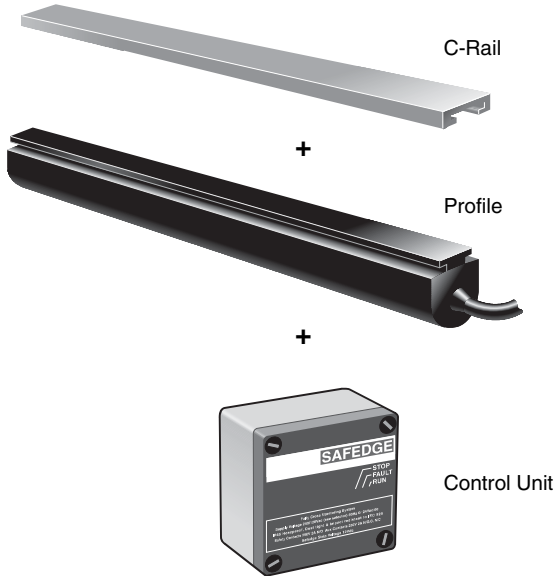


# Safedge™ Profiles

## Overview

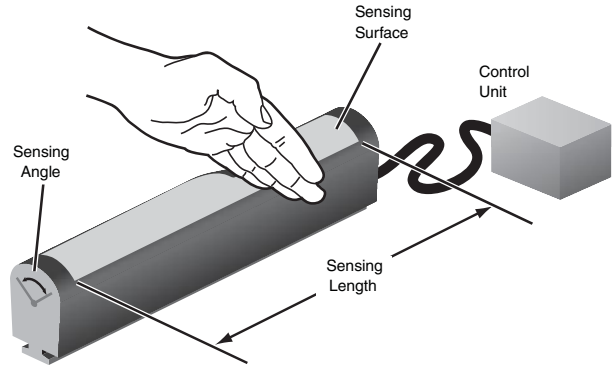
### System Components

The Safedge sensitive edge systems are used in a variety of applications where the edge of an object must be detected by contact. The Safedge system consists of three parts: 1) a C-rail, which is used to mount the profile; 2) a profile, which contains the sensing surface; and 3) a control unit, which checks the operation of the profile and interfaces with the control system. A typical system is shown below.



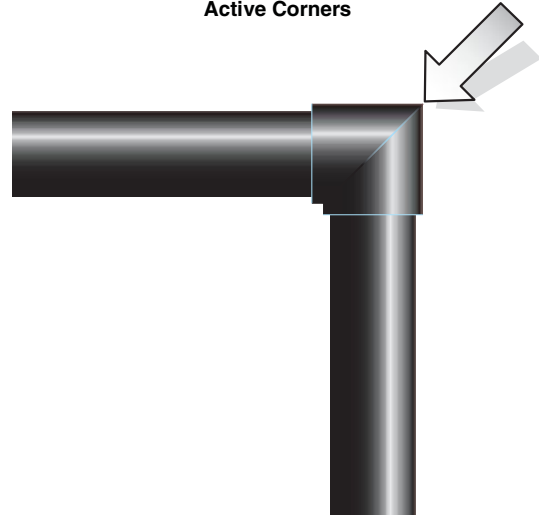
### Sensing Surface

The profile is best actuated along its sensing surface. The sensing surface of the Safedge system is active along almost the full length of the edge. The 10 mm at the beginning and end are not active.



One distinct advantage of the Safedge system is the active corners. Pressure applied to the corners is detected by the control unit.

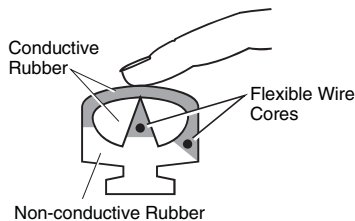
### Active Corners



### Operating Principle

The profile works on the principle of a two-wire design with conductive rubber. Two wires run the length of the profile. The wires are terminated with a known resistor. When the profile is deformed, the conductive rubber comes in contact with each other and causes the overall resistance to drop.

Pressure required is 10 N (2.25 lb) when applied in this direction

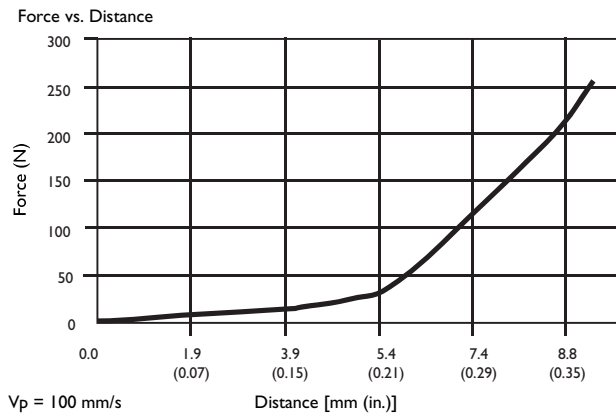
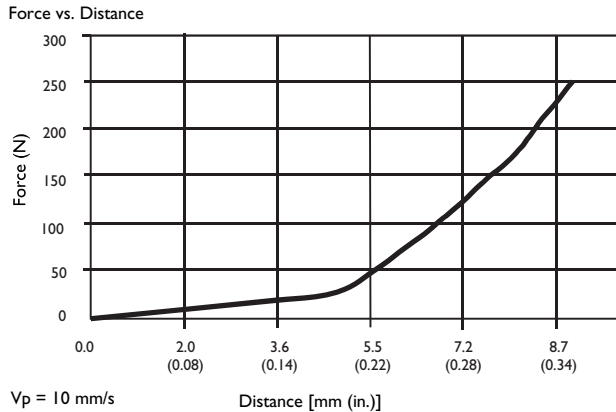


