

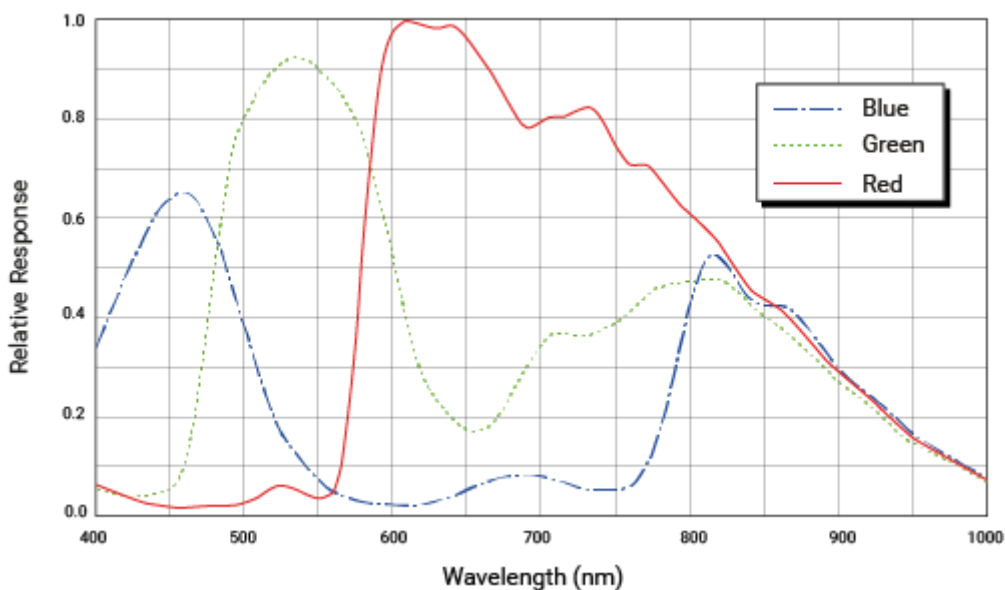
# Specifications

## General Specifications

| Specification                       | acA2040-120uc                                                                                                                                  |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Resolution<br>(H x V Pixels)        | 2064 x 1544 (full resolution)<br>2048 x 1536 (default resolution)<br>You can change the resolution by changing the <a href="#">Image ROI</a> . |
| Sensor Type                         | Sony IMX252LQR-C<br>Progressive scan CMOS<br>Global shutter                                                                                    |
| Optical Size                        | 1/1.8"                                                                                                                                         |
| Effective Sensor Diagonal           | 8.9 mm                                                                                                                                         |
| Pixel Size (H x V)                  | 3.45 $\mu\text{m}$ x 3.45 $\mu\text{m}$                                                                                                        |
| Frame Rate<br>(at Default Settings) | 120 fps                                                                                                                                        |
| Product Line                        | <a href="#">ace U</a>                                                                                                                          |
| Mono / Color                        | Color                                                                                                                                          |
| Image Data Interface                | USB 3.0, nominal max. 5 Gbit/s (SuperSpeed)                                                                                                    |
| Pixel Formats                       | See <a href="#">Pixel Format</a> .                                                                                                             |
| Synchronization                     | Via hardware trigger<br>Via software trigger<br>Via free run                                                                                   |
| Exposure Time Control               | Via hardware trigger<br>Programmable via the camera API                                                                                        |
| Camera Power Requirements           | Nominal 5 VDC supplied via the camera's USB 3.0 port<br>$\approx 3.5$ W (typical) @ 5 VDC                                                      |
|                                     |                                                                                                                                                |

|                  |                                                                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I/O Lines        | <ul style="list-style-type: none"> <li>1 <a href="#">opto-coupled input line</a></li> <li>1 <a href="#">opto-coupled output line</a></li> <li>2 <a href="#">general purpose I/O (GPIO) lines</a></li> </ul>                |
| Lens Mount       | C-mount                                                                                                                                                                                                                    |
| Size (L x W x H) | <ul style="list-style-type: none"> <li>29.3 mm x 29 mm x 29 mm (without lens mount or connectors)</li> <li>48.2 mm x 29 mm x 29 mm (with lens mount and connectors)</li> </ul>                                             |
| Weight           | <80 g                                                                                                                                                                                                                      |
| Conformity       | <p>CE (includes RoHS), UL Listed, FCC, GenICam 2.x (including PFNC 2.x and SFNC 2.x), IP30, USB3 Vision, REACH</p> <p>The EU Declaration of Conformity is available on the <a href="#">Basler website</a>.</p>             |
| Accessories      | <ul style="list-style-type: none"> <li><a href="#">Cables for your camera model</a></li> <li><a href="#">Lenses for your camera model</a></li> <li><a href="#">Additional accessories for your camera model</a></li> </ul> |

## Spectral Response

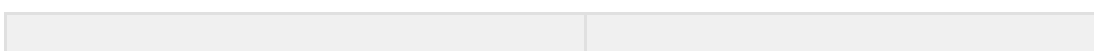


The spectral response curve excludes lens characteristics, light source characteristics, and IR cut filter characteristics.

