3024 COMPACT
24 V DC STATIC ELIMINATOR BARS

DISTRIBUTOR MANUAL

CONFIDENTIAL

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1. BACKGROUND

The 3024 Compact is the latest model in the range of 24 V DC Static Eliminator Bars from Fraser. It has been developed as a direct response to the need for a 24 V DC Bar in shorter lengths.

Our existing 3024 Bar remains the most successful product in the Fraser static eliminator range. The new 3024 Compact builds on the success of the 3024, giving customers what they have requested.

The 3024 Bar was introduced in 2011 and became a very important product for us. It gave our customers the benefits of:

- High Performance
- No HT Cables
- 24 V DC Supply
- Compact size with active length the same as the overall length
- Remote and on-Bar monitoring
- Long-life Tungsten emitters

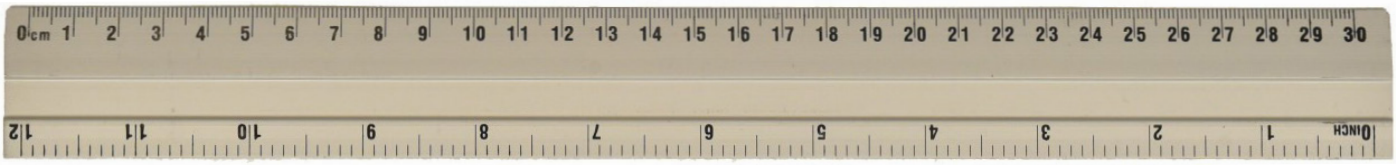
The 3024 Compact, launched in June 2019, has all the benefits of the 3024 but also offers:

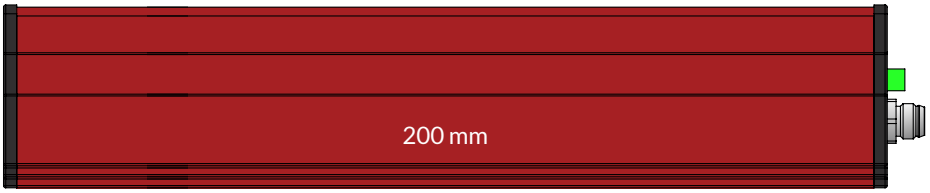
Two new shorter lengths which are below the previous minimum length of the 3024F – making it the shortest available 24 V DC Bar on the market at time of launch. It is available in 150 and 200 mm lengths.

Additionally, the 3024 Compact now has UL certification. Having passed the rigorous UL testing procedures, any manufacturer can be confident that this product is safe for the operator to use and safe in the production environment.

The 3024 Compact is a short-range static eliminator operating at 7.5 kV DC using pulsed DC, with an enhanced emitter pitch to provide the best performance in such a short length. It uses technology from both the 3014 and 3024 family, so we have given it a separate identity.

Please read the following notes which explain how the 3024 Compact Bar works and how your customers can benefit from our 24 V DC Technology.





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2. SUMMARY OF KEY FEATURES AND SALES POINTS

COMPACT LENGTH

The 3024F is very successful, and customers wanted shorter lengths, especially when there is a very narrow web or a confined width in which to locate the bar.

Customers said that they wanted a shorter 24 V DC Bar and we were able to achieve this using the 3024 extrusion and technology from the 3014 and 3024 Bars. We now offer the bar in 150 mm and 200 mm lengths.

The two different lengths of 3024 Compact.

24 V DC

The market for 24 V DC Bars is continuing to grow quickly because the advantages of 24 V DC are valuable and desirable to OEMs and end-users worldwide:

- Most modern machines use 24 V DC to power and control ancillary equipment. In many cases 110 - 250 V AC supplies are not available where the static eliminators are to be installed.
- 24 V DC allows easy interface with the machine controls, with monitoring of status and performance.
- 24 V DC static eliminators give better performance than traditional static eliminators.
- 24 V DC means that there are no high voltage cables and external power units to be routed and sited on the machine.
- OEMs can sell 24 V DC equipment anywhere in the World. They do not have to be concerned with different voltages and frequencies.
- Low voltage cables are cheap to buy and easy to replace if damaged.
- AC bars of varying quality are available in all markets. A full range of 24 V DC bars gives us a compelling advantage against cheap AC bars.

PRICE

The 3024 Compacts will have a similar price to the shortest 3024F. Their cost of manufacture is just as high and they have no direct competition.

