

Laser-Lock

Class 4 Laser Product Interlock Combiner

Version 1.1 rev 16 January 2024



User Guide

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Revision History

Version	Released	Description
1.0	25 February 2022	Initial release.
1.1	16 January 2024	Updated laser-lock mechanical drawings and product images. Updated connection diagram and interlock LED instructions. Updated Japan office contact information.

Updates to the Manual

Changes are periodically made to the product and these will be incorporated into new editions of the manual. Please check for new releases of the manual at: andor.oxinst.com/downloads. If you find an issue in this manual please contact your customer support representative (Section 1.1) with a description of the issue.








PLEASE READ THIS INFORMATION FIRST

CAUTION – USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

1. If the equipment is used in a manner not specified by Andor, the protection provided by the equipment may be impaired.
2. Do not position this product so that it is difficult to operate the mains disconnecting device. See “4.1 Emergency Mains Disconnection” on page 17.
3. Before using the system, please follow and adhere to all warnings, and safety, manual handling, and operating instructions located either on the product, or in this manual.
4. If used in combination with a HLE, ILE, Dragonfly, or other laser product, also refer to the respective hardware guide(s)
5. Keep this manual in a safe place for future reference.
6. Users must be authorised and trained personnel only; otherwise, this may result in personal injury, and/or equipment damage and impaired system performance.
7. There are no user-serviceable parts inside the product and the enclosure must not be opened. Only authorised service personnel may service this equipment.
8. IEC Technical Document IEC TR 60825-14 recommends the presence of a Laser Safety Officer (LSO); however, national guidelines should be referred to.
9. Do not attempt to bypass any safety interlocks. They are provided to comply with the safety requirements of various regulatory agencies and must be employed to protect the operator.
10. Protective earth is an integral part of the protection against electric shock in this product and is provided via the earth pin of the external power supply. Ensure that this is plugged into the building earth system via the mains socket. Do not tamper with any of the earthing measures.
11. Any AC/DC Power Supply used with this product must meet the requirements specified in “Electrical Power Specifications” on page 21.
12. No parts should be replaced by the customer, except for the mains cables, which must be of the same type and rating as that supplied (and as specified in “Electrical Power Specifications” on page 21) and certified in accordance with your region's safety regulations.
13. Make sure all cables are located so that they will not be subject to damage, especially the mains cable..
14. While running an experiment, keep room temperature as stable as possible.
15. Performance of the system may be adversely affected by rapidly changing environmental conditions or operation outside of the operating conditions specified in “Appendix A: Technical Specifications” on page 20.
16. Ensure that adequate ventilation is provided as specified in “Appendix A: Technical Specifications” on page 20
17. This product is designed to be used in an indoor environment. If the customer chooses to use this outside, then it is their responsibility to provide adequate protection. Andor assumes no liability for damage or obligation to repair under warranty relating to use outside of the environmental requirements specified in “Appendix A: Technical Specifications”.
18. Medical Diagnosis: This equipment has not been designed and manufactured for the medical diagnosis of patients.

19. Electromagnetic Compatibility (EMC) – Caution: This product was designed for and tested using the IEC/EN 61326-1 EMC standard for Class A emissions and a Basic immunity environment. Class A means that it is not designed for a domestic or residential environment, and Basic immunity refers to the fact that it is not designed for a typical industrial environment. This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
20. Electromagnetic Compatibility: As required by IEC/EN 61326-1, we must inform you that electromagnetic emissions in excess of that required by that EMC standard for the emissions class of this product can in theory occur due to its connection to other equipment.
21. Electromagnetic Compatibility: This product has been designed and tested to perform successfully in a normal (basic) electromagnetic environment, e.g. a typical life science test laboratory, as per the EU EMC Directive. It is not designed to operate in a harsh electromagnetic environment, e.g. close to the following equipment: EMI/RFI generators, electrostatic field generators, electromagnetic or radioactive devices, plasma sources, arc welders, x-ray instruments, intense pulsed sources, or other similar sources of high energy fields whose emissions are not within the normal range expected under the EU EMC Directive.
22. Ionising Radiation: Please note that this product is not designed to provide protection from ionising radiation. Any customer using this product in such an application should provide their own protection.
23. This product is a precision scientific instrument containing fragile components. Always handle it with care.
24. Do not wet or spill liquids on the product, and do not store or place liquids on the product.
25. If spillage occurs on the product, switch off power immediately, and wipe off with a dry, lint-free cloth.
26. If any ingress of liquids has occurred or is suspected, unplug the mains cables and do not use. Contact customer support.
27. See "5.1 Cleaning and Decontamination" on page 18.
28. Do not expose the product to open flames.
29. Do not allow objects to fall on the product.