The control unit provides a voltage source to the wires in the profile. It continuously checks the continuity of the wires for shorts, opens and changes in resistance. If the circuit opens, becomes shorted, or the resistance changes, the output of the control unit turns off.

The control unit can also be used to monitor the performance of the output switching devices.

### Force Travel Relationship

Since the Safedge system is a contact device, a force is required to operate the device. This force is dependent on the shape of the object applying the force, the speed of the object and deformation distance on the profile. To help understand the force requirements, the European standard EN1760-2 2001 provides three test objects travelling at two speeds. Shown in the graph below is the force that is applied over the deformation distance on the surface of the profile. Note that the force required to operate the corners is greater than the force required along the straight section of the profile. This force must be used as a guideline, as the inanimate object can not be harmed.



### Risk Assessment

A risk assessment must be performed to determine the proper use of the edge system. Additional protective measures must be used when an individual can reach around or over the edge system and gain access to a hazard. The edge system is designed to be a contact type of system. Therefore “cushion factor” is an important consideration.

### Selecting the Cushion Factor

One of the important characteristics of edge systems is called cushion factor. The cushion factor is the distance the profile can be depressed after the signal is generated. This is important when the profile is mounted on automated doors.

Automated doors will continue to close for some finite time after the profile sends the initial stop signal. This is known as the system response time. The system response time is the sum of the Safedge control unit response time, the control system response time, and the mechanical stopping time. Systems with longer response time should utilize larger cushion factors. Users must validate that injury does not occur if parts of the body get jammed, for example between the sensing edge and the fixed part of a machine.

Users might also consider a reversing option. When the profile is depressed, the Safedge control unit sends a signal to a reversing relay. Since the reversing relay is not a safety rated device, the user must still confirm that injury does not occur if parts of the body get jammed.

### Typical Applications

Typical applications for sensitive edge systems are:

- Sliding doors
- Sliding gates
- Automated guided vehicles
- X-Y tables
- Fence tops
- Scissor jacks
- Loading platforms

The profile is mounted on the leading edge of the moving object. As the profile comes in contact with an object, the sensing surface of the profile deforms. The deformation causes the conductive rubber parts to make contact and reduce the circuit resistance. The control makes contact.

Typically, the edge of the object is leading edge and is moving, like a sliding door or gate. Edge systems have also been used on the leading edges of X-Y tables and automated guided vehicles.

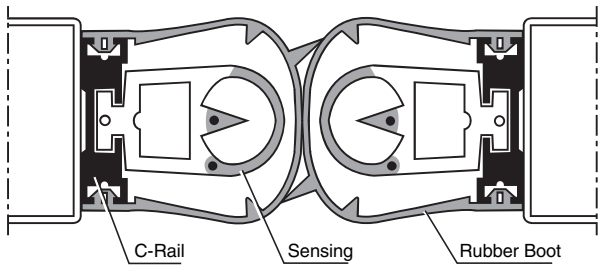
In some applications, a drip edge or seal is needed to reduce wind and rain leaking into a door. The Safedge system accommodates both types of applications. Safedge has three profiles that include a sealing lip.



# Safedge™ Profiles

## Overview

Safedge can also be ordered with a rubber cover as shown below. This allows compression of the rubber boot without deforming the profile.



### Cable Termination

The cable can be terminated in one of four ways providing flexibility in design and installation of cable routing. Specify the LHT or RHT from the point of view of looking directly at the end of the profiles as shown below.

SET—Straight

UNDER—Under



LHT—Left-hand

RHT—Right-hand

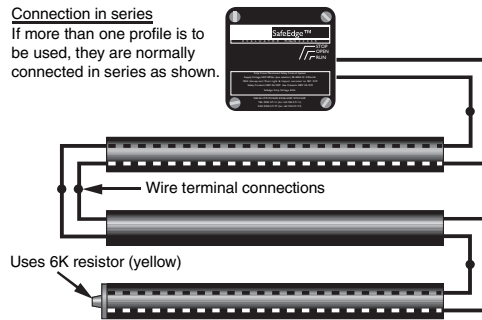


### Connection Methods

The profiles can be connected in one of two ways: series or parallel. Either method provides the same performance. Selection of the method is determined by ease of installation. The more popular method is series.

