OTB Series Optical Touch Button Product Manual

Features

- Zero-force touch-activated photoelectric replacements for mechanical push buttons
- Momentary-action touch buttons with SPDT electromechanical relay or solid-state outputs
- Optimized for easy mounting with a 30 mm threaded base
- Ergonomic design eliminates hand, wrist, and arm stress
- Pre-installed field covers protect the device and prevent inadvertent activation



WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Models

Models with a 6-foot cable and flying leads

Models with a Black Cover	Models with a Yellow Cover	Voltage	Output
OTBVN6	**OTBVN6 W/Y**	10 V DC to 30 V DC	Complementary NPN (sinking) outputs
OTBVP6	**OTBVP6 W/Y**		Complementary PNP (sourcing) outputs
OTBA5		120 V AC	SPDT electromechanical relay output
OTBVR81	**OTBVR81 W/Y**	20 V AC or DC to 30 V AC or DC[1]	

Models with a Male 7/8 in-16UNF Quick Disconnect Connector

Models with a Black Cover	Models with a Yellow Cover	Voltage	Output	Pinout
OTBVN6QD		10 V DC to 30 V DC	Complementary NPN (sinking) outputs	4-Pin
OTBVP6QD	**OTBVP6QD W/Y**		Complementary PNP (sourcing) outputs	
OTBA5QD		120 V AC	SPDT electromechanical relay output	5-Pin
OTBVR81QD	**OTBVR81QD W/Y**	20 V AC or DC to 30 V AC or DC (20 V DC to 30 V DC power may be applied without regard to polarity.)		

Models with a Male M12 Quick Disconnect Connector

Models with a Black Cover	Models with a Yellow Cover	Voltage	Output	Pinout
OTBVP6QDH	**OTBVP6QDH W/Y**	10 V DC to 30 V DC	Complementary PNP (sourcing) outputs	4-Pin
OTBVR81QDH		20 V AC or DC to 30 V AC or DC (20 V DC to 30 V DC power may be applied without regard to polarity.)	SPDT electromechanical relay output	5-Pin

Models with a quick disconnect require a mating cordset. See "Accessories" on page 7.

To order a model with polycarbonate upper housing (others are polysulfone), add the suffix "**L**" to the model number. For example, **OTBVN6L**. Not all listed models are available with this option and minimum order quantities may apply. Contact Banner Engineering for availability or more information.

Important... Read this before proceeding!

The user is responsible for satisfying all local, state, and national laws, rules, codes, and regulations relating to the use of this product and its application. Banner Engineering Corp. has made every effort to provide complete application, installation, operation, and maintenance instructions. Please contact a Banner Applications Engineer with any questions regarding this product.

[1] 20 V DC to 30 V DC power may be applied without regard to polarity.

Original Instructions
13-Nov-24

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28436
p/n: 28436 Rev. O

The user is responsible for making sure that all machine operators, maintenance personnel, electricians, and supervisors are thoroughly familiar with and understand all instructions regarding the installation, maintenance, and use of this product, and with the machinery it controls. The user and any personnel involved with the installation and use of this product must be thoroughly familiar with all applicable standards, some of which are listed within the specifications. Banner Engineering Corp. makes no claim regarding a specific recommendation of any organization, the accuracy or effectiveness of any information provided, or the appropriateness of the provided information for a specific application.

EU Declaration of Conformity (DoC)

Banner Engineering Corp. herewith declares that these products are in conformity with the provisions of the listed directives and all essential health and safety requirements have been met. For the complete DoC, please go to www.bannerengineering.com.

Product	Directive
OTB Series DC and AC Models	EU: EMC Directive 2014/30/EU, Low Voltage Directive 2014/35/EU

Representative in EU: Spiros Lachandidis, Managing Director, **Banner Engineering BV** Park Lane | Culliganlaan 2F bus 3 | 1831 Diegem, BELGIUM

Overview

Banner Optical Touch Buttons (OTB) are touch-activated photoelectric switches designed to replace capacitive touch switches and mechanical push buttons. The OPTO-TOUCH's SPDT electromechanical relay or solid-state output (depending upon model) is activated when a finger, introduced into the "touch area" (yoke) of the switch, interrupts the OPTO-TOUCH's infrared sensing beam.

