SLD-mCS/sCS-series Miniature High Power Broadband Light Source Modules

Technical Product Specification

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Description

SLD-mCS/sCS-series Miniature Broadband SLD Light Source Modules are wide-spectrum SM- or PM-fiber coupled light source modules for applications requiring a reliable, high-power, stable and low-noise SLD light source with a wide and flat spectrum and a short coherence length.

SLD-mCS/sCS devices substitute SLD-MS light sources, providing better stability, higher efficiency, wider operating range and lower noise. They can be built using any SUPERLUM SLD if its drive current is less than 400 mA. They may be powered by a wide range of supply voltages, from 9 V to 30 V DC, and allow the use of switched-mode DC power supplies.

Guaranteed operation temperature range is 0…+50 °C (case). Light source modules for a harsh environment applications, for example, for operation in extended temperature ranges (up to -40…+85 °C) are available upon request (depends on the P/N of the SLD used, i.e. the SLD drive current and voltage).

SLD-mCS/sCS sources allow different control modes of SLDs. Modules with internal PD monitor may be driven in Constant Current (ACC) and Constant Power (APC) modes. SLD power can be set by internal potentiometer ("internal" control operation mode, INT) or controlled by 0-4 V analog voltage ("external" control operation mode, EXT). Operation modes can be selected using easily accessible jumpers.

SLD-mCS/sCS sources ensure very high stability of SLD output over entire operating temperature range and low SLD noise. Particularly, the design of the controller used in both sources ensures that in the range from 10 kHz to 1 MHz there is no excess noise except for the SLD's intrinsic quantum noise. In all standard models (i.e. those based on standard SLDs of Superlum) the SLD can be modulated (ON/OFF) at the rate of up to 50 kHz.

SLD-mCS sources have FC/APC-terminated fiber pigtailed output. As a standard, the fiber is protected by a 3 mm tube.

SLD-sCS sources have FC/APC mating sleeve. About 1 m long, terminated with FC/APC connectors on both ends, 900 µm buffered fiber cable is always enclosed to the SLD-sCS. The SLD-sCS has a little bigger chassis than the SLD-mCS. This allows the integration of additional elements like, for example, output power monitors, small size isolators and others.

SLD-mCS/sCS sources have two control ports, "LOGIC" port for switching SLD ON/OFF and error indications, and "ANALOG" port for readout of SLD parameters and SLD power setting in "EXT" mode.

When ordering the light sources with standard SLDs inside, just add "mCS" or "sCS" to SLD P/N not referring SLD module package type. For example, SLD-mCS-371-HP1-SM-PD describes SLD-mCS with a standard SMF fiber coupled SLD-371-HP1 module inside. Only butterfly packaged modules may be integrated into to SLD-mCS and SLD-sCS.