PERFORMANCE

The static elimination performance of the 3024 Compact is better than anything else that can fit into the same length. The only competitors are existing AC static eliminators. The 3024 Compact has an active ionisation length equal to the overall length and this is a big advantage with shorter bars. See the performance data in Section 5.

TUNGSTEN EMITTERS

Tungsten is the best material to withstand high voltage ion generation, but it is also expensive. The 3024 Compact has tungsten emitters to show that it has been designed for a long and productive life. The emitters are at a pitch optimised to achieve the highest short-range performance in the available length.

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3. TECHNICAL SPECIFICATION

Power Input

Input Voltage:	24 V DC nominal, 21 - 28 V DC range.
Input Current:	1.0 A max. (0.5 A max if not using remote monitor).
Maximum Input Power:	24 W (12 W if not using remote monitor).
Input Connector:	M8, 4-pole, male.

Output

Output Voltage:	±7.5 kV ±5% Integrated in the Bar.
Output Frequency:	50 Hz.
Emitter Material:	Tungsten.
Emitter Touch Current:	80 µA max. per emitter. Shockless.

Monitoring

Status Indication Endcap LED:	Green Flashing:	OK, Bar operating normally.
	Red:	Supply voltage out of range, internal fault or excessive load.

Remote Monitor

Signalling Outputs:	'OK' and 'Attention'.	
Signalling Levels:	24 V output, 3 kΩ output impedance.	
	Output current:	Sourcing (+24 V): 8 mA
		Sinking (0 V): 20 mA
	Limited to 50 mA max. (output low) by internal protection.	
	PLC compatibility: Compatible with IEC 61131-2 'Type 3' PLC inputs.	
	Remote monitor states: Bar OK, Fault, Bar not powered.	

Protection	Internal Protection:	Under-voltage lockout.
		Over-voltage lockout.
		Transient over-voltage (surge) protection.
		Reverse supply polarity protection.
	HV supplies overload protected (e.g. due to proximity earth).	
	Signalling outputs protected against short circuit to +24 V or GND.	

Environmental Conditions	Ambient Temperature:	0 to 55 °C.
	Relative Humidity:	Maximum 70 % RH, non-condensing.
	Ingress Protection:	IP66. Bar will not be damaged by exposure to water, but will not function correctly if the emitters are bridged by moisture.
	Vibration:	Installation location must by vibration-free.

Mechanical	Dimensions:	22.0 x 41.5 mm.
	Length:	150 mm and 200 mm.
	Weight:	150 mm = 220 g. 200 mm = 280 g.
	Materials:	FR-ABS, epoxy resin, tungsten emitters, steel fixings.

Approvals CE and UL.

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3. TECHNICAL SPECIFICATION

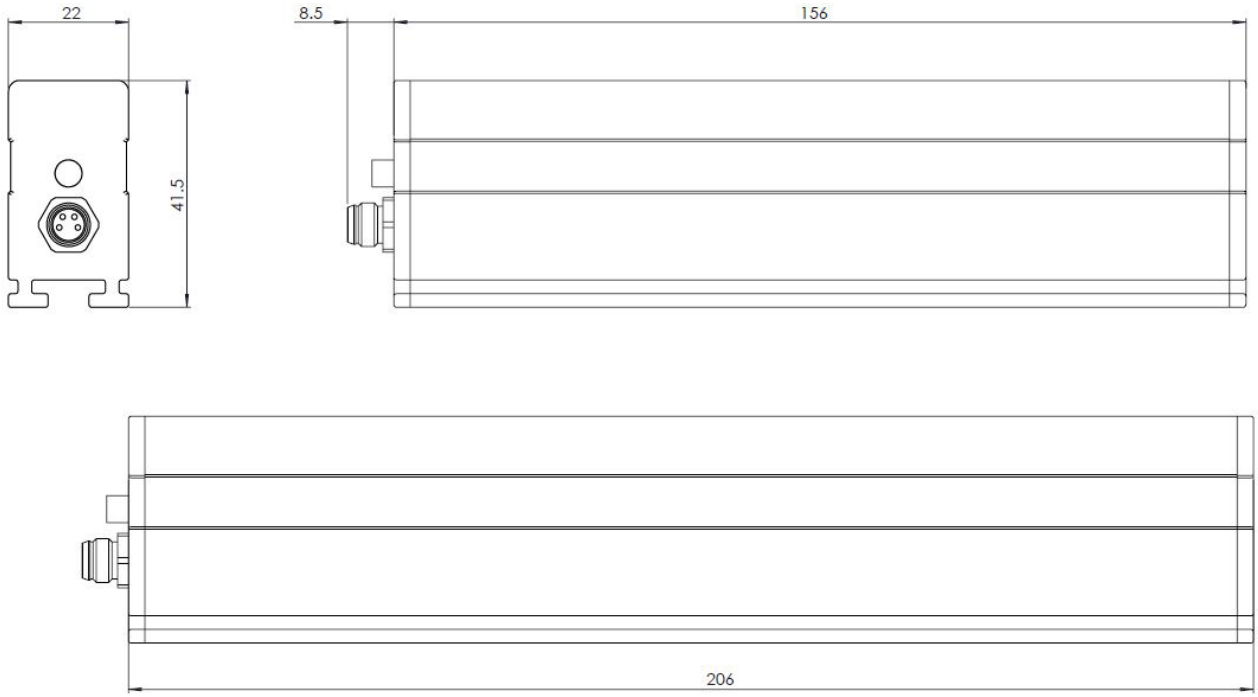
The status of the 3024 Compact Bar is indicated by the LED on the endcap. Duplicate outputs enable integration with control system / PLC.

