

# *External RF Driver*

Electrical Driver for AOTF-crystal

## Instruction Manual



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# 1 General

## Introduction

Please take the necessary time to read this manual. It contains information concerning the usage of the External RF Driver.

This manual covers the External RF Driver, with the product number A901-100-000

The External RF Driver is for use with the SuperK EXTREME, which comprises a Class 4 laser and only persons who are familiar with laser safety regulations are allowed to operate any of these systems.

This product is not UL-approved but all safety components are UL-approved.

Do you have any questions concerning this product, please do not hesitate to contact us at [support@nktphotonics.com](mailto:support@nktphotonics.com).

## Description

The External RF Driver is an electrical driver for the Acousto-Optic Tunable Filter (AOTF) used in e.g. the SuperK SELECT. Together with the SuperK SELECT the External RF Driver can be configured to select up to 8 desired wavelengths from the SuperK EXTREME output spectrum.

The External RF Driver is easy to use together with the SuperK EXTREME system as it should be connected to the External Bus on the SuperK EXTREME system and is controlled via the SuperK EXTREME graphical user interface SuperKontrol 2.0.

The SuperK accessory range completes the SuperK ecosystem with plug-and-play filters and fiber delivery systems providing robust filtering and routing options in an easy-to-use format. All accessories are source-independent, and can be used with any of the SuperK EXTREME models.

# 2 Compliance

## CE Approval

The External RF Driver is CE-marked. The External RF Driver is by nature a high power Radio Frequency transmitter and the radiated emission is therefore dependant on what is connected to the RF output. So with e.g. a single-shielded coax cable the radiated emission will exceed the specified limits for CE-compliance.

The External RF Driver has been tested preliminary for radiated emission in a radio frequency non-anechoic room with the SuperK SELECT with a 1.5 meter RG223 coax cable. Even with all eight channels operating at 100 % RF power, which is very unlikely in a real situation, the radiated emission from the External RF Driver, coax cable and SuperK SELECT is believed to be below the maximum limit in a radio frequency anechoic room.

### 3 Labeling

#### Item

The Item label provides information about:

- the manufacturer of the system (NKT Photonics, Blokken 84, DK-3460 Birkerød)
- a short name of the system, External RF Driver
- the product number (P/N) A901-100-000
- the serial number (S/N) for the actual system 8 digits, e.g 11150140
- the design version (Ver), e.g. 01
- when the actual External RF Driver was manufactured, e.g. 03-2011 for March 2011
- that the system meets the EU consumer safety and environmental requirements (CE-mark).



Figure 2-1: Item label

#### Label Position

The figure below shows the position of the Item label.



Figure 2-2: Item label on the back of the External RF Driver

#### Warranty Label

It is not allowed to open the External RF Driver. Thus the External RF Driver is equipped with a warranty label on the top cover, see figure below. The warranty void if the system is opened.



Figure 2-3: Warranty label on the top cover

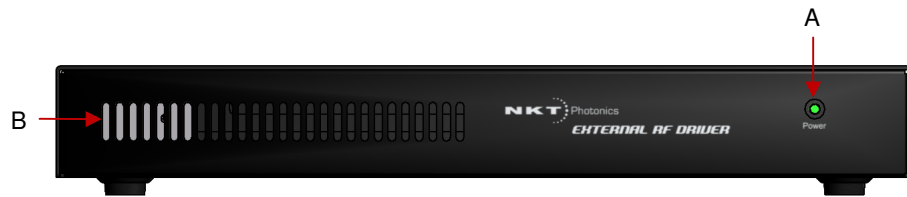
## 4 Interface

The External RF Driver has the same width and depth as the SuperK EXTREME system. The External RF Driver is designed so it can be placed underneath the SuperK EXTREME system.

The following sub-sections describes interfaces on the front and back panels on the External RF Driver.

### 4.1 Front Panel

The front panel features a line power indicator and air inlet.



