

# WarpCube E10 Scanhead

## Users Manual

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# 1 Copyright

This document is © by HALaser Systems / OpenAPC Project Group. This document and the described hardware is subject to modifications. Errors expected. This document is subject to change without prior notice. The given technical data base on specifications of the vendor of components of the hardware. Tolerances are to be expected. Duplication of this manual in whole or in part or reproduction by any means are forbidden without the prior, written consent of HALaser Systems.

WarpCube E10 scanheads, their hardware and design are copyright by Laser Control Systems.

# 2 Warranty

WarpCube E10 scanheads are manufactured by Laser Control Systems. Thus warranty and repair is done via the manufacturer directly. For details please refer to <http://lasercontrols.com/customer-support/> or contact HALaser Systems.

# 3 History

Date	Changes in document
11/2017	Functional description added
10/2017	Maximum scanning angle added
04/2017	Recommended working temperature added
01/2017	Power supply information extended
12/2015	Type name updated
08/2015	Technical data extended
07/2015	Mechanical drawings corrected
06/2015	Initial version

# 4 Safety

The hardware component described within this document is designed to be part of a laser scanner system which itself can be part of a machine. Laser radiation may effect a person's health or may otherwise cause damage. Prior to installation and operation compliance with all relevant safety regulations including additional hardware-controlled safety measures has to be secured. The client shall solely be responsible to strictly comply with all applicable and relevant safety regulations regarding installation and operation of the system at any time.

The hardware component described here is shipped without prefabricated equipment for electric installation. It is intended to be integrated in machines or other equipment. It is not for use "as is". Prior to operation compliance with all relevant electric / electromagnetic safety regulations including additional hardware-controlled safety measures has to be secured. The client shall solely be responsible to strictly comply with all applicable and relevant regulations regarding installation and operation of the system at any time.

The scanhead described here is designed to deflect an input laser beam and output it again. It can't block or weaken the laser beam. To prevent unwanted emission of the laser beam, above a particular danger class the laser device must be fitted with a shutter or any other suitable device. This laser device must be of sufficient

quality so that the laser beam can only be emitted at the beam output on the deflection unit. Proper warning signs have to be attached at the machine or device where this scanhead is used so clearly inform any user about all possible dangerous operations.

The surfaces of the scanheads mirrors are extremely sensitive and should not be touched in any way and may only be cleaned by experienced personnel. Thus we strongly recommend sending the deflection unit in to HALaser Systems for the mirrors to be cleaned, as opening of the scanhead by unauthorized personnel voids the warranty.



To improve the optical properties of the mirrors, lenses or protection glasses, different material are applied as coatings. Some of them may be potentially hazardous to health if inhaled or swallowed. Under normal circumstances, no special precautions are necessary when handling or storing mirrors, lenses or protection glasses with such specific coatings.

In case of damage to such a component and/or coating, follow these instructions:

- switch off the laser immediately
- avoid inhaling dust of possibly broken or burned components
- leave the room for at least 30 minutes
- wear gloves and a mouth protector while performing all the subsequent steps
- pack the optical elements in an airtight sealed plastic container, in case of fragments carefully collect up all fragments
- clean all contaminated components and surfaces with a damp cloth and pack the cleaning cloths in a sealed plastic container too
- ensure professional disposal of the container, optionally you also can return them to your supplier

Please note: these general instructions are relevant only in case special coatings are used on any of the optical components. This includes also third party components which may be operated together with the WarpCube scanhead (like F-Theta lenses or protection glasses). For detailed information about the used coatings, their dangerousness and for specific handling instructions in case of normal operation or damages, please contact the supplier of the related components.

## 5 Overview

This document describes the WarpCube E10 digital scanhead, its characteristics and usage.

This scanhead is a component according to Low Voltage Directive (LVD) 2006/95/EC of the European Union which can be used as part of a laser scanning system which itself can be part of a machine.

This document contains important information on qualified and safe handling of the WarpCube E10 scanhead. Therefore you should familiarize yourself with the content of this manual before using the scanhead for the first time. Furthermore this manual must be accessible to anyone who will be involved in developing, installing or using a laser device featuring the WarpCube E10 scanhead. When the scanhead is sold on, this operating manual or an authorized copy must be passed on with it.

