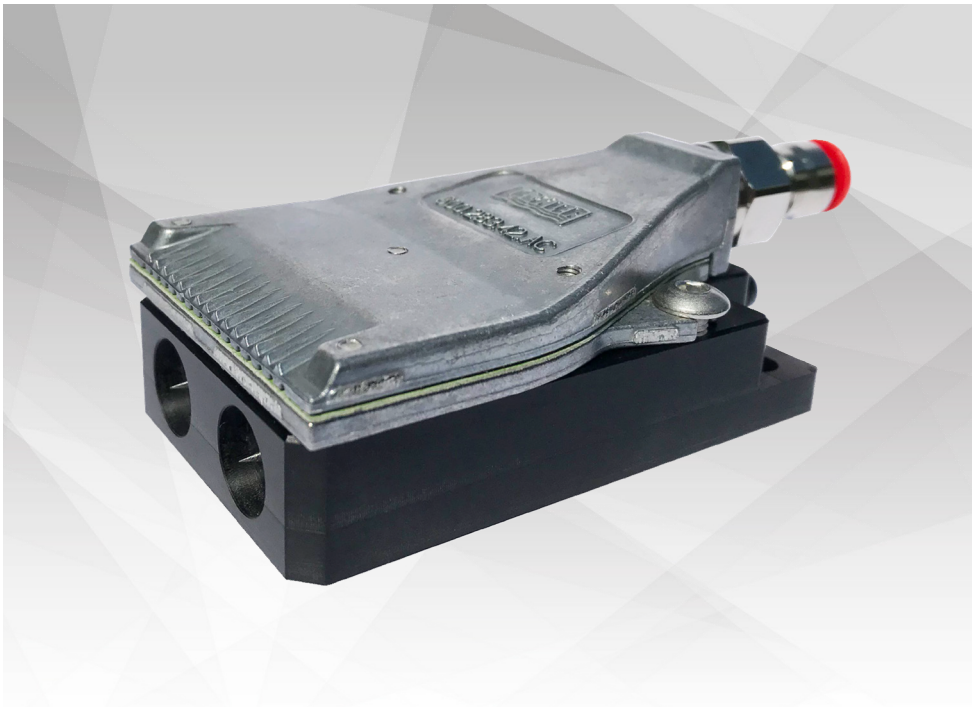
OPERATING INSTRUCTIONS



FL24VUC IONIZED AIR NOZZLE

WITH INTEGRATED REMOTE MONITOR

Static Clean static control equipment has been designed to give you many years of productive service. However, the science of static control has unique rules which must be followed to allow the equipment to give a good return on your investment.

Please read the following operating and maintenance instructions carefully.

Contents **Page**

1. Introduction

The Static Clean FL24VUC Ionized Air Nozzle ('the Ionizer') is part of a high-performance range of static eliminators from Static Clean. These products are used by leading manufacturers throughout the world to increase safety and productivity.

Before you install the Ionizer, please follow the installation instructions carefully for maximum benefit.

1.1. Features and Benefits

- The Static Clean FL24VUC Ionized Air Nozzle is designed to neutralize and clean electrostatically charged surfaces and small products.
- The use of Pulsed-DC high voltage provides excellent charge decay performance even at longer distances, and ion balance suitable for most industrial applications.
- The flat nozzle produces intense airflow, which transports the ionized air at high speed for optimal cleaning and blow-off capability.
- Powered by 24 V DC, it features integrated high voltage supplies meaning that no high voltage cabling is required.
- The status of the Ionizer, including need for cleaning, is indicated by a single LED. An 'ATTENTION' output signal and a 'STANDBY' input signal enable integration with control system/PLC.
- The 24 V DC power supply and remote signaling 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 achieved with mounting holes integrated into the product body.
- The Ionizer is intended for use in indoor factory environments only. It is not suitable for outdoor use.

1.2. Explanation of Symbols

Warning!

This symbol appearing in the operating instructions refers to operations which, if carried out improperly, may result in serious personal injuries.

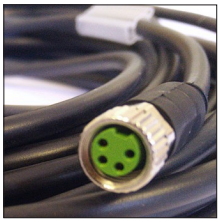
Caution!

This symbol appearing in the operating instructions refers to operations which, if carried out improperly, may result in damage to property.

2. Checking On Delivered Equipment

Before starting the installation, please check that the Ionizer has not been damaged in transit. If the packaging material is damaged, please report this immediately to the vendor.

Check that the additional items are present with the Ionizer:



Power Supply Cable

If ordered, a 24 V power supply cable with an M8 x 4-pin connector will be supplied.

See Section 13 for details of cables and other accessories.

AC-DC Power Supply Unit

If ordered, a 24 V DC output, 100 - 250 V AC input PSU (Part No. 4203-31101) will be supplied. The 0 V output is earth-grounded and a secondary safety earth-ground connection is provided.

