SSA-ISD Connect with Indication

Instruction Manual

Original Instructions
215320 Rev. C
22 March 2021

215320

Contents

1 Product Overview

SSA-ISD Connect with Indication

- Connects conventional emergency stop buttons or safe mechanical switch contacts to an ISD chain of devices
- Rugged design; easy installation with no assembly or individual wiring required
- 5-pin M12/Euro-style female quick disconnect to connect an input device
- In-Series Diagnostic (ISD) for health and status information when used with a compatible Banner Safety Controller
- Built-in indication for input device status
- Built-in indication for ISD Status

1.1 Models

Model	Reset Function	Input Device Connector					
		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Indication
SSA-ISD-TCA	No	CH1a	CH1b	NC	CH2a	CH2b	Green/Red

1.2 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.

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.

WARNING:

- **Not a safeguarding device**
- Failure to follow these instructions could result in serious injury or death.
- This device is not considered a safeguarding device because it just converts the signal from an external device to an ISD compatible signal. A safeguarding or supplemental device with 2 normally closed (NC) contacts must be connected to this device. A safeguarding device limits or eliminates an individual's exposure to a hazard without action by the individual or others. This device cannot be substituted for required safeguarding. Refer to the applicable standards to determine those requirements.

1.3 Overview

The SSA-ISD Connect with Indication is an adapter unit to integrate and serially connect Electromechanical Safety Switches (EMSSs) without ISD into machine designs.

This connector can be used to connect a safety point on a machine that is not suitable for an existing ISD device, such as a panel mount e-stop or mechanical interlocks on a door. The SSA-ISD Connect interfaces with devices that have two normally closed (NC) safety contacts.

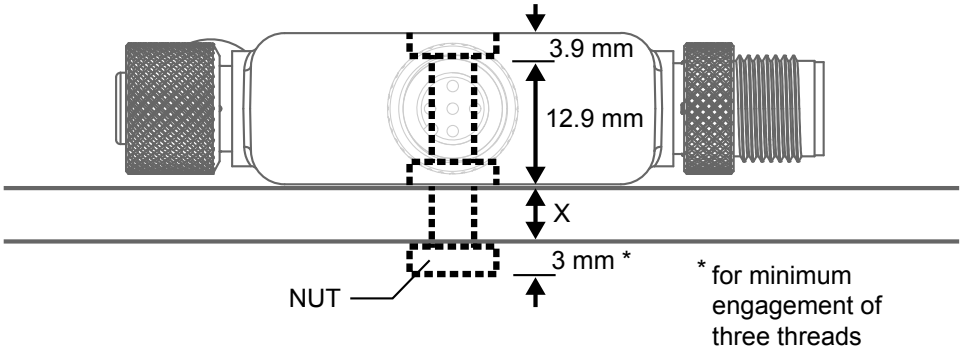
The indicators on the SSA-ISD Connect provide local diagnostics. One LED provides the status of the input device. The other LED provides the status of the OSSD inputs (ISD chain).

2 Installation Instructions

2.1 Mechanical Installation

Install the SSA-ISD Connect to allow access for functional checks, maintenance, and service or replacement. Do not install the SSA-ISD Connect in such a way to allow for intentional defeat.

All mounting hardware is supplied by the user. Fasteners must be of sufficient strength to guard against breakage. Use of permanent fasteners or locking hardware is recommended to prevent the loosening or displacement of the device. The mounting hole (4.5 mm) in the SSA-ISD Connect accepts M4 (#6) hardware. See the figure below to help in determining the minimum screw length.



Screw Length (with screw head fitting in counterbore) = 12.9 mm + “X” mm + 3 mm

CAUTION: Do not overtighten the SSA-ISD Connect's mounting screw during installation. Overtightening can affect the performance of the SSA-ISD Connect.

Important: It is the responsibility of the machine builder (user) to ensure the SSA-ISD Connect series wiring/cabling is not easily manipulated by an operator to defeat the safety function(s), for example, ensure the operator cannot remove a device from the chain.

2.2 Installation Requirements

The device is intended for indoor use only and must not be affected by environmental conditions. Do not expose the device to excessive shocks and vibrations, otherwise the device may be deformed or damaged, causing malfunction or operation failure.

Electrical installation must be made by qualified personnel [1] and must comply with NEC (National Electrical Code), NFPA 79 or IEC/EN 60204-1, and all applicable local standards. It is not possible to give exact wiring instructions for a device that interfaces to a multitude of machine control configurations. The following is general in nature; it is recommended to perform a risk assessment to ensure appropriate application, interfacing/connection, and risk reduction (see ISO 12100 or ANSI B11.0).

[1] A person who, by possession of a recognized 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 subject matter and work.

WARNING:
- **Risk of electric shock**
- Use extreme caution to avoid electrical shock. Serious injury or death could result.
- Always disconnect power from the safety system (for example, device, module, interfacing, etc.), guarded machine, and/or the machine being controlled before making any connections or replacing any component. Lockout/tagout procedures might be required. Refer to OSHA 29CFR1910.147, ANSI Z244-1, or the applicable standard for controlling hazardous energy.
- Make no more connections to the device or system than are described in this manual. Electrical installation and wiring must be made by a Qualified Person [2] and must comply with the applicable electrical standards and wiring codes, such as the NEC (National Electrical Code), NFPA 79, or IEC 60204-1, and all applicable local standards and codes.

2.3 Protective (Safety) Stop Circuits

A protective (safety) stop allows for an orderly cessation of motion for safeguarding purposes, which results in a stop of motion and removal of power from the Machine Primary Control Elements (MPCE) (assuming this does not create additional hazards).

A protective stop circuit typically comprises a minimum of two normally open contacts from forced-guided, mechanically linked relays, which are monitored through External Device Monitoring (EDM) to detect certain failures, to prevent the loss of the safety function. Such a circuit can be described as a "safe switching point".

Protective stop circuits are either single channel, which is a series connection of at least two normally open contacts, or dual-channel, which is a separate connection of two normally open contacts. In either method, the safety function relies on the use of redundant contacts to control a single hazard. If one contact fails On, the second contact arrests the hazards and prevents the next cycle from occurring.

Interface the protective stop circuits so that the safety function cannot be suspended, overridden, or defeated, unless accomplished in a manner of the same or greater degree of safety as the machine's safety related control system that includes the SSA-ISD Connect.

An ISD compatible Banner Safety Controller, such as the SC10-2ro, provides a series connection of redundant contacts that form protective stop circuits for use in either single-channel or dual-channel control.

2.4 Output Signal Switching Devices (OSSDs) and External Device Monitoring (EDM)

The SSA-ISD Connect is able to detect faults on OSSD1 and OSSD2. These faults include short circuits to +24 V DC and 0 V, and between OSSD1 and OSSD2.

Both OSSD outputs must be connected to the machine control so that the machine's safety-related control system interrupts the circuit or power to the machine primary control element(s) (MPCE), resulting in a non-hazardous condition.

Final switching devices (FSDs) typically accomplish this when the OSSDs go to an OFF state.

Refer to the output specifications and these warnings before making OSSD output connections and interfacing the SSA-ISD Connect to the machine.

