

User Manual

Infrared Camera
VELOX 327k veL



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1. Preface

1.1. About this manual

This manual contains the specifications and properties of the IRCAM infrared (IR) camera and its components and describes the steps to its configuration and operation.

The software to operate the camera (e.g., *IRCAM API* or *IRCAM Works*) is described in the documents provided with the software.

1.2. Legend



| | |
|---|---|
|  | Such a warning draws the attention of you to an operation process, a process, a condition or an instruction which must be considered strictly and be kept, because otherwise danger for body and life of the persons consists who work with the device. |
|  | Such a safety tip draws the attention of you to an operation process, a process, a condition or an instruction which must be considered strictly and be kept, because it can come otherwise to heavy damage to the camera or to a data loss. |
|  | Tips contain either additional information to a certain subject or special instructions to the use of the product. |

1.3. Contacting IRCAM

IRCAM GmbH
Nürnberger Straße 71
D-91052 Erlangen
Germany
Fon: +49-9131-9700980
Fax: +49-9131-97009899
E-Mail: info@ircam.de
Homepage: www.ircam.de

2. Safety Instructions and Precautions





2.1. General




| | |
|---|--|
|  | <p>Do not open the camera housing. Internal components might be damaged and warranty will void.</p> |
|  | <p>Never touch lens surfaces or the detector window with bare fingers as this will result in contamination and degradation of the optical performance. If, however, such contamination occurs, clean the surfaces very carefully using premoistened wipes (e.g. Chemtronics OPTIC PREP).</p> |

2.2. EMI and ESD

Excessive electromagnetic interference (EMI) and electrostatic discharge (ESD) can cause damage or problems with the 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, the following general guidelines should be followed:

| | |
|---|---|
|  | <p>Always use the original cables provided by IRCAM.</p> |
|  | <p>Avoid placing the camera and the cables parallel to wires carrying high current, switching voltages or electrical devices which employ switching technology.</p> |
|  | <p>Attempt to connect all grounds to a single point, e.g. use a single power outlet for the entire system (mainly camera power supply and computer) and connect all grounds to the single outlet. This will help to avoid large ground loops (a primary cause of EMI problems).</p> |
|  | <p>Use a line filter on the main power supply.</p> |

| | |
|---|---|
|  | <p>Install the camera and camera cables as far as possible from devices generating sparks. If necessary, use additional shielding.</p> |
|  | <p>Do not operate the camera under high static or dynamic magnetic fields.</p> |
|  | <p>Decrease the risk of ESD by taking the following measures:</p> <ul style="list-style-type: none"> ○ Use conductive materials at the point of installation (e.g. floor, workplace) ○ Use suitable clothing (cotton) and shoes. ○ Control the humidity in your environment. Low humidity can cause ESD problems. ○ Do not touch the pins of electrical connectors. |

2.3. Temperature and Humidity

Sufficient heat dissipation must be provided to maintain the temperature of the camera housing at the specified maximum operating temperature. Since each installation is unique, IRCAM does not describe a strictly required technique for proper heat dissipation. Instead, we provide the following general guidelines:

| | |
|---|--|
|  | <p>The camera is equipped with an active ventilation system. The air inlets and outlets at the top side of the camera must not be obstructed. During operation, air ventilation must be guaranteed to avoid damage by overheating of the camera.</p> |
|  | <p>Do not expose the camera to direct sunlight.</p> |
|  | <p>It must be made sure that the temperature of the camera housing does not exceed 50 °C, in order to avoid damage of the camera. Operating the camera at excessive temperatures will void the warranty.</p> |



The bottom plate of the camera may be used as a cooling surface and may be mounted on a heat sink.



Forced external air cooling may be used to maintain the safe operating temperature of the camera.

3. Specifications

3.1. General Specifications

| Technical data | |
|-------------------------------|-------------------------------------|
| Model | IRCAM VELOX 327k veL |
| Format | 640 x 512 Pixels |
| Detector technology | MCT FPA Detector |
| Spectral response | 7.7 to 12 micron |
| Pixel pitch | 15 µm |
| Fullframe rate | 133 Hz |
| Integration time | Adjustable |
| Integration mode | Snapshot (Integrate-then-read) |
| A/D resolution | 15 bit |
| Windowing ¹ | Variable |
| Stirling cooler | MTTF: 10 000 h, guaranteed: 3 000 h |
| Housing | Aluminum, chromated & painted |
| Data interface | Camera Link and Gigabit Ethernet |

¹ In windowing mode, only a rectangular part of the detector is read out. As a consequence, the maximum frame rate increases.

