CONTRASTECH

Mars Coaxpress Area Scan Cameras User Manual

V2.2.0, Feb. 2022

PREFACE

Purpose of This Manual

This Manual is a basic description of Mars Coaxpress Area Scan Cameras, which mainly includes the product description, quick installation guide and Simple introduction of SDK(iCentral).This manual may be updated due to product upgrades or other reasons. Please ask your sales engineer for the latest version of the manual if you need it.

Hangzhou Contrastech Co., Ltd.
Tel: 86-571-89712238
Add.: No.8, Xiyuan 9th Road West Lake District, Hangzhou 310030 China

Disclaimer

The information and specifications described in this manual are subject to change without notice.

Latest Manual Version

For the latest version of this manual, see the Download Center on our web site at:
www.contrastech.com.

Technical Support

For technical support, e-mail: support@contrastech.com.

Warranty

To ensure that your warranty remains in force, adhere to the following guidelines:

Do not remove the camera's serial number label
If the label is removed and the serial number can't be read from the camera's registers, the warranty is void.

Do not open the camera housing
Do not open the housing. Touching internal components may damage them.

Prevent ingress or insertion of foreign substances into the camera housing
Prevent liquid, flammable, or metallic substances from entering the camera housing. If operated with any foreign substances inside, the camera may fail or cause a fire.

Avoid electromagnetic fields
Do not operate the camera in the vicinity of strong electromagnetic fields. Avoid electrostatic charging.

Clean with care
Avoid cleaning the sensor if possible.

Handle this camera with care.
Do not abuse the camera. Avoid striking, shaking, etc. The camera could be damaged by improper handling.

Read the manual
Read the manual carefully before using the camera

Contents

CHAPTER 1 Product Description

Product Introduction

Mars series area scan cameras, latest developed by ContrasTech in 2016, are equipped with the most popular data interfaces in the Vision Market: the Gigabit Ethernet interface with 100 meter cable length, the USB 3.0 interface with plug and play capability and Camera Link high-speed transmission interface -- a stable and mature industrial-grade connection bus. All of these interfaces are standardized and offer the option to provide power and data to the camera via one single cable. The cameras also offer separate input/output ports for triggering or flash control.

The CoaXPress large area scan industrial camera adopts high performance photosensitive chip andtransmits image data through CoaXPress port. Conforms to CoaXPress protocol and GenICam standard.Up to 4 × 6.25 Gbps or 4 × 12.5 Gbps transmissionspeed meets the requirements of most industrial applications. It can work stably in various poor environments, which makes it an industrial camera with high stability at low cost.With this variety of sensors and interfaces, combined with the extensive features offered, Mars is a fit for a wide range of vision applications.

Product Features

- CoaXPress uses CXP-6/CXP-12, theoretical bandwidth 4 x 6.25Gbps/4 x 12.5 Gbps;
- Supports software trigger, external trigger, mixed mode, free run mode and etc.;
- Outputs multiple image data formats and supports ROI.
- Conforms to CoaXPress protocol and GenICam standard;
- Supports PoCXP power supply and DC 24V wide-range power supply for Cameras.

Mechanical Dimensions

The dimensions is in millimeters:

- Fig. 1-1: Mechanical Dimensions (in mm) for Cameras with 80 * 80 * 47mm housing (M42 interface).
- Fig. 1-2: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 72mm housing (M58 interface).
- Fig. 1-3: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 72mm housing (F interface).
- Fig. 1-4: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 69.6mm housing (M58 interface).
- Fig. 1-5: Mechanical Dimensions (in mm) for Cameras with 80 * 80 * 65.3mm housing (M42 interface).
- Fig. 1-6: Mechanical Dimensions (in mm) for Cameras with 80 * 80 * 72mm housing (M58 interface).
- Fig. 1-7: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 69.8mm housing (M58 interface).
- Fig. 1-8: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 91.1mm housing (M58 interface).
- Fig. 1-9: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 91.1mm housing (F interface).
- Fig. 1-10: Mechanical Dimensions (in mm) for Cameras with 80 * 80 * 73.4 housing (M58 interface).
- Fig. 1-11: Mechanical Dimensions (in mm) for Cameras with 100 * 100 * 65.7 housing (M72 interface).

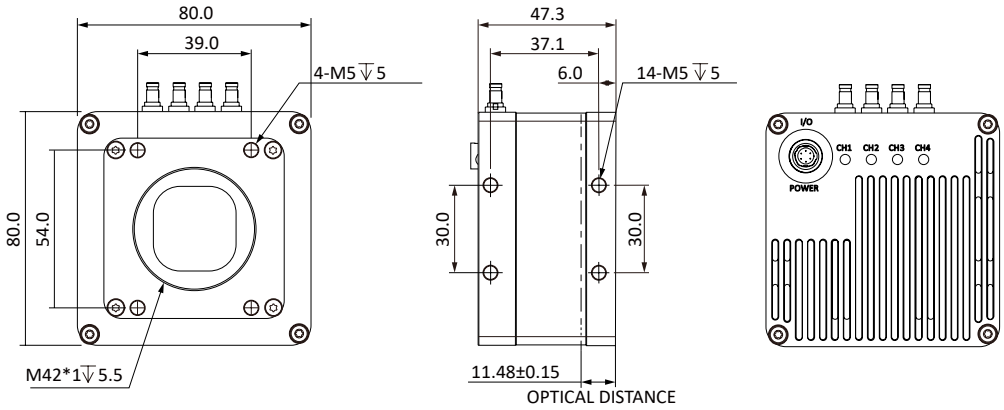


Fig. 1-1: Mechanical Dimensions (in mm) for Cameras with 80 * 80 * 47mm housing (M42 interface).

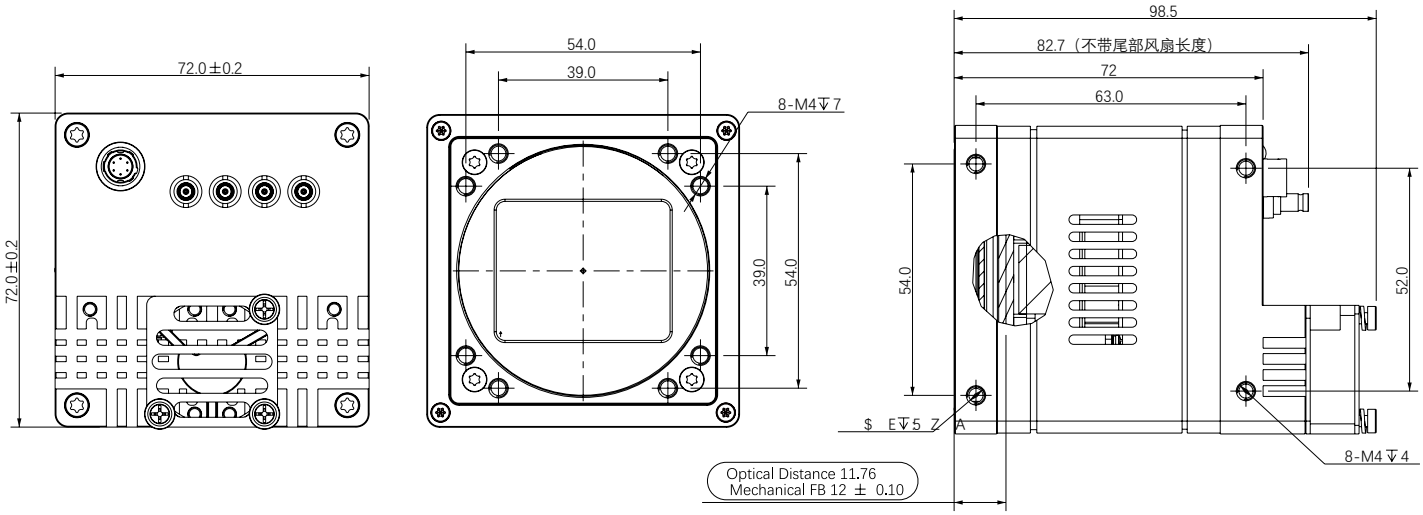


Fig. 1-2: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 72mm housing (M58 interface).

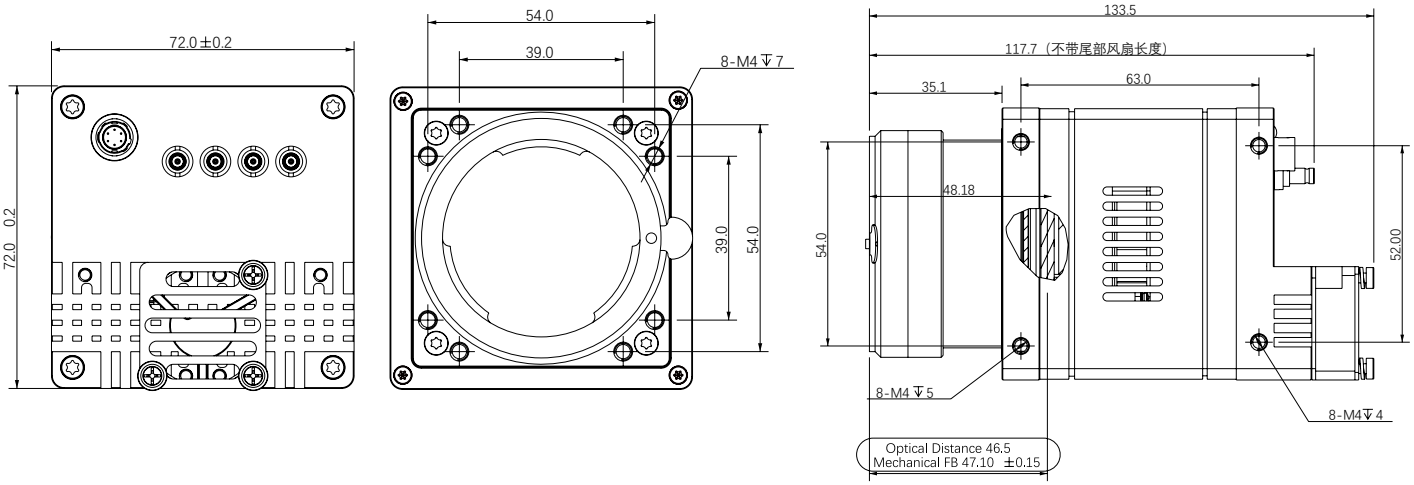


Fig. 1-3: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 72mm housing (F interface).

