



Iron CoaXPress/SDI Industrial Grade Camera



(Part-No. KY-Iron)

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Datasheet

20 aMesila St., Nesher 3688520, Israel
POB 25004, Haifa 3125001, Israel
Tel:(+972)-72-2723500 Fax:(+972)-72-2723511
www.kayainstruments.com

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Version	Date	Notes
1.0	05/01/2019	Initial Release
1.1	14/01/2019	Added pane-tilt correction schematics

PRELIMINARY

4.1 Overview

The family *Iron* is an industrial grade low-cost low-power global shutter CMOS cameras with either CoaXPress 12G or SDI 12G connection interface.

The camera varies models provides high quality video with frames up to 12Mpixel and data rates of up to 216 fps.

The camera incorporates Sony Pregius IMX global shutter sensor with 3.45 μ m pixel size. This provides high dynamic range, high resolution and a large field of view.

With compact outline and low power design this camera can be fitted into tight spaces. Superior sensor performance allows very low light vision capabilities.

4.2 Product Applications

This camera is ideally suited for:

- Perimeter vision
- Military/Defense systems
- 3D
- Low light surveillance
- Special Effects
- VR

4.3 Features

- Color/Monochrome models
- Ruggedized design
- Up to 3.5W power at full rate
- Full image processing feature set
- Full sensor alignment calibration
- 6.25 Gbps CoaXPress 1.1
- 12 Gbps CoaXPress 2.0
- PoCXP support

- 12 Gbps SDI
- C mount / CS mount
- Full EMVA1288 report
- GenCam compatible
- Full built-in self-test (BIT)
- Full built-in voltage testing
- Customization as per user requirements

4.4 Related documents and accessories

Documents:

- Iron User Guide
- Iron Quick Start Guide
- Vision Point Software Installation Guide
- Vision Point App User Guide for Acquisition Mode
- Vision Point API Data Book
- Predator II CoaXPress Frame Grabber HW and Installation Guide

Accessories:

- CoaXPress cables (Micro-BNC to Micro-BNC)
- CoaXPress cables (Micro-BNC to BNC)
- CoaXPress cables (Micro-BNC to DIN)

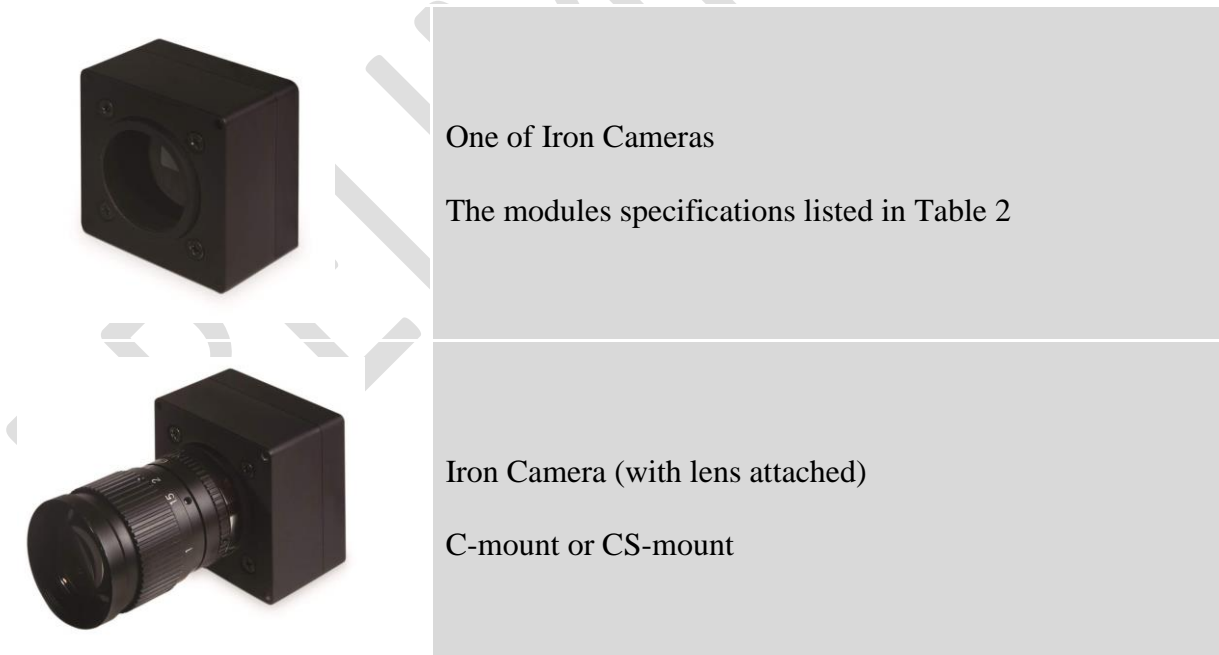
5.1 System Structure

Iron CoaXPress/SDI cameras provides industrial grade, high resolution image capturing interface. Iron CoaXPress supports connection speeds 12.5Gbps, 6.25Gbps and 3.125Gbps with discovery speed of 3.125Gbps. The camera can be connected to any CoaXPress Frame Grabber host which supports these connection speeds according to latest CoaXPress specification.

