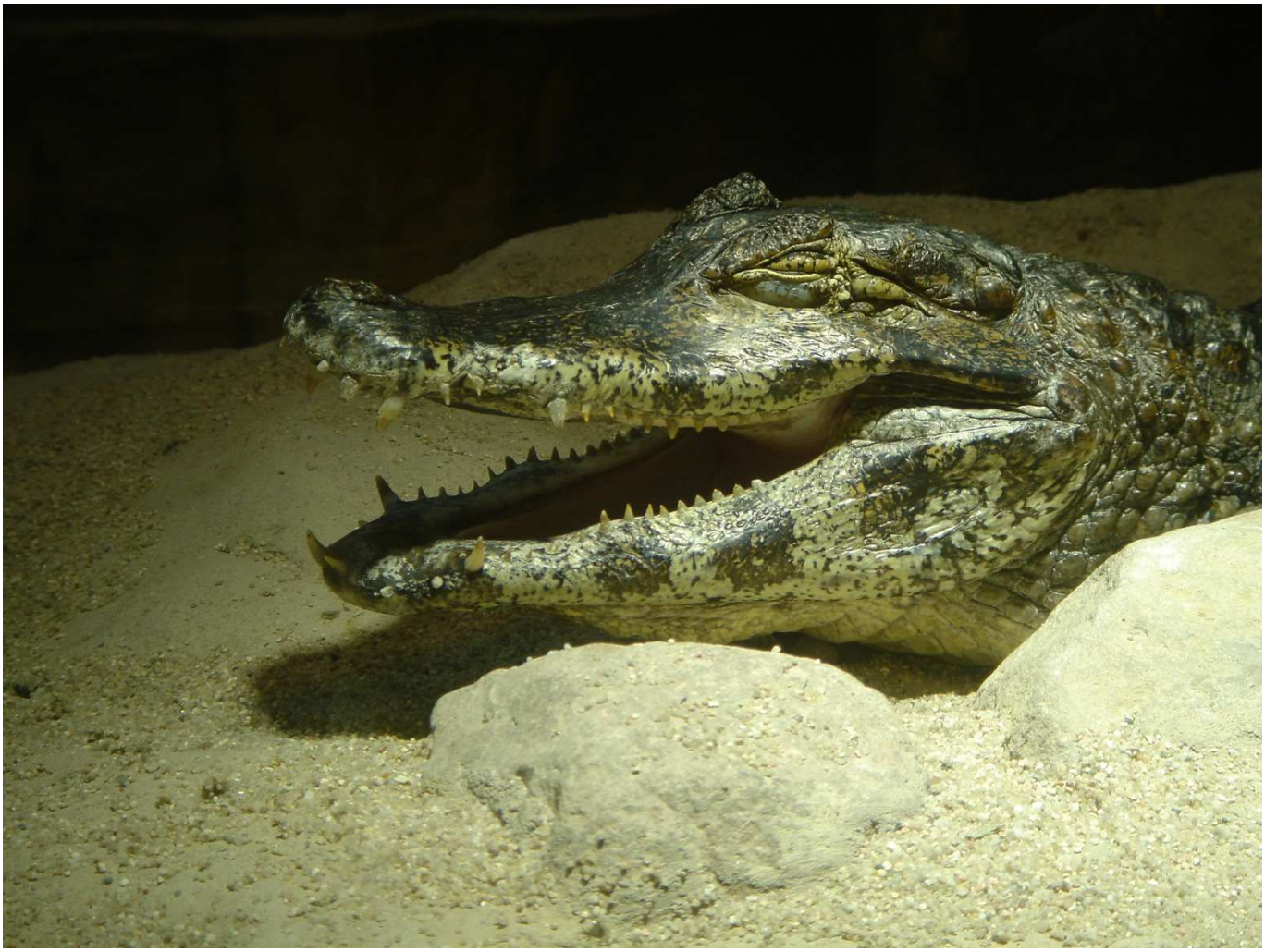
You might just run away from this…



... but laser radiation will catch you with the speed of light

February 2019

About the nature of laser radiation

Laser radiation is directed electromagnetic radiation with a narrow range of wavelengths. It can also be highly concentrated in space and time. If you want to know more, search the Internet. If it is visible, we call it light. From this point of view, the laser is an expensive way of making light. If it is invisible, it can be shortwave UV or long wave infrared radiation. What we can't see demands respect, and quite rightly so.