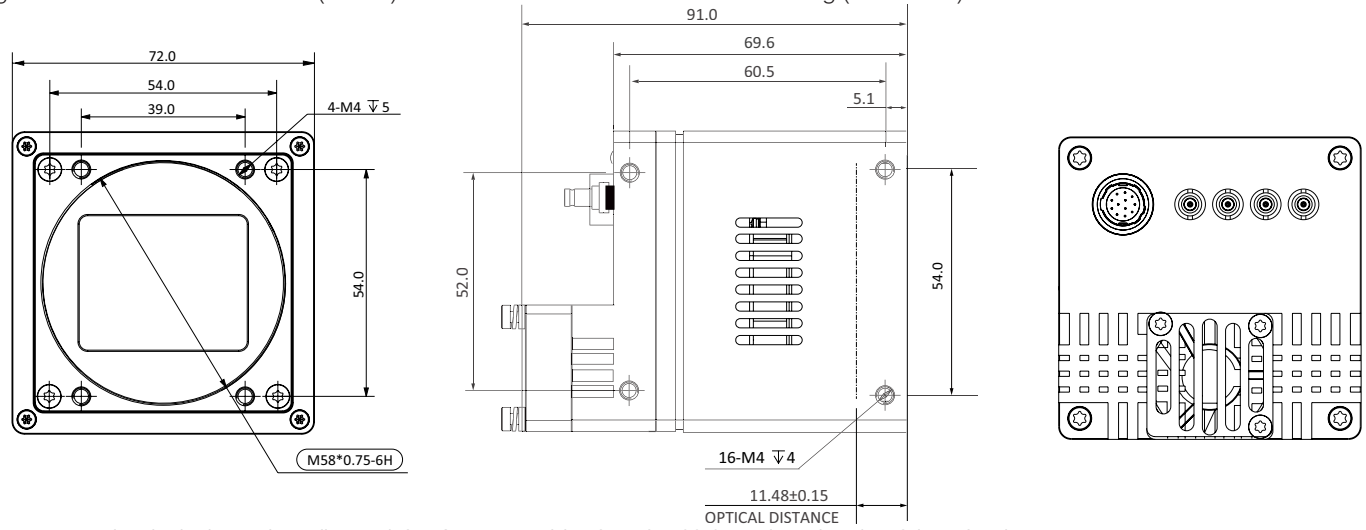


Fig. 1-4: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 69.6mm housing (M58 interface).

Mechanical Dimensions

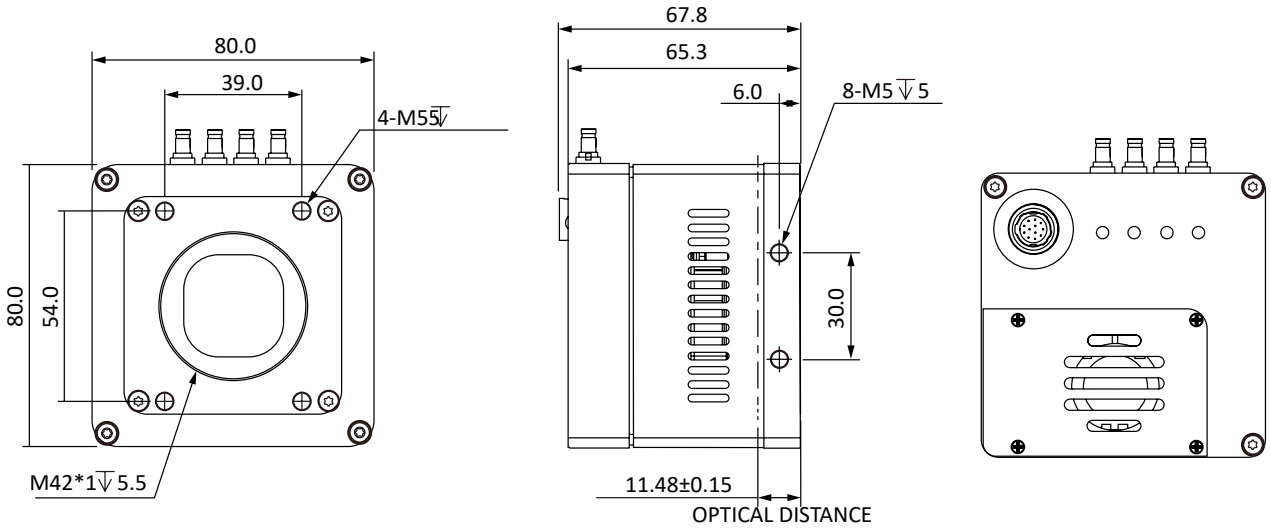


Fig. 1-5: Mechanical Dimensions (in mm) for Cameras with 80 * 80 * 65.3mm housing (M42 interface).

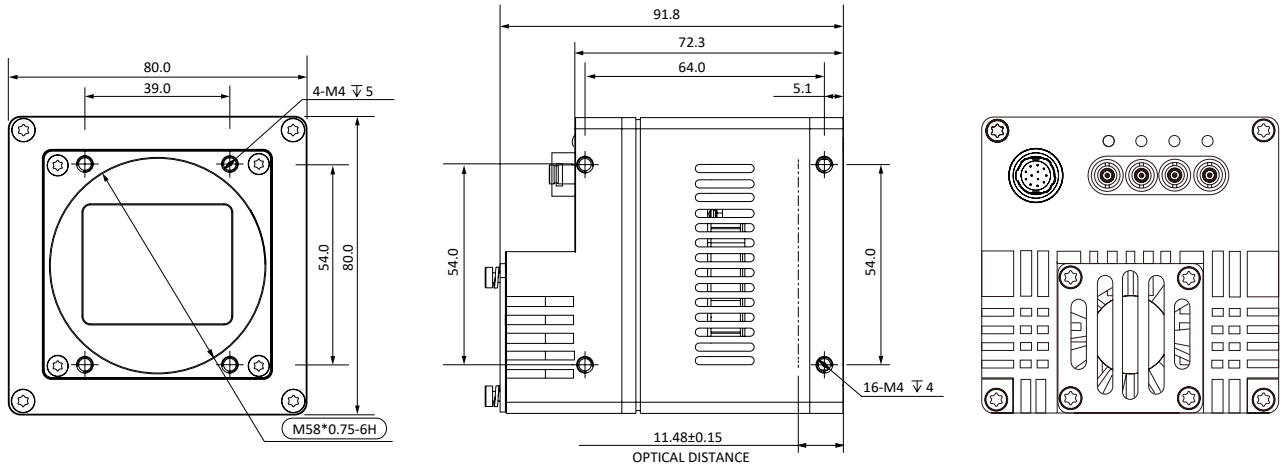


Fig. 1-6: Mechanical Dimensions (in mm) for Cameras with 80 * 80 * 72mm housing (M58 interface).

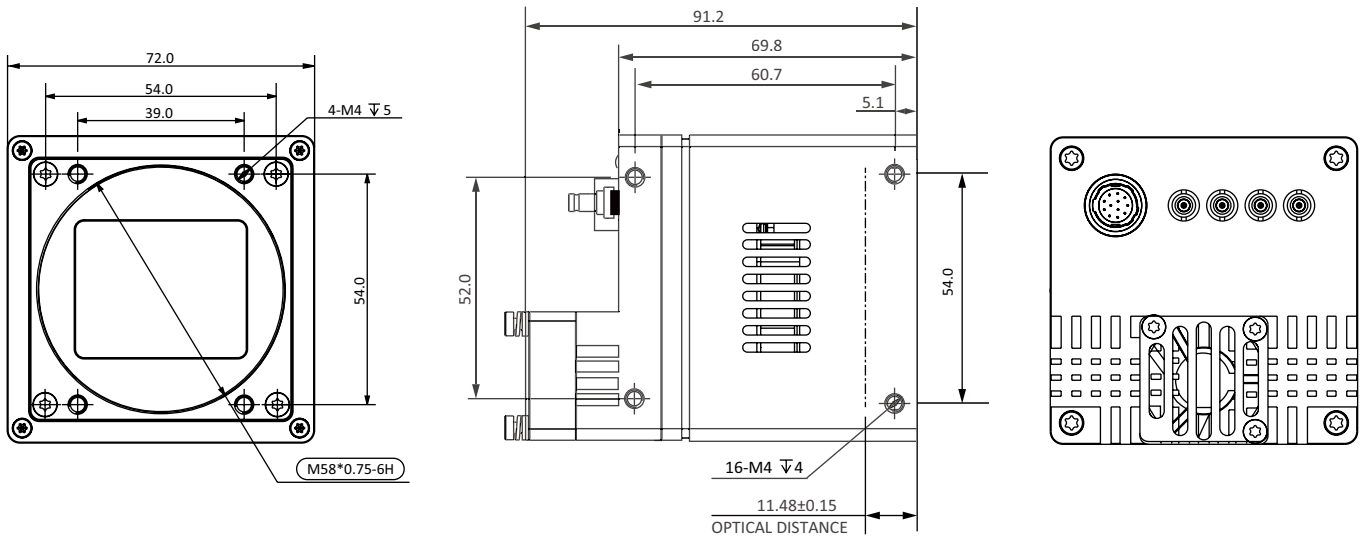


Fig. 1-7: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 69.8mm housing (M58 interface).

Mechanical Dimensions

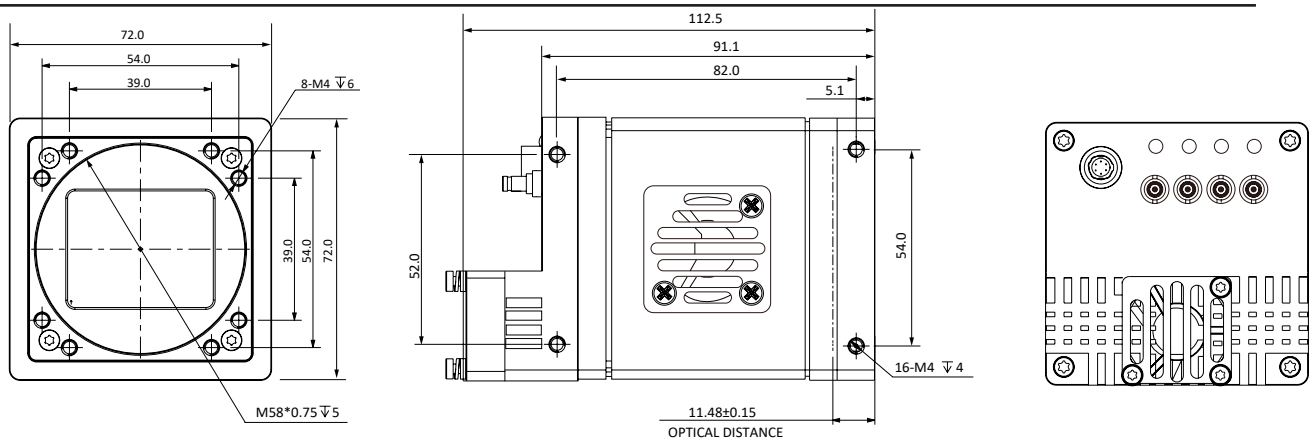


Fig. 1-8: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 91.1mm housing (M58 interface).

