

# Total risk matrix regarding dangers for humans for Diener Plasma Cleaner

<b>Very Serious (E)</b>	<b>4, 6</b>				
<b>Serious (D)</b>					
<b>Moderate (C)</b>					
<b>Small (B)</b>		<b>5</b>			
<b>Very small (A)</b>	<b>1, 2</b>	<b>3</b>			
<b>Cons. ↑ Propab. →</b>	<b>Very small (1)</b>	<b>Small (2)</b>	<b>Average (3)</b>	<b>High (4)</b>	<b>Very high (5)</b>

The colours show areas with evaluated risks which are acceptable (green), considerable, measures should be taken (yellow) and not acceptable, measures MUST be taken to reduce the risk (red).

## Description of Consequences

<b>A =&gt; Very small</b>	<b>Security / immediate damage to people</b>	<b>environmental consequences</b>
<b>B =&gt; Small</b>	=> damage which requires first aid only	=> insignificant damage and short restitution time
	=> damage which requires professional medical attention	=> less damage and short restitution time
<b>C =&gt; Moderate</b>	=> serious damage /illness	=> less damage but long restitution time
<b>D =&gt; Serious</b>	=> Serious damage/illness with possible inability to work	=> long lasting damage with long restitution time
<b>E =&gt; Very serious</b>	=> Death	=> long lasting and not reversible damage

## Description of Probability

<b>1 =&gt; Very small</b>	=> Ca. one incident in 50 years or less often
<b>2 =&gt; Small</b>	=> Ca. one incident in 10 years or less often
<b>3 =&gt; Average</b>	=> Ca. one incident per year or less often
<b>3 =&gt; High</b>	=> Ca. one incident per month or less often
<b>4 =&gt; Very High</b>	=> weekly

# Risk evaluation of Diener Plasma Cleaner

Participants during risk evaluation (+function): Søren Heinze (Chief engineer and instrument responsible)

The responsibility for all described risks lies at the NTNU NanoLab leader and this document is approved by him or her:

ID	Activity/Name	Description (involved dangers and consequences)	Law, regulation	Existing safety measures	Existing documentation and other comments	Probability (1-5)	Consequences (A-E)	
							Humans (A-E)	Environment (A-E)
1	UV radiation	The plasma in the machine is producing UV radiation which might damage the skin or the eyes.	Law regarding ionizing radiation (Strålevernloven)	=> The glass-window to the chamber should block almost all of the UV radiation. => during the course users are made aware that they shall not stare for long time into the glowing plasma	Course and manual	<b>1</b>	<b>A</b>	--
2	Exposure to ozone	During the process ozone is produced which might slip out of the chamber when it is opened before the purge cycle after the process has ended.	Chemical regulations (Kjemikalieforskriften)	=> During the process the chamber is always under vacuum and all ozone is sucked into the exhaust. However some residual ozone might stay in the chamber The the chamber is purged with air when the cleaning process is finished => during the course users are made aware not to open the door before the purge cycle has ended.	Course => even if ozone slips out it would be just smallest amounts	<b>1</b>	<b>A</b>	--
3	Danger to squeeze body parts	The door has a magnet to hold the door which attracts the door. If a user is not carefull enough he or she might squeeze e.g. a finger		=> during the course users are made aware to be careful while closing the door.	course	<b>2</b>	<b>A</b>	--

4	Potentially dangerous voltages	Potentially dangerous electrical currents, might be present inside parts of the machine while power is connected to it. This could cause an electric shock if a cover is removed from the unit and internal parts are touched Attention: Capacitors might keep high voltage for some minutes after the power is unplugged	Law regarding service at and work with electrical constructions and equipment	=> users are not allowed to remove covers from the instrument or parts of it => maintenance and repair is done by trained engineers only => the instrument will be disconnected from power and the person who will do the work have to wait some minutes prior work that requires the removal of covers	Course and manual	<b>1</b>	<b>E</b>	--
5	Hot surfaces	The electrode may become hot during operation.		=> during the course users are made aware that they have to take care regarding hot surfaces inside the chamber while loading the machine and that they have not to touch the electrode	course	<b>2</b>	<b>B</b>	
6	Short circuit of the electrode	The electrode might be short circuited if conductive parts touch it => if users try to change a short circuited status by themself a risk for an electrical shock exists		=> during the course users are made aware that they must make sure that conductive parts must not touch the electrode. => users are made aware to inform an engineer about all unusual incidents and users are made aware they they shall never try to “repair” something by themself	Course and manual	<b>1</b>	<b>E</b>	