Installation Instructions

Original Instructions

Allen-Bradley by ROCKWELL AUTOMATION

Guardmaster®

MatGuard Pressure Sensitive Safety Mat System

Catalog Numbers 440F-C4000D, 440F-C4000P, 440F-C4000S, 440F-C28013

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Updated Figure 1...Figure 4	1
Updated Conformity	2
Updated Safety mat conformity	2
Added Declaration of Conformity	22

Introduction

The MatGuard™ Pressure Sensitive Safety Mat System is designed for use as a safety product in an industrial environment by professional personnel. The system protects against risks that the isolation of electrical power when an operator is in the vicinity of the hazard can minimize. This instruction covers the installation and use of all parts of the system, including special shapes and sizes of safety mats.

Only suitably trained and qualified personnel must perform all installation procedures in accordance with statutory requirements for safety. Read this instruction in full before installation. After installation, retain this instruction in a safe and accessible place. For further assistance, contact your local Allen-Bradley product distributor or Rockwell Automation sales office.

Figure 1 - Control Unit Marking 440F-C4000P and 440F-C4000S (a)

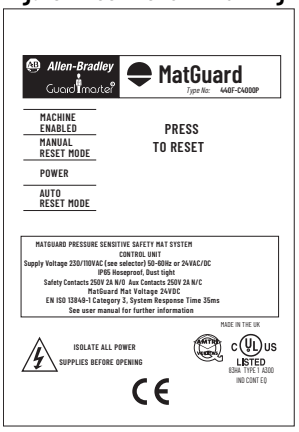


Figure 2 - Control Unit Marking 440F-C4000D

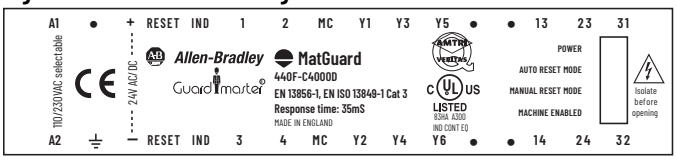
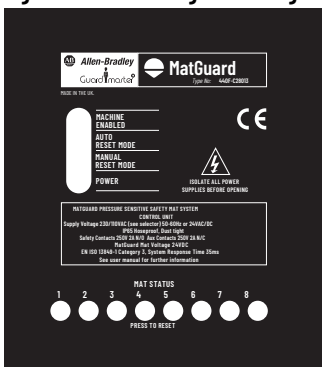


Figure 3 - Safety Mat Marking

Figure 4 - Mat Manager Markings 440F-C28013



(a) The position of the Reset button differs on 440F-C4000 control units.

Rockwell Automation

Specifications

Table 1 - Control Units and Mat Manager

Attribute	440F-C4000D	440F-C4000P	440F-C4000S	440F-C28013
Conformity	EN 13856-1, EN 62061, Category 3, UL 508			
Response time [1]	35 ms			
Environmental protection	• Enclosure-IP40: DIN0470 • Terminals-IP20: DIN0470	IP65	NEMA12	
Impulse withstand voltage	2500V			
Contamination level	III			
Switched current/voltage, min	10 mA/10V			
Power supply (user select)	110/230V AC [2] (50-60Hz) and 24V AC/DC +10% -15%			24V AC/DC or 110/230V selectable
Power consumption	< 9VA 6 W			
Relay outputs	• 2 x independent volt free N.O. safety contacts • 1 x volt free N.C. auxiliary contact • NB - Aux must not be used for safety circuit • Fuse externally, 5 A max (quick acting) for AC/2.5 A max (quick acting) for DC			• 2 x independent volt free N.O. safety contacts • 1 x independent volt free N.C. monitored contact • 1 x volt free N.C. auxiliary contact • 1 x volt free N.O. auxiliary contact
Utilization category	• AC - 15; 4 A/250V AC • DC - 13; 2 A/30V DC			
Outputs	Remote reset/status indicator: 24V DC/0.24 W			
Inputs	Remote reset switch (2 x N.O.)			
Safety inputs	4-wire mat			8 x 4-wire mats with molded Allen-Bradley® connectors
Status Indicator	• 1 - Power (green) • 2 - Auto Reset mode (green) • 3 - Manual Reset mode (green) • 4 - Machine-enabled (green)			• 1 - Power (green) • 2 - Manual Reset mode (green) • 3 - Auto Reset mode (green) • 4 - Machine-enabled (green) • 5...12 - Channel fault status (green/red)
Internal controls	AC Voltage selector, auto/manual reset selector			
Internal supply fuses	• 500 mA replaceable (1 off) • 500 mA resettable (1 off)	500 mA replaceable (2 off)		
Operating temperature range	-10...+45 °C (14...113 °F)			
Relative humidity	Up to 90% at 50 °C (122 °F)			
Vibration	Tested in accordance with IEC 68-2-6, frequency range 10...55 Hz, displacement 0.15 mm (0.01 in.) 10 cycles per axis, sweep rate, 1 octave per minute			
MC-MC contactor monitor loop	N.C. contactor loop			
Conductor size, max	2 x 1.5 mm^2 (16 AWG) stranded with sleeves stripped 8 mm (0.31 in.), 2 x 2.5 mm^2 (14 AWG) solid conductor	1 x 1.5 mm^2 (16 AWG) stranded with sleeves stripped 5 mm (0.2 in.), 1 x 2.5 mm^2 (14 AWG) solid conductor		
Terminals	Plus/minus captive terminal screws M3.5 with self-lifting connection, washer terminal boards separately removable	Minus terminal screws M2.5 that are mounted at 45° to PCB		
Installation group	C in accordance with VDE 0110			
Material	Polycarbonate		Steel c/w polycarbonate screen	
Mounting details	35 mm (1.38 in.) DIN rail	4 x M4 holes	4 x M6 holes	
Miscellaneous	Manual Reset mode (M) requires a connected Reset button	–		
Housing (D x H x W)	120 mm x 73 mm x 152 mm (4.72 in. x 2.87 in. x 5.98 in.), 32 way DIN rail	75 mm x 180 mm x 130 mm (2.95 in. x 7.09 in. x 5.12 in.)	143 mm x 230 mm x 210 mm (5.63 in. x 9.06 in. x 8.27 in.)	
Weight	0.92 kg (2.03 lb)	0.88 kg (1.94 lb)	0.3.2 kg (7.05 lb)	

(1) Safety mat pressed, safety contacts open.
(2) 110V setting allows for use at 100V ±10%.

Table 2 - Safety Mat

Attribute	Value
Safety mat conformity	EN 13856-1, EN ISO 13849-1, Category 1, UL 508
Weight of person with detection, min	35 kg (77 lb)
Detection zone, max	100 m^2 (1076 ft^2)
Number of individual safety mats, max	No limit (up to max 100 m^2)
Total length of connection wires, max	200 m (656 ft)
Mass / m^2 (sensor mats)	24 kg (53 lb)
Environmental protection mats	IP67
Mechanical life	1 x 10^6 operations
Relative humidity	0...100%
Safety mat outer cover material	Vinyl
Standard color	Yellow
Operating temperature range	-10...+55 °C (14...131 °F)
Storage temperature range	-40...+70 °C (-40...+158 °F)

The system that is composed of interconnected safety mats and control unit meets the requirements of EN ISO 13849-1 Category 3.

System Description

The safety mat system comprises one or more interconnected pressure sensitive safety mats and a control unit. There are no dead zones within the detection zone. Individual safety mat sections are available in rectangular standard sizes and also in specially cut shapes, up to the size of the largest standard safety mat. All safety mats have the same construction and operation principle.

Each safety mat has two conductive plates that are held apart by non-conductive compressible separators. The safety mats operate at 24V DC and connect in series to form a floor level sensing system for hazardous areas around the machinery. The control unit monitors the circuit through the safety mats. When the area is clear, the control unit provides a signal to the machine control circuit. When you step on any safety mat, the conductive plates touch and the resistance in the circuit drops, which causes the control unit to shut down the machine. Any single electrical fault in the safety mat, wiring, or control unit is detected and the control unit outputs go to a safe (off) state. The molded vinyl safety mats are sealed to IP67.

440F-C28013 Mat Manager

The unit comprises an eight-channel safety mat system. When you step on any safety mat, the control unit shuts down the machine and the channel fault status display indicates which safety mat is operated.

Two operating modes are available: Manual Reset and Auto Reset.

In Manual Reset mode, the output-on signal can only be restored after the removal of the actuating force and after a reset. To reset the unit manually, push and release the lid-mounted control unit Reset button or a remote-mounted button. At power-on or following the loss and subsequent restoration of power, the outputs are off until a reset signal is received, even if the safety mat is not actuated.

In Auto Reset mode, the output-on signal is achieved solely by the removal of the actuating force. For both modes, the safety contacts are always off (open) after the safety mat actuates. See Installation on page 13 for mode selection. Individual safety mats connect to each other and to the control unit via four wires. The control unit has cross-monitored safety relays and it is possible to configure the unit so that an external contactor fault is detectable.

The control unit complies with the requirements of EN ISO 13849-1 Category 3 regarding electrical faults and can be met for the associated part of the machine control system. Compliance with the requirements of EN ISO 13849-1 Category 1 is achieved for the safety mat sensors. Installation on page 13 details the interfacing. The operating principle of the safety mat is shown in Figure 5 and Figure 6.

Figure 5 - Safety Mat at Reset

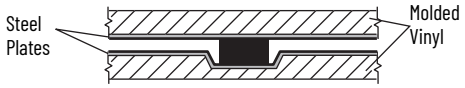
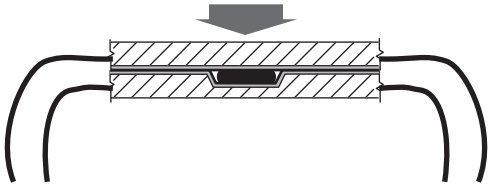


Figure 6 - Safety Mat Activated



When the safety mat activates, the non-conductive compressible separators (shown as black) compress into their recess, which allows the two plates to make contact, and offers all-over sensitivity. The system is intended for the detection of adult persons with a weight of 35 kg (77.16 lb) or more. The system is suitable for the detection of adults who use walking aids (walking sticks or frames).

IMPORTANT	The system is not suitable for the detection of children. The system must not be used with any additional covering on the safety mat.

The vinyl outer surface of the safety mat is sealed to resist the ingress of liquids. The seal resists bleaches, acids, salt, and most industrial chemicals. See Table 3 on page 6 for detailed guidance on chemical resistance.

The system operates at 24V DC with restricted fault current. Therefore, damage to the safety mats or interconnecting wiring does not generate any electric shock hazard in normal circumstances.

