X-SERIES
INTELLIGENT IONISING BARS

DISTRIBUTOR MANUAL

CONFIDENTIAL

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1. BACKGROUND

There is increasing competition in the short & long range static eliminator markets. Our current family of NEOS products has market-leading performance but we wanted to put a larger and clear gap between Fraser and the rest of the competition.

Our goal was to use all our experience from the NEOS range of products to develop the most competitive suite of static eliminators available - and we are proud to announce that we have achieved this.

The X-SERIES Suite of products launches with:

- more power: up to 33 kV
- market leading performance
- more intuitive 'tool free' on-bar control
- Improved Reliability and Intelligence
- backwards compatibility with NEOS
- enhanced connectivity built into X-SERIES design. (Industry 4.0 Compatible for future applications)

The NEOS range had up to a true 30 kV output under load; when combined with our reactive intelligence it already provides class leading performance. The X-SERIES of products now raises the bar further and offers the complete range from 12kV up to 33 kV for greater ionisation output.

With an extensive understanding of Static Elimination techniques developed from a large R&D investment in test equipment and real ground-breaking research, we have been able to significantly refine the intelligence system to better measure the static on the target and react more responsively. The X-SERIES is now considerably more effective at removing large electrostatic charges than its NEOS equivalent. Our Market-leading performance is fully explained in Section 2.

On-bar control of the X-SERIES products is through a very simple operator interface.

The X-12 and X-20 anti-static bars can be easily installed by an end user. All the settings can be adjusted without tools, via the two IP rated buttons on the endcap. Power can also be maintained onto the unit whilst the X-12 and X-20 are being made as the High Voltage is disabled whilst this operation is being carried out.

The X-33 Long Range bar utilizes two simple rotary switches for user control as space on the endcap is less restricted. The right-hand switch turns on or off the intelligence and the left-hand switch gives the 4 options for distance in each mode. This is more intuitive, and again, it will be much easier to see the bar setting than on NEOS through both the switch-positions and the indication given by 5 green/red LEDs on the endcap.

Whilst performance of the eliminator bars is critical, reliability is just as important to our customers, and this is assured by a rigorous approach and focus to understanding and improving the robustness of our design.

For control through PLCs, the bar can be switched on and off, held in standby mode and report its status with exactly the same signals as those used by the NEOS range. We have sought to remove any barriers to customers switching to the new, more powerful and reliable suite of bars. The X-SERIES is compatible with Type 1, 2 and 3 PLC inputs.

The X-SERIES of products is also the first family of products from Fraser Anti-Static Techniques specifically designed to be compatible with Industry 4.0 applications. The X-12, X-20 and X-33 products have been designed to allow future connectivity to external sensing devices and data collection services.

2. SUMMARY OF KEY FEATURES AND SALES POINTS

X-12 & X-20 : CONTROLLABILITY AND EASE OF USE

The X-12 and X-20 static bars can be installed by an end-user and all the settings can be made from the endcap via the use of two IP rated buttons, without the use of any tools.

X-12 Endcap Controls

- Distance Control: distance-to-target setting. See Section 8.
- The status of the bar, including the need for cleaning, is indicated by 3 bi-colour LEDs on the endcap of the bar. Duplicate outputs enable integration with a control system or PLC. See Section 7.
- Intelligence Control: Intelligence ON/OFF. See Section 8.
- The 24 V DC power supply and remote monitoring connections are made via an
- M12 5-pin connector.
- An external AC-DC PSU can be ordered if 24 V DC is not available.
- Mounting onto the machine is with ‘T’ fixings that slide into the slot in the bar.

X-20 Endcap Controls

As part of the X-SERIES development, we have listened to the comments regarding adjustment of the NEOS bar requiring the use of tools. No tools are required to change the mode of the X-SERIES bars and we have also made use of the 3 LEDs to give a visual indication of the settings as they are modified. When the bar is functioning correctly, The LEDs will clearly illuminate the selected operating mode at all times.

We now have 3 distance settings for both Intelligent operation and Manual operation giving 6 modes in total for the X-12 and X-20 bars. This provides additional functionality to the NEOS Range which only had 2 settings for Intelligent and 3 for Manual. The distance setting modifies the output frequency of the bar, however distance is more understandable by the customer.

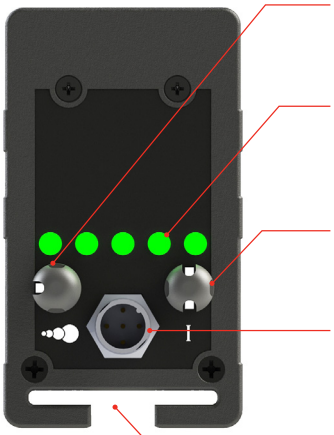
This functionality makes Fraser a market leader as none of our competitors give this adjustment capability on their bars. For example, Simco ThunderION does not have these features in its basic bar. Meech requires the use of a separate controller to ‘program’ the bar which is an additional cost and limits the adjustments to a site where this separate controller has been purchased.

The Fraser approach is to make life easier and hassle-free for our customers, so they want to use our products for years to come as they appreciate the quality and service they get from the Fraser team.

The bar now has a 3 LED display offering a 180 degree viewing angle. Using these LEDs, the bar will communicate to the user the polarity of the static charge on the web in an intuitive manner.

X-33 : CONTROLLABILITY AND EASE OF USE

The bar can be installed by an end-user and all the settings can be made from the endcap via the two rotary switches, without the use of any tools.



X-33 Endcap Controls

As mentioned previously, we have listened to the comments regarding adjustment of the NEOS bar, that it needed tools and that it was very difficult to see which setting was chosen, and we have improved that. We have also made use of the 5 LEDs to give a visual indication of the settings as they are modified. When the bar is functioning correctly, all of the LEDs will flash at the HV frequency.

We have also given additional granularity to the settings. We now have 4 distance settings for both Intelligent operation and Manual operation. With NEOS we had only 2 settings for Intelligent and 3 for Manual. The distance setting actually modifies the output frequency of the bar, however distance is more easily understandable by the customer.

Nobody else gives this adjustment capability on the bar. Simco ThunderION does not have these features in its basic bar. Meech require the use of a separate controller to 'programme' the bar which is an additional cost.

The bar also now has a 5 LED display offering a 180 degree viewing angle. Using these LEDs the bar will communicate to the user the magnitude of the static load on the web and its polarity in an intuitive manner.

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 interfacing 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.

2. SUMMARY OF KEY FEATURES AND SALES POINTS

CONNECTIVITY

At launch, the X-SERIES of products has the same connectivity through a Remote Monitor as the latest versions of NEOS to allow easy upgrade with no additional installation works or electrical changes for our customers.

It is compliant with PLC Type 1, 2 and 3 inputs using the same 5-pin M12 connector.

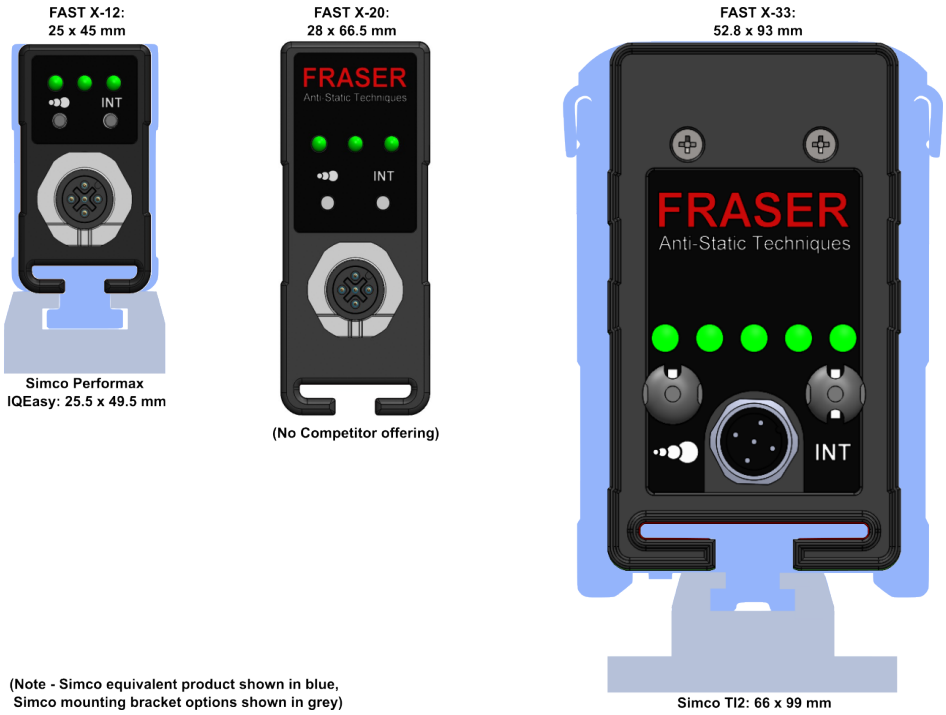
Through this connector we can switch the bar on and off, hold the bar in stand-by mode (the bar is powered but the HV is held low, which means the bar can react very quickly to machine start-up) and detect a clean-me signal, and additionally a fault.

See Section 8 for wiring details.

OTHER FEATURES

Our strategy for the X-SERIES was to make it completely backwards compatible with the NEOS Range, so that it will be very easy to replace the old bar with the new one and take advantage of the performance and reliability benefits that X-SERIES provides:

- The wiring and remote monitor functions are the same. We have used the same long-life emitters from the best possible material – Tungsten. These emitters are replaceable in the X-20 and X-33 models.
- We have maintained the same minimum lengths as with NEOS, except for X-12F which previously had a 300mm option. X12 can now be supplied in sizes from 360mm and X-20 from 450mm increasing in specific steps to a maximum length of 5 m. Note that the order length is the cut extrusion length excluding the endcaps and connectors.
- As before, the active length of ionisation is at least equal to the physical length.
- The X-SERIES is a similar weight to its NEOS equivalent with the X-33 being lighter per unit length compared to its NEOS 30 equivalent. It has our standard type of slide fittings in a T-shaped track on the back of the bar. These fixings have the same bolt size as the equivalent NEOS fixings so that an X-SERIES eliminator bar can be fitted to the same existing machine brackets.
- The cross-sectional size of Fraser X-SERIES products are some of the most compact available on the market allowing lower profile installations than all of our major competitors.