Drawings

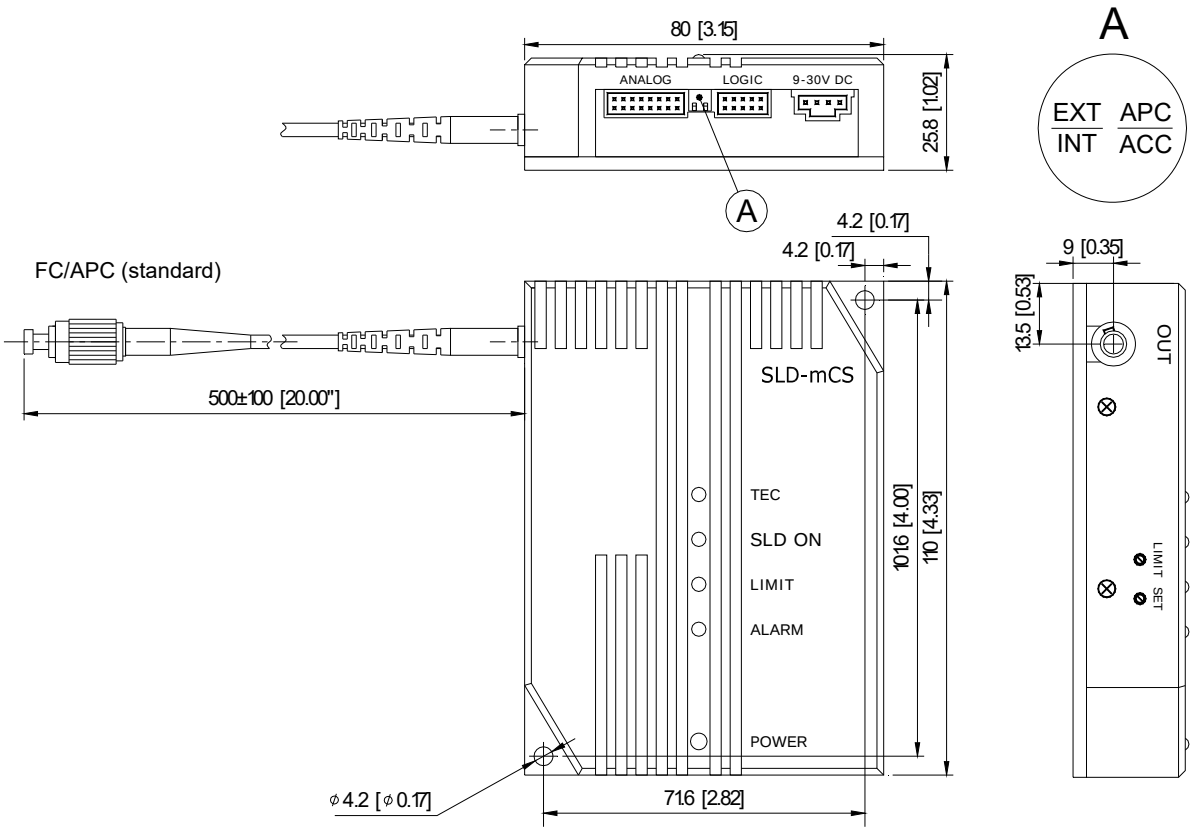

Figure 1, a. Drawing of SLD-mCS light source module. All dimensions are in millimeters [inches]. On the left side of the device: "LIMIT" – potentiometer for setting the SLD current limit, "SET" – potentiometer for setting the SLD power or drive current in "internal control" mode. SLD-mCS status LEDs on the top side: "TEC" (SLD temperature setpoint is reached), "SLD ON" (SLD is on), "LIMIT" (drive current limit is reached), "ALARM" (system error occurred), "POWER" (power is on). Operation mode switches on the front side: "EXT/INT" ("external control" mode/"internal control" mode), "APC/ACC" (Automatic Power Control/Automatic Current Control).

