

# pco.inspector high speed mobile digital high speed 10bit CMOS camera system with Tablet PC

- 636 fps at full resolution (1357 fps at VGA resolution)
- extremely mobile solution with Tablet PC LM1600
- high resolution (1280 x 1024 pixel)
- exposure time range 50 ns - 5 s
- more than 2 h operation by battery
- image memory in camera (camRAM up to 4GB)
- easy to use tripod
- standard interfaces (IEEE1394, camera link)



# pco.inspector high speed

This high speed 10bit CMOS camera inspection system comprises advanced CMOS and electronics technology. It is packed together with an excellent Tablet PC LM1600 into a case with batteries and tripod. Therefore, the inspection system can be used anywhere operated for more than 2 hours by its own batteries.

With the new approach to integrate the image memory (camRAM) into the camera itself, it enables unmatched fast image recording with 1GB/s. The system features an excellent resolution (1280 x 1024pixel) and low noise. 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). The available exposure times range from 1 $\mu$ s (50ns optional) to 5s. This digital CMOS camera system is perfectly suited for high speed inspection applications such as production line fault detection and motion analysis.

## technical data: camera system

	unit	setpoint	pco.1200 hs
resolution (hor x ver) <sup>1</sup>	pixel		1280x1024
pixel size (hor x ver)	$\mu\text{m}^2$		12.0 x 12.0
sensor format/ diagonal	mm <sup>2</sup> / mm		15.36x12.29/ 19.67
peak quantum efficiency	%	@ 520nm typical	27
full well capacity	e <sup>-</sup>		63 000
image sensor			MT9M413
dynamic range	dB	@ CMOS camera	59.6
dynamic range A/D <sup>2</sup>	bit		10
readout noise	e <sup>-</sup> rms	@ 66MHz	85
imaging frequency, frame rate	fps	@full frame/ @ROI VGA	636/ 1357
pixel scan rate	MHz	dual speed	66 / 86
A/D conversion factor	e <sup>-</sup> /count		30
spectral range	nm		290..1100
exposure time	s		1 $\mu$ s..5s (50ns..5s opt.)
anti-blooming factor		typical	no blooming
smear	%		no smear
binning horizontal	pixel		1
binning vertical	pixel		1
dark current	e <sup>-</sup> /pixel·s	@25 °C typical	5900
region of interest	pixel	horizontal vertical	steps of 10 steps of 1
interframing time (PIV mode)	ns	@FWHM <sup>3</sup> and 100% fullwell signal	70

## technical data: camera system

non linearity	%	full temperature range	<2
uniformity darkness DNSU <sup>4</sup>	e <sup>-</sup> rms	@ 90% center zone	<700
uniformity brightness PRNU <sup>5</sup>	% rms	typical	0.6
trigger, auxiliary signals		internal/ external	software / TTL level
power consumption	W	typical/ maximum	25 / 40
power supply	VAC		90..260
mechanical dimensions camera (w x h x l)	mm <sup>3</sup>		84 x 66 x 175
mechanical dimensions case (w x h x l)	mm <sup>3</sup>		178 x 425 x 500
weight	kg	complete system	12.9
operating temperature range	°C		+5..+40
operating humidity range	%		10..90
storage temperature range	°C		-20..+70
optical input			Nikon f-mount, c-mount
data interface			IEEE1394, camera link, ethernet
CE certified			yes

### software:

Camware software for camera control, image acquisition 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:

CMOS image sensor in color version  
 custom-made versions  
 camRAM available in: 1GB, 2GB and 4GB  
 trolley for simple transport and as solid base for operation

- [1] horizontal versus vertical
- [2] Analog-to-Digital-converter
- [3] full width half maximum
- [4] dark signal non-uniformity
- [5] photo reponse non-uniformity

## frame rate table [frames per second]

pixelclock	66MHz	86MHz
exposure time	1/fps / <1/fps	1/fps / <1/fps
1280x1024 pixel (full frame)	488 / 486	636 / 634
1280x512 pixel	977 / 969	1272 / 1263
1280x256 pixel	1953 / 1923	2545 / 2506
1280x128 pixel	3906 / 3788	5090 / 4936
1280x64 pixel	7813 / 7353	10180 / 9581
1280x32 pixel	15625 / 13889	20360 / 18098
1280x16 pixel	31250 / 25000	40720 / 32576

(Regions of Interest are free selectable, this table just shows the relation between vertical resolution and image rate)

## Tablet PC - Motion Computing LM1600



### technical data: Tablet PC LM1600

processor		@ 1.5 GHz	Intel® Pentium® M processor LV758
operating system			MS® Windows® XP Tablet PC Edition
RAM	GB		1
harddisk			60
display		XGA TFT LCD View Anywhere®	12"
weight	kg		1.42
mechanical dimensions Tablet PC (w x h x l)	mm <sup>3</sup>		296 x 240 x 18.7-22
operating temperature range	°C		+5..+35
operating humidity range	%		20..80
storage temperature range	°C		-20..+65
CE certified			yes

Further technical information can be found on:  
[www.motioncomputing.com](http://www.motioncomputing.com) or [www.thetabletstore.de](http://www.thetabletstore.de)

View into a bottling machine, which fills beer bottles. The uptake of the empty bottles can be seen in the background (recorded at 636fps).

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## areas of application

■ high speed inspection ■ motion analysis in sports ■ fault detection in high throughput production lines ■ motion analysis of animals ■ material testing ■ tensile tests ■ airbag inflation ■ fast flow visualisation ■ spray analysis ■ hydrodynamics ■ fuel injection ■ fast events in nature and medicine

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