Radium

DBD1000/220-240 DIM

Electronic control gear for XERADEX®
Excimer lamps

User instruction

V1.4 Oct. 2016

Content

The technical data given in this data sheet are nominal values. Variations with individual devices are possible.

DBD 1000/220-240 DIM

Ordering designation	Article No.	IC
DBD 1000/220-240 DIM	52317009	n/a

Technical Data

Supply voltage	VAC	220-240 (± 10%)
Mains frequency	Hz	50/ 60
Rated power	W	1200
Dimension	mm	642 x 110 x 228
HV-Cable length	mm	600
Weight	kg	13
Cooling		Active
Connections	• Analog interface and control 20 pol (MCV 1,5/20-GF-3,81 Phoenix) • Remote control RS 485 interface 4 wire bidirectional • Mains IEC power connector	
Surrounding conditions	• Operating temperature 10 - 40°C • Humidity max. 60% • Always above dew point	
Features	• Fully computer controllable (power, temperature, operation time lamp/ECG, dimming) • Interlock • The output power is encoded to the max. power for operation without cooling, depending from the radiant length of the respective lamp • Power is dimmable from 20-100%	

Directives and standards

- 2006/95/EC
- 92/31/EWG
- VDE1000
- EN55011

Additional documents

Title
• XERADEX® Handling Instruction

For above mentioned publications and more information, please contact Radium (see chapter contact)

Safety instructions

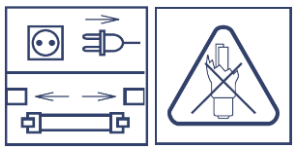
XERADEX® lamps may only be installed, exchanged and operated by qualified personnel. Read this handling instruction and the instructions for XERADEX® and luminaire carefully before starting the lamp.

Explosives

Take care that no explosives – gases or liquids – can come into contact with the DBD 1000 or the XERADEX® lamp. XERADEX® lamps are driven by HV-pulses (> 4 kV) that can ignite gaseous, liquid or massive explosives coming into contact with DBD 1000, XERADEX® or all cable to the DBD 1000 or between lamp, shielding and DBD 1000. Take care, that all ground connections are properly connected.

High Voltage

The XERADEX® lamp uses high voltage to generate a discharge. **Touching electrical parts during operation can cause severe injury or death.** Make sure the lamp socket is securely connected to a protective earth (PE) grounding at all times. Do not touch any part of the XERADEX® lamp during operation. Never open the DBD 1000 or run the DBD 1000 without its housing
If the DBD 1000 needs to be repaired send it back to Radium. Never repair, longer or change the lamp cable. Wrong cable or wrong cable length will destroy the DBD 1000 irreversibly. To change the cable or change the HV plug, send the complete DBD 1000 back to Radium.



Switch off and disconnect the ECG from its main supply source before mounting or changing the lamp. Never touch a broken lamp before disconnecting the ECG (power supply) from mains power supply.

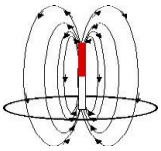
Over-Temperature

The DBD 1000 should not be covered in a way that the active cooling is reduced. The DBD 1000 housing temperature may reach 65°C. The ambient temperature must not exceed 40°C.

The DBD 1000 output is save against short or open contact and the DBD 1000 is temperature controlled. If the heat sink exceeds 65°C or falls below 5°C the output is switched off and an over temperature level LED at the front and the digital interface shows the failure. After cooling down the DBD 1000 can be started again.

Over temperature warns you that a massive error occurred!

Take care the DBD 1000 is not covered and the ambient temperature around the DBD 1000 does nor exceeds 40°C. If necessary, lower the ambient temperature by active cooling.