3.2. Environmental Conditions

| Environmental conditions | |
|------------------------------------|---|
| Temperature (operating) | -30 °C ... +50 °C |
| Temperature (non-operating) | -40 °C ... +70 °C |
| Humidity (operation) | 20 % ... 80 %, relative, non-condensing |
| Humidity (non-operating) | 10 % ... 90 %, relative, non-condensing |

3.3. Mechanical Specifications

3.3.1. Camera Dimensions and Mounting points

IRCAM IR cameras are manufactured with high precision. Planar, parallel and angular sides guarantee precise and stable mounting. The camera's dimensions in millimeters are as shown in the drawings below. The camera housing is equipped with eight M6 threads at the bottom side. They may be used to mount the camera. Using four threads gives sufficient stability.

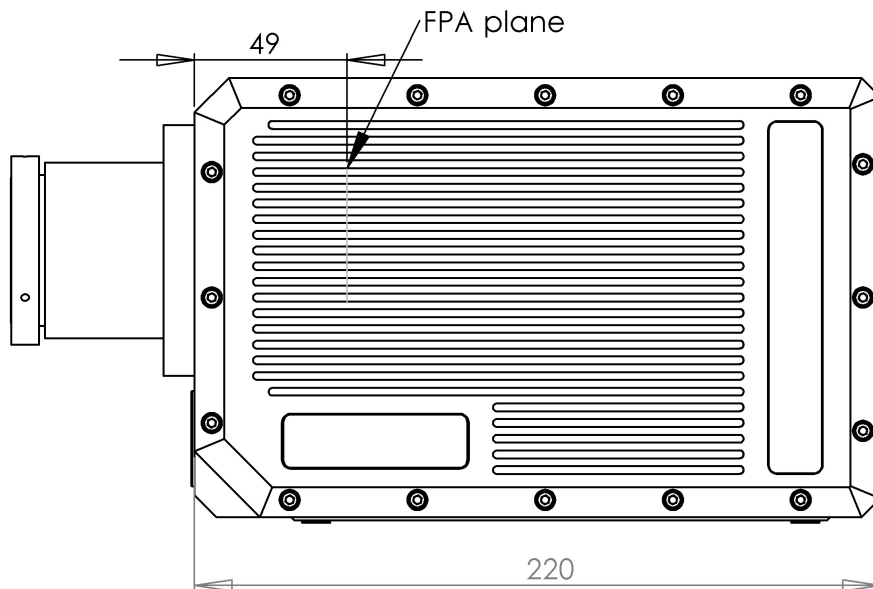


Fig. 1: Side view

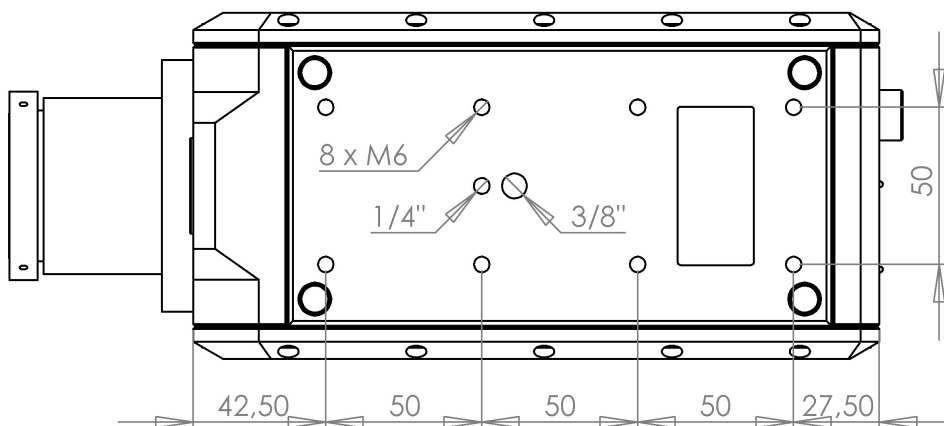


Fig. 2: Bottom view

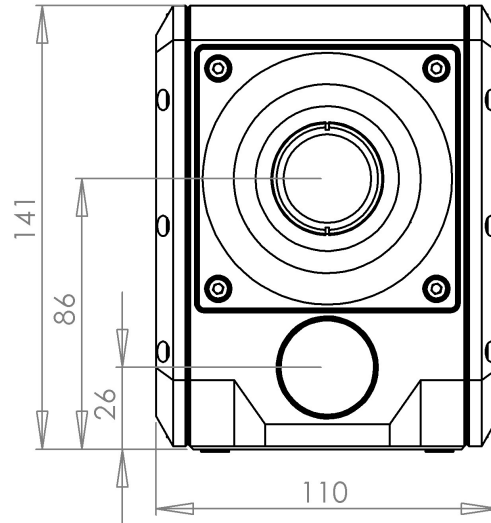


Fig. 3: Front view

3.3.2. Lens Mount

Lenses are mounted at the front flange of the camera with four M4 screws. There may be a sealing ring at the back side of the lens flange.

3.3.3. Lens

The lens "IR L 25" may be focused using the focus ring. The focus range is infinity to approx. 0.15 meter.

3.4. Electrical Specifications

3.4.1. Connectors

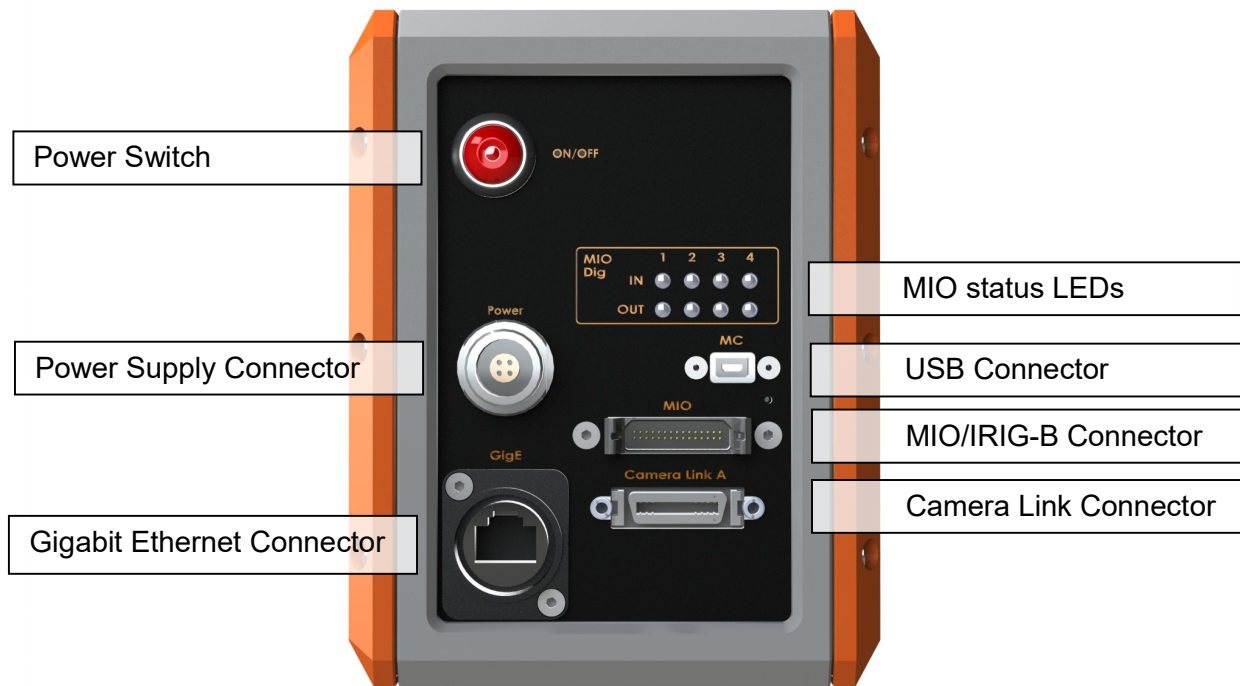


Fig. 4: Rear side of camera with connectors

The camera has the following items at the back side:

- Power switch (pushbutton): Connects and disconnects the external 24 V power supply voltage.
- MIO status LEDs (light up when input/output high)
- MIO Connector for IRIG-B input (description see below)
- Mini-USB port (firmware-port for Thermo Shutter)
- Camera Link
- Power Supply connector (connects via appropriate cable to the 24 V power supply). Only the original IRCAM power supplies shall be used to operate the camera!
- Gigabit Ethernet Connector

3.4.2. MIO Connector for IRIG-B signal

The MIO connector comprises the MIO interface. It shall be used only with the appropriate cable available from IRCAM GmbH.

Connector Pinout:

| Pin # | Signal Name | Signal Level | Use |
|-------|--------------|------------------|-----------------------------|
| 1 | Trigger In 1 | 0...5 V (0,1 mA) | IRIG-B Input |
| 2 | Trigger In 2 | 0...5 V (0,1 mA) | IRIG-B Input |
| 3 | Trigger In 3 | 0...5 V (0,1 mA) | IRIG-B Input |
| 4 | Trigger In 4 | 0...5 V (0,1 mA) | IRIG-B Input |
| 19 | 5.0 V | 5.0 V, 50 mA | Auxiliary voltage output |
| 21 | GND | 0 V | GND for all digital signals |
| 22 | GND | 0 V | GND for all digital signals |

3.4.3. Power Supply

The camera comes with one desktop power supply and one ruggedized power supply and proper cables.

3.5. Filter Wheel

The built-in filter wheel accepts up to six filters with a diameter of 25 mm or 25.4 mm (1 inch). The maximum filter thickness is 1 mm.

3.5.1. Filter mounting and changing

The filters are fixed with threaded rings.

For mounting a filter, the following tools are required:

- IRCAM Special tool
- Hexagon screwdriver 3 mm
- Pair of tweezers
- Clean gloves

Follow these steps to mount a filter in the filter wheel:

1. Remove the lens using the hexagon screwdriver
2. Move the filter wheel to the desired position. The position number 1 is marked with a red dot. The numbering is clockwise.
3. Loosen the filter mounting ring using the IRCAM special tool.
4. If another filter is already mounted, remove it carefully and put it into an appropriate protection box.

5. Put the new filter into the filter wheel.
6. Insert the filter mounting ring and tighten it carefully with the IRCAM special tool.
7. Mount the lens.

