



# WORKSWELL INFRARED CAMERA

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## User Manual

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**End users Validity date:** till next revision

**Revision Number:** 210223

# Introduction

Workswell Infrared Cameras („WIC“) are designed and manufactured for easy and user-friendly integration for all machine vision applications as well as R&D projects. All Workswell Infrared Cameras use the newest Long Wave Infrared Detector Technology. Customers can choose from three types of detector resolution: 640 x 512 or 336 x 256 pixel format.

WIC are powered directly from USB3 or Ethernet cable instead of external supply adapter. Internal electronics is protected by metal enclosure. Very low power consumption decreases needs for special cooling and large camera dimensions. WIC are fully compatible with USB3 and Gigabit Ethernet protocol.

Workswell CorePlayer software automatically detects a camera, configures an address and ensures a camera connection. All WIC use 14 RAW data format or calculated temperature values. Image can be shown in different color palletes with interactive side bar and measurement tools. Users can manage camera parameters such as Gain, NUC, Factory Reset, etc. There is also tutorial application, Linux and Windows dll libraries and C# application code available. CorePlayer Application Workswell CorePlayer is included for free of charge in every WIC package.



## Legal Disclaimer

All products (software, hardware or firmware) manufactured by Workswell s.r.o. are warranted against defective materials and workmanship for a period of twelve (12) months, provided such products have been under normal storage and use in accordance with herein instructions.

The warranty extends only to the original purchaser and is not transferable. It is not applicable to any product which has been subjected to misuse, neglect, accident or abnormal conditions of operation.

In the case of a defect in a product covered by this warranty the product must not be further used in order to prevent additional damage. The purchaser shall promptly report any defect to Workswell s.r.o. or its authorized distributor or this warranty will not apply.

Workswell s.r.o. will, at its option, repair or replace any such defective product free of charge if, upon inspection, it proves to be defective in material or workmanship and provided that it is returned to Workswell within the said twelve-month period.

Nobody but Workswell s.r.o. is allowed to open or modify such product.

Workswell s.r.o. has no other obligation or liability for defects than those set forth above. No other warranty is expressed or implied. Workswell s.r.o. shall not be liable for any direct, indirect, special, incidental or consequential loss or damage, whether based on contract, tort or any other legal theory.

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# Warnings and Cautions

## Warnings

Before using the product, please check that there is no visible damage or malfunction. If there are any visible signs of damage or other defect on the device, then on no account should it be installed or put into operation.

Any interference and noncertified service operations into the product leads to an automatic loss of warranty.

## Notifications

Do not use or store the device in conflict with the storage and operating conditions laid down in this manual (only for hardware).

- Do not point the infrared camera (with or without the lens cover) at strong energy sources, for example, devices that cause laser radiation, or the sun. This can have an unwanted effect on the accuracy of the camera. It can also cause damage to the detector in the camera.
- Do not use the *Workswell WIC* in temperatures more than +50°C (+122°F). High temperatures can cause damage to the camera.
- Do not use the *Workswell WIC* in temperatures less than -15°C (+5°F). Low temperatures can cause damage to the camera.
- Do not apply solvents or equivalent liquids to the cameras, the cables, or other items. Damage to the items can occur.
- Be careful when you clean the infrared lens. The lens has an anti-reflective coating which is easily damaged. Do not use too much force to clean the infrared lens. This can cause damage to the anti-reflective coating.
- The encapsulation rating is only applicable when all the openings on the all components of the system are sealed with their correct covers, hatches, or caps.



## General information and conditions

### Repairs & return merchandise authorization (RMA)

An RMA number is required for Workswell to process returned products, whether the product is under warranty or out of warranty. International returns must be coordinated in advance of shipment in order to adhere to import requirements. Please get information on [service@workswell.eu](mailto:service@workswell.eu).

### Calibration including general maintenance

General maintenance is done in conjunction with calibration, to verify and update camera status before calibration. Shipping cost is not included in the price.

### Placing an order

All orders must be placed on [orders@workswell.eu](mailto:orders@workswell.eu) together with ordering sheet. The ordering sheet must contain all necessary information about Distributor (customer), shipment address and ordered equipment together with ordering codes. Without this information shall not be the order accepted.

