

# FOculus

IEEE1394 Digital CCD Camera Line



*Always a new perspective*

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*NEW ELECTRONIC TECHNOLOGY*

# FOculus – Always a new perspective

## 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. Three different housing versions support sixteen cameras available in monochrome and color, allowing a large selection of different resolutions, frame rates and CCD image sensors. This diversity provides a solution for a wide variety of vision applications.

### General features

FOculus comes in a robust and compact industrial metal housing (29x29x39mm, 44x29x63mm and 64x64x60mm) with C / CS-mount connection, equipped with high sensitive high-quality SONY CCD image sensors to perform best image quality. The large selection of different sensors (1/3", 1/2", 2/3", 1/1.8") with resolutions of (VGA, SVGA, XGA, SXGA, UXGA) used within FOculus will provide the best camera for individual applications. Each FOculus camera is supplied with a viewer software and a complete SDK.

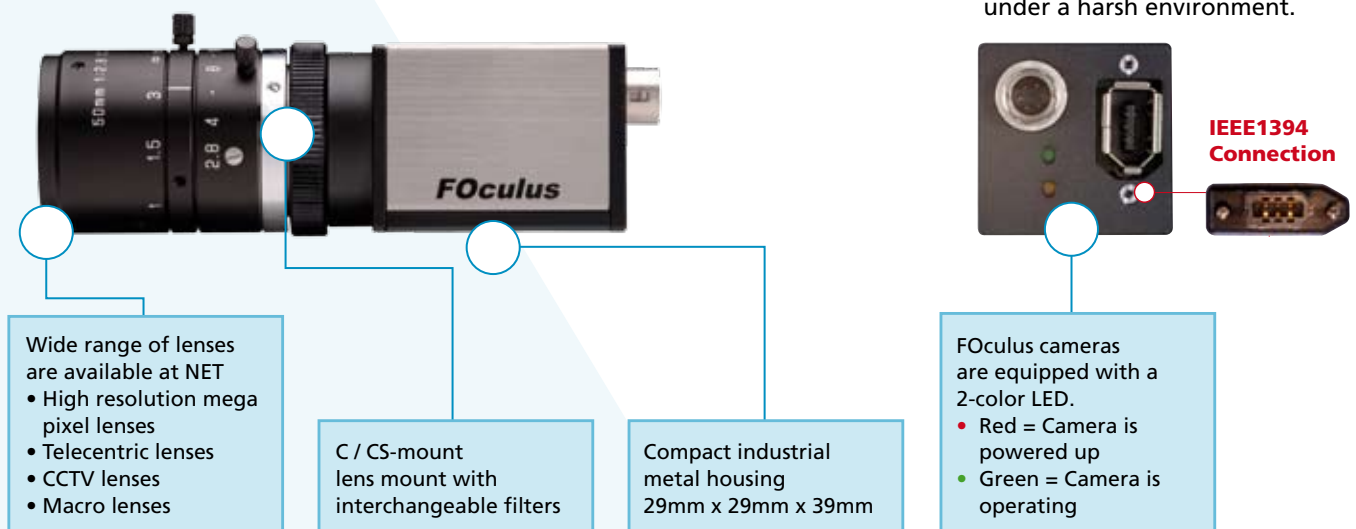
### Control features

FOculus offers features acc. to IIC 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
  - Mode14 – preset multiple shutter mode with a single trigger
  - 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)**