## IR Cut Filter

Color cameras are equipped with an IR cut filter. The filter is mounted in a filter holder inside the lens mount.

The IR cut filter has the following spectral characteristics:

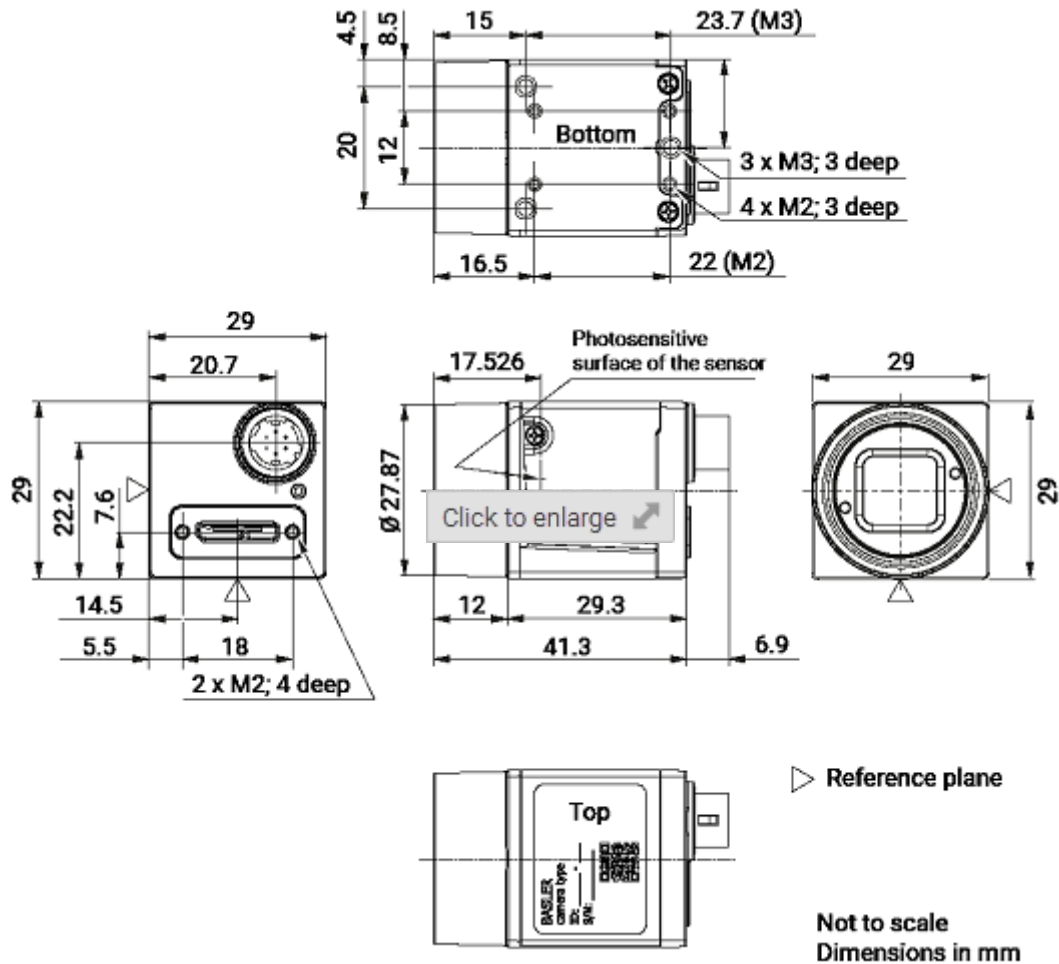


| Wavelength [nm] | Transmittance            |
|-----------------|--------------------------|
| 450–610         | $T_{\min} > 90 \%$       |
| 450–620         | $T_{\text{avg}} > 93 \%$ |
| $645 \pm 10$    | $T = 50 \%$              |
| 700–1070        | $T_{\max} < 4 \%$        |
| 690–1070        | $T_{\text{avg}} < 1 \%$  |

The filter holder can't be removed.

## Mechanical Specifications

### Camera Dimensions and Mounting Points



### Maximum Allowed Lens Intrusion

→ See [Maximum Allowed Lens Intrusion](#).

### Mounting Instructions

→ See [Mounting Instructions](#).

## Stress Test Results

→ See [Stress Test Results](#).

