SETTING UP A SAFETY CONFIGURATION STEP-BY-STEP

TECHNOLOGY BRIEF

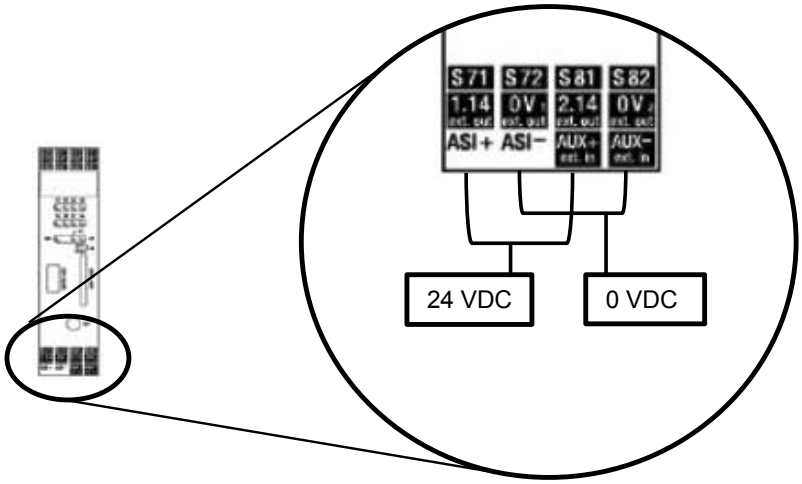
The following example configurations are intended to show how the Pepperl+Fuchs safety controller can be used to solve everyday safety applications. While each example has been designed with the utmost care users are reminded that they have to verify that the setups satisfy the rules and conditions for their industries and those required by law and end user. Ultimately, we hope to provide a useful resource for all users of the SIMON+ configuration environment.

SAFETY AT WORK

Basic setup for examples 1–7

In order to try example configurations using the Pepperl+Fuchs safety controller, the following electrical connections need to be made. In addition to these connections, the configuration software SIMON+ (VAZ-SW-SIMON+) must be installed on a Windows PC. The communication interface between SIMON+ and the safety controller is established through a USB connection.

- +24 VDC on grey terminal **AUX+ ext. in**
- +24 VDC on yellow expansion port terminal **ASI+**
- 0 VDC on grey terminal **AUX - ext. in**
- 0 VDC on yellow expansion port terminal **ASI-**
- Output +24 VDC from safe output on terminal **1.14 ext. out**
- 0 VDC from safe output on terminal **0 V ext. out**



Applicable products:
VAS-2A8L-KE4-8SE safety controller
VAZ-SW-SIMON+ configuration software
18 Jan 2012

Part No. TDOCT-B0E1_ENG

Pepperl+Fuchs Group www.pepperl-fuchs.com
USA: +1 330 486 0001 fa-info@us.pepperl-fuchs.com
Germany: +49 621 776-4411 fa-info@de.pepperl-fuchs.com
Singapore: +65 6779 9091 fa-info@sg.pepperl-fuchs.com

PEPPERL+FUCHS SENSING YOUR NEEDS

TECHNOLOGY BRIEF

Example 1 – Simple e-stop circuit

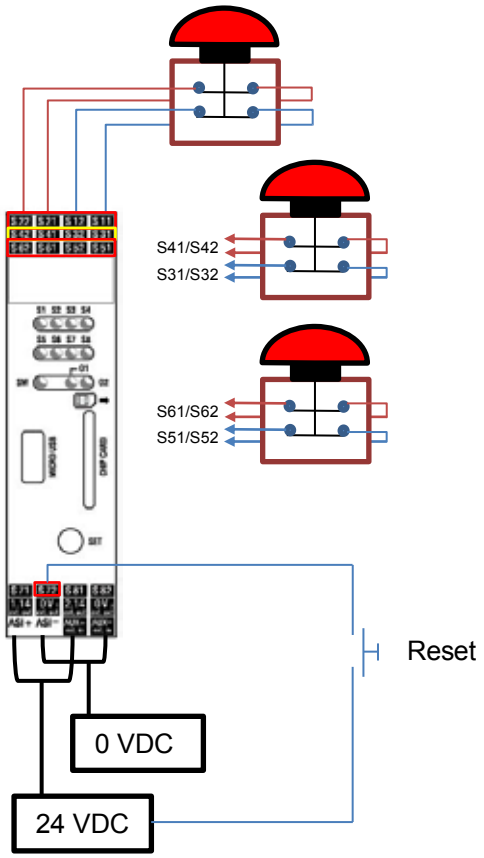
Depressing any one of the e-stops will turn OFF safe output OSSD1. Once all e-stops are in their released state, the reset can be activated and the safe output OSSD1 will turn ON.

