pressure sensitive safety footmats

and

Safedge system
The Nelsa Eurozone system has been developed to meet the stringent specifications laid down by both legal requirements and industrial necessity.

The Eurozone system combines sound engineering practice with a unique innovative construction process to give maximum reliability and safety. The mat has been designed from the "ground up" to meet the arduous conditions found on the factory floor, and uses tried and trusted components and techniques throughout. The mats are available in a wide range of standard sizes to meet most requirements quickly and economically. Special sizes and shapes can be supplied to meet the requirements of any application.

The mat has two conductive treated plates that are held apart by non conductive compressible separators. Each 4 wire mat, operating on only 24V DC is pre-wired, and connected in series with any other mats forming a complete floor level guarding system for the hazardous areas. The circuit through the mat is monitored by the Eurozone Control Unit which, when the area is clear, provides a signal to the machine control circuit.

EC Type certification

Third party certification to EN 1760-1, EN 954-1 category 3 & EN 60204-1

The ultimate presence sensing system for area detection

Overall sensitivity including uniting trim

Completely failsafe system with cross monitored control unit

Rugged construction - will take the weight of a 3 ton forklift truck

Sealed to IP67 - washdowns are no problem

Vinyl construction - resistant to most oils

Application examples
When a mat is stepped on, the conductive plates touch and the resistance in the circuit falls to zero. This is monitored by the Control Unit, which shuts the machine down. The unique molding process ensures the long life and reliability of the mat.

Being completely sealed (IP67), water, liquids and coolants present no problem. In addition the tough vinyl will resist bleaches, acids, salts and all but the most aggressive of industrial chemicals. Whether it is a machine tool, packaging machine, mechanical handling or food machine, the Eurozone system copes easily.

**Easy To Install**

Provided the floor is reasonably flat, clean and free from debris, installation is simple and economical. Lay the mats on the floor, with the uniting trim between the mats. Ensure lead wires from the mat are located conveniently to enable interconnection. Connect all mats together using the connectors supplied and lay wires around the perimeter of the mat area. Place the surface trim around the perimeter of the area, ensuring that none of the wires are trapped, and that the trim is notched to allow the final wires to exit. Drill the floor and insert suitable fixings to secure the trim.

Interconnection of the mats to the control box is equally simple as only four wires exit the whole system and a minimum amount of technical expertise is required. Simple, no nonsense, installation. Fully illustrated installation instructions are provided.

different ribbed pattern on reverse side (as illustrated)
The Nelsa Eurozone mat system has been designed to conform with the European Standard EN 1760-1 “Safety of machinery - Pressure sensitive devices; mats and floors”. This standard contains requirements for all aspects of design. Some of the most important points are as follows:-

(From 4.2.2) Where an effective sensing area is built up from more than one sensor (mat) it shall have no dead zone.

The standard gives details of the size, force and positioning of test pieces for testing the mat sensitivity.

(From 4.5.1) A single sensor (mat) shall still perform its function after one million actuations by a mass of 75kg.

(From 4.7) When the actuating force is applied the output signal switching device(s) shall change from an ON state to an OFF state. It shall remain in the OFF state for at least as long as the actuating force is applied.

(From 4.7.1) Device with reset -

b) After the actuating force has been removed, the output of the output signal switching device(s) shall only change to the ON state after the application of a reset signal.

(From 4.7.2) Device without reset - For a pressure sensitive mat without reset the output of the output signal switching device(s) shall change to an ON state at power ON and after the actuating force has been removed.

(From 4.15) The pressure sensitive mats shall meet the requirements of the category for which they are specified.....

NOTE: The Nelsa Eurozone mat system features an “active” mat and a dual channel monitoring fail-safe control unit. This means that any single electrical fault in the mat, wiring or control unit will be detected and the control unit will go to a safe (OFF) condition.

(From informative annex B.1.1) The top (mat) surface should be of a material which will withstand the operating duty..... The top surface should not present a risk through becoming slippery due to wear or the effects of liquids....

