

DUO-TOUCH SG Two-Hand-Control Kit Features



Each kit includes an AT-FM-10K Module, and two STB Touch Buttons



DUO-TOUCH SG Safety Module:

- Diverse-redundant microcontrollers
- Monitors two Banner STB Self-Checking Optical Touch Buttons, or two mechanical push buttons
- Two redundant, forced-guided (mechanically linked) output contacts rated at 6 A
- Two auxiliary solid-state outputs (NPN and PNP), plus auxiliary N.C. relay output
- Feedback input monitors external machine control elements
- 5 indicator LEDs for Power, Fault, Input 1, Input 2 and Output
- 24V ac/dc operation
- DIN-rail-mountable 22,5 mm-wide housing with removable terminal blocks
- 500 ms (max.) simultaneity requirement for touch button operation

STB Self-Checking Optical Touch Buttons:

- Diverse-redundant microcontroller-based photoelectric touch buttons
- Continuous internal self-checking operation
- Ergonomically designed to eliminate hand, wrist and arm stresses associated with repeated operation; require no physical pressure to operate
- Immune to ambient light, EMI and RFI interference
- High excess gain cuts through heavy contamination

The Duo-Touch SG Two-Hand-Control Kit system is certified to:

- Type IIIC requirements of EN 574/ISO 13851 Safety of Machinery – Two-Hand-Control devices
- Category 4 requirements of EN 954-1/ISO 13849-1 Safety of Machinery – Safety-Related Parts of Control Systems – Part 1: General Principles of Design

DUO-TOUCH SG Two-Hand-Control Kit Models

| Kits | | Components | | | | |
|--|----------------|----------------------------|-----------------------|---------|---------------------------|--|
| Including 2 STB Touch Buttons & DUO-TOUCH SG Safety Module | Supply Voltage | DUO-TOUCH SG Safety Module | STB Touch Buttons | | | |
| | | | Model Number | Outputs | Cable/ Connector* | |
| ATK-VP6 (30 642 90) | 24V dc | AT-FM-10K | STBVP6 (30 641 79) | PNP | 4-wire 2 m integral cable | |
| ATK-VP6Q5 (30 642 92) | | | STBVP6Q5 (30 641 81) | | 4-Pin Euro-style | |
| ATK-VR81 (30 642 87) | 24V ac/dc | | STBVR81 (30 641 90) | Relay | 5-wire 2 m integral cable | |
| ATK-VR81Q6 (30 642 89) | | | STBVR81Q6 (30 641 92) | | 5-Pin Euro-style | |

* 9 m 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. See page 15.



Important ... read this page before proceeding!

The Banner DUO-TOUCH SG Two-Hand-Control safety system provides a measure of protection for the operator against reaching danger zones during hazardous situations by locating the control actuating devices in a specific position and monitoring the actuating devices for specific conditions.

In Europe, the functions that the Banner DUO-TOUCH SG Two-Hand-Control safety system is intended to perform are regulated by the CEN (European Committee for Standardisation) and the CENELEC (European Committee for Electrotechnical Standardisation). Whether or not any particular DUO-TOUCH SG Two-Hand-Control system installation meets all applicable European and international requirements depends upon factors that are beyond the control of Banner Engineering Corp. These factors include the specific ways the safety module is applied, installed, wired, operated, and maintained.

Banner Engineering Corp. has attempted to provide complete application, installation, operation, and maintenance instructions. In addition, we suggest that any questions regarding the use or installation of this two-hand-control safety system be directed to the factory applications department at the telephone numbers or address shown on the back page of this manual.

The user of this Two-Hand-Control safety system must ensure 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 system, and with the machinery upon which it is installed.

The user and any personnel involved with the installation and use of this safety system must be thoroughly familiar with all applicable European and international standards. The standards, listed below, directly address the use of two-hand-control systems. Banner Engineering Corp. makes no claim regarding a specific recommendation of any organisation, the accuracy or effectiveness of any information provided, or the appropriateness of the provided information for a specific application.

The user has the responsibility to ensure that all local, national and international laws, rules, codes, and regulations relating to the use of this two-hand-control system are satisfied. Extreme care is urged that all legal requirements are met and that all installation and maintenance instructions contained in this manual are followed.

Directives and Standards

| | |
|------------------------|--|
| ISO 12100-1 (EN 292-1) | “Safety of Machinery – Basic Concepts, General Principles for Design, Part 1: Basic Terminology, Methodology” |
| ISO 12100-2 (EN 292-2) | “Safety of Machinery – Basic Concepts, General Principles for Design, Part 2: Technical Principles and Specifications” |
| ISO 13851 (EN 574) | “Safety of Machinery – Two-Hand-Control Devices” |
| ISO 13849-1 (EN 954-1) | “Safety of Machinery – Safety-Related Parts of Control Systems, Part 1: General Principles for Design” |
| ISO 13855 (EN 999) | “Safety of Machinery – The Positioning of Protective Equipment” |
| IEC/EN 60204-1 | “Electrical Equipment of Machines: Part 1: General Requirements” Also, request a type “C” standard for your specific machinery. |

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons

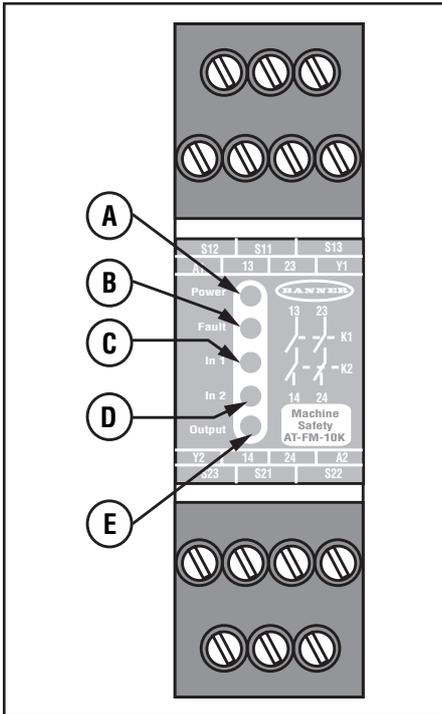


Figure 1. DUO-TOUCH SG Safety Module AT-FM-10K status indicators and terminal locations

Key Legend:

- A Power ON (green)
- B Internal Fault (red)
- C Input 1 Status (green)
- D Input 2 Status (green)
- E Output Status (green)

DUO-TOUCH SG Safety Module Description

A DUO-TOUCH SG Two-Hand-Control Safety Module may be used with:

- 2 Banner STB Self-Checking Optical Touch Buttons, each with one normally open and one normally closed relay output contact, or
- 2 Banner STB Self-Checking Optical Touch Buttons, each with two current-sourcing PNP outputs, or
- 2 mechanical push buttons with one normally open and one normally closed contact each (Form C contact)

If the machine operator removes one or both hands from the STB(s), the Duo-Touch SG relays de-energise, causing the output contacts to open. The relays will not re-energise until both STBs are deactivated and then simultaneously reactivated.