### IEEE1394 interface

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



## Product overview

### Applications

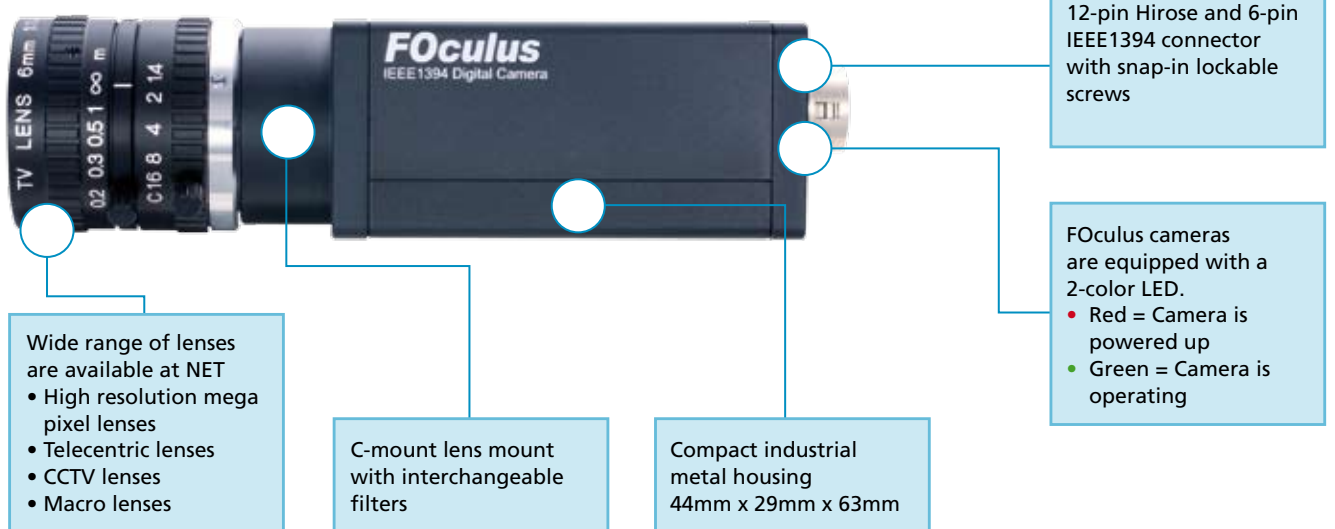
FOculus cameras are designed for industrial applications such as machine vision and industrial inspection i.e. bonder-, wafer- and die- inspection, positioning/alignment, completeness inspection, surface inspection, printing inspection, identification, edge and contour analysis, blob analysis, morphology 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 and National Instrument's LabView.

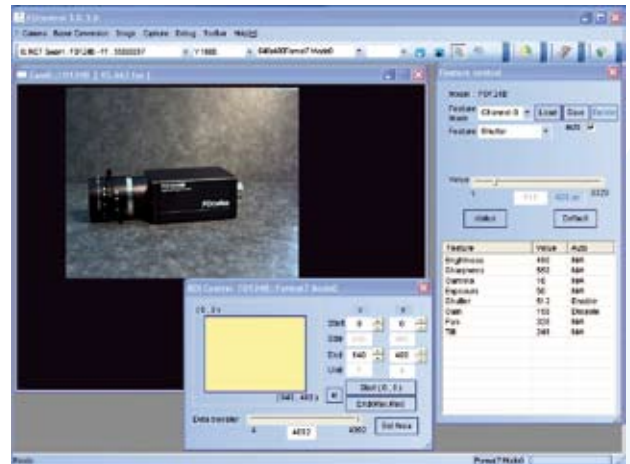
### Connectors are locked in place

The 12-pin Hirose and 6-pin IEEE1394 connector are locked into place via snap-in function and screws for a reliable data transfer.



### 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 and Matrox's MIL & MIL-Lite.



12-pin Hirose and 6-pin IEEE1394 connector

FOculus cameras are equipped with a 2-color LED.

- Red = Camera is powered up
- Green = Camera is operating

Compact industrial metal housing  
64mm x 64mm x 60mm

Wide range of lenses are available at NET

- High resolution mega pixel lenses
- Telecentric lenses
- CCTV lenses
- Macro lenses

C-mount lens mount with adjustable back focal length



# Technical Data

## NET – IEEE1394 Digital CCD Camera Line



### FOculus Tiny Version

A state of the art camera leaves virtually no limits in respect to the „design-in“ and the tiny housing to adapt to each application. High quality SONY image sensors are used and functions such as Auto White Balance and High Speed Up Trigger Frame Rate have been integrated into the FOculus Tiny version.