WARNING:
- **Interfacing both output signal switching devices (OSSD)**
- Failure to follow these instructions could result in serious injury or death.
- Unless the same degree of safety is maintained, never wire an intermediate device(s) (PLC, PES, PC) between the safety module outputs and the master stop control element it switches such that a failure causes a loss of the safety stop command or the failure allows the safety function to be suspended, overridden, or defeated.
- Connect both OSSD outputs to the machine control so that the machine’s safety-related control system interrupts the circuit to the machine primary control element(s), resulting in a non-hazardous condition.

[2] A person who, by possession of a recognized 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 subject matter and work.

WARNING:
- **Interfacing OSSD Outputs to Machine Inputs**
- Failure to properly interface the OSSD Outputs to the guarded machine could result in serious injury or death.
- To ensure proper operation, the Banner device output parameters and machine input parameters must be considered when interfacing the Banner device OSSD outputs to machine inputs. Design the machine control circuitry so that the maximum load resistance value is not exceeded and the maximum specified OSSD Off-state voltage does not result in an On condition.

External device monitoring (EDM) is a function used to monitor the state of the external, positively guided (mechanically linked) machine control contacts (Final Switching Devives (FSD) and/or MPCEs). The SSA-ISD Connect does not include the EDM function. As a result, the SSA-ISD Connect should be used with an external safety monitoring device that monitors the status of the two SSA-ISD Connect OSSDs and is capable of providing the EDM function.

Examples of appropriate external safety monitoring devices include the Banner SC10-2ro Safety Controller.

WARNING:
- **The SSA-ISD Connect does not have external device monitoring (EDM).**
- If EDM is required for the application, it must be implemented in the external control.

2.4.1 Fault Tolerant Output Feature

Faults that do not immediately compromise the safe operation of the SSA-ISD Connect (for example safety output to external potential, crosswire short safety output) result in a delayed switch-off of the safety outputs.

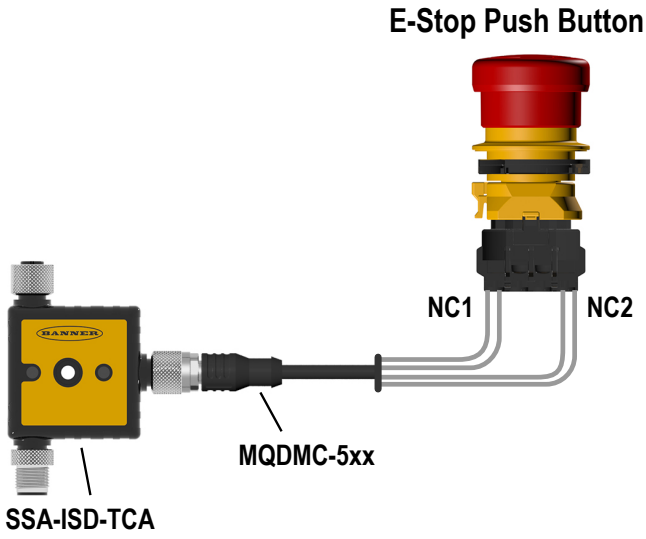
The safety outputs switch off when the error warning exceeds 20 minutes. In case of error warning, the SSA-ISD Connect will flash the ISD red LED.

Use this fault tolerance feature to run down the machinery in a controlled manner. After fixing the fault, the error message is confirmed by a voltage reset. The safe outputs enable and allow a restart.

Faults that directly affect the safe operation of the SSA-ISD Connect will immediately cause a lockout condition and the OSSDs will turn off.

2.5 Wiring

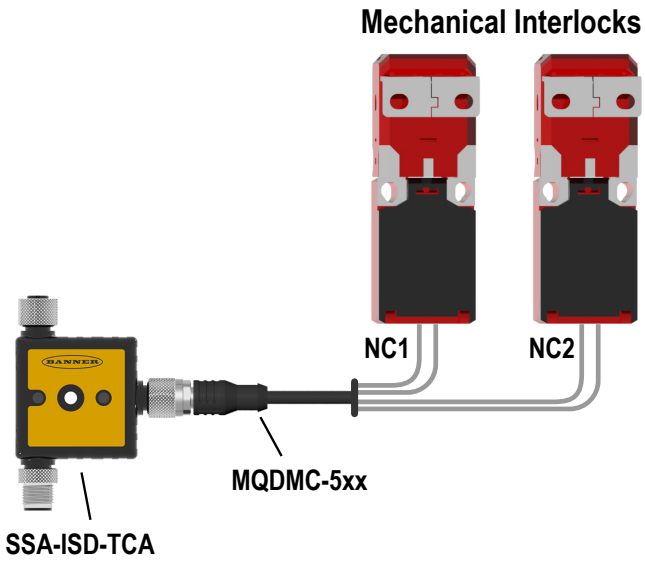
Figure 1. Wiring the SSA-ISD Connect to a panel mount Emergency Stop button



CH1a - Pin 1 - Brown
CH1b - Pin 2 - White
N/C - Pin 3 - Blue
CH2a - Pin 4 - Black
CH2b - Pin 5 - Gray

Figure 2. Wiring the SSA-ISD Connect to an SSA-EB1P-02ECQ5A E-stop button with a MQDEC-5xxSS cordset

Figure 3. Wiring the SSA-ISD Connect to mechanical interlocks



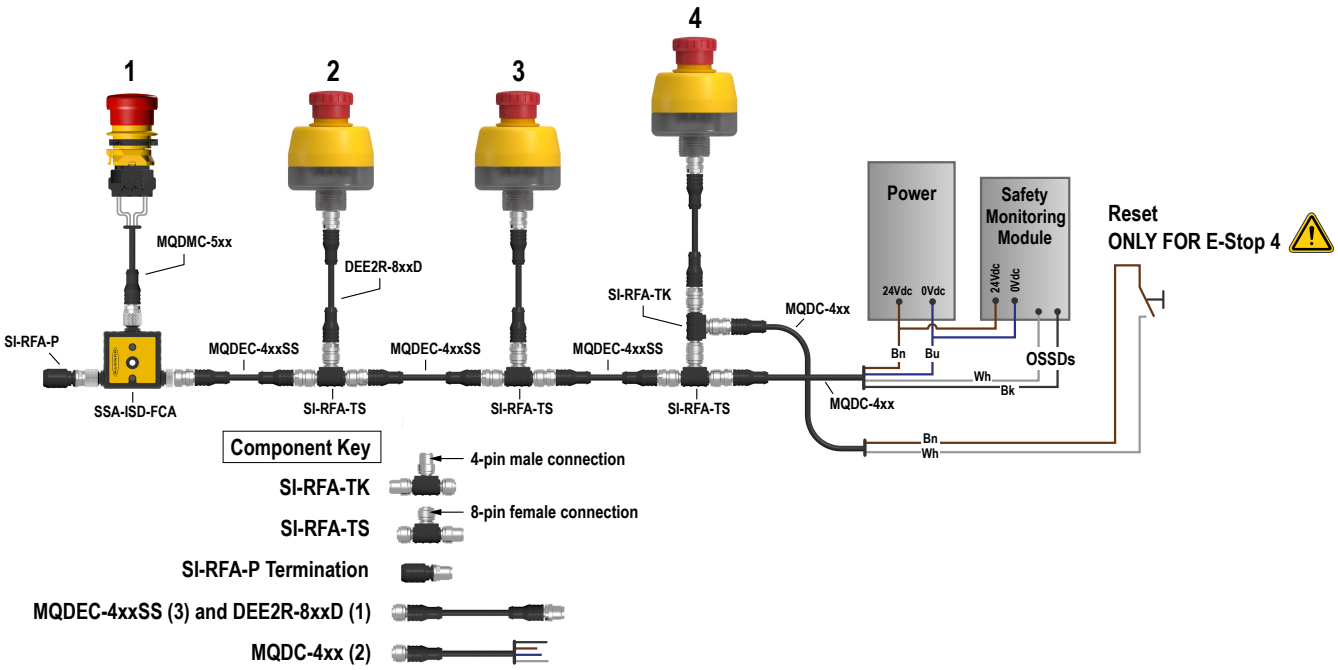
CH1a - Pin 1 - Brown
CH1b - Pin 2 - White
N/C - Pin 3 - Blue
CH2a - Pin 4 - Black
CH2b - Pin 5 - Gray