The Duo-Touch SG Two-Hand-Control Kit system is certified to:

- Type IIIC requirements of EN 574/ISO 13851 Safety of Machinery – Two-Hand-Control devices, and
- Category 4 requirements of EN 954-1/ISO 13849-1 Safety of Machinery – Safety-Related Parts of Control Systems – Part 1: General Principles of Design

The Safety Module’s output signal consists of two sets of redundant, forced-guided (mechanically linked) contacts (see Figure 5 page 9). Circuitry within the Safety Module monitors these internal contacts and prevents an output signal from occurring if a fault is detected. A feedback loop is offered for monitoring the status of the machine control elements.

DUO-TOUCH SG Safety Module LED Indicators

- Power On:** ON when power is applied
- Fault:** ON if simultaneity is not met or external wiring fault
Flashing when internal fault condition is detected
- Input 1 (2) Status:** ON if touch button is activated
OFF when button is not activated
Flashing if external wiring fault is detected
- Output Status:** ON if both relays (K1 and K2) are energised
Flashing if feedback error has occurred



WARNING ... Point-of-Operation Guarding

When properly installed, the DUO-TOUCH SG Two-Hand-Control Safety Module provides protection only for the hands of the machine operator. It may be necessary to install additional point-of-operation safeguarding, such as safety light curtains and/or hard guards, to protect personnel from hazardous machinery. **Failure to install point-of-operation guards on hazardous machinery can result in a dangerous condition which could lead to serious injury or death.**

DUO-TOUCH[®] SG – Two-Hand-Control Kits with STB Touch Buttons

Appropriate Applications

The DUO-TOUCH SG Two-Hand-Control Safety Module may be used as an initiation device for most powered machinery, where machine cycling is controlled by a machine operator.

When using a two-hand-control system for safeguarding, both of the operator's hands must be used to initiate the machine cycle. In effect, this makes the operator a "hostage" while the hazard is present, thus limiting or preventing exposure to the hazard. The two-hand-control actuators must be located so that hazardous motion (for example, closing of the die) is complete or stops before the operator can release one or both of the buttons and reach the hazard (see page 7, Minimum Safety Distance).

Concurrent use of both hands is required, meaning that both buttons must be actuated simultaneously – within a very short time span. This time span is specified by EN 574/ISO 13851 as not more than 500 ms, even under single-fault conditions. This requirement not only reduces the possibility of intentional defeat, but also reduces the chance of unintended initiation of the machine cycle.

The machine control, when used in single cycle or single stroke mode, must provide an anti-repeat feature so that at the end of one machine cycle, further cycles are prevented and the operator must release the two-hand-control actuators before the next cycle can be initiated (see Caution at right).

The STB Touch Buttons must be protected from accidental or unintended operation. This can be accomplished by their mounting position and/or through the use of protective shields such as rings, guards or shields. Suggested methods are shown on page 6.

It should be noted that two-hand-control and two-hand-trip safeguarding protect only the operator's hands. Additional safeguarding or other appropriate standards may be required.

The user must refer to the relevant standards for additional requirements for the application of two-hand-control and two-hand-trip devices when used as a safeguarding means.



CAUTION ... Not an Anti-Repeat Control Device

Anti-repeat control is not a function of the DUO-TOUCH SG Two-Hand-Control Safety Module. The user of this device must provide a suitable means of accomplishing anti-repeat control for any single-stroke or single-cycle machine.

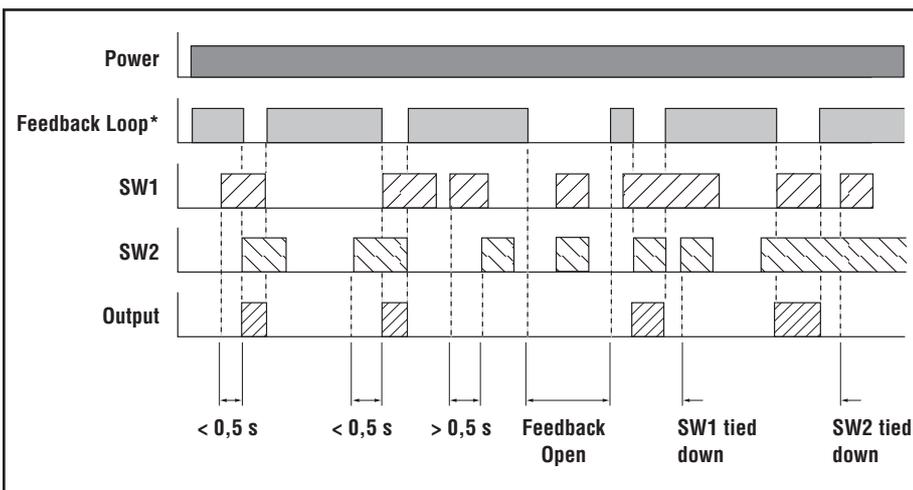


Figure 2. DUO-TOUCH SG Safety Module AT-FM-10K timing diagram

* Feedback loop can remain closed at all times (if jumpered), when no monitoring contacts are available (see also Feedback Loop on page 8.)

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons

Part-Revolution Clutched Machinery

EN 692 “Mechanical Presses – Safety” allows a two-hand-control safety module to operate part revolution power presses for any of the following functions: “inch” (jog), “single-stroke” or “continuous” (run). Two-hand-control safety modules are recognised as a means of protecting the machine operator when the hand controls are safely located and protected from false operation (see pages 6 and 7) and when the two-hand trip device is properly interfaced to the machine (see pages 8 and 9) to control the required stopping action.

