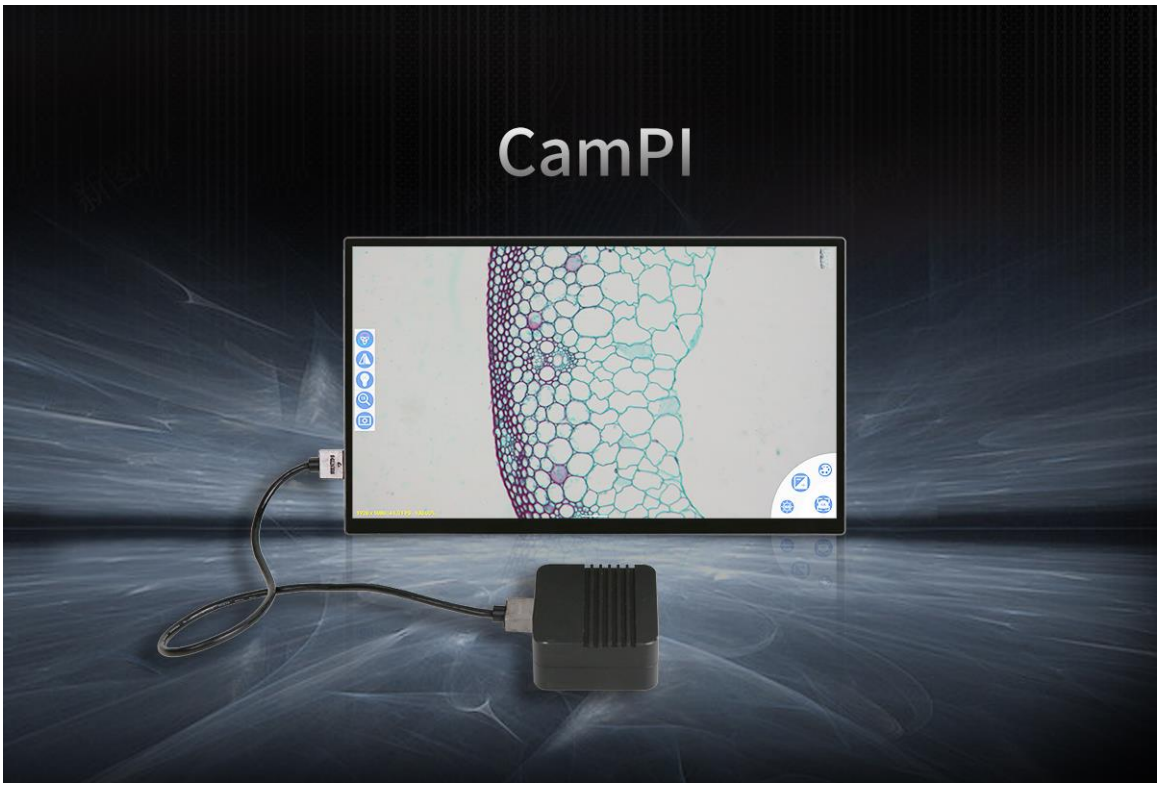
Camera Intelligent Control Platform CamPI Help Manual



Contents

1 CamPI Camera Intelligent Control Platform(CICP)

1.1 Basic properties of CamPI

CamPI is a SoC camera intelligent control platform launched by ToupTek Photonics that integrates powerful computing power and camera control functions. The HCMOS series cameras developed by ToupTek Photonics only need a standard HDMI cable to connect with the CamPI camera intelligent control platform and complete the functions of camera control, video display, image capture, video recording and measurement.

The CamPI camera intelligent control platform is equipped with multi-touch TFT-LCD displays of different sizes and resolutions, which can get rid of the user's dependence on the keyboard and mouse during operation, and use finger touch operation to realize the control of HCMOS cameras or other peripherals manipulation.

The combination of CamPI series camera intelligent control platforms and HCMOS series cameras are expected to be used in various products such as intelligent detection, processing, analysis and control, covering public security criminal investigation, precision agriculture and forestry, water quality monitoring, remote sensing and telemetry, industrial inspection, cultural relics identification, medical treatment, etc. This combination has extremely high commercial prospects and value.