(From informative annex B.1.7) In some situations, heavy loads (such as fork lift trucks) can be applied to the sensor (mat)..... If this is required the user should identify the need to the mat manufacturer.

NOTE: The standard Nelsa Eurozone mat can be successfully used with fork lift trucks, as illustrated.

The Nelsa Eurozone mat system should be installed in accordance with the requirements of pr EN 999 - ‘The positioning of protective equipment in respect of approach speeds of parts of the human body’.

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**Table of Nominal Standard Sizes**

<table>
<thead>
<tr>
<th>Model No.</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEZ 1010</td>
<td>500mm (19.7&quot;)</td>
<td>500mm (19.7&quot;)</td>
</tr>
<tr>
<td>NEZ 1030</td>
<td>500mm (19.7&quot;)</td>
<td>1500mm (59.1&quot;)</td>
</tr>
<tr>
<td>NEZ 1510</td>
<td>750mm (29.5&quot;)</td>
<td>500mm (19.7&quot;)</td>
</tr>
<tr>
<td>NEZ 1515</td>
<td>750mm (29.5&quot;)</td>
<td>750mm (29.5&quot;)</td>
</tr>
<tr>
<td>NEZ 1530</td>
<td>750mm (29.5&quot;)</td>
<td>1500mm (59.1&quot;)</td>
</tr>
<tr>
<td>NEZ 2010</td>
<td>1000mm (39.4&quot;)</td>
<td>500mm (19.7&quot;)</td>
</tr>
<tr>
<td>NEZ 2015</td>
<td>1000mm (39.4&quot;)</td>
<td>750mm (29.5&quot;)</td>
</tr>
<tr>
<td>NEZ 2020</td>
<td>1000mm (39.4&quot;)</td>
<td>1000mm (39.4&quot;)</td>
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<tr>
<td>NEZ 2025</td>
<td>1000mm (39.4&quot;)</td>
<td>1250mm (49.2&quot;)</td>
</tr>
<tr>
<td>NEZ 2030</td>
<td>1000mm (39.4&quot;)</td>
<td>1500mm (59.1&quot;)</td>
</tr>
</tbody>
</table>

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**Measuring for Installation**

**Please Supply a Sketch Layout for Multiple Mats**

When calculating the overall area of layout add ‘X’, ‘Y’ & ‘Z’ to allow for Perimeter trim and joints.
The Eurozone Control Unit monitors all of the mats which are connected together to form the safeguarded zone which may be a total of 100m² and made from any number of mats. It interfaces with the control circuit of the machine and includes two safety relays to ensure control redundancy.

**Detects**
- Presence on the mat
- Short circuit
- Open circuit

**Cross monitored output with redundancy**

**Auto/Manual reset**

**Selectable input voltage**

**DIN rail mounting model**
Model No: NEZ 4000

**IP65 Polycarbonate enclosure**
Model No: NEZ 4000

**IP 65 steel enclosure**
Model No: NEZ 4000

**NMEA 12**
Model No: NEZ 4000
In general the covering has excellent resistance to acids, alkalis and salts. Hot acids and alkalis, as well as concentrated and organic acids, have a deleterious effect on 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.

NOTE: Combinations of chemicals can have unpredictable effects. Testing is recommended in such cases. Small pieces of the vinyl material are available from Nelsa inc. if testing is required.

In this example the Eurozone is being used with a machine whose worst case response time has been measured as 0.485 seconds.

Using the formulae above,

\[ T = t_1 + t_2 \]

\[ T = 35\text{mS} + 485\text{mS} = 520\text{mS} \]

Sensor mats will be required from 2032mm right up to the edge of the machine baseplate.

**CALCULATION EXAMPLE**

**ORDER UNIT**

Sensor mat conformity: EN 1760-1, EN 954-1: CATEGORY 1

**SPECIFICATIONS**

**ORDER UNIT**

Sensor mat conformity: EN 1760-1, EN 954-1: CATEGORY 1

Minimum weight of person with assured detection: 35Kg

Maximum detection zone: 100m²

Maximum number of individual mats: No limit (up to max 100m²)

Maximum total length of connection wires: 200m

Mass / m² (sensor mats): 24Kg

Environmental protection mats: IP66/IP67 - dust sealed, jet sealed, temporary immersion proof.