2.5.1 Wire the SSA-ISD Connect in a Chain of ISD E-Stops

When connecting emergency stop units in series, simplify the wiring by using special t-adapters, low cost unshielded four-wire double-ended cables, and the SSA-ISD Connect with Indication.

A configuration of three lighted ISD e-stops and a panel mount e-stop is shown. The SSA-EB1PLx-0Dx E-stops, SI-RFD switches, and the SSA-ISD Connect can be combined in a single chain.

Figure 4. Wiring the SSA-ISD Connect in a chain of ISD e-stops



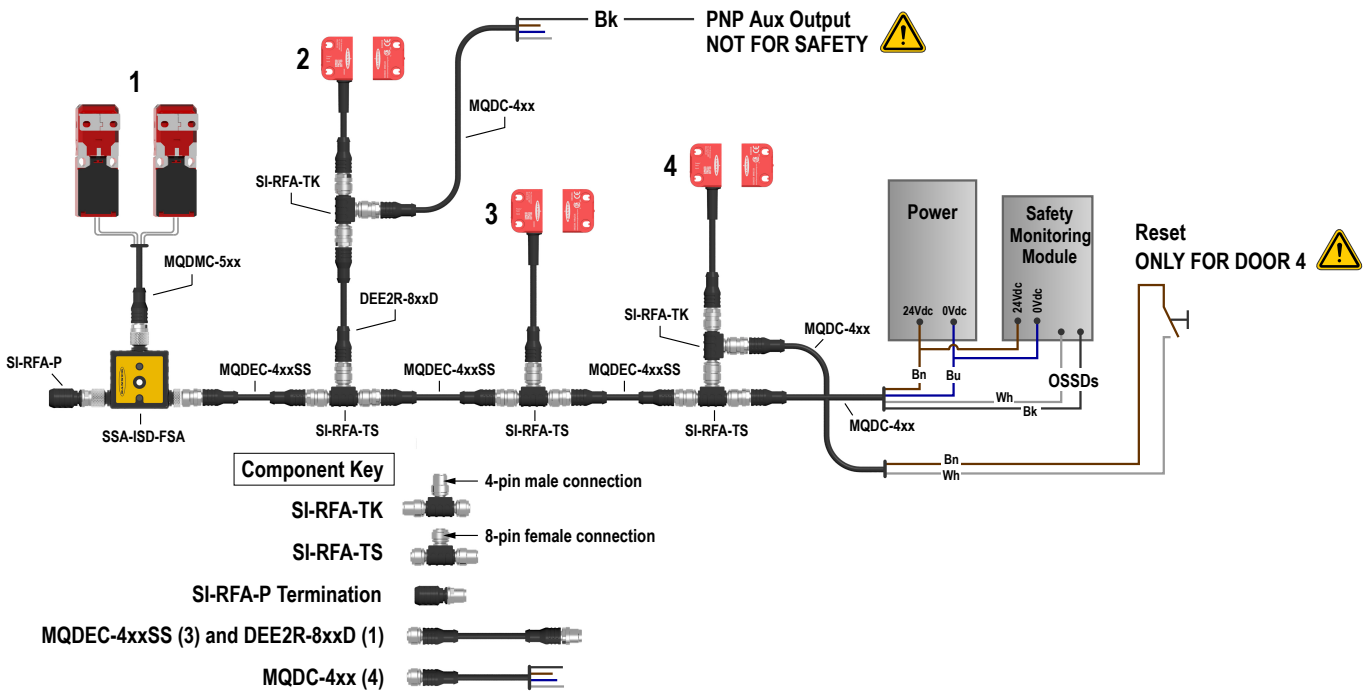
1. Connect the female 4-pin M12/Euro-Style cable to the male 4-pin M12/Euro-Style of the series connection t-adapter (SI-RFA-TS).
2. Connect your reset device.
   - If you are using a manual reset model of emergency stop device—Connect the female 8-pin M12/Euro-Style of the reset t-adapter (SI-RFA-TK) to the male 8-pin M12/Euro-Style connector of the series connection t-adapter.
   - If you are using a reset switch—Connect a female 4-pin M12/Euro-Style cable to the male 4-pin M12/Euro-Style QD of the reset t-adapter.
3. Connect the SSA-EB1PLx-0Dx to the male 8-pin M12 connector of the t-adapter. Use the DEE2R-8xxD extension cables as needed.
4. Connect the male 4-pin M12 end of a double-ended cable to the female 4-pin M12 of the t-adapter. Connect the female end of the double ended cable to the next series connection t-adapter (SI-RFA-TS) or the SSA-ISD Connect.
5. At the end of the line, install a terminating plug (SI-RFA-P) to properly truncate the system.
6. Wire the wired end of the 4-pin M12 cable (from step 1) directly to a Safety Monitoring Device, such as an ISD-enabled Banner Safety Controller model SC10-2roe. You may also wire the 4-pin M12 cable to an In-Series Diagnostic (ISD) module then to the Safety Monitoring device.
7. Verify that the ISD chain of devices and the safety monitoring device are powered from the same power supply or the commons of the separate supplies are the same. Ensure that the voltage level at the ISD enabled device in position #1 (furthest from the power supply) is above 19.5 V for the system to operate properly.

2.5.2 Wire the SSA-ISD Connect in a Chain of ISD Interlocks

When connecting ISD interlocks in series, simplify the wiring using special t-adapters, low cost unshielded four-wire double-ended cables, and the SSA-ISD Connect with Indication.

A configuration of three SI-RFDx switches and an SSA-ISD Connect with two mechanical interlocks connected in shown below. The SSA-EB1PLx-0Dx E-stops, SI-RFD switches, and the SSA-ISD Connect can be combined in a single chain.

Figure 5. Wiring the SSA-ISD Connect in a chain of ISD interlocks



Important: The inputs to the SSA-ISD-TCA must meet the three second maximum simultaneity requirement to prevent faults.

