Kredig GmbH

OP-TI-CAL K300

OXYFUEL PLASMA TOOL INTEGRATED CAMERA LIFTER

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1 Content

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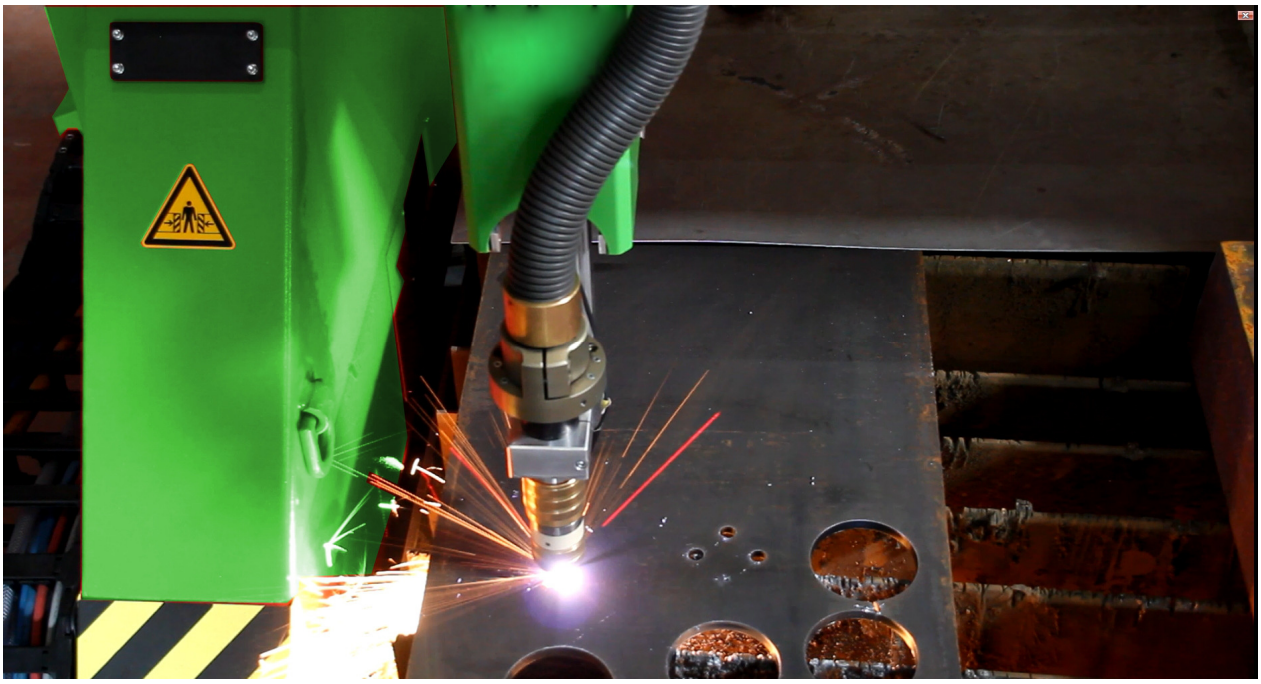
OP-TI-CAL K300 is an innovative system for user and process support on tool stations of numerically controlled machines. It integrates the functions:

- Process and workpiece control
- Optical monitoring of tool positioning
- Distance control between tool and workpiece