Three dry contact e-stops

- E-stop 1 connected to S11/S12 and S21/S22
- E-stop 2 connected to S31/S32 and S41/S42
- E-stop 3 connected to S51/S52 and S61/S62

One reset acting on all e-stops

- Reset is activated by applying +24VDC to S72



Part No. TDOCT-B0E1_ENG

SETTING UP A SAFETY CONFIGURATION STEP-BY-STEP

Example 2 -- Simple e-stop and magnetic door switch setup

Depressing the e-stops will turn OFF safe output OSSD1. Once the e-stop has been released it can be reset. If doors are closed, the safe output OSSD1 will turn ON.
Opening any one of the doors will turn OFF safe output OSSD1. When all doors are closed, the safe output OSSD1 will turn ON automatically (no reset) provided the e-stop has been released and reset.

One dry contact e-stop

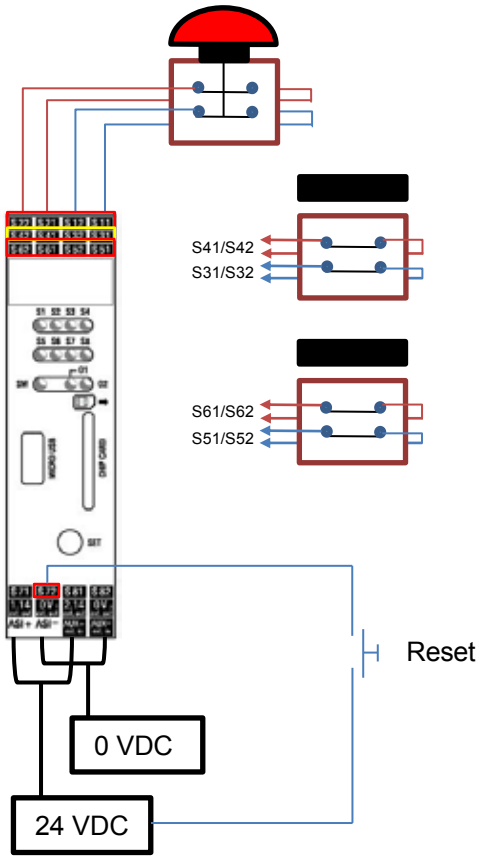
- E-stop 1 connected to S11/S12 and S21/S22

Two safety magnetic door switches

- Magnetic door switch 1 connected to S31/S32 and S41/S42
- Magnetic door switch 2 connected to S51/S52 and S61/S62

Reset acting on the e-stop only

- Reset is activated by applying +24 VDC to S72



Example 2a -- Magnetic door switches subject to strong bounce

Simple e-stop and magnetic door switch setup suitable in situations where the doors protected by the magnetic switches are subjected to significant bounce. This is a modification of example 2; the same electrical connections as shown for that example apply.
In this example, the setup of the magnetic door switches has been changed to allow short–term, single-contact opening of up to 200 ms (this time is user selectable). This is frequently necessary on small access doors used to cover conveyor systems in the food and packaging industries. All other settings are unchanged.
Depressing the e-stops will turn OFF safe output OSSD1. Once the e-stop has been released it can be reset. If doors are closed, the safe output OSSD1 will turn ON.
Opening any one of the doors will turn OFF safe output OSSD1. When all doors are closed, the safe output OSSD1 will turn ON automatically (no reset) provided the e-stop has been released and reset.