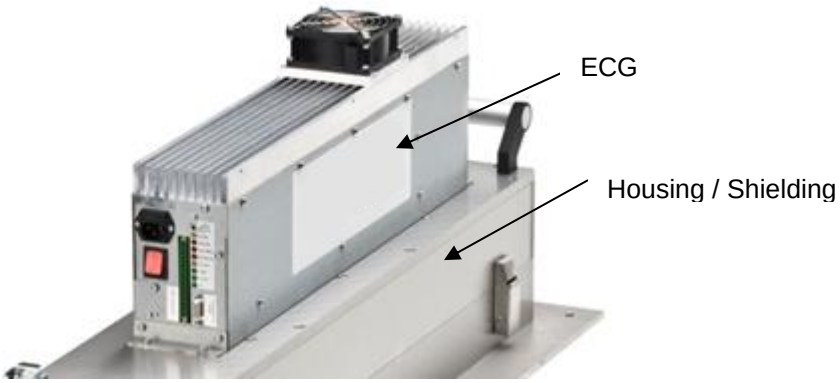


EMC Shielding

Please note that the DBD 1000 is a 90 kHz high voltage frequency generator. A XERADEX® lamp is powered by repetitive very short high voltage pulses. DBD 1000, XERADEX® -lamp and the cable between DBD 1000 and XERADEX® have to be in a closed, high frequency shielded, unit carefully connected to ground.

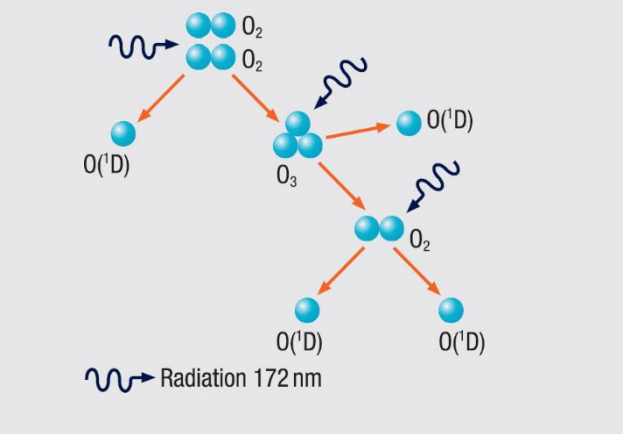
If the DBD 1000 is mounted outside housing and shielding, DBD 1000 has to be carefully connected to the housing (see assembly example p.7). The cable length outside the housing should be as short as possible. Please note that the lamp-cable is not shielded. Close shield braid reduces the lamp efficiency. For further information contact Radium.

Before connecting the DBD 1000 to mains and before connecting the XERADEX® lamp to the DBD 1000 take care that a safe PE connection between DBD 1000 and lamp socket is always given.



Ozone generation

XERADEX® emits 172 nm vacuum ultraviolet radiations (VUV). Radiation below 200 nm is absorbed by oxygen and the oxygen then is partly transformed into ozone and activated atomic oxygen. Ozone is a harmful colourless or bluish gas with a strong characteristic odour. Due to the strongly oxidizing properties of ozone, ozone is a primary irritant, affecting especially the eyes and respiratory systems. It can be hazardous at even low concentrations.