The connection can be established for distance of up to 35m at highest speed, and up to 100m for the lowest speed.

Iron cameras can also expose SDI interface which support LS and HS SDI connection interface. The camera is highly compatible and can be easily connect (Plug-and-play) to systems and monitors, which support input SDI interface.

An example of the system components is shown below:





Standard CoaXPress third party Frame Grabber



CoaXPress Cable



SDK

Friendly Software environment, includes Video management, GUI, SDK and API

Table 1 : Iron Camera system components

For more information about the system components, please refer the documents listed in the previous section.

PRELIMINARY

An example of the system configuration is described in Figure 1.

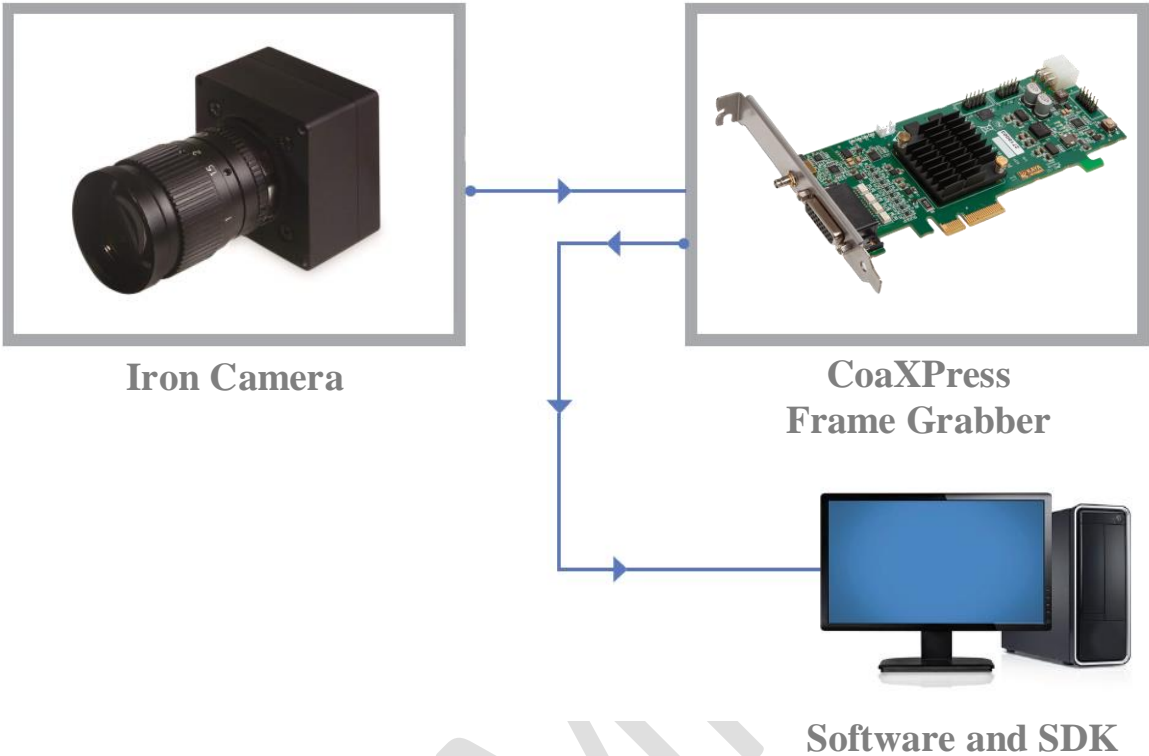


Figure 1 : Iron camera system structure example diagram

PRELIMINARY

5.2 Iron Camera Technical Data Summary

Type	Iron250	Iron252	Iron253	Iron255	Iron305
Pixel size	3.45 μm	3.45 μm	3.45 μm	3.45 μm	3.45 μm
Sensor resolution	2448 (H) x 2048 (V)	2048 (H) x 1536 (V)	4096 (H) x 3000 (V)	4096 (H) x 2160 (V)	4096 (H) x 2160 (V)
Sensor size	11.1 mm	8.9 mm	17.6 mm	16.1 mm	16.1 mm
Sensor	Sony Pregius IMX250	Sony Pregius IMX252	Sony Pregius IMX253	Sony Pregius IMX255	Sony Pregius IMX305
Video output	CoaXPress up to 12 Gbps, SDI 12G	CoaXPress up to 12 Gbps, SDI 12G	CoaXPress up to 12 Gbps, SDI 12G	CoaXPress up to 12 Gbps, SDI 12G	CoaXPress up to 12 Gbps, SDI 12G
Frame rate	163 fps @8bit resolution 144 fps @10bit resolution 89 fps @ 12bit resolution	216.2 fps @8bit resolution 191.5 fps @10bit resolution 118.5 fps @ 12bit resolution	68.3 fps @8bit resolution 64.6 fps @10bit resolution 46.4 fps @ 12bit resolution	93 fps @8bit resolution 88 fps @10bit resolution 63 fps @ 12bit resolution	63.7 fps @ 12bit resolution
Sensor positioning	Full pan/tilt calibration for optical axes	Full pan/tilt calibration for optical axes	Full pan/tilt calibration for optical axes	Full pan/tilt calibration for optical axes	Full pan/tilt calibration for optical axes
Dimensions (open-frame)	41x41x24 mm (including lens mount)	41x41x24 mm (including lens mount)	41x41x24 mm (including lens mount)	41x41x24 mm (including lens mount)	41x41x24 mm (including lens mount)
Dimensions (closed-frame)	43x43x24 mm (including lens mount)	43x43x24 mm (including lens mount)	43x43x24 mm (including lens mount)	43x43x24 mm (including lens mount)	43x43x24 mm (including lens mount)
Electronic shutter	Global shutter	Global shutter	Global shutter	Global shutter	Global shutter
Interface Connector	Micro-BNC	Micro-BNC	Micro-BNC	Micro-BNC	Micro-BNC
Temporal Noise	2.2 e ⁻ @25C	2.2 e ⁻ @25C	2.2 e ⁻ @25C	2.2 e ⁻ @25C	2.2 e ⁻ @25C
Full Well Charge	9828 e ⁻	9828 e ⁻	9828 e ⁻	9828 e ⁻	9828 e ⁻

System Description

Dynamic range	70.8dB at 520 nm	70.8dB at 520 nm	70.8dB at 520 nm	70.8dB at 520 nm	70.8dB at 520 nm