Banner Optical Touch Buttons are ergonomically designed to eliminate the hand, wrist, and arm stresses associated with mechanical push buttons. They require absolutely no physical pressure to operate. LED indicators light for "power on" and "output activated".

All models are highly resistant to EMI, RFI, and ambient light interference. OTBs have a black polysulfone (or red polycarbonate) upper housing and fiber-reinforced thermoplastic polyester base. Polycarbonate models have the letter "L" in their model number suffix. Environmental considerations for use of the two types differ (see Specifications). The 30 mm threaded base on all models provides easy mounting, and Banner Optical Touch Buttons are easily retrofitted to existing machines.

Rugged polypropylene (TP) field covers are installed on all models to avoid inadvertent switch actuation due to objects (such as loose clothing or debris) that might accidentally block the sensing beam and to protect the device. The polypropylene material is capable of absorbing high impact (even at low temperatures) and is highly resistant to abrasion and to damage by most chemicals.

> **NOTE:** A field cover is installed on this OPTO-TOUCH. If this cover is missing or has become lost or damaged, contact Banner Engineering immediately for a replacement.

Installing the OTBs

Install the OPTO-TOUCH Optical Touch Buttons so the environment does not adversely affect the means of actuation. Severe contamination of the touch area (yoke) of the switch or other environmental influences may cause slow response or false energized (on) conditions.

Mount the buttons to protect them from accidental or unintentional operation.

When installing the hand controls, consider ergonomic principles to avoid unnecessary fatigue. Install the touch buttons at a height and in a location that will be comfortable for the user. See ANSI B11.TR1 *Ergonomic Guidelines*, and EN894 *Safety of Machinery-Ergonomic Requirements-Control Actuators* for more information.

Mount the buttons a safe distance from moving machine parts, as determined by the appropriate standard (for example, ANSI B11.19, ISO 13851). It must not be possible for the operator or other non-qualified persons to relocate them. Failure to establish and maintain the required distance may result in an increased risk of harm.

If OPTO-TOUCH Optical Touch Buttons are used to initiate machines or operations in which false operation of an Optical Touch Button could be dangerous, point-of-operation safeguarding devices and/or related safety controls must be installed and maintained to meet all appropriate OSHA regulations, ANSI B11 machine safety standards (for example, ANSI B11.19) or other relevant regulations.

> **CAUTION: Hand Controls**—The environment in which hand controls are installed must not adversely affect the means of actuation. Severe contamination or other environmental influences may cause slow response or false energized (on) conditions of mechanical or ergonomic buttons. This may result in exposure to a hazard.

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CAUTION:
- **Install hand controls to prevent accidental actuation**
- It is not possible to completely protect the two-hand control system from defeat.
- OSHA regulations require the user to arrange and protect hand controls to minimize possibility of defeat or accidental actuation.

WARNING: Never use an OPTO-TOUCH Optical Touch Button as an actuator in an emergency stop (E-Stop) circuit. E-Stop actuators must be purely mechanical devices that require no power to operate. OPTO-TOUCH Optical Touch Buttons require power to operate and **must not be used as E-Stop actuators under any circumstances**.

Two-Hand Control

Two-Hand Control is an operator actuating control that initiates a machine cycle through the synchronous use of both buttons and concurrent actuation during the hazardous portion of the machine cycle. Synchronous use is defined as the actuation of both buttons within 500 ms of each other. If one or both buttons are released, an immediate stop command is issued to the machine control and the hazard ceases at any point in the machine cycle.

Alternatively, Two-Hand Trip is similar, but typically initiates a full machine cycle and does not cause a stop or cessation of the hazard if either or both the buttons are released. Two-Hand Trip is typically used on single-cycle or full-revolution machines.

In addition to the general installation requirements listed above, Two-Hand Control/Trip can be used for simple machine cycle actuation and must comply with NFPA 79 and/or ISO 60204-1. If the Two-Hand Control/Trip is also used for safeguarding, additional requirements must be complied with and are found in ANSI B11.19, ISO 13851 and other relevant regulations. In either case, the machine (safety) control must also provide the appropriate level of safety performance (risk reduction) as determined by a risk assessment and the functions of anti-tiedown and anti-repeat.