3. TECHNICAL SPECIFICATION

Power Supply	X-12	X-20	X-33
Input voltage	24 V DC nominal, 21 - 28 V operating range. 0 V earthed.	24 V DC nominal, 21 - 28 V operating range. 0 V earthed.	24 V DC nominal, 21 - 28 V operating range. 0 V earthed.
Input current	2.5 A max.	2.5 A max.	2.5 A max.
Maximum input power	20 W	40 W	60 W
Input connector	M12, 5-pole, male	M12, 5-pole, male	M12, 5-pole, male

Output	X-12	X-20	X-33
Output voltage	±12 kV (-0/+10%)	±20 kV (-0/+10%)	±33 kV (-0/+10%)
Emitter material	Long-life, high-grade tungsten (non-replaceable)	Replaceable Long-life, high-grade tungsten	Replaceable Long-life, high-grade tungsten
Emitter touch current	100 µA max. per emitter	100 µA max. per emitter	100 µA max. per emitter

Monitoring (All X-SERIES Models)	
Endcap LED status indication	**Green flashing, Solid or scrolling:** OK, bar is operating normally **Red/Green flashing:** 'Clean Me' - attention required **Flashing Red:** standby mode **Solid Red:** supply voltage out of range or internal fault

Remote Monitor (All X-SERIES Models)	
Signalling outputs	'Fault' and 'Clean Me'
Signalling levels	0 V / 24 V output
Output current	Sourcing (+24 V): 50 mA Sinking (0 V): 50 mA Limited to 50 mA max.

PLC (All X-SERIES Models)	
Compatibility	Compatible with IEC 61131-2 Type 1, 2 and 3 PLC inputs
Remote monitor states	Bar OK, 'Clean Me', Fault, Bar not powered

Protection (All X-SERIES Models)	
Internal protection	Under-voltage/over-voltage lockout, surge protection, reverse supply polarity protection. Over-temperature protection. HV supplies protected against overload. Signalling outputs protected against short-circuiting.

3. TECHNICAL SPECIFICATION

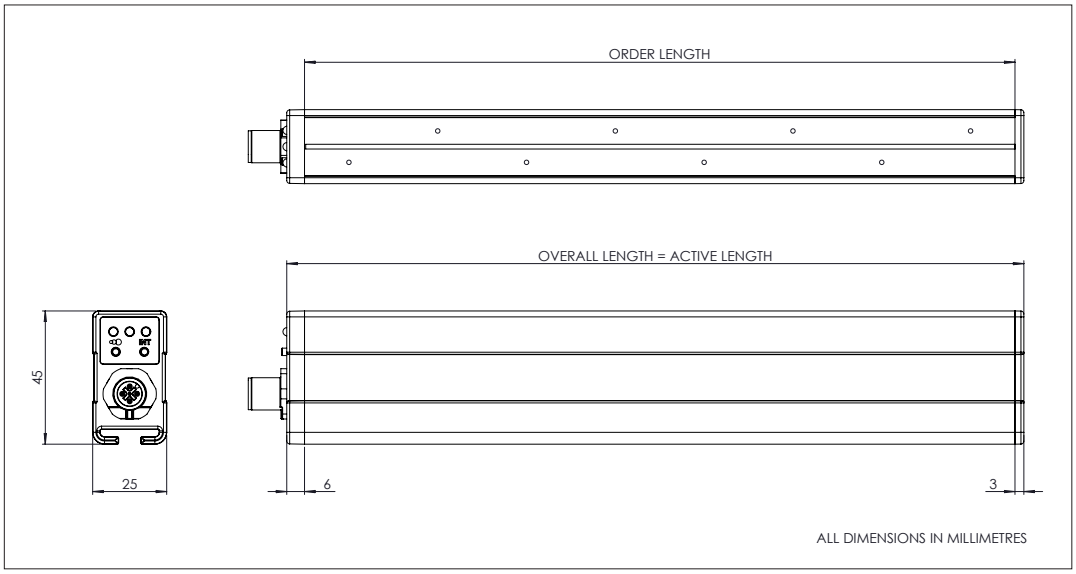
Environmental Conditions	X-12	X-20	X-33
Ambient temperature	0 - 55 °C	0 - 55 °C	0 - 55 °C
Relative humidity	Maximum 70 %, non-condensing	Maximum 70 %, non-condensing	Maximum 70 %, non-condensing
Ingress protection	IP67. Internal, industrial use.	IP67. Internal, industrial use.	IP64. Bar will not be damaged by exposure to water, but will not function correctly if the emitters are bridged by moisture.

Mechanical	X-12	X-20	X-33
Dimensions	25 x 45 mm (W x H)	28 x 66.5mm (W x H)	52.8 x 93 mm (W x H)
Length	X-12F - Minimum length 360 mm to 4.98 m in 60 mm steps X-12L - Minimum length 360 mm to 4.92 m in 120 mm steps	Minimum length 450 mm to 4.95m in 150 mm steps	Minimum length 600 mm then 750 mm to 6,000 mm in 250 mm steps
Mass	1.5kg/m	2.5kg/m	1.02 kg + (2.5 kg/m) e.g. 1,000 mm bar: 3.52 kg
Materials	FR-ABS, epoxy resin, tungsten emitters, steel fixings.	FR-ABS, epoxy resin, tungsten emitters, steel fixings.	FR-ABS, epoxy resin, tungsten emitters, steel fixings.

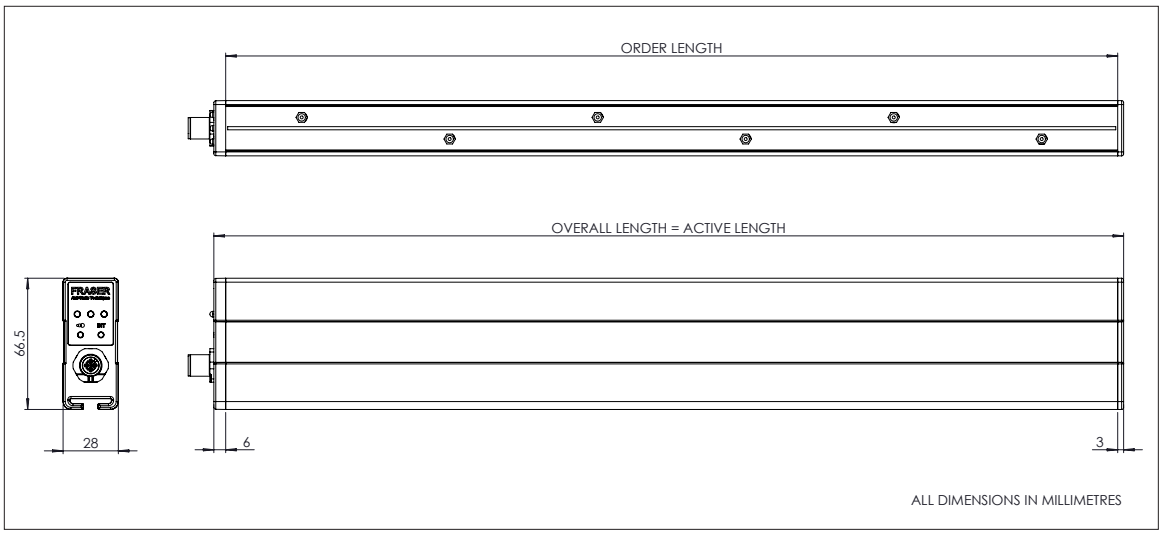
Approvals			
CE Marking	CE. CB		
EU LVD (2014/35/EU)	EN 62368-1:2014		
EU EMCD (2014/30/EU)	Emissions: EN 61000-6-3:2007 Immunity: EN 61000-6-2:2005		

3. TECHNICAL SPECIFICATION

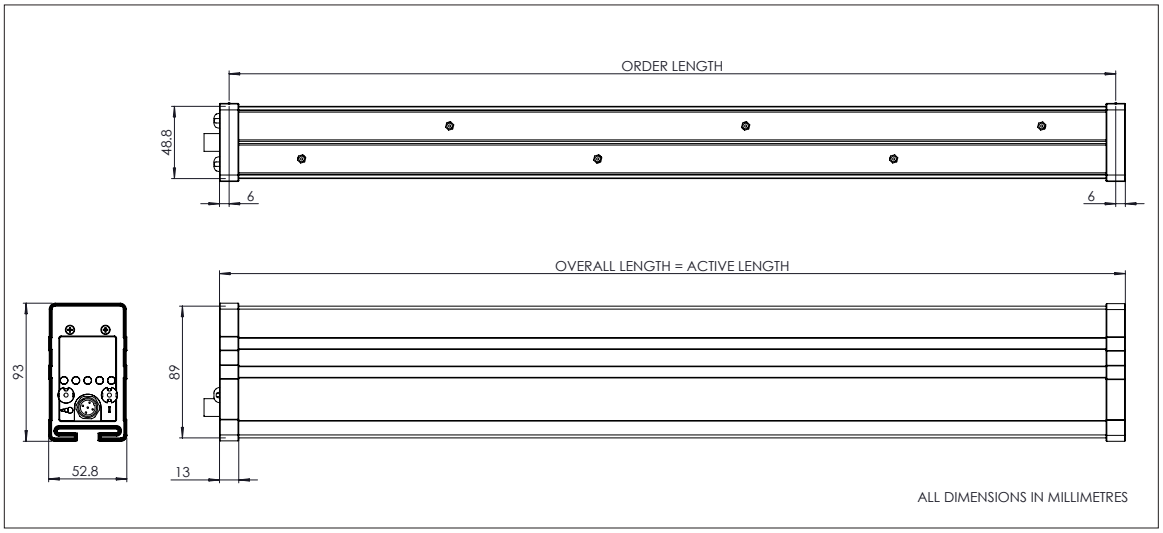
X-12 Specifications



X-20



X-33



4. MARKET AND APPLICATIONS

The X-SERIES has been designed for applications where high-performance, short and long-range static neutralisation is needed. The family of bars allows the neutralization of charges at a range of 40 mm to 1,500+ mm.

The power of the X-33 makes it ideally suited to OEMs and end users with large winders, including slitters/ rewinders, cast and blown film extruders, and laminators.

The X-20 has no competitor equivalent and is ideal for medium-sized winders. The X-20 addresses a gap in the market where a cost effective but high performance longer range bar is required.

The X-12L is ideal for smaller widers on compact equipment where space is at a premium.

The X-12F is simply the most powerful short range bar available on the market from any supplier and addresses the need for static control on the fastest web processes on the planet.

Our strength in the UK is very clear. We supply Atlas Converting, the UK's biggest slitter-rewinder OEM. We also supply the next 5 or 6 biggest slitter-rewinder OEMs including Alpha Converting, Elite Cameron/TS Converting, SRC and Universal Converting. We also supply many winder manufacturers across the globe including Bruckener, Jurmet and many, many more.