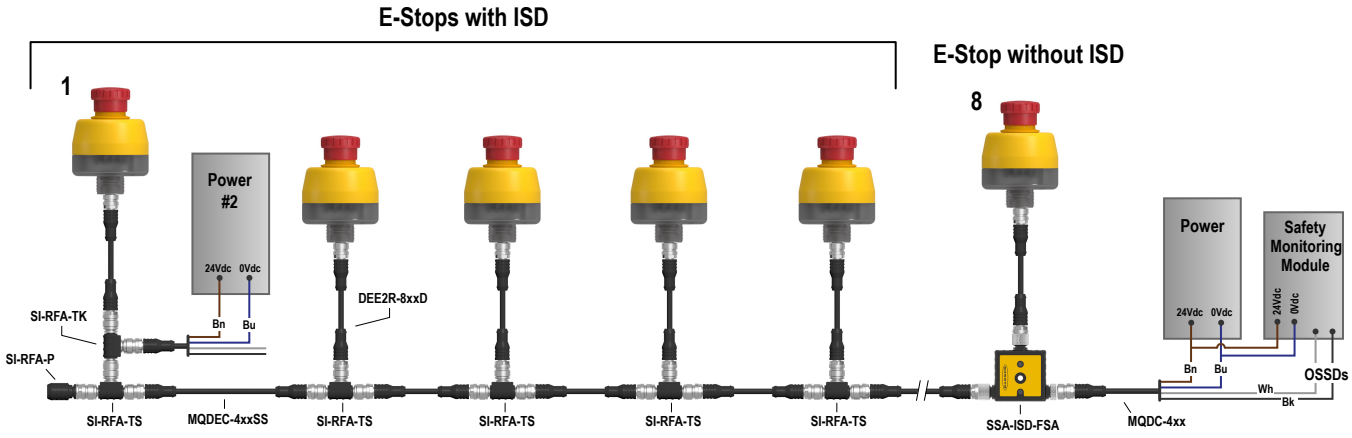
1. Connect the female 4-pin M12/Euro-style cable to the male 4-pin M12/Euro-style of the series connection t-adapter (SI-RFA-TS).
2. Connect your reset device.
   - If you are using a manual reset model of SI-RFD switch—Connect the female 8-pin M12/Euro-style of the reset t-adapter (SI-RFA-TK) to the male 8-pin M12/Euro-style connector of the series connection t-adapter.
   - If you are using a reset switch—Connect a female 4-pin M12/Euro-style cable to the male 4-pin M12/Euro-style QD of the reset t-adapter.
3. Connect the interlock to the male 8-pin M12 connector of the t-adapter. Use the DEE2R-8xxD extension cables as needed.
4. Connect the male 4-pin M12 end of a double-ended cable to the female 4-pin M12 of the t-adapter. Connect the female end of the double ended cable to the next series connection t-adapter (SI-RFA-TS) or the SSA-ISD Connect.
5. At the end of the line, install a terminating plug (SI-RFA-P) to properly truncate the system.
6. Wire the wired end of the 4-pin M12 cable (from step 1) directly to a Safety Monitoring Device, such as an ISD-enabled Banner Safety Controller model SC10-2roe. You may also wire the 4-pin M12 cable to an In-Series Diagnostic (ISD) module then to the Safety Monitoring device.
7. Verify that the ISD chain of devices and the safety monitoring device are powered from the same power supply or the commons of the separate supplies are the same. Ensure that the voltage level at the ISD enabled device in position #1 (furthest from the power supply) is above 19.5 V for the system to operate properly.

2.5.3 Wiring Additional Power Supplies

For guidance on maximum total cable length and maximum number of devices before an additional power supply may be needed, see Figure 8 on p. 11. For using ISD information to monitor the individual device voltages, see In-Series Diagnostic (ISD) Information on p. 12.

In a long series or series with many ISD devices, the voltage at all devices must stay above 19.5 V for proper operation. An additional power supply may be required to maintain a minimum of 19.5 V at all devices. There are two options to connect an additional power supply.

*Figure 6. Option 1: Use a **SI-RFA-TK** Reset Connector in series with ISD Device. If available, set the power supplies for parallel output.*



Note: Option 1 can only be used if the chain contains an SI-RFA-TS connector (the SI-RFA-TK cannot be connected to an SSA-ISD-TCA).

Figure 7. Option 2: Replace the terminator with a power supply. The OSSD1 and OSSD2 wires at power supply #2 must be connected to +24 V DC. If available, set the power supplies for parallel output.

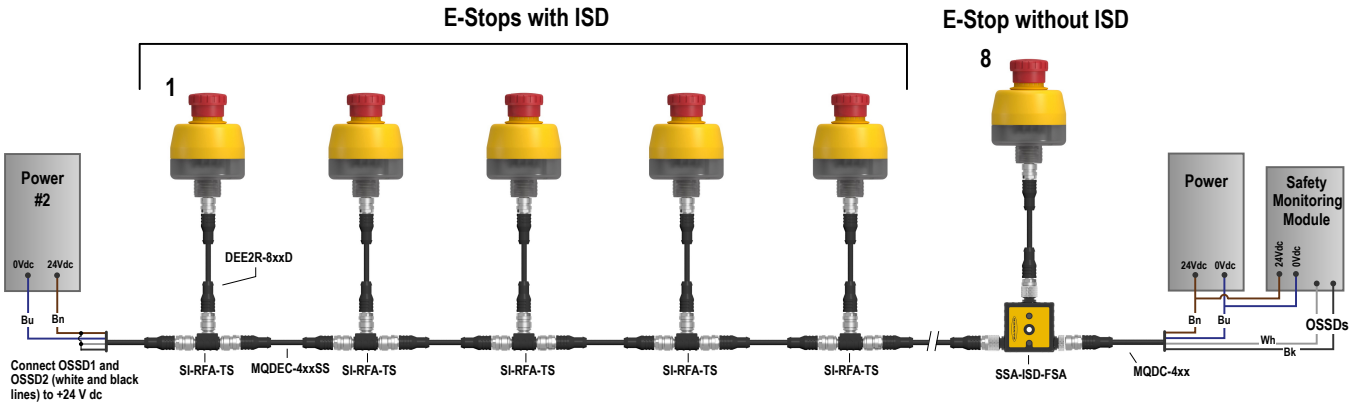
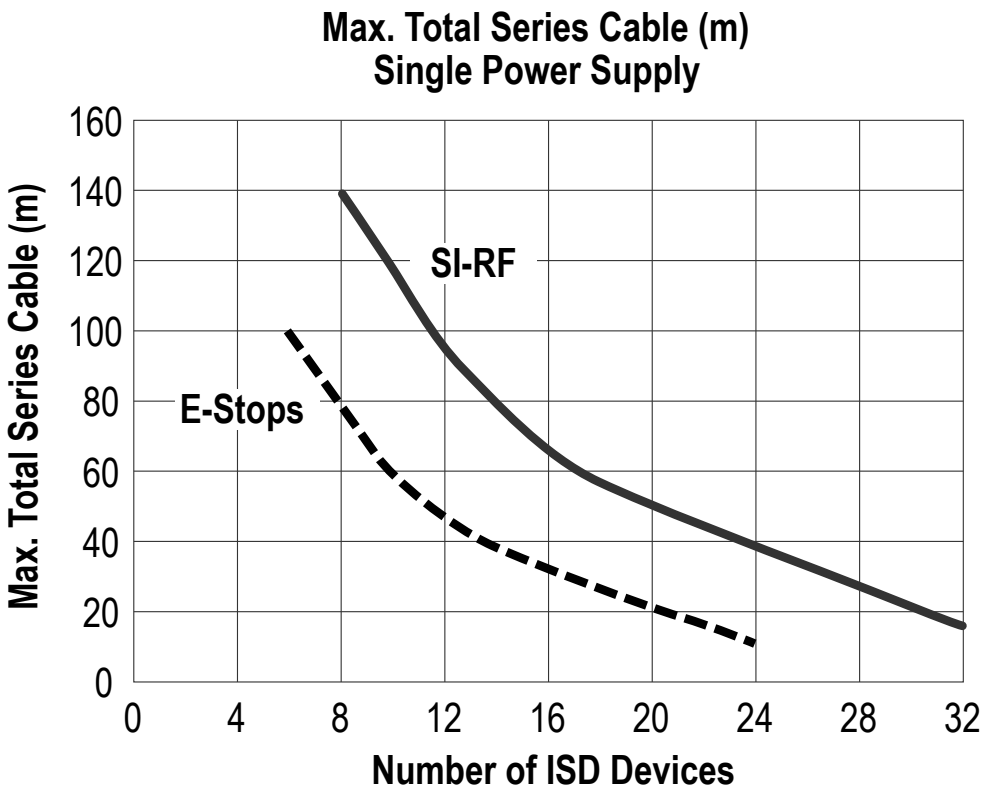