The level of the safety performance of a Two-Hand Control/Trip system depends on the actuating controls (buttons) and the circuity/logic monitoring those actuating controls (THC modules, Safety Controllers, etc.). Typically, systems incorporating OPTO-TOUCH Optical Touch Buttons are limited to Type IIIA or IIIB per ISO 13851. If a Type IIIC system is required, STB Self-Checking Optical Touch Buttons (datasheet p/n 64136) and an appropriate Two-Hand Control logic module or Safety Controller (for example, AT-FM-10K, SC26/XS26, SC10) can comply with the additional requirements.

Anti-tiedown requires the release of both buttons before a subsequent cycle can be re-initiated. This applies after a cycle has been completed or if a stop has otherwise occurred. The anti-tiedown function must be designed to ignore false input signals. False signals include (but are not limited to) voltage transients, contact bounce, and EMI or RFI noise. Two-Hand Control logic modules and Safety Controllers with anti-tiedown are available, which include circuitry to minimize the possibility of false actuation.

Anti-repeat function causes a stop at the end of the machine cycle and requires release of all actuating controls (for example,, buttons) before another cycle or stroke can be initiated. The anti-repeat function must be incorporated into the machine and/or the machine (safety) control.

Other installation considerations include that the actuating controls (for example, buttons) must be arranged far enough apart so that the operator cannot operate both actuating controls using one arm or hand. And, both actuating controls must be located far enough away from the nearest hazard that the operator cannot reach the hazard with a hand or other body part before the hazardous motion or situation ceases. Installation considerations, including the separation distance (safety distance) and calculations to determine this distance are found in ANSI B11.19 or ISO 13851.

WARNING:
- **Mount hand controls at a safe distance from moving machine parts**
- Failure to establish and maintain the safety distance (minimum distance) could result in serious injury or death.
- Mount hand controls as determined by the applicable standard. The operator or other non-qualified persons must not be able to relocate the hand controls.

WARNING:
- **Use adequate point-of-operation guarding**
- Failure to properly guard hazardous machinery can result in a dangerous condition that could lead to serious injury or death.
- When properly installed, a two-hand control safety device provides protection only for the hands of the machine operator. It might be necessary to install additional safeguarding, such as safety light curtains, additional two-hand controls, and/or hard guards, to protect all individuals from hazardous machinery.

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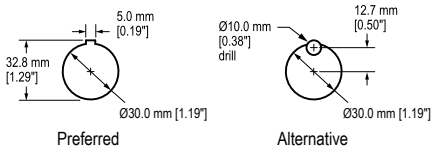
WARNING:

- **Ensure the safety circuit integrity**
- The safety circuit integrity level is affected by the design and installation of the safety devices and the means of interfacing with those devices.
- Perform a risk assessment to determine the appropriate safety circuit integrity level or category to ensure the expected risk reduction is achieved and all applicable regulations and standards are in compliance (see ANSI B11.0 and ANSI B11.19, ISO 12100 and ISO13849-1 or the applicable standards).

Mounting Hole Information

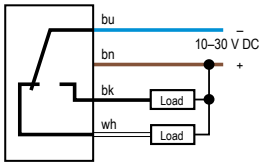
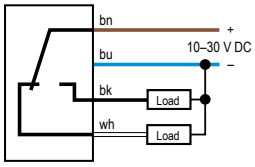
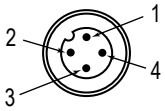
The OPTO-TOUCH has a 30-millimeter threaded base that fits directly into a standard mounting hole for an oil-tight push button. A lock ring, supplied with each OPTO-TOUCH, can be used to prevent switch rotation.

The mounting hole details shown at the right are used for the OPTO-TOUCH and also for standard oil-tight push buttons and their legend plates. The drawing at the far right shows how to approximate the keyway using a drill hole.

