VarioCAM® HD head

User Manual

State: March 2016
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1 Introduction

Dear user,

We would like to congratulate you on purchasing your new VarioCAM® HD head thermography system.

Please carefully read this user manual before initial start-up. This is the only way to ensure that you are able to fully leverage the performance capability of your thermography system. Please particularly observe the notes on device safety in accordance with chapter 2 in order to avoid damages to the thermography system.

All information provided within the framework of this user manual describes a completely equipped VarioCAM® HD thermography system of the “head” series. Depending on the selected model and the individual customisation, technical data, scope of functions and supplied accessories of your thermography system may deviate from the version described herein. Equipment-dependent features are identified accordingly by means of an * within this user manual.

As a matter of principle, the descriptions of the technical data and the specific scopes of functions and delivery in the corresponding shipping documents are decisive (order confirmation/bill of delivery).

This product is subject to further developments within the scope of technical progress.

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VarioCAM® HD head

1. Introduction

The VarioCAM® HD head is a state-of-the-art thermography system designed for precise, quick and non-contact measurements of the surface temperature of objects.

VarioCAM® HD head was designed for stationary application and can be used for measuring and transmitting temperature values. The compact and resilient design and a very high degree of protection allow for industrial application even in unfavourable external conditions.

High measurement accuracy, precision optics with extraordinary image quality as well as the universal interface concept for digital real-time thermography data collection using GigE Vision* allow for using the VarioCAM® HD head in the most varied fields of application.

Diverse accessories and different software packages for preprocessing and further processing the recordings turn the VarioCAM® HD head into a universal thermography system for a broad range of applications.

Typical fields of application of the thermography system are, amongst other things:

- Research and development
- Optimization of components and assemblies
- Material inspections
- Control of process temperatures
- Quality assurance
- Stationary micro-thermography
- Security technology and early fire detection
2 Equipment safety-related instructions

General
The VarioCAM® HD head is a high-quality, carefully calibrated optical measurement device. Please handle it with the corresponding care. Avoid contaminations, particularly in the lens areas.

Depending on the version of the lens interface, the device is equipped with degree of protection IP54 (bayonet) and IP67 (screw thread).

Please observe the conditions for use, storage and transportation of the device mentioned within the framework of the technical data (see chapter 3.3, Technical data – page 9).

Only use the supplied transport box* and/or the supplied transport packaging* in order to transport the VarioCAM® HD head.

Only the manufacturer is allowed to open the camera housing. Any intervention performed by other persons is inadmissible and will result in the forfeiture of any warranty claims.

Only use accessories or spare parts expressly recommended by the manufacturer regarding the VarioCAM® HD head. Otherwise, malfunctions or damages may occur. Any warranty claims are excluded for such damages.

Standards, directives
The VarioCAM® HD head meets the requirements of the following standards:


- **EN 61326-1:2006**
Handling

The VarioCAM® HD head is equipped with a highly sensitive uncooled microbolometer detector. The object radiations occurring in thermographic practice do not induce any changes to the detector. However, overloads exceeding a black body radiation of 1,000°C in the measuring ranges 1 and 2*, as well as 2,000°C in measuring range 3* may result in irrevocable damages and must therefore be avoided.

The VarioCAM® HD head must not be pointed directly into the sun or other high-radiation sources (e.g. lasers) neither during operation nor when switched off, because this may result in irrevocable changes to the microbolometer detector, the origins of which can be clearly demonstrated. The manufacturer does not assume any warranty for damages caused this way.

It is also absolutely necessary to prevent the sun or other high-energy radiation sources from indirectly coming into the field of view of the VarioCAM® HD head through reflective surfaces!

When the VarioCAM® HD head is not in use, the supplied protective lens cap must be attached at all times.

The lens should not be replaced in rooms with high amounts of dust or moisture, because the degree of protection is not provided for when the lens is removed.
3 Technical description

3.1 Functional principle

The VarioCAM® HD head is a thermography system designed for the long-wave infrared spectral range (LWIR) of (7.5 ... 14) µm. The lens reproduces the object scene to a microbolometer array with (1,024 x 768) and/or (640 x 480) pixels. The electrical signal of the detector array is processed further by the internal electronics. In this, the electronics comprises all functions required for camera operation, such as actuation of the microbolometer array, A/D conversion, offset and gain correction, pixel correction as well as actuation of the interfaces differing according to the equipment.