IMPORTANT: DO NOT USE standard 'computer style' PSUs without earth-grounded outputs to avoid risk of operator shocks and damage to the PSU or Ionizer.

3. Safety

The Ionizer has been designed in accordance with the safety requirements of the EU Low Voltage Directive.

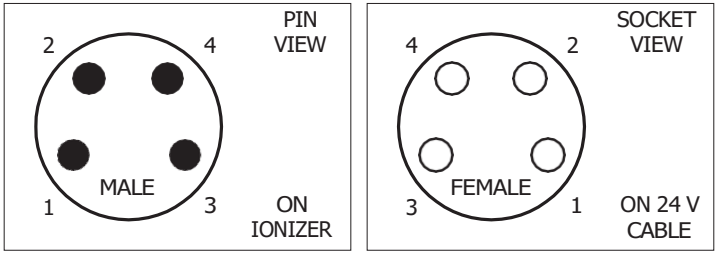
Warnings:

- The product should be cleaned regularly. The product **should not** be cleaned while powered.
- The emitter pins are a Class 1 electrical energy source. Direct contact with the emitter while the product is powered will not result in electrically-caused injury, but may cause a detectable sensation due to the small current that will flow.
- The emitter pins are necessarily sharp. The emitter pins are a Class 2 mechanical energy source. Contact with the emitters during cleaning may be painful but will not cause an injury requiring emergency medical attention.
- Installation and maintenance must only be carried out by suitably qualified personnel.
- The negative pole of the 24 V DC supply provided to the product must be permanently earth-grounded.
- Adequate installation earth-ground is required to ensure safe and proper operation.
- Do not connect or disconnect the M8 cable from the Ionizer while it is powered.
- A small amount of ozone will be produced as part of the ionization process. When correctly installed the level of concentration of ozone is less than 0.1 ppm and is within internationally accepted limits.
- Faulty air hoses and connectors can cause serious injury. Only install compressed air hoses when depressurized.
- Noise levels must be checked in final installation and operating air pressure.

4. Electrical Connections

4.1. M8 Pin Assignments

The M8 connector pin numbering scheme is shown below. Note that due to the 'STANDBY' input, this numbering scheme differs from other Static Clean products, such as the 4203 and 4103 bars.

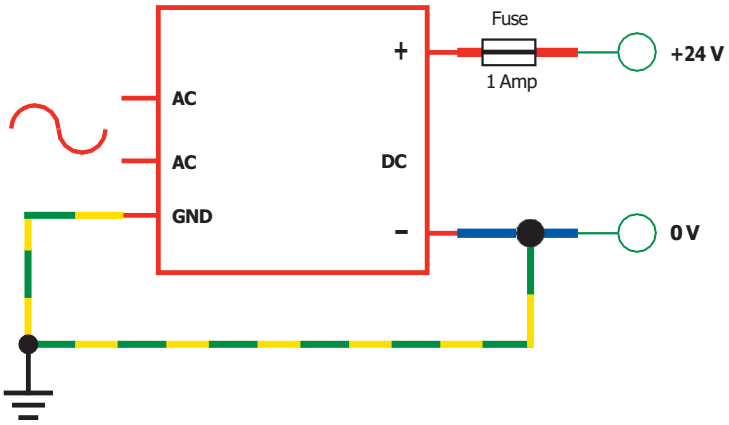


The pin assignment and typical wire colors are given in the table below. This refers to cables supplied by Static Clean. Other cables may have different color schemes.

Pin	Wire Color	Function	Details
1	Brown	+24 V	21 – 28 V operating range, 0.25 A maximum current.
2	White	'STANDBY' Input Signal	Applying a voltage of between +21 V and +28 V causes the product to enter 'STANDBY' mode, in which the high voltage output is disabled and the LED flashes red. Either leave disconnected or connect to 0 V if not required. 5 kΩ nominal input impedance.
3	Blue	0 V and GND	0 V **must** be connected to ~~earth~~ ground.
4	Black	'ATTENTION' Output Signal	+24 V nominal output voltage, 3 kΩ output impedance in active state. Low impedance connection to 0 V in inactive state.

4.2. Power Supply Connections

The diagram below shows the power supply connection requirements when using the 24 V DC power supply on the customer's machinery.



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

The 0 V supply connection should be earth-grounded. This connection should be made at the power supply output terminal if possible.

The earth-grounding terminal on the product **must** be connected to installation protective earth-ground (PE).