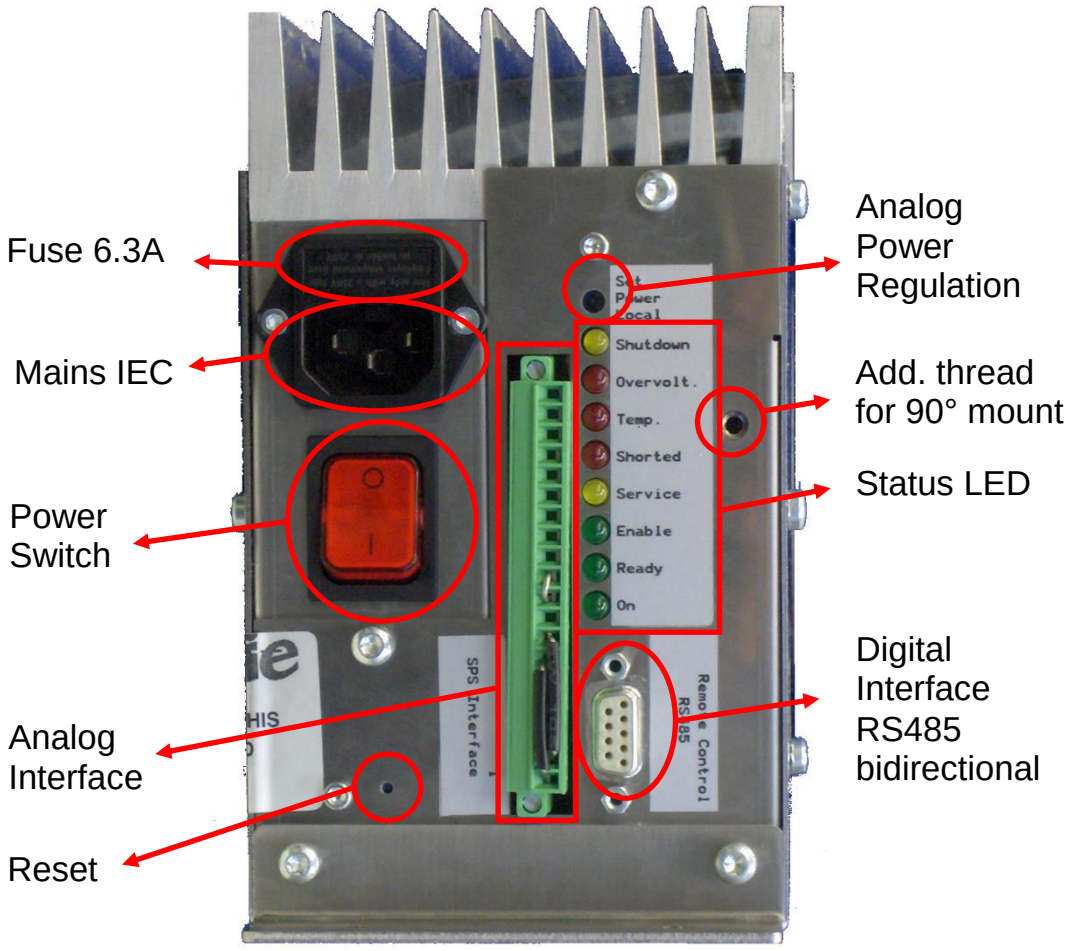


Using XERADEX® in air or oxygen is only possible in a closed system or together with an exhaust system which protects the user from ozone contact.

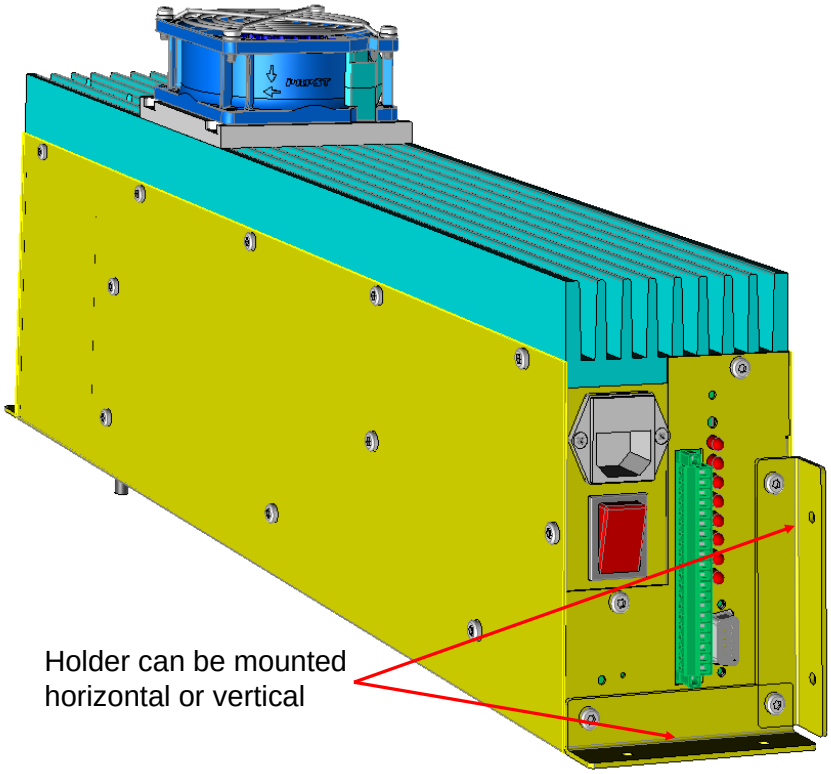
The ECG DBD 1000 has to be outside the ozone containing area.