The 24 V DC power supply and remote monitoring connections are made via an M8 4-pin connector. An external AC-DC PSU can be ordered if 24 V DC is not available.

Mounting onto the machine is with a 'T' fixing which slides into the slot here.

The 3024 Compact Static Eliminator Bar is intended for use in indoor factory environments only. It is not suitable for outdoor use.

DIMENSIONS



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4. MARKET AND APPLICATIONS

WHERE IS THE MARKET FOR THE 3024 COMPACT?

There are two general areas:

Replacing and upgrading AC static eliminators.

This is a strong trend with OEMs and international manufacturing companies. They regard 24 V DC as the future of static control and do not want to use traditional static eliminators for the reasons given above.

New applications where a compact 24 V DC Bar is the most suitable static eliminator.

The advantages of 24 V DC technology were identified in a previous section.

However, many customers are happy with traditional AC static eliminators. They are familiar with AC technology and understand it. They see no reason to change. They also have good economic arguments on multi-Bar systems: three or four AC Bars and a power unit will cost considerably less than the same number of 24 V DC Bars. For these customers we offer both AC and DC technologies, giving objective advice on each type.

For single Bar systems the 3024 Compact will cost less than many AC single Bar and Power Unit systems. It will also be much more powerful.

APPLICATIONS

The 3024 Compact has been designed for compact applications where space is limited. There are many applications for this market-leading product in industries like labelling, packaging, medical moulding and automated assembly.

We will give further application updates as our experience grows.

You should immediately tell anyone who uses short 1250-S Bars so that they know about this new opportunity.

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5. PERFORMANCE, COMPETITION AND PRICING

PERFORMANCE OF THE 3024 COMPACT STATIC ELIMINATOR BAR

The 3024 Compact is a short-range static eliminator for distances from 20 to 150 mm. The target was for the 3024 Compact to be much more powerful than the 1250-S Bar - and therefore more powerful than all other leading AC Bars. This has been achieved.

The performance comparison is:

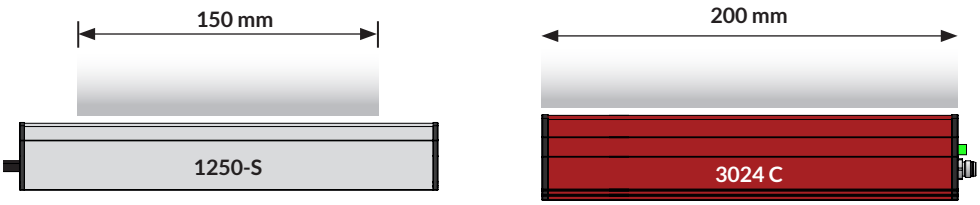
3024 Compact-200 vs 1250-S-0200 10 kV to below 500 V test (with additional capacitance).