### EXPORT STATEMENT

These commodities are for commercial end use only. They may not be used in the design, development, production, or use of nuclear, chemical or use of nuclear, chemical or biological weapons or missiles and not be sold transferred or exported to Belarus, Burma (Myanmar), Ivory Coast (Côte d'Ivoire), Libya, Zimbabwe, Cuba, Iran, North Korea, Sudan, Russia and Syria.



# Package Content

## Package Content

Confirm that the package contains the items listed below.

- Workswell Infrared Camera
- USB3 Cable (USB3 version)
- Ethernet Cable (2x) (GigE Version)
- PoE Adapter (GigE Version)
- Adding back cover and front cover (optional)
- Calibration certificate
- Download Card
- Quick Start Guide
- Hard transport case

## Download Card

The Download Card gains the cardholder access to download the relevant documents, including the user manual in electronic form, and software on the website [www.workswell.eu](http://www.workswell.eu).



# Help and FAQ

## General Instructions

- try to find an answer by searching this User Manual
- contact your dealer
- search Workswell s.r.o. website at [www.workswell.eu](http://www.workswell.eu)
- contact customer support at [support.workswell.eu](http://support.workswell.eu)





# Workswell Infrared Camera Specification

Thermal and optical data	
Resolution	640 x 512 pixels or 336 x 256 pixels
Framerate	60Hz or 30 Hz (or 9 Hz available on request for non-ITAR delivery)
Temperature ranges	-25°C to +150°C -40°C °C to +550°C (optional up to 1 500°C with special filter)
Accuracy	±2% or ±2°C
Temperature sensitivity	≤0.03°C (30mK) @ 30°C
Spectral Range	7.5 – 13.5 μm
Dynamic range	14bit radiometric temperature data, 14bit RAW data
Calibration	Yes, calibrated both temperature ranges
Detector Type	Uncooled VOx microbolometer
Lenses	Interchangeable and focusable, various field of view
Available Lenses	18°, 25°, 30°, 45°, 69°
Focus	Manual continuous (Min. focus distance depends on lens)
Communication and Power Supply Interface	
Ethernet version	Gigabit Ethernet, RJ-45 connector
USB3 version	USB3, Thumbscrews lock micro USB connector
Analog video output	PAL/NTSC video format (only for USB3 version)
Input Supply Voltage	5 V DC for USB3, Power over Ethernet 48V type
Power Dissipation	< 1.3 W (max. 3 W during NUC calibration time)
Mechanical data	
Dimensions for USB3 version	97 x 65 x 63 mm for IP40 for WFOV, 186 x 65 x 63 mm for IP65 for WFOV,
Dimensions for GIGE version	106 x 65 x 63 mm for IP40 for WFOV, 179 x 65 x 63 mm for IP65 for WFOV,
Weight	360 g for GIGE WFOV model (without back and front IP65 cover)
Mounting and tripod	4 x 1/4-20 UNC thread and 10 x M4
Internal Protection	IP 65 with plugin back cover (IP 40 without)



