High Resolution X-ray Imaging System

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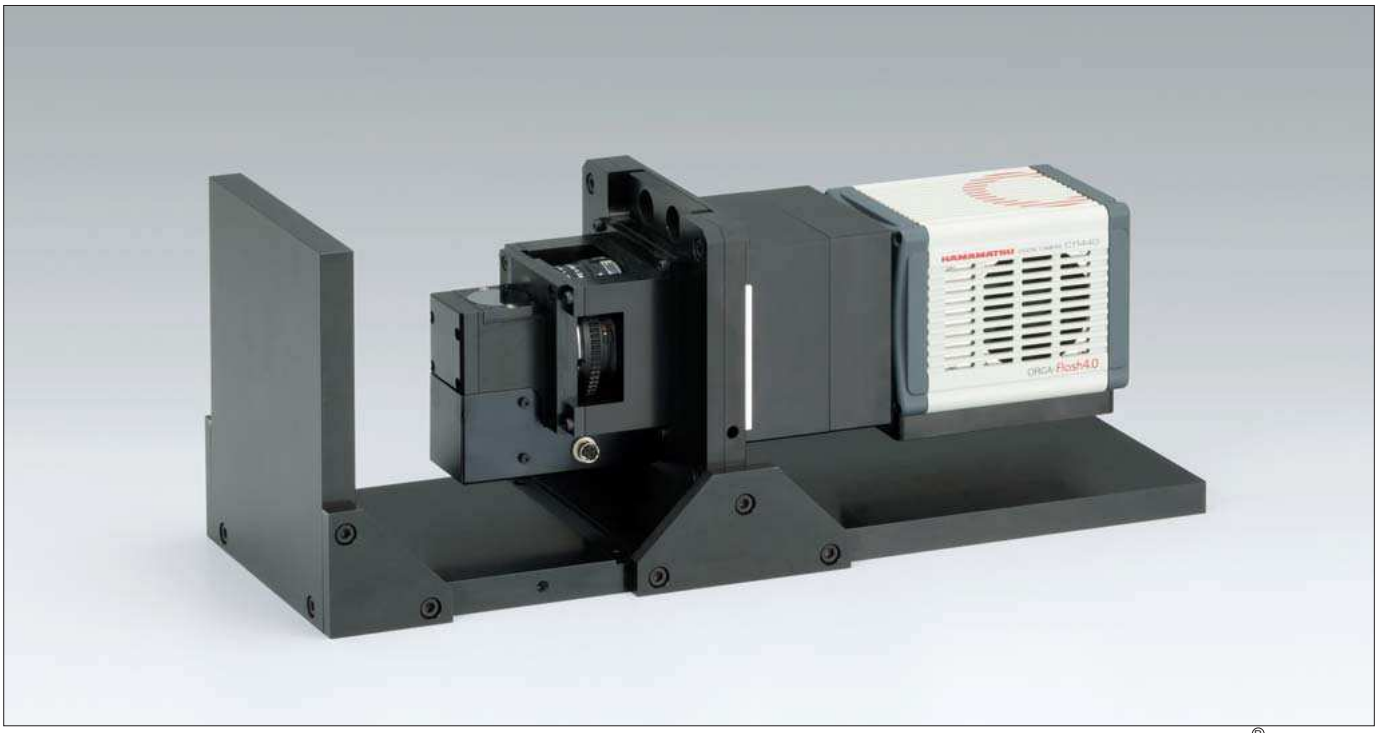
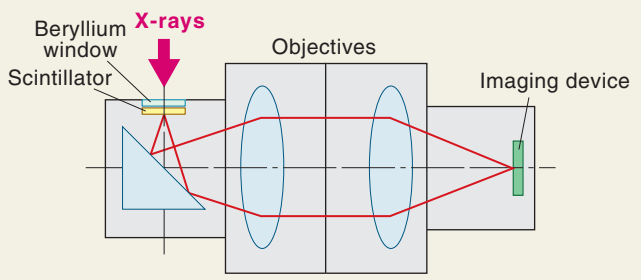


▲M11427-42 (Camera: ORCA®-Flash4.0)

The high resolution X-ray imaging system is designed for the application of X-ray beam alignment.
Adopting unique mechanism, it enables to combine various type of CCD cameras for real time X-ray beam alignment. Beryllium input window realized wide range of X-ray energy and coupled with L-shaped quartz optics makes high X-ray radiation tolerance.
Suitable for high resolution X-ray beam alignment in large synchrotron radiation facilities.

