Photonic Lattice

NEW HIGH-SPEED 2D POLARIZATION CAMERA

CRYSTA

Crysta is the first 1,000,000 frame per second 2D Polarization Camera. The Crysta is a powerful tool to understand phenomena such as birefringence, retardation, stress and impact fracture mechanisms within transparent and semi-transparent materials and fluids.

OEM SDK available.

High-Speed 2D Polarized Imaging, displaying amplitude and wavelength.

CRYSTA

Conventional high-speed cameras have been used for nearly eight years and are widely accepted worldwide to visualize fast occurring events and phenomena oooccuring on a subjects exterior.

But conventional high-speed imaging has lacked any polarization sensitivity to enable the study of polarization phenomena, such as is increasingly required for rheology and structural dynamics, where an understanding of what is taking place internally is required for the advancement of lightweight materials, experimental mechanics, and high-precision processing technologies.

The CRYSTA has been developed to be the first high-speed camera with polarization sensitivity, developed through more than five years of research and development by the market leader in high-speed camera innovation; Photron.

The high-speed polarization image sensor was developed through combining a Photonic-crystal micro polarizer array and conventional high-speed two-dimensional image sensor.
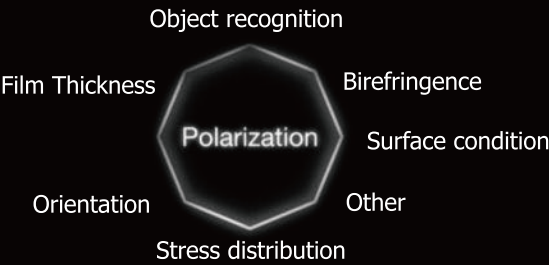
Photron is committed to continually expand the area of high-speed imaging with this new concept of polarization.

Exclusive technology, "High-Speed polarization image sensor"

This image sensor is equipped with a Photonic-crystal micro array with different polarizer orientations of $0°$, $45°$, $90°$ and $135°$ for individual pixels. Unlike the conventional polarizing systems, Crysta does not require a rotational polarizing plate. Therefore, the optical intensity information necessary for polarization measurement can be obtained with a single microsecond exposure. One of the key benefits with this new image sensor is that the sampling rate is more than 1,000-times faster than that of the conventional systems. This is achieved by directly connecting the polarizers to unique high-speed pixel-parallel output circuits.
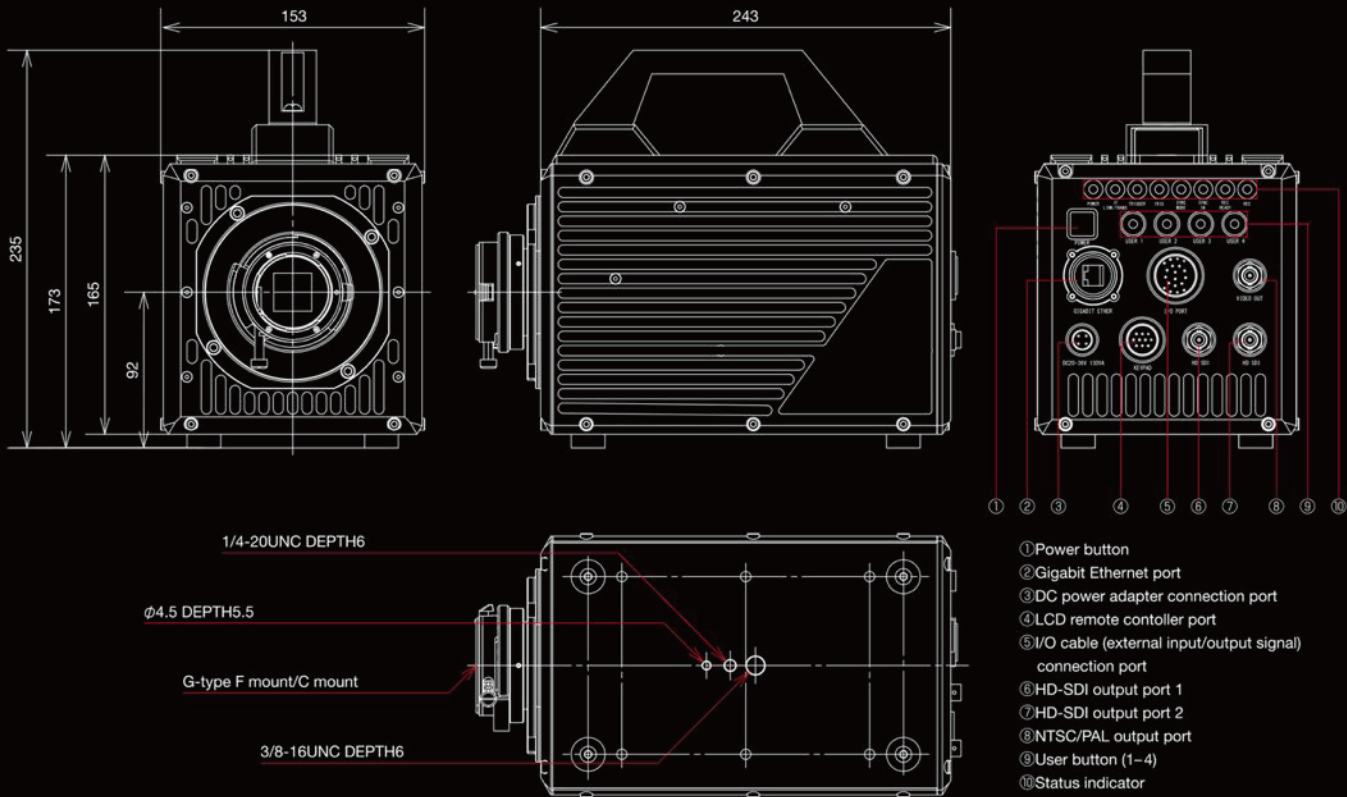
Micro polarizer array   High-speed image sensor

