Bobcat-640-GigE/CL

Bobcat-320-GigE/CL

Datasheet Document

ENG-2012-DSD019-R003

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Revision History

Issue	Issue date	Reason for changes	Modified by	Approved by
001	21/03/2014	First released issue	CDU	JDS
002	17/07/2015	2nd released issue	KNB	JDS
002.01	04/09/2015	Trigger info updated	JDS	KNB
003	12/01/2016	3th released issue	KNB	JDS

Change Details

This table lists all changes of this issue compared to the previous released one.

Chapter/Section	Changes	Modified by

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List of Abbreviations

ADC	Analog Digital Convertor
ADU	Analog to Digital Unit
AGC	Auto-Gain and Offset Control
CL	Camera Link
e^-	electrons
FPA	Focal Plane Array
GigE	Gigabit Ethernet
ITR	Integrate Then Read
IWR	Integrate While Read
NUC	Non Uniformity Correction
SDK	Software Development Kit
SMA	Sub-Miniature version A connector
SWIR	Short-Wave Infrared

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1. Configurations and General Description

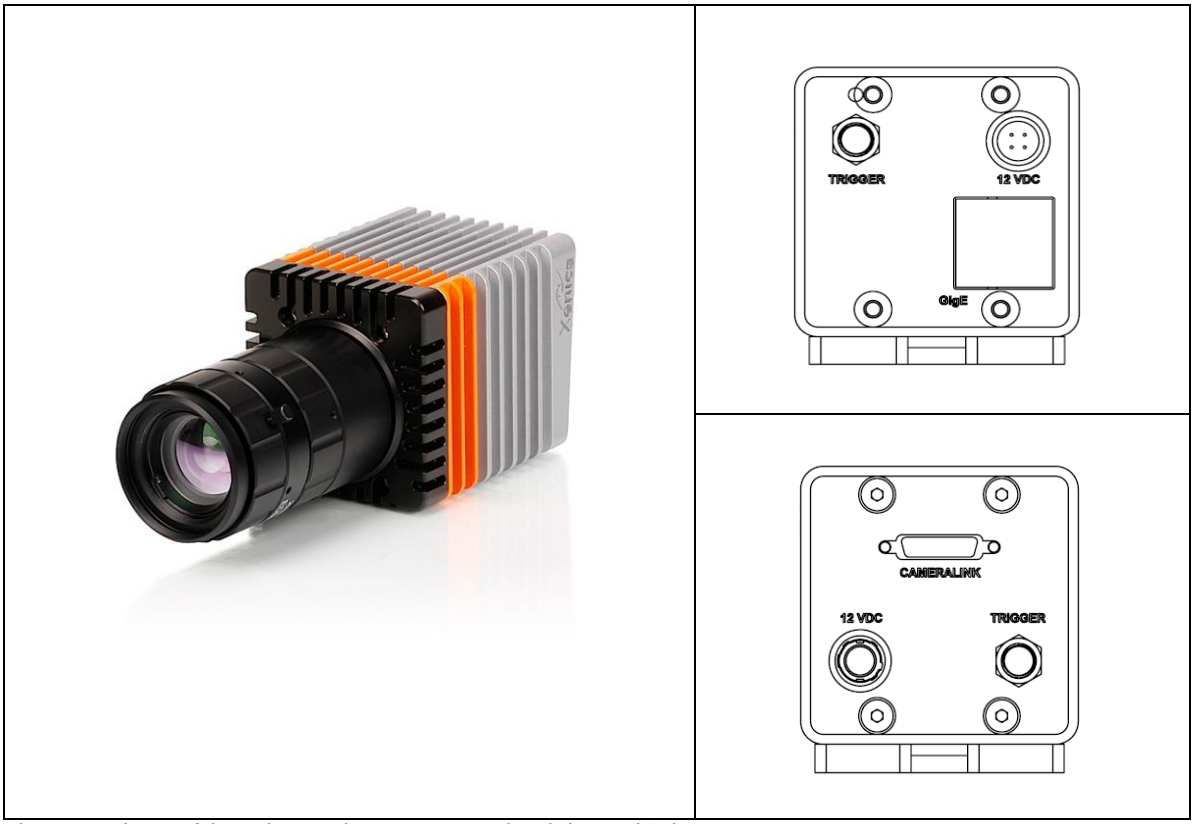

Figure 1-1 Picture of the Bobcat and connector overview (GigE and CL)

