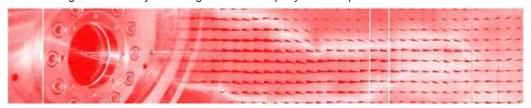
# pco.1600 cooled digital 14bit CCD camera system

- excellent resolution (1600x1200pixel)
- 14bit dynamic range
- fast image recording 160MB/s
- image memory in camera (camRAM up to 4GB)
- excellent low noise of 14e<sup>-</sup> rms @ 10MHz
- thermoelectrical cooling of -50°C vs. ambient
- standard interfaces (IEEE1394, camera link, ethernet)
- UV sensitive & color CCD image sensor available



pco. imaging This PCO brochure is presented to you by: Intelligent Laser Applications GmbH, Karl-Heinz-Beckurts-Strasse 13, D-52428 Juelich Phone +49.(0)2461.690-430, Fax +49.(0)2461.690-439, info@ila.de, www.ila.de ILA is a registered PCO system integrator and third party software provider





## pco.1600

This high performance 14bit CCD camera system comprises advanced CCD and electronics technology. With the new approach to integrate the image memory (camRAM) into the camera itself, it enables unmatched fast image recording with 160MB/s. The system features thermo-electrical cooling (down to –50°C vs. ambient), an excellent high resolution (1600 x 1200pixel) and low noise (down to 14e¯ rms). It consists of a compact camera with an external intelligent power supply. The image data are transferred via customer selectable standard data interfaces to a computer (IEEE 1394 ("firewire"), camera link, ethernet). The available exposure times range from 5µs to 49days (500ns opt.).

#### technical data

|                                     | unit                    | setpoint                          | pco.1600            |
|-------------------------------------|-------------------------|-----------------------------------|---------------------|
| resolution (hor x ver) <sup>1</sup> | pixel                   | @normal/                          | 1600x1200           |
|                                     | piirto.                 | @extended                         | 1648x1214           |
|                                     |                         | mode                              |                     |
| pixel size (hor x ver)              | µm²                     |                                   | 7.4 x 7.4           |
| sensor format/                      | mm <sup>2</sup> /       | @extended                         | 12.2 x 9.0 /        |
| diagonal                            | mm                      | mode                              | 15.2                |
| peak quantum                        | %                       | @500nm typical                    | 55                  |
| efficiency                          |                         |                                   |                     |
| full well capacity,                 | e-                      | normal /                          | 40 000 /            |
| transfer capacity                   |                         | with ver-binning /                | 50 000 /            |
| of CCD                              |                         | with hor-binning                  | 100 000             |
| linearity range of CCD              | e-                      |                                   | 40 000              |
| output @40MHz                       |                         |                                   |                     |
| image sensor                        |                         |                                   | KAI-2001            |
| maximum dynamic                     | dB                      |                                   | 73                  |
| range                               |                         |                                   |                     |
| dynamic range A/D <sup>2</sup>      | bit                     |                                   | 14                  |
| readout noise                       | e <sup>-</sup> rms      | @10 / 20 / 40MHz                  | 14 / 24 / 30        |
| imaging frequency,                  | fps                     | @full frame                       | 30                  |
| frame rate                          |                         |                                   |                     |
| pixel scan rate                     | MHz                     |                                   | 2 x 10 / 2 x 20     |
|                                     |                         |                                   | 2 x 40              |
| A/D conversion factor               |                         | normal / low                      | 2.1 / 4.2           |
| spectral range                      | nm                      | normal /                          | 3201000             |
|                                     |                         | UV sensitive                      | 2001000             |
| exposure time                       | S                       |                                   | 5µs49days           |
|                                     |                         | to unit not                       | (500ns49days opt.)  |
| anti-blooming factor                | %                       | typical                           | 000                 |
| smear                               |                         |                                   | 0.01                |
| binning horizontal                  | pixel                   |                                   | 1, 2                |
| binning vertical dark current       | pixel                   | @20 °C tunical                    | 1, 2, 4, 8<br>0.5 / |
| uark current                        | e <sup>-</sup> /pixel·s | @20 °C typical<br>@-20 °C typical | 0.57                |
| region of interest                  | pixel                   | w-20 °C typical                   | 1, 2, 3, 4n         |
| region of interest                  | PIXE                    | HOLO A VEI                        | 1, 2, 0, 411        |