#### Series Connection

**Connection in series**  
If more than one profile is to be used, they are normally connected in series as shown.



#### Parallel Connection



A maximum of two profiles can be connected in parallel.



### Description

The ability of the Safedge profile to out perform competition lies in its innovative design. It uses a combination of non-conductive rubber and flexible wire-cored conductive rubber bonded together so it keeps bouncing back into shape even after repeated compressions.

The Safedge profiles come in three different cushion factors: 5 mm (0.2 in.), 19 mm (0.75 in.), and 41 mm (1.6 in.). Cushion factor is the distance the profile can be depressed after a signal has been generated. The profiles are also offered with a sealing lip which is designed to reduce drafts between the profile and opposing surface.

The profiles come in two different materials. Use the EPDM material in the presence of conductive fluids. The NBR/CR material performs better in the presence of oils. Review the chemical resistance chart to help make the best choice of material. If in doubt, a small sample of the profile should be tested for chemical resistance before a final selection is made.

The Safedge profile has no rigid internal parts which can “break through” or cause fatigue failures after prolonged use. The multi-stranded copper wire core throughout the length of the strip reduces the risk of resistance build up on long lengths.

### Features

- Various profiles
- Conductive rubber technology
- Up to 50 m lengths
- Aluminum, plastic or zinc-coated steel mounting rails
- Rubber boot optional
- Active corners
- Sealing lip available

### Specifications

Standards	EN1760-2, EN 954-1, ISO13849-1, IEC/EN60204-1, ANSI B11.19, AS 4024.5
Certifications	CE Marked for all applicable directives and TÜV. C-Tick not required.
Power Supply	Operates on 4V DC supplied from control unit.
Operating Temperature [C (F)]	EPDM material: -5...55° (23...131°) NBR/CR material: 0...55° (32...131°)
Relative Humidity	90%
Enclosure Type Rating	IP65 (NEMA 6P)
Wire Size	18 AWG
Material	EPDM: Ethylene Propylene Diene Modified Rubber NBR/CR: Acrylonitrile (34% nitrile) Butadiene Rubber/Chloroprene Rubber
Bend Radius, Min.	500 mm (19.6 in.)

### Chemical Resistance of Safedge Profile

Substance	Resistance—"S" Profile EPDM	Resistance—"N" Profile NBR/CR
Acetic Acid (10%)	Good	Good
Acetone	Good	Fair
Ammonium Hydroxide (35%)	Good	Good
Benzene	Poor	Poor
Diesel Oil	Poor	Good
Ethyl Alcohol (Ethanol)	Good	Good
Hydrochloric Acid (10%)	Good	Good
Lubricating Oil	Poor	Good
Nitric Acid (10%)	Good	Fair
Petrol (Gasoline)	Poor	Fair
Silicone Fluids	Good	Good
Sodium Chloride (25%)	Good	Good
Trichlorethylene	Good	Poor
Vegetable Oils (general)	Good	Good
Water (distilled)	Good	Good
Water (sea)	Good	Good
Latex Paint	Good	Good
Oil Base Paint	Good (easy to clean)	

2-Safety Edges

Presence Sensing Safety Devices  
**Safedge™ Profiles**

**Product Selection—Profiles**

Code (See page 2-112)	Approx. Dimensions [mm (in.)]	Safedge Profile	Description	Cushion Factor	Length [m (ft)]	Cat. No.
A		0110S	Black, EPDM, Weight: 463 g/m (0.33 lbs/ft)	5 mm (0.20 in.)	5 (16.4)	440F-E0110S05
					10 (32.8)	440F-E0110S10
					20 (65.6)	440F-E0110S20
C		0110N	Black, NBR/CR, Weight: 460 g/m (0.31 lbs/ft)	5 mm (0.20 in.)	5 (16.4)	440F-E0110N05
					10 (32.8)	440F-E0110N10
					20 (65.6)	440F-E0110N20
B		0110R	Red, EPDM, Weight: 502 g/m (0.34 lbs/ft)	5 mm (0.20 in.)	5 (16.4)	440F-E0110R05
					10 (32.8)	440F-E0110R10
					20 (65.6)	440F-E0110R20
E		1610S	Black, EPDM, Weight: 843 g/m (0.57 lbs/ft)	19 mm (0.75 in.)	5 (16.4)	440F-E1610S05
					10 (32.8)	440F-E1610S10
					20 (65.6)	440F-E1610S20
F		1610N	Black, NBR/CR, Weight: 837 g/m (0.56 lbs/ft)	19 mm (0.75 in.)	5 (16.4)	440F-E1610N05
					10 (32.8)	440F-E1610N10
					20 (65.6)	440F-E1610N20
H		0310S	Black, EPDM, Weight: 1209 g/m (0.81 lbs/ft)	41 mm (1.61 in.)	5 (16.4)	440F-E0310S05
					10 (32.8)	440F-E0310S10
					20 (65.6)	440F-E0310S20
D, J		0510S	Black, EPDM, with Sealing Lip, Weight: 545 g/m (0.37 lbs/ft)	5 mm (0.20 in.)	5 (16.4)	440F-E0510S05
					10 (32.8)	440F-E0510S10
					20 (65.6)	440F-E0510S20
G, K		0804S	Black, EPDM, with Sealing Lip, Weight: 1013 g/m (0.68 lbs/ft)	19 mm (0.75 in.)	5 (16.4)	440F-E0804S05
					10 (32.8)	440F-E0804S10
					20 (65.6)	440F-E0804S20