Operating Environment	
Operating temperature	-10°C to +50°C
Storage temperature	-30°C to +60°C
Humidity	5% to 95% non-condensing
Content of delivery	Workswell infrared camera, calibration certificate, software CorePlayer, cables, PoE (GigE version), download card, hard transport case
Thermal Camera Settings	
Source of image	As a source of image can be used <b>full image</b> (full sensor size) or only a part of the image specified by a rectangle <b>ROI</b> tool
Framerate	According to the camera you can change frame-rate from <b>1Hz to 30Hz</b>
Calibration	Using <b>Calibration</b> button you can activate <b>NUC</b> (non-uniformity compensation) to reach the best image quality and camera signal stabilization
Play/Pause	Using Play/Pause icon you can start and pause real time image streaming
Start recording/Snapshot	During radiometric thermal video acquisition (using <b>Start capture</b> button) you can save <b>snapshots</b> (Radiometric JPG) at the same time
AVI Record	User can save live video streaming directly as <b>AVI format</b> . It is possible to change framerate and bitrate and display into the video <b>Palette bar</b> , <b>Bottom bar</b> and <b>ROI</b>
Thermal Image Settings	
Palette	User can choose from <b>14 palettes</b> – BlackRed, BlueRed, BWRGB, Fire, FLIR Iron, Gradient, Gray, Iron1, Natural, Rainbow, Sepia, Steps, Temperature, WBRGB
Interpolation	To obtain a smooth image without pixelization, user can interpolate the image
Units	Temperature can be displayed and calculated in <b>°C or °F</b>
Acquisition Parameters	<b>Emissivity</b> (continuously in range 0.01 – 1.0 with step 0,01) and <b>Reflected temperature</b>
Advanced Parameters	In CorePlayer can be set/changed other parameters as <b>Atmospheric temperature</b> , <b>Humidity</b> , <b>Distance</b> and <b>Transmission of external optics</b>
Temperature Range	Interactive temperature range can be used in <b>manual</b> or <b>automatic</b> mode. Using it you can change the color distribution of temperatures to e.g. highlight details.
Isothermal Mode	User can set <b>Isothermal mode</b> of the image. CorePlayer offers four types of isotherms: <b>Below</b> , <b>Above</b> , <b>Between</b> and <b>Below and Above</b> .
Report generation	
Report Contents	There are automatically shown <b>thermal images</b> and <b>time graphs</b> and parameters of the image: <b>emissivity</b> , <b>reflected temperature</b> , <b>atmospheric temperature</b> , <b>humidity</b> , <b>distance</b> and <b>transmission of external optics</b>
Additional Information	User can insert into a report: protocol <b>name</b> , <b>date and time</b> of measurement, company <b>logo</b> , <b>user/company name</b> and additional information about measured <b>area</b>



Measurement features	
<b>ROI analysis</b>	User can insert into the image variety of measurement tools/ROI: <b>Point, Line, Polyline</b> and <b>Rectangle</b> . User can insert more ROIs into one image, change its color, replace it or delete ROIs that a user can see in the top-right subwindow
<b>Zoom</b>	User can <b>zoom</b> real-time streamed data, the acquired image or sequence – continuously, each mouse scroll zooms 0,5x
<b>Measured Values</b>	In each ROI can be measured and visualized <b>Min, Max, and Average</b> temperature. User can save temperature values from the ROI as <b>CSV file</b>
Graphs	
<b>Thermal Scanner</b>	Temperature values for Line ROI could be visualized in <b>Thermal Scanner</b> . User can select number of lines and temperature range (manual or automatic)
<b>Thermal Profile</b>	All measured data can be displayed in real time <b>Thermal Profile</b> (for Line ROI). User can adjust range of <b>graph axis</b> and see the measurement <b>Target Cross</b> for fast and easy visualization of measured graph values
<b>Time Graph</b>	Temperature values from all ROI tools (for real time visualization or captured sequence measurement) can be showed into the <b>Time Graph</b> . User can adjust range of <b>graph axis</b> and see the measurement <b>Target Cross</b> for fast and easy visualization of graph values. For saved sequence can be set upper and lower <b>limit</b> for the temperatures in each ROI and x-axis in <b>relative or real time</b>
Radiometric Sequence	
<b>Playback</b>	Radiometric video can be played <b>Backwards, Forwards</b> , show <b>Next frame or Previous frame</b> or play the sequence continuously in the <b>loop</b>
<b>Processing</b>	User can <b>cut</b> the video and save it into new file as radiometric sequence.
Additional functions	
<b>Export</b>	User can export images into different file formats - save *.seq file as <b>Radiometric JPEG, PNG or CSV</b> file. Radiometric sequence can be exported to <b>AVI</b> file
<b>Presentation Mode</b>	For presentation purposes the live stream or acquired image can be displayed in <b>full screen mode</b> with image related controls.
<b>User Interface</b>	Intuitive and well-arranged <b>user interface</b> . User can change layout of sub-windows or restore layout to defaults
<b>Image Information</b>	The information about saved image in sub-window: <b>filename, camera type, captured date, resolution, emissivity and reflected temperature</b>
<b>Camera Information</b>	CorePlayer shows information about connected camera: <b>IP and MAC address, Camera manufacturer, Camera model, Name, Serial number and Resolution</b>
<b>GPS Support</b>	CorePlayer supports integration of <b>GPS data</b> from standard GPS receiver and display the position in Google Maps