Figure 8. Maximum total cable length for a single power supply



The ISD Connect has a similar current demand to the SI-RFD sensors. However, when used with a number of lighted ISD E-Stops, the current draw of the E-stops governs the cable lengths and when more power is needed.

WARNING:
- **Safety devices with OSSDs and without ISD, such as safety light curtains, are not compatible.**
- Failure to follow these instructions could result in serious injury or death.
- Do not use safety devices with OSSDs and without ISD in a series connection of multiple ISD devices.

Note:
- **Safety devices with solid-state OSSDs are not acceptable Input Devices**
- Failure to follow these instructions could result in serious injury or death.
- Only use safety devices with two normally closed (NC) contacts as input devices to the SSA-ISD Connect.

2.6 Checkout

At machine set up, a *Designated Person*[3] should test each safety point for proper machine shutdown response. A *Designated Person* should check the safety point for proper operation, physical damage, button looseness, and excessive environmental contamination. This should take place on a periodic schedule determined by the user, based on the severity of the operating environment and the frequency of switch actuations.

Adjust, repair, or replace components as needed. If inspection reveals contamination on the switch, thoroughly clean the switch and eliminate the cause of the contamination. Replace the switch and/or appropriate components when any parts or assemblies are damaged, broken, deformed, or badly worn; or if the electrical/mechanical specifications (for the environment and operating conditions) have been exceeded.

[3] A *Designated Person* is identified in writing by the employer as being appropriately trained to perform a specified checkout procedure. A Qualified Person possesses a recognized degree or certificate or has extensive knowledge, training, and experience to solve problems relating to the emergency stop installation.

Always test the control system for proper functioning under machine control conditions after performing maintenance, replacing the safety point, or replacing any component of the device.

2.7 In-Series Diagnostic (ISD) Information

The information transmitted via the In-Series Diagnostic (ISD) interface is not safety related. The diagnostic technology allows a wide range of device information to be loaded into the machine control system.

To interpret this information, Banner diagnostic modules are available, including the SI-RF-DM1 and -DM2 Diagnostic Modules and the SC10-2roe Safety Controller. Refer to the instruction manuals for detailed information on the diagnostic devices. By means of diagnostics, the following information can be transmitted, among others:

- Safety Device Status (on, off, or faulted)
- Under-voltages in the series connection (chain)
- Attempts to remove a device from the chain
- Wrong order of devices in the chain

At this time this information can be refined using the following interfaces:

- USB - Displays device information on the PC (requires using the SI-RF-DM1 or SC10-2roe)
- IO-Link - Bus independent data reading into the control system (requires using the SI-RF-DM1 or SI-RF-DM2 and an IO-Link master)
- Industrial Ethernet Protocols - Bus data reading into the control system (requires using the SC10-2roe Safety Controller)

3 Specifications

Important: Interface the SSA-ISD Connect with Indication only to a SELV (Safety Extra-Low Voltage) for circuits without earth ground or a PELV (Protected Extra-Low Voltage) for circuits with earth ground power supply according to EN/IEC 60950.

Rated Supply Voltage (Ue)
24 V DC +15%, -20% (SELV/PELV power supply)
The external voltage supply must be capable of buffering brief mains interruptions of 20 ms, as specified in IEC/EN 60204-1.

Rated Conditional Short-Circuit Current
100 A

Rated Isolation Voltage (Ui)
75 V DC

No-Load Current
60 mA typical at 24 V DC
75 mA maximum at 19.2 V DC

Rated Impulse Withstand Voltage (Uimp)
500 V

Indication
Red (618 nm), Green (525 nm)

Housing/connectors
Housing: Polyvinyl Chloride (PVC), Black
Connector Nuts: Nickel plating on Cu/Zn allow

Vibration Resistance
Operating extremes: 10 Hz to 500 Hz, amplitude 0.35 mm, acceleration 50 m/s^2

Operating Conditions
–25 °C to +55 °C (–13 °F to +131 °F)
45% to 85% relative humidity (no condensation)

Environmental Ratings
For Indoor Use Only
IEC IP65, IEC IP67 (EN 60529)

OSSD Outputs
Two, solid-state, current sourcing PNP outputs
Switching element function: PNP, NO
Voltage level: according to Type 3 EN 61131-2
Maximum operating current: 30 mA
Leakage current: ≤ 1 mA DC
On-state voltage: ≥ Ue – 3 V
Protection: Sustained short circuit and overload protection; thermal / digital (clocking)
Test pulse duration: 70 us
Test pulse rate: 1 s

Input Device Requirements
Accepts two normally closed (NC) contacts

Simultaneity Requirement
Three seconds

Power Up Delay
≤ 2 s

Response Time
40 ms maximum + (7 ms × number of following ISD devices)