One dry contact e-stop

- E-stop 1 connected to S11/S12 and S21/S22

Two safety magnetic door switches

- Magnetic door switch 1 connected to S31/S32 and S41/S42
- Magnetic door switch 2 connected to S51/S52 and S61/S62

Reset acting on the e-stop only

- Reset is activated by applying +24 VDC to S72

Part No. TDOCT-B0E1_ENG

Example 3 – Simple e-stop, door switch and light curtain setup

This is a modification to example 2a. Any one of the three safe input devices will turn OFF the safe output OSSD1. When the e-stop or the light curtain has been released, the safety controller can be reset using input terminal S72. Just as in example 2a, the magnetic door switch does not require a reset.

One dry contact e-stop

E-stop 1 connected to S11/S12 and S21/S22

One safety magnetic door switch

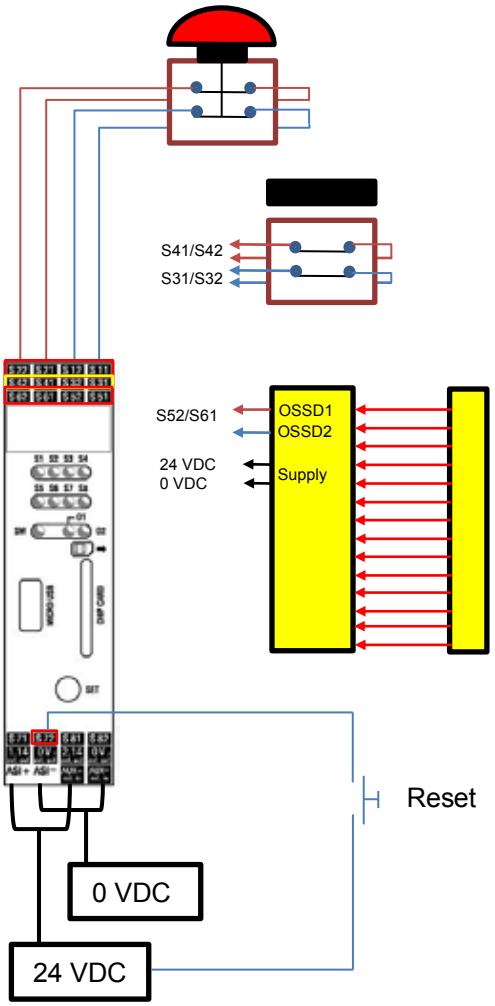
- Magnetic door switch connected to S31/S32 and S41/S42. It is configured for a situation with considerable bounce.

One light curtain

- Electronic safe outputs from light curtain are connected to S52/S61
- Power the light curtain from the same power supply used to power the safety controller

Reset acting on the e-stop and the light curtain

- Reset is activated by applying +24 VDC to S72



Pepperl+Fuchs Group
www.pepperl-fuchs.com
USA: +1 330 486 0001
fa-info@us.pepperl-fuchs.com
Germany: +49 621 776-4411
fa-info@de.pepperl-fuchs.com
Singapore: +65 6779 9091
fa-info@sg.pepperl-fuchs.com

Example 4 – Simple e-stop setup with feedback to PLC

This is a modification to example 1. Two conventional outputs are used to provide feedback (Safe Output OFF, Ready to Reset). Depressing any one of the e-stops will turn OFF safe output OSSD1. The deactivated OSSD1 is indicated to the PLC by means of a messaging output on the safety controller. Once all e-stops are in their released state, the reset can be activated and the safe output OSSD1 will turn ON. When the safety controller is ready to be reset but the reset signal has not been applied, a second messaging output "Ready to reset" on the safety controller is ON.