Figure 7 - Basic System and Connections 440F-C4000P and 440F-C4000S Control Units (Two Contactors)

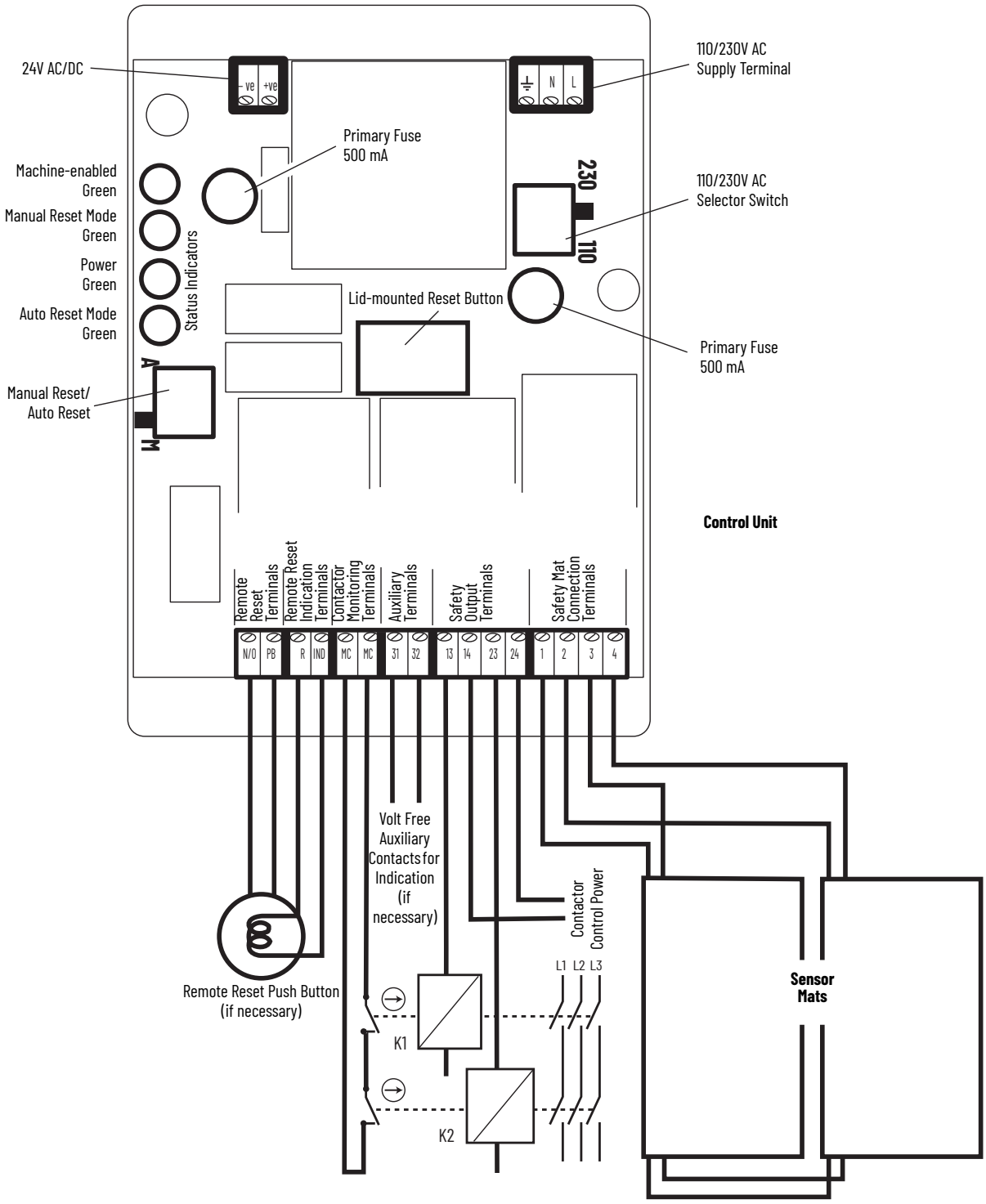


Figure 8 - Basic System and Connections 440F-C4000D Control Unit (Two Contactors)

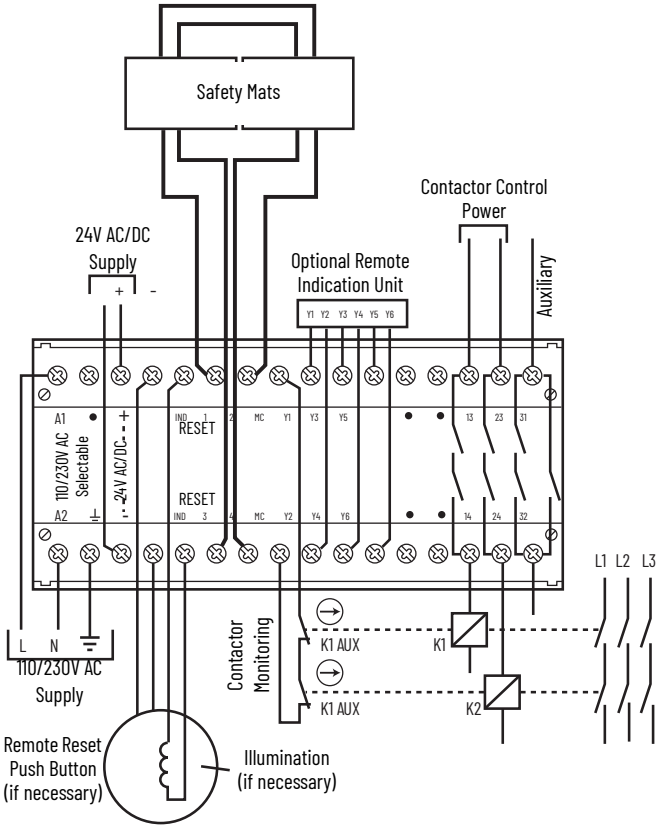
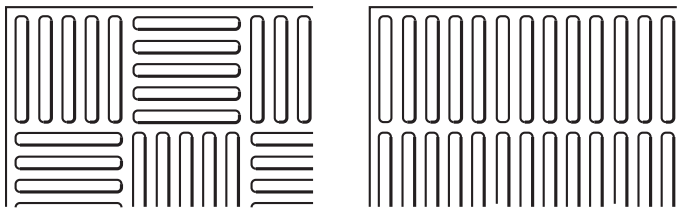


Figure 9 - Rib Pattern



Checker Rib Pattern
Provides grip in all directions

Straight Pattern
Easier to clean (hose/washdown) Suitable for dirty or hygiene-sensitive applications

Applications

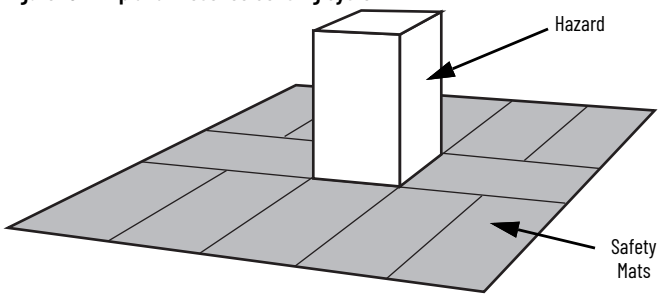
Use the proper type of safeguarding system that is suitable for the intended application. A documented process of risk assessment of the machinery or process reveals the identity and nature of the hazards together with other relevant information. The compare the characteristics of the safeguarding system with the results of the risk assessment to determine whether the risk can reduce to an acceptable level.

On some applications, the combined use of multiple types of safeguarding systems can be necessary to achieve an acceptable level of risk.

- The system is designed for the protection of personnel by sensing their presence on floor areas around machinery and other similar hazards.
- Use the system only within the given specification limits and install strictly in accordance with the information that is provided in this manual.
- The system alone does not provide protection against hazards that arise from the ejection of materials, gases, and radiation. These applications can require additional protective measures, such as physical guards.
- The system is not intended for use as a perimeter-only guard.
- The system is not intended for use as a machine initiation or reinitiation device. Configure the machine control circuit so that when the output contacts of the system close, the starting circuit of the machine enables, but does not directly cause the machine to start up. It must only be possible to start or restart the machine by a separate and deliberate action at the designated machine controls.
- The system is not suitable for use in explosive atmospheres.
- If you require further guidance concerning the suitability of the system for a specific application, contact your local Allen-Bradley product distributor or Rockwell Automation sales office.

Figure 10 shows safety mats in use as a combined trip and presence sensing system.

Figure 10 - Trip and Presence Sensing System

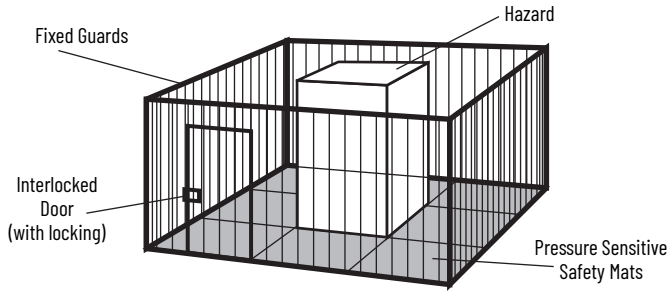


The system allows a clear view of the process and unhindered access for operators and some types of vehicles.

- There must be sufficient space to allow the minimum distance from the hazard to the accessible safety mat perimeter to be in accordance with the safety distance calculations given in System Configuration on page 6.
- Safety mat sensors must cover the entire floor area between the defined perimeter and the hazard so that it is not possible to approach or be in the vicinity of the hazard without actuating the safety mat system.

Figure 11 shows safety mats in use as a presence sensing system within a guarded perimeter.

Figure 11 - Presence Sensing System within Guarded Perimeter



The system provides presence sensing to help prevent any possibility of the start of the machine while personnel are inside the enclosed area.

- The safety distance calculations that are given in Combined Trip and Presence Sensing Device on page 7 are not applicable when the system is used in this way as a secondary protective system. The perimeter guarding method must conform with all relevant requirements.
- Safety mat sensors must cover the entire floor area between the enclosed perimeter and the hazard so that it is not possible for personnel to be in the enclosed area without actuating the safety mat system.

System Configuration

Only design these installations if you have experience in safety-related control system design, and are suitably competent in electrical and mechanical engineering.

Many factors contribute to a safe and proper installation. Work through the following steps to confirm that nothing is overlooked and that the installation is planned and implemented with minimum fuss and maximum confidence. The detail of the procedures that follow is based on European best practice, and in compliance with the EU Machinery Directive. Even if these requirements do not apply in your installation, we recommend that you follow the same steps, but modify the details to suit relevant statutory requirements or codes of practice (for example, ANSI, OSHA).

Nature of Hazard

The system provides protection against risks that the isolation of electrical power when an operator is near the hazard can minimize. Additional measures are required to address other hazards identified in a risk assessment (for example, part ejection, or hot surfaces). These measures can include fixed guards, interlocked guards, warning notices, and so on. Contact your local Allen-Bradley distributor or Rockwell Automation sales office for further information, if necessary.

IMPORTANT A risk assessment is included in EN ISO 12100.

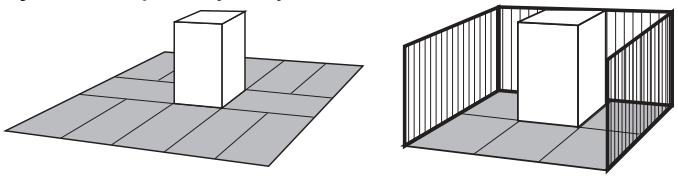
Nature of Safeguarding

The system design must satisfy three main requirements.

- The machine must stop if a person is in a position able to reach into the hazardous zone.
- The machine must come to a stop before an approaching person can be in the position able to reach into the hazardous zone.
- The system must not be easily bypassed.

The recommended use of the safety mat system gives presence sensing over the whole area where access is possible to the hazard (see Figure 12). Other uses of the safety mat system, for example, solely as a perimeter access guard, or as a machine enabling device, are not recommended. If you are considering the safety mat system for any application that is not covered by this manual, contact your local Allen-Bradley distributor or Rockwell Automation sales office.

Figure 12 - Example Safety Mat Systems



Environment and Operating Conditions

See Specifications on page 2 and the information in this section to confirm that there are no adverse factors that can compromise the integrity of the system.

Table 3 - Chemical Resistance of Safety Mat Vinyl Covering

Substance	Resistance of Mat Covering
Water	Excellent
Ethyl Alcohol	Excellent
Sodium chloride	Excellent
Bleach	Excellent
Hydrochloric acid	Fair to excellent
Sulphuric acid	Fair to excellent
Nitric acid	Fair to excellent
Acetic acid	Fair
Petrol (gasoline)	Fair
Trichloroethylene	Fair to poor
Benzene	Poor
Acetone	Poor

In general, the covering has excellent resistance to acids, alkalies, and salt. Hot acids and alkalies, and concentrated and organic acids, have a deleterious effect with prolonged exposure. The covering has fair resistance to aliphatic solvents, fair to poor resistance to aromatic and chlorinated solvents, and poor resistance to ketones and most esters.

IMPORTANT Combinations of chemicals can have unpredictable effects. We recommend you conduct tests in such cases. Small pieces of the vinyl material are available from your local Allen-Bradley distributor or Rockwell Automation sales office, if tests are required.

Slip and Trip Hazards

Both safety mat patterns provide a non-slip surface under most conditions, but must be kept free from large deposits of grease, soaps, or gels. If the straight rib side is uppermost, we recommend that the ribs run across the hazard to give improved grip.

Wear and Damage

Impacts from sharp or heavy objects can damage the outer surface of the safety mat. After every such event, inspect the safety mat for deformation or punctures and replace if necessary.

Safety mats are designed and tested to withstand one million operations in any one spot. In use, do not exceed this number of operations in any single location. Occasional heavy loads (for example, up to three ton trucks) are unlikely to damage the safety mats, but do not use safety mats on traffic through routes.

Explosive Atmosphere

The system is not suitable for use in explosive atmospheres.