Operation is performed using the digital interfaces presented depending on the equipment. RS232*, Ethernet* (GigE Vision)*, WLAN (IEEE802.11 a/b/g)*, Bluetooth 2.1/3.0 (IEEE802.15.1 class2)*, and USB2.0* are available as interfaces. Specific software packages are required in order to use these interfaces. You will find more information on the aforementioned in the description of the corresponding user manuals.

3.2 Description of the functional units

Lens

The camera lens collects the IR radiation in the field of view emitted by the measuring object and reproduces this IR radiation on the detector array. Field of view (FOV, Field of View) and resolution/measuring spot size (IFOV, Instantaneous Field of View) are determined at the same distance to the focal distance f of the used lens.

The following standard lenses are available:

<table>
<thead>
<tr>
<th>Lens</th>
<th>Focal distance (mm)</th>
<th>Min. focus (m)</th>
<th>IFOV (mrad)</th>
<th>FOV (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super wide-angle lens</td>
<td>7.5</td>
<td>0.2</td>
<td>2.3</td>
<td>(98.5 x 82.1)</td>
</tr>
<tr>
<td>Wide-angle lens</td>
<td>15</td>
<td>0.2</td>
<td>1.1</td>
<td>(60.3 x 47.0)</td>
</tr>
<tr>
<td>Normal lens</td>
<td>30</td>
<td>0.3</td>
<td>0.57</td>
<td>(32.4 x 24.6)</td>
</tr>
<tr>
<td>Telephoto lens</td>
<td>60</td>
<td>2.0</td>
<td>0.28</td>
<td>(16.5 x 12.4)</td>
</tr>
<tr>
<td>Super telephoto lens</td>
<td>120</td>
<td>4.0</td>
<td>0.14</td>
<td>(8.3 x 6.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Macro</th>
<th>Focal distance (mm)</th>
<th>Focus (mm)</th>
<th>Field of view (mm²)</th>
<th>Resolution (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close-up 0.2x</td>
<td>for 30</td>
<td>max. 137</td>
<td>(85 x 63)</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>min. 70</td>
<td>(54 x 40)</td>
<td>51</td>
</tr>
<tr>
<td>Close-up 0.5x</td>
<td>for 30</td>
<td>max. 47</td>
<td>(34 x 25)</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>min. 33</td>
<td>(30 x 22)</td>
<td>29</td>
</tr>
<tr>
<td>Close-up 0.5x</td>
<td>for 60</td>
<td>max. 100</td>
<td>(35 x 27)</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>min. 78</td>
<td>(29 x 22)</td>
<td>28</td>
</tr>
</tbody>
</table>
3. Technical description

**Thermography system with resolution of (640 x 480) IR pixels**

<table>
<thead>
<tr>
<th>Lens</th>
<th>Focal distance (mm)</th>
<th>Min. focus (m)</th>
<th>IFOV (mrad)</th>
<th>FOV (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super wide-angle lens</td>
<td>7.5</td>
<td>0.2</td>
<td>3.3</td>
<td>(93.7 x 77.3)</td>
</tr>
<tr>
<td>Wide-angle lens</td>
<td>15</td>
<td>0.2</td>
<td>1.7</td>
<td>(56.1 x 43.6)</td>
</tr>
<tr>
<td>Normal lens</td>
<td>30</td>
<td>0.3</td>
<td>0.83</td>
<td>(29.9 x 22.6)</td>
</tr>
<tr>
<td>Telephoto lens</td>
<td>60</td>
<td>2.0</td>
<td>0.42</td>
<td>(15.2 x 11.4)</td>
</tr>
<tr>
<td>Super telephoto lens</td>
<td>120</td>
<td>4.0</td>
<td>0.21</td>
<td>(7.6 x 5.7)</td>
</tr>
</tbody>
</table>

