pco.1200 hs
digital high speed 10bit CMOS camera system

- 636 fps at full resolution (1357 fps at VGA resolution)
- extremely fast image recording – 1 GB/s
- high resolution (1280 × 1024 pixel)
- exposure time range 50 ns – 5 s
- image memory in camera (camRAM up to 4 GB)
- interframing time 75 ns
- standard interfaces (IEEE 1394, camera link)

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pco.1200 hs

This high speed 10 bit CMOS camera system comprises advanced CMOS and electronics technology. With the new approach to integrate the image memory (camRAM) into the camera itself, it enables unmatched fast image recording with 1 GB/s. The system features an excellent resolution (1280 × 1024 pixel) 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 µs (50 ns optional) to 5 s. This digital CMOS camera system is perfectly suited for high speed camera applications such as material testing, external crash tests or super slow motion movie clips.

technical data

	unit	setpoint	pco.1200 hs
resolution (hor × ver) [1]	pixel		1280 × 1024
pixel size (hor × ver)	µm²		12.0 × 12.0
sensor format / diagonal	mm² / mm		15.36 × 12.29 / 19.67
peak quantum efficiency	%	@ 520 nm typical	27
full well capacity	e^-		63 000
image sensor			MT9 M413
dynamic range	dB	@ CMOS camera	59.6
dynamic range A/D [2]	bit		10
readout noise	e^- rms	@ 66 MHz	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^- / count	normal	55
spectral range	nm		290..1100
exposure time	s		1 µs..5 s (50 ns..5 s opt.)
anti–blooming factor		typical	no blooming
smear	%		no smear
binning horizontal	pixel		1
binning vertical	pixel		1
dark current	e^- / pixel·s	@ 25 C typical	5900
region of interest	pixel	horizontal vertical	steps of 10 steps of 1
interframing time (PIV mode)	ns	@ FWHM [3] and 100% fullwell signal	70

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technical data

non linearity	%	full temperature range	< 2
uniformity darkness DSNU [4]	e^- rms	@ 90% center zone	< 700
uniformity brightness PRNU [5]	%	typical	0.6
trigger, auxiliary signals		internal external	software TTL level
power consumption	W	typical maximum	25 40
power supply	VAC		90...260 (12 VDC optional)
mechanical dimensions camera (w × h × l)	mm^3		84 × 66 × 175
mechanical dimensions power supply (w × h × l)	mm^3		135 × 51 × 195
weight	kg		1
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			IEEE 1394, camera link
CE certified			yes

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

software	Camware software for camera control, image acquisition and archiving of images in various file formats (WindowsXP and later) 32 / 64 bit–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: 2 GB and 4 GB

frame rate table [frames per second]

pixelclock exposure time	66 MHz 1/fps / <1/fps	86 MHz 1/fps / <1/fps
1280 × 1024 pixel (full frame)	488 / 486	636 / 634
1280 × 512 pixel	977 / 969	1272 / 1263
1280 × 256 pixel	1953 / 1923	2545 / 2506
1280 × 128 pixel	3906 / 3788	5090 / 4936
1280 × 64 pixel	7813 / 7353	10180 / 9581
1280 × 32 pixel	15625 / 13889	20360 / 18098
1280 × 16 pixel	31250 / 25000	40720 / 32576

areas of application

■ high speed particle image velocimetry (PIV) ■ short time physics ■ hyper velocity impact studies ■ automobile crash tests ■ material testing ■ tensile tests ■ airbag inflation ■ fast flow visualisation ■ spray analysis ■ hydrodynamics ■ fuel injection ■ sparks in electric switches ■ combustion process analysis ■ semiconductor quality control ■ fast events in nature and medicine ■ ballistics ■ super slow motion movie clips ■ visualization of fast biological events (muscle contraction) ■ traffic control ■ spray imaging

The images are taken from a sequence showing the contraction of a single skeleton muscle cell (lenght = 600 µm, thickness = 50 µm) after intracellular simulation. The series starts at time 0 with image #1 (300x479 pixel, 1400 fps).
...with friendly permission of, O. Friedrich, Medical Biophysics Group, Institut für Physiologie & Pathophysiologie, Heidelberg, Germany

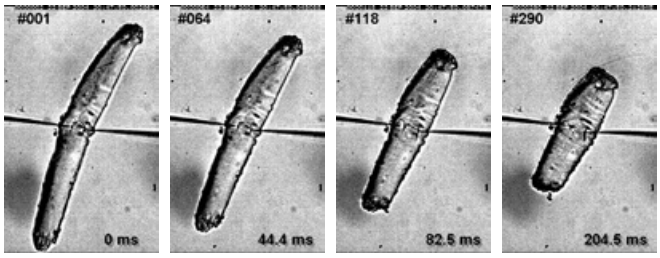

Image of a sequence showing a biscuit falling into a dish of milk, part of an advertising sequence (1280x1024 pixel, 636 fps).
...with friendly permission of, S. Weiss, Munich, Germany, www.digital-highspeed.com

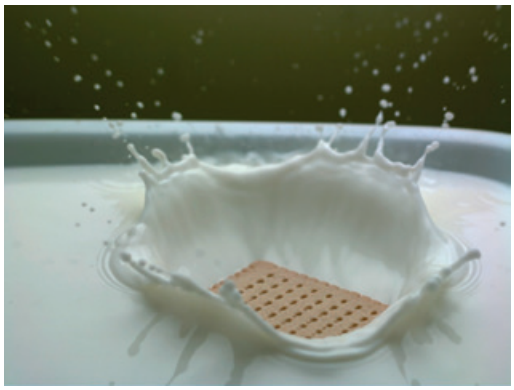

Image of a sequence showing water drops falling onto a water surface, part of a scientific documentation sequence (1280x1024 pixel, 600 fps).
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contact

europe
PCO AG
Donaupark 11
93309 Kelheim, Germany

fon +49 (0)9441 2005 50
fax +49 (0)9441 2005 20
info@pco.de
www.pco.de

america
PCO-TECH Inc.
6930 Metroplex Drive
Romulus, Michigan 48174, USA

fon (248) 276 8820
fax (248) 276 8825
info@pco-tech.com
www.pco-tech.com

asia
PCO Imaging Asia Pte.
3 Temasek Ave
Centennial Tower, Level 34
Singapore, 039190

fon +65 6549 7054
fax +65 6549 7001
info@pco-imaging.com
www.pco-imaging.com

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