Label Symbols

	Laser Radiation Hazard
	EU CE Mark by which we indicate that this product meets the requirements all the relevant EU Product Directives that require this mark, including the Low Voltage Directive for safety (as this product is manufactured in Northern Ireland, it does not require the UKCA Mark)
	EU WEEE (Waste Electrical and Electronic Equipment) Mark which indicates that this should not be disposed of in domestic waste but at a suitable recycling site
	China EPUP (Environmental Protection Use Period) Mark that indicates that this product is expected to last for 20 years approximately before ending-up in the waste and recycling system
	D.C. Voltage Symbol

Section 1: Introduction

The Laser-Lock is an important component of your laser microscopy system; designed to prevent accidental exposure to laser radiation, it serves as the main interface between interlock devices. When used as part of a laser product, the Laser-Lock unit provides compliance with IEC 60825-1 and CDRH regulations requiring manual reset functionality for Class 4 laser systems.

The Laser-Lock is not a replacement for, nor a reason to disregard standard laser safety principles.

This manual contains useful information and advice to ensure that you know how the system works, and how to use it effectively. The manual should be read in conjunction with those provided for other relevant parts of your laser microscopy system. Some of the interlock components described in this manual may not be present in the system you have purchased.

If you have any questions regarding your Laser-Lock unit, please feel free to contact Andor directly, or via your local representative or supplier.

1.1 Technical Support

If you have any questions regarding the use of this equipment, please contact the representative* from whom your system was purchased, or:

Europe

Andor Technology Ltd.
7 Millennium Way
Springvale Business Park
Belfast
BT12 7AL
Northern Ireland
Tel. +44 (0) 28 9023 7126
Fax. +44 (0) 28 9031 0792

USA

Andor Technology
300 Baker Avenue
Suite # 150
Concord
MA 01742
USA
Tel. +1 (860) 290-9211
Fax. +1 (860) 290-9566

Asia-Pacific

Andor Technology (Japan)
5 Sumitomo Fudosan Osaki Twin Building East
5-1-18 Kita-Shinagawa,
Shinagawa-ku,
Tokyo 141-0001
Japan
Tel: +81(0)4510 3528
Fax: +81(0)4510 3518

China

Andor Technology (China)
Haitong Times Business Center,
Building B2 West,
No.11 West Third Ring North Road,
Haidian District,
Beijing,
100089
China
Tel: +86 (0) 10 5884 7900
Fax. +86 (0) 10 5884 7901

* The latest contact details for your local representative can be found on the [Contact and Support](#) page of our website.

1.2 Disclaimer

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PLEASE NOTE, AI TRANSLATIONS OF THIS USER MANUAL MAY RESULT IN INCORRECT INFORMATION. IN THE EVENT OF A CONFLICT WITH A FOREIGN LANGUAGE TRANSLATION, ANDOR'S ENGLISH TRANSLATION WILL PREVAIL.

1.3 Copyright and Protective Notices

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The publication of information in this documentation does not imply freedom from any patent or proprietary right of Andor Technology or any third party.

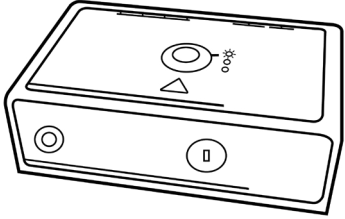
1.4 Trademarks and Patent Information




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Manufacturers Information
Andor Technology Ltd., Belfast, BT12 7AL, UK.

1.5 Supplied Components

The Laser-Lock box is provided as part of an installed system, connection cables and interlock fittings appropriate for your order will be provided and installed by our installation engineers.

	Description	Quantity
	Laser-Lock box	1

	External AC/DC power supply with region-specific mains plugs	1		User guide (in electronic format)	1
	USB cable	1			

Section 2: Product Overview

2.1 Interlock Safety System

The Interlock System comprises of a set of switches which are used to detect the state and configuration of the Microscopy System including the Microscope Eyepiece prism, the transmitted light arm on inverted microscopes and the presence of a stage cover if one is installed. Interlocks may also be fitted on laser products, such as on the optical head of the Mosaic 3 unit.

An additional connector section is available for the connection of a Remote Interlock, e.g. the door of a restricted access laboratory.