Customers for the X-SERIES will typically fall, but are not limited to, the following categories:

- Slitter OEMs / Winder OEMs
- Film extruder OEMs
- Gravure / Flexo printing OEMs
- Large multinational / international film producers
- Food packaging manufacturers
- Gravure printer end-users

X-SERIES is entirely backwards compatible with the NEOS range and competitively priced. This makes the X-SERIES the logical choice when replacement of installed NEOS bars is needed either due to end of product life or where customers want a higher performance and robust static-neutralisation solution

For further application notes, please see the Fraser documents:

'Short-Range Static Neutralisation'

'Long-range Neutralisation Winder Applications'.

5. PERFORMANCE, COMPETITION AND PRICING

The existing NEOS 30 was already more powerful than our leading competitor – see the comparisons with the Simco ThunderION bars, which we have previously shared to Fraser Distributors. The X-SERIES range of products takes performance to the next level.

This has been achieved through the following developments:

- Operating Voltage increased to 33 kV for the X-33
- Reactive intelligence refined
- Increasing the range setting options
- Design based on a resilient and robust philosophy. Using the extensive knowledge and experience of the Fraser team to design out some of the issues our competitors suffer with their products.

a. We have increased the operating voltage from 30 kV to 33 kV

Please bear in mind that this is the actual voltage under load, unlike some other manufacturers' bars (See Simco Comparison). Increasing the voltage of X-33 by 10% to 33 kV does give a small benefit, but the huge increase in performance is not explained by this. It has been achieved through the significant improvements to the new X-SERIES intelligence incorporated into every X-SERIES Eliminator Bar.

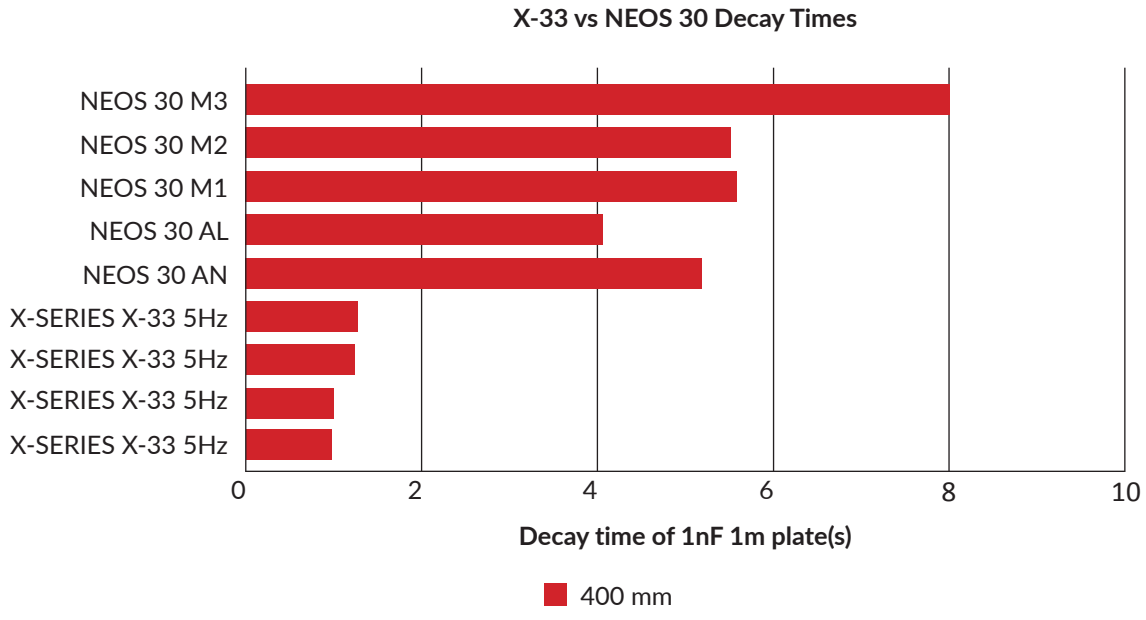
b. We have refined the reactive intelligence from NEOS so that it responds with more ionisation to meet the actual charge in the product.

With the NEOS range, we used additional pulses of both polarities to allow us to compare the positive and negative outputs and react accordingly. With the X-SERIES we use a very short dead-time between the positive and negative pulses to measure the field with no interference from the bar's own output. This is incredibly sensitive and allows us to react more quickly. Our unique software algorithms allow control over the following features to provide market leading responsiveness:

- Duty Cycle
- Frequency
- Dead Time
- HV Level
- Rise and Fall Times of the waveform

This more holistic approach allows a continuously reactive and adaptive response to improve performance. The sophisticated algorithm allows us to control all the parameters continuously for a better overall result. Even in manual mode we can modify some of these parameters to get the best results.

This has resulted in better neutralisation power as shown in the graphs below:



It is worth looking at those results in detail. These are the times taken to decay a plate with a large capacitance (ability to hold a large charge) from a starting point of 20 kV down to 2 kV.

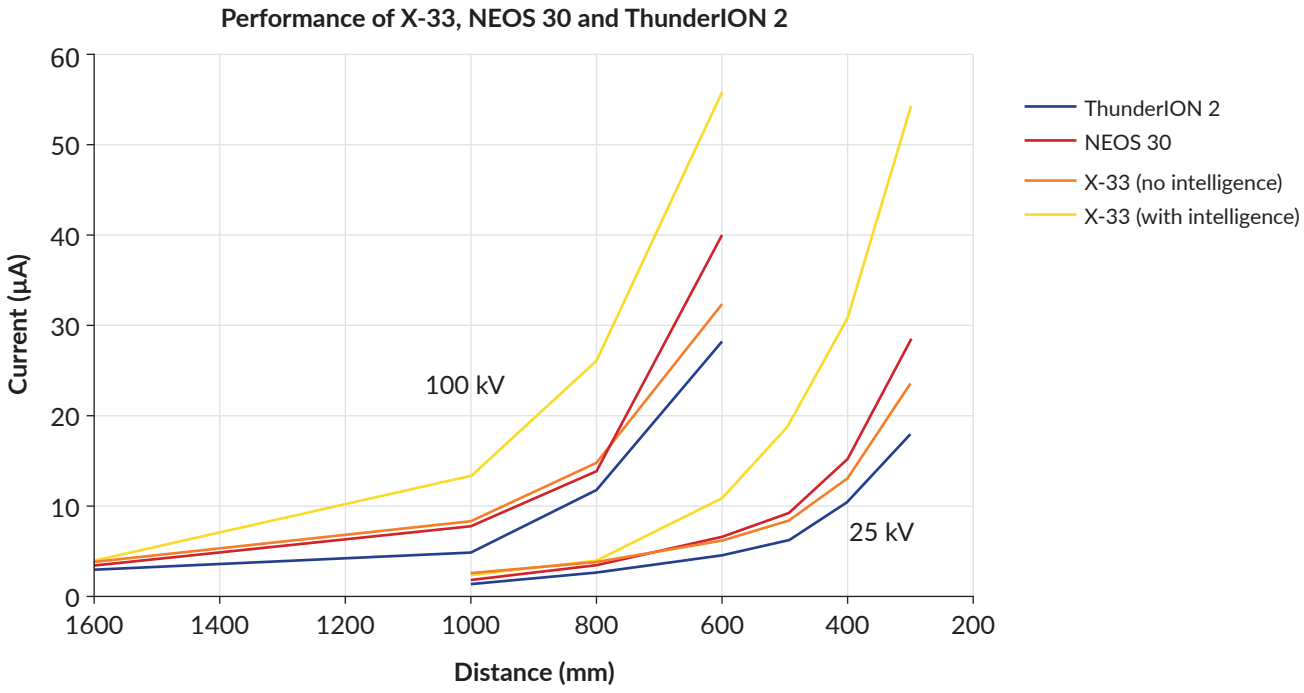
	X-12	X-20	X-33
Distance to Plate	TBC	TBC	400mm
X-SERIES Best Decay Rate	TBC	TBC	0.945 seconds
NEOS Best Decay Rate	TBC	TBC	4.11 seconds

For example, at a distance of 400 mm, the X-33 reduces the plate to 2 kV in only 0.95 seconds. The best decay that NEOS 30 could manage was 4.1 seconds. This is a massive difference. This illustrates that the X-SERIES intelligence is more than 4 times more effective in this test which is a positive demonstration of the speed with which the intelligence reacts.

At Fraser, we have understood for some time that Charge Plate Neutralisation is a not an ideal way to validate performance. Once the plate is charged up to 20 kV, no more charge is added and the bar is allowed to neutralise the plate. This presents two issues: 20 kV is a low level of charge for a big winder and as soon as the voltage drops there is less work for the bar to do. This does not truly 'exercise' a bar fully and this is not what happens in the real world. On a winder, more charged material is continuously being added and so a more effective way to monitor performance is to mirror this effect. At present, our competitors do still use the Charge Plate method so it is important for us to produce these results to reinforce our superiority, as well as saying there is a better method.

Our improved method is designed to replicate what happens with a winder, where more charge is being added all the time. To provide more 'real world' measurements, we have developed equipment which holds the charge plate at a high voltage (up to 100 kV) and for our most powerful bars, we measure how much electrical current the system requires to maintain that voltage whilst the bar is trying to neutralise it. Current is the movement of charge and so it directly represents the bar's ability to remove charge.

Therefore, plate current is a much better measure of true performance. Below you can see the graph for X-33 with and without intelligence. Using the same test rig, we have also tested NEOS 30 and Simco ThunderION to give a comparison.



5. PERFORMANCE, COMPETITION AND PRICING

We need to take time to look at the graph on the previous page carefully to understand the data. We have included two sets of data - one set at 25 kV and the other set at 100 kV. Each dataset shows 4 traces for comparison.

A larger current on the y-axis is showing a higher level of performance as it is equivalent to how much charge the anti-static bar is removing from the target.

The lowest blue line is for the standalone Simco ThunderION. At every voltage and every distance it is less powerful than either NEOS 30 or X-33.

The red and orange lines represent NEOS 30 WITH intelligence and X-33 WITHOUT intelligence. As you can see, they are very close together. This is to be expected. The additional 33 kV power of X-33 is being matched and at shorter distances beaten by the intelligence of the NEOS 30 at 30 kV. This shows that higher voltage alone is not the biggest factor.

The most important thing to understand from this graph is shown by the yellow line. It tells us just how much additional performance the X-33 intelligence system enables. X-33 with intelligence is quite simply, the best long-range bar ever.

The following table is taken from the Performance Graph. It shows that X-33 is at least twice as powerful as

ThunderION 2 at all distances and voltages measured.

Plate Voltage (kV)	Distance (mm)	Plate Current (µA)		# of times X-SERIES more powerful
		X-33	ThunderION 2	
100	1000	14	5	x 2.8
100	600	57	28.5	x 2.0
25	600	10.5	3	x 3.5
25	300	53	17	x 3.1

FUTURE PROOFING

The X-SERIES of Eliminator Bars are already a better product than their NEOS equivalents, but it has also been designed as a platform for further development so that it can be adapted for Industry 4.0, Internet of Things (IoT) and smart factories in the future.

