 7 Segments **8** = 8 Segments **9** = 9 Segments **10** = 10 Segments*	**Blank** = None **A** = Audible **ALS** = Sealed Audible Continuous Tone **AOS** = Omni-Directional Sealed Audible Continuous Tone **AOSI** = Omni-Directional Sealed Audible Continuous Tone with Intensity Adjust	**K** = IO-Link	**Blank** = Black **C** = Gray	**Q** = Euro Integral QD **QP** = Euro Pigtail QD QD models require mating cordset

*Not available with audible

PRO-KIT-ACC Includes:

MQDC-506-USB
Pro Converter Cable
CSB-M1251FM1251M
Splitter
PSW-24-1
Power Supply

ACC-PRO-CABLE5
Mating accessory for cabled and terminal models
MQDC-801-5M-PRO
5-pin to 8-pin double-ended cordset

LASER MARKING AVAILABLE

TL70 Tower Lights

Modular Tower Lights

- Light segments have user-selectable solid ON or flashing
- Up to six light segments (six color options) or five segments plus an audible in one device
- Rugged, water-resistant IP65 housing with UV stabilized material
- Bright, uniform indicator segments appear gray when off to eliminate false indication from ambient light

Preassembled DC

Housing	Color/Position 1	2	3	4	5	6	Audible Alarm*	Housing Color	Connection
TL70	G	R	Y	B	W	O			Q

G = Green, **Y** = Yellow, **R** = Red, **B** = Blue, **W** = White, **O** = Orange, **Blank** = None

Audible Alarm*
Blank = None
A = Audible (92 dB)
AL = Louder Audible (85 -101 dB)
AP = Programmable Audible

Housing Color
Blank = Black
C = Gray

Connection
Blank = 2 m Integral Cable
T = Terminal Wired
Q = Euro Integral QD
QP = Euro Pigtail QD

Preassembled AC

Housing	Color/Position 1	2	3	4	5	6	Audible Alarm*	Housing Color	Connection
TL70Z	G	R	Y	B	W	O			Q

G = Green, **Y** = Yellow, **R** = Red, **B** = Blue, **W** = White, **O** = Orange, **Blank** = None

Audible Alarm*
Blank = None
A = Audible (92 dB)
AL = Louder Audible (85 -101 dB)
AP = Programmable Audible

Housing Color
Blank = Black
C = Gray

Connection
Blank = 2 m Integral Cable
Q = 1/2-20/Micro-style Integral QD**

* Not available with six light modules

** Models with Q are limited to 4 modules

Preassembled Wireless

Housing	Radio	Color/Position 1	2	3	4	5	6	Audible Alarm*	Housing Color	Connection
TL70	DXN2	W	B	G	Y	R	O			Q

DXN2 = Node 2.4 GHz
DXN9 = Node 900 MHz
DR2M = MultiHop Data Radio 2.4 GHz
DR9M = MultiHop Data Radio 900 MHz

G = Green, **Y** = Yellow, **R** = Red, **B** = Blue, **W** = White, **O** = Orange, **Blank** = None

Audible Alarm*
Blank = None
A = Audible (92 dB)
AL = Louder Audible (85 -101 dB)
AP = Programmable Audible

Housing Color
Blank = Black
C = Gray

Connection
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

Requires Gateway or master radio of the same frequency

K50 and K30 Pro

Domed and Compact Indicators

- Simplified ordering and design
- Reliable performance in harsh environments
- Improved production efficiency
- Compact models for low profile applications
- Full flexibility of colors and animations with Pro Editor software or IO-Link®

K50 Pro

Example Model Number: K50L2RGB7Q

Family	Material	Color & Input	Audible Alarm*	Connection
K50L2		**RGB7**	**A1**	**Q**
K50L2 = Dome **K50CL2** = Compact**	**Blank** = Standard **F** = FDA Grade	**RGB7** = RGB Multicolor (7 colors) **RGBK** = RGB Muliticolor with IO-Link	**Blank** = No Audible **A1** = Audible **AL1** = Loud Audible **ALS** = Sealed Audible	**Blank** = 2 m Integral Cable **Q** = Euro Integral QD** **QP** = Euro Pigtail QD QD models require mating cordset

* Audible models not available in FDA-grade material or compact

** Compact and integral QD models not available in FDA-grade material

K30 Pro

Example Model Number: K30L2RGB7Q

Family	Material	Color & Input	Connection
K30L2		**RGB7**	**Q**
Blank = Standard **F** = FDA Grade		**RGB7** = Multicolor	**Blank** = 2 m Integral Cable **Q** = Euro Integral QD* **QP** = Euro Pigtail QD **T** = Terminal Screw* QD models require mating cordset

* Integral QD and Terminal Screw models not available in FDA-grade material

SMB30FA

SMB22FVK

SMB30SC

SMB22A

PRO-KIT-ACC Includes:

MQDC-506-USB
Pro Converter Cable
CSBM1251FM1251M
Splitter
PSW-24-1
Power Supply

ACC-PRO-CABLE5
Mating accessory for cabled and terminal models
MQDC-801-5M-PRO
5-pin to 8-pin double-ended cordset

4-Pin Euro QD

MQDEC-415
5 m (15')
MQDEC-415RA
5 m (15')

5-Pin Euro QD

MQDC1-515
5 m (15')
MQDC1-515RA
5 m (15')

5-Pin M12/ Euro QD Washdown (IP69K)
Straight connector

MQDC-WDSS-0515
5 m (15')

S22 Touch Series

Flush Touch Button

- Large, bright illuminated area for clear visibility of input and touch status
- Flush mount design sits tight against panel, machine and bracket surfaces
- Independent color control or preconfigured models to suit your indication needs
- Momentary versions remain activated as long as touch is present, while latching versions toggle between activated and not activated states on successive touches
- Excellent immunity to false triggering by water spray, detergents, oils, and other foreign materials
- Rugged, water-resistant IP69K design for washdown environments
- Ergonomically designed to eliminate hand, wrist and arm stresses, requiring no physical pressure to operate and can be actuated with bare hands or work gloves

Multipurpose Independent Control

Family	Output State	Output Function	Activation Method	Material	Color	Function	Connector
S22	A	M	T	S	RGB7	F2	QP
	A = Normally Open **R** = Normally Closed	**M** = Momentary **L** = Latching	**T** = Touch	**S** = Standard **F** = FDA Grade	**RGB7** = RGB Multicolor (7colors)	**F2** = Multifunction	**Blank** = 2 m Integral Cable **QP** = Euro Pigtail QD

Illuminated Button Control

Family	Output State	Output Function	Activation Method	Material	Color		Function	Connector
					not activated	activated		
S22	A	L	T	S	G	R	H	Q
	A = Normally Open **R** = Normally Closed	**M** = Momentary **L** = Latching	**T** = Touch	**S** = Standard **F** = FDA Grade	**G** = Green **Y** = Yellow **R** = Red **B** = Blue **W** = White **X** = Not used		**H** = Output only	**Blank** = 2 m Integral Cable **Q** = Euro Integral QD **QP** = Euro Pigtail QD **T** = Terminal Screws

SMB22A

SMB22FVK

SMBAMS22P

SMB22RAVK

5-pin Euro QD

MQDC1-515
5 m (15')
MQDC1-515RA
5 m (15')

5- pin M12 Euro-Style Washdown
Straight connector models only

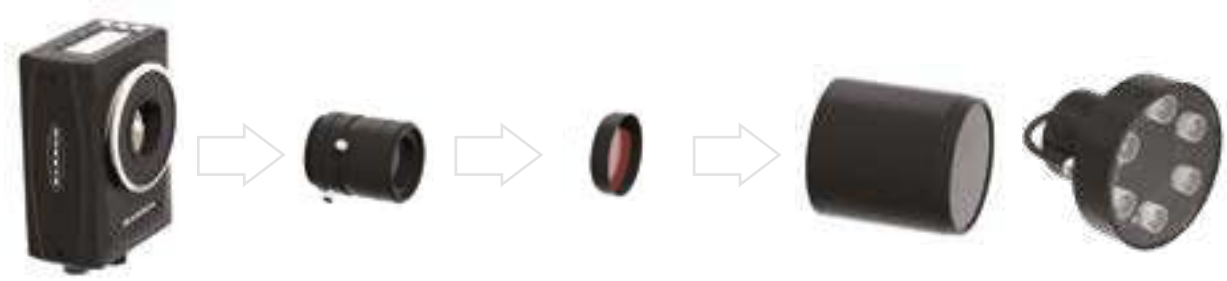
MQDC-WDSS-0515
5 m (15')

VE Series

Versatile, Easy-To-Use Smart Cameras

- Available in 5 MP (2592 x 2048 pixels), 2MP (1600 x 1200 pixels), 1.3MP (1280 x 1024 pixels), and WVGA (752 x 480 pixels) models, all with the same powerful inspection capabilities
- Runtime editing capability reduces costly downtime and the software emulator allows for offline building and troubleshooting of applications
- Factory communications (EtherNet/IP™, Modbus/TCP, PROFINET® and RS-232 Serial) for integration on the manufacturing floor
- Two-line, eight-character onboard display provides inspection information and focus number and makes it easy to update sensor settings, facilitating fast product changeover
- Robust metal housing with optional lens covers with or without LED lighting to achieve IP67 rating for use in harsh environments with heat, vibration, or moisture

Family	Resolution	Imager	Ethernet Connection
VE	**202**	**G**	**1A**
	200 = WVGA, 752 x 480 pixels **201** = 1.3 MP, 1280 x 1024 pixels **202** = 2MP, 1600 x 1200 pixels **205** = 5 MP, 2592 x 2048 pixels	**G** = Grayscale	**1A** = M12, 8-pin Euro-style female



Select a camera resolution

Choose lens

Optional filters create additional contrast

IP67 lens covers or ring lights available for additional protection

SMBVERA

SMBVEMP
Mounting Plate

12-pin Euro with Shield

MQDC2S-1215
MQDC2S-1215RA
5 m (15')

RJ45 to Ethernet 8-pin M12 Euro (Cat5e shielded)

STP-M12-815
5 m (15')

ABR Series

Imager-Based Barcode Readers

- Powerful decoding capability to read even difficult 1D and 2D codes, including DPM and low contrast codes
- Compact metal housing for industrial environments
- Quick configuration with on-board push buttons or a PC using Barcode Manager to solve the most difficult barcode reading applications
- Integrated LED lighting and easy focus adjustment in one package for maximum application flexibility
- Versatile lens options are available to simplify setup and configuration, including autofocus (ABR 7000) which easily adapts to changes in reading distance
- Factory communication options include Ethernet, serial and USB for integration on the manufacturing floor
- Embedded web server interface for monitoring images and statistics over any network

Series	Family	Resolution	Lens		Lighting	Front Window	Communication Type	Code Type
ABR	7	1	06	–	R	S	E	2

7

1 = 1.3MP 1280x1024 pixels

06 = 6 mm
09 = 9 mm
L9* = 9 mm
12 = 12 mm
16 = 16 mm

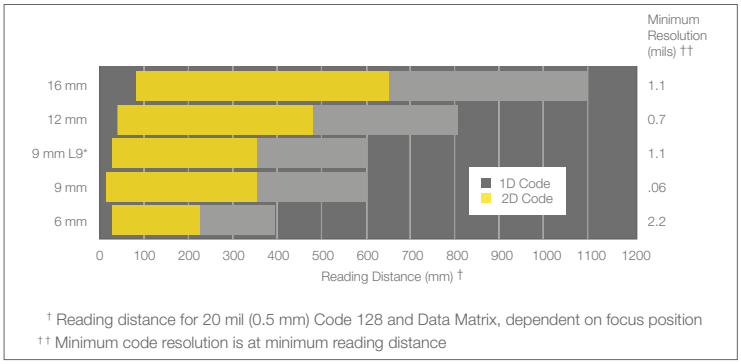
R = Red
M = Multicolored**

S = Standard

E = Ethernet

2 = 1D + 2D

* Liquid lens autofocus
** Red and blue LEDs for optimized reading of DPM codes, available on 6 mm and 9 mm models only



† Reading distance for 20 mil (0.5 mm) Code 128 and Data Matrix, dependent on focus position
†† Minimum code resolution is at minimum reading distance

Series	Family	Resolution/ Lens		Lighting	Front Window	Communication Type	Code Type
ABR	3	106	–	W	S	U	1

3

009 = WVGA 752x480 pixels (9 mm lens)
106 = 1.2MP 1280x960 pixels (6 mm lens)

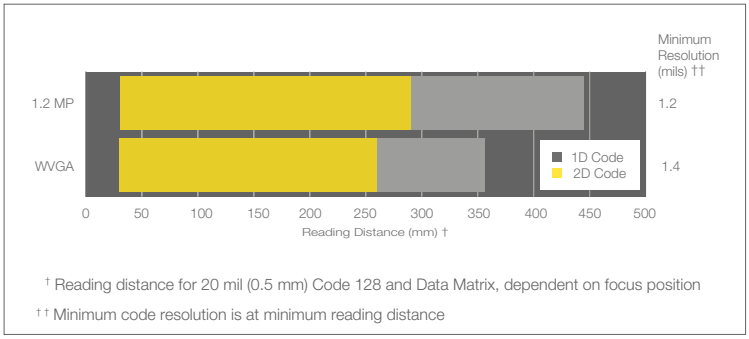
W = White

S = Standard
P = Polarized*

* Only available in 1.2MP models

U = USB
E = Ethernet

1 = 1D
2 = 1D + 2D



† Reading distance for 20 mil (0.5 mm) Code 128 and Data Matrix, dependent on focus position
†† Minimum code resolution is at minimum reading distance

For Use with ABR Ethernet Models

17-pin M12 female shielded (for power, serial and IO) — **MQDC2S-1715** 5 m (15')

4-pin M12 D-code to RJ45 Ethernet for Ethernet Communication — **STP-M12D-415** 5 m (15')

For Use with ABR USB Models

Power and USB Communication only

17-pin M12 female to USB — **MQDEC-1703SS-USB**

OR

Power, USB Communication, IO and Serial Communication

17-pin M12 female shielded (for power, serial and IO) — **MQDC2S-1715** 5 m (15')

Splitter cable. 17-pin M12 female trunk with one 17-pin M12 male branch and one USB branch — **CSB-M121701USB02M121702**

Connection Box

TCNM-ACBB1

For Use with TCNM-ACBB1 Connection Box

17-pin M12 female to DB25 (replaces MQDC2S-17xx) — **MQDEC-1703SS-DB25** 0.9 m (3')

17-pin female to 17-pin male shielded (optional extension cable) — **MQDEC-1715SS** 5 m (15')

Integrated Touchscreen shown

iVu BCR Barcode Reader

Imager-Based Barcode Readers

- Program through an integrated touch screen, remote touch screen or PC interface
- Reads a variety of 1D and 2D barcodes including DataMatrix (ECC 200), Linear Bar Codes, Code 128, Code 39, Codabar, Interleaved 2 of 5, EAN 13, EAN 8, UPC-E, POSTNET, IMB, and Pharmacode
- Ethernet (EtherNet/IP™, Modbus/TCP, and PROFINET®) and Serial RS-232 communications
- Read multiple barcodes in any orientation with one device
- Rugged IP67 housing for factory environments
- Available with a variety of lens and integrated light options – red, blue, green, white, UV or infrared

Series	Touch Screen	Sensor Type	Ring Light Color	Lens (mm)
IVU2P	T	B	R	04

Touch Screen: **T** = Integrated; **R** = Remote*

Sensor Type: **B** = Barcode

Ring Light Color: **R** = Red; **B** = Blue; **G** = Green; **W** = White; **I** = Infrared; **6** = UV365; **9** = UV395; **XC** = C-mount; **X** = No Ring Light

Lens (mm): **04** = 4.3; **06** = 6; **08** = 8; **12** = 12; **16** = 16; **25** = 25; **Blank** = No lens (only C-Mount)

* Remote display or PC is required for set up and viewing of Remote Touch Screen sensors

Accessories shown on page 66

iVu Vision Sensors

Color and Grayscale Vision Sensors

- The iVu and iVu Color Vision Sensors are used to monitor parts for type, size, orientation, shape, location, and color or color variations.
- Configure in minutes using Vision Manager PC software, onboard touchscreen display or using remote touchscreen to access to hard to reach places
- All-in-one solution with camera, controller, lens, and light included in one package
- Inspect multiple features with a wide variety of grayscale or color tools
- Compact, rugged, IP67 housing available with a variety of integrated ring lights including red, blue, green, white, infrared or UV
- Interchangeable lenses, including C-mount, for maximum application flexibility
- Factory communications (EtherNet/IP™, Modbus/TCP, PROFINET®, PCCC and Serial RS-232) for integration on the manufacturing floor
- Ability to change parameters on the fly with full runtime editing to reduce costly downtime

Series	Touch Screen	Sensor Type	Ring Light Color	Lens (mm)
IVU2P	T	G	R	04
	T = Integrated **R** = Remote*	**C** = Color† **G** = Grayscale	**R** = Red **B** = Blue **G** = Green **W** = White **I** = Infrared **6** = UV365 **9** = UV395 **XC** = C-mount** **X** = No Ring Light	**04** = 4.3 **06** = 6 **08** = 8 **12** = 12 **16** = 16 **25** = 25 **Blank** = No lens (only C-Mount)

* Remote display or PC is required for set up and viewing of Remote Touch Screen sensors

** Requires C-mount lens

† Color sensor only available in white, C-mount or no ring light

Sensors with Remote Touch Screen

RDM35 Remote Touch Screen (sold separately)

SMBIVURAL

SMBIVURAR

SMBIVUU

SMBRDM35
Docking station for machine mountable remote display

Power (Required)
12-Pin M12/Euro with Shield

MQDC2S-1215
5 m (15')
MQDC2S-1215RA
5 m (15')

Ethernet (Required for Ethernet communications)
RJ45 to 4-Pin Pico QD

IVUC-E-415
5 m (15')

USB
Used to update firmware and access sensor files

PSG-4M-403-USB
0.9 m (3')

Machine Mountable Remote Display (Required for use of RDM35 remote display)
Double-ended M12/ 8-pin Euro

IVURDM-QD-815
5 m (15')
IVURDM-QD-815RA
5 m (15')

DXM Wireless Controller

Industrial Wireless Controller

- Enables end-to-end IIoT solutions, connecting Banner sensors to Banner's Connected Data Solutions (CDS) cloud platform
- Integrates Banner's ISM radio, cellular connectivity, and local I/O
- Program the DXM using action rules and ScriptBasic language, which can execute concurrently
- Log data on the Micro SD card
- Automation protocols include Modbus RTU, Modbus/TCP, and EtherNet/IP for communications with PLC's, HMI's, or other local hosts
- Interactive programmable user interface with LCD and LED indicators
- Industry standard RS-485, Ethernet, and USB communication ports
- Easily interfaces with Banner CDS and other cloud service providers

Controller Models*

Models	Description	Frequency
DXM700–B1R1	DXM700 Controller with Performance Series Gateway	900 MHz
DXM700–B1R2	DXM700 Controller with MultiHop Modbus Data Radio	900 MHz
DXM700–B1R3	DXM700 Controller with Performance Series Gateway	2.4 GHz
DXM700–B1R4	DXM700 Controller with MultiHop Modbus Data Radio	2.4 GHz
DXM1000–B1R1	DXM1000 Controller with Performance Series Gateway	900 MHz
DXM1000–B1R2	DXM1000 Controller with MultiHop Modbus Data Radio	900 MHz
DXM1000–B1R3	DXM1000 Controller with Performance Series Gateway	2.4 GHz
DXM1000–B1R4	DXM1000 Controller with MultiHop Modbus Data Radio	2.4 GHz

Connected Data Soutions (CDS) Software Packages

Models	Description
806252	Starter Package 1,000 Data Points per hour Total Storage: 2 million Data Points
806253	Standard Package 4,000 Data Points per hour Total Storage: 20 million Data Points
806254	Premium Package 12,000 Data Points per hour Total Storage: 100 million Data Points

PSD-24-4
DC power supply – desktop style, 24 V dc 4A, Euro 4-pin connector

PSDINP-24-13
DC power supply DIN rail mount, 24 - 28 V dc, 1.3A

MQDMC-401
Euro-style male quick disconnect cable, 4-Pin straight connector

BWA-AH12106
enclosure

SX1-LTE-001
Cellular Data Modem Verizon 4G LTE Cat. 1

SX1-GSM-001
Cellular Data Modem Worldwide HSPA 3G with 2G GSM fallback

Q45 Nodes

for Predictive Maintenance

- To save on installation time, Q45 1-wire serial nodes are pre-configured to work with Banner 1-wire serial sensors. The compact size, integrated lithium batteries, and a variety of compatible sensors make remote monitoring easy.
- The Q45VTP is designed to pair with the QM30VT1 Vibration and Temperature sensor. Vibration characteristics and sample intervals can be set using DIP switches.
- The Q45TH connects directly to the M12FTH4Q temperature and humidity sensor. Sample rates can be set using DIP switches.
- The Q45U is a universal 1-wire serial node that reads any Banner 1-wire serial sensor and determines an efficient power setting.

Select Your Node

	Radio Band	Series	Device Type*
DX80N	2	Q45	U
	9 = 900 MHz **2** = 2.4 GHz	**Q45**	**VTP** = Vibration/Temperature **TH** = Temperature/Humidity **U** = Universal

* Sensor units must be ordered separately

Select Your Sensor

QM30VT1
Vibration & Temperature Sensor

M12FTH4Q
Temperature and Humidity Sensor

K50UX1RA
Ultrasonic Sensor

Vibration

Ultrasonic

Q45

All-in-One Sensors

- Vibration and Temperature or Tank Level sensor and node in one compact package
- Uses a 1-wire serial interface
- Easy-to-order
- Easy-to-deploy
- DIP switch configurable for vibration characteristics and sample intervals
- Dual-axis vibration sensing

Vibration: Sensor and Node

Models	Frequency	Description
DX80N9Q45VA	900 MHz	All-in-one Vibration and Temperature sensor
DX80N2Q45VA	2.4 GHz	All-in-one Vibration and Temperature sensor sensor

Ultrasonic: Sensor and Node

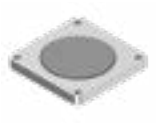
Models	Range	Description
DX80N9Q45UAC	900 MHz	Q45 Node with Integrated Ultrasonic Sensor
DX80N2Q45UAC	2.4 GHz	Q45 Node with Integrated Ultrasonic Sensor

QM30VT Series

Vibration and Temperature Sensor

- Avoid machine failures and delays by detecting problems early
- Provides high accuracy vibration and temperature measurements
- Dual-axis vibration detection up to 4 KHz bandwidth
- Manufactured with a sealed aluminum housing
- Reduces labor costs by obviating manual checks and eliminating error

Models	Description
QM30VT1	Vibration and temperature sensor with 1-wire serial interface; 3 m QD cable
QM30VT2	Vibration and temperature sensor that functions as a modbus slave device via RS-485; 3 m QD cable
QM30VT2-SS-9M	Vibration and temperature sensor with stainless steel housing that functions as a modbus slave device via RS-485; 9 m cable with flying leads



BWA-BK-013

BWA-BK-012

5-pin Double Ended M12/Euro-Style with Shield

DEE2R-53D
1 m (3')

K50U Ultrasonic Sensor

Wireless Level and Tank Monitoring

- Provides a distance measurement from the target to the sensor
- Monitor wirelessly to avoid long cable runs
- Built-in temperature compensation for reliable measurement
- Threaded housing for easy installation

Models	Description
K50UX1ARA	Ultrasonic sensor with 1-wire serial interface; 1 m sensing range
K50UX1CRA	Ultrasonic sensor with 1-wire serial interface; 3 m sensing range
K50UX2ARA	Ultrasonic sensor that functions as a modbus slave device via RS-485; 1 m sensing range
K50UX2CRA	Ultrasonic sensor that functions as a modbus slave device via RS-485; 3 m sensing range

BWA-BK-006
Mounts both the K50U Ultrasonic sensor and a Wireless Q45 Node

5-pin Double Ended M12/Euro-Style with Shield

DEE2R-53D
1 m (3')

Pressure Sensor Node

All-in-One Performance Series Node

- Combines a media isolated pressure sensor, a Performance Series wireless node, and a battery power supply
- Compact, one-piece design simplifies installation and eliminates the need for ordering multiple components
- Integrates easily in applications where infrastructure, movement, or mobility make wired solutions impractical, ineffective, or cost-prohibitive
- Field-proven, Sure Cross wireless architecture ensures secure, reliable communication between devices

Models	Description
DX80N9X1W-PS50G	0-50 PSI GAUGE Pressure Sensor in the housing port pre-wired to the Node
DX80N9X1W-PS50G1	0-50 PSI GAUGE Pressure Sensor in the housing port 1 meter cable pre-wired to the Node
DX80N9X1W-PS150G	0-150 PSI GAUGE Pressure Sensor in the housing port pre-wired to the Node
DX80N9X1W-PS150G1	0-150 PSI GAUGE Pressure Sensor in the housing port 1 meter cable pre-wired to the Node
DX80N9X1W-PS500S	0-500 PSI SEALED GAUGE Pressure Sensor in the housing port pre-wired to the Node
DX80N9X1W-PS500S1	0-500 PSI GAUGE SEALED Pressure Sensor in the housing port 1 meter cable pre-wired to the Node

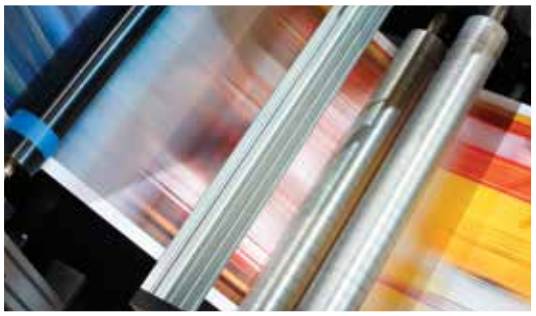
Condition Monitoring Node

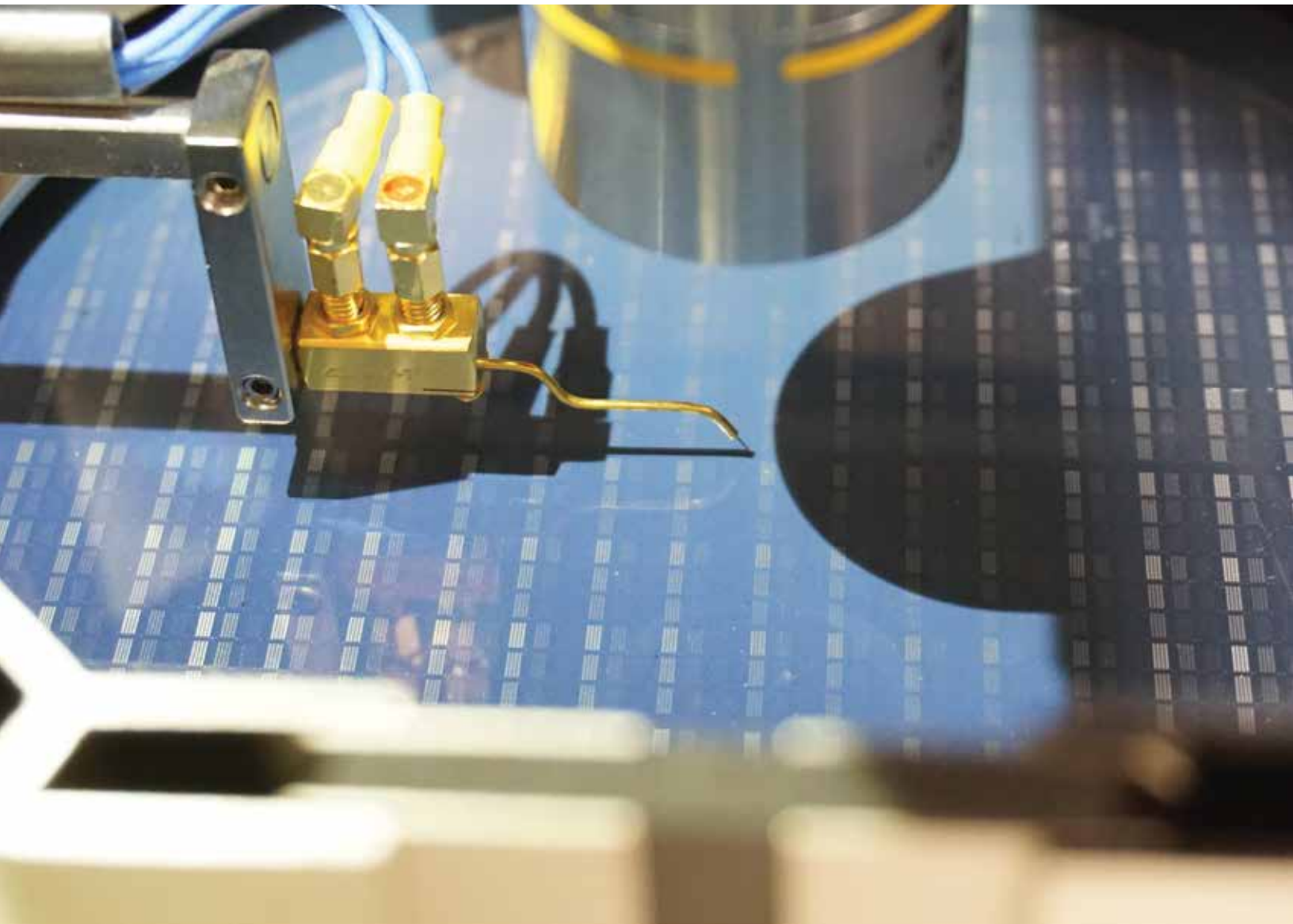
Vibration, Temperature, and Current

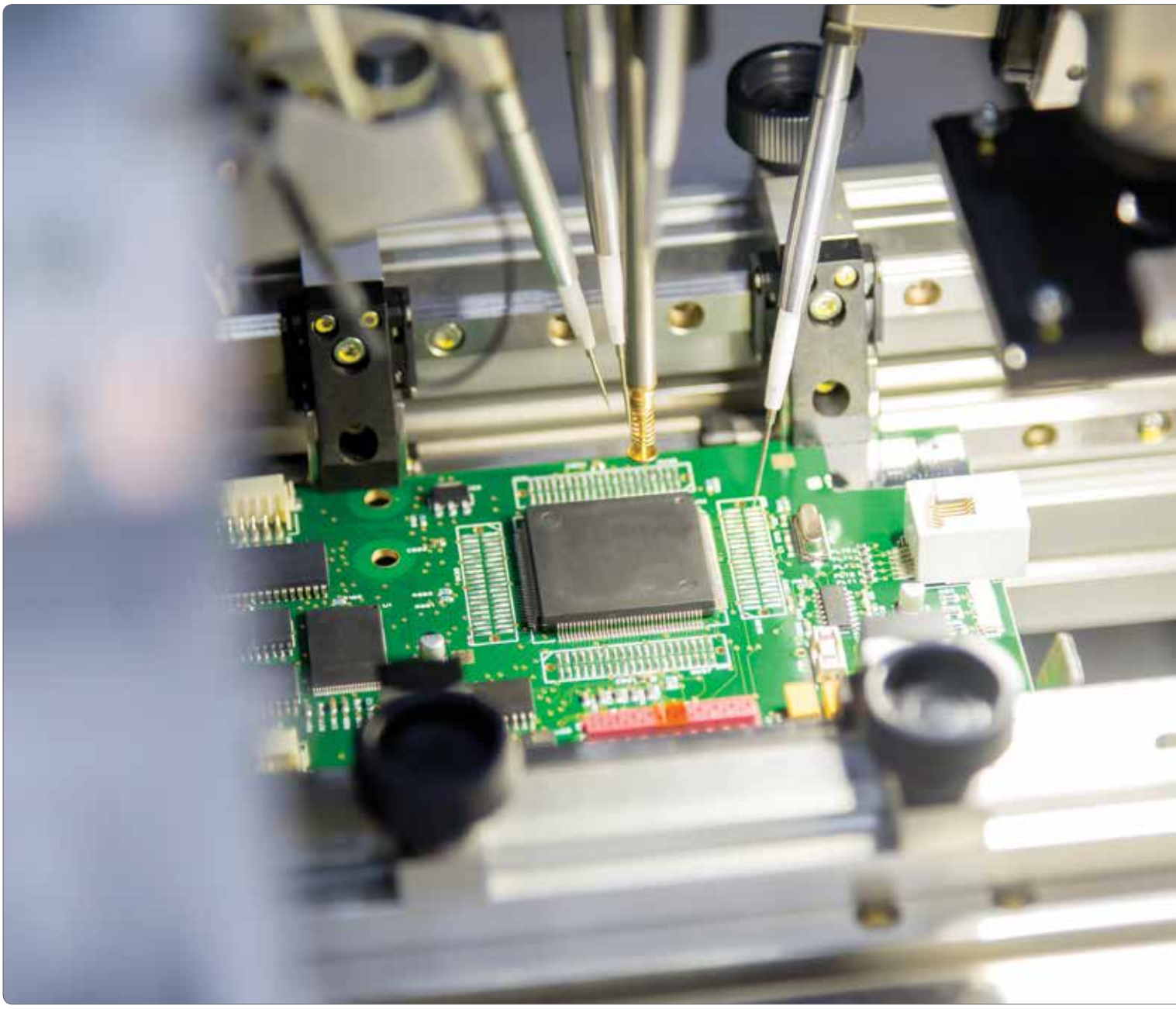
- Performance Node with a Euro-style connector for use with a Banner VT1 Vibration and Temperature sensor (sold separately) and one-meter twisted pair cable for use with a current transformer
- 20 A and 150 A split core current transformers included
- DIP switch configurable
- Compatible with the Vibrations Solutions Kit
- Improved internal antenna for extended wireless range
- 6+ year battery life

Models	Frequency	Description
DX80N9X1W-CM1L	900 MHz	Pre-wired Euro-style connector for use with any Banner 1-Wire Serial Vibration Sensor (sold separately). Pre-wired one-meter twisted pair cable reports true RMS current (20 A and 150 A current transformers included with Node).
DX80N2X1W-CM1L	2.4 GHz	

Fiber Optic Sensing Solutions







What is a Fiber Optic System?