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#### technical data

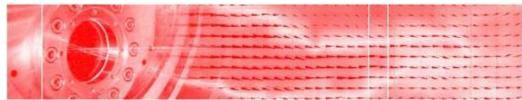
| P                       | 0/                 | 6 11 1           | 0                                  |
|-------------------------|--------------------|------------------|------------------------------------|
| non linearity           | %                  | full temperature | <2                                 |
|                         |                    | range @10 MHz    |                                    |
| uniformity darkness     | e <sup>-</sup> rms | @ 90% center     | <20                                |
| DSNU <sup>3</sup>       |                    | zone             |                                    |
| uniformity brightness   | %                  | typical          | 2                                  |
| PRNU <sup>4</sup>       |                    |                  |                                    |
| trigger, auxiliary      |                    | internal/        | software /                         |
| signals                 |                    | external         | TTL level                          |
| power consumption       | W                  | typical/         | 24 /                               |
|                         |                    | maximum          | 40                                 |
| power supply            | VAC                |                  | 90260                              |
| mechanical              | mm <sup>3</sup>    |                  | 84 x 66 x 175                      |
| dimensions camera       |                    |                  |                                    |
| $(w \times h \times l)$ |                    |                  |                                    |
| mechanical              | mm <sup>3</sup>    |                  | 135 x 51 x 195                     |
| dimensions power        |                    |                  |                                    |
| supply (w x h x l)      |                    |                  |                                    |
| weight                  | kg                 |                  | 1.8                                |
| operating               | °C                 |                  | +5+40                              |
| temperature range       | Ü                  |                  | 101                                |
| operating               | %                  |                  | 1090                               |
| humidity range          | 70                 |                  | 1000                               |
| storage                 | °C                 |                  | -20+70                             |
| temperature range       | Ü                  |                  | 2070                               |
| optical input           |                    |                  | c-mount,                           |
| optical input           |                    |                  | Nikon f-mount                      |
| optical input window    |                    |                  | fused silica                       |
| data interface          |                    |                  | IEEE1394, camera                   |
| data interiace          |                    |                  | link, ethernet                     |
| CE certified            |                    |                  | •                                  |
| cooled CCD              | °C                 | versus ambient   | yes $\Delta$ -50                   |
| Cooled CCD              | C                  |                  | Δ-50                               |
|                         |                    | temperature      | O etems Delties                    |
| cooling method          |                    |                  | 2 stage Peltier cooler with forced |
|                         |                    |                  |                                    |
| to be of or only        |                    | full the ex-     | air cooling                        |
| interframing time       | ns                 | full image       | 180                                |
| (PIV modus)             |                    |                  |                                    |

- horizontal versus vertical Analog-to-Digital-converter dark signal non-uniformity photo reponse non-uniformity

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software: Camware software for camera control, image acqui-

sition and archiving of images in various file formats, WindowsXP and later, 32bit-dynamic link library (DLL) is available for user customisation and integration on PC platforms (software development kit - SDK), software is operational in either single mode or with built-in recorder functions, drivers for popular third party

software packages are available (see website)

options: CCD image sensor in color & UV sensitive version

custom-made versions

camRAM available in: 512MB, 1GB, 2GB & 4GB

#### frame rate table [frames per second]

| pixelclock          | 10MHz       | 20MHz       | 40MHz         |
|---------------------|-------------|-------------|---------------|
| used A/D converters | 1/2         | 1/2         | 1 / 2         |
| full frame          | 4.8 / 9.2   | 9.3 / 17.2  | 17.3 / 29.8   |
| 2x2 binning         | 9.4 / 17.7  | 17.9 / 32.1 | 32.4 / 53.4   |
| 2x8 binning         | 33.1 / 57.3 | 58.1 / 91.9 | 92.9 / 130.5  |
| ROI 1280x1024pixel  | 5.6 / 10.7  | 10.8 / 19.9 | 20.1 / 34.2   |
| ROI 640x480pixel    | 11.5 / 21.3 | 21.7 / 38.1 | 38.7 / 62.2   |
| ROI 320x240pixel    | 21.3 / 37.9 | 38.7 / 63.9 | 65.2 / 96.6   |
| ROI 160x120pixel    | 37.5 / 62.4 | 64.4 / 97.5 | 100.5 / 135.7 |

# areas of application

laser induced fluorescence high resolution microscopy luminescence microscopy electron microscopy fluorescence spectroscopy (up to NIR) bioluminescence chemoluminescence low light level imaging imaging of bio markers (e.g. green fluorescent protein, GFP) time resolved spectroscopy spray analysis hydrodynamics electrophoresis absorption kluminescence spectroscopy imaging of potential sensitive dyes (Neuroscience) night vision security astronomy combustion process analysis gel imaging fuel injection

### contact

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