Signal-to-Noise Ratio (SNR max)	40 dB at 520 nm	40 dB at 520 nm	40 dB at 520 nm	40 dB at 520 nm	40 dB at 520 nm
Quantum Efficiency (QE) X FF	63% @525nm	63% @525nm	63% @525nm	63% @525nm	63% @525nm
Shortest Exposure	10us	10us	10us	10us	10us
Image acquisition	Continuous / Triggered	Continuous / Triggered	Continuous / Triggered	Continuous / Triggered	Continuous / Triggered
Output resolution	8, 10 or 12 bit	8, 10 or 12 bit	8, 10 or 12 bit	8, 10 or 12 bit	8, 10 or 12 bit
Monochrome/color	Monochrome / Color	Monochrome / Color	Monochrome / Color	Monochrome / Color	Color
Power input	PoCXP full support (7-28V with external power option)	PoCXP full support (7-28V with external power option)	PoCXP full support (7-28V with external power option)	PoCXP full support (7-28V with external power option)	PoCXP full support (7-28V with external power option)
Weight (without lens)	~50g	~50g	~50g	~50g	~50g
Power consumption	<3W @ 24V DC	<3W @ 24V DC	<3W @ 24V DC	<3W @ 24V DC	<3W @ 24V DC
Operating temperature	- 30 C to 70 C	-30 C to 70 C	-30 C to 70 C	-30 C to 70 C	-30 C to 70 C
Lens mount	C-mount, CS-mount	C-mount, CS-mount	C-mount, CS-mount	C-mount, CS-mount	C-mount, CS-mount
Shock/Vibration	MIL 810	MIL 810	MIL 810	MIL 810	MIL 810
Ingress protection	IP67 (with protective lens tube)	IP67 (with protective lens tube)	IP67 (with protective lens tube)	IP67 (with protective lens tube)	IP67 (with protective lens tube)
On camera processing	<ul style="list-style-type: none"> • Defect pixel correction • White balance • ROI 	<ul style="list-style-type: none"> • Defect pixel correction • White balance • ROI 	<ul style="list-style-type: none"> • Defect pixel correction • White balance • ROI 	<ul style="list-style-type: none"> • Defect pixel correction • White balance • ROI 	<ul style="list-style-type: none"> • Defect pixel correction • White balance • ROI

	<ul style="list-style-type: none"> • Image flip • Flat field/ Fixed patter noise correction • LUT • Gain (Analog / Digital) • Auto black level 	<ul style="list-style-type: none"> • Image flip • Flat field/ Fixed patter noise correction • LUT • Gain (Analog / Digital) • Auto black level 	<ul style="list-style-type: none"> • Image flip • Flat field/ Fixed patter noise correction • LUT • Gain (Analog / Digital) • Auto black level 	<ul style="list-style-type: none"> • Image flip • Flat field/ Fixed patter noise correction • LUT • Gain (Analog / Digital) • Auto black level 	<ul style="list-style-type: none"> • Image flip • Flat field/ Fixed patter noise correction • LUT • Gain (Analog / Digital) • Auto black level
XY Sensor Centering calibration (Optional)	±0.1mm	±0.1mm	±0.1mm	±0.1mm	±0.1mm
Sensor Rotation Calibration (Optional)	±1.5mrad	±1.5mrad	±1.5mrad	±1.5mrad	±1.5mrad
Optical Distance tolerance (Optional)	±0.1mm	±0.1mm	±0.1mm	±0.1mm	±0.1mm
Sensor Perpendicularity calibration (Optional)	±1mrad	±1mrad	±1mrad	±1mrad	±1mrad