This is designed to prevent the user from being accidentally exposed to potentially hazardous laser radiation emitted by the laser product into the microscopy system.

2.2 Laser-Lock Functions

The Laser-Lock enables the interlock switches on a laser microscopy system to control multiple laser source interlock inputs at the same time, and also provides the following functions for the combined system, as required by IEC 60825-1 and CDRH regulations:

- Secure access key switch for Class 3B/4 laser system for laser products that don't already have them
- Remote interlock connector for Class 3B/4 laser system
- Manual reset for Class 4 laser system

If a switch detects that the microscopy system is in a position such that the user may be exposed to a high laser radiation level (e.g. if the eyepiece prism is not at the camera position), the laser products will be disengaged until the switches detect that the system is in a proper position once more.

If a remote interlock switch, connected into the remote interlock connector, detects a condition such as a lab door being opened, the laser products will disengage until the condition is rectified and the interlock system has been reset to permit laser radiation.

CAUTION - THE LASER-LOCK CONTAINS NO USER SERVICEABLE PARTS AND NO DISASSEMBLY OF THE SYSTEM OR THE ENCLOSURE SHOULD BE ATTEMPTED BY THE USER. DISASSEMBLY IS ONLY TO BE PERFORMED BY TRAINED AND CERTIFIED ANDOR SERVICE PERSONNEL.

Use of the Laser-Lock is not a replacement for, nor a reason to disregard, standard laser safety principles.

2.2.1 Laser-Lock Fascia Interface



Figure 1: Front of the Laser-Lock Box, has the power LED and the key switch.

2.2.2 Laser-Lock Rear Panel Interface



Figure 2: Image of connection plate of Laser-Lock Box, from left to right, USB power connector, remote interlock, microscope interlock, 4x product interlock connectors.

2.2.3 Laser-Lock Top Panel Interface



Figure 3: Laser lock box top panel view with solid blue LED indicating Ready (LED on).

2.3 Function of Controls and Indicators

2.3.1 Key Switch

The system can only be powered on with the use of the Key Switch. The mechanism of the Key Switch is such that the key cannot be removed from the switch when it is in the ON position. The Key Switch is used to restrict access to authorised/trained users only. This feature is present to provide one key for multiple products and/or to make up for the deficiency of some laser products that do not conform to the requirements of IEC 60285-1 and the CDRH Regulations for Class 3B and Class 4 products to have a key control.

2.3.2 Power LED

The Power LED gives an indication of a successful power ON condition and illuminates (green) when power is supplied to the unit and the Key Switch is in the ON position.

2.3.3 Interlock Status LED

The Interlock Status LED illuminates (blue) when all interlocks are closed. The LED will be off if the Microscope Interlock is opened, and flashes if the Remote Interlock is opened.

2.3.4 Interlock Reset Button

If the remote interlock is opened, the system must be reset before laser emission will be restarted. This is achieved by pressing the reset button on the top of the device. Both IEC 60285-1 and the CDRH Regulations require this Manual Reset after a Remote Interlock is opened.

Section 3: Installation

This product is supplied as part of a system, and must be installed by an Andor Installation Technician or a trained Andor Systems distributor. The following is only provided to augment this.

3.1 Laser-Lock Installation

3.1.1 Location and Mounting

The Laser-Lock must be placed where it can be easily seen and accessed by the user. Power and interlock cables should be routed in such a way as to prevent accidents, and to prevent damage to the cables.

3.1.2 Assembly

This product itself requires no assembly. Cable connections are covered in the following sections.

3.1.3 Power Connection

- Power the unit using either the USB Micro-B external power supply or from your PC via the USB Micro-B cable provided.
- If either of these need replaced, then standard replacements can be used; however, the external power supply should be approved by a suitable certification body.

3.2 Interlock Cable Installation

- Do not pull cables by the sheath but use the connector body.
- Most of the interlock cables will be installed by trained Andor support staff, but the following information is provided to familiarise the user with all of the connections.

3.2.1 Microscope Interlock Connector

- The microscope interlock connector connects the Laser-Lock to the interlock cable loop that contains all of the microscope interlock switches or other interlock switches that need to turn off ALL of the attached laser products.
- Closure of the interlock loop connected to this connector does not require the Manual Reset button to be pressed to re-activate the lasers.
- Any switch or cable connected to this connector must be capable of handling 5 V 80 mA DC.