### 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.



	FO124TB (B/W)	FO124TC (Color)	FO323TB (B/W)	FO323TC (Color)	FO432TB (B/W)	FO432TC (Color)	FO531TB (B/W)	FO531TC (Color)
Image Sensor	1/3" IT CCD ICX424AL/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		1024 (H) x 768 (V) XGA		1392 (H) x 1040 (V) SXGA		1628 (H) x 1236 (V) UXGA	
Data Path	8bit or 12bit BW/Raw RGB + YUV422		8bit or 12bit Raw BW/RGB + YUV422		8bit or 12bit BW/Raw RGB + YUV422		8bit or 12bit Raw BW/RGB + YUV422	
Pixel Size	7.40 (H) x 7.40 (V) µm		4.65 (H) x 4.65 (V) µm		4.65 (H) x 4.65 (V) µm		4.40 (H) x 4.40 (V) µm	
Scanning System	Progressive Scan				Progressive Scan			
Frame Rate	60fps (format7) 60 / 30 / 15 / 7.5 / 3.75 / 1.875 fps		30fps (format7) 30 / 15 / 7.5 / 3.75 / 1.875 fps		20fps (format7) 15 / 7.5 / 3.75 / 1.875 fps		16fps (format7) 15 / 7.5 / 3.75 / 1.875 fps	
Synchronization	Internal				Internal			
Digital Interface	IEEE1394a				IEEE1394a			
Software Interf.	Acc. IIDC v. 1.31				Acc. IIDC v. 1.31			
Gain Control	Manual: 0 ~ 25 dB; Auto Gain				Manual: 0 ~ 25 dB; Auto Gain			
Gamma	0.4 ~ 2.5				0.4 ~ 2.5			
Strobe Output	Yes				Yes			
S/N Ratio	56 dB or better				56 dB or better			
Power Supply	+ 8 VDC to + 30 VDC via the IEEE1394 cable				+ 8 VDC to + 30 VDC via the IEEE1394 cable			
Transfer Rate	400 Mbps				400 Mbps			
Trigger Mode	Software or External Trigger / Mode 0 ~ 5; 14, 15				Software or External Trigger / Mode 0 ~ 5; 14, 15			
Shutter Speed	Manual: tbd; Auto Shutter				Manual: tbd; Auto Shutter			
Advanced Features	Pixel Binning (B/W only); RS232 (SIO/Pass through); ROI; One Shot & Multi Shot; Multi Camera Auto Sync; High Speed Up Trigger Framerate				Pixel Binning (B/W only); RS232 (SIO/Pass through); ROI; One Shot & Multi Shot; Multi Camera Auto Sync; High Speed Up Trigger Framerate			
Operating Temp.	- 5°C to + 45°C				- 5°C to + 45°C			
Regulations	FCC, CE, RoHS				FCC, CE, RoHS			
Lens Mount	C/CS-mount				C/CS-mount			
Dimension	29 (W) x 29 (H) x 39 (D)mm				29 (W) x 29 (H) x 39 (D)mm			

# Technical Data

## NET – IEEE1394 Digital CCD Camera Line

	FO124B	FO124C	FO134B	FO134C	FO234B	FO234C	FO323B	FO323C	FO432B	FO432C	FO442B	FO442C	FO531B	FO531C
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/AQ		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 (fps)	86 (format7) 60 / 30 / 15 / 7.5 / 3.75 / 1.875		86 (format7) 60 / 30 / 15 / 7.5 / 3.75 / 1.875		63 (format7) 60 / 30 / 15 / 7.5 / 3.75 / 1.875		36 (format7) 30 / 15 / 7.5 / 3.75 / 1.875		20 (format7) 15 / 7.5 / 3.75 / 1.875		16 (format7) 15 / 7.5 / 3.75 / 1.875		16 (format7) 15 / 7.5 / 3.75 / 1.875	
Advanced Features	Pixel Binning B/W & FO531C; RS232 (SIO/Pass through); ROI; One Shot & Multi Shot; Multi Camera Auto Sync													
Scanning System	Progressive Scan													
Synchronization	Internal													
Digital Interface	IEEE1394a / 400 Mbps / acc. IIDC 1.31													
Gain Control	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													
Shutter Speed	Manual: 1µsec ~ 65 sec; Auto Shutter													
Operating Temp.	- 5°C to + 45°C													
Regulations	FCC, CE, RoHS													
Size / Mount	64 (W) x 64 (H) x 60 (D)mm / Approx. 300g / C-mount													