Considerations for Choosing Fiber Optic Technology

Fiber Optic systems are comprised of a fiber amplifier and optical fibers. The amplifier, or sensor, emits, receives, and converts the light energy into an electrical signal. Individual fiber optic assemblies simply guide light from the amplifier to a sensing location, or from the sensing location back to the amplifier.

Think of an optical fiber as being similar to a garden hose: like a hose transports water, the fiber transports light from one end to the other.

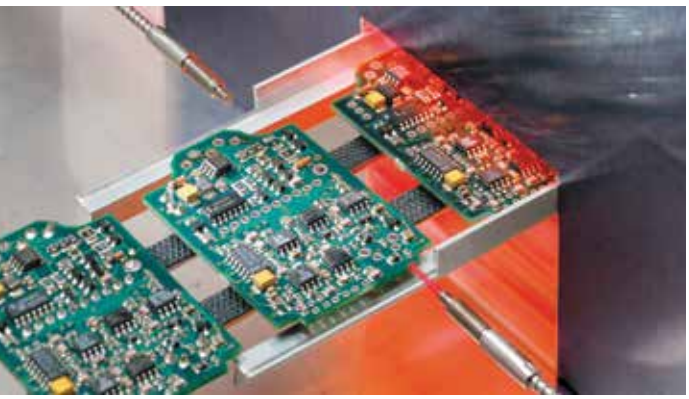
The main advantage of fiber optic sensors is the versatility. Fibers are typically used because of space constraints, hostile environments, or lack of power at the sensing location. Since the fiber amplifier is a separate piece, it can be mounted and powered remotely.

Banner Engineering has the largest portfolio of fiber optic assemblies in the Industry. We have over 1,000 different fibers to meet every space, environment and sensing requirement.

Typical Applications for Fiber Optics

- Punch presses
- Vibratory feeders
- Conveyors
- Pill counting
- Small object detection
- Leading edge detection
- Ovens
- Semiconductor processing equipment
- Robotic arms and moving machines
- Edge guiding
- Hazardous locations
- Final inspection stations

Why Fiber Optics?



Compact Size for Tight Sensing Locations

- The small size and flexibility allow positioning and mounting in tight spaces
- Plastic fiber optic assemblies are usually single strands of optical fiber and can be routed into extremely tight areas
- Plastic fibers also survive well under repeated flexing
- Pre-coiled plastic fiber optics are available for sensing applications on reciprocating mechanisms

Reliable Performance in Harsh or Explosive Environments

- Fibers can be constructed to survive in areas with corrosive material or extreme moisture and are immune to electrical noise
- Fiber optics contain no electrical circuitry and have no moving parts, so they can safely “pipe” light into and out of hazardous sensing locations
- Most glass fiber optic assemblies are very rugged and perform reliably in extreme temperatures
- Sheathing materials such as polypropylene, Teflon®, and stainless steel are used to shield both plastic and glass fiber optic assemblies in harsh environments
- Optical fibers are low in mass, enabling fiber optic assemblies to withstand high levels of vibration and mechanical shock

Flexibility to Meet a Wide Variety of Application Requirements

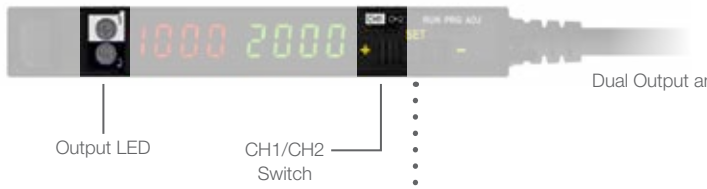
- Some fiber optics have bendable probes that can be optimally shaped to the physical and optical requirements of a specific application
- Specialty fibers are available for water detection, clear object detection, or for vacuum feed-through areas

Overview of DF-G Series Amplifiers

- The DF-G Series is an easy-to-use DIN-rail-mountable fiber optic sensor.
- It provides high-performance sensing in low-contrast applications.
- The sensor's compact housing has dual digital displays (Red/Green) and a bright output LED for easy programming and status monitoring during operation.

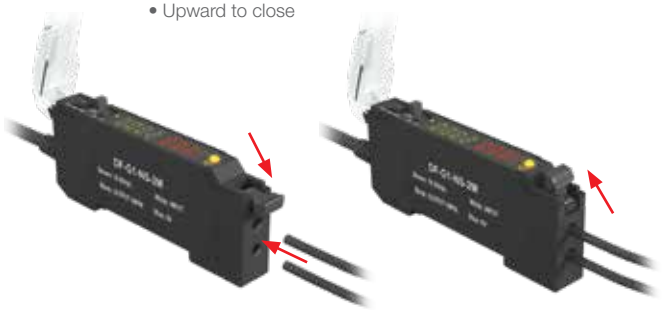
	DF-G1	DF-G2	DF-G3
Outputs	Discrete	Discrete	Discrete and Analog
LED Colors	R	R B W IR G	R IR LIR
IO-Link	IO-Link®	IO-Link®	IO-Link®
Light Intensity Receiver	✓		
Small Object Counting		●	
Extremely Fast Response Speed		10 µs	
High Power			✓
Water Detection			✓

Simple user interface. Highly visible dual display. Easy sensor set up.



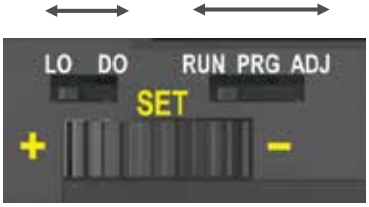
Lever Action Fiber Clamp

- Push lever downward to open
- Upward to close



User Interface

- Light Operate and Dark Operate Slide Switch is easy to see and change the selection
- Run, Program and Adjust Mode Switch
  - RUN locks out changes
  - PROGRAM (PRG) allows for full sensor configuration
  - ADJUST (ADJ) enables threshold adjust and teaching



Rocker Button

- Three position Jog Switch
  - Rocker Switch (+) and (-) precisely adjusts thresholds and easily navigate menus
  - Press to click initiates Teach and SETs, and allow selection of displayed menu

General Purpose Amplifiers

DF-G1: Single Discrete Output

Sensing Beam Color	Connection	Range	NPN Model	PNP Model
Visible red	2 m	Range varies by response speed used, gain setting, target light source intensity, ambient light level and with fiber optics used.	DF-G1-NS-2M	DF-G1-PS-2M
	9 m		DF-G1-NS-9M	DF-G1-PS-9M
	150 mm (6 in) PVC pigtail, M8 Pico connector, 4-pin		DF-G1-NS-Q3	DF-G1-PS-Q3
	150 mm (6 in) PVC pigtail, M12 Euro QD connector, 4-pin		DF-G1-NS-Q5	DF-G1-PS-Q5
	Integral M8 Pico, 4-pin		DF-G1-NS-Q7	DF-G1-PS-Q7

DF-G2: High-Speed Single Discrete Output

Sensing Beam Color	Connection	Range	NPN Model	PNP Model
Visible red	2 m	Range varies by response speed used, gain setting, target light source intensity, ambient light level and with fiber optics used.	DF-G2-NS-2M	DF-G2-PS-2M
	9 m		DF-G2-NS-9M	DF-G2-PS-9M
	150 mm (6 in) PVC pigtail, M8 Pico connector, 4-pin		DF-G2-NS-Q3	DF-G2-PS-Q3
	150 mm (6 in) PVC pigtail, M12 Euro QD connector, 4-pin		DF-G2-NS-Q5	DF-G2-PS-Q5
	Integral M8 Pico, 4-pin		DF-G2-NS-Q7	DF-G2-PS-Q7

DF-G3: High-Power Single Discrete Output

Sensing Beam Color	Connection	Range	NPN Model	PNP Model
Visible red	2 m	Range varies by response speed used, gain setting, target light source intensity, ambient light level and with fiber optics used.	DF-G3-NS-2M	DF-G3-PS-2M
	9 m		DF-G3-NS-9M	DF-G3-PS-9M
	150 mm (6 in) PVC pigtail, M8 Pico connector, 4-pin		DF-G3-NS-Q3	DF-G3-PS-Q3
	150 mm (6 in) PVC pigtail, M12 Euro QD connector, 4-pin		DF-G3-NS-Q5	DF-G3-PS-Q5
	Integral M8 Pico, 4-pin		DF-G3-NS-Q7	DF-G3-PS-Q7

A model with a QD connector requires a mating cordset

DF-G3: High-Power Dual Independent Discrete Outputs

Sensing Beam Color	Connection	Range	NPN Model	PNP Model
Visible red	2 m	Range varies by response speed used, gain setting, target light source intensity, ambient light level and with fiber optics used.	DF-G3-ND-2M	DF-G3-PD-2M
	9 m		DF-G3-ND-9M	DF-G3-PD-9M
	150 mm (6 in) PVC pigtail, M8 Pico connector, 5-pin		DF-G3-ND-Q3	DF-G3-PD-Q3
	150 mm (6 in) PVC pigtail, M12 Euro QD connector, 5-pin		DF-G3-ND-Q5	DF-G3-PD-Q5
	Integral M8 Pico, 5-pin		DF-G3-ND-Q7	DF-G3-PD-Q7

DF-G3: High-Power One Analog and One Discrete Output

Sensing Beam Color	Connection	Analog Output	Range	NPN Model	PNP Model
Visible red	2 m	Voltage: 0-10 V DC	Range varies by response speed used, gain setting,target light source intensity, ambient light level and with fiber optics used.	DF-G3-NU-2M	DF-G3-PU-2M
	9 m	Voltage: 0-10 V DC		DF-G3-NU-9M	DF-G3-PU-9M
	150 mm (6 in) PVC pigtail, M8 Pico, 5-pin	Voltage: 0-10 V DC		DF-G3-NU-Q3	DF-G3-PU-Q3
	150 mm (6 in) PVC pigtail, M12 Euro, 5-pin	Voltage: 0-10 V DC		DF-G3-NU-Q5	DF-G3-PU-Q5
	Integral M8 Pico, 6-pin	Voltage: 0-10 V DC		DF-G3-NU-Q7	DF-G3-PU-Q7
Visible red	2 m	Current: 4-20 mA	Range varies by response speed used, gain setting,target light source intensity, ambient light level and with fiber optics used.	DF-G3-NI-2M	DF-G3-PI-2M
	9 m	Current: 4-20 mA		DF-G3-NI-9M	DF-G3-PI-9M
	150 mm (6 in) PVC pigtail, M8 Pico, 5-pin	Current: 4-20 mA		DF-G3-NI-Q3	DF-G3-PI-Q3
	150 mm (6 in) PVC pigtail, M12 Euro QD, 5-pin	Current: 4-20 mA		DF-G3-NI-Q5	DF-G3-PI-Q5
	Integral M8 Pico, 6-pin	Current: 4-20 mA		DF-G3-NI-Q7	DF-G3-PI-Q7

A model with a QD connector requires a mating cordset\

Application Specific Amplifiers

DF-G1 Light Intensity Receiver

Connection*	Range	NPN Models	PNP Models
2 m	Range varies by response speed used, gain setting, target light source intensity, ambient light level and with fiber optics used.	**DF-G1-NR-2M**	**DF-G1-PR-2M**

DF-G2 Small Object Counter

Connection*	Sensing Beam Color	Window Size	NPN Models	PNP Models**
2 m	Visible red	Determined by the fiber optic assembly	**DF-G2-NC-2M**	**DF-G2-PC-2M**

See page 20 for a sample of array fibers

DF-G2 Color LED

Connection*	Sensing Beam Color	Range	NPN Models	PNP Models
2 m	Infrared†	190% of Visible Red Range	**DF-G2IR-NS-2M**	**DF-G2IR-PS-2M**
2 m	Broad spectrum white	50% of Visible Red Range	**DF-G2W-NS-2M**	**DF-G2W-PS-2M**
2 m	Visible green	60% of Visible Red Range	**DF-G2G-NS-2M**	**DF-G2G-PS-2M**
2 m	Visible blue	70% of Visible Red Range	**DF-G2B-NS-2M**	**DF-G2B-PS-2M**

DF-G3 Water Detection

Connection*	Sensing Beam Color	Range††	Output	NPN Models	PNP Models
2 m	Long infrared (1450 nm)†	900 mm	Voltage: 0-10 V DC, Discrete	**DF-G3LIR-NU-2M**	**DF-G3LIR-PU-2M**
2 m	Long infrared (1450 nm)†	900 mm	Current: 4-20 mA, Discrete	**DF-G3LIR-NI-2M**	**DF-G3LIR-PI-2M**
2 m	Long infrared (1450 nm)†	900 mm	Single Discrete	**DF-G3LIR-NS-2M**	**DF-G3LIR-PS-2M**
2 m	Long infrared (1450 nm)†	900 mm	Dual Discrete	**DF-G3LIR-ND-2M**	**DF-G3LIR-PD-2M**

A model with a QD connector requires a mating cordset

* Connector options:
- For 9 m cable, change the suffix **2M** to **9M** in the 2 m model number (example, **DF-G3LIR-NU-9M**)
- For 150 mm (6 in) PVC, M8 Pico QD connector, 4-pin change the suffix **2M** to **Q3** in the 2 m model number (example, **DF-G3LIR-NU-Q3**)
- For 150 mm (6 in) PVC, M12 Euro QD connector, 4-pin change the suffix **2M** to **Q5** in the 2 m model number (example, **DF-G3LIR-NU-Q5**)
- For integral M8 Pico QD connector, 4-pin change the suffix **2M** to **Q7** in the 2 m model number (example, **DF-G3LIR-NU-Q7**)

** Includes Health Mode Output

† Excess gain = 1, Long Range response speed, opposed mode sensing. PIT46U plastic fiber used for visible LED models, IT.83.3ST5M6 glass fiber used for IR model

†† IR models require T5 terminated glass fiber optic cables

IO-Link®

DF-G Fiber Amplifiers with IO-Link

The DF-G Series has a simple user interface to ensure easy sensor set-up and programming via displays and switches/buttons, remote input teach wire or IO-Link.

DF-G1

Connection*	Sensing Beam Color	Range	Output	Model*
150 mm (6 in) PVC pigtail, M12 Euro, 5-pin	Visible red	Range varies by Speed Selection used and with fiber optics used	Dual complementary outputs: - 1 push-pull (IO-Link) - 1 PNP	**DF-G1-KS-Q5**

DF-G2

Connection*	Sensing Beam Color	Range**	Channel 1 Output	Channel 2 Output	Model*
150 mm (6 in) PVC pigtail, M12 Euro, 5-pin	Visible red	1100 mm	IO-Link, push/pull	PNP only, or input	**DF-G2-KD-Q5**
150 mm (6 in) PVC pigtail, M12 Euro, 5-pin	Infrared†	2100 mm	IO-Link, push/pull	PNP only, or input	**DF-G2IR-KD-Q5**

DF-G3

Connection*	Sensing Beam Color	Range**	Channel 1 Output	Channel 2 Output	Model*
150 mm (6 in) PVC pigtail, M12 Euro, 5-pin	Visible red	3000 mm	IO-Link, push/pull	PNP only, or input	**DF-G3-KD-Q5**
150 mm (6 in) PVC pigtail, M12 Euro, 5-pin	Infrared†	6000 mm	IO-Link, push/pull	PNP only, or input	**DF-G3IR-KD-Q5**

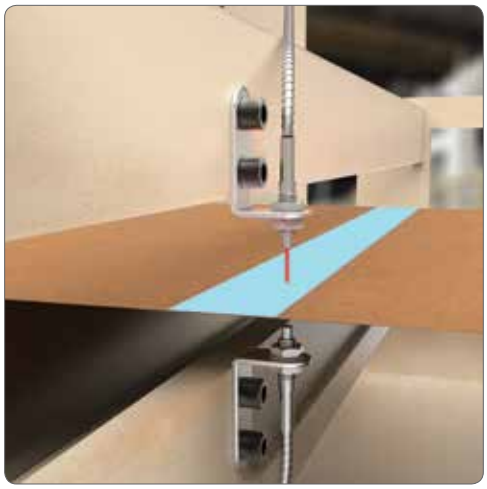
A model with a QD connector requires a mating cordset

* Connector options:
- For 2 m cable, change the suffix **Q5** to **2M** in the **Q5** model number (example, **DF-G3-KD-9M**)
- For 9 m cable, change the suffix **Q5** to **9M** in the **Q5** model number (example, **DF-G3-KD-9M**)
- For 150 mm (6 in) PVC, M8 Pico QD connector, 4-pin change the suffix **Q5** to **Q3** in the **Q5** model number (example, **DF-G3-KD-Q3**)
- For integral M8 Pico QD connector, 4-pin change the suffix **Q5** to **Q7** in the **Q5** model number (example, **DF-G3-KD-Q7**)

** Excess gain = 1, Long Range response speed, opposed mode sensing. **PIT46U** plastic fiber used for visible LED models, **IT.83.3ST5M6** glass fiber used for IR model

† IR models require T5 terminated glass fiber optic cables

Fiber Optic Applications



Web Monitoring/Splice Detection

Challenge
- Material texture, color, or finish vary
- Dusty environment
- Easy setup

Featured Solution

Amplifier: DF-G2-PS-2M

Fiber: PIT43TSL5-VL

Key Features
- Variety of opposed mode fiber arrays for edge guiding
- High excess gain with auto thresholding
- Option for mid-point teach mode

Key Benefits
- Opposed mode fiber arrays minimize effects of changing textures, colors, or transparencies
- Able to burn through dust and compensate for dust that settles on fibers
- Mid-point teach learns the optimal web position with an easy single-point teach

Liquid Level Detection

Challenge
- Detect liquid level in transparent or different color vials and bottles
- Limited space to mount a sensor

Featured Solution

Amplifier: DF-G3LIR-PS-2M
(Water Detection Sensor)

Fiber: IT43ST5-VL (pair)

Key Features
- Detect water-based liquids inside translucent or opaque plastic and glass containers
- Compatible with standard glass fibers with T5 termination

Key Benefits
- Reduce product waste by detecting under-filled vials early in the packaging process
- Quick and simple installation with many small fiber optic bundles styles to choose from

Light Intensity Detection

Challenge
- Verify correct assembly and function of automotive indicator lights

Featured Solution

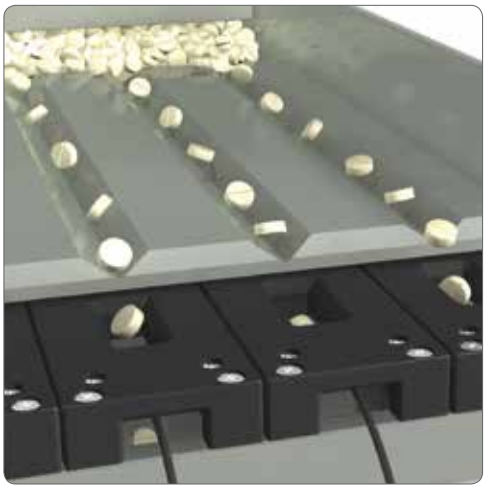
Amplifier: DF-G1-PR-Q5

Fiber: PIT46U-VL

Key Features
- Designed to detect light emission from a wide variety of sources - 410 nm to near infrared

Key Benefits
- Quality improvement and return reduction
- Quick and simple installation with many small fiber optic bundle styles to choose from

Related Applications
- Appliance lighting
- LED indicators on equipment
- Window tint verification
- Dashboard lighting verification



High-Speed Small Object Detection

Challenge

- Tablets move at high speed
- Small tablets are hard to detect

Featured Solution

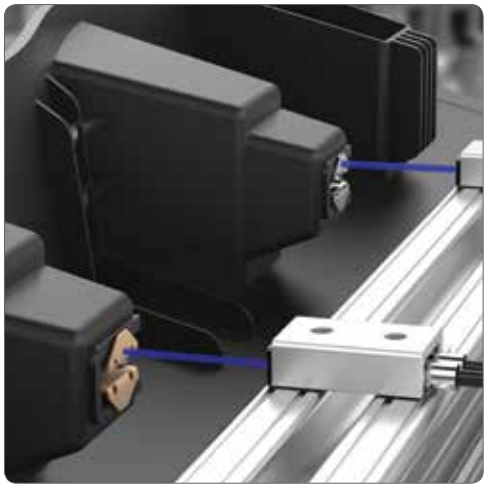
Amplifier: DF-G2-PC-2M (small object counter)
Fiber: PFCVA-10X25-E

Key Features

- Automatic Gain Compensation (AGC) algorithm compensates for dust build-up on fiber optics
- Fiber optic array can detect objects as small as 2 mm in diameter

Key Benefits

- Increase the time between scheduled maintenance by extending the counting cycle and maintain count accuracy as dust increases during production
- Improve process flexibility by detecting even the smallest tablet in a large 40 mm area



Blue LEDs for Low Contrast Detection

Challenge

- Detecting presence and correct clips used in a door panel assembly

Featured Solution

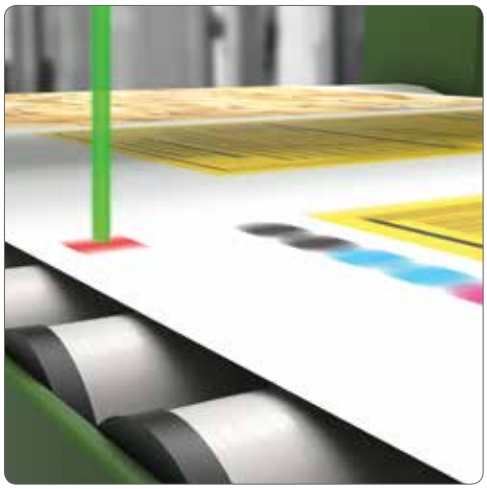
Amplifier: DF-G2B-PS-Q5 (Blue LED)
Fiber: PBL46U

Key Features

- Blue LED optimal for detecting silver and gold clips in place
- Can easily differentiate and verify correct color clip used since gold clips reflect less blue light than silver

Key Benefits

- Highly reliable and cost-effective solution to reduce errors and rejects
- Diffuse lensed fibers provide small, bright spot



Green LEDs for Registration Mark Detection

Challenge

- Accurately detect red registration mark on roll of packaging
- Product passes at high speed

Featured Solution

Amplifier: DF-G2G-PS-2M
Fiber: PBT23U-VL

Key Features

- 10 µs response time

Key Benefits

- Green LED creates optimal contrast with red registration mark

High Temperature – Leading Edge Detection

Challenge

- Temperature is above the limit for most plastic fibers

Featured Solution

Amplifier: DF-G1-PS-Q3

Fiber: One pair of IT46ST5-VL

Key Features

- Glass fiber assemblies are suitable for high temp applications up to 249° C
- Stainless steel sheathing protects cable jacket from abrasion and high temperature

Key Benefits

- Thermal process applications
- For sensing near manufacturing ovens
- Manufacturing of solar panels, colored glass and ceramics
- Widest selection of plastic and glass fibers for high temp applications

Long–Range Detection in a Hazardous/Dirty Area

Challenge

- Detecting correct product placement in harsh environment, fibers get coated in oil and dirt
- Cables can be abraded or cut

Featured Solution

Amplifier: DF-G3-PS-Q5

Fiber: PIT46TMB5

Key Features

- With extended range of DF-G3 amplifier, fibers can be placed much farther away and still reliably detect correct positioning

Key Benefits

- No build-up of dirt and oil on fiber amplifier because it is out of the area
- Steel Skin fibers offer protection to the cabling

Fill Level Detection – Water Bottles

Challenge

- Difficult to consistently detect the top edge of clear water in a variety of bottles

Featured Solution

Amplifier: Two DF-G3LIR-PS-2M

Fiber: Two pairs of IT43ST5-VL with L2 Lens

Key Features

- Banner's DF-G3LIR water sensor employs a unique LED that can clear detect water-based liquids

Key Benefits

- Regardless of the bottle color or texture, the DF-G3LIR water sensors will see the clear water-based liquids inside

Precise Positioning

Challenge

- Detect leading edge of board to trigger adhesive application
- Then verify that adhesive was applied properly to trays of IC chips

Featured Solution

Amplifier: Two DF-G3-PD-2M

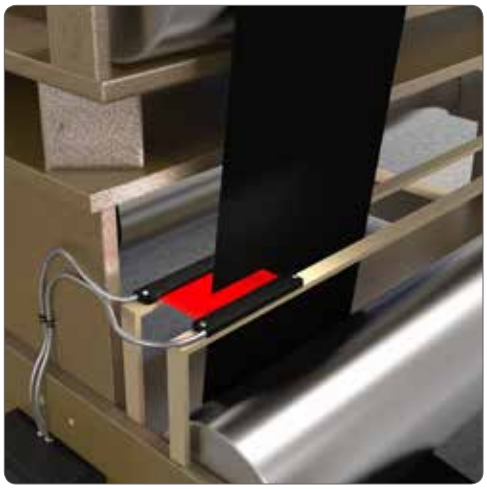
Fiber: Two PBT23UM4-VL Diffuse Reflective

Key Features

- Fast response speed
- Small spot size

Key Benefits

- Accurate leading edge detection
- Prevents product waste by assuring glue was applied



Edge Guiding

Challenge

- Incorrect winding causes major issues with assembly and increased downtime to fix the film

Featured Solution

Amplifier: DF-G3-PU-Q5

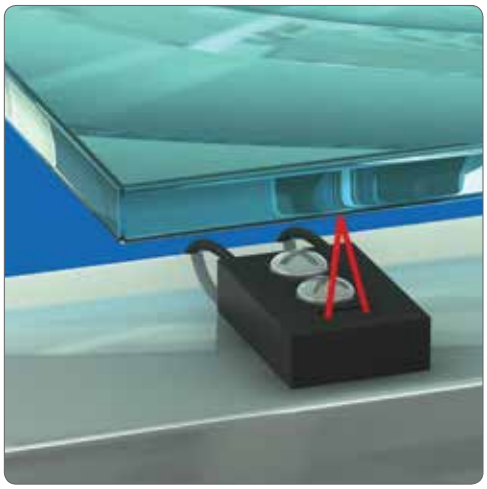
Fiber: PGIRS66U-100

Key Features

- Compact fibers can sense very slight changes in position

Key Benefits

- The DF-G3 fiber optic amplifier used with plastic array fibers detects the edges of the film and guides it into proper position



Detecting Presence of Clear Photomask – Semiconductor Manufacturing

Challenge

- Clear object in a confined space

Featured Solution

Amplifier: DF-G1-PS-Q7

Fiber: P32-C6

Key Features

- Convergent Beam Fiber can detect glass regardless of color or transparency
- Form factor (right angle) of fiber fits in a confined space
- 6 mm focus point with tight depth of field

Key Benefits

- Solution is extremely robust based on optical contrast

Fiber Amplifier Accessories

SA-DIN-BRACKET
to mount DF-G without DIN rail

SA-DIN-CLAMP
end clamps for DIN rail

DIN-35-70: 70 mm
DIN-35-105: 105 mm
DIN-35-140: 140 mm
DIN-35-180: 180 mm
DIN-35-220: 220 mm

pre-cut DIN Rail

4-pin Euro QD
(for ..Q5 models)

Straight connector models listed; for right-angle, add **RA** to the end of the model number (ex, **MQDC-406RA)**

MQDC-406
2 m (6')
MQDC-415
5 m (15')
MQDC-430
9 m (30')

5-pin Euro QD
(for ..Q5 models)

Straight connector models listed; for right-angle, add **RA** to the end of the model number (ex, **MQDC1-506RA)**

MQDC1-506
2 m (6')
MQDC1-515
5 m (15')
MQDC1-530
9 m (30')

4-Pin Pico QD
(for ..Q7 and ..Q3 models)

Straight snap-lock coupling

PKG4-2
2 m (6')
PKG4-5
2 m (15')

Pico QD (for ..Q7 and ..Q3 models)

Right-angle snap-lock coupling

PKW4Z-2
2 m (6')
PKW4Z-5
2 m (15')

5-Pin Threaded Pico QD
(for ..Q7 and ..Q3 models)

Threaded straight connector

PKG5M-2
2 m (6')
PKG5M-5
5 m (15')
PKG5M-9
9 m (30')

Pico QD (for ..Q7 and ..Q3 models)

Threaded right-angle connector

PKW5M-2
2 m (6')
PKW5M-5
5 m (15')
PKW5M-9
9 m (30')

6-Pin Pico QD
(for ..Q7 and ..Q3 models)

Straight snap-lock coupling

PKG6Z-2
2 m (6')
PKG6Z-9
9 m (30')

Pico QD (for ..Q7 and ..Q3 models)

Right-angle snap-lock coupling

PKW6Z-2
2 m (6')
PKW6Z-9
9 m (30')

4-Pin Threaded Pico QD
(for ..Q7 and ..Q3 models)

Threaded straight connector

PKG4M-2
2 m (6')
PKG4M-5
2 m (15')
PKG4M-9
9 m (30')

Pico QD (for ..Q7 and ..Q3 models)

Threaded right-angle connector

PKW4M-2
2 m (6')
PKW4M-5
2 m (15')
PW4MM-9
9 m (30')

Specifications

DF-G1

Supply Voltage and Current	NPN/PNP Models: 10 to 30 V dc (10% max ripple) IO-Link Models: 18 to 30 V dc (10% max ripple) Standard Mode: 960 mW, Current consumption < 40 mA @ 24 V dc ECO Display Mode: 720 mW, Current consumption < 30 mA @ 24 V dc
Indicators	Red 4-digit Display: Signal Level Green 4-digit Display: Threshold Yellow LED: Output conducting (In Program Mode, Red and Green displays are used for programming menus)
Output Configuration	NPN/PNP Models: 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model IO-Link Models: 1 push-pull and 1 PNP (complementary outputs)
Output Response Time	High Speed: 200 us Standard: 500 us Long Range: 2 ms Extra Long Range: 5 ms Light receiver models: 50 ms, 150 ms
Certifications	CE c UL us LISTED 3TJJ IND. CONT. EQ. IO-Link®

DF-G2

Supply Voltage and Current	NPN/PNP Models: 10 to 30 V dc (10% max ripple) IO-Link Models: 18 to 30 V dc (10% max ripple) Standard Mode: 960 mW, Current consumption < 40 mA @ 24 V dc ECO Display Mode: 720 mW, Current consumption < 30 mA @ 24 V dc
Indicators	Red 4-digit Display: Signal Level Green 4-digit Display: Threshold Yellow LED: Output conducting (In Program Mode, Red and Green displays are used for programming menus)
Output Configuration	1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model, plus 1 Health Mode output (small object counter only) IO-Link Models: 1 push-pull and 1 PNP (independently configurable)
Output Response Time	Super High Speed: 10 µs High Speed: 15 µs DF-G2 Small Object Counter: 25 µs Fast: 50 µs Standard: 250 µs 50 µs Medium Range: 500 µs Long Range: 1000 µs 150 µs 250 µs Long Range with immunity to Energy Efficient Lights: 2,000 µs 500 µs
Certifications	CE c UL us LISTED 3TJJ IND. CONT. EQ. IO-Link®

DF-G3

Supply Voltage and Current	NPN/PNP Models: 10 to 30 V dc (10% max ripple) IO-Link Models: 18 to 30 V dc (10% max ripple) Standard Mode: 960 mW, Current consumption < 40 mA @ 24 V dc Voltage output models: 12 to 30 V dc (10% max ripple) Current output models: 10 to 30 V dc (10% max ripple) ECO Display Mode: 720 mW, Current consumption < 30 mA @ 24 V dc
Indicators	Red 4-digit Display: Signal Level Green 4-digit Display: Threshold Yellow LED: Output conducting (In Program Mode, Red and Green displays are used for programming menus)
Output Configuration	NPN/PNP Models: 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model IO-Link Models: 1 push-pull and 1 PNP (independently configurable) Voltage output models: 1 analog voltage output (user configurable as 1 V to 5 V or 0 V to 10 V) with 1 current sinking (NPN) or 1 current sourcing (PNP) discrete output Current output models: 1 analog current output (4 mA to 20 mA) with 1 current sinking (NPN) or 1 current sourcing (PNP) discrete output
Output Response Time	High Speed: 500 us Fast: 1000 us Standard: 2 ms Long Range: 8 ms Extra Long Range: 24 ms
Certifications	CE c UL us LISTED 3TJJ IND. CONT. EQ. IO-Link®

Fiber Optics

What Are Fiber Optics?