Three dry contact e-stops connected to inputs

- E-stop 1 connected to S11/S12 and S21/S22
- E-stop 2 connected to S31/S32 and S41/S42
- E-stop 3 connected to S51/S52 and S61/S62

One reset acting on all e-stops

- Reset is activated by applying +24 VDC to S72

Error Unlock

- The Error Unlock function is activated by applying +24 VDC to S81

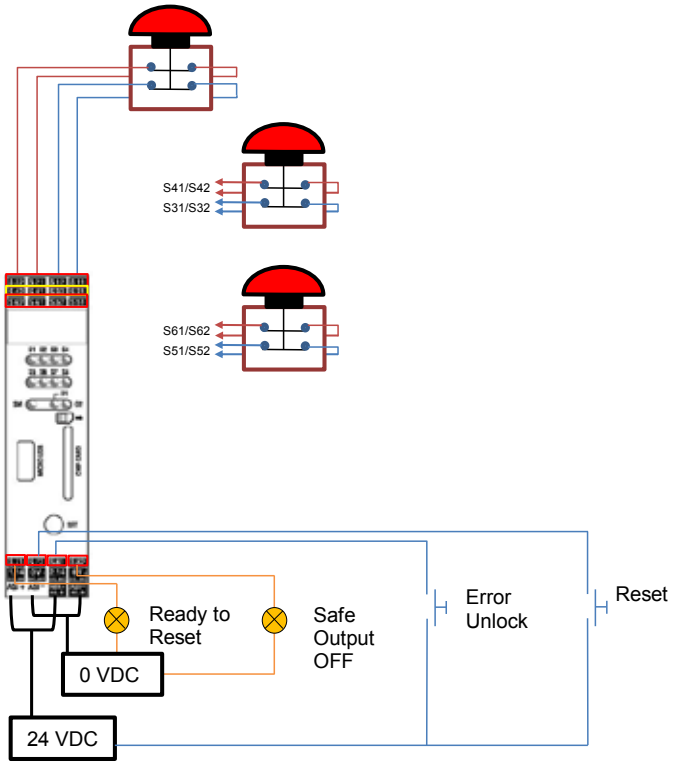
Feedback output signaling OSSD1 has been deactivated

- Output S82 is ON when safe output OSSD1 is OFF

Feedback output signaling that the safety controller is ready to be reset

- Output S71 is ON when all e-stops are released and safety controller is ready to reset the safe output OSSD1

The error unlock function of the safety controller can be initiated by applying +24 VDC to S81. This duplicates the operation of the multipurpose SET button on the safety controller.



Note: Assigning the output on terminal S71 and S82 to provide feedback functionality to the PLC is performed in the Output assignment window. Select Edit/Output assignment ... or click the icon.

S-18					Color of all devices - Grey
S-19		S71			Color of all devices - Yellow
S-20					Color of all devices - Green/Yellow

S-591					State of output switching element 16 - inve
S-640		S82			State of message output 1 - inverted
S-641					State of message output 2 - inverted

Instead of **"State of message output 1 – inverted," "State of output switching element 1-inverted"** can be used.

