

Optiv Performance 664 Technical Data Version 04/2010







| Product description  | The 3D multi-sens<br>measurement in o<br>tactile sensor, the<br>The basic machin   | sor coordinate measuring machine C<br>one system. The system supports mu<br>TTL laser (Through-The-Lens) as we<br>e with vision sensor can be expande   | Dptiv P<br>ulti-ser<br>ell as th<br>ed with | Performance 664 combines optical and tactile<br>nsor measurements using the vision sensor, the<br>he innovative Chromatic White light Sensor, (CWS).<br>n all the available sensors on a modular basis. |
|--|--|---|---|---|
| Fields of application  | <ul><li>Use on shop flo</li><li>Versatile geom</li></ul>   | por<br>etry measurements and GD&T analy   | ysis wi                                     | th standard accuracy  |
| Design   | <ul> <li>Design princip         <ul> <li>Low-vibrati</li> <li>Integrated</li> </ul> </li> <li>Guides:         <ul> <li>Precision r</li> </ul> </li> <li>Drives:             <ul> <li>DC servo n</li> <li>Length measur</li> <li>Incrementa</li> <li>Resolution:                     <ul> <ul> <li>0,1 µm</li> </ul> </ul></li> </ul> </li> </ul> <li>Design princip</li> | e:<br>on granite construction with a fixed<br>subframe with optional vibration da<br>nechanical linear guides on all axes<br>notors, power transmission via back<br>ing system:<br>Il length measuring system | bridge<br>impers<br>lash fr                 | e and a moving table  |
| Measuring range (X x Y x Z)  |  | Optiv Performan   | ice 664                                     | 4 – Single Z (one vertical axis)  |
| (1) Vision sensor <> Touch-tria-   |  | Measuring range single sen  | isor  | Mutual measuring range <sup>(1)</sup>   |
| ger probe (X offset = 52 mm)   | x  | 600 mm  |   | 548 mm  |
|  | Y  | 600 mm  |   | 600 mm  |
|  | Z  | 400 mm  |   | 400 mm  |
| Loading capacity<br>Dimensions in mm<br>and weights in kg  | <ul> <li>Load-bearing c</li> <li>Dimensions se</li> <li>Machine weigh</li> </ul>   | apacity of the glass plate up to 40 k<br>e machine layout on page 8<br>t including electronic cabinet 1300  | kg  |   |
| Measuring accuracy <sup>(2)</sup><br><sup>(2)</sup> The conditions of<br>acceptance of Hexagon<br>Metrology Vision GmbH apply. | At 20°C, accord<br>Vision sensor, a<br>standard measu<br>length in mm)<br>Z measuring ac<br>Ez = (2,4 + L/150)<br>X,Y measuring a<br>Ex, Ey = (1,3 + L)<br>XY measuring a<br>Exy = (1,5 + L/12)  | ing to ISO 10360-7 <sup>(2)</sup> , with<br>t highest zoom magnification,<br>uring plane (L = measurement<br>curacy<br>(2) μm<br>accuracy<br>(150) μm<br>ccuracy<br>5) μm                                     |   | At 20°C, according to ISO 10360-2 <sup>(2)</sup> , with<br>touch-trigger probe ( $L = measurement length$<br>in mm)<br>E1 = (2,4 + L/150) µm<br>E2 = (3,2 + L/125) µm<br>E3 = (3,9 + L/100) µm          |

| Airborne noise emissions | • The A-weighted emission sound pressure level at operator's position is less than 70 db(A).                      |
|--------------------------|---|
| Environmental            | - Limits of permissible floor vibration < 5 x 10 $^3$ m/s $^2$ corresponds to an amplitude of < 5 $\mu m$ at 5 Hz |
| requirements             | • Air humidity 40 % - 70 % RL   |
|                          | <ul> <li>Environmental temperature 20 °C ± 1 K</li> </ul>   |
|                          | <ul> <li>Permissible temperature gradient 0,8 K/h, 1,0 K/d, 0,6 K/m</li> </ul>                                    |
| Throughput               | Max. traversing speed   |
|                          | » per axis 200 mm/s   |
|                          | » in a plane 280 mm/s   |
|                          | » in space 340 mm/s   |
| Vision sensor            | Technical description   |
|                          | Sensor for non-contact measurement of smallest and closely toleranced features                                    |
|                          | » High resolution black-and-white or color CCD cameras,   |
|                          | for interference-free, low noise image reproduction   |
|                          | » Maximum optical precision due to low distortion optics  |
|                          | » CNC zoom  |
|                          | » Fixed optics  |
|                          | » 2-step zoom   |
|                          | » Powerful image processing   |
|                          | » Fast, precision video autofocus   |
|                          | » Contour scanning mode   |
|                          | » Best fit routines   |
|                          | » Geometry filters and speckle filters  |
|                          | » MultiCapture:   |
|                          | MultiCapture allows all 2D features within a field of view to be captured simultaneously, regardles               |
|                          | of the feature type. Inspection speeds can be increased by 35 % or more, depending on the feature                 |
|                          | size and density. The capture sequence for groups of features using MultiCapture is also automati                 |
|                          | cally optimized, creating the most efficient possible path with the fewest number of stage move-<br>ments.        |
|                          | » RGB Sensitivity Adjustments for color cameras:  |
|                          | Software controls for Red/Green/Blue (RGB) sensitivity in images from a color camera allow for                    |
|                          | fine control adjustment over image contrast. This capability improves overall consistency in visior               |
|                          | inspection in general and is especially useful for colored parts where edges can be difficult to                  |
|                          | capture with grayscale or lighting modifications alone.   |
|                          |   |