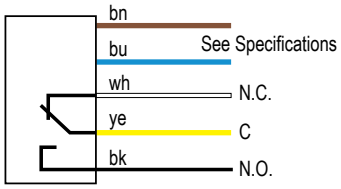
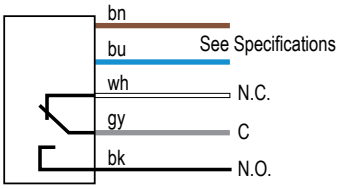
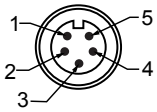
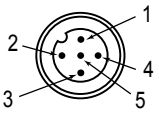


Wiring Diagrams

4-Pin Models

NPN Models	PNP Models	4-pin Male 7-8 in-16UNF Connector	4-pin Male M12 Connector
			
		1. Brown 2. White 3. Blue 4. Black	1. Brown 2. White 3. Blue 4. Black

5-Pin Models

AC and AC/DC Models		5-pin Male 7/8 in-16UNF	5-pin Male M12 Quick Disconnect Connector
7/8 in-16UNF QD 	*5-pin M12 QD* 		
		1. Black 2. Blue 3. Yellow 4. Brown 5. White	1. Brown 2. White 3. Blue 4. Black 5. Gray

Voltage Specifications
OTBA5 models: 105 V AC to 130 V AC

OTBB5 models: 210 V AC to 250 V AC

OTBVR81 models: 20 V AC/DC to 30 V AC/DC

NOTE: For OTBVR81 Models, the connection of DC power is without regard to polarity.

Specifications

Supply Voltage

Supply voltage varies, depending on the model ordered:

105 V AC to 130 V AC
210 V AC to 250 V AC (50/60Hz)
10 V DC to 30 V DC
20 V AC/DC to 30 V AC/DC (at 25 mA, exclusive of load)

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

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Output Protection

100 ms delay on power-up; outputs do not conduct at this time

Models with solid-state outputs are protected against false pulse on power-up and continuous overload or short circuit of outputs

Output Configuration:

AC and AC/DC models: All models have SPDT electromechanical relay (one N.O. contact, one N.C. contact)

DC-only models:

OTBVN6 models have complementary NPN sinking outputs
OTBVP6 models have complementary PNP sourcing outputs

Indicator LEDs

Two indicator LEDs. One lights whenever power is applied; the other lights whenever the switch is activated

Operating Temperature

–20 °C to +50 °C (–4 °F to +122 °F)

90% at +50 °C maximum relative humidity (non-condensing)

Environmental Considerations

Models with polysulfone housing): Prolonged exposure to direct outdoor sunlight causes embrittlement of the polysulfone housing. Window glass effectively filters longer wavelength ultraviolet and provides excellent protection from sunlight. Contact Banner Engineering regarding outdoor applications.

Models with polycarbonate housing: Avoid prolonged exposure to hot water and moist high-temperature environments above 66 °C (150 °F). Avoid aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons, and strong alkalis. Clean periodically using mild soap solution and a soft cloth. Avoid strong alkaline materials.

Construction

Black polysulfone (or red polycarbonate) upper housing and fiber-reinforced thermoplastic polyester base. Electronics fully epoxy-encapsulated. Totally encapsulated, non-metallic enclosure. Threaded base has M30 x 1.5 external threads and 1/2-in NPSM internal threads. Base requires a 1-3/16-in diameter mounting hole (fits most standard automotive- size jumbo legend plates and oiltight pushbutton holes).

Protective cover: Polypropylene copolymer

Ambient Light Immunity

120,000 lux (direct sunlight)

EMI/RFI Immunity

Highly resistant to both single and mixed EMI and RFI noise sources

Response Time

100 ms ON/OFF

Cable

AC and AC/DC quick-disconnect (QD) models require a MBCC-512 5-conductor cable, MQDC-4xx 4-conductor cable, MQDC1-5xx 5-conductor cable, or MQDC-4xx 4-conductor cable

DC-only quick-disconnect (QD) models require model MBCC-412 4-conductor 7/8 in. 16UNF cable, MQDC-4xx 4-conductor cable, or MQDC-4xx 4-conductor cable

Cables are purchased separately

Models with attached cable (non-QD models): 2 m (6 ft) PVC-jacketed, 22 AWG 4- or 5-conductor cable

Output Rating:

AC and AC/DC models:

Maximum voltage is 250 V AC or 30 V DC
Maximum current is 7 amps (resistive load)
Minimum load is .05 watts (DC), .05VA (AC)
Mechanical life of relay is 50,000,000 operations (minimum)
Electrical life of relay is 100,000 operations (minimum) at full resistive load
Transient suppression recommended when switching inductive loads

DC models:

150 mA maximum load (each output)
ON-state saturation voltage: less than 1 V at 10 mA; less than 1.5 V at 150 mA
OFF-state leakage current: less than 1 µA

Environmental Rating

NEMA 1, 3, 4, 4X, 12, and 13; IP66

Certifications

Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

2399833

E71083; E164886

Required Overcurrent Protection

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.

Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.

Supply wiring leads < 24 AWG shall not be spliced.

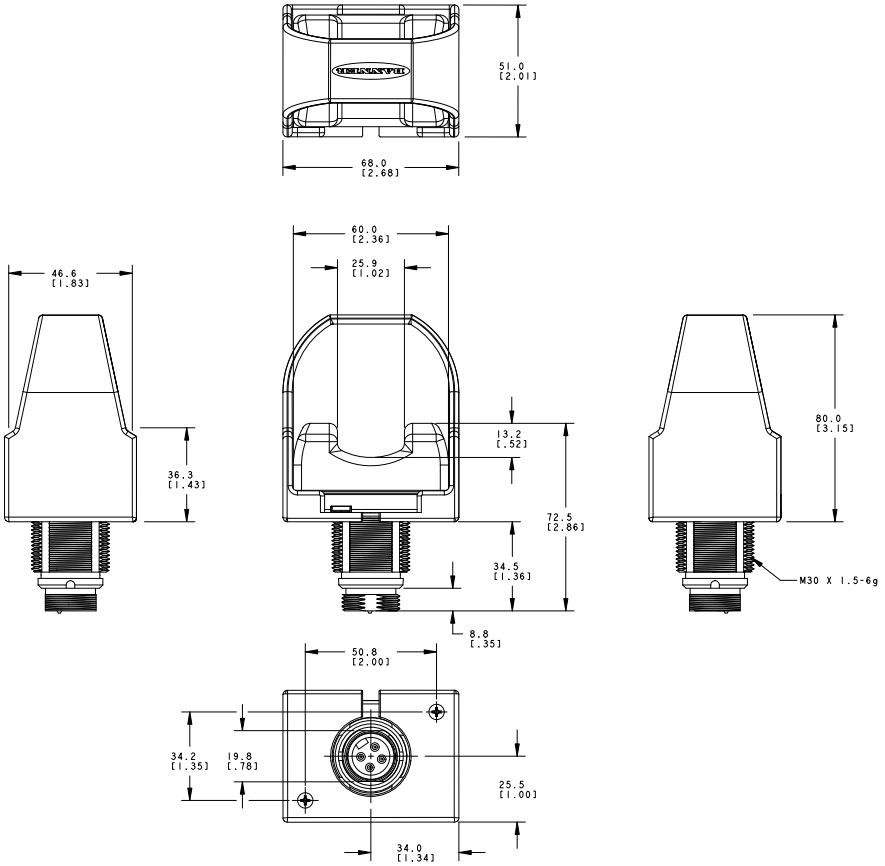
For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (A)	Supply Wiring (AWG)	Required Overcurrent Protection (A)
20	5.0	26	1.0
22	3.0	28	0.8
24	1.0	30	0.5