## IFOV and Field of View calculator

Resolution 640 x 512 pixels	Field of view	Spatial resolution IFOV	Min focus distance
Focal length 9 mm	FOV 69° x 56°	1.889 mrad from 1 meter	7 cm
Focal length 13 mm	FOV 45° x 37°	1.308 mrad from 1 meter	15 cm
Focal length 19 mm	FOV 32° x 26°	0.895 mrad from 1 meter	20 cm
Focal length 25 mm	FOV 25° x 20°	0.683 mrad from 1 meter	40 cm
Resolution 336 x 256 pixels	Field of view	Spatial resolution	Min focus distance
Focal length 6.8 mm	FOV 45.6° x 35.5°	2.5 mrad from 1 meter	5 cm
Focal length 9 mm	FOV 35° x 27°	1.889 mrad from 1 meter	7 cm
Focal length 13 mm	FOV 25° x 19°	1.308 mrad from 1 meter	15 cm
Focal length 19 mm	FOV 17° x 13°	0.895 mrad from 1 meter	20 cm
Focal length 25 mm	FOV 13° x 10°	0.683 mrad from 1 meter	40 cm



## Focusing the camera

### WFOV Lens

The infrared camera has adjustable focus. You use sharpening mechanism mounted on lens for focusing of WFOV lens.

#### Short distance



In order to focus on short distance, gently rotate the lens counter-clockwise. During this movement, the lens extends from the camera body. If the lens can rotate too easily, you probably get on the edge of the focus range. Trying to rotate the lens more may cause the lens to fall out.

#### Long distance



In order to focus on long distance (or infinity) gently rotate the lens clockwise. During this movement, the lens retracts to the camera body. If the lens can rotate too hard, you probably get on the edge of the focus range. Trying to rotate the lens more may cause the lens to damage.



## NFOV Lens

The infrared camera has adjustable focus. You have to loosen the locking screw on the bottom of lens and rotate whole lens for focusing NFOV lens.

### Short distance



In order to focus on short distance, gently rotate the lens counter-clockwise. During this movement, the lens extends from the camera body. If the lens can rotate too easily, you probably get on the edge of the focus range. Trying to rotate the lens more may cause the lens to fall out.

### Long distance



In order to focus on long distance (or infinity) gently rotate the lens clockwise. During this movement, the lens retracts to the camera body. If the lens can rotate too hard, you probably get on the edge of the focus range. Trying to rotate the lens more may cause the lens to damage.



## Changing lenses



1. If you want change lenses, unscrew the focusing mechanism as much as you can.



2. Loosen the two small screws from the side of the focusing mechanism.



3. Screw in the outer ring below the level of lens and take down the inner ring.



4. Unscrew lens by hand.



5. Put out lens and give the new one into the camera.



6. Screw in the new lens by hand as much as you can.





7. Insert the inner ring on the lens, but make sure that lens lock into lugs of inner ring.

8. Hold the inner ring by hand and outer ring unscrew to the same level with the inner ring



9. Screw in the two small screws from the side of the focusing mechanism and lenses are changed.





## High temperature filter



1. Put the high temperature filter on focusing mechanism to the groove.



2. Screw in small screw from the side of the high temperature filter.



## Connect camera to PC

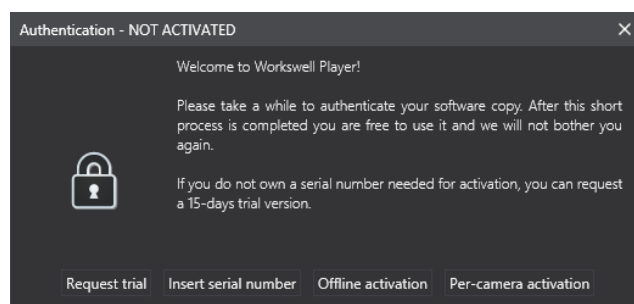
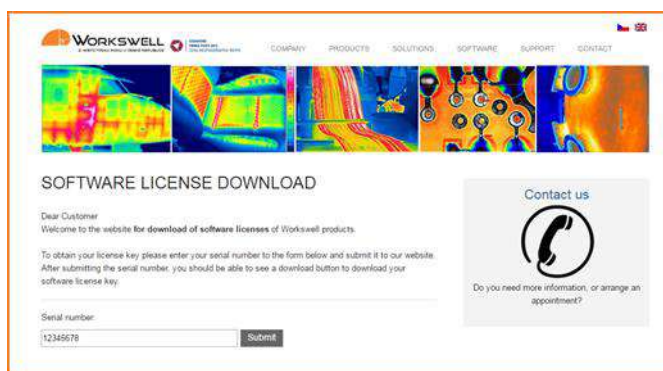
### USB3

- 1) Download and install software CorePlayer (link on Download Card).