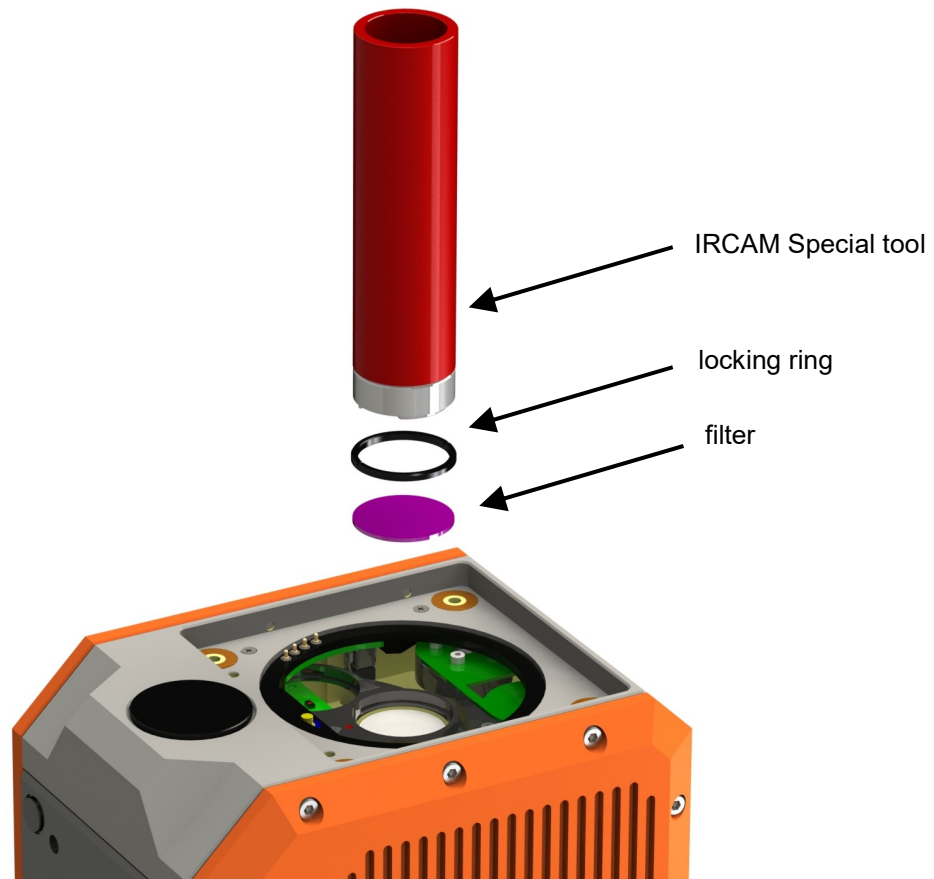








Fig. 5: Filter change using IRCAM special tool



During the work with the filter wheel, the camera shall be switched off, because unintentional rotation of the filter wheel might cause injuries. Please disconnect the camera from the power supply before working with the filter wheel!

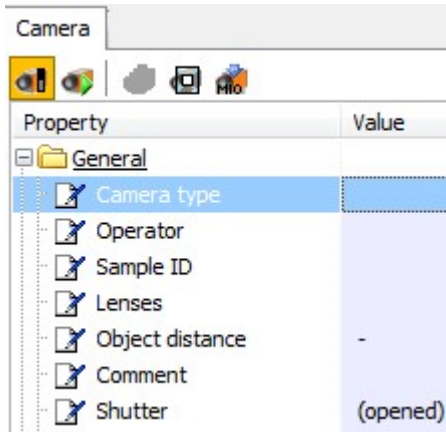
| | |
|---|---|
|  | <p>Always make sure that the filter mounting ring is fixed such that it cannot loosen during operation of the filter wheel. A loose filter – especially in rotating mode of the filter wheel – might severely damage the internal parts of the camera.</p> |
|  | <p>Do not touch filters with bare fingers as this will contaminate the surface! If, however, such contamination occurs, clean the surfaces very carefully using premoistened wipes (e.g. Chemtronics OPTIC PREP).</p> |
|  | <p>Always make sure that the filter wheel is symmetrically equipped with filters to avoid unbalanced mass as this would cause vibrations in rotating filter wheel mode and might cause damage to the mechanics!</p> |
|  | <p>Filters and the filter wheel are delicate. Do not use excessive force to the filter wheel and the filters as this might cause damages.</p> |
|  | <p>To permit the correct assignment of the filter to the image data, the file „wheel*.cfg“ (in the „IRCAM Works“ directory) must be edited properly (see IRCAM Works help file).</p> |
|  | <p>Due to the fact that the filter substrate has a refractive index greater than 1 (e.g. Germanium: 4) a filter changes the optical path. When a filter is inserted, the focus of the lens moves towards the focal plane array. This has to be taken into account, especially when the camera is used both with and without filter.</p> |

3.5.2. Operation modes

The built-in filter wheel has two operating modes:

- switching mode
- rotating mode (up to 1000 rotations per minute, i.e. 100 Hz frame rate)