Mechanical life: 10⁷ operations.

Humidity: 0 - 100% RH

Sensor mat outer covering material: Vinyl.

The system comprising interconnected sensor mats and control unit meets the requirements of EN 954-1 Category 3 when installed according to the information for use.

**CONTROL UNIT**

Conformity: EN 1760-1, EN 60204-1: EN 954-1: CATEGORY 3

Response time (mat pressed to safety output contacts open): 35mS

Environmental protection: IP65

Impulse withstand voltage: 2500V

Contamination level: III.

Min. switched current/ voltage: 10mA/ 10V.

Power supply - user select: 110V/ 230V AC or 24V AC/ DC. +10% -15%.

110V setting also enables use at 100V ±15%

Power consumption: <9 VA 6W.

Relay outputs: 2 x independent voltage free N/O safety contacts - Fuse externally.

Max. external output fuse - 5A (quick acting)

1 x voltage free N/C auxiliary contact

Utilisation category (AC): 4A/ 250VAC/ 500VA at COSØ =1.

Max. switched DC current: 2A/ 30VDC/ 60W

Outputs: Remote reset/ indicator: 24V DC / 0.24W

Inputs: External contactor monitoring & Remote reset switch (2 x N/O)

Indication LEDs: Auto Reset Mode - Green / Power - Green

Manual Reset Mode - Green / Machine Enabled - Green

External controls: Reset (optional)

Internal controls: Voltage selector & Manual reset mode/ Auto reset mode selector.

Internal supply fuses: 500mA (2off).

Ambient temperature range: -10°C to +45°C

Humidity: 0-90% RH at +50°C

Vibration: Tested in accordance with IEC 68-2-6, frequency range 10 - 55Hz, displacement 0.15mm, 10 cycles per axis, sweep rate, 1 octave per minute.

Control unit case material: Polycarbonate

Weight: 870g.

**SSENSOR M M AATT**

Sensor mat conformity: EN 1760-1, EN 954-1: CATEGORY 1

Minimum weight of person with assured detection: 35Kg

Maximum detection zone: 100m²

Maximum number of individual mats: No limit (up to max 100m²)

Maximum total length of connection wires: 200m

Mass / m² (sensor mats): 24Kg

Environmental protection mats: IP66/ IP67 - dust sealed, jet sealed, temporary immersion proof.

Mechanical life: 10⁷ operations.

Humidity: 0 - 100% RH

Sensor mat outer covering material: Vinyl.

The system comprising interconnected sensor mats and control unit meets the requirements of EN 954-1 Category 3 when installed according to the information for use.

**CALCULATION EXAMPLE**

In this example the Eurozone is being used with a machine whose worst case response time has been measured as 0.485 seconds.

Using the formulae above,

\[ T = t_1 + t_2 \]

\[ T = 35\text{mS} + 485\text{mS} = 520\text{mS} \]

Sensor mats will be required from 2032mm right up to the edge of the machine baseplate.
This new type of sensitive edging system is ideal as a safety sensor in applications such as power operated doors, guided vehicles and moving machinery beds etc. It can provide a continuous line of high sensitivity touch sensing along or around practically anything. Light pressure from any direction through 90° on the profile will cause the control unit to stop or reverse motor driven movement or sound an alarm. It is easy to fit and totally flexible so it keeps bouncing back into shape even after repeated heavy crushing forces.

The secret of the Safedge’s ability to outperform competition lies in its innovative design. It uses a combination of non-conductive rubber and flexible wire cored conductive rubber bonded together to form a variety of perfectly flexible and energy absorbing profiles.

The Safedge has no rigid internal parts which can "break through" or cause fatigue failures after prolonged use. The copper wire core throughout the length of the strip (up to 50m) ensures that there are no problems of resistance build up on long lengths.