Part No. TDOCT-B0E1_ENG

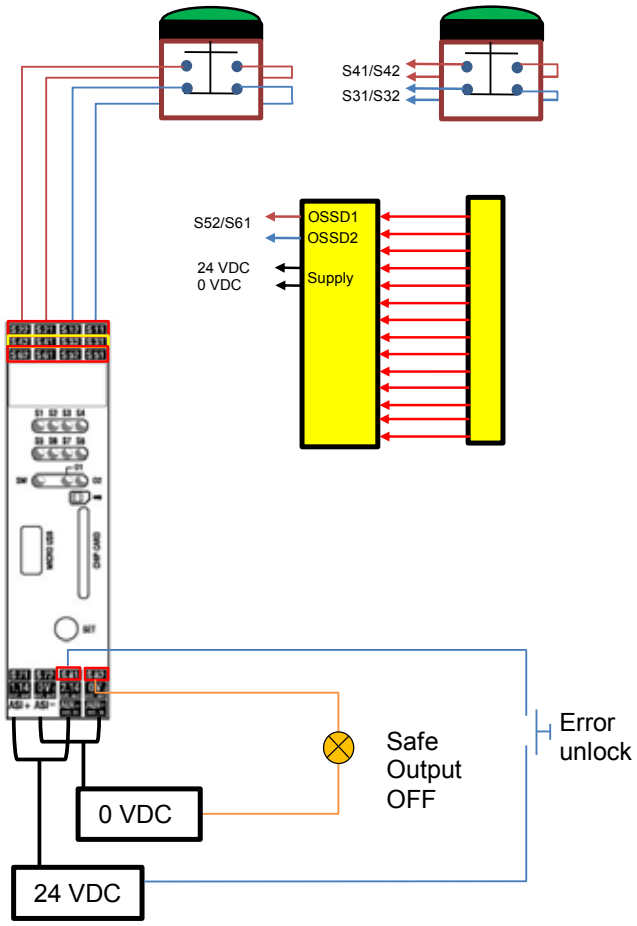
TECHNOLOGY BRIEF

Example 5 – Two-hand press control with light curtain

In this example, two safety palm buttons (e.g., Pepperl+Fuchs' capacitive safety palm button PB1-xx or PB2-xx) and an electronic light curtain are connected to the safety controller. For two-hand control, the following must be achieved in order to activate the safe output of the controller and thus cycle the press:

- Continuity – both palm buttons must remain activated for the entire time of the press stroke
- Synchronicity – the two palm buttons must be activated within 500 ms of each other
- Antitie-down – when one palm button is released, the other button must also be released before another press cycle can be started

Access to the press is also protected by an electronic light curtain. Should this light curtain be interrupted while the press is being cycled, the safe output turns OFF.



Two safety palm buttons

- PB 1 connected to S11/S12 and S21/S22
- PB 2 connected to S31/S32 and S41/S42

One safety light curtain

- Safe outputs from light curtain are connected to S52/S61
- Power the light curtain from the same power supply used to power the safety controller

Feedback output signaling that OSSD1 has been deactivated

- Output S82 is ON when safe output OSSD1 is OFF

Error Unlock

- The Error Unlock function is activated by applying +24 VDC to S81

S-591					State of output switching element 16 - inve
S-640		S82			State of message output 1 - inverted
S-641					State of message output 2 - inverted

Instead of **"State of message output 1 – inverted," "State of output switching element 1-inverted"** can be used.

Part No. TDOCT-B0E1_ENG

Pepperl+Fuchs Group www.pepperl-fuchs.com
USA: +1 330 486 0001 fa-info@us.pepperl-fuchs.com
Germany: +49 621 776-4411 fa-info@de.pepperl-fuchs.com
Singapore: +65 6779 9091 fa-info@sg.pepperl-fuchs.com

TECHNOLOGY BRIEF

Example 6 – Solenoid-locking door switch, e-stop, and indicators

In this example, a solenoid-locking door safety switch ("power to lock" or "power to unlock" design) and an e-stop are used. The safe output OSSD1 turns ON when the door is closed and latched and the e-stop is released. Non-safe inputs are used to detect when to lock/unlock the door. Messaging outputs are used to indicate when the safe output OSSD1 is OFF, the door is closed and locked, and the e-stop is ready to be reset.
OSSD 2 is used to control the solenoid; a messaging output cannot be used as it does not provide enough current to supply the solenoid.

One solenoid-locked safety door switch
- Door switch connected to S11/S12 and S21/S22

One safety e-stop
- E-stop connected to S31/S32 and S41/S42

Feedback output signaling that OSSD1 has been deactivated
- Output S82 is ON when the safe output OSSD1 is OFF