PRINCIPLE



The irradiated X-ray is converted to visible light and conducted to the lens bended 90 degrees by L-shaped mirror in order to reduce the X-ray damage onto the digital camera.

FEATURES

- **X-ray proof design**
  (adopting a quartz glass plate and L-shaped optics)
- **Easy to exchange scintillators**
- **Possible to detect low X-ray energy**
- **Small size and light weight**
- **Remote controllable focus adjustment**
- **One touch design for camera attachment**
- **High resolution**

APPLICATIONS

- **X-ray CT**
- **Phase contrast X-ray CT**
- **X-ray optics alignment**
- **X-ray topography**
- **X-ray microscope**
- **Angiography**
- **XAFS**

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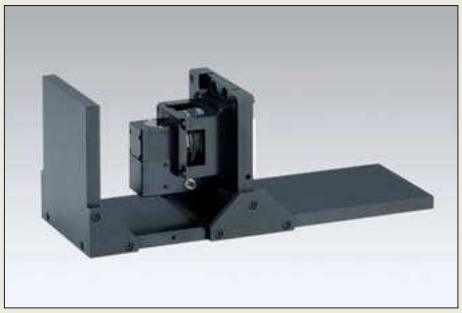
Imaging unit selection

M11427-42 (Standard type)

Imaging unit: AA40

- Resolution: 10 µm
- Scintillator diameter: 17 mm



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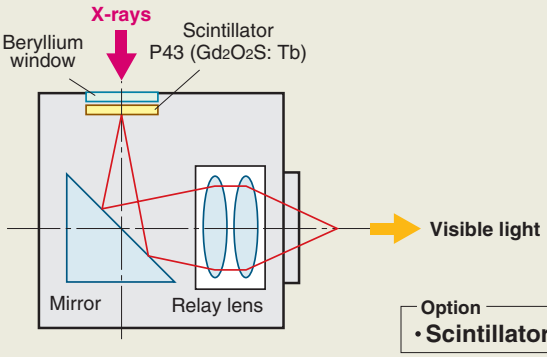


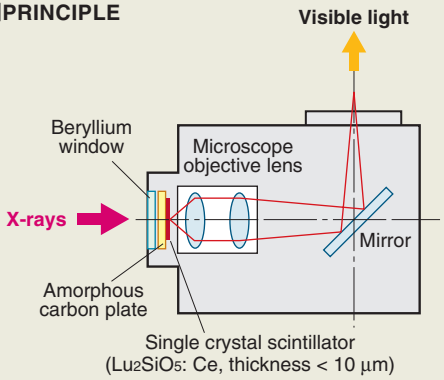
Option
- Scintillator: CsI

M11427-51, -52, -53 (Small area type)

Imaging unit: AA50

- Resolution: 2 µm
- Scintillator diameter: 10 mm

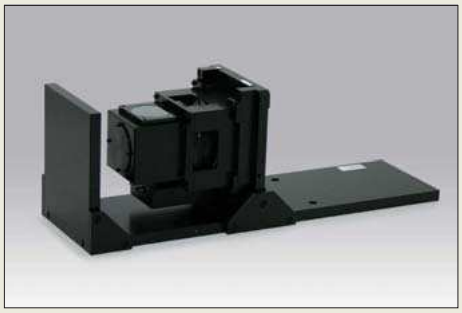
■PRINCIPLE



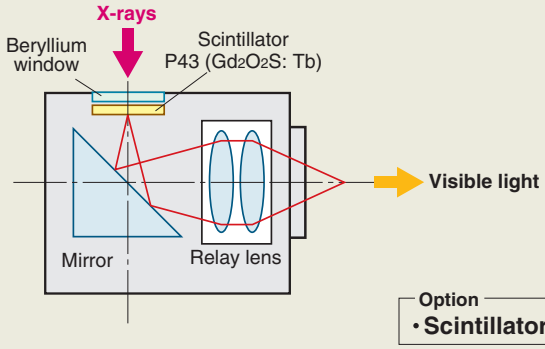
M11427-61 (Large area type)