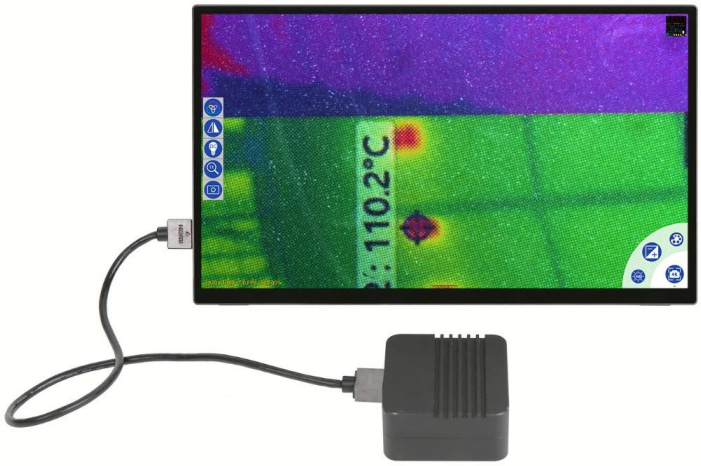


Figure 1 Connection between CamPI and HCMOS series cameras

1.2 CamPI hardware features

- Modular high scalability：The core board and the interface board are designed independently, while focusing on the core camera functions, it has the characteristics of high scalability and embeddability;
- Simple image transmission：Only one HDMI cable is needed to connect with HCMOS series cameras, which can perfectly realize the control of the camera, the transmission, display and processing of image and video data, eliminating the trouble of hardware compatibility and camera driver problems, seamlessly integrated with the camera, providing users with worry-free mobile image acquisition solutions;
- Openness of product development： Users can develop and run their own image processing applications through the supplied SDK, realize on-site industrial control through standard user interfaces, process image and video data according to preferences and needs, and finally submit scientific reports, completely liberated from camera hardware problems and image or video data capture problems, focus on problem-oriented image processing and analysis, and quickly develop user own target equipment;
- Portability of product use/integration： Compact size ensures portability for product use and integration;

- Versatility of product application：It can be applied to various scenarios, such as microscope observation, biological image analysis, industrial inspection and various intelligent image analysis equipment, to meet different development needs.