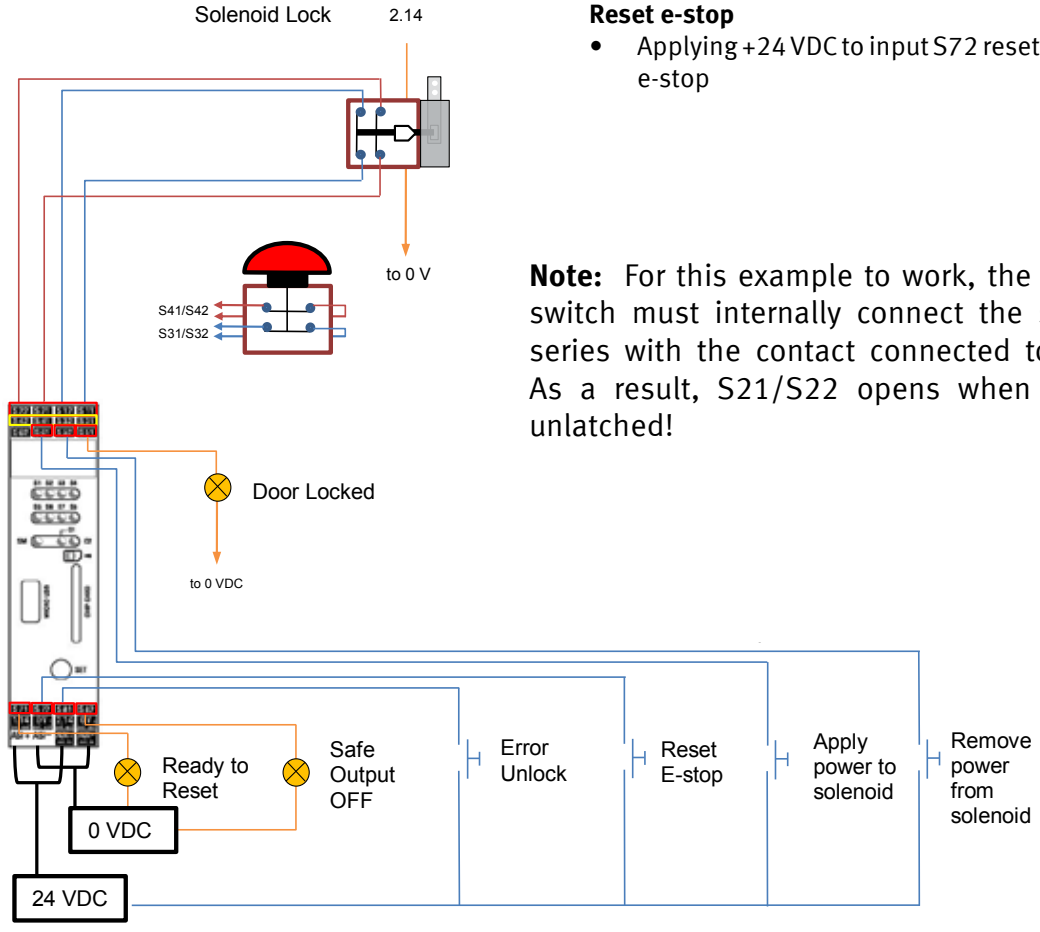
Feedback output signaling when e-stop is ready to be reset
- Output S71 is ON when e-stop is released and ready to be reset

Feedback output signaling when door is closed and locked
- Output S51 is ON when door is closed and locked

Door locking solenoid
- The solenoid is activated using OSSD2 output contacts 2.14 and 0 V

Solenoid control
- Applying +24 VDC to input S52 applies power to solenoid
- Applying +24 VDC to input S61 removes power from solenoid

Reset e-stop
- Applying +24 VDC to input S72 resets the released e-stop



Note: For this example to work, the safety door switch must internally connect the solenoid in series with the contact connected to S21/S22. As a result, S21/S22 opens when the key is unlatched!

Part No. TDOCT-B0E1_ENG

Example 6a – Solenoid-locking door (auto locking)

In this example, a solenoid-locking door safety switch ("power to unlock" design) and one e-stop are used. The safe output OSSD1 turns ON when the door is closed and latched (i.e., no power to the solenoid) and the e-stop is released and reset. A non-safe input is used to unlock the door switch. Messaging outputs are used to indicate that the safe output OSSD1 is OFF, the door is closed and locked, the door is unlocked and can be opened, and when the e-stop is ready to be reset. In this example, once unlocked, the door auto-locks after five seconds.
OSSD 2 is used to control the solenoid; a messaging output cannot be used as it does not provide enough current to supply the solenoid.