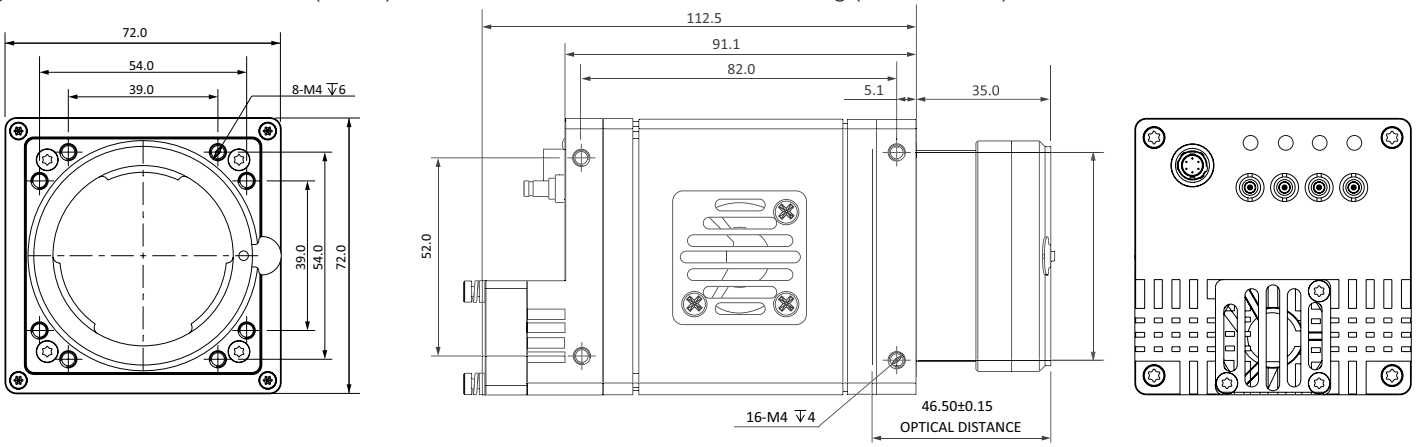


Fig. 1-9: Mechanical Dimensions (in mm) for Cameras with 72 * 72 * 91.1mm housing (F interface).

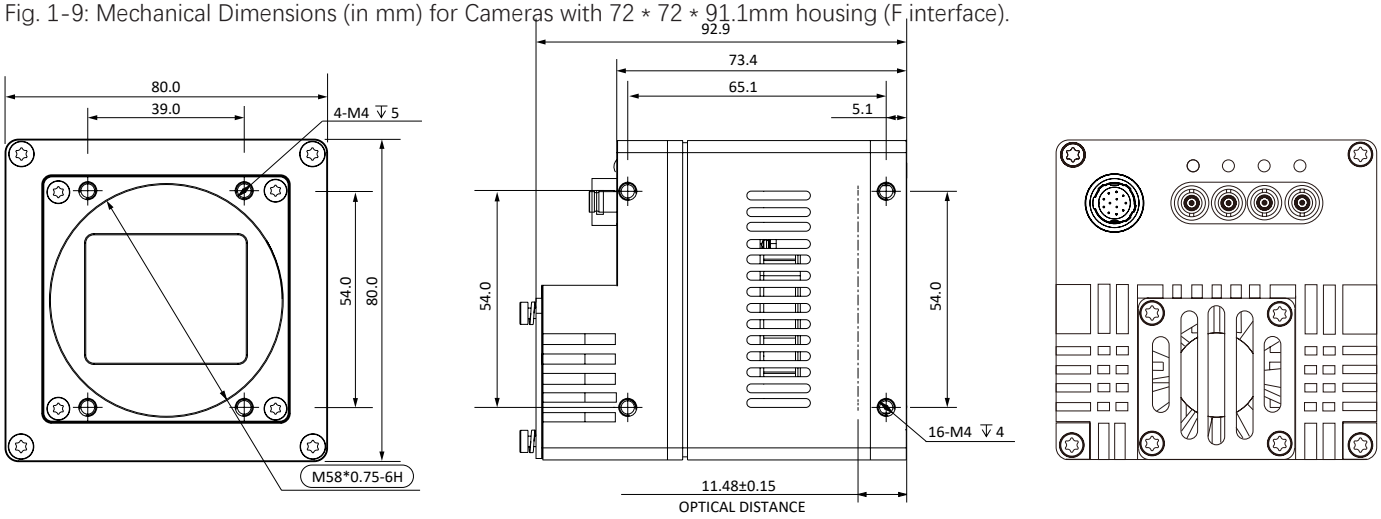


Fig. 1-10: Mechanical Dimensions (in mm) for Cameras with 80 * 80 * 73.4 housing (M58 interface).

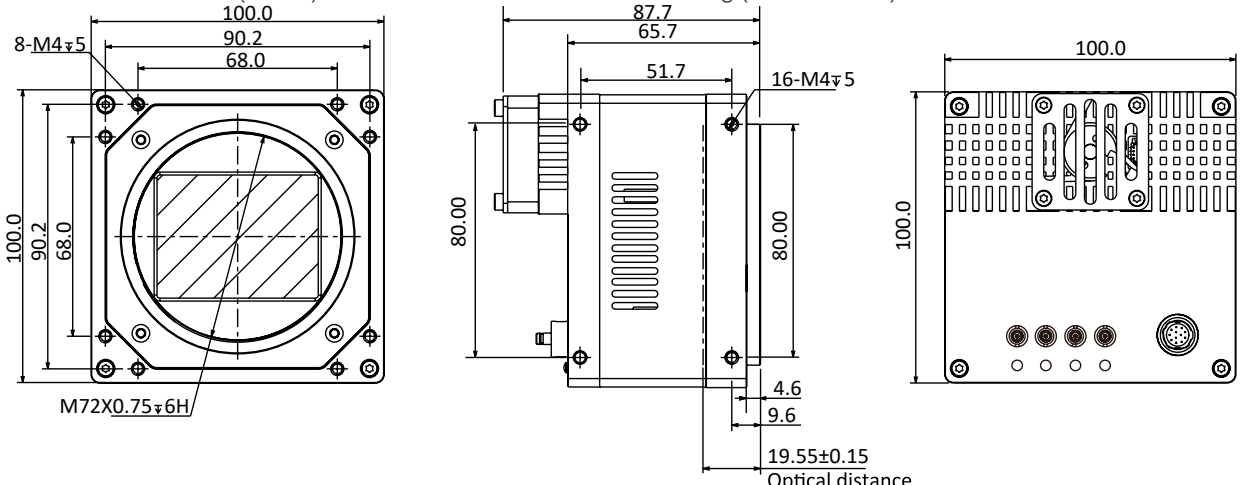


Fig. 1-11: Mechanical Dimensions (in mm) for Cameras with 100 * 100 * 65.7 housing (M72 interface).

Status LED Description

Mode	Status LED		Description
Normal	Red	Fast Flashing Red	The device is starting.
	Blue	Low-light Blue	IP has been assigned, Software API is not connected with the device.
		High-light Blue	API is connected with the device, free mode, No image transmission
		Fast Flashing Blue	API is connected with the device, free mode, with image transmission
		Slow Flashing Blue	Using trigger mode.
	Red ↔ Blue	Flashing Alternately Red and Blue	Firmware is upgrading.
Abnormal	Red	Steady Red	Device malfunction
		Slow Flashing Red	The Network is disconnected.

Electrical Standard

Module	Description
Data Ports	CoaXPress 1/2/4 channel(s);Single channel supports 2.5 Gbps/3.125 Gbps/5 Gbps/6.25 Gbps (CXP-12) CoaXPress 1/2/4 channel(s);Single channel supports 2.5 Gbps/3.125 Gbps/5 Gbps/6.25 Gbps (CXP-6)
Sync mode	Hardware trigger, software trigger and free run mode
Exposure control	Hardware trigger, set by camera API programming
Power supply	+18 ~ +26VDC, < 1% ripple, powered by the Hirose 12-pin connector of the camera[1]; Powered by PoCXP[2];
Input/output port	3 opto-isolated inputs; 3 opto-isolated outputs; 1 RS232 interface
Weight	/
Lens interface	/

1.The power supply must meet SELV and LPS specifications.
2.Must use a 75Ω coaxial cable that conforms to the CoaXPress protocol standard;

Pin	Signal	Description
1	Power	Power
2	Line0	Input/output port
3	Line1	Input/output port
4	Line2	Input/output port
5	GND	Signal ground(ISO_GND)
6	-	DC Ground

Pin	Signal	Description
1	-	DC Camera Power Ground and RS232 Signal Ground (GND)
2	-	+14~+24VDC DC Camera Power
3	RXD RS232	Serial Port Receive
4	TXD RS232	Serial Port Send
5	Line3	Opto-coupler Isolated Input
6	Line4	Opto-coupler Isolated Input
7	Line5	Opto-coupler Isolated Input
8	OPT_IN_GND	Opto-coupler Input Ground, do not connect to power ground
9	Line0	Opto-coupler Isolated Output
10	Line1	Opto-coupler Isolated Output
11	Line2	Opto-coupler Isolated Output
12	OPT_OUT_GND	Opto-coupler Output Ground, do not connect to power ground

Avoiding EMI and ESD Problems

The cameras are frequently installed in industrial environments. These environments often include devices that generate electromagnetic interference (EMI) and they are prone to electrostatic discharge (ESD). Excessive EMI and ESD can cause problems with your camera such as false triggering or can cause the camera to suddenly stop capturing images. EMI and ESD can also have a negative impact on the quality of the image data transmitted by the camera.

To avoid problems with EMI and ESD, you should follow these general guidelines:

- Always use high quality shielded cables. The use of high quality cables is one of the best defenses against EMI and ESD.
- Try to use camera cables that are only as long as necessary and try to run the camera cables and power cables parallel to each other. Avoid coiling camera cables. If the cables are too long, use a meandering path rather then coiling the cables.
- Avoid placing camera cables parallel to wires carrying high-current, switching voltages such as wires supplying stepper motors or electrical devices that employ switching technology. Placing camera cables near to these types of devices can cause problems with the camera.
- Attempt to connect all grounds to a single point, e.g., use a single power outlet for the entire system and connect all grounds to the single outlet. This will help to avoid large ground loops. (Large ground loops can be a primary cause of EMI problems.)
- Use a line filter on the main power supply.
- Install the camera and camera cables as far as possible from devices generating sparks. If necessary, use additional shielding.
- Decrease the risk of electrostatic discharge by taking the following measures:
  - Use conductive materials at the point of installation (e.g., floor, workplace).
  - Control the humidity in your environment. Low humidity can cause ESD problems.