A Control Unit is available with two channel failsafe electronics with 100% redundancy and will give guaranteed isolation of machine power if anything presses on the profile. It will also initiate power isolation in the event of component or power supply failure, or if the profile or connecting wire is severed.

The Safedge profile slides into a "C" rail which is fixed to equipment to be guarded. A range of accessories is available for end termination and corner joints with a choice of eight different sensing profiles.

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**Sensitive Edge System**

- EC Type certification
- Conforms to Pr EN 1760-2 & EN 954-1 Category 3
- UL & CSA approved
- Failsafe system
- Up to 50 metres on one control unit
- 90° corner units fully sensitive as standard, other angles available
- Can be radiused to 200mm
- Fully redundant & cross monitored control unit
- High resistance to abrasion
- Suitable for outdoor use, specify when ordering
- "C" rails
  - "C" rail C112/A can be supplied curved to meet most applications

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The pressure required is 10 Newtons when applied in this direction. Flexible copper cores send the signal to the control unit.
The Safedge is available in 9 different profiles. Straight sections are fixed using the “C” section mounting rail. The profile can also be bent to a minimum radius of 200mm. Various cushion factors are offered for applications where “over travel” may be experienced. **NOTE:** All profiles below with the exception of N24 0110N are manufactured from **EPDM** - Ethylene Propylene Diene Modified Rubber. The profile in Fig 2 is manufactured from **NBR/ CR** - Acrylonitrile (nitrile) Butadiene Rubber/ Chloroprene Rubber, petrol and wear and has a high resistance to abrasion.

**Fig:1**
- Cushion factor 5mm
- N24 0110
- N24 0110N: Increased resistance to conductive fluids
- N24 0110N: Increased resistance to oil

**Fig:2**
- Cushion factor 19mm
- N24 1610
- N24 1610N: Increased resistance to oil

**Fig:3**
- Cushion factor 41mm
- N24 0310
- N24 0510
- N24 0510N

**Fig:4**
- Cushion factor 5mm with sealing lip
- N24 0804
- N24 0804N

**Fig:5**
- Cushion factor 19mm with sealing lip
- N24 0210
- N24 0210N

**Fig:6**
- Cushion factor 41mm with sealing lip

**“C” rails available**

- **“C” rail- aluminum C112/ A**
  - N24 1212
  - Suitable for the fixing of all the Safedge Profiles.

- **“C” rail- zinc coated steel C112/ S**
  - N24 1112
  - Suitable for the fixing of all the Safedge Profiles.

- **“C” rail- PVC - C112/ PB**
  - Black,
  - C112/ PR = Red or C112/ PY = Yellow
  - N24 1212PB, N24 1212PR or N24 1212PY
  - Suitable for the fixing of all the Safedge Profiles.
  - 3 colours available

- **“C” rail- aluminum C112/ A3**
  - N24 1215
  - Ideal when external fixing of “C” rail is required. Accepts all profiles

- **“C” rail- aluminum C112/ A2**
  - N24 1214
  - Ideal when external fixing of “C” rail is required. Accepts all profiles

- **“C” rail- aluminum C112/ A4**
  - N24 1216
  - Deeper rail allows cables to be run through channel under safedge profiles. Accepts all profiles

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**ALL “C” RAILS ARE SUPPLIED WITHOUT FIXING HOLES.**

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Telephone: (414) 423-8121
The failsafe Control Unit monitors the status of the Safedge profile and provides an output of two fully cross monitored relays with complete redundancy.

- Monitors up to 50m of Safedge profile
- Two safety relay outputs
- A changeover auxiliary relay
- Auto/Manual reset
- Indicators for RUN, STOP and FAULT CONDITIONS
- Provides contactor monitoring
- Supply Voltages- 240Vac, 110Vac, 24Vac, and 24Vdc as standard on one control unit. Other voltages available
- Control Circuit Voltage- all relay outputs are volt free
- IP 65 enclosure - N24251
- IP 40 DIN rail - N24251/D