*Figure 3-1: Front panel of External RF Driver*

#### Front Panel Interfaces

- A. Line Power indicator: Green emitted light verifies that the system is powered up.
- B. Air inlet: Together with inlet on both sides of the system, the inlet on the front panel provides the air inlet for the thermal cooling of the External RF Driver. Do not cover or block the air inlet.

## 4.2 Back Panel

The back panel features all electrical and connections and air outlet on the External RF Driver.

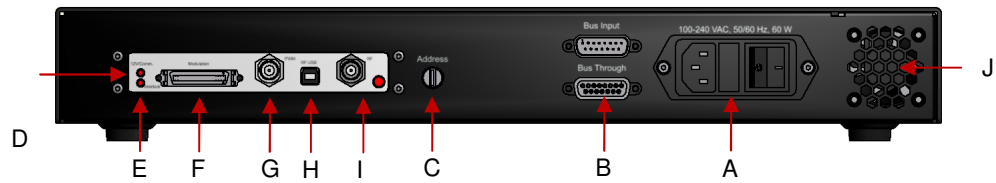


Figure 3-2: Back panel of External RF Driver

### Back Panel Interfaces

- A. Power inlet and Main power switch
- B. Bus Input and Bus Through
- C. Address Selector
- D. 12VComm LED
- E. Interlock LED
- F. Modulation Input (Future Use)
- G. PWM Output (Future Use)
- H. RF USB Connection
- I. RF Output and LED
- J. Air outlet

### 4.2.1 Power Inlet and Main Power Switch

#### Power Inlet

The External RF Driver has a universal main input allowing from 100 to 240 VAC, 50/60 Hz, IEC socket, type C13. The system must be connected to protective earth.

The External RF Driver dissipates maximum 60 W from the Power inlet.

#### Mains Power Switch

The Mains Power Switch turns the External RF Driver ON/OFF.

#### Fuses

In between the Power Inlet and the Mains Power Switch there is a socket for two fuses. If fuses have to be replaced, T2A/250V types must be used.

## 4.2.2 Bus Input and Bus Through

The Bus Input and Bus Through Output is a digital bus interface and 12 volt supply connection from the SuperK EXTREME system. The bus can support up to 16 external accessories. Additional accessories are connected to the Bus Through port (B in fig. 3-2).

### Current Consumption

The External RF Driver itself draws maximum 150 mA from the 12 volt supply in the digital bus.

### Pin Connections

The table below provides the pin-out on the Bus Input and Bus Through.

Pin no.	Name	Description
1	NC	Not connected.
2	RS485-	The negative/inverted part of the RS485 communication signal.
3	Interlock loop+	Positive connection of interlock loop. Should be connected to Interlock loop- (pin no. 4) to enable laser emission from the system.
4	Interlock loop-	Negative connection of interlock loop. Should be connected to Interlock loop+ (pin no. 3) to enable laser emission from the system.
9	Emission	Logic output. High when the SuperK EXTREME system has laser emission. With an 240 $\Omega$ internal series resistor the Anode from a LED can be connected directly to this pin and the Cathode to GND (pin no. 5,6, 13 or 14) to indicate laser emission externally.
10	RS485+	The positive/non-inverted part of the RS485 communication signal.
11	Not in use	For future use. Do not connect anything to this pin.
12	Interlock	Logic output. High (5V) when interlock circuit is not open and has been reset. This signal can be used to control safety related precautions on the External bus.
5, 6, 13, 14	GND	0 volt / ground.
7, 8, 15	+12 V	+ 12 volt supply connection.

Table 3-1: Bus pin-out

### External Bus Defeater

If no other accessories are connected to the Bus Through output, the bus has to be terminated with an External Bus defeater providing a short connection on pin 3 and 4 (Interlock loop).