Fiber optics are used to transmit light energy over long distances. Optical fibers are thin, transparent strands of optical quality glass or plastic that can be as thin as a strand of hair. In photoelectric sensing, these fibers are used to transmit and/or receive light from the LED of a sensor.

Plastic Fiber Optic Assemblies

Plastic fiber optics usually have a large, monofilament core which comes in a single strand of fiber optic.

Advances in LED technology have improved the performance and range of plastic fiber optic sensing systems to the point that they are nearly equivalent to glass fibers. Plastic fibers are a versatile, cost-effective choice for many fiber optic sensing applications.

Advantages:

- Less expensive
- Allow less signal attenuation
- More flexible
- Survive well under repeated flexing
- Can be cut to length in the field
- Can be routed into extremely tight areas

Glass Fiber Optic Assemblies

Most glass fiber optic assemblies are very rugged and perform reliably in extreme temperatures, corrosive or vacuum chamber environments. Glass fiber optic assemblies can transmit both visible and infrared light, where plastic fiber optics can only transmit visible light. A common problem experienced with glass fibers is breakage of the individual strands resulting from sharp bending or continued flexing, as occurs on reciprocating mechanisms. Banner glass fibers with a T5 connection are compatable with DF-G plastic amplifiers.

Advantages

- Powerful and very rugged
- Can carry infrared light to provide longer range
- Reliable in extreme temperatures and harsh environments

Vantage Line

See page 18

Problem solving fibers that solve a majority of common applications. Most models feature a PVC overmolded flex relief.

Array & Slot

See page 20

Array fibers are ideal for small part counting and detecting objects at any point in the sensing area. Slot fibers are ideal for web guiding and edge detection.

Heavy Duty

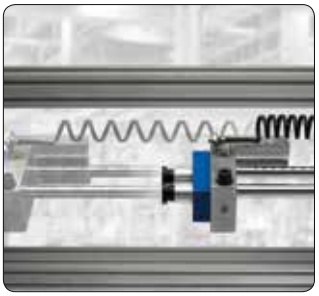
See page 22

Heavy duty fiber models resist kinking, cutting and abrasion and are ideal for places where the fibers are exposed to repeated stress.

Tight Bend

See page 24

Able to be bent to a tight radius for limited space set-ups and difficult-to-access locations.



Retractile

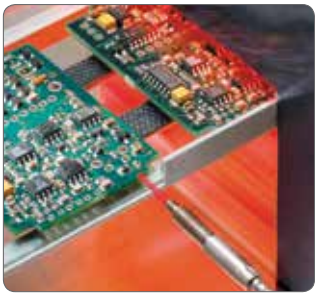
See page 25

Designed for linear motion applications where the fiber is repeatedly moved back and forth. The cable is coiled and can offer a full range of movement without a tangle of loose cable.

Liquid Level

See page 26

Easily detect liquids with tube mounted fiber assemblies, special wavelength infrared light, or liquid probes.



High Temperature

See page 27

Glass fibers specially terminated for use in the DF-G Fiber Amplifiers. Can withstand temperatures up to 315 °C – much higher than plastic fibers. For thermal process applications, areas near ovens or high heat.

Accessories

See page 28

Screw on lenses to focus the light beam are available for a variety of fibers. Also available are special brackets for mounting and fiber cutters to custom fit fiber cables to the application.

Vantage Line Fibers

- OEM friendly packaging
- No fiber cutter included
- Opposed models come as a pair

Opposed Fibers

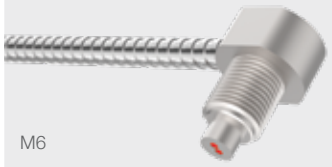
Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
 M6	• Plastic fiber with flex relief • Integrated glass lens • 20 mm spot size at 100 mm • Threaded Stainless steel	15 mm	DF-G1 1260 DF-G2 1760 DF-G3 4000	1 m ✂ 2 m	PITL23UM6-VL PITL26UM6-VL
 M4	• Plastic fiber with flex relief • Integrated glass lens • 30 mm spot size at 100 mm • Threaded Stainless steel	15 mm	DF-G1 670 DF-G2 1765 DF-G3 4000	1 m ✂ 2 m	PITL23UM4-VL PITL26UM4-VL
 M3	• Plastic fiber with flex relief • 0.5 mm core diameter • Threaded nickel plated brass	15 mm	DF-G1 80 DF-G2 205 DF-G3 750	1 m ✂ 2 m	PIT23U-VL PIT26U-VL
 M4	• Plastic fiber with flex relief • 0.5 mm core diameter • Threaded nickel plated brass • M2.6 threaded lens mount	15 mm	DF-G1 65 DF-G2 170 DF-G3 630	1 m ✂ 2 m	PIT23UM4-VL PIT26UM4-VL
 M3	• Plastic fiber with flex relief • 1 mm core diameter • Threaded nickel plated brass	25 mm	DF-G1 245 DF-G2 640 DF-G3 2320	1 m ✂ 2 m	PIT43UM3-VL PIT46UM3-VL
 M4	• Plastic fiber with flex relief • 1 mm core diameter • Threaded nickel plated brass • M2.6 threaded lens mount	25 mm	DF-G1 220 DF-G2 590 DF-G3 2140	1 m ✂ 2 m	PIT43U-VL PIT46U-VL
 M4	• Plastic fiber with flex relief • 1 mm core diameter • Threaded Stainless Steel • M2.6 threaded lens mount	25 mm	DF-G1 170 DF-G2 455 DF-G3 1660	1 m ✂ 2 m	PIAT43UTA-VL PIAT46UTA-VL
 M4	• Plastic fiber with flex relief • 1 mm core diameter • Threaded Stainless Steel • M2.6 threaded lens mount	2 mm	DF-G1 190 DF-G2 500 DF-G3 1850	1 m ✂ 2 m	PIAT43UHFTA-VL PIAT46UHFTA-VL
 M4	• Stainless monocoil jacket • 1 mm core diameter • Threaded Stainless Steel • M2.6 threaded lens mount	25 mm	DF-G1 240 DF-G2 630 DF-G3 2300	1 m 2 m	PIT43TSL5-VL PIT46TSL5-VL
 M4	• Stainless monocoil jacket • 1 mm core diameter • Threaded Stainless Steel • M2.6 threaded lens mount	25 mm	DF-G1 60 DF-G2 150 DF-G3 560	1 m 2 m	PIAT43TSL5TA-VL PIAT46TSL5TA-VL
	• Plastic fiber with flex relief • 30 x 0.25 mm core diameter • Plastic housing • Smallest detectable object 2 mm** • 14.5 mm wide sensing area	60 mm	DF-G1 230 DF-G2 600 DF-G3 2180	1 m 2 m	PIR1X323T-VL PIR1X326T-VL

✂ Cut to custom length

* Typical range shown is with a 2 m model

** Smallest detectable object achievable with emitter and receiver spaced 50 mm apart

Diffuse Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
 M3	• Plastic fiber with flex relief • 0.5 mm core diameter • Threaded nickel plated brass	15 mm	DF-G1 25 DF-G2 70 DF-G3 250	1 m ✂ 2 m	**PBT23U-VL** **PBT26U-VL**
 M4	• Plastic fiber with flex relief • 0.5 mm core diameter • Threaded nickel plated brass	15 mm	DF-G1 25 DF-G2 60 DF-G3 230	1 m ✂ 2 m	**PBT23UM4-VL** **PBT26UM4-VL**
 M6	• Plastic fiber with flex relief • 1 mm core diameter • Threaded nickel plated brass	25 mm	DF-G1 75 DF-G2 200 DF-G3 715	1 m ✂ 2 m	**PBT43U-VL** **PBT46U-VL**
 M6	• Plastic fiber with flex relief • 1 mm core diameter • Threaded Stainless Steel	25 mm	DF-G1 45 DF-G2 120 DF-G3 440	1 m ✂ 2 m	**PBAT43UTA-VL** **PBAT46UTA-VL**
 M6	• Plastic fiber with flex relief • 1 mm core diameter • Threaded Stainless Steel	2 mm	DF-G1 55 DF-G2 140 DF-G3 520	1 m ✂ 2 m	**PBAT43UHFTA-VL** **PBAT46UHFTA-VL**
 M6	• Stainless monocoil jacket • 1 mm core diameter • Threaded Stainless Steel	25 mm	DF-G1 80 DF-G2 200 DF-G3 740	1 m 2 m	**PBT43TSL5-VL** **PBT46TSL5-VL**
 M6	• Stainless monocoil jacket • 1 mm core diameter • Threaded Stainless Steel	25 mm	DF-G1 30 DF-G2 90 DF-G3 315	1 m 2 m	**PBAT43TSL5TA-VL** **PBAT46TSL5TA-VL**
	• Plastic fiber with flex relief • 32 x 0.25 mm core diameter • Plastic housing • Smallest detectable object 1 mm** • 14.5 mm wide sensing area	25 mm	DF-G1 55 DF-G2 140 DF-G3 515	1 m ✂ 2 m	**PBR1X323U-VL** **PBR1X326U-VL**

✂ Cut to custom length

* Typical range shown is with a 2 m model

** Smallest detectable object measured using a metal pin with BRT-92x92CB retro-reflector placed 50 mm from fiber face

Plastic Fiber Cutter

PFC-4 (qty 1)
PFC-4-100 (qty 100)

Array and Slot Fibers

- Small part counting applications
- Edge guiding applications
- Quick and easy setup and alignment

Opposed Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
	• Sold as a pre-mounted pair • 16 x 0.25 mm core diameter • Smallest detectable object 3 mm** • Sensing area 25 x 25 mm	5 mm	25	2 m	**PFCVA-25X25-E**
	• Sold as a pre-mounted pair • 16 x 0.25 mm core diameter • Smallest detectable object 1.5 mm** • Sensing area 10 x 25 mm	5 mm	25	2 m	**PFCVA-10X25-S**
	• Plastic fiber with flex relief • Sold as a pair • Plastic housing • Smallest detectable object 2 mm** • 14.5 mm wide sensing area	60 mm	DF-G1 230 DF-G2 600 DF-G3 2180	1 m ✂ 2 m	**PIR1X323T-VL** **PIR1X326T-VL**
	• Sold as a pair • Protective die-cast zinc housing • Smallest detectable object 1.5 mm** • 40 mm wide sensing area	40 mm	DF-G1 220 DF-G2 570 DF-G3 2090	2 m ✂	**PGIRS66U-40**
	• Sold as a pair • Protective die-cast zinc housing • Smallest detectable object 3 mm** • 100 mm wide sensing area	40 mm	DF-G1 220 DF-G2 570 DF-G3 2090	2 m ✂	**PGIRS66U-100**
	• Plastic fiber with flex relief • Sold as a pair • Metal housing • Smallest detectable object 1.25 mm** • 40 mm wide sensing area	60 mm	DF-G1 215 DF-G2 560 DF-G3 2045	2 m ✂	**PIRSL1X326T5-40**
	• Sold as a pair • Aluminium housing • Smallest detectable object 0.5 mm** • Ideal for compact web guiding • 5.25 mm wide sensing area	5 mm	DF-G1 190 DF-G2 495 DF-G3 1800	2 m ✂	**PIRS1X166U**
	• Sold as a pair • Aluminium housing • Smallest detectable object 0.75 mm** • Ideal for compact web guiding • 5.25 mm wide sensing area	5 mm	DF-G1 185 DF-G2 485 DF-G3 1770	2 m ✂	**PIR1X166U**

✂ Cut to custom length

* Typical range shown is with a 2 m model

** Smallest detectable object achievable with emitter and receiver spaced 50 mm apart

Diffuse Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
	• Plastic fiber with flex relief • Plastic housing • Smallest detectable object 1 mm • 14.5 mm wide sensing area	25 mm	DF-G1 55 DF-G2 140 DF-G3 515	1 m ✂ 2 m	PBR1X323U-VL PBR1X326U-VL
	• Aluminum housing • Smallest detectable object 0.25 mm** • 10.9 mm wide sensing area	5 mm	DF-G1 60 DF-G2 160 DF-G3 575	2 m ✂	PBR1X326U
	• Aluminium housing • Smallest detectable object 0.25 mm** • 10.9 mm wide sensing area	5 mm	DF-G1 50 DF-G2 125 DF-G3 450	2 m ✂	PBRS1X326U
	• Plastic fiber with flex relief • Metal housing • Smallest detectable object 0.25 mm** • 20 mm wide sensing area	25 mm	DF-G1 30 DF-G2 75 DF-G3 275	2 m ✂	PBRSL1X326U

✂ Cut to custom length

* Typical range shown is with a 2 m model

** Smallest detectable object measured using a metal pin with BRT-92x92CB retro-reflector placed 50mm from fiber face

Slot Fibers

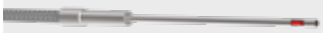
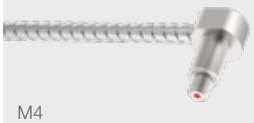
Fiber Head	Description	Minimum Bend Radius	Slot Width (mm)	Fiber Length	Model
	• Plastic fiber with flex relief • Metal housing • 32 beams • Ideal for edge guiding	60 mm	20 mm	2 m ✂	PDIRS1X326T5-20
	• Plastic housing • Single beam	2 mm	12 mm	2 m ✂	PDIS46UM12
	• Plastic housing • Single beam	8 mm	5 mm	2 m ✂	PDIS16UM5

✂ Cut to custom length

Heavy Duty Fibers

- Resist kinking, cutting and snagging
- Opposed models come as a pair
- SteelSkin sheathing allows for protection with a tight bend radius

Opposed Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
 M4	• Plastic fiber • 1 mm core diameter • SteelSkin sheathing • Threaded Stainless steel • M2.6 threaded lens mount	12 mm	DF-G1 175 DF-G2 460 DF-G3 1690	1 m 2 m	PIAT43TMB5 PIAT46TMB5
	• Plastic fiber • 1 mm core diameter • SteelSkin sheathing • Stainless steel Ferrule tip	12 mm	DF-G1 185 DF-G2 490 DF-G3 1780	1 m 2 m	PIF43TMB5 PIF46TMB5
	• Plastic fiber • 1 mm core diameter • SteelSkin sheathing • 51 mm Stainless steel side-view probe	12 mm	DF-G1 125 DF-G2 330 DF-G3 1200	1 m 2 m	PIPS43TMB5 PIPS46TMB5
	• Plastic fiber • Smallest detectable object 1 mm** • SteelSkin sheathing • Aluminium side-view array • 10 mm wide sensing area	12 mm	DF-G1 210 DF-G2 555 DF-G3 2025	1 m 2 m	PIRS1X163TMB5M.4 PIRS1X166TMB5M.4
	• Plastic fiber with flex relief • Smallest detectable object 3.5 mm** • SteelSkin sheathing • Plastic side-view array • 56 mm wide sensing area	12 mm	DF-G1 190 DF-G2 490 DF-G3 1800	2 m	PIRS1X166TMB5M2
 M3	• Plastic fiber • 0.5 mm core diameter • SteelSkin sheathing • Threaded Stainless steel	12 mm	DF-G1 50 DF-G2 140 DF-G3 510	1 m 2 m	PIT23TMB5M3 PIT26TMB5M3
 M4	• Plastic fiber • 1 mm core diameter • SteelSkin sheathing • Threaded Stainless steel • M2.5 threaded lens mount	12 mm	DF-G1 185 DF-G2 490 DF-G3 1775	1 m 2 m	PIT43TMB5 PIT46TMB5
 M4	• Stainless monocoil jacket • 1 mm core diameter • Threaded Stainless Steel • M2.6 threaded lens mount	25 mm	DF-G1 240 DF-G2 630 DF-G3 2300	1 m 2 m	PIT43TSL5-VL PIT46TSL5-VL
 M4	• Stainless monocoil jacket • 1 mm core diameter • Threaded Stainless Steel • M2.6 threaded lens mount	25 mm	DF-G1 60 DF-G2 150 DF-G3 560	1 m 2 m	PIAT43TSL5TA-VL PIAT46TSL5TA-VL

* Typical range shown is with a 2 m model

** Smallest detectable object achievable with emitter and receiver spaced 50 mm apart

Diffuse Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
 M6	• Plastic fiber • 0.5 mm core diameter • SteelSkin sheathing • Threaded Stainless steel	12 mm	DF-G1 40 DF-G2 110 DF-G3 400	1 m 2 m	PBAT43TMB5MTA PBAT46TMB5MTA
 M3	• Coaxial Plastic fiber • 0.5 mm & 9 x 0.25 mm core diameter • SteelSkin sheathing • Threaded Stainless steel	12 mm	DF-G1 30 DF-G2 75 DF-G3 275	1 m 2 m	PBCT23TMB5 PBCT26TMB5
 M4	• Coaxial Plastic fiber • 0.5 mm & 9 x 0.25 mm core diameter • SteelSkin sheathing • Threaded Stainless steel	12 mm	DF-G1 30 DF-G2 75 DF-G3 275	1 m 2 m	PBCT23TMB5M4 PBCT26TMB5M4
 M4	• Coaxial Plastic fiber • 0.5 mm & 9 x 0.25 mm core diameter • SteelSkin sheathing • Threaded Stainless steel	12 mm	DF-G1 20 DF-G2 55 DF-G3 200	1 m 2 m	PBCT23TMB5MTA PBCT26TMB5MTA
	• Plastic fiber • 1 mm core diameter • SteelSkin sheathing • 51 mm Stainless steel side-view probe	12 mm	DF-G1 35 DF-G2 90 DF-G3 340	1 m 2 m	PBPS43TMB5 PBPS46TMB5
 M6	• Plastic fiber • 1 mm core diameter • Stainless monocoil jacket • Threaded Stainless steel	25 mm	DF-G1 125 DF-G2 325 DF-G3 1190	1 m 2 m	PBT43TSL5-VL PBT46TSL5-VL
 M6	• Plastic fiber • 1 mm core diameter • Stainless monocoil jacket • Threaded Stainless steel	25 mm	DF-G1 110 DF-G2 280 DF-G3 1030	1 m 2 m	PBAT43TSL5TA-VL PBAT46TSL5TA-VL
 M6	• Plastic fiber • 1 mm core diameter • SteelSkin sheathing • Threaded Stainless steel	12 mm	DF-G1 50 DF-G2 135 DF-G3 490	1 m 2 m	PBT43TMB5 PBT46TMB5

* Typical range shown is with a 2 m model

Tight Bend Fibers

- Minimal transmission loss under extreme bend radius
- Bend radius of 1-5 mm

Opposed Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
 M4	• 1 mm core diameter • Threaded Nickel plated brass • M2.5 threaded tip	2 mm	DF-G1 140 DF-G2 365 DF-G3 1335	2 m ✂	PIT46UHF
 M4	• Plastic fiber with flex relief • 1 mm core diameter • Threaded stainless steel • M2.6 threaded tip	2 mm	DF-G1 190 DF-G2 500 DF-G3 1830	1 m ✂ 2 m	PIAT43UHFTA-VL PIAT46UHFTA-VL
 M4	• 1 mm core diameter • Threaded stainless steel • M2.5 threaded tip	2 mm	DF-G1 155 DF-G2 410 DF-G3 1500	2 m ✂	PIAT46UHFMTA

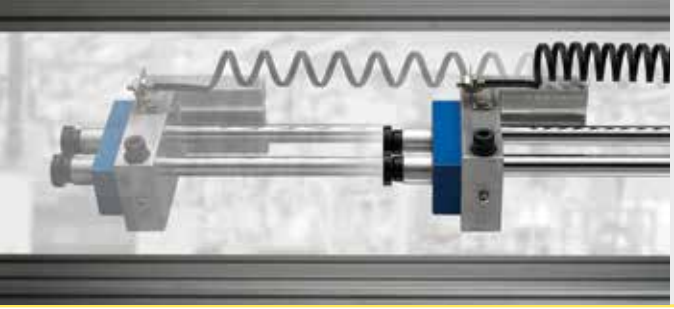
* Typical range shown is with a 2 m model

Diffuse Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
 M6	• 1 mm core diameter • Threaded Nickel plated brass	2 mm	DF-G1 35 DF-G2 90 DF-G3 330	2 m ✂	PBT46UHF
 M6	• Plastic fiber with flex relief • 1 mm core diameter • Threaded stainless steel	2 mm	DF-G1 55 DF-G2 140 DF-G3 515	1 m ✂ 2 m	PBAT43UHFTA-VL PBAT46UHFTA-VL
 M4	• 1 mm core diameter • Threaded stainless steel	2 mm	DF-G1 45 DF-G2 115 DF-G3 415	2 m ✂	PBAT46UHFMTA

✂ Cut to custom length

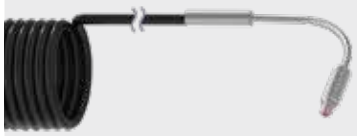
* Typical range shown is with a 2 m model



Retractile Fibers

- 10,000 or more repeat linear motion cycles
- Fiber is coiled to prevent tangle of loose cable

Opposed Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range (mm)	Fiber Length	Model
 M4	• 1 mm core diameter • 10,000+ flexes • Threaded stainless steel • M2.5 threaded tip	25 mm	DF-G1 200 DF-G2 525 DF-G3 1915	2 m ✂	PIAT46UC
 M4	• 1 mm core diameter • 10,000+ flexes • Nickel plated brass • 89 mm long probe tip	25 mm	DF-G1 200 DF-G2 525 DF-G3 1915	2 m ✂	PIP46UC
 M4	• 1 mm core diameter • 10,000+ flexes • Nickel plated brass • M2.5 threaded tip	25 mm	DF-G1 200 DF-G2 525 DF-G3 1915	2 m ✂	PIT46UC

Diffuse Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range (mm)	Fiber Length	Model
 M6	• 1 mm core diameter • 10,000+ flexes • Threaded Nickel plated brass • 89 mm long Stainless steel probe tip	25 mm	DF-G1 30 DF-G2 80 DF-G3 285	2 m ✂	**PBP46UC**
 M6	• 1 mm core diameter • 10,000+ flexes • Threaded stainless steel	25 mm	DF-G1 30 DF-G2 80 DF-G3 285	2 m ✂	**PBT46UCMNF**
	• 1 mm core diameter • 10,000+ flexes • Stainless steel Ferrule tip	25 mm	DF-G1 30 DF-G2 80 DF-G3 285	2 m ✂	**PBF46UC**

✂ Cut to custom length

Tube Liquid Detection

- Detects liquid level through transparent tubing
- Includes mounting straps
- No contact with liquid

Description	Minimum Bend Radius	Fiber Length	Model
• Plastic convergent fiber • 1 mm core diameter • Compatible with 2 mm-25 mm tubes	2 mm	2 m ✂ 5 m	**PDI46U-LLD** **PDI415U-LLD**

Water Detection

- Opposed sensing solution
- Use with L2 lens and DF-G3LIR Fiber Amplifier

Description	Minimum Bend Radius	Fiber Length	Model*
• Glass opposed fiber • 1 mm core diameter • 12 mm M4 thread tip • Stainless Steel sheath	25 mm	1 m 2 m	**IT43ST5-VL** **IT46ST5-VL**

* Sold individually

Probe Liquid Detection

- Teflon® encapsulated
- Output switches when tip immersed in liquid

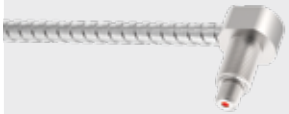
Description	Minimum Bend Radius	Fiber Length	Model
• Plastic fiber • 1 mm core diameter • Probe length is 16.5 mm	2 mm	2 m ✂ 5 m	**PBE46UTMLLP** **PBE415UTMLLP**

✂ Cut to custom length

High Temperature

- Terminated for use in plastic fiber sensors
- Stainless steel sheathing for harsh environments
- Can withstand temperatures up to 315 °C

Opposed Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model**
 M4	• Glass fiber • Rated 315° C at the tip • Stainless monocoil • Threaded Stainless steel • M2.5 threaded tip	25 mm	DF-G1 120 DF-G2 320 DF-G3 1160	2 m	**IMT.756.6S-HT**
 M4	• Glass fiber • Rated 249° C at the tip • Stainless monocoil • Threaded Stainless steel • M2.5 threaded tip	25 mm	DF-G1 205 DF-G2 540 DF-G3 1965	1 m 2 m	**IT43ST5-VL** **IT46ST5-VL**
 M4	• Glass fiber • Rated 249° C at the tip • Stainless monocoil • Threaded Stainless steel • M2.5 threaded tip	25 mm	DF-G1 255 DF-G2 665 DF-G3 2425	1 m 2 m	**IAT43ST5TA-VL** **IAT46ST5TA-VL**

* Typical range shown is with a 2 m model
** Sold individually

Diffuse Fibers

Fiber Head	Description	Minimum Bend Radius	Typical Range* (mm)	Fiber Length	Model
	• Glass fiber • Rated 315° C at the tip • Stainless monocoil • Threaded Stainless steel	25 mm	DF-G1 60 DF-G2 160 DF-G3 580	1 m 2 m	**BMT13.33S-HT** **BMT16.6S-HT**
	• Glass fiber • Rated 249° C at the tip • Stainless monocoil • Threaded Stainless steel	25 mm	DF-G1 70 DF-G2 185 DF-G3 675	1 m 2 m	**BT63ST5-VL** **BT66ST5-VL**
	• Glass fiber • Rated 249° C at the tip • Stainless monocoil • Threaded Stainless steel	25 mm	DF-G1 80 DF-G2 210 DF-G3 765	1 m 2 m	**BAT63ST5TA-VL** **BAT66ST5TA-VL**

* Typical range shown is with a 2 m model

Fiber Accessories

Lenses

- Screw on lenses to focus the light beam even more
- Fixed/adjustable focus lenses have very small light spot for detecting small objects

Adjustable Focus

LZ3C8

- Accepts M3 threaded fibers
- Beam spot ø 0.5-3.2 mm

L2

- Accepts M2.5 threaded fibers
- Range extension

Opposed Fibers (for longer range)

L2RA

- Accepts M2.6 threaded fibers
- 90° beam deflection
- Range extension

L08FP

- Accepts 2.2 mm outer diameter fiber jacket
- M8 x 1.0 threaded acrylic lens

Fixed Focus

L4C6

- Accepts M4 threaded fibers
- Beam spot ø 0.25 mm @ 6 mm

L4C20

- Accepts M4 threaded fibers
- Beam spot ø 4 mm @ 20 mm

Brackets

SMBFP3

- Mounting hole for M3 threads
- 304 Stainless Steel

SMBFP4

- Mounting hole for M4 threads
- 304 Stainless Steel

SMBFP4N

- Mounting hole for M4 threads
- 304 Stainless Steel

SMBFP6

- Mounting hole for M6 threads
- 304 Stainless Steel

Plastic Fiber Cutter

PFC-4 (qty 1)
PFC-4-100 (qty 100)

Packaging Solutions

Industry 4.0

What IIoT Means for Manufacturing

IIoT is perhaps the biggest buzzword in factory automation today, and it is a key aspect of Industry 4.0. IIoT already impacts the way factories operate today, and it will increasingly impact businesses in the future.

Industry 4.0, IoT, and IIoT

Industry 4.0 describes the current wave of technological innovation as an era in history characterized by interconnectivity enabled by the internet and wirelessly-connected devices. While digital technologies enable the collection of large amounts of valuable data, this data primarily exists in silos that are not easily accessible for analysis and actionable insights.

The technologies of Industry 4.0 make data readily available and automate the communication between industrial automation equipment and systems. This enables predictive analysis for machines as well as process optimization across the factory floor.

The **Internet of Things (IoT)** describes the technologies that connect objects—from consumer electronics to industrial components—to the internet. The **Industrial Internet of Things** (or IIoT) refers specifically to the impact of this innovation on industrial applications.

The key benefits of IIoT technologies for factory automation include:

- Visibility and Remote Access to the operational status of machine components (both historically and in real-time)
- Predictive Analytics for more accurate planning of machine maintenance
- Interconnectivity for seamless communication among machines, components, and people

What Does IIoT Mean For Factories?

Following are three practical examples of how visibility, predictive analytics, and interconnectivity are impacting factories today.

Visibility and Remote Access Increase Efficiency

In order to ensure efficient processes throughout the factory, machine operators must quickly and easily determine the status of machines. The greater the visibility, the easier it is to identify and resolve problems and keep operations running smoothly.

Traditional tower lights provide visibility wherever they can be physically seen. However, tower lights equipped with wireless communication capabilities both display a visual indication of an event and transmit wireless alerts. This helps ensure that operational problems are identified and addressed immediately, regardless of whether a machine operator is physically present to see the visual indicator.

An additional benefit of wireless indicators is data logging for use in OEE (Overall Equipment Effectiveness) calculations. Not only can operators respond to alerts quickly as they occur, but a history of alerts can also be stored and analyzed offline. This historical data can be used to track machine uptime, production volume, rejected parts, and other key metrics to make more informed decisions over time.

Predictive Maintenance Increases Machine Uptime and Availability

In addition to real-time status monitoring, IIoT technologies can also be used to help avoid machine failures thanks to predictive maintenance.