Table 2 : Iron camera technical data summary

5.3 Quantum Efficiency

The following figures show the quantum efficiency of the Iron camera series:

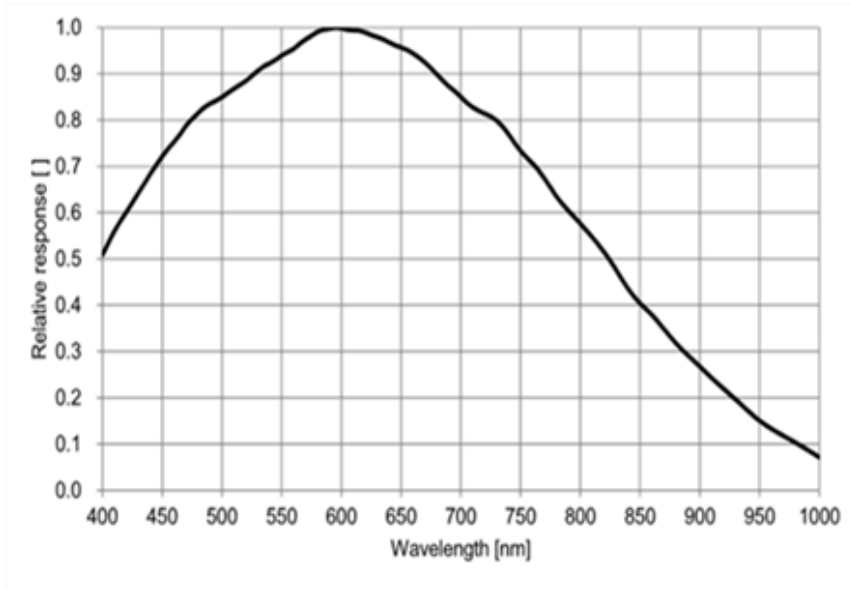


Figure 2 : Mono Spectral Response Sony IMX Quantum Efficiency Curve

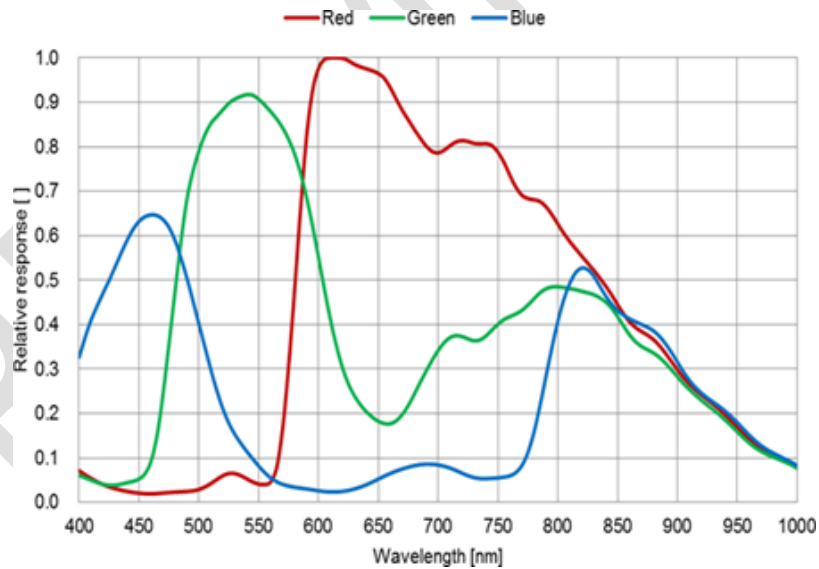


Figure 3 : Color Spectral Response Sony IMX Quantum Efficiency Curve

This section provides general information on Iron unit hardware. It covers mechanical characteristics, features and pin assignments for various connectors and camera models. For more detailed information regarding camera characteristics, please refer to the specific section of the Iron camera model.

6.1 Iron unit LED

The Iron unit has a link indication status LED, as seen in Figure 4.