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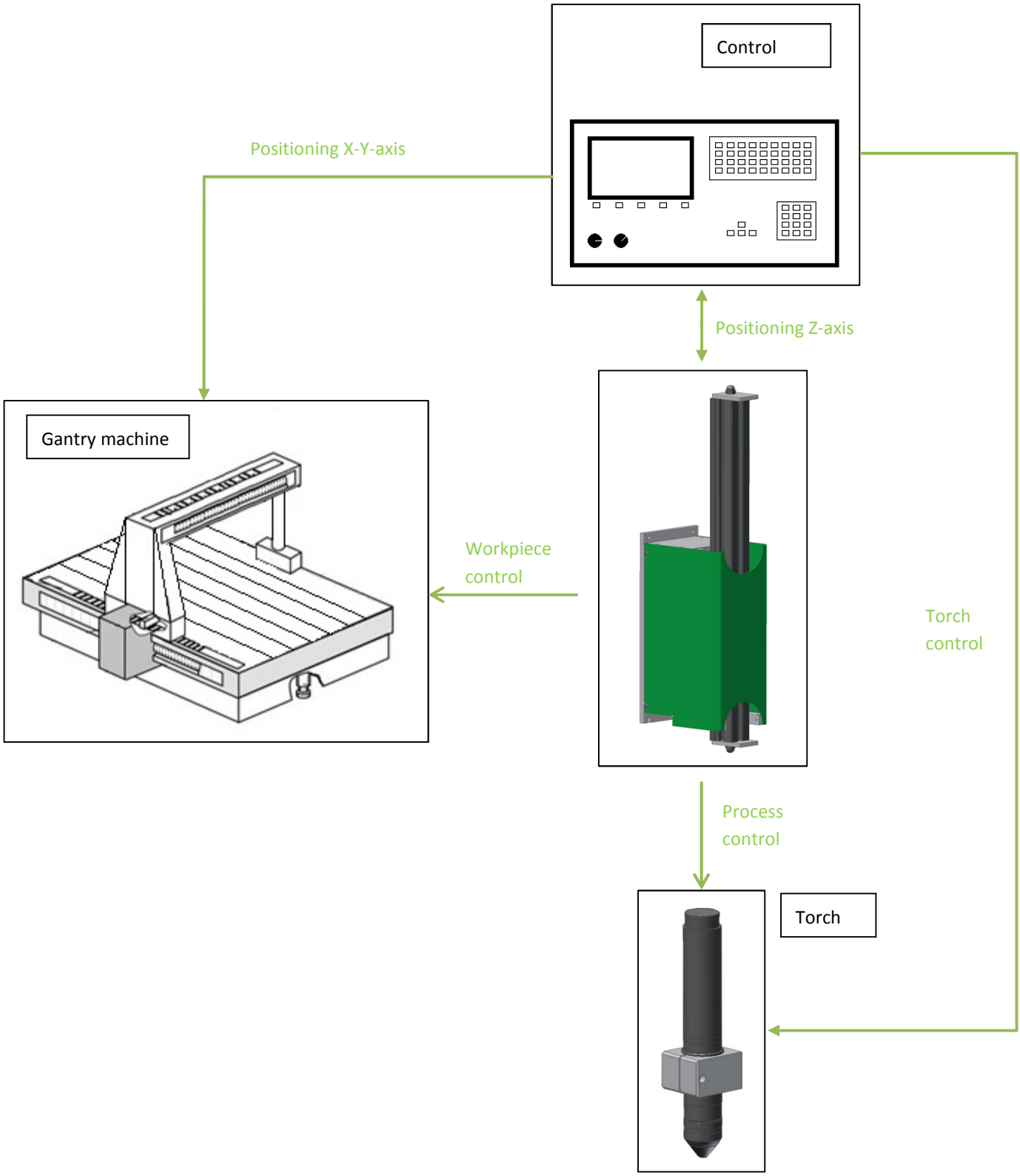
1 Block diagram



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2 Technical data

2.1 Overview

Electrical characteristics	
Power supply	24V DC – 5A

Environmental influences	
Operating temperature	(5 to +40°C)
Storage temperature	(-20 to +80°C)
Humidity class	G according to DIN 40040

Interfaces	
	ETHERCAT (optional)
	CAN (isolated)
	RS422/485 (customer-specific protocol)
Inputs	
Analog	Arc In: 0 - 10V not isolated
	2 channels: 0-10V (customer-specific)
Digital	14 channels: optocoupler (customer-specific)
Outputs	
Digital	4 channels: relay (customer-specific)
	4 channels: optocoupler (customer-specific)

Mechanical characteristics	
Mass	13 Kg
↑ Lifting force	170 N
↓ Sinking force	170 N
Workpiece thickness	Max. 80 mm above zero
Vmax	10 m/min
Driving range	200 mm (optional up to 700mm)
Distance lift – table (zero)	300 mm (optional up to 800mm)

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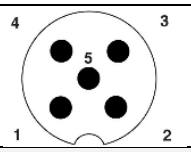
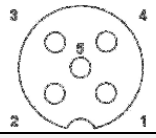
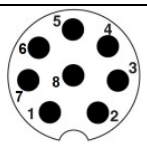
2.2 Pin assignment

CAN	Connector M12 male 5 pole 
Assignment	
Pin	**Designation**
1	Not connected
2	Not connected
3	GND (CAN)
4	CAN-H
5	CAN-L
housing	GND (shielding)

Power	Connector M12 female 5 pole 
Assignment	
Pin	**Designation**
1	Not connected
2	UB+ 24V DC (max. 5A)
3	GND
4	Not connected
5	Not connected
housing	GND (shielding)

I/O	Connector M12 male 8 pole 
Assignment	
Pin	**Designation**
1	Analog 1 +
2	Analog 1 -
3	GND
4	UB+ OUT (auxiliary voltage)
5	Digital in
6	GND
7	Digital out (relay)
8	Digital out (relay)
housing	GND (shielding)

Depending on customer requirements, the system can be extended to include different interfaces. We are happy to implement the desired interfaces for our customers. Please ask us for further information.