About the value of laser radiation

Leaving James Bond and other spectacular applications aside, laser radiation is primarily of technical interest. It can be focused into much smaller areas than, for instance, sunlight. Special effects can be achieved through its interaction with materials due to the narrow range of wavelengths. Its capacity to be tightly focused is the basis for materials processing. This allows high temperatures to be generated in very small spaces, so that we can weld, cut or drill without mechanical contact. This is as useful in engineering as it is in medicine. For instrumentation, on the other hand, the ability to tightly control the radiation in space and time plays a more important role.

About the danger of laser radiation

Striking the flat of your hand against a piece of wood is not particularly painful, but hitting a sharp nail certainly is. Why? It's a question of area. In the first case the whole of the hand is involved, but in the second case only a small part. The same applies to laser radiation. If a laser beam is focused over a large area, it causes less damage than when it is focused on to a small area. But the diameter of a laser beam can be held constant over long distances. It can therefore be as dangerous at a distance of several kilometres as it is at the source.

Like many other things in life, laser radiation is not equally dangerous to every part of the body. What is a mere pinprick to the skin, can still be capable of making you blind. Why? The main reason is the difference in the depth to which the radiation penetrates different kinds of tissue. When the penetration depth is shallow, the radiation is absorbed by a very small volume of tissue, and therefore causes a large rise in temperature. This is particularly true of the retina at the back of the eye.

Any human protective reaction, such as dazzling or pain, fails beyond certain power limits. The injury happens, so to speak, at the speed of light .

About protection from laser radiation

If we set out to cut metal sheets using laser radiation, we cannot expect miracles from the possible methods of protecting ourselves from laser radiation. There are in fact just two possibilities :

> The incoming laser energy is absorbed by the protective material. This can not, of course, go on indefinitely, as after a certain time the material will have melted, evaporated or exploded, and will have lost its ability to protect.
>
> The incoming laser energy is reflected by the protective material. You yourself will be all right if you wear eye protection of this sort, but the colleague next to you may be at risk. And even so, reflective layers cannot keep out unlimited amounts of laser radiation.

In either case it is important that the protective gear provides enough time to withdraw to safety.

Protection against laser radiation is regulated in the EC by part of the Health and Safety at Work Regulations, in Directive 89/686/EEC, which has been implemented as national law in all the countries of the EC. It specifies that any protective gear worn on the body must be approved. The directive specifies the harmonized European standards as the basis for testing. Other European directives that must be satisfied concern the protective effect and the selection of the materials used in manufacture.

Approval is given in two stages:

> Testing according to a harmonized European standard .
>
> Evaluation on the basis of the test results .

The tester and the evaluator involved in this activity must be approved in an EC member country. Although it is permitted for testing and evaluation to be carried out within the same organization, the personnel involved must be different .

A product that has been approved for the EC market can be recognized from the CE mark and from the correct identification of the product in accordance with the appropriate standard. Here are two examples :

> Alignment glasses, to EN 208 0,1W $2 \cdot 10^{-5}$J 488-532 RB2 OB
>
> Safety glasses, to EN 207 1200-1260 DIR LB4 + M LB4Y OB

In this case, OB is the manufacturer's identifier of Offenhaeuser+Berger GmbH. This can be followed by a quality mark, granted by the Test Institute. The tested scale numbers for the individual modes follow the letter group of LB. The letter Y follows the scale number of impulse modes, if they were tested at a repetition rate larger than 25 Hz.

About choosing the right eye protection

Unfortunately, choosing the right laser protection glasses is not altogether easy. For this reason, the standards, whose real purpose is to provide a basis for testing in connection with type approval, include informative annexes (see EN 207/208, Annex A/B). The procedure is as follows:

First carry out a risk analysis. The risk presented by a laser installation depends on the radiation source, the system by which the radiation is guided, and the particular features at the place where the laser radiation acts. The first question to ask is: from which points in your laser equipment, and in what form, can radiation that is hazardous to your eyes emerge? Examine at least the following possibilities:

> **Radiation source:** The source of laser radiation is usually an encapsulated unit with an aperture which is the first place at which the radiation is accessible. In the case of diode-pumped solid-state lasers, the radiation from the diode laser may also be accessible, and must be taken into account. In rare cases, the radiation may also be accessible in the laser resonator. You should also check whether the fundamental wavelength of frequency-multiplier radiation sources is accessible.
>
> **Beam delivery system:** The beam deluivery system usually consists of optical elements between which the laser radiation passes freely, or of an optical fibre into which the laser beam is coupled. Check whether the uncontrolled escape of radiation is possible along this path. With systems that employ optical fibres, it is possible that a fibre may be broken at some time. If that happens, the radiation will emerge with about the same intensity as it does from the intact end of the fibre. The beam divergence here is determined by the numerical aperture of the fibre. In most cases there is a lens at the end of the radiation guidance system that guides the laser beam to the place where it is required. The escape of radiation is also possible in this area.
>
> **Application site:** The radiation can be focused or collimated onto the place where it is used. Many materials are highly reflective.

