SELF-CHECKING
ANTI-TIEDOWN
Two-Hand-Control System
A diverse-redundant system for protection of machine operators’ hands.

Banner has made hand protection safety systems even more reliable. When Banner’s new STB Self-checking Optical Touch Buttons are used with Banner’s new DUO-TOUCH® SG safety module, the world’s first and only ergonomic self-checking, two-hand-control system is created. It’s ergonomic because it requires no physical pressure to operate.

The first FMEA verified, self-checking touch buttons.

Similar to Banner’s popular OTB buttons, the next generation STB Self-checking Optical Touch Buttons have an important addition—a unique design that uses an additional emitter and receiver for redundant self-checking of the primary emitter and receiver. These are the first optical touch buttons to provide the Failure Modes and Effects Analysis (FMEA) verified self-checking feature.* No other manufacturer of ergonomic touch buttons can make this claim.

* Patent pending. FMEA (Failure Modes and Effects Analysis) refers to a rigorous evaluation and test method needed to verify that internal failures will not cause an unsafe condition.

DUO-TOUCH® SG Safety Module.

This new two-hand-control safety module is designed to verify proper operations of two-hand-control devices, for increased control reliability in anti-tiedown applications. The DUO-TOUCH SG uses a diverse-redundant microcontroller circuit to monitor one normally-open and one normally-closed contact set on each hand control device. If either device is released, the DUO-TOUCH SG cancels its output signal.

- Dual-diverse microcontroller
- Two redundant, force-guided (positive guided) output contacts, rated at 6 amps
- Machine control elements are monitored by external device monitoring input
- Five indicator LEDs for Power, Fault, Input 1, Input 2 and Output
- 24V ac/dc operation
**Dependable switching with no physical pressure required.**

The STB Self-checking Optical Touch Button is a photoelectric-based, manual activation device designed to provide an ergonomic alternative to conventional mechanical push buttons and palm buttons. The STB creates a pulsed infrared beam that spans its touch zone. The buttons switch when their light beam is broken by a simple insertion of a finger. No pushing is necessary, eliminating the hand, wrist and arm stresses that may result from repeated push button operation. This reduces harmful tendon, nerve and neurovascular disorders.

**Advanced diverse-redundant, dual-microcontroller design.**

The STB features a new internal design based on dual microcontrollers. When the STB is activated, two separate outputs (one normally-open and one normally-closed) change state. The patent-pending STB circuit uses a diverse-redundant, self-checking design, that will detect an internal safety-critical circuit fault and immediately switch its outputs to the OFF state. It’s designed to be used with Category 4, Type IIIC Two-Hand Control devices per EN 574. These devices monitor the STB outputs, detect the output change of state and respond accordingly.

**Exceptional operator diagnostics.**

The STB has two green LEDs to provide feedback about power, output state or fault conditions. The indicators are located on the front of the device.

- Green Power LED indicator turns on when STB is powered up
- Green Output/Fault LED indicator turns on when button is activated and outputs change to ON state
- Green Output/Fault LED flashes when STB microcontrollers detect an internal fault; outputs are held in OFF state

**Rugged and reliable.**

The STB is rugged and reliable, meeting NEMA 1, 3, 4, 4X, 12, 13 and IEC IP66 standards. It is resistant to even the most difficult and contaminated environments.

- Immune to ambient light, EMI and RFI interference
- High excess gain cuts through heavy contamination

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**STB Self-Checking Optical Touch Button: a push button you don’t have to push.**

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### STB Self-Checking Optical Touch Buttons: Model Selection & Dimensions

<table>
<thead>
<tr>
<th>Models</th>
<th>Part Number</th>
<th>Cable</th>
<th>Upper Housing</th>
<th>Supply Voltage</th>
<th>Output Type</th>
<th>DUO-TOUCH® SG Compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>STBVP6</td>
<td>64179</td>
<td>4-wire 2 m (6.5') integral cable</td>
<td>Polysulfone</td>
<td>10 to 30V dc</td>
<td>Complementary PNP</td>
<td>AT-FM-10K</td>
</tr>
<tr>
<td>STBVP6Q</td>
<td>64180</td>
<td>4-Pin Mini-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6Q5</td>
<td>64181</td>
<td>4-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVR81</td>
<td>64190</td>
<td>5-wire 2 m (6.5') integral cable</td>
<td>Polysulfone</td>
<td>20 to 30V ac/dc</td>
<td>Two Individual &amp;</td>
<td>AT-FM-10K</td>
</tr>
<tr>
<td>STBVR81Q</td>
<td>64191</td>
<td>5-Pin Mini-style QD</td>
<td></td>
<td></td>
<td>Complementary Relays</td>
<td></td>
</tr>
<tr>
<td>STBVR81Q6</td>
<td>64192</td>
<td>5-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6L</td>
<td>64182</td>
<td>4-wire 2 m (6.5') integral cable</td>
<td>Lexan®</td>
<td>10 to 30V dc</td>
<td>Complementary PNP</td>
<td>AT-FM-10K</td>
</tr>
<tr>
<td>STBVP6LQ</td>
<td>64185</td>
<td>4-Pin Mini-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6LQ5</td>
<td>64189</td>
<td>4-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVR81L</td>
<td>64193</td>
<td>5-wire 2 m (6.5') integral cable</td>
<td>Lexan®</td>
<td>20 to 30V ac/dc</td>
<td>Two Individual &amp;</td>
<td>AT-FM-10K</td>
</tr>
<tr>
<td>STBVR81LQ</td>
<td>64194</td>
<td>5-Pin Mini-style QD</td>
<td></td>
<td></td>
<td>Complementary Relays</td>
<td></td>
</tr>
<tr>
<td>STBVR81LQ6</td>
<td>64195</td>
<td>5-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6LQ5</td>
<td>64182</td>
<td>4-wire 2 m (6.5') integral cable</td>
<td>Polysulfone</td>
<td>10 to 30V dc</td>
<td>Complementary PNP</td>
<td>AT-FM-10K</td>
</tr>
<tr>
<td>STBVP6LQ</td>
<td>64185</td>
<td>4-Pin Mini-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6LQ5</td>
<td>64189</td>
<td>4-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

