

# KORE / KORE HD

Laser Show Projector



## Information and Manual

Version 1.5

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# This is EVIL KORE.

Thank you for purchasing a KORE laser system by EVIL lasers/LIVE Lasersystems. Your laser system has carefully been handcrafted in Austria for professional needs all around the world. We hope that this laser system will be a true work horse for your applications.

To ensure a safe and smooth operation, please read this manual carefully. Yet it is mandatory to be aware of all possible dangers related to the use of show laser systems. Depending on the country you are, certain additional qualifications like a LSO (laser safety officer) may be required to operate this product legally. Furthermore, it may be the case that this laser projector needs to be registered at your local authorities before using it publicly. Please contact your local competence center for further information. If you need any help making the KORE legal to use in your country, please contact us.

Moreover, if you experience any problems related to this laser system, contact us. Our contact information can be found at the end of this document. We are happy to help!

## Power Supply and Fuses

The KORE supports voltages between 95V and 250V. Use the included Neutrik Powercon cable only, to connect to your power outlet.

The used fuse is a 5A (slow-blowing). In case you need to change, do not use fuses above this value.

You can use the Powercon OUT connector to daisy-chain further KORE laser projectors. Never use more than 4 KORE in a row! Appropriate power cables for daisy-chaining can be purchased from LIVE Lasersystems.

## Signal Input

The KORE is compatible to the ILDA standard. Make sure to use shielded cables in order to ensure a proper laser output.

If your KORE has a FB4 installed you can use the “Network” port to connect your computer via an ethernet cable.

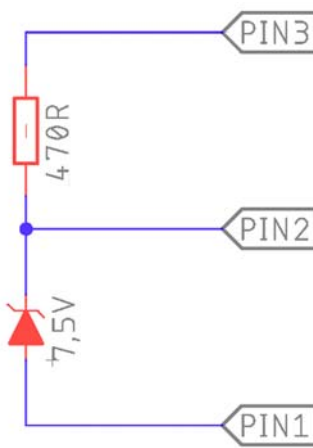
# Remote Interlock

## Bridging adaptor

There is a bridging adaptor available for the KORE laser systems. This adaptor is different to 3<sup>rd</sup> party adaptors due to the advanced KORE interlock system. Please contact LIVE Lasersystems for spare part purchasing information. However, you can make your own adaptor with a little solder skills and 3 components.

You need a 470Ω resistor, a 7,5V Z-diode (2% tolerance) and a 3-pin XLR connector (female, if you prefer to connect it to the “Interlock IN”).

Solder your bridging adaptor according to this schematic:



The bridging adaptor is capable of activating up to 20 KORE laser systems connected to the same interlock system.

The bridging adaptor is intended to be used for service purposes only. Using a bridging interlock adaptor for display purposes is not recommended and does not comply with the EN 60825-1.

## E-stop box

If you want to use the remote interlock using an e-stop, contact LIVE Lasersystems for purchasing the official e-stop box.



It is mandatory to use the official KORE e-stop box in order to be compliant to the EN 60825-1.

The KORE laser system according to EN 60825-1 consists of the KORE laser itself as well as an official KORE e-stop box. The user may integrate the KORE in another existing interlock system by himself/herself. In this case the user has to make sure that the whole system applies to the EN 60825-1 by himself/herself.

The e-stop works the following way: Once you connected the e-stop to a KORE, the EVIL lasers logo lights up. Turn the key switch on, release the e-stop button and press the activate button until the whole emission indicator LED strip above the laser aperture lights up (this takes at least 5 seconds). If the e-stop gets pushed/the key switch turned off or the power supply cut, the laser emission stops immediately. In order to activate again, you need to release the e-stop button again/turn on the key switch and keep pushing the activate-button for at least 5 seconds again.

The KORE has a redundant internal interlock system. It may be the case that only half of the emission indicator LED strip is lighting up. Make sure that you keep the activate-button pressed until the whole indicator strip has light up.

The "EMERGENCY STOP" lettering lights up if any e-stop button is pushed or any key switch is in the OFF position within the whole interlock network.

One KORE can each supply up to 3 e-stop boxes. Two KORE in the same interlock system may supply up to 6 e-stop boxes (and so on).