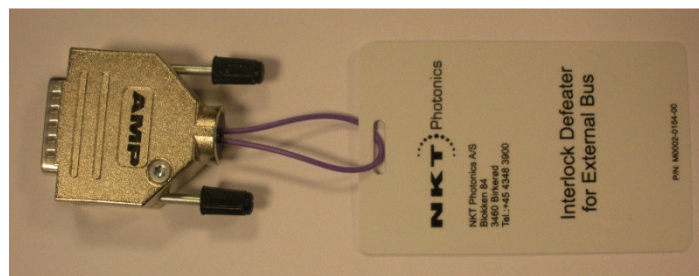


Figure 3-3: External Bus defeater

## Cable

The digital bus can be connected to multiple external accessories. Each bus cable length must be 3 meter long or less. All bus cables must be shielded.

### 4.2.3 Address Selector

On the digital bus used for communication between the SuperK EXTREME system and external accessories, all accessories communicating on the bus should have unique individual addresses.

The Address Selector has 16 different settings, from 0 to F (hexadecimal numbers).

Set the selector to a unique position before powering up the SuperK EXTREME system.

### 4.2.4 12V/Comm LED

This LED indicates status for the supply voltage and the communication from the RF Driver. The 12V/Comm LED emits green light when the 12 volt supply voltage is present and accurate. The LED emits red light if the 12 volt supply voltage is too low. When the 12 volt supply voltage is present and the RF Driver transmit on the digital bus the 12V/Comm LED emits yellow light.

### 4.2.5 Interlock LED

The Interlock LED shows the status of the Interlock signal. When the Interlock LED emits green light the Interlock signal is present and the system may be able to provide laser emission. If the Interlock LED emits red light, the Interlock chain is broken and the system cannot provide laser emission.

### 4.2.6 Modulation Input

The Modulation input is for future use. The input will in future be used for amplitude modulation (AM) and frequency shift keying (FSK) of the RF Driver channels.

### 4.2.7 PWM Output

The PWM output is for future use. The output can provide an 0 to 200 kHz pulse width modulated output. This output will in future be used for the FSK inputs on the Modulation connector.

The PWM cable must be less than 3 meters long. A standard single-shielded RG-58 cable can be used.

### 4.2.8 RF USB Connection

Direct USB connection to the internal RF Driver. All communication between the user interface SuperKontrol 2.0 and the SuperK EXTREME system goes via the other USB connection (F).

The USB cable must be less than 3 meters long. A standard USB cable can be used.



## **4.2.9 RF Output and LED**

High frequency output for connection to the RF input on the SuperK Select or SuperK Cross. This output can provide watts of RF-power and must be terminated into a proper load, e.g. SuperK Select or SuperK Cross.

The red LED indicates when the RF Driver output is active. With RF-power on the output the cable between the RF-output on the RF Driver interface and the external accessory must not be disconnected as this may damage the RF Driver.

The RF cable between the RF Driver and the external accessory should be as short as possible and less than 3 meters. The cable type should be a double-shielded type, e.g. RG-223.

## **4.2.10 Air Outlet**

The SuperK EXTREME is cooled down with air sucked in from the air inlet on the two sides and the front panel and blown out via the air outlet on the back. The system features five fans, one small fan in the bottom and four larger fans above. The four larger are all electrically controlled, i.e. air flow is adjusted as needed. Common for all air outlets and inlets is that they must not be covered off.

## 5 Installation and Operation

### Turn Off System

Before connecting the External RF Driver to the SuperK EXTREME system and other accessories, make sure that the SuperK EXTREME system and External RF Driver is completely turned off on the mains switches on the back of the SuperK EXTREME system and External RF Driver.

### Bus Input

Connect the Bus Input on the External RF Driver to the External Bus connector on the back of the SuperK EXTREME system.



Figure 4-1: Bus cable connected to SuperK EXTREME system.

For reasons of clarity only the electrical connection related to the External RF Driver is shown here. In order for the SuperK EXTREME system to work the power supply and the door-switch interlock must also be provided.