European EMC Directive

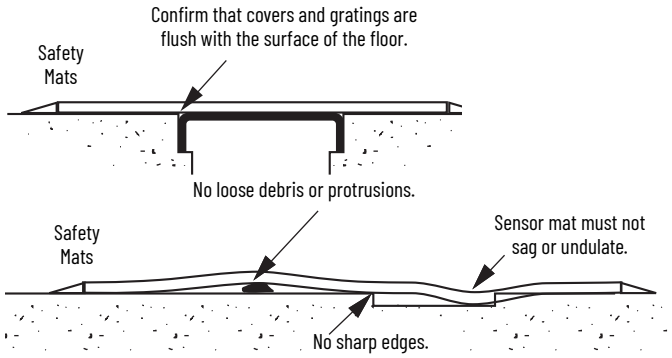
The safety mat system complies with the requirements of the European EMC Directive. Normal operation under interference conditions, likely in industrial environments, is verified and has been tested and certified.

IMPORTANT Special measures can be required in the presence of abnormally high levels of E.M.I., for example, near to welding or induction heating equipment, or near radio transmitters or transceivers.

Floor

The floor or mounting surface for the safety mats must be flat, smooth, rigid, and shows no perceptible distortion under the heaviest anticipated load. Undulations, protrusions, large gaps, or other irregularities increase the sensitivity of the sensor mats and can result in intermittent unintended switching off (nuisance tripping).

Figure 13 - Floor Conditions



Small and regular protrusions, such as a checker plate pattern, are acceptable. Skimmed concrete floors are ideal. If any doubt exists, contact your local Allen-Bradley distributor or Rockwell Automation sales office.

Control Unit Mounting

See Approximate Dimensions on page 21. Do not mount the control unit within the detection zone.

If you require access to the control unit for manual reset or routine indicator observation, mount the control unit at an accessible position outside the protection zone that still provides a good view of the hazard and protection zone.

Situate the reset actuator outside the protection zone and in a position that gives good visibility of the hazard and protection zone.

In other cases, you can mount the control unit can anywhere that is convenient outside the protection zone that accommodates for the access requirements for tests and maintenance.

Mount the 440F-C4000D control unit within an enclosure to a minimum of IP54 (in accordance with EN 60529).

IMPORTANT The control unit is not suitable for direct exposure to high-pressure cleaning.

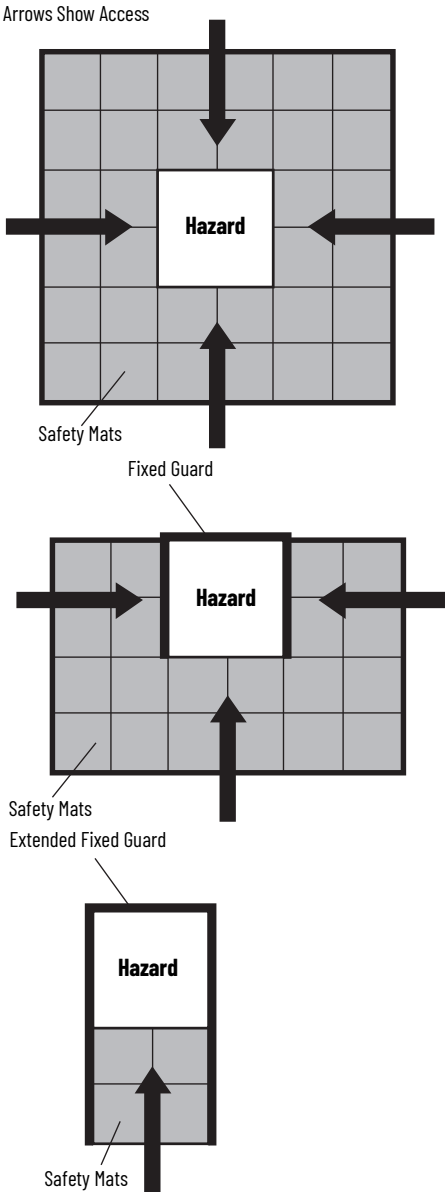
Safety Mat Positioning

Combined Trip and Presence Sensing Device

The position of the safety mat edges is calculated as a horizontal distance from the hazardous zone. Define the hazardous zone as a volume and account for all possible modes of the machine and all variations in the size of the workpiece. You must record the dimensions, position of the hazardous zone, and the assumptions that you use so you can check the adequacy of the safeguarding.

If you use other safeguarding measures with the safety mat system, those measures can affect the requirements for the size and position of the safety mats, as shown in Figure 14.

Figure 14 - Safety Mat Positioning



IMPORTANT Fixed guards must meet the requirements of EN 14120 and EN 13857.

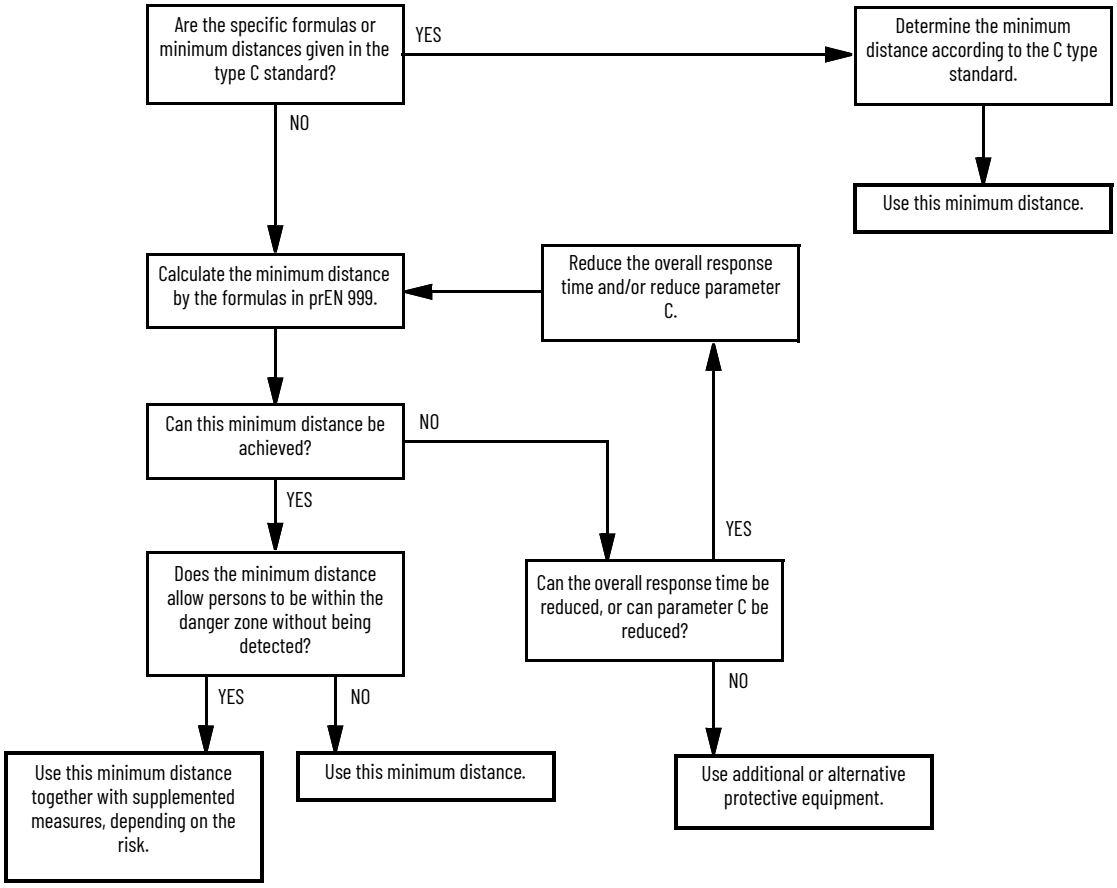
First, ascertain one or more routes where you require unobstructed access to the hazardous zone across the safety mat system. Consider all routine needs for access, such as product inspection, machine inspection and adjustment, tool changes, and the removal of blockages. Also consider visual observation of the process. Consider the space requirements of persons and ancillary equipment close to the machine during interventions.

Safety Distance Calculations

Applications that use the safety mat system as a combined trip and presence sensing system must be done in accordance with EN 13855. See Figure 15 on page 8.

If the machine is designed in conformity with an existing harmonized European C type standard for that machine (which gives specific formulas or minimum distances), use these standards in preference to the standards given in EN 13855.

Figure 15 - Methodology Flowchart



The calculated minimum distance is the minimum horizontal distance from the outer edge of the MatGuard safety mat system detection zone to the nearest part of the hazard.

The EN 13855 formula for floor-mounted safety mats is:
S = (1600 x T) + 1200 mm

S is the minimum safety distance in millimeters.

The factor of 1600 is based on the standard assumption of 1600 mm/s (63 in./s) as the approach speed.

T is the overall stopping time in seconds.

The added 1200 mm (47.24 in.) is parameter C given in EN 999 and accounts for stride length and arm reach.

The overall stopping time T is the sum of two parts:
T = t1 + t2

t1 is the maximum time between actuation of the sensing function and the output signal switching devices being in the off state.

For the MatGuard safety mat system, t1 = 35 ms.

t2 is the response time of the machine, that is, the time that is required to stop the machine or remove the risks after receiving the output from the MatGuard safety mat system.

The response time of the machine that is used in the calculation must be the worst case time. Some machines have inconsistent response times, which are dependent upon the mode of operation, the nature of the workpiece, and the point in the operating cycle at which stopping is initiated. Allow for conditions that can affect the response time, such as wear on brakes. Some circumstances can require an allowance for further delays in the machine control system.

Calculation Example

In the following example, the MatGuard safety mat system is used with a machine with a worst case response time measured as 0.485 seconds.

Using the formula,

T = t1 + t2
= 35 ms + 485 ms
= 520 ms = 0.520 s

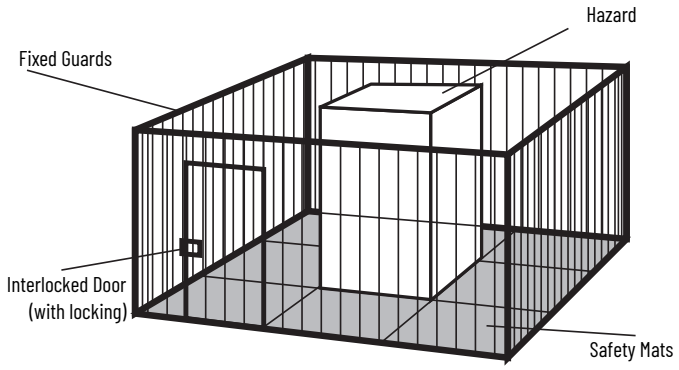
S = (1600 x 0.520) + 1200 mm
= 832 + 1200 mm = 2032 mm

Safety mats are required from 2032 mm (80 in.) up to the edge of the machine baseplate.

Presence Sensing System Within Perimeter Guarding Area

If the area around the hazard is enclosed within a guarded perimeter (see Figure 16 on page 9), the requirements of prEN 999 do not necessarily apply. In these applications, the MatGuard safety mat system detects the presence of an operator to help prevent reset of the perimeter-guarding system and the restart of the machine while the operator is inside the enclosure.

Figure 16 - Guarded Perimeter



IMPORTANT Fixed guards must meet the requirements of EN 14120 and EN 13857.

A suitable perimeter guarding system would be a fixed guard with an access door that is fitted with an interlock switch with conditional guard unlocking (see EN 14119). A trip device, such as a safety light curtain, can also be suitable for some applications. Calculate the position of the safety light curtain according to EN 13855.

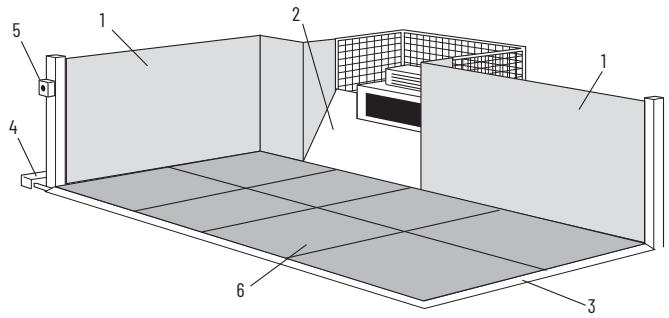
Fixed Guards

Design the fixed guards must so that access is not possible to the hazardous zone other than via the MatGuard safety mat. Guard construction and position must be in accordance with EN 14120 and EN 13857.