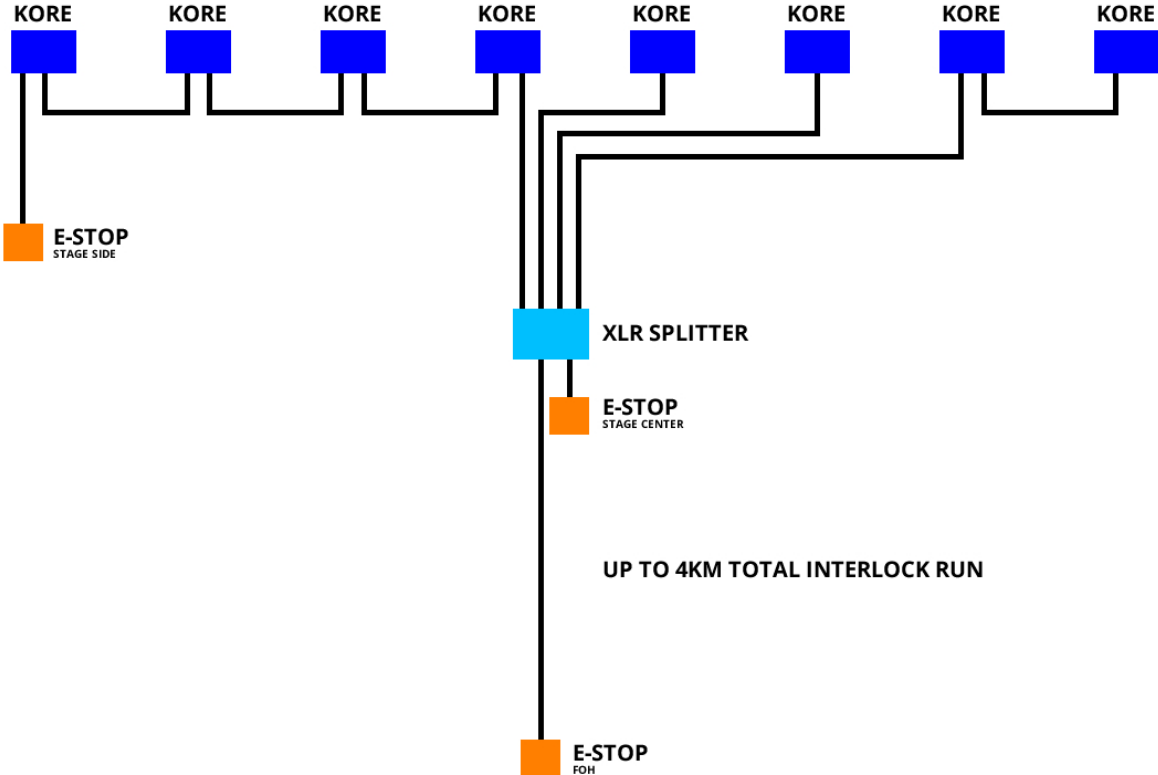
## **Cabling**

The maximum interlock cable length can be up to 4km (this only applies if the original KORE emergency stop box is used). Use standard microphone and/or DMX cables with standard XLR 3-pin connectors.

The KORE remote interlock system supports both, parallel and serial (daisy-chain) connection of KORE lasers and e-stops. This leads to the most flexible topography possible. E-stop boxes may be added at any point in the interlock systems. All e-stops must be released and all key switches turned on in order to enable laser emission by pushing the activate button for at least 5 seconds. Multiple e-stops do not defeat themselves!

If a bridging adapter is connected, an e-stop box would still work in the same interlock network. Keep in mind that all connected laser systems will activate themselves automatically if the e-stop button is released (and the key switch is in ON position) due to the bridging adapter.

