

SERIES CSS 34

Pulse-Echo Based Compact Non-Contact Safety Sensor



Features & Benefits

- **Non-contact sensing ...** for long term reliability.
- **Four different actuating surfaces ...** for a variety of mounting options.
- **Sealed for moisture protection ...** ideal for most hostile environments. Meets both IP65 and IP67 requirements.
- **Tamper-resistant ...** frequency-matched sensor and actuator required for operation.
- **Integral LED diagnostic indicators ...** facilitate easy installation and troubleshooting.
- **Integral self-monitoring (CSS34), feedback and reset functions (CSS34F0/F1) ...** satisfy requirements of Safety Control Category 4, and may remove need for safety control module. *See note below.
- **Designed for “daisy chaining” ...** up to 200m.
- **Dual PNP 500mA safety outputs ...** for application versatility.
- **Integrated mounting plate included ...** allows for easy and accurate alignment of sensor and actuator.

Description

The CSS 34 non-contact, electronic safety sensor is designed for application in safety circuits and is used for monitoring the position of movable safety guards. In this application the safety sensor monitors the closed position of hinged, sliding or removable guards with the aid of a coded actuator.

The CSS 34 Safety Sensor fulfills the requirements for proximity devices with defined behavior under fault conditions according to EN 60947-5-3 with the classification PDF-M (self-monitoring).

The CSS 34 Safety Sensor and CST 34 actuator are a matched pair. As the actuator approaches the sensor, the sensor excites the actuator at a predetermined resonant frequency and the reads back the actuator oscillation. The sensor evaluates the actuator frequency and its distance to the actuator.

Identification of the actuator is interpreted as a closed guard by the safety sensor, and the safety outputs are enabled.

The safety sensor is a dual channel design with two short-circuit proof, safe PNP outputs, each of which can switch up to 250 mA. Due to continuous internal function tests and the monitoring of the safety outputs, a number of CSS 34 Safety Sensors can be wired in series without detriment to the control category. Series wired safety sensors continue to fulfill the requirements of Control Category 4 according to EN 954-1.

The models CSS34 F0/F1 have an integrated feedback option that control positive-guided contactors/relays without the need for a downstream safety control module. The integrated start/restart interlock feature provides an input for a reset pushbutton with edge detection, or without edge detection (suitable for automatic reset). The CSS34F0/F1 models are suitable as individual or end devices in a series wired chain of standard CSS34 sensors to replace a safety control module. The CSS34F0/F1 system, comprising the sensor, monitored relay and the reset switch, meets the requirements of Control Category 4 according to EN954-1, provided that positive guided contactors/relays are used.

Typical Applications

The sealed, compact units are ideal for use on movable machine guards where multiple guard monitoring on a machine is required, and/or where hostile environments exist. Typical applications include printing machinery, textile machinery, paper converting equipment, material handling systems, packaging machinery, chemical processing equipment, and wood-working machinery.

AVAILABLE MODELS AND ACTUATORS (Actuators Ordered Separately)

Model Number Standard Version	Description
CSS12-34-VDML*	Top Actuating surface with diagnostic output
CSS12-34-VDMST*	Top Actuating surface with diagnostic output, M12 Cable connector
CSS14-34-SDML*	Side Actuation surface with diagnostic output
CSS14-34-SDMST*	Side Actuation surface with diagnostic output, M12 Cable connector
F0	Integrated Feedback, without edge detection, auto-reset
CSS12-34F0-VDMST	Top Actuating surface with diagnostic output, M12 Cable connector
CSS14-34F0-SDMST	Side Actuation surface with diagnostic output, M12 Cable connector
F1	Integrated Feedback, with edge detection of reset button, manual reset
CSS12-34F1-VDMST	Top Actuating surface with diagnostic output, M12 Cable connector
CSS14-34F1-SDMST	Side Actuation surface with diagnostic output, M12 Cable connector
CST34-S-1	Side surface actuator
CST34-V-1	Top surface actuator

Sensors available with a serial diagnostic cable, for use with a PROFIBUS DP network. Please consult factory.

*See note below.

Safety Control Module Requirements

Dual-channel safety inputs, suitable for PNP semiconductor outputs. The internal function tests of the sensor cause the outputs to periodically switch off for a millisecond. This must be tolerated by the control module. The following SCHMERSAL safety control module is recommended for this application: SRB 301 LCB, SRB 324 ST

*Note: A safety control module may be required for reset function and/or feedback monitoring functions, as well as increased output current requirements.