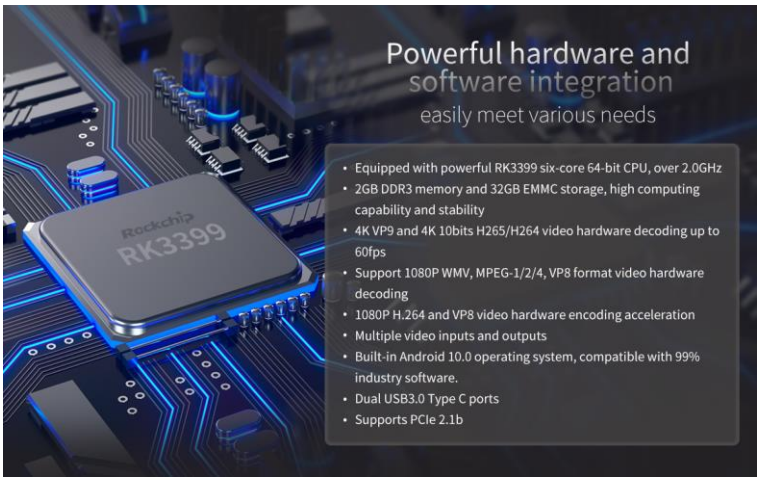


Figure 2 The first feature of CamPI hardware

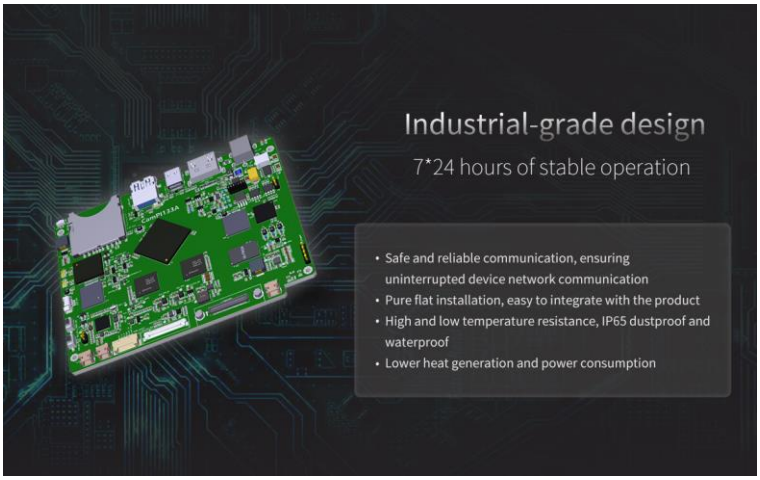


Figure 3 The second feature of CamPI hardware

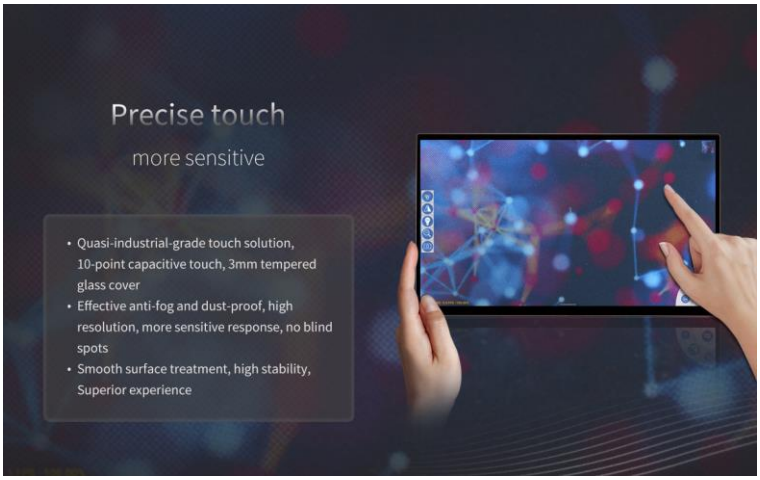


Figure 4 Operation features of CamPI

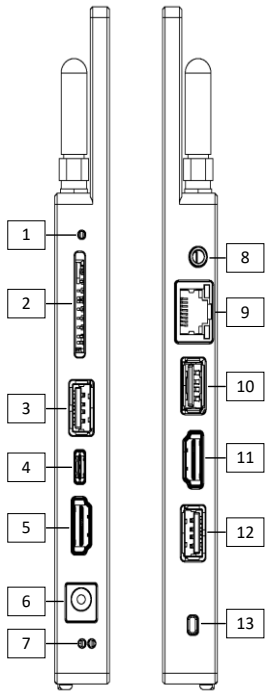
1.3 CamPI series camera intelligent control platform

Currently, there are two types to choose from, and more will be added in the future.

Model	Processor	Memory/Storage	Display	Computing Power	System Version
CamPI2K133A	RK3399	2G LPDDR3/32GEMMC	1080P multi-touch display	NA	Android 10.0
CamPI4K133A	RK3588	2G LPDDR3/32GEMMC	4K multi-touch display	6 TOPS	Android 12.0

1.4 Peripheral interfaces and specifications of CamPI2K133A camera intelligent control platform

Table 1 Interfaces of CamPI2K133A Camera Intelligent Control Platform



No	Name and Function
1	Recovery key: Used together with **Power key** 13, press both at the same time to enter the firmware burning mode.
2	SD card slot:
3	USB 3.0 A port 1: External mouse, keyboard, U disk and other peripherals can be connected.
4	USB-C port: External mouse, keyboard, U disk and other peripherals can be connected; it can be connected to the DP port of the monitor to display the CamPI2K133A interface; It can be connected to a PC, and the built-in storage of CamPI2K133A can be accessed on the PC side; in the firmware burning mode, the firmware can be burned on the PC side.
5	HDMI 2.0 A port 1: HCMOS series camera input interface 1.
6	12V DC5525: Power input interface.
7	Status indicator: The left side is the power indicator light, which is off when the power is not connected, and is always red when the power is connected; The right side is the running indicator light, which goes out when the machine is turned off, and the green light flashes when it is turned on.
8	2.5mm audio port: External shutter release.
9	10/100/1000Mbps adaptive network port
10	USB 2.0 A port 1: External mouse, keyboard, U disk and other peripherals can be connected.
11	HDMI 2.0 A port 2: HCMOS series camera input interface 2.
12	USB 3.0 A port 2: USB3.0 image data interface. *The function is not yet available.*
13	Power button: Short press to power on; long press to power off.