Imaging unit: AA60

- Resolution: 10 µm or more
- Scintillator diameter: 35 mm



■PRINCIPLE



Option
- Scintillator: CsI

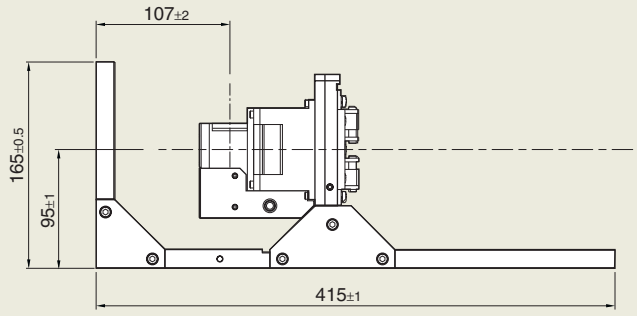
SPECIFICATIONS

Type number	M11427-42	M11427-51	M11427-52	M11427-53	M11427-61
Imaging unit	**AA40**	**AA50**			**AA60**
Scintillator diameter	17 mm	10 mm			35 mm
Input window material	Beryllium (0.5 mm)	Beryllium (0.5 mm) / Amorphous carbon (2 mm)			Amorphous carbon (0.5 mm)
Sensitivity range	3 keV or more	3 keV or more			3 keV or more
Scintillator material	P43 (Gd_2O_2S: Tb)	LSO (Lu_2SiO_5: Ce)			P43 (Gd_2O_2S: Tb)
Peak emission wavelength	540 nm	420 nm			540 nm
Minimum thickness of scintillator	10 µm	10 µm			10 µm
Substlate material of scintillator	Quart glass	Amorphous carbon plate			Quart glass
Resolution *	10 µm	4 µm	2 µm	1 µm	10 µm or more
10 % Decay time	1 ms	40 ns			1 ms
First lens	50 mm (F1.4)	10× (NA 0.3)	20× (NA 0.4)	50× (NA 0.55)	105 mm (F2.4)
Second lens	105 mm, 50 mm, 35 mm or 16 mm	-			105 mm, 50 mm, 35 mm or 16 mm
ND filter	ND10 / ND1	-			ND10 / ND1

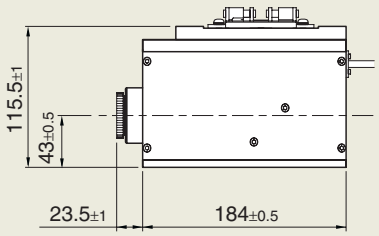
* Depending on the camera type

DIMENSIONAL OUTLINES (Unit: mm)

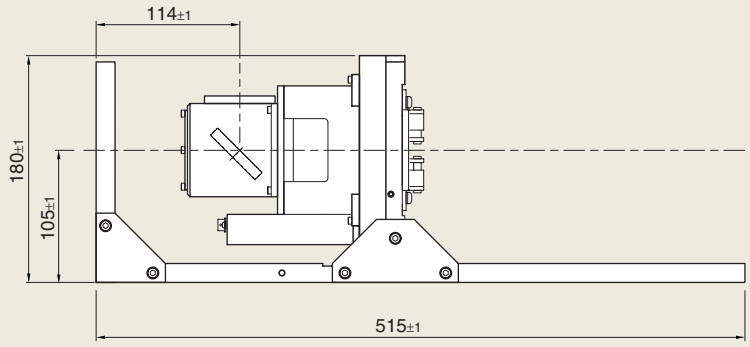
Imaging unit: AA40 (Approx. 5.2 kg)



Imaging unit: AA50 (Approx. 3.7 kg)



Imaging unit: AA60 (Approx. 6.5 kg)



Camera selection

ORCA-Flash4.0

High speed, High resolution, Low readout noise

Field of view Camera lens (f=50 mm)	AA40 (f=50 mm)	13.3 mm × 13.3 mm
	AA50 (20×)	0.665 mm × 0.665 mm
	AA60 (f=105 mm)	27.93 mm × 27.93 mm

ORCA-Flash2.8

High speed, Low readout noise

Field of view Camera lens (f=35 mm)	AA40 (f=50 mm)	9.957 mm × 7.471 mm
	AA50 (20×)	0.348 mm × 0.261 mm
	AA60 (f=105 mm)	20.91 mm × 15.69 mm