SERIES CSS 34 TECHNICAL DATA

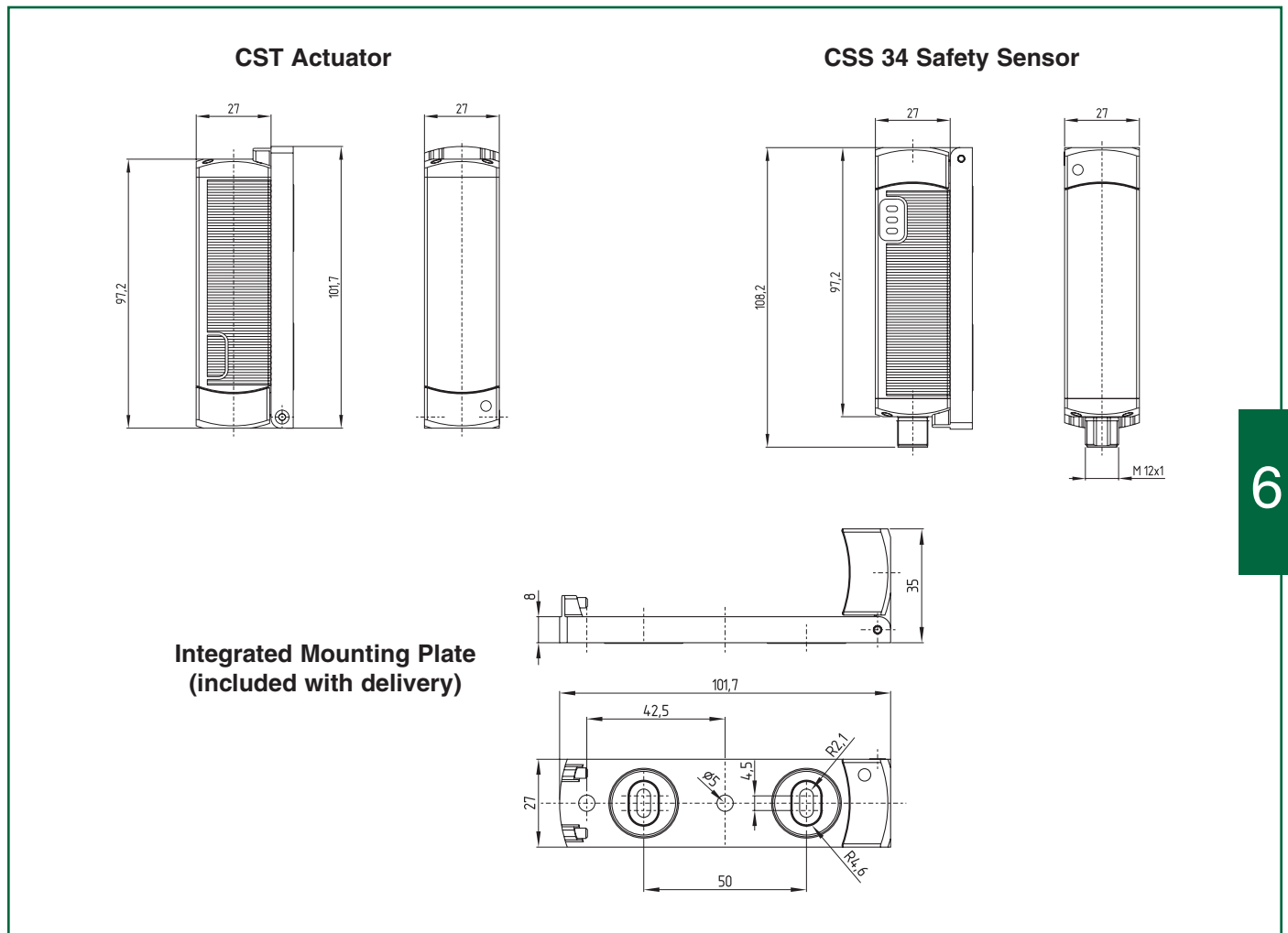
MECHANICAL SPECIFICATIONS

Housing	Glass fiber reinforced thermoplastic
Degree of Protection	IP65 and IP67
Switching Distance	Top (V) 12mm Nominal 10-15mm (Maximum) Side (S) 14mm Nominal 12-17mm (Maximum)
Operating Temperature	-25°C to +70°C
Storage Temperature	-25°C to +85°C
Hysteresis	1mm
Repeatability	≤ 0.5mm
Response Time	≤ 30ms
Vibration Resistance	10-55Hz, amplitude 1mm
Shock Resistance	30g/11ms
Conformity to Standards	CE BG EN 60947-5-3 UL/CSA EN 954-1 IEC 61508