15.0kV x8.00k SE(U)   5.00um
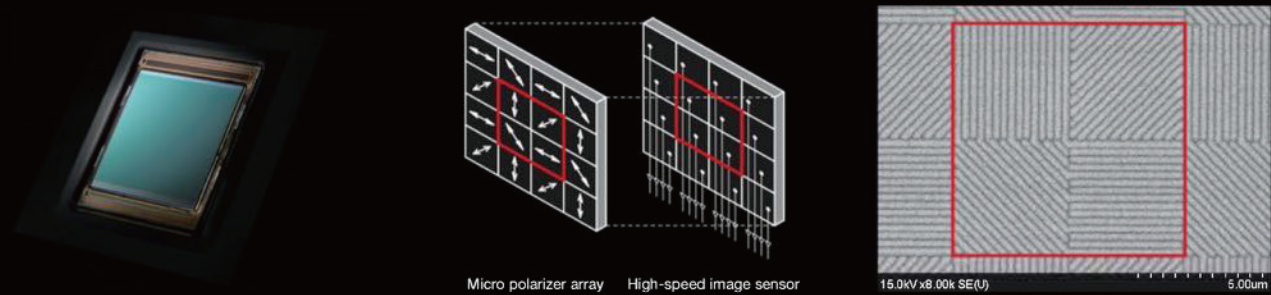
Polarization allows you to visualize and measure various physical quantities and properties previously invisible