The following schematic shows a possible remote interlock network:

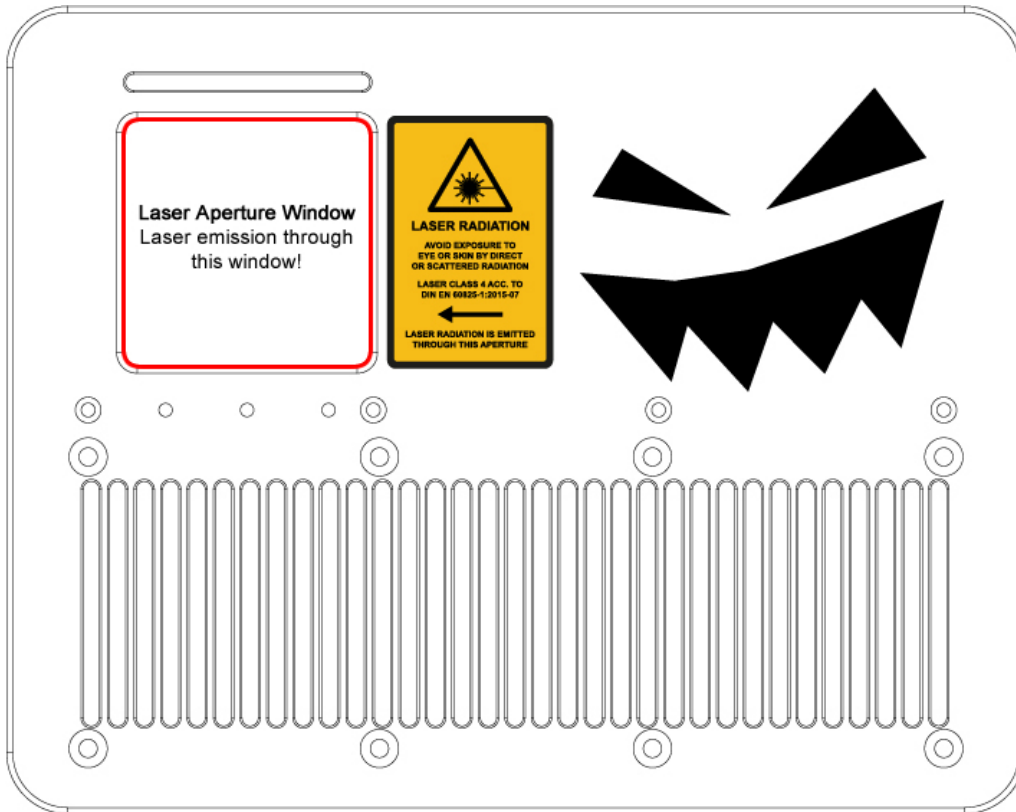


# Labeling and General Safety Information

Your KORE laser system comes with 2 different laser warning stickers. One is in English and one in German. Depending on the country you use your KORE, apply either-or right next to the laser aperture (according to the picture below).

International norms require a warning sign on a laser system. Make sure it is always visible.

If you lost a sticker or you need additional ones, please contact LIVE Lasersystems.



Take some time and read carefully all safety information on the enclosed labels:



LIVE Lasersystems and associates are not liable for any damages caused by misuse or improper use of any KORE laser system. The user is fully responsible for the safe use in his/her country.

Besides human/living organism injury, it is also possible that electrical devices like video projectors or camera systems may be damaged by the emitted laser radiation.

Handle the laser system with care. Optical and electronic parts may be damaged by wrong handling. Make sure to check the safe use of every laser system under secured circumstances before use in front of susceptible objects/living organisms. Do not use the laser system if something seems to be unsafe or if the "System Status" LED is lit red.

The laser system is sensitive to condensed water. Only use the laser system under noncondensing conditions.

The laser system is not waterproof nor is it completely dust proof. Make sure to use respective covers/enclosures for safe use. The official rain cover provided by LIVE Lasersystems is definitely a good way of protecting the laser system of water and snow. Nevertheless, LIVE Lasersystems does not take any responsibility for any damage caused by water or dust.

Make sure the laser system is used between -30°C and 50°C (ambient) temperature only! The laser system is not able to handle temperatures beyond these limits (f.e. if it is being used under direct sunlight).

All KORE laser systems are class 4 laser devices according to EN 60825-1 and shall be handled/used accordingly. It is highly recommended to attend a respective laser safety course before use.

Use decent clamps when mounting the laser systems on truss systems or other objects. Make sure the safety eye is used together with an appropriate safety rope. The weight of a KORE is max. 13kg. Scale your mounting devices accordingly. Special requirements may be mandatory by local laws. Make sure the laser system is secured according to these laws.

Make sure the laser system's ventilation area is free of blocking objects and enough air ventilation is ensured.