**Note:** Maximum roll size before axial connector needed is 20 m (65.6 ft).

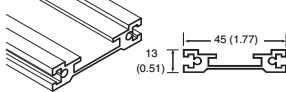
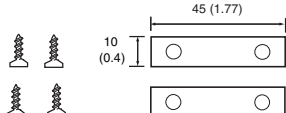
Code (See page 2-112)	Approx. Dimensions [mm (in.)]	Safedge Profile	Description	Cushion Factor	Length [m (ft)]	Cat. No.
I, L		0210S	Black, EPDM, with Sealing Lip, Weight: 1291 g/m (0.87 lbs/ft)	41 mm (1.61 in.)	5 (16.4)	440F-E0210S05
					10 (32.8)	440F-E0210S10
					20 (65.6)	440F-E0210S20
M		0118S	Black, EPDM, Weight: 242 g/m (0.163 lbs/ft) (mini profile)	3.75 mm (0.15 in.)	5 (16.4)	440F-E0118S05
					10 (32.8)	440F-E0118S10
					20 (65.6)	440F-E0118S20
N, O		1111S	Black, EPDM, Weight: 680 g/m (0.457 lbs/ft)	NA	5 (16.4)	440F-E1111S05
					10 (32.8)	440F-E1111S10
					20 (65.6)	440F-E1111S20

**Note:** Maximum roll size before axial connector needed is 20 m (65.6 ft).

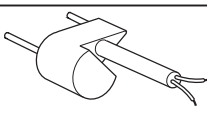

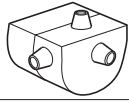
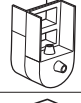

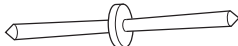



### Product Selection—C-Rails

Code	Approx. Dimension [mm (in.)]	Description	Cat. No.
A		Aluminium type, Type C112/A. Suitable for all profiles. Length: 3 m (9.8 ft) Weight: 258 g/m (0.17 lbs/ft)	440F-R1212
B		Zinc-Coated Steel; Type C112/S. Suitable for all profiles. Length: 2 m (6.5 ft) Weight: 663 g/m (0.45 lbs/ft)	440F-R1112
C		PVC Black; Type C112/PB. Suitable for all profiles. Length: 3 m (9.8 ft) Weight: 111 g/m (0.07 lbs/ft)	440F-R1212PB
D		PVC Red; Type C112/PR. Suitable for all profiles. Length: 3 m (9.8 ft) Weight: 111 g/m (0.07 lbs/ft)	440F-R1212PR
E		PVC Yellow; Type C112/PY. Suitable for all profiles. Length: 3 m (9.8 ft) Weight: 111 g/m (0.07 lbs/ft)	440F-R1212PY
F		Aluminium Vertical Lip; Type C112/A2. Suitable for all profiles. Length: 2 m (6.5 ft) Weight: 368 g/m (0.25 lbs/ft)	440F-R1214
G		Aluminium Horizontal Lip; Type C112/A3. Suitable for all profiles. Length: 2 m (6.5 ft) Weight: 388 g/m (0.26 lbs/ft)	440F-R1215
H		Aluminium Deep Channel; Type C112/A4. Suitable for all profiles. Length: 2 m (6.5 ft) Weight: 345 g/m (0.23 lbs/ft)	440F-R1216
I		Aluminium; Suitable for Mini Profile Only. Length: 2 m (6.5 ft) Weight: 150 g/m (0.10 lbs/ft)	440F-R1219

Presence Sensing Safety Devices  
**Safedge™ Profiles**


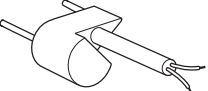


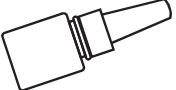
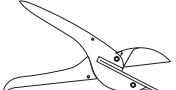


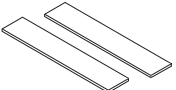
Code	Approx. Dimension [mm (in.)]	Description	Cat. No.
J		Aluminium; Suitable for Rubber Boot Only. Length: 2 m (6.5 ft) Weight: 667 g/m (0.448 lbs/ft)	440F-R2151
NA		Aluminium End Plate for C-Rail Option J; 2 Plates; 4 Screws, flat head Phillips, 10mm, #6 Weight: 7g (0.01 lbs)	440F-R2152