3.2.2 Remote Interlock Connector

- The Remote Interlock Connector is a requirement of IEC 60285-1 and the CDRH Regulations for Class 3B and Class 4 laser products.
- Remote interlocks are remote from the laser products as opposed to being local to the products themselves, e.g. microscope interlocks are local to the system, but lab door interlocks are further away.
- Remote interlocks in a Class 4 laser product require that after closure of the interlock loop connected to this connector the Manual Reset button **MUST** be pressed to re-activate the lasers.
- This inconvenience was thought necessary by the standards authors because due to the increased hazard of a Class 4 laser they thought there was a greater danger to personnel who triggered a remote interlock in, for example, a lab door who may not be aware of what is going on in the lab.
- The Manual Reset function has been provided for the HLE as an external box for easier access by users, and for some other Class 4 scenarios.
- If remote interlock switches are not required, this unit is provided with a Remote Interlock defeat that plugs into this connector to disable this function.
- A short, unterminated remote interlock cable is also provided to allow you to attach via soldering or some other means your own remote interlock switch cable assembly. The switches in such an assembly must close when you want the laser to be activated, and open when you want to stop lasers from emitting, and must be in series.
- Any switch or cable connected to this connector must be capable of handling 5 V 20 mA DC.

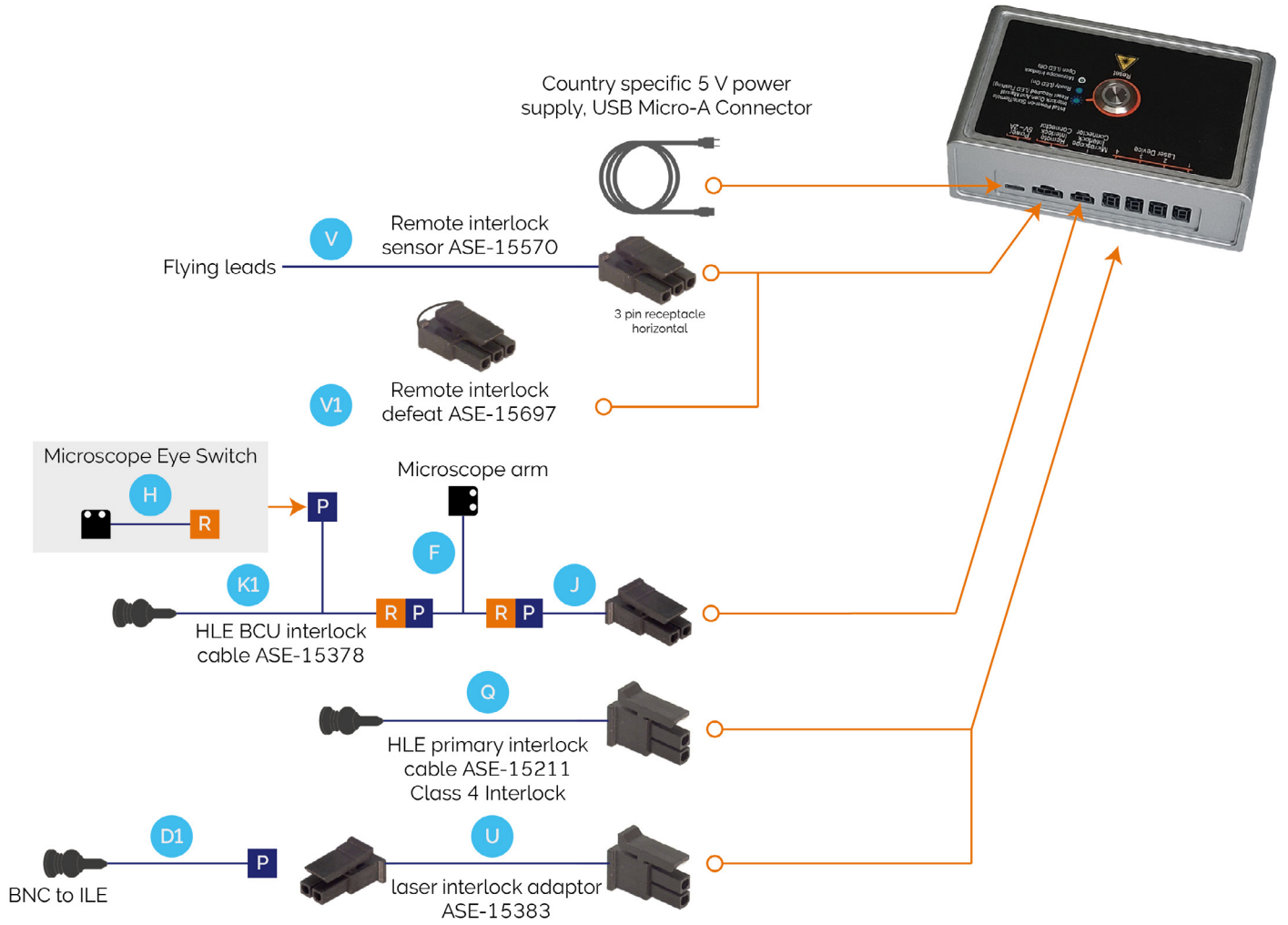


3.2.3 Laser Device Connector

- Each laser device connector is provided to connect the unit to the interlock connector of each separate laser source in the system, and to interlock switches that you only want to interlock that individual laser source, e.g. certain Andor products may have dye cells or beam splitters that contain safety interlocks you only want to de-activate the one laser source related to these.
- In other circumstances where a product may allow the use of several laser sources, the safety interlocks would have to be connected into the Microscope Interlock Connector loop to allow them to turn-off ALL of the laser sources at once.



3.3 Typical System Configurations



Section 4: Operation

4.1 Emergency Mains Disconnection

In case of emergency, the disconnect as follows:

**SWITCH OFF THE POWER AT THE MAINS SOCKET AND
REMOVE THE MAINS LEAD FROM THE EXTERNAL POWER SUPPLY**

4.2 Power Up