Each of our X-SERIES electronics motherboard is already designed to carry a 'daughter' board to provide additional features which will follow:

- It will be possible to use an externally supplied signal to the bar to continually optimize it for distance to target whilst still employing intelligence. This will replace the NEOS 30 OEM with a much more resilient and better performing product.
- We will be able to synchronise and mesh the output between a number of bars across a large web. This will immediately improve the performance by removing any possibility of adverse interactions between bars and allowing intelligence to be used even more effectively.
- The X-SERIES range of products will ultimately be able to employ separate X-SERIES Static Measurement nodes to feedback to the X-SERIES Eliminators in a closed loop to achieve the required result in specific applications where single Static eliminators can struggle.
- There will be options to fit Industry standard Protocol communication modules such as ProfiNet, Ethernet/IP, Modbus TCP and others to allow the bar to be controlled and report OEE data as part of a node in an Industry 4.0 automated factory.

COMPETITION

At the time of writing the X-SERIES range of products are the most competitive and reliable static eliminators available.

PRICING

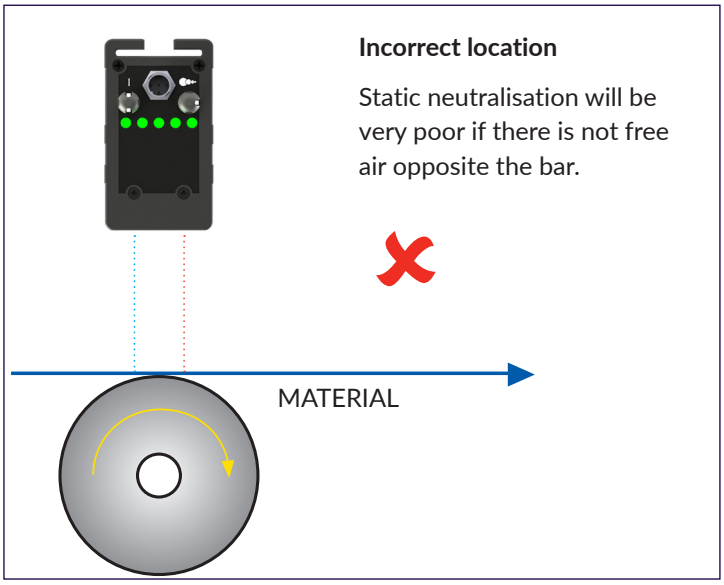
All of these additional features of the X-SERIES range of products are available for a comparable price.

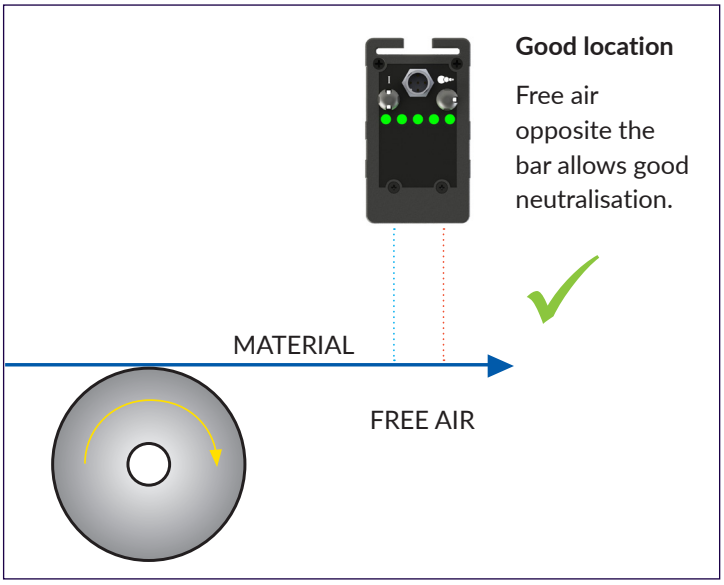
We want to make it easy for customers to make the change to the X-SERIES and, by carefully controlling all costs, we are pleased to confirm that the X-SERIES will have a similar list price as its NEOS Equivalents. This will enable us to be very competitive for OEM and End-User sales.

6.1 POSITIONING OF THE BAR

The best location is at, or immediately before, the area where static is causing the problem. Remember that static can be regenerated if the material passes over rollers or through a process after neutralising. A Static Meter such as the Fraser 715 is useful to determine the best position.

Important: Except on a winding reel of material (see the examples on the following page), the material to be neutralised must be in free air, not touching another surface as it passes the bar. It is not possible to neutralise static electricity where the material is touching another surface or roller.



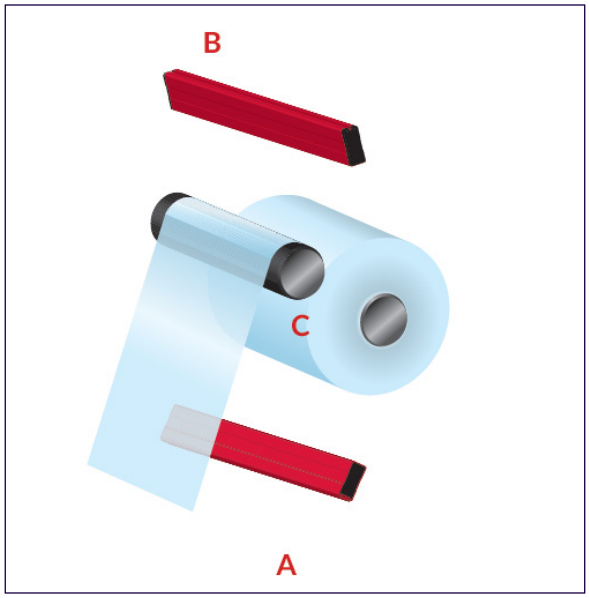


Generally, with a rewind or unwind, it is desirable to use a long-range bar to cope with the changing geometry so that you can neutralise the reel from the core to the finished diameter at the end of the wind.

There is an optimum location to neutralise the reel, which is shown by the following diagrams.

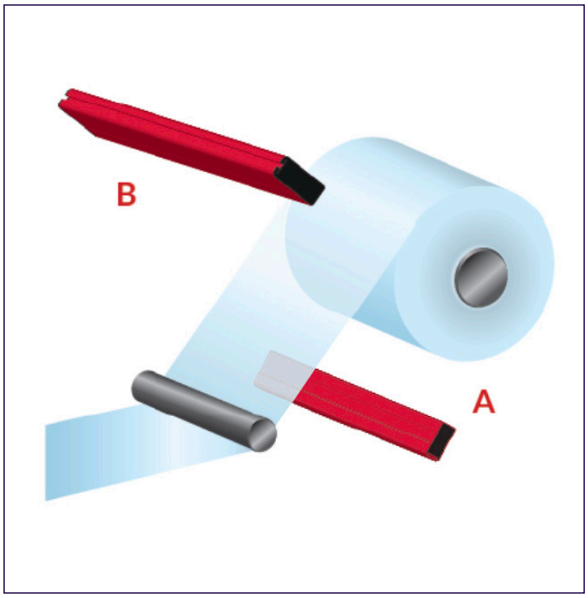
The principle is to neutralise the film AFTER it leaves the final roller and as it joins the reel.

LAY-ON OR CONTACT ROLLER EXAMPLE



If there is a lay-on or contact roller (C), the best position for the X-SERIES is on the side where the film leaves the lay-on roller - in this case theunderside (A) - because it can neutralise the charge as soon as it is created. If this is not practical, then position the bar on the top side. (B)

CENTRE WINDER EXAMPLE



On a centre winder the X-SERIES may be positioned above or below the reel. It is a good idea for the ionisation to be directed mainly at the reel, but also catching the single sheet, as shown at (A). Position (B) is also acceptable.

It is often not possible to place a bar in the optimum position (A). The reason for this may be that the ideal bar location would get in the way of the loading/unloading process for the reels or would be in a position where operators might stand on it.

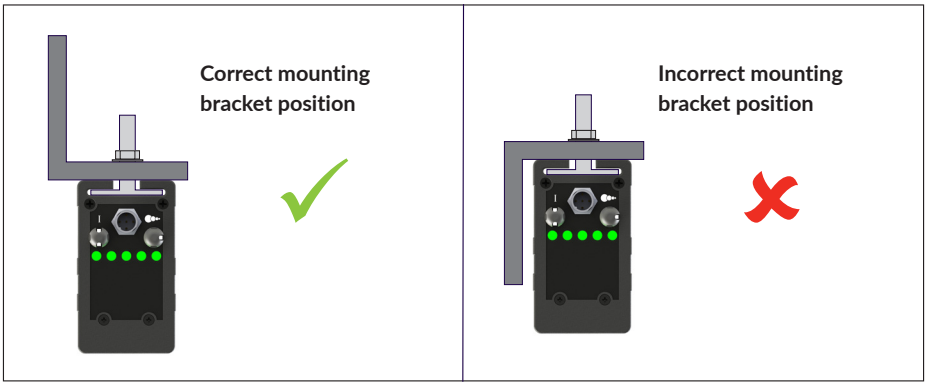
In a dirty or dusty environment, it is better to place the bar facing down, since the face of the bar will not be covered by the dust. This is not a problem. It is possible to position the bar at other positions, such as (B) and still achieve a very good result.

We always say that a film web must be in ‘free air’ and not touching a roller to achieve good neutralisation. This is because we know that the charge on the material will temporarily combine with the roller and not be available for removal by the eliminator. This remains true. However, once you have a number of layers on a reel or winder, all with the same polarity of charge on them, the charge can no longer combine and can therefore be neutralised layer by layer.

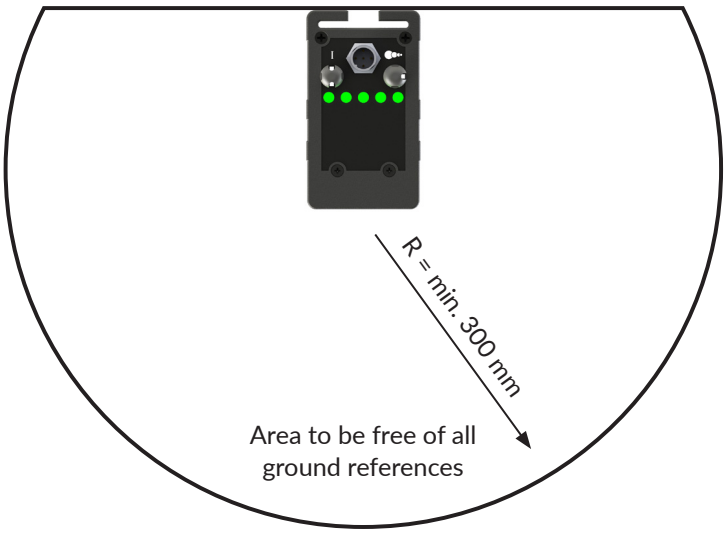
6.2 INSTALLATION OF THE BAR

Note: Long bars need careful handling during installation to avoid damage.
Bars longer than 2,000 mm must be handled by two people.