**Product Selection—Component Parts**

Description	Product Selection Criteria	Cat. No.
 Connector and Cable (diameter = 5 mm (0.20 in.))	1 m (3.2 ft)	440F-A1301
	2 m (6.56 ft)	440F-A1302
	5 m (16.4 ft)	440F-A1305
	10 m (32.8 ft)	440F-A1306
	15 m (49.2 ft)	440F-A1307
 Terminator	6 kΩ (yellow) resistor for series termination	440F-A1308
	15 kΩ (blue) for parallel termination	440F-A1309
 Closing Cap for profile codes (A, B, C, D, J)	Closing Cap material: EPDM	440F-A1302S
	Closing Cap material: NRB	440F-A1302N
 Closing Cap for profile codes (E, F, G, H, K)	Used to close profiles 440F-E0310S and 440F-E1610S.	440F-A1303S
	Used to close profile 440F-E1610N.	440F-A1303N
 Axial Connector	With this connector you can directly connect two profiles. Suitable for 440F-E0110S profiles.	440F-A0061S
	With this connector you can directly connect two profiles. Suitable for 440F-E0110R profiles.	440F-A0061N
 Straight Pin Connector	Kit contains one pair of pins suitable for one joint.	440F-A0004
 90° Corner Connector	For use with profile 440F-E0110S	440F-A0071S
	For use with profile 440F-E0110R	440F-A0071S
	For use with profile 440F-E0110N	440F-A0071N
	For use with profile 440F-E0310S	440F-A0073S
	For use with profile 440F-E1610S	440F-A0074S
 90° Corner Connector (vertical)	For use with profile 440F-E1610N	440F-A0074N
	For use with profile 440F-E0110N	440F-A0072N
	For use with profile 440F-E0110S or 440F-E0110R	440F-A0072S
	For use with profile 440F-E1610N	440F-A0075N
	For use with profile 440F-E1610S	440F-A0075S
 45° Corner Connector	For use with profile 440F-E0310S	440F-A0076S
	For use with profile 440F-E0110N	440F-A0071N45 *

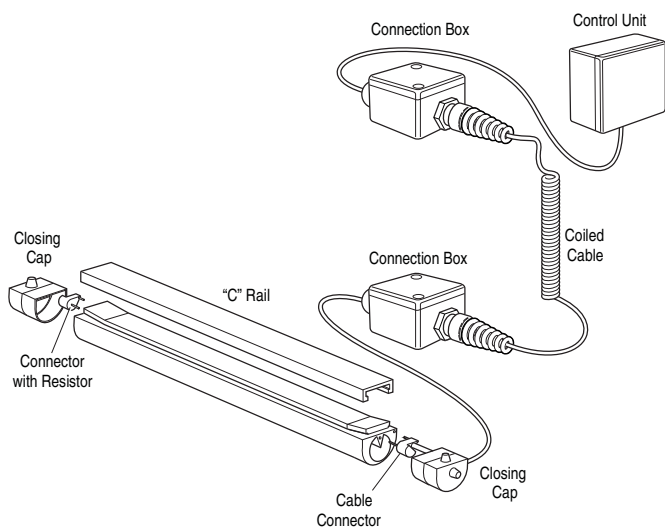
\* Includes two rubber strips (440F-A0005) when using profile 440F-E0110N.

2-Safety Edges

	Description	Product Selection Criteria	Cat. No.
	60° Corner Connector	When using profile 440F-E0110N	440F-A0071N60 *
	30° Corner Connector	When using profile 440F-E0110N	440F-A24007130 *
	Connector and Cable	Use only on Mini Profile—1 m (3.3 ft)	440F-A1181
		Use only on Mini Profile—3 m (9.8 ft)	440F-A1183
		Use only on Mini Profile—5 m (16 ft)	440F-A1185
	Terminator	Use only on Mini Profile—8 kΩ (yellow) resistor for series termination	440F-A1186
	Closing Cap	Use only on Mini Profile—Closing Cap material: EPDM	440F-A1318
	Cyanocrylate Adhesive	Use Loctite 401 for dry applications. Use Loctite 380E for wet applications.	NA
	Shears	Use to cut profiles.	440F-A3084
	Connection Box	Polycarbonate housing 53 x 53 x 35 mm (2.09 x 2.09 x 1.38 in.) complete with two pole terminal and trumpet type screw on connector with strain and relief clamp. For use with coiled cable.	440F-A0116
	Coiled Connection Cable	2.5 m (8.2 ft) (extended) of flexible coiled cable. Shelf length is 889 mm (35 in.) long. OD of coil is 22 mm (0.86 in.) and OD of cable is 5 mm (0.20 in.).	440F-A2450
		3.5 m (11.5 ft) (extended) of flexible coiled cable. Shelf length is 1270 mm (50 in.) long. OD of coil is 22 mm (0.86 in.) and OD of cable is 5 mm (0.20 in.).	440F-A2700
	Two rubber strips	When using profile 440F-E0110N shelf length is 175 x 10 x 0.7 mm (6.89 x 0.39 x 0.03 in.).	440F-A0005

\* Includes two rubber strips (440F-A0005) when using profile 440F-E0110N.