Different levels of hazard must usually be expected when servicing compared to normal operation. During servicing, it is often possible to reduce the danger by operating the equipment at less than full power.

In any event, bear in mind that laser safety glasses are only intended to cover some residual risk. You should therefore always try to fully exploit all the other approaches to protection. This includes permanent covers over the beam path, photocells to interrupt the laser emission, and mechanical restrictions on the emission area.

The following modes of laser operation are distinguished by the EN 207 standard:

Abbreviation	Name	Definition
D	Continuous wave	Constant power for at least 5 seconds
I	Pulsed mode	Emissions of shorter duration (including periodic emissions)
R	Giant pulsed mode	Emissions of extremely short duration, although of at least 1 ns (including periodic emissions)
M	Mode-locked	Emissions (usually periodic) of extremely short duration of less than 1 ns .

Assignment to the different operating modes also depends on the wavelength. In operating mode M, with a pulse duration of less than 100 fs, a spread of the emitted range of wavelengths, and the distribution of the radiation intensity over this waveband, must be expected, and must be borne in mind when choosing suitable laser safety glasses.

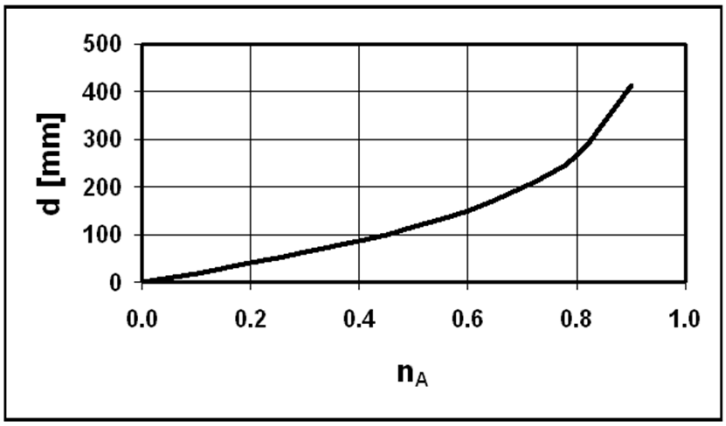
Determine the following parameters at the exposure site for each set of hazardous circumstances:

Laser wavelength: Some types of laser can be operated at different wavelengths. Bear in mind that ultra-short pulse laser radiation can involve emission over a waveband up to 100 nm wide.

Continuous wave: Whenever a particular power is emitted for 5 seconds or more, the radiation is classified as continuous wave. Note that the mean power quoted by many manufacturers is an indication that pulsed mode operation is involved, not continuous wave. The laser power emitted by many laser systems can be adjusted within certain limits. For the quantitative considerations, you should use the highest power that can be present at the exposure site.

Pulsed mode: In many laser systems, the energy of a single pulse, the duration of the pulse and the pulse repetition rate can be adjusted within certain limits. These parameters may also be interdependent. Various operating conditions should therefore be considered, including, at least, the lowest and highest pulsed energies. The mean power of a pulsed laser is the product of the pulse energy and the pulse repetition rate. If, therefore, you know these two parameters, you can find the missing parameter.

Beam diameter: In order to find the diameter of the laser beam at the site of possible exposure, you have two options, depending on the way in which the beam is guided. If the radiation is divergent, find this diameter at a distance of 100 mm from the smallest beam diameter. For radiation escaping from optical fibres, this is the distance from the end of the fibre, but in focussed systems it is the distance from the focal point. The following diagram illustrates the approximate beam diameter at 100 mm distance from the end of an optical fibre in relation to the fibre's numerical aperture .