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Camera	Product Number	General Description
Bobcat-640-GigE-Industrial	XEN-000298	High resolution SWIR (or VisNIR) imaging Camera with TE1 stabilization and GigE interface
Bobcat-640V-GigE-Industrial	XEN-000139	
Bobcat-640-GigE-Scientific	XEN-000296	
Bobcat-640V-GigE-Scientific	XEN-000099	
Bobcat-640-CL-Industrial	XEN-000297	High resolution SWIR (or VisNIR) imaging Camera with TE1 stabilization and Cameralink interface
Bobcat-640V-CL-Industrial	XEN-000140	

Table 1-1 Bobcat-640 camera configurations and general description

Camera	Product Number	General Description
Bobcat-320-GigE-100Hz	XEN-000583	Compact SWIR Imaging Camera with TE1 stabilization and GigE interface
Bobcat-320-GigE-400Hz	XEN-000524	
Bobcat-320-GigE-400Hz-Gated	XEN-000525	
Bobcat-320-CL-100Hz	XEN-000584	Compact SWIR Imaging Camera with TE1 stabilization and Cameralink interface
Bobcat-320-CL-400Hz	XEN-000526	
Bobcat-320-CL-400Hz-Gated	XEN-000585	

Table 1-2 Bobcat-320 camera configurations and general description

General Description and Applications

The Bobcat is a very compact SWIR camera using an InGaAs FPA detector, for imaging in the SWIR (900 to 1700nm) or VisNIR (400 to 1700nm) wavelength range. The Bobcat is available in 2 different resolutions: 320x256 or 640x512.
The camera has a CL or GigE output, low noise and dark current, together with low weight, power and size. In addition, various C-mount lenses (SWIR or Visible) are available.
The Bobcat-640 can be operated both in high gain and low gain, and ITR and IWR. For the Bobcat-320, only high gain and ITR is available.The Bobcat has also different image processing algorithms implemented onboard: multiple non-uniformity corrections (NUC or TrueNUC), Autogain and Offset Control (AGC), Auto Exposure and Histogram Equalization. Regarding the implemented algorithms, the Bobcat-320 is available in 3 different versions: a basic 100Hz basic version, an advanced 400Hz version, and a gated 400Hz version.
As a result the camera is very well suited for various applications, such as night vision, waste sorting, food inspection, in-line quality control, imaging of hot objects (300 to 800°C range), machine vision & process control and failure analysis.

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2. Specifications

2.1. ROIC Specifications

ROIC Specifications	Bobcat-640	Bobcat-320
ROIC type	ROIC with CTIA topology	ROIC with CTIA topology
ROIC Read Noise High Gain (1)	60 electrons	60 electrons
ROIC Read Noise Low Gain (1)	400 electrons	N.A.
Integration Capacitor High Gain	6.7 fF	10 fF
Integration Capacitor Low Gain	85 fF	N.A.
Full Well High Gain	$80x10^3$ electrons	$125x10^3$ electrons
Full Well Low Gain	$1.1x10^6$ electrons	N.A.
Readout modes	Integrate Then Read (ITR) Integrate While Read (IWR)	Integrate Then Read (ITR)

Table 2-1 ROIC specifications

(1) Typical value

2.2. Array Specifications

Array Specifications	Bobcat-640	Bobcat-320
Array type	InGaAs FPA; ROIC with CTIA topology	
Resolution	640 x 512	320 x 256
Pixel pitch	20 µm	
Array size	12.8 x 10.24 mm^2	6.4 x 5.12 mm^2
	16.39 mm diagonal	8.2 mm diagonal
Spectral band	0.9 to 1.7 (SWIR)	0.9 to 1.7 µm (SWIR)
	Optional 0.4 to 1.7 µm (VisNIR)	
Quantum Efficiency (SWIR) (1)	80 %	
Quantum Efficiency (VisNIR) (1)	85 %	N.A.
Dark current (2)	0.19 x 10^6 e^-/s/pixel at 200mV bias at 288K	
	30 fA at 200mV bias at 288K	
Pixel operability	>99 %	
Array cooling	TE1	

