PHOTONIC SOLUTIONS

LASER SAFETY **EYEWEAR**

Photonic Solutions supplies EN207:2009 certified laser safety eyewear for medical, military, aviation, scientific and industrial applications. They are all lightweight, comfortable and are therefore easy to wear – an important consideration for users who may spend long hours wearing them. The eyewear features non-reflective polycarbonate filters which attenuate by absorbing the laser radiation and all items are fully approved with CE certification.

LaserShields

Laser Safety

Under EN 60825-1 classification scheme, lasers are classified into seven hazard classes depending on the accessible emission limits. The scheme is a measure of the laser's ability to produce injuries to personnel. The classes are as follows:

Class 1: the radiation is not dangerous and no protection equipment needed
Class 1M: the radiation is not dangerous when used without optical instruments but may become dangerous when used in combination with optical instruments - no protective equipment required if used without optical instruments
Class 2: The radiation emitted is not dangerous due to aversion responses including the blink reflex – no protective equipment needed
Class 2M: The radiation emitted is not dangerous due to aversion responses including the blink reflex but may become dangerous when used with optical instruments - no protective equipment required if used without optical instruments
Class 3R: The radiation from these lasers exceeds the maximum permissible exposure values so is dangerous to the eyes and safety glasses are recommended
Class 3B: Direct laser view is dangerous so safety glasses are mandatory
Class 4: Both direct and diffuse radiation is dangerous so personal safety equipment is necessary

Understanding Laser Filter Specifications.

In EN207:2009, lasers are divided into 4 regimes, depending on whether they are continuous wave (cw) or pulsed:-

Designation	Laser Type	Pulse width
D	Continuous wave (CW) laser	>250ms
I	Long pulse length laser	1us < I < 250ms
R	Q-switched pulsed laser	1ns < R < 1us
M	Mode locked (ultrafast) pulsed laser	< 1ns, eg picosecond, femtosecond

In accordance with EN207:2009, after testing, the eyewear is clearly marked to specify the minimum level of protection afforded by the filter and frame.
For example on a filter you may see: -
180-315 D LB7 + R LB4 so what does it mean?
180-315: identifies the minimum and maximum wavelength range in nm
D LB7: identifies the laser type, in this case D, which is CW, and LB7 indicates the level of protection across the specified wavelength range with a minimum OD of 7.*
R LB4: identifies the laser type in this case R which is Q-switched pulsed, and LB4 indicates the level of protection across the specified wavelength range with a minimum OD of 4.*

* OD (Optical Density) is not the whole story. The eyewear has to be able to attenuate the beam to provide protection and also withstand a given power or energy density. EN207:2009 therefore takes into account the power or energy density of the incident beam that the filter (and frame) can withstand, ie the damage threshold. Both should be able to withstand a direct hit of laser radiation of specified power/ energy and duration – and should retain their blocking properties for 5 seconds for a CW laser or 50 pulses for pulsed lasers.

The damage threshold consideration takes precedence in determining the LB rating, eg a filter demonstrating an OD of 6 but only passing the damage threshold test equivalent for a filter with OD2, would be labelled LB2. By way of a real example, take the EC2 filter which has an OD at 10600nm of greater than 7, but under EN207:2010 it has an LB rating at 10600nm of LB3. With a given LB number, the OD at that wavelength will always be greater than the LB number, ie with an LB5 rating the OD will be at least 5, etc.

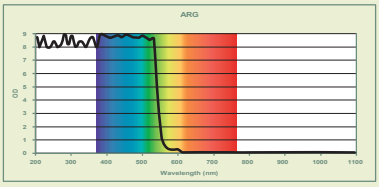
This is the main difference between the USA (ANSI) standard, which only takes OD into account when specifying laser protection, and the European standard which take into account the OD and the damage threshold of the filter and the frame.

Argon/ Doubled Nd:YAG | Filter Specification

ARG
M rated
for ultrafast lasers

OD 7+@ 190-532nm
Colour Orange
% VLT 48%
Material Polycarbonate

D LB7 + IR LB4 @ 180-315nm
DIRM LB6 @ >315-532nm

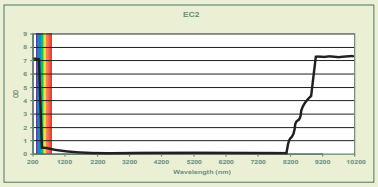


Excimer/CO_2 | Filter Specification

EC2
M rated
for ultrafast lasers

OD 7+ @ 190-398nm
OD 7+ @9,000-11,000nm
Colour Clear
% VLT 93%
Material Polycarbonate