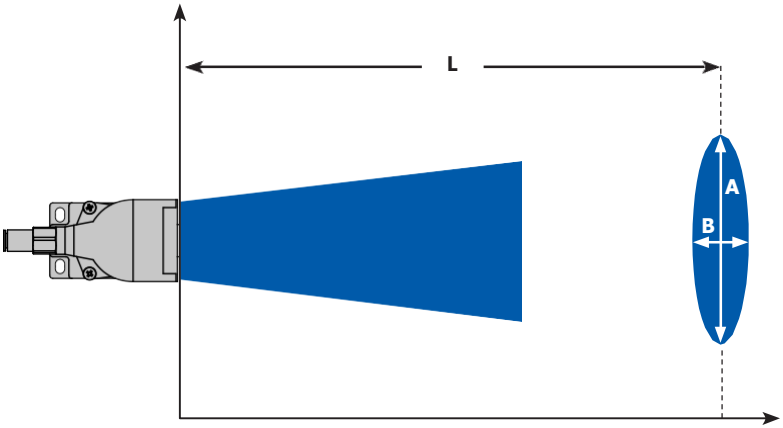
WARNING: If the product is not properly earth-grounded, there is a risk of the operator receiving an electric shock from the product.

CAUTION: If the product is not earth-grounded the residual ion balance of the product cannot be guaranteed.

5. Air Connections and Supply

- Connect a ¼" OD airline to the PTC (push to connect) air fitting at the rear of the air nozzle on the Ionizer. Do NOT use 6 mm airline, it is too loose and will not work. Only use oil-free, dry and filtered compressed air.
- Compressed air hoses should be kept as short as possible. Kinks and bends less than 3x hose diameter should be avoided. Unnecessary quick-lock couplings in the air hose should be avoided to minimise pressure loss.
- A pressure regulator is recommended to set the best pressure for the job to be done. The maximum pressure that the Ionizer can accept is 10 Bar (145 psi).
- Exceeding the maximum pressure of 10 Bar will damage the nozzle.

Jet Pattern of the FL24VUC Ionized Air Nozzle

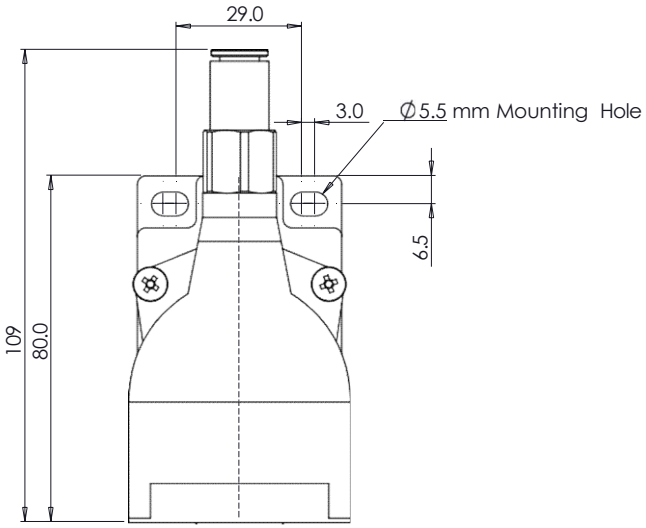


Pressure	1 Bar	3 Bar	5 Bar
Distance L (mm / inch)	750 / 29.5	900 / 35.4	900 / 35.4

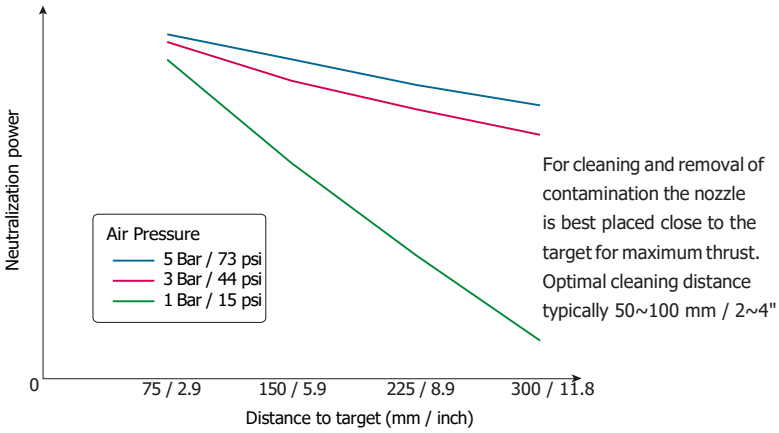
Jet dimensions at L

A (mm / inch)	170 / 6.7	210 / 8.3	240 / 9.4
B (mm / inch)	150 / 5.9	180 / 7.1	210 / 8.3

6. Mounting and Location



- Use M5 fastenings through the 5.5 mm diameter holes to mount the Ionizer.
- The emitters of the Ionizer should face the product to be neutralized, and the emitters should both be mounted a minimum of 25 mm / 1"(ideally at least 50 mm / 2") from an earth-grounded metal object.
- Sharp metal edges within 50 mm / 2"of the emitters should be avoided.
- Neutralization power is a function of distance to target and air pressure. See the graph below.



