



10 things you should know before  
investing in a cold laser device

1. **Correct dose**

The effects of laser therapy are described by the so-called Arndt-Schultz law, a dose-response relation that indicates that a low dose has a low effect, a medium dose has a stimulating effect, and a too high dose can have a negative effect.

2. **The 2 most common mistakes**

When it comes to treating with laser therapy, the two most common mistakes are applying either too low or too high of a dose.

3. **Definition of dose:** Power x Time.

Note: **average** output power is used for dose calculation. More details on page 3.

4. **Dose too low**

A dose that is too low is usually the result of a too low output power.

A laser of 100 mW will only be able to stimulate superficial tissue, e.g. a tennis elbow.

5. **Unclear specifications**

Many manufacturers are unclear, or creative, in their indications of output power.

**Example 1:**

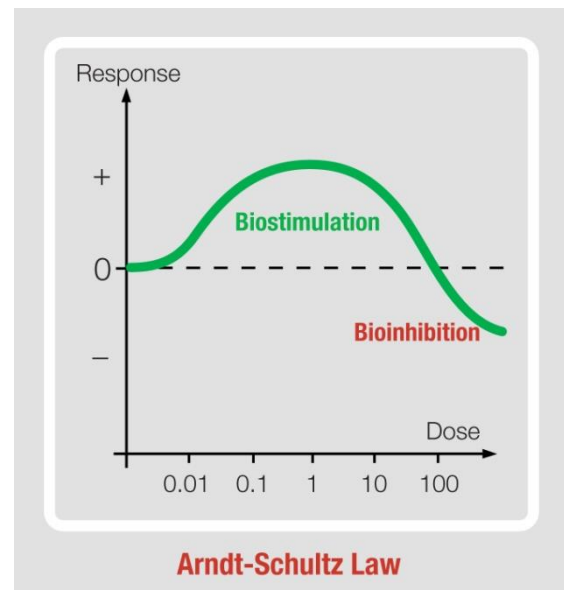
A laser is listed with an output power of 250 mW. When you read more closely, it turns out that it is 250 mW **peak** output power, and a **Duty Cycle** of 25%. The average output power, therefore, is only 62.5 mW. In addition, the output is distributed over an area of 4.5 cm<sup>2</sup> so that the **Power Density** is only 13.9 mW/cm<sup>2</sup>. That is extremely low, and the depth of penetration is just a few millimeters. Also, the laser is classified as a **Class 2M** laser, the same as a laser pointer of 1 mW.

**Example 2:**

A laser is listed with an output power of 60 W. That is, 60.000 mW. That sounds extremely high; however, it turns out it is a so-called **superpulsed** laser, with a **Duty Cycle** of 0.1%. The average output power, therefore, is only 60 mW.

6. **Dose too high**

Even with a **Class 3B** laser of 500 mW, it is important to be able to turn the power down, when necessary. A laser of more than 500 mW is a **Class 4** laser, which comes with a **very** high risk of overdose. A dose too high inhibits the healing, instead of accelerating it. In other words, worse than doing nothing. Overdose can also lead to therapy reactions in the form of aggravation of the tissue in the area being treated, and general discomfort.



**7. Is Class 4 better than Class 3B?**

Per definition, a Class 4 laser has a higher output power than a Class 3B laser, that much is obvious. But a Class 4 laser is designed to cut, burn, or vaporize and is – in medicine – usually used for surgery, tattoo removal, eye correction etc.

A Class 3B laser, on the other hand, has a biostimulating effect that accelerates the natural healing process.

To prevent a Class 4 laser from burning or damaging the tissue, it needs to be defocused so much so that it, in reality, becomes a Class 3B laser at the skin surface.

[WALT](#) does **not** recommend Class 4 lasers for biostimulation.

**8. Depth of penetration**

The depth of penetration is proportional to the [Power Density](#) (W/cm<sup>2</sup>) at the surface of the skin. The higher the power density, the deeper the penetration. With that argument, many Class 4 laser manufacturers will claim that their laser has a deeper penetration. However, the power density that is possible with a Class 4 laser is so high that it would heat up the top layer of the tissue to above the pain threshold. Therefore, as mentioned, it is necessary to defocus or reduce the power to a level equal to a 500 mW Class 3B laser.