Table 2 CamPI2K133A Technical Parameters

Core functions	Processor	Dual-core Cortex-A72 big core + Quad-core Cortex-A53, 64-bit processor, running on Android 10.0 system, with a maximum frequency of 2 GHz. It is equipped with Mali-T860MP4 GPU, supporting 4K and H.265 hardware decoding
	Memory	2GB
	Storage	32GB
	Network support	Supports 5G and 2.4GHz WiFi, equipped with independent dual antennas
	Built-in ROM	32KB EEPROM
Display screen	Panel size	13.3 inch
	Panel type	TFT-LCD
	Resolution	1920x1080, FHD, 166PPI

	Touch form	10-point anti-interference capacitive touch
	Screen color	16.7M, 100% sRGB
	Brightness	400 cd/m2
	Contrast	1500:1
	Viewing angle	89/89/89/89
Peripherals	Compatible camera	HCMOS series cameras
	Camera interface	HDMI 1, HDMI 2
	Peripheral interface	Dual HDMI 2.0 Dual USB-A 3.0 USB-C (DP) USB-A 2.0 SD card slot 10/100/1000Mbps adaptive Ethernet port 2.5mm shutter cable interface 12V DC5525 power input port
Software	Built-in software	CamView
	Software function	Real-time image display, control, measurement, capturing photos, and recording videos Exposure & gain control White balance Color adjustment Color modes Sharpening Denoising Power frequency Flip Single/Burst/Timer/delayed capture modes Chinese/English/German/French/Japanese/Korean/Spanish/Italian multi-language support

2 HCMOS Series Cameras Compatible with CamPI Camera Intelligent Control Platform

Figure 5 HCMOS cameras can be directly connected to the CamPI camera intelligent control platform using an HDMI cable

Table 3 HCMOS Series Camera Specifications

Model	Sensor & size	Pixel (μm)	G Sensitivity/Dark Signal	FPS	Capture resolution	Exposure
HCMOS08300KPA	8.3M/IMX678(C) 1/1.8”(7.68x4.32)	2.0x2.0	3541(mV/lx/s) 0.15mv with 1/30s	42@1920x1080	3840x2160	0.02ms~15s
HCMOS08300KPB	8.3M/IMX585 1/1.2”(11.2x6.3)	2.9x2.9	5970mv with 1/30s 0.15mv with 1/30s	42@1920x1080	3840x2160	0.02ms~15s
HCMOS20000KPA	20M/IMX283 1” (13.2x8.9)	2.4x2.4				
HCMOS45000KPA	45M/IMX294 4/3”(17.26x13.03)	4.6x4.6	108mv with 1/30s 0.03mv with 1/30s	42@1920x1080	8160*5616	0.02ms~15s
HCMOS04200KMB-RAW	4.2M/GSENSE2020BSI (M,UV, RS) 1.2”(13.31x13.31)	6.5x6.5	1.1x108(e-/((W/m2).s)) QE93.7%@550nm 80(e-/s/pix)	18@2048x2048 18@1024x1024	2048x2048 1024x1024	0.15ms-15s
HCMOS04200KMB-YUV	4.2M/GSENSE2020BSI (M,UV, RS) 1.2”(13.31x13.31)	6.5x6.5	1.1x108(e-/((W/m2).s)) QE93.7%@550nm 80(e-/s/pix)	18@2048x2048 18@1024x1024	2048x2048 1024x1024	0.15ms-15s
HSWIR01300KMA	1.3M/IMX990(M) 1/2”(6.40x5.12)	5.0x5.0	121mV with 1/30s 1.0mV with 1/30s	35@1280x1024 35@640x512	1280x1024 640x512	50us~3600s