7. Monitoring: LED and Remote

The LED on the Ionizer indicates its status as follows:

LED Indication	Ionizer Status	Ionization
Green	OK	Active
Green/Red flashing	Cleaning/attention required	Active
Red	Overload, over temperature, hardware fault, supply voltage out of range	Inactive
Red Flashing	'STANDBY' mode	Inactive
Not illuminated	Ionizer not powered	Inactive

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

Please see Section 12 for wiring instructions and examples for the remote monitoring interface.

Please read these instructions carefully before installing the Ionizer, because the electrical specifications and signaling scheme of the remote monitoring interface differ from those of other Static Clean 24 V DC static eliminator products (4103 and 4203 series bars).

8. Commissioning and Operation

Before turning the Ionizer on for the first time, check:

- The positioning and mounting of the Ionizer. The emitters of the Ionizer should face the product to be neutralized, and the emitters should both be mounted a minimum of 25 mm / 1" (ideally at least 50 mm / 2") from an earth-grounded metal object. Sharp metal edges within 50 mm / 2" of the emitters should be avoided.
- All metal objects, structures and surfaces in proximity to the product are earth-grounded, such that the proximity of the high voltage emitters does not cause these objects to become electrically charged.
- The electrical installation of the Ionizer has been completed in accordance with the wiring instructions in this document. In particular, ensure that the 0 V supply return is connected to earth-ground.
- Noise levels have been checked in final installation and at operating air pressure.
- If using the external AC-DC power adapter, ensure that the supplementary grounding wire is connected to the installation protective earth-ground.
- Any operators who will work in close proximity to the Ionizer are aware of its presence and familiar with its operation.

9. Maintenance

WARNING: Always disconnect power before working on the Ionizer.
Only disconnect and connect compressed air hoses when depressurized.

Cleaning is the only maintenance required. Dirt around the emitters will reduce ionization effectiveness and result in unsatisfactory static neutralization performance.

The frequency of cleaning will depend on the process and the environment in which the Ionizer is installed. The Ionizer should be cleaned when an 'ATTENTION' state is indicated by the LED, or after approximately 1 month of continuous operation, whichever occurs first.

To ensure best performance, the Ionizer should be visually inspected on a regular basis and cleaned whenever convenient.

A cleaning kit is available from Static Clean, Part No. 81220. This is the ideal solution for regular Ionizer cleaning. Alternatively a toothbrush or soft nailbrush can be used. Do not use a wire brush as this may cause damage to the Ionizer.

Alternative cleaning materials are warm soapy water, or isopropyl alcohol (IPA). The Ionizer must be dry before the power is switched back on.

10. Troubleshooting

In the event of problems with the product, please use the following checks:

Symptom	Cause(s)	Solution(s)
No LED (not illuminated)	Product not powered.	• Check power supply and connections. • Check external fuse. • Check supply cable for damage.
Constant Red LED	Power supply voltage outside of specified range.	• Check and adjust power supply voltage. • Ensure appropriate power supply cable used. • Ensure power supply not overloaded.
	Internal fault.	• Contact supplier.
Flashing Red LED	Product in 'STANDBY' mode.	• Connect pin 2 of the M8 connector (usually white wire) to 0 V, or leave disconnected. Refer to installation instructions.
Flashing Red/ Green LED	Emitters need cleaning.	• Power off product, clean emitters.
Poor Ionization/ Neutralization Performance	Emitters need cleaning.	• Power off product, clean emitters.
	Emitters worn.	• Check emitters for excessive wear.
	Ionizer installed too far from material to be neutralized.	• Review installation, move Ionizer closer to material if possible. Refer to installation instructions.
	Emitters too close to earth-grounded metal surfaces.	• Review installation, move Ionizer further away from earth-grounded metal surfaces if possible. Refer to installation instructions.

11. Technical Specifications and Dimensions

Power Supply

Input Voltage:	24 V DC nominal, 21 - 28 V operating range 0 V earth-grounded
Input Current:	0.25 A max
Maximum Input Power:	7 W
Input Connector:	M8, 4-pole, male

Output

Ionization Method:	Pulsed DC
Output Voltage:	+/- 7 kV nominal
Output Frequency:	10 Hz as standard
Emitter Material:	Tungsten
Emitter Touch Current:	<100 µA

Monitoring

LED Status Indication:	Flashing Green: OK, Ionizer operating normally Flashing Red / Green: Ionizer requires cleaning Constant Red: Supply voltage out of range or internal fault Flashing Red: Ionizer in 'STANDBY' mode

Remote Monitor Output

Signalling Output:	'ATTENTION' output signal on pin 4 (black wire)
Output 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:	+24 V: Ionizer OK 0 V: Ionizer requires cleaning, Ionizer fault, Ionizer in 'STANDBY' mode