1. Turn the key clockwise until the green power LED illuminates.
2. Ensure interlocks are closed.
3. Press the flashing blue reset button.
4. Laser products will activate.

4.2.1 Microscope Interlock Opened

(Blue interlock open LED is off)

1. Close microscope interlock(s).
2. Laser products will re-activate

4.2.2 Remote Interlock Opened

(Blue interlock open LED is flashing)

1. Close remote interlock(s).
2. Press the flashing blue reset button.
3. Laser products will re-activate

4.3 Power Down

1. Turn the key anti-clockwise until the key is in a vertical position.

Section 5: Maintenance

Important: The system should be powered down prior to performing any maintenance checks.

5.1 Cleaning and Decontamination

To clean the product, only use a damp lint-free cloth. Do not wet the connectors. Do not use solvents, cleaning agents, or aerosols.

5.2 Regular Checks

The state of the product should be checked regularly, especially the integrity of the enclosure and the power cable.

DO NOT USE EQUIPMENT THAT IS DAMAGED.

5.3 Annual Electrical Safety Checks

It is advisable to check the integrity of the insulation on an annual basis, e.g. U.K. PAT testing.

DO NOT USE EQUIPMENT THAT IS DAMAGED.

Section 6: Troubleshooting

If the Laser-Lock box is provided as part of system with a HLE, ILE, Dragonfly, or other laser product, please refer to the troubleshooting sections of their respective user guides, available at andor.oxinst.com/downloads.

Appendix A: Technical Specifications

Environmental Specifications

	Laser-Lock Box
Location to be used	Indoor
Altitude	Up to 2000 m
Operating temperature	0°C to 45°C
Storage temperature	-20°C to 70°C
Operating relative humidity	<70% (non-condensing)
Pollution degree	Pollution degree 2. Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.
Cooling vent clearance	Do not cover

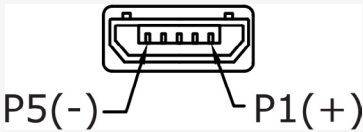
Mechanical Specifications

	Laser-Lock Box
Weight (unit only*)	200 g [0.4 lbs]
Weight (External Power Supply)	125 g [0.3 lbs]
Dimensions	12.5 x 7.5 x 4.5 cm

Electrical Power Specifications

Laser-Lock Box	
Mains Input for Supplied External Power Supply	100 - 240 V AC, 50 - 60 Hz ± 3Hz
Power Consumption	Laser-lock only 0.61 W Laser-lock + external power supply 0.82 W
Voltage Rating	5 V DC Power
Current Rating	2 A
Mains Overvoltage Category	CAT II An overvoltage category of CAT II means that the equipment is designed to cope with transient voltages above the rated supply that would be experienced by any product connected to a standard single-phase mains socket in a building.