**Macro**

<table>
<thead>
<tr>
<th>Close-up 0.2x</th>
<th>Focal distance (mm)</th>
<th>Focus (mm)</th>
<th>Field of view (mm²)</th>
<th>Resolution (μm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close-up 0.5x</td>
<td>for 30</td>
<td>max. 137</td>
<td>(78 x 58)</td>
<td>119</td>
</tr>
<tr>
<td></td>
<td></td>
<td>min. 70</td>
<td>(49 x 37)</td>
<td>75</td>
</tr>
<tr>
<td>Close-up 0.5x</td>
<td>for 30</td>
<td>max. 47</td>
<td>(31 x 23)</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td></td>
<td>min. 33</td>
<td>(27 x 21)</td>
<td>42</td>
</tr>
<tr>
<td>Close-up 0.5x</td>
<td>for 60</td>
<td>max. 100</td>
<td>(32 x 24)</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>min. 78</td>
<td>(26 x 20)</td>
<td>42</td>
</tr>
</tbody>
</table>

**Detector**

The VarioCAM® HD head is equipped with an uncooled microbolometer FPA detector (uncooled Focal Plane Array) with a resolution of (1,024 x 768) or (640 x 480) IR pixels. The individual elements of the detector are microscopically small, thin-film resistors on extremely thin diaphragms arranged a few micrometers above the silicon read-out circuit in an unsupported manner. The lens of the thermography system reproduces the thermal radiation from the scene onto these detector elements and these detector elements absorb this radiation. The temperature change of the detector elements resulting thereof results in signals that can be analysed electronically, read-out line-by-line and column-by-column using a read-out circuit.

The use of an uncooled detector ensures the quick availability of the camera function upon start-up (starting time < 30 seconds) and continuous operation.

**Detector electronics**

The detector electronics supplies the BIAS voltages and further actuation signals required for detector operation and ensures that the analogue output signal of the detector is pre-processed and digitalised.

**Image processing electronics**

With the help of an FPGA (Field Programmable Gate Array) and up to two* processors, real-time image processing with the following essential functions (depending on the equipment) is implemented:

- Detector electronics interface
- Gain and offset correction
- Defect pixel treatment
- Low-pass filtration
- Zoom generator
- Graphics overlay*
- IR/graphics mixer*
- GigE-Vision interface*
PC interfaces* (USB2.0/WLAN/Bluetooth)
Video image interfaces* (DVI-D, FBAS)

**Optomechanics**

With the help of an optomechanic assembly, the following functions are implemented:

- Focus (motor focus)
- Measuring range switch-over (apertures)*
- Internal NUC (Non Uniformity Correction) with shutter

Furthermore, this assembly optionally comprises a module for hardware-based increase of the geometric resolution of the thermography system to (2,048 x 1,536) IR pixels (detector with [1,024 x 768] pixels) and (1,280 x 960) IR pixels (detector with [640 x 480] pixels) in the "Resolution Enhancement"* mode.

**Interfaces and controls**

The VarioCAM® HD head can be controlled remotely using the optional RS232, GigE-Vision, Bluetooth or WLAN interfaces by means of commands. Operation is explained in the manuals of the corresponding software.

**Power supply**

Optionally,

- an external 15V wall plug transformer (accessories)* or
- power over Ethernet* (48 V; IEEE 802.3at standard for a type 1 PD)

can be used to supply the VarioCAM® HD head with power.

The wall plug transformer is connected to the 14-pin (right-hand side) LEMO socket on the reverse of the housing.

**Interfaces**

The thermography system is equipped with the following interfaces:

- RS232* (LEMO 14-pin)
- DVI-D (HDMI connector) behind the cover on the reverse of the camera, composite video (LEMO 14-pin)
- 2 x digital I/O (5V) for external trigger input/trigger output* (LEMO 14-pin)
- 2 x analog output* 0-5V (LEMO 14-pin)
- GigE-Vision* (LEMO 8-pin)
- USB2.0* (mini-AB, behind the cover on the reverse of the camera)
- WLAN*
- Bluetooth*
- Process interface*

Simultaneously using several interfaces on the 14-pin LEMO socket is allowed for by means of a breakout box*. When using a breakout box*, the breakout box* is also used for external power supply.
VarioCAM® HD head

3. Technical description

As an alternative to the digital high-resolution DVI-D image data on the HDMI socket, the analog image data (4:3 PAL/NTSC) is available as a FBAS signal (composite) on the 14-pin LEMO socket. The HDMI socket can be used to connect screens processing a resolution of (1,280 x 768) or (1,280 x 800) pixels in accordance with the VESA standard.