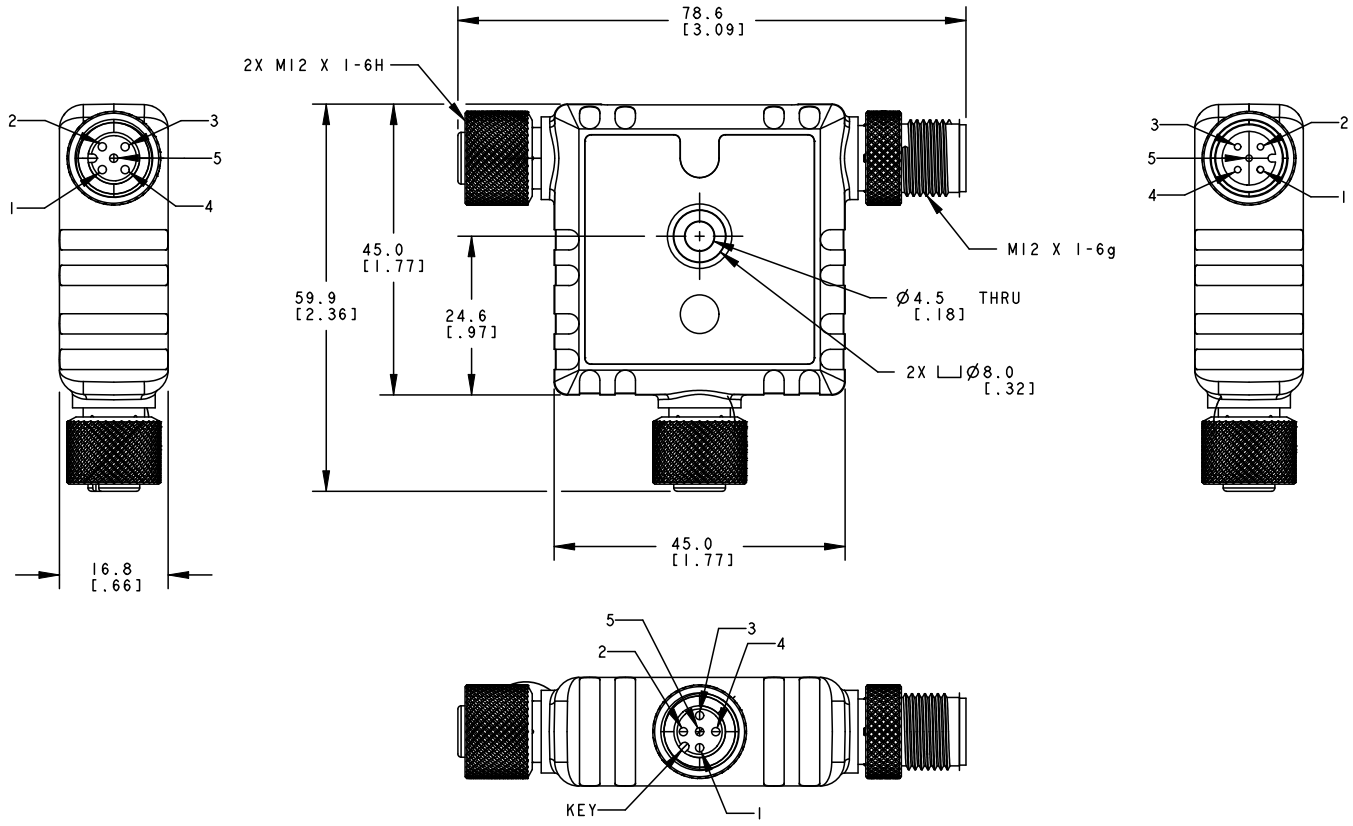
Maximum Cable Length Between ISD Devices
30 m

EMC
According to EN 61326-1 and EN 61326-3-1

Safety Data
SIL 3 (IEC 61508)
SILCL 3 (EN 62061)
Category 4, PL e (EN ISO 13849-1)
PFHD: 6.56 × 10^{-9} 1/h according to EN 62061
Service Life: 20 years

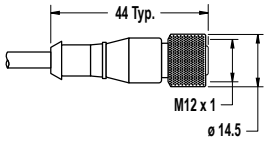
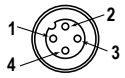
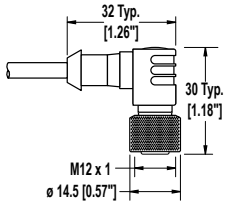
3.1 Dimensions

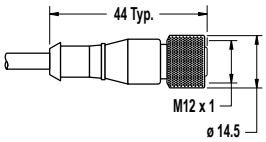
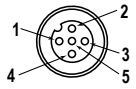
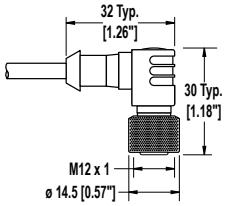
All measurements are listed in millimeters, unless noted otherwise.

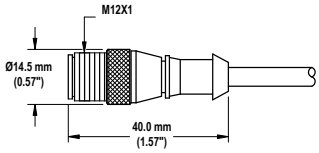
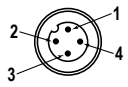


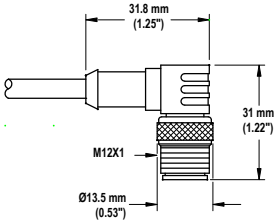
4 Accessories

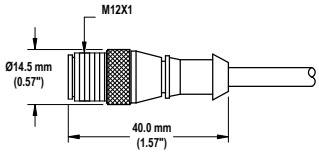
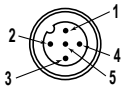
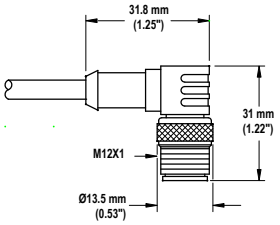
4.1 Cordsets

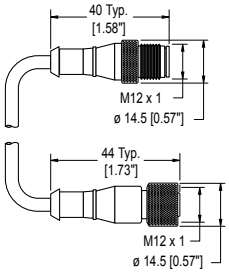
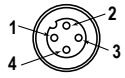
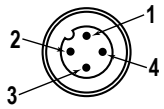
4-Pin Threaded M12 Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDC-406	2 m (6.56 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-415	5 m (16.4 ft)			
MQDC-430	9 m (29.5 ft)			
MQDC-450	15 m (49.2 ft)			
MQDC-406RA	2 m (6.56 ft)	Right-Angle		
MQDC-415RA	5 m (16.4 ft)			
MQDC-430RA	9 m (29.5 ft)			
MQDC-450RA	15 m (49.2 ft)			

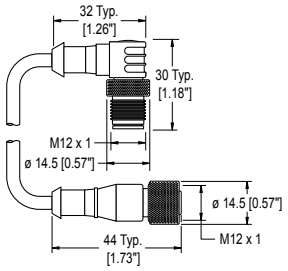
5-Pin Threaded M12 Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDC1-501.5	0.5 m (1.5 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDC1-506	2 m (6.5 ft)			
MQDC1-515	5 m (16.4 ft)			
MQDC1-530	9 m (29.5 ft)			
MQDC1-506RA	2 m (6.5 ft)	Right-Angle		
MQDC1-515RA	5 m (16.4 ft)			
MQDC1-530RA	9 m (29.5 ft)			

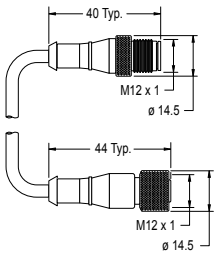
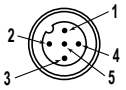
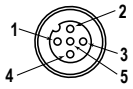
4-Pin Threaded Male M12 Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Male)**
MQDMC-401	0.23 m (0.75 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MQDMC-406	1.83 m (6 ft)			
MQDMC-415	4.57 m (15 ft)			
MQDMC-430	9.14 m (30 ft)			

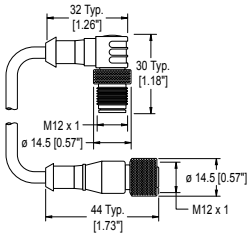
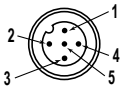
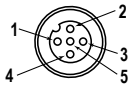
4-Pin Threaded Male M12 Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Male)**
MQDMC-406RA	1.83 m (6 ft)	Right-angle		
MQDMC-415RA	4.57 m (15 ft)			
MQDMC-430RA	9.14 m (30 ft)			

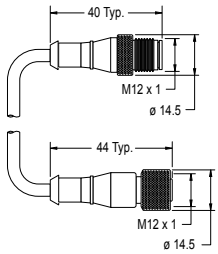
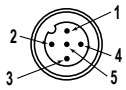
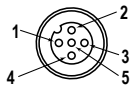
5-Pin Threaded Male M12 Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Male)**
MQDMC-501	0.3 m (1 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Gray
MQDMC-506	2.04 m (6.69 ft)			
MQDMC-515	5.04 m (16.5 ft)			
MQDMC-530	9.04 m (29.7 ft)			
MQDMC-506RA	2 m (6.56 ft)	Right-Angle		
MQDMC-515RA	5 m (16.4 ft)			
MQDMC-530RA	9 m (29.5 ft)			