D LB7 + IR LB4 @ 190-315nm
DIRM LB5 @ >315-398nm
DI LB3 @ 9,000-11,000nm

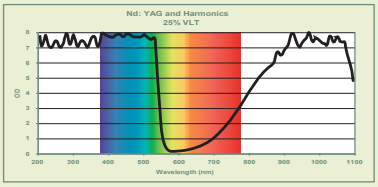


Nd:YAG + Harmonics | Filter Specification

DBY
M rated
for ultrafast lasers

OD 7+ @ 190-534nm
OD 7+ @ 960-1064nm
OD 6+ @ 925-1070nm
OD 5+ @ 850-925nm
Colour Amber
% VLT 35%
Material Polycarbonate

D LB7 + R LB4 @ 180-315nm
D LB5 + IRM LB6 @ >315-534nm
DIRM LB5 @ 850-925nm
D LB5 + IRM LB6 @ >925-980nm
D LB6 + IRM LB7 @ >980-1064nm
DIRM LB5 @ >1064-1085nm



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Infra Red Diode Lasers | Filter Specification

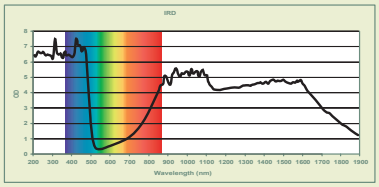
IRD

M rated

for ultrafast lasers

OD 6+ @ 180-450nm
OD 6+ @ 180-450nm
OD 3+ @ 820-1720nm
OD 4+ @ 870-1600nm
OD 5+ @ 940-1070nm
Colour Green
% VLT 19%
Material Polycarbonate

D LB6 @ 180-315nm
DR LB4 @ >315-400nm
DIR LB2 @ >770-820nm
DIR LB3 @ 820-865nm
DIR LB4 @ 865-940nm
DIRM LB5 @ >940-1064nm
DIRM LB4 @ 1064-1400nm
DI LB2 @ >1400-1850nm

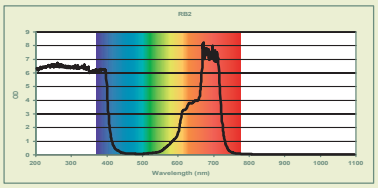


Ruby/HeNe | Filter Specification

RB2

OD 6+ @ 190-400nm
OD 3+ @ 615-720nm
OD 4+ @ 651-670nm
OD 5+ @ 671-715nm
OD 6+ @ 680-710nm
OD 7+ @ 690-700nm
Colour Teal
% VLT 35%
Material Polycarbonate

D LB6 @ 180-315nm
R LB4 @ 180-400nm
DR LB4 @ >315-400nm
DIR LB3 @ >615-660nm
DIR LB4 @ 660-665nm
D LB4 + IR LB5 @ >665-715nm
IR LB7 @ 694nm



Ti:Sapphire/Nd:YAG + Harmonics | Filter Specification

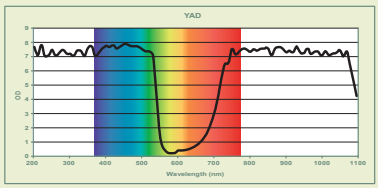
YAD

M rated

for ultrafast lasers

OD 7+ @ 180-534nm
OD 5+ @ 720-730nm
OD 6+ @ >730-740nm
OD 7+ @ >740-1070nm
Colour Amber
% VLT 11%
Material Polycarbonate

D LB7 + R LB4 @ >180-315nm
D LB5 + IRM LB6 @ >315-534nm
D LB5 + IRM LB6 @ 730-740nm
D LB6 + IRM LB7 @ >740-1070nm

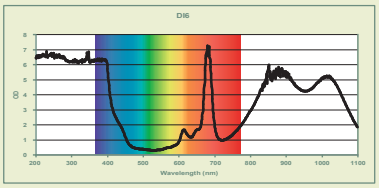


Diode | Filter Specification

DI6

OD 5+ @ 190-400nm
OD 3+ @ 670-695nm
OD 3+ @ 815-1050nm
OD 2+ >1050-1080nm
Colour Green
% VLT 35%
Material Polycarbonate

DIR LB3 @ 670-690nm
DIR LB3 @ 808-1050nm
DIR LB2 @ 665-<670nm
DIR LB2 @ >690-698nm
DIR LB2 @ 790-<808nm
DIR LB2 @ >1050-1080nm
DIR LB1 @ >610-664 + 735-789nm