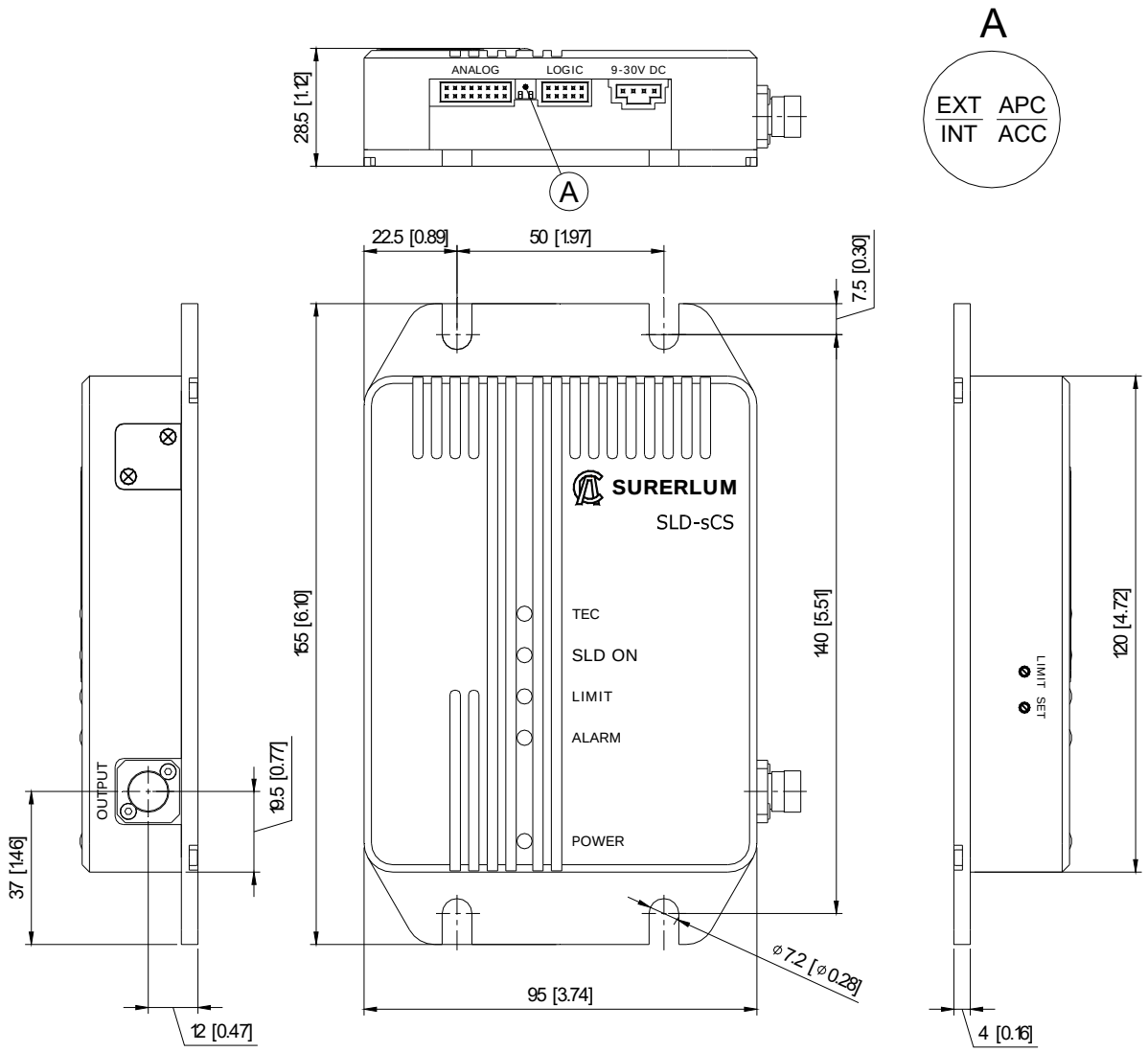

Figure 1, b. Drawing of SLD-sCS light source module. All dimensions are in millimeters [inches]. On the left side of the device: “LIMIT” – potentiometer for setting the SLD current limit, “SET” – potentiometer for setting the SLD power or drive current in “internal control” mode. SLD-sCS status LEDs on the top side: “TEC” (SLD temperature setpoint is reached), “SLD ON” (SLD is on), “LIMIT” (drive current limit is reached), “ALARM” (system error occurred), “POWER” (power is on). Operation mode switches on the front side: “EXT/INT” (“external control” mode/”internal control” mode), “APC/ACC” (Automatic Power Control/Automatic Current Control).

Pinouts

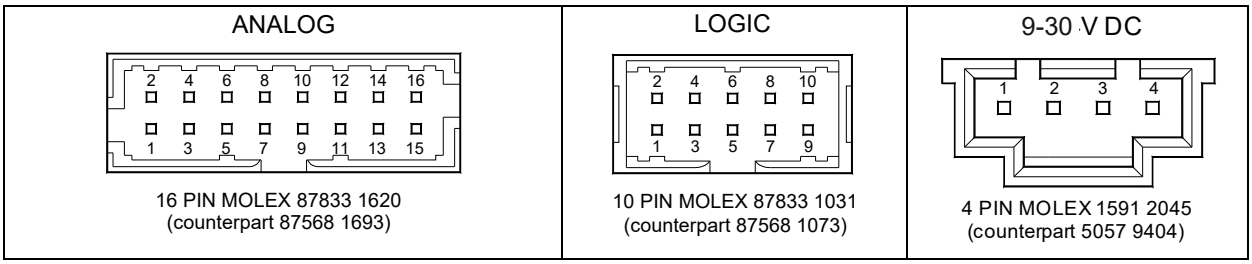

Figure 2. Pin configurations for SLD-mCS/sCS control ports and power supply connectors.

Table 1. Pin function descriptions.