- Use all of the 'T' fixings provided for mounting the bar. These slide into the slot in the base of the bar. When mounting the bar, the 'T' fixings must be evenly distributed along the length of the bar. Do not allow more than 800 mm of unsupported bar between 'T' fixings.
- The bar must be dry and oil-free.
- Only mount the bar with the slot touching the machine or the mounting bracket.
- When mounting to the machine or on a bracket, make sure no metal extends beyond the slot in the bar. See the diagram below.



- It is important that the emitter pins are not touching, or close to metal objects, to avoid spark erosion that will damage both the bar and the metal object.
- The distance for the X-12F Eliminator from the material should be: 40 – 250 mm.
- The distance for the X-12L Eliminator from the material should be: 100 – 600 mm.
- The distance for the X-20 Eliminator from the material should be: 150 – 700 mm.
- The distance for the X-33 Eliminator from the material should be: 250 - 1,500+ mm



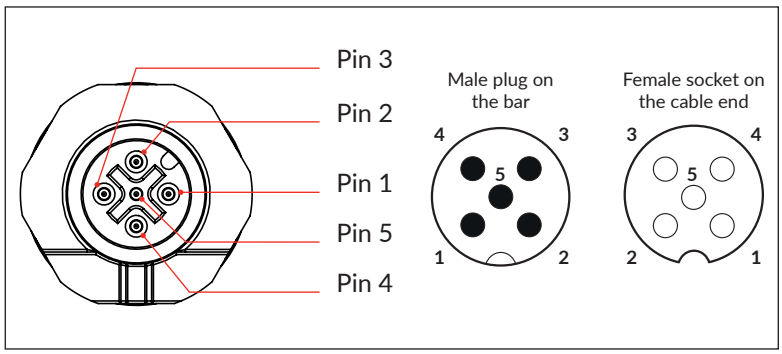
7. INSTALLATION: ELECTRICAL INSTALLATION AND MONITORING

This section describes the electrical installation of the X-SERIES Static Eliminator bars and the functioning of its remote monitoring

interface. Wiring examples are provided for common installation types.

7.1 M12 CONNECTOR ON THE BAR

The M12 connector pin numbering scheme for our X-SERIES suite of products are shown below.

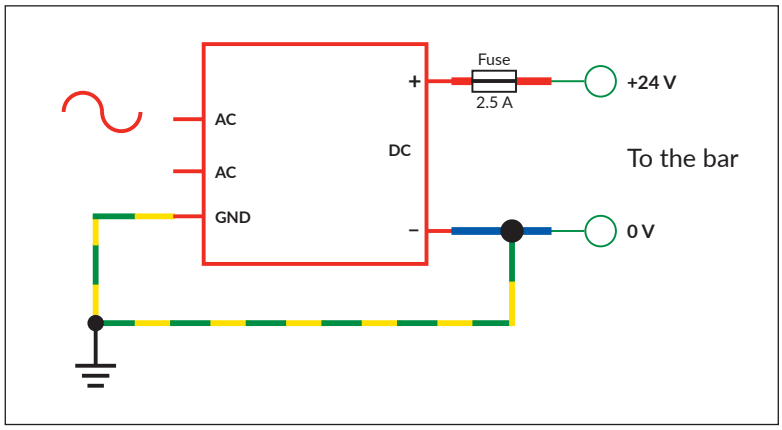


Pin	Colour	Function
1	Brown	24 V
2	White	Fault
3	Blue	0 V / Earth
4	Black	Clean Me
5	Grey or Green/Yellow	Disable

The table refers to cables supplied by Fraser. Third-party supplied cables can have different colour schemes.

7.2 POWER SUPPLY CONNECTIONS

The diagram below shows the power supply connection requirements.



The 24 V supply connection (Pin 1, brown wire) must be fitted with a 2.5 A fuse.
It is recommended that a type 'T' or 'gG' fuse is used.

The 0 V supply connection must be connected to the installation protective earth (PE). This connection should be made at the power supply output terminal if possible. There is no additional grounding connection to the bar – it is essential that this connection is made externally.

Warning!
If the 0 V output of the DC power supply is not grounded, there is a risk that the operator can receive an electric shock from the M12 connector on the bar.

Caution!
If the 0 V output of the DC power supply is not grounded, damage can occur to the power supply and/or the bar.

Caution!
If the 0 V output of the DC power supply is not grounded the residual voltage (balance) level of the bar cannot be guaranteed.

7.3 STATUS LED AND REMOTE MONITOR

The X-SERIES range of bars provides a signal showing its operational status in the following ways:

i. Status LEDs

The status of the bar, including the need for cleaning, is indicated by the 3 or 5 bi-colour LEDs on the endcap.

X-12 (F & L Versions)

X-20

X-33

X-12 & X-20 LED INDICATION DURING NORMAL OPERATION

LED Indication (X-12 & X-20 Only)	Bar Status	Ionisation
All off ○ ○ ○	The bar is not powered	Inactive
All flashing red ◑ ◑ ◑	Standby mode	Inactive
All solid red ● ● ●	There is a fault with the bar	Inactive
Alternate flashing red ◑ ○ ◑ then ○ ◑ ○	Entering Config Mode (Flash sides then middle)	Inactive
Alternate flashing red ○ ◑ ○ then ◑ ○ ◑	Exiting Config Mode (Flash middle then sides)	Inactive
Single Solid Green LED ● ○ ○	Manual Control - Short Distance Mode Selected	Active
Two Solid Green LED's ● ● ○	Manual Control - Mid-Range Distance Mode Selected	Active
Three Solid Green LED's ● ● ●	Manual Control - Long Distance Mode Selected	Active
All flashing green/red ◑ ◑ ◑	'Clean Me'. The bar needs attention.	Active
Scrolling right, green ● ● ●	Positive Intelligence. The speed is proportional to the level of intelligence.	Active
Scrolling left, green ● ● ●	Negative Intelligence. The speed is proportional to the level of intelligence.	Active

WHEN IN CONFIG MODE

Pressing  **Button**

LED Indication (X-12 & X-20 Only)	Bar Status	Ionisation
Single Green LED 	Short Distance Mode Selected	Inactive
Two Green LED's 	Mid-Range Distance Mode Selected	Inactive
Three Green LED's 	Long Distance Mode Selected	Inactive

Pressing INT **Button**

LED Indication (X-12 & X-20 Only)	Bar Status	Ionisation
Green Middle LED 	Intelligence Control On Selected	Inactive
Red Middle LED 	Intelligence Control Off Selected	Inactive

X-33 LED INDICATION DURING NORMAL OPERATION

LED Indication (X-33 Only)	Bar Status	Ionisation
All off ○ ○ ○ ○ ○	The bar is not powered	Inactive
All flashing red	Standby mode	Inactive
All solid red	There is a fault with the bar	Inactive
All flashing green/red	'Clean Me'. The bar needs attention.	Active
All flashing green	Frequency of the HV. Bar OK.	Active
Scrolling right, green	+ Intelligence. The speed is proportional to the level of intelligence.	Active
Scrolling left, green	- Intelligence. The speed is proportional to the level of intelligence.	Active

ii. Remote Monitor

The bar is equipped with a remote monitoring interface that allows the operating status of the bar to be fed into a PLC system or checked remotely.

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.

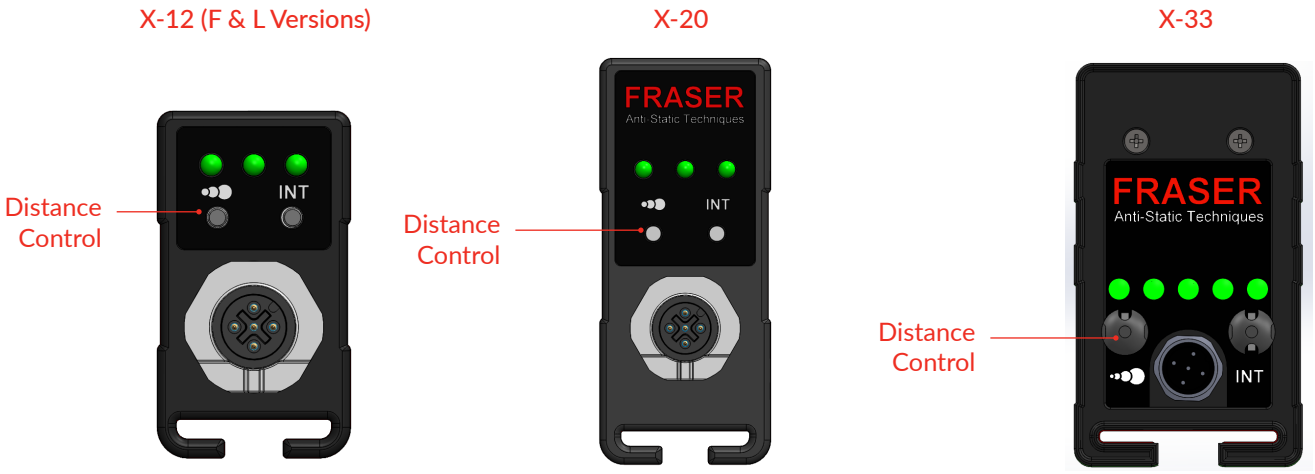
See Section 10 for wiring examples for the remote monitoring interface.

8. OPERATION, MAINTENANCE AND SAFETY

This section describes the adjustments available on the bar, commissioning the bar for use, maintenance procedures and a safety overview.

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

8.1 THE DISTANCE CONTROL



Distance Setting 

Use the Distance Control switch shown above to adjust the setting for the required distance to the target.

The Distance Control alters the frequency of the duty cycle:

- High frequency is best for short range
- Low frequency is best for long range

X-12 & X-20 DISTANCE SETTINGS

Enter config mode by pressing the distance setting button () for 3 seconds.

Once the LED's flash red, each subsequent press of the Distance setting button will cycle through the modes shown below.