**SPECIFICATIONS**

- **Power Supply:** 110/230 V AC and 24 V AC/DC.
- **Power Consumption:** <6 VA.
- **MC-MC Contactor monitoring Loop:** Normally closed contactor loop.
- **Safety inputs:** Safedge Profile (open res. 6K8).
- **Safedge Profile voltage:** Maximum operating voltage profile 12 V DC (open circuit). Nominal operating voltage: 4 V (run condition).
- **Internal fuses:** 2 x 2A Safety fuses, 500 mA supply Fuse.
- **Internal switches:** Mains selector switch.
- **Relay outputs:** 2 N/O safety and 1 N/C aux.
  - Aux must not be used for safety circuit.
- **Utilisation Cat. (AC):**
  - 2 A / 250 V AC / 500 V A at COSØ =1
  - Max. switched DC current/voltage: 1 A / 30 V DC / 30 W.
  - Min. switched current/voltage: 10 mA / 10 V.
- **Max. output fuse:** 2 A Quick acting.
- **Indication LED 1:** Green: Run.
  - LED 2: Yellow: Off.
  - LED 3: Red: Stop.
- **System response time:** 13 ms
- **Impulse withstand voltage:** 2500 V.
- **Over voltage:** Category 2.
- **Operating temperature:**
  - Safedge control unit: -10°C to +55°C.
  - Safedge Profile: -5°C to +55°C except profile 01610N (0°C to 55°C)
- **Contamination level:** III.
- **Humidity:** 90% RH at +55 °C.
- **Enclosure protection:** IP 65 (std enclosure), IP 40 (DIN rail enclosure)
- **Max. conductor size:** 1 x 1 mm² stranded with sleeves stripped 5 mm, 1 x 1.5 mm² solid conductor.
- **Terminals:** Mains terminal screws M2 spring action.
- **Weight:** (IP 65 controller) 334 g - (IP 40 controller) 250g
- **Material and colour:** Clear lid, beige base polycarbonate.
- **Installation group:** C in accordance with VDE 0110.
- **Fixing details:** 4 Screws 95 mm centres.
- **Miscellaneous:** The Safedge Profile must be terminated with a 68 K resistor.

### CHEMICAL RESISTANCE OF SAFEDGE PROFILE

<table>
<thead>
<tr>
<th>Substance - Resistance - Std. Profile</th>
<th>Resistance - “N” Profile NBR/CR</th>
<th>Resistance - Std. Profile</th>
<th>Resistance - “N” Profile NBR/CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACETIC ACID (10%)</td>
<td>GOOD</td>
<td>NITRIC ACID (10%)</td>
<td>GOOD</td>
</tr>
<tr>
<td>ACETONE</td>
<td>GOOD</td>
<td>PETROL</td>
<td>POOR</td>
</tr>
<tr>
<td>AMMONIUM HYDROXIDE (35%)</td>
<td>GOOD</td>
<td>SILICONE FLUIDS</td>
<td>GOOD</td>
</tr>
<tr>
<td>BENZENE</td>
<td>POOR</td>
<td>SODIUM CHLORIDE (25%)</td>
<td>GOOD</td>
</tr>
<tr>
<td>DIESEL OIL</td>
<td>POOR</td>
<td>TRICHLOROETHYLENE</td>
<td>GOOD</td>
</tr>
<tr>
<td>ETHYL ALCOHOL (ETHANOL)</td>
<td>GOOD</td>
<td>VEGETABLE OILS (GENERAL)</td>
<td>GOOD</td>
</tr>
<tr>
<td>HYDROCHLORIC ACID (10%)</td>
<td>GOOD</td>
<td>WATER (DISTILLED)</td>
<td>GOOD</td>
</tr>
<tr>
<td>LUBRICATING OIL</td>
<td>POOR</td>
<td>WATER (SEA)</td>
<td>GOOD</td>
</tr>
</tbody>
</table>
connection in parallel & series

STANDARD CONNECTION METHOD

CONNECTING IN SERIES
If more than one profile is to be used they are normally connected in series as shown. Std connections of multiple lengths supplied with 1m cables.

CONNECTING IN PARALLEL
A maximum of two profiles can be connected in parallel to assist in ease of wiring in certain applications.

