

Shad-o-Box HS Product Family



Shad-o-Box HS

Key Features

- Large active area up to 10x15 cm
- Up to 10 lp/mm resolution
- Gigabit Ethernet interface (Camera Link optional)
- 14-bit digital video output
- Energy range from 10 to 225 kV
- Ready-to-run software and drivers

Applications

- Digital radiography
- Industrial CT (Computed Tomography)
- Real-time inspection / Non-Destructive Testing
- X-ray analysis for mining & minerals

Overview

The Shad-o-Box HS product family leverages Teledyne DALSA's advanced CMOS image sensing technology to capture low-dose X-ray images and deliver higher image quality than a-Si flat panels and image intensifier devices.

Shad-o-Box HS cameras contain a large-area, high-resolution CMOS detector with a photodiode pixel array featuring three standard size options of approximately 3x4, 4x6 and 5x5 inches. The cameras are available in different resolutions featuring either a 135 μ m, 99/100 μ m or 49.5 μ m pixel size. All detectors are capable of real-time, full-resolution imaging at frame rates up to 40 fps. The detectors are optimized for the 40-160 kV energy range but cover both the low (10-50 kV) and extended (up to 225 kV) energy ranges, making this camera an ideal choice for industrial inspection, biomedical and scientific X-ray imaging applications.

The detector array consists of a single CMOS die (no tiling) that contains multiple output taps to enable high frame rates and a direct-contact Gd2O2S scintillator such as Kodak Min-R[®] 2190 or Mitsubishi Chemical DRZ-Std. The scintillator converts x-ray photons into visible light that is sensed by the CMOS photodiodes. A thin graphite cover protects the sensor from accidental damage as well as ambient light. The Shad-o-Box HS camera also contains lead and steel shielding to protect the camera electronics from the X-ray radiation.

The video signal is digitized to 14 bits, reassembled (deinterlaced) within the camera's FPGA, and then transferred directly to the host memory. The cameras communicate via a fast, reliable Gigabit Ethernet interface using standard Cat5e cables over lengths of up to 100m. An optional Camera Link interface is also available (contact your sales representative for details).

Each camera ships with our ShadoCam Imaging application and Teledyne DALSA's CamExpert™ software, which provides simple, user-friendly tools for communicating with the camera and acquiring images. The user-friendly interface allows easy access to features such as adjusting the frame rate, single and multiple frame acquisitions, and control of advanced timing modes.

Shad-o-Box HS Camera Options

Device	Pixels	Active Area	Resolution	Frame Rate
Shad-o-Box 512 HS	768 x 512	10.4 x 6.9 cm	135 μ m	35 fps
Shad-o-Box 1024 HS	768 x 1024	10.4 x 13.8 cm	135 μ m	35 fps
Shad-o-Box 1280 HS	1280 x 1280	12.8 x 12.8 cm	100 μ m	30 fps
Shad-o-Box 688 HS	1032 x 688	10.2 x 6.8 cm	99 μ m	40 fps
Shad-o-Box 1548 HS	1032 x 1548	10.2 x 15.3 cm	99 μ m	20 fps
Shad-o-Box 3K HS	2304 x 1300	11.4 x 6.4 cm	49.5 μ m	10 fps
Shad-o-Box 6K HS	2304 x 2940	11.4 x 14.6 cm	49.5 μ m	5 fps

Shad-o-Box HS Product Family

Specifications

Detector Specifications		Units
Typ. dark current (23°C) ⁽¹⁾	12	ADU/s ⁽²⁾
Read noise (rms)	4-8	ADU
Typ. dynamic range	3000:1	
Digitization	14	bits
Image lag	<0.1	%
Non-linearity (10..90% FS)	<1.5	%
Readout period ⁽³⁾	22	ms
Max. frame rate (full res.)	30	fps
Output data rate	40	MHz

⁽¹⁾ dark current doubles approx. every 8°C

⁽²⁾ ADU = Analog-Digital Unit = 1 LSB (Least Significant Bit)

