

## Datasheet Optical Coupling

As a manufacturer of imaging equipment for thin sections BEWTEC has profound experiences in proximity optics and opto-mechanical couplings. Optical sensors (CCD or CMOS) can be coupled to any optical elements either directly (*proximity coupling*) making use of fiberoptic image guides or with classical lens or *relay optics*. Fiberoptic image guides win against relay optics by far when a Lambertian distribution is to be imaged, e.g 70% transmission for luminescent materials used for signal conversion to the visible spectrum (magnification 1).

**Applications** - customized applications, scientific instruments and OEM components

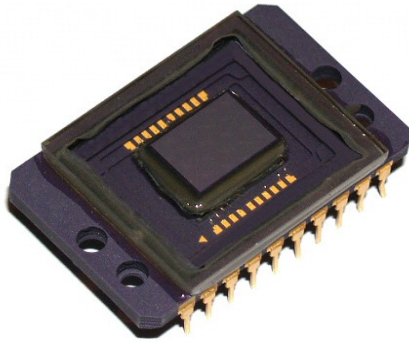
- Special Detectors
  - Electron microscopy (REM, TEM)
  - X-ray imaging
  - X-ray microtomography
  - Multi-Channel-Plate Detector Systems (Open MCP Detector)
  - VUV and EUV-detectors and EUV-microscopy
- Imaging
  - Low-light imaging with or without Image Intensification due to excellent light transmission
  - Ultra-fast imaging with gated Image Intensifiers
- Mechanics
  - Adaptation of apertures with magnifying or minifying tapered fiberoptics, magnification 1:1 up to 1:5
  - Displacement focal plane without relay optics
  - Protection against ambient influences

### Characteristics:

- Outstanding 70% total transmission for proximity optics (1:1 imaging ratio) hits transmission for lens optics
- What kind of sensors?  
Coupling of 0-, 1- and 2-dimensional sensors possible, like
  - Photodiode Arrays
  - PIN-Diodes
  - CCDs
  - CMOS
  - line-CCDs

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Here are some examples of various sensor types to be extended with fiberoptic elements according to customers' demands (list based on our positive experiences).



### Sony

Sony ICX 083AL  
Sony ICX 259AL (1/3")  
Sony ICX 259AK (1/3")  
Sony ICX 285AL  
Sony ICX414AL  
Sony ICX 419AL (1/2")  
Sony ICX 418AL (1/2")  
Sony ICX423AL  
Sony ICX429AL

### E2V / Atmel / Thomson

TH7888  
TH7899  
line CCDs (Atmel)



### Kodak

KAF1602 LE  
KAF 1603ME  
KAF-1001E(S9NE6739)  
KAI 11000M  
KAI 11002

### Dalsa

Dalsa FT01104203XMY0611010

### Sharp (1/3")

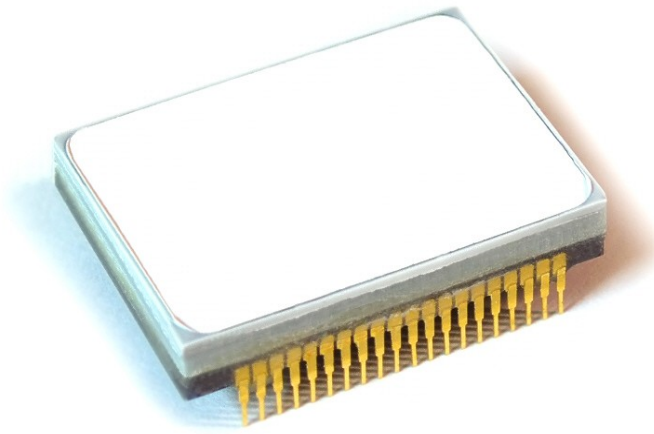
Sharp RJ 2361

### Different large CMOS

(E2V, Atmel, Thomson, Fill Factory)

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- What kind of fiberoptics?
  - Coupling of Fiberoptic Plates, specially grinded Fiberoptic Windows or Fiberoptical tapers possible (FOP, FOW, FOT)
  - A wide range of mechanical dimensions possible
  - fiber diameter 3-4 $\mu\text{m}$ , 5 $\mu\text{m}$ , 6 $\mu\text{m}$ , 10 $\mu\text{m}$  or more fiber
  - tapers: imaging ration about 1:1 up to 1:5 with magnifying or minifiying tapers
- Fiberoptic surfaces can support thin films or layers of optically active materials, e.g.
  - deposited layers of luminophors (e.g. phosphors like Gadoliniumoxisulfid, P43)



- deposited thin transparent films like the electrical conductive ITO
  - covered with plates of many optically active materials like EOM, AOM
  - szintillator materials like Csl
  - YAG-crystals etc.
- thick Fiberoptic Plates provide additional protection of the open sensor against dust, mechanical impact, chemicals, vacuum or radiation (heat, electron bombardement, x-rays and radioactive irradiation).
- Manufacturing of replacement units possible:  
Enhanced ex- and inter-changability of a fiberoptically coupled sensor to other optical devices like image intensifiers or other special instruments
- Adaptation of refractive index possible

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### Practical:

Please note that a protective window of the CCD is to be removed in order to bring the active area of the sensor and the fiberoptic apertures into close proximity.

A variety of procedures are at hand to remove the protective windows of different CCD types. However, if possible, the CCDs should be procured from the manufacturer with temporary windows instead.

Removing of the protective window of the CCD bares an average risk of 10-20 % to damage the CCD, depending on the CCD. CCDs supplied with non-permanent protection windows will reduce the risk of damage to about 5 % for regular operations or modification. Please note: In the case of damages to the unit we assume liability only at rough negligence.

### Annotation:

the following material is reported to work, too:

<b>DALSA</b>	IA-D1-0064E, IA-D1-00124E, IA-D1-0256D, IL-C6-2048B
<b>EEV</b>	CCD15-11-5-656
<b>Fairchild</b>	FCCD 181 IEDC
<b>Kodak</b>	C2L, KFA 1000, MA 361
<b>Philips</b>	FT 1010, FT-18V1
<b>Reticon</b>	RL 0128 KAU-011, HS0256JAU-11, RA 1024 JAU 022, RL 2048 SAQ-011
<b>Sony</b>	ICX 022, ICX 024, ICX 038, ICX 039, ICX 055, ICX 083, ICX 085
<b>Thomson</b>	TH 7696, TH 7863, TH 7883, TH 7888, TH 7895, TH 7896, TH 7899