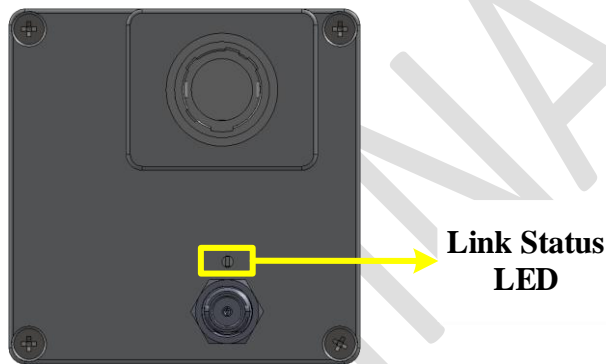


Figure 4 : Iron CoaXPress/SDI camera link indication status LED

The CoaXPress/SDI indication LED is located on the back side of the Iron camera, adjacent to the stream connector (CoaXPress or SDI). The LED's behavior is described in Table 3:

CoaXPress LED state	Condition
Solid red	Camera is up. No connection with the Frame Grabber was established
Solid green	Link is active. Stable connection is established with the Frame Grabber
Fast flash green	Camera is in data transmission mode

Table 3 : CoaXPress/SDI status LED behavior

6.2 Iron Camera Series Mechanical Dimensions

Part Name	Iron CoaXPress Platform Camera	Iron CoaXPress Open Frame Camera	Iron CoaXPress Camera w/o pane-tilt correction	Iron CoaXPress Camera with pane-tilt correction	Iron CoaXPress/SDI Camera with GPIO, w/o pane-tilt correction	Iron CoaXPress/SDI Camera with GPIO and pane-tilt correction
Weight	15gr.	30.83gr.	58.57gr.	68.57gr.	81.09gr.	91.09gr.
Dimensions	41x41x19mm	41x41x32mm	44x44x35.26mm	44x44x36.2mm	44x44x38.7mm	44x44x38.7mm
Interface	CoaXPress	CoaXPress	CoaXPress	CoaXPress	CoaXPress/SDI	CoaXPress/SDI
Optical	-	-	C, CS - Mount	C, CS - Mount	C, CS - Mount	C, CS - Mount

Table 4 : Iron Series Mechanical Summary

6.2.1 Iron CoaXPress Open Frame Camera Mechanical Dimensions

The exact device mechanical dimensions are as defined in the image below.

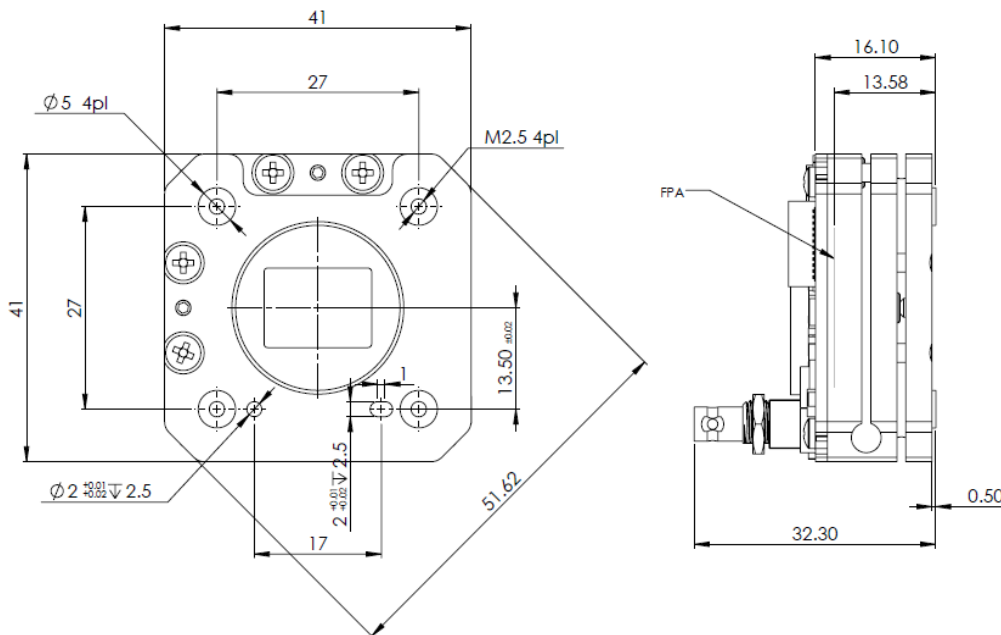


Figure 5 : Iron Open Frame Mechanical Dimensions

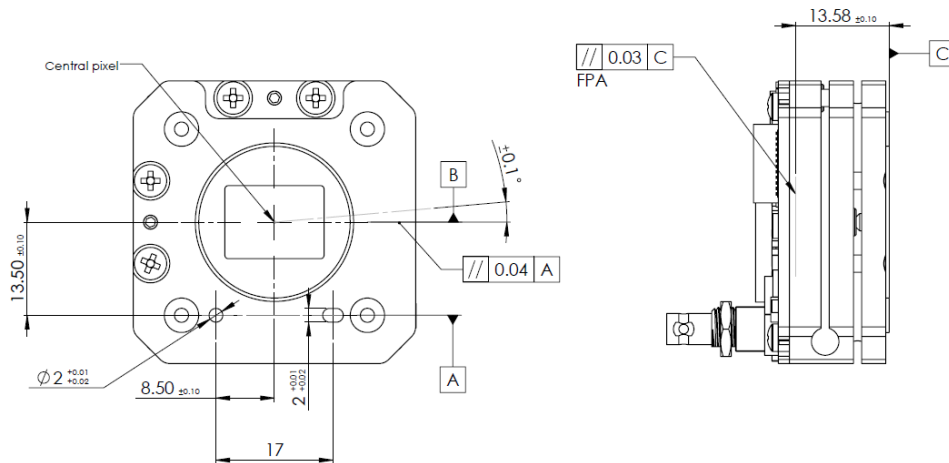


Figure 6 : Iron open frame FPA position tolerances

NOTES:

- 1) The Iron CoaXPress connector is Micro-BNC type in order to support CoaXPress 2.0 standard.
- 2) The Iron CoaXPress connector is a vertical type. A right angle option is available upon request.

6.2.2 Iron CoaXPress Camera Mechanical Dimensions

The exact device mechanical dimensions are as defined in the image below.

Iron CoaXPress dimensions with pane-tilt correction:

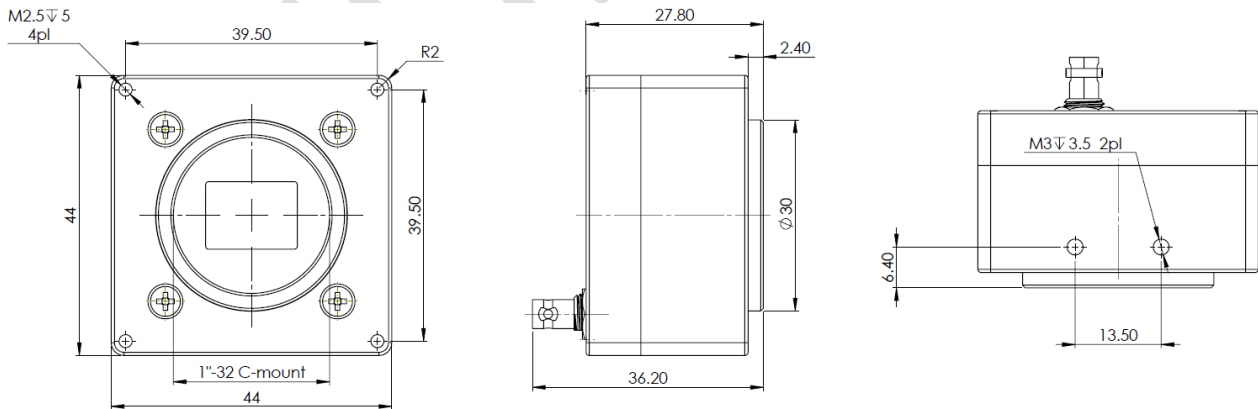


Figure 7 : Iron CoaXPress with pane-tilt correction mechanical dimensions

Iron CoaXPress dimensions w/o pane-tilt correction:

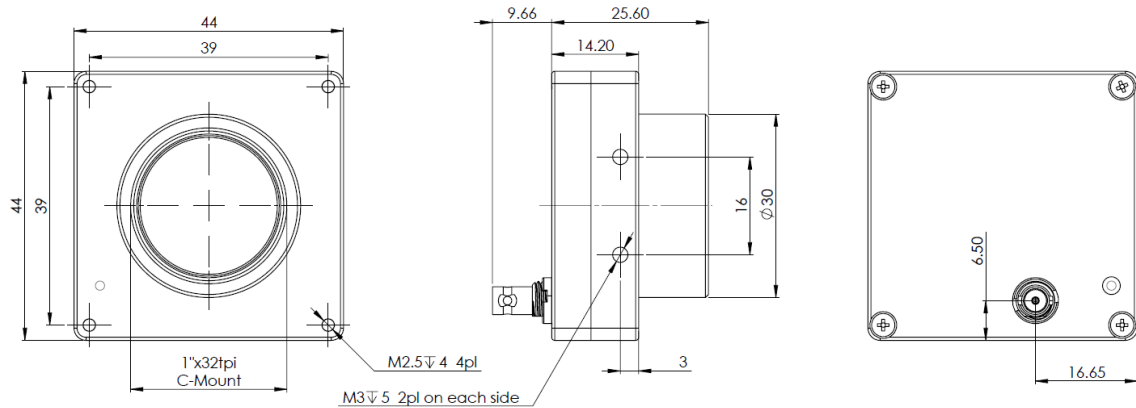


Figure 8 : Iron CoaXPress w/o pane-tilt correction mechanical dimensions

6.2.3 Iron CoaXPress/SDI Camera with GPIO Mechanical Dimensions

The exact device mechanical dimensions are as defined in the image below.