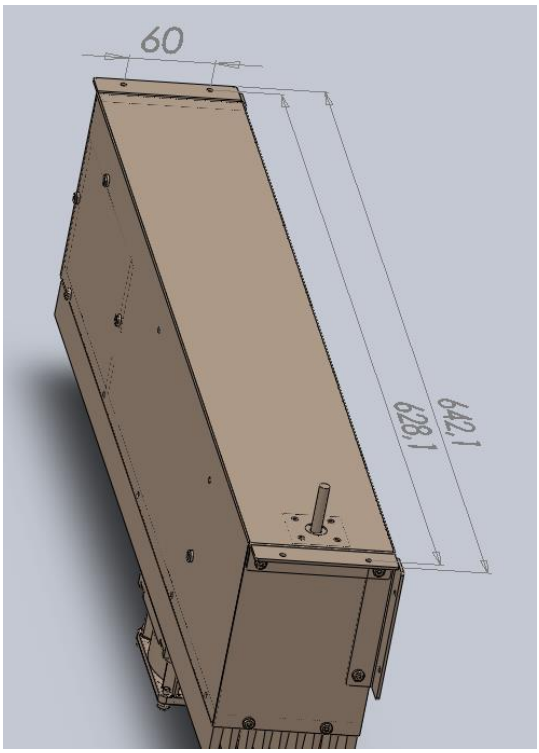
From "**International chemical safety card 0068**":
EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the respiratory tract inhalation of the gas may cause lung oedema. Inhalation of the gas may cause asthma-like reactions. The substance may cause effects on the central nervous system, resulting in headache and impaired vigilance and performance.
EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Lungs may be affected by repeated or prolonged exposure to the gas.

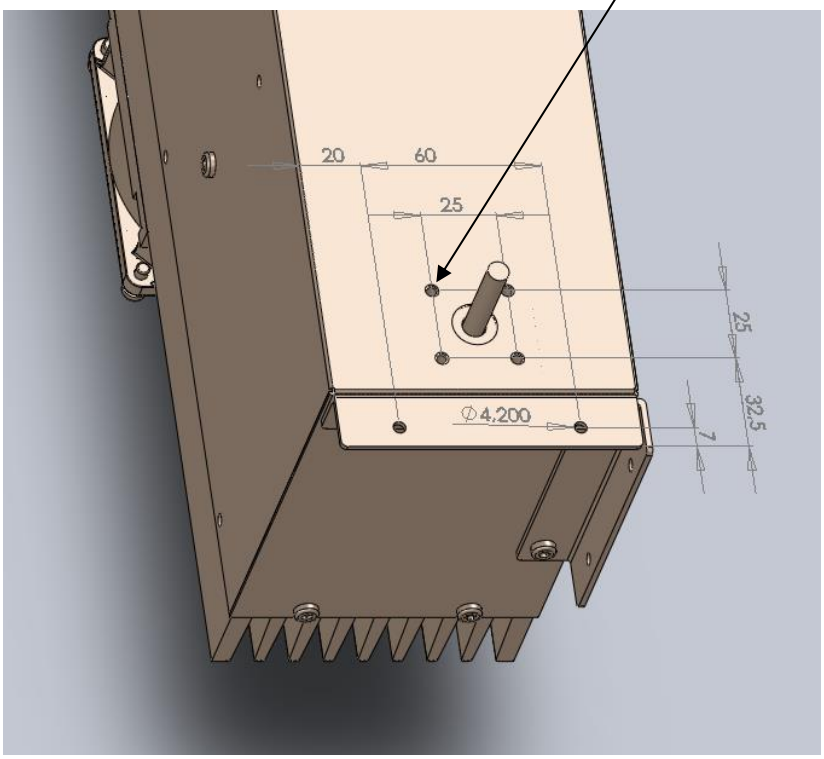
Front panel


Fuse 6.3A
Mains IEC
Power Switch
Analog Interface
Reset
Analog Power Regulation
Add. thread for 90° mount
Status LED
Digital Interface RS485 bidirectional
Shutdown
Overvolt.
Temp.
Shorted
Service
Enable
Ready
On
SPS Interface
Remote Control RS485