4-Pin Threaded M12 Cordsets—Double Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout**
MQDEC-401SS	0.31 m (1 ft)	Male Straight/ Female Straight		Female  Male  1 = Brown 2 = White 3 = Blue 4 = Black
MQDEC-403SS	0.91 m (2.99 ft)			
MQDEC-406SS	1.83 m (6 ft)			
MQDEC-412SS	3.66 m (12 ft)			
MQDEC-420SS	6.10 m (20 ft)			
MQDEC-430SS	9.14 m (30.2 ft)			
MQDEC-450SS	15.2 m (49.9 ft)			

4-Pin Threaded M12 Cordsets—Double Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout**
MQDEC-403RS	0.91 m (2.99 ft)	Male Right-Angle/ Female Straight		
MQDEC-406RS	1.83 m (6 ft)			
MQDEC-412RS	3.66 m (12 ft)			
MQDEC-420RS	6.10 m (20 ft)			
MQDEC-430RS	9.14 m (30.2 ft)			
MQDEC-450RS	15.2 m (49.9 ft)			

5-Pin Threaded M12 Cordsets—Double Ended					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Male)**	**Pinout (Female)**
MQDEC-501SS	0.31 m (1.02 ft)	Male Straight/ Female Straight			
MQDEC-503SS	0.91 m (2.99 ft)			1 = Brown 2 = White 3 = Blue	4 = Black 5 = Gray
MQDEC-506SS	1.83 m (6 ft)				
MQDEC-512SS	3.66 m (12 ft)				

5-Pin Threaded M12 Cordsets—Double Ended					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Male)**	**Pinout (Female)**
MQDEC-501RS	0.31 m (1.02 ft)	Male Right-angle/Female Straight			
MQDEC-503RS	0.91 m (2.99 ft)			1 = Brown 2 = White 3 = Blue	4 = Black 5 = Gray
MQDEC-506RS	1.83 m (6 ft)				
MQDEC-512RS	3.66 m (12 ft)				

5-Pin Threaded M12 Cordsets—Double Ended					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Male)**	**Pinout (Female)**
DEE2R-51D	0.3 m (1 ft)	Female Straight/Male Straight			
DEE2R-53D	0.91 m (3 ft)				
DEE2R-58D	2.44 m (8 ft)				
DEE2R-515D	4.57 m (15 ft)				
DEE2R-525D	7.62 m (25 ft)				
DEE2R-550D	15.2 m (50 ft)			1 = Brown 2 = White 3 = Blue	4 = Black 5 = Green/Yellow
DEE2R-575D	22.9 m (75 ft)				

5-Pin Threaded M12 Cordsets—Double Ended					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Male)**	**Pinout (Female)**
DEE2R-5100D	30.5 m (100 ft)				

4.2 Adapters and Other Accessories

Model	Description
SI-RFA-TS	SI-RF T-adapter for series connection, 4 pin to 8 pin to 4 pin
SI-RFA-TK	SI-RF T-adapter for connection of the reset button, 8 pin to 4 pin to 8 pin
SI-RFA-P	SI-RF Termination plug M12
SI-RFA-DM1	SI-RF Diagnostic Module with 8 digital outputs and 1 diagnostic circuit Interfaces: IO-Link, USB 2.0
SI-RDA-DM2	SI-RF Diagnostic Module with 1 diagnostic circuit Interfaces: IO-Link

4.3 Safety Controllers

Safety Controllers provide a fully configurable, software-based safety logic solution for monitoring safety and non-safety devices. For additional models and XS26 expansion modules, see instruction manual p/n 174868 (XS/SC26-2).

Non-Expandable Models	Expandable Models	Description
SC26-2	**XS26-2**	26 convertible I/O and 2 Redundant Solid State Safety Outputs
SC26-2d	**XS26-2d**	26 convertible I/O and 2 Redundant Solid State Safety Outputs with Display
SC26-2e	**XS26-2e**	26 convertible I/O and 2 Redundant Solid State Safety Outputs with Ethernet
SC26-2de	**XS26-2de**	26 convertible I/O and 2 Redundant Solid State Safety Outputs with Display and Ethernet
SC10-2roe		10 Inputs, 2 redundant relay safety outputs (3 contacts each) (ISD compatible)

4.4 ISD Connect Compatible Devices

The following tables list devices that can be directly connected to the ISD Connect via Quick Disconnect cables.

The following E-stops with Quick Disconnect connectors can be directly connected to the SSA-ISD-TCA using a MQDEC-5xxSS or DEE2R-5xxD cable.

Model	Push Button	Housing	E-Stop Contacts	Connections
SSA-EB1P-02ECQ5A	Standard 40 mm	30 mm mount	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5
SSA-EB2P-02ECQ5A	Large 60 mm	30 mm mount	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5
SSA-EB1P-02ED1Q5A	Standard 40 mm	Flush mount	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5
SSA-EB2P-02ED1Q5A	Large 60 mm	Flush mount	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5
SSA-EB1PM-02ED1Q5A	Lockable 44 mm	Flush mount	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5

Model	Push Button	Housing	E-Stop Contacts	Connections
SSA-EB1PL2-02ECQ5A	Illuminated 40 mm	30 mm mount	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5

The following Safety Limit and Hinge Switches with Quick Disconnect connectors can be directly connected to the SSA-ISA-TCA with splitter cable CSE5A-M1251M1251 and MQDEC-5xxSS or DEE2R-5xxD if needed. The SI-HG(Z)63 units need a MQEAC-601-Q5A adapter cable per switch.

Model	Style	Housing Material	Contact Configuration	Connections
SI-LM40KHE-Q5A [4]	Limit Switch	Metal	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5
SI-LS83E-Q5A [4]	Limit Switch	Plastic	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5
SI-LS100F-Q5A [4]	Limit Switch	Plastic	2 NC/1 NO	CH1 = pin 1 & 2, CH2 = pin 4 & 5
SI-QM90E-Q5A [4]	Limit Switch	Plastic	2 NC	CH1 = pin 1 & 2, CH2 = pin 4 & 5
SI-HG63FQDL	Hinge	Stainless Steel	2 NC/1 NO	
SI-HGZ63FQDL	Hinge	Zinc Diecast	2 NC/1 NO	
SI-HG63FQDR	Hinge	Stainless Steel	2 NC/1 NO	
SI-HGZ63FQDR	Hinge	Zinc Diecast	2 NC/1 NO	
SI-HG63FQDRR	Hinge	Stainless Steel	2 NC/1 NO	
SI-HG63FQDRR	Hinge	Zinc Diecast	2 NC/1 NO	

[4] Actuator, cable gland and/or conduit adapter ordered separately.

5 Product Support and Maintenance

5.1 Maintenance and Service

Do not use alcoholic cleaning agents.

The SSA-ISD Connect is maintenance-free.