You can, however, also use the definition of the smallest accessible beam diameter. This is appropriate if the minimum distance at which exposure is possible is greater than 100 mm. In that case, you can calculate the beam diameter according to the formula $\mathbf{d = d_0 \cdot x/f}$. Here, d_0 is the beam diameter at the lens, **x** is the distance from the focal point, and **f** is the focal length of the lens. Bear in mind in every case that the standards define the beam diameter as the diameter in which 63% of the power or pulse energy is located. If the beam has a square cross-section, the beam diameter is given by the formula $\mathbf{d = (4 \cdot A/\pi)^{1/2}}$, where **A** is the cross-sectional width of the beam. In the majority of cases it is impossible to look directly into the focused beam. If, however, you must also take this case into account, it is possible that such high levels of protection are required that they cannot be implemented.

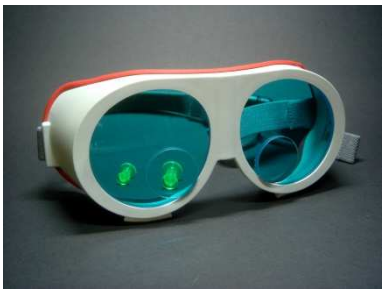
You can do the calculations necessary to find the required scale number with these parameters.

Remember that a lot of laser equipment can also be operated in a number of different modes. These operating modes can also occur in combination. When considering continuous wave operation, therefore, consider the possibility of superimposed pulses, and take these into account, if necessary, when determining the level of protection required.

Our laser safety glasses and laser alignment glasses

	Spectacle frames	Goggles
	for those with normal sight or contact lenses; with cord and cord stopper for individual fitting	users can wear their own spectacles underneath; with elastic head-band and buckle
Models for low-to-medium protection of easily cleaned plastic, comfortable on the skin		
Models for medium-to-high protection made of metal, with comfortable plastic lining next to the face		

All these frames are illustrated with neutral filters. The glasses on the following pages are fitted with the appropriate filters, ready to use. They are all supplied with a leather storage case.



A balanced range of filters is available, carefully matched to a wide range of different, common laser systems. Frame type KB^{low} with filters for YAG and diode lasers is also available with integrated magnifying glasses, with a working distance of 250 mm at 2x magnification as standard.

All glasses satisfy the 89/686/EEC European directive and are tested in accordance with EN 207/208.

Laser safety glasses to EN 207 screen out laser radiation down to a level that is considered safe (laser class 1). A higher level of radiation can be let through in the visible range (laser class 2), as the reflex to shut the eyelids provides additional protection. For this reason, the class of laser alignment glasses is available for the 400-700 nm range, as described by the EN 208 standard. The bandwidth has been chosen to be somewhat smaller than the actual visible range of 380-780 nm, as the reflex for closing the eyelids does not operate at the edges of the visible spectrum. The distinction between continuous wave and pulsed mode operation is made for laser alignment glasses.

Because the laser alignment glasses provide less attenuation, it is possible to see the laser beam. There is, however, no reason for exaggerated expectations, as laser alignment glasses should also provide enough protection when illuminated directly. In alignment work, on the other hand, it is normally the light scattered from the laser beam, whose intensity is only a fraction of that of the full strength of the beam, that is observed. Although the visibility of the scattered light can be improved by reducing the level of lighting at the workplace, this too has its limits.

If you would like more support from us in choosing the right eye protection, just get in touch with us by telephone, fax, or e-mail.

Laser safety glasses suitable for CO2

Order number	Frame type	Scale numbers	T_{D65}
000000-4013.437	BM*low*	9000-10600 **D** LB3+**I** LB2	92%
205410-9008.002	KB*low*	9000-11500 **D** LB3+**I** LB4	
000000-3013.437	BM*light*	9000-11500 **DI** LB4	
205480-9008.002	KB AL		
000000-3014.437	BM*light*	9000-11500 **DI** LB5	
205480-9008.003	KB AL		