Bypass Prevention

It must not be possible to reach the hazard without standing on the MatGuard safety mats. Prevent access to the hazardous zone from positions that do not involve standing on the MatGuard safety mats. This restricted access requires additional angle plates and the careful position of pipework and trunking. Best practice is shown in Figure 17.

Figure 17 - Bypass Prevention Best Practice



Item	Description
1	Fixed guards help prevent access to the hazardous zone in such a way that there is no access between the guard and sensors.
2	A sloping cover plate helps prevent the operator from avoiding the sensing area by standing on the machine base plate.
3	A ramp at the point of access reduces the tripping hazard at the sensor edge. The ramp can also protect connected cables. The optional perimeter trim is a ramp section.
4	Cable trunking is installed outside of the fixed guard. This configuration helps prevent against the misuse as access to the hazardous zone.
5	A Reset button is in a well-protected location that gives full visibility of the machine.
6	Safety mats are properly installed.

Electric Interfacing

The protection that the system provides depends on the correct interfacing between the system and the machine.

The safety output contacts from the system are arranged as two independent voltage free N.O. contact pairs. See the terminal positions in Installation on page 13 and ratings in Specifications on page 2.

The control unit conforms to Category 3 according to EN ISO 13849-1. In common with other safety mats and floors, Category 3 performance for the safety mat cannot be achieved for faults that result from severe mechanical damage or long-term degradation. The safety mats conform to Category 1 according to EN ISO 13849-1.

The system, which is composed of interconnected safety mats and a control unit, meets the requirements of EN ISO 13849-1 Category 3.

Use the safety mat system as the sole protective measure or in combination with other measures or devices (for example, safety light curtain, system of work).

Where a harmonized European C standard is available for the machine type, it contains requirements and guidance for the safety-related control system of the machine. EN ISO 13849-1 also provides guidance. You must provide an adequate level of protection against foreseeable faults to the appropriate category of EN ISO 13849-1. For this reason, we recommend you use a dual-channel configuration with duplication and monitoring of the final switching elements (contactors) on all higher risk applications.

Examples of interconnections of the safety mat system (Figure 18 on page 10...Figure 21 on page 11) show control unit applications with:

- Circuit status
- Supply power is on
- No presence on safety mat
- Reset button operated (if in Manual Reset mode)
- Machine start circuit enabled

IMPORTANT If one or both of the contactors stick on, the motor stops when the safety mat is stood on and the fault is detected.