Full-Revolution Clutched Machinery

A two-hand-control safety module used to initiate the cycle of a full-revolution clutched machine is known as a “two-hand-trip device.” Two-hand-trip devices are recognised by CEN and GENELEC as a means of protecting the machine operator when the hand controls are safely located and protected from false operation (see pages 6 and 7) and when the two-hand-trip device is properly interfaced to the machine (see pages 8 and 9) to prevent accidental cycle initiation.

Theory of Operation

The input circuit of the DUO-TOUCH SG Safety Module requires simultaneous actuation of both two-hand-control actuators to generate an output signal. European standard EN 574/ISO 13851 requires that the two hand controls be actuated within 0,5 seconds of each other.

The timing diagram in Figure 2 (page 4) illustrates that an output signal from the DUO-TOUCH SG Safety Module occurs only if switch #1 (SW1) and switch #2 (SW2) are actuated within 0,5 seconds of each other. The total response time (from the time the devices are disengaged until the module’s output contacts open) is 0,035 seconds + 0,020 seconds = 55 milliseconds. The device output does not re-energise until both hand controls are disengaged, and then simultaneously re-actuated. This logic reduces the possibility of defeat of the two-hand-control by tying down one or both hand controls.

STB Touch Button Description

STB Self-Checking Optical Touch Buttons are identical in fit and form with the proven and popular OTB Series buttons. The internal design of the new buttons, however, based on diverse-redundant microcontrollers, allows the wiring to a Banner DUO-TOUCH SG Two-Hand-Control Safety Module designed and certified to Type IIIC per EN 574/ISO 13851 (requiring 1 normally open and 1 normally closed contact per input channel).

The STB is a photoelectric “beam-break” activation device that incorporates a self-checking optical circuit designed to detect internal safety-critical faults. Both the emitter and receiver are continuously exercised and monitored via secondary photoelements. If a fault is detected, the microcontrollers will hold the outputs in the OFF state and flash a Fault LED to alert an operator.

All models are supplied with a yellow polypropylene field cover to prevent inadvertent switching.

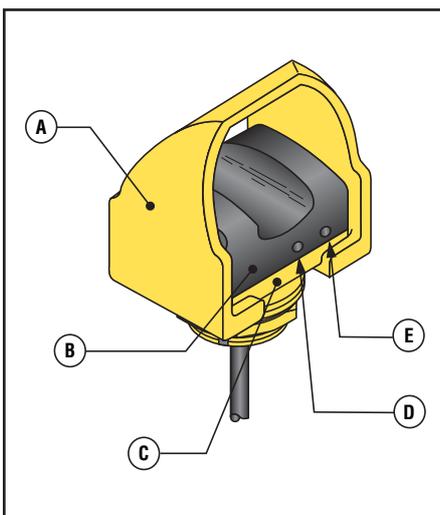


Figure 3. STB Touch Button features

STB Touch Button LED Indicators

Power On (green):

ON when power is applied

Output, Fault (green):

ON when button is activated

OFF when button is not activated

Flashing when a fault condition is detected

Key Legend:

A Polypropylene Field Cover

B Black Polysulfone Upper Housing

C Yellow Fibre Reinforced PBT Base

D Output Fault LED

E Power ON/OFF LED

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons

Mechanical Installation

Installation of the DUO-TOUCH SG Safety Module

The DUO-TOUCH Safety Module must be installed inside an enclosure. It is not designed for exposed wiring. It is the user's responsibility to house the Safety Module in an enclosure with IP54 rating, or better. Dimensions of the Safety Module are shown in figure 6 (page 14). The device mounts directly onto a standard 35-mm DIN rail.

Heat dissipation considerations

For reliable operation, the user must ensure that the operating specifications are not exceeded. The enclosure must provide adequate heat dissipation, so that the air closely surrounding the module does not exceed the maximum operating temperature stated in the specifications (page 12). Methods to reduce heat build-up include venting, forced airflow (e.g., exhaust fans), adequate enclosure exterior surface area, and spacing between modules and other sources of heat.

Installation of the STB Touch Button

The hand controls must be mounted in accordance with European standards EN-574/ISO 13851 and EN 999/ISO 13855, and any appropriate Type-C standard. EN-574/ISO-13851 requires that the hand controls be mounted to protect them from accidental or unintentional operation. Use shields, covers, rings, collars, dividers, or similar protection to prevent accidental switch actuation and to discourage use of forearms or elbows. This standard also includes a detailed discussion of approaches to protection of hand controls.

Prevention of defeat using hand and elbow of the same arm:

In general, the buttons should be at least 550 mm apart (in a straight line) to avoid the operator using the hand and elbow of the same arm or operate both hand controls by the use of only one arm. Alternatively, the buttons should have a shield to prevent the operation by an elbow.

Prevention of defeat using one hand:

The hand controls must be arranged to require the use of both hands for simultaneous actuation, therefore, they should be at least 260 mm apart, to prevent operation by a single hand. The cover supplied with the STB Touch Buttons conforms to the requirements of EN 574/ISO 13851, Cone test.

Figure 4 shows two examples for mounting the STB Touch Buttons. When mounted on top of the control bar, the protective field covers should be in place, as shown. For added protection, mount the STB Touch Buttons sideways under and behind a protective hood, rather than on top of the bar, leaving the field covers off. This side mount prevents the operator from positioning and leaving an object in the path of the beam, intentionally bypassing the safeguard.

Requirements for Multiple-Operator Control

CEN and CENELEC have specified several conditions for situations where multiple operators work together to control one machine:

- Each operator must actuate his/her own pair of Touch Buttons, with all pairs of actuators active at one time, in order to initiate a machine cycle; the machine may not be allowed to operate until this condition is true.
- The actuators all must be released between cycles.
- The actuation and de-actuation of all workstations requiring two-hand-control must be observable and supervisable by the employer.
- The clutch/brake control system must be designed so that the clutch cannot be actuated if all the operating workstations are bypassed.

It is the responsibility of the user to determine if this two-hand-control system can be interfaced to the machine in a manner to satisfy all existing requirements for multiple-operator control.



CAUTION ... Install Hand Controls to Prevent Accidental Actuation

Total protection for the two-hand-control system from "defeat" is not possible. However, the user is required by CEN/ CENELEC regulations to arrange and protect hand controls to minimise possibility of defeat or accidental actuation.