ELECTRICAL SPECIFICATIONS

Mode of Operation	Inductive
Rated Operating Voltage	24 VDC -15%/+10%
Rated Operating Current	0.6A
No Load Current	0.1A
Residual Current	≤ 0.5mA
Rated Impulse Withstand Voltage	1 kV
Rated Insulation Voltage	32 VAC/VDC
Safety Outputs	(2) PNP, short-circuit proof
Safety Output Current	0.25A per output
Safety Output Voltage Drop	Max. 0.5V
Signaling Output	PNP, short-circuit proof
Signaling Output Operating Voltage	Max. 4V below rated operating voltage
Signaling Output Operating Current	Max. 0.05A
Interconnection Cable: Connector:	Y-UL2517/8xAWG22 (8x0.35mm ²), 2m M12x1, 8 pin quick connect

DIMENSIONS



SERIES CSS 34 TECHNICAL DATA

SWITCHING DISTANCES







The actuating curves represent the points at which the CSS 34 sensor switches on and off upon the approach of the actuator.

Legend

- S Switching Distance
- V, V1, V2 Possible misalignment (see drawings at right)
- S_{ON} Switch-on point
- S_{OFF} Switch-off point
- S_H Hysteresis area
S_H = S_{OFF} - S_{ON}
- S_{Bo} Assured operation point
- S_{Br} Assured release point (according to EN60947-5-3)

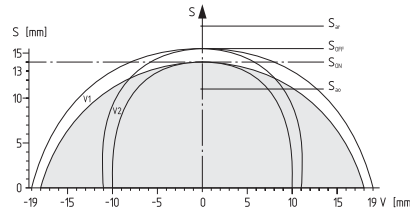
Minimum distance between two sensor sets: approximately 100mm

Function table of visual diagnostic LED

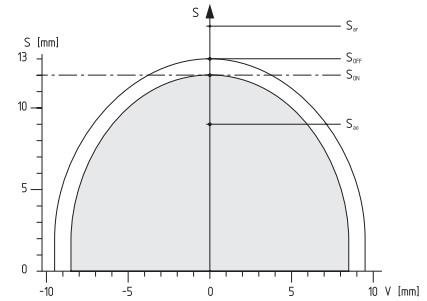
Visual diagnostic (red)	Cause of fault
1 pulse 	Fault on Output Y1
2 pulses 	Fault on Output Y2
3 pulses 	Cross-wire short Y1/Y2
4 pulses 	Ambient temperature too high
5 pulses 	Incorrect or defective actuator
Continuous 	Internal fault

Six different fault conditions are signalled by the diagnostic LED flashing with predefined pulse sequence or with continuous red light.

Actuation From Side

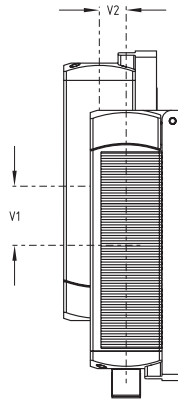


Actuation From Top



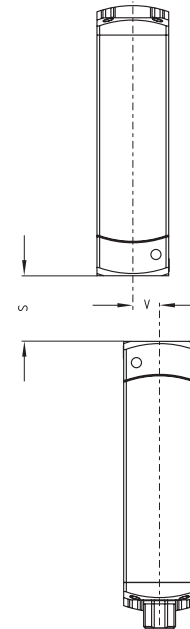
Sideways Misalignment

Horizontal: Max ±10mm (V2)
Vertical: Max ±18mm (V1)



Top Misalignment

Horizontal: Max ±8.5mm (V)



Electronic Diagnostic function of CSS34 or CSS34F with conventional diagnostic output

Sensor Condition	LEDs			Electronic diagnostic output 24V DC, 50mA	Safety outputs
	Green	Red	Yellow		
No Target, Power On	On	Off	Off	0V	0V
Actuated	On	Off	On	24V	24V
Actuated in limit area	On	Off	Flashes (1Hz)	24V pulsed	24V
Actuated and feedback circuit open*	On	Off	Flashes (5Hz)	24V	0V ¹
Actuated in limit area and feedback circuit open*	On	Off	Flashes (1Hz/5Hz)	24V pulsed	0V ¹
Fault	On	Flashes	On	0V	30 min. delay 24V→0V