X-12F DISTANCE MODE RECOMMENDATIONS

Control Position		Neutralisation Distance	X-12F Frequency
1	● ○ ○	40 mm - 100 mm	50 Hz
2	● ● ○	80 mm - 150 mm	20 Hz
3	● ● ●	125 mm - 250 mm	1 Hz

X-12L DISTANCE MODE RECOMMENDATIONS

Control Position		Neutralisation Distance	X-12L Frequency
1	● ○ ○	100 mm - 300 mm	5 Hz
2	● ● ○	150 mm - 400 mm	2 Hz
3	● ● ●	350 mm - 600 mm	1 Hz

X-20 DISTANCE MODE RECOMMENDATIONS

Control Position		Neutralisation Distance	X-20 Frequency
1	● ○ ○	150mm - 400 mm	5 Hz
2	● ● ○	300 mm - 500 mm	2 Hz
3	● ● ●	450 mm - 700 mm	1 Hz

If no buttons are pressed for 3 seconds, the bar will return to normal mode automatically.

Note:
High Voltage Operation is DISABLED for X-12 and X-20 whilst setting changes are being made.

X-33 DISTANCE MODE RECOMMENDATIONS

Control Position		Neutralisation Distance	X-33 Frequency
1	◔	250 mm - 500 mm	5 Hz
2	◑	350 mm - 750 mm	2.5 Hz
3	◕	500 mm - 1,000 mm	1 Hz
4	●	750 mm - 1,500 mm	0.5 Hz

Warning!
For X-33 Bars - Turn off the bar when changing the setting.

8.2 THE INTELLIGENCE CONTROL

X-12 (F & L Versions)

X-20

X-33

Intelligence Setting INT

Use the Intelligence Control button or switch to select Manual or Intelligent operation.

In Manual mode, the bar produces ionisation purely determined by the setting of the Distance Control rotary switch.

In Intelligent mode, the bar continuously assesses the state of the charge on the web and modifies the operating parameters of the bar to give optimal ionisation under all conditions. It adjusts the polarity, duty cycle and frequency of the ion emission to suit the application.

The Intelligence setting can **double the neutralisation power** of a X-SERIES bar in Manual mode. X-SERIES Intelligence monitors the charge in the target and adjusts the ion emission to achieve faster neutralisation. There are practical limits to the sensing capability of the X-SERIES Eliminator Bar - if the electric field is weak or at a long distance it will be more difficult to monitor.

X-12 & X-20 INTELLIGENCE SETTINGS

Enter config mode by pressing the intelligence setting button (INT) for 3 seconds.

Once the LED's flash red, each subsequent press of the Intelligence setting button will cycle through the modes shown below.

Control Position		Intelligence	Function
1	○ ● ○	OFF	The bar operates in Manual mode.
2	○ ● ○	ON	The bar operates in Intelligent mode.

If no buttons are pressed for 3 seconds, the bar will return to normal mode automatically.

Note:
High Voltage Operation is DISABLED for X-12 and X-20 whilst setting changes are being made.

X-33 INTELLIGENCE SETTINGS

Control Position		Intelligence	Function
0	◓	OFF	The bar operates in Manual mode.
1	◒	ON	The bar operates in Intelligent mode.

Warning!
For X-33 Bars - Turn off the bar when changing the setting.

8.3 SELECTING THE BEST SETTING

The factory settings for the X-SERIES are Intelligence ON and Distance Control position 2. This gives intelligent operation at medium distances.

This setting can be changed to meet the actual requirements of the installation. Typical reasons for this could be:

1. Distance
The X-SERIES intelligence loses sensitivity with distance, especially if the static charge level is not high. The Distance settings correspond to the distance to the object to be neutralised. See the distance chart for guidance.

2. Installation
If there are metal parts in the target area or close to the X-SERIES bar, these could interfere with the sensing - giving it misleading information. See Positioning in Section 3.

3. Intermittent Static Charge
For example, if the target is not continuously present there is no charge to sense. In this case it can be better to turn off Intelligence and just use a Distance setting.

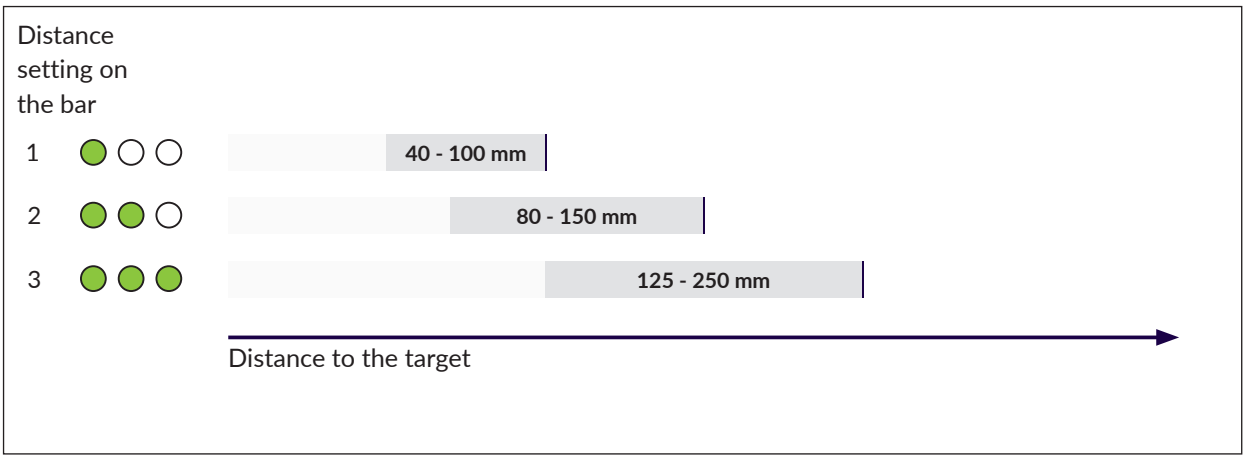
4. Speed of Process
Faster material speeds benefit from closer distances and higher frequencies.

A small amount of experimentation can be needed to produce the best performance for the application. Use the rotary switch controls on the endcap to change the settings.

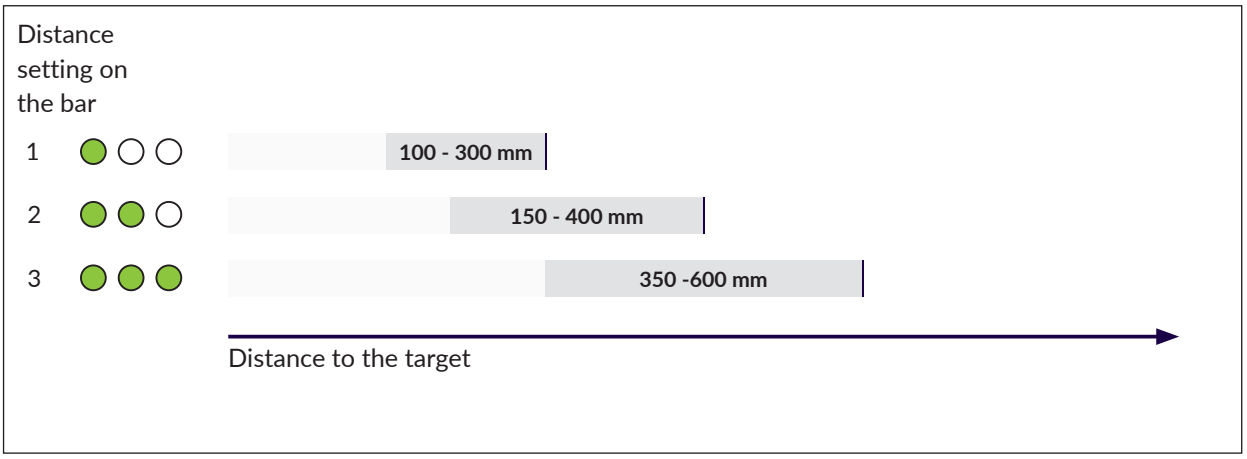
Warning!
For X-33 Bars - Turn off the bar when changing the setting.

See the chart below for the typical range of each Distance setting.

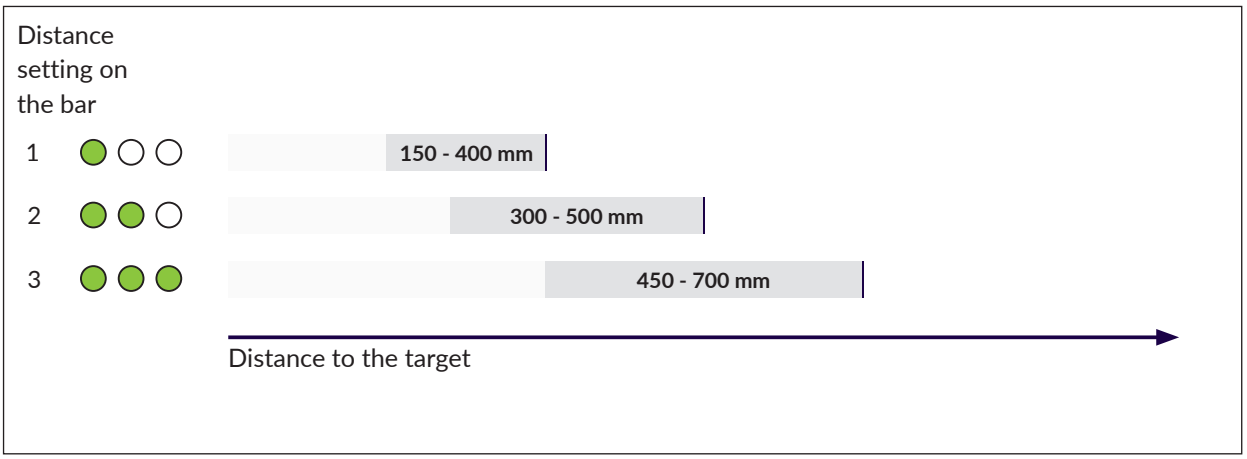
X-12F DISTANCE MODE RECOMMENDATIONS



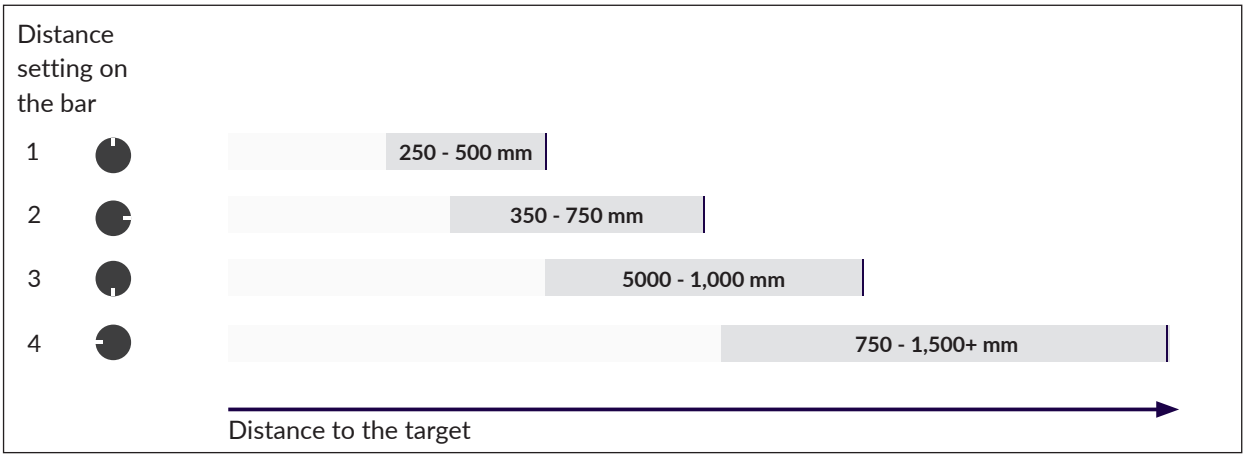
X-12L DISTANCE RECOMMENDATIONS



X-20 DISTANCE RECOMMENDATIONS



X-33 DISTANCE RECOMMENDATIONS



8.4 COMMISSIONING

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

- The positioning and mounting of the bar is in accordance with the instructions given 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. In particular, ensure that the 0 V output of the 24 V supply is connected to the installation protective earth.
- If using the external AC-DC power supply, make sure that the supplementary grounding wire is connected to the installation protective earth.
- Make sure the Distance and Intelligence controls are correctly set. See Section 8.
- 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.