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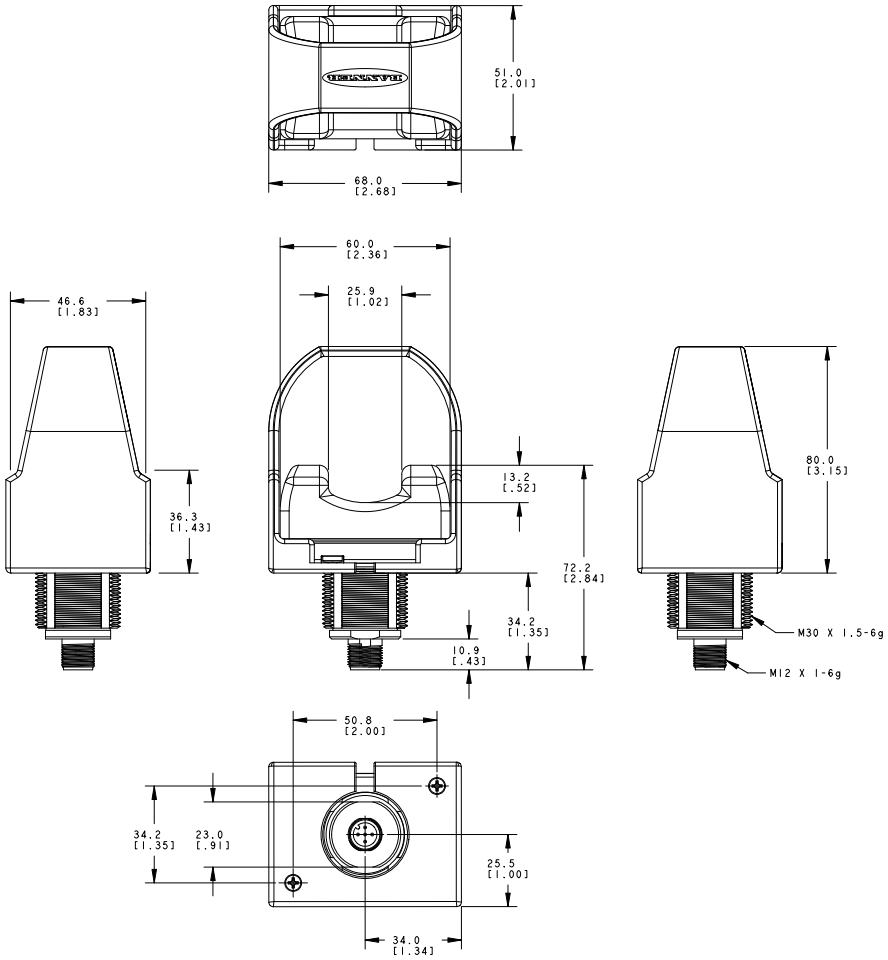
Dimensions

OTB with 7/8 in. 16UNF Quick-Disconnect



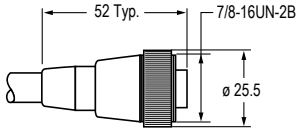
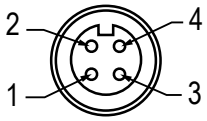
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OTB with M12 Quick-Disconnect



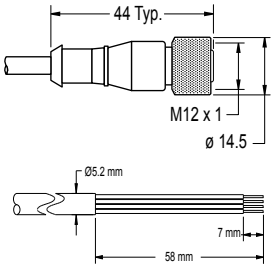
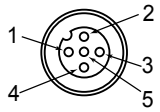
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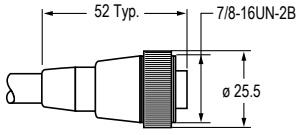
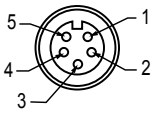
Cordsets

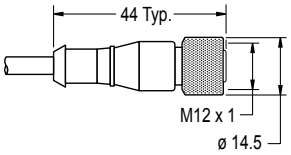
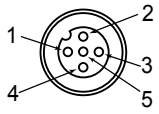
4-Pin Single-Ended 7/8-in Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MBCC-406	1.83 m (6 ft)	Straight		
MBCC-412	3.66 m (12 ft)			
MBCC-430	9.14 m (30 ft)			

1 = Brown
2 = White
3 = Blue
4 = Black

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4-Pin Single-Ended M12 Female Cordsets					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**	
MQDC-403	1 m (3.28 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black 5 = Not used
MQDC-406	2 m (6.56 ft)				
MQDC-410	3 m (9.8 ft)				
MQDC-415	5 m (16.4 ft)				
MQDC-430	9 m (29.5 ft)				
MQDC-450	15 m (49.2 ft)				
MQDC-460	18.3 m (60 ft)				
MQDC-470	21 m (68.9 ft)				
MQDC-4100	30 m (98.43 ft)				

5-Pin Single-Ended 7/8-in Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MBCC-506	1.83 m (6 ft)	Straight		 1 = Black 2 = Blue 3 = Yellow 4 = Brown 5 = White
MBCC-512	3.66 m (12 ft)			
MBCC-530	9.14 m (30 ft)			

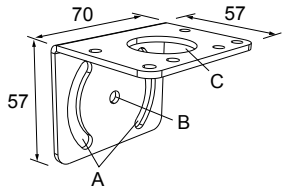
5-Pin Single-Ended M12 Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDC1-501.5	0.5 m (1.5 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDC1-503	0.9 m (2.9 ft)			
MQDC1-506	2 m (6.5 ft)			
MQDC1-515	5 m (16.4 ft)			
MQDC1-530	9 m (29.5 ft)			
MQDC1-560	18 m (59 ft)			
MQDC1-5100	31 m (101.7 ft)			