*Only for CSS34F0/F1 with feedback circuit

¹ The sensor waits for a signal from the feedback circuit:

F0 – Close feedback circuit

F1 – Trailing edge on feedback circuit

SERIES CSS 34 WIRING EXAMPLE 1

Series wiring with single diagnostic output

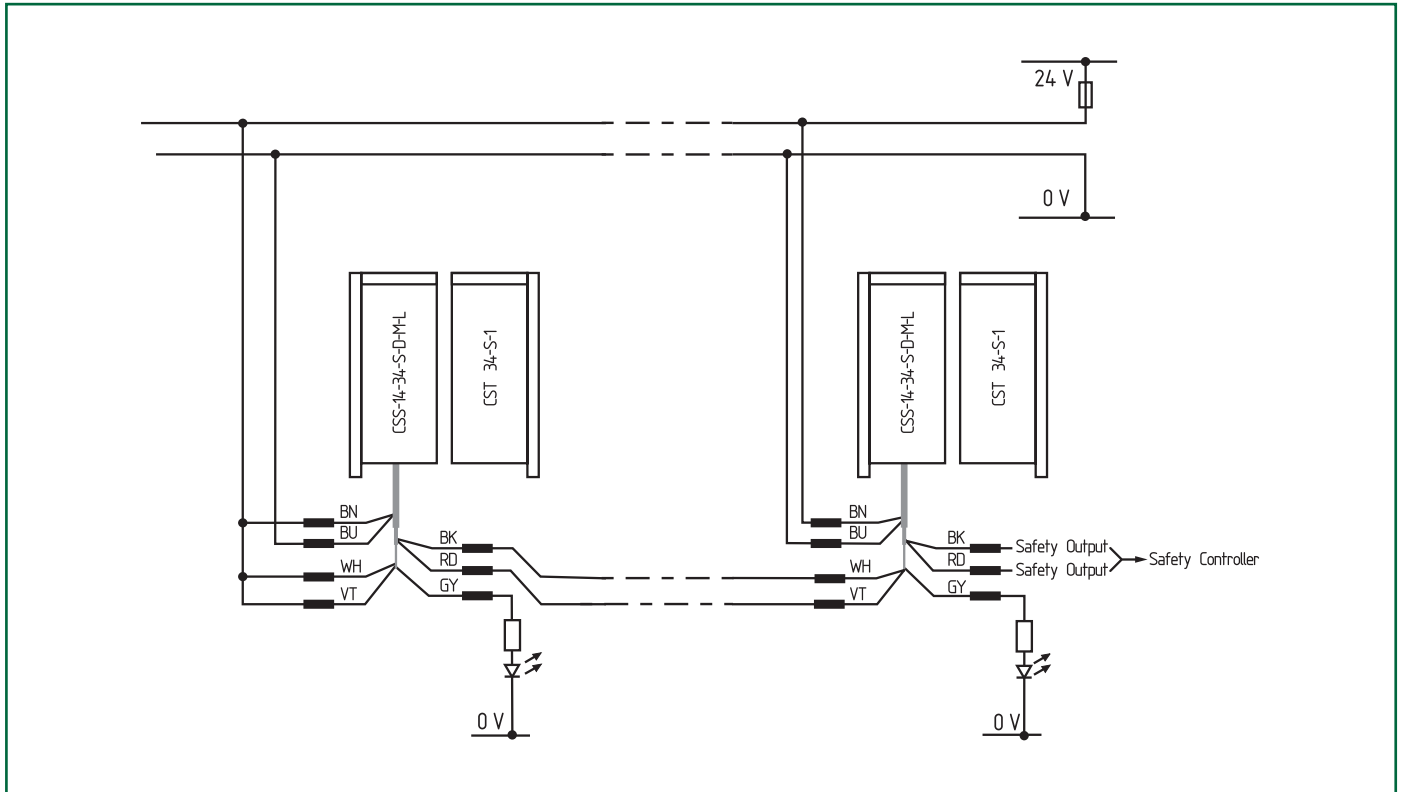
The supply voltage is wired to both safety inputs of the last sensor of the chain (starting from the safety controller). The safety outputs of the first sensor are wired to the safety controller. The sensor chain can be built up over a length of two hundred meters.