Laser safety glasses suitable for YAG

Order number	Frame type	Scale numbers	T_{D65}
205437-9001.002	BM*low*	900-940 **DIR** LB5+**M** LB5Y >940-1000 **D** LB5+**IR** LB6+**M** LB6Y >1000-1100 **D** LB5+**I** LB7+**R** LB6+**M** LB6Y >1100-1400 **D** LB5+**I** LB7+**R** LB6 >1400-3000 **D** LB3+**I** LB2 9000-10600 **D** LB3+**I** LB2	70%
205415-0000.002	KB*low*	900-940 **DIR** LB5+**M** LB5Y >940-1000 **D** LB5+**IR** LB6+**M** LB6Y >1000-1400 **D** LB5+**IR** LB8+**M** LB7Y >1400-3000 **D** LB3+**I** LB4 9000-11500 **D** LB3+**I** LB4	
000000-1012.582	KB*low* with magnifying lens		
205436-9415.002	BM*light*	900-940 **DIR** LB5+**M** LB5Y >940-1000 **DIR** LB6+**M** LB6Y >1000-1400 **D** LB6+**IR** LB8+**M** LB8Y >1400-3000 **DI** LB4 9000-11500 **DI** LB5	
205480-9006.002	KB AL		
205436-9415.004	BM*light*	900-1000 **DIR** LB5 >1000-1030 **DIR** LB7+**M** LB7Y >1030-1400 **D** LB7+**IR** LB8+**M** LB8Y >1400-2500 **DIR** LB5 >2500-2800 **DIR** LB4 >2800-3000 **DIR** LB5 9000-11500 **DI** LB5	72%
205480-9006.004	KB AL		

Laser safety glasses suitable for YAG harmonic lasers

Order number	Frame type	Scale numbers	T_{D65}
000000-4013.447	BM*low*	180-315 **D** LB8+**IR** LB4 >315-400 **DIR** LB5 >400-532 **DIRM** LB5 900-910 **DIRM** LB2 >910-980 **DIRM** LB3 >980-1065 **DIRM** LB4 >1065-1100 **DIRM** LB5 >1100-1400 **DIR** LB5	26%
205713-0000.001	KB*low*	180-315 **D** LB9+**IR** LB4 >315-532 **DIRM** LB5 900-910 **DIRM** LB2 >910-980 **DIRM** LB3 >980-1065 **DIRM** LB4 >1065-1400 **DIRM** LB5	
000000-3013.447	BM*light*		
205480-9005.001	KB AL	180-315 **D** LB9+**IR** LB5 >315-532 **DIRM** LB5 900-910 **DIRM** LB2 >910-980 **DIRM** LB3 >980-1065 **DIRM** LB4 >1065-1400 **DIRM** LB5	
000000-1012.551	KB AL	180-315 **D** LB10+**IR** LB5 >315-535 **D** LB6+**IR** LB7+**M** LB7Y >535-545 **DIRM** LB4 >545-550 **DIRM** LB3 900-940 **DIR** LB5+**M** LB5Y >940-1000 **DIR** LB6+**M** LB6Y >1000-1400 **D** LB6+**IR** LB8+**M** LB8Y >1400-3000 **DI** LB4 9000-11500 **DI** LB5	16%

Laser safety glasses suitable for alexandrite diodes

Order number	Frame type	Scale numbers	T_{D65}
000000-4013.436	BM*low*	680-700 **DIR** LB3+**M** LB3Y >700-720 **DIR** LB4+**M** LB4Y >720-750 **DIR** LB5+**M** LB5Y >750-770 **D** LB5+**IR** LB7+**M** LB7Y >770-1100 **D** LB5+**I** LB7+**R** LB6+**M** LB6Y >1100-1200 **D** LB5+**IR** LB6 >1200-1260 **DIR** LB4	63%
205413-0000.002	KB*low*	680-700 **DIR** LB3+**M** LB3Y >700-720 **DIR** LB4+**M** LB4Y >720-750 **DIR** LB5+**M** LB5Y >750-770 **D** LB5+**IR** LB7+**M** LB7Y >770-1090 **D** LB5+**IR** LB8+**M** LB7Y >1090-1200 **D** LB5+**IR** LB6+**M** LB6Y >1200-1260 **DIR** LB4+**M** LB4Y	
000000-1012.581	KB*low* with magnifying lenses		
000000-3013.436	BM*light*	680-700 **DIR** LB3+**M** LB3Y >700-720 **DIR** LB4+**M** LB4Y >720-750 **DIR** LB5+**M** LB5Y >750-770 **D** LB6+**IR** LB7+**M** LB7Y >770-1090 **D** LB6+**IR** LB8+**M** LB8Y >1090-1200 **DIR** LB6+**M** LB6Y >1200-1260 **DIR** LB4+**M** LB4Y	
205480-9004.002	KB AL		

Laser safety glasses suitable for diode HeNe lasers

Order number	Frame type	Scale numbers	T_{D65}
000000-1012.722	BM*low*	625-630 **DIRM** LB3 >630-650 **DIRM** LB4 >650-658 **DIRM** LB5 >658-690 **DIRM** LB4 >690-695 **DIRM** LB3	70%
000000-1012.723	KB*low*		