In connection with the software packages IRBIS® 3 remote* and IRBIS® 3 online*, the GigE-Vision interface* allows for remotely controlling the thermography system, as well as for transmitting digital image information to a PC in real time*.

3.3 Technical data

<table>
<thead>
<tr>
<th>Spectral range</th>
<th>(7.5 ... 14) µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature measuring range</td>
<td>(-40 ... 1.200) °C, optionally &gt; 2.000°C</td>
</tr>
<tr>
<td>Temperature resolution @ 30 °C</td>
<td>Better than 0.05 K, optionally 0.03 K according to camera/detector type</td>
</tr>
<tr>
<td>Measurement accuracy</td>
<td>± 1.5 K or ± 1.5%</td>
</tr>
<tr>
<td>Emissivity</td>
<td>Adjustable between 0.1 and 1.0 in increments of 0.01</td>
</tr>
<tr>
<td>Image format (pixels)</td>
<td>(1,024 x 768), Resolution Enhancement* to (2,048 x 1,536) (640 x 480), Resolution Enhancement* to (1,280 x 960)</td>
</tr>
<tr>
<td>Detector</td>
<td>Uncooled Microbolometer Focal Plane Array</td>
</tr>
<tr>
<td>IR frame rate</td>
<td>30 Hz (1,024 x 768), 60Hz (640 x 480)</td>
</tr>
<tr>
<td>Normal lens (field of view)</td>
<td>1.0/30mm (32.4 x 24.6)° at (1,024 x 768) 1.0/30mm (29.9 x 22.6)° at (640 x 480)</td>
</tr>
<tr>
<td>Zoom function</td>
<td>Up to 32-fold digital</td>
</tr>
<tr>
<td>A/D conversion</td>
<td>16 bit</td>
</tr>
<tr>
<td>Image storage</td>
<td>SDHC card, GigE Vision 30Hz and/or 60Hz</td>
</tr>
<tr>
<td>Interfaces</td>
<td>DVI-D*, PAL/NTSC-FBAS*, GigE-Vision*, RS232*, USB2.0*, WLAN/Bluetooth*, 2 x digital I/O*, 2 x analogue out*, process interface*</td>
</tr>
<tr>
<td>Power supply</td>
<td>15 VDC wall plug transformer* or PoE* wall plug transformer* in accordance with IEEE 802.3at standard for type 1</td>
</tr>
<tr>
<td>Working temperature range</td>
<td>(-25 ... 50) °C; activation temperature &gt; -15 °C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>(-40 ... 70) °C</td>
</tr>
<tr>
<td>Moisture during operation and storage</td>
<td>Relative humidity 5 % to 95 %, non-condensing</td>
</tr>
<tr>
<td>Dimensions (without lens)</td>
<td>(190 x 90 x 94) mm</td>
</tr>
<tr>
<td>Weight (without lens)</td>
<td>1.15 kg</td>
</tr>
<tr>
<td>Tripod connection</td>
<td>1/4&quot; Photo thread</td>
</tr>
</tbody>
</table>

Attention: observe max penetration depth of 4.5 mm! (DIN 4503)

| Measuring functions       | Max. 8 freely selectable ROI, auto hot/cold spot display, isotherms |
| Automatic functions       | Autofocus, autoimage, autolevel, autorange, alarm*, auto-NUC, auto lens detection*, premium snap*, Resolution Enhancement* |
| Degree of protection of the camera | IP54 (bayonet) or IP67 (thread), IEC 529 |
| Degree of protection of the camera-side cables | IP54 and/or IP65 possible as an option |
| Impact strength           | 25 G, IEC 68-2-29 |
| Vibration strength during operation | 2 G, IEC 68-2-6 |

* (Properties and technical specifications depend on the camera configuration and vary within the equipment packages of VarioCAM® HD.
Design and specification are subject to continuous further development; subject to changes within the meaning of technical progress.)
3.4 Dimensions

The dimensions specified in the following are applicable to the VarioCAM® HD head with normal lens with a focal distance of 30 mm (bayonet interface). When using other lenses, the total dimensions will change accordingly.