i) 9 m (30’) cables are available by adding suffix “W/30” to the model number of any cabled STB (e.g., STBVP6 W/30).

ii) QD models require an accessory QD cable.

iii) STB models are not compatible with AT-.M-2A DUO-TOUCH modules, due to power input requirements.
# STB Self-Checking Optical Touch Buttons: Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Supply Voltage and Current** | STBVP6 Models: 10 to 30V dc  
STBVR81 Models: 20 to 30V ac/dc |
| **Supply Protection Circuitry** | Protected against transient voltages and reverse polarity             |
| **Output Configuration**       | STBVP6 Models: Complementary PNP (sourcing) open-collector transistors  
STBVR81 Models: Complementary electromechanical relays |
| **Output Rating**              | STBVP6 Models (solid-state outputs):  
Maximum load: 150 mA  
On-state saturation voltage: ≤ 15V @ full load  
Off-state leakage current: < 1 µA |
|                                | STBVR81 Models (electromechanical relays):  
Maximum switching voltage: 150V dc, 125V ac  
Maximum switching current: 1A  
Maximum resistive load power: 60 VA dc, 30 W dc  
Mechanical life of relay: 10⁵ cycles  
Electrical life of relay: 3 x 10⁶ cycles 1A, 24V resistive |
| **Output Protection**          | All models protected against false pulse on power-up. Models with solid-state outputs have overload and short-circuit protection. |
| **Response Time**              | 20 milliseconds on/off                                                  |
| **Indicators**                 | 2 green LED indicators:  
Power: ON – power applied  
OFF – power off  
Output/fault: ON – button is activated  
OFF – button is deactivated  
Flashing – internal fault or blocked button on power-up detected |
| **Construction**               | Totally encapsulated, non-metallic enclosure. Black polysulfone or red Lexan® polycarbonate upper housing (see Application Notes below); fiber-reinforced PBT polyester base. Electronics fully epoxy-encapsulated. Supplied with polypropylene (TP) field cover. |
| **Environmental Rating**       | Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IEC IP66 |
| **Connections**                | PVC-jacketed 2 m (6.5') cables (standard on integral-cable kits); or QD fitting, depending on model. Accessory QD mating cables required for QD models.  
STBVP6 Models: 4-wire (4-pin Mini-style QD)  
STBVR81 Models: 5-wire (5-pin Mini-style QD)  
Integral 9 m (30') cables are also available. |
| **Ambient Light Immunity**     | Up to 100,000 lux                                                       |
| **EMI/RFI Immunity**           | Immune to EMI and RFI noise sources per IEC 947-5-2                     |
| **Operating Conditions**       | Temperature: 0° to +50°C (+32° to +122°F)  
Maximum relative humidity: 90% @ +50°C (non-condensing) |
| **Application Notes**          | Environmental considerations for models with polysulfone upper housings:  
The polysulfone upper housing will become brittle with prolonged exposure to outdoor sunlight. Window glass effectively filters longer wavelength ultraviolet light and provides excellent protection from sunlight. Avoid contact with strong alkalies. Clean periodically using mild soap solution and a soft cloth.  
Environmental considerations for models with Lexan® upper housings:  
Avoid prolonged exposure to hot water and moist high-temperature environments above 66°C (150°F). Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalies. Clean periodically using mild soap solution and a soft cloth. |

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**WARNING ... Not a Stand-Alone Safety Device**

STB Self-checking Optical Touch Buttons are intended to be part of a type IIIC two-hand-control system, and are not, by themselves, safety devices. To be used in a safety application, the STB must be interfaced with a type IIIC two-hand-control module, such as the Banner AT-FM-10K, in order to meet all relevant safety requirements of the appropriate standards.
DUO-TOUCH® SG Safety Module

<table>
<thead>
<tr>
<th>Model (Part Number)</th>
<th>Enclosure</th>
<th>Response</th>
<th>Supply Voltage</th>
<th>Output Type</th>
<th>Timing Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT-FM-10K (60698)</td>
<td>Polycarbonate NEMA 1 (IEC IP20)</td>
<td>35 ms (off)</td>
<td>24V ac/dc</td>
<td>Two redundant safety relay contacts</td>
<td></td>
</tr>
</tbody>
</table>

Kits are available which include one DUO-TOUCH SG Safety Module and two STB Touch Buttons; see chart below. STB Self-checking Optical Touch Buttons are also available separately, see page 4.