Distance to Plate	3024C-200	1250-S-0200mm	Percentage that 3024C is more powerful
20 mm	0.37	0.63	70%
30 mm	0.73	1.24	69%
50 mm	1.68	2.76	64%
75 mm	3.65	5.40	48%
100 mm	6.38	9.62	50%

The performance at 20 to 50 mm is market-leading. While the performance extends to 150 mm, the customer should always try to position the 3024 Compact Bar between 20 to 50 mm from the object.

This performance is achieved partly by having clean, square wave shapes at up to 7.5 kV compared to the sinusoidal waveform of an AC Bar and partly due to having no 'dead-end' and a longer active length, which is even more important in short bars.

Active Length Comparison of 200 mm 1250-S and 3024 Compact



3024 Compact has 33 % longer active length.

We also tested the 3024 Compact against the 3014 and 30241F by taping-off emitters to make artificial length 200 mm bars. We found that the 3024 Compact was more powerful than the 3014 and less powerful than the 30241F. This is to be expected.

COMPETITION

At the time of writing there is no other 24 V DC bar with integrated electronics that can fit into the same space. The only real competition is with much lower performance traditional AC static eliminator bars.

PRICING

The 3024 Compact has a similar price to the shortest 3024F. This is because the cost of manufacture is identical. The price is no more than a short AC bar and power unit but offers much greater performance without any other competition. This makes it a compelling option.

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6. INSTALLATION: MECHANICAL

HANDLING

Take care when handling the Bar, particularly when removing from its packaging and installing on machinery.

LOCATION OF THE BAR

The most effective Bar installation location is at or immediately before the area where static is causing a problem, but remember that static can be re-generated by subsequent passage over rollers or through another process.

The 3024 Compact Bar should be mounted in a clean, dry and oil-free location.

A static meter such as the Fraser 715 is useful in determining the best location for the Bar.

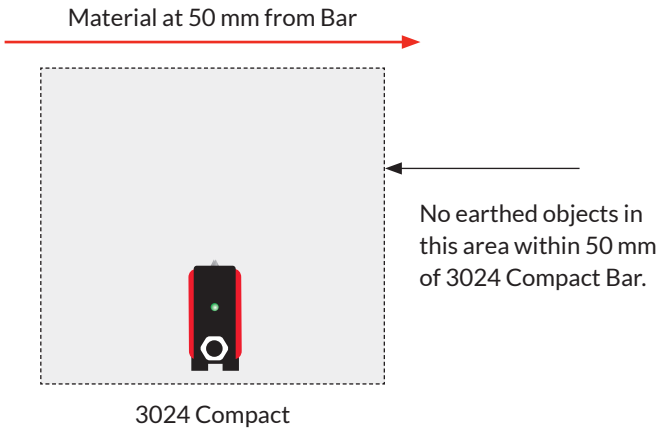
POSITIONING OF THE BAR

Except on a winding reel of material, the material to be neutralised should be in free air and not touching another surface as it passes the Bar.

It is not possible to neutralise static where the material is touching another surface or roller.

Position the Bar such that no earthed metal parts are closer to the Bar than the material to be neutralised - earthed objects can attract ions away from the target reducing the neutralisation power and causing an ion imbalance.

The distance between the Bar and material to be neutralised is 20 mm to 150 mm. The best distance is 20 mm to 50 mm.



The emitter pins must not touch or be close to metal objects, for example parts of a machine.

Proximity of earthed metal objects to the Bar will reduce performance by attracting the ions emitted by the Bar. In extreme cases spark erosion damage to the emitters and the metal object may occur.

If installation conditions are such that proximity of earthed metal to the Bar is unavoidable, avoid placing one row of emitters much closer to the object than the other. Unequal loading of the emitter pins may lead to imbalance in the ionisation output of the Bar.

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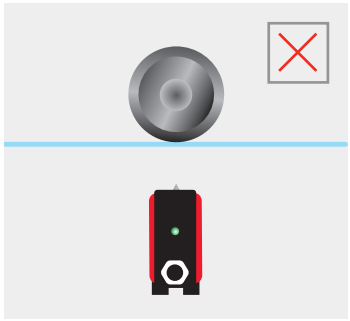
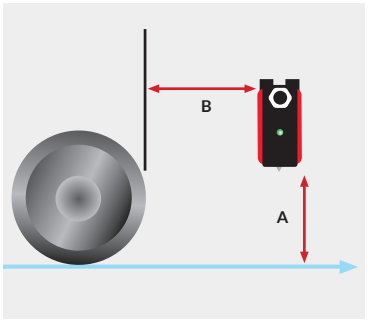
SUMMARY



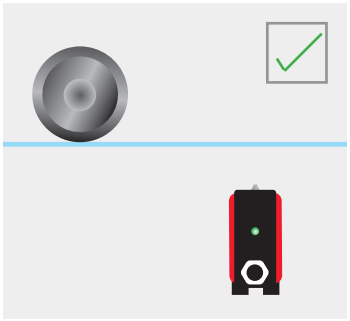
There will be very poor static neutralisation if there is not free air opposite the Bar.