Precautions

NOTICE

Cleaning of the sensor and the housing

Sensor

Avoid cleaning the surface of the camera's sensor if possible. If you must clean it:

- Before starting, disconnect the camera from camera power and I/O power.
- Use a soft, lint-free cloth dampened with a small amount of high-quality window cleaner.
- Because electrostatic discharge can damage the sensor, you must use a cloth that won't generate static during cleaning (cotton is a good choice).
- Make sure the window cleaner has evaporated after cleaning, before reconnecting the camera to power.

Housing

To clean the surface of the camera housing:

- Do not use solvents or thinners; they can damage the surface.
- Use a soft, dry cloth that won't generate static during cleaning (cotton is a good choice).
- To remove tough stains, use a soft cloth dampened with a small amount of neutral detergent; then wipe dry.

NOTICE

An incorrect plug can damage the 6-pin/12-pin connector.

The plug on the cable that you attach to the camera's 6-pin/12-pin connector must have 6/12 female pins.

Using a plug designed for a smaller or a larger number of pins can damage the connector.

NOTICE

Avoid dust on the sensor.

The camera is shipped with a plastic cap on the lens mount. To avoid collecting dust on the camera's IR cut filter (color cameras) or sensor (mono and mono NIR cameras), make sure that you always put the plastic cap in place when there is no lens mounted on the camera.

To avoid collecting dust on the camera's IR cut filter (color cameras) or sensor (mono cameras), make sure to observe the following:

- Always put the plastic cap in place when there is no lens mounted on the camera.
- Make sure that the camera is pointing down every time you remove or replace the plastic cap, a lens or a lens adapter.
- Never apply compressed air to the camera. This can easily contaminate optical components, particu-larly the sensor.

CHAPTER 2 Installation and Setup

Software Installation

System Requirements

The Mars Camera Software Suite for Windows requires that one of the following operating systems is installed on your computer:

- Windows 7 (32 bit or 64 bit)
- Windows 10 (32 bit or 64 bit)

Brief Introduction of Mars Camera Software Suite

The options available with the Mars Camera Software Suite let you change parameters and control the camera by using a stand alone GUI (known as iCentral) or by accessing the camera from within your software application using the API.

The Mars Camera Software Suite is designed for use with all Mars cameras with both the GigE and USB 3.0. The iCentral offers reliable, real time image data transport into the memory of your computer at a very low CPU load.

The Mars Camera Software Suite includes several tools that you can use to change the parameters on your camera, including iCentral and API for different programming languages (C#/C++/.NET).

Installation Steps:

1. Download the iCentral from the ContrasTech website:

http://www.contrastech.com/en/service.html

2. Launch the downloaded installer.

3. Follow the instructions on the screen. The installer will guide you through the installation process.

During installation, you can choose whether to install the software for use with a GigE camera or a USB 3.0 camera.

Hardware Installation

Installing a Coaxpress Camera

i	If you use a firewall on your computer, disable the firewall for the network adapter to which your camera is connected.

The installation procedures assume that you will be making a peer-to-peer connection between your camera and a computer. Make sure that the following items are available before starting the installation:

- A Mars Coaxpress Camera;
- As applicable, a power supply and a Coaxpress frame grabber;
- As applicable, a suitable lens for the camera;
- A computer with a Coaxpress frame grabber installed; (The computer must be equipped with an appropriate operating system.);
- A standard Coaxpress cable(85KHz).

You should perform the software installation procedure first and the hardware installation procedure second.

Steps:

1. Mount a lens with adapter onto your camera. For lenses, make sure that the lens is screwed into the camera's lens adapter as far as it will go;
2. Connect the camera to the computer and power.

   If you are using PoCXP:

   a. Connect one end of a CXP cable to the CXP1 connector of the Coaxpress frame grabber and connect the other end of the cable to the CXP connector of the camera.If you need to connect 2 interfaces, the corresponding Coaxpress cable interface also corresponds to the camera interface.

   b. Connect the power supply plug of the Coaxpress frame grabber to the power supply port of the PC motherboard. (Coaxpress frame grabber needs to support PoCXP)

   If you are using 6/12-Pin Hirose cable:

   a. Connect one end of a CXP cable to the CXP1 connector of the Coaxpress frame grabber and connect the other end of the cable to the CXP connector of the camera.If you need to connect 2 interfaces, the corresponding Coaxpress cable interface also corresponds to the camera interface.

   b. Plug the 6-pin/12-pin connector of the cable from your power supply into the 6-pin/12-pin connector of the camera.

   c. Switch on the power supply.

3

CHAPTER 3 Features

Frame Rate

Frame rate, in area scan cameras, is the number of images the camera outputs every second.

■ Influential Facts for Frame Rate

- Single frame reading time: The shorter the time period of reading one frame, the higher the frame rate.
- Bandwidth: The bigger the bandwidth, the bigger the transmission data volume and the higherthe frame rate.
- Exposure time: The longer the exposure time, the lower the frame rate and vice versa.

■ Operation

Step 1 Connect the camera.

Step 2 Open the iCentral.

Step 3 Display the AcquisitionControl menu and set a reasonable frequency for AcquisitionFrameRate.

Step 4 Starts image acquisition.

Acquisition Mode

Acquisition mode of the camera includes Continuous, Single Frame and MultiFrame.Configurations are as follows.

Parameter	Working Principle
SingleFrame	The camera starts capturing and stops after one capture.
Continuous	● The camera starts and keeps capturing. ● Manual operation is required for stopping the capture.
MultiFrame	You can set the number of frames to be captured in AcquisitionFrameCount (1–255). ● The camera starts and keeps capturing. ● You can manually stop capturing before the set volume is reached.

AcquisitionFrameCount needs to be configured for MultiFrame. Enter a reasonable number as needed.

Trigger Mode

The trigger mode of the camera includes SoftwareTrigger (software trigger) and LineN (hardware trigger).

■ Trigger Type

Select FrameStart (frame trigger) or AcquisitionStart (image capture trigger) under TriggerSelector.

- FrameStart：Single frame capture. One trigger signal captures one frame.
- AcquisitionStart：Continuous capture. One signal triggers continuous captures.

Trigger Mode

■ Trigger Source

- Software trigger: Trigger signal comes from software.
- Hardware trigger: Trigger signal comes from external devices through I/O port. For the detailed number of signal channels for each camera I/O port, refer to the electrical specifications of the camera.
- Frame grabber trigger: Only available for CXP cameras. The capture card transmits the external signals to the camera to trigger image capture.

■ Trigger Operation

Step 1 Enable TriggerMode.

Step 2 Set TriggerSource to Software.

Each click on TriggerSoftware gets a frame.

Step 3 (Optional) Set TriggerSource to LineN.

Each trigger signal from external devices gets a frame.

Step 4 When hardware trigger is enabled, you can select trigger signal through TriggerActivation.

- RisingEdge：Press the trigger board to send trigger signal.
- FallingEdge：Release the trigger board to send the signal.

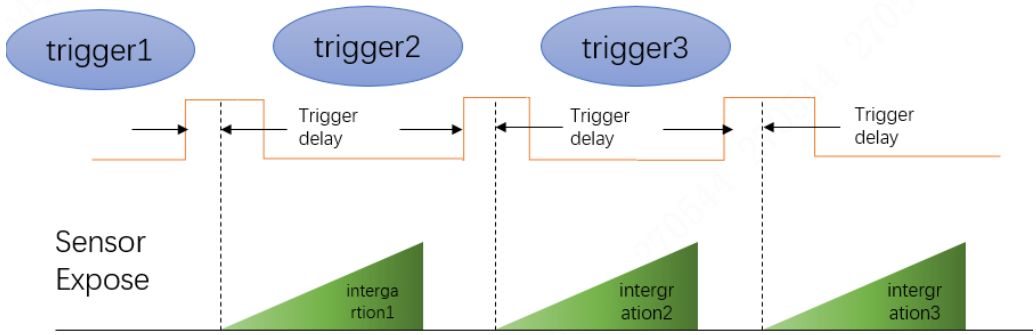
Step 5 You can send the trigger signal as needed after setting the trigger source.

Parameter	Description
AcquisitionFrameRate	Image frame rate. The AcquisitionFrameRate value is only recognized when AcquisitionFrameRateEnable is set to True. **Note：** If the set frame rate exceeds the maximum limit, the value of ResultingframeRateAbs, the actual frame rate the camera outputs is ResultingframeRateAbs value.
AcquisitionFrameRateEnable	
AcquisitionStatusSelector	Check trigger status. Set AcquisitionStatusSelector to AcquisitionTriggerWait (wait status of image capture trigger) or FrameTriggerWait (wait status of frame trigger), and then check AcquisitionStatus, True means waiting to trigger and False means already triggered.
AcquisitionStatus	
TriggerSelector	Select trigger type. Select FrameStart (frame trigger) or AcquisitionStart (image capture trigger) under TriggerSelector, and then set TriggerMode to On or Off to enable or disable the trigger mode. If both trigger modes are enabled at the same time, you can only get image captured when AcquisitionStart triggers first and FrameStart later.
TriggerActivation	
TriggerDelay	Trigger delay. Refers to the time period from the camera receives the trigger signal to responses to the signal. Effective for both software and hardware trigger.
TriggerSoftware	Trigger mode.
TriggerSource	TriggerSource 支持 SoftwareTrigger(软件触发)、lineN(硬件触发) 以及采集卡触发 CXPin。 TriggerSource supports SoftwareTrigger (software trigger), LineN (hardware trigger) and frame grabber trigger CXPin. For software trigger, click TriggerSoftware or call API can both capture a frame. For hardware trigger, set TriggerActivation to RisingEdge or FallingEdge, and then when external cables generate rising or falling edge signals, the camera is triggered to capture a frame. For frame grabber trigger, the camera is triggered when the frame grabber sends out a trigger command. **Note：** You can select trigger source for AcquisitionStart or FrameStart separately.
TriggerActivation	

- For detailed trigger settings, see the user manual of the frame grabber.
- When the LineDebouncerTimeAbs value is higher than that of the high-low level, as the above example, the smoothing level is higher than 5000 us, the camera has no stream. Do not set the LineDebouncerTimeAbs value higher than that of the high-low level.

Trigger Delay

You can set delay time from the camera receiving the trigger signal to responding to the signal to capture.



The trigger signal is rising edge in the following figure. The delay time is configured through Trigger Delay with μs as unit and ranges from 0 μs–10000000 μs, namely, 0 s–10 s.