Laser safety glasses for red-green-blue

Order number	Frame type	Scale numbers	T_{D65}
000000-1012.731	BM*low*	180-315 **D** LB8+**IR** LB4 >315-540 **DIRM** LB4 >625-630 **DIRM** LB3 >630-650 **DIRM** LB4 >650-658 **DIRM** LB5 >658-690 **DIRM** LB4 >690-695 **DIRM** LB3	8%
000000-1012.732	KB*low*		

Laser safety glasses suitable for Kr-YAG harmonic lasers

Order number	Frame type	Scale numbers	T_{D65}
000000-4015.436	BM*low*	180-315 **D** LB8+**IR** LB4 >315-400 **D** LB5+**I** LB7+**R** LB6 >400-545 **D** LB5+**I** LB7+**IRM** LB6+**M** LB6Y >545-560 **D** LB5+**IRM** LB6 >560-565 **DIRM** LB5 >565-570 **DIRM** LB4	16%
205413-0000.005	KB*low*	180-315 **D** LB9+**IR** LB4 >315-545 **D** LB5+**IR** LB7+**M** LB7Y >545-560 **D** LB5+**IRM** LB6 >560-565 **DIRM** LB5 >565-570 **DIRM** LB4	
000000-3015.436	BM*light*	180-315 **D** LB10+**IR** LB4 >315-545 **D** LB6+**IR** LB7+**M** LB7Y >545-560 **DIRM** LB6 >560-565 **DIRM** LB5 >565-570 **DIRM** LB4	
205480-9004.005	KB AL	180-315 **D** LB10+**IR** LB5 >315-545 **D** LB6+**IR** LB7+**M** LB7Y >545-560 **DIRM** LB6 >560-565 **DIRM** LB5 >565-570 **DIRM** LB4	

Laser safety glasses suitable for Ar-YAG harmonic lasers

Order number	Frame type	Scale numbers	T_{D65}
000000-1012.726	BM*low*	180-315 **D** LB8+**IR** LB4 >315-540 **DIRM** LB4	27%
000000-1012.727	KB*low*		
000000-4013.445	BM*low*	180-315 **D** LB8+**IR** LB4 >315-400 **D** LB5+**I** L7+**R** LB6 >400-535 **D** LB5+**I** L7+**R** LB6+**M** LB6Y >535-545 **DIRM** LB4 >545-550 **DIRM** LB3	26%
205710-0000.002	KB*low*	180-315 **D** LB9+**IR** LB4 >315-535 **D** LB5+**IR** L7+**M** LB7Y >535-545 **DIRM** LB4 >545-550 **DIRM** LB3	

Laser safety glasses suitable for Ar excimer lasers

Order numberr	Frame type	Scale numbers	T_{D65}
000000-4013.435	BM*low*	180-315 **D** LB8+**IR** LB4 >315-400 **D** LB5+**I** L7+**R** LB6 >400-500 **D** LB5+**I** L7+**R** LB6+**M** LB6Y >500-505 **DIRM** LB5 >505-510 **DIRM** LB3	70%
205411-0000.002	KB*low*	180-315 **D** LB9+**IR** LB4 >315-500 **D** LB5+**IR** LB7+**M** LB7Y >500-505 **DIRM** LB5 >505-510 **DIRM** LB3	
000000-3013.435	BM*light*	180-315 **D** LB10+**IR** LB4 >315-500 **D** LB6+**IR** LB7+**M** LB7Y >500-505 **DIRM** LB5 >505-510 **DIRM** LB3	
205480-9001.002	KB AL	180-315 **D** LB10+**IR** LB5 >315-500 **D** LB6+**IR** LB7+**M** LB7Y >500-505 **DIRM** LB5 >505-510 **DIRM** LB3	

Laser safety glasses suitable for excimer lasers

Order number	Frame type	Scale numbers	T_{D65}
000000-4012.442	BM*low*	180-315 **D** LB8+**IR** LB3+**M** LB1 >315-380 **DIR** LB4	92%
205610-0000.000	KB*low*	180-315 **D** LB9+**IR** LB3+**M** LB1 >315-380 **DIRM** LB4	
000000-3012.442	BM*light*	180-315 **D** LB9+**IR** LB3 >315-380 **DIRM** LB4	
205680-9001.000	KB AL		