Table 2-2 Array specifications

(1) Typical value @ 1600nm (SWIR); @ 950 (VISNIR)
(2) Typical value

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2.3. Camera Specifications

Imaging specifications	Bobcat-640	Bobcat-320-100Hz	Bobcat-320-400Hz	Bobcat-320-400Hz-Gated
Maximum frame rate (full frame)	100 Hz	100Hz	400Hz	
Window of interest (minimum size)	32x4	N.A.	32x4	32x4
Exposure time range (1)	1µs – 40 ms	1µs – 40 ms		0.1µs – 40 ms
A ot D conversion resolution	14 bit	14 bit		
Gain (in Low Gain mode) [e-/ADU count]	16.2	N.A.		
Gain (in High Gain mode) [e-/ADU count]	1.28	1.5		
Camera Read Noise Low Gain (2) [e^-]	400	N.A.		
Camera Read Noise High Gain (2) [e^-]	120	110		
Dynamic Range Low Gain [dB]	68	N.A.		
Dynamic Range High Gain [dB]	56	61		

Table 2-3 Camera imaging specifications Bobcat-640 and Bobcat-320

(1) In high gain mode at 25°C FPA temperature: the max. exposure time is dark current limited.
(2) Typical value, measured in dark at t_{exp} = 0.1ms and 25°C FPA temperature

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On Board Image Processing Features Bobcat-320		Bobcat-320-CL-100Hz	Bobcat-320-CL-400Hz	Bobcat-320-CL-400Hz-Gated	Bobcat-320-GigE-100Hz	Bobcat-320-GigE-400Hz	Bobcat-320-GigE-400Hz-Gated
Image Correction	1 fixed NUCs onboard	x	x				
	4 fixed NUCs onboard				x	x	x
	5 fixed NUCs onboard			x			
	2 TrueNUCs onboard		x				
	3 TrueNUCs onboard			x			
	Real-time fixed NUC switching			x			
Auto-Gain and Offset		x	x	x	x	x	x
Auto-Exposure			x	x			
Histogram Equalization			x	x			
Trigger possibilities		x	x	x	x	x	x

Table 2-4 On board image processing features Bobcat-320

On Board Image Processing Features Bobcat-640		Bobcat-640-CL	Bobcat-640-GigE
Image Correction	1 fixed NUCs onboard	x	
	4 fixed NUCs onboard		x
	3 TrueNUCs onboard	x	
Auto-Gain and Offset		x	x
Auto-Exposure		x	
Histogram Equalization		x	
Trigger possibilities		x	x

Table 2-5 On board image processing features Bobcat-640

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Camera Specifications		
Interfaces		
Optical interface	C- mount	
Camera control	Cameralink	Bobcat-CL
	GigE	Bobcat-GigE
Image Acquisition	Cameralink	Bobcat-CL
	GigE	Bobcat-GigE
Trigger	Trigger In / Out (configurable)	
Power Requirements		
Power consumption (1)	2.8W	Bobcat-CL
	4W	Bobcat-GigE
Maximal power consumption	10W	
Power Supply	12 V	
Start-up time	< 10 s	
Trigger Characteristics (2)		
Trigger-in delay (SMA trigger) (3)	3.3 µs falling edge	Bobcat-640
	3.1 µs rising edge	
Trigger-in delay (CC1 trigger) (only for Bobcat-CL)	1.3 µs rising and falling edge	
Trigger-in jitter	± 0.05 µs	
Trigger-in delay (SMA trigger) (3)	7.2 µs falling edge	Bobcat-320
	7.0 µs rising edge	
Trigger-in delay (CC1 trigger) (only for Bobcat-CL)	5.3 µs rising and falling edge	
Trigger-in jitter	± 0.05 µs (4)	
Physical characteristics		
Dimensions (5)	55W x 55H x 72L	Bobcat-CL
	55W x 55H x 81,7L	Bobcat-GigE
Weight camera head (5)	285g	Bobcat-CL
	334g	Bobcat-GigE
Environmental specifications		
Shock	40g, 11ms, according to MIL-STD810G	
Vibration	5g (20 to 2000 Hz), according to MIL-STD810G	
Operating case temperature range	-40 to 70°C	
Storage temperature range	-45 to 85°C	

Table 2-6 Camera specifications Bobcat: operating mode – interfaces – power requirements – trigger characteristics - physical characteristics – environmental specifications

(1) Typical value, measured without TEC
(2) Trigger delays are specified between trigger pulse and start of integration on the ROIC
(3) With Trigger-in voltage = 5V
(4) For external synchronization in gated mode, it is recommended to use trigger-out mode, with configurable delay and no jitter.
(5) Without Lens