3.6. Thermo-Shutter

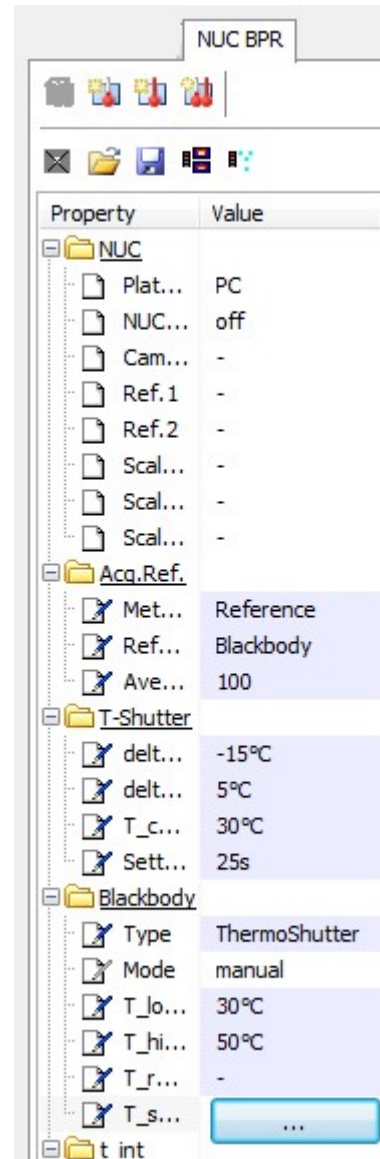


The camera has a temperature-controlled shutter which is located between filter wheel and lens.

The shutter can be opened or closed using IRCAM Works (tab sheet "Camera", "General"). The temperature of the shutter can be set to values higher than the current internal temperature of the camera by using tab sheet "NUC BPR", "Blackbody", set Type to "ThermoShutter", then use entries "T_r..." (T_read) to read its temperature and "T_s..." (T_setnow) to set it (deg. Celsius).

We recommend setting T_setnow to 0 (switching it off) shortly before acquiring images in order to avoid electrical interferences of the temperature control circuit.

Operating range: The temperature range is limited down to the maximum of internal camera temperature and 1 °C and up to 70 °C. Only integer values between 1 and 70 are accepted by the software.



4. Using the Camera

4.1. Set-up

Please follow these steps to set up the camera:

1. Connect the camera and the power supply with the power cable.
2. Connect the camera to the computer / IRControl unit.
3. Connect the MIO cable if you want to use the MIO interface.
4. Switch on the power supply.
5. Switch on the camera with the power switch. The camera and its Stirling cooler engine will start immediately. After less than 5 - 6 minutes, the detector has reached operating conditions and the Stirling cooler noise will decrease.
6. Activate the camera by software.

Switching-off procedure:

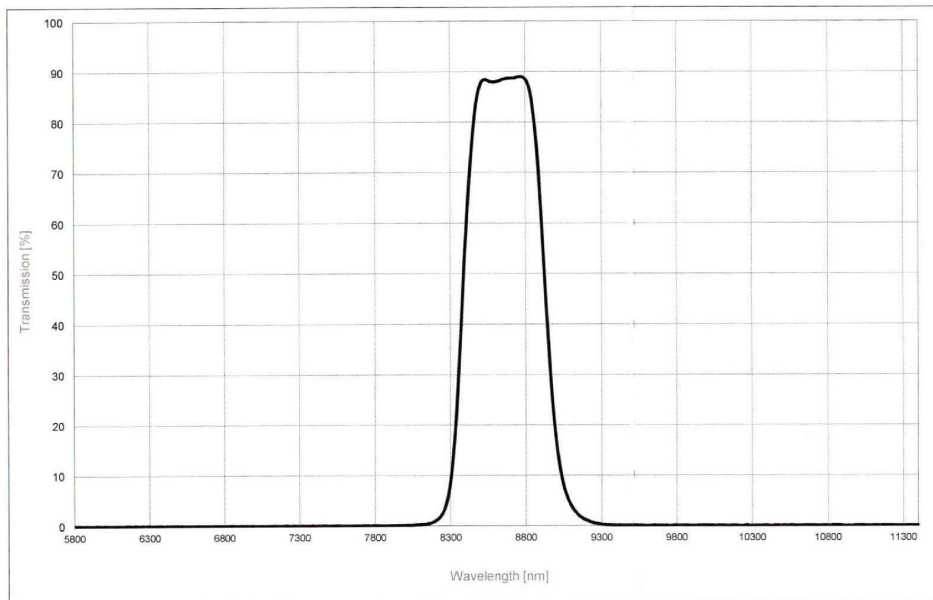
1. De-activate the running image acquisition in software.
2. Switch off the camera with the power button.