One solenoid-locked safety door switch
- Door switch connected to S11/S12 and S21/S22

One safety e-stop
- E-stop connected to S31/S32 and S41/S42

Feedback output signaling that OSSD1 has been deactivated
- Output S82 is ON when the safe output OSSD1 is OFF

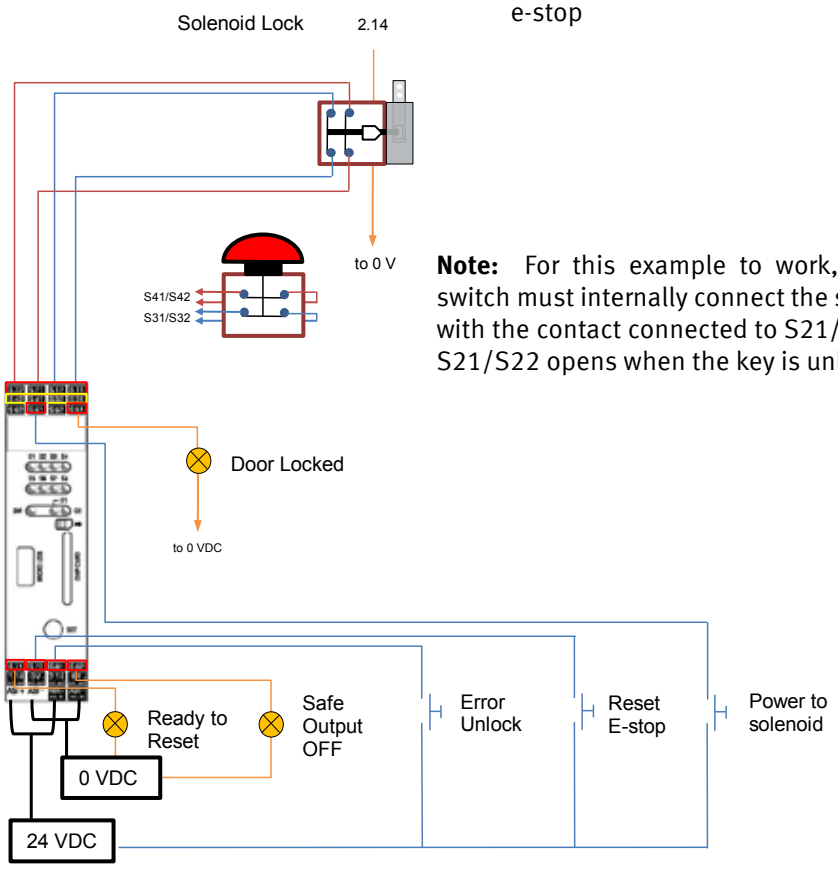
Feedback output signaling when e-stop is ready to be reset
- Output S71 is ON when e-stop is released and ready to be reset

Feedback output signaling when door is closed and locked
- Output S51 is ON when door is closed and locked

Door locking solenoid
- The solenoid is activated using OSSD2 output contacts 2.14 and 0 V

Solenoid control
- Applying +24 VDC to input S52 applies power to solenoid
- Applying +24 VDC to input S61 removes power from solenoid

Reset e-stop
- Applying +24 VDC to input S72 resets the released e-stop



Note: For this example to work, the safety door switch must internally connect the solenoid in series with the contact connected to S21/S22. As a result, S21/S22 opens when the key is unlatched!

Part No. TDOCT-B0E1_ENG

Example 7 – Safety circuit with EDM feedback

This is a modification of example 1. Safe output OSSD1 is used to drive the solenoid of a motor starter. The feedback contact on the motor starter is monitored. Depressing any one of the e-stops will turn OFF safe output OSSD1. Once all e-stops are in their released state, the reset can be activated and the safe output OSSD1 will turn ON . EDM is based on the following conditions:

1. When the output on the motor starter is closed, the feedback contact must open within a defined amount of time
2. When the output on the motor starter is opened, the feedback contact must be closed within a defined amount of time
3. The safety controller goes into the Error Lock state if the feedback contact does not operate as described in steps 1 and 2. The safety controller must now be reset using the SET button.