Figure 18 - Single-channel Diagram - 440F-4000P and 440F-4000S Control Units

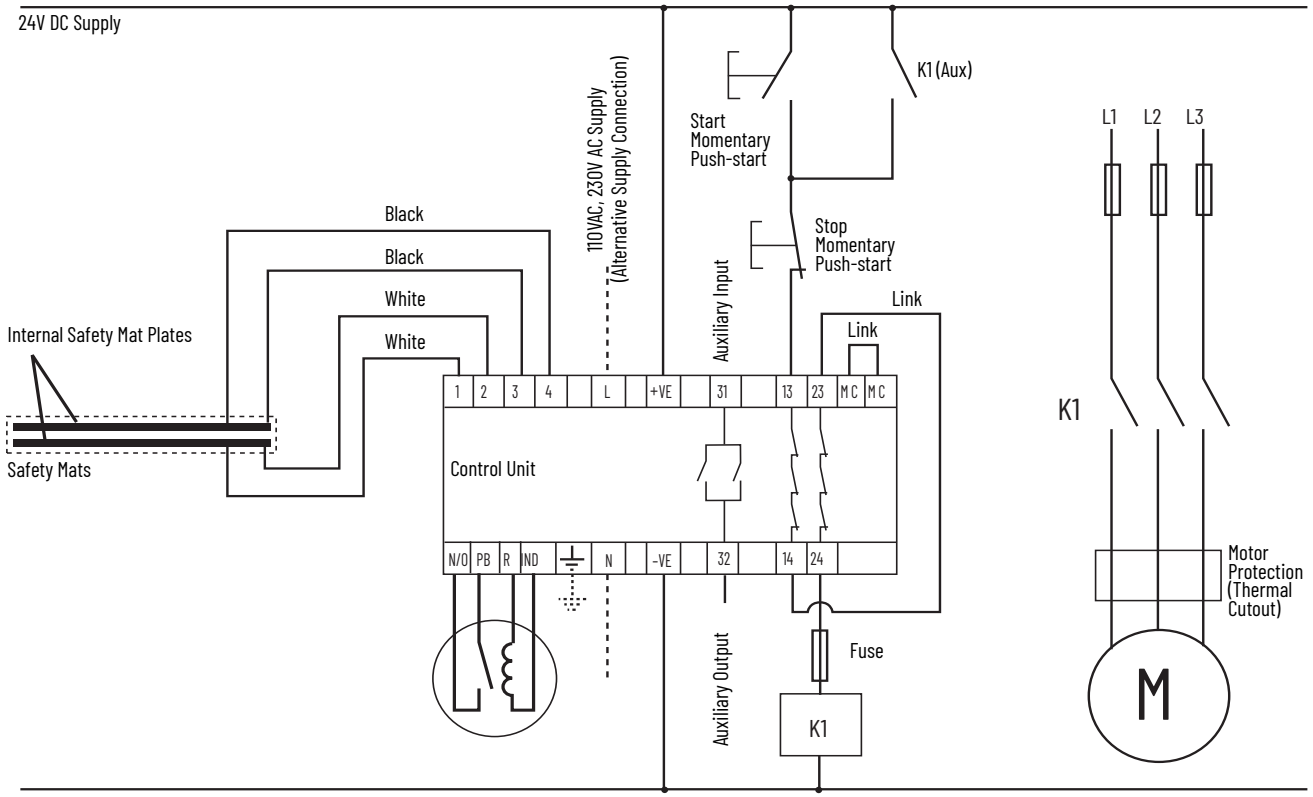


Figure 19 - Dual-channel Diagram - 440F-4000P and 440F-4000S Control Units

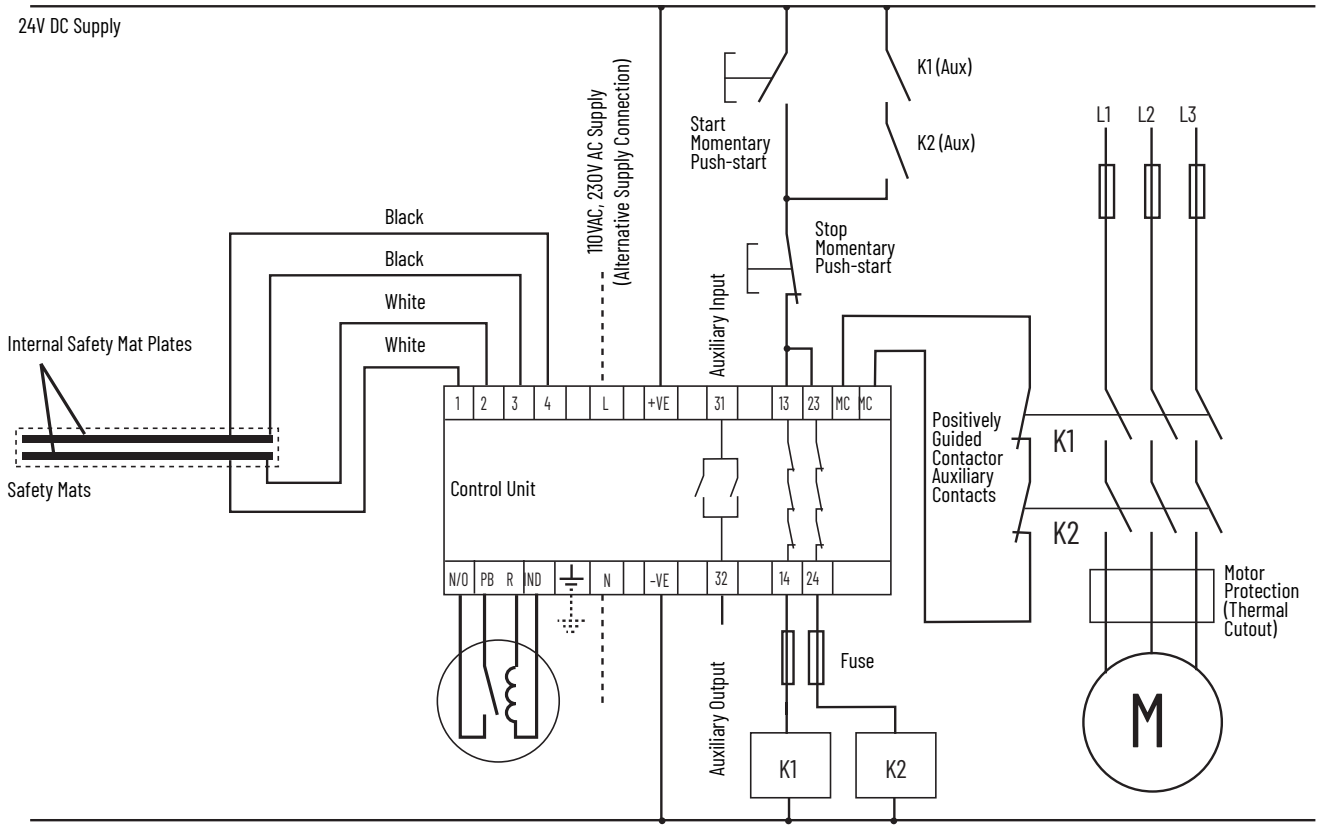


Figure 20 - Single-channel Diagram - 440F-4000D Control Unit

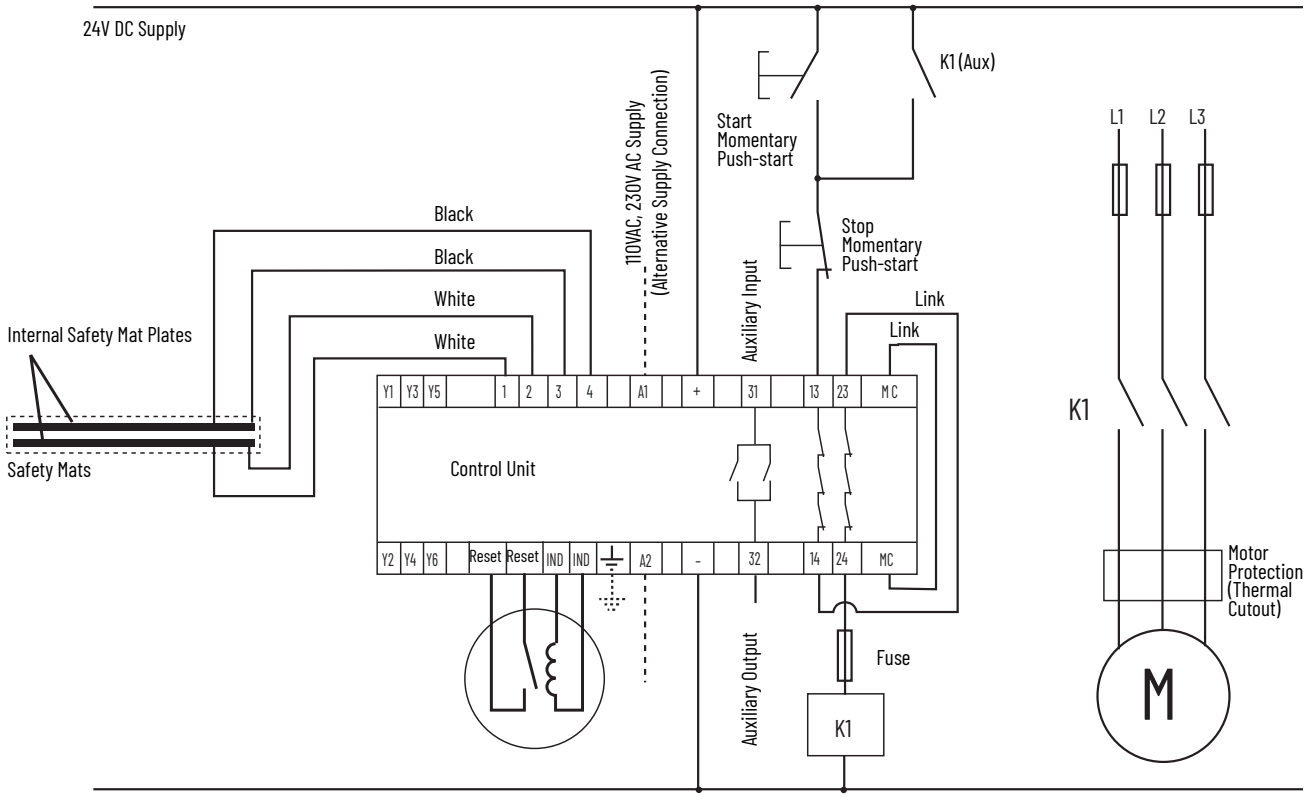
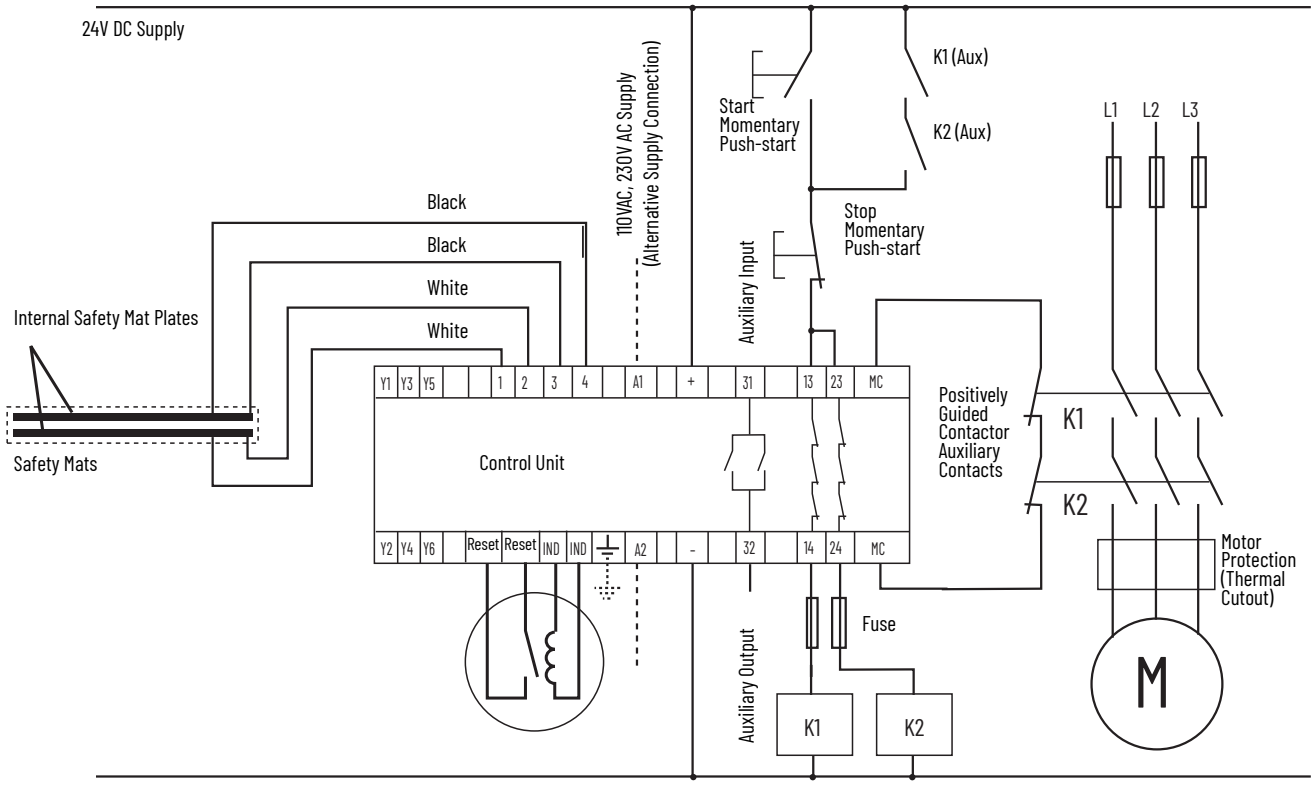


Figure 21 - Dual-channel Diagram - 440F-4000D Control Unit



After completion of the safety-related control system design, confirm that the response time assumed in Combined Trip and Presence Sensing Device on page 7 remains valid. If the value changes, repeat the safety distance calculations.

Next, consider the options for reset. Account for the consequences of the selected reset scheme for hazards such as unexpected startup, both under normal conditions and under fault conditions. Figure 22 on page 12 and Figure 23 on page 12 show both reset modes of the MatGuard safety mat system.

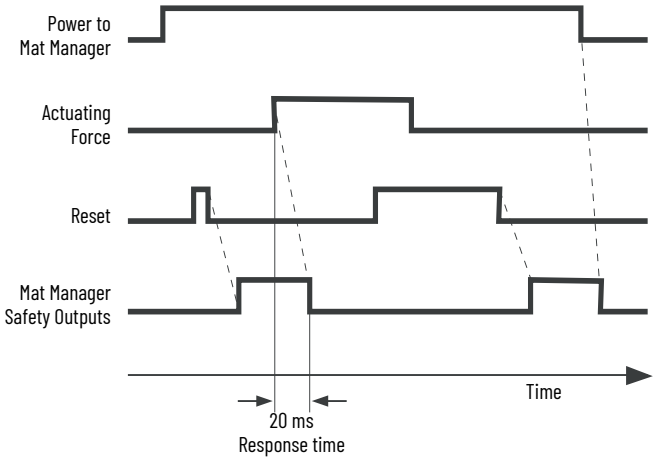
Reset Modes

Manual Reset Mode

To initiate manual reset, push and release a remotely mounted momentary Reset button, or use voltage-free contacts within the machine safety-related control system. The safety outputs of the safety mat manager remain off until reset after power-up and can require primary/secondary reset circuits in complex systems where other power-up interlocks (start interlocks) are present.

Figure 22 - Manual Reset Mode

Relationship between actuation, reset, and output.

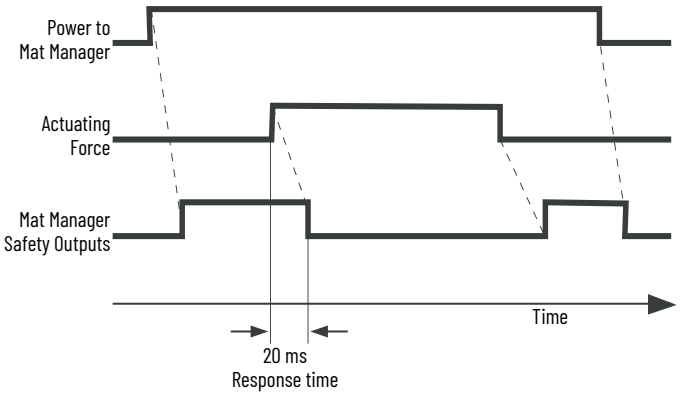


Auto Reset Mode

When used in Auto Reset mode, the control system of the machine requires a separate reset function to help prevent machine startup when stepping off the safety mat, or after a temporary power supply failure or dip.

Figure 23 - Auto Reset Mode

Relationship between actuation, reset, and output.



Auxiliary Output

An auxiliary output is a non-safety, status output. Use an auxiliary output, for example, as a status import to the PLC in systems that use PLC functional machine control in combination with hard wired safety circuits. Other uses include diagnostics in protection schemes, and/or driving status lamps or alarms. The safety function must not depend on this output.

Arc Suppression

We recommend arc suppression networks or devices for all inductive loads. For safety circuits, suppressors must fit across the load and never across the contacts. The supply and load characteristics determine the type and ratings of the suppressors. Suppressors can increase response time, particularly suppressor diodes across DC coils, and must be in place when you measure response times.

Contactor Monitoring

Contactor monitoring is provided via the two terminals marked MC. Use contactor monitoring in all dual-channel, two contactor systems. If one of the contactors fails to isolate the power, the safety mat control unit locks out and helps prevent the re-energization of the other contactor until the fault is rectified.

Final Safety Mat Layout

After you consider the previous factors, check and finalize the safety mat layout. Consider whether the machine response time changed from the initial calculations.

Whenever possible, arrange safety mats with the wires at the outside edge of the detection zone. This arrangement simplifies installation and replacement, if necessary, and all wiring is protected by the perimeter trim.

Wiring

Protect all system wiring from mechanical damage and suitably seal all wiring for the operating environment. Waterproof butt connectors are supplied for safety mat to safety mat connections and are protected by the edge trim. Where wire runs are required across the floor, the 440F-T3230 wire guide provides suitable protection. Use conduit or trunking for other wire runs. Use correctly sized and tightened conduit fittings or cable glands to IP65 to maintain the sealing integrity of the control unit.

Wiring practices must be in accordance with EN 60204-1 Clause 14.

IMPORTANT	To isolate the 110/230V supply, separately rout the input power supply to enter the control unit via separate fittings or glands than those fittings that are used for the output wiring. You can use conduit to bury wiring from the control unit to the safety mat in the floor, or pass the wiring via the edge trim. We recommend flexible conduit for this type of installation. See Installation on page 13 for further details. Determine the wiring method and determine the input and output connection points for the safety mat to control unit wiring.

Final Details

Prepare a work schedule and drawings of the system layout and the electrical circuit. We recommend that you record and retain all measurements and calculations in the technical file for the machine.

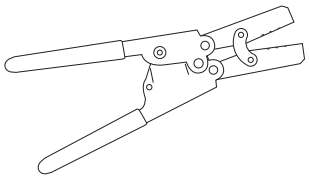
Installation

The system designer must supervise the installation and commissioning. A mechanical technician and an electrician familiar with industrial wiring practices are required for the installation.

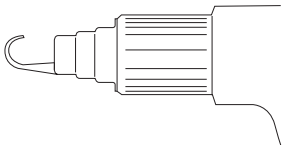
Only a trained electrical technician with experience in safety installations can perform the commissioning.

The following special tools are required:

- Crimp tool for pre-insulated butt splice connectors



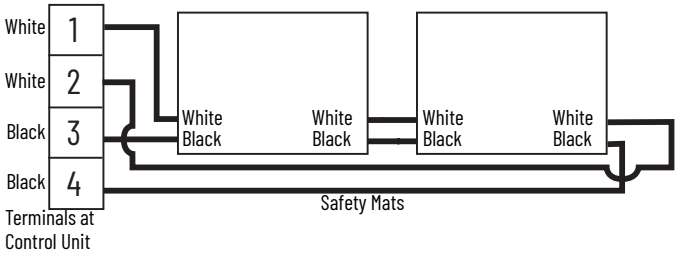
- Hot air gun with reflector attachment for heat shrinking



Safety Mat Installation

Isolate and lock off the machine power supply at the source. Verify that the floor is flat, smooth, clean, free of debris, and that any buried conduit or other wiring provision is correctly in place. Unpack the safety mats; take care to keep the safety mats flat and not to pull on the wires. Place the safety mats on the floor in the planned positions with the connecting wires at the periphery of the detection zone. Connect the safety mat sections together according to Figure 24.

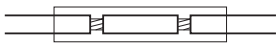
Figure 24 - Safety Mat Connections



The safety mat wires have a black outer covering; two have a black inner sheath and two have a white inner sheath (see Figure 24 for positions).

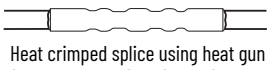
Leave a sufficient wire tail length to enable the connection to be remade if a safety mat must be replaced, but confirm that the interconnecting wires fit easily under the edge trim without being crushed. Use the supplied butt connectors to join the wires, as shown in Figure 25. Where the safety mat wires require extending (for example, front safety mat to rear safety mat connections, and control unit connections), use an extra pair of the butt connectors and a length of twin wire.

Figure 25 - Wire Connections



Strip wires 8 mm (0.31 in.) and insert into the crimping barrel.

Crimp using the correct cavity size on the crimp tool.

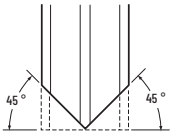


Heat crimped splice using heat gun with deflector until tubing shrinks and adhesive shrinks and flows.