- Coaxial LED top light
- Coaxial and telecentric LED back light
- Multi-segment ring light (lateral top light) (\*)
  - » Color variants: green, red, blue, yellow, white, multi-color

(\*) not available for 50x lens

# CNC zoom

- 1:10 motorized zoom, for a continuous adjustment of field of view and resolution
- CCD camera 1/2"
  - » H 752 x V 582 pixel
- Available multiplier lenses: 2,5x, 5x

| Ма              | ignification variants | s of the CNC zoom ( | detail mode to overview mod | le)           |
|-----------------|-----------------------|---------------------|-----------------------------|---------------|
| Multiplier lens | Working distance      | Pixel size          | Field of view H x V         | Magnification |
|                 | (mm)                  | (µm/pixel)          | (mm)                        | on 22" LCD    |
| 2,5x            | 89                    | 1,30 to 13,00       | 1,0 x 0,8 to 9,8 x 7,6      | 436x to 45x   |
| 5x              | 33                    | 0,65 to 4,00        | 0,5 x 0,4 to 3,0 x 2,3      | 904x to 148x  |

## Fixed optics with changeable lenses

- · Fixed focal length, telecentric precision optics
- CCD camera 1/2"
  - » H 752 x V 582 pixel
- Available lenses 1x, 3x, 5x, 10x, 20x, 50x

|   | Magnifica                | tion variants of the fi  | xed optics                  |                             |
|---|--------------------------|--------------------------|-----------------------------|-----------------------------|
| Optical<br>magnification<br>of the lens | Working distance<br>(mm) | Pixel size<br>(µm/pixel) | Field of view H x V<br>(mm) | Magnification<br>on 22" LCD |
| 1x                                      | 79                       | 8,50                     | 6,4 x 4,9                   | 69x                         |
| Зx                                      | 75                       | 2,83                     | 2,1 x 1,6                   | 207x                        |
| 5x                                      | 64                       | 1,70                     | 1,3 x 1,0                   | 346x                        |
| 10x                                     | 48                       | 0,85                     | 0,6 x 0,5                   | 691x                        |
| 20x                                     | 20                       | 0,43                     | 0,3 x 0,2                   | 1.383x                      |
| 50x                                     | 15                       | 0,17                     | 0,1 x 0,1                   | 3.457x                      |

### 2-step zoom

- In two steps electronically switchable magnification by factor 1:3,3
- Camera #1: 1/3" CCD camera
  - » H 752 x V 582 pixel
- Camera #2: 2/3" CCD camera
  - » H 752 x V 582 pixel
- Available lenses: 1x, 3x, 5x, 10x, 20x, 50x

| Magnification | variants of the 2-s | tep zoom (camera | #1, detail mode / camera | #2, overview mode) |
|---------------|---------------------|------------------|--------------------------|--------------------|
| Optical       | Working             | Pixel size       | Field of view H x V      | Magnification      |
| magnification | distance            | (µm/pixel)       | (mm)                     | on 22" LCD         |
| of the lens   | (mm)                |                  |                          |                    |
| 1x            | 79                  | 6,35 / 21,09     | 4,8 x 3,7 / 15,9 x 12,3  | 93x / 28x          |
| Зx            | 75                  | 2,12 / 7,03      | 1,6 x 1,2 / 5,3 x 4,1    | 278x / 84x         |
| 5x            | 64                  | 1,27 / 4,22      | 1,0 x 0,7 / 3,2 x 2,5    | 463x / 138x        |
| 10x           | 48                  | 0,64 / 2,11      | 0,5 x 0,4 / 1,6 x 1,2    | 925x / 281x        |
| 20x           | 20                  | 0,32 / 1,05      | 0,2 x 0,2 / 0,8 x 0,6    | 1.851x / 562x      |
| 50x           | 15                  | 0,13 / 0,42      | 0,1 x 0,1 / 0,3 x 0,2    | 4.627x / 1.490x    |