* Feedback loop can remain closed at all times (if jumpered), when no monitoring contacts are available.

DUO-TOUCH SG Kits

<table>
<thead>
<tr>
<th>KITS</th>
<th>COMPONENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes 2 STB Touch Buttons &amp; a DUO-TOUCH SG Module</td>
<td>STB Self-checking Optical Touch Buttons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Models</th>
<th>Part Number</th>
<th>DUO-TOUCH SG Safety Module</th>
<th>STB Touch Buttons</th>
<th>Supply Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATK-VP6</td>
<td>64290</td>
<td>AT-FM-10K</td>
<td>STBVP6 PNP</td>
<td>10 to 30V dc</td>
</tr>
<tr>
<td>ATK-VP6Q</td>
<td>64291</td>
<td>AT-FM-10K</td>
<td>STBVP6Q PNP</td>
<td>10 to 30V dc</td>
</tr>
<tr>
<td>ATK-VR81</td>
<td>64287</td>
<td>AT-FM-10K</td>
<td>STBVR81 Relay</td>
<td>20 to 30V ac/dc</td>
</tr>
<tr>
<td>ATK-VR81Q</td>
<td>64288</td>
<td>AT-FM-10K</td>
<td>STBVR81Q Relay</td>
<td>20 to 30V ac/dc</td>
</tr>
</tbody>
</table>

* 9 m (30’) cables are available by adding suffix “W/30” to the kit model number including any cabled sensor (e.g., ATK-VP6 W/30). QD models require an accessory QD cable.
**DUO-TOUCH® SG Two-Hand-Control Module Specifications & Dimensions**

<table>
<thead>
<tr>
<th><strong>Supply Voltage and Current</strong></th>
<th>24V ac/dc ±15% at 150 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply Protection Circuitry</strong></td>
<td>Protected against transient voltages and reverse polarity (dc hookup is without regard to polarity)</td>
</tr>
<tr>
<td><strong>Output Configuration</strong></td>
<td>Outputs (K1 and K2): two redundant (total of four) forced-guided safety relay contacts</td>
</tr>
<tr>
<td>Contact ratings:</td>
<td></td>
</tr>
<tr>
<td>Maximum voltage: 250V ac or 250V dc</td>
<td></td>
</tr>
<tr>
<td>Maximum current: 6A ac or dc (resistive load)</td>
<td></td>
</tr>
<tr>
<td>Maximum power: 1500 VA, 150 watts</td>
<td></td>
</tr>
<tr>
<td>Mechanical life: 50,000,000 operations</td>
<td></td>
</tr>
<tr>
<td>Electrical life: 150,000 cycles (typically @ 1.5 kVA switching power)</td>
<td></td>
</tr>
<tr>
<td>NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts.</td>
<td></td>
</tr>
<tr>
<td><strong>Output Response Time</strong></td>
<td>35 milliseconds maximum ON/OFF</td>
</tr>
<tr>
<td><strong>Input Requirements</strong></td>
<td>Outputs from both hand controls (1 N.O. and 1 N.C.) must each be capable of switching 10 to 50 mA @ 18 to 30V dc.</td>
</tr>
<tr>
<td><strong>Simultaneity Monitoring Period</strong></td>
<td>≤500 milliseconds</td>
</tr>
<tr>
<td><strong>Status Indicators</strong></td>
<td>4 green LED indicators:</td>
</tr>
<tr>
<td>Power ON</td>
<td></td>
</tr>
<tr>
<td>Input 1 energized</td>
<td></td>
</tr>
<tr>
<td>Input 2 energized</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td></td>
</tr>
<tr>
<td>1 red LED indicator:</td>
<td>Fault</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td>Polycarbonate. Rated NEMA 1 (IEC IP20)</td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>Mounts to standard 35 mm DIN rail track. Safety modules must be installed inside an enclosure rated NEMA 3 (IEC IP54), or better.</td>
</tr>
<tr>
<td><strong>Vibration Resistance</strong></td>
<td>10 to 55Hz @ 0.35 mm displacement per IEC 68-2-6</td>
</tr>
<tr>
<td><strong>Operating Conditions</strong></td>
<td>Temperature: 0° to +50°C (+32° to 122°F)</td>
</tr>
<tr>
<td>Maximum Relative Humidity: 90% @ +50°C (non-condensing)</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>See dimension drawing below.</td>
</tr>
<tr>
<td><strong>Safety Category</strong></td>
<td>4 per EN 954-1; Type IIIC per EN 574</td>
</tr>
<tr>
<td><strong>Certifications</strong></td>
<td>Approvals in process. Contact factory for more information.</td>
</tr>
</tbody>
</table>

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![Dimensions Diagram]

22.5 mm (0.89")

118.0 mm (4.65")

84.0 mm (3.31")
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