Pin number	Name	IN/OUT	Description/structure
DC power input (4 pin MOLEX Connector P/N 1591 2045)			
1,2	+9 to +30 V	IN	+9 to +30 V DC
3,4	GND		Power ground
***Attention*: Power ground, Analog ground and case of SLD-mCS/sCS light source are connected inside the device.**			
LOGIC CONTROL (10 pin MOLEX Connector P/N 87833 1031)			
1	STATUS TEC	OUT	Open collector. Goes to low impedance state when the SLD temperature setpoint is ***NOT*** reached.
3	STATUS SLD	OUT	Open collector. Goes to low impedance state when SLD is ON.
5	STATUS LIM	OUT	Open collector. Goes to low impedance state when the SLD current limit is reached.
7	SLD ON/OFF	IN	SLD ON/OFF; **SLD is ON when 5 V is applied**, **OFF when 0 V is applied**; 200 Ω and LED of optocoupler in series.
9	ALARM	OUT	Open collector. Goes to low impedance state in case of system error
2,4,6,8,10	LOGIC GND		Logic ground.
***Attention*: It is not recommended to connect Logic ground to Analog ground as it may result in increased noise.**			
ANALOG CONTROL (16 pin MOLEX Connector P/N 87833 1620)			
1	+5 V AUX	OUT	+5V DC auxiliary output; 20 mA max.
3	SLD I LIMIT	OUT	Analog output; Indicates the set SLD current limit.
5	REF OUT	OUT	Reference voltage output, 4.5 V; R= 50 Ω.
7	PD OUT	OUT	Analog output; Indicates the back-facet PD monitor current.
9	SLD I SET	IN	Analog input; the voltage on this pin sets the SLD current (ACC) or sets the PD monitor current (APC)*.
11	SLD I REAL	OUT	Analog output; Indicates the real SLD current.
13	SLD I SETC	OUT	Analog output; Indicates the set SLD current.
15	TEC I	OUT	Analog output; Indicates the TEC current.
2,4,6,8,10,12,14,16	ANALOG GND		Analog ground.
***Attention*: Power ground, Analog ground and case of SLD-mCS/sCS light source are connected inside the device.**			

* To enable this input, the “external control” mode must be selected with the “EXT/INT” operation mode switch.

Absolute Maximum Ratings

Table 2. Absolute maximum ratings*.

Parameter		Value
DC supply voltage		35 V
DC supply peak current		1.2 A
Optical power		Depends on SLD and pre-set current limit
SLD drive current		According to the SLD Datasheet
Voltages -"ANALOG" I/O	"ANALOG" pin 1	4.5 V min., 5.5 V max.
Voltages - "ANALOG" I/O	"ANALOG" pins except pin 1	−0.3 to 7 V
Voltages - "LOGIC" I/O	Pin 7 SLD ON/OFF	−5 to 5.5 V
Voltages - "LOGIC" I/O	Open collectors	50 V
Electric current – "Analog" I/O	"ANALOG" pin 1	20 mA
Electric current – "Analog" I/O	"ANALOG" pins except pin 1	10 mA
Electric current – "LOGIC" I/O	Open collectors	100 mA
Electric current – "LOGIC" I/O	Pin 7 SLD ON/OFF	20 mA
Short circuit – "Analog" I/O		2 s maximum
Operating temperature (case)		0 to +50 °C
Storage temperature		-20 to +70 °C

*** NOTICE:** Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only. Functional operation of devices at these, or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics

Table 3. Electrical characteristics of SLD-mCS/sCS sources.

Parameter	Note	Min.	Typ.	Max.	Unit
DC supply voltage		9		30	V
DC supply current*		-	-	1.2	A
DC supply peak current†		-	-	1.2	A
SLD ON/OFF via "LOGIC" I/O	10 mA min.	4.0	5.0	5.5	V
Output power set via "ANALOG" I/O (input, 0-max)	APC mode	0.0	-	4.0	V
SLD drive current set via "ANALOG" I/O (input)‡	ACC mode	0.0	-	4.0	V
ANALOG I/O – The set value of SLD current (output)		0.0	-	4.0	V
ANALOG I/O – The real value of SLD current (output)		0.0	-	0.4	V
ANALOG I/O – SLD current limit (output)		0.0	-	4.0	V
ANALOG I/O – TEC current (output)	0.3 V=-1.5A TEC 2.7 V=1.5A TEC	0.3	-	2.7	V
ANALOG I/O – Real PD monitor current (output)		0.0	-	4.0	V
ANALOG I/O – Reference voltage for control of SLD current	10 mA max.	4.477	4.500	4.523	V
ANALOG I/O – 5 V DC output	20 mA max.	4.9	5.0	5.1	V

* Depends on DC voltage applied. DC supply power of up to 11 W should be available to achieve stable operation at extremes of operating temperature range.
† Short-term peak current to assure rapid switching-on at temperature extremes.
‡ Optional only.