B: Should be > A to avoid ion loss to rollers or parts of the machine.

A: 20 to 150 mm.

20 to 50 mm is best for performance



The free air opposite the Bar allows good neutralisation.

MOUNTING OF THE BAR

The 3024 Compact Bar uses the same T-fixings as the 3024 Bar. Each bar will have 2 x T-fixings provided for mounting the Bar.

These slide in the slot in the base of the Bar and should be evenly distributed.

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7. INSTALLATION: ELECTRICAL INSTALLATION AND MONITORING

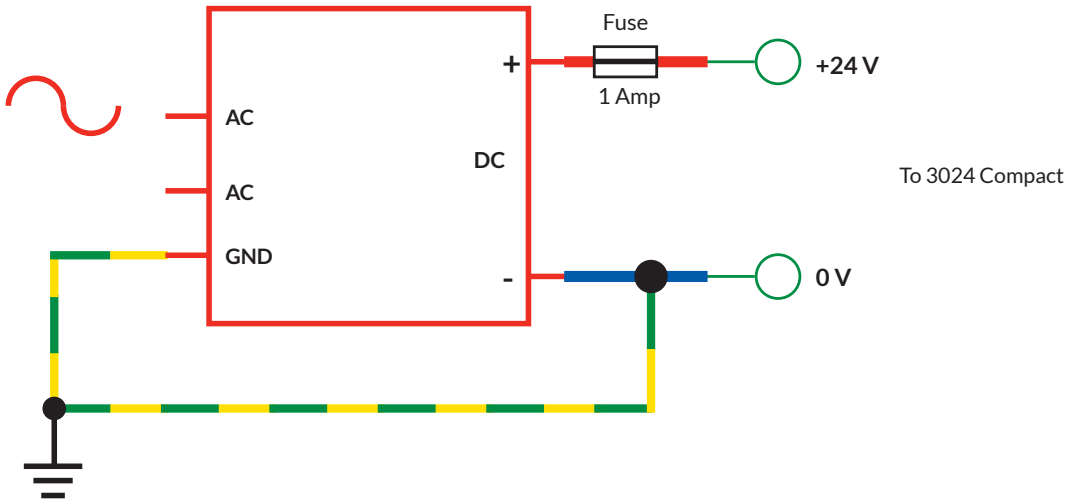
This section describes the electrical installation of the 3024 Compact Static Eliminator Bar and the functioning of its remote monitoring interface.

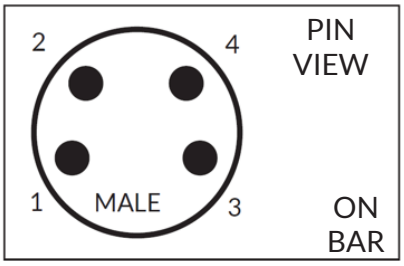
Wiring examples are provided for common installation types.

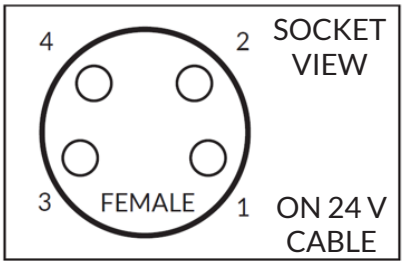
Using an existing 24 V DC supply:

The 24 V output must be fitted with a 1 Amp fuse e.g. Type: 1 A, T, 250 V The 0 V output must be connected to earth.

The WHITE wire to the M8 4-pin connector must be connected to installation earth.