## 6 Features and Technical Data

WarpCube E10 scanhead offers the following functions and features:

Type	fully digital, self tuning
Interface	two-channel XY2/100 (2D)
Power supply requirements	+24 V / 4 A
Idle power consumption (no galvo movements)	< 10 W
Mirror size	10 mm
Maximum Laser Power	50 W (special mirrors required for higher power values <sup>1)</sup> )
Screw thread for optics	M 85 x1
Positioning speed	up to 20 m/sec
Marking speed	up to 6 m/sec

Precision writing	500 cps
High quality writing	1000 cps
Resolution	10 $\mu$ rad
Total scanning angle	40 degrees
Scanner Lag (Tracking error)	0,13 msec
1% step response setting to 0,1% fs	0,28 msec
Scale drift	<40 ppm/ $^{\circ}$ C
Zero drift	<10 $\mu$ rad/ $^{\circ}$ C
Linearity	99,9%
Short term repeatability	<8 $\mu$ rad
Protection class	IP55
Weight	2,2 kg
Ambient temperature	10 .. 40 $^{\circ}$ C <sup>2)</sup>

<sup>1)</sup> at 1064 nm, requires precise central justification of the laser and utilisation of full available mirror surface; customer has to take care the laser does not hit the mounting points of the mirrors, this would lead to damage of the scanhead together with a loss of any kind of warranty. Depending on used pulses and frequency additional cooling of the head may be necessary.

<sup>2)</sup> Depending on used pulses, frequency and laser power, additional cooling of the head may be necessary also when operated under recommended temperature conditions.

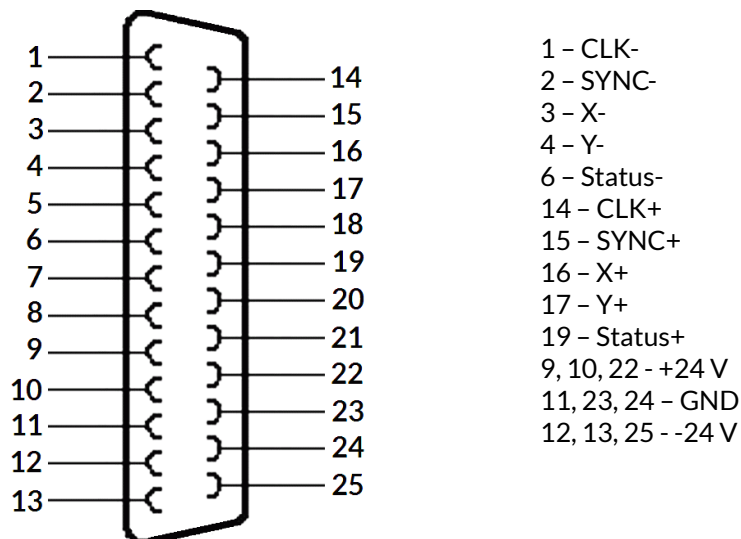
## 7 Functional Description

The WarpCube E10 scanhead can be used to deflect a laser beam in X and Y direction. This results in an area within which a laser can be moved to any position. This area is known as "marking field". This operation is performed by two mirrors, each of which is moved by a galvanometer scanner. The scanhead itself provides a beam input, into which the laser beam is fed, and a beam output, through which the laser beam is emitted from the unit after deflection. Only suitable lasers have to be fed into the beam input. Depending on some additional equipment, the beam output is either open or fitted with an F-Theta lens or protection glass.

An F-Theta lens is an optical component which is specially designed for use with 2-axis scanheads. It focuses the laser beam at optimum quality on any position in the marking field with a nearly constant beam length at all marking positions. Thus the desired marking field has to fit to an F-Theta lenses nominal size. At the same time such a lens provides partial optical compensation for the distortion that is unavoidable when using a two-axis scanhead unit. The remaining distortion must be compensated by the scanner controller card and/or the controlling software.