4.2. Troubleshooting

- Gigabit Ethernet:
 - The Ethernet cable must be connected.
 - If using external trigger, please ensure a minimum frame rate of approx. 10 Hz. Otherwise, the driver might detect a timeout and stop image transmission.
- Camera Link:
 - Please ensure the cable is connected. It should be connected to Port "A" or "0" depending on the frame grabber labeling.
 - The cable is labeled with "camera" and "grabber". Please do not use it in the wrong direction.
 - Camera Link is not hot-plug! Please connect the cables before camera power is switched on

5. Appendix A: Filter transmission spectra

5.1. BP 8465-550 (BP08, Pos. 2)



BP-8645-550 nm Ø25.4x1.0 mm

Specifications:

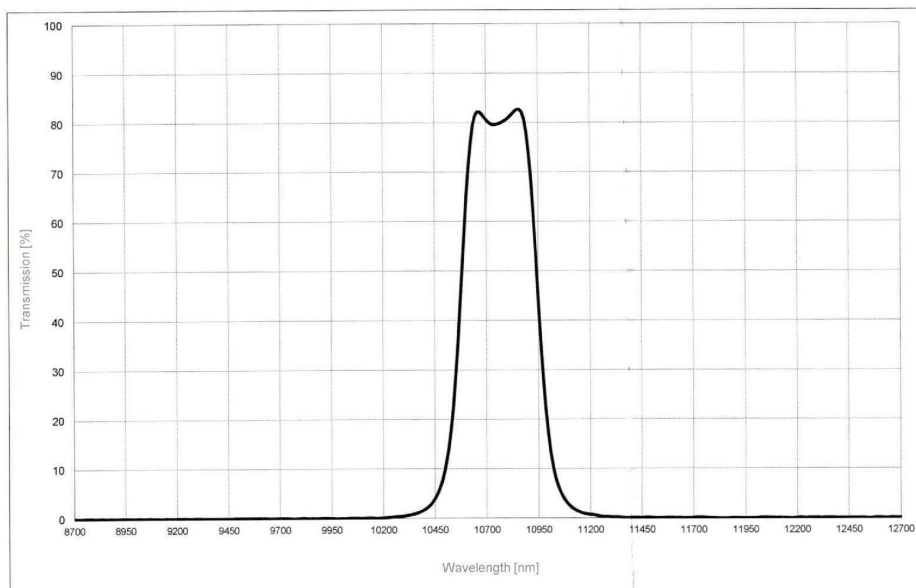
CWL: 8645 ±50 nm

HW: 550 ±50 nm

Tmin: 70 %

Blocking: 200 - 13500 nm (OD 3)

5.2. BP10740-390 (BP10, Pos. 3)



BP-10740-390 nm Ø25.4x1.0 mm

Specifications:

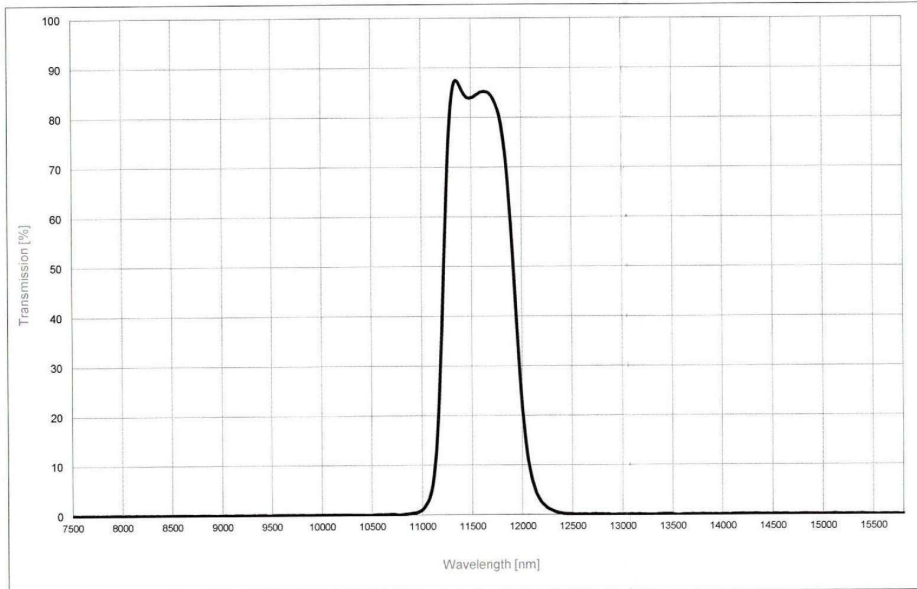
CWL: 10740 ±80 nm

HW: 390 ±40 nm

Tmin: 70 %

Blocking: 200 - 18000 nm (OD 3)