Mechanical installation







Electrical connection data

Mains voltage	**220V (+/- 10%) 50/60Hz** **230V (+/- 10%) 50/60Hz** **240V (+/- 10%) 50/60Hz**
Phases	**1**
Power	**P = 1200W**
Current	**6 A**
Fuse	**Fine-wire fuse (6,3 A) inside IEC mains connector**
Efficiency	**η >= 0,70**
Ground leakage current	**I < 3,3mA (230V/50Hz)**
Operating conditions	**permanent**
Degree of protection	**IP40**

Output data

Output	**galvanic isolated**
Output voltage	**Max. - 5kV**
Output power	**Max. 1000W**
Stand by	**20 W**
Output power regulation @ 100%	**0 W, 100 W - 1000 W**
PWM dimming	**20 % - 100 % (0 % = off)**
Frequency	**90 kHz**
Distance ECG - lamp	**0.6 m**
Number of lamps	**1**

Surrounding conditions

Storage temperature	**- 20°C**	**to**	**70°C**
Surrounding temperature in operation	**10°C**	**to**	**40°C**
Rel. humidity while storage	**10%**	**to**	**90%** **always above dew point**
Rel. humidity in operation	**30%**	**to**	**60%** **always above dew point**

Interface

Serial Interface (Remote control RS485)

Sub-D 9-pole / socket

Pin	Name	Function
1	GND485	Ground interface RS485
2	R +	Differential Rx + Signal
3	T -	Differential Tx - Signal
4	GND485	Ground interface RS485
5	GND485	Ground interface RS485
6	GND485	Ground interface RS485
7	R -	Differential Rx - Signal
8	T +	Differential Tx + Signal
9	GND485	Ground interface RS485

Protocol

The communication via RS485 follows the RS232 protocol with the following settings:

- 1 stop bit
- no parity bit
- 8 char bits
- 9600 Baud (default)

Text is transmitted in ASCII-format.

Command	Description
<A>'y'<CR>	Set Input for dimming 'y' = <Y> for dimming analog 'y' = <N> for dimming digital
<A><?><CR>	Request which input for dimming is active Answer: <A>'y'<CR><LF> 'y' = <Y> for dimming analog 'y' = <N> for dimming digital
<Z><?><CR>	Request which max. power is set

	Answer: <Z>'x''x''x''x' <CR><LF> **'x''x''x''x' = <0>** **to <9><9><9><9> power in W**
<P>'x''x''x'<CR>	**Set dimming (in %)** **'x''x''x' = <0>, <2><0> to <1><0><0>** **percent of set max. power**
<P><?><CR>	**Request which dimming percentage is set** **Answer: <P>'x''x''x''x' <CR><LF>** **'x''x''x''x' = <0> to <9><9><9><9> set dimming in %**
<H><CR>	**Request of system lifetime (in h)** **Answer: <H>'x''x''x''x''x'<CR><LF>** **'x''x''x''x''x' = <0><0><0><0><0> to <9><9><9><9><9> hours**
<L><CR>	**Request of lamp lifetime (in h)** **Antwort: <L>'x''x''x''x''x'<CR><LF>** **'x''x''x''x''x' = <0><0><0><0><0> to <9><9><9><9><9> hours**
<L><C><CR>	**Reset of lamp lifetime (in h)**
<T><CR>	**Request of ECG temperature (in °C)** **Answer: <T>'x''x''x''x''x'<CR><LF>**
<V><?><CR>	**Request of delay in dimming increase** **Answer: <V>'x''x''x''x'<CR><LF>** **'x''x''x''x''x' = <0><0><0><0> to <9><9><9><9><9> x1.1067ms time delay**
<V>'x''x''x''x'<CR>	**Set delay in dimming increase** **'x''x''x''x''x' = <0><0><0><0> to <9><9><9><9>** **Delay is xxxx times 1.1067ms per every 1% of dimming increase. For sample see chapter: "Time Delay for dimming"** **Delay is active after each switch-on or increase of dimming. Delay is not active at decrease of dimming or switch of by setting dimming to 0%.**