Remote Input

Signalling Input:	'STANDBY' input signal on pin 2 (white wire)
Input Signalling Levels:	0 V / 24 V nominal signal level (28 V max) <1 V or disconnected: Ionizer operates normally >21 V: Ionizer in 'STANDBY' mode
Input Signalling Delay:	<1 s
Input Impedance:	5 kΩ nominal input impedance

11. Technical Specifications and Dimensions

Protection

Internal Protection:	Under-/over-voltage indication, surge protection, reverse supply polarity protection
	HV supplies protected against internal overload and short-circuit
	Signalling output protected against short-circuit

Air Supply

Air Pressure:	Maximum 10 Bar / 145 psi
Air Fitting:	1/4" OD PTC (push to connect)
Air Consumption:	300 L/min @ 2 Bar / 10.6 cfm @ 29 psi
Blowing Force:	2.4 N @ 2 Bar / 29 psi

Environmental Conditions

Ambient Temperature:	0 – 55 °C / 32 – 131 °F
Relative Humidity:	Maximum 70 % rH, non-condensing
Ingress Protection:	IP67
Vibration:	Installation location must be vibration-free

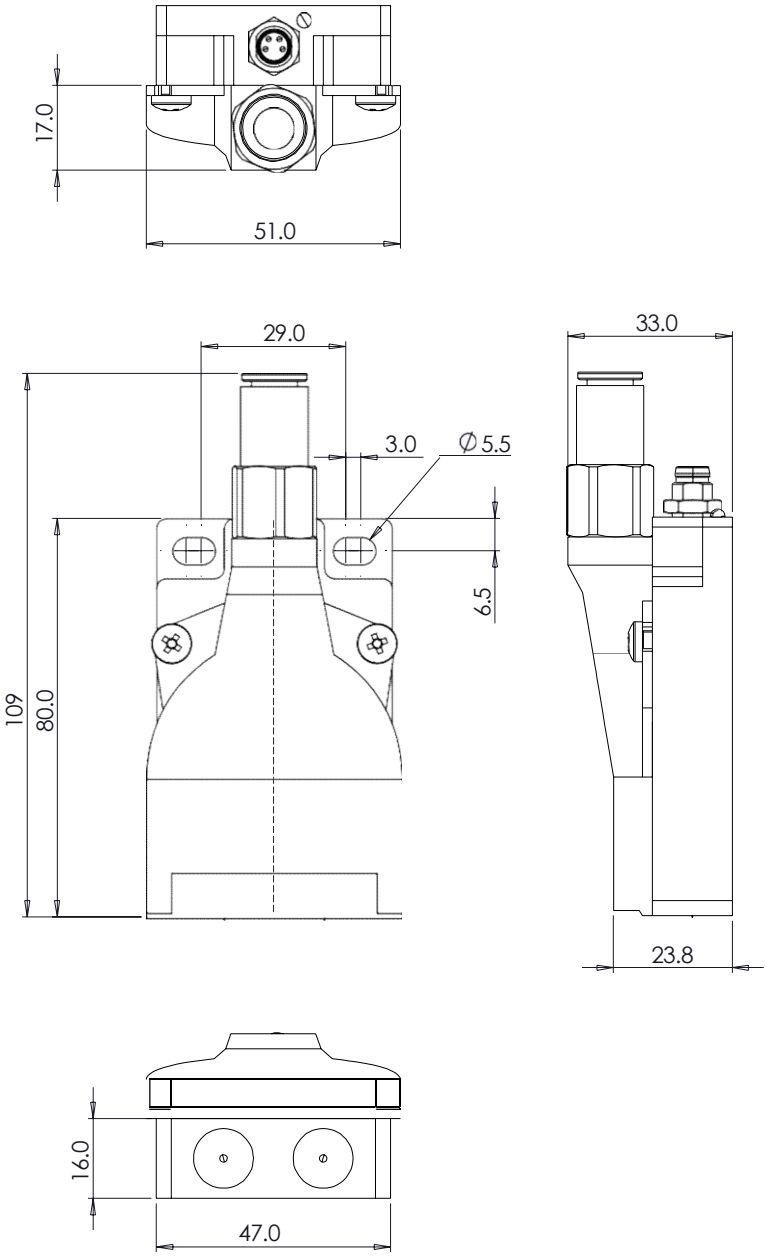
Mechanical

Dimensions (mm / inch):	80 x 51 x 33 / 3.2 x 2.0 x 1.3 (excluding connector)
Mass:	Static Eliminator 100 g, Nozzle 60g
Materials:	PVC body, epoxy resin encapsulant, tungsten emitter, aluminium nozzle

Regulatory

CE Marking	EU LVD (2014/35/EU)
	EU EMCD (2014/30/EU): EN 61000-6-3:2007, EN 61000-6-2:2005
Approvals	UL Certified (4203 Ultra-Compact incorporated within 4800 DC)

12. Remote Interface and Wiring Examples



12. 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.