Laser alignment glasses suitable for Ar lasers

Order number	Frame type	Scale numbers	T_{D65}
000000-1012.476	BM^{low}	0,1W $2 \cdot 10^{-5}$J 400-520 RB2	27%
000000-1012.477	KB^{low}		

Laser alignment glasses suitable for frequency-doubled YAG lasers

Order number	Frame type	Scale numbers	T_{D65}
205637-0000.000	BM^{low}	0,1W $2 \cdot 10^{-5}$J 488-532 RB2	25%
205612-0000.000	KB^{low}		

Laser alignment glasses, broadband, red

Order number	Frame type	Scale numbers	T_{D65}
000000-1012.480	BM^{low}	0,01W $2 \cdot 10^{-6}$J 540-650 RB1	10%
000000-1012.481	KB^{low}		

Laser alignment glasses suitable for diode HeNe lasers

Order number	Frame type	Scale numbers	T_{D65}
000000-1012.486	BM^{low}	0,1W $2 \cdot 10^{-5}$J 600-700 RB2	30%
000000-1012.487	KB^{low}		

Laser safety window CO_2 – standard sizes

Order number	Size	Scale numbers	T_{D65}
000000-1012.596	500 x 500 x 4,1 mm	9000-11500 **DI** LB5	92%

Laser safety window YAG^{medium} – standard sizes

Order number	Size	Scale numbers	T_{D65}
104580-0000.065	Ø 65 x 5,8 mm	900-940 **DIR** LB5+**M** LB5Y >940-1000 **DIR** LB6+**M** LB6Y >1000-1400 **D** LB6+**IR** LB8+**M** LB8Y >1400-3000 **DI** LB4 9000-11500 **DI** LB5	70%
104580-0200.100	200 x 100 x 5,8 mm		

Laser safety window YAG^{high} – standard sizes

Order number	Size	Scale numbers	T_{D65}
110640-0297.210	297 x 210 x 6,4 mm	900-1000 **DIR** LB5 >1000-1030 **DIR** LB7+**M** LB7Y >1030-1400 **D** LB7+**IR** LB8+**M** LB8Y >1400-2500 **DIR** LB5 >2500-2800 **DIR** LB4 >2800-3000 **DIR** LB5 9000-11500 **DI** LB5	72%
110640-0200.100	200 x 100 x 6,4 mm		
110640-0000.065	Ø 65 x 6,4 mm		

Laser safety window diode – standard sizes

Order number	Size	Scale numbers	T_{D65}
102440-0200.100	200 x 100 x 4,4 mm	680-700 **DIR** LB3+**M** LB3Y >700-720 **DIR** LB4+**M** LB4Y >720-750 **DIR** LB5+**M** LB5Y >750-770 **D** LB6+**IR** LB7+**M** LB7Y >770-1090 **D** LB6+**IR** LB8+**M** LB8Y >1090-1200 **DIR** LB6+**M** LB6Y >1200-1260 **DIR** LB4+**M** LB4Y	63%
102440-0000.065	Ø 65 x 4,4 mm		

Laser safety window Ar-YAG 2x – standard sizes

Order number	Size	Scale numbers	T_{D65}
106460-0200.100	200 x 100 x 4,6 mm	180-315 **D** LB10+**IR** LB5 >315-535 **D** LB6+**IR** LB7+**M** LB7Y >535-545 **DIRM** LB4 >545-550 **DIRM** LB3	26%
106460-0000.065	Ø 65 x 4,6 mm		

Laser safety window Ar excimer – standard sizes

Order number	Size	Scale number	T_{D65}
000000-1012.584	200 x 100 x 4.6 mm	180-315 **D** LB10+**IR** LB5 >315-500 **D** LB6+**IR** LB7+**M** LB7Y >500-505 **DIRM** LB5 >505-510 **DIRM** LB3	70%
107460-0000.065	Ø 65 x 4.6 mm		