By monitoring machine components in real-time for increases in vibration and temperature, problems can be detected and resolved before they become too severe and cause additional damage or result in unplanned downtime. Over time, the historical data creates a valuable machine performance log that can be used to make more informed maintenance decisions down the line.

Interconnectivity Streamlines Factory Communications

Wireless technologies also enable seamless interaction among human workers, and can have a significant impact on the efficiency of manual production lines. For example, instead of requiring machine operators to walk over to the manager area for assistance with a technical issue, a wireless system utilizing connected pushbuttons or switches and tower lights can be used to alert managers when assistance is needed on the line.

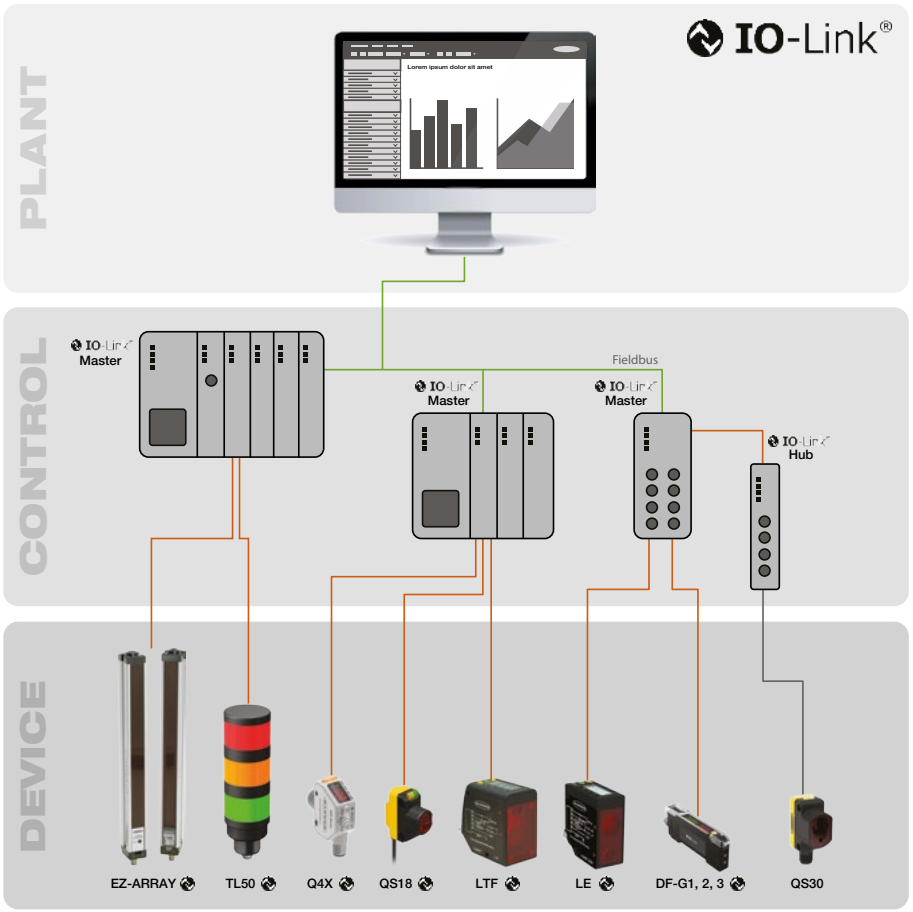
Is Your Business IIoT-Ready?

From keeping machines running smoothly to enabling seamless communication among machines, components, and people, the benefits of IIoT technologies are tangible. However, it can be challenging knowing where to start and how to use these technologies to their fullest advantage.

Below are three questions to help manufacturers prepare for a move from digital to IIoT:

- What are the inefficiencies in your operations?
- What kind of data would help you overcome these inefficiencies?
- What communication processes need to be in place in order to utilize data in a meaningful way?

Answering these questions can help manufacturing facilities identify the best technologies to meet their immediate business needs and start taking advantage of the long-term benefits of IIoT.



What is IO-Link?

IO-Link (IEC61131-9) is an open standard serial communication protocol that allows for the bi-directional exchange of data from sensors and devices that support IO-Link and are connected to a master. The IO-Link master can transmit this data over various networks, fieldbuses, or backplane buses, making the data accessible for immediate action or long-term analysis via an industrial information system (PLC, HMI, etc.). Each IO-Link sensor has an IODD (IO Device Description) file that describes the device and its IO-Link capabilities.

5 Advantages of IO-Link

1. Standardized and Reduced Wiring

   IO-Link devices do not require any special or complicated wiring, but can be connected using the same cost-effective standard unshielded 3-wire cables as conventional discrete I/O. In addition, IO-Link also eliminates the need for analog sensors and reduces the variety of cord sets required for sensors, which saves inventory costs. IO-Link also supports a master-slave configuration with passive connection points, which further reduces wiring requirements.

2. Increased Data Availability

   Access to sensor-level data helps ensure the smooth operation of system components, streamlines device replacement, and enables optimized machine maintenance schedules—all of which save costs and reduce the risk of machine downtime.

   This wealth of valuable data made available through IO-Link is integral for the Industrial Internet of Things (IIoT) and Industry 4.0 initiatives.

3. Remote Configuration and Monitoring

   With IO-Link, users can read and change device parameters through the control system software, enabling fast configuration and commissioning that saves time and resources. In addition, IO-Link allows operators to dynamically change the sensor parameters from the control system as needed—such as in the case of product changeover—which reduces downtime and allows machines to accommodate greater product diversity.

   In addition, the ability to monitor sensor outputs, receive real-time status alerts, and adjust settings from virtually anywhere allows users to identify and resolve problems that arise on the sensor level in a timely manner. This capability reduces costly downtime and improves overall efficiencies.

4. Simple Device Replacement

   In addition to the ability to remotely adjust sensor settings, IO-Link's data storage capability also allows for automated parameter reassignment in case of device replacement (also known as Auto-Device Replacement or ADR). Users can import existing sensor parameter values into a replacement sensor for seamless replacement, getting the new device up and running as quickly as possible.

5. Extended Diagnostics

   IO-Link provides users with visibility into errors and health status from each device. This means that users can see not only what the sensor is doing but also how well it is performing—a valuable insight into a machine's efficiency. In addition, extended diagnostics allow users to easily identify when a sensor is malfunctioning and diagnose the problem without shutting down the line or machine.

   The combination of real-time and historic data not only reduces troubleshooting efforts as issues arise but also allows for optimization of machine maintenance schedules, saving costs and increasing efficiency in the long term

Industry Challenges

- Unplanned Downtime
- Wash Down Enviornment
- Frequent Product Changeover
- Machine Troubleshooting
- Detecting Challenging Packaging material
- Safeguarding Complex machines
- Predictive Maintenance
- Data and Analytics
- Food Safety Regulations
- Track and Trace

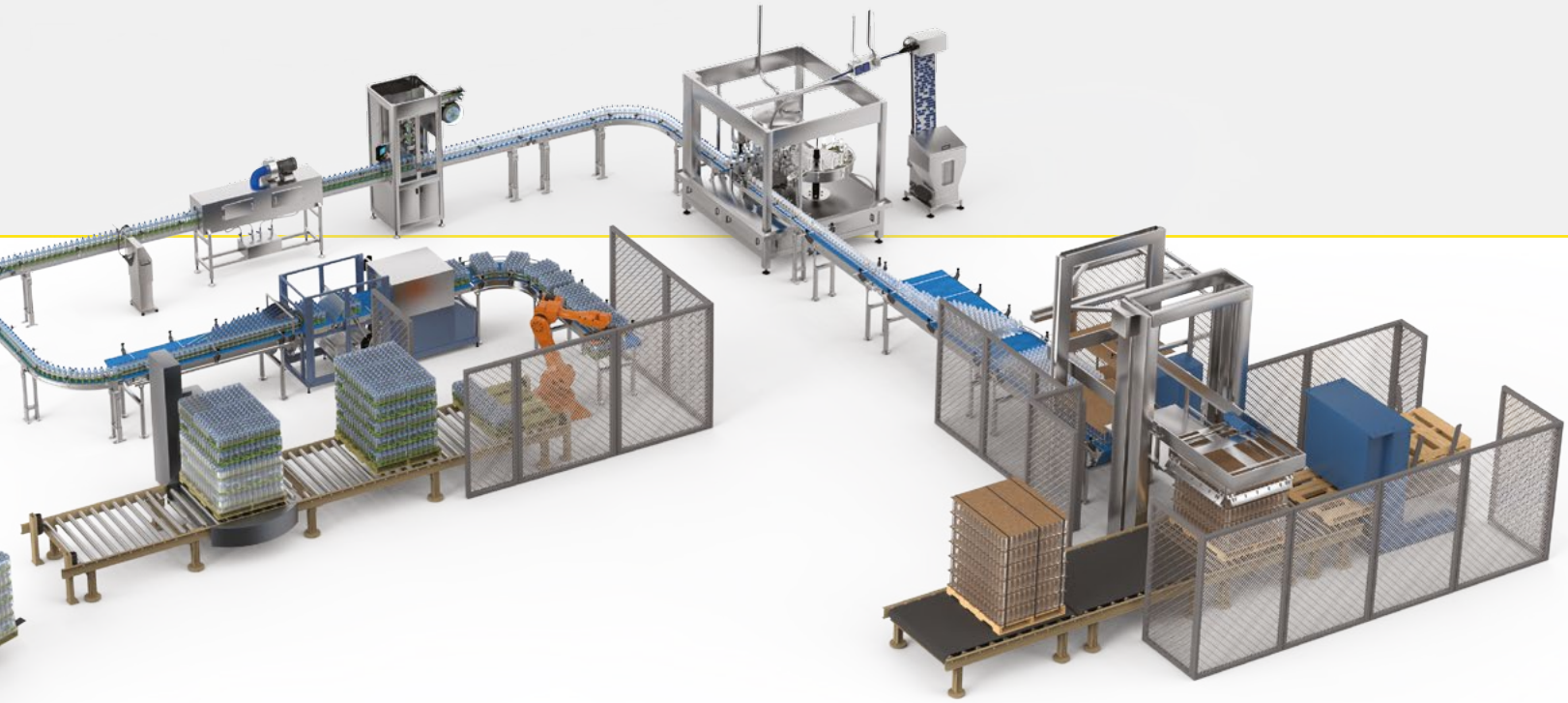
Banner Engineering is Developing Products to meet these Challenges:

IO-Link Communication

IO-Link is an open standard serial communication protocol that allows for the bi-directional exchange of data from sensors and devices that support IO-Link and are connected to a master. The IO-Link master can transmit this data over various networks, fieldbuses, or backplane buses, making the data accessible for immediate action or long-term analysis via an industrial information system (PLC, HMI, etc). Banner IO-Link products reduce wiring, increase data availability, enable remote configuration and monitoring, simplify device replacement, and provide extended diagnostics.

Safety Products that meet Cat 4 PLe

Protecting employees at your work place is a high priority and that is why Banner designs our safety components to the highest safety ratings in the market.



Ecolab Certified

Many manufactures use a mixture of cleaning chemicals to prevent the growth of bacteria on their equipment. Banner takes this into consideration when selecting housing and window materials for our products for food and beverage industries. Ecolab Certification means the Banner product is robust when exposed to cleaning chemicals and will hold up well to regular cleaning.

FDA Compliant Materials

In the manufacturing process it is possible for food or beverages to come in contact with components on the line during the processing, packaging, or storage process. Banner understands this concern and is developing products with housings made of FDA compliant materials.

IP69K Products

There is an increasing need in the market to develop sensors that can hold up to washdown areas and therefore Banner is developing more sensors that meet and exceed the IP69K test requirements. The IP69K rating refers to the product's ability to resist ingress of dust as well as high temperature high pressure water.

Hygienic Design

Food safety is a high priority for manufacturers today. When developing new products for the food and beverage industry, Banner takes into consideration the shape of the sensor housing. It is important for the housing shape to be self-draining to remove residues of products and chemicals during the cleaning process. The housing should also be smooth and free from crevices, sharp corners, protrusions, and shadow zones.

Packaging in the Food Industry

The food industry is the largest industry on the planet. As economies around the world continue to evolve and develop, so do the lifestyles and demands of consumers. In this highly competitive market, a company's ability to respond and adapt to these changes is critical. Changing consumer demands quickly translates to changes in products, production processes and packaging.

Banner has developed products specifically designed for the food industry. Our industry knowledge and expertise in sensors and vision sensors, LED lights and indicators, wireless networks and safety control allow us to offer solutions that address these challenges. Products and solutions from Banner help food manufacturers around the world reduce expenses, improve quality and efficiency, and increase product output and profits without compromising worker safety.

Solutions for Packaging in the Food Industry

see page 43

Clear Tray Detection for Fill Trigger

Challenge

- Reliably sense transparent containers
- Suitable for harsh washdown environments

Featured Solution

Q4X

Other Solutions

QM26 Clear Object Detection
QS18 Clear Object Detection

Key Features

- Algorithm uses distance and intensity for clear object detection
- FDA grade stainless steel and Ecolab certified
- IP69K
- No reflector required

Key Benefits

- Reliably detects transparent containers no matter what shape or surface
- Holds up to chemicals used to clean equipment which reduces downtime
- Holds up to temperature cycling which occurs in high temperature and high pressure washdown
- Quick installation and the reflector is not a concern for maintenance

see page 40

Roll Diameter

Challenge

- Accurately measure roll diameter
- Targets often contain vibrant, multi-colored, graphics of varying reflectivity

Featured Solution

LE250

Other Solutions

LE550
LTF
Q4X

Key Features

- Sub-millimeter repeatability regardless of color, reflectivity, or angle
- Factory calibrated for full scale measurement out of box
- Two-line, eight-character display

Key Benefits

- Stable measurement minimizes waste left on core
- Easily deployable without need to teach specific range or empty core
- Visual feedback for easy adjustment and troubleshooting

see page 41

Hopper Fill Level Monitoring

Challenge

- Variable target size, texture, color and reflectivity
- Measuring hopper fill level while avoiding false readings from side walls

Featured Solution

LTF

Other Sslutions

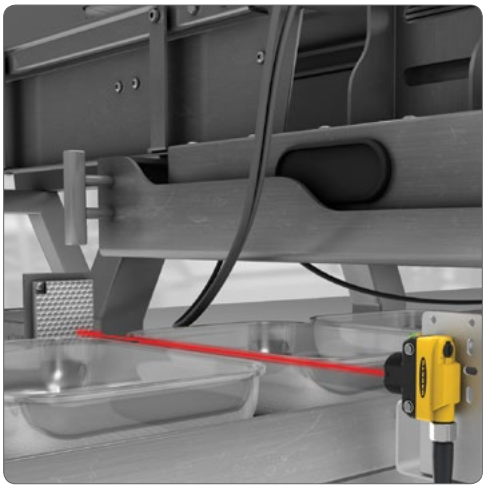
LE550
QT50U

Key Features

- Best in class linearity, repeatability and resolution
- Visible red laser spot
- Two-line, eight-character display
- 12 m and 24 m range

Key Benefits

- Accurate readings regardless of color, texture, or angle of target
- Laser spot allows for easy alignment
- Visual feedback for quick adjustment and troubleshooting
- Long range allows sensor to be out of the way of operators or for washdown



see page 45

Clear Object Detection

Challenge

- Sense leading edge of clear PET trays and clamshell packaging
- Food powder on reflector creates false outputs
- Complicated sensor set up

Key Features

- Polarized coaxial optical design
- 400 µs ON/OFF response time
- ClearTracking Algorithm
- Single push teach method

Featured Solution

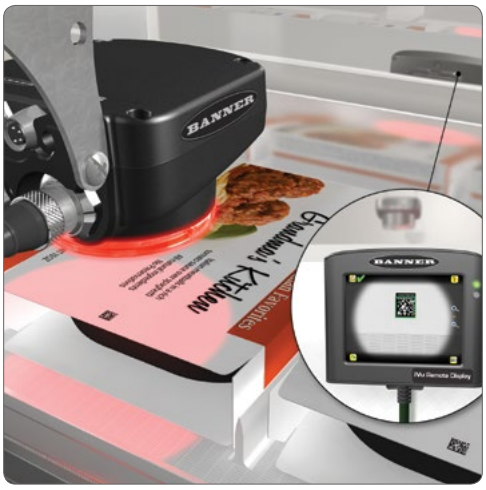
QS18 Clear Object Detection

Other Solutions

Q4X

Key Benefits

- Reliably detects clear and mirror-like surfaces
- Precise leading-edge detection
- Ability to compensate for dust build-up and ensure consistent detection
- Single push teach method makes for quick and easy installation



see page 64

Carton Verification

Challenge

- Ensuring the product is correctly placed in the appropriate carton
- Changeover between different products can increase downtime
- Need easy-to-use solution

Key Features

- Reads a variety of linear and 2D barcodes
- Ethernet communications
- Up to 30 stored inspections
- Configured via touchscreen

Featured Solution

iVu GEN II BCR

Other Solutions

*Presence*Plus BCR

Key Benefits

- Robust barcode decoding
- Barcode data can be stored in PLC or set for simple pass fail
- Reduce downtime with saved inspections for different products
- No complex software minimizes necessary training for setup

see page 65

Cabinet Lighting

Challenge

- Limited space inside panel
- Dark control panel makes it difficult to troubleshoot problems

Key Features

- 15 mm profile
- Completely sealed with an IP67 rating for use in wet or dusty environments

Featured Solution

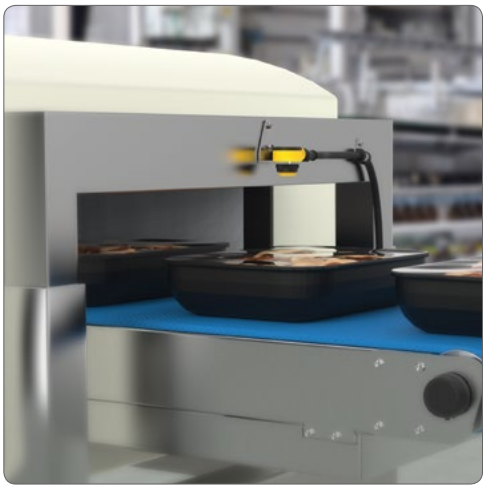
WLS15

Other Solutions

WLB32

Key Benefits

- Low profile fits in tight spaces
- Will hold up and last a long time in tough environments



see page 47

Sensors for Wash Down Areas

Challenge
- High pressure high temperature washdown
- Harsh cleaning agents degrade housing
- Thermal cycling causes condensation

Featured Solution
T18-2

Other Solutions
Q4X

Key Features
- IP69K-rated
- Ecolab certified
- Ultrasonically welded joints
- Epoxy encapsulated

Key Benefits
- Tested to withstand 1200 PSI and 180 °F washdown
- Chemically compatible with washdown chemicals
- Ultrasonically welded joints create one piece housing
- Epoxy-filled housing reduces potential for condensation

see page 66

Machine Illumination—Washdown

Challenge
- Machine illumination in close contact with food
- Wash down area
- Food contamination hazards

Featured Solution
WLS27

Other Solutions
WLS15

Key Features
- Brilliant LED illumination in hygienic cylindrical design
- Rugged ultrasonically welded, IP69K construction and Ecolab certified
- Shatterproof copolyester housing

Key Benefits
- 50,000 hours lifetime, easy-to-clean light
- Specifically designed to withstand food and beverage industry applications
- No secondary enclosure needed to protect against broken lights

see page 77

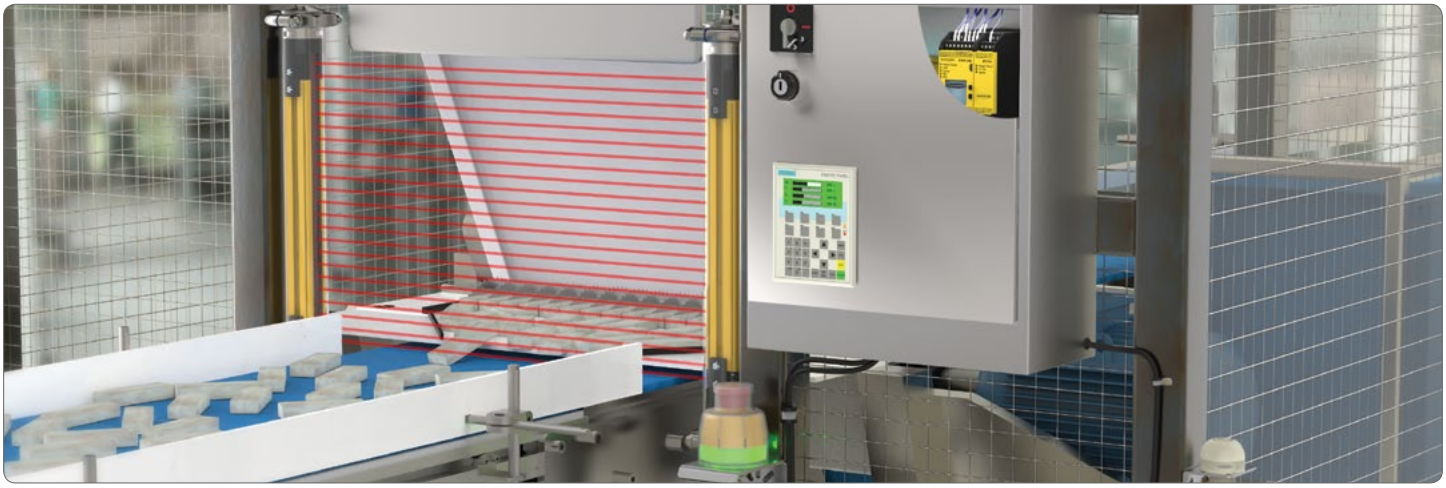
Wash Down Touch Buttons

Challenge
- Control panel located in washdown area
- Workers use thick rubber gloves
- Food area

Featured Solution
S22 Touch

Key Features
- Rugged IP69K construction
- Smart electric field sensing technology
- FDA-grade models available

Key Benefits
- Built for high-pressure washdown environments
- Easily actuated with bare hands or work gloves
- FDA-grade models for use in food environments



Safety Light Curtain—Wash Down Area

see page 56

Challenge

- Safeguard food processing machine
- Wash down area with harsh chemicals
- Temperature cycling

Key Features

- End-to-end zone protection with no dip switches
- IP69K enclosure with 316L stainless steel end caps
- Hydrophobically vented

Featured Solution

EZ-SCREEN LS (IP69K)

Key Benefits

- Intuitive, easy-to-use
- Build to withstand high pressure, high temperature washdown
- Air vents with vapor barriers prevent condensation during thermal cycling

E-Stop Safety—Wash Down Area

see page 58

Challenge

- Holding up to a harsh environment
- Ability to identify which E-Stop was pressed
- Assembling components is time consuming

Key Features

- IP69K rated FDA Grade Silicon cover
- Ecolab certified
- Preassembled for fast installation
- Green/Red lighted base
- 8-pin Quick-Disconnect

Featured Solution

30 mm Mount E-Stop (IP69K)

Key Benefits

- Withstands high pressure and high temperature washdown
- Certified to withstand cleaning chemicals used in the food processing industry
- 360° visible indication of E-Stop actuation
- Easy installation with no assembly or wiring required

Safety Monitoring

see page 60

Challenge

- Safeguard machine with varying safety add-ons depending on customer needs
- Complex logic or multiple safety scenarios
- Communicate with HMI to display machine status

Key Features

- Free, easy-to-use software using drag and drop function blocks
- Simulation mode
- Expandable I/O modules
- Industrial Ethernet communications and Profinet communications

Featured Solution

XS26-2

Other Solutions

SC26-2

Key Benefits

- Configure safety program in minutes
- Test configuration without need to wire or even own safety controller
- Base controller with 26 inputs and two dual-channel safety outputs can be expanded to fit machine requirements
- Ethernet-enabled models allows for easy communications with PLC or HMI

Packaging in the Beverage Industry

Beverage production offers some of the biggest challenges in factory automation.

From severe conditions and harsh cleaning processes that can quickly degrade system components to safeguarding palletizers, conveyors, and other equipment that pose a safety hazard to personnel, each challenge works against total Overall Equipment Effectiveness (OEE) and the overall profitability of an organization.

Banner understands these challenges. Our industry knowledge, expertise in sensors, safety control, LED lights and indicators is combined the most comprehensive product catalogs in the industry. We are able to provide products and solutions that solve the unique challenges faced by beverage producers, helping them ensure and improve product quality, productivity, and safety, and achieve maximum Overall Equipment Effectiveness.

Solutions for Packaging in the Beverage Industry

see page 43

Line Pressure Control

Challenge

- Sensing bottle stoppage and shortage often requires two sensors
- On and Off-delay logic to ignore passing bottles requires additional PLC programming
- Bottles can be clear to opaque and filled or empty

Featured Solution

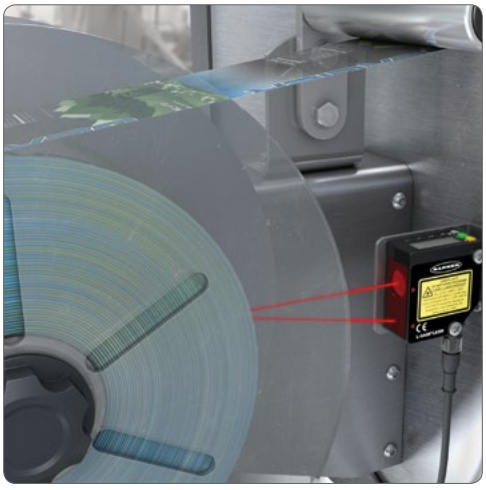
Q4X Dual Discrete

Key Features

- Dual discrete output
- Programmable output logic
- Dual mode/Clear Object Detection mode

Key Benefits

- One sensor solution instead of two
- On and off-delays within sensor reduce PLC programming
- Robust clear object sensing using distance and intensity changes



see page 40

Roll Diameter

Challenge

- Flexible packaging often contains vibrant, multi-colored graphics of varying reflectivity that can be difficult to reliably sense
- Variable roll stock diameter increases changeover time when sensors need to be adjusted

Featured Solution

LE250/550

Other Solutions

Q4X

LTF

Key Features

- Laser triangulation with linear array technology
- Ready to measure full scale out of box or can be programmed with integrated LCD display

Key Benefits

- Ensures repeatability and accuracy for challenging targets regardless of color, reflectivity, or angle
- Reduces downtime between product changeover

see page 44

Shrink Sleeve Labelling At High Speeds

Challenge

- High speed shrink sleeve applicator can run 800 bottles per minute
- Precise leading-edge sensing to center sleeve on bottle

Featured Solution

QS18LLP

Other Solutions

DF-G2

QS18 Clear Object Detection

Key Features

- 700 µs response time
- Laser-based retroreflective sensor

Key Benefits

- Fast response time to easily keep up with bottling line
- Narrow laser beam ensures repeatable leading-edge sensing

see page 45

Clear Bottle Tipped

Challenge

- Detect downed bottles to prevent jams on filling line
- Bottles can be plastic, glass, clear or opaque

Key Features

- Single-point teach mode
- Coaxial polarized optics

Featured Solution

QS18 Clear Object Detection

Other Solutions

Q4X

Key Benefits

- Easy teach process minimizes install time
- Coaxial optics ensure reliable sensing regardless of material or opacity

see page 46

Level Fill

Challenge

- Sense liquid in bottles of various colors from clear to opaque
- Sense under-filled clear or opaque bottles

Key Features

- 1450 nm wavelength detects water-based liquids inside translucent or opaque plastic and glass bottles
- Use of apertures to decrease the minimum detectable change in liquid level

Featured Solution

QS30H2O

Other Solutions

DF-G3LIR

Key Benefits

- See through bottles and detect water-based liquids
- Under-filled bottles can be removed from bottling line

see page 64

Data Code Presence

Challenge

- Laser etched date code changes regularly
- Product changeover requires parameter changes without connecting to a PC

Featured Solution

iVu Plus BCR Gen2

Other Solutions

VE

P4 Omni

Key Features

- Easy-to-use toolset
- Integral and remote screen for configuration and troubleshooting
- Save and store 30 inspections

Key Benefits

- Quickly create barcode inspection
- No computer software needed for setup
- Save inspections for quick product changeover

see page 42

Registration Mark on Shrink Sleeve Label

Challenge

- Repeatable sensing of registration mark
- Registration mark colors vary depending on product
- Shiny, high-gloss labels

Featured Solution

R58E

Other Solutions

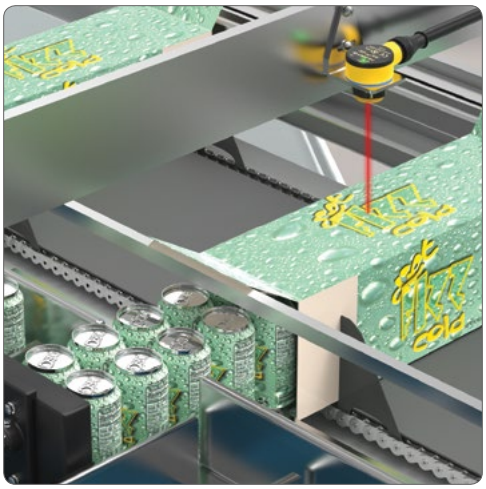
R55F

Key Features

- 50 µs response time
- RGB LED
- Smart gain-control algorithm

Key Benefits

- Quick response time ensures repeatable sleeve length
- RGB LED optimizes contrast
- Smart gain-control maximizes performance on low-contrast or high-gloss applications



see page 47

Sensors for Wash Down Areas

Challenge

- Case packers are subject to washdown procedures
- Cases are often multicolored and have a glossy finish

Key Features

- IP69K, FDA-grade materials
- Ultrasonically welded housing and epoxy encapsulated cavities
- High excess gain

Featured Solution

T18-2

Other Solutions

M18-4

Key Benefits

- Built to withstand high-pressure, high-temperature washdown
- One-piece construction eliminates adhesives and effectively seals out moisture
- Minimal color sensitivity prevents chattering output on difficult targets

see page 66

Machine Illumination—Washdown

Challenge

- Enclosed area is dark, making it hard for operators to see potential problems
- Filler machine is subject to washdown procedures
- Secondary lighting enclosure to protect against broken pieces

Key Features

- Bright LED illumination rated for 50k hours
- Hygienic, IP69K, Ecolab certified housing
- Shatterproof copolyester shell

Featured Solution

WLS27

Other Solutions

WLS28-2

Key Benefits

- Long lasting LED lights require minimal maintenaince
- Rugged design stands up to demanding washdown procedures
- Shatterproof housing can be installed directly inside the machine without worry

see page 77

Wash Down Touch Buttons

Challenge

- Control panel located in washdown area
- Workers use thick rubber gloves
- Food area

Key Features

- Rugged, fully encapsulated IP69K construction
- Smart electric field sensing
- FDA-grade models available

Featured Solution

S22 Touch

Key Benefits

- Built for high-pressure washdown environments
- Easily actuated with bare hands or work gloves
- FDA-grade models for use in food environments

see page 65

Cabinet Lighting

Challenge

- Limited space inside panel
- Dark control panel makes it difficult to troubleshoot problems

Key Features

- 15 mm profile
- Completely sealed with an IP67 rating for use in wet or dusty environments

Featured Solution

WLS15

Other Solutions

WLB32

Key Benefits

- Low profile fits in tight spaces
- Will hold up and last a long time in tough environments

see page 72

Machine Indication

Challenge

- Ability to easily see indicator status from all angles in high ambient light conditions
- Machines use combination of AC and DC power sources
- Installation/Assembly time

Key Features

- Constructed with white windows with high intensity LED's
- AC and DC power options available
- Audible options
- Preassembled models

Featured Solution

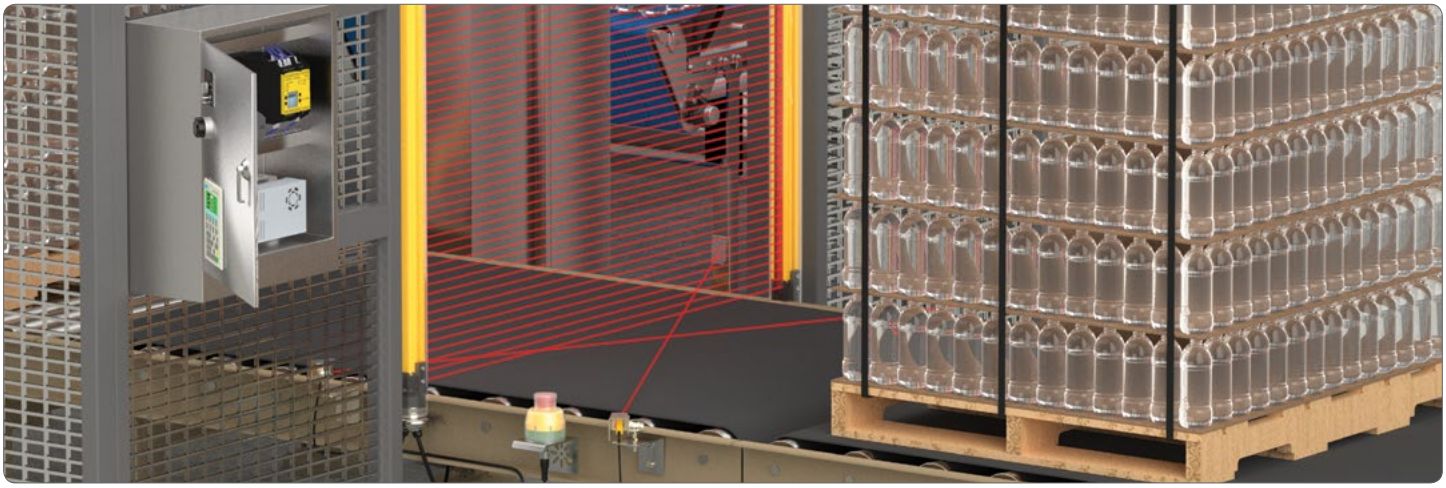
TL50

Other Solutions

TL70

Key Benefits

- High visibility of on and off states
- Flexibility to work with machines regardless of power supply
- Fast installation as no assembly is required



Safety Monitoring

see page 60

Challenge

- Safeguard machine with variable safety add-ons depending on customer needs
- Complex logic or multiple safety scenarios
- Communicate with HMI to display machine status

Key Features

- Free, easy-to-use software using drag and drop function blocks
- Simulation mode
- Expandable I/O modules
- Ethernet and Profinet communications

Featured Solution

XS26-2

Other Solutions

SC26-2

Key Benefits

- Configure safety program in minutes
- Test configuration without need to wire or even own safety controller
- Base controller with 26 inputs and two dual-channel safety outputs can be expanded to fit machine requirements
- Ethernet-enabled models allow for easy communications with PLC or HMI

Safety Light Curtain—Wash Down Area

see page 56

Challenge

- Safeguard beverage palletizer
- Wash down area with harsh chemicals
- Temperature cycling

Key Features

- End-to-end zone protection with no dip switches
- IP69K enclosure with 316L stainless steel end caps
- Air vent with vapor barrier

Featured Solution

EZ SCREEN LS (IP69K)

Key Benefits

- Intuitive, easy-to-use safety light curtains
- Built to withstand high pressure high temperature washdown
- Air vents with vapor barriers prevent condensation during thermal cycling

E-Stop Safety—Wash Down Area

see page 58

Challenge

- Harsh environment with high pressure washdown
- Difficult to tell what E-Stop is pressed when wired in series
- Modular systems are time consuming to install

Key Features

- IP69K rated FDA Grade Silicon cover
- Ecolab certified
- Green/Red lighted base
- 8-pin Quick-Disconnect

Featured Solution

30 mm Mount E-Stop (IP69K)

Key Benefits

- Withstands high pressure and high temperature washdown
- Certified to withstand cleaning chemicals used in the food processing industry
- 360° visible indication of E-Stop actuation
- Easy installation with no assembly or wiring required

Packaging in Consumer Goods

From stand-up pouches packed in bliss boxes to plastic clam shells shrink-wrapped together, the size, shape and materials used to package a product are becoming increasingly diverse. To accommodate this diversity, packaging automation is becoming more intelligent to support a greater number of SKUs on production lines. With the accelerating pace of packaging automation comes greater need to safeguard packaging equipment.