Switch off the laser system if it is not used for a longer period.

The laser system maybe needs to be inspected by technical control institutes and/or official experts.

Do not touch any trim potentiometer (on mainboard, diode drivers, scanner driver) inside the laser projector. If there is a need of adjusting any settings, please contact LIVE Lasersystems first.

Although this document is written with care, it is suspect to change and under continuous development. LIVE Lasersystems does not take any responsibility for any errors and/or resulting damages.

Contact LIVE Lasersystems for any updated manual documents.



# LED Indicators

The KORE has 3 indicator LEDs on the back. These show several states of the projector. Once the projector is turned on, it may be the case that some “warnings” occur. These will most probably be because of wrong temperature and are not to worry about. The projector is capable of compensating extreme temperatures (it may take up to some minutes in order to reach perfect operation temperature and therefore 100% output power).

## Interlock Status

No light: No bridging adapter or e-stop box is connected.

Orange light: A valid bridging adapter or e-stop box is connected. The ILDA interlock pins are not bridged though. There will be no laser output.

Green light: Everything is fine. A valid bridging adapter or e-stop box is connected and the ILDA interlock pins are bridged.

Red light: There is an error within the interlock network. Either the interlock connector is not valid or there is a short between the strands. Check all cables and connections.

## Temperature Status

No light: Everything is fine. The KORE’s heatsink has the perfect temperature for operation.

Blue light: The KORE’s heatsink is too cold for perfect operation. The KORE is now actively heating up until it reached the right temperature. During this time the laser output will be reduced to 50% power.

Red light: The KORE’s heatsink is too hot for perfect operation. The KORE is now actively cooling down until it reached the right temperature. During this time the laser output will be reduced to 50% power.

## Projector Status

Orange light: The temperature of the laser modules isn’t right. The thermo electric pads will heat up/cool down all modules until all of them reach the perfect temperature. During this time the laser output power will be reduced to 50%. If the heatsink temperature (temperature status LED) isn’t at perfect temperature, the laser output will be reduced to even 25%. Once all temperatures inside the projector reached their right level, the laser will again output its 100%.

If the orange light keeps lighting for more than 5 minutes, there may be a defect within the temperature control. In this case, please contact LIVE Lasersystems.

Green light: Everything is fine.

Red light: There is a major error within the projector. Please contact LIVE Lasersystems for further assistance.

# Scanfail Safety & Safety Features

The KORE is equipped with a scanfail safety circuit with some advanced features. All these features are accessible via the "Safety" USB port.

*If your KORE has a FB4 installed, the integrated scanfail safety comes with factory settings and cannot be changed. For advanced safety functions, use the FB4 ScanGuard function.*

The current KORE Safety Center software (Windows XP/7) can be downloaded via the following link:

[http://www.evil-lasers.com/downloads/kore\\_safety\\_center.zip](http://www.evil-lasers.com/downloads/kore_safety_center.zip)

The installation manual for the software and its drivers can be found here:

[http://www.evil-lasers.com/downloads/driver\\_installation\\_manual.pdf](http://www.evil-lasers.com/downloads/driver_installation_manual.pdf)

Once all drivers are installed, open the KORE Safety Center (the KORE is already connected to your computer). You can switch between English and German using the check boxes on the top right of the window. The following guide will use the English labeling of all buttons.

Click "Search Safeties" and wait until the KORE's safety is listed. Click on the new listed entry and switch to the "Safety Settings" tab. Click on "READ SETTINGS" button in order to get all values stored on your KORE's safety memory. You have now the possibility to change values of all safety functions.

**Notice: The KORE comes with a certain preset. We do not recommend changing any safety settings!**

The KORE's safety features different zones, like the "Single Beam Zone" and "Safe Zone". The "Single Beam Zone" disables all safety functions while the "Safe Zone" disables the laser output within the defined area. Both zones can be defined by first clicking on the respective button (f.e. "SINGLE BEAM ZONE"). Now you can click on either colored bar on top, right, bottom or left. If you now click into the black window (representing the laser output area), the zone slides from the respective side to the mouse cursor. All colored areas will be used as zone, the remaining black area stays untouched according to all safety settings. You can reset all zones by either resetting them individually or clicking the "RESET ZONE" button.