Output Signal

The camera contains 1 opto-isolated output Line 0 and 1 Line 2 which can be set to input or output.

Step 1 Under Digital IO Control, set Line 2 as Line Selector.

Step 2 Set Line Mode to Output.

The output signal triggered by the camera can be used as switch on/off signal to control external devices such as alarm light, light source and PLC. Trigger signal can be sent out through electrical level reversal and Output signal. Configure parameters by Digital IO Control.

Black Level

The camera supports black level which can adjust the gray level deviation of the output data and decides the average gray level when the sensor is not photosensitive. Different ADC bit depth modes corresponds to different black level parameter range of the camera.

Configure black level.

Step 1 Select Once or Continuous under Analog Control > Black Level Enable.

Step 2 Enter the value in Black Level as needed.

Gain

Gain contains analog gain and digital gain. Analog gain can amplify the analog signal, and digital gain can amplify the signal after ADC (Analog to Digital Conversion).

Analog gain amplifies the signal, with higher value comes the stronger gain, higher brightness and more noise. Digital gain amplifies signals after ADC, same as analog gain, the higher the value, the stronger the gain, the higher the brightness and the more the noise. Compares to analog gain, the noise of digital gain is even more.

■ Analog Gain

Analog gain parameter settings include Off, Once and Continuous.

Analog Gain Mode	Parameter	Working Mode
Manual	Off	Adjusts analog gain based on the set value of GainRaw.
Automatic once	Once	Runs analog gain adjustment automatically for a period and then stops based on the current situation.
Continuous	Continuous	Runs analog gain adjustment continuously and automatically based on the current situation.

■ Digital Gain

Set the DigitalShift parameter among 0–4. The higher the value, the stronger the gain, the higher the brightness and the more the noise.

White Balance

White balance renders the intensities of colors on images captured under different lights through adjusting the corresponding R/G/B value. It keeps the white parts of the image white under different color temperature.

White balance supports Off, Once and Continuous mode.

WB Mode	Parameter	Working Mode
Manual	Off	Manually set the value of Red, Green and Blue channels under BlackRatioSelector and BalanceRatio.
Automatic once	Once	Runs white balance adjustment automatically for a period and then stops based on the current situation.
Continuous	Continuous	Runs white balance adjustment continuously and automatically based on the current situation.

You can use white balance to correct the image when the color is much different from the actual objects.

Step 1 Set BalanceWitheAuto to Off.

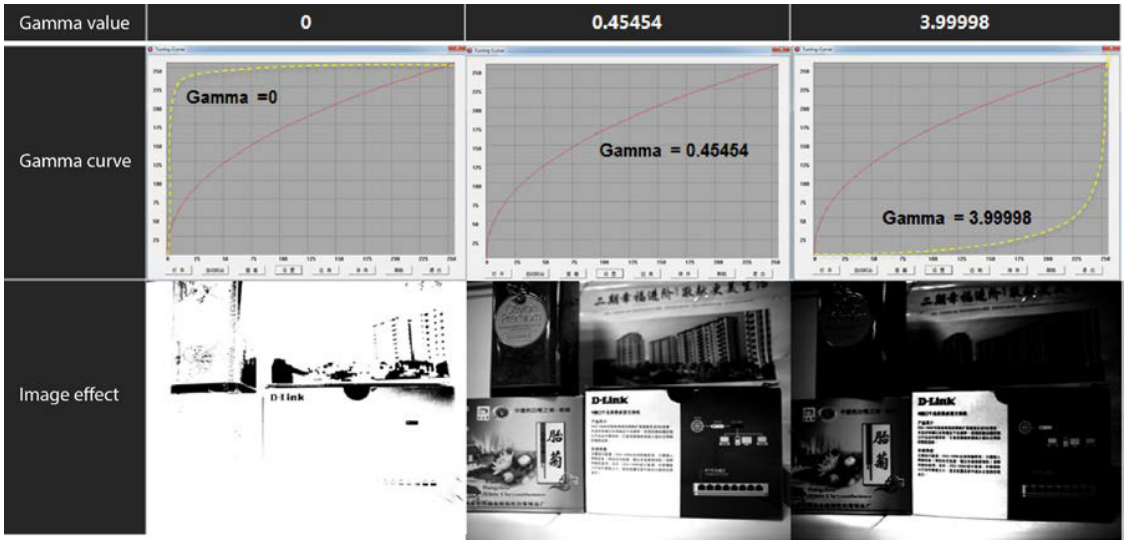
Step 2 Select R/G/B channels to be adjusted under BlackRatioSelector.

Step 3 Adjust the BalanceRatio to a reasonable value among 0–15. Do the same for R/G/B.

- Save the parameters after correction to avoid repeated configuration in case of unexpected occasions.
- You need to do white balance correction again if the light source or color temperature changes on the camera position.

Gamma

Gamma is used to correct the influence caused by nonlinear response of monitors on image. The smaller the value, the brighter the image. Gamma coefficient ranges from 0 to 3.99998.



Configure parameters.

Step 1 Set GammaEnable to True.

Step 2 Adjust Gamma value until the brightness meets the requirements.

Step 3 Gamma value is not valid when setting GammaEnable to False.

Gamma and LookUpTable are on opposite sides. When Gamma is enabled, LUT is unavailable. To make it available, set Gamma value to 1.

Transmission Management

You can configure related parameters in transmission protocol. For details about parameter configurations, see the table below.

Parameter	Description
Standard	The identification number of CoaXPress protocol. It is 0xC0A79AE5 (constant).
VersionMajor	Major version of CoaXPress protocol.
VersionMinor	Minor version of CoaXPress protocol.
XmlManifestSize	The number of XML files which describe the camera.
XmlManifestSelector	Select the XML files which describe the camera.
XmlVersionMajor	The major version of the XML files which describe the camera.
XmlVersionMinor	The minor version of the XML files which describe the camera.
XmlVersionSubMinor	The minor version of the XML files which describe the camera.
XmlSchemaVersionMajor	The major version number of the XMLSchema file.
XmlSchemaVersionMinor	The minor version number of the XMLSchema file.
XmlSchemaVersionSubMinor	The minor version number of the XMLSchema file.
XmlUrlAddress	The address of XMLURL register.
IidcAddress	The address of IIDC protocol. 0 Means that the IIDC protocol is not supported.
ConnectionReset	Reset connection.
DeviceConnectionID	The ID of the current connection.
MasterHostConnectionID	The ID of the host connection.
ControlPacketSizeMax	The maximum size of the control packet supported.
StreamPacketSizeMax	The maximum package size set by frame grabber.
NumberOfLink	The number of links currently connected.
LinkSpeed	The speed of the current link.
DefaultNumberOfLink	The default number of links. **Note:** This parameter is immediately saved after configuration. The frame grabber will set the number of links based on this set parameter for next connection.
DefaultLinkSpeed	Default link speed. **Note:** This parameter is immediately saved after configuration. The frame grabber will set the link speed based on this indicated parameter for next connection.
TapGeometry	The output image format.
Image1StreamID	The ID of image stream.
PayloadSize	The size of image load.

IO Feature

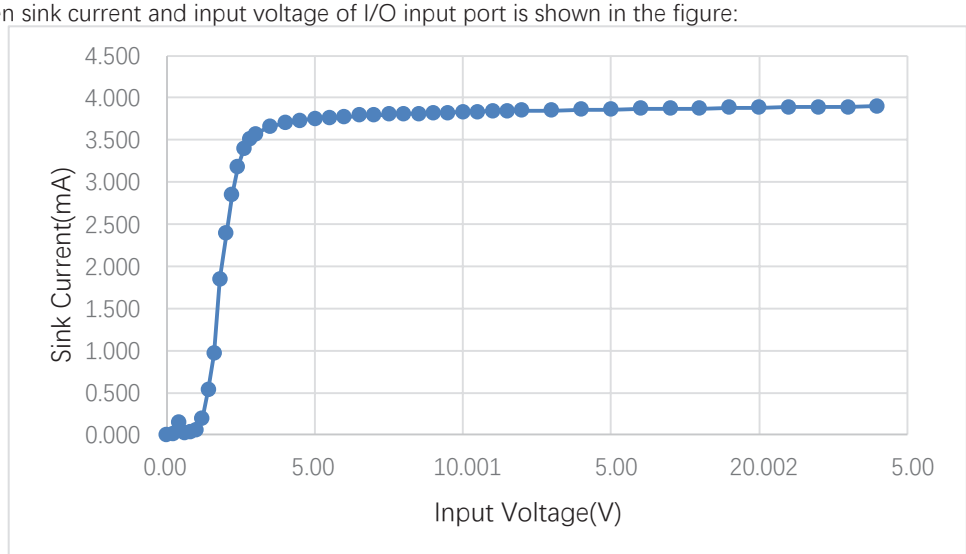
- The power supply should meet SELV and LPS specifications.
- 75 Ω coaxial cable conforming to the CoaXPress protocol must be used.

■ Opto-isolated Input

- Current and Voltage

Input Voltage	Description
+26.0VDC	Limit voltage. Input Voltage should not exceed this limit, otherwise it will cause damage to the device.
+0~+24VDC	Safety I/O input voltage range
+0~+1.4VDC	Logic 0
>+1.4V~+2.2VDC	The input state flips here, and the logic state is indefinite within this voltage range
>+2.2VDC	Logic 1

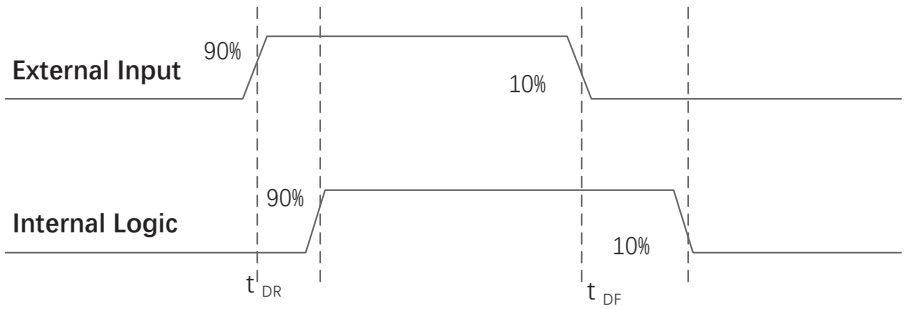
The relationship between sink current and input voltage of I/O input port is shown in the figure:



- These are typical values measured at ambient temperature of 25° C, and may be different depending on camera models.
- The maximum sink current for the opto-isolated input is about 4 mA.