Solutions for Packaging in Consumer Goods Industry

see page 43

Shiny Product Detection

Challenge

- Reflective, irregular shaped objects can cause erratic and inconsistent readings
- No gap between products as they come down the conveyor
- PLCs with slow scan times may not keep up with high speed lines

Featured Solution

Q4X

Other Solutions

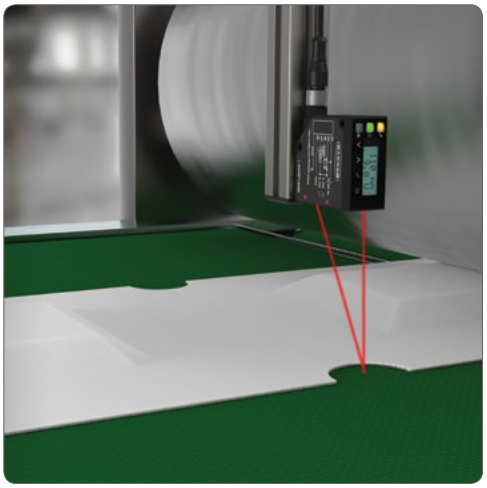
LTF

Key Features

- High excess gain and dynamically adjusted laser power
- Built-in Foreground Suppression Mode
- On-delay and off-delay logic built into sensor

Key Benefits

- Excess gain and dynamic laser power allows the sensor to reliably measure shiny objects at steep angles
- Foreground Suppression Mode allows a sensing window to be set on the apex of the container as it passes by
- Built-in on and off-delays can extend output time



see page 40

Material Thickness—Diaper

Challenge

- Control thickness of absorbent material
- Porous or uneven material causes erratic reading
- Quickly change measurement range for product changeover

Featured Solution

LE 550/250

Other Solutions

Q4X

Key Features

- Laser triangulation distance measurement
- Advanced measurement algorithms
- Two-line, eight-character display with pushbutton programming

Key Benefits

- Repeatable and accurate measurements regardless of target's color or texture
- Perform average, max/min, measurement range readings instead of a single point measurement
- Easy setup, troubleshooting, and real-time feedback

see page 41

Roll Diameter

Challenge

- Accurately measure roll diameter of various materials
- Large parent rolls of material
- Easy to setup without need to present full/empty roll

Featured Solution

LTF

Other Solutions

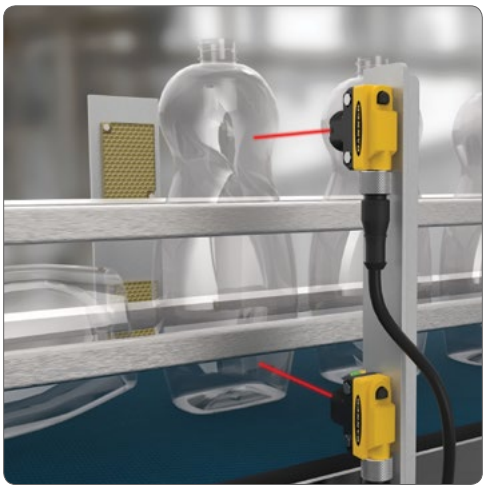
LE550

Key Features

- Repeatable sensing regardless of texture, color, or angle of target
- 12 m and 24 m ranges available
- Two-line, eight-character display with push button input

Key Benefits

- Accurate measurement reduces waste left on the core
- Long ranges for large rolls and easy alignment with visible laser spot
- Pushbutton interface allows for easy setup, adjustment, and troubleshooting



see page 45

Clear Object Detection

Challenge

- Two sensors used to sense down bottle and prevent jams on filling line
- Containers can be plastic, glass, clear or opaque

Key Features

- Single-point teach mode
- Coaxial polarized optics

Featured Solution

QS18 Clear Object Detection

Other Solutions

Q4X

Key Benefits

- Easy teach process minimizes install time
- Coaxial optics ensure reliable sensing regardless of material or opacity

see page 46

Fill Level

Challenge

- Sense underfilled bottles through an opaque container
- Need to see through plastic bottle, but not clear liquid inside
- Repeatable level control

Key Features

- 1450 nm wavelength LED emitter
- 8 m model QS30H2O sensor
- Apertures available

Featured Solution

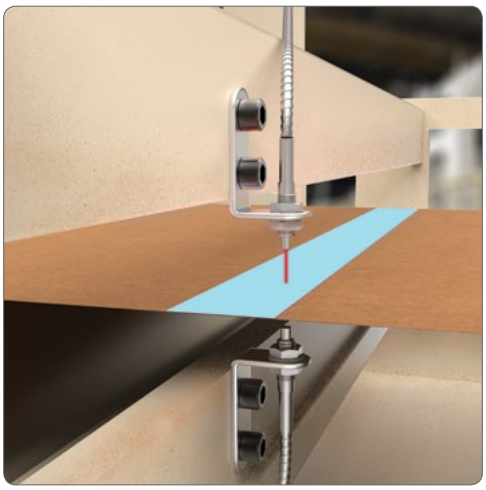
QS30H2O

Other Solutions

DF-G3LIR

Key Benefits

- Special wavelength that cannot see through water-based liquids
- Long range sensor can see through bottles, but not water-based liquid inside
- Use of apertures narrow the effective beam for precise fill level



see page 48

Web Monitoring/ Splice Detection

Challenge

- Material texture and transparency vary
- Dusty environment
- Easy setup

Key Features

- Variety of opposed mode fiber arrays for edge guiding
- High excess gain with auto thresholding
- Option for mid-point teach mode

Featured Solution

DF-G3

Key Benefits

- Opposed mode fiber arrays minimize effects of changing textures and transparencies
- Able to burn through dust and compensate for dust that settles on fibers
- Mid-point teach learns the optimal web position with an easy single-point teach

see page 62

Label and Cap Verification

Challenge

- Ensure cap integrity, label verification and bottle orientation before case packer
- High product changeover
- Vision systems can be complex and require computer software

Key Features

- Multiple vision tools in one inspection
- Save up to 30 inspections
- Configuration via integrated or remote display

Featured Solution

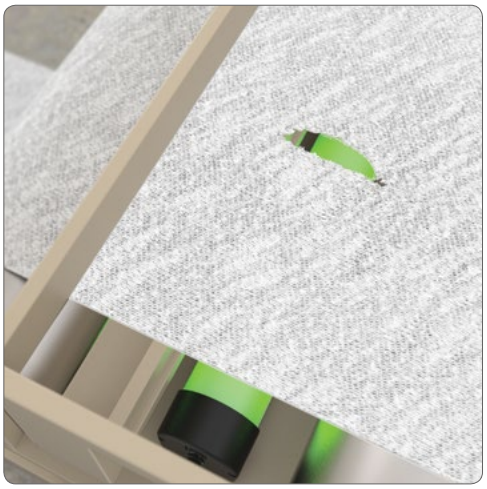
iVu Plus TG Gen2

Other Solutions

VE

Key Benefits

- One iVu vision sensor can inspect both cap and label using easy-to-use Match tool
- Preconfigured inspections reduce downtime between product changeovers
- No complex software to learn, easily troubleshoot problems through integral or remote screen



see page 70

Visual Web Inspection

Challenge

- Operator visually inspects web of non-woven material for holes or thin spots
- Product changeover and operator changes require easy adjustability to get proper contrast
- Fluorescent lights require maintenance and risk of broken glass

Key Features

- Bright, uniform light
- Dimming capable via potentiometer or remote input
- Rugged metal housing, shatterproof light cover, long-lasting energy-efficient LEDs

Featured Solution

WLB92

Other Solutions

WLB32

Key Benefits

- Uniform light acts as backlight to see thin spots on web
- Easily dimmable to accommodate operator preferences and product changes
- Industrial-grade design provides maintenance-free illumination

see page 65

Cabinet Lighting

Challenge

- Limited space inside panel
- Dark control panel makes it difficult to troubleshoot problems

Key Features

- 15 mm profile
- Completely sealed with an IP67 rating for use in wet or dusty environments

Featured Solution

WLS15

Other Solutions

WLB32

Key Benefits

- Low profile fits in tight spaces
- Will hold up and last a long time in tough environments

E-Stop Safety

see page 58

Challenge

- Many E-stops in series make it difficult to tell which one is pressed
- Modular systems are time consuming to install

Key Features

- Green/Red lighted base
- 8-pin Quick-Disconnect

Featured Solution
30 mm Mount
E-Stop

Other Solutions

Key Benefits

- 360 visible indication of E-Stop actuation reduces downtime
- Easy installation with no assembly or wiring required

Safety Light Curtain

see page 56

Challenge

- Safeguard palletizing machine
- Alignment of light curtains over large span
- In an area where accidental impact can occur and cause damage

Key Features

- End-to-end zone protection with no dip switches
- Bi-color alignment indicators
- Metal end caps, this aluminum housing with 5 mm recessed window

Featured Solution
EZ-SCREEN LS

Other Solutions
EZ-SCREEN LP

Key Benefits

- Intuitive, easy-to-use safety light curtains
- Highly visible indicators streamline alignment process and facilitate easy troubleshooting
- Heavy duty housing to avoid damage from impact

Safety Monitoring

see page 60

Challenge

- Safeguard machine with variable safety add-ons depending on customer needs
- Complex logic or multiple safety scenarios
- Communicate with HMI to display machine status

Key Features

- Free, easy-to-use software using drag and drop function blocks
- Simulation mode
- Expandable I/O modules
- Ethernet and Profinet communications

Featured Solution
XS26-2 Safety Controller

Other Solutions
SC26-2

Key Benefits

- Configure safety program in minutes
- Test configuration without need to wire or purchase safety controller
- Base controller with 26 inputs and two dual-channel safety outputs can be expanded to fit machine requirements
- Ethernet-enabled models allows for easy communications with PLC or HMI

Packaging in the Pharmaceutical Industry

Around the world, companies operating in the pharmaceutical manufacturing industries rely on Banner Engineering for our industry knowledge, experience and expertise to provide products and solutions that improve automation efficiency, maintain product quality, and protect operator safety.

Banner is an expert in advanced optics, LED, laser, and photoelectric circuits, offering sensors for tablet fill level monitoring and count verification, cap and closure inspection, print and label verification, and product identification and serialization. We have the industry's most complete family of safeguarding devices, allowing customers to design the highest level of safety into a machine, without compromising productivity. LED products from Banner provide clear status indication and bright, uniform illumination for machines, processes and workstations. We have a complete line-up of actuators, ideal for medical assembly, medical kitting and storage retrieval systems.

Solutions for Packaging in the Pharmaceutical Industry

see page 43

Clear Vial Detection

Challenge

- Reliably sense different vials of varying sizes, transparencies, and materials without a retroreflector
- Exposure to sterilizing chemicals

Featured Solution

Q4X (flush front)

Other Solutions

QM26 Clear Object Detection

QS18 Clear Object Detection

Key Features

- Algorithm uses distance and intensity for clear object detection
- FDA grade 316 Stainless Steel housing that is IP69K washdown rated and Ecolab certified

Key Benefits

- Reliably detect transparent objects without a reflector
- Reduced downtime from reflectors fogging up
- Reduced unscheduled down time from mechanical failure due to the SIP environment

see page 43

Vibratory Feeder – Stopper Fill Level

Challenge

- Prevent frequent start/stops
- Reliably detect stoppers of different colors, sizes, and shapes

Featured Solution

Q4X

Other Solutions

Q60 (Adj. Field)
QS30 (Adj. Field)

Key Features

- Independent and adjustable on delays and off delays
- Reliably measure distance regardless of the surface reflectivity or color

Key Benefits

- Increase the vibratory bowl's product life by reducing the start/stop frequency by ignoring signal noise
- A single sensor and setup will work detect all stopper variations, reducing change over time

see page 49

Liquid Level Detection

Challenge

- Detect liquid level in different color vials and bottles
- Limited space to mount a sensor

Featured Solution

DF-G3LIR Water sensor with a pair of IT43ST5-VL fiber optic bundle and L2 Lens

Other Solutions

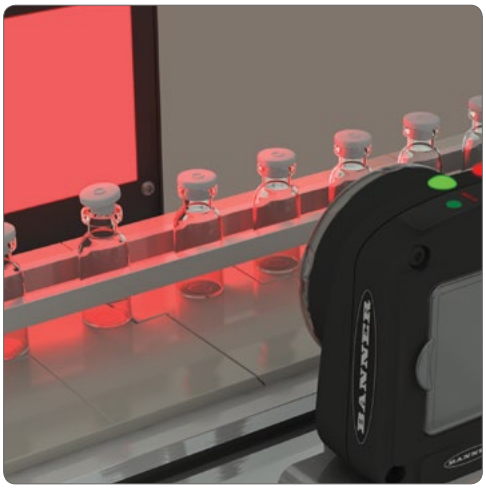
QS30H2O

Key Features

- Detect water-based liquids inside translucent or opaque plastic and glass containers
- Compatible with standard glass fibers

Key Benefits

- Reduce product waste by detecting underfilled vials early in the packaging process
- Quick and simple installation with many small fiber optic bundles styles to choose from



see page 62

Raised/Missing Stopper inspection

Challenge

- The height of the vials can vary
- Do not want to support a complex “vision system”

Key Features

- Find and inspect key features
- Integral and Remote Touch Screen for programming

Featured Solution

iVu Plus TG Gen2

Other Solutions

VE

Q4X

Key Benefits

- No need to mechanically move the iVu Plus when the height of the vial changes, which reduces downtime
- Easy configuration without a PC reduces setup time

see page 64

Label Verification

Challenge

- Position and type of the barcode on the label varies between product SKUs
- Ability to view inspection status without connecting to a PC

Key Features

- Imager-based barcode reader can read all the standard 1D and 2D barcodes within the sensing window
- Integral and Remote Touch Screen for configuring and viewing captured images

Featured Solution

iVu Plus BCR Gen2

Other Solutions

*Presence*PLUS OMNI

TCNM Barcode Reader

Key Benefits

- No required mechanical adjustments reduces changeover times
- Reduce unplanned down time by making all the necessary adjustment right on the integrated touch screen

see page 66

Machine Illumination and Status Indication

Challenge

- Easily identify when the machine requires an operator intervention
- Hygienic requirements and shatterproof design inside a packaging area

Key Features

- Ability to switch between colors from a 24 V dc input
- Encased in a shatterproof, chemically resistant, IP69K copolyester shell

Featured Solution

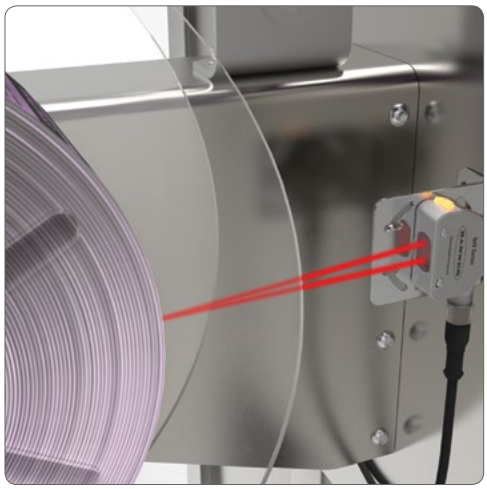
WLS27 (Dual Color)

Other Solutions

WLS28-2 (Dual Color)

Key Benefits

- Quickly identify the machine requiring operator intervention by illuminating the entire machine
- Reduce installation costs by installing the worklight without an additional protective housing



see page 43

Roll Diameter Measurement to Reduce Waste

Challenge

- Flexible packaging often contains vibrant, multi-colored, graphics of varying reflectivity that can be difficult to reliably sense
- Varying size of roll stock increases changeover time when sensors need to be adjusted

Key Features

- Uses laser triangulation with linear array technology
- Ready to measure right out of the box or can be programmed with the integrated LCD display

Featured Solution

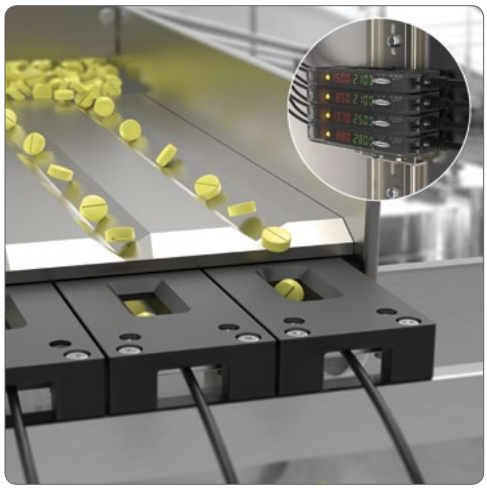
Q4X

Other Solutions

LE250
S18U

Key Benefits

- Ensures repeatability and accuracy for challenging targets regardless of color, reflectivity, or angle
- Reduces downtime with rapid product changeovers



see page 48

Tablet Counting During Bottle Filling

Challenge

- Tablet dust can accumulate in the environment
- Tablet can be as small as 2 mm in diameter

Key Features

- Automatic Gain Compensation (AGC) algorithm compensates for dust build-up on fiber optics
- 40 mm fiberoptic array can detect objects as small as 2 mm

Featured Solution

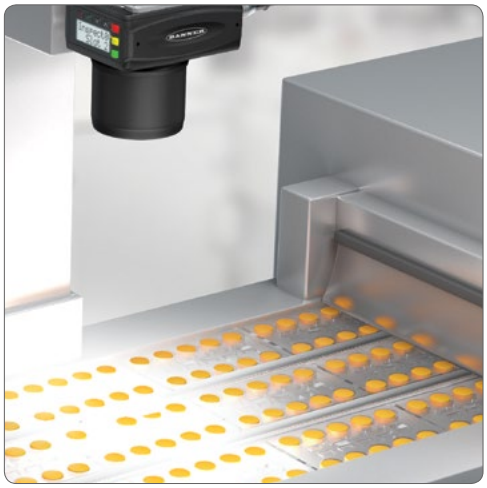
DF-G3 Small Object with PGIRS66U-40 fiber

Other Solutions

D10 Amp with
PFCVA-25X25-E fiber

Key Benefits

- Increase the time between scheduled maintenance by extending the counting cycle and maintain count accuracy as dust increases during production
- Improve process flexibly by detecting even the smallest tablet in a large 40 mm area



see page 61

Blister Filling Inspection

Challenge

- Partial tables can fall into a blister cavity
- The size of the blister pack and number of blisters per pack change frequently

Key Features

- 2 megapixel imager
- Store hundreds of configurations on the VE smart camera
- Standard Ethernet communication protocols like Etherent/IP, and FTP

Featured Solution

VE

Other Solutions

iVu Plus

Key Benefits

- Detect small defects and partial tablets
- Rapid product changeovers
- Easily export results and images to central database

E-Stop Safety—Pharmaceutical Isolator

see page 58

Challenge

- Harsh environment with exposure to cleaning chemicals
- Difficult to tell what E-Stop is pressed when wired in series
- Modular systems are time consuming to install

Key Features

- IP69K FDA Grade Silicon cover
- Ecolab certified
- Green/Red lighted base
- 8-pin Quick-Disconnect

Featured Solution

30 mm Mount
E-Stop (IP69K)

Key Benefits

- Certified to withstand cleaning chemicals used in the pharmaceutic industry
- 360° visible indication of E-Stop actuation
- Easy installation with no assembly or wiring required

Safety Light Curtain—Pharmaceutical Isolator

see page 56

Challenge

- Safety light curtains that scan across the isolator internally must be easily cleaned and hold-up to the sterilization process
- Safeguarding large filling and packaging systems have multiple safeguarding points and zones

Key Features

- IP67/IP69K, hygienically designed and chemically-resistant tubular enclosed EZ-SCREEN LS
- Scalable safety solution

Featured Solution

EZ-SCREEN LS
(IP69K)

Other Solutions

EZ-SCREEN LP

Key Benefits

- Designed to work in the harsh environment of a sterile filling and packaging systems

Safety Monitoring

see page 60

Challenge

- Safeguard machine with variable safety add-ons depending on customer needs
- Complex logic or multiple safety scenarios
- Communicate with HMI to display machine status

Key Features

- Free, easy-to-use software using drag and drop function blocks
- Simulation mode
- Expandable I/O modules
- Ethernet and Profinet communications

Featured Solution

XS26-2

Other Solutions

SC26-2

Key Benefits

- Configure safety program in minutes
- Control and monitor all the safety devices on the filling equipment
- Test configuration without need to wire or even own safety controller
- Base controller with 26 inputs and two dual-channel safety outputs can be expanded to fit machine requirements
- Ethernet-enabled models allow for easy communications with PLC or HMI

Solutions for Remote Monitoring

Solutions for Remote Monitoring

see page 54

Temperature and Vibration Monitoring

Challenge

- Off-line motor testing requires costly down time and can miss changes between testing
- On-line or dynamic testing may neglect key symptoms that indicate motor decline

Featured Solution

QMV42VT1 or QMV42T2 (with DX80 nodes, Q45U Nodes, or MultiHop Modbus RTU radios)

Key Features

- Sensor continuously monitors RMS velocity and temperature to detect problems early
- Monitor remotely using wireless I/O instead of running cable
- Schedule maintenance without disrupting production by getting email or text in real time when vibration threshold has been exceeded

Key Benefits

- Automate the testing process to save time and better predict mechanical failure
- Save maintenance costs by scheduling motor rework rather than unplanned downtime

see page 55

Temperature and Humidity Monitoring

Challenge

- Running power and signal wire to sensors may require long conduit runs overhead or underground
- Conduit runs over production lines lead to costly downtime
- Checking temperature and humidity manually is time consuming and the human factor can lead to errors

Featured Solution

M12FTH (with DX80 Node, Q45U Node, or MultiHop Modbus RTU radios)

Key Features

- Battery-powered nodes with compatible temperature and humidity sensors are perfect for ease of installation
- Temperature accuracy of +/- 0.3 °C and humidity accuracy of +/- 2% relative humidity
- Signal is transmitted wirelessly over radio frequencies
- Up to 47 nodes can be added per gateway creating an efficient network collecting data from multiple points

Key Benefits

- Effective solution that reduces the scrap product from out of specification temperatures or humidity
- Easily monitor environmental conditions in locations previously too difficult or expensive to access

see page 51

Barrel, Tote, or Tank Level Inspection

Challenge

- Difficult to tell how much liquid product is in a barrel, tote or tank
- Running out of product at the wrong time can be a hassle and create unnecessary production loss
- Running cables for power and signal wires to barrels, totes or tanks for automatic level monitoring can be expensive and creates a potential tangled mess as items are moved around

Featured Solution

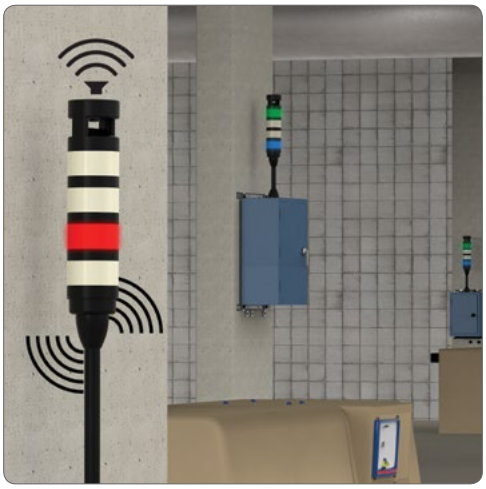
K50U Ultrasonic (with DX80 Node, Q45U Node, or MultiHop Modbus RTU radios)

Key Features

- Ultrasonic sensor specifically for tank level monitoring, is optimized for power consumption and has threaded housing to fit a bung of a barrel or tote
- Utilizes power from batteries inside the node for ease of installation and use
- Signal can be monitored remotely with no cables by using wireless radio waves

Key Benefits

- Easily monitor remote and mobile barrels, totes and tanks
- Empty barrels are switched with full ones in a timely manner with no production loss
- Manage inventory with real time data indicating when to re-order materials



see page 74

Machine Indicator Tower Lights with Wireless Connectivity

Challenge

- Placing indicators in locations that don't have an existing signal cable
- Long conduit runs are costly and installation may cause unnecessary down time
- Legacy machines often don't have the ability to send data to the network

Featured Solution

TL70 Wireless Tower Light

Key Features

- Flexible solution for placing an indicator in the desired location
- Line of sight range of signal is up to 2 miles
- Bright LED's for easy visual monitoring of a machine's condition
- Wireless connectivity enables machine status to be collected on legacy machines

Key Benefits

- Wireless connectivity results in more uptime and efficient troubleshooting
- Easy installation compared to hard wiring tower lights into the network

see page 53

Line Throughput/Scoreboarding/Part Counting

Challenge

- Monitoring machine production throughput requires time-consuming electrical installation
- Each machine and production line may have unique product detection needs

Featured Solution

Q4X
DXM100

Key Features

- Nodes on a machine monitor the signal on existing sensors and wirelessly transmit the signal back to a Gateway
- Log the data and communicate to the network or the cloud
- Show production metrics on scoreboard

Key Benefits

- Easy and cost effective installation
- Add counting capabilities to legacy machines

see page 78

Wireless Clean Room Indication

Challenge

- Monitor the status of each clean room in one central location without adding long conduit runs
- Signal personnel when it is safe to enter and exit the clean room.