Top Mount, with Field Covers in Place



Side Mount, with Field Covers Removed



Figure 4. Install STB Buttons so that they are protected to prevent defeat or inadvertent actuation

Minimum Safety Distance

EN 999/ISO 13855 – Safety of Machinery – The positioning of protective equipment in respect of approach speeds of parts of the human body.

Both hand controls must be located far enough away from the nearest hazard point that the operator cannot reach the hazard with a hand or other body part before the hazardous motion ceases. If no appropriate Type-C standard exists then the minimum distance shall be calculated using the general formula.

Example Minimum Safety Distance (S) Calculation

The following example illustrates the use of the formula to calculate the minimum safety distance:

K = 1600 mm per second

T₁ = 0,055 seconds

T₂ = 0,50 seconds (measured by a stop-time measuring device)

C = 250 mm

S = $K \times T + C$ (where $T = T_1 + T_2$)
= $1600 \times (0,055 + 0,50) + 250$
= 1138 mm

In this example, both hand controls must be located no closer than 1138 mm from the nearest hazard point.

General Formula

S = K x T + C where:

S is the minimum safety distance in millimetres, from the danger zone to the detection point, line or plane;

K is a constant in millimetres per second, derived from data on approach speeds of the body or part of the body: **K = 1600 mm per second**;

T is the overall response time in seconds;

C is an additional distance in millimetres, based on intrusion towards the danger zone prior to actuation; **C = 250 mm**.

Where machine specific European standards specify a different distance than the safety distance calculated using this standard then the greater of the distances shall be used as the minimum safety distance.

Note: Overall response time is the time between the physical initiation of the safety device and the machine coming to a stop or the risk being removed. The overall response time comprises a minimum of two phases:

T = T₁ + T₂ where:

T₁ is the maximum response time of the safety device between the physical initiation of the sensing function and the output signal switching devices being in the OFF state.

The DUO-TOUCH SG Safety Kit (AT-FM-10K Safety Module interfaced with STB Touch Buttons) has an output response time of 55 milliseconds.

T₂ is the response time of the machine, that is the time required to stop the machine or remove the risk after receiving the output signal from the safety device.

Note: If the risk from encroachment of the body or part of the body towards the danger zone is eliminated while the device is being actuated, e.g. by adequate shrouding, then C may be zero, with a minimum allowable distance for S of 100 mm.



WARNING ... Location of Touch Button Controls

Hand controls must be mounted a safe distance from moving machine parts. It must not be possible for the operator or other non-competent persons to relocate them. **Failure to establish and maintain the required safety distance could result in serious injury or death.**

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons

Electrical Installation

Because the DUO-TOUCH SG Safety Module interfaces to many types of machine controls, it is not possible to give exact wiring instructions here. The following guidelines are general in nature.

Connection of Input Switches

The STBs are connected to the Duo-Touch SG module as shown in Figures 5a and 5b (page 9). STB1 and STB2 both have one normally open and one normally closed output contact each, or two current-sourcing complementary outputs each, all capable of reliably switching 10-20 mA. Connect one STB to terminals S11, S12, S13 and the other to terminals S21, S22 and S23. If STBs with PNP outputs are used, the system must be supplied with 24V dc. Wire gauge for the switch connections is not specified.

Connection of Power to the DUO-TOUCH SG Safety Module

The Safety Module requires a 24V ac or dc supply voltage. Power consumption of the Safety Module is approximately 4,5 VA. Use extreme caution whenever installing ac power. We recommend to use 1,2 to 1,7 mm² wire for power and output connections. A hand-operated supply disconnect (e.g. a circuit breaker) must be provided (per IEC/EN 60204). If activation devices other than STB Touch Buttons are used, they must share the same voltage supply with the Safety Module (see WARNING on page 9).

Connection to the Machine to be Controlled

The wiring diagrams (Figures 5a and 5b) show a generic connection of the Safety Module's two redundant output contacts to machine primary control elements MPCE1 and MPCE2. An MPCE is defined as an electrically-powered element, external to the DUO-TOUCH SG, which directly controls the machine's normal operating motion so that it is the last (in time) to operate when motion is either initiated or arrested. Some older machines offer only one MPCE; for such machines, it is necessary to add at least a second MPCE to establish control reliability. See: "NOTICE Regarding Machine Interface", on the right. As shown in Figures 5a and 5b, a normally-closed forced-guided monitor contact from each of the two MPCEs must be connected in series across terminals Y1 and Y2. This feedback loop allows the circuit of the Safety Module to monitor the state of the MPCEs, and to prevent a successive machine cycle, if an MPCE fault is detected. When MPCE monitor contacts are not available, a jumper wire must be installed across terminals Y1 and Y2.

IMPORTANT: When a jumper wire is used, it is the user's responsibility to provide a control-reliable means of machine interface, (per EN 954/ISO 13849), to ensure that any single MPCE component failure will prevent a successive machine cycle.

The outputs of the DUO-TOUCH SG Safety Module are rated at 250V ac/dc maximum, at 6 amps maximum resistive load. Force-guided Safety relays may be installed between the outputs of the Safety Module and the MPCEs to increase switching capacity. Whenever a safety relay is added as an intermediate switching device, a normally-closed force-guided monitor contact of that relay must be added to the series feedback loop between Safety Module terminals Y1 and Y2.

When switching inductive ac loads, it is good practice to protect the Safety Module outputs by installing appropriately-sized arc suppressors. However, if arc suppressors are used, they must be installed across the load being switched (e.g., across the coils of external safety relays), and never across the safety module's output contacts (see WARNING on page 9).



CAUTION ...
Disconnect Power
Before Wiring

Always disconnect all power from the DUO-TOUCH SG Safety Module and the machine being controlled before making any wire connections.

Insulation of hand controls and associated wiring must be rated for 250V ac minimum. If the hand controls have metal housings, the housings must be connected to protective earth ground.

Electrical installation of hand controls must be made by a qualified electrician and must comply with IEC/EN-60204-1, -2 and all applicable local standards.

NOTICE Regarding the Machine Interface

The DUO-TOUCH SG Two-Hand-Control Safety Module has two redundant output channels for interfacing to the machine primary control elements. Some machines have only one control element; for such machines, it is necessary to duplicate the circuit of the single control element.

According to EN 954/ISO 13849 Control Reliability, the device, system, or interface must be designed, constructed, and installed so that a single component failure will not prevent normal stopping action from taking place but will prevent a successive machine cycle.