Mounting Brackets

SMB30MM

- 12-gauge stainless steel bracket with curved mounting slots for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor

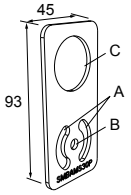
Hole center spacing: A = 51, A to B = 25.4
Hole size: A = 42.6 × 7, B = ø 6.4, C = ø 30.1



SMBAMS30P

- Flat SMBAMS series bracket
- 30 mm hole for mounting sensors
- Articulation slots for 90°+ rotation
- 12-gauge 300 series stainless steel

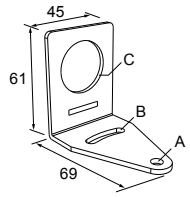
Hole center spacing: A=26.0, A to B=13.0
Hole size: A=26.8 × 7.0, B=ø 6.5, C=ø 31.0



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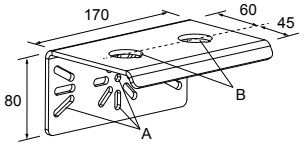
SMB30A
- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- 12-gauge stainless steel

Hole center spacing: A to B=40
Hole size: A=ø 6.3, B= 27.1 × 6.3, C=ø 30.5



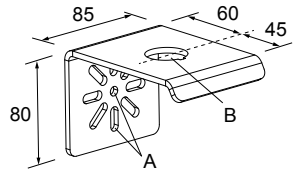
SSA-MBK-EEC2
- Two 30 mm holes
- 8 gauge steel, black finish (powder coat)
- Front surface for customer-applied labels

Hole size: A = ø 7 , B = ø 30



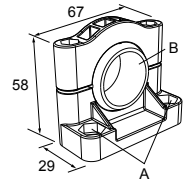
SSA-MBK-EEC1-SS
- Single 30 mm hole
- 8 gauge 316 stainless steel
- Front surface for customer-applied labels

Hole size: A = ø 7 , B = ø 30



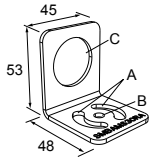
SMB30SC
- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included

Hole center spacing: A=ø 50.8
Hole size: A=ø 7.0, B=ø 30.0



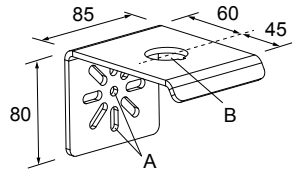
SMBAMS30RA
- Right-angle SMBAMS series bracket
- 30 mm hole for mounting sensors
- Articulation slots for 90°+ rotation
- 12-gauge (2.6 mm) cold-rolled steel

Hole center spacing: A=26.0, A to B=13.0
Hole size: A=26.8 × 7.0, B=ø 6.5, C=ø 31.0



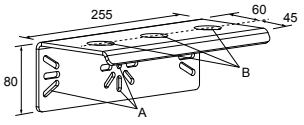
SSA-MBK-EEC1
- Single 30 mm hole
- 8 gauge steel, black finish (powder coat)
- Front surface for customer-applied labels

Hole size: A = ø 7 , B = ø 30



SSA-MBK-EEC3
- Three 30 mm holes
- 8 gauge steel, black finish (powder coat)
- Front surface for customer-applied labels

Hole size: A = ø 7 , B = ø 30



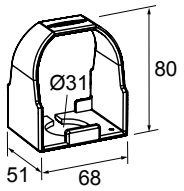
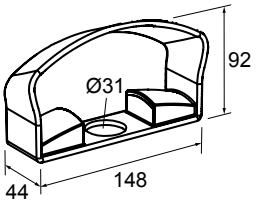
The SSA-MBK-EECx brackets offer:
- Horizontal and vertical (post) mounting
- Interchangeable positions of mounted devices (e.g. OTB/STB/VTB, E-Stop, K50s)

Replacement Field Covers

Field covers are designed to prevent inadvertent activation of optical touch buttons by objects that accidentally block the sensing beam. Field covers are constructed of rugged polypropylene and are highly resistant to abrasion and to damage by most chemicals.

Additional colors are available. Contact Banner Engineering for options.

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Model	Description	
OTC-1-BK	Standard Black Field Cover	
OTCL-1-BK	Large Black Field Cover	

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