Once you have done all settings, click on "TESTING VALUES" followed by "SAVE NEW VALUES". Disconnect the KORE from your computer. Turn off the KORE, wait for 10 seconds and then power up again. The KORE should now have all new values stored.

**Notice: If you want to deactivate all safety features, simply define the "Single Beam Zone" covering the whole output area. Although, we never recommend disabling these safety features! (The scanfail safety is not affected by any settings done in the software).**

The KORE Safety Center also works on Windows 10 under certain circumstances. Please contact LIVE Lasersystems for further assistance.

If you experience any problems, please contact LIVE Lasersystems.

# Maintenance

The KORE is designed for low maintenance. Nevertheless, depending under which circumstances the laser projector is used, you need to clean the optics and/or readjust the beam alignment.

Do not open the laser system if you are not a professional. Any damages caused by the user voids warranty. LIVE Lasersystems offers maintenance services and service plans. Contact LIVE Lasersystems for more information.

To open up the KORE, you will need a Torx 10 screwdriver. The cover lid (top lid) can be released by unscrewing 22 screws. Before you remove the lid, please make sure the KORE is unplugged from any power supply. You may need to power up the KORE after the lid is removed in order to adjust the beam alignment. This is not recommended for any unexperienced user. It may be the case in which the laser emits in an unintended direction!

It is commonly known that there is laser emission right over the scanning unit. It may also be the case that laser light is emitted in any other direction. Expect it to be the same power, divergence and wavelengths as you would expect from the aperture window.

Wear safety goggles (optical density according to the used wavelengths and powers) when adjusting the laser alignment! The respective laser wavelengths and powers can be found under point "Laser Specifications".

Warning: Follow the instructions very carefully! It may be the case that hazardous laser light is emitted if different tools are used or different procedures are performed.

Please contact LIVE Lasersystems for further assistance.

## **Cleaning optics**

Make sure you use the right utensils and fluids to clean.

Aperture window: For the aperture window, you can use normal glass cleaner and a soft cloth for a streak-free result. Make sure you do not scratch the surface.

Dichroic filters/scanner mirrors: Use isopropyl alcohol and cotton sticks. Dip the cotton stick into the alcohol and make sure it soaks up completely. Now wipe over the optics while twisting the stick so the dust sticks on the whole cotton stick. Never use a cotton stick twice. Dust particles may scratch other optics respectively the coating.

If you have any questions left regarding the cleaning of optics, contact LIVE Lasersystems before accidentally making any damage.

## **Cleaning the outside and lower part**

Make sure the laser is unplugged from any power supply before cleaning.

The housing of the KORE is damp wipeable.

From time to time the lower part containing all low voltage power supply units needs to be removed from dust. Use an air compressor to carefully blow out all dirt and dust. Make sure the fans are blocked from spinning while blowing compressed air through the lower part of the laser projector.