Table 4. Detailed description of analog outputs ("ANALOG" I/O connector)

PIN & name	Description	Scale	Voltage	Note
Pin 1, +5 V AUX	+5 V DC output	-	5 V	± 2%
Pin 3, SLD I LIMIT	SLD current limit	1 V= 100 mA	0 – 4 V	
Pin 5, REF OUT	Reference output voltage	-	4.5 V	± 0.5%
Pin 7, PD OUT	PD monitor photocurrent	1 V=1 mA	0 – 4 V	
Pin 11, SLD I REAL	Real current through SLD	1 mV= 1mA	0 – 0.4 V	
Pin 13, SLD I SETC	Set SLD current (ACC)	1 V= 100 mA	0 – 4 V	
Pin 15, TEC I	TEC current	0.3 V=-1.5A TEC 2.7 V=1.5A TEC	0.3 – 2.7 V	

Optical Characteristics

Optical characteristics of any SLD-mCS/sCS light source module are determined by the SLD module used. In case of SLD-sCS, additional losses in FC/APC connections (up to 20% and more) shall be considered, depending on SLD wavelength. The insertion loss of the cable provided by Superlum does not exceed 10%.

The typical output power drift at 0…+50 °C is below 200 ppm/°C after warming up (depending on the P/N of the SLD inside the light source). The typical long-term (8 hours) power stability at temperatures near +25 ° is well below 1000 ppm after 30 minutes of warming up.

Recommended external control circuits

Standard SLD-mCS/sCS sources are set to ACC mode and "internal" SLD control mode (except the special cases when other settings are specified in the related documents). It is recommended to contact Superlum before changing the control modes from factory presets to user ones.

For the SLD-mCS/sCS module to emit light (1) power must be applied to the power connector; (2) a +5 V TTL signal must be applied to pin 7 of “LOGIC” connector, as suggested in Figure 3; and (3) the SLD temperature must stabilize at a preset value. When power is applied, it takes some time for the temperature to stabilize. Note that a protection circuit prevents the SLD from switching on until its temperature reaches the setpoint. If only power is applied, the light source module powers on, the SLD temperature stabilizes at the preset level, but the SLD remains off.

It is strongly recommended to switch off the SLD when not in use. If the SLD is not in use for a short time, it is recommended to switch it off, but to keep power to the light source. The SLD temperature will be kept at the preset level as long as power to the light source is maintained. It will greatly decrease the SLD switch-on time, given that the process of temperature stabilization inside the package may take seconds (depending on ambient temperature).

In addition, the simple external circuit shown in Figure 4 can be used to monitor the SLD status from a convenient location, while the SLD- mCS/sCS module itself is out of sight. The external indicating LED in Figure 4 is on when the SLD emits light.

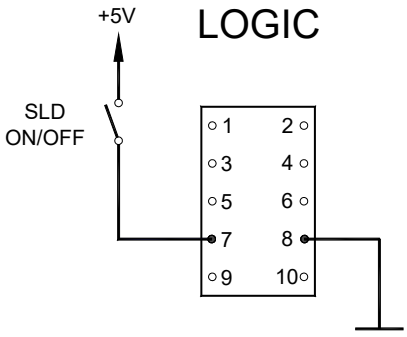

Figure 3. External circuit for switching SLD on and off remotely. “LOGIC” – 10 pin I/O connector of SLD-mCS/sCS source.

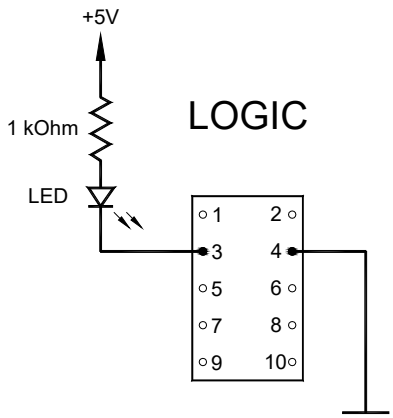

Figure 4. External circuit for remote monitoring of SLD status. “LOGIC” – 10 pin I/O connector of mSLD-CS/sCS source.