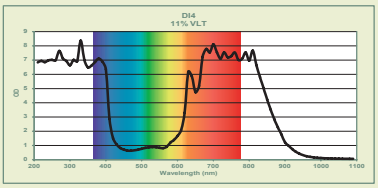


Diode | Filter Specification

DI4

OD 5+ @ 190-400nm
OD 4+ @ 625-850nm
OD 5+ @ 662-835nm
OD 5+ @ 633nm
Colour Blue
% VLT 12%
Material Polycarbonate

D LB7 + R LB3 @ 180-315nm
D LB5 + R LB6 @ >315-395nm
DR LB4 @ 625-830nm
DIR LB3 @ >830-850nm
I LB4 @ 625-670nm
I LB5 @ >670-800nm
I LB4 @ >800-830nm



Nd:YAG/Ti:Sapphire | Filter Specification

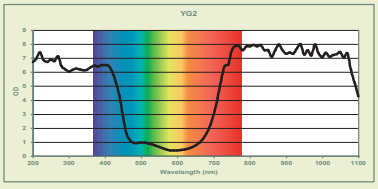
YG2

M rated

for ultrafast lasers

OD 6+ @ 180-400nm
OD 5+ @ 720-1090nm
OD 7+ @ 750-1064nm
Colour Amber
% VLT 25%
Material Polycarbonate

D LB6 + R LB4 @ 180-315nm
DR LB4 @ >315-400nm
DM LB5 @ 720-725nm
IR LB5 @ 720-750nm
DM LB6 @ >725-1075nm
IRM LB7 @ >750-1064nm
IR LB5 @ >1064-1075nm



Mineral Glass | Filter Specification

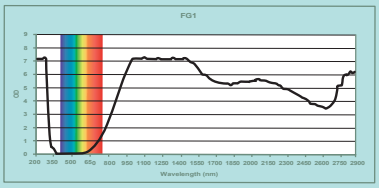
FG1

NEW

OD 3+ @ 850-2800nm
OD 5+ @ 950-1010nm
OD 4+ @ 900-2600nm
OD 7+ @ >1010-1500nm
OD 5+ @ >1500-2350nm
OD 5+ @ >2800-10600nm
Colour Clear
% VLT 75%
Mineral Glass

DIR LB3 @ 850-900nm
DIR LB4 @ >900-950 + >1400-2200nm
DIR LB5 @ >950-1000nm
DIR LB6 @ >1000-1063nm
D LB6 + IRM LB7Y @ >1063-1400nm
DI LB4 @ 2900-3200nm + 10600nm

Available in frame styles #37 or #11 only



We offer a range of frame styles which can be worn on their own or over prescription glasses.
Some of the latest frame styles eg #34 can take prescription inserts.

Style 11.

- Universal style.
- Comfortable over prescription frames or alone.
- Soft touch frame.

Style 33.

- Universal style.
- Comfortable over prescription frames or alone.
- Soft touch frame.

Style 34.

- Sleek stylish fit.
- Removable prescription insert.
- Soft temples.

Style 36.

- Modern universal style (medium).
- Adjustable temples.
- Comfortable over prescription frames or alone.
- Full field of view.

Style 39.

- Modern fitover style (large).
- Soft touch nylon frame.
- Full field of view.

Style 900.

- Universal style (large).
- Comfortable over prescription frames or alone.
- Full field of view.

Patient I-Shield

The Patient I-Shield is fully adjustable, unbreakable and features a bend-to-fit nosepiece offering revolutionary patient laser safety. The brushed stainless steel tight orbital area eye covers provide high level protection from laser radiation and are ideal for procedures close to the patient's eyes.

We hold all of the following listed LaserShields in stock in Edinburgh for immediate delivery. They can be purchased securely, on-line from our web shop at **www.photonicshop.co.uk**. We will continue to add to this list, so please check our website or contact us directly if you need a filter which is not listed here. Alternative frame styles as shown are available for same price, however delivery time is around 4 weeks from order.

Filter Type	Frame Style	Price £ (excl VAT)	Availability
ARG	39	110	In stock
EC2	900	75	In stock
DBY	39	135	In stock
IRD	39	130	In stock
RB2	39	120	In stock
YAD	36/39	190	In stock
DI6	39	120	In stock
DI4	36	120	In stock
YG2	39	140	In stock
FG1	37/11	210	In stock

Each LaserShield comes in it's own protective case with cleaning accessory and securing strap

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