Object recognition
Film Thickness
Birefringence
Polarization
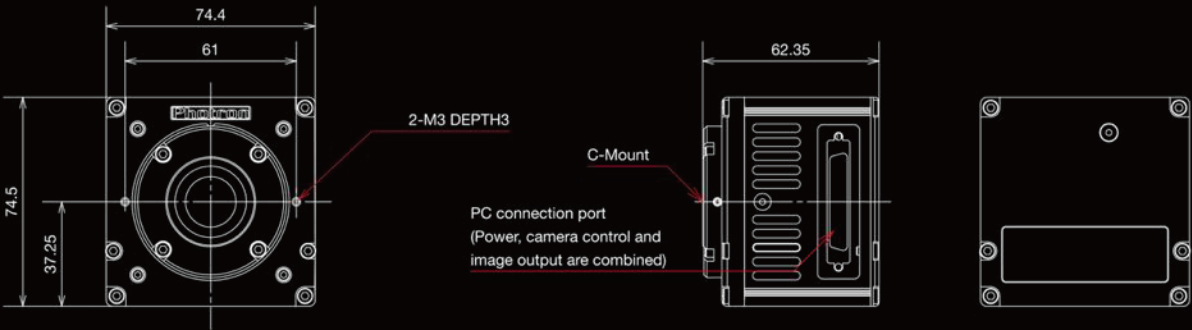Surface condition
Orientation
Other
Stress distribution

Polarized light has a regular direction of amplitude. Polarization can be classified as linear, circular, and elliptic Moreover, depending on the extent of polaization, light can be classified as completely polarized, partially polarized and non-polarized. The polarization condition of light changes depending on the structure and surface of the transmission material. Comparison between the incident and output conditions of light thus enables various measurements and visualizations to be achieved.
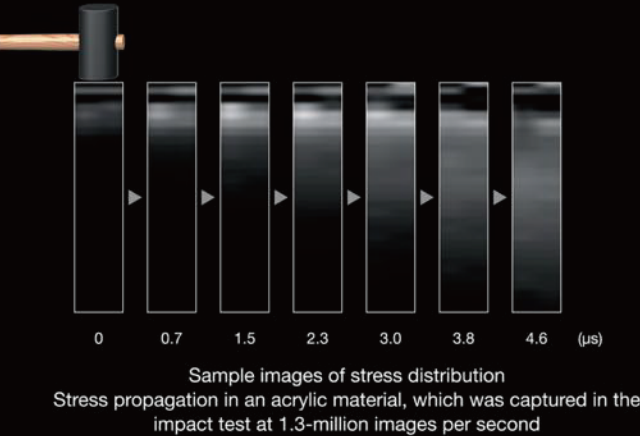
Outline Diagram

CRYSTA PI-1P/WP

153   243   235   173   165   92

1/4-20UNC DEPTH6
⌀4.5 DEPTH5.5
G-type F mount/C mount
3/8-16UNC DEPTH6

①Power button
②Gigabit Ethernet port
③DC power adapter connection port
④LCD remote contoller port
⑤I/O cable (external input/output signal) connection port
⑥HD-SDI output port 1
⑦HD-SDI output port 2
⑧NTSC/PAL output port
⑨User button (1–4)
⑩Status indicator

CRYSTA PI-5P/WP

74.4   61   74.5   37.25   62.35

2-M3 DEPTH3
C-Mount
PC connection port
(Power, camera control and image output are combined)

Applications Include

Rheology, Experimental Mechanics, Defense, Optical Measurement, Life Sciences, Non-Newtonian Flow, Impact Fracture Test, Separation Test, Stretch Test, Rubbing Test and Manufacturing Interferometer.

0   0.7   1.5   2.3   3.0   3.8   4.6   (μs)

Sample images of stress distribution
Stress propagation in an acrylic material, which was captured in the impact test at 1.3-million images per second