Featured Solution

K70L Wireless
DXM100

Key Features

- Up to 47 wireless nodes can wirelessly send a wide variety of data to a central gateway.
- Logic controller with action rules and ScriptBasic programming

Key Benefits

- Without adding additional wiring, send current temperature, humidity, pressure and entry/exit door status from every clean room to a central monitoring room
- Wirelessly activate an indication light and lock or unlock the entry/exit doors based on the room parameters

Products

IO-Link®

LE Series

Laser Sensor

- The LE laser sensors are ready to measure right out of the box with easy adjustment, setup and use.
- Easy adjustment with a two-line, eight-character intuitive display
- Repeatability and accuracy for challenging targets, from metal to black rubber
- Visible 2 laser for small spot size and simple alignment
- Applications see page 10, 16, 24

Family	Range	Output	Laser Class	Connector
LE	550	I		Q
	550 =100-1000 mm **250** =100-400 mm	**I** = 4 to 20 mA analog and (1) NPN/PNP discrete **U** = 0 to 10 V analog and (1) NPN/PNP discrete **D** = (2) NPN/PNP discrete **K** = Dual Discrete with IO-Link NOTE: Discrete NPN/PNP is user configurable	**Blank** = Class 2 **C1** = Class1	**Blank** = 2 m Integral Cable **Q** = Rotatable M12 Euro QD **QP** = PVC M12 Euro Pigtail QD **W/30** = 9 m Integral Cable

RWAMSLE
replacement windows

SMBAMSLEIP
full assembly with plate and wo protective windows

SMBAMSLTFP
mounting plate

SMBLEU

SMBLEL

SMBLEFA

5-pin M12 Euro-Style with Shield

MQDEC2-515
MQDEC2-515RA
5 m (15')

Specifications

Supply Voltage and Current	12 to 30 V dc Normal Run Mode: 1.7 W, Current consumption less than 70 mA at 24 V dc
Sensing Beam	Visible red Class 2 laser, 650 nm
Construction	Housing: die-cast zinc Lens: polycarbonate
Environmental Rating	IP67, NEMA 6
Operating Conditions	Temperature: –20 to +55 ºC Humidity: 90% at +55 ºC
Certifications	CE c UL us LISTED

IO-Link®

LTF Series

High-Performance Laser Time-of-Flight

- Best in class combination of range, repeatability and accuracy enable highly reliable target detection and precise distance measurement
- Two-line, eight-character display and push-button programming for easy setup, troubleshooting and real-time distance measuring
- Durable IP67 housing, high ambient light immunity and stable performance across temperatures provide reliable performance in challenging environments
- Advanced options, including delay timers, advanced triggered measurement modes and cross-talk avoidance
- Applications see page 10, 24

Family	Range (m)	Output	Laser Class	Sensing Mode	Connector
LTF	12	I	C2	LD	Q
	12 = 12 **24** = 24	**I** = 4 to 20 mA analog and (1) NPN/PNP discrete **U** = 0 to 10 V analog and (1) NPN/PNP discrete **K** = Dual Discrete with IO-Link NOTE: Discrete NPN/PNP is user configurable	**C2** = Class 2	**LD** = Laser diffuse	**Blank** = 2 m Integral Cable **Q** = Rotatable M12 Euro QD **QP** = PVC M12 Euro Pigtail QD **W/30** = 9 m intergal cable

SMBLTFL

SMBLTFU

SMBAMSSLTFP

SMBLTFFA
includes 3/8" bolt for mounting
SMBLTFFAM10
includes 10 mm bolt for mounting
SMBLTFFAM12
clamps directly onto industry standard bracket systems of 1/2" or 12 mm rods

5-pin M12 Euro-Style with Shield

MQDEC2-515
MQDEC2-515RA
5 m (15')

4-pin M12 Euro-Style Double-ended
Use for: IO-Link Models

MQDEC2-412
MQDEC2-412RA
4 m (12')

Specifications

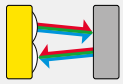
Supply Voltage and Current	12 to 30 V dc
Sensing Beam	Visible red laser; class 2
Range	50 to 24000 mm (1.97 to 472.44 in)
Response Time	Fast: 1.5 ms Standard: 8 ms Medium: 32 ms Slow: 256 ms
Beam Spot Size	Distance (mm) / Size 50 / 6.5 mm 7500 / 10 mm 12000 / 12.5 mm 24000 / 35 mm
Repeatability (1σ)	±0.15 to 2 mm (Slow 256 ms shown. For more info see datasheet.)
Resolution	< 0.3 to 3 mm (Resolution measured as twice repeatability with white target at slow response speed at 20 °C)
Construction	Die-cast zinc housing; acrylic window
Environmental Rating	IEC IP67; NEMA 6
Operating Conditions	Temperature: –20 to +55 °C Humidity: 90% at +55 °C maximum relative humidity (non-condensing)
Certifications	CE c UL us LISTED

R58E Series

Registration Mark Sensor

- The R58E sensors offer maintenance-free, solid-state reliability for color contrast applications. With a fast, 50-microsecond sensing response time, the R58E provides excellent registration repeatability, even in speedy applications.
- Bipolar outputs
- 10,000 actuations per second and 15 microsecond repeatability
- Rugged mechanical housing rated to IP67
- Applications see page 18

Visible Red, Green or Blue LED, depending on registration mark

Sensing Mode/LED	Focus	Connection	Output Type	Models: Parallel	Models: Perpendicular
 CONVERGENT	10 mm	2 m	Bipolar NPN/PNP	R58ECRGB1	R58ECRGB2
		5-pin Euro Pigtail QD	Bipolar NPN/PNP	R58ECRGB1Q	R58ECRGB2Q
		2 m	PNP	R58BPCRGB1	R58BPCRGB2
		5-pin Euro Pigtail QD	PNP	R58BPCRGB1Q	R58BPCRGB2Q
		2 m	NPN	R58BNCRGB1	R58BNCRGB2
		5-pin Euro Pigtail QD	NPN	R58BNCRGB1Q	R58BNCRGB2Q


SMB55A


SMB55RA


SMB55F


SMB55S

5-pin Euro-Style
Used with: *Expert* models

4-Pin Euro-Style
Used with: R58 models

MQDEC2-515
MQDEC2-515RA
5 m (15')

MQDC-415
MQDC-415RA
5 m (15')

Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) R58A: 36 mA exclusive of load R58B & R58E: 75 mA @ 10 V dc 35 mA @ 30 V dcw
Output Configuration	R58 Expert & R58A: Bipolar: One current sourcing (PNP) and one current sinking (NPN) R58B: Single output: One current sourcing (PNP) or one current sinking (NPN)
Output Response Time	50 microseconds
Repeatability	15 microseconds
Construction	Zinc alloy die-cast housing with black painted finish and o-ring sealed lens port cap Lens: Acrylic Lens port cap and lens holder: ABS Sensitivity and LO/DO adjusters: Acetal QD: Anodized aluminum
Environmental Rating	IEC IP67
Operating Conditions	Temperature: R58E: –10 to +50 °C R58A & R58B: –10 to +55 °C Relative humidity: 90% at 50 °C (non-condensing) Storage temperature: –20 to +80 °C
Certification	CE

IO-Link®

Q4X Series

Laser Measurement Sensor

- Save time and money with the Q4X which is ready to measure right out of the box
- A simple user experience from installation to setup
  - Bright spot alignment
  - Three push buttons simplify setup
  - Intuitive menus
- Four-digit display shows distance to target in mm
- FDA-grade stainless steel is suitable for IP69K washdown environments
- Applications see page 10, 16, 24, 30, 32

Threaded

Family	Housing Style	Output	Mode	Range		Connector
Q4X	T	B	LAF	300	–	Q8

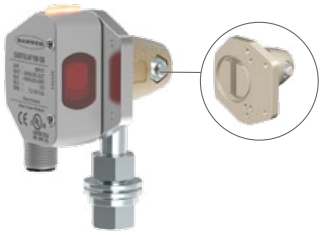
- **T** = 18 mm Threaded Barrel
- **B** = Bipolar Discrete NPN & PNP†
- **K** = Dual Discrete with IO-Link
- **U** = 0 to10 V Analog
- **I** = 4 to 20 mA Analog
- **LAF** = Laser Adjustable-Field
- **COD** = Clear Object
- **600** = 25-600 mm*
- **500** = 25-500 mm**
- **300** = 25-300 mm††
- **100** = 25-100 mm
- **Q8** = Integral QD

Flush

Family	Housing Style	Output	Mode	Range		Connector
Q4X	F	N	LAF	310	–	Q8

- **F** = Flush face
- **P** = PNP
- **N** = NPN
- **K** = Dual Discrete with IO-Link
- **U** = 0 to10 V Analog
- **I** = 4 to 20 mA Analog
- **LAF** = Laser Adjustable-Field
- **610** = 35-610 mm*
- **310** = 35-310 mm
- **110** = 35-110 mm
- **Q8** = Integral QD

* Only available in Dual Discrete with IO-Link models
** Not available in Dual Discrete with IO-Link models
† Clear Object models only available with bipolar output
†† Clear object only this range



SMBQ4XFA
includes 3/8" bolt for mounting

SMBQ4XFAM10
includes 10 mm bolt for mounting

SMBQ4XFAM12
clamps directly onto industry standard bracket systems of 1/2" or 12 mm rods

SMB18A

SMBAMS18P

5-pin Euro-Style
Used with: Analog models
MQDEC2-515
MQDEC2-515RA
5 m (15')

5-Pin Washdown Euro-Style
Used for: Analog Washdown
MQDCWD-506
2 m (6.5')

4-pin Euro-Style
Used with: NPN, PNP, Dual Discrete
MQDC-415
MQDC-415RA
5 m (15')

5-pin Euro-Style
Used with: Bipolar
MQDC1-515
MQDC1-515RA
5 m (15')

4-Pin Washdown Euro-Style
Used for: NPN, PNP, Dual Discrete
MQDC-WDSS-0415
5 m (15')

5-Pin Washdown Euro-Style
Used for: Bipolar
MQDC-WDSS-0515
5 m (15')

Specifications

Supply Voltage and Current	10 to 30 V dc at less than 675 mW 12 to 30 V dc for Analog models
Sensing Beam	Visible red Class 1 laser, 655 nm
Output Response Time	User selectable: 50 ms, 25 ms, 10 ms, 3 ms and 1.5 ms
Construction	Housing 316 L stainless steel; PMMA acrylic lens cover, Polysulfone lightpipe and display window
Environmental Rating	IP67 per IEC60529; IP68 per IEC60529; IP69K per DIN40050-9
Operating Conditions	Temperature: –10 °C to +50 °C Humidity: 35% to 95% relative humidity
Certifications	

QS18 Laser

DC-Operated Long-Range Laser Sensors

- Narrow visible beam spot for easy alignment and small object detection
- Long sensing ranges
- Available in opposed, diffuse and retroreflective mode
- Applications see page 16

Family	Output	Power	Sensing Mode		Connector
QS18	VP	6	LLP	–	Q8
	VN = NPN **VP** = PNP	**6** = DC power	**LLP** = Polar retro		**Blank** = 2 m Integral Cable **Q8** = M12 4-pin Euro QD

SMBQ4XFA

SMBQS18A

SMB18A

SMBQS18AF

SMB18SF

4-pin M12 Euro-Style

MQDC-415
MQDC-415RA
5 m (15')

4-pin M12 Euro-Style with Shield

MQDEC2-415
MQDEC2-415RA
5 m (15')

Specifications

Supply Voltage and Current	10 to 30 V dc (10% max. ripple) at less than 35 mA
Output Response Time*	700 microseconds ON/OFF
Repeatability*	130 microseconds
Construction	Housing: ABS Lens Cover: acrylic Window: PMMA
Environmental Rating	Rated IEC IP67; NEMA 6; UL Type 1
Operating Conditions	Temperature: -10° to +50 °C Relative humidity: 90% @ 50 °C (non-condensing)
Certifications	CE

IO-Link®

QS18 *Expert*™

Clear Object Detection Sensor

- Response speed of 400 µs ON/OFF
- Coaxial optics and small spot size for applications with space limitations
- ClearTracking algorithm provides reliable operation by compensating for dust build-up and ambient temperature changes
- Applications see page 11, 17, 25

Family*	Output	Power	Sensing Mode		Connector
QS18E	P	6	XLPC	–	Q8

Output
- **N** = NPN
- **P** = PNP
- **K** = Programmable PNP or NPN with IO-Link

Power
- **6** = DC power

Sensing Mode
- **XLPC** = Polar retro with coaxial optics

Connector
- **Blank** = 2 m Integral Cable
- **Q** = M8 4-pin Pico Pigtail QD
- **Q5** = M12 4-pin Euro Pigtail QD
- **Q7** = M8 4-pin pico QD
- **Q8** = M12 4-pin Euro QD

* All models require a reflector

SMBQ4XFA

SMBQS18A

SMB18A

SMBQS18AF

SMB18SF

4-pin M12 Euro-Style

MQDC-415
MQDC-415RA
5 m (15')

4-pin M8 Pico-Style

PKG4M-5
PKW4M-5
5 m (15')

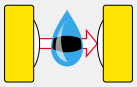
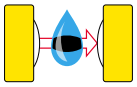
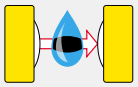
Specifications

Supply Voltage	10 to 30 V dc (10% max. ripple) at less than 35 mA, exclusive of load; 10 to 24 V dc @ greater than 55° C
Output Response Time	400 microseconds ON/OFF
Repeatability	100 microseconds
Range	Depends on reflector
Construction	Housing: ABS Window: PMMA
Environmental Rating	Meets NEMA 6; IEC IP67; UL Type 1
Operating Conditions	Temperature: -20° to +70° C Relative humidity: 90% @ 50° C (non-condensing)
Certifications	CE cULus

QS30 Water Detection

DC-Operated Long-Range Sensors

- Ability to work reliably in low contrast applications
- Ability to detect liquid in translucent and opaque bottles
- 1450 nm infrared wavelength to enhance contrast of clear liquids
- Applications see page 17, 25

Sensing Mode	Range	Connection	Output Type	Model (⇨ Infrared LED)
 OPPOSED WATER DETECTION	4 m	2 m 5-pin Euro Pigtail QD	–	**QS30EXH2O Emitter***
				QS30EXH2OQ5 Emitter*
		2 m 5-pin Euro Pigtail QD	Bipolar NPN/PNP LO	**QS30ARXH2O**
				QS30ARXH2OQ5
		2 m 5-pin Euro Pigtail QD	Bipolar NPN/PNP DO	**QS30RRXH2O**
				QS30RRXH2OQ5
		2 m 5-pin Euro Pigtail QD	Analog 0-10 V	**QS30RXH20U**
				QS30RXH20UQ5
 OPPOSED WATER DETECTION	2 m	2 m 5-pin Euro Pigtail QD	Bipolar NPN/PNP LO	**QS30ARH2O**
				QS30ARH2OQ5
		2 m 5-pin Euro Pigtail QD	Bipolar NPN/PNP DO	**QS30RRH2O**
				QS30RRH2OQ5
SUPER HIGH-POWER  OPPOSED WATER DETECTION	8 m	2 m 5-pin Euro Pigtail QD	–	**QS30EXSH2O Emitter***
				QS30EXSH2OQ5 Emitter*
		2 m 5-pin Euro Pigtail QD	Bipolar NPN/PNP LO	**QS30ARXSH2O**
				QS30ARXSH2OQ5
		2 m 5-pin Euro Pigtail QD	Bipolar NPN/PNP DO	**QS30RRXSH2O**
				QS30RRXSH2OQ5

SMBQS30L

SMBQS30Y

SMBQS30YL

SMB30A

5- pin Euro QD (for Q models)

MQDC1-515 5 m (15')
MQDC1-515RA 5 m (15')

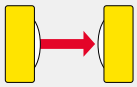
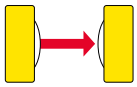
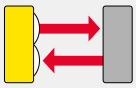
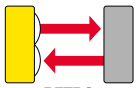
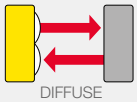
Specifications

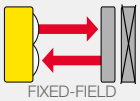
Supply Voltage and Current	Emitters (Water): 10 to 30 V dc (10% max. ripple) at less than 80 mA Receivers (Water): 10 to 30 V dc (10% max. ripple) at less than 65 mA Analog Receivers (water): 15 to 30 V dc (10% max. ripple) at less than 65 mA (exclusive of load)	
Output Configuration	Bipolar: One PNP (current sourcing) and one NPN (current sinking); Light Operate (LO) or Dark Operate (DO) selectable or configurable (depending on model)	
Output Response Time	Opposed (Water): 10 x excess gain or more– Standard: 1 millisecond ON/OFF 2x to 10x excess gain– Standard: 3 milliseconds ON/OFF	Super High-Power: 10 milliseconds ON/OFF Super High-Power: 30 milliseconds ON/OFF
Repeatability	Opposed (Water): 10 x excess gain or more– Standard: 500 microseconds 2x to 10x excess gain– Standard: 2.5 milliseconds	Super High-Power: 5 milliseconds Super High-Power: 25 milliseconds
Construction	Housing: ABS plastic Lens cover: acrylic	
Environmental Rating	Opposed (Water): IEC IP67 (nema 6); PW12 1200 PSI washdown per NEMA PW12	
Operating Conditions	Opposed (Water), Opposed (High-Power): -20° to +60° C	Relative humidity: 90% (non-condensing)g)
Certifications	CE	

T18-2 Series

Epoxy Encapsulated Right-Angle Sensor

- Chemically robust epoxy encapsulated plastic sensors for wash-down applications
- Permanent laser etched product marking will not wear off after repeated cleaning cycles
- Food grade plastics materials used for all exposed surfaces
- Powerful and bright visible red emitter beam for easy alignment and set-up
- Highly visible output and dual-function power and stability indicators
- Advanced ASIC technology makes sensor resistant to optical and electrical noise source
- Applications see page 12, 19

Sensing Mode	Range	Output Type	Model* ⇨ Infrared LED
 OPPOSED	25 m	—	**T18-2NAEL-2M Emitter**
	25 m with beam inhibit		**T18-2NAEJ-2M Emitter**
	25 m with adjustment		**T18-2NAES-2M Emitter**
 OPPOSED	25 m	Complementary NPN	**T18-2VNRL-2M Reciever**
		Complementary PNP	**T18-2VPRL-2M Reciever**
	25 m with adjustment	Complementary NPN	**T18-2VNRS-2M Reciever**
		Complementary PNP	**T18-2VPRS-2M Reciever**
 POLARIZED RETRO	6 m with BRT-84 reflector	Complementary NPN	**T18-2VNLP-2M**
		Complementary PNP	**T18-2VPLP-2M**
	6 m with BRT-84 reflector, with adjustment	Complementary NPN	**T18-2VNLPC-2M**
		Complementary PNP	**T18-2VPLPC-2M**
 RETRO	7.5 m with BRT-84 reflector, with adjustment	Complementary NPN	**T18-2VNLV-2M**
		Complementary PNP	**T18-2VPLV-2M**
 DIFFUSE	750 mm with adjustment	Complementary NPN	**T18-2VNDL-2M**
		Complementary PNP	**T18-2VPDL-2M**
	300 mm with adjustment	Complementary NPN	**T18-2VNDS-2M**
		Complementary PNP	**T18-2VPDS-2M**

Sensing Mode	Range	Output Type	Model with Red Emitter*	Model with Infrared Emitter*
 FIXED-FIELD	30, 50, 75, 100, 150, 200 mm replace ".." in model number with range required	Complementary NPN	**T18-2VNFF..-2M**	**T18-2VNFF..IR-2M**
		Complementary PNP	**T18-2VPFF..-2M**	**T18-2VPFF..IR-2M**

* Only 2 m (6.5 ft) PVC cable models are listed. To order 9 m (30 ft) PVC cable models, add suffix "9M" (for example, T18-2VNDL-9M).
To order 4-pin Euro M12 integral QD models, add suffix "Q8" (for example, T18-2VNDL-Q8).

SMB18A

SMB18FA..
Stainless steel models available

4-pin Euro-Style
Used with: NPN, PNP, Dual Discrete

MQDC-415
MQDC-415RA
5 m (15')

4-Pin Washdown Euro-Style
Used for: NPN, PNP, Dual Discrete

MQDC-WDSS-0415
5 m (15')

Specifications

Supply Voltage and Current	10 to 30 V dc for ambient temperature ≤ 55 °C	10 to 24 V dc for ambient temperature > 55 °C
Output Configuration	Complementary PNP or NPN by model number	
Output Response Time	Response is independent of signal strength Opposed models: 1.5 milliseconds ON, 1 millisecond OFF Retro, Polarized Retro, and Diffuse models: 1.5 milliseconds ON, 0.75 milliseconds OFF	Fixed Field models: 2 milliseconds ON, 2 milliseconds OFF Delay on Power-up: 100 milliseconds; outputs do not conduct during this time
Repeatability	Repeatability is independent of signal strength Opposed models: 170 microseconds	Retro, Polarized Retro, and Diffuse models: 100 microseconds Fixed Field models: 200 microseconds
Construction	Housing, M12 QD, and cover: Black or Yellow PBT polyester Indicator windows: Clear PBT polyester	Indicator cover and gain pot driver: PBT polyester Front window: PMMA
Environmental Rating	IEC IP69K	
Operating Conditions	–40 °C to +70 °C (–40 °F to +158 °F)	95% at +50 °C maximum relative humidity (non-condensing)
Certifications		

IO-Link®

DF-G3 Series

Long-range Fiber Optic Amplifiers

- World-class long-range sensing capability, more than 3 m (10 ft) with opposed mode fibers
- Easy to read dual digital displays show both signal level and threshold simultaneously
- Cross-talk avoidance function allows seven inspections in dense sensing point applications
- Models with IO-Link enable a point-to-point communication link between a master device and a sensor, facilitating remote monitoring, teaching, and configuration
- Operator control of the sensitivity (hysteresis) provides additional detection sensitivity, or a stabilized output depending on the application details
- Applications see page 25, 32

IO-Link

Visible Red LED ⇨ Infrared LED

Sensing Beam Color	Range	Connection	Output	Models
Visible Red, 635 nm	3,000 mm	2 m	Channel1: IO-Link, push/pull Channel2: PNP only output, or input	**DF-G3-KD-2M**
Infrared, 850 nm	6,000 mm	2 m	Channel1: IO-Link, push/pull Channel2: PNP only output, or input	**DF-G3IR-KD-2M**

Single Output

Visible Red LED ⇨ Infrared LED

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	**DF-G3-NS-2M**	**DF-G3-PS-2M**
Infrared, 850 nm	6,000 mm	2 m	**DF-G3IR-NS-2M**	**DF-G3IR-PS-2M**

Dual Output

Visible Red LED ⇨ Infrared LED

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	**DF-G3-ND-2M**	**DF-G3-PD-2M**
Infrared, 850 nm	6,000 mm	2 m	**DF-G3IR-ND-2M**	**DF-G3IR-PD-2M**

Analog

Visible Red LED ⇨ Infrared LED

Sensing Beam Color	Range	Connection	Analog Output	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	Voltage: 0-10 V DC	**DF-G3-NU-2M**	**DF-G3-PU-2M**
			Current: 4-20 mA	**DF-G3-NI-2M**	**DF-G3-PI-2M**
Infrared, 850 nm	6,000 mm	2 m	Voltage: 0-10 V DC	**DF-G3IR-NU-2M**	**DF-G3IR-PU-2M**
			Current: 4-20 mA	**DF-G3IR-NI-2M**	**DF-G3IR-PI-2M**

* Only 2 m (6.5 ft) PVC cable models are listed. To order M8 Pico pigtail, change suffix "**2M**" to "**Q3**" (for example, **DF-G3-NU-Q3**).
To order M12 Euro pigtail, change suffix "**2M**" to "**Q5**" (for example, **DF-G3-NU-Q5**).

DF-G3 Series

Water Detection Fiber Optic Amplifiers

- 1450 nm infrared wavelength to enhance contrast of clear liquids
- Reliable detection of presence or absence of water-based liquids
- Easy to read dual digital displays show both signal level and threshold simultaneously
- Cross-talk avoidance function allows seven inspections in dense sensing point applications
- Models with IO-Link enable a point-to-point communication link between a master device and a sensor, facilitating remote monitoring, teaching, and configuration
- Applications see page 30

Single Output

⇨ Infrared LED

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Long Infrared, 1450 nm	900 mm	2 m	**DF-G3LIR-NS-2M**	**DF-G3LIR-PS-2M**

Dual Output

⇨ Infrared LED

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Long Infrared, 1450 nm	900 mm	2 m	**DF-G3LIR-ND-2M**	**DF-G3LIR-PD-2M**

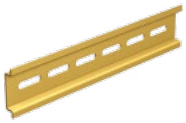
Analog

⇨ Infrared LED

Sensing Beam Color	Range	Connection	Analog Output	NPN Models	PNP Models
Long Infrared, 1450 nm	900 mm	2 m	Voltage: 0-10 V DC	**DF-G3LIR-NU-2M**	**DF-G3LIR-PU-2M**
			Current: 4-20 mA	**DF-G3LIR-NI-2M**	**DF-G3LIR-PI-2M**

* Only 2 m (6.5 ft) PVC cable models are listed. To order M8 Pico pigtail, change suffix "**2M**" to "**Q3**" (for example, **DF-G3-LIR-Q3**).
To order M12 Euro pigtail, change suffix "**2M**" to "**Q5**" (for example, **DF-G3-LIR-Q5**).

Additional DF-G1, DF-G2, and DF-G3



DIN-35..

SA-DIN-BRACKET

SA-DIN-CLAMP
Mounting Clamp

4-pin Euro QD

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

4- pin Pico QD
Straight snap-on connector

Right-angle snap-on connector

PKG4-2
2 m (6')

PKW4Z-2
2 m (6')

Specifications

Supply Voltage and Current	NPN/PNP Models: 10 to 30 V dc (10% max ripple) Voltage output models: 12 to 30 V dc (10% max ripple) Standard Mode: 960 mW, Current consumption < 40 mA @ 24 V dc	IO-Link Models: 18 to 30 V dc (10% max ripple) Current output models: 10 to 30 V dc (10% max ripple) ECO Display Mode: 720 mW, Current consumption < 30 mA @ 24 V dc
Sensing Beam	DF-G3: Visible red, 635 nm	DF-G3IR: Infrared, 850 nm DF-G3LIR: Long Infrared, 1450 nm
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages	
Output Configuration	NPN/PNP Models: 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model IO-Link Models: 1 push-pull and 1 PNP (complementary outputs) Voltage output models: 1 analog voltage output (user configurable as 1 V to 5 V or 0 V to 10 V) with 1 current sinking (NPN) or 1 current sourcing (PNP) discrete output Current output models: 1 analog current output (4 mA to 20 mA) with 1 current sinking (NPN) or 1 current sourcing (PNP) discrete output	
Output Rating	100 mA max. load (derate 1 mA per °C above 30 °C) OFF-state leakage current: NPN/PNP/current: < 5 µA at 30 V dc IO-Link: < 50 µA at 30 V dc	ON-state saturation voltage: NPN: < 1.5 V PNP: < 2 V IO-Link: < 2 V
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up	
Output Response Time	High Speed: 500 us Standard: 2 ms Extra Long Range: 24 ms	Fast: 1000 us Long Range: 8 ms
Delay at Power-up	500 milliseconds max.; outputs do not conduct during this time	
Indicators	Red 4-digit Display: Signal Level (In Program Mode, Red and Green displays are used for programming menus)	Green 4-digit Display: Threshold Yellow LED: Output conducting
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover	
Environmental Rating	IEC IP50, NMA 1	
Operating Conditions	Temperature: –10 to +55 °C	Storage: –20 to +85 °C Relative Humidity: 50% @ +50 °C (non-condensing)
Certifications	CE c UL us LISTED 3TJJ IND. CONT. EQ. IO-Link®	

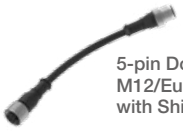
K50U Series

Ultrasonic Sensor for Wireless Level and Tank Monitoring

- Three meter sensing range with a 300 mm dead zone
- Provides a distance measurement from the target to the sensor
- Built-in temperature compensation
- Rugged design for demanding sensing environments; rated IEC IP67, NEMA 6P
- Functions as a Modbus slave device using RS-485
- Applications see page 36

Range and Frequency	Supply Voltage	I/O	Models
Range: 300 mm to 3 m Frequency: 114 kHz	3.6 to 5.5 V dc	Distance to target using a 1-wire serial interface	**K50UX1RA**
Range: 300 mm to 3 m Frequency: 114 kHz	3.6 to 5.5 V dc or 10 to 30 V dc	Distance to target using Modbus RS-485	**K50UX2RA**

BWA-BK-006
Mounts both the K50U Ultrasonic sensor and a Wireless Q45 Node



5-pin Double Ended M12/Euro-Style with Shield

DEE2R-53D
1 m (3')

Specifications

Supply Voltage and Current	3.6 to 5.5 V dc or 10 to 30 V dc
Current	Active comms: 11.3 mA at 30 V dc
Indicators	Two LEDs
Construction	Housing: PBT polyester Transducer: Epoxy/ceramic composite
Sensing Range	Sensing range: 300 mm to 3 m (11.8 in to 118 in)
Resolution	Resolution: 0.1% of distance (1.5 mm minimum)
Sensor Connection	1 ¼ in NPT Connection
Cable Connection	Integral 5-pin M12/Euro-style male quick disconnect (QD)
Environmental Rating	Leakproof design, rated IEC IP67 (NEMA 6)
Certifications	CE

QT50U Series

Long-Range Ultrasonic Sensors

- Features a small ultrasonic dead zone of 200 mm
- Available in a chemically resistant model with a Teflon® flange
- Detects targets at long ranges within confined areas, such as a storage tank, without interference from the tank walls
- Push-button and remote TEACH-mode programming with an external switch, computer or controller for added security and convenience
- Applications see page 10

10-30 V DC

Range	Connection	Output	Models*
200 mm to 8 m	2 m 5-pin Mini QD 5-pin Euro QD	Selectable 0 to 10 V dc or 4 to 20 mA	**QT50ULB** **QT50ULBQ** **QT50ULBQ6**
200 mm to 8 m	2 m 5-pin Mini QD 5-pin Euro QD	Selectable Dual NPN or PNP	**QT50UDB** **QT50UDBQ** **QT50UDBQ6**

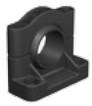
Universal Voltage, 85-264 V AC/48-250 V DC

Range	Connection	Output Operation Mode	Output	Models*
200 mm to 8 m	2 m 5-pin Micro QD 5-pin Mini QD	Window-limit (complementary outputs)	SPDT e/m relay	**QT50UVR3W** **QT50UVR3WQ1** **QT50UVR3WQ**
200 mm to 8 m	2 m 5-pin Micro QD 5-pin Mini QD	Pump/level control (pump-in and pump-out logic)	SPDT e/m relay	**QT50UVR3F** **QT50UVR3FQ1** **QT50UVR3FQ**

Add suffix **-CRFV** to model number for Teflon®-protected face and transducer

SMB30A

SMB30MM



SMB30SC

5-pin Euro-Style

MQDEC2-515
MQDEC2-515RA
5 m (15')

5-Pin Micro-Style

MQVR3S-515
MQVR3S-515RA
5 m (15')

5-Pin Mini-Style

MBCC2-512
4 m (12')

Specifications

Supply Voltage and Current	Analog models: 10 to 30 V dc (10% max. ripple); 100 mA max @ 10 V, 40 mA max. @ 30 V (exclusive of load) Dual-discrete models: 10 to 30 V dc (10% max. ripple); 100 mA max. @ 10 V, 40 mA @ 30 V (exclusive of load)
Output Configuration	Analog models: Voltage sourcing: 0 to 10 V dc Current sourcing: 4 to 20 mA Dual-discrete models: Dual PNP or NPN, selectable using DIP switch
Linearity (Analog Models)	+/- 0.2% of span from 200 to 8000 mm; +/- 0.1% of span from 500 to 8000 mm (1 mm minimum)
Resolution/Repeatability	1.0 mm
Output Response Time	Analog models: 100 to 2300 milliseconds Dual-discrete models: 100 to 1600 milliseconds
Construction	Transducer: Ceramic/Epoxy composite Housing: ABS/Polycarbonate Membrane Switch: Polyester Lightpipes: Acrylic
Environmental Rating	IEC IP67; NEMA 6P
Operating Conditions	Temperature: -20 to +70 °C Relative humidity: 100%
Certifications	CE

DXM Wireless Controller

Industrial Wireless Controller

- ISM radios available in 900 MHz and 2.4 GHz for local wireless network
- Converts Modbus RTU to Modbus TCP/IP or Ethernet I/P
- Logic controller can be programmed using action rules and text language methods
- Cellular connectivity
- Micro SD card for data logging
- Email and text alerts
- Local I/O options: universal inputs, NMOS outputs, and analog outputs
- Powered by 12 to 30 V dc, 12 V dc solar panel, or battery backup
- RS-232, RS-485, and Ethernet communications ports; and a USB configuration port
- LCD display for I/O information and user programmable LED's
- Applications see page 37

Description	Frequency	Models*
DXM100 Controller, with DX80 Gateway, preconfigured as a protocol converter	900 MHz	**DXM100-B1R1**
DXM100 Controller, with DX80 Gateway, preconfigured as a protocol converter	2.4 GHz	**DXM100-B1R3**
DXM100 Controller with MultiHop Data Radio	900 MHz	**DXM100-B1R2**
DXM100 Controller with MultiHop Data Radio	2.4 GHz	**DXM100-B1R4**
DXM100 Controller with DX80 Gateway and CDMA cellular module, preconfigured as a protocol converter	900 MHz	**DXM100-B1C1R1**
DXM100 Controller with DX80 Gateway and CDMA cellular module, preconfigured as a protocol converter	2.4 GHz	**DXM100-B1C1R2**

* Additional local I/O available with the DXM150 models, contact Banner for more information