Fig. 1 View from the right side

Fig. 2 View from the left side
Fig. 3 View from the front

Fig. 4 View from the back

Fig. 5 View from below

Additional fastening thread behind the rubber bumpers (4x) M5/maximum depth 5 mm

Guide bore Ø 4.5 H10 usable width max. 6 mm

Tripod socket UNC 1/4” - 20 G maximum depth 6 mm

Rubber bumper
4 Unpacking and control

Upon receipt of the VarioCAM® HD head, please check the components for completeness and integrity. Possible damages must be reported to the supplier immediately.

The VarioCAM® HD head system is delivered in a transport box* or in a transport packaging*.

The basic package contains the following components

- Thermography system VarioCAM® HD head, including lens
- Protective lens cap
- User manual VarioCAM® HD head
- Transport box/transport packaging

Optional accessories*

- Wall plug transformer (15VDC) 14-pin LEMO connector
- PoE wall plug transformer
- Replacement lenses, macro attachments
- Protective window for lenses, laser protection filter
- Breakout box, including connecting cable and 14-pin LEMO connector, trigger cable
- Gigabit Ethernet card
- Ethernet cable with 8-pin LEMO connector
- Device tripod
- Thermography software of the IRBIS®³ family
5 Denomination of the camera components

Fig. 6 View from the side

Drilled holes for 90° rotated assembly
4 x M 5.0
Observe the maximum penetration depth of 5 mm!

1/4" photo thread connection (at camera bottom)

Fig. 7 View from the rear

Cover for process interface
LEMO socket 8-pin for GigE cable
Behind cover:
USB 2.0, DVI-D (HDMI)

Power-on LED
Power button
LEMO socket 14-pin for wall plug transformer, FBAS, trigger, RS232, analog OUT (Breakout box)

Fig. 8 View from the lens side

Red mark for lens installation
In order to engage the lens, turn clockwise

Lens
6 Quick guide

The procedure described below is intended to make your first operation of the VarioCAM® HD head easier. In order to achieve professional results, we recommend meticulous reading of the entire manual.

6.1 Preparation

You will need the following equipment:

- VarioCAM® HD head
- Wall plug transformer* with LEMO connector
- Ethernet cable* with 8-pin LEMO connector
- IRBIS® 3 software*

6.2 Start

- Provide for power supply for the VarioCAM® HD head by
  - inserting the power supply cable of the wall plug transformer* – 14-pin LEMO connector (red dot pointing to the top) – into the right LEMO socket on the reverse of the camera
  or
  - inserting the Ethernet cable (when using PoE power supply) – 8-pin LEMO connector – into the left LEMO socket. In order to avoid confusions, the Ethernet cable is marked blue.

- Establish the Ethernet connection to the computer:
  - Insert the Ethernet cable with the 8-pin LEMO connector (red dot pointing to the top) into the left LEMO socket.

- Remove the protective cap from the lens.

- Push the Power button and the device is switched on. System initialization is indicated by the power-on LED initially flashing green. The power-on LED then illuminated permanently in green indicates that the VarioCAM® HD head is ready-to-operate in Live mode.

In order to switch off the device, the Power button must be pressed for 5 seconds or the power supply must be disconnected.

When using an optional “ever on” wall plug transformer or an “ever on” breakout box, the VarioCAM® HD head can only be switched off by disconnecting the power supply.
6.3 Display

- Initially, in order to transmit data using the respective interface, the IRBIS® remote* or IRBIS® 3* software supplied depending on the equipment must be installed in accordance with the description in the respective manual.
- Start the software and establish the connection to the camera: “Verbinden” (Connect) button. The Live mode can be started and/or interrupted by using the “Live” button.
- Initially, you must select a motif with a contrast-rich scene (e.g. an active electrical device) and point the VarioCAM® HD head towards this scene.
- Depending on the respective software, the focus is set using the corresponding buttons for far/near/autofocus. In IRBIS® 3 online, the camera remote control window must be opened initially (Camera menu).
- Depending on the equipment and the software, the thermography images can be saved as single images or image sequences to the internal SDHC card or by using the respective interface to the control unit.
- In order to analyze the thermography images, the supplied analysis software must be installed and started.