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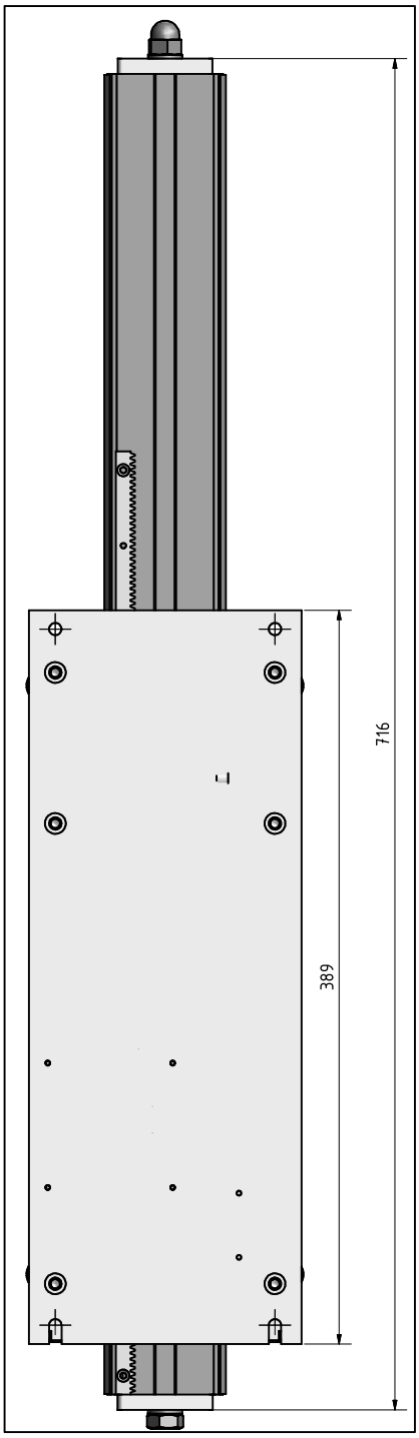
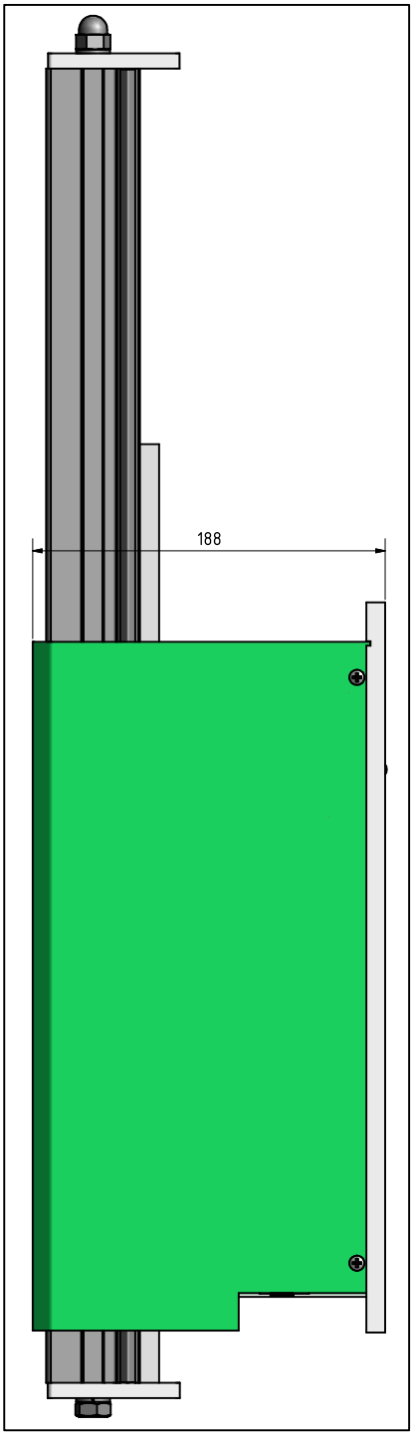
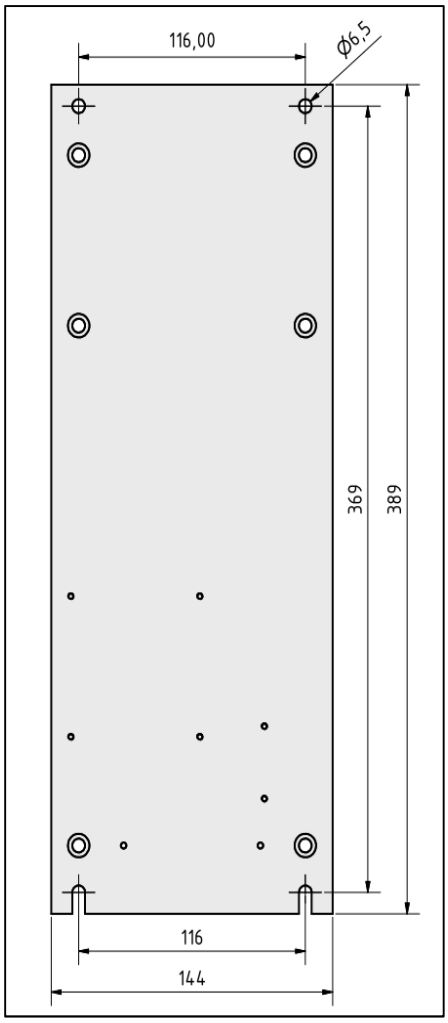
2.3 Dimensions