3 Combination of CamPI and HCMOS and Its Application

3.1 Combination of CamPI and HCMOS and optical system

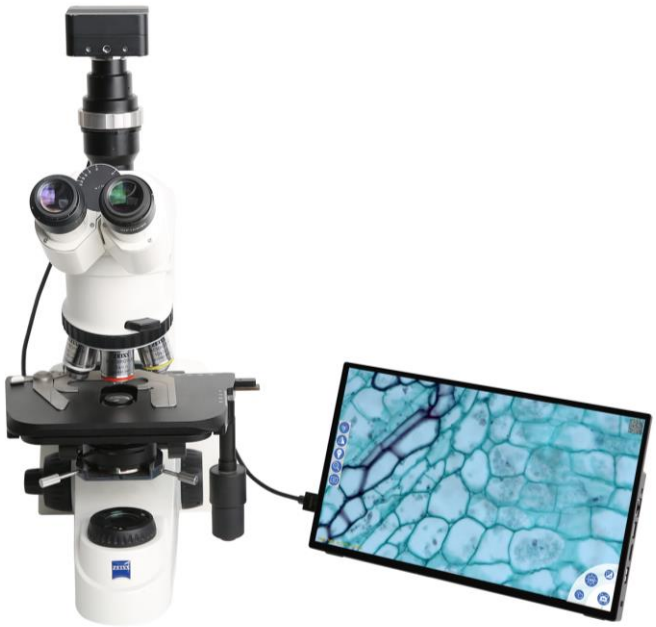


Figure 6 HCMOS08300KPA+CamPI2K133A+biological microscope (CamPI is placed on the workbench separately)

Figure 7 HCMOS08300KPA+CamPI2K133A+biological microscope (CamPI is directly fixed on the HCMOS camera)

Figure 8 HCMOS08300KPA+CamPI2K133A+biological microscope side view (CamPI is directly fixed on the HCMOS camera)

Figure 9 HCMOS08300KPA+CamPI2K133A+TPS210A50 (CamPI placed on the workbench)

Figure 10 HCMOS08300KPA+CamPI2K133A+TPS210A50 (CamPI directly fixed on the camera)

Figure 11 HCMOS08300KPA+CamPI2K133A+TPS210A50 side view (CamPI directly fixed on the camera)

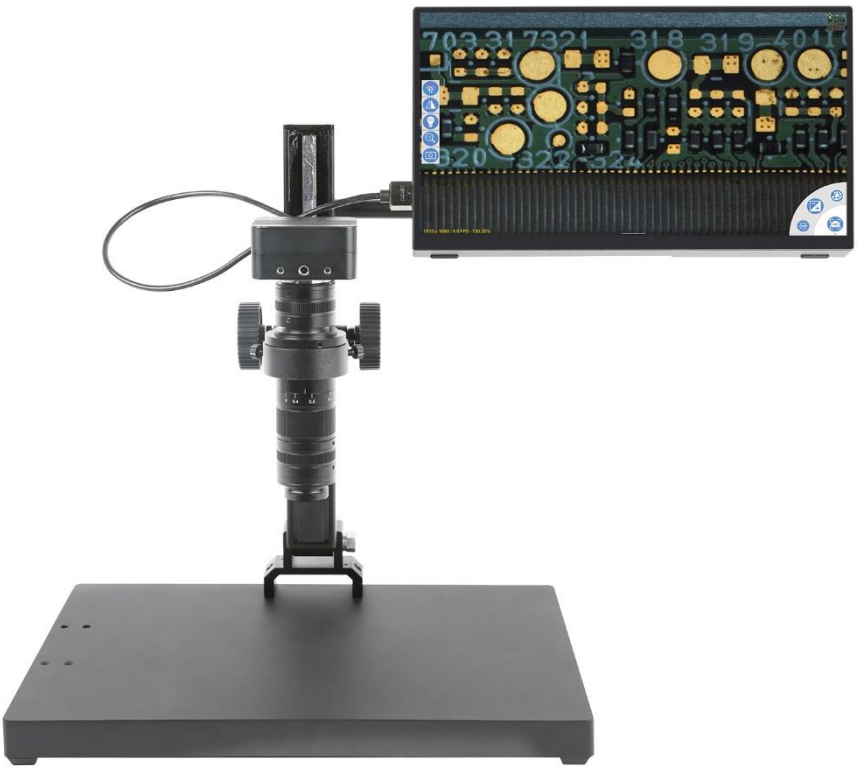


Figure 12 HCMOS08300KPA+CamPI2K133A+TPS210A50 (CamPI is fixed on the side pole of TPS)

3.2 Application of CamPI+HCMOS

Public security criminal investigation, precise agriculture and forestry, water quality monitoring, remote sensing and telemetry, industrial inspection, cultural relic identification, medical treatment, etc.