### Bus Through

Use the Bus Through connector for other NKT Photonics accessories that should be connected to the digital bus. If the External RF Driver is the last accessory on the digital bus, then connect the External Bus defeater to the Bus Through connector.

### Address Selector

Please make sure that if more external accessories communicating on the digital bus are connected to the bus, please set the Address Selectors on the various accessories to different addresses, so the communication does not get corrupted.

### RF Output

Connect RG-223 BNC-BNC cables from the External RF Driver to the RF input on the accessory with the AOTF crystal the External RF Driver is intended to drive.



Figure 4-2: RF BNC cable connected to RF Output.

### Optical Connections

As the External RF Driver is a purely electrical device, please refer to the instruction manuals for the SuperK EXTREME system and optical accessories on e.g. how to connect and what to be aware of. The SuperK EXTREME is a class 4 laser and as such dangerous.

### Turn On System

When the electrical connections have been established as described above and the optical connections have been safely established as described in the SuperK EXTREME instruction manual and other instructions manuals for optical accessories, the mains switches on the back of the SuperK EXTREME system and External RF Driver can be switched on.

Given that the Address Selector on the External RF Driver and other external accessories are all set to unique addresses the SuperK EXTREME system will automatically find all these accessories during start up.

The SuperK EXTREME system can following be operated with accessories as described in the SuperKontrol 2.0 manual.

### Warning

Do not disconnect the BNC cable from the RF Output on the External RF Driver or on the input of the accessory where the RF Output is connected to when the RF Output LED emits red light as this may damage the External RF Driver.

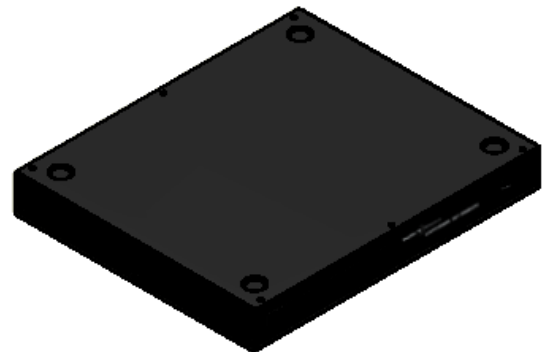
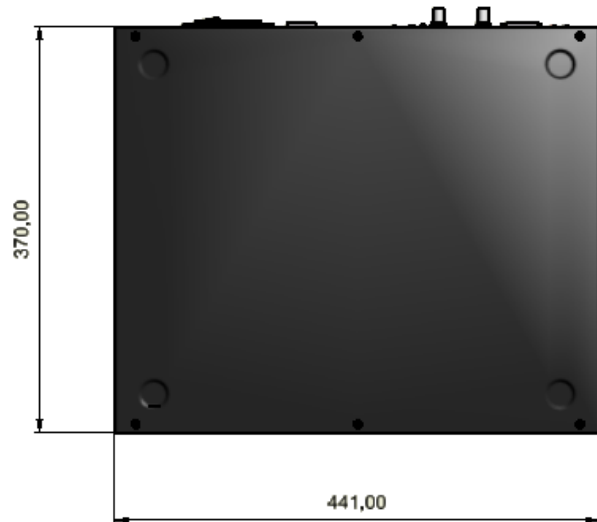
## 6 Service

The External RF Driver does not contain any user serviceable parts. If the system starts to malfunction, consult NKT Photonics A/S. The unit is sealed with a label "WARRANTY VOID IF REMOVED" and the chassis should under no circumstances be opened.

## 7 Electrical and Mechanical Specifications

Parameter	Conditions	Value	Unit
Temperature range	Ambient temperature	15 to 37	°C
Humidity	Non condensing	20 to 80	%RH
Supply voltage		100 to 240	VAC
Power dissipation		Max. 60	W
Fuse		T2A/250V	-
Height	See drawing below	65.8	mm
Width		441.0	
Depth		370.0	
Weight		5	kg

### 7.1 System Dimensions



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