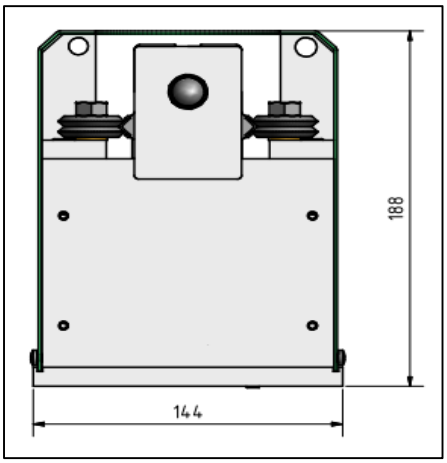
Rear view



Side view



Mount



Bottom view

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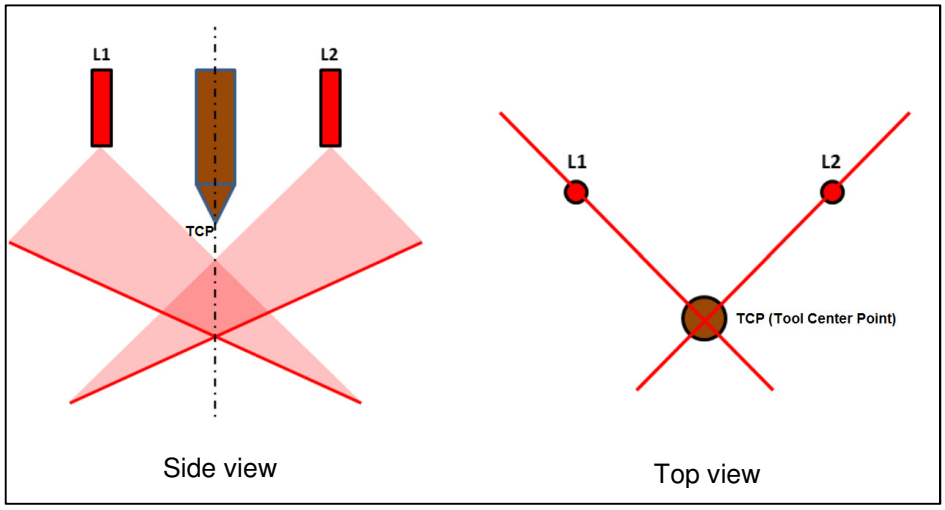
3 Description of the distance detection function

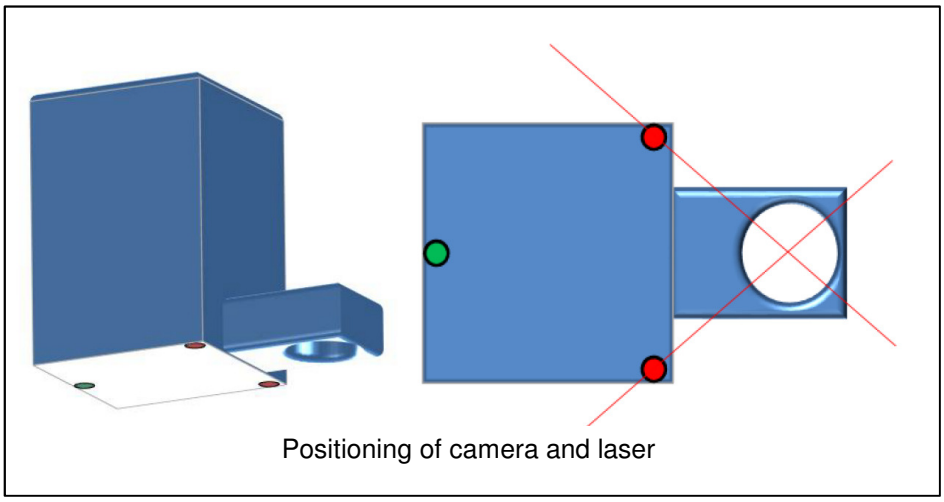
3.1 Function

A tool is guided along a vertical axis. The main task is to position the tool precisely over the workpiece and to control the distance between tool and workpiece exactly.