![Fig. 9 Analysis using the IRBIS® 3 software](image)
7 Start-up

7.1 Using a tripod*

For this, the thermography camera is equipped with a 1/4" photo thread connection (DIN 4503) on the bottom of the device. In order to achieve rigid camera images, it is recommendable to fix the VarioCAM® HD head to a tripod (optional accessories).

Please observe the maximum penetration depth of the photo thread of 4.5 mm (DIN 4503).

4 additional fastening points (threaded bores M5, maximum penetration depth 5mm) are located on the left side of the camera (see Fig. 2 View from the left side – page 10), as well as on the bottom of the camera under the rubber feet (see Fig. 5 View from below – page 11).

When using the M5 fastening bores on the bottom of the camera, the tripod thread attachment plate must be removed or a corresponding recess for this plate must be designed before installing the VarioCAM® HD head on a level surface.

7.2 Connecting a power supply

7.2.1 Power supply using a wall plug transformer 14 VDC

■ Connect the power supply to the VarioCAM® HD head by inserting the power supply cable of the wall plug transformer* with its 14-pin LEMO connector (red dot pointing to the top) into the right LEMO socket on the reverse of the camera.

■ Alternatively, a modified wall plug transformer* is available switching on the camera immediately upon connection (e.g. for starting cameras installed in protective housings, the Power button of which is inaccessible).

■ When using a breakout box, the 14-pin connector of the wall plug transformer must be connected to the breakout box (see Fig. 15 Breakout box reverse – page 19).

7.2.2 Power supply using Power over Ethernet (PoE)

■ In the event of power supply using Power over Ethernet*, the power is supplied via the Ethernet cable. Insert the 8-pin LEMO connector of the Ethernet cable (red dot to the top) into the left LEMO socket. In order to avoid confusions, the Ethernet cable is marked in a blue color, just like the left LEMO socket.

■ The Power over Ethernet interface supports supply devices in accordance with IEEE 802.3at standard for type 1 (corresponds to the 13 W standard according to IEEE 8022.3-2008).
7.3 Replacing the lens

Only replace the lenses in dry and low-dust conditions. When the lens is removed, the degree of protection of the system is no longer guaranteed!

7.3.1 Bayonet lens interface

Position the VarioCAM® HD head on a solid, level underground so that the lens is directed towards you. Rotate the lens on the thermography system counterclockwise as far as it will go and/or until the two red dots are aligned. Then, remove the lens to the front.

In order to attach the lens, the red marking spots on lens and camera must be aligned. In this position, the lens must be pressed slightly against the camera corpus and turned clockwise until the red dot of the lens is aligned with the white dot of the camera.

7.3.2 Screw thread lens interface

Regarding the VarioCAM® HD head version with alternative screw thread lens interface*, the lenses are replaced in analogy to the bayonet: The lens is removed by turning it counterclockwise and the lens is attached by turning it clockwise.

7.4 Operation using the Ethernet interface* IEEE802.3

The following connection options make sure that the VarioCAM® HD head can be connected to the PC/notebook. The accessories described are contained in the scope of delivery as an option*.

1) Connect the RJ 45 connector of the Ethernet cable to the Ethernet interface of the PC.

2) Insert the 8-pin LEMO connector with the blue mark into the left LEMO socket.

VarioCAM® HD head with Ethernet cable and wall plug transformer

The Ethernet cable is used in order to connect the thermography camera to the 8-pin LEMO socket (left-hand side, blue mark). The wall plug connector is connected to the right 14-pin LEMO socket.
Please find information on how to further proceed regarding the installation of the Ethernet driver for the VarioCAM® HD head in chapter 8, Software installation, starting on page 21.

Connecting the wall plug transformer

In order to operate the VarioCAM® HD head (Ethernet connection without PoE), the 14-pin LEMO connector of the wall plug transformer is inserted into the right LEMO socket.

7.5 Operation using breakout box (RS232*, video output FBAS*, trigger I/O*, analog out*)

Using the breakout box will expand the connection options of the VarioCAM® HD head. The interfaces 2 x analog output, 2 x trigger I/O, PAL/NTSC-FBAS, as well as the digital RS232 interface are accessible via the breakout box.

Please follow the specified steps on how to establish the required connections.