Pin	Colour	Function
1	Brown	24 V
2	White	Earth
3	Blue	0 V and Earth
4	Black	Remote Monitor

1. Status LED and Remote Monitor

The 3024 Compact Bar gives a signal showing its operational status in two ways:

i. LED

- the LED is located next to the cable connector on the Bar.
- flashes GREEN if all is OK.
- flashes RED if there is a fault.

ii. Remote Monitor

- uses the black wire in the 4-wire supply cable to send a 0 V or 21 - 28 V signal to the PLC or other destination chosen by the customer.
- the voltage is taken from the power supply to the Bar. No additional power source is required. The voltage out will be the same as the voltage in: 21 - 28 V DC.

See wiring diagram and examples on page 12.

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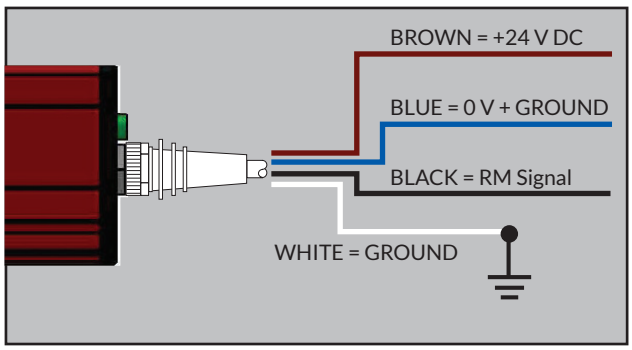
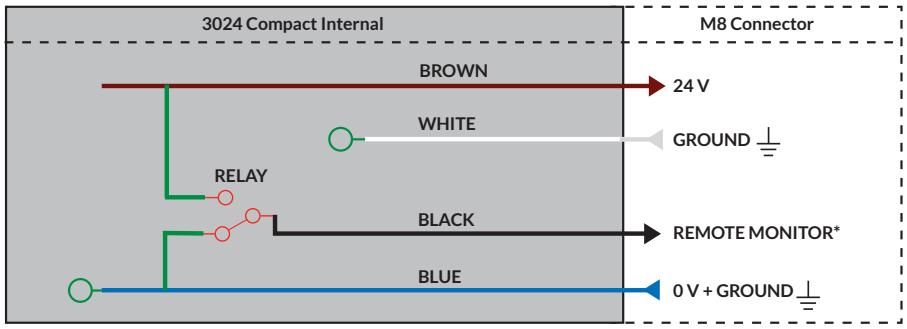


If the remote monitor function is not needed, then insulate the black wire and do not connect anything to it.



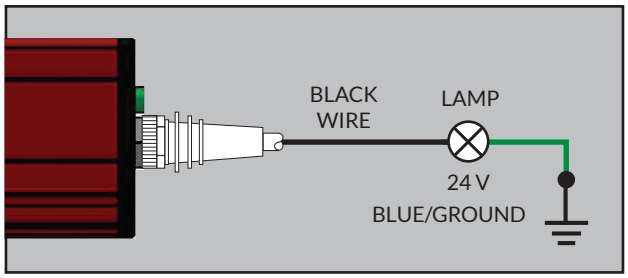
* Source/Sink 100 mA max. Protected by electronic fuse.

Remote Monitor signal is valid 4 seconds after power is applied.

BLACK = 24 V when 3024 Compact status signal **OK**
BLACK = 0 V when 3024 Compact status signal **FAULT**

Example Application Use of Remote Monitor

EXTERNAL LAMP/INDICATOR

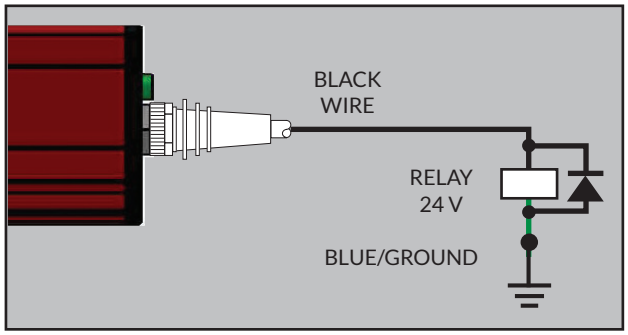


An external indicator can be connected to the BLACK wire to show status. This is useful for bars mounted in inaccessible areas.

Lamp rating 24 V DC, maximum 2 W. An LED can also be used with a suitable resistor.

Maximum current 100 mA.

EXTERNAL RELAY



An external relay can be connected for additional control/ feedback configurations.

Coil rating 24 V DC, 2 W max. Maximum current 100 mA.