**9. Is more power better?**

Yes and no. When a large volume of tissue needs to be treated, a high output power – distributed over an area and not too concentrated – is an advantage and will reduce the total treatment time significantly. This is possible with a Class 4 laser that is defocused to Class 3B – or a Class 3B laser with several laser diodes.

**10. Piece of advice**

Ask for complete data, primarily average output power and wavelength. If the data you receive is different from the definitions listed here, ask for an explanation.

- How concentrated – or defocused – is the laser beam?
- Is it possible to turn the power up and down?
- Is the laser portable or stationary?
- What are your specific needs?
- Is the laser user-friendly?
- What kind of support do they offer?
- Education and training?
- Warranty?

## Definitions:

**Average output:** the average output power over time.

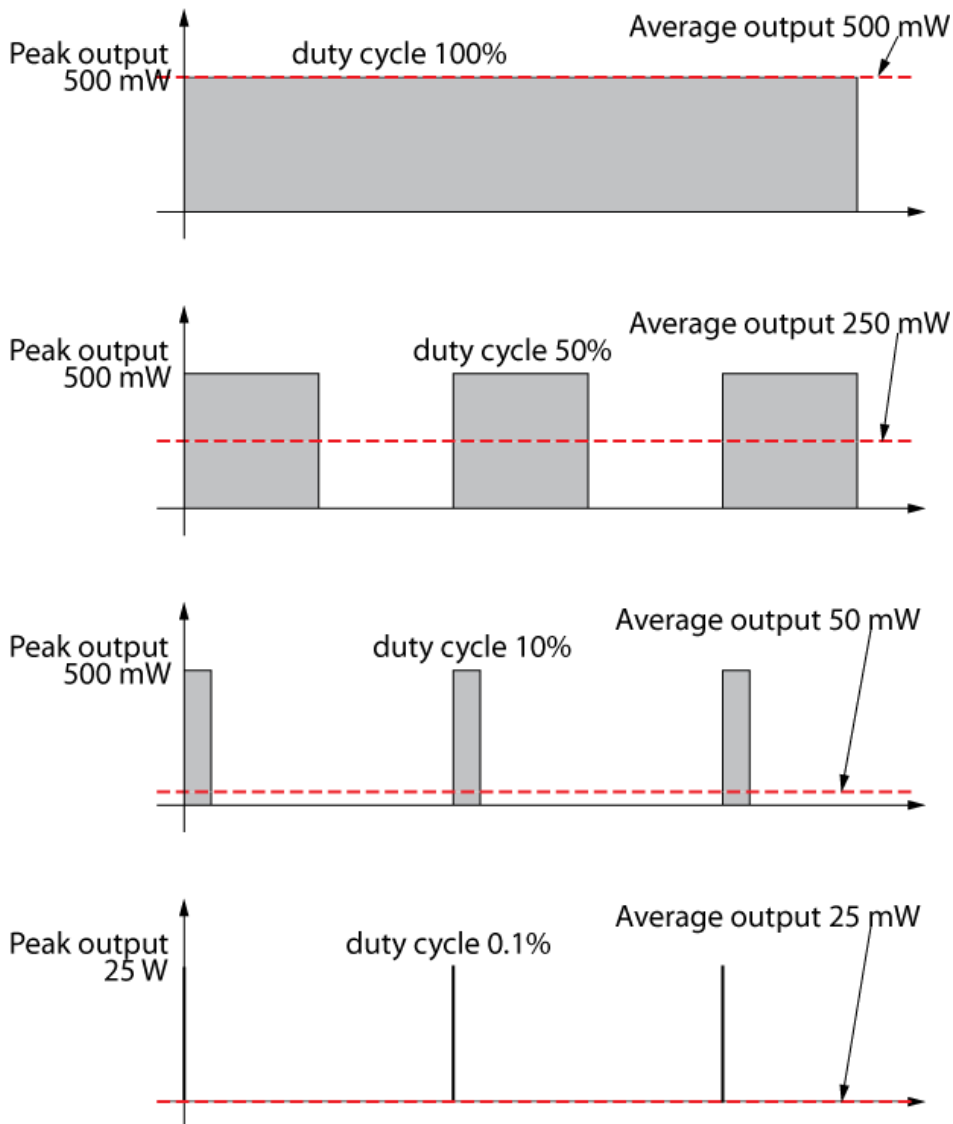
**Peak output:** the maximum output power the moment the laser is turned on.