Iron CoaXPress/SDI dimensions with pane-tilt correction:

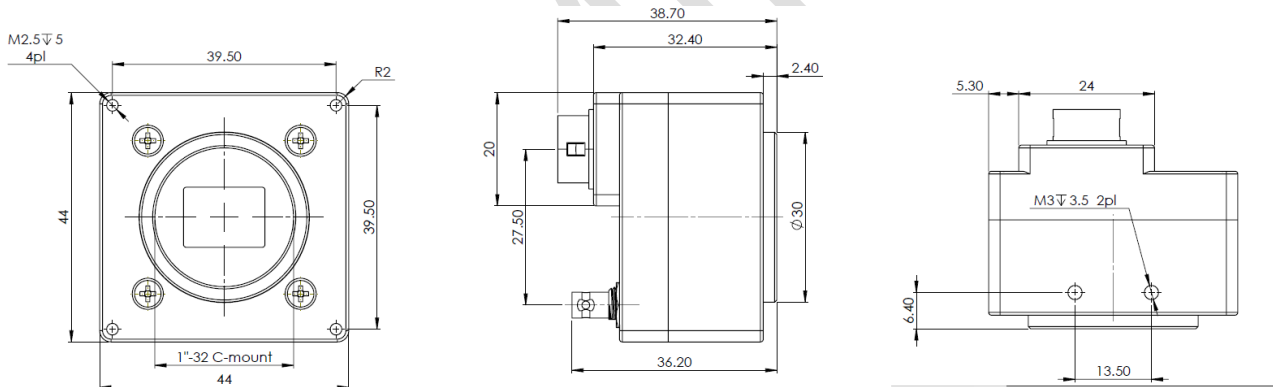


Figure 9 : Iron CoaXPress/SDI with GPIO and pane-tilt correction mechanical dimensions

Iron CoaXPress/SDI dimensions w/o pane-tilt correction:

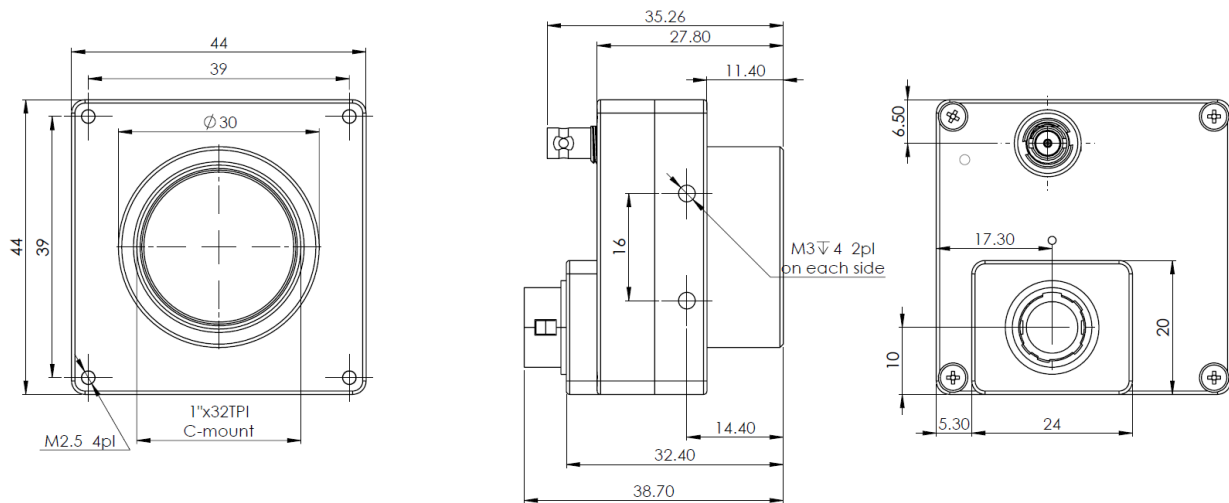


Figure 10 : Iron CoaXPress/SDI with GPIO w/o pane-tilt correction mechanical dimensions

6.3 Iron SDI Interface

The Iron camera supports SMPTE ST-2082 interface standard, 12G-SDI (high-definition serial digital interface) video stream, for digital video transmission over a single-link coaxial cable. The data transmission speed of the system is at 12 Gbps.

- SMPTE ST-2082 standard
- Supports 12G-SDI with a resolutions of 2160p60
- Single-link standard coaxial 75-ohm cable
- Streams serial digital video
- 10-bit YCrCb 4:2:2 encoding

6.4 Pane-tilt correction

TBD

6.5 Iron CoaXPress/SDI Camera GPIO pinout

The Iron CoaXPress/SDI camera has a GPIO connector that can be used by the user for various purposes. The GPIO connector in use is an HR10A-10P-12P(74) female (Hirose Electric). The female 12-pin HIROSE connector provides camera control via an RS232 serial interface and outputs Lens Control signals for Zoom, Focus, and Iris for a standard C-Mount and CS-Mount motorized lens. The following figure describes the pin out of the Iron CoaXPress camera Hirose 12 pin female connector.