External AC/DC Power Supply Requirements

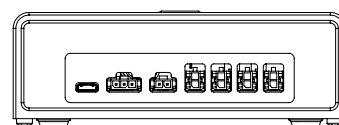
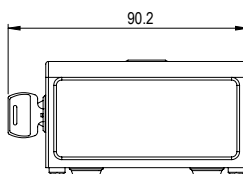
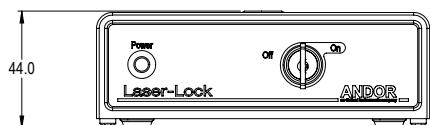
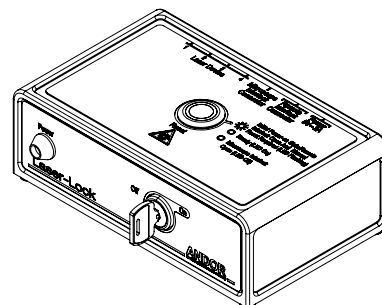
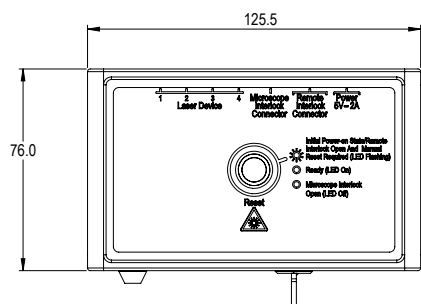
Laser-Lock Box	
Supplied EPS	PS-5
Low Voltage Supply	5 V
Low Voltage Supply Current	1 A min.
Low Voltage Supply Cable Plug	USB Micro-B Plug
Low Voltage Supply Cable Plug Insertion View	
Low Voltage Supply Pin Connections	See above
Safety	Certified to an appropriate IEC standard, e.g. IEC 62368-1, and meet the reinforced insulation from mains requirement of IEC 61010-1
Environmental	Ensure that the EPS meets the environmental specification of the overall product (see above)

Electrical Connections Specification

Description	Function	Connector Type	Part Number	Signal Type
Power Connector	Provides power to the Laser-Lock unit.	USB Micro-A	-	5 V DC 2 A
Remote Interlock Connector	Input, connects to remote interlocks. (e.g. Door Switch)	Molex Micro-Fit 3.0 1 Row 3 Way	Molex 43645-0300	Open Circuit if Interlock Open (20 mA at 5 V)
Microscope Interlock Connector	Input, connects to microscope interlocks. (e.g. eyepiece position)	Molex Micro-Fit 3.0 1 Row 2 Way	Molex 43645-0200	Open Circuit if Interlock Open (80 mA at 5 V)
Laser Product Connectors	Output, connects to laser products to disable when an interlock is opened.	Molex Micro-Fit 3.0 2 Row 1 Way	Molex 43025-0200	Open Circuit if Product Disengaged

Appendix B: Mechanical Drawings

Dimensions in mm [inches]



Appendix C: Other Information

C.1 Terms and Conditions of Sale and Warranty Information

The terms and conditions of sale, including warranty conditions, will have been made available during the ordering process. The current version for the US is [available here](#), for all other regions (except Japan) please [click here](#).

C.2 EU/UK REACH Regulation Statement

Andor's EU/UK REACH Regulation statement is available [here](#).

C.3 Waste Electronic and Electrical Equipment

The company's statement on the disposal of WEEE can be found in the [Terms and Conditions](#).



Appendix D: China RoHS Hazardous Substances Declaration

Name and Content of Hazardous Substances in the Product
 产品中有害物质的名称及含量 产品中有害物质的名称及含量

Hazardous Substance: 有害物质						
Component Name 部件名称	Lead (Pb) 铅	Mercury (Hg) 汞	Cadmium (Cd) 镉	Chromium VI Compounds (Cr ⁶⁺) 六价铬化合物	Polybrominated Biphenyls (PBB) 多溴化联苯	Diphenyl Ethers (PBDE) 多溴联苯醚
Printed Circuit Board Assembly (Surface-mount Resistors) 电路板组件 (表面贴装电阻器)	X	O	O	O	O	O
Key Switch 钥匙开关	X	O	O	O	O	O
PS-5 External Power Supply (CUI SMI6B-5-4-MUB) PS-5 外接电源 (CUI SMI6B-5-4-MUB)	X	O	O	O	O	O
BNC Cable Connectors BNC 电缆连接器	X	O	O	O	O	O

This table was developed according to the provisions of SJ/T 11364
 本表格依据SJ/T 11364 的规定编制

O - The content of such a hazardous substance in all homogeneous materials of such a component is below the limit required by GB/T 26572

O - 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572 规定的限量要求以下

X - The content of such a hazardous substance in a certain homogeneous material of such a component is above the limit required by GB/T 26572

X - 表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572 规定的限量要求