PSDINP-24-13
DIN Rail mount power supply

PSD-24-4
Desktop style power supply

4-pin Male Euro-Style

MQDMC-401

Specifications

Supply Voltage	12 to 30 V dc or 12 V dc solar panel and 12 V sealed lead acid battery
Power Consumption	35 mA average at 12 V
Solar Power Battery Charging	1 Amp maximum with 20 Watt solar panel
Radio Range	900 MHz, 1 Watt: Up to 9.6 km (6 miles) 2.4 GHz, 65 mW: Up to 3.2 km (2 miles)
Logging	8 GB maximum; removable Micro SD card format
Protocols	Modbus RTU Master/Slave, Modbus TCP, and Ethernet/IP
Construction	Polycarbonate; DIN rail mount option
Environmental Rating	IP20
Courtesy Power	One; output at 5 volts , 500 mA maximum
Switched Power Outputs	5 V/400 mA maximum; 16 V/125 mA maximum
Analog Outputs	0 to 20 mA or 0 to 10 V dc output Accuracy: 0.1% of full scale +0.01% per °C Resolution: 12 bit
NMOS Outputs	Less than 1 A max current at 30 V dc ON-state saturation: less than 0.7 V at 20 mA ON condition: Less than 0.7 V Off condition: Open
Certifications	CE

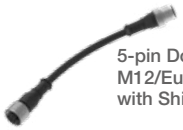
QM42 Series

Vibration and Humidity Sensors

- Provides high accuracy vibration (velocity RMS) and temperature measurements
- Manufactured with a robust zinc alloy housing
- Connects via a 1-wire serial interface
- Reduces labor costs by obviating manual checks and eliminating error
- Applications see page 36

I/O	Power	Connection	Models
1-Wire Serial	3.6 to 5.5 V dc	3 m	**QM42VT1**
RS-485 Modbus	3.6 to 5.5 V dc low power option or 10 to 24 V dc	3 m	**QM42VT2**

BWA-BK-002 **BWA-BK-001**



5-pin Double Ended M12/Euro-Style with Shield | **DEE2R-53D** 1 m (3')

RS-485 to USB Adaptor
Used with QM42VT2 to talk to GUI | **BWA-HW-006**

1-Wire Serial to USB Adaptor
Protocol converter used with QM42VT1 to talk to GUI | **BWA-USB1WIRE-001**

Specifications

Supply Voltage and Current	3.6 to 5.5 V dc or 10 to 24 V dc	
Vibration	Mounted base resonance: 5.5 kHz nominal Measuring range: 0-46 mm/sec or 0–1.8 in/sec RMS	Frequency Range: 10 – 1000 Hz Accuracy: ± 10% @25 °C
Temperature	Measuring range: -40 to +105 °C (-40 to +221 °F)	Resolution: 0.1 °C Accuracy: ±3 °C
Construction	Housing: Zinc alloy	
Shock	400G	
Environmental Rating	IEC IP67; NEMA 6	
Operating Conditions	Temperature: –40 to +105 °C	
Certifications	CE	

M12F Series

Temperature and Humidity Sensors

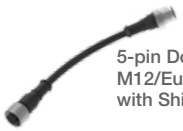
- Manufactured with a robust metal housing
- Designed to work as a Modbus slave device via RS-485 or with Sure Cross® 1-wire serial interface -P6 nodes, -H6 MultiHop Radios, or Q45 Sensor Node DX80N2Q45TH
- Ships with aluminum grill filter cap; optional stainless steel 10 micrometer sintered filter available separately
- Applications see page 36

Temperature and Humidity

I/O	Power	Connection	Models
RS-485 Modbus	3.6 to 5.5 V dc low power option or 12 to 24 V dc	5-pin Euro QD	**M12FTH3Q**
1-wire serial interface	3.6 to 5.5 V dc		**M12FTH4Q**

Temperature

I/O	Power	Connection	Models
RS-485 Modbus	3.6 to 5.5 V dc low power option or 12 to 24 V dc	5-pin Euro QD	**M12FT3Q**
1-wire serial interface	3.6 to 5.5 V dc		**M12FT4Q**



5-pin Double Ended M12/Euro-Style with Shield

DEE2R-53D
1 m (3')

FTH-FIL-001
Aluminum Grill Filter Cap

FTH-FIL-002
Stainless Steel Filter Cap

M12F Specifications

Supply Voltage and Current	3.6 to 5.5 V dc low power option or 12 to 24 V dc
Resolution	Humidity: 0.1% relative humidity Temperature: 0.1 °C
Construction	Housing: metal
Environmental Rating	IEC IP67; NEMA 6
Operating Conditions	Temperature: –40 °C to +85 °C
Certifications	C US CSA: Class I, Division 2, Groups A, B, C, D — Certificate 1921239

EZ-SCREEN® LS

Rugged Safety Light Screen with Enhanced Features

- Alignment indicators are highly visible and intuitive diagnostics simplify setup, facilitate troubleshooting and streamline installation
- No blind zone design provides end-to-end sensing to eliminate gaps in detection
- Metal end caps, thick aluminum housing and a recessed window to avoid damage from impact
- Standard pairs, cascade systems and extensive accessories to suit a wide variety of safeguarding configurations
- Applications see page 13, 21, 27, 33

Hygienic

Family	System Type	Resolution		Defined Area	Connector
EZLSA-HTE	R	23	–	770	

System Type
- **E** = Emitter only
- **R** = Receiver only

Resolution
- **23** = 23 mm

Defined Area
- **280** = 280 mm
- **350** = 350 mm
- **420** = 420 mm
- **490** = 490 mm
- **560** = 560 mm
- **630** = 630 mm
- **700** = 700 mm
- **770** = 770 mm
- **840** = 840 mm
- **910** = 910 mm
- **980** = 980 mm
- **1050** = 1050 mm

Connector
- **Blank** = 25 ft., 8-wire, high durometer PVC Cordset
- **F** = Remote Fixed Blanking model with additional 25 ft. cordset for blanking configuration

Standard

Family	System Type	Resolution		Defined Area	Connector*
SLL	P	14	–	770	P88

System Type
- **E** = Emitter only
- **R** = Receiver only
- **P** = Pair (Emitter and Receiver)

Resolution
- **14** = 14 mm
- **23** = 23 mm
- **40** = 40 mm

Defined Area
- **280** = 280 mm
- **350** = 350 mm
- **420** = 420 mm
- **490** = 490 mm
- **560** = 560 mm
- **630** = 630 mm
- **700** = 700 mm
- **770** = 770 mm
- **840** = 840 mm
- **910** = 910 mm
- **980** = 980 mm
- **1050** = 1050 mm
- **1120** = 1120 mm
- **1190** = 1190 mm
- **1260** = 1260 mm
- **1330** = 1330 mm
- **1400** = 1400 mm
- **1470** = 1470 mm
- **1540** = 1540 mm
- **1610** = 1610 mm
- **1680** = 1680 mm
- **1750** = 1750 mm
- **1820** = 1820 mm

Connector*
- **P8** = 300 mm pigtail, 8-Pin M12 QD (individual Emitter or Receiver models)
- **P88** = 300 mm pigtail, 8-Pin M12 QD (on BOTH Emitter and Receiver models)
- **Blank** = no pigtail, RD connection (for RDLS-8..D cordset)

* 5-pin M12 QD options available (P5 or P55)

Cascadable

Family	Cascadable	System Type	Resolution		Defined Area	Connector*
SLL	C	P	14	–	770	P88

Cascadable
- **C** = Cascadable

System Type
- **E** = Emitter only
- **R** = Receiver only
- **P** = Pair (Emitter and Receiver)

Resolution
- **14** = 14 mm
- **23** = 23 mm
- **40** = 40 mm

Defined Area
- **280** = 280 mm
- **350** = 350 mm
- **420** = 420 mm
- **490** = 490 mm
- **560** = 560 mm
- **630** = 630 mm
- **700** = 700 mm
- **770** = 770 mm
- **840** = 840 mm
- **910** = 910 mm
- **980** = 980 mm
- **1050** = 1050 mm
- **1120** = 1120 mm
- **1190** = 1190 mm
- **1260** = 1260 mm
- **1330** = 1330 mm
- **1400** = 1400 mm
- **1470** = 1470 mm
- **1540** = 1540 mm
- **1610** = 1610 mm
- **1680** = 1680 mm
- **1750** = 1750 mm
- **1820** = 1820 mm

Connector*
- **P8** = 300 mm pigtail, 8-Pin M12 QD (individual Emitter or Receiver models)
- **P88** = 300 mm pigtail, 8-Pin M12 QD (on BOTH Emitter and Receiver models)
- **Blank** = no pigtail, RD connection (for RDLS-8..D cordset)

* 5-pin M12 QD options available (P5 or P55)

Machine Interface Connections

8-PIN RD Cordsets
RDLS-815
4.6 m (15')

8-pin M12 Euro-Style
QDE-850D
15.3 m (50')

8-pin Euro-Style Straight splitter
CSB-M1280M1280
CSB-M1281M1281
CSB-M12815M1281

8-pin Euro-Style double-ended male/female
DEE2R-815D
4.5 m (15')
DEE2R-850D
15.3 m (50')

Cascading Connections

Double-ended RD to RD
DELS-118E
2.5 m (8.2')
DELS-1115E
4.6 m (15')

EZLSA-MBK-11

EZLSA-MBK-12

EZLSA-MBK-16

EZLSA-MBK-20

EZLSA-K30LGR
Connects directly to
SLLCR... cascade receiver

K30LGRXPQ
requires 4-pin QD

K50LGRXPQ
requires 4-pin QD

TL50GRQ
requires 4-pin QD

RD to Euro-Style
Connects indicators to a cascade receiver
DELSEF-41D
0.3 m (1')
DELSEF-48D
2.5 m (8.2')

Specifications

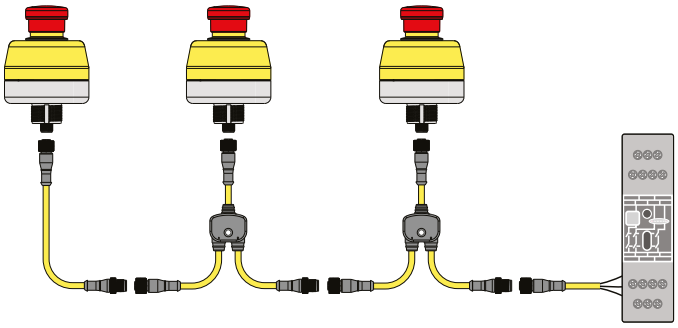
Supply Voltage at the Device	24 V dc ±15% (use a SELV-rated power supply according to EN IEC 60950).The external voltage supply must be capable of buffering brief mains interruptions of 20 ms, as specified in IEC/EN 60204-1.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24 V dc or dc common
Effective Aperture Angle (EAA)	Meets Type 4 requirements per IEC 61496-2
Residual Ripple	±10% maximum
Electrical Safety Class	III (per IEC 61140: 1997)
Operating Range	0.1 m to 12 m (4 in to 39 ft) — Range decreases with use of mirrors and/or lens shields: • Lens shields — approx 10% less range per shield • Glass-surface mirrors — approx 8% less range per mirror See the specific mirror datasheet for more information
Resolution	14 mm, 23 mm, or 40 mm, depending on model
Mounting Hardware	Emitter and receiver each are supplied with a pair of swivel end-mounting brackets (EZLSA-MBK-11). Models 980 mm and longer are supplied with an additional center-mount bracket (EZLSA-MBK-12) for center support in applications with significant vibration. Mounting brackets are 8-gauge cold-rolled steel, black zinc finish.
Enclosure	Extruded aluminum housing with yellow polyester powder finish standard and well-sealed, rugged die-cast zinc end caps, acrylic lens cover
Safety Rating	Type 4 per IEC 61496-1, -2 Category 4 PL e per EN ISO13849-1 SIL3 per IEC 61508; SIL CL3 per IEC 62061
Environmental Rating	Light Screen: IEC IP65/IEC IP67 Enclosure: IP69K
Operating Conditions	–20 to +55 °C (–4 to +131 °F) 95% maximum relative humidity (non-condensing)
Shock and Vibration	Components have passed vibration and shock tests according to IEC 61496-1. This includes vibration (10 cycles) of 10-55 Hz at 0.35 mm (0.014 in) single amplitude (0.70 mm peak-to-peak) and shock of 10 g for 16 milliseconds (6,000 cycles).
Certifications	CE c UL us LISTED

E-Stop Button

Illuminated 30 mm Mount

- Illumination allows for easy identification of which E-stop has been activated.
- Easy installation and no assembly or individual wiring required
- Push-to-stop, twist-to-release or pull-to-release operation per IEC 60947-5-5
- Compliant with ANSI B11.19, ANSI NFPA79 and IEC/EN 60204-1 Emergency Stop requirements
- Incorporate with OTB/STB optical touch button for a simplified operator station that does not require an additional enclosure.
- "Safe Break Action" ensures NC contacts will open if the contact block is damaged or separated from the actuator
- Models designed to interface with Safety BUS nodes/gateways
- Applications see page 13, 21, 27, 33

Description	Illumination	Models
2NC / 1NO (PNP)	YEL/RED-Flash/Solid	**SSA-EB1PLYR-12ECQ8**
2NC / 1NO (PNP)	GREEN/RED-Flash/Solid	**SSA-EB1PLGR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid	**SSA-EB1PLXR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Flash/Solid, with 60 mm button	**SSA-EB2PLXR-12ECQ8**
2NC / 1NO (PNP)	OFF/RED-Solid/Solid	**SSA-EB1PL-12ECQ8**
2NC – Safety BUS node compatible	YEL/RED-Flash	**SSA-EB1PLYR-02ECQ5A**
2NC – Safety BUS node compatible	OFF/RED-Flash	**SSA-EB1PLXR-02ECQ5A**
2NC – Safety BUS node compatible	OFF/RED-Soild	**SSA-EB1PL-02ECQ5A**
2NC – Safety BUS node compatible	Illuminated button, OFF (armed), RED (solid, PUSH ON)	**SSA-EB1PL2-02ECQ5A**
2NC – Safety BUS node compatible	YEL/RED-Flash	**SSA-EB1PLYR-02ECQ5B**
2NC – Safety BUS node compatible	OFF/RED-Flash	**SSA-EB1PLXR-02ECQ5B**
2NC – Safety BUS node compatible	OFF/RED-Solid	**SSA-EB1PL-02ECQ5B**
2NC – Safety BUS node compatible	Illuminated button, OFF (armed) RED (solid, PUSH ON)	**SSA-EB1PL2-02ECQ5B**



SSA-MBK-EEC1

SSA-MBK-EEC2

SSA-MBK-EEC3

SSA-EB1P-ECWC
Washdown cover

(A)
Euro-Style
Straight
splitter

4-Pin
CSS-M12F43M12M41M12F41
0.9 m (3')

8-Pin
CSS-M12F83M12M81M12F81
0.9 m (3')

(B)
Euro-Style
Double-ended
male/female

5-Pin
DEE2R-53D
0.9 m (3')

8-Pin
DEE2R-83D
0.9 m (3')

(C)
M12/Euro-Style

4-Pin
MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

8-Pin
MQDC2S-815
5 m (15')
MQDC2S-815RA
5 m (15')

30 mm E-Stop Push Button Specifications

Housing / Button Mounting	Polycarbonate / Polyamide Threaded base has M30 x 1.5 external threads.(M30 hardware included) Max. Tightening Torque: 0.56 N·m (5 in·lbf)
Operating Temperature	–25 to +55 °C
Environmental rating	IP65 (IEC60529)
Operating Humidity	45% to 85% RH (no condensation)
Insulation Resistance	100M minimum (500 V dc megger)
Impulse Withstand Voltage	2.5 kV
Pollution Degree	3
Overvoltage Category	II
Contact material / bounce*	Gold plated silver / 20 ms
Electrical Life	100,000 operations minimum, 250,000 operations minimum at 24 V ac/dc, 100 mA
Mechanical Life	250,000 operations
B10d	100,000 (based on ISO13849-1(2006))
Shock & Vibration Resistance	Operating extremes: 150m/s2 (15G) Operating extremes: 10 to 500 Hz, amplitude 0.35 mm acceleration 50 m/s2
LED Illumination	Color: Yellow - 590 nm, Red - 618 nm, Green - 525 nm Flash Rate: 1.6 Hz at 50% duty cycle Voltage/Current: 12 – 30 V dc; 120 mA at 12 V dc, 65 mA at 24 Vdc, 60 mA at 30 V dc, SSA-EB1..LGR-.. GREEN only: 12 – 30 V dc; 135 mA @ 12 V dc, 75 mA @ 24 V dc, 70 mA @ 30 V dc
Electrical Rating	Minimum load: 1 mA @ 5 V ac/dc SSA-EB1xx-..Q5A/Q5B: 3A @ 250 V maximum UL Applications (UL/cUL): 1.5A @ 250 V ac, 1A @ 30 V dc (pilot duty) SSA-EB1xx-xxED1Q8: 2A at 60 V ac/75 V dc maximum CE Applications: AC-15: 1.5A @ 250 V ac, DC-13: 1A @ 30 V dc
Rated Insulation Voltage (Ui)	250 V
Rated Current (Ith)	3A
Rated Operating Voltage (Ue)	See Electrical Rating
Rated Operating Current	**SSA-EB1xxLxx-02ED1Q5A/Q5B**

Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A
		Inductive Load (AC-15)	—	—	3A	1.5A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A
Monitor Contacts (NO)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	1.2A	0.6A
		Inductive Load (AC-15)	—	—	0.6A	0.3A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A

SSA-EB1PLxx-02ECQ5A/Q5B (illuminated)

Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	—	—	3A
		Inductive Load (AC-15)	—	—	3A	1.5A
	DC	Resistive Load (DC-12)	2A	—	0.4A	0.2A
		Inductive Load (DC-13)	1A	—	0.22A	0.1A

SSA-EB1Pxx-xxECQ8
See above for SSA-EB1P-22ECQ8 Monitor Contacts

Safety Contact (NC)	AC 50/60 Hz	Resistive Load (AC-12)	—	2A	—	—
		Inductive Load (AC-15)	—	2A	—	—
	DC	Resistive Load (DC-12)	2A	0.4A	—	—
		Inductive Load (DC-13)	1A	0.22A	—	—
Auxiliary Output (NO)	12 to 30 V dc (from pin 2)	Resistive Load (DC-12)	0.25A	—	—	—
		Inductive Load (DC-13)	0.25A	—	—	—

- The rated operating currents are measured at resistive/inductive load types specified in IEC 60947-5-1.
- See “Electrical Rating” above for maximum voltage/current rating per model.

Design Standards	Compliant with EN/IEC 60497-1 / -5-1, ISO 13850, ANSI B11.19 , ANSI NFPA79, IEC 60204-1
Certifications	CE c UL us LISTED

XS26-2

Safety Controller

- Easy to both program and install while providing scalable flexibility to meet your growing automation needs.
- Allows up to eight expansion modules
- Configuration software free of charge
- Real-time live display feedback
- Intuitive functional diagram configuration; logic function blocks including AND, OR, XOR, NAND, NOR, SR Flip-flop, RS Flip-flop
- Ethernet models available providing up to 256 status outputs and non-safety virtual outputs
- Applications see page 13, 21, 27, 33

Controller

Description	Model
Expandable	**XS26-2**
Expandable + Display	**XS26-2d**
Expandable + Ethernet	**XS26-2e**
Expandable + Display + Ethernet	**XS26-2de**

Expansion Modules

Description	Output Configuration	Model*
8 Pin Safety input module	NA	**XS8si**
16 Pin Safety input module	NA	**XS16si**
Safety output module	2 dual channel PNP	**XS2so**
Solid-state safety output module	4 dual channel PNP	**XS4so**
Safety relay output module	2 NO/1NC	**XS1ro**
Safety relay output module	4 NO/2 NC	**XS2ro**

* All models come with screw terminals

SC-XM2
Memory Card

SC-XMP2
Programming Tool

SC-USB2
USB Cable

SC-TC2
Spring Terminal Block Set

Specifications

Power	24 V dc, ± 20% Ethernet models: add 40 mA Display models: add 20 mA Expandable models: add 3.6 A max. bus load
Safety Inputs (and Convertible I/O when used as inputs)	Input On threshold: > 15 V dc (guaranteed on), 30 V dc max. Input Off threshold: < 5 V dc and < 2 mA, –3 V dc min. Input On current: 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc Input lead resistance: 300 Ω max. (150 Ω per lead) Input requirements for a 4-wire Safety Mat: • Max. capacity between plates: 0.22µF • Max. capacity between bottom plate and ground: 0.22µF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Solid State Safety Outputs	Input On threshold: > 15 V dc (guaranteed on), 30 V dc max. Input Off threshold: < 5 V dc and < 2 mA, –3 V dc min. Input On current: 5 mA typical at 24 V dc, 50 mA peak contact cleaning current at 24 V dc Input lead resistance: 300 Ω max. (150 Ω per lead) Input requirements for a 4-wire Safety Mat: • Max. capacity between plates: 0.22 µF • Max. capacity between bottom plate and ground: 0.22 µF • Max. resistance between the 2 input terminals of one plate: 20 Ω
Response and Recovery Times	See Configuration Summary in the data sheet
Environmental Rating	NEMA 1 (IEC IP20), for use inside NEMA 3 (IEC IP54) or better enclosure
Operating Conditions	Temperature range: 0 to +55 °C
Mechanical Stress	Shock: 15g for 11 milliseconds, half sine, 18 shocks total (per IEC 61131-2) Vibration: 3.5 mm occasional / 1.75 mm continuous @ 5Hz to 9Hz, 1.0g occasional and 0.5g continuous @ 9Hz to 150Hz: all at 10 sweep cycles per axis (per IEC 61131-2)
Removable Terminals	Important: Clamp terminals are designed for 1 wire only. If more than 1 wire is connected to a terminal, a wire could loosen or become completely disconnected from the terminal, causing a short. Wire size: 24 to 12 AWG (0.20 to 3.13 mm²) Wire strip length: 7 to 8 mm (0.275 in to 0.315 in)
Design Standards	Category 4, PL e (EN ISO 13849) SIL CL 3 (IEC 62061, IEC 61508)
Certifications	CE c UL us LISTED IND. CONT. EQ. 3NVF UL LISTED PROGRAMMABLE SAFETY CONTROLLER 3NBN

VE Series

Versatile, Easy-To-Use Smart Cameras

- Available in 2MP (1600 x 1200 pixels), 1.3MP (1280 x 1024 pixels) and WVGA (752 x 480 pixels) models, all with the same powerful inspection capabilities
- Runtime editing capability reduces costly downtime and the software emulator allows for offline building and troubleshooting of applications
- Factory communications (EtherNet/IP, Modbus/TCP, PROFINET and RS-232 Serial) for integration on the manufacturing floor
- Two-line, eight-character onboard display provides inspection information and focus number and makes it easy to update sensor settings, facilitating fast product changeover
- Robust metal housing with optional lens covers to achieve IP67 rating for use in harsh environments with heat, vibration, or moisture
- Applications see page 32

Family	Resolution	Imager	Ethernet Connection
VE	202	G	1A
	200 = WVGA, 752 x 480 pixels **201** = 1.3 MP, 1280 x 1024 pixels **202** = 2MP, 1600 x 1200 pixels	**G** = Grayscale	**1A** = M12, 8-pin Euro-style female

SMBVERA

SMBVEMP
Mounting plate with M8x1.25, 10-32, and 1/2-20 adapter holes

12-pin Euro-Style with Shield
MQDC2S-1215
MQDC2S-1215RA
5 m (15')

RJ45 to Ethernet 8-pin M12 Euro (Cat5e shielded)
STP-M12-815
5 m (15')

Specifications

Power	12 to 30 V dc
Discrete I/O	1 Trigger IN 5 programmable I/O
Output Configuration	Optically isolated
Lens	C-mount
Communication	10/100/1000 Mbps Ethernet, Serial RS-232
Communication Protocols	Ethernet/IP, Modbus/TCP, PCCC, PROFINET, TCP/IP, FTP, and RS-232
Acquisition	256 grayscale levels Frames per Second: VE202G1A: 50 fps, max. depending on inspection settings VE202G2A: 50 fps, VE200G1A: 60 fps, VE201G1A: 60 fps Image Size: 752 x 480 pixels = VE200G1A 1280 x 1024 pixels = VE201G1A 1600 x 1200 pixels = VE202G1A, VE202G2A
Construction	Housing: Aluminum Display Label: Polyester
Connections	Communications: M12, 8-pin Euro-style male Light Connector: M8, 3-pin Pico-style female Power, Discrete I/O: M12, 12-pin Euro-style female
Software Tools	Average Gray, Bead, Blemish, Blob, Line Detect, Circle Detect, Edge, Locate, Logic, Match, Math, Measure, Object
Environmental Rating	IEC IP67 with optional lens cover
Certifications	CE c UL us LISTED

iVu TG Plus Gen2

Image Sensor

- Image sensor combines the simplicity of a photoelectric sensor and the intelligence of a vision sensor, providing high-performance inspection capabilities at your fingertips
- All-inclusive image sensor with lens, light, IO and touch screen programming
- Optional remote touch screen for programming
- Profinet® communication protocol to simplify communications with some of the most commonly used industrial controllers in factory automation
- Supports the ability to obtain results and command rapid product changeovers over TCP/IP, EtherNet/IP, Modbus/TCP protocols or PROFINET
- Ability to change parameters on the fly
- Additional sort tools, multi-tool and the ability to store up to 30 inspections
- Applications see page 26, 31

Family†	Touch Screen	Ring Light Color	Lens (mm)
IVU2P	**TG**	**R**	**04**
IVU2P = Match, Area, Blemish, Sort and Multi-tool with Ethernet and storage for 30 inspections	**TG** = Integrated **RG** = Remote*	**R** = Red **B** = Blue **G** = Green **W** = White **I** = Infrared **6** = UV365 **9** = UV395 **XC** = C-mount** **X** = No Ring Light	**04** = 4.3 **06** = 6 **08** = 8 **12** = 12 **16** = 16 **25** = 25 **Blank** = No lens (only C-Mount)

* Remote display is required for set up and viewing of sensors with a remote touch screen

** Requires C-mount lens

RDM35 Remote Touch Screen (sold separately)

Sensors with Remote Touch Screen

SMBIVURAL

SMBIVURAR

SMBIVUU

SMBIVUB
TG model only

SMBRD35

SMBKS

SMBRDM35

Used with: Remote Display Screens

Power

M12/Euro-Style with Shield

12-Pin

MQDC2S-1215
5 m (15')
MQDC2S-1215RA
5 m (15')

4-Pin Pico

PSG-4M-403-USB
0.9 m (3')

Ethernet

RJ45 to 4-Pin Pico QD
TG Plus only

IVUC-E-415
5 m (15')

iVu & iVu Plus Specifications

General	
Supply Voltage	10-30 V dc
Demo Mode	Full tool functionality on canned images
Sensor Lock	Optional password protection
Integrated Ring Light	Red, IR, Green, Blue, White, UV or no integrated ring light
Imager	1/3 inch CMOS 752 x 480 pixels; adjustable Field-of-View (FOV)
Lens Mount	M12 X 1 mm thread (c-mount lens); microvideo lens 4.3, 6, 8, 12, 16, 25 mm
Output Rating	150 mA
Exposure Time	0.1 milliseconds to 1.049 seconds
Construction	Black Valox™ sensor housing; acrylic window iVu Plus Integrated: Die cast zinc and Black Valox™
External Strobe Output	+ 5 V dc
Environmental Rating	IP67
Model Specific	
Power Connection	Integrated and remote touch screen: 12-pin Euro-style (M12) male connector Accessory cordset required for operation; QD cordsets are ordered separately.
Supply Current	850 mA max. (exclusive of I/O load)
USB 2.0 Host	Integrated and remote touch screen: 4-pin Pico-style (M8) female connector Optional USB cordset required for operation of USB Thumb Drive. QD cordsets are ordered separately.
Ethernet Connection	iVu Plus TG: 4-pin Pico-style (M8) male connector. Ethernet cordsets are ordered separately.
Output Configuration	NPN or PNP, software on-screen selectable
Tools	Area, Blemish, Match and Sort
Display	Integrated touch screen: 68.5 mm (2.7") LCD Color Integrated Display 320 x 240 pixels Remote touch screen: See RD35 Remote Display specifications
Acquisition	100 fps (frames per second) max.
Operating Conditions	Stable Ambient Temperature: Integrated touch screen: 0 to +45 ºC Remote touch screen: 0 to +40 ºC
Remote Display Connection (Remote Touch Screen Models Only)	8-pin Euro-style (M12) female connector. Accessory cordset required for remote display; QD cordsets are ordered separately.
Certifications	CE NOTE: iVu Plus remote must use Euro QD power cordset for CE compliance. c UL us LISTED

iVu Remote Display Specifications

Screen Size	3.5" diagonal	**Stylus**	Delrin
LCD Aspect Ratio	4:3	**Display Weight**	4.8 oz (RD35), 12 oz (RDM35)
Display Resolution	320 x 240 RGB	**Bracket & Stylus Weight**	1.1 oz
Viewing Angle	60 degrees left, and 60 degrees right, 50 degrees up, and 55 degrees down	**Connection**	Molex HandyLink connector
Housing Material	Zinc Zamac #3 (RDM35), Polycarbonate (RD35)	**Operating Temperature**	0° to + 40 °C
Bracket Material	Delrin (RD35), ABS (RDM35)		

iVu Plus BCR Gen2

Bar Code Reader (BCR)

- Powerful, affordable inspection solution solves a wide variety of simple and complex applications
- Solve a variety of linear and 2D bar code applications
- First-time users can have it up and running in minutes
- Optional remote touch screen for programming
- Ability to change parameters on the fly
- Ethernet communication available
- Capable of storing and controlling up to 30 inspections for fast product change over
- Applications see page 11, 18, 31

Family	Touch Screen	Ring Light Color		Lens (mm)	
IVU2P	**RB**	**R**		**04**	
IVU2P = Reads 1D and 2D with Ethernet and storage for 30 inspections	**TB** = Integrated **RB** = Remote	**R** = Red **B** = Blue **G** = Green **W** = White **I** = Infrared	**6** = UV365 **9** = UV395 **XC** = C-mount* **X** = No Ring Light	**04** = 4.3 **06** = 6 **08** = 8 **12** = 12	**16** = 16 **25** = 25 **Blank** = No lens (only C-Mount)

* Requires C-mount lens

Accessories are shown on previous page.

Specifications

General	
Supply Voltage	10-30 V dc
Demo Mode	Full tool functionality on canned images
Sensor Lock	Optional password protection
Integrated Ring Light	Red, IR, Green, Blue, White, UV or no integrated ring light
Imager	1/3 inch CMOS 752 x 480 pixels; adjustable Field-of-View (FOV)
Lens Mount	M12 X 1 mm thread (c-mount lens); microvideo lens 4.3, 6, 8, 12, 16, 25 mm
Output Rating	150 mA
Exposure Time	0.1 milliseconds to 1.049 seconds
Construction	Black PBT sensor housing; acrylic window iVu Plus Integrated: Die cast zinc and Black PBT
External Strobe Output	+ 5 V dc
Environmental Rating	IP67
Model Specific	
Power Connection	12-pin Euro-style (M12) male connector Accessory cordset required for operation; QD cordsets are ordered separately.
Supply Current	850 mA max. (exclusive of I/O load)
USB 2.0 Host	4-pin Pico-style (M8) female connector Optional USB cordset required for operation of USB Thumb Drive. QD cordsets are ordered separately.
Ethernet Connection	4-pin Pico-style (M8) male connector. Ethernet cordsets are ordered separately.
Output Configuration	NPN or PNP, software selectable
Display	Integrated touch screen: 68.5 mm (2.7") LCD Color Integrated Display 320 x 240 pixels Remote touch screen: See RD35 Remote Display specifications
Acquisition	Integrated and remote touch screen: 100 fps (frames per second) max.
Operating conditions	Stable Ambient Temperature: Integrated touch screen: 0 to +45 ºC Remote touch screen: 0 to +40 ºC
Remote Display connection (Remote Touch Screen Models Only)	8-pin Euro-style (M12) female connector Accessory cordset required for remote display; QD cordsets are ordered separately.
Certifications	CE NOTE: iVu Plus remote must use Euro QD power cordset for CE compliance. c UL us LISTED

Remote display specifications on previous page.