12.1. Remote Output Signaling Scheme

The remote monitoring interface has one output signal, **'ATTENTION'**.
The signaling scheme is described in the following table:

Condition	Ionization	ATTENTION (Black, Pin 4)
Ionizer powered, all OK	ACTIVE (HV ON)	ACTIVE (24 V)
Ionizer powered, requires attention (e.g. cleaning)	ACTIVE (HV ON)	INACTIVE (0 V) **Will** sink current
Overload, hardware fault, supply voltage out of range	INACTIVE (HV OFF)	INACTIVE (0 V) **Will** sink current
Ionizer in STANDBY	INACTIVE (HV OFF)	INACTIVE (0 V) **Will** sink current
Ionizer not powered	INACTIVE (HV OFF)	INACTIVE (0 V) **Will not** sink current

IMPORTANT:
Because the output is implemented using an electronic switch rather than a relay, when the ionizer is not powered, the output will <u>not</u> sink current.

12. Remote Interface and Wiring Examples

12.2. Remote Output Electrical Specifications

The **'ATTENTION'** signal is designed to allow direct connection to PLC digital inputs conforming with IEC 61131-2 Type 3 characteristics. The detailed specification of the remote signaling output is given in the table below.

Characteristic	Specification	Notes
High-level output voltage, open-circuit	V_{IN} - 0.5 V	V_{IN} is nominally 24 V. High-level output voltage depends on power supply voltage.
Output impedance, high-level	3 kΩ	Internal pull-up to V_{IN}
Maximum output current, high-level, V_{IN} = 24 V (sourcing)	8 mA	Output shorted to 0 V
Low-level output voltage, open-circuit	0 V	Connected internally to 0 V by low-impedance switching device
Output impedance, low-level	<50 Ω	
Maximum output current, low-level (sinking)	20 mA	Protected by internal self-resetting fuse
Maximum externally applied voltage	28 V	Signal output is also protected against transient over-voltage

12.3. Remote Input Signalling Scheme

The remote interface has one input signal, **'STANDBY'**.
The signalling scheme is described in the following table:

STANDBY (White, Pin 2)	Ionization	LED
Low (<0.5 V)	ACTIVE (HV ON)	Flashing Green
	ACTIVE (HV ON)	Green / Red Flashing
	INACTIVE (HV OFF)	Constant Red
High (+21 V to +28 V)	INACTIVE (HV OFF)	Flashing Red

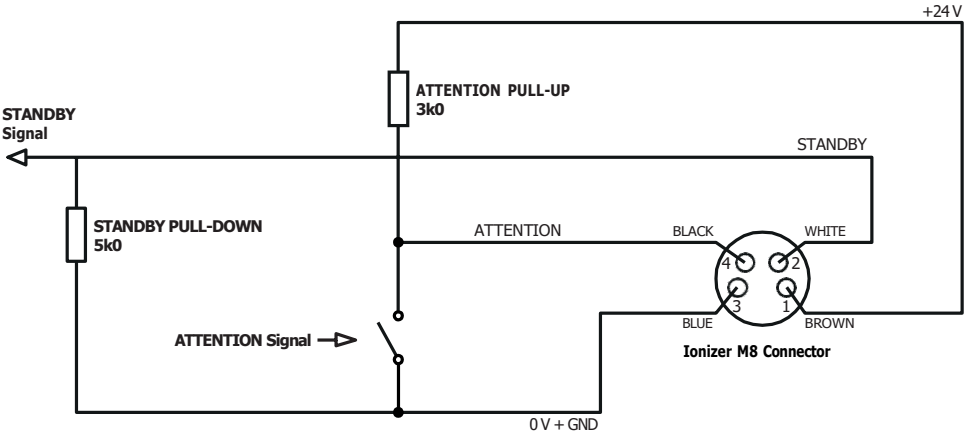
12.4. Remote Input Electrical Specifications

The **'STANDBY'** input signal is designed to allow direct connection to a PLC digital output, a switch or a relay contact. The detailed specification of the remote signalling input is given in the table below:

Characteristic	Specification	Notes
Nominal drive voltage	0 V / 24 V	Digital input with 24 V logic-level
High-level threshold voltage	8 V typical 20 V maximum	A high-level drive voltage of at least 21 V is recommended
Low-level threshold voltage	6 V typical 1 V maximum	A low-level drive voltage of less than 0.5 V is recommended
Input impedance	5 kΩ +/- 10 %	Internal pull-down to 0 V
Maximum input current, input connected to +28 V	6 mA	Limited by internal resistor
Maximum externally applied voltage	28 V	Input is protected against transient over-voltage. However, prolonged exposure to voltages higher than 28 V may permanently damage the product.
Minimum externally applied voltage	-1 V	Drive voltages below 0 V are not recommended. Prolonged exposure to voltages lower than -1 V may permanently damage the product.