<S><CR>	**Request of measured output power (in W) and system status** **Answer: <S>'x''x''x''x''z'<CR><LF>** **'x''x''x''x' = <0> to <9><9><9><9> measured output power in W** **'z': Variable number (0 to 9 possible) of Status flags following the measured power.** **The following Status flags can be send:** **- <T> Temperature error** **- <t> Temperature warning** **(See also chapter over temperature)** **- <l> Cooler warning** **- <C> Cooler and/or temperature have or had fault** **- <K> Short at HV-Output** **- <O> Overvoltage at Output (hardware detection)** **- <o> Overvoltage at Output (software detection)** **- <L> Lamp defect (not expected measured values during ignition or running)** **- <N> Emergency stop**
<U><CR>	**Request negative voltage maximum (in V)** **Answer: <U>'z''x''x''x''x''x'<CR><LF>** **'z': sign <-> if negative, none if positive** **'x''x''x''x''x' = <0><0><0><0><0> to <9><9><9><9><9> V**
<I><CR>	**Request negative current maximum (in mA)** **Answer: <U>'z''x''x''x''x''x'<CR><LF>** **'z': sign <-> if negative, none if positive** **'x''x''x''x''x' = <0><0><0><0><0><0> to <9><9><9><9><9><9> mA**

Time delay for dimming

Under some circumstances XERADEX lamps tend to produce some filaments inside the lamp that decrease the homogeneity of the lamp output for the first seconds or minutes after switching on cold lamps. That effect only occurs under high power conditions of 350 – 500 W/m and disappears automatically. To avoid this effect it is best not to cool the switched off lamps. Additionally the lamps can be warmed up either by dimming stepwise to the requested value or use the automatic delay function.

By setting a “V” value with help of the RS485 interface every time the lamp is switched-on by switching on the ECG or by increasing the value for dimming a time delay is active. The delay is active after each switch-on or increase of dimming until it is changed again. The value is stored permanent in the ECG. The delay is not active at decrease of dimming or switch of by setting dimming to 0% or switch of the ECG completely.

Delay is the preset “V” value times 1.1067ms per every 1% of dimming increase.

Example: Delay-factor is set to 904 and the power is increased from 0% to 100% or switched on with preset 100%. The dimming will be from 0% to 20% instantaneously and from 20% to 100% every second 1%, so 100% will be reached after 80s.

Status LED

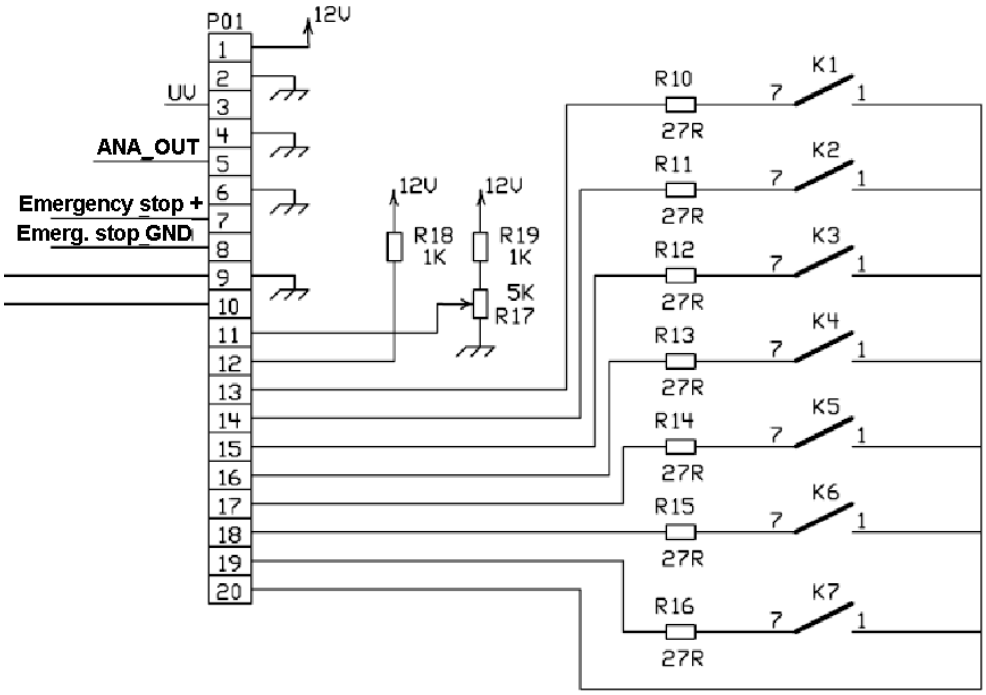
Diode	Name	Color	Function
1	On	Green	ECG switched on
2	Ready	Green	ECG ready
3	Enable	Green	Lamp active
4	Service	Yellow	Unexpected parameter
5	Shorted	Red	Short at HV-Output
6	Temp.	Red	Temperature error (Heat sink exceeds 65°C or falls below 5°C)
7	Overvolt.	Red	Overvoltage at Output
8	Shutdown	Yellow	Emergency stop Output is locked by hardware LED off if interlock loop is open