● Signal Amplitude and Trigger Delay

The relationship between input signal amplitude and trigger delay is as follows:

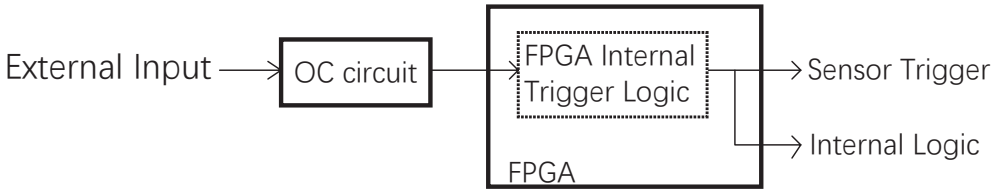


Input signal amplitude (V_{p-p})	Rising edge trigger delay t_{DR} (μs)	Falling edge trigger delay t_{DF} (μs)
3.00	4.282	17.316
5.00	4.074	17.670
9.00	4.016	17.798
10.00	4.010	17.816

The trigger delay refers to the delay from the external opto-isolated input to FPGA pin input,without taking into account the internal logic delay of FPGA.

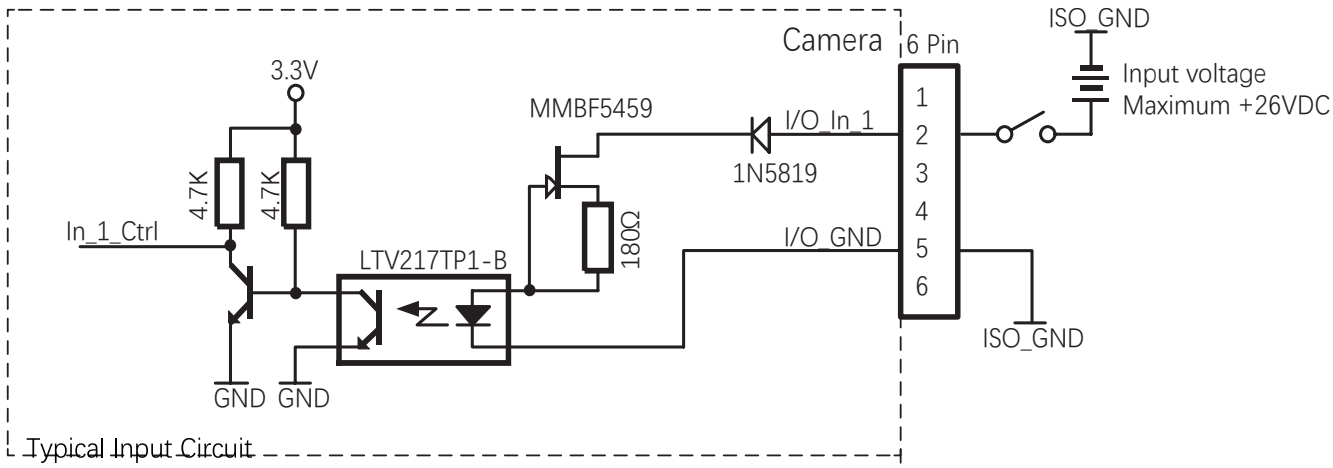
IO Feature

Delay logic:



1.These are typical values measured at the ambient temperature of 25° C.
2.The opto-isolated input supports the shortest input positive pulse of 3.2 μs (typical) and the shortest input negative pulse of 18.0 μs (typical).

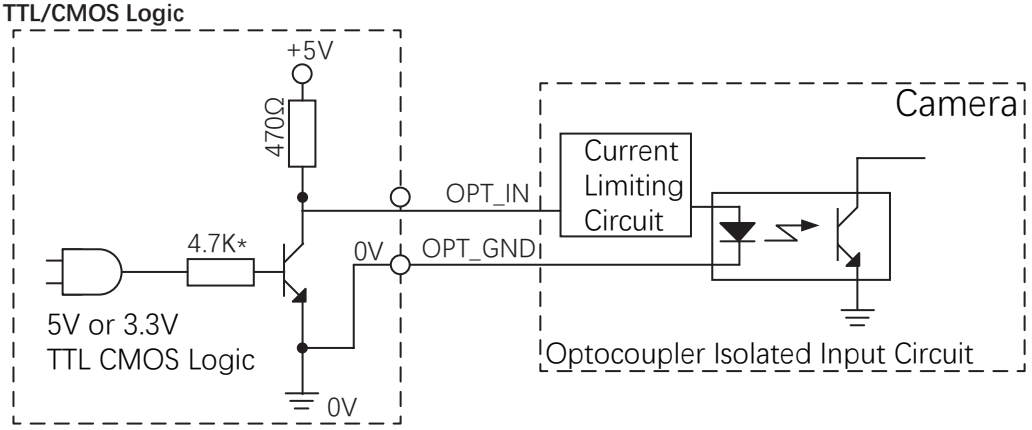
Typical Application Example of Opto-coupler Input:



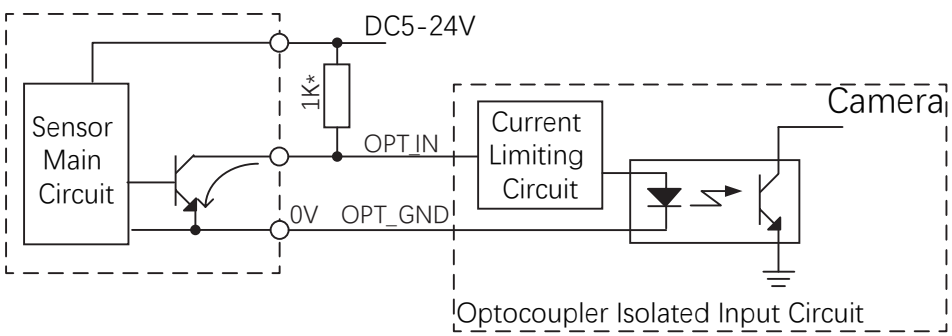
- Do not apply voltage greater than the voltage rating to the input terminal.
- The port fuse is not a user-replaceable part. If the fuse is blown due to overcurrent such as short circuit, please contact the after-sales service.

● Typical Application Connection Diagram

Connect with TTL/CMOS Logic



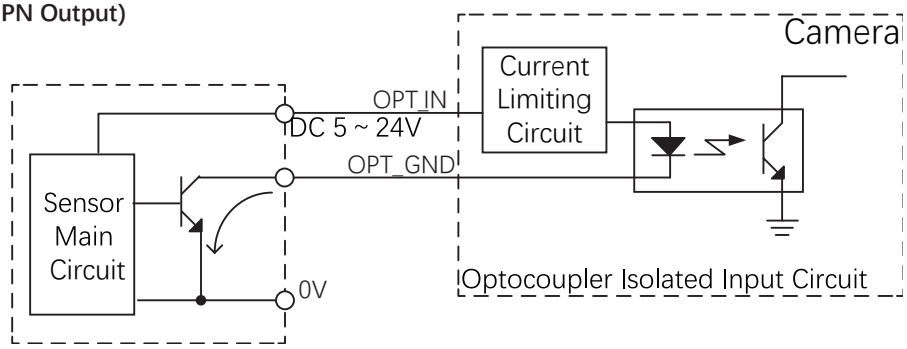
Sensor (NPN Output)



Note: The sensor output of this connection method needs to connect a pull-up resistor to the sensor power supply, select a suitable resistance value, and ensure that the high and low levels meet the input requirements of the camera's optocoupler isolation interface.

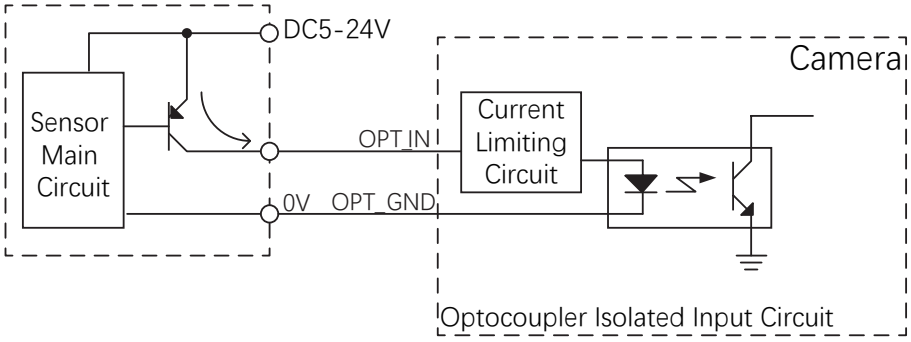
IO Feature

Sensor (NPN Output)

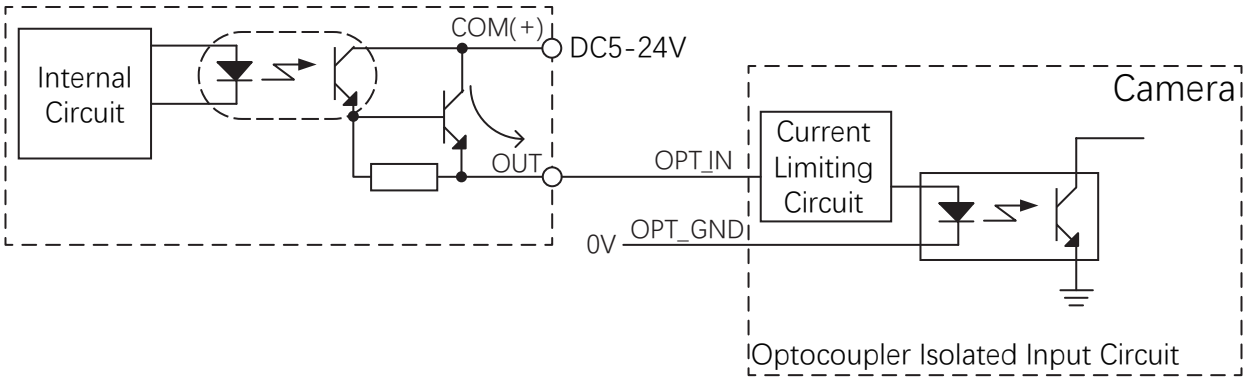


Note: Since the optocoupler isolation input\output shares OPT_GND, the optocoupler output OPT_OUT cannot be used according to this connection.