IF MULTIPLE PROFILES ARE TO BE USED A SKETCH WOULD OFTEN HELP.
CONNECTION DETAILS MUST BE STATED AT TIME OF ORDERING

ALTERNATIVE CONNECTION METHOD

Uses 15K resistor (blue)

alternative cable termination

SET - Standard End Termination
LHT - Left Hand Termination
RHT - Right Hand Termination

N.B. - Standard End Terminations will be supplied unless otherwise specified

How to order factory assembled systems

Our Profile is supplied with 1 metre of cable connected from one end as standard. Longer lengths are available. Alternative cable terminations are shown on page 10.

Example shown
Profile 0110 x 2.0 metres 'SET' termination
"C" Rail 112/A x 2.0 metres
N24251 Evaluator

IF MULTIPLE PROFILES ARE TO BE USED A SKETCH WOULD OFTEN HELP.

Accessories

AXIAL CONNECTOR 006/1
N24 006/1
With this connector you can connect directly two profiles. Suitable for 0110, 0110N and 0110I profiles.

COILED CONNECTION CABLE
N24 2450 - 2.5m (extended)
of flexible coiled cable.
N24 2700 - 3.5m (extended)
of flexible coiled cable.
Typical use - when Safedge is mounted on moving machine guard or door.

CONNECTION BOX - N24 0116
Polycarbonate housing 53 x 35 complete with two pole terminal and trumpet type screw on connector with strain relief clamp.
For use with coiled cable.

DELAY TIMER N24 2001
Provides a 0.8 sec. delay at evaluator resetting. IP20 Terminals, IP40 Mounting.
Din rail mounting EN50022 (for supplied adaptor plate).
24V to 240V 1 x 2 way output.
Dimensions 22.5 x 70 x 110.
Typical use - for reversing roller shutter doors.
Some OEM's may prefer to assemble the Safedge themselves. The Safedge can be supplied in rolls which the customer can cut to size and terminate. The components below are already included in the assembled profile as ordered on opposite page.

**CABLE CONNECTOR 130**
With connecting cable as shown.
Cables available in 1, 2 and 10 metres
N24 1301 = 1metre
N24 1302 = 2metres
N24 1305 = 5metres
N24 1306 = 10metres
N24 1307 = 15metres

**CONNECTOR with resistor**
Single length or series connection:
N24 1308 = 6kΩ colour yellow
Parallel connection:
N24 1309 = 15kΩ colour blue

**CLOSING CAP 130/2**
N24 130/2
CLOSING CAP 130/2 material: NBR/CR

**CABLE CONNECTOR**

**CONTROL UNIT**

**CLOSING CAP 130/3**
N24 130/3
For closure of profiles with sealing border for dosing the coating chambers of profiles 003.10 and 016.10.
CLOSING CAP 130/3 material: NBR/CR

**CYANOACRYLATE ADHESIVE N24 0020**
Contents: 2g. Sufficient for approx. 15 terminations.

**STRAIGHT PIN CONNECTORS N24 0004**
For profiles 0310 and 1610.
Kit contains 1 pair of pins suitable for 1 joint.

**90° CORNER CONNECTOR**
(horizontal)
N24 0110 = for use with profile 0110
N24 0110N = for use with profile 0110N
N24 0110I = for use with profile 0110I
N24 0310 = for use with profile 0310
N24 1610 = for use with profile 1610
N24 1610N = for use with profile 1610N

**CYANOACRYLATE ADHESIVE N24 0020**
Contents: 2g. Sufficient for approx. 15 terminations.

**SHARS - N24 3084**
Suitable for cutting profiles 0110, 0110N, 0110I

**rubber covered profile system - for door applications**

The Rubber Covered Profile System is ideal for use on door applications. The cover allows movement to form a seal without tripping the device and is suitable for outdoor applications. Suitable for 0110 or 1610 Profiles. Specify the Safedge system in the normal way replacing the standard C Rail with C Rail N24 2151 by length, + Rubber cover profile N24 1111 by length, + End plate N24 2152 per end.
Your local distributor is