3.2 Design

The system consists of a camera and two line lasers in combination with an image processing micro-computer system. The two lasers project their lines onto the workpiece.





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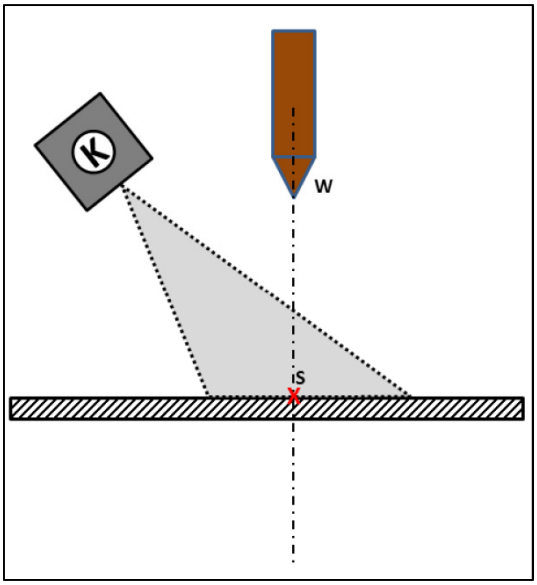
The generated pattern is detected by the camera. The integrated image processing unit automatically calculates the distance between the torch and workpiece surface by "real time measurement".
The live measuring tool provides the workpiece distance immediately. There is no requirement to repeat the height calibration. The tool can be moved directly to the target position (initiation height).

The Live View function (see 3.3.2) also makes it possible to observe the operating point from the operating unit of the machine control system.



The picture taken by the camera looks like this:

There is no need for a laser pointer like those used in conventional measuring systems.
Compared with a laser pointer, the laser cross is much easier to see, simplifying manual operation.

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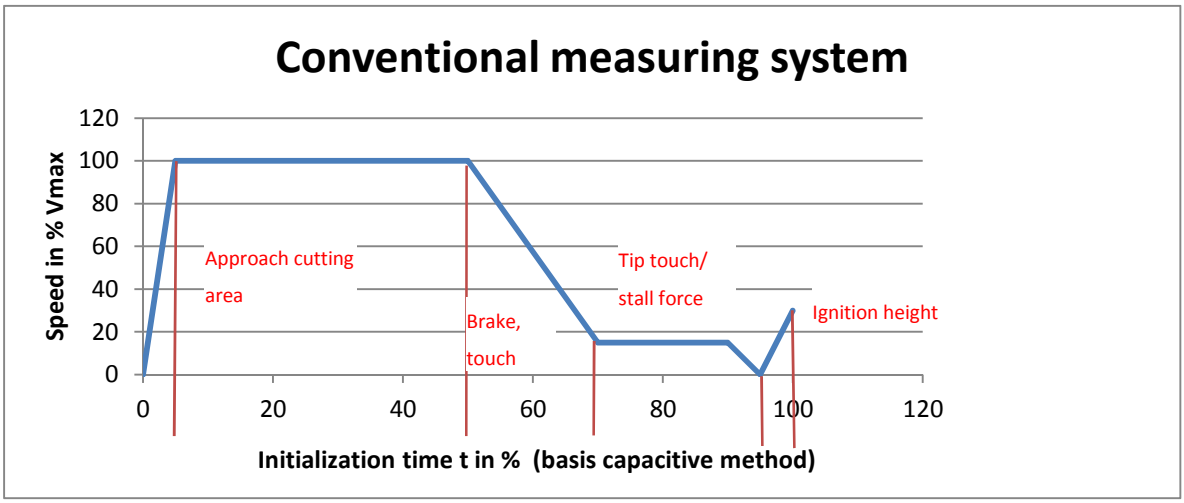
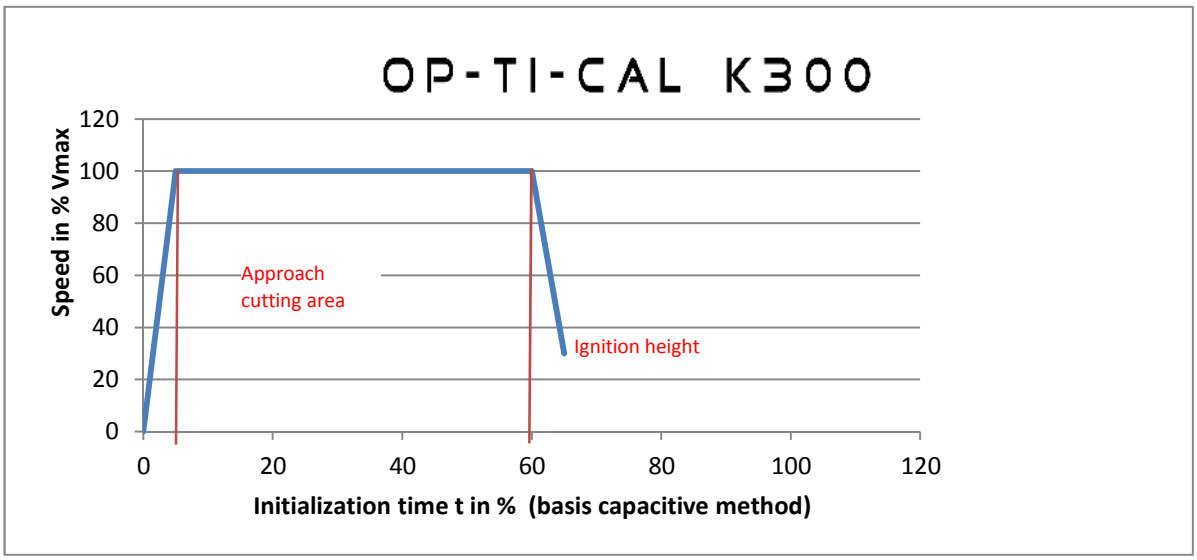
3.3 Advantages