SLD emission can be switched on automatically when power is applied to SLD-mCS/sCS light source module. For this purpose, it is only necessary to connect pin 1 of “Analog Control” connector (+5 V DC auxiliary output) and pin 7 of “Logic Control” connector, and analog and logic grounds by a separate wire. *Note that this option is highly NOT recommended with SLDs classified as Class 3B laser light sources, particularly with SLDs emitting more than 10 mW power in 800-900 nm range, by safety considerations.*

SLD power can be controlled externally by applying a voltage to pin 9 of “ANALOG” I/O. Figure 5 shows suggested circuit diagrams for “external control” of SLD power by (a) using the 4.5 V DC reference voltage output of SLD-mCS/sCS module and (b) applying an external DC voltage. The front panel switch “EXT/INT” (See Fig.1) should be switched to “EXT” (“external control” mode). It is recommended that the control mode settings (“external control” or “internal control”) are specified when ordering. Note that changing the output power by the “SET” potentiometer (See Fig.1.) is disabled when the operation mode is changed to “external control” mode. Also note that fast modulation is not possible via pin 9 of “ANALOG” I/O — it is possible only through pin 7 of “LOGIC” I/O.

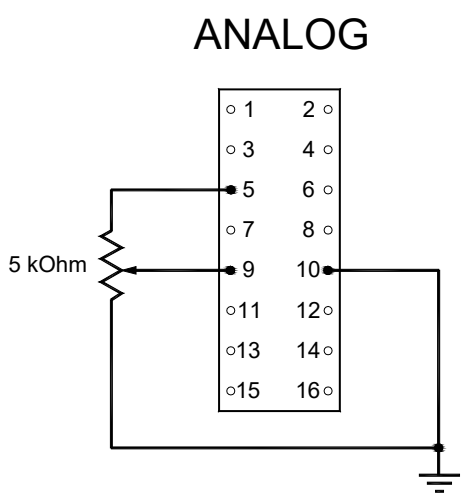

Figure 5 (a). External control of output power using 4.5 V DC reference voltage output of SLD-mCS/sCS.

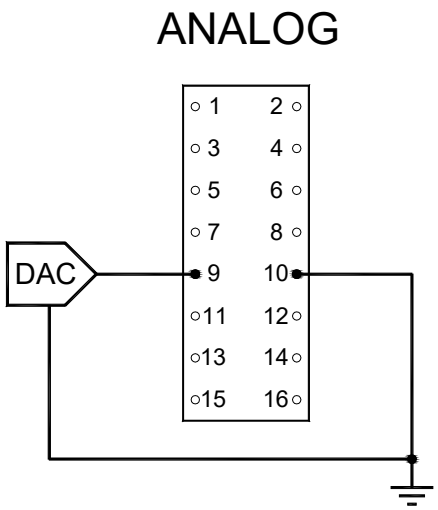

Figure 5 (b). External control of output power of SLD-mCS/sCS using external DC voltage.

Mounting

For the SLD-mCS/sCS to operate within the specified ambient temperature range, it is required to mount the device to an appropriate heatsink and to provide free air circulation around the top cover. An SLD-mCS/sCS light source can be used without a heatsink, but this will limit the maximum operating temperature of the device. Free air circulation around the SLD-mCS/sCS is required in this case, and forced-air (fan) cooling or similar measures are recommended. For selected models, the maximum operating ambient temperature without a heatsink is as high as +50 °C (please contact Superlum for more details).

Laser hazard classification

All standard SLD-mCS/sCS sources except models at 680 nm emit invisible light. It may have a potential hazard associated with CLASS 3R or 3B of IEC 60825-1 (Edition 2.0; 2007-03).

The SLD-mCS/sCS light source is designed for use as a component for integration into photonics equipment and it is, therefore, out of scope of applicable standards related to laser safety, such as IEC 60825-1. Note that any equipment incorporating this component may be subject to these standards. Standard SLD-mSC/sCS modules do not have *ALL* the laser safety features (like remote interlock, key operated master control, warning signals and labels). However, these features can be implemented using control interfaces.

Please contact Superlum for more details about laser safety issues for each particular model of SLD-mSC/sCS light source modules.