5.3. BP11660-813 (BP11, Pos. 5)



BP-11660-813 nm Ø25.4x1.0 mm

Specifications:

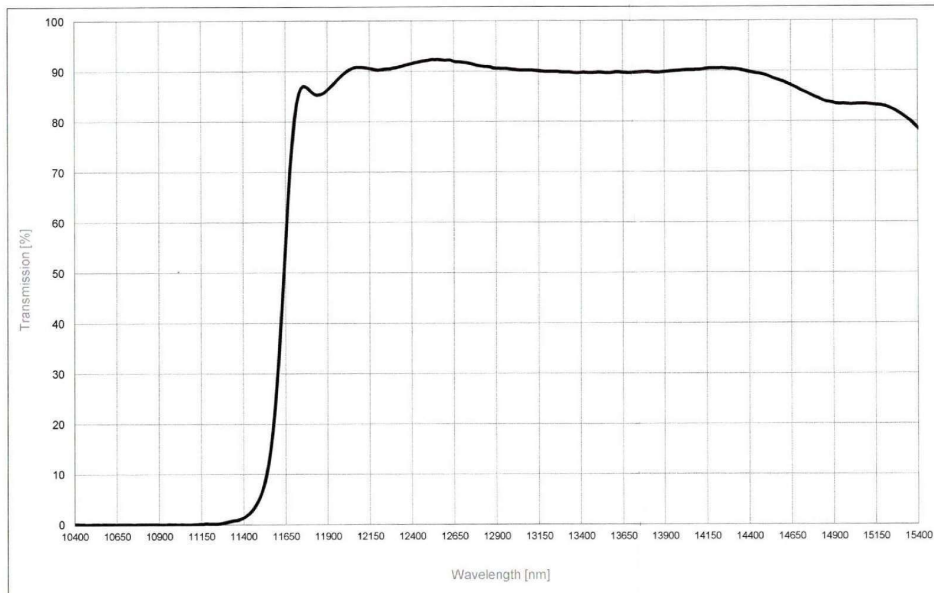
CWL: 11660 ±120 nm

HW: 813 ±120 nm

Tmin: 80 %

Blocking: 100 - 18000 nm (OD 3)

5.4. LP11500 (LP11, Pos. 6)



LP-11500 nm Ø25.4x1.0 mm

Specifications:

Cuton 5 %: 11500 ±200 nm

Tavg: 75 %

Blocking: 200 nm (OD 3)

6. EC Declaration of Conformity



KONFORMITÄTSERKLÄRUNG EC- DECLARATION OF CONFORMITY

Die Firma: **IRCAM GmbH**
The Company: **Nürnberger Str. 71**
D-91052 Erlangen

erklärt, dass die Produkte: **Infrared Camera IRCAM VELOX 327k veL**
declares that the product

den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen
des FTEG (Artikel 3 der R&TTE) entspricht.
complies with the appropriate essential requirements of the FTEG (Article 3 of R&TTE) and the other relevant provisions.

Harmonisierte Normen: **Gesundheit und Sicherheit gem. §3 (1) 1. (Artikel 3 (1) a))**
Harmonised standards: **Health and Safety requirements contained in §3 (1) 1. (Article 3 (1) a))**

EN 60 950: 1992 +A1: 1993 +A2: 1993 +A3: 1995 +A4: 1997 +A11: 1997

Harmonisierte Normen: **Schutzanforderungen in Bezug auf die EMV §3 (1) 2, Artikel**
3(1) b))
Harmonised standards: **Protection requirements with respect to EMC §3 (1) 2, (Article 3 (1) b))**

EN 55 022: 1998 Class B +A1: 2000; EN 55 024: 1998

Diese Erklärung wird verantwortlich abgegeben durch:
This declaration is submitted by:

Erlangen, 29. November 2017
Erlangen, November 29h, 2017



Dr. Oliver Schreer
Geschäftsführer
Director