3.3.1 Cost reduction

While conventional systems have to recalibrate the height of the workpiece for each cutting operation, the optical measuring system offers permanent height control and speeds up the calibration process considerably. The following diagrams show the initialization time for each new step. On the time axis, 100% corresponds to the initialization time of a conventional measuring system.





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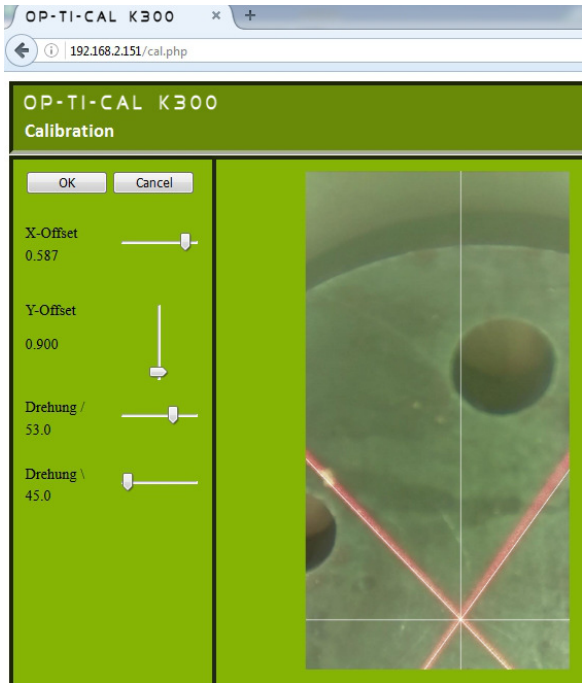
3.3.2 Live-View

3.3.2.1 Web interface

The **O**xyfuel **P**lasma **T**ool **I**ntegrated **CA**mera **L**ifter displays the captured image for various applications via an integrated web server. The web interface can be used from any machine with an existing browser. This could be a machine control unit, a control room, a PC, or a laptop.

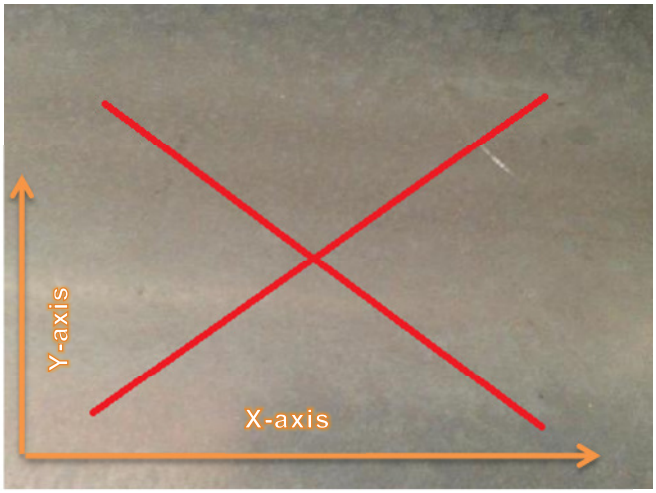
Over the web interface, the area of the operating point is shown in real time. The operator can therefore carry out positioning movement directly from the machine control unit. In contrast to conventional systems, a remote control is no longer required.

3.3.2.2 Calibration



Calibration can also be done via the web interface. The focus has been placed on ease of use for the operator. An auxiliary screen is overlaid on top of the laser cross using slide controls. Once these coincide exactly, calibration is complete.