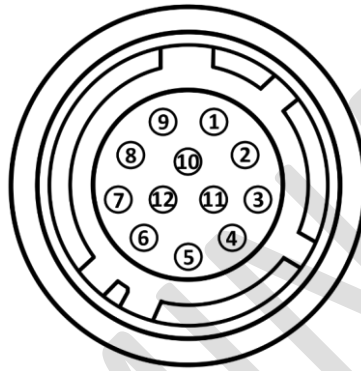


Figure 11 : Iron CoaXPress/SDI GPIO connector pinout

NOTE: An HR10A-10P-12P(74) (Hirose Electric) connector or equivalent should be used on the cable side.

The Iron CoaXPress/SDI camera GPIO connector available configurations are described in the following sections.

6.5.1 Iron CoaXPress/SDI Camera GPIO pinout description

The following table describes the pinout of the Iron SDI camera GPIO connector.

Pin number	Pin description	Direction
1	Supply return	GND
2	Supply voltage	Input
3	RS232 RX	Input
4	RS232 TX	Output
5	Out 2 return (Opto Isolated)	Output
6	Out 1 return	Output

7	Out 1 Signal	Output
8	In 1 Signal (Opto Isolated)	Input
9	In 2 Signal	Input
10	In 1 return (Opto Isolated)	Input
11	In 2 return	Input
12	Out 2 Signal (Opto Isolated)	Output

Table 5 : Iron CoaXPress GPIO connector pin out

6.5.2 Iron SDI Camera GPIO with PIRIS control

The following table describes the GPIO connector pinout of the Iron SDI camera with PIRIS control.

Pin number	Pin description	Direction
1	Common Ground	GND
2	Supply voltage	Input
3	RS232 RX	Input
4	RS232 TX	Output
5	IRIS Motor A 1	Output
6	Out 1 return	Output
7	Out 1 Signal	Output
8	Tri-Level sync	Input
9	IRIS Motor B 2	Output
10	Tri-Level sync return	Input
11	IRIS Motor B 1	Output
12	IRIS motor A 2	Output

Table 6 : Iron SDI camera with PIRIS control GPIO pinout

6.5.3 Iron SDI GPIO with Genlock control

The following table describes the GPIO connector pinout of the Iron SDI camera with Genlock control.

Pin number	Pin description	Direction
1	Supply return	GND
2	Supply voltage	Input
3	RS232 RX ⁽¹⁾	Input
4	RS232 TX ⁽²⁾	Output
5	Out 2 return (Opto Isolated)	Output
6	Out 1 return	Output
7	Out 1 Signal	Output
8	Tri-Level sync	Input
9	In 2 Signal	Input
10	Tri-Level sync return	Input
11	In 2 return	Input
12	Out 2 Signal (Opto Isolated)	Output

Table 7 : Iron SDI camera with Genlock control GPIO pinout

7.1 Absolute maximum ratings

Specification	Values
Power supply	-0.3V to 28V
Storage temperature	-55°C to 85°C
Operating ambient temperature	-30°C to 85°C ⁽¹⁾

Table 8 : Absolute maximum ratings

(1) Operating ambient temperature of 85°C results in performance degrading.

7.2 Absolute maximum ratings for GPIO

Specification	Minimum voltage [V]	Maximum voltage [V]
HR10A-10P-12P(74)	-0.3	12

Table 9 : Absolute maximum ratings for GPIO

7.3 Operating conditions

Parameter	Description	Minimum	Typical	Maximum
Supply Voltage	Supply voltage	10.5		26
12 Icc	Supply Current from 12V	-	0.25A	-

Table 10 : Operating conditions

Symbol	Parameter	Test condition	MIN	MAX	Units
VIH	Input High Voltage		2.7	12	V
VIL	Input Low Voltage		-12	-2.7	V
IIN	Input Current	VIN = 0 V or VIN = VDD		±5	µA

Table 11 : RS232 receiver (input) specifications

Symbol	Parameter	Test condition	MIN	MAX	Units
VOH	Output High Voltage	VIN = max	5.5	12	V
VOL	Output Low Voltage	VIN = min	-12	-5.5	V

Table 12 : RS232 driver (output) specifications

For more detailed information please, contact KAYA Instruments representative.

Item name	Item part number
Iron Camera	KY-IRON-250/253/255/305 ⁽¹⁾
Predator II CoaXPress Frame Grabber	KY-FGPII
DC 24V 72W Power adapter	KY-PWR-24
Coaxial cable - Micro-BNC to Micro-BNC	KY-FCC-000-XXX.X ⁽²⁾
Coaxial cable - Micro-BNC to BNC	KY-FCC-001-XXX.X ⁽²⁾
Coaxial cable - Micro-BNC to DIN	KY-FCC-002-XXX.X ⁽²⁾

(1) Sensor type, see table 2

(2) Cable length in x meters

Table 13 : Ordering Information

PRELIMINARY