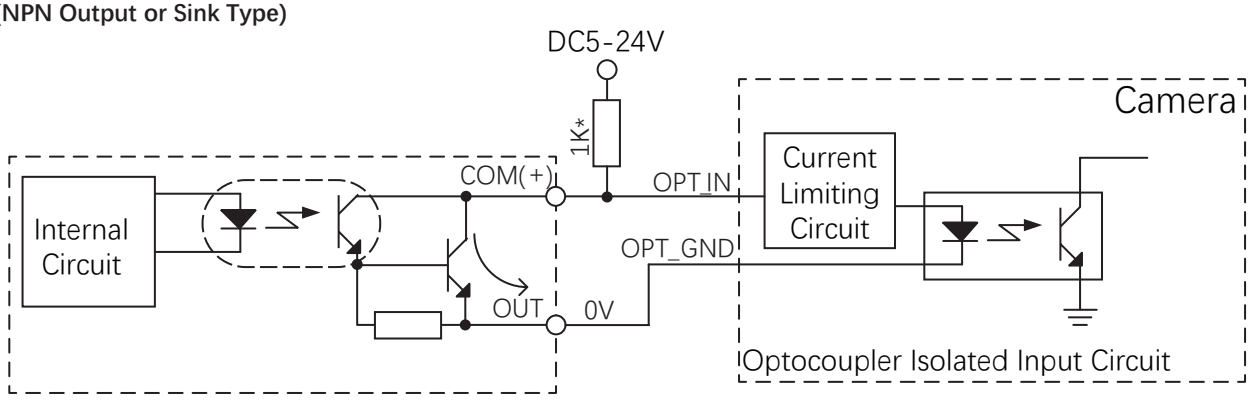
Sensor (PNP Output)



PLC (PNP Output or Source Type)



PLC (NPN Output or Sink Type)



Note: The PLC output of this connection method needs to connect a pull-up resistor to the external power supply. Choose an appropriate resistance value to ensure that the high and low levels meet the input requirements of the camera's optocoupler isolation interface.

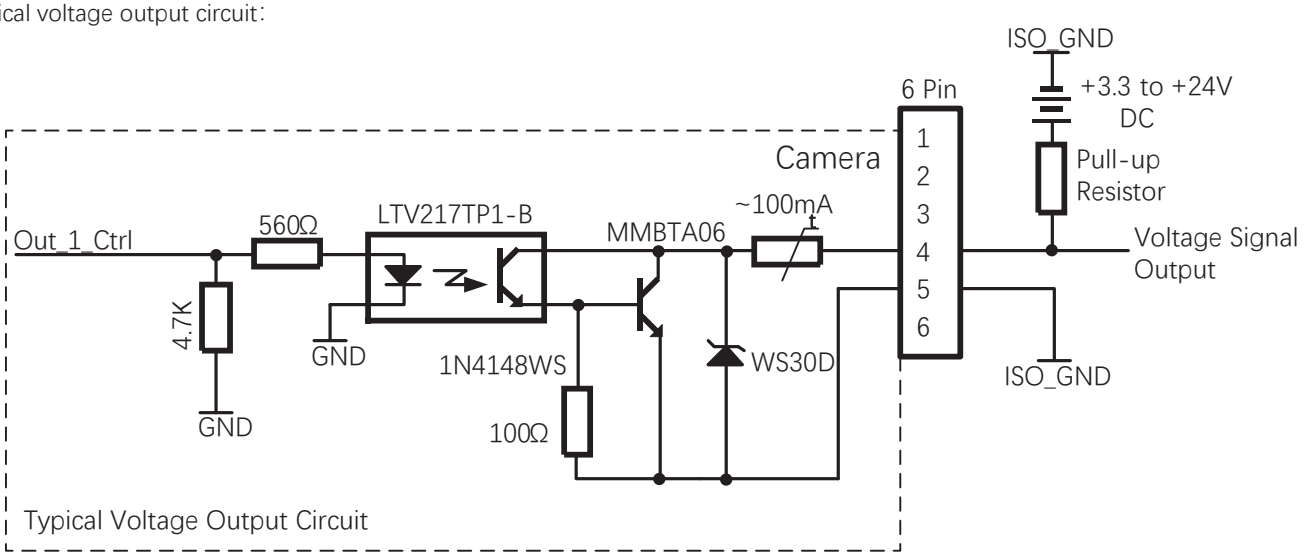
IO Feature

■ Opto-isolated Output

● Current and Voltage

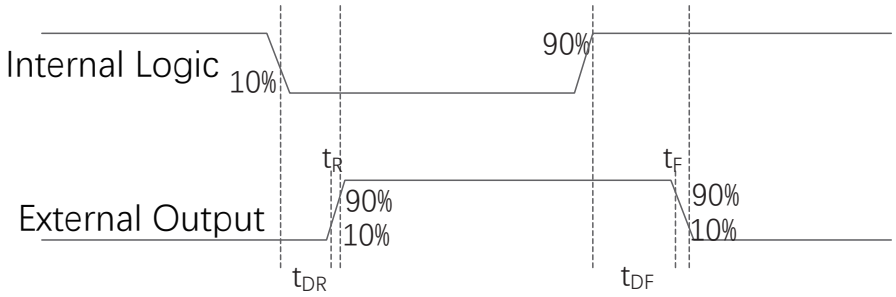
Voltage	Description
+26.0 VDC	Limit voltage, input must not exceed this limit value, otherwise it will cause equipment damage
<+3.3VDC	I/O output may be wrong
+3.3~+24VDC	Safe working voltage range at output

Typical voltage output circuit:



● Trigger Delay

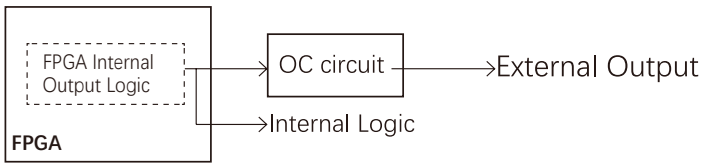
The pull-up resistor value selection in the figure should be based on the given voltage that does not exceed the maximum allowable current value of the optocoupler isolation output port. The larger the pull-up resistor value, the smaller the optocoupler conduction voltage drop, the longer the rise and fall time of the output waveform and the smaller the external driving ability.
The recommended value of optocoupler is 270Ω when 5V power supply, 560Ω when 12V power supply, and 1kΩ when 24V power supply.
Using a 1kΩ pull-up resistor, the output rise/fall time and rise/fall edge delay time under different external power supply voltages are as follows:



External power supply voltage (V)	Rise time (t_R)	Fall time (t_F)	Rising edge trigger delay t_{DR} (μs)	Falling edge trigger delay t_{DF} (μs)
5	19.70	3.20	39.9	8.06
12	24.06	5.22	44.8	11.8
24	30.11	8.10	44.8	53.2

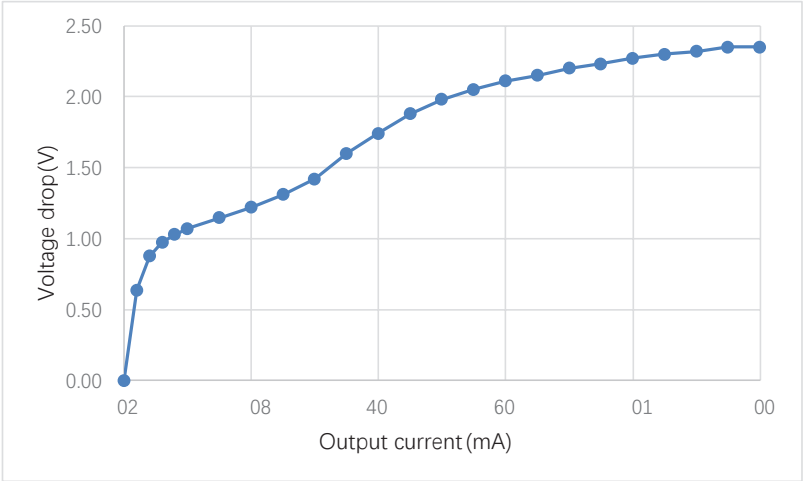
- The output delay refers to the delay from the internal logic output of the FPGA to the external opto-isolated output pin, without taking into account the internal logic delay of FPGA.
- These are typical values measured at ambient temperature of 25° C, and may be different depending on camera models.

IO Feature



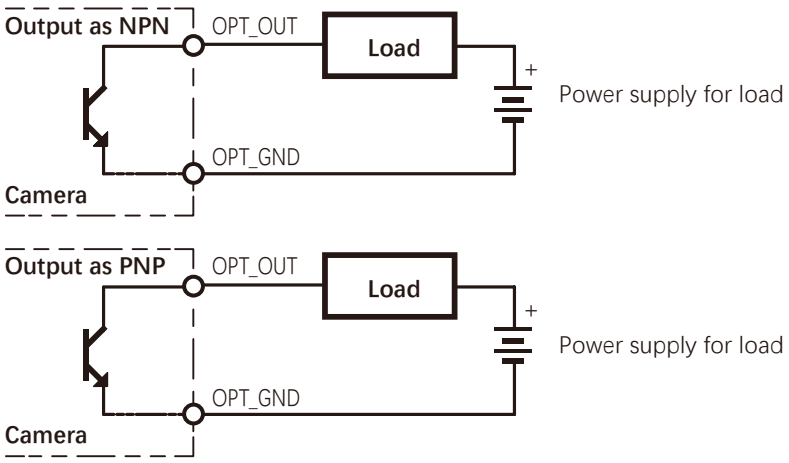
The following figure shows the relation between the opto-isolated output voltage drop (voltage drop between OPT_OUT and OPT_GND) and output current (current flowing into OPT_OUT pin).
The maximum voltage drop at the opto-isolated output port is about 2.35 V (measured at the maximum output current of 100 mA).

Relation between the opto-isolated output voltage drop and output current:

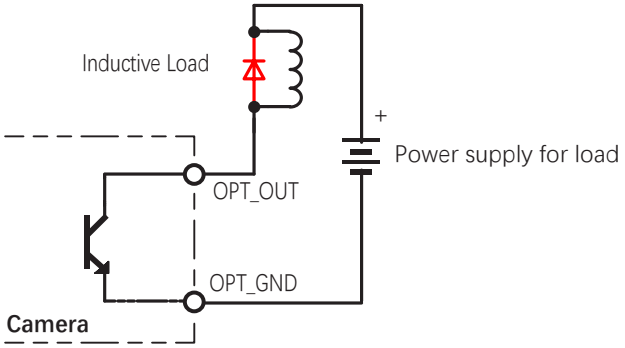


The camera's transistor output is separated from the internal loop by an opto-isolated. Therefore the transistor output can be used as either an NPN output or a PNP output.

