Method and Device for Capturing An Image of A Target Object

Abstract

A method for capturing the image of a target object illuminated by an illumination laser is described, with which it is possible to stabilise the image and correct higher order imaging aberrations. By splitting off the partial beam from the pulsed laser beam of the illumination laser and by delaying the partial beam laser light, it becomes possible to distinguish between the laser light that is aimed at the target object through the illumination beam by means of the illumination optics unit and reflected therefrom, and the laser light that is reflected from the target object due to the partial beam laser light that is guided "backwards" through the receiving optics unit, so that the light from both that is reflected by the target object can be distinguished from the pulsed light beams that have been temporally offset by the optical delay device.

~~A method for capturing the image of a target object (Z) illuminated by an illumination laser (1) includes the following steps:~~

~~a) Illuminating the target object (Z) by means of a pulsed laser beam (L) emitted by the illumination laser (1), which beam is aimed at the target object (Z) in the form of an illumination (L_2) beam by an illumination optics unit (2);~~

~~b) Receiving the illumination beam laser light reflected from the target object (Z) by means of a receiving optics unit (3);~~

~~c) Directing the received reflected illumination beam laser light to an image capturing device (4) to generate an image of the target object on the image capturing device (4);~~

~~d) Detecting the angular offset of the image of the target object with respect to a reference axis of the receiving optics unit (3);~~

~~e) Stabilising the visual axis of the image capturing device (4) detected by imaging of the target object device by means of a first optical correcting element (30) of the receiving optics unit (3) that compensates for the angular offset;~~

~~wherein the following additional steps are carried out to stabilise the imaging of the target object:~~

~~a'$_4$) Decoupling a partial beam (L_4) from the laser beam (L) emitted by the illumination laser (1);~~

~~a'$_2$) Delaying the decoupled partial beam (L_4) in an optical delay device (62);~~

~~a'$_3$) Illuminating the target object (Z) by means of the partial beam (L_4) that is directed at the target object (Z) by the receiving optics unit (3);~~

~~b'$_4$) Receiving the partial beam laser light which is reflected by the target object (Z) and which defines a reference wavefront by the receiving optics unit (3);~~

~~b'$_2$) Decoupling the received reflected partial beam laser light from the light that is received by the receiving optics unit (3);~~

~~c') Directing the decoupled reflected partial beam laser light to a wavefront sensor (50);~~

~~d') Detecting a wavefront error in the received reflected partial beam laser light, and~~

~~e') Fine tuning the receiving optics unit to compensate for the detected wavefront error by means of a second optical correcting element (32) of the receiving optics unit (3).~~

(Fig. 1)