In the case of part-revolution clutch machinery, each machine control element must be capable of immediately stopping the dangerous machine motion, irrespective of the state of the other element. For full-revolution clutch machinery, each machine control element must be capable of preventing a subsequent cycle, irrespective of the state of the other element. The slower of the two machine control elements must be used when calculating safety distance for the hand controls. (See "Mechanical Installation of Hand Controls", page 6 and Warning on page 9.)

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons



WARNING ... Intermediate Switching Devices

Never wire an intermediate device (for example, a programmable logic controller - PLC), other than a safety relay, between any DUO-TOUCH SG Safety Module output and the machine control element it switches. To do so sacrifices the control reliability of the control-to-machine interface, and creates an unsafe condition which could result in serious injury or death. Whenever a safety relay is added as an intermediate switching device, a normally closed force-guided monitor contact of that relay must be added to the series feedback loop between Safety Module terminals Y1 and Y2. (Reference EN 954-1/ISO 13849-1 and IEC/EN-60204-1).



WARNING ... Use of Electronic Hand Controls

Electronic (powered) hand controls include optical touch buttons, capacitive touch buttons and similar devices. When electronic hand controls are used as input switches for a DUO-TOUCH SG Safety Module, the hand controls and the Safety Module must be powered from the same voltage source.

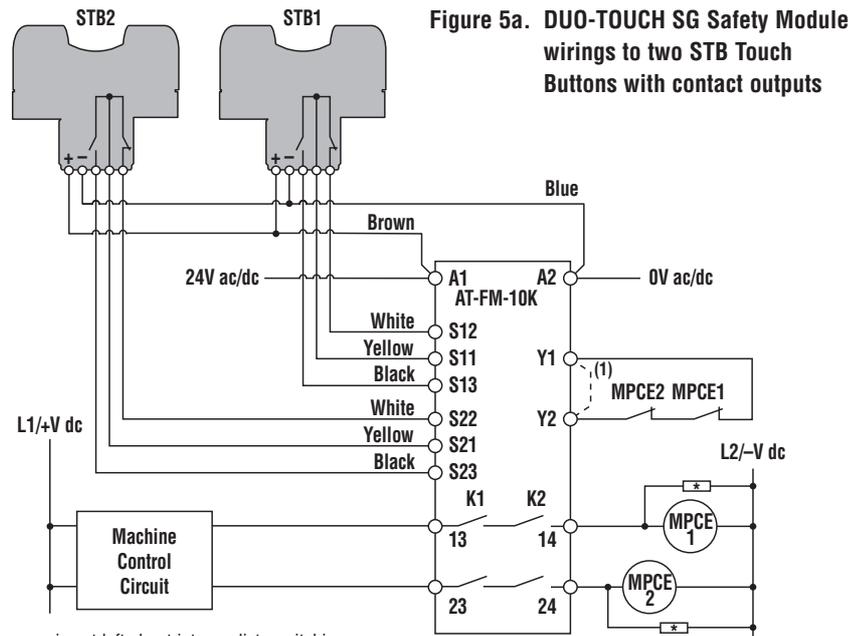
If power is applied to the Safety Module before power is applied to the electronic hand controls, and if the electronic hand controls are both actuated at the time they are powered, an output from the DUO-TOUCH SG Safety Module will result which may trigger machine motion. Furthermore, electronic hand controls cannot guarantee the state of their outputs at the time power is applied to them.

Failure to power the DUO-TOUCH SG Safety Module and associated electronic hand controls from the same voltage source creates a potentially dangerous condition, which could result in serious injury or death.



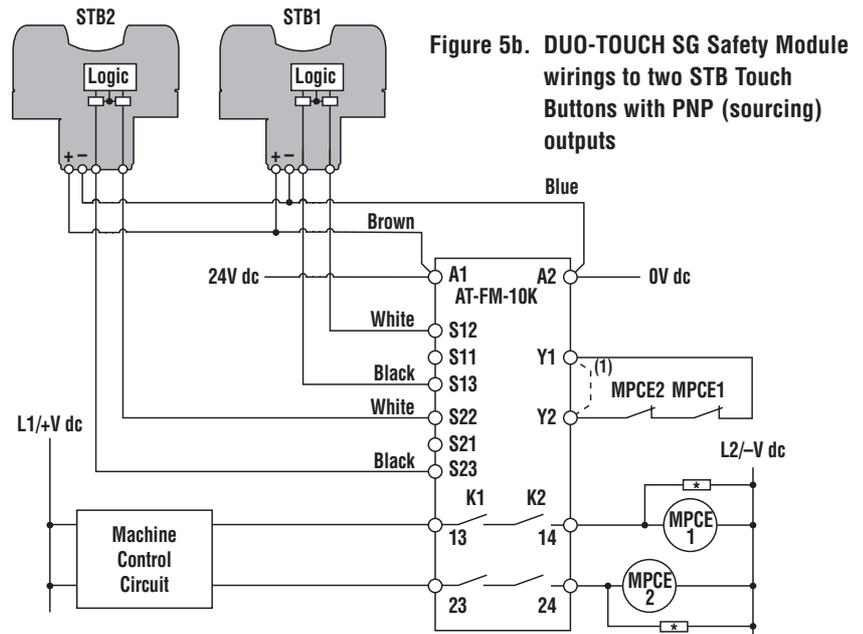
WARNING ... Use of Arc Suppressors

If arc suppressors are used, they MUST be installed as shown across the coils of the Machine Primary Control Elements (MPCEs). NEVER install suppressors directly across the output contacts of the DUO-TOUCH SG Safety Module. It is possible for suppressors to fail as a short circuit. If installed directly across the output contacts of the DUO-TOUCH SG Safety Module, a short-circuited suppressor will create an unsafe condition which could result in serious injury or death.



(1) See warning at left about intermediate switching devices.

* Arc Suppressor – See Warning



(1) See warning at left about intermediate switching devices.

* Arc Suppressor – See Warning

Figure 5. DUO-TOUCH SG Safety Module wirings

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons

Initial Checkout Procedure

To perform the initial checkout, it is necessary to view the red Fault LED and the four green status indicators: Power, Input 1, Input 2 and Output. Proceed with caution around open wiring.