3.3.2.3 Positioning

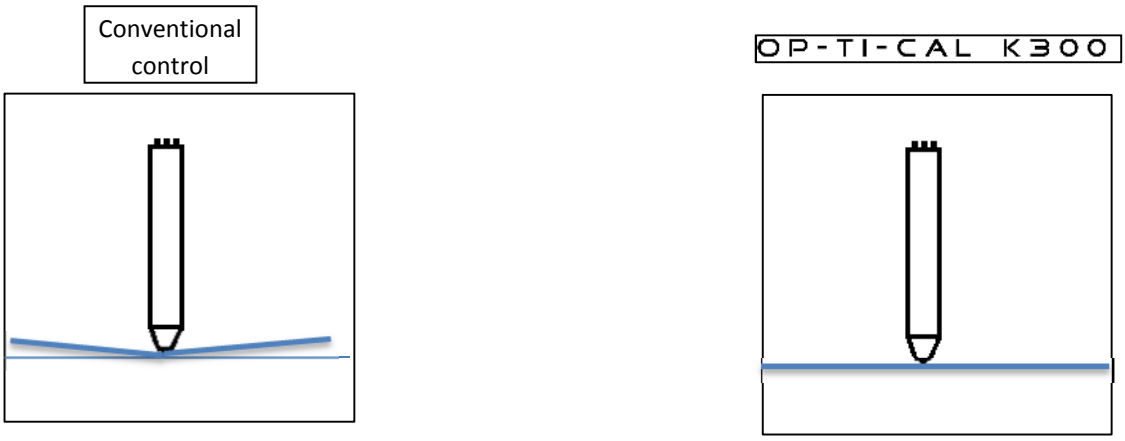


During normal operations, it is possible that the torch may fail to cut through the material fully. The machine operator can easily find the initial cutting point on the displayed camera image and start the cutting process again.
The plate alignment can also be easily determined with the Live View function. Using the camera image, the operator

can detect the edges and the dimensions of the plate or carry out other positioning movement.
During the cutting process (when the torch is active), a live image is not available.

3.3.3 Material/workpiece

Another important advantage of the optical Z-axis control is the machining of very thin plates. Conventional methods lead to the deformation of the plates during the tip touch / stall force process. This results in a measurement error that has a negative impact on the cutting process. The non-contact optical system used by OP-TI-CAL K300 prevents any bending or damage, thereby eliminating measurement errors.



The **O**xyfuel **P**lasma **T**ool **I**ntegrated **CA**mera **L**ifter shows its advantages also when interacting with different materials. Conventional height controls have their limitations when interacting with materials such as:

- Plates covered with foil
- Oxidized plates
- Primed plates

The optical measuring system combines all advantages in comparison to the "resistive setting". All materials can be detected and processed.

3.4 Maintenance

3.4.1 Torch mounting

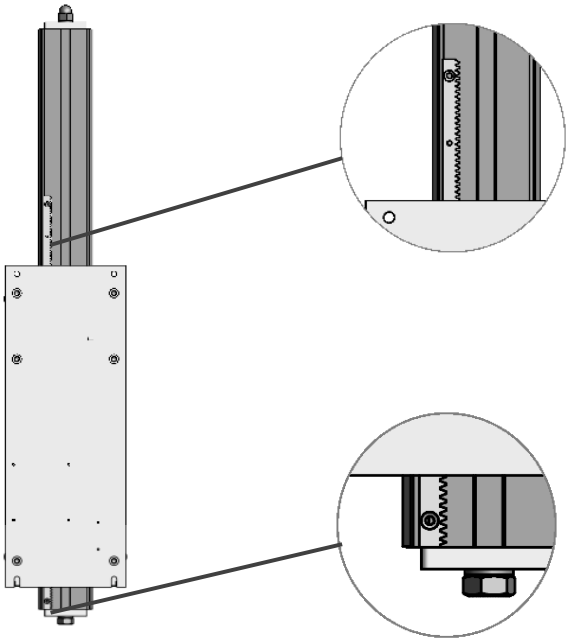
Conventional systems require special, very complex torch mountings for detecting the height of non-conductive surfaces. They consist of pneumatic components and additional sensor elements. These requirements lead to expensive, error-prone, and maintenance-intensive systems.
Dispensing with pneumatic components and sensor elements makes it possible to use a cost-effective and maintenance-free torch mounting.

3.4.2 Contamination

Avoiding tip touch / stall force during normal operations offers another advantage compared with conventional systems. There is no contamination of the torch nozzle. Conventional controls can very easily lead to contamination due to direct contact between the workpiece and torch. This is the result of contamination during the cutting process, which leads to process downtime, subsequent maintenance or a deterioration in cutting quality. By avoiding contact with the workpiece, the optically controlled OP-TI-CAL K300 avoids any contamination of the torch.