- 2) Connect USB3 cable to camera screw fastening screws and connect cable to USB3 port on PC.

- 3) Download license file from our website (link on Download Card), for download license, insert serial number of camera.



- 4) Connect camera to CorePlayer, select Per-camera activation and insert license.



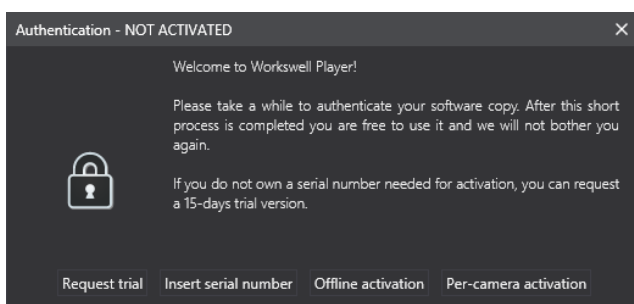
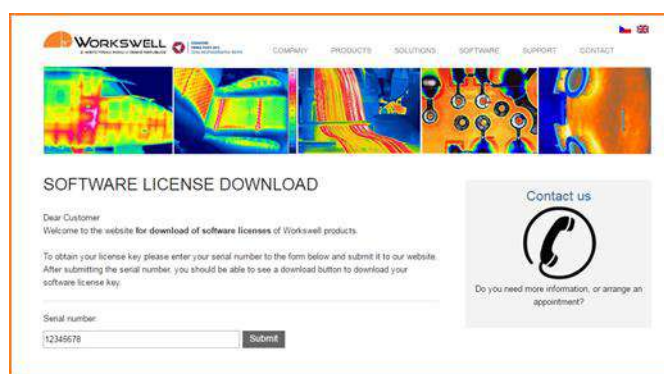
## GigE

- 1) Download and install software CorePlayer (link on Download Card).



- 2) Connect first Ethernet cable to camera and PoE adapter to port POWER+DATA OUT. Second Ethernet cable connect to PC and PoE adapter to port LAN IN.

- 3) Download license file from our website (link on Download Card), for download license, insert serial number of camera.



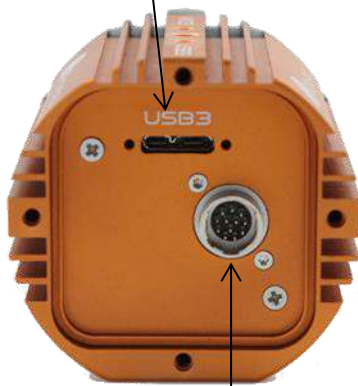
- 4) Connect camera to CorePlayer, select Per-camera activation and insert license.



## Analog output

The USB3 infrared camera is equipped with both analog video output and USB3 port to transfer the images directly to a computer with CorePlayer software. In both cases, it is required to supply +5V DC through the micro USB connector.

micro USB3  
(power supply and PC connection)



Analog video output



## Adding back and front IP cover

If you want increase the IP camera protection parts, please add Back and Front cover for better water and liquid dirty pollutions protection and follow these steps:



- 1) First install the Back part carefully. The bigger cable gland is used for USB3 devices. Cable has to be pushed through from inside to outside, because the connector to PC is smaller. Then put the cable into cut hole.

The smaller cable gland is used for GigE ETHERNET cameras.

Cable has to be pushed through and then crimped.

- 2) Connect cable to camera, insert back cover to back side of camera and screw bolts (longest bolt is down). Everything has to be tight enough and all O-rings and sealing has to be installed
- 3) Front IP protection cap can be screwed on the front camera forehead. Please carefully screw the aluminium cap with germanium window and tighten. There has to be no gap between front camera forehead and aluminium tubus and germanium glass.