Sensors used:

Safety Sensor CSS14-34-SDML:

This sensor has one output cable. The output of the first sensor is wired into the input of the next sensor and so on.

SERIES CONNECTION OF CSS 34



CSS14-34-SDML

Operating Voltage	(BN) brown	P (+24 V)
	(BU) blue	0 V
Safety Input	(WH) white	channel 1
	(VT) violet	channel 2
Signal Output	(GY) gray	diagnostic
	(PK) pink	nonfunction
Safety Output	(BK) black	channel 1
	(RD) red	channel 2

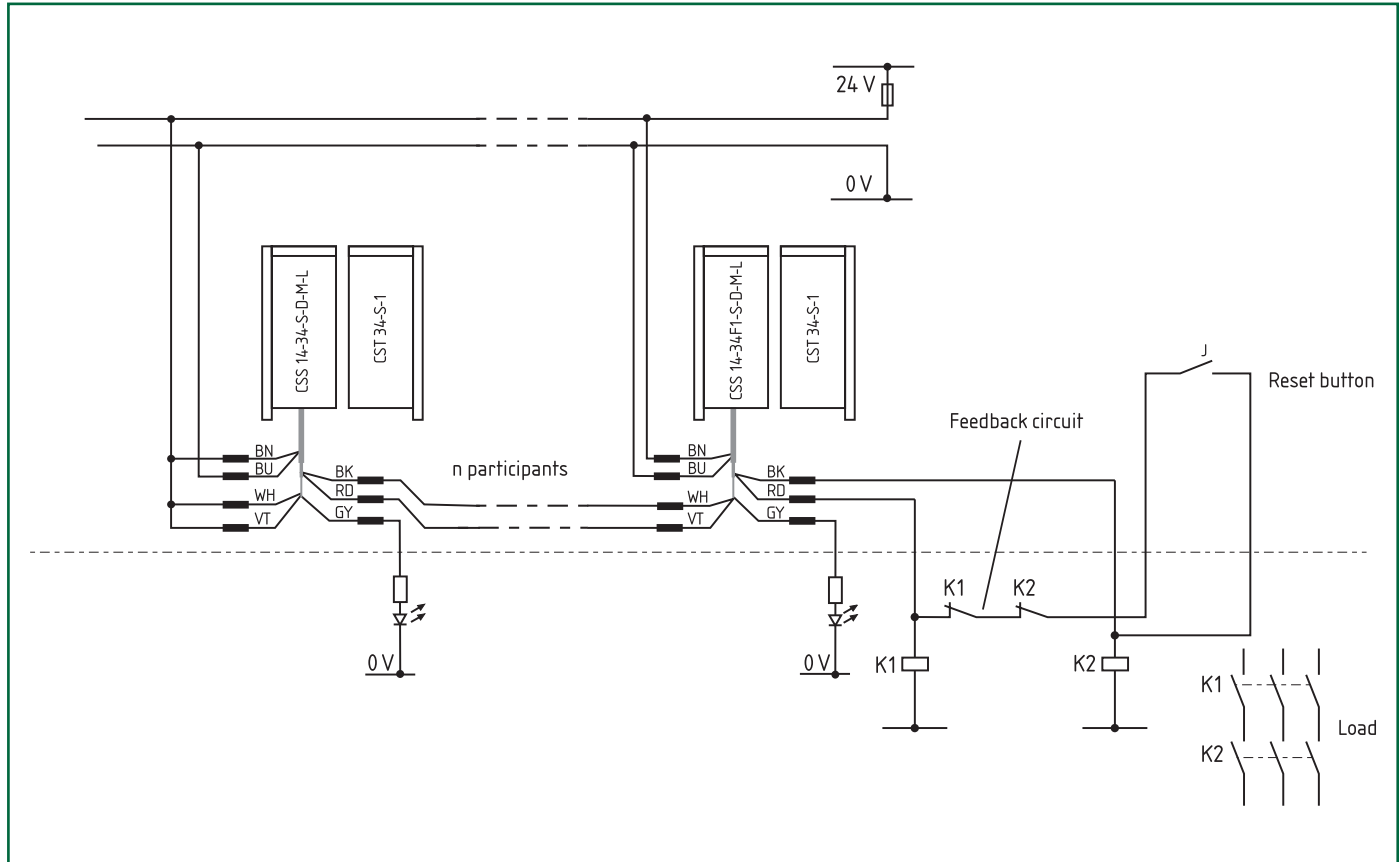
SERIES CSS 34 WIRING EXAMPLE 2

Wiring example for series-wiring of the CSS 34 and CSS 34F1 safety sensors with conventional diagnostic outputs

In a safety chain of multiple sensors, only the first device can be a sensor of the CSS 34F type. All other components of the chain must be of the default type CSS 34, up to a maximum length of 200m.

