

FOculus



IEEE1394 Digital CCD and CMOS Camera Line



Always a new perspective

SOLUTIONS THAT MEET YOUR REQUIREMENTS

CCD and **CMOS** cameras

www.net-gmbh.com



NET
NEW ELECTRONIC TECHNOLOGY

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Product overview

NET's FOculus product family

With the cameras of the FOculus product line the step into the world of digital image processing becomes very easy and cost effective. Two different housing versions support cameras in monochrome and color, allowing a large selection of different resolutions, frame rates and CCD image sensors. In order to complete the IEEE1394a FOculus family additional 6 models with CMOS image sensors have been added. This diversity provides a solution for a wide variety of vision applications.

General features

FOculus comes in a robust and compact industrial metal housing (**29 x 29 x 39mm Tiny models**, **44 x 29 x 63mm Small version**) with C/ CS-mount connection, equipped with high-sensitive, high-quality CCD / CMOS image sensors to perform best image quality. The large selection of different sensors (1/3", 1/2", 1/1.8", 2/3") with resolutions of (VGA, WVGA, SVGA, XGA, SXGA, UXGA, QXGA) used within FOculus will provide the best camera for individual applications.

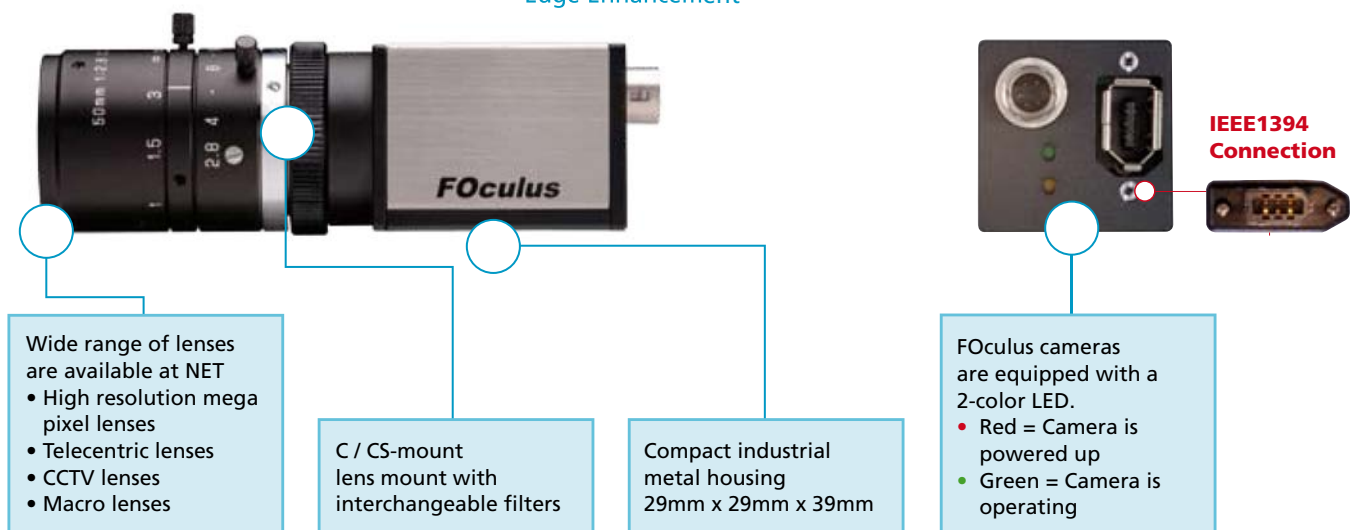
Control features

FOculus offers features acc. to IIDC 1.31 like Trigger & Strobe, Shutter, Gain, White Balance, Brightness, Gamma:

- **Partial Scan**
 - ROI
 - Format 7 free selectable
- **Trigger**
 - Software / ext. Trigger
 - Mode 0 ~ 5
 - Mode 14 – preset multiple shutter mode with a single trigger
 - Mode 15
 - One-Shot / Multi-Shot functionality
- **Binning**
 - Vertical 1x2
 - Full 2x2
- **Video Modes / Formats**
 - Format 0, 1, 2, 7
 - Mode 0 - 7
- **Time Stamp**
- **Multi Camera Auto-Sync**
- **Serial I/O Interface (RS232)**
- **Frame Save Function**
- **LUT (Look up table)**
- **One Pixel Snow Noise Remove**
- **Edge Enhancement**

IEEE1394 interface

The interface cable is tightly secured by the screw lock of the IEEE1394 connector even under a harsh environment.