## Requirements

### Environmental Requirements

#### Temperature and Humidity


|                                                                                                                                  |                                   |
|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Housing temperature during operation                                                                                             | 0–50 °C (32–122 °F)               |
| Humidity during operation                                                                                                        | 20–80 %, relative, non-condensing |
| Storage temperature                                                                                                              | -20–80 °C (-4–176 °F)             |
| Storage humidity                                                                                                                 | 20–80 %, relative, non-condensing |
| Housing temperature according to UL 60950-1                                                                                      | max. 70 °C (158 °F)               |
| Ambient temperature according to UL 60950-1                                                                                      | max. 30 °C (86 °F)                |
| UL 60950-1 test conditions: no lens attached to camera; no heat dissipation measures; ambient temperature kept at 30 °C (86 °F). |                                   |

#### Heat Dissipation


→ See [Providing Heat Dissipation](#).

### Electrical Requirements


#### DANGER

Electric Shock Hazard 

#### WARNING

Fire Hazard 

#### NOTICE

Incorrect voltage can damage the camera. 

#### Camera Power

You must supply camera power that complies with the Universal Serial Bus 3.0 specification.

The camera's nominal operating voltage is 5 VDC, effective on the camera's connector.

## Opto-Coupled I/O Input Line

| Voltage                                                                                                               | Description                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 30 VDC                                                                                                                | Absolute maximum. This voltage must never be exceeded. Doing so may damage the camera and voids the warranty. |
| 0–24 VDC                                                                                                              | Safe operating range.                                                                                         |
| 0–1.4 VDC                                                                                                             | Indicates a logical 0 (with inverter disabled).                                                               |
| >1.4–2.2 VDC                                                                                                          | Region where the logic level transition occurs; the logical status is not defined in this region.             |
| >2.2 VDC                                                                                                              | Indicates a logical 1 (with inverter disabled).                                                               |
| <ul style="list-style-type: none"><li>• <b>Minimum current:</b> 5 mA</li><li>• <b>Current draw:</b> 5–15 mA</li></ul> |                                                                                                               |

## Opto-Coupled I/O Output Line

| Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Description                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 30 VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Absolute maximum. This voltage must never be exceeded. Doing so may damage the camera and voids the warranty. |
| 3.3–24 VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Safe operating range.                                                                                         |
| <3.3 VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Unreliable I/O output.                                                                                        |
| <ul style="list-style-type: none"><li>• <b>Leakage current:</b> &lt;60 <math>\mu</math>A. Actual leakage depends on operating temperature and production spread of electronic components.</li><li>• <b>Maximum load current:</b> 50 mA</li><li>• <b>Minimum load current:</b> Not specified. Consider the following:<ul style="list-style-type: none"><li>• Leakage current will have a stronger effect when load currents are low.</li><li>• Propagation delay of the output increases as load currents decrease.</li><li>• Higher-impedance circuits tend to be more susceptible to EMI.</li><li>• Higher currents cause higher voltage drops in long cables.</li></ul></li></ul> |                                                                                                               |

## General Purpose I/O Lines

### NOTICE

Applying incorrect electrical signals to the camera's GPIO line can severely damage the camera.



## Operation as Input

| Voltage                                                                                                                                                                                                                                                    | Description                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 30 VDC                                                                                                                                                                                                                                                     | Absolute maximum. This voltage must never be exceeded. Doing so may damage the camera and voids the warranty. |
| 0–5 VDC                                                                                                                                                                                                                                                    | Safe operating range. The minimum external pull-up voltage is 3.3 VDC.                                        |
| 0–0.8 VDC                                                                                                                                                                                                                                                  | Indicates a logical 0 (with inverter disabled).                                                               |
| >0.8–2.0 VDC                                                                                                                                                                                                                                               | Region where the logic level transition occurs; the logical status is not defined in this region.             |
| >2.0 VDC                                                                                                                                                                                                                                                   | Indicates a logical 1 (with inverter disabled).                                                               |
| <ul style="list-style-type: none"><li>• <b>Current draw (high-level):</b> &lt;100 <math>\mu</math>A</li><li>• <b>Sink current:</b> Your application must be able to accept 2 mA sink current from the GPIO input line without exceeding 0.8 VDC.</li></ul> |                                                                                                               |

## Operation as Output

| Voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Description                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 30 VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Absolute maximum. This voltage must never be exceeded. Doing so may damage the camera and voids the warranty. |
| 3.3–24 VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Safe operating range.                                                                                         |
| <3.3 VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Unreliable GPIO output.                                                                                       |
| <ul style="list-style-type: none"><li>• <b>Internal pull-up resistor:</b> <math>\approx</math>2 k<math>\Omega</math>, with open collector. Many applications will have to provide an additional pull-up resistor.</li><li>• <b>Residual voltage ("on" state):</b> <math>\approx</math>0.4 V at 50 mA and 25 <math>^{\circ}</math>C (77 <math>^{\circ}</math>F) housing temperature. Actual residual voltage depends on operating temperature, load current, and production spread of electronic components.</li><li>• <b>Leakage current:</b> &lt;60 <math>\mu</math>A. Actual leakage depends on operating temperature and production spread of electronic components.</li><li>• <b>Maximum load current:</b> 50 mA</li><li>• <b>Minimum load current:</b> Not specified. However, consider the following:<ul style="list-style-type: none"><li>• Leakage current will have a stronger effect when load currents are low.</li><li>• Propagation delay of the output increases as load currents decrease.</li><li>• Higher-impedance circuits tend to be more susceptible to EMI.</li><li>• Higher currents cause higher voltage drops in long cables.</li></ul></li></ul> |                                                                                                               |

## Circuit Diagrams

→ See [Circuit Diagrams for Basler ace Cameras](#).