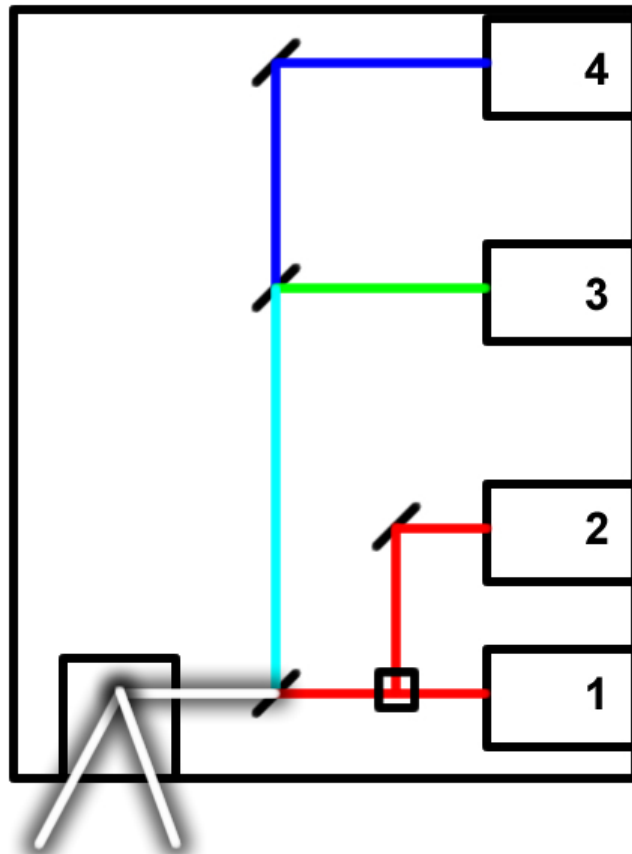
## **Adjusting the beam alignment**

The KORE uses highly stable optic mounts. Due to the high stability, the drawback is a slightly more complicated procedure (3 point mirror mounts) to realign all laser sources. For the adjustments, you will need a 0.9mm Allen key. Connect your laser show software to the KORE and draw either a single beam or any other simple figure. Make sure you use the color white, so that all color sources are used. Once the lid of the KORE is removed, you need to push down the blue interlock contact. Otherwise there will be no laser output. Turn down the laser power using the intensity potentiometers on the back of the KORE (if your KORE is equipped with a FB4, use the color intensity adjustment settings). You do not need the full intensity for the alignment. Just keep the power above visibility.

The following image shall assist you with the naming of all modules and the adjusting of the different color sources. The example shows a KORE 7 setup. Every mirror mount is adjusted using 3 Allen screws. The movement will therefore not happen in x and y direction but a mixture of both. You will need to approach the final adjustment by switching between those 3 screws a few times.

The first step is to cover/turn off all modules except for the first one. For covering use a non-reflective and heat resistant material. Module 1 shall directly point to the scanner mirrors. In the second step uncover the second red module (i.e. module 2). Use the Allen key to adjust the polarized beam splitter cube. Make sure the beam keeps aligned over a long distance (over 10m). You may use an external (first surface coated) mirror to extend the alignment distance. Do not adjust the mirror mount in front of module 2. Once you have realigned all red modules, continue with the blue module(s). By adjusting the dichroic filter in front of module 4, make sure the blue beam hits the dichroic filter in front of module 1 (the one left to the PBS cube). Now adjust this dichroic filter so the blue beam perfectly overlaps the red beam. Last but not least uncover/turn on the green source and adjust the dichroic filter in front of module 3 so that the green beam overlaps the magenta (red & blue) beam. The KORE is now realigned and the beam shall stay uniform over a long distance.

If you need to adjust a KORE 10 or 12, repeat the same steps like for the red modules also for the green and blue modules. If you experience a misalignment within one module (i.e. 2 diodes, 8 diodes (HD series)) please contact LIVE Lasersystems for further assistance.



# Laser Specifications

## **KORE 3**

Red laser source: 1.4W (635nm +/- 5nm)  
Green laser source: 1.0W (520nm +/- 5nm)  
Blue laser source: 1.4W (450nm +/- 5nm)  
Total output power: 3.8W (max.)

Divergence: < 0.55mrad (half angle), < 1.1mrad (full angle)  
Beam diameter: < 3mm (FWHM), < 5mm (1/e<sup>2</sup>)

Scanning speed DT-50: 43kpps (at 8° ILDA)  
Scanning speed EMS-8000: 60kpps (at 8° ILDA)

All scanning speed statements according to the respective manufacturer. Derivations may be the case.

NOHD (Nominal Ocular Hazard Distance): 392m

## **KORE 5**

Red laser source: 1.4W (635nm +/- 5nm)  
Green laser source: 1.0W (520nm +/- 5nm)  
Blue laser source: 2.8W (450nm +/- 5nm)  
Total output power: 5.2W (max.)

Divergence: < 0.55mrad (half angle), < 1.1mrad (full angle)  
Beam diameter: < 3mm (FWHM), < 5mm (1/e<sup>2</sup>)

Scanning speed DT-50: 43kpps (at 8° ILDA)  
Scanning speed EMS-8000: 60kpps (at 8° ILDA)

All scanning speed statements according to the respective manufacturer. Derivations may be the case.

NOHD (Nominal Ocular Hazard Distance): 459m

## **KORE 7**

Red laser source: 2.8W (635nm +/- 5nm)  
Green laser source: 2.0W (520nm +/- 5nm)  
Blue laser source: 2.8W (450nm +/- 5nm)  
Total output power: 7.6W (max.)