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Technical Data - T-series CMOS image sensor

Tiny CMOS Features

All CMOS cameras of the FOculus family use the same small but robust housing like the FOculus Tiny models. 2 monochrome and 4 color cameras with pixel numbers from 360.000 to 3.100.000 offer for almost every application the best choice camera. Frame rates at full resolution reach from 8.5 fps to 60 fps. Features like progressive scan, partial scan and shutter speeds from 32 μ s to 1 sec with a signal to noise ratio better than 43dB are standard for the CMOS FOculus industrial cameras.



Tiny CMOS



	FO1224TB	FO1224TC	FO1433TB	FO1421TC	FO1520TC	FO1631TC
Image Sensor	1/3" MT9V022177ATM	1/3" MT9V022177ATC	1/2" MT9M001	1/3" MT9M131	1/3.2" MT9D131	1/2" MT9T031
Effective Pixel	752(H) x 480(V)	752(H) x 480(V)	1280(H) x 1024(V)	1280(H) x 1024(V)	1600(H) x 1200(V)	2048(H) x 1536(V)
Data Path	8 or 10bit	8 or 10bit Raw RGB/YUV422	8 or 10bit	8 or 10bit Raw RGB/YUV422	8 or 10bit Raw RGB/YUV422	8 or 10bit Raw RGB/YUV422
Pixel Size	6.0 μ m x 6.0 μ m	6.0 μ m x 6.0 μ m	5.2 μ m x 5.2 μ m	3.6 μ m x 3.6 μ m	2.8 μ m x 2.8 μ m	3.2 μ m x 3.2 μ m
Frame Rate	60 fps	60 fps	24 fps	11 fps	8.5 fps	10 fps
Scanning System	Global Shutter	Global Shutter	Rolling Shutter	tbd	tbd	Rolling Shutter
Binning	2x2	not supported	not supported	tbd	tbd	2x2
Format 7	Partial Scan (Unit: 4x4)					
Trigger	Edge	Rising Edge or Falling Edge				
	Mode	0				
	Source	External Trigger or Software Trigger				
Strobe Output	Active High, Support Normal Mode or Trigger Mode					
Memory Save/Load	16 Channels(0:factory, 1~4:feature, 5~15:mode/feature)					
SIO(RS-232)	IIDC V.1.31 version : Path through or NET Command					
Digital Interface/Transfer Rate	IEEE1394.1 port(6pin) / 400Mbps					
Gain Control	0 ~ 12dB (Manual or Auto)	0 ~ 12dB (Manual or Auto)	6 ~ 18dB (Manual or Auto)	tbd	tbd	0 ~ 63 dB (Manual or Auto)
Shutter Speed	93 μ sec ~ 100ms	93 μ sec ~ 100 ms	60 μ sec ~ 500 ms	tbd	tbd	63 μ sec ~ 1 sec
S/N Ratio	45 dB	45 dB	45 dB	tbd	tbd	43 dB
Control Function	Brightness, Sharpness, Gamma, Auto-Shutter, Pan/Tilt	Brightness, Sharpness, Gamma, Auto-Shutter, Pan/Tilt, U/B, V/R, Hue/G, White Balance	Brightness, Sharpness, Gamma, Auto-Shutter, Pan/Tilt	Brightness, Sharpness, Gamma, Auto-Shutter, Pan/Tilt, U/B, V/R, Hue/G, White Balance	Brightness, Sharpness, Gamma, Auto-Shutter, Pan/Tilt, U/B, V/R, Hue/G, White Balance	Brightness, Sharpness, Gamma, Auto-Shutter, Pan/Tilt, U/B, V/R, Hue/G, White Balance
Lens Mount	C- / CS- mount					
External Dimension	29 (W) x 29 (H) x 39 (D) mm					
Operation	-5°C to 45°C					
Camera Specification	IIDC 1394-based Digital Camera Specification v1.31					

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Technical Data - T-series CCD image sensor

Tiny CCD Features

The Tiny-Series is the smallest camera of the FOculus Family. The robust housing with dimensions of 29 x 29 x 39mm is especially designed to meet the requirements of rough industrial environment.