2-Safety Edges



Example application of profile using coiled cable. The coiled cable can not be directly connected to the profile due to the weight of the cable. The proper use of the coiled cable is to connect the coiled cable to the profile through the connection box. The coiled cable should be secured to both the moving and stationary objects so as to prevent straining of the terminal connections.



Factory Assembled Product Selection (standard profile)

440F - **E\*** **C** **A** **M** **V** **01270**  
*a b c d e*

*a*

Profile	
Code	Description
A	0110S
B	0110R
C	0110N
D	0510S with Sealing Lip on Right Side
E	1610S
F	1610N
G	0804S with Sealing Lip on Right Side
H	0310S
I	0210S with Sealing Lip on Right Side
J	0510S with Sealing Lip on Left Side
K	0804S with Sealing Lip on Left Side
L	0210S with Sealing Lip on Left Side
N	Rubber Boot over 0110S
O	Rubber Boot over 1610S
P	No Profile

*b*

C-Rail	
Code	Description
A	1212 aluminium for profile codes A-L
B	1112 zinc coated steel for profile codes A-L
C	1212PB PVC black for profile codes A-L
D	1212PR PVC red for profile codes A-L
E	1212PY PVC yellow for profile codes A-L
F	1214 aluminium with vertical lip for profile codes A-L
G	1215 aluminium with horizontal lip for profile codes A-L
H	1216 aluminium deep rail for profile codes A-L
J	2151 aluminium for profile codes N and O
N	No C-Rail (not needed)

*e*

Length of Edge	
Code	Description
5 digit number	Enter length of edge in mm; for example: 50 m = 50000, 500 mm = 00500; 300 mm minimum; ± 2.5 mm tolerance

\* Order Controller separately. Refer to SafeEdge Controllers product selection on page 2-115.

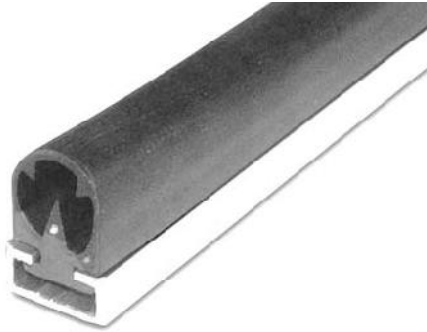
*c*

Cable Entrance	
Code	Description
A	LHT left entrance with 1 m cable
B	LHT left entrance with 2 m cable
C	LHT left entrance with 3 m cable
D	LHT left entrance with 5 m cable
E	LHT left entrance with 10 m cable
F	RHT right entrance with 1 m cable
G	RHT right entrance with 2 m cable
H	RHT right entrance with 3 m cable
I	RHT right entrance with 5 m cable
J	RHT right entrance with 10 m cable
K	SET straight entrance with 1 m cable
L	SET straight entrance with 2 m cable
M	SET straight entrance with 3 m cable
N	SET straight entrance with 5 m cable
O	SET straight entrance with 10 m cable
P	UNDER entrance with 1 m cable
Q	UNDER entrance with 2 m cable
R	UNDER entrance with 3 m cable
S	UNDER entrance with 5 m cable
T	UNDER entrance with 10 m cable
U	No entrance components

*d*

Termination	
Code	Description
A	LHT left exit with 1 m cable
B	LHT left exit with 2 m cable
C	LHT left exit with 3 m cable
D	LHT left exit with 5 m cable
E	LHT left exit with 10 m cable
F	RHT right exit with 1 m cable
G	RHT right exit with 2 m cable
H	RHT right exit with 3 m cable
I	RHT right exit with 5 m cable
J	RHT right exit with 10 m cable
K	SET straight exit with 1 m cable
L	SET straight exit with 2 m cable
M	SET straight exit with 3 m cable
N	SET straight exit with 5 m cable
O	SET straight exit with 10 m cable
P	UNDER exit with 1 m cable
Q	UNDER exit with 2 m cable
R	UNDER exit with 3 m cable
S	UNDER exit with 5 m cable
T	UNDER exit with 10 m cable
U	Parallel Termination—15 kΩ
V	Series Termination—6 kΩ
W	No exit components

Factory Assembled Product Selection (mini-profile)



440F - **E\*** **M** **I** **M** **V** **01270**  
*a b c d e*

*a*

Profile	
Code	Description
M	0118S 3.75 mm (0.15 in.) Cushion Factor Black, Mini Profile
P	No Profile

*b*

C-Rail	
Code	Description
I	1219 aluminium for "Profile" code M
N	No C-Rail (not needed)