- 4) Check the complete assembled camera with installed Front and back IP cover, if there are no gab and everything is well sealed and placed. After you will install the Front and Back protection part, please sprinkle the water on the camera and check if there is no ingress to the camera body.



# Maintenance

## Camera recalibration

It is highly recommended to send the WIC camera with all accessories for recalibration and predictive maintenance and service procedure. After one year of using, the optical system can be polluted or mechanically changed. Also the temperature drift inside the camera can slightly change the sensor parameters. For these reasons, the camera and specific lens has to be recalibrated.

Please send the camera back to Workswell company or another Workswell partner for one-year recalibration procedure.

## Cleaning the WIC head and cables

### Liquids:

Use one of these liquids:

- Warm water
- A weak detergent solution

### Equipment:

A soft cloth

### Procedure:

- 1) Soak the cloth in the liquid.
- 2) Twist the cloth to remove excess liquid.
- 3) Clean the part with the cloth.

## Cleaning the infrared lens

### Liquids:

Use one of these liquids:

- A commercial lens cleaning liquid with more than 30% isopropyl alcohol.
- 96% ethyl alcohol (C<sub>2</sub>H<sub>5</sub>OH)
- DEE (= „ether“ = diethylether, C<sub>4</sub>H<sub>10</sub>O)
- 50% acetone (= dimethylketone, (CH<sub>3</sub>)<sub>2</sub>CO)) + 50% ethyl alcohol (by volume). This liquid prevents drying marks on the lens.

### Equipment:

Cotton wool

### Procedure:

- 1) Soak the cotton wool in the liquid.
- 2) Twist the cotton wool to remove excess liquid.
- 3) Clean the lens one time only and discard the cotton wool.

### Warning:

Make sure that you read all applicable MSDS (Material Safety Data Sheets) and warning labels on containers before you use a liquid: the liquids can be dangerous.

### Caution:

- Be careful when you clean the infrared lens. The lens has a delicate anti-reflective coating.
- Do not clean the infrared lens too vigorously. This can damage anti-reflective coating. Re-applying antireflective coating is not possible and is required to change the lens.





## Contacts

### Sales Department

Adam Švestka, MSc., MBA

Mobile: +420 725 955 464

E-mail: [adam.svestka@workswell.cz](mailto:adam.svestka@workswell.cz)

### Support contact details

Mobile: +420 725 877 063

Web: [support.workswell.eu](http://support.workswell.eu)

Web: [www.workswell.eu](http://www.workswell.eu)

### Headquarters

Libocka 653/51b

160 00, Prague 6

Czech Republic

### Branches

Mezirická 100

756 61, Roznov p. R.