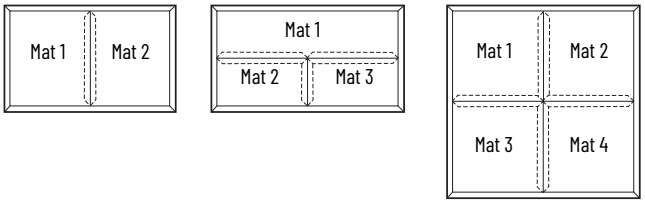
Unite Trim Mounting

Miter all active uniting trim sections that are used in the installation to 45°. Mitered trim aids in installation and helps retain the overall sensitivity of the sensing area.

Figure 26 - Unite Safety Mats



Miter All Trims to 45°
As Shown in Mat Layouts



Perimeter Trim Mounting

Where the wiring to the control unit is not buried, notch the perimeter trim at the wire entry and exit positions, and cut the trim slope to suit the conduit system selected. Notch the perimeter trim so that any flexing of the perimeter trim does not trap the wiring. Confirm that there are no sharp edges or burrs that can damage the wires.

Figure 27 - Perimeter Trim and Uniting Trim Showing Detection Zone

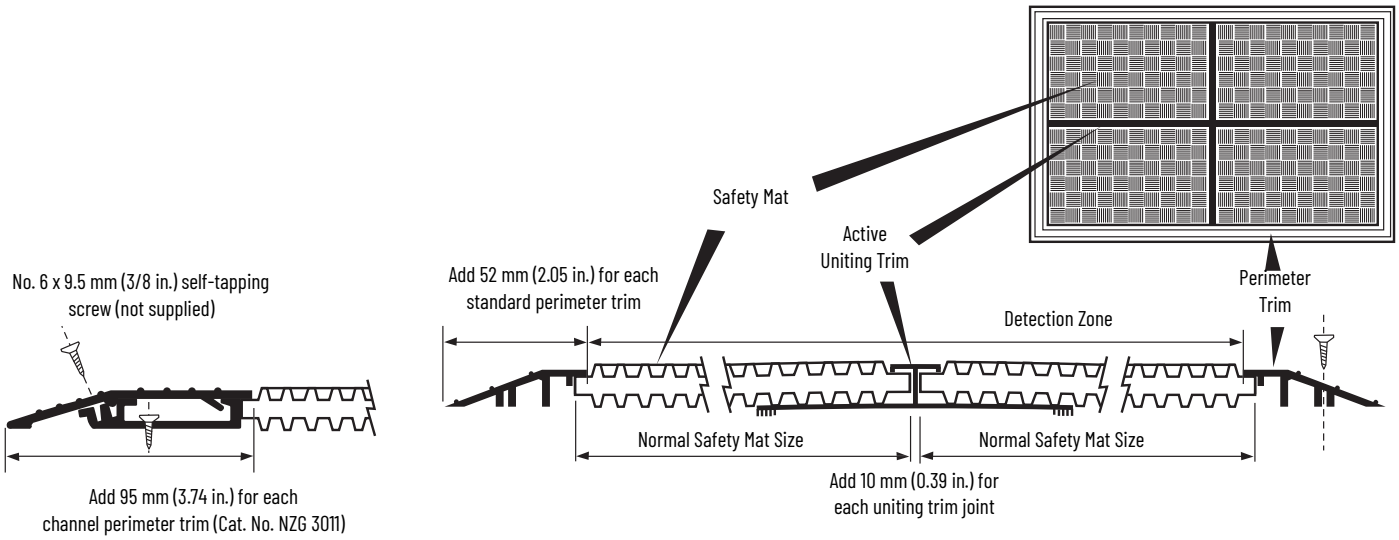
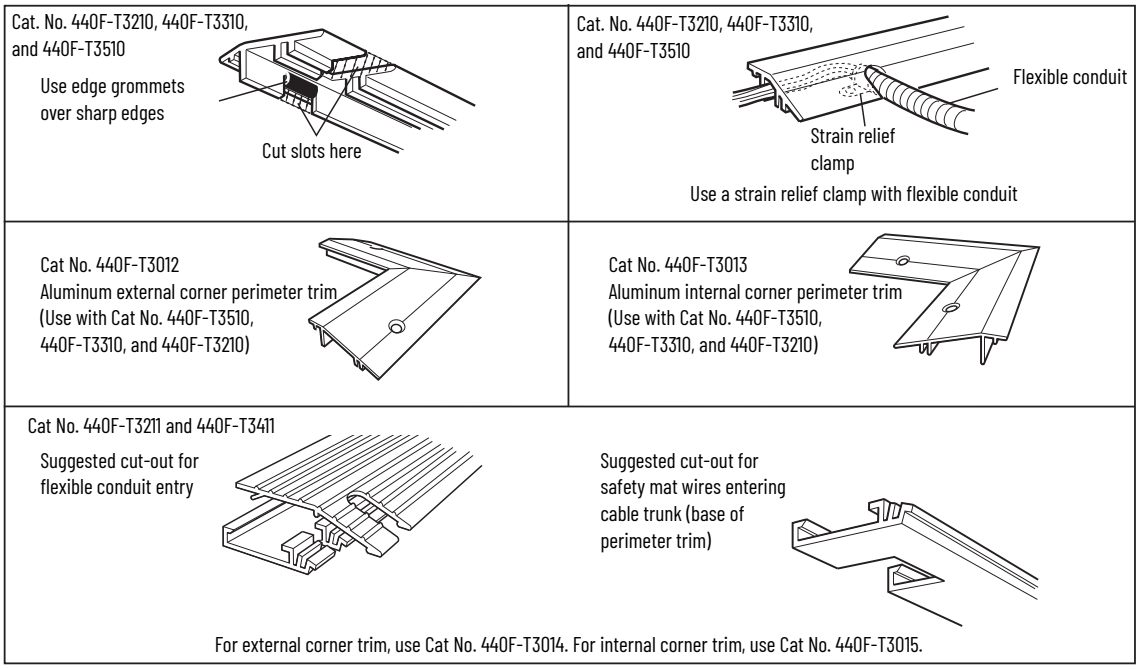


Figure 28 - Details of Trim Mounting



Mark out the edge trim mounting positions on the floor, allowing the trim to overlap the safety mat. Use the holes in the trim as a guide to mark out and drill the floor (fit plugs if necessary). Clean off the floor and use countersunk screws that are suited to the application to mount the safety mats and edge trim in place.

As you fit the perimeter trim, confirm that none of the wiring is trapped or crushed between the trim and the floor or the top and bottom sections (depending on trim type).

Use a strain relief clamp where the wiring exits the perimeter trim wherever wires can be caught or pulled. Protect all wiring in suitable conduit. If possible, the wiring and conduit must not cross a floor area where it is a tripping hazard. If crossing the floor is unavoidable, enclose the wiring and conduit within the 440F-T3230 protective wire guide.

Control Unit Installation and Wiring

Only install the control unit as supplied. Do not modify or subject the control unit to any procedures or connections other than what is described in this manual.

To prepare the 440F-C4000P control unit, carefully knock out the cable entry positions to be used. Rout the input power separately and enter the control unit via a separate entry than the output wiring. Mount the control unit in the planned position. All wiring to the control unit terminals must use either the supplied wire type, or multi-strand conduit cable, switchgear cable, or equipment wire with 0.5...1.5 mm^2 (30...16 AWG) conductors. Use glands or adapters that provide an ingress protection rating of IP65 to achieve cable entry into the 440F-C4000P control unit. Confirm that the glands or adapters are of a suitable size and are fully tightened.

Only use the supplied insulated pin crimps. This wire and terminal combination avoids the possibility of shorts from loose strands or open circuits that overtightening or vibration can cause.

Only use a suitable ratchet type crimp tool. Crimp onto both the conductor and the insulation. Do not connect multiple wires onto one crimp.

Verify that the power supply remains isolated and locked off until Check the Electrical Functions on page 16.

Externally fuse the main AC supply at the point of supply by a 500 mA maximum high rupture capacity (HRC) fuse. Fuse the neutral side of the supply to the same specification, unless it is referenced to earth.

Figure 29 - 440F-C4000P and 440F-C4000S Control Unit Wiring

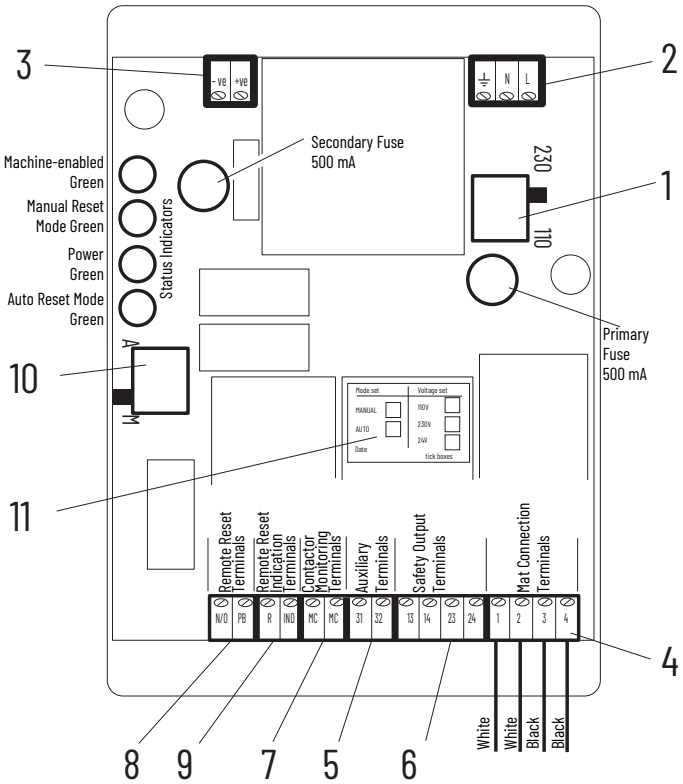


Figure 30 - 440F-C28013 Mat Manager Wiring

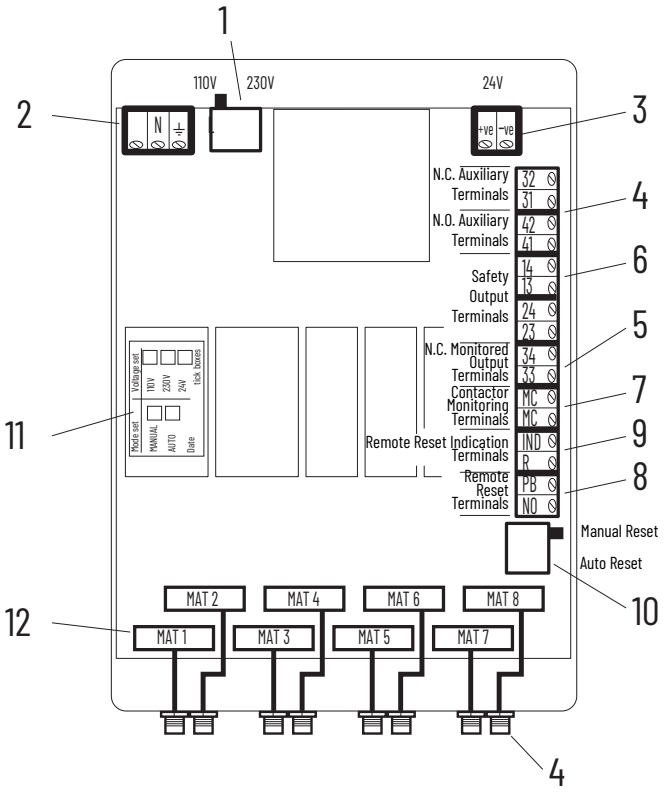
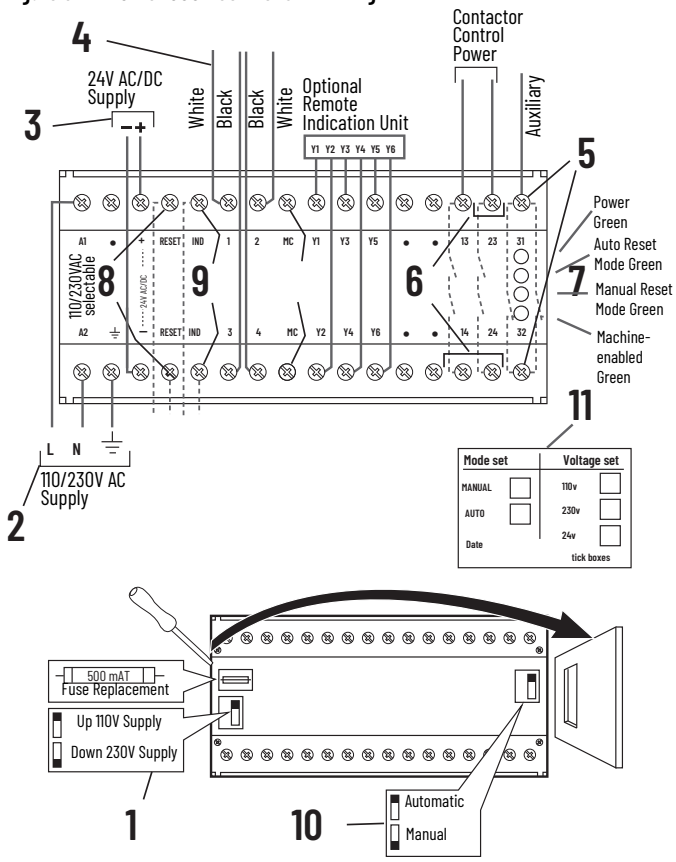


Figure 31 - 440F-C4000D Control Unit Wiring



Installation Procedure

1. Switch the voltage selector switch to 110V or 230V as appropriate to match the supply voltage.

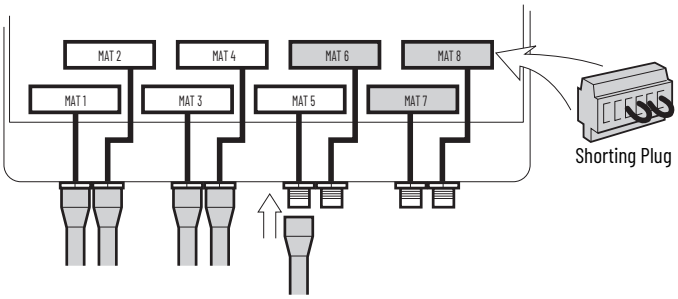
   The system is factory set at 230V AC.