The CSS 34F1 safety sensor enables a direct control of the contactor or relay. The internal monitoring module of the CSS 34F1 version monitors the trailing edge of the reset button in addition to the feedback contacts. The sensor is switched on when the button is released. It can be used for manual reset on safety guards with accessible protection field. The protected field must be designed in such manner that a single reset button can be used.

SERIES CONNECTION OF CSS34 AND CSS34F1



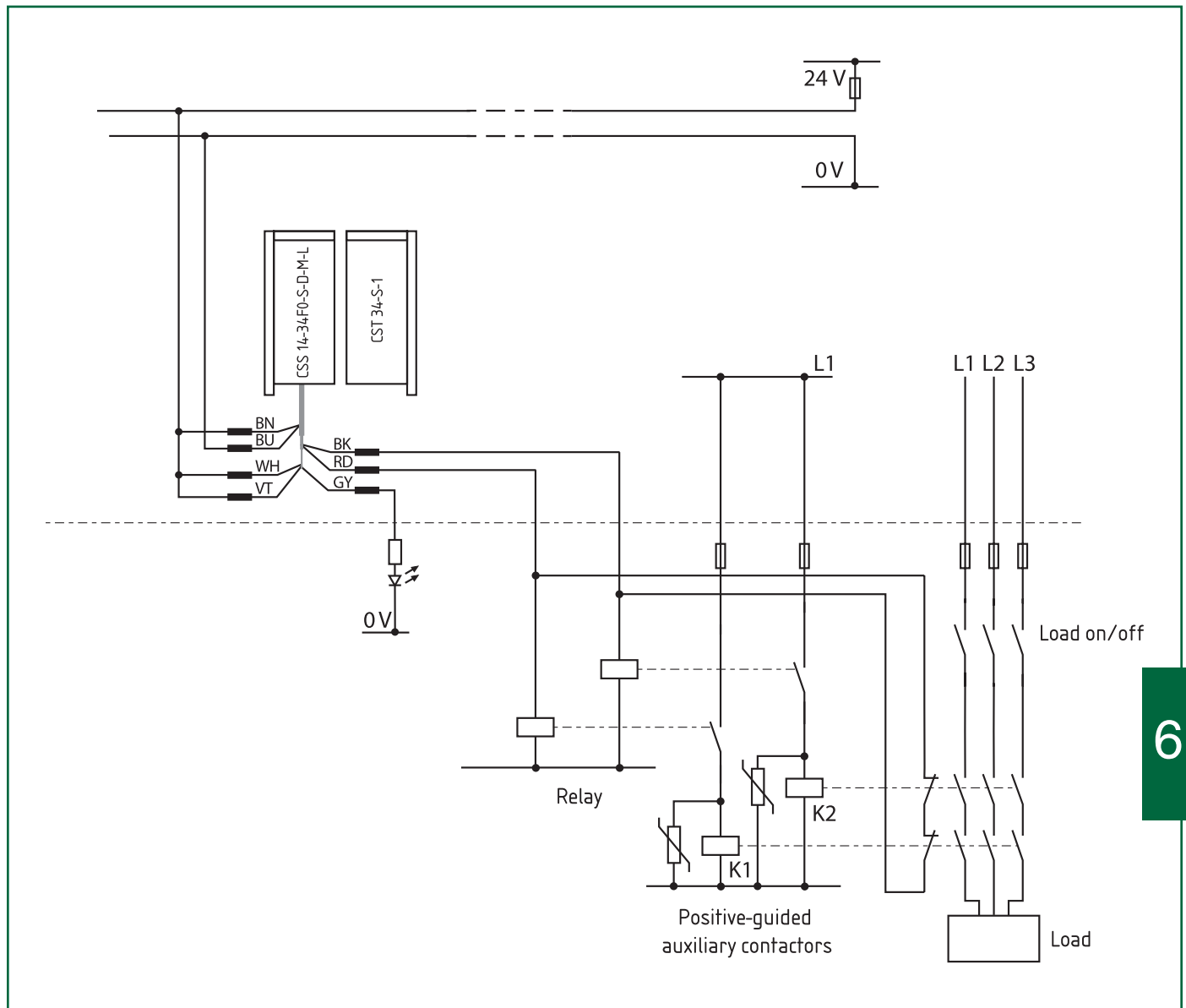
SERIES CSS 34 WIRING EXAMPLE 3

Wiring example for the CSS 34F0 safety sensors with conventional diagnostic output with auxiliary relay for controlling high-capacity contactors