- 1) Verify that the two actuating devices are properly connected to the DUO-TOUCH SG Safety Module.
- 2) Apply power to the Safety Module and to the STB Touch Buttons.
- 3) Verify that only the Power indicator is ON. If any of the other Safety Module indicators are ON, disconnect the power to the safety module and check all wiring. Do not continue this checkout procedure until the cause of the problem is corrected.
- 4) Activate both hand controls simultaneously (within 0,5 seconds), and hold them engaged. Input 1 and Input 2 indicators should come ON. Release both hand controls simultaneously. K1 and K2 indicators should go OFF, together.

To perform the initial checkout, it is necessary to view the red Fault LED and the four green status indicators: Power, Input 1, Input 2 and Output. Proceed with caution around open wiring.

- 5) Again, activate the two hand controls simultaneously, and hold them engaged. Input 1 and Input 2 indicators should come ON. Release one hand control, while holding the other engaged. One of the indicators should remain ON. The Output indicator should go OFF. Re-activate the hand control which was just released. The Output indicator should remain OFF. Release both hand controls. Input 1 and Input 2 indicators should then be OFF.
- 6) Activate only one hand control and hold it engaged. Input 1(Input 2) indicator should come ON. After more than 1/2 second, activate the second hand control. Input 1 (Input 2) indicator should remain ON, while Input 2 (Input 1) indicator remains OFF.
- 7) Remove power from the Safety Module and disconnect the monitor contact feedback loop at terminals Y1 and/or Y2. Re-apply power to the Safety Module. Activate both hand controls simultaneously. Input 1 and Input 2 indicator LEDs should remain OFF.

If the DUO-TOUCH SG Safety Module passes all of these tests, reconnect the output wires at terminals 13/14 and 23/24 and the monitor contact feedback loop at terminals Y1 and Y2. **Do not attempt to use the DUO-TOUCH SG Two-Hand-Control Safety Module until all of the tests are passed.**



CAUTION ... Disconnect Power Before Checkout

Before performing the initial checkout procedure, make certain all power is disconnected from the machine to be controlled. Temporarily disconnect the wires connected to the outputs of the DUO-TOUCH SG Safety Module at terminals 13/14 and 23/24.

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons

***Qualified Person:** A person who, by possession of a recognised degree or certificate of professional training, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve problems relating to the installation, maintenance and use of the DUO-TOUCH SG Two-Hand-Control Safety System (EN-50100-1, Annex C).



WARNING

If all of the described checks cannot be verified, the two-hand-control system must not be used until the problem has been corrected. Injury or death to personnel may result from attempts to use the machine under such conditions.



CAUTION ... Abuse of Module After Failure

If an internal fault has occurred and the AT-FM-10K will not reset, **do not tap, strike, or otherwise attempt to correct the fault by a physical impact to the housing.** An internal relay may have failed in such a manner that its replacement is required.

If the module is not immediately replaced or repaired, multiple simultaneous failures may accumulate such that the safety function can not be guaranteed.

Periodic Checkout and Maintenance

Daily Checkout:

To be Performed at Every Power-up, Shift Change, and Machine Setup Change
Daily checkout and checkouts after tooling and machine setup changes must be performed by a Designated Person, appointed and identified in writing by the employer.

- 1) Verify that all point-of-operation guards are in place and operating properly.
- 2) Verify that the two hand controls must be simultaneously engaged to actuate the machine.
- 3) **For single-cycle machines:** Verify that maintained engagement of the two hand controls results in only one machine cycle.
- 4) **For part-revolution clutch machinery:** Verify that release of either hand control results in the immediate arrest of the machine motion.
- 5) Verify that the distance from each hand control to the closest hazard point is not less than the calculated safety distance (see page 7).

Semi-Annual Checkout:

To be Performed at Six-month Intervals

This semi-annual checkout must be performed by a Qualified Person*. A copy of test results should be kept on or near the machine.

- 1) Perform the daily checkout procedure (see above).
- 2) Perform the initial checkout procedure (see page 10).
- 3) Calculate the safety distance (see page 7), and verify that the hand controls are far enough away from the nearest hazard point. Relocate the hand controls, if necessary.
- 4) Verify that the hand controls are positioned to require the use of both hands for operation, and are protected from false or inadvertent operation.
- 5) Inspect the machine controls and the connections to the DUO-TOUCH SG Safety Module to ensure that wiring is direct, as described on pages 8 and 9, and that no modifications have been made which could adversely affect the System.

Repairs

NOTE: Do not attempt any repairs to the DUO-TOUCH SG Two-Hand-Control Kit, either the Safety Module or the STB Touch Buttons. They contain no field-replaceable components. Return them to the factory for warranty repair or replacement.

If it ever becomes necessary to return a DUO-TOUCH SG Safety Module or STB Touch Button to the factory, please do the following:

- 1) Contact the Banner Factory Application Engineering Group at the address or at the numbers listed at the bottom of the back page. They will attempt to troubleshoot the system from your description of the problem. If they conclude that a component is defective, they will issue an RMA (Return Merchandise Authorisation) number for your paperwork, and give you the proper shipping address.
- 2) Pack the components carefully. Damage which occurs in return shipping is not covered by warranty.

DUO-TOUCH[®] SG – Two-Hand-Control Kits with STB Touch Buttons

DUO-TOUCH SG Safety Module Specifications

| | |
|---------------------------------------|--|
| Supply Voltage and Current | 24V ac/dc \pm 15% at 150 mA (with STBVR81 or other mechanical switches) 24V dc \pm 15% at 150 mA (with STBVP6 buttons) |
| Supply Protection Circuitry | Protected against transient voltages and reverse polarity |
| Output Configuration | Outputs (K1 and K2): two redundant (total of four) safety relay (force-guided) contacts (N.O.) Contact ratings: Maximum voltage: 250V ac or 250V dc Maximum current: 6A ac or dc (resistive load) Maximum power: 1500 VA, 150 watts Mechanical life: 10.000.000 operations Electrical life: 150.000 cycles (typically at 1,5 kVA switching power) NOTE: Transient suppression is recommended when switching inductive loads. Install suppressors across load. Never install suppressors across output contacts (see Warning on page 9). |
| Output Response Time | AT-FM-10K output response time: 35 milliseconds DUO-TOUCH SG Kit (AT-FM-10K interfaced with STB buttons) output response time: 55 milliseconds |
| Input Requirements | Outputs from two-hand-controls must each be capable of switching 10 to 50 mA at 18 to 30V dc. |
| Simultaneity Monitoring Period | 500 milliseconds |
| Status Indicators | 4 green LED indicators: Power ON Input 1 energised Input 2 energised Output 1 red LED indicator: Fault |
| Housing | Polycarbonate |
| Protection class (IEC-60529) | IP20 |
| Mounting | Mounts to standard 35 mm DIN rail track. Safety Module must be installed inside an enclosure rated IP54, or better. |
| Vibration Resistance | 10 to 55Hz at 0,35 mm displacement per IEC 68-2-6 |
| Operating Conditions | Temperature: 0° to +50°C Maximum Relative Humidity: 90% at +50°C (non-condensing) Heat Dissipation Considerations: See page 6 |
| Dimensions | See Figure 6 |
| Safety Category | Category 4 per EN 954-1/ISO 13849-1; Type IIIC per EN 574/ISO 13851 |
| Certifications |  Yes – see Figure 9 on page 16 |