ImagEM®-1K

High sensitivity

Field of view Camera lens (f=50 mm)	AA40 (f=50 mm)	13.3 mm × 13.3 mm
	AA50 (20×)	0.665 mm × 0.665 mm
	AA60 (f=105 mm)	27.93 mm × 27.93 mm

ORCA-R2

Dual scan, Low dark current

Field of view Camera lens (f=35 mm)	AA40 (f=50 mm)	12.386 mm × 11.1 mm
	AA50 (20×)	0.4335 mm × 0.33 mm
	AA60 (f=105 mm)	26.01 mm × 19.8 mm

C9300-124

High resolution

Field of view Camera lens (f=105 mm)	AA40 (f=50 mm)	17.143 mm × 11.429 mm
	AA50 (20×)	1.8 mm × 1.2025 mm
	AA60 (f=105 mm)	36.00 mm × 24.05 mm

C9300-221

High frame rate

Field of view Camera lens (f=16 mm)	AA40 (f=50 mm)	14.8 mm × 11.1 mm
	AA50 (20×)	0.2368 mm × 0.1776 mm
	AA60 (f=105 mm)	31.08 mm × 23.31 mm

SPECIFICATIONS

Camera type number		ORCA-Flash4.0 (C11440-22CU)		ORCA-Flash2.8 (C11440-10C)	ImagEM-1K (C9100-14)		ORCA-R2 (C10600-10B)		C9300-124	C9300-221
Imaging device		FL-400 scientific CMOS		FL-280 scientific CMOS	Frame transfer EM BT-CCD		ER-150 interline CCD		Interline CCD	Interline CCD
Effective number of pixels		2048 × 2048		1920 × 1440	1024 × 1024		1344 × 1024		4000 × 2672	640 × 480
Cell size		6.5 µm × 6.5 µm		3.63 µm × 3.63 µm	13.0 µm × 13.0 µm		6.45 µm × 6.45 µm		9.0 µm × 9.0 µm	7.4 µm × 7.4 µm
CCD effective area		13.3 mm × 13.3 mm		6.97 mm × 5.23 mm	13.3 mm × 13.3 mm		8.67 mm × 6.60 mm		36.00 mm × 24.05 mm	4.74 mm × 3.55 mm
Readout speed	Single readout	100 frames/s(Camera Link), 30 frames/s(USB 3.0)		45.4 frames/s	9.5 frames/s		16.2 frames/s, 8.5 frames/s		2.5 frames/s	82 frames/s
	Dual readout	-		-	-		-		4.5 frames/s	150 frames/s
Full well capacity		30 000 electrons		18 000 electrons	400 000 electrons		18 000 electrons		40 000 electrons	20 000 electrons
Readout noise (r.m.s.)	EM 10×	-		-	3 electrons		-		-	-
	EM 1200×	-		-	1 electron max.		-		-	-
	Normal	1.3 electrons		3 electrons (gain 8×)	19 electrons / 10 electrons		10 electrons / 6 electrons		40 electrons	20 electrons
Dark current	Air cooled	0.5 electrons/pixel/s (-10 ℃)		-	0.01 electrons/pixel/s (-55 ℃)		0.001 electrons/pixel/s (-35 ℃)		2 electrons/pixel/s	2 electrons/pixel/s
	Water cooled	0.15 electrons/pixel/s (-20 ℃)		-	0.001 electrons/pixel/s (-70 ℃)		0.0005 electrons/pixel/s (-40 ℃)		-	-
Quantum efficiency	420 nm	40 %		60 %	55 %		55 %		50 %	50 %
	540 nm	72 %		60 %	90 %		70 %		50 %	50 %
Cooling method		Forced air	Water cooled	Passive air-cooled	Forced air	Water cooled	Forced air	Water cooled	Forced air	Forced air
Cooling temperature		-10 ℃	-20 ℃	+5 ℃	-55 ℃	-70 ℃	-35 ℃	-40 ℃	+10 ℃ to +12 ℃	0 ℃ to +5 ℃
A/D converter		16 bit		12 bit	16 bit		12 bit / 16 bit		12 bit	12 bit
Digital I/F		Camera Link / USB 3.0		Camera Link	Camera Link		IEEE1394b-2002		Camera Link	Camera Link

*Refer to the camera catalog for detail inforation.

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