Additional auxiliary relays are used when the capacity of the safety outputs of the sensor is insufficient to enable direct control of the contactors or to switch, e.g., from 24V DC to 230V AC.

The NC contacts of the load-switching contactors are monitored.

CONNECTION OF CSS34F0 WITH RELAYS TO SWITCH HIGH-CAPACITY LOADS



COMPATIBLE PULSE-ECHO SAFETY CONTROLLERS SRB301LC/B



ELECTRICAL SPECIFICATIONS

Operating Voltage	24 VDC -15% / +20%, residual ripple max. 10% 24 VAC -15% / +10%, 50/60 Hz
Power Consumption	1.7 W (max.), 1.9 VA
Fuse (Input Power)	Internal glass fuse F1: T 0.25 A
Fuse (Safety Outputs)	6 A Slow-blow (Recommended)
Switching Capacity (Safety Outputs)	230 VAC, 6 A Resistive (inductive with suitable suppressor circuit)
Switching Capacity (Auxilliary Contacts)	24 VDC, 2 A
Application Category	AC 15 / DC 13, EN 60 947-5-1
Pick-up Delay	≤ 30 ms
Drop-out Delay	≤ 50 ms
Contact Type & Materials	AgSnO, self cleaning, positive-guided
Contact Resistance	100 mOhm (max. in new state)
Air Cleaner & Creepage Distance	DIN VDE 0110-1 (04.97), 4 kV/2
Cable Connections	<ul style="list-style-type: none"> Screw terminals for 13 to 20 AWG Stranded or multi-core with wire end ferrule
Terminal Labeling	DIN EN 50 005 / DIN 50 013