Transistor output:



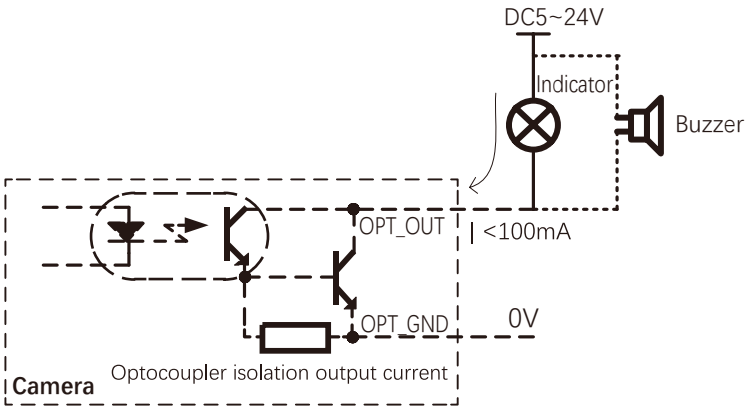
- The maximum allowable sustained current at the opto-isolated output port is 100 mA. Please do not apply voltage that exceeds the maximum switching capacity to the output terminal or connect a load.
- The port fuse is not a user-replaceable part. If the fuse is blown due to overcurrent such as short circuit, please contact the after-sales service.
- If the output of the camera is connected to an inductive load such as an intermediate relay, the model with a built-in fly-wheel diode must be used (or an external fly-wheel diode, such as 1N4007); otherwise, this may lead to the damage of the output port due to instantaneous overvoltage.



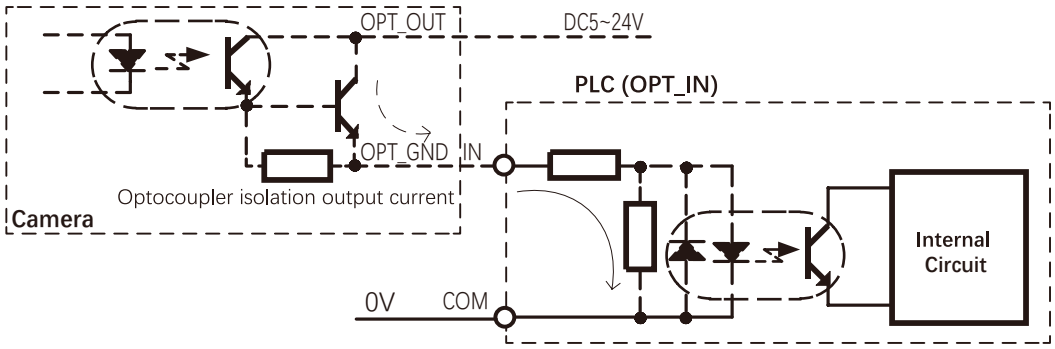
IO Feature

Typical Application Connection Diagram

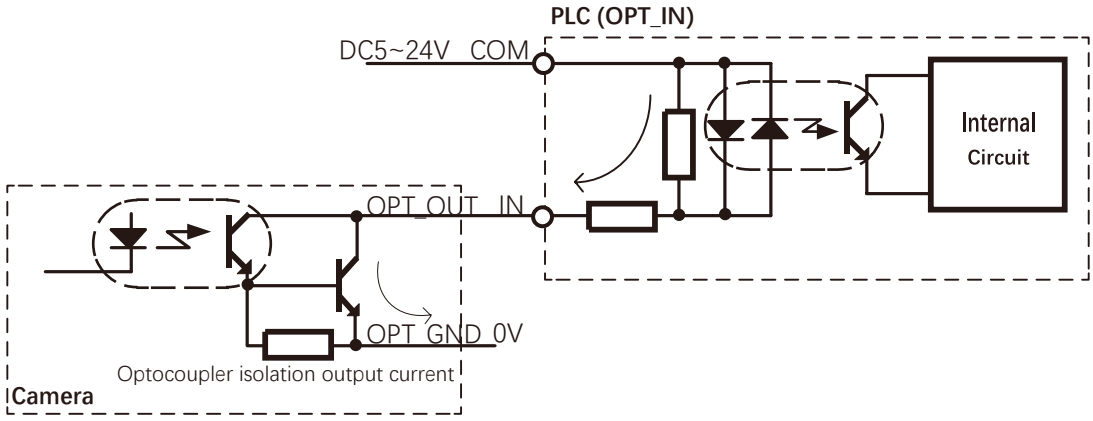
Typical Application Example of Opto-coupler Output:

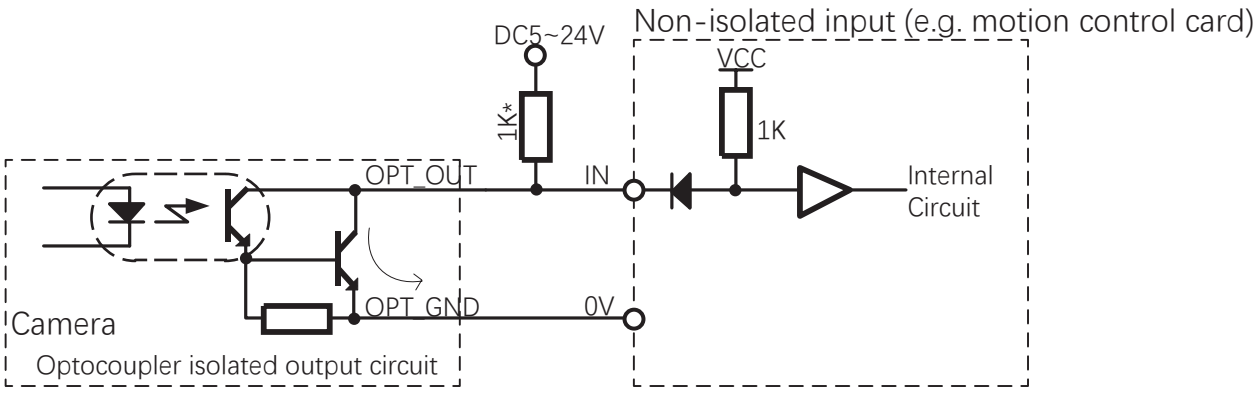


The wiring diagram of inputting the optocoupler output of the camera to the PLC through the negative common terminal:



The wiring diagram of inputting the optocoupler output of the camera to the PLC through the common terminal:





Note: This connection method needs to connect a pull-up resistor to the external power supply. Choose a suitable resistance value to ensure that the high and low levels meet the input requirements of the opposite terminal.

Configuration Sets

The camera can store three user sets. They serve as convenient storage locations for the camera user and have no impact on the operation of the camera.

The values are designated as Default, UserSet1 and UserSet2.

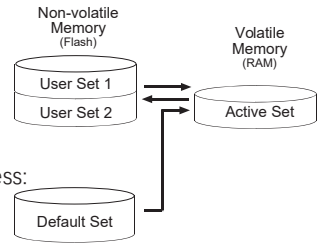
You can use iCentral application to easily set the parameters.

Active Set: The active set is the camera's current parameter settings. It is located in the camera's volatile memory and the settings are lost if the camera is reset or if power is switched off.

Default Set: The default set is the camera's factory optimized configuration. It is saved in a permanent file in the camera's non-volatile memory. It is not lost when the camera is reset or switched off.

User Sets: There are two reserved areas in the camera's non-volatile memory available for saving configuration sets. A configuration set saved in a reserved area is commonly referred to as a "user set" .

The two available user sets are called User Set 1 and User Set 2.



■ Saving User Sets

Saving the current active set into a user set in the camera's nonvolatile memory is a three step process:

- Make changes to the camera's settings until the camera is

operating in a manner that you would like to save.

- Set the UserSetSelector parameter to UserSet1, or UserSet2.
- Execute a UserSetSave command to save the active set to the selected user set.

Saving an active set to a user set in the camera's non-volatile memory will overwrite any parameters that were previously saved in that user set.

You can set the UserSetSelector parameter and execute the UserSetSave command via iCentral. You can also set the parameters from within your application software by using the API that we provide.

■ Loading Saved Set or the Default Set into the Active Set

If you have saved a configuration set into the camera's non-volatile memory, you can load the saved set from the camera's non-volatile memory into the camera's active set.

When you do this, the loaded set overwrites the parameters in the active set. Since the settings in the active set control the current operation of the camera, the settings from the loaded set will now be controlling the camera.

You can also load the default set into the camera's active set.

To load an UserSet or the default set into the active set:

- Set the UserSetSelector parameter to UserSet1, UserSet2, or Default.
- Execute a UserSetLoad command to load the selected set into the active set.

You can set the UserSetSelector parameter and execute the UserSetLoad command via iCentral. You can also set the parameters from within your application software by using the API that we provide.

i	Loading a user set or default set into the active set is only allowed when the camera is idle, i.e. when it is not acquiring images continuously or does not have a single image acquisition pending. Loading the default set into the active set is a good course of action, if you have grossly misadjusted the settings in the camera and you are not sure how to recover. The default set is optimized for use in typical situations and will provide good camera performance in most cases.

Flat Field Correction

The image quality can be affected by uneven light, fixed-pattern noise of the sensor and noise of uneven responses during using the area scan cameras. FFC (Flat Field Correction) is needed for these situations.

It is mainly for ensuring image balance when applied to area scan cameras.

FFC works by combination of 3 corrections.

- In dark field, correct fixed-pattern noise.
- In Bright field, correct uneven response.
- In Bright field, correct uneven lens or light.

	The ratio between the maximum and the minimum brightness of the image which needs FFC cannot exceed 2.

Parameter	Description
FFCMode	Enable or disable FFC.
FFCStatus	Current FFC status. ● Working: Normal. ● Disabled: FFC disabled. ● ROINotMatch: The current ROI does not match with the parameter.Try loading the FFC coefficient again. ● NoParameter: No correction coefficients are saved in the camera. ● LoadingParameter: Loading correction coefficient. ● CropedParameter: The current correction coefficient has been cropped. It happens when the set ROI does not match that of the correction coefficient. The cropped coefficient has a slight influence on image quality. If you require high quality, generate new FFC coefficient based on the indicated ROI.
FFCRefreshStatus	Refresh FFC status. For certain frame garbber clients on which the automatic refresh of register is not available, you need to click FFCRefreshStatus to refresh manually.
FFCReloadParameter	Load FFC coefficient again. Click it to load the coefficient again when the set ROI does not match that of the correction coefficient. FFCStatus shows Working or CropedParameter after successful loading.

CHAPTER 4 Technical Support

Technical Support

If you need advice about your camera or if you need assistance troubleshooting a problem with your camera,it's highly recommended to describe your issue in details and contact us via E-mail at support@contrastech.com

It would be helpful if you can fill-in the following table and send to us before you contact our technical support team.

Camera Model:		Camera's SN:	
Describe the issue in as much detail as possible:			
If known, what's the cause of the issue?			
How often did/does the issue occur?			
How severe is the issue?			
Parameter set	Please connect the camera directly to PC and use iCentral to make note of the parameter when the issue occurred.		

Hangzhou Contrastech Co., Ltd.
C-5F, No.8 Xiyuan 9th Road, West Lake District Hangzhou Zhejiang 310030 China
Tel: 86-571-89712238
www.contrastech.com