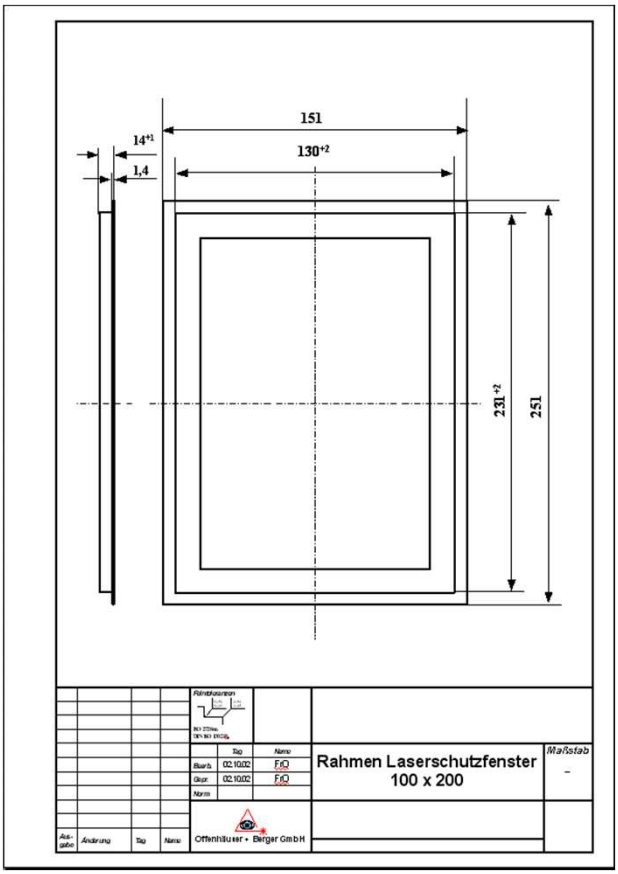
In addition to the standard dimensions, we also offer a large number of special measurements for all types of window. Perhaps the dimensions you want are already included. If not, we will make the window for you, provided it can be cut from the standard dimensions:

Round	20–120 mm diameter
Rectangular	20–297 mm side length up to 365 mm diagonal

All window types are tested to EN 207 .

We also offer mounting frames for some window formats. They are supplied ready-assembled with suitable attenuation elements. Final fitting then only requires an appropriate cut to be made in the safety wall. They are fastened with adhesive. Special adhesive for typical engineering surfaces is included.

Order number	Window size
300000-0200.100	200 x 100 mm
300000-0297.210	279 x 210 mm

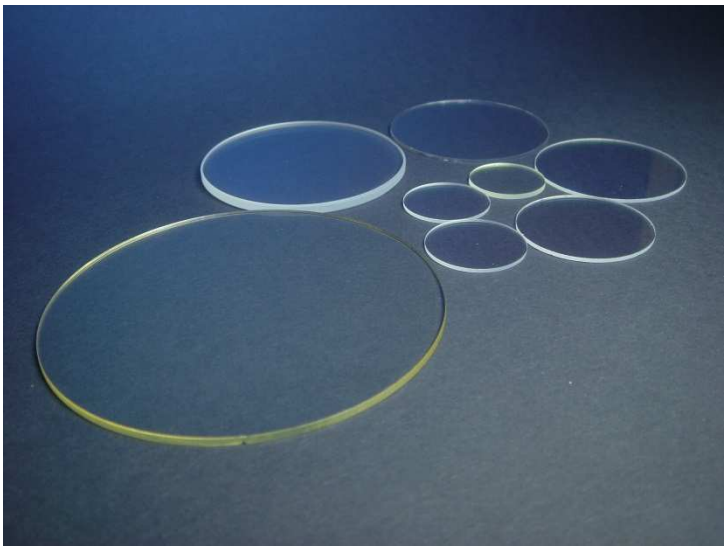


Laser exit windows

Laser exit windows protect valuable lenses from particles created by the action of the laser beam on the workpiece. We offer them in both plastic and mineral materials. With an AR-coating on both sides, a spectral transmission factor of at least 99.5% at 1064 nm (Nd:YAG laser) is achieved. Optimization for other wavelengths is also possible on request .

Type	Order number	Size
Plastic, uncoated	000079-1569.740	Ø 65 x 1.7 mm
	000079-1569.795	Ø 95 x 1.7 mm
Mineral, AR coated	000089-1569.740	Ø 55 x 1.1 mm
	000090-1569.740	Ø 65 x 1.1 mm
	000000-1012.526	Ø 65 x 3.3 mm

In addition to the standard dimensions, we also offer a large number of special sizes for all types of window. Perhaps the size you want is already included. If not, we will make the window for you, provided it can be cut from the standard dimensions:



Subject to technical changes. This applies particularly to the quoted scale numbers. These can change at short notice if the standards in accordance with which our products are tested change, or if the certifying authority changes the conditions for other reasons .

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