Divergence: < 0.55mrad (half angle), < 1.1mrad (full angle)  
Beam diameter: < 3mm (FWHM), < 5mm (1/e<sup>2</sup>)

Scanning speed DT-50: 43kpps (at 8° ILDA)  
Scanning speed EMS-8000: 60kpps (at 8° ILDA)

All scanning speed statements according to the respective manufacturer. Derivations may be the case.

NOHD (Nominal Ocular Hazard Distance): 556m

## **KORE 10**

Red laser source: 2.8W (635nm +/- 5nm)  
Green laser source: 3.0W (520nm +/- 5nm)  
Blue laser source: 4.4W (450nm +/- 5nm)  
Total output power: 10.2W (max.)

Divergence: < 0.55mrad (half angle), < 1.1mrad (full angle)  
Beam diameter: < 3mm (FWHM), < 5mm (1/e<sup>2</sup>)

Scanning speed DT-50: 43kpps (at 8° ILDA)  
Scanning speed EMS-8000: 60kpps (at 8° ILDA)

All scanning speed statements according to the respective manufacturer. Derivations may be the case.

NOHD (Nominal Ocular Hazard Distance): 645m

## **KORE 12**

Red laser source: 2.8W (635nm +/- 5nm)  
Green laser source: 4.0W (520nm +/- 5nm)  
Blue laser source: 6.0W (450nm +/- 5nm)  
Total output power: 12.8W (max.)

Divergence: < 0.55mrad (half angle), < 1.1mrad (full angle)  
Beam diameter: < 3mm (FWHM), < 5mm (1/e<sup>2</sup>)

Scanning speed DT-50: 43kpps (at 8° ILDA)  
Scanning speed EMS-8000: 60kpps (at 8° ILDA)

All scanning speed statements according to the respective manufacturer. Derivations may be the case.

NOHD (Nominal Ocular Hazard Distance): 723m

## **KORE 3 HD**

Red laser source: 1.3W (638nm +/- 5nm)  
Green laser source: 1.0W (520nm +/- 5nm)  
Blue laser source: 1.4W (450nm +/- 5nm)  
Total output power: 3.7W (max.)

Divergence: < 0.4mrad (half angle), < 0.8mrad (full angle)  
Beam diameter: < 3mm (FWHM), < 5mm (1/e<sup>2</sup>)

Scanning speed DT-50: 43kpps (at 8° ILDA)  
Scanning speed EMS-8000: 60kpps (at 8° ILDA)

All scanning speed statements according to the respective manufacturer. Derivations may be the case.

NOHD (Nominal Ocular Hazard Distance): 532m

## **KORE 7 HD**

Red laser source: 2.8W (638nm +/- 5nm)

Green laser source: 2.0W (520nm +/- 5nm)

Blue laser source: 2.8W (450nm +/- 5nm)

Total output power: 7.6W (max.)

Divergence: < 0.4mrad (half angle), < 0.8mrad (full angle)

Beam diameter: < 3mm (FWHM), < 5mm (1/e<sup>2</sup>)

Scanning speed DT-50: 43kpps (at 8° ILDA)

Scanning speed EMS-8000: 60kpps (at 8° ILDA)

All scanning speed statements according to the respective manufacturer. Derivations may be the case.

NOHD (Nominal Ocular Hazard Distance): 765m

## **KORE 12 HD**

Red laser source: 2.8W (638nm +/- 5nm)

Green laser source: 4.0W (520nm +/- 5nm)

Blue laser source: 6.0W (450nm +/- 5nm)

Total output power: 12.8W (max.)

Divergence: < 0.4mrad (half angle), < 0.8mrad (full angle)

Beam diameter: < 3mm (FWHM), < 5mm (1/e<sup>2</sup>)

Scanning speed DT-50: 43kpps (at 8° ILDA)

Scanning speed EMS-8000: 60kpps (at 8° ILDA)

All scanning speed statements according to the respective manufacturer. Derivations may be the case.

NOHD (Nominal Ocular Hazard Distance): 994m



# Contact

If you experience any faults or issues, please don't hesitate to contact us.

We are happy to help: [info@evil-lasers.com](mailto:info@evil-lasers.com)/[info@live-lasersystems.at](mailto:info@live-lasersystems.at) or +43 1 944 2883.