8.5 MAINTENANCE

Warning!
Always disconnect the power before working on the bar.

- Cleaning is the only maintenance required. Dirt around the emitters will reduce ionisation effectiveness and result in unsatisfactory static neutralisation performance.
- The frequency of cleaning will depend on the process and the environment in which the bar is installed. The bar should be cleaned when 'Clean Me' is indicated by the endcap LEDs and/or the remote monitoring interface. Continued operation for extended periods when 'Clean Me' is active can ultimately result in the bar being stressed beyond its designed limits and could affect any warranty claims in the unlikely event of failure.

- Our Fraser cleaning kit (Part No. 81220) is ideal for use, alternatively a toothbrush or nail brush can be used. Do not use a wire brush as this could damage the bar.
- The bar can be washed with soapy water or IPA, but it must be dry around the emitters before turning the power on.
- Please note, when handling and cleaning, that the emitter pins are sharp and care is needed!

- The emitter pins are shockless - there is a large resistor below each emitter reducing the current to a shockless level. However please note that DC current can transfer charge to a body if it is touching or close to an emitter for a longer period. This could give a shock when discharging.

- Whilst the emitters on the X-12 are not-replaceable, the emitters on the X-20 and X-33 Eliminator bars should be replaced every two years or when worn. Please use the emitter key supplied with the bars to remove/replace easily.

Scan me!

Link to Fraser Cleaning Video

8.6 SAFETY

The X-SERIES bar has been designed in accordance with the safety requirements of EN 62368-1:2014. This IEC-derived standard is harmonised under the EU Low Voltage Directive and recognised by UL.

- The emitter pins are resistively coupled to the high voltage supplies. The emitters are a Class 1 electrical energy source, as defined in EN 62368 -1:2014. Contact with the emitters is not painful and will not result in electrically-caused injury, but may cause a detectable sensation due to the small current that will flow.

- 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.

- The emitter pins of the bar are necessarily sharp. The emitter pins are a Class 2 mechanical energy source, as defined in EN 62368 -1:2014. Contact with them may be painful, but will not cause an injury requiring emergency medical attention. Take care when handling the bar.

- Installation and maintenance work on the bar must only be carried out by suitably qualified personnel.
- 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.
- Do not connect or disconnect the M12 cable from the bar while it is powered.
- 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.
- Any changes to the equipment without written consent of the manufacturer will nullify the warranty and certifications.
- The bar is intended for use in indoor factory environments only. It is not suitable for outdoor use.

9. TROUBLESHOOTING

In the event of problems with the bar, please use the following checks.

Symptom	Cause(s)	Solution(s)
Green LEDs: solid, flashing or scrolling	The bar is operating correctly	• See Section 7.3 for further information
No lit LEDs ○ ○ ○ ○ ○	Bar not powered	• Check the power supply and connections • Check the fuse • Check the supply cable for damage
Flashing red LEDs ◑ ◑ ◑ = X-12 & X-20 ◑ ◑ ◑ ◑ ◑ = X-33	Standby mode. The DISABLE signal is active (18 - 28 V)	• Reduce the voltage at the DISABLE input to less than 12 V to restore the normal operation of the bar
Solid red LEDs ● ● ● = X-12 & X-20 ● ● ● ● ● = X-33	Power supply voltage outside of specified range	• Check and adjust the power supply voltage • Make sure that a correct power supply cable is used • Ensure the power supply is not overloaded
	HV supplies overloaded	• Check the installation of the bar • Move the bar further from earthed metal objects • Check the bar for damage
	Internal fault	• Contact your supplier
Alternate flashing red/green LEDs ◑ ◑ ◑ = X-12 & X-20 ◑ ◑ ◑ ◑ ◑ = X-33	Emitters need cleaning	• Turn off the power to the bar then clean the bar
	Bar is installed too close to machine parts	• Check the installation of the bar • Move the bar further from metal parts
Poor Ionisation/ Neutralisation Performance	Emitters need cleaning	• Turn off the power to the bar then clean the bar
	Emitters worn	• Check emitters for excessive wear • Replace the emitters (X-20 & X-33 only)
	Bar is installed too close to machine parts	• Review the installation • If possible, move the bar away from machine parts
	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
	Bar is installed opposite roller/ machine parts	• Review the installation • If possible, move the bar opposite material in free air

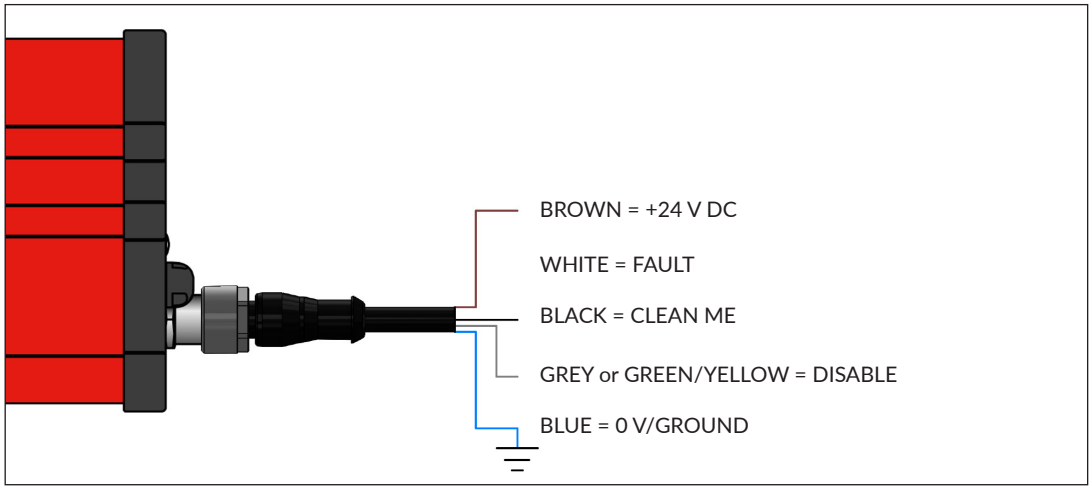
10. REMOTE INTERFACE AND WIRING EXAMPLES

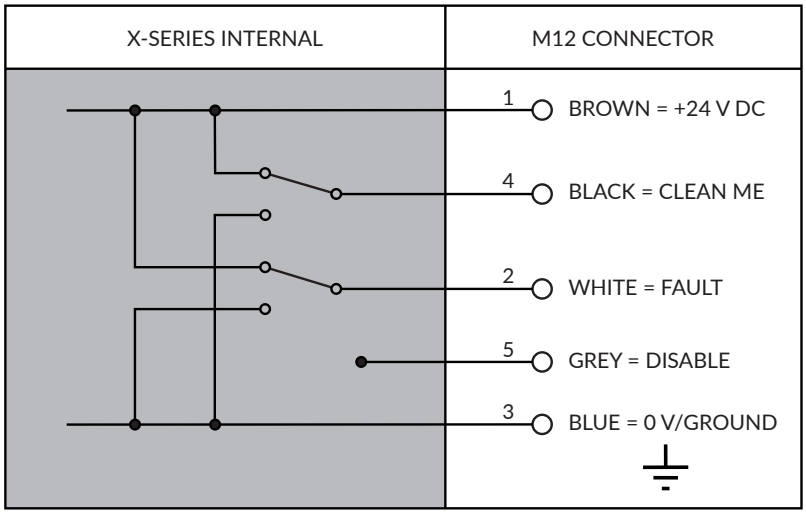
This section describes the functioning of the remote monitoring interface in more detail and provides wiring examples for common installation types.

10.1 SIGNALLING

The X-SERIES range of eliminator bars feature two PLC Type 1, 2 and 3 compatible outputs to enable remote monitoring of the bar status, and a DISABLE input to allow the HV supplies to be externally disabled when not required ('Standby' mode). For example, the bar can be linked into the safety interlock system of the machine to ensure operator safety during changeover periods.

See wiring diagram and examples below.





Remote Monitor outputs (Fault, Clean Me)

Both outputs are compatible with IEC 61131-2 Type 1, Type 2 and Type 3 PLC inputs, capable of sinking or sourcing 50 mA continuously. The outputs can also be used for direct driving of external lamps or relays.

See wiring diagrams and examples that follow.