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Correction Files Bobcat-320 (Fixed NUC and TrueNUC) [1]	
Bobcat-320-GigE-100Hz	Fixed NUC, CTIA mode: 500 µs, 1ms, 5 ms, 10ms
Bobcat-320-GigE-400Hz	Fixed NUC, CTIA mode: 500 µs, 1ms, 5 ms, 10ms TrueNUC, CTIA mode (only to be used in Xeneth software) - 10µs – 500µs - 100µs – 40ms
Bobcat-320-GigE-400Hz-gated	Fixed NUC, Gated Mode: 100ns Fixed NUC, CTIA mode: 500 µs, 1ms, 5 ms, 10ms TrueNUC, CTIA mode (only to be used in Xeneth software) - 10µs – 500µs - 100µs – 40ms
Bobcat-320-CL-100Hz	Fixed NUC, CTIA mode: 500 µs, 1ms, 5 ms, 10ms
Bobcat-320-CL-400Hz	Fixed NUC, CTIA mode: 500 µs, 1ms, 5 ms, 10ms TrueNUC, CTIA mode: - 10µs – 500µs - 100µs – 40ms
Bobcat-320-CL-400Hz-gated	Fixed NUC, Gated Mode: 100ns Fixed NUC, CTIA mode: 500 µs, 1ms, 5 ms, 10ms TrueNUC, CTIA mode: - 10µs – 500µs - 100µs – 40ms TrueNUC, gated mode (only onboard): - 100ns – 1µs

Table 2-7 Correction files provided with the Bobcat-320

Correction Files Bobcat-640 (Fixed NUC and TrueNUC) [1]	
Bobcat-640-GigE	Fixed NUC - Low gain 500 µs - Low gain 5 ms - High gain 500 µs - High gain 5 ms TrueNUC (only to be used in Xeneth software) - Low Gain ITR 100 µs – 20 ms - High Gain ITR 100 µs – 10 ms
Bobcat-640-CL	Fixed NUC - Low gain 500 µs - Low gain 5 ms - High gain 500 µs - High gain 5 ms TrueNUC - Low Gain ITR 100 µs – 20 ms - High Gain ITR 100 µs – 10 ms - High Gain IWR 10 ms – 40 ms

Table 2-8 Correction files provided with the Bobcat-640

[1] A Fixed NUC is applicable only for a fixed exposure time; A TrueNUC is applicable for a pre-defined exposure time range

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Lens configuration Bobcat-640 & Bocat-320	
Optical interface	C-mount
Other Lenses	VIS or SWIR lenses available For more information, see http://www.xenics.com/LSG

Table 2-9: Lens configuration Bobcat-640 and Bobat-320

Software		
Bobcat-640-Industrial	Xeneth advanced	Standard
	Xeneth SDK	Optionally
	Xeneth Labview SDK	Optionally
Bobcat-640-Scientific	Xeneth advanced	Standard
	Xeneth SDK	Standard
	Xeneth Labview SDK	Optionally
Bobcat-320-100Hz	Xeneth advanced	Standard
	Xeneth SDK	Optionally
	Xeneth Labview SDK	Optionally
Bobcat-320-400Hz	Xeneth advanced	Standard
	Xeneth SDK	Standard
	Xeneth Labview SDK	Optionally
Bobcat-320-400Hz-gated	Xeneth advanced	Standard
	Xeneth SDK	Standard
	Xeneth Labview SDK	Optionally

Table 2-10 Software Bobcat-640 and Bobcat-320

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Accessories				
Trigger cable		ELC-001760	Optional	Bobcat-640-GigE-Industrial Bobcat-640-CL Bobcat-320
			Standard	Bobcat-640-GigE-Scientific
Ethernet Cable 5m		ELC-001330	Optional	Bobcat-640-GigE-Industrial Bobcat-320-GigE
			Standard	Bobcat-640-GigE-Scientific
Frame grabber	NI 1433	ELC-001986	Optional	Bobcat-640-CL Bobcat-320-CL
	Euresys Grablink	ELC-002139		
Camera-Link Cable MDR to SDR		ELC-001281	Optional	
Camera-Link Cable SDR to SDR		ELC-002171		
Power supply		ASY-001268	Standard	Bobcat-640 Bobcat-320
Power cord		ELC-001288	Optional (EUR)	
		ELC-001500	Optional (USA)	
		ELC-001501	Optional (UK)	
Bobcat case		ASY-000046	Standard	

Table 2-11 Accessories

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