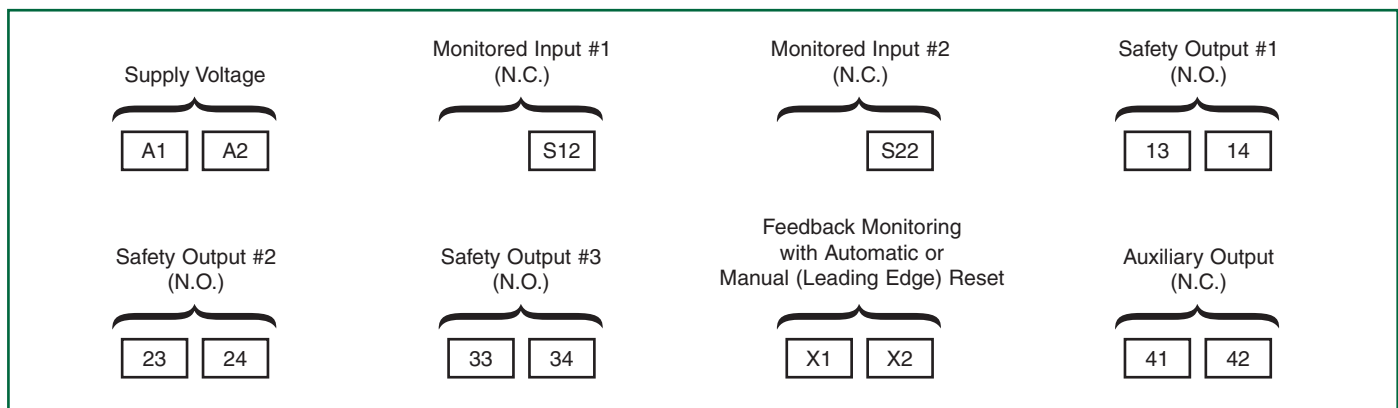
TECHNICAL FEATURES

Input Voltage	24 V AC/DC
# Discrete Input Devices Monitored	1 (Single or Dual channel)
Monitored Contact Configuration	N.C. (Dry Contacts) or PNP-switching
Number & Type Safety Outputs	3 N.O. (Dry Contacts)
Number & Type Auxilliary (Non-Safety or Signalling Output)	1 N.C. (Dry Contacts)
Typical Input Devices Monitored	<ul style="list-style-type: none"> E-stops (N.C.) Interlock switches (N.C.) Devices with PNP semi-conductor outputs
Type of Reset (Selectable)	<ul style="list-style-type: none"> Manual (24 V Leading Edge) Automatic
Feedback Monitoring	Yes
LED Displays	Green LEDs for: <ul style="list-style-type: none"> K1 (safety relay 1) K2 (safety relay 2) Ui (voltage beyond internal fuse) U_s (voltage at input terminals)
Conformity to Standards	UL, CSA, BG (CE-compliant)
Stop Category	0
Safety Control Category Rating Per EN 954-1	4

MECHANICAL SPECIFICATIONS

Dimensions (W x H x D)	22.5mm x 100mm x 121mm (0.9" x 3.9" x 4.75")
Ambient Operating Temperature Range	-25°C to +45°C (-13°F to +113°F)
Mechanical Life Expectancy	>10 ⁷ switching cycles
Weight	230 gm (0.5 lbs.)
Mounting	DIN rail (35mm)

Terminal Connections For Use With AZM 200



COMPATIBLE PULSE-ECHO SAFETY CONTROLLERS SRB324ST



TECHNICAL FEATURES

Input Voltage	24 V AC/DC
# Discrete Input Devices Monitored	1 (Single or Dual channel)
Monitored Contact Configuration	N.C. (Dry Contacts) or PNP-switching
Number & Type Safety Outputs	5 N.O. (2 delayed: 1-30 sec.) (dry contacts)
Number & Type Auxilliary (Non-Safety or Signalling Output)	1 N.C. (Dry Contacts) 3-PNP
Typical Input Devices Monitored	<ul style="list-style-type: none"> E-stops (N.C.) Interlock switches (N.C.) Devices with PNP semi-conductor outputs
Type of Reset (Selectable)	<ul style="list-style-type: none"> Monitored-manual (trailing edge) Automatic
Feedback Monitoring	Yes
LED Displays	Green LEDs for: <ul style="list-style-type: none"> K1-K4 (safety relays 1-4) U_i (voltage beyond internal fuse) U_b (voltage at input terminals)
Conformity to Standards	UL, CSA, BG (CE-compliant)
Stop Category	0 (3 safety outputs) 1 (2 safety outputs)
Safety Control Category Rating Per EN 954-1	4

ELECTRICAL SPECIFICATIONS

Operating Voltage	24 VDC -15% / +20%, residual ripple max. 10% 24 VAC -15% / +10%, 50/60 Hz
Power Consumption	4.8 W, 7.8 VA max. (Plus signalling contacts Y1-Y3)
Fuse (Input Power)	<ul style="list-style-type: none"> Internal glass fuse F1, tripping current > 2.5 A (reset approx. 1 second) Internal hybrid fuse F2, tripping current > 1.0 A (reset after interruption of supply voltage)
Fuse (Safety Outputs)	6 A Slow-blow (Recommended)
Switching Capacity (Safety Outputs Stop 0)	230 VAC, 6 A Resistive (inductive with suitable supressor circuit)
Switching Capacity (Auxilliary Contacts)	Y1-Y3: 24 VDC, 100mA (PNP) 61/62: 24 VDC, 2A max. (Dry)
Application Category	AC-15 / DC 13, EN 60 947-5-1
Pick-up Delay	≤ 30 ms
Drop-out Delay	≤ 30 ms (13/14, 23/24, 33/34)
Contact Type & Materials	AgSnO, self cleaning, positive-guided
Contact Resistance	100 mOhm (max. in new state)
Air Cleaner & Creepage Distance	DIN VDE 0110-1 (04.97), 4 kV/2
Cable Connections	<ul style="list-style-type: none"> Plug-in, self-lifting, screw terminals 13 to 20 AWG Stranded or multi-core with wire end ferrule
Terminal Labeling	DIN EN 50 005 / DIN 50 013

MECHANICAL SPECIFICATIONS

Dimensions (W x H x D)	45mm x 100mm x 121mm (1.8" x 3.9" x 4.75")
Ambient Operating Temperature Range	-25°C to +45°C (-13°F to +113°F)
Mechanical Life Expectancy	>10 ⁷ switching cycles
Weight	480 gm
Mounting	DIN rail

Terminal Connections For Use With AZM 200