10. REMOTE INTERFACE AND WIRING EXAMPLES

The remote monitor signals are valid 5 seconds after power is applied, according to the following conditions:

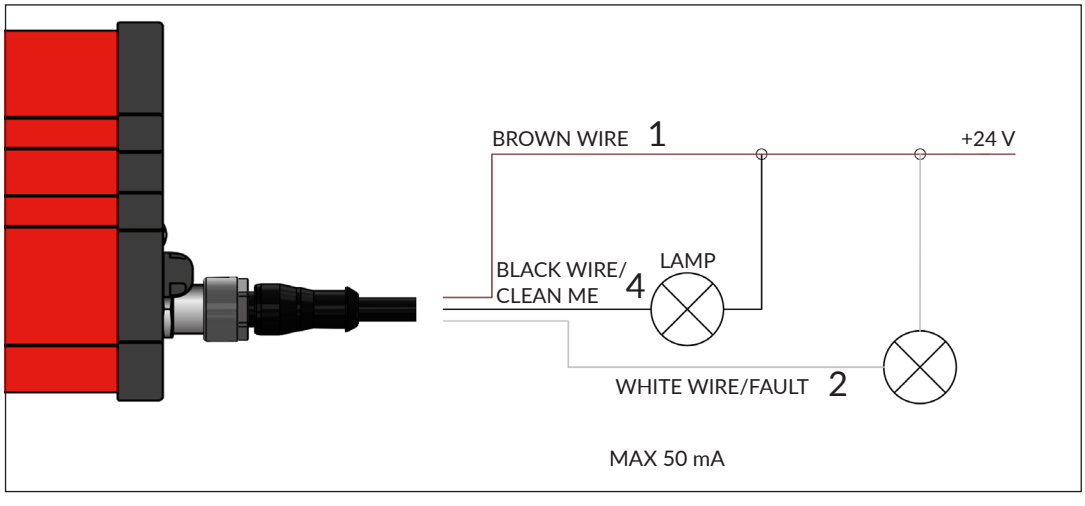
Condition	Ionisation	Fault (White, Pin 2)	Clean Me (Black, Pin 4)
Bar powered, all OK	Active (HV ON)	LOW	LOW
Bar powered, requires attention (e.g. cleaning)	Active (HV ON)	LOW	HIGH
Overload, hardware fault or standby mode.	INActive (HV OFF)	HIGH	HIGH
Standby mode	INActive (HV OFF)	LOW	LOW
		LOW <0.5 V, HIGH >20 V, when VIN = 24 V at 25 °C Maximum current sink/source = 50 mA. Internally protected by electronic fuses.	

A working bar in good operating condition will thus internally connect both outputs to 0 V, after a delay of up to 5 seconds after power is applied.

Caution!
Voltage applied to the outputs must not exceed 28 V DC and must be of the correct polarity.

10.2 EXAMPLE APPLICATIONS

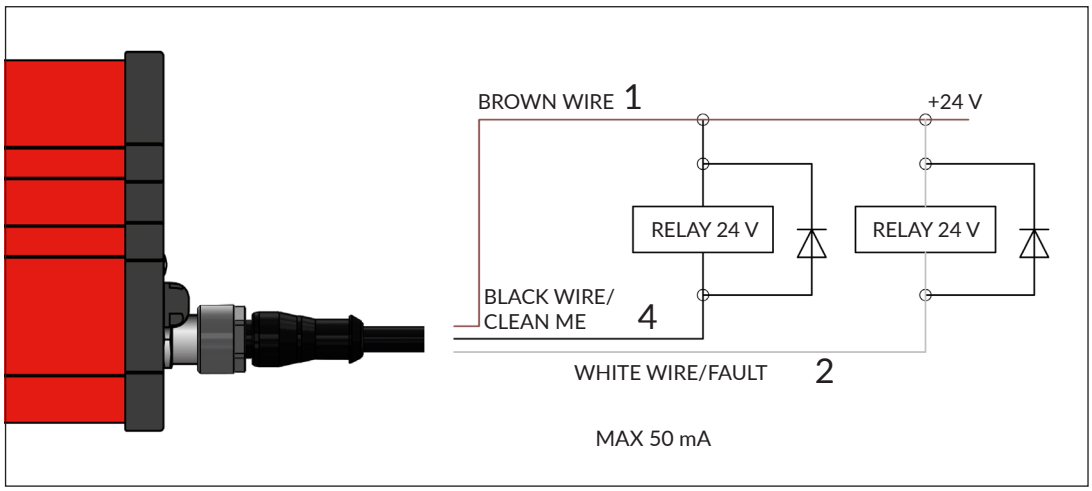
External lamp/indicator
External lamps or indicators can be connected to the FAULT or CLEAN ME outputs to remotely display the status of the bar. This is useful for bars mounted in inaccessible areas. Lamp rating 24 V DC, maximum 1.2 W. An LED can also be used with a suitable resistor. Maximum lamp current 50 mA.



10. REMOTE INTERFACE AND WIRING EXAMPLES

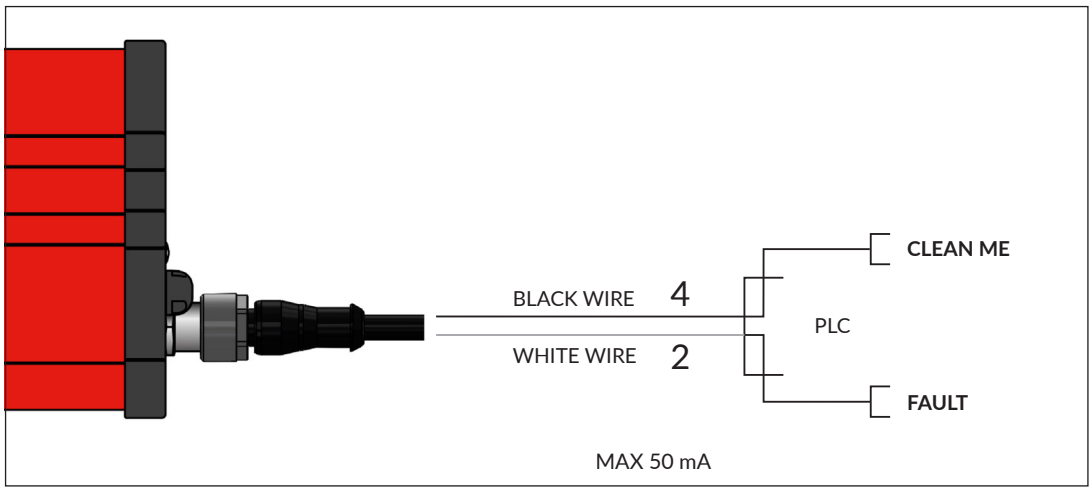
External relay

An external relay can be connected for additional control/feedback applications.
Coil rating 24 V, 1.2 W max.



External PLC Input Type 1, Type 2 or Type 3

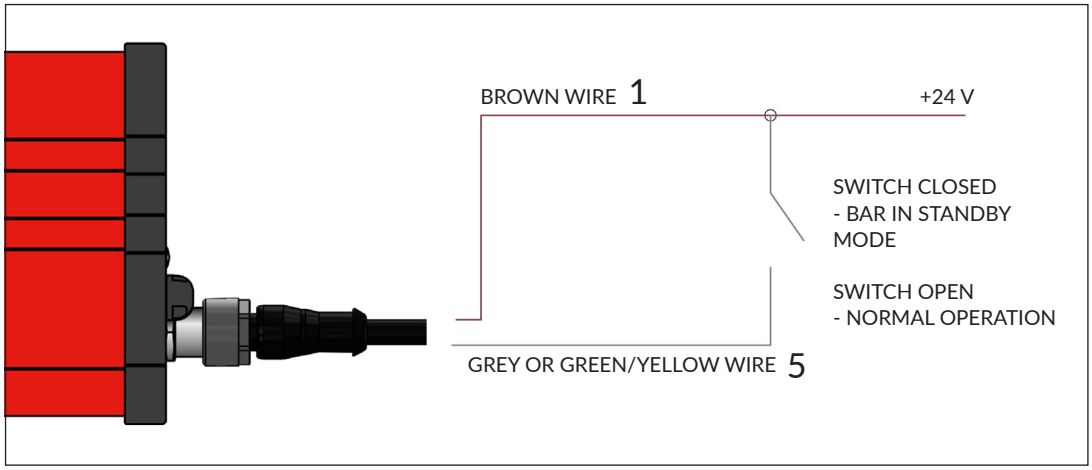
Interfacing to an external 24V IEC 61131-2 Type 1, Type 2 or Type 3 PLC digital input can be achieved by direct connection.



10.3 REMOTE DISABLE INPUT

The X-SERIES bar features a remote DISABLE input signal (Grey or Green/Yellow wire). This may be useful for installations in which the bar is not used continuously and it is desirable that the bar should be inactive when not required, or in installations in which the operation of the bar is to be interlocked with other machinery.

The HV supplies may be externally disabled (Standby mode) by applying any DC voltage between 18 V and 28 V to the DISABLE input, for example by using an external switch or relay contact between the DISABLE input and 24 V. Subsequently reducing the voltage at the DISABLE input to less than 12 V restores normal operation of the bar



In Standby mode the internal HV supplies of the bar are disabled, the status LEDs flash red, and the FAULT output is inactive (open circuit) to indicate that ionisation is disabled. The DISABLE signal has a weak internal pull-down resistor, thus if the DISABLE signal is left disconnected the bar will operate normally.

Caution!

Voltage applied to the DISABLE input must not exceed 28 V DC, and must be of the correct positive polarity. The bar may be permanently damaged by connecting the DISABLE input to any voltage outside the range of 0 V - 28 V DC.

Warning!

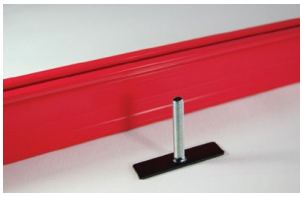
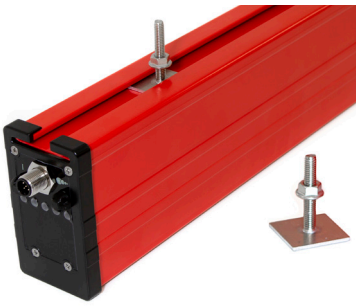
Where the optional NEOS-PSU has been ordered ensure the Power Unit is connected to a 3-wire AC mains supply, Live + Neutral + Ground, and that the extra Earth wire from the power supply is bonded to Ground. With this optional supply an interface cable is required to access the remote monitor feature.

11. 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 Picture	Description	Part No.
	3 m cable. M12 female, bare ends. Straight socket.	81193
	5 m cable. M12 female, bare ends. Straight socket.	81194
	7.5 m cable. M12 female, bare ends. Straight socket.	81195
	10 m cable. M12 female, bare ends. Straight socket.	81196
	3 m cable. M12 female, bare ends. 90° socket.	81199
	5 m cable. M12 female, bare ends. 90° socket.	81200
	7.5 m cable. M12 female, bare ends. 90° socket.	81201
	10 m cable. M12 female, bare ends. 90° socket.	81202

11. ACCESSORIES AND SPARE PARTS

Item Picture	Description	Part No.
	Universal AC-DC power supply: 100 - 250 V AC, 24 V DC output. Fitted with 1.5 m of cable.	NEOS-PSU
	X-12 & X-20 Mounting 'T' Bracket and flanged nut.	X-12 – 341210 X-20 - 34208
	X-33 'T' fixing (40 mm) including flanged nut	36321
	Replacement Emitter (X-20 & X-33 Units Only)	34201
	Replacement Emitter Key (X-20 & X-33 Units Only)	342018
	Fraser Ioniser Cleaning Kit: - 1000 ml of cleaning fluid - Soft bristle hand brush - Instructions for use	81220