12.5. Remote Interface Schematic

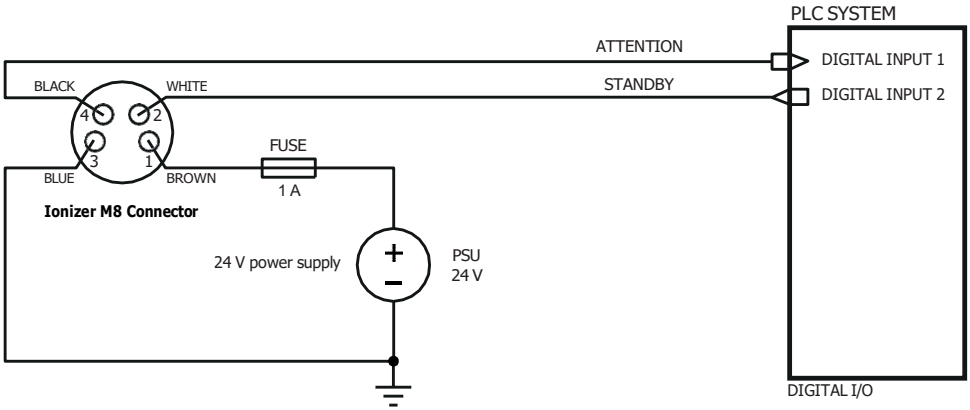
The simplified schematic diagram below shows the implementation of the remote signalling input and output on the Ionizer. This is a simplified model of the electronic interface within the Ionizer.



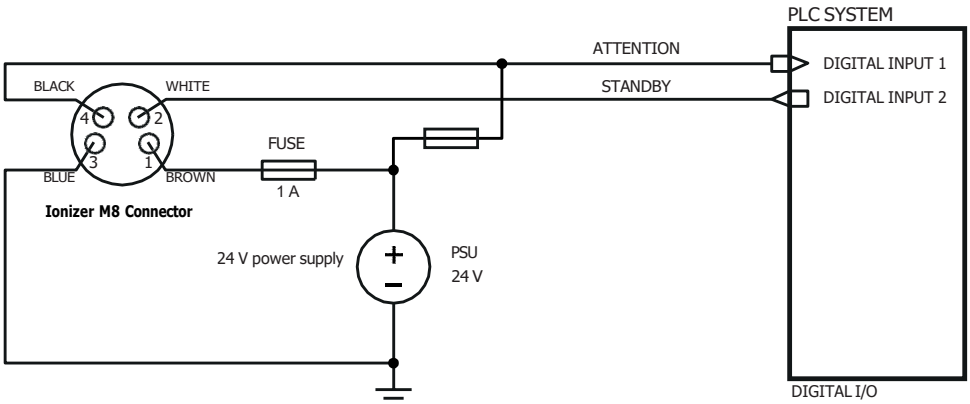
The switch in the diagram above is shown in the position corresponding to 'Ionizer powered, all OK'.

12.6. Interfacing with PLC Systems

To interface the Ionizer with a PLC digital input conforming with IEC 61131-2 Type 3 characteristics, simply connect the 'ATTENTION' output from the Ionizer to the PLC digital input module as shown below. The 'STANDBY' line may be driven directly from a 24 V digital output.



To interface the Ionizer with a PLC system having IEC 61131-2 Type 1 or Type 2 input characteristics, fit an external 1 kΩ pull-up resistor to supply the current required by these input types, as shown below. The resistor should have a power rating of at least 1 W.



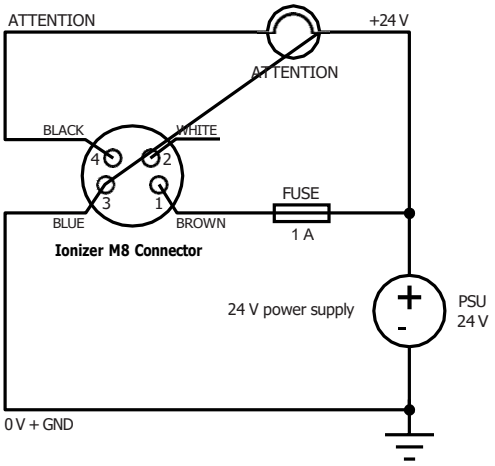
12.7. Powering the Ionizer directly from a PLC digital output

A typical 24 V, 0.5 A, PLC output is capable of supplying the average current required by the Ionizer, and can be used to power the Ionizer directly.