WLS15 Series

Low Profile LED Strip Light

- Improves visibility, safety, and efficiency
- 15 mm low profile fits in tight spaces that other lights cannot
- Installs in minutes without impacting existing application framework
- Professional quality and certified product
- Applications see page 11, 20, 26

Family	Cascadable	Color	Length (mm)	Window	Construction	Connector
WLS15	X	DW	0360	D	S	C2
	C = Cascadable **X** = Non Cascadable	**DW** = Daylight White **WW** = Warm White	**0220** **0640** **0360** **0920** **0500** **1200**	**D** = Diffused	**S** = Sealed (IP66, IP67)	**C2** = 2 m Integral **QP** = 150 mm Integral Euro QD **QS** = 150 mm Integral cable with Deutsch DTM

LMBWLS15

LMBWLS15-150S

LMBWLS15MAG

4-pin Euro-Style

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

2-pin Deutsch
Single-ended cordset with straight connectors

DTMC-215
5 m (15')

Specifications

Supply Voltage and Current

12 V dc or 24 V dc nominal
Absolute operational limits of 10 V dc to 15 V dc and 20 V dc to 27 V dc
Use only with a suitable Class 2 power supply (UL) or a SELV power supply (CE)
Light can be PMW dimmed between 25% to 100% with a frequency up to 1000 Hz

Light Length (mm)	Typical Current (A) at 25 °C		Maximum Current (A) at -40 °C		Lumens	
	12 V dc	24 V dc	12 V dc	24 V dc	Daylight White	Warm White
0220	0.19	0.10	0.24	0.12	175	170
0360	0.38	0.20	0.48	0.24	350	340
0500	0.57	0.30	0.72	0.36	525	510
0640	0.76	0.40	0.96	0.48	700	680
0920	1.14	0.60	1.44	0.72	1050	1020
1200	1.52	0.80	1.92	0.96	1400	1360

Light Characteristics

Color Temperature (CCT):
Daylight white: 5,000 K Warm white: 3,000 K CRI: 80 minimum

Construction

Clear anodized aluminum inner housing; Polycarbonate outer housing, Polyamide end caps

Mounting

Integral mounting slots for M4 (#8) screws, tighten to 5 in·ibf max torque
Multiple bracket options available

Environmental Rating

Rated IEC IP66 and IEC IP67 Suitable for wet locations per UL 2108

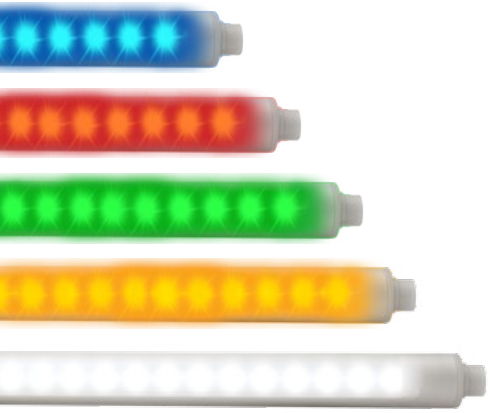
Operating Conditions

Temperature: –40 to +70 °C Storage Temperature: –40 to +70 °C

Application Notes

When connecting cascadable lights in series it is important not to exceed maximum current limitations:
Maximum length of light at 12 V dc = 2.4 m Maximum length of light at 24 V dc = 6 m

Certifications



WLS27 Series

LED Light Bar

- Encased in shatterproof, UV-stabilized, copolyester shells
- Round shape makes them suitable for laminar airflow applications
- Rugged, water-resistant IP66, IP67 and IP69K design
- Daisy chain power to multiple lights
- Capability to dim lights using the wiring pinout (Hi/Lo/Off)
- Automatic temperature protection built into the unit extends the product life
- Single- and dual-colored models available
- Applications see page 12, 19, 31

Single Color

Family	Cascadable	Color	Lighted Length (mm)	Window	Construction	Connector
WLS27	X	W	285	D	S	Q

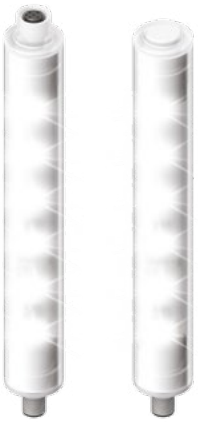
- Cascadable: **C** = Cascadable; **X** = Non Cascadable
- Color: **Blank** = Cool White; **WW** = Warm White; **R** = Red; **G** = Green; **B** = Blue; **Y** = Yellow
- Lighted Length (mm): 145, 285, 430, 570, 710, 850, 990, 1130
- Window: **D** = Diffused Plastic
- Construction: **S** = Sealed
- Connector: **Q** = Integral Euro QD (dc)

Dual-Color

Colors (C) /Density (D)

Family	Cascadable	C1	D1	C2	D2	Lighted Length (mm)		Window	Construction	Connector
WLS27	X	W		R	2	285	–	D	S	Q

- Cascadable: **C** = Cascadable; **X** = Non Cascadable
- C1 / C2: **Blank** = Cool White; **WW** = Warm White; **R** = Red; **G** = Green; **B** = Blue; **Y** = Yellow
- Density: **Blank** = 100%; **2** = 50%; **3** = 33%
- Lighted Length (mm): 145, 285, 430, 570, 710, 850, 990, 1130
- Window: **D** = Diffused Plastic
- Construction: **S** = Sealed
- Connector: **Q** = Integral Euro QD



First or Middle of Cascade

Stand-Alone or Cascade End Light

LMBWLS27EC

LMBWLS27H

LMBWLS27U

LMBWLS27SP

Standard

4-pin Euro-Style

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

4-pinEuro-Style QD Double-Ended Straight/Straight

MQDEC-403SS
1 m (3')

4-pin Euro-Style QD Splitter

Length	
Branches	Trunk
0.3 m	0.3 m

CSB-M1241M1241

IP69K Washdown

4- pin M12 Euro-Style Washdown Cordset
Straight connector models only

MQDC-WDSS-0415
5 m (15')

4-pin Euro-Style QD Double-Ended Washdown
Straight/Straight

MQDEC-WDSS-403SS
1 m (3')

WLS27 Specifications

Supply Voltage and Current	12 to 30 V dc see data sheet for details by length

Lumens

Length (mm)	One-Color WLS27 Lumens (Typical @ 25 °C)						Typical Wattage* (Watts)
	Cool White	Warm White	Red	Green	Blue	Yellow	
145	325	325	55	180	40	50	3.6
285	650	650	110	360	80	100	7.2
430	975	975	165	540	120	150	11.0
570	1300	1300	220	720	160	200	14.6

Length (mm)	One-Color WLS27 Lumens (Typical @ 25 °C)						Typical Wattage* (Watts)
	Cool White	Warm White	Red	Green	Blue	Yellow	
710	1625	1625	275	900	200	250	18.5
850	1950	1950	330	1080	240	300	22.1
990	2275	2275	385	1260	280	350	25.9
1130	2600	2600	440	1440	320	400	29.8

*Typical operating wattage is measured at 24 V dc

Light Characteristics	Color: Cool white Color temperature (CCT): 6000–7100K
Useful Life	Lumen Maintenance - L70 When operating within specifications, output will decrease less than 30% after 50,000 hours.
Construction	Clear anodized aluminum housing; FDA-grade copolyester outer housing
Mounting	Bracket LMBWLS27EC included (2 for lights up to 570 mm or 3 for lights 710 mm and longer); see datasheet for additional options
Environmental Rating	IEC IP66, IP67, and IP69K, per DIN 40050
Operating Conditions	–40 to +70 ºC
Certifications	CE c UL us LISTED D

WLB32 Series

LED Light Bar

- Banner's WLB32 is an ultra-bright LED fixture that features an even light output for a no glare 'glow'
- Highly energy efficient for overall cost savings
- High/Low/OFF switch
- Daisy chain power to multiple lights
- Metal housing, shatterproof window
- Easy installation with snap clips, or a choice of magnetic or angle brackets
- Applications see page 11, 20, 26

WLB32

Example Model Number: WLB32C285PBQ

Family	Power	Cascadable	Lighted Length (mm)	Shield	Control	Connector	Plug Type**
WLB32		C	285		PB	Q	

Power
- **Blank** = DC
- **Z** = AC

Cascadable
- **C** = Cascadable

Lighted Length (mm)
- **285**
- **570**
- **850**
- **1130**

Shield
- **Blank** = No shield
- **E** = Eye shield

Control
- **Blank** = None
- **M** = Motion Switch
- **PB** = Hi/Lo/OFF Switch

Connector
- **Blank** = 2 m Integral Cable (dc)
- **Q** = Integral Euro QD (dc)
- **QM** = AC

Plug Type**

** Only needed for AC models

- **B** = North & Central America, Japan, Taiwan
- **D** = India, Sri Lanka, Nepal, Namibia
- **EF** = France, Belgium, Slovakia, Tunisia, Germany, Austria, Netherlands, Spain, S. Korea, Turkey, Poland
- **G** = UK, Ireland, Cyprus, Malta, Malaysia, Singapore, Hong Kong, Vietnam
- **I** = Australia, New Zealand, Papua New Guinea, Argentina, China
- **N** = Brazil, South Africa
- **C** = AC connector with flying leads
- **Blank** = AC (no power cord)

Cascadable

AC or DC

Hi/Low/Off Switch

Motion Detection

Eye Shield

LMBWLB32

LMBWLB32-180S

LMBWLB32MAG

LMBWLB32U

LMBWLB32UT

Cordsets for DC Models

4-pin Euro-Style

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

4-pinEuro-Style QD Double-Ended
Straight/Straight or Straight/Right-angle

MQDEC-403SS
1 m (3')
MQDEC-403RS
1 m (3')

4-pin Euro-Style QD Splitter

Length			
Branches	Trunk		
0.3 m	0.3 m	**CSB-M1241M1241**	

Cordsets for AC Models

Double-Ended
NEMA 5-15 grounded (IEC Type B)

LQMAC-306B
2 m (6.5')

Double-Ended
For Cascading Straight/Straight

LQMAEC-312SS
3 m (12')

Specifications

Supply Voltage and Current	12 to 30 V dc 90 to 264 V ac

Lighted Length (mm)	Max Current Draw (A)		Typical Current Draw (A)					Lumens
	DC	AC (at 90 V ac)	12 V DC	24 V DC	30 V DC	120 V ac	230 V ac	
285	0.8	0.125	0.66	0.31	0.24	0.075	0.045	650
570	1.6	0.250	1.36	0.62	0.48	0.150	0.080	1300
850	2.4	0.375	2.19	0.93	0.72	0.225	0.115	1950
1130	3.2	0.500	3.02	1.24	0.96	0.300	0.150	2600

Light Characteristics	Color: Daylight white Color temperature (CCT): 5000K (±300K)
Useful Life	Lumen Maintenance - L70 When operating within specifications, output will decrease less than 30% after 50,000 hours.
Push Button	II = 100% intensity I = 50% intensity 0 = Off
Construction	Anodized aluminum housing; polycarbonate window and end caps; stainless steel mounting brackets
Mounting	Snap clips; magnetic mount or swivel bracket accessories available
Environmental Rating	IEC IP50
Operating Conditions	DC models: –40 C to 70 °C AC models: –25 to 45 °C
Certifications	CE c UL us LISTED c TÜV us E476617

WLB92 Series

LED Light Bar

- Increase worker productivity and ergonomics with bright, high-quality, uniform light
- Durable light stands up in your environment with a rugged metal housing and shatterproof light cover
- No maintenance time or cost with long-life, energy-efficient LEDs
- Flexibility to place light where needed with ac and dc models
- Easy installation with variety of mounting options: surface, swivel, snap and hanging brackets
- AC models are DLC certified and have a five year warranty
- Applications see page 26

24 V DC

Family	Cascadable	Color	Lighted Length (mm)	Control	Connector
WLB92	X		550	PB	Q
	X = Non Cascadable	**Blank** = Daylight White **WW** = Warm White **R** = Red **G** = Green **B** = Blue **Y** = Yellow	**550** **1100**	**PB** = Switch and Dimming Knob*	**Blank** = 2 m Integral Cable (dc) **Q** = Integral Euro QD (dc)

* Models include dimming knob for manual intensity control

100-277 V AC

Family	Voltage	Cascadable	Color	Lighted Length (mm)	Control	Connector	Plug Type**
WLB92	Z	C		550	PB	QM	B
	Z = AC	**C** = Cascadable	**Blank** = Daylight White **WW** = Warm White **R** = Red **G** = Green **B** = Blue **Y** = Yellow	**550** **1100**	**A** = 0-10 V Analog Dimming (Conduit CT models) **PB** = Switch and Dimming Knob (AC QM models)	**QM** = AC† **CT** = Conduit Entry††	**** Only needed for AC QM models** **B** = North & Central America, Japan, Taiwan **D** = India, Sri Lanka, Nepal, Namibia **EF** = France, Belgium, Slovakia, Tunisia, Germany, Austria, Netherlands, Spain, S. Korea, Turkey, Poland **G** = UK, Ireland, Cyprus, Malta, Malaysia, Singapore, Hong Kong, Vietnam **I** = Australia, New Zealand, Papua New Guinea, Argentina, China **N** = Brazil, South Africa **C** = AC connector with flying leads **Blank** = AC (no power cord)

† Models with a connector include ON/OFF switch as well as a dimming knob for intensity control

†† Conduit entry models include dimmability via a 0 to 10 V input circuit

LMBWLB92

LMBWLB92CLIP

LMBWLB92HK5

LMBLWB92S

LMBWLB92RAS

4-pin Euro-Style

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

Double-Ended
For Cascading
straight/straight

LQMAEC-306SS
2 m (6.5')

Specifications

Supply Voltage and Current	24 V dc +/- 10% 100 to 277 V ac

Lighted Length (mm)	Max Current Draw (A)		Typical Current Draw (A)				Lumens
	DC	AC (at 90 V ac)	24 V DC	120 V ac	230 V ac	277 V ac	
550	1.75 A	0.425 A	1.45 A	0.295 A	0.160 A	0.145 A	3130
1100	3.5 A	0.850 A	2.9 A	0.590 A	0.310 A	0.260 A	6500

Light Characteristics	Color: Daylight white Color temperature (CCT): 5000K (±300K) Color: Warm white Color temperature (CCT): 3,000 K
Useful Life	Lumen Maintenance - L70 When operating within specifications, output will decrease less than 30% after 50,000 hours.
Construction	Anodized aluminum housing; polycarbonate window and end caps
Mounting	Several options available; see above and datasheet
Environmental Rating	IEC IP40
Operating Conditions	See datasheet
Certifications	AC daylight white models only

LASER MARKING AVAILABLE

IO-Link®

TL50 Tower Lights

Preconfigured Tower Lights

- Exceptionally bright, highly visible from a distance
- Install quickly and easily with no assembly required
- Clearly evident on/off status
- Versatile mounting options
- Compact, sleek, rugged design with IP67 models available
- Audible alert: continuous, pulsed and staccato models available
- Models available with IO-Link communication
- Applications see page 20

Housing	Brightness	Supply Voltage	Color Position 1	2	3	4	5	6**	7**	Audible Alarm	Control	Housing Color	Connection
TL50	H		G	R	Y						K		Q

Blank = Standard
H = High Brightness

G = Green
Y = Yellow
R = Red
B = Blue
W = White
T = Turquoise
O = Orange
V = Violet
S = Sky Blue
M = Magenta
Blank = Audible Only

K = IO-Link†

Blank = Black
C = Gray

Blank = 2 m Integral Cable
Q = Euro Integral QD (dc only)
QP = Euro Pigtail QD (Available with Micro Pigtail QD for ac models if 4 segments or less)

Blank (1 to 5 colors) = 18 to 30 V dc or 21 to 27 V ac
Blank (6 or 7 colors) = 12 to 30 V dc or 21 to 26 V ac
Z = 100 to 240 V ac

Blank = None (IP67)
A = Audible (IP50)
ALS = Sealed Audible Continuous Tone
ALS3 = Sealed Audible Pulsed Tone
ALS4 = Sealed Audible Staccato Tone
AOS = Omni-Directional Sealed Audible Continuous Tone
AOSI = Omni-Directional Sealed Audible Continuous Tone with Intensity Adjust
AOS3 = Omni-Directional Sealed Audible Pulsed Tone
AOS3I = Omni-Directional Sealed Audible Pulsed Tone with Intensity Adjust
AOS4 = Omni-Directional Sealed Audible Staccato Tone
AOS4I = Omni-Directional Sealed Audible Staccato Tone with Intensity Adjust

* These colors are not available in the high brightness models

** Positions 6 and 7 not available in high brightness models; Position 7 not available with audible

† IO-Link not available on high brighness or ac models

Audible
max. intensity 92 db
@ 1 meter (typical)

Sealed
max. intensity 94 db
@ 1 meter (typical)

Sealed Omni-Directional
max. intensity 99 db
@ 1 meter (typical)

SMB30A

SMB30MM

SMBAMS30P

SMB30RAVK

Euro-Style

3 Lights/4-Pin	4 Lights/5-Pin	5+ Lights/8-Pin
MQDC-415 5 m (15') **MQDC-415RA** 5 m (15')	**MQDC1-515** 5 m (15') **MQDC1-515RA** 5 m (15')	**MQDC2S-815** 5 m (15') **MQDC2S-815RA** 5 m (15')

Micro-Style

3 Lights/4-Pin	4 Lights/5-Pin
MQADC-415 5 m (15') **MQADC-415RA** 5 m (15')	**MQDAC2-515** 5 m (15') **MQDAC2-515RA** 5 m (15')

Elevated Mount System

Foldable Bracket

Specifications

Supply Voltage and Current	DC models: 18 to 30 V dc (10% max. ripple); or 21 to 27 V ac Standard Brightness: Indicators: 45 mA max. current per LED color Standard Audible Alarm (IP50): @ 25 mA max. current Sealed Audible Alarm (IP67): 35 mA max. current Omni-Directional Sealed Audible Alarm: 45 mA max. current High Brightness: max. current per LED color: Indicators: 18 V dc—100 mA; 30 V dc—60 mA; 21 V ac—80 mA; 27 V ac—70 mA Standard Audible (IP50): 25 mA max. current Sealed Audible Alarm (IP67): 35 mA max. current Audible only: @ 45mA max. AC models: 100 to 240 V ac; 50 or 60 Hz
Indicators	LEDs are independently selected— Green, Yellow, Red, Blue, White, Turquoise, Orange, Violet, Sky Blue or Magenta; 1-7 colors depending on model
Supply Protection Circuity	Protected against reverse polarity and transient voltages
Input Response Time	Indicators ON/OFF (dc): 10 milliseconds (max.) Indicators ON/OFF (ac): 500 milliseconds (max.)
Audible Alarm	Audible measurements are made in the direction sound exits the device. For standard audible models, this is the top of the unit (when mounted vertically, sound is directed toward the ceiling). For sealed audible models (IP67), sound exits the vented openings in the side of the unit, which should be oriented so that the sound is directed toward the machine operator(s). In environments with high ambient noise levels or high ceilings that absorb sound, the sealed version is recommended. Standard Audible Alarm: 2.7 KHz ± 500 Hz oscillation frequency; max. intensity 92 db @ 1 meter (typical) Sealed Audible Alarm: 29 KHz to 250 Hz oscillation frequency; max. intensity 94 db @ 1 meter (typical) Omni-Directional Sealed Audible Alarm with Intensity Adjustment: 2.1 KHz ± 250 Hz oscillation frequency; max intensity 95 dB at 1 meter (3.3 ft) (typical)
Audible Adjustments	Standard Audible Alarm: Unscrew the cover (up to 1.5 turns max.) to adjust the audible intensity. (Do not exceed 1.5 turns or the cover may detach during operation.) For max. intensity, rotate the center plug 180° counterclockwise to remove it. Sealed Audible Alarm and Omni-Directional Sealed Audible Alarm with Intensity Adjustment: Rotate the front cover until the desired intensity is reached.
Construction	Bases and Covers: ABS Light Segment: Polycarbonate
Environmental Rating	General-Purpose: IEC IP67 Audible: IEC IP50 or IEC IP67, depending on model
Operating Conditions	General-Purpose: –40 to +50 °C Audible: –20 to +50 °C Relative Humidity: 95% @ 50 °C (non-condensing) Storage Temperature: –40 to +70 °C
Certifications	CE c UL us LISTED

LASER MARKING AVAILABLE

TL70 Series

Tower Lights

- Light segments have user-selectable solid ON or flashing
- Up to six light segments (six color options) or five segments plus an audible in one device
- Rugged, water-resistant IP65 housing with UV stabilized material
- Bright, uniform indicator segments appear gray when off to eliminate false indication from ambient light
- Applications see page 37

Preassembled DC

Housing	Color/Position 1	2	3	4	5	6	Audible Alarm*	Housing Color	Connection
TL70	G	R	Y	B	W	O			Q

Color/Position
G = Green, **Y** = Yellow, **R** = Red, **B** = Blue, **W** = White, **O** = Orange, **Blank** = None

Audible Alarm*
Blank = None
A = Audible (92 dB)
AL = Louder Audible (85 -101 dB)
AP = Programmable Audible

Housing Color
Blank = Black
C = Gray

Connection
Blank = 2 m Integral Cable
T = Terminal Wired
Q = Euro Integral QD
QP = Euro Pigtail QD

Preassembled AC

Housing	Color/Position 1	2	3	4	5	6	Audible Alarm*	Housing Color	Connection
TL70Z	G	R	Y	B	W	O			Q

Color/Position
G = Green, **Y** = Yellow, **R** = Red, **B** = Blue, **W** = White, **O** = Orange, **Blank** = None

Audible Alarm*
Blank = None
A = Audible (92 dB)
AL = Louder Audible (85 -101 dB)
AP = Programmable Audible

Housing Color
Blank = Black
C = Gray

Connection
Blank = 2 m Integral Cable
Q = 1/2-20/Micro-style Integral QD**

* Not available with six light modules
** Models with Q are limited to 4 modules

Preassembled Wireless

Housing	Radio	Color/Position 1	2	3	4	5	6	Audible Alarm*	Housing Color	Connection
TL70	DXN2	W	B	G	Y	R	O			Q

Radio
DXN2 = Node 2.4 GHz
DXN9 = Node 900 MHz
DR2M = MultiHop Data Radio 2.4 GHz
DR9M = MultiHop Data Radio 900 MHz

Color/Position
G = Green, **Y** = Yellow, **R** = Red, **B** = Blue, **W** = White, **O** = Orange, **Blank** = None

Audible Alarm*
Blank = None
A = Audible (92 dB)
AL = Louder Audible (85 -101 dB)
AP = Programmable Audible

Housing Color
Blank = Black
C = Gray

Connection
Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

Requires Gateway or master radio of the same frequency

SMB30A

SMB30MM

SMBAMS30P

SMB30RAVK

Euro-Style

3 Lights/4-Pin	4 Lights/5-Pin	5+ Lights/8-Pin
MQDC-415 5 m (15') **MQDC-415RA** 5 m (15')	**MQDC1-515** 5 m (15') **MQDC1-515RA** 5 m (15')	**MQDC2-815** 5 m (15') **MQDC2-815RA** 5 m (15')

Micro-Style
For AC models

3-Lights/4-Pins	4 Lights/5-Pin
MQAC2-415 5 m (15')	**MQAC2-515** 5 m (15')

Specifications

Supply Voltage and Current	12 to 30 V dc Indicators—Maximum current per LED color: Blue, Green, White: 420 mA at 12 V dc; 145 mA at 30 V dc Red, Yellow, Orange: 285 mA at 12 V dc; 120 mA at 30 V dc Audible: Standard: 30 mA at 12 to 30 V dc Loud: 350 mA at 12 V dc; 110 mA at 30 V dc Multitone: 270 mA at 12 V dc; 110 mA at 30 V dc Programmable: 250 mA at 12 V dc; 110 mA at 30 V dc	100 to 240 V ac; 50/60 Hz Maximum current per color or audible module: 70 mA at 120 V ac and 60 Hz 50 mA at 230 V ac and 50 Hz
Supply Protection Circuity	Protected against reverse polarity and transient voltages	
Indicator Response Time	DC models: OFF Response: 150 µs (maximum) at 12 to 30 V dc ON Response: 180 ms (maximum) at 12 V dc; 50 ms (maximum) at 30 V dc	AC models: OFF Response: 150 µs (maximum) at 12 to 30 V dc ON Response: 180 ms (maximum) at 12 V dc; 50 ms (maximum) at 30 V dc
Audible Alarm	2.6 KHz ± 250 Hz oscillation frequency; maximum intensity 92 dB at 1 m (3.3 ft) (typical)	
Audible Adjustments	Rotate the cover until the desired volume is reached Change in sound intensity from fully open to fully closed is 8 dB	
Radio Range (Wireless Models)	900 MHz, 1 Watt (Internal antenna): Up to 3.2 km (2 miles) 2.4 GHz, 65 mW (Internal antenna): Up to 1000 m (3280 ft) with line of sight	
Minimum Separation Distance (Wireless Models)	900 MHz, 1 Watt: 4.57 m (15 ft) 2.4 GHz, 65 mW: 0.3 m (1 ft)	
Construction	Bases, segments and Covers: Polycarbonate	
Environmental Rating	IEC IP65	
Operating Conditions	–40 to +50 °C Relative Humidity: 95% @ 50 °C (non-condensing) Storage Temperature: –40 to +70 °C	
Certifications	CE c UL us LISTED	

K50L2 and K30L2

Domed Indicators

- Get seven colors via only three inputs
- Save controller outputs and wiring
- Improve production efficiency through enhanced visual management
- Install wherever you need indication to improve communication and productivity
- Standardize to simplify ordering and spare parts
- Collaborate with Banner on custom models
- Applications see page 12, 19

Family	Material	Color	Input	Audible Alarm*	Connection
K50L2		**RGB**	**7**	**A1**	**Q**
K50L2 = K50L2, K30L2	**Blank** = Standard **F** = FDA Grade	**RGB** = Multicolor	**7** = 7 colors **K** = IO-Link††	**Blank** = No Audible **A1** = Audible **AL1** = Loud Audible **ALS** = Sealed Audible	**Blank** = 2 m Integral Cable† **Q** = Euro Integral QD** **QP** = Euro Pigtail QD

* Audible models not available in FDA-grade material
** Integral QD not available in FDA-grade material
† IO-Link models not available with integral cable
†† IO-Link not available in K30L2 models


SMB30FA


SMB22FVK


SMB30SC


SMB30A

K30L2 accessories listed on next page.


4- pin Euro QD

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

Specifications

Supply Voltage and Current	K50L2: 10 to 30 V dc; 220 mA Max. at 10 V dc; 100 mA Max. at 30 V dc K30L2: 10 to 30 V dc; 60 mA Max. at 10 V dc; 30 mA Max. at 30 V dc
Construction	Polycarbonate housing
Environmental Rating	K50L2: Standard: IEC IP66/IP67/IP69K Standard Audible: IEC IP50 Sealed Audible: IEC IP66/IP67/IP69K K30L2: IEC IP66/IP67/IP69K
Operating Temperature	–40 to 50 °C
Certifications	CE c UL us LISTED

S22 Touch Series

Flat Touch Button

- Large, bright illuminated area for clear visibility of input and touch status
- Flush mount design sits tight against panel, machine and bracket surfaces
- Independent color control or preconfigured models to suit your indication needs
- Momentary versions remain activated as long as touch is present, while latching versions toggle between activated and not activated states on successive touches
- Excellent immunity to false triggering by water spray, detergents, oils, and other foreign materials
- Rugged, water-resistant IP69K design for washdown environments
- Ergonomically designed to eliminate hand, wrist and arm stresses, requiring no physical pressure to operate and can be actuated with bare hands or work gloves
- Applications see page 12, 19

Multipurpose Independent Control

Family	Output State	Output Function	Activation Method	Material	Color	Function	Connector
S22	A	M	T	S	RGB7	F2	QP
	A = Normally Open **R** = Normally Closed	**M** = Momentary **L** = Latching	**T** = Touch	**S** = Standard **F** = FDA Grade	**RGB7** = RGB Multicolor (7colors)	**F2** = Multifunction	**Blank** = 2 m Integral Cable **QP** = Euro Pigtail QD

Illuminated Button Control

Family	Output State	Output Function	Activation Method	Material	Color (not activated / activated)	Function	Connector
S22	A	L	T	S	G / R	H	Q
	A = Normally Open **R** = Normally Closed	**M** = Momentary **L** = Latching	**T** = Touch	**S** = Standard **F** = FDA Grade	**G** = Green **Y** = Yellow **R** = Red **B** = Blue **W** = White **X** = Not used	**H** = Output only	**Blank** = 2 m Integral Cable **Q** = Euro Integral QD **QP** = Euro Pigtail QD **T** = Terminal Screws

SMB22A

SMB22FVK

SMBAMS22P

SMB22RAVK

5-pin Euro QD

MQDC1-515
5 m (15')
MQDC1-515RA
5 m (15')

5- pin M12 Euro-Style Washdown Cordset
Straight connector models only

MQDC-WDSS-0515
5 m (15')

Specifications

Supply Voltage	10 to 30 V dc
Supply Current	80 mA max current (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Construction	Housing: Polycarbonate or FDA grade plastic, depending on model Translucent dome: Polycarbonate or FDA grade plastic, depending on model Mounting Nut: PBT
Environmental Rating	Standard: UL Type 4x, 13 FDA Grade: UL Type 4x Cable, Pigtail, QD models: IEC IP66, IP67, IP69K per DIN 40050-9 on front and back Terminal models: IEC IP66, IP67, IP69K per DIN 40050-9 on front only
Connections	2 m PVC integral cable, integral Euro-style QD, 150 mm Euro-style pigtail QD or terminal
Operating Conditions	Temperature: –40 to +50 °C Storage Temperature: –40 to +70 °C
Certifications	CE cULus LISTED

LASER MARKING AVAILABLE

K70L Series

Medium-Sized Domed Indicator

- Bright, uniform indicator light
- All models have flashing input control
- Models are available with up to five colors in one device
- Rugged, water-resistant IP65-rated design
- 12 V to 30 V dc operations
- Wireless options available in either 900 MHz and 2.4 GHz ISM Bands
- Applications see page 37

Standard and Wireless

Family	Model	Color					Input*	Connection
K70	L	W	B	G	Y	R	P	Q

L = Standard
DXN2 = Wireless 2.4 GHz
DXN9 = Wireless 900 MHz

G = Green
Y = Yellow
R = Red
B = Blue
W = White

P = PNP
N = NPN

*Leave blank for wireless

Blank = 2 m Integral Cable
Q = Euro Integral QD
QP = Euro Pigtail QD

SMB30FA

SMB22FVK

SMB30SC

SMB30A

4-pin Euro QD

MQDC-415
5 m (15')
MQDC-415RA
5 m (15')

Specifications

Supply Voltage and Current	K70L: 12 V to 30 V dc; 200 mA Max. at 12 V dc; 90 mA Max. at 30 V dc
Supply Protection Circuitry	Protected against reverse polarity, transient voltages
Construction	Polycarbonate housing
Environmental Rating	K70L: IEC IP65
Operating Temperature	–40 to 50 °C
Certifications	CE c UL us LISTED Depending on model)

Архангельск (8182)63-90-72
Астана (7172)727-132
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Липецк (4742)52-20-81
Киргизия (996)312-96-26-47
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Казахстан (772)734-952-31
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Таджикистан (992)427-82-92-69
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

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