⁽³⁾ time required to transfer image from sensor to camera memory

Camera Specifications	1280 HS	All Others	Units
Typical supply voltage	12	6.5	Volts
Supply voltage range	11 to 13	6.0 to 8.0	Volts
Maximum supply current ⁽⁴⁾	1.0	1.5	Amps
Typical power dissipation ⁽⁴⁾	< 10	< 10	Watts
Camera interface	Gigabit Ethernet	Gigabit Ethernet	
Trigger connector	TTL	TTL	

⁽⁴⁾ depends on camera model

General Specifications		Units
Operating temperature	0 to 40	°C
Storage temperature	-10 to +55	°C
Humidity (non-condensing)	10 to 80	% R.H.
Weight ⁽⁴⁾	< 3.5	kg

⁽⁴⁾ depends on camera model

Shad-o-Box HS Product Family

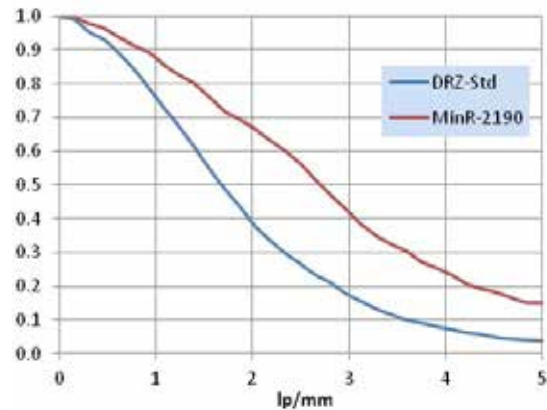
Resolution & Sensitivity

The Shad-o-Box HS cameras are designed to work with X-ray sources operating from 40 to 160 kVp. X-ray energies as low as 10-15 keV can be detected. Although the cameras can be used with X-ray energies as high as 225kV, we strongly recommend the use of additional shielding at higher energies in order to protect the sensor element and electronics from damage.

The pixel spacing of each camera model determines the limiting resolution of the sensor. The actual Modulation Transfer Function (MTF) of the detector depends on the type of scintillator that is installed. A thicker phosphor screen will produce more signal, but at the expense of high-frequency contrast. Typical MTF curves for the two standard scintillator options are shown in the graph below.

Scintillator	Typical Sensitivity ⁽¹⁾
Min-R 2190	4.1 ADU/ μ R @ 50kVp 5.2 ADU/ μ R @ 80kVp
DRZ-Std	10.5 ADU/ μ R @ 50kVp 14.5 ADU/ μ R @ 80kVp