## 8 Electrical Connection

The scanhead is compatible with the industry standard XY2/100 data interface that is available on several industry-grade scanner controller cards (like E1701D controller). The pin out and voltage supply connections are shown below and require a male D-SUB25 connector:



The power supply needs to support up to 4 A current drain and needs to be a balanced +/- 24 V (+/- 0.25 V tolerance). In case the supply drops below +/- 18 V, the circuits will shut down. Typical idle currents are 130 mA for the -Ve rail and 260 mA for the +Ve rail. The current draw will only exceed 1.0 A average under very heavy driving conditions.



**ATTENTION:** Power has to be feed into scanhead only but never into connected controller card!



**ATTENTION:** During operation it has to be ensured the symmetric power with + 24 V and - 24 V is available all the time. Switching off one of both or unplugging the D-SUB25 connector during operation may damage electronics and - as follow up - the mirrors too.

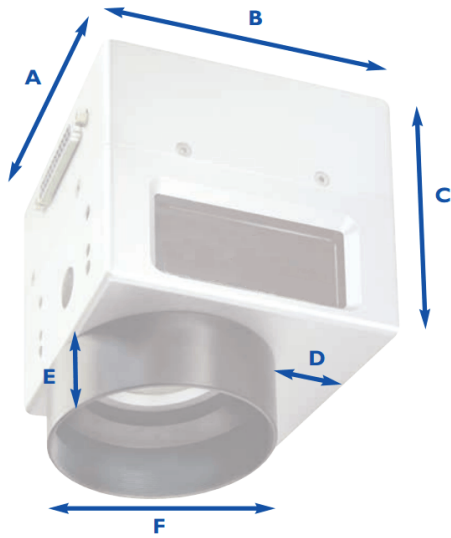
On power up the galvos will be checked by the internal digital signal processors to find the correct tuning parameters required for optimum performance. This sequence can take up to 30 seconds. Afterwards the head will be ready for use and will respond to the XY2/100 inputs as required.

If either of the galvos deflect outside of their maximum marking field, or if the RMS current rises above 2.5 A, or any other illegal operation condition appears, the head will shut down to avoid damages. In this case the X or Y

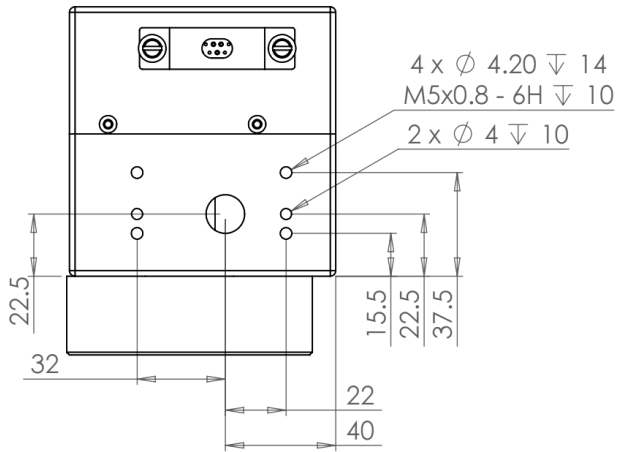
status LED will change from green to red. Normally the operation can be resumed by cycling the power off and on.

# 9 Mechanical Specifications

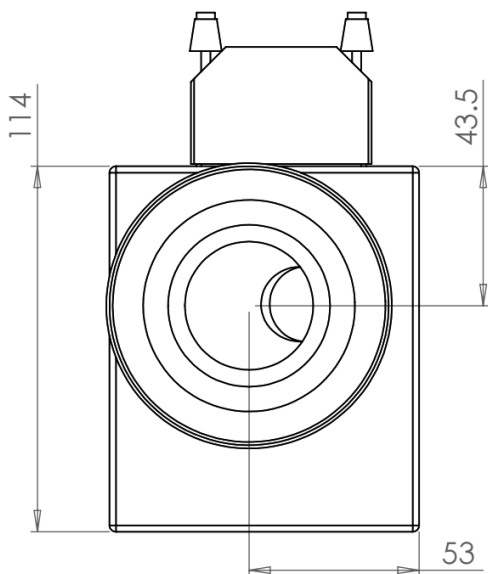
Dimensions:



- A - 97 mm
- B - 115 mm
- C - 97 mm
- D - 15 mm
- E - 30 mm
- F - 90 mm



Drawing Beam Entrance Side



Drawing Beam Exit Side



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