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Faults

A fault signal could mean:

i. **Input voltage is outside of 21 V - 28 V range**
   - check input voltage at the Bar.

ii. **Bar overloaded**
   - clean the Bar.
   - make sure that the positioning of the Bar meets these instructions.

iii. **HV output not correct**
   - contact Fraser or distributor.

Where the optional 100 - 250 V AC Power Supply has been ordered ensure the Power Unit is connected to a 3-wire AC mains supply. Live + Neutral + Ground, and that the extra Earth wire from the power supply is bonded to Ground. With this optional supply an interface cable is required to access the remote monitor feature.

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8. OPERATION, MAINTENANCE AND SAFETY

The 3024 Compact Static Eliminator Bar has no settings that require adjustment.

This section describes commissioning the Bar for use and explains the LED status indication.

The operation of the integrated remote monitoring function is described in Section 7, Electrical Installation and Monitoring.

COMMISSIONING

Before turning the Bar on for the first time, ensure that:

- The positioning and mounting of the Bar is in accordance with the instructions in Section 6 of this document.
- The electrical installation of the Bar has been completed in accordance with the instructions given in Section 7 of this document. It is important that the 0 V output of the 24 V supply is grounded to the installation earth.
- If using the external AC-DC power adapter, ensure that the supplementary grounding wire is connected to the installation earth.
- The Bar is clear of any moving parts which may damage it when the machine or process is in operation.
- Any operators who will work in close proximity to the Bar are aware of its presence and familiar with its operation.

The Bar may now be powered up for the first time.

LED

The 3024 Compact Static Eliminator Bar is equipped with a bi-colour LED indicator on its endcap, located next to the M8 power/signal connector. The LED indicates the operational state of the Bar.

When the Bar is first powered, the LED will illuminate RED for up to three seconds. If the Bar is in good working order, the LED will then illuminate GREEN to indicate normal operation.

In normal operation the LED will illuminate solid GREEN. This shows that all internal measured parameters are within their nominal ranges and that ionisation is being generated.

If the Bar detects a fault condition, the LED will illuminate solid RED. The ionisation will be disabled in this state. This condition may be caused by:

- Supply voltage outside of normal range (less than 21 V or more than 28 V).
- High voltage supplies are overloaded (e.g. by earthed object close to emitters) or excessive contamination.
- Internal fault within the Bar.

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MAINTENANCE

Cleaning is the only maintenance required. The electronic components within the Bar are fully encapsulated for protection and insulation, and as such no repair is possible.

Turn off the power supply to the Bar before performing any installation or maintenance work on the Bar.

Dirt around the emitters will reduce ionisation effectiveness and result in unsatisfactory static neutralisation performance. Dirt on the extrusion body may allow energy to track to earth.

The frequency of cleaning will depend on the nature of the process(es) run on the machine the Bar is mounted on, and the general environment in which the Bar is installed. The Bar should be cleaned when an 'attention required' status is indicated by the endcap LED and/or remote monitoring interface.

To ensure best performance, the Bar should also be visually inspected on a regular basis and cleaned whenever convenient to do so. As discussed earlier in this manual, certain types of contamination may not trigger the 'attention' signal e.g. if the contamination is heavily insulative.

To obtain good ionisation performance, the emitter pins of the Bar are very sharp. Take care to avoid injury when cleaning the Bar.

A Bar cleaning kit is available from Fraser Anti-Static Techniques, **part number 81220**. This is the ideal solution for regular Bar cleaning, but alternatively a toothbrush or soft nail brush can be used to clean the Bar. Do not use a wire brush as this will damage the Bar.

When cleaning the Bar, ensure that the emitters, the resin surface around the emitters and the Barrier between emitter rows are all cleaned thoroughly.

The Bar can be cleaned with water and a gentle detergent, or isopropyl alcohol (IPA), but it must be dry around the emitters before turning the power on again.

Keep the Bar dry and free of dust, dirt, oil, corrosive substances and solvents.

SAFETY

Installation and maintenance work on the Bar must only be carried out by suitably qualified personnel.

The Fraser 3024 Compact Bar is a pulsed DC Static Eliminator Bar, with 24 V power input. It has been designed in accordance with the safety requirements of EN 62368-1:2014 (Audio/video, information and communication technology equipment, Part 1: Safety requirements). This standard is harmonised under the EU Low Voltage Directive and recognised by UL. This standard supersedes EN 60950-1:2006, against which the 3024 Bar was certified. Its technical requirements are very similar, but the method of safety assessment used differs. If there are any questions about this please contact us.