DUO-TOUCH[®] SG – Two-Hand-Control Kits with STB Touch Buttons

STB Touch Button Specifications

| | |
|-------------------------------------|--|
| Supply Voltage and Current | STBVP6 Models: 10 to 30V dc at 75 mA (exclusive of load) STBVR81 Models: 20 to 30V ac/dc at 75 mA |
| 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 | <p>STBVP6 Models (solid-state outputs): Maximum load: 150 mA Minimum on-state voltage: supply voltage – 1,5V at full load Off-state leakage current: < 1 µA</p> <p>STBVR81 Models (electromechanical relays): Maximum voltage: 150V dc, 125V ac Maximum switching current: 1A (resistive load) Maximum switching power: 60 VA, 30W (resistive load) Mechanical life of relays: 1 x 10⁹ operations Electrical life of relays: at 6V dc, 100 mA – approx. 5 x 10⁷ operations at 24V dc, 1A – approx. 3 x 10⁶ operations</p> |
| Output Protection | All models protected against false pulse on power-up. Models with solid-state outputs have overload and short-circuit protection. |
| Output Response Time | 20 milliseconds, maximum |
| Indicators | <p>2 green LED indicators: Power: ON – power applied OFF – power off</p> <p>Output/fault: ON – button is activated OFF – button is deactivated Flashing – internal fault or blocked button on power-up detected</p> |
| Construction | Totally encapsulated, non-metallic enclosure. Black polysulfone upper housing (see Application Note below); fibre-reinforced PBT polyester base. Electronics fully epoxy-encapsulated. Supplied with polypropylene field cover. |
| Protection class (IEC-60529) | IP66 |
| Connections | PVC-jacketed 2 m cables standard on integral-cable kits; or QD fitting, depending on model. Accessory QD cables required for QD models; see Accessories, page 15. STBVP6Q5 Models: 4-wire (4-pin Euro-style QD) STBVR81Q6 Models: 5-wire (5-pin Euro-style QD) Integral 9 m cables are also available; see model selection chart, page 1. |
| Ambient Light Immunity | Up to 100.000 lux |
| EMI/RFI Immunity | Highly resistant to both single and mixed EMI and RFI noise sources, per IEC 947-5-2. |
| Operating Conditions | Temperature: -20° to +50°C Maximum relative humidity: 90% at +50°C (non-condensing) |
| Application Note | Environmental considerations: 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 alkalis. Clean periodically using mild soap solution and a soft cloth. |