	FO1245B	FO1245C	FO1345B	FO1345C	FO2345B	FO2345C	FO3235B	FO3235C	FO4325B	FO4325C	FO4425B	FO4425C	FO5315B	FO5315C
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/AQ		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 (fps)	86 (format7) 60 / 30 / 15 / 7.5 / 3.75 / 1.875		86 (format7) 60 / 30 / 15 / 7.5 / 3.75 / 1.875		63 (format7) 60 / 30 / 15 / 7.5 / 3.75 / 1.875		36 (format7) 30 / 15 / 7.5 / 3.75 / 1.875		20 (format7) 15 / 7.5 / 3.75 / 1.875		16 (format7) 15 / 7.5 / 3.75 / 1.875		16 (format7) 15 / 7.5 / 3.75 / 1.875	
Advanced Features	Pixel Binning B/W & FO5315C; 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													
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 ~ 65 sec; Auto Shutter													
Operating Temp.	- 5°C to + 45°C													
Regulations	FCC, CE, RoHS													
Size / Mount	44 (W) x 29 (H) x 63 (D)mm / Approx. 110g / C-mount										44 (W) x 29 (H) x 67 (D)mm / Approx. 110g / C-mount		44 (W) x 29 (H) x 63 (D)mm / Approx. 110g / C-mount	

### Contact

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# **FOculus**



**FOculus - CCD and CMOS - IEEE1394 Camera Line**



**CCD and CMOS Image Sensors**

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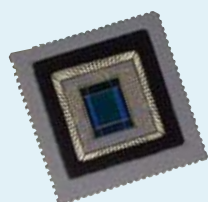
# Technical Data of CMOS FOculus

## CCD and CMOS - FOculus IEEE1394 Camera Line



	FO1224TB	FO1224TC	FO1433TB	FO1421TC	FO1520TC	FO1631TC
	WVGA	WVGA	SXGA	SXGA	2 MP	3 MP
Image Sensor	1/3" MT9V022177ATM	1/3" MT9V022177ATC	1/2" MT9M001	1/3" MT9M131	1/3.2" MT9D131	1/2" MT9T031
Effective Pixels	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)
Max Resolution	752 x 480	752x480	1280 x 1024	1280 x 1024	1600x1200	2048x1536
Cell Size	6.0 μm x 6.0 μm	6.0 μm x 6.0 μm	5.2 μm x 5.2 μm	3.6 μm x 3.6 μm	2.8 μm x 2.8 μm	3.2 μm x 3.2 μm
Frame Rate (fps)	60	60	25.6	11	8.5	10
Lens Mount	C-mount					
Scanning System	Progressive System					
Binning	2x2					
Format 7	Partial Scan (Unit: 4x4)					
Trigger	Edge	Rising Edge or Falling Edge				
	Mode	0				
	Source	External Trigger or Software Trigger				
Strobe	Active High, Support Normal Mode or Trigger Mode.					
Memory Save/Load	16 Channels(0:factory, 1~4:feature, 5~15:mode/feature)					
Control Functions	Brightness, Sharpness, Gamma, Auto-Exposure, Auto-Shutter, Pan/Tilt U/B V/R, Hue/G					
SIO(RS-232)	IIDC v1.31 version : Path through or NET Command					
Frame Delay from Read-out	Min. 43us					
Digital Interface / Transfer Rate	IEEE 1394 1 port(6pin) / 400Mbps					
Gain	16 ~ 64					
Shutter Speed	32 usec ~ 1 sec					
Data Depth	8 bit or 10 bit B/W / 8 bit or 10 bit B/W for Color					
S/N Ratio	63dB					
Supply Voltage & Power	8 VDC ~ 30 VDC					
External Dimension / Weight	29(W) x 29(H) x 39(D) mm / Approx 110g					
Operation / Storage Temp.	-5°C to 45°C / -30°C to 60°C					
Camera Specification	IIDC 1394-based Digital Camera Specification v1.31					

FOxxxTB\* = monochrome ; FOxxxTC = color



### Tiny CMOS Features:

- Single housing from WVGA to 3 Megapixel
- Latest CMOS Technology integrated
- Monochrome and color cameras
- CMOS and CCD versions identical in housing dimension
- IEEE1394.a DCAM 1.31
- Same Viewer and SDK for all FOculus cameras

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