*c*

Cable Entrance	
Code	Description
K	SET straight entrance 1 m cable
M	SET straight entrance 3 m cable
N	SET straight entrance 5 m cable
P	UNDER entrance 1 m cable
R	UNDER entrance 3 m cable
S	UNDER entrance 5 m cable
U	No entrance components

*d*

Termination	
Code	Description
K	SET straight entrance 1 m cable
M	SET straight entrance 3 m cable
N	SET straight entrance 5 m cable
P	UNDER entrance 1 m cable
R	UNDER entrance 3 m cable
S	UNDER entrance 5 m cable
V	Series Termination—8 kΩ
W	No Termination

*e*

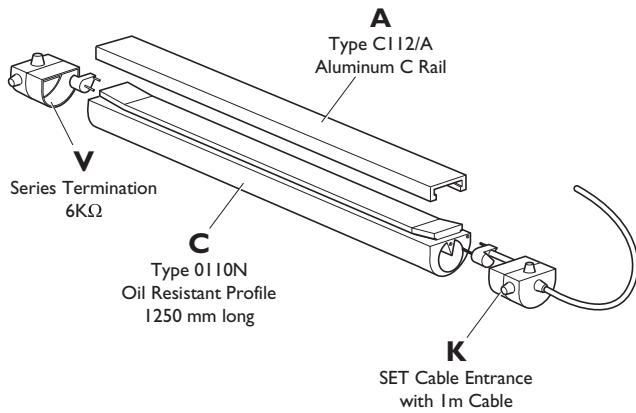
Length of Edge	
Code	Description
5 digit number	Enter length of edge in mm; for example: 50 m = 50000, 500 mm = 00500; 300 mm minimum; ± 2.58 mm tolerance

\* Order Controller separately. Refer to SafeEdge Controllers product selection.

2-Safety Edges

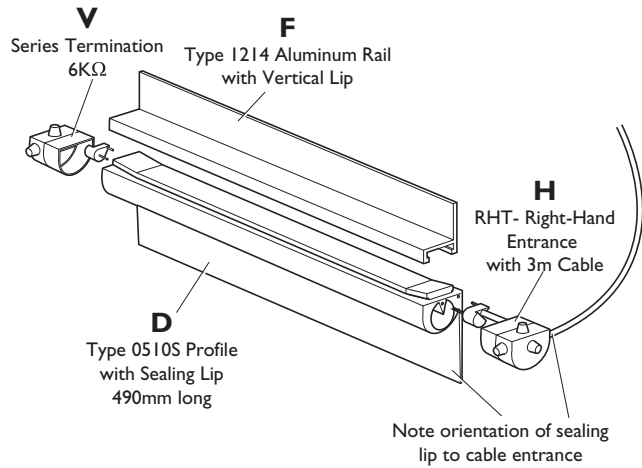
**Factory Assembled Examples**

**440F-ECAKV01250**



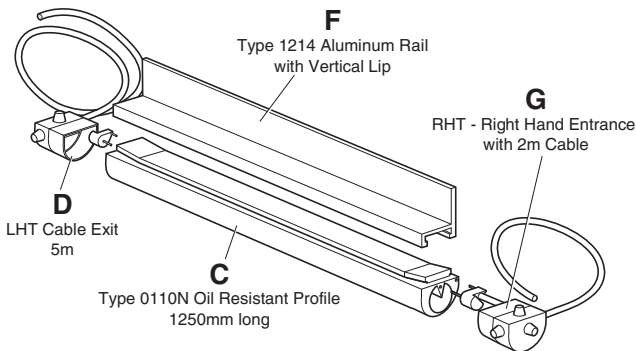
This is a single oil resistant profile which is 1250 mm (49.2 in.) long. The edge is terminated with a Series Termination. A 1 m (3.2 ft) cable enters straight into the closing cap. The profile is mounted on a standard aluminum C-rail.

**440F-EDFHV00490**



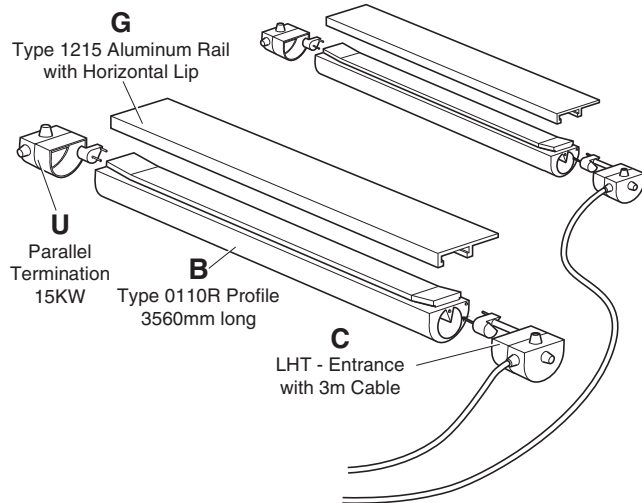
This single profile has a sealing lip and is 490 mm (19.2 in.) long. The profile is terminated with a Series Termination. A 3 m (9.8 ft) cable enters into the right hand side of the closing cap from a plastic surface mounted controller. The profile is mounted on an aluminum rail with a vertical lip for ease of mounting. The orientation of the sealing lip to the vertical lip can be reversed by the user by sliding the profile out of the C-rail, rotating the C-rail 180° and then re-inserting the profile back into the C-rail.