2. If you use a 110V or 230V AC supply, wire to the terminals shown, including a protective earth. Check the setting on the voltage selector switch, set in step 1. Do not make any connections to the terminal shown in step 3. The size of the protective earth wire must be at least equal to that of the supply wire.
3. If you use a 24V AC/DC supply, connect to the terminals shown to deliver the correct polarity. Do not make any connections to the terminals shown in step 2. With 24V AC, the earthed pole of the power supply must connect to the terminal (-ve).
4. Safety mat connections: Connect the leads from the safety mat to the terminals shown. 1=White, 2=White, 3=Black, 4=Black.

   440F-C28013 mat manager: Eight quick-connect adaptors that are labeled 1...8 are on the base of the unit and provide connection to the safety mats.

   If less than eight mats connect to the control unit, the other connections must end with the supplied shorting plugs. The required safety mats must connect in sequence (1...8) to the quick connect adaptors on the outside of the unit. To end unused connectors, unplug fitted connectors and replace with shorting plugs as shown in Figure 32.

Figure 32 - Connect/Terminat Safety Mat Connections



5. The auxiliary outputs terminal provides auxiliary N.C. contacts (for example, closed when the machine-enabled status indicator is off) suitable for indication or alarm devices. The auxiliary N.C. contacts must not be connected to the safety circuit.

   MGCSM1 and MGCSM4 offer N.C. and N.O. contacts.

   Safety outputs are volt free terminals for connection to the machine safety circuit; safety outputs connect in series with the machine contactor control circuit (max rating 250V, 4 A). Protect safety outputs externally with suitably rated fuses.

   For one contactor, use terminals 13 and 24 with terminals 14 and 23 linked.

   For two contactors with two independent control circuits (dual-channel system), use terminals 13 and 14 for connection to one contactor control circuit and terminals 23 and 24 for connection to the other.

   See Figure 18 on page 10...Figure 21 on page 11 for examples of typical interfacing with the machine control circuit.

IMPORTANT The safety outputs must connect directly via hard wiring to the machine primary control elements (contactors). Safety outputs must not connect via any elements such as ordinary relays or PLCs not suitably specified for safety-related functions.

6. The control unit is provided with contactor monitoring terminals linked. When the link is removed, terminals can connect to positively guided N.C. auxiliary contacts on the machine contactors to provide monitoring of the contactors in dual-channel control systems. If one contactor fails to isolate the power at de-energisation of its control coil, the safety mat control unit does not allow the other contactor to energize until the fault is rectified.
7. Remote reset N.O. terminals are provided for the connection of a remote Reset button.

   Catalog numbers 440F-C4000P, 440F-C4000S, and 440F-C28013: If there is not a full view of the hazardous zone from the control unit, disconnect the wires from the reset switch on the control unit lid at the terminal block to disable the reset function at the control unit.
8. The reset indication (if used) with an illuminated push-button remote reset switch, shows when the safety mat system must reset. Remote reset indication terminals are for connection to the bulb (28V).
9. Set the manual reset/auto reset (M/A switch) to the required setting.

   M = Manual Reset mode

   A = Auto Reset mode

IMPORTANT Disconnect the machine prime mover from the final contactors so that no machine movement can take place.

10. Mark and sign the label according to the established voltage and mode settings.
11. Recheck the wiring connections including connections or modifications that were made to the machine control system wiring. Replace the lid. Secure the lid on the relevant units.

Check the Mechanical Installation

1. Check that safety mats, perimeter trim, and uniting trims are undamaged and correctly positioned and secured. Check that the designed safety distance is achieved.
2. Check that access to the hazardous zone is not possible other than via the safety mat and that any fixed guards are positioned according to the design and are secure.
3. Check that the presence of a person between the hazardous zone and the safety mat system is restricted.
4. Check that the environmental conditions, present or foreseeable, correspond to conditions considered during the design stage.
5. Check that the installation is free of hazards that were not foreseen at the design stage.
6. Check that any warning notices are in place.
7. Check that any other required protective measures are installed.

Check the Electrical Functions

Manual Mode Only (Not for 440F-C28013 Mat Manager)

1. Check the status indicators on the control unit:
   - Power indicator (green) illuminates
   - Manual Reset indicator (green) illuminates
   - Reset lamp in the Reset button illuminates
   - Machine-enabled indicator (green) is off
2. Press and release the Reset button.
   a. Verify that the machine-enabled status indicator illuminates and the reset lamp turns off.
   b. Stand on the safety mat and check that the machine-enabled status indicator turns off.
3. Step off the safety mat, check that the machine-enabled status indicator remains off and the Reset button illuminates.
   - Press and release the Reset button, check that the machine-enabled status indicator illuminates and the Reset button turns off.
4. To check the remote Reset buttons and lamps (if fitted), repeat the previous tests.
5. To check the correct operation of any status monitoring that is connected to the safety mat system, repeat the previous steps.

Auto Reset Mode Only (Not for 440F-C28013 Mat Manager)

1. Check the status indicators on the control unit:
   - Power indicator (green) illuminates
   - Machine-enabled indicator (green) illuminates
2. Stand on the safety mat and check that the machine-enabled status indicator turns off.
3. Step off the safety mat, check that the machine-enabled status indicator illuminates.
4. To check the correct operation of any status monitoring that is connected to the safety mat system, repeat the previous steps.

440F-C28013 Control Unit Functions

Auto Reset Mode Only

1. Check the status indicators on the control unit:
   - Power indicator (green) illuminates
   - Machine-enabled indicator (green) illuminates
   - The channel fault status indicators 1...8 (green) illuminate, matching the number of safety mats installed.
2. Stand on safety mat number 1 and check that the machine-enabled status indicator turns off and the channel fault status indicator changes to red.
3. Step off the safety mat and check that the control system returns to the same state as step 1.
4. Repeat the process for each safety mat that is connected to the control unit. Check that the corresponding channel fault status indicator changes to red.

Manual Reset Mode Only

1. Check the status indicators on the control unit:
   - Power indicator (green) illuminates
   - Machine-enabled indicator (green) illuminates
   - The channel fault status indicators 1...8 (green) illuminate, matching the number of safety mats installed.
2. Stand on safety mat number 1 and check that the machine-enabled status indicator turns off and the channel fault status indicator changes to red.
3. Step off the safety mat, operate the Reset button to reset the system manually, and then check that the control system returns to the same state as step 1.
4. Repeat the process for each safety mat that is connected to the control unit. Check that the corresponding channel fault status indicator changes to red.

Channel fault status indicators indicate individual safety mat operation or fault.

Mode of Operation (440F-C28013 Mat Manager)

Auto Reset

- On power-up: Power, auto reset, and machine-enabled status indicators illuminate.
- When the safety mat operates: Machine-enabled status indicator turns off.
- Stand off the safety mat: Machine-enabled status indicator illuminates.

Manual Reset

- On power-up: Power, manual reset, and machine-enabled status indicators illuminate.
- Press the Reset button: Machine-enabled status indicator illuminates.
- When the safety mat operates: Machine-enabled status indicator turns off.
- Stand off the safety mat: Machine-enabled status indicator is still off.
- Press the Reset button: Machine-enabled status indicator illuminates.

Under Fault Condition

Machine-enabled status indicator turns off and does not allow reset until the fault is rectified. In the fault condition, if there is a safety mat fault, one or more of the safety mat status indicators illuminate. Under an open circuit or short circuit, the indicators illuminate red. If there is a fault condition and none of the safety mat status indicators illuminate, then the fault is a control unit fault.

Check Safety Functions

Single-channel Systems

See Figure 18 on page 10 and Figure 20 on page 11.

Simulate normal operation. Stand on the safety mat to actuate and check that the main contactor drops out immediately. Check that any other safety-related stop functions like the brake or clutch contactors are operating as intended.

Dual-channel Systems

See Figure 19 on page 10 and Figure 21 on page 11.

1. Simulate normal operation. Stand on the safety mat to actuate and check that both final contactors drop out immediately. Check that any other safety-related stop functions like the brake or clutch contactors are operating as intended.
2. Isolate the power source and then short circuit terminals 13 and 14 at terminal block 6 to install a temporary fault (see Figure 29 on page 15 or Figure 30 on page 15).
3. Reinstate the power source and actuate the safety mat and check that one of the final contactors drops out immediately and any other stop functions that are associated with that channel operate as intended.
4. Check that the control unit does not reset.
5. Isolate the power source and remove the temporary fault. Reinstate the power source and check that the safety mat system operates normally. Take the same electrical safety precautions and repeat the test with a temporary short circuit across terminals 23 and 24 at terminal block 6 (see Figure 29 on page 15 or Figure 30 on page 15).
6. Again, check that the control unit does not reset.
7. Remove the temporary fault, check that the safety mat system operates correctly.

All System Types

1. Conduct any other tests required to confirm that the safety-related control system meets the requirements of its category according to EN ISO 13849-1, and works as intended.
2. Check any other safety functions associated with the machine circuits that the installation of the safety mat system can affect. You must have an existing procedure for these tests.
3. Isolate the machine power supply at the source.
4. Reconnect any automatic reset function provided by the machine control system.
5. Reconnect the machine prime mover to the final contactors.
6. Secure all covers and doors.

Functional Checkout

Reinstate the machine electrical supply. Check the following:

1. Machine operation cannot commence until the safety mat control unit is reset. Perform the walking test described in Routine Inspection and Test on page 18.
2. Check that actuation of the safety mat stops hazardous movement.
3. Check that the machine does not start, but does enable restart, when you step off the safety mat.
4. Check that when approaching the machine at a walking pace, hazardous movement stops before the hazardous zone can be reached. In critical applications, conduct stop-time tests.
5. If any type of muting system is installed, check that the safety mat system is muted only during non-hazardous parts of the operating cycle and that any mute indicators operate correctly.
6. Test the emergency stop function of the machine.

Commissioning

Before putting the machine into its normal service, confirm that operators and supervisors are aware of the nature and purpose of the safety mat system and that they understand the functions of the controls and indicators.

Confirm that the technical specifications together with inspection, test, and service instructions are available to the appropriate personnel and that a system is in place to record inspections.

Confirm that personnel understand that no additional coverings, boards, plates, or planks are allowed on the safety mat during operation of the machine.

Maintenance

During maintenance operations, disconnect the prime mover of the machine before you work on the safety mat system. Observe electrical safety precautions.

Safety Mat Cleaning

Regularly sweep the safety mats clear of deposits such as swarf and other materials. Use warm water and detergent to wash or hose down the safety mats to clean or remove buildup, such as grease, if necessary. Do not use solvents.