Sample images of Object Recognition
Window Tracking of Running Vehicles

CRYSTA

Specifications

	PI-1 series		PI-5 series	
Outline				
Model	CRYSTA PI-1P	CRYSTA PI-1WP	CRYSTA PI-5P	CRYSTA PI-5WP
Feature	Super High-Speed polarization imaging		Real-time transfer to PC memory and SDK accessory	
Image sensor	High-speed polarization image sensor		High-speed polarization image sensor	
Polarizer	Linear polarizer	Phase shifter + linear polarizer	Linear polarizer	Phase shifter + linear polarizer
Polarization operating wavelength range (nm)	520 - 570	520 - 570	520 - 570	520 - 570
Customization of operating wavelength	Contact Us	Contact Us	Contact Us	Contact Us
Polarizer structure of four neighboring pixels (°)	0, 45, 90, 135	Contact Us	0, 45, 90, 135	Contact Us
Customization of polarizer structure	Contact Us	Contact Us	Contact Us	Contact Us
Digital output (bit)	12	12	12	12
Resolution(Max) @ polarization imaging	1,024 × 1,024	1,024 × 1,024	2,560 × 2,048	848 × 680
Resolution(Max) @ monochrom imaging	1,024 × 1,024	1,024 × 1,024	2,560 × 2,048	848 × 680
Frame rate (full frame)	60 - 7,000	60 - 7,000	15 - 250	15 - 250
Frame rate (windowing)	1,550,000	1,550,000	10,000	10,000
Exposure time(Min) (nsec)*2	369	369	2,893	2,893
Lens mount	Interchangeable F-mount and C-mount using supplied adapters	Interchangeable F-mount and C-mount using supplied adapters	C-Mount	C-Mount
Interface	1000Base-T	1000Base-T	PCI-Express	PCI-Express
Output data format	RAW, BMP and other	RAW, BMP and other	RAW, BMP and other	RAW, BMP and other
SDK and sample software	Standard, C/C++	Standard, C/C++	Standard, C/C++	Standard, C/C++
Operating temp of camera (head) (°C)	0 - 40 (without condensation)	0 - 40 (without condensation)	0 - 40 (without condensation)	0 - 40 (without condensation)
Storage temp of camera (head) (°C)	-20 ~ 60 (without condensation)	-20 ~ 60 (without condensation)	-20 ~ 60 (without condensation)	-20 ~ 60 (without condensation)
Operating humidity of camera (head) (%)	Below 85 (without condensation)	Below 85 (without condensation)	Below 80 (without condensation)	Below 80 (without condensation)
Storage humidity of camera (head) (%)	Below 85 (without condensation)	Below 85 (without condensation)	Below 80 (without condensation)	Below 80 (without condensation)
Operating temp of control PC (°C)	-	-	5 - 35 (without condensation)	5 - 35 (without condensation)
Storage temp of control PC (°C)	-	-	-40 ~ 60 (without condensation)	-40 ~ 60 (without condensation)
Operating humidity of control PC (%)	-	-	8 - 85 (without condensation)	8 - 85 (without condensation)
Storage humidity of control PC (%)	-	-	8 - 90 (without condensation)	8 - 90 (without condensation)
AC supply voltage (V)*3	100	100	100	100
AC supply frequency (Hz)	50-60	50-60	50-60	50-60
AC power consumption (VA)	130	130	600	600
DC supply voltage (V)	20-36	20-36	12	12
DC power consumption (VA)	130	130	20	20
Memory capacity (GB)	32	32	32 (memory size of standard PC)	32 (memory size of standard PC)
Record duration (seconds)	2.98 (at 7,500fps)	2.98 (at 7,500fps)	11.46 (at 250fps)	11.46 (at 250fps)
Camera (head) external dimensions (mm)	153 × 165 × 243 (WHD)	153 × 165 × 243 (WHD)	74.4 × 74.5 × 62.35 (WHD)	74.4 × 74.5 × 62.35 (WHD)
Camera (head) weight (kg)	7.4	7.4	0.48	0.48
Camera head cable length (m)	-	-	5, 15	5, 15
Trigger type	Start, End, Random and other	Start, End, Random and other	Start, End, Random and other	Start, End, Random and other
External synchronization	Possible	Possible	Impossible	Impossible

*2. Adjustable exposure time depends on imaging speed. Please contact us for details.
*3. Please contact Photron for information regarding a 200V version.
* Certain parts are subject to export restrictions for use outside Japan. Please contact Photron to discuss any export restrictions for your area.