Analog Interface

Phoenix plug MCV 1,5/20-GF-3,81

Pin	Name	Function
1	+12 V	Internal 12 VDC (max. 100 mA)
2	GND	Internal ground
3	UV	Not used
4	GND	Not used
5	ANA_OUT	Analog output proportional to lamp power
6	GND	Internal ground
7	Emergency stop V+	Emergency stop: HV output active if voltage 10 V – 24 V applied, otherwise output locked by hardware
8	Emerg. stop GND	Emergency stop ground
9	GND	Internal ground

10	**LSTG**	**Analog Input for power regulation (PWM dimming)** **0 V; 2 V -10 V correlate 0 %; 20% - 100%**
11	**U pot.**	**Output internal potentiometer** **Can be bridged to PIN10 to regulate by internal potentiometer**
12	**Ext. potentiometer**	**Output to use external 5kΩ potentiometer, sliding contact to be connected to PIN10**
13	**On**	**Relay K1**
14	**Ready**	**Relay K2**
15	**Enable**	**Relay K3**
16	**Service**	**Relay K4**
17	**Shorted**	**Relay K5**
18	**Temperature**	**Relay K6**
19	**Overvoltage**	**Relay K7**
20	**GND Relays**	**Common ground for K1 – K7**



Reset button

At interface side of the DBD1000 below the power switch there is a hole with a reset push-button behind (see pic. page 8). If pressed for 5 seconds the DBD1000 switches back into the defined state of analog power regulation and 9600 Baud serial communication.
The correct reset will be signalized by the simultaneous shine of LEDs "Shorted" and "Overvoltage". The DBD1000 has to be switched of and restarted afterwards to be used again.

Starting the DBD1000

If the DBD1000 is connected to mains and switched on the LED "ON" lights green. If emergency stop is supplied with 10 – 24 V LED "Shutdown" lights yellow. Earliest after 15 sec the DBD1000 is ready (LED "Ready" green) and the lamp can be activated.

CAUTION ! The DBD1000 will be started with the last used parameters.

If the XERADEX lamp is on the LED "Enable" lights green. If the DBD1000 switches of automatically (LEDs "Overvolt" or "Temp" or "Shorted" lighting red), the DBD1000 has to be switched off and restarted to be used again. Please be aware automatic switch-off may show a massive error. Control setup and remove failure before restarting again.

Cooling

The DBD1000s heat sink at the top side is cooled by an external fan. The fans rotation speed is power and temperature dependent regulated. The DBD1000 works up to a heat sink temperature of 65°C. At temperatures higher than 60°C or lower than 5°C a warning via the RS485 is given. At temperatures higher than 65°C or lower than 5°C the HV output is switched off automatically. The internal circulation is ensured by an additional fan inside the DBD1000.

Position

The DBD1000 can be mounted and run in any position.

Contact

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Appendix A: Mate N-Lock plug