**440F-ECFGD01250**






This is a single oil resistant profile which is 1250 mm (49.2 in.) long. The edge is terminated with a 1 m (3.2 ft) cable. A 1 m cable enters straight into the closing cap. The profile is mounted on an aluminum C-rail with a vertical mounting lip. A control unit is not included. This edge is intended to be used in series with another length of edge which has a terminating resistor.

**440F-EBGCU03560**

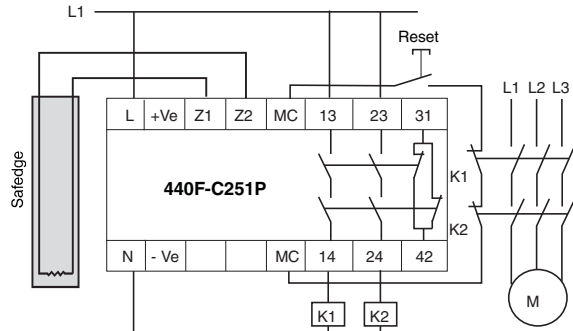


This is a red-colored single profile which is 3560 mm (140.15 in.) long. This profile is part of a parallel profile system, for ease of mounting, as it is terminated with a Parallel Termination. A 3 m (9.8 ft) cable enters into the left side of the closing cap. The profile is mounted on an aluminum C-rail with a horizontal lip for ease of mounting. The horizontal lip can be reversed by the user by sliding the profile out of the C-rail, rotating the C-rail and then re-inserting the profile back into the C-rail. A separate Cat. No. must be entered for the other profile.

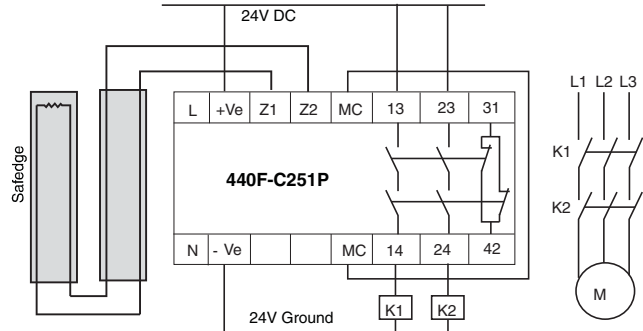
**Product Selection—Relays**

Single Function Safety Relays	Safety Outputs	Auxiliary Outputs	Terminals	Reset Type	Power Supply	Cat. Page No.	Cat. No.
	2 N.O.		Fixed		24V AC/DC or 115/230V AC		440F-C251D
	1 N.O.	1 N.C.	Removable	Automatic/Manual	24V AC/DC	5-72	440F-C252D
	2 N.O.		Fixed		24V AC/DC or 115/230V AC		440F-C251P

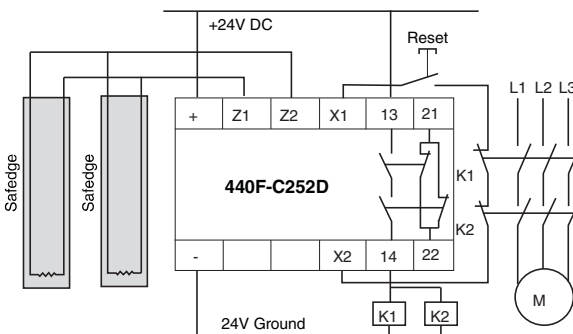
**Typical Wiring Diagrams**



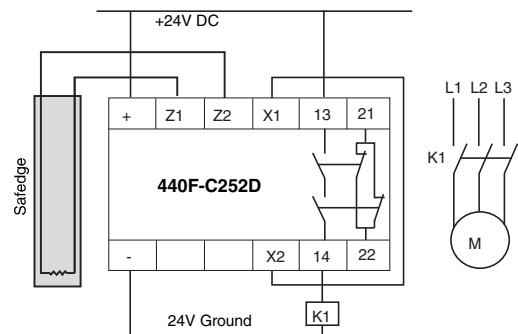
Series Terminated, Safedge Input, Manual Reset, Dual Channel Output, Monitored Output



Series Terminated, Cascaded, Safedge Input, Automatic Reset, Dual Channel Output, No Output Monitored



Parallel Terminated, Safedge Input, Manual Reset, Dual Channel Output, Monitored Output



Series Terminated, Safedge Input, Automatic Reset, Single Channel Output, No Output Monitored

2-Safety Edges