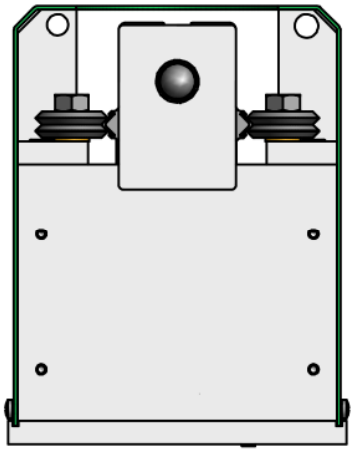
4 Constructive engineering

4.1 Rack drive



The mechanics of OP-TI-CAL K300 are designed for maximum precision and accuracy. OP-TI-CAL K300 includes a backlash-free rack drive and includes a precision measuring system.

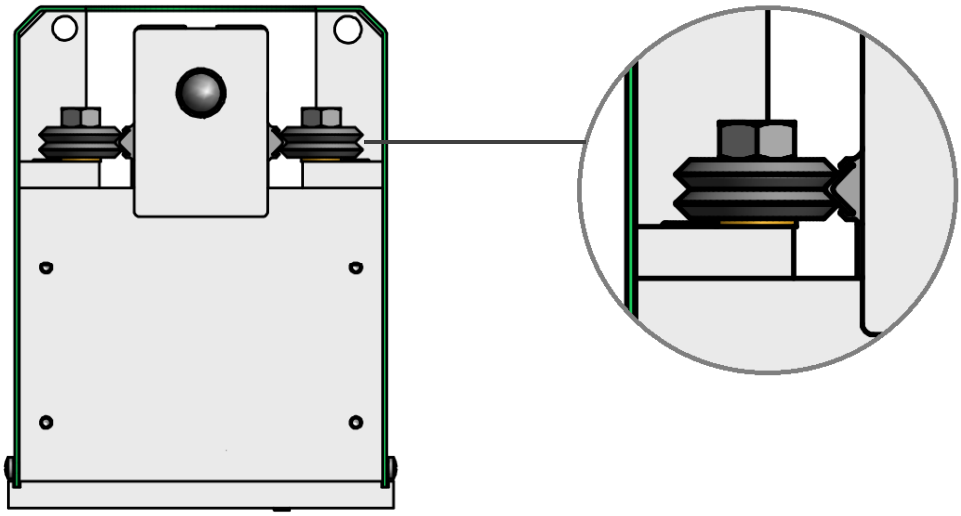
4.2 Modern, durable, and stable design



During the development of OP-TI-CAL K300 , the focus was not only placed on precision, but also on compact design, low weight, and optimized materials.

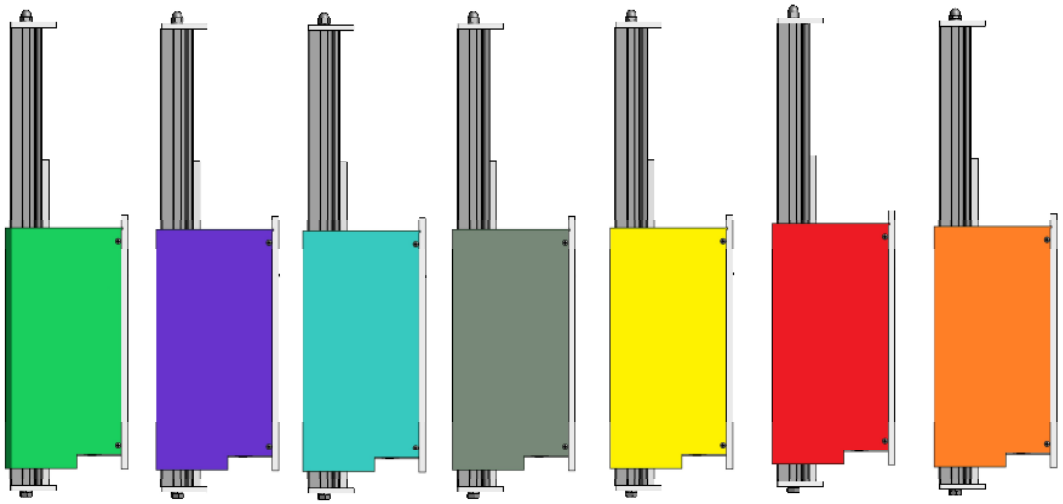
The compact design increases the cutting area, without compromising on strength or durability.

4.3 Guidance system



Precision, accuracy, and compact design are not mutually exclusive with durability and robustness.
The hardened and fully integrated V-guidance system is dirt resistant and a guarantee for long-lasting precision.

4.4 Customized design



If desired, you can configure OP-TI-CAL K300 in your own personal style. With your own colors and logos, the system can be integrated perfectly into your environment.

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