Czech Republic

Univerzitní 1

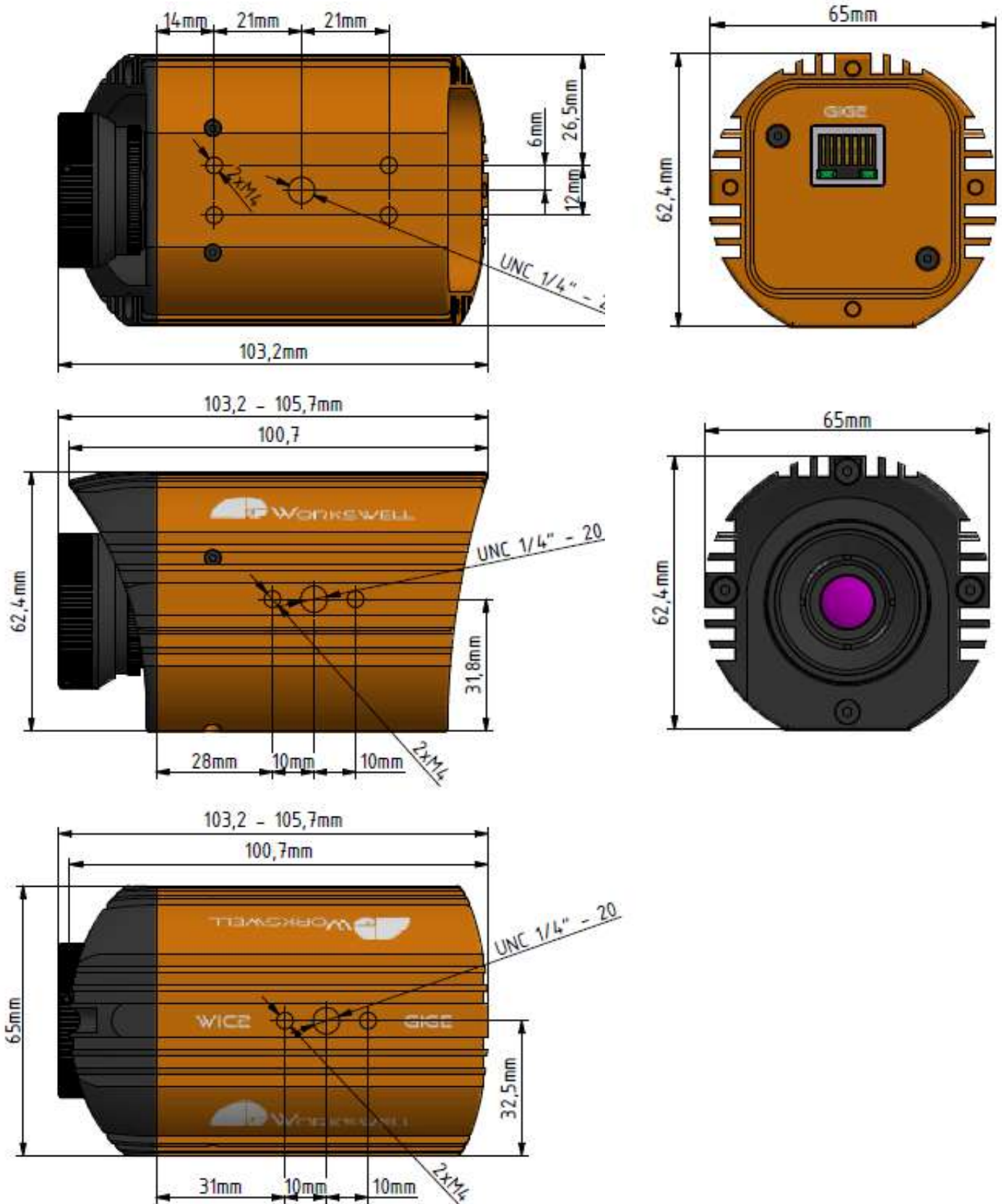
010 08, Zilina

Slovak Republic



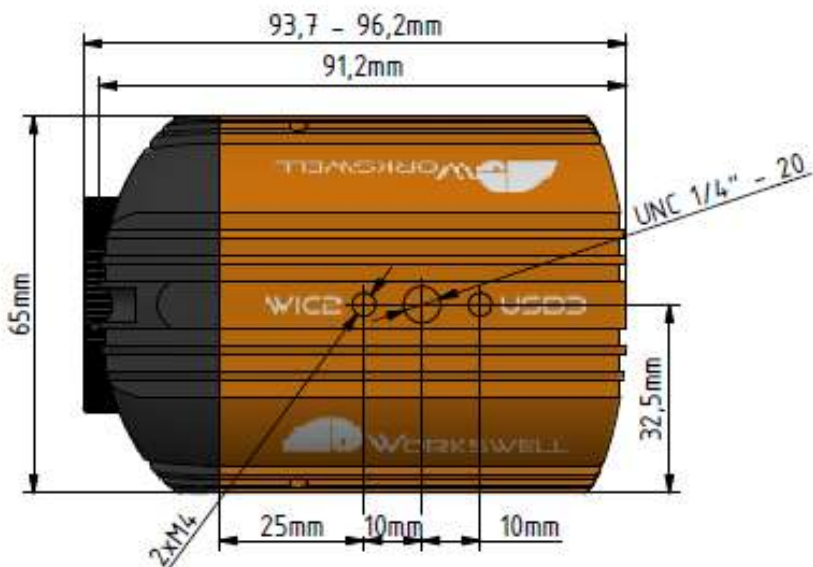
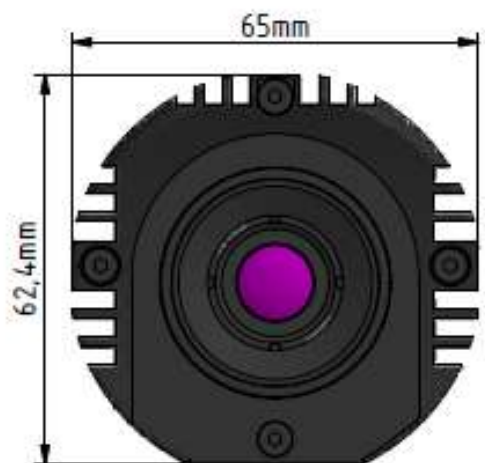
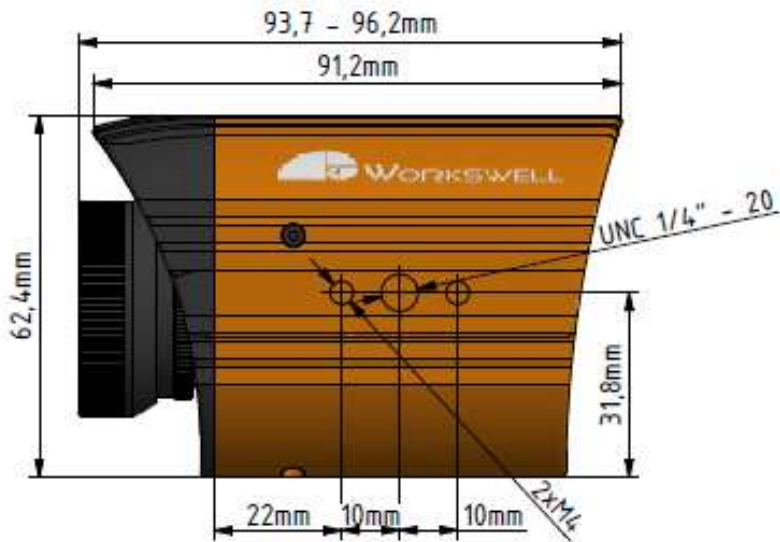