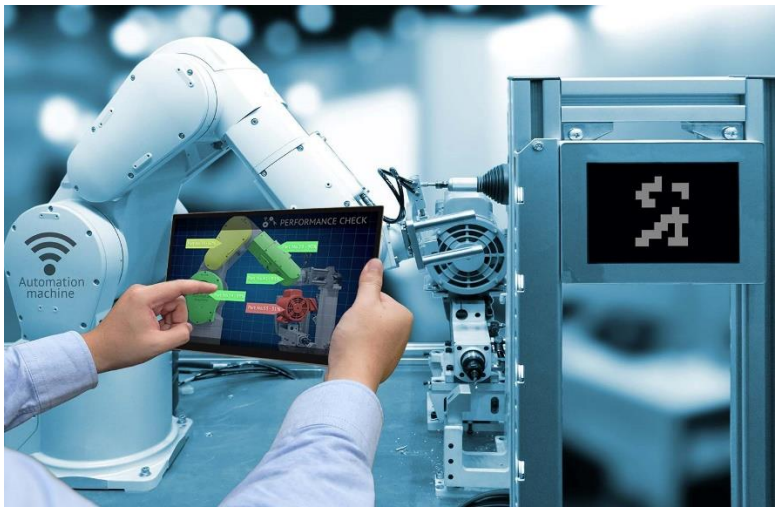


Figure 13 CamPI and Smart Manufacturing

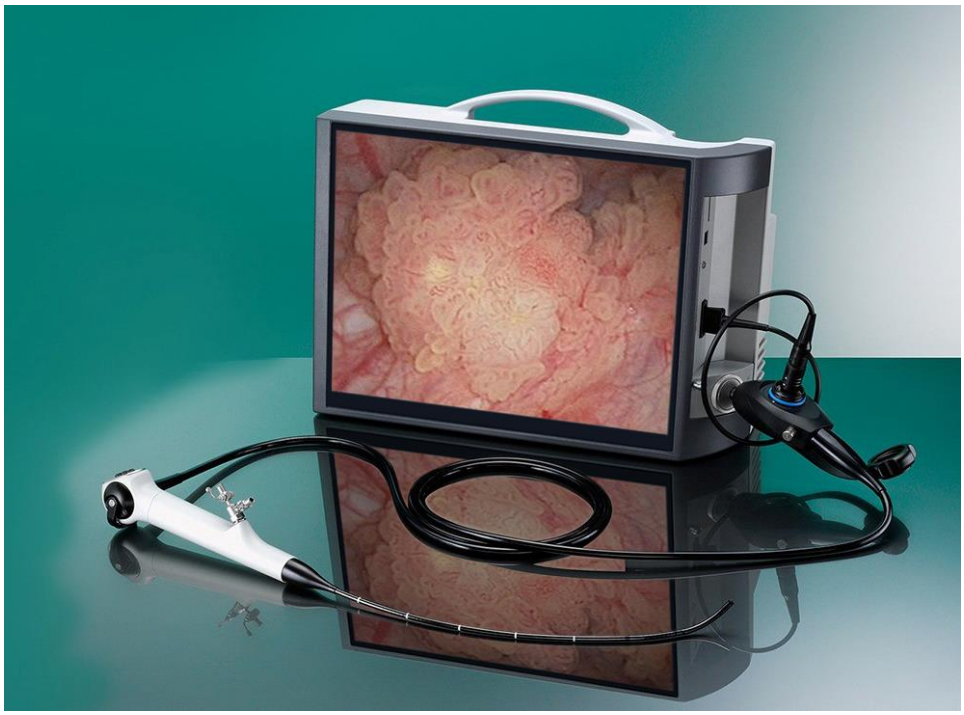


Figure 14 CamPI and Endoscopy Applications