Emitter Pins: The emitter pins of the Bar are protected by suitably-rated current-limiting resistors such that they may be considered a Class 1 electrical energy source, as defined in EN 623681:2014. This means that contact with the emitter pins is not painful and will not result in an electrically-caused injury, but may cause a detectable sensation due to the small current that will flow.

The emitter pins of the Bar are necessarily sharp in order to perform their intended function. The emitter pins are considered a Class 2 mechanical energy source, as defined in EN 623681:2014. This means that contact with them may be painful but will not cause an injury requiring emergency medical attention.

Ozone: A small amount of ozone will be produced as part of the ionisation process. When installed correctly, the level of concentration of ozone is less than 0.1 ppm and is within internationally accepted limits.

Shocks to Personnel: As with all pulsed DC Static Eliminators, it is possible for the user to receive a small static shock as a result of their body being charged by the Bar, and then discharging to a nearby earthed object. This is not dangerous but may be uncomfortable and cause surprise.

Essential: It is worth repeating, because some installers ignore these important rules:

- the negative pole of the 24 V DC supply provided to the Bar must be permanently earthed.
- adequate installation earth / ground is required to ensure safe and proper operation.

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E sales@fraser-antistatic.co.uk W www.fraser-antistatic.com

9. TROUBLESHOOTING

In the event of difficulties with the Bar, please use the following checks to assist with diagnosing and correcting the issue.

Symptom	Cause(s)	Solution(s)
No LED	The Bar is not powered.	• Check the power supply and connections. • Check the fuse. • Check the supply cable for damage.
Red LED	The power supply voltage is outside of the specified range.	• Check and adjust the power supply voltage. • Ensure an appropriate power supply cable is used. • Ensure the power supply is not overloaded.
	HV supplies are overloaded.	• Check the installation of the Bar. • Move the Bar further from earthed metal objects. • Check the Bar for damage.
	Internal fault.	• Contact supplier.
Poor Ionisation/ Neutralisation Performance	Emitters need cleaning.	• Clean the Bar.
	Emitters worn.	• Check the emitters for excessive wear. • Replace the Bar.
	The Bar is installed too close to machine parts.	• Review the installation. If possible, move the Bar away from machine parts.
	The Bar is installed too far from the material to be neutralised.	• Review the installation. If possible, move the Bar closer to the material to be neutralised.
	The Bar is installed opposite roller/ machine parts.	• Review the installation. If possible, move the Bar opposite material in free air.

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10. ACCESSORIES AND SPARE PARTS

A range of accessories to assist with installation and maintenance of the Bar is available from Fraser Anti-Static Techniques. Please contact your Technical Sales Liaison with any pricing and delivery queries on these items.

Item Photo	Description	Part Number
	**3 m** cable M8 female, Bare ends. **Straight socket.**	80892
	**5 m** cable M8 female, Bare ends. **Straight socket.**	80930
	**7.5 m** cable M8 female, Bare ends. **Straight socket.**	80931
	**10 m** cable M8 female, Bare ends. **Straight socket.**	80932
	**3 m** cable M8 female, Bare ends. **90° socket.**	80933
	**5 m** cable M8 female, Bare ends. **90° socket.**	80934
	**7.5 m** cable M8 female, Bare ends. **90° socket.**	80935
	**10 m** cable M8 female, Bare ends. **90° socket.**	80936
	Universal AC/DC power supply. 100 - 250 V 50/60 Hz AC input, 24 V DC output. **Fitted with 1.5 m of cable.**	E3024-PSU

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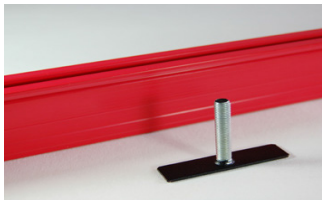
10. ACCESSORIES AND SPARE PARTS

Item Photo	Description	Part Number
	**2 m** M8 male to M8 female 4-pin extension cable for AC/DC power supply unit.	80937
	Mounting 'T' Bracket, including flanged nut. 40 mm stud length, M6 thread.	30248
	Fraser Ioniser Cleaning kit containing: • 500 ml of cleaning fluid. • Soft bristle hand brush. • Instructions for use.	81220

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