The FOculus Tiny CCD series consists of 5 monochrome and 5 color models with SONY sensors and resolutions from VGA to UXGA and frame rates at full resolution from 16 to 60fps. Besides all standard features of an industrial camera the FOculus tiny cameras also offer some special features like auto white balance and a special overlapping shutter mode.



Tiny CCD



	FO124TB	FO124TC	FO134TB	FO134TC	FO323TB	FO323TC	FO432TB	FO432TC	FO531TB	FO531TC
Image Sensor	1/3" IT CCD ICX424AL/AQ		1/2" IT CCD ICX414AL/AQ		1/3" IT CCD ICX204AL/AK		1/2" IT CCD ICX267AL/AQ		1/1.8" IT CCD ICX274AL/AQ	
Effective Pixel	659 (H) x 494 (V) VGA		659 (H) x 494 (V) VGA		1034 (H) x 779 (V) XGA		1388 (H) x 1040 (V) SXGA		1628 (H) x 1236 (V) UXGA	
Data Path	8bit or 12bit BW/Raw RGB + YUV422									
Pixel Size	7.40 x 7.40 μm		9.90 x 9.90 μm		4.65 x 4.65 μm		4.65 x 4.65 μm		4.40 x 4.40 μm	
Frame Rate	60 fps 86 fps (format7)		60 fps 86 fps (format7)		30 fps 36 fps (format7)		15 fps 20 fps (format7)		15 fps 16 fps (format7)	
Scanning System	Progressive Scan									
Binning	Pixel Binning B/W & FO531TC									
Synchronization	Internal									
Trigger	Edge		Rising Edge or Falling Edge							
	Mode		Mode 0 ~ 5; 14, 15							
	Source		External Trigger or Software Trigger							
Strobe Output	Active High, Support Normal Mode or Trigger Mode									
SIO(RS-232)	IIDC V. 1.31 version : Pass through or NET Command									
Digital Interface/Transfer Rate	IEEE1394.1 port(6pin) / 400Mbps									
Gain Control	Manual: 0 ~ 25 dB; Auto Gain				Manual: 0~27db Auto Gain		Manual: 0~25db Auto Gain		Manual: 0 ~ 27 dB; Auto Gain	
Shutter Speed	Manual: 1μs ~ 3600s / Auto Shutter									
Gamma	0.4 ~ 2.5									
S/N Ratio	56 dB or better									
Advanced Features	ROI; One Shot & Multi Shot; Multi Camera Auto Sync; High Speed Up Trigger Framerate, LUT, Frame Save									
Lens Mount	C- / CS-mount									
External Dimension	29 (W) x 29 (H) x 39 (D)mm									
Operating Temp.	- 5°C to + 45°C									
Regulations	FCC, CE, RoHS									
Camera Specifications	IIDC 1394-based Digital Camera Specification v1.31									