| <ul> <li>Coaxial reflection into the optical path of the Vision sensor</li> <li>Measuring principles: Foucault and triangulation method</li> <li>Functionality:         <ul> <li>Autofocus sensor for quick focussing of the Vision sensor and measuring heights,<br/>bore depths and flatness</li> </ul> </li> </ul> |
|---|
| <ul> <li>» Scanning sensor for the contour and surface scanning</li> <li>• Available starting from 5x lens, recommended starting from 10x lens</li> <li>• Laser safety class 2, average output &lt; 1 mW</li> </ul>   |
| <ul> <li>Red laser, wavelength 650 nm to 680 nm</li> <li>Spot size approx. 100 μm at 5x lens and accordingly approx. 50 μm at 10x lens</li> <li>Resolution ± 0,1 μm</li> </ul>  |
| <ul> <li>Measuring accuracy within E<sub>1</sub> (at 10x lens and up)</li> <li>Average focus speed 0,2 s</li> <li>Scanning feature in conjunction with PC-DMIS CAD++ Vision</li> </ul>  |
|   |

white light sensor (CWS)

#### Technical description

 Optical sensor for focussing and scanning purposes according to the principle of chromatic length aberration of white light

· Surface independent and robust measurement with a resolution in the nanometer range

| CWS<br>measuring head        | 10 mm  | 3 mm    | 600 µm | 300 µm |
|------------------------------|--------|---------|--------|--------|
| Working distance             | 75 mm  | 22,5 mm | 6,5 mm | 4,5 mm |
| Resolution<br>in Z direction | 300 nm | 100 nm  | 20 nm  | 10 nm  |
| Diameter of the<br>CWS spot  | 25 µm  | 12 µm   | 4 µm   | 5 µm   |

Mutual measuring range Vision sensor <--> CWS in X direction = 515 mm (X offset = 85 mm) Mutual measuring range Vision sensor <—> Touch-trigger probe <—> CWS in X direction = 463 mm

## Touch-trigger probe

| 6-way touch-trigger probe  | 5-way touch-trigger probe  |
|--|--|
| Technical  | description  |
| <ul> <li>Compact 6-way touch-trigger probe using<br/>innovative micro strain gauge technology</li> <li>Allows for small trigger forces and offers<br/>advanced triggering accuracy as well as<br/>long reliable operation</li> </ul> | <ul> <li>Compact mechanically switching<br/>5-way touch-trigger probe</li> </ul>                       |
| Мои  | nting  |
| M8 t   | hread  |
| S1   | yli  |
| • M2<br>• Kit wi<br>• Kit wit  | thread<br>:h 10 styli<br>h 25 styli  |
| Available  | modules  |
| SF standard force     LF low force   | <ul><li>SF standard force</li><li>MF medium force</li></ul>  |
| Sense d  | irections  |
| • 6-way: ± X, ± Y, ± Z   | • 5-way: ± X, ± Y, + Z   |
| Unidirectiona  | l repeatability  |
| <ul> <li>0,40 μm (Trigger level 1)</li> <li>0,50 μm (Trigger level 2)</li> </ul>   | <ul> <li>± 0,35 μm (SF module)</li> <li>± 0,50 μm (MF module)</li> </ul>                               |
| XY (2D) form meas  | surement deviation   |
| <ul> <li>± 0,80 μm (Trigger level 1)</li> <li>± 0,90 μm (Trigger level 2)</li> </ul>   | <ul> <li>± 0,80 μm (SF module)</li> <li>± 1,00 μm (MF module)</li> </ul>                               |
| XYZ (3D) form mea  | surement deviation   |
| <ul> <li>± 1,00 μm (Trigger level 1)</li> <li>± 1,40 μm (Trigger level 2)</li> </ul>   | -  |
| Trigge   | r force  |
| • X, Y: 0,02 N / Z: 0,07 N (all modules)   | <ul> <li>X, Y: 0,08 N / Z: 0,75 N (SF module)</li> <li>X, Y: 0,10 N / Z: 1,90 N (MF module)</li> </ul> |
| Stylus module  | changing racks   |
| With     With     With   | 2 slots<br>3 slots   |

