

# HUD CMOS Camera

Get the Pilot's View with Kappa Head-Up Display Cameras

Cutting-edge Kappa HUD camera technology with the latest sensor technology and image processing is designed for all technical generations of HUD systems, from current scanning laser back to older CRT technology. Kappa is your experienced partner, for latest generation technology as well as in the retrofit area. Without having to use a motorized lens the camera system is suitable for camera positions between combiner and windshield, while the camera dynamic is still > 105 dB. For camera positions between the pilot and the performance is ensured by the use of a motorized lens. Kappa HUD cameras can be qualified up to DAL B. Kappa HUD cameras are available in several shapes on demand.



**Sensor-specific data**

Sensor	IMX252 (Sony)	IMX273 (Sony)
Typ	CMOS	
Shutter	Global	
Color	RGB	
Optical format	1/1.8" (full resolution) 7.1 mm x 5.3 mm; diagonal 8.9 mm 1/2.3" (FullHD)	1/2.9" (full resolution) 5.0 mm x 3.8 mm; diagonal 6.3 mm 1/3.6" (HD)
Number of pixels	2064 x 1544 pixels	1456 x 1080 pixel
Pixel size	3.45 µm x 3.45 µm	

**Typical performance | EMVA1288**

Quantum efficiency	46 % (467 nm); 57 % (533 nm); 52 % (630 nm)
Dynamic range	71 dB (105 dB with AGC/AET, without motorized lens)
Saturation	10000 e-
Maximum SNR	40 dB
Temporal dark noise	2.2 e-
DSNU	0.7 e-
PRNU	0.6 %
Sensitivity	5 photons (533nm)
Non linearity	0.2 %

**System data | interface-specific data**

HD interface	Full HD SMPTE-292 1080p30 4:2:2 HD-SDI (1.5 Gbit/s) SMPTE-424 1080p60 4:2:2 HD-SDI (3 Gbit/s)	HD SMPTE-292 720p60 4:2:2 HD-SDI (1.5 Gbit/s)
Communication interface	RS 232 – Kappa standard communication interface	
IO Interface	Event mark switch	
Power	28V MIL-STD 704D power supply	
Lens	Integrated ruggedized lens, various FOVs	
System	Housed HUD CMOS camera according to customer specifications. Available in several shapes on demand.	
Connector	Customer specific	

We are constantly checking the accuracy of the technical data. We are prepared to provide more detailed information on request. Technical data are subject to change without notice!

# HUD CMOS Camera

Gets the Pilot View with Kappa Head-Up Display Cameras

## Signal processing

System	14-bit digital
Gain	manual/automatic (AGC): 0 to 48 dB
Exposure time (AET)	Manual/automatic 16.667 ms – 43 µs (IMX252)
Color processing	14-bit color DSP
Gamma	0.3 – 2.2
Diagnostics	integrated self test
Image processing	Event mark – according to customer specification
Latency	16.67 ms
Measurement window	position and size adjustable

## Qualification

Temperature	Low: MIL-STD-810G, method 502.5, -55°C (storage), -40°C (operation) High: MIL-STD-810G, method 501.5, +85°C (storage), +60°C (operation)		
Temperature Shock	MIL-STD-810G, method 503.5, -40°C to +60°C		
Acceleration	Operational: MIL-STD 810G, method 513.6 9.1 g	Structural: MIL-STD 810G, method 513.6 13.6 g	Crash safety: MIL-STD 810G, method 513.6 40 g
Shock	Functional shock: MIL-STD-810G, method 516.6, procedure I	Bump: 25 g for 6 ms in 3 axes, 1000 bumps in each axes	
Vibration	Endurance: MIL-STD-810G, method 514.6, procedure I, curve GL+G	Random: MIL-STD-810G, method 514.6, procedure I, curve R	
Conducted Susceptibility	EUROCAE ED-14G / RTCA/DO-160G, Section 20, Susceptibility Conducted, Category Y , with automatic recovering EUROCAE ED-14G / RTCA/DO-160G, Section 20, Susceptibility Conducted, Category R without any susceptibility		
Radiated Emissions	EUROCAE ED-14G / RTCA/DO-160G, Section 21 Emission of Radio Frequency Energy, Category H.		
Radiated Susceptibility	EUROCAE ED-14G / RTCA/DO-160G, Susceptibility Radiated, Category Y, with automatic recovering EUROCAE ED-14G / RTCA/DO-160G, Section 20 Radio Frequency Susceptibility Radiated, 20 V/m (SW/CW) from 100 MHz to 1 GHz, 60 V/m (SW/CW) from 1 GHz to 18 GHz.		
ESD	EUROCAE ED-14G / RTCA/DO-160G, Section 25 Electrostatic Discharge, Category A.		
Magnetic Effect	RTCA/DO160G section 15 Category Z		
Power	EUROCAE ED-14G / RTCA/DO-160G, Section 17 Voltage Spike, Category A. EUROCAE ED-14G / RTCA/DO-160G, Section 18 Audio Frequency Conduced Susceptibility - Power Inputs, Category Z. EUROCAE ED-14G / RTCA/DO-160G, Section 19 Induced Signal Susceptibility, Category ZC.		
Software / Hardware	RTCA/DO-178C / RTCA/DO-254		

We are constantly checking the accuracy of the technical data. We are prepared to provide more detailed information on request.  
Technical data are subject to change without notice!