Routine Inspection and Test

We recommend weekly routine inspections.

1. Stop the machine. Clean the safety mats and allow them to dry. Inspect the top surface of the safety mat for damage. Minor nicks and abrasions of the vinyl cover are acceptable, but immediately address any damage that exposes the metal plate.
2. Check that the perimeter trim and uniting trim are not cracked, broken, or distorted and are mounted securely. Replace damaged parts immediately.
3. Test the safety mat operation. Two persons are required, one to walk on the safety mat, the other to observe the control unit. On systems that use Manual Reset mode, continually press and release the Reset button.
   a. Check that the machine-enabled status indicator is on before actuation of the safety mat, and turns off as soon as the safety mat is stepped on.
   b. Walk over each section of the safety mat and each joining section in turn. Stand with both feet on the same uniting trim between two sections. The machine-enabled status indicator must remain off during the entire time.
   c. Step off the safety mat, operate the Reset button. Check that the machine-enabled status indicator illuminates.
   d. Start the machine, step onto the safety mat and check that the machine stops immediately.
4. Check that all barriers such as fixed guards and angle plates are in place, undamaged, and securely mounted. If these checks reveal any problems, do not allow the use of the machine until they are rectified. Record the inspection and test in a written log.

Thorough Examination and Test

We recommend thorough inspections every 6 months or after damage.

Contact your local Allen-Bradley distributor or Rockwell Automation sales office for information on an authorized testing service. A person who is competent in electrical and mechanical engineering must perform the tests. Two persons are required, one to walk on the safety mat, the other to observe the control unit.

1. Conduct the Routine Inspection and Test.
2. Isolate the power source to the machine and safety mat system. Observe electrical safety precautions.
3. Inspect the safety mat components thoroughly for mechanical damage.
4. Disconnect the wires to the safety mat at terminals 1…4 at the MatGuard control unit.
5. Connect the two white wires to one test input of an ohmmeter and connect the two black wires to the other input. Walk over each section of the safety mat and each joining section in turn. Stand with both feet on the same uniting trim between two sections until all areas of the safety mat are covered. The maximum resistance with presence on the safety mat must not exceed 100 Ω.

If these checks reveal any problems, do not allow the use of the machine until you rectify the problems.

Check that the stopping performance of the machine has not deteriorated from the stopping performance that was used in the original safety distance calculations. Record the inspection and test in a written log.

Dismantle and Disposal

To dismantle the safety mat system, the procedure is the reverse of the installation, with no extra hazards.

Confirm that the machine and safety mat system power is isolated and locked off at the source before starting work.

If the system is to be reconfigured or relocated, observe the handling precautions that are given in System Configuration on page 6. The safety mat system does not contain any hazardous materials that require special precautions for disposal.

Fault Finding

Disconnect the prime mover before working on the safety mat control system with power applied.

Observe electrical safety precautions.

No Start

With no presence on the safety mat and after following the correct reset procedure, the machine does not start.

1. If the machine-enabled indicator on the safety mat control unit is on, there is a probable fault on the machine or the control system external to the safety mat system.
   a. Check the external fuses in the control unit safety output wiring and replace if necessary. Confirm that the correct value of the fuse is used (2 A max).
   b. Record the replacement in the inspection log. If either fuse blows immediately or requires early replacement, there is a probable fault in the machine control circuit between the safety output of the safety mat control unit and the final control elements (contactors) of the machine.
2. If the machine-enabled status indicator on the safety mat control unit is off:
   a. Check that the power status indicator is illuminated. If it is not, check the power supply to the safety mat control unit.
   b. Check that the power supply connects to the appropriate terminals.
   c. Check the primary and secondary fuses in the control unit and replace if necessary. Confirm that the correct value of fuse is used (500 mA anti-surge) for both primary and secondary fuses.
   d. Record the replacement in the inspection log. If either fuse blows immediately or requires early replacement, contact your local Allen-Bradley distributor or Rockwell Automation sales office.
3. If the machine-enabled status indicator on the safety mat control unit is off and the power status indicator is on, there is a fault in the system. On dual-channel systems with contactor monitoring, if the external safety output fuses did not blow, it is still probable that there is a fault external to the control unit. One fault in either wiring channel can cause the safety mat control unit to lock off the safety outputs until the fault is rectified and the control unit is reset.
   a. Check that all connecting wiring in the system is configured correctly and is not damaged and that both contactors are functioning correctly.
   b. Rectify any faults and, if in Manual Reset mode, press and release the control unit Reset button.
4. If the problem is not resolved, contact your local Allen-Bradley distributor or Rockwell Automation sales office.

No Stop

The machine does not stop or can start with presence on the safety mat.

Do not allow use of the machine with presence on the safety mat.

1. Check that the machine-enabled status indicator is illuminated on the safety mat control unit.
2. If the machine-enabled status indicator is not illuminated, there is a probable fault on the machine or the control system external to the safety mat system. Do not allow use of the machine until the fault is rectified and tested.
3. If the machine-enabled status indicator is illuminated, do not allow use of the machine and contact your local Allen-Bradley distributor or Rockwell Automation sales office immediately.

Repair

ATTENTION: Before working on the safety mat system or machine control system, isolate the power source to the machine and safety mat system. Observe electrical safety precautions.

User repairs are limited to replacement by new safety mat system parts. If problems occur, return the units to your Allen-Bradley distributor.

Use the recommended butt splice connectors to make any repairs to the connecting wires.

Tampering with components parts invalidate the warranty.

The warranty is invalid if the quality seal is broken on the DIN rail control unit.

Replacement Parts

Safety Mat Size		Safety Mat	Standard Perimeter Trim Kit
Millimeters	Inches	Cat. No.	Cat. No.
500 x 500	19.7 x 19.7	440F-M1010BYNN	440F-T1010
500 x 600	19.7 x 23.6	440F-M1012BYNN	440F-T1012
500 x 900	19.7 x 35.4	440F-M1018BYNN	440F-T1018
500 x 1000	19.7 x 39.4	440F-M1020BYNN	440F-T1020
500 x 1200	19.7 x 47.2	440F-M1024BYNN	440F-T1024
500 x 1500	19.7 x 59.1	440F-M1030BYNN	440F-T1030
600 x 600	23.6 x 23.6	440F-M1212BYNN	440F-T1212
600 x 750	23.6 x 29.5	440F-M1215BYNN	440F-T1215
600 x 900	23.6 x 35.4	440F-M1218BYNN	440F-T1218
600 x 1000	23.6 x 39.4	440F-M1220BYNN	440F-T1220
600 x 1200	23.6 x 47.2	440F-M1224BYNN	440F-T1224
600 x 1500	23.6 x 59.1	440F-M1230BYNN	440F-T1230
750 x 500	29.5 x 19.7	440F-M1510BYNN	440F-T1510
750 x 750	29.5 x 29.5	440F-M1515BYNN	440F-T1515
750 x 1500	29.5 x 59.1	440F-M1530BYNN	440F-T1530
800 x 600	31.5 x 23.6	440F-M1612BYNN	440F-T1612
800 x 750	31.5 x 29.5	440F-M1615BYNN	440F-T1615
800 x 900	31.5 x 35.4	440F-M1618BYNN	440F-T1618
800 x 1000	31.5 x 39.4	440F-M1620BYNN	440F-T1620
800 x 1200	31.5 x 47.2	440F-M1624BYNN	440F-T1624
800 x 1500	31.5 x 59.1	440F-M1630BYNN	440F-T1630
900 x 900	35.4 x 35.4	440F-M1818BYNN	440F-T1818
900 x 1000	35.4 x 39.4	440F-M1820BYNN	440F-T1820
900 x 1200	35.4 x 47.2	440F-M1824BYNN	440F-T1824
900 x 1500	35.4 x 59.1	440F-M1830BYNN	440F-T1830
1000 x 750	39.4 x 29.5	440F-M2015BYNN	440F-T2015
1000 x 1000	39.4 x 39.4	440F-M2020BYNN	440F-T2020
1000 x 1200	39.4 x 47.2	440F-M2024BYNN	440F-T2024
1000 x 1250	39.4 x 49.2	440F-M2025BYNN	440F-T2025
1000 x 1500	39.4 x 59.1	440F-M2030BYNN	440F-T2030

Item	Specification	Cat. No.
Standard perimeter trim	2 m (6.56 ft)	440F-T3210
Standard perimeter trim	3 m (9.84 ft)	440F-T3310
Standard perimeter trim	5 m (16.4 ft)	440F-T3510
External corner standard perimeter trim	-	440F-T3012
Internal corner standard perimeter trim	-	440F-T3013
Perimeter trim with cable channel	2 m (6.56 ft)	440F-T3211
Perimeter trim with cable channel	4 m (13.12 ft)	440F-T3411
External corner perimeter trim with cable channel	-	440F-T3014
Internal corner perimeter trim with cable channel	-	440F-T3015
Active uniting trim	-	440F-T3020
Vinyl wire guide	-	440F-T3230
Safety mat control units	-	440F-C4000P 440F-C4000S 440F-C4000D 440F-C28013
Fuse	500 mA	440R-A31562
Shorting plug	-	440F-A28639

For special-sized safety mats, refer to the model number printed on the label.

After replacing any parts, you must conduct the inspection and test that is shown in Routine Inspection and Test on page 18. Pay special attention to those parts that were replaced.

IMPORTANT After maintenance or repair operations, correctly refit all edging trims, fastenings, and cable protection. Failure to do this step, the use of non-approved parts, or modifications can prevent the safety mat system from achieving its specified performance.

Service

For service and assistance, contact your local Allen-Bradley distributor or Rockwell Automation sales office.

Record of Routine Inspection and Test on page 18 (weekly)

Date	Inspected By	Comments

Record of Thorough Examination and Test on page 18 (every 6 months)

Date	Inspected By	Comments

Approximate Dimensions

Figure 33 - 440F-C4000P Control Unit (Polycarbonate) [mm (in.)]

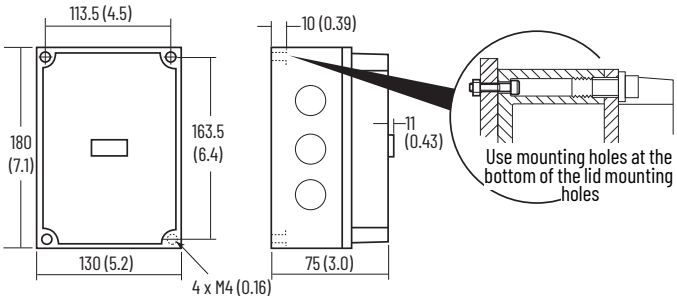


Figure 34 - 440F-C4000D Control Unit (DIN Rail) [mm (in.)]

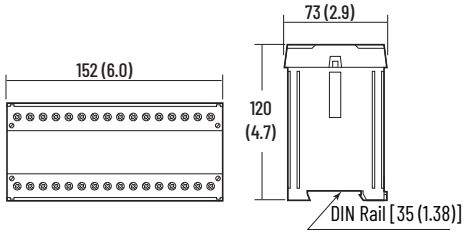
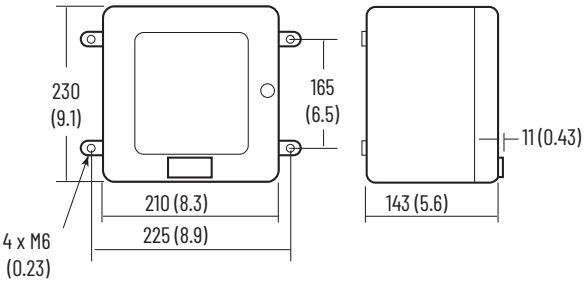


Figure 35 - 440F-C4000S Control Unit and 440F-C28013 Mat Manager (Steel) [mm (in.)]



Declaration of Conformity

CE Conformity

Rockwell Automation declares that the products that are shown in this document conform with the essential requirements of the 2014/30/EU EMC Directive and 2006/42/EC Machinery Directive.

For a comprehensive CE certificate visit: rok.auto/certifications.

UKCA Conformity

Rockwell Automation declares that the products that are shown in this document are in compliance with the essential requirements of the UK 2016 No. 1091 – Electromagnetic Compatibility Regulations and 2008 No. 1597 – Supply of Machinery (Safety) Regulations.

For a comprehensive UKCA certificate visit: rok.auto/certifications.

Notes:

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

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