For long-term and trouble-free operation, please periodically check the following points:

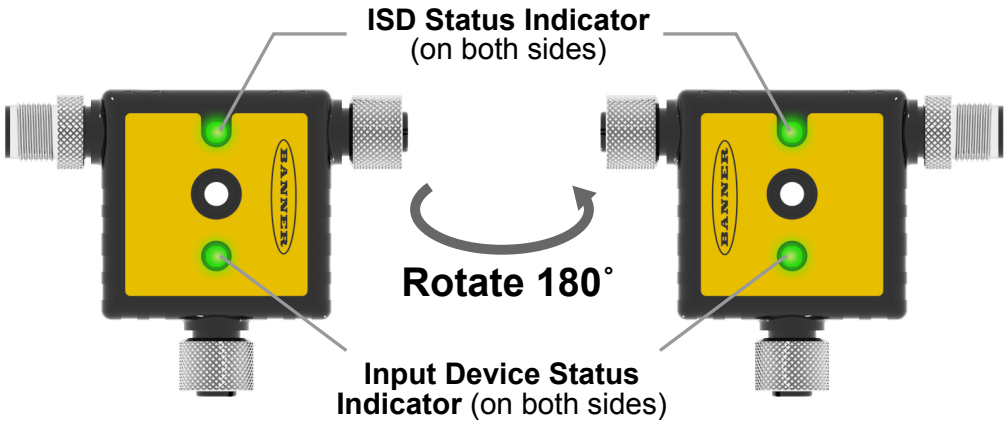
- solid fit of all components
- reliable switching function
- if damage occurs, please exchange the relevant components

Liability disclaimer— By breach of the given instructions (concerning the intended use, the safety instructions, the installation and connection through qualified personnel and the testing of the safety function) manufacturer's liability expires.

5.2 Status Indicators

The SSA-ISD Connect with Indication has matching indicators on both sides to allow for installation needs and still provide adequate indication visibility. Each indicator displays both red and green. When power is applied, both LEDs flash red/green/off, then turn on in the appropriate state (red or green).

Figure 9. SSA-ISD Connect status indicators



Input Device Status (Two NC Contact Status)	OSSD Inputs	SSA-ISD Connect Status	OSSD Outputs	Input Device LED	ISD Status LED
Run State (closed)	On	Normal	On	Green	Green
Run State (closed)	Off	Normal	Off	Green	Red
Off State (open)	On	Normal	Off	Red	Green
Off State (open)	Off	Normal	Off	Red	Red
x	x	Fault (Volt. Mon)	Off	Red Flashing	Red Flashing
Run State (closed)	On	Fault (OSSD)	On/Off *	Red Flashing	Red Flashing
x	x	Fault (internal)	Off	Red Flashing	Red Flashing

*OSSD Fault Tolerant Mode: OSSDs remain on for 20 minutes then turn off. For more information, see Fault Tolerant Output Feature on p. 6.

5.3 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
SSA-ISD Connect with Indication	Machinery Directive 2006/42/EC

Representative in EU: Peter Mertens, Managing Director, Banner Engineering BV. Address: Park Lane, Culliganlaan 2F, bus 3,1831 Diegem, Belgium.

5.4 ISD Information Available Using ISD

Obtain the following information from the ISD chain and a diagnostic unit or an ISD-enabled Safety Controller.

Cyclic Data about the Chain		
Short Name	**Data Format**	**Description**
Count mismatch	1/0	The number of devices in chain does not match configuration
Order mismatch	1/0	The order of devices in the chain does not match the configuration
No ISD data detected	1/0	No (or corrupted) ISD data being transmitted (being received by diagnostic device)
Incompatible device	1/0	The chain or a unit in the chain has data but not ISD data
ISD detected not configured	1/0	ISD data detected on inputs that are not configured as ISD input
Terminator missing	1/0	Terminator plug not present (or inputs to first device low)
Actuator not taught	1/0	Not applicable
Wrong actuator detected	1/0	Not applicable
Internal unit error	1/0	A unit in the chain has an internal error
Output fault detected	1/0	A unit in the chain has an output fault and will turn off after the switch off delay period

Individual Unit Data - Flags		
Short Name	**Data Format**	**Description**
Actuator detected	1/0	Not applicable
Wrong actuator detected/Input status	1/0	Input devices connect status
Sensor not paired	1/0	Not applicable
Output 1	1/0	Output 1 is on
Output 2	1/0	Output 2 is on
Marginal range/Input status	1/0	Input devices contact status
Input 1	1/0	ISD device input 1 is on
Input 2	1/0	ISD device input 2 is on
Local reset expected	1/0	An ISD device with the latch feature requires a reset
Operating voltage warning	1/0	Voltage to the ISD device is at the limit of specifications
ISD data error	1/0	ISD error bit, corrupted data was received from the SI-RF ISD chain of switches.
Safety input fault	1/0	The system detected a fault on a safety input of an ISD device, power cycle required
Output error	1/0	ISD Device detects an output short to voltage or ground. This starts the "switch-off timer" counter.
Operating voltage error	1/0	Voltage to the ISD Device is above (over 30 V DC) or below (less than 19.2 V DC) limit of range.
Power cycle required	1/0	ISD Device detects a fault, a power cycled required.

Individual Unit Data - Configuration		
Short Name	**Data Format**	**Description**
Local reset unit	1/0	The ISD Device includes the latch feature
High coding level	1/0	Not applicable
Cascadable	1/0	The ISD Device includes the cascade feature Note: This will always be true for Emergency Stop models with ISD.
Fault tolerant outputs	1/0	Indicates that the ISD Device includes the fault tolerant output feature where output faults cause a 20 minute off delay/fault delay. Note: This will always be true for Emergency Stop models with ISD.

Individual Unit Data - Values		
Short Name	**Data Format**	**Description**
Device		Type of ISD Device
Expected code		Not applicable
Received code		Not applicable
Teach-ins remaining	number	Not applicable
Number of voltage errors	number	The number of voltage warnings received in the last 60 seconds (voltage is checked every second), a number between 0 and 60
Number of operations	number	The number of on/off cycles the device has experienced
Output switch-off time	number	The delay counter for certain output faults (0 - inactive, 20 to 1 - remaining minutes to device lockout state)
Range warning count	number	Not applicable
Supply voltage	number	The actual input voltage detected by the ISD device.
Internal temperature	number	The internal temperature of the ISD device (°C)
Actuator distance	number	Not applicable
Expected company name		Not applicable, value of 6 will be received
Received company name		Not applicable, this is the code received from an actuator (for RFID switches)

Note: If an ISD chain is in operation and is severed (for example, a cable is cut, a cable came loose, etc.), the ISD information stops. After a number of seconds (approximately 5 seconds) the information resumes minus the devices that have been separated from the chain.

5.5 Contact Us

Banner Engineering Corp. headquarters is located at:

9714 Tenth Avenue North
Minneapolis, MN 55441, USA
Phone: + 1 888 373 6767

For worldwide locations and local representatives, visit www.bannerengineering.com.

5.6 Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp. Any misuse, abuse, or improper application or installation of this product or use of the product for personal protection applications when the product is identified as not intended for such purposes will void the product warranty. Any modifications to this product without prior express approval by Banner Engineering Corp will void the product warranties. All specifications published in this document are subject to change; Banner reserves the right to modify product specifications or update documentation at any time. Specifications and product information in English supersede that which is provided in any other language. For the most recent version of any documentation, refer to: www.bannerengineering.com.

For patent information, see www.bannerengineering.com/patents.