Three dry contact e-stops

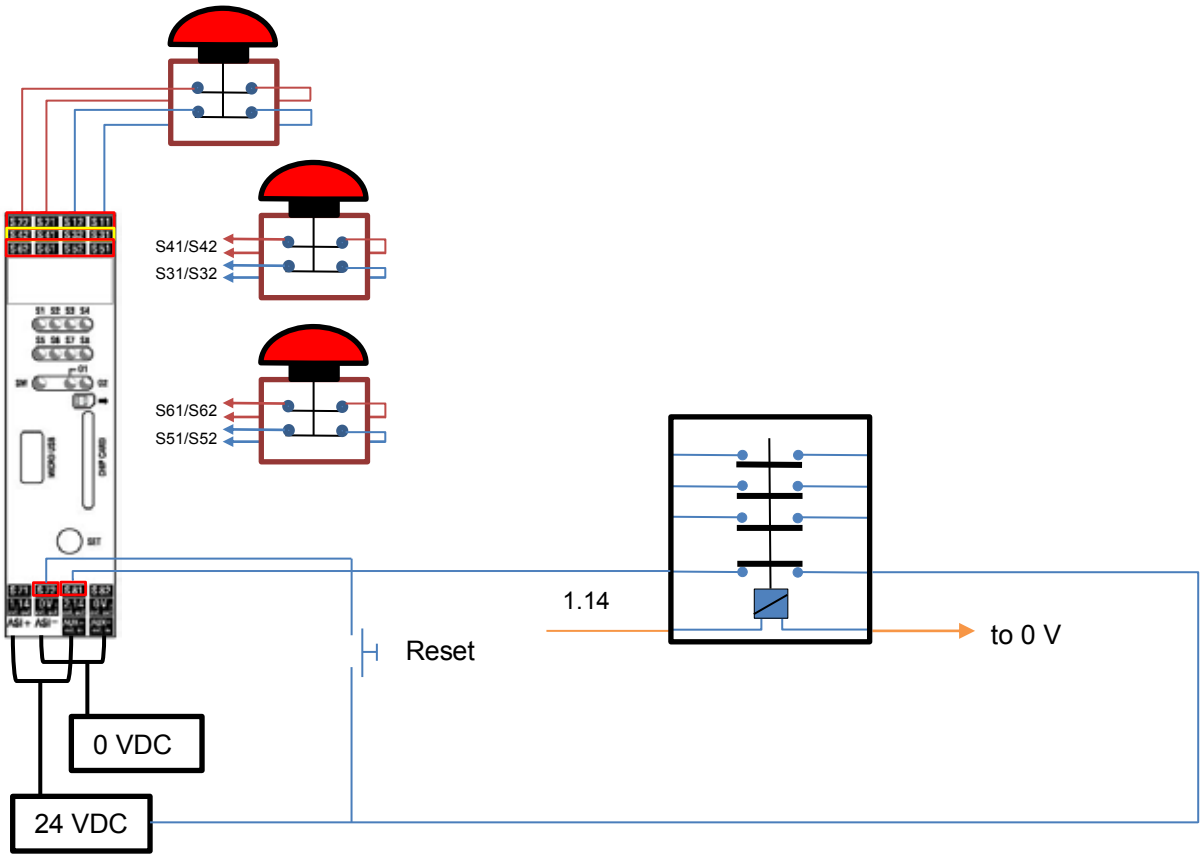
- E-stop 1 connected to S11/S12 and S21/S22
- E-stop 2 connected to S31/S32 and S41/S42
- E-stop 3 connected to S51/S52 and S61/S62

One reset acting on all e-stops

- Reset is activated by applying +24VDC to S72

EDM feedback contact

- Feedback is provided through input terminal S81



Pepperl+Fuchs Group
www.pepperl-fuchs.com
USA: +1 330 486 0001
fa-info@us.pepperl-fuchs.com
Germany: +49 621 776-4411
fa-info@de.pepperl-fuchs.com
Singapore: +65 6779 9091
fa-info@sg.pepperl-fuchs.com