1. Initially, the connection between thermography camera and breakout box must be established. For this, insert the 14-pin LEMO connector of the breakout box connecting cable into the right LEMO socket on the reverse of the VarioCAM® HD head.

2. Now, the supplied wall plug transformer must be connected to the breakout box. The 14-pin LEMO socket required for the aforementioned can be found next to the connecting cable. If the VarioCAM® HD head is supplied with power using PoE*, the wall plug transformer must not be connected to the breakout box.

3. RS232* must be connected to the breakout box using the 9-pin Sub-D plug-and-socket connector, video output FBAS* and trigger I/O* must be connected using standard BNC sockets.

4. 2 x analog outputs* are available via the optional terminal strip.

After having established the connections to the breakout box, the Power button on the reverse of the camera can be pushed and the VarioCAM® HD head can be switched on.

As an alternative, a breakout box with “ever on” function is available. If the VarioCAM® HD head is connected to this breakout box, it automatically activates as soon as the power supply is established.
Connecting the breakout box

Fig. 14  Breakout box (RS232, BNC: FBAS, Trigger)

Fig. 15  Breakout box reverse

7.6  Trigger channels VarioCAM® HD head

7.6.1  Trigger function

Triggering uses the Ethernet to affect the 16bit IRB data transmission. The trigger signal (5 V) is fed in via the BNC sockets of the breakout box identified with T1 and T2 from where it is forwarded to the VarioCAM® HD head (right socket) using the connecting cable with 14-pin LEMO connector. Commercially available BNC cables can be used in order to connect the trigger signal sources to the breakout box.

- **T1**: Trigger channel 1 is used by the IRBIS® 3 software.
- **T2**: Trigger channel 2 is reserved for the SDK and further specific applications.
The voltage level of the trigger signals from the VarioCAM® HD to the input and the output is 5 V.

The VarioCAM® HD head reacts to a low-high trigger edge. The trigger event causes simultaneous marking in the header of the following frame (IR image). Within the IRBIS® 3 software, this mark is analysed by the IRBGRAB.DLL implemented there and results in the corresponding data being saved. The minimum width of a trigger pulse should be 10 µs.

### 7.6.2 SyncOut

In order to synchronize other cameras and processes and for active thermography applications, the Framesync signal of the VarioCAM® HD head can be generated. The generation of the Framesync signal is activated by the corresponding software command. Framesync (low-high edge) indicates the process of recording the first image line. The synchronisation pulse has a length of approx. 600 µs.

The voltage level on the output is 5 V. The signal should be uncoupled with a high impedance.
8 Software installation

8.1 Installation instructions

In order to operate the VarioCAM® HD head using the GigE interface, the driver software “WinPcap” must be installed first. We recommend using a GigE network card – independent of the company’s network – in order to actuate the VarioCAM® HD head. Depending on the used Ethernet adapter, different configuration options will be available after the Ethernet adapter is installed.

We recommend using the internal GigE network card at all times for camera connection.

For the installation described below, you must dispose of the access rights of the user group “Administrators”.

8.2 Installation of WinPcap

Upon execution of the file “WinPcap_4_1_2.exe”, please follow the setup wizard by always clicking “Next >“.

![Start window](image)

Fig. 16 Start window
8. Software installation

Fig. 17  Start of the installation

Fig. 18  Confirmation of the terms and conditions of the license agreement
The installation is finished by clicking the “Finish” button.
8.3 Setting the network adapter

Fig. 21  Selection of the LAN connection

Upon opening the “Network and Sharing Center”, the “Change adapter settings” menu item can be selected. In this menu item, the network card to be used must be highlighted and its properties must be opened by using the right mouse button.

8.3.1 Setting the IP address

Before configuring the network card for being used in connection with the camera, the properties of the interface card to be used must be checked. In this, releasing non essential functionalities and assigning a fixed IP address are important. The screenshots shown below provide an overview:

Fig. 22  Properties of the LAN connection

Please note that you only need the components described above in order to establish an Ethernet connection to the VarioCAM® HD head. Therefore, we recommend deactivating any further components contained in the input mask.
Fig. 23  Setting the IP address

If the option “Internet protocol (TCP/IP)” is selected, you can use the “Properties” button in order to set the IP address of the GigE network card. This IP address can be freely defined in accordance with the specifications made by your network in the “Use the following IP address” menu item.