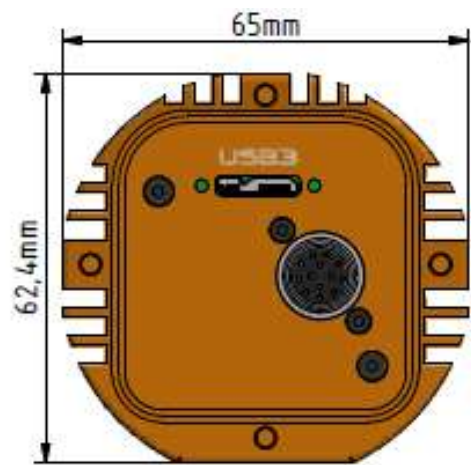
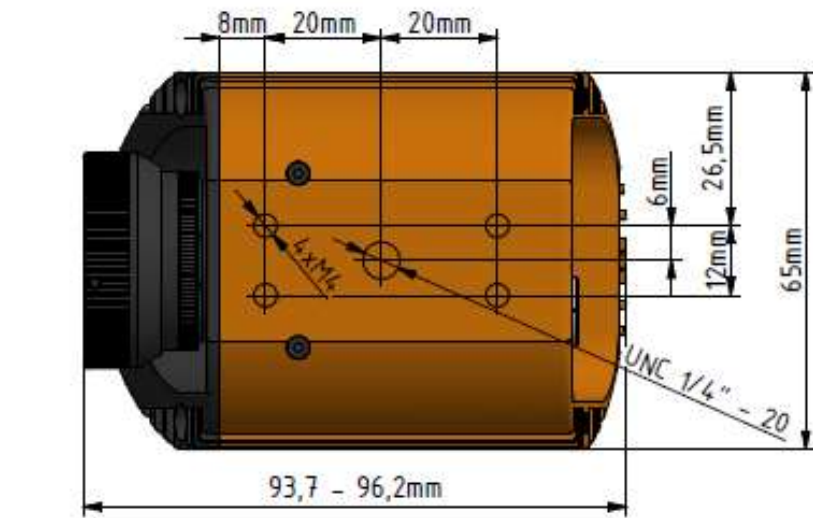


## Mechanical drawings – GIGE WFOV





# Mechanical drawings – USB3 WFOV



## Mechanical drawings – Back Cover IP65