**Duty cycle:** the percentage of the time the laser is on.

**Relation:** Average output power = Peak output power x Duty Cycle

**Continuous laser diode:** most laser diodes are designed to work continuously, also called Continuous Wave or CW. They can be pulsed by being turned on and off, as shown below. When a laser diode operates continuously, in other words it is on all the time, it has a Duty Cycle of 100%.

CW laser diodes are available in all wavelengths from around 300 nm to above 1000 nm.



**Superpulsed laser diode:** this type of laser diode is designed to operate in an extremely pulsed mode. It is turned ON for a very short amount of time with a very high peak output– and then left OFF for a time period equal to 1000 times the ON time.

The wavelength is always 904 nm or 905 nm. The Duty Cycle is 0.1%. A typical superpulsed laser has a peak output power of 25 W and an average output power of 25 mW.

**WALT:** World Association for Laser Therapy. A worldwide non-profit organization for researchers, doctors, and other practitioners. Devoted to research, education, and clinical application of laser therapy. WALT publishes dose recommendations for laser therapy. For details, visit their website: <https://waltza.co.za/>

**LASER:** The word laser is an acronym for Light Amplification by Stimulated Emission of Radiation. Laser is a special type of light that is monochromatic and coherent. In other words, laser is a form of light that is pure and well organized. These properties give laser (with the right wavelength) the ability to penetrate deep into the tissue, much deeper than LED.

**LED:** LED is an acronym for Light Emitting Diode. LED's are used everywhere: in traffic lights, large billboards, lighting in homes and commercial buildings etc. They are mass produced and very cheap.

**Dose:** total energy dose measured in Joules. Calculated as average Power x Time, measured in Watt x seconds.

**Power density:** Watt/cm<sup>2</sup>, an indication of how concentrated the laser beam is. For deep tissue treatment, 500 mW/cm<sup>2</sup> is suitable. For more superficial issues, it is important to reduce the output power to 100 mW/cm<sup>2</sup>.

**Defocused:** instead of being concentrated to a point or a parallel beam, the laser beam is distributed over a larger area.

**Biostimulating laser therapy:** also called: Low Level Laser Therapy (LLLT); PhotoBioModulation (PBM); cold laser; laser photo stimulation; Laser Phototherapy.

**Classification:** all lasers are classified according to their output power. The classification is based on the **average output power per laser source.**

A laser device can have several laser sources, typically laser diodes. It is the power per laser diode that determines the class, not the total power.

The laser classes are:

- Class 1 and 1M: less than 0.4 mW (1 milliWatt = 1/1000 of 1 Watt)
- Class 2 and 2M: less than 1 mW
- Class 3R: less than 5 mW
- Class 3B: less than 500 mW
- Class 4: more than 500 mW (no upper limit)

## Learn more

To learn more about laser therapy and how you can use it in your practice, or to get help choosing the right laser for you, visit our website: [www.powermediclasers.com](http://www.powermediclasers.com); or contact us by phone: (+1) 608-406-2020.

## About PowerMedic Lasers



PowerMedic Lasers was established in 1982 and we have been involved with the development and production of laser therapy devices right from the start.

From day one, our overall objective has been to deliver technological solutions to relieving and curing illnesses in people and animals. The goal is to create tools that, in the hands of professional practitioners, can accelerate the natural healing process.

It is our philosophy that our products should not pretend to be anything more than what they are. The purpose of our products is what underlines our overall objective – to aid in healing – and nothing else. Ergonomics, simple operation, intuitive, self-explanatory controls are a natural result of this objective. A robust, reliable, and well-rounded tool follows. And a beautiful, aesthetic design comes almost naturally.

It is our opinion that the greatest inspiration for improvement and new development comes from the users of our products. Openness and responsiveness are therefore an integrated part of our pursuit of constantly developing better and better products – in line with our vision: to accelerate healing and give people and animals a better life.