Mutual measuring range Vision sensor <--> Touch-trigger probe in X direction = 548 mm (X offset = 52 mm) Mutual measuring range Vision sensor <--> Touch-trigger probe <--> CWS in X direction = 463 mm

| Control system and | CNC controller:   |
|--------------------|---|
| safety regulations | » 3 to 5 axes microprocessor CNC with vector path control   |
|                    | Safety equipment:   |
|                    | » Emergency-Stop circuit with Emergency-Stop switch   |
|                    | » Scale signal monitoring   |
|                    | » Safety limit switches   |
|                    | » Protective covers for the axes' drives  |
|                    | » Collision protection for touch-trigger probes   |
|                    | Safety regulations:   |
|                    | » DIN EN ISO 12100-1 and -2 (Safety of machinery)   |
|                    | » DIN EN 60204-1 (Safety of machinery - Electrical equipment of machines)                                   |
|                    | » DIN EN ISO 13849-1 (Safety of machinery - Safety-related parts of control systems)                        |
|                    | » DIN EN 61000-4-2 and -4 (Electromagnetic compatibility EMC, immunity of machines)                         |
|                    | » DIN EN 55011 (Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics) |
|                    |   |
|                    | <u>^</u>  |

| Technical Data     |   |
|--------------------|---|
|                    |   |
| Supply data        | • Power 115/230 V ± 10%   |
|                    | • Frequency 50/60 Hz ± 5%   |
|                    | Power consumption 1000 VA   |
|                    | Air supply (vibration damping system):  |
|                    | » Air pressure connection with 1/2" quick-connect coupling  |
|                    | » Air pressure at least 600000 pascal (Pa)  |
|                    | » Air consumption approx. 20-40 NI/min  |
|                    | » Pre-cleaned air according to ISO 8573-1 class 1   |
|                    |   |
| Optional equipment | Vibration damping system  |
| Optional equipment | <ul><li>Vibration damping system</li><li>Mechanical bearing rotary table</li></ul>  |
| Optional equipment | <ul> <li>Vibration damping system</li> <li>Mechanical bearing rotary table</li> <li>Probe changer</li> </ul>  |
| Optional equipment | <ul> <li>Vibration damping system</li> <li>Mechanical bearing rotary table</li> <li>Probe changer</li> <li>Motorised indexing probe head</li> </ul>   |
| Optional equipment | <ul> <li>Vibration damping system</li> <li>Mechanical bearing rotary table</li> <li>Probe changer</li> <li>Motorised indexing probe head</li> <li>Machine enclosure</li> </ul>  |
| Optional equipment | <ul> <li>Vibration damping system</li> <li>Mechanical bearing rotary table</li> <li>Probe changer</li> <li>Motorised indexing probe head</li> <li>Machine enclosure</li> <li>Air conditioning for machine enclosure</li> </ul>  |
| Optional equipment | <ul> <li>Vibration damping system</li> <li>Mechanical bearing rotary table</li> <li>Probe changer</li> <li>Motorised indexing probe head</li> <li>Machine enclosure</li> <li>Air conditioning for machine enclosure</li> <li>Periphery:</li> </ul>  |
| Optional equipment | <ul> <li>Vibration damping system</li> <li>Mechanical bearing rotary table</li> <li>Probe changer</li> <li>Motorised indexing probe head</li> <li>Machine enclosure</li> <li>Air conditioning for machine enclosure</li> <li>Periphery: <ul> <li>Worktable</li> </ul> </li> </ul>                             |
| Optional equipment | <ul> <li>Vibration damping system</li> <li>Mechanical bearing rotary table</li> <li>Probe changer</li> <li>Motorised indexing probe head</li> <li>Machine enclosure</li> <li>Air conditioning for machine enclosure</li> <li>Periphery: <ul> <li>Worktable</li> <li>Printers, monitors</li> </ul> </li> </ul> |

Machine layout



Stage layout



size of all threads M6 - 15 deep



### Optiv

Hexagon Metrology is the all-rounder in the world of metrology. With its new brand Optiv, the world's largest metrology group keeps this promise once again. Optiv stands for multisensor measuring machines of any kind. The portfolio ranges from benchtop measuring machines to high-accuracy multisensor measuring machines which achieve top performances even in the nano range. Multisensor measuring machines combine optical and tactile measuring techniques and thus, enable the user to measure all features of a workpiece in one measurement cycle. At the same time Optiv features both: flexibility and accuracy.

### Optiv. Optical Performance Technology in Vision.

### **Hexagon Metrology**

Hexagon Metrology is part of the Hexagon group and brings leading brands from the field of industrial metrology under one roof.

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Version 04/2010. April 2010.