## Cable Requirements

### USB 3.0 Cable

- Use a high-quality USB 3.0 cable with a Micro-B plug.
- To **avoid EMI**, cables must be shielded, as specified in the USB 3.0 standard.
- Basler recommends using USB 3.0 cables from the [Basler Vision Components](#) range.

For more information about recommended USB 3.0 cables, see the [Recommended Accessories for Basler USB 3.0 Cameras](#) document.

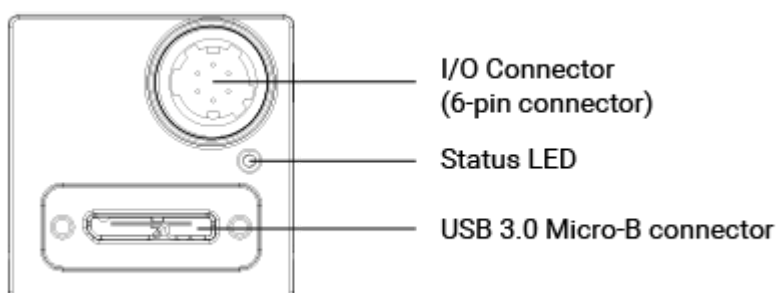
### I/O Cable

- The I/O cable must be shielded.
- The I/O cable must have a cross-section at least 0.14 mm<sup>2</sup> (close to AWG26).
- Use twisted pair wire cables.
- Maximum recommended cable length: 10 m
- Camera-side connector: Hirose micro plug (part number HR10A-7P-6S) or equivalent
- Close proximity to strong magnetic fields should be avoided.
- Basler recommends using I/O cables from the [Basler Vision Components](#) range:
  - [GPIO cable, 10 m](#) (yellow cable): For use with the [GPIO lines](#) of your camera. To avoid interferences due to crosstalk, the opto-coupled I/O lines are not connected.
  - [Opto-I/O cable, 10 m](#) (blue cable): For use with the [opto-coupled I/O lines](#) of your camera. To avoid interferences due to crosstalk, the GPIO lines are not connected.
  - [Opto-GPIO Y-cable, 2 x 10 m](#) (yellow-blue cable): Allows you to use the [GPIO lines](#) and the [opto-coupled I/O lines](#) simultaneously without interferences due to crosstalk. There are two separate wires to split both I/O types.

## Physical Interface

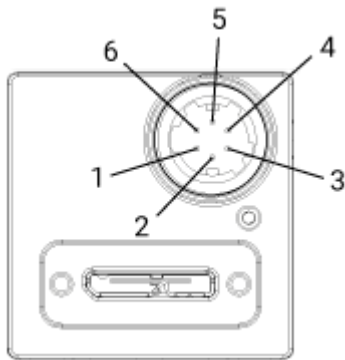
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### Camera Connectors and Status LED



|                           |                                                                                                                                 |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 6-pin connector           | Hirose micro receptacle (part number HR10A-7R-6PB)<br>Recommended mating connector: Hirose micro plug (part number HR10A-7P-6S) |
| USB 3.0 Micro-B connector | Standard USB 3.0 Micro-B connector with screw lock<br>Recommended mating connector: Standard connector with screws              |
| Status LED                | Indicates camera operation (LED lit = camera operating).                                                                        |

## Connector Pin Numbering and Assignments



| Pin | Line   | Function                                    |
|-----|--------|---------------------------------------------|
| 1   | Line 3 | General purpose I/O (GPIO) line             |
| 2   | Line 1 | Opto-coupled I/O input line                 |
| 3   | Line 4 | General purpose I/O (GPIO) line             |
| 4   | Line 2 | Opto-coupled I/O output line                |
| 5   | -      | Ground for opto-coupled I/O lines           |
| 6   | -      | Ground for General Purpose I/O (GPIO) lines |

## Precautions

→ See [Safety Instructions for Basler ace Cameras](#).

## Installation

→ See [Camera Installation](#).

## Features

→ See the [camera features section](#).

Suggestions for improving the documentation? Send us your [feedback on this topic](#).

For technical questions, please contact your [local distributor](#) or use the [support form](#) on the Basler website.