⁽¹⁾ Shad-o-Box 1280 HS, W target, 2mm glass window, no filtration



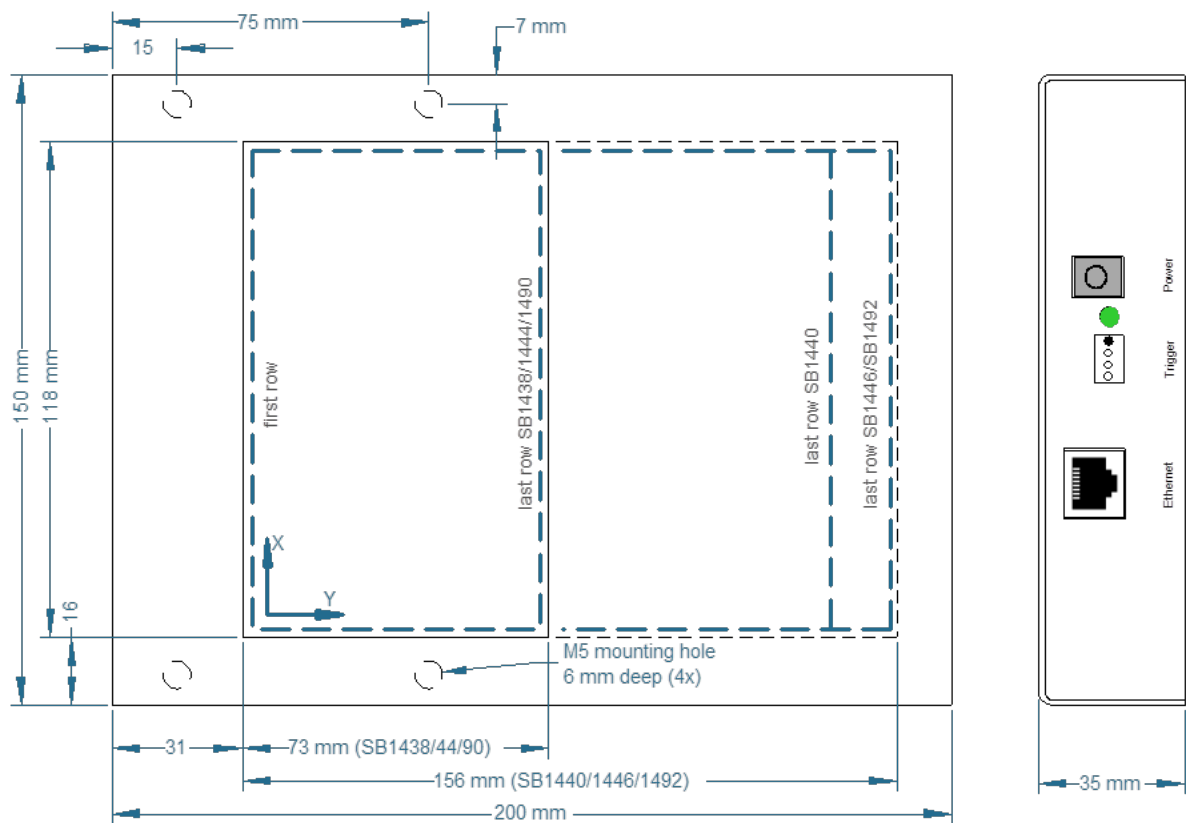
Software

Each Shad-o-Box HS camera ships with Teledyne DALSA's ShadoCam Imaging application, CamExpert software and a Gigabit Ethernet driver. The software is compatible with Windows® XP, VISTA, Windows 7 and 8. Check with your sales representative for compatibility with earlier Windows versions or with the Linux operating system. The camera can be connected on a network, but for optimal performance a dedicated network adapter is highly recommended.

For writing custom applications to acquire images from the camera, we recommend using Teledyne DALSA's Sopera LT or Sopera Essentials SDK (sold separately).

Shad-o-Box HS Product Family

Mechanical Drawing: 3x4" and 4x6" Models



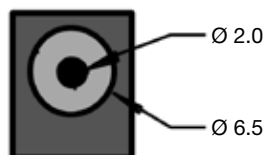
Data Connector:

RJ45 HALO HFJ11-1G16E-L12RL

Power Connector:

DC power jack, 2 mm center pin

center pin: 6.5 VDC
outside: ground



Trigger I/O Connector:

4-pin FCI 78208-104HLF

Mates with FCI 78211-004LF

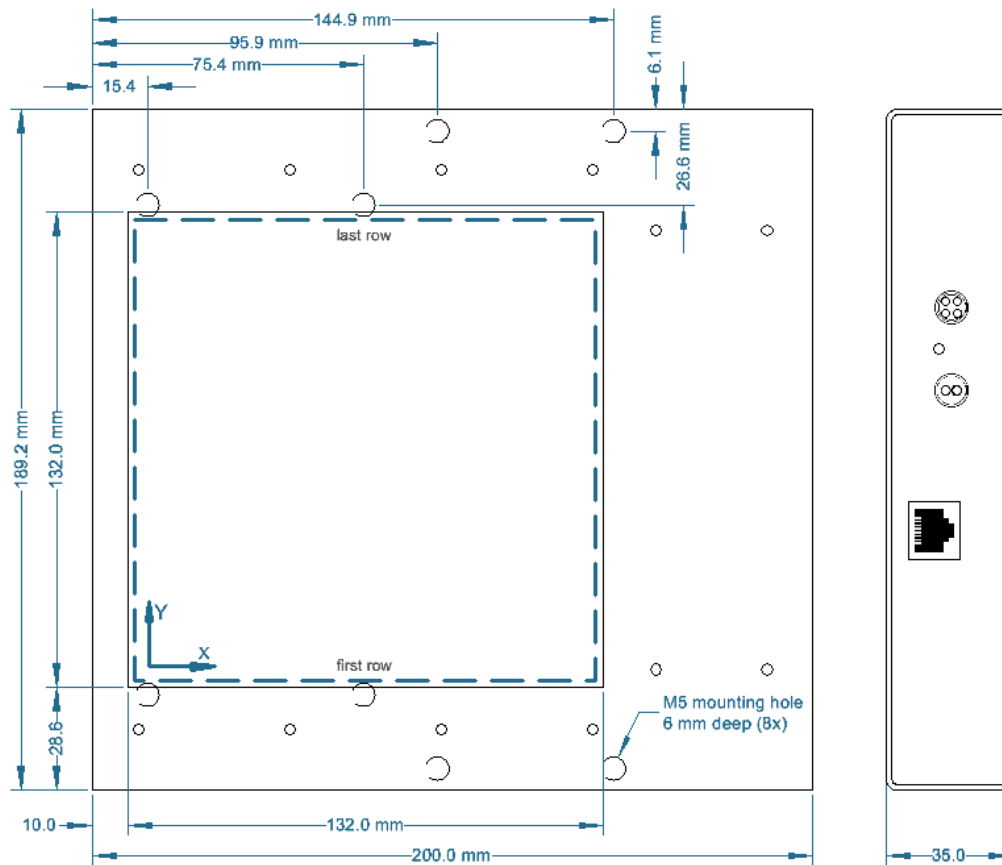
TTL (open collector), opto-isolated

- Pin 1 Trig out+
- Pin 2 Trig out-
- Pin 3 Trig in+
- Pin 4 Trig in-



Shad-o-Box HS Product Family

Mechanical Drawing: Shad-o-Box 1280 HS



Data Connector:

RJ45 HALO HFJ11-1G16E-L12RL

Power Connector:

2-pin LEMO EGG.0B.0302

Pin 1 +12 VDC
Pin 2 ground



Trigger I/O Connector:

4-pin LEMO EGG.0B.0304

TTL (open collector), opto-isolated

Pin 1 Trig out+
Pin 2 Trig out-
Pin 3 Trig in+
Pin 4 Trig in-



Shad-o-Box HS Product Family

Ordering Information

Shad-o-Box HS cameras are available in a single image quality grade (up to 25 correctable line defects). Specify option -01 for the Kodak Min-R® 2190 scintillator, or option -02 for a Mitsubishi Chemical DRZ-Std scintillator. Additional scintillator options may be available by request.

All cameras ship with a universal input power supply (90-264V, 50-60Hz), power cord, Ethernet cable, software CD and User's Manual. For international orders, please specify the type of power cord you require.

P/N	Description
SB1438	Shad-o-Box 512 HS Camera (7x10cm, 135 μ m pixel)
SB1440	Shad-o-Box 1024 HS Camera (10x14cm, 135 μ m pixel)
SB1350	Shad-o-Box 1280 HS Camera (13x13cm, 100 μ m pixel)
SB1444	Shad-o-Box 688 HS Camera (7x10cm, 99 μ m pixel)
SB1446	Shad-o-Box 1548 HS Camera (10x15cm, 99 μ m pixel)
SB1490	Shad-o-Box 3K HS Camera (7x11cm, 49.5 μ m pixel)
SB1492	Shad-o-Box 6K HS Camera (11x15cm, 49.5 μ m pixel)

www.teledynedalsa.com

Americas

Sunnyvale, CA
+1 408-736-6000
sales.rad-icon@teledynedalsa.com

Europe

Eindhoven, The Netherlands
+31 40-259-9000
sales.europe@teledynedalsa.com

Asia Pacific

Tokyo, Japan
+81 3-5960-6353
sales.asia@teledynedalsa.com

Shanghai, China
+86 21-3368-0027
sales.asia@teledynedalsa.com

Shad-o-Box cameras are manufactured and supported by Teledyne Rad-icon Imaging, a wholly owned subsidiary of Teledyne DALSA. Teledyne DALSA has its corporate offices in Waterloo, Canada. Teledyne DALSA reserves the right to make changes at any time without notice. Teledyne DALSA © 2013.