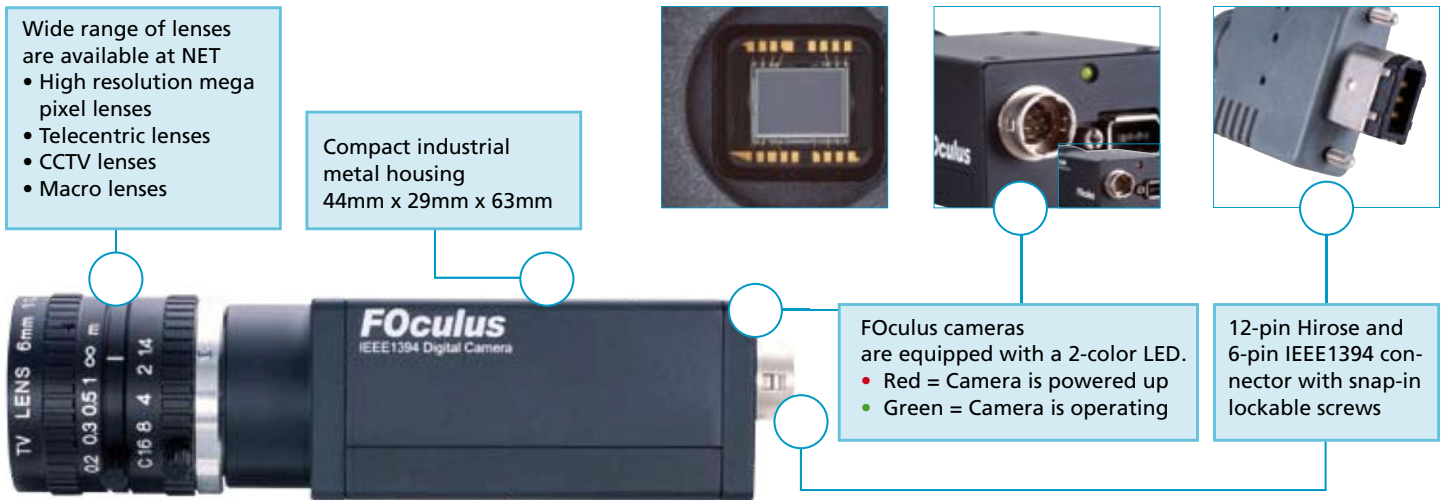
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Technical Data - S-series CCD image sensor

FOculus S- Version

7 color and 7 monochrome cameras in the S-Series cover all common SONY CCD sensor sizes 1/3" up to 2/3" with resolutions from VGA to UXGA and frame rates from 16fps to 86fps. Binning, Progress-

sive Scan and many different shutter modes and much more interesting features prepare the FOculus S-Series cameras for universal use in Image Processing and Factory automation.



	FO124SB	FO124SC	FO134SB	FO134SC	FO234SB	FO234SC	FO323SB	FO323SC	FO432SB	FO432SC	FO442SB	FO442SC	FO531SB	FO531SC
Image Sensor	1/3" IT CCD ICX424AL/AQ		1/2" IT CCD ICX414AL/AQ		1/2" IT CCD ICX415AL/AQ		1/3" IT CCD ICX204AL/AK		1/2" IT CCD ICX205AL/AK		2/3" IT CCD ICX285AL/AK		1/1.8" IT CCD ICX274AL/AQ	
Effective Pixel	659 x 494 VGA		659 x 494 VGA		782 x 582		1034 x 779 XGA		1392 x 1040 SXGA		1392 x 1040 SXGA		1628 x 1236 UXGA	
Data Path	8 or 12bit BW/RawRGB + YUV422		8 or 12bit BW/RawRGB + YUV422		8 or 12bit BW/RawRGB + YUV422		8 or 12bit BW/RawRGB + YUV422		8 or 12bit BW/RawRGB + YUV422		8 or 12bit BW/RawRGB + YUV422		8 or 12bit BW/RawRGB + YUV422	
Pixel Size	7.40 x 7.40 µm		9.90 x 9.90 µm		8.30 x 8.30 µm		4.65 x 4.65 µm		4.65 x 4.65 µm		6.45 x 6.45 µm		4.40 x 4.40 µm	
Frame Rate	60 fps 86 (format7)		60 fps 86 (format7)		60 fps 63 (format7)		30 fps 36 (format7)		15 fps 20 (format7)				15 fps 16 (format7)	
Advanced Features	Pixel Binning B/W & FO531SC; RS232 (SIO/Pass through); ROI; One Shot & Multi Shot; Multi Camera Auto Sync; Opto-Isolated I/O; Industrial Lock Screw Support													
Scanning System	Progressive Scan													
Synchronization	Internal													
Digital Interface	IEEE1394a / 400 Mbps / acc. IIDC 1.31													
Gain Control	0 - 25 dB; Auto Gain										0 - 27 dB; Auto Gain		0 - 25 dB; Auto Gain	
Gamma	0.4 ~ 2.5													
Strobe Output	Yes													
S/N Ratio	56 dB or better													
Power Supply	+ 8 VCD to + 30 VCD via the IEEE1394 cable													
Trigger Mode	Software or External Trigger / Mode 0 ~ 5; 14										Software or External Trigger / Mode 0 ~ 5; 14; 15		Software or External Trigger / Mode 0 ~ 5; 14	
Shutter Speed	Manual: 1µsec ~ 3600s; Auto Shutter													
Operating Temp.	- 5°C to + 45°C													
Regulations	FCC, CE, RoHS													
Lens Mount	C-mount													
External Dimension	44 (W) x 29 (H) x 63 (D)mm										44 (W) x 29 (H) x 67 (D)mm		44 (W) x 29 (H) x 63 (D)mm	