Figure 15 CamPI and Industrial Videoscope Application

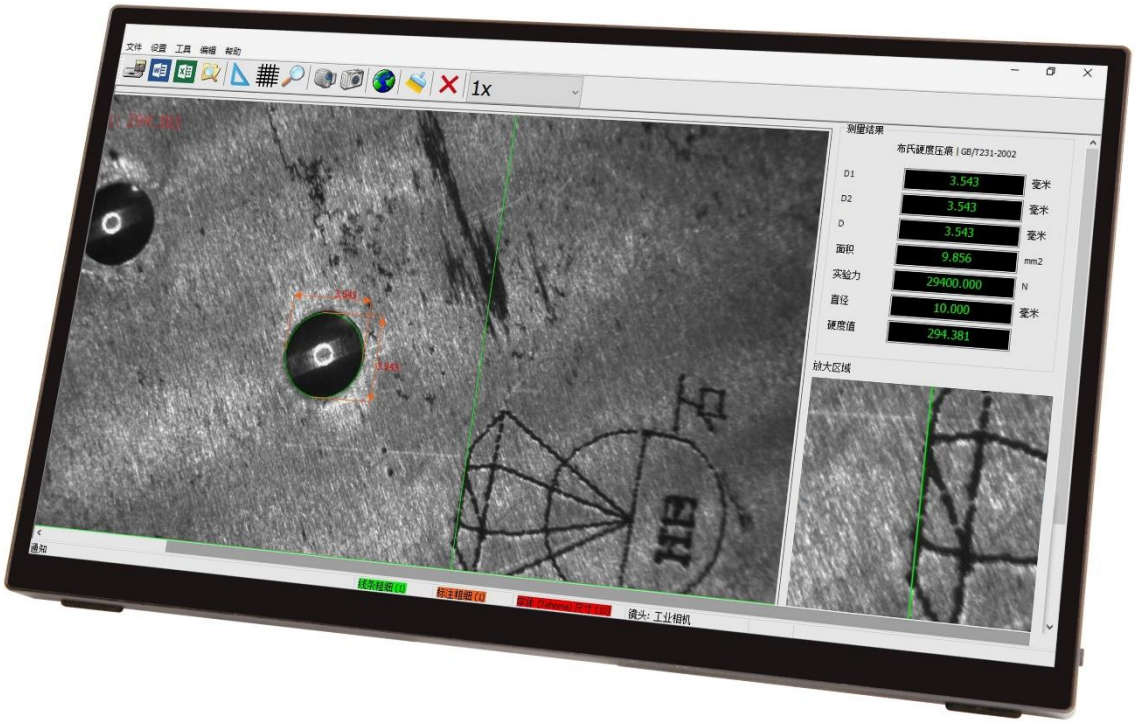


Figure 16 CamPI and Hardness Tester

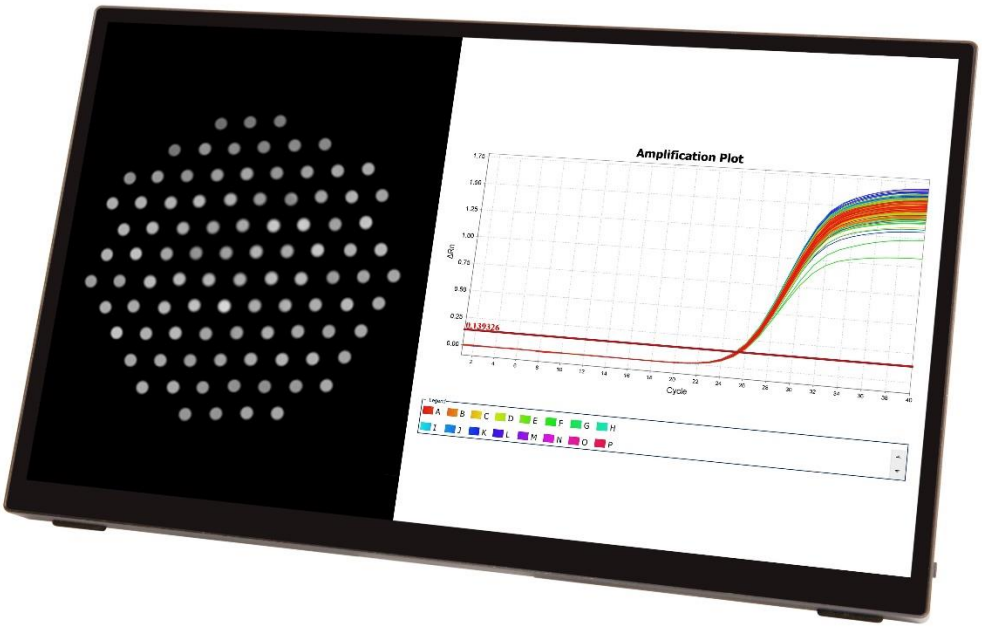


Figure 17 CamPI and PCR instrument