It is possible that over-current trips may be experienced on PLC outputs due to the pulsing of the HV supplies in the Ionizer. This will depend on the characteristics of the PLC output module. In this case, use the PLC output to control a relay which switches the main 24 V supply to the Ionizer.

12.8. Connecting an external indicator to the ATTENTION output

Typical 24 V LED-based industrial indicators with rated current of 20 mA or less can be driven by the remote signalling output. The recommended wiring scheme for an external indicator is shown below. The indicator will illuminate when the Ionizer signals an 'ATTENTION' state.



IMPORTANT: Connecting indicators with higher current requirements to the Ionizer will not damage it, but it is unlikely that satisfactory brightness will be obtained.

12.9. Connecting an external relay to the ATTENTION output

To provide potential-free contacts or switch a higher voltage or current level, a relay can be installed between the Ionizer and external control circuit.

External relays must be connected with the Ionizer output **sinking** current to energise the relay coil.

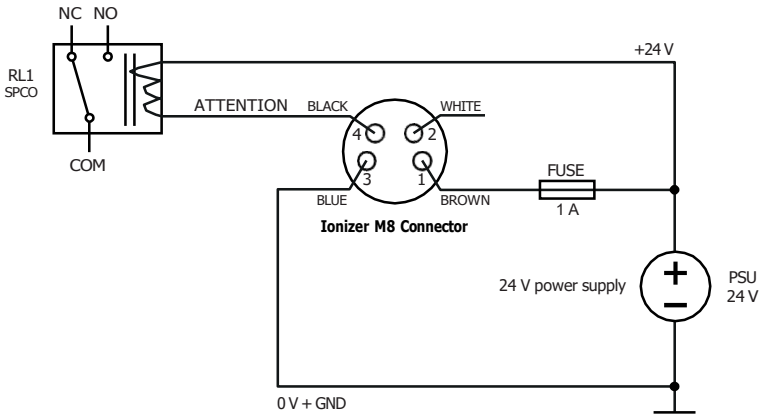
PLC interfacing relays with high-sensitivity 24 V DC coils should be used to interface with the Ionizer. Some examples are:

- Phoenix Contact PLC-RSC series
- Finder 38 series
- Wieland FLARE-24DC series
- Omron G2RV series

IMPORTANT: Relay coil drive current at 24 V should not exceed 20 mA.

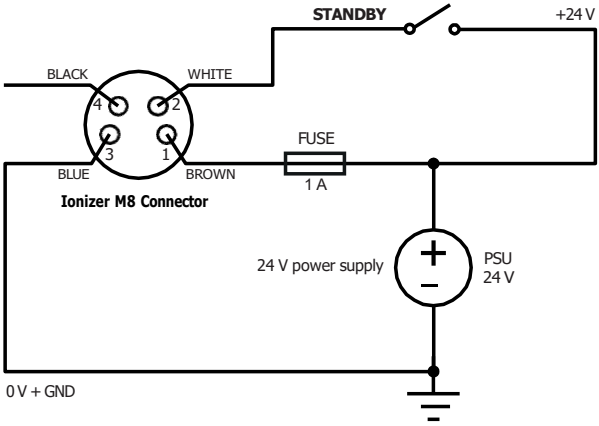
IMPORTANT: The external relay should be fitted with a coil suppressor.

The recommended wiring scheme for an external relay (using an SPCO relay) is shown below.



12.10. Controlling the STANDBY line from a switch or relay contact

The recommended wiring scheme for controlling the Ionizer from an external switch or relay contact is shown below. When the switch or relay contact is closed, the Ionizer is in 'STANDBY' mode. When the switch is open, the Ionizer is active.



13. Accessories

A range of accessories to assist with installation and maintenance of the Ionizer is available from Static Clean. Please contact your local distributor to enquire regarding pricing and delivery of these items.

Item Picture	Description	Part No.
	**3 m** cable M8 female, Bare ends. **Straight socket.**	4203-80892
	**5 m** cable M8 female, Bare ends. **Straight socket.**	4203-80930
	**7.5 m** cable M8 female, Bare ends. **Straight socket.**	4203-80931
	**10 m** cable M8 female, Bare ends. **Straight socket.**	4203-80932
	**3 m** cable M8 female, Bare ends. **90º socket.**	4203-80933
	**5 m** cable M8 female, Bare ends. **90º socket.**	4203-80934

13. Accessories

Item Picture	Description	Part No.
	**7.5 m** cable M8 female, Bare ends. **90º socket.**	4203-80935
	**10 m** cable M8 female, Bare ends. **90º socket.**	4203-80936
	Universal AC-DC power supply: 100 - 250 V AC, 24 V DC output Fitted with 1.5 m of cable.	4203-31101
	M8 male to M8 female 4-pin extension cable for AC-DC power supply unit. (Available in 2 m lengths)	4203-80937

For more information about static and to view the full range of our products, please visit **www.staticclean.com**

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