Accessories

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No cable length limitation for FOculus

The IEEE1394 interface standard specifies a limited cable length of 4.5meter. NET's optical repeater FO800R solution covers a distance of up to 1.000 meter between FOculus and PC. The FO800R works as easy as the plug and play principle. The data communication speed reaches 800 / 400Mbps depending on the IEEE1394 a. / b. standard.

Software

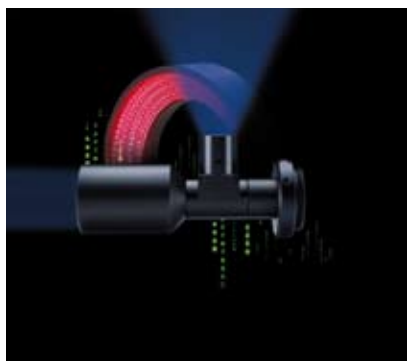
The integration of FOculus is supported through a wide variety of common drivers and allows the easy function of plug-and-play. The software package from NET - viewer application and SDK - makes the integration into existing and fully customized image processing systems simple. The flexible structured SDK supports individual applications requirements easy and user friendly. The FOculus family is compatible to software libraries like MVTec Halcon & Active Vision Tools, National Instruments LabView, Cognex Vision Pro and Matrox's MIL & MIL-Lite.

Applications

FOculus cameras are designed for industrial applications such as machine vision and industrial inspection i.e. bonder-, wafer- and die-inspection, positioning/ alignment, completeness inspection, surface inspection, printing inspection, identification, edge and contour analysis, blob analysis, morphology analysis, bar code and data matrix analysis, OCR and OCV, microscopy and much more.

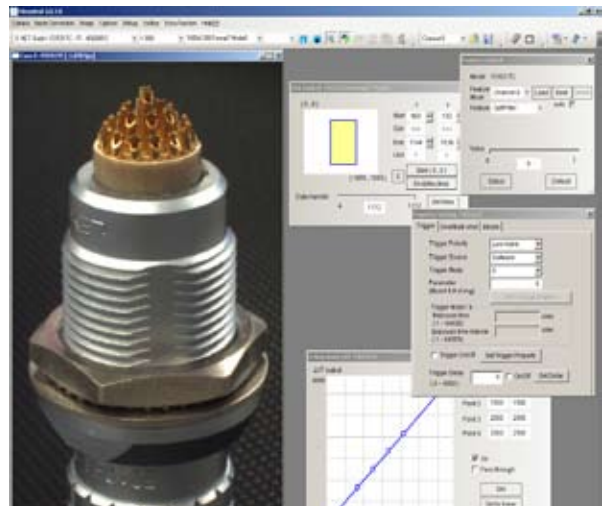
Application Programming Interface(API) & System Integration

The Foculus viewer software and the flexible SDK allow an easy integration into many commercial systems via operating system features as well as integration into fully customized image processing systems. Currently our API is compatible with the software libraries i.e. MVTec's Halcon & Active Vision Tools, Matrox's MIL & MIL-Lite, Cognex Vision Pro and National Instrument's LabView.



Lenses & Illumination

With more than 400 different lenses and the same number of different LED illuminations we offer one of the most complete portfolios. Especially for precise measurements in combination with high resolution cameras our more than 160 different telecentric lenses enable the user to find the best solution for his application.



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