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons

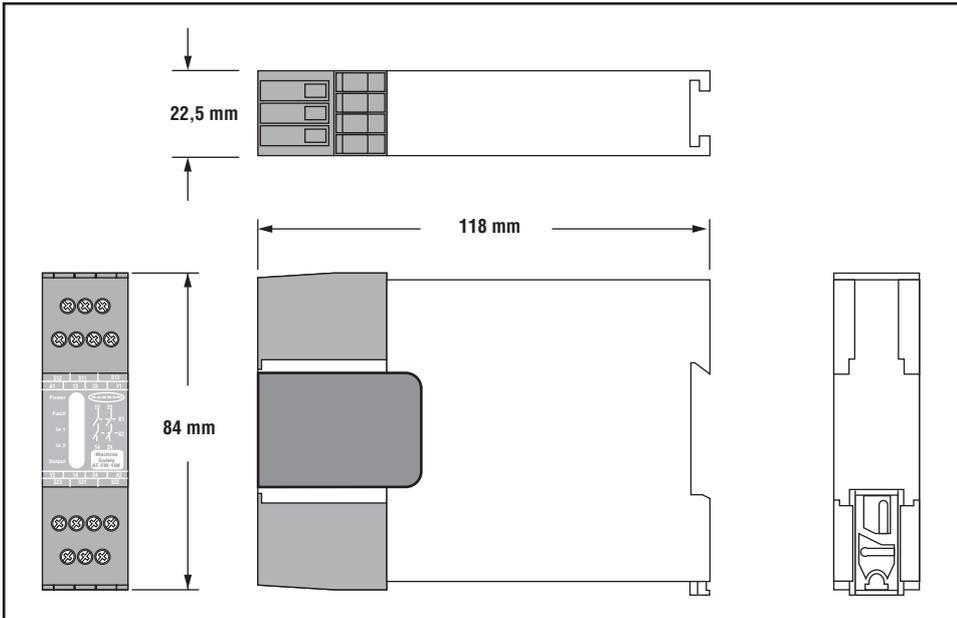


Figure 6. DUO-TOUCH SG Safety Module dimensions

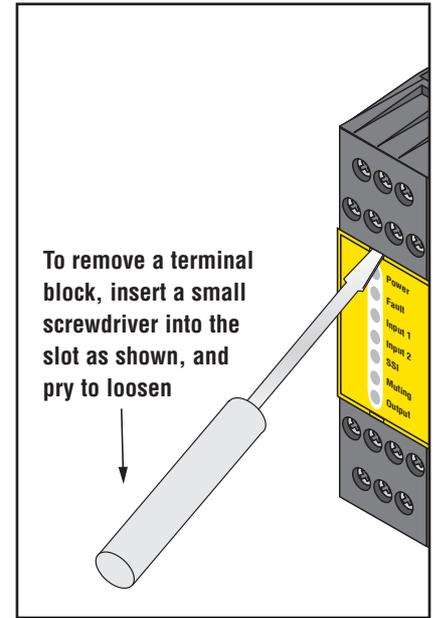


Figure 7. Removing a terminal block

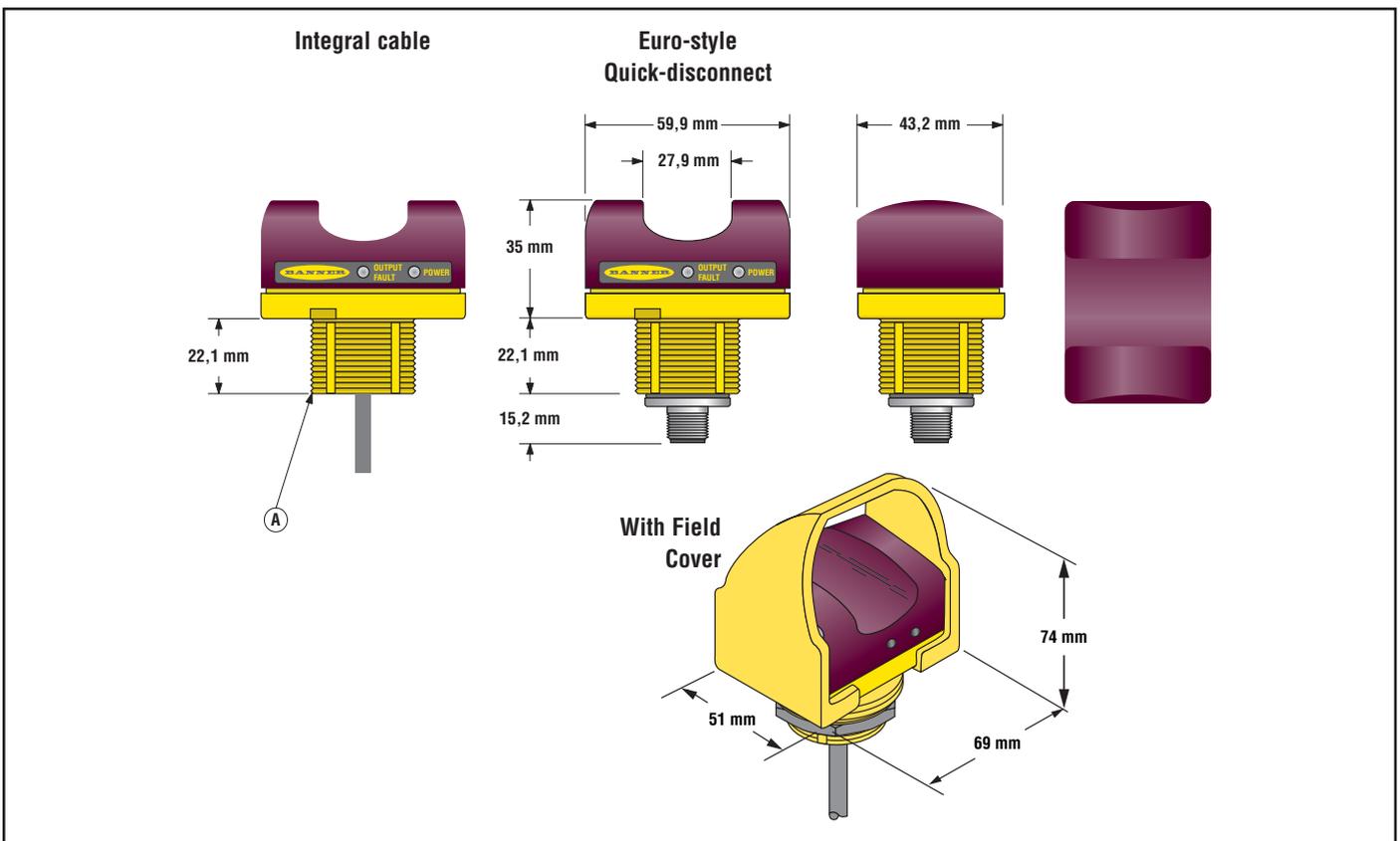


Figure 8. STB Touch Button dimensions

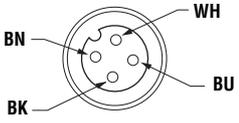
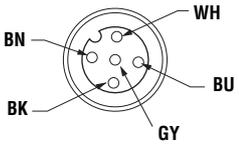
Key Legend:

A M30 External threads – Jam nut, lock ring and seal washers are supplied

DUO-TOUCH® SG – Two-Hand-Control Kits with STB Touch Buttons

Accessories

STB Touch Button Quick-Disconnect (QD) Cables

| Style | Model | Length | Used with: | Pin-out |
|---|--|-------------------|--|---|
| 4-Pin M12 Female Pin-out Straight | MQDC-406 (30 451 36) MQDC-415 (37 487 00) MQDC-430 (30 271 42) | 2 m 4 m 9 m | All STB Euro-style QD-models with PNP outputs |  |
| 5-Pin M12 Female Pin-out Straight | MQDC1-506 (30 511 27) MQDC1-515 (30 478 12) MQDC1-530 (30 478 14) | 2 m 4 m 9 m | All STB Euro-style QD-models with electromechanical relay outputs |  |

Mounting Brackets

| Model | Description | Photo |
|----------------------------|---|---|
| SMB30C (34 701 00) | <ul style="list-style-type: none"> • 30 mm split clamp bracket • Black reinforced thermoplastic polyester • Includes stainless steel mounting and hardware |  |
| SMB30SC (30 525 21) | <ul style="list-style-type: none"> • 30 mm swivel bracket • Black reinforced thermoplastic polyester • Includes stainless steel mounting and swivel locking hardware |  |
| SMB30MM (37 849 00) | <ul style="list-style-type: none"> • 30 mm curved mounting slot for versatility/orientation • Stainless steel • Clearance for M6 hardware |  |

Field Covers

| Model | Description | Material |
|-----------------------------|--------------------|---------------------|
| OTC-1-BK (38 807 00) | black field cover | polypropylene resin |
| OTC-1-GN (38 809 00) | green field cover | polypropylene resin |
| OTC-1-RD (30 309 77) | red field cover | polypropylene resin |
| OTC-1-YW (30 309 78) | yellow field cover | polypropylene resin |