During the further progress of the installation you will need two free network addresses. Should you have any questions regarding this, please contact your network administrator directly.

The “Retrieve IP address automatically” option must not be selected. If this option is however activated, the computer will try to retrieve a dynamic network address from the camera system, which is indicated by the corresponding network symbol in the tool bar. In this case, no connection can be established to the VarioCAM® HD head.
8.3.2 Configuration of the network card

You can use the “Configure…” button in the “Properties of LAN connections” window in order to define the properties of the network card.

We strongly recommend activating the “Jumbo Packet” property in order to achieve a trouble-free Ethernet connection to the VarioCAM® HD head. This function significantly reduces the occupancy rate of the network and allows for loss-free data transmission even at high frame rates.

Please select the highest possible value from the available drop-down list.

Please preferentially select the value “1.0 Gbit/s full duplex” and the “Automatic negotiation” menu item only if this value is not available.
9 Establishing a connection to the IRBIS® 3* software

Within the IRBIS® 3 program, the "Connect" button must be clicked in the "Camera" menu item in order to establish the connection between camera and software.
9. Establishing a connection to the IRBIS® 3* software
9. Establishing a connection to the IRBIS® 3* software

The following "Select camera" dialog must be used to select the camera type "VarioCAM HD". Clicking the "Accept" button will start the establishment of the connection to the thermography system.

All further functions of the program are described in detail in the manuals "RBIS® 3 – Infrared thermography software".
10 Maintenance of the device

10.1 Cleaning of lenses and protective windows

The surfaces of lenses and protective windows are susceptible to scratching. Improper cleaning can cause damage.

Lenses generally shall be treated so that cleaning is not required. Avoid smudging lenses by only handling while wearing protective gloves, preferably made of cotton.

- Do not clean the lenses and windows unnecessarily. If cleaning is unavoidable, clean the surfaces only as intensely as necessary.
- At the beginning of cleaning, first remove dust and loose particles by blowing with filtered oil-free compressed air (for example with a small bellow or canned, compressed air) or with a camel hair brush.
- For easier cleaning of adhering particles, please only use a clean, lint- and fibre-free cloth (unused lens cleaning or microfibre cloth, wood-free pulp cloth). If necessary, add a drop of cleaning solution (see below) to the centre of the cloth. Run the cloth slowly over the lens surface without applying pressure. After wiping, both the cloth and the surface of the lens should be nearly dry, meaning that no smearing or smudges should remain.
- For strongly adhering dirt or fingerprints, if necessary, a gentle uniform pressure may be applied. For such instances, surgical cotton or cotton swabs may be suitable for use, in addition to the types of cloths listed above. These can be moistened with a few drops of cleaning solution. Excess solution should be shaken off before use by shaking the cloth, cotton or cotton swabs.
- Wipe extremely slowly and only in one direction. Rapid wiping in multiple directions can cause scratches. Use a new cloth, cotton or cotton swab for each cleaning.
- The only suitable cleaning solutions are ethanol or methanol.

If smudges persist even after following these steps, please contact InfraTec service.

10.2 Calibration

The VarioCAM® HD head system was calibrated very carefully to the official normal with the manufacturer, maintaining the measure connection in doing so.

We recommend having the calibration checked by the manufacturer or by another certified authority at intervals of two years. This check should be performed in combination with the general maintenance of the device with the manufacturer.
11 Protection of the environment

The VarioCAM® HD head is an optoelectronic device containing specific infrared lenses and electronic printed circuit boards. These components must be disposed of specifically when the device is at the end of its use.

The manufacturer offers to take back the VarioCAM® HD head product from the customer in order to ensure that the device is disposed of in an environmentally friendly manner when the device is at the end of its use.

In this case, please return the device to the address mentioned in chapter 12 Service – page 32.
12 Service

According to the manufacturer’s recommendation, the VarioCAM® HD head system should be maintained by customer services at an interval of two years.

The manufacturer guarantees the implementation of the service on the VarioCAM® HD head product.

Should you experience any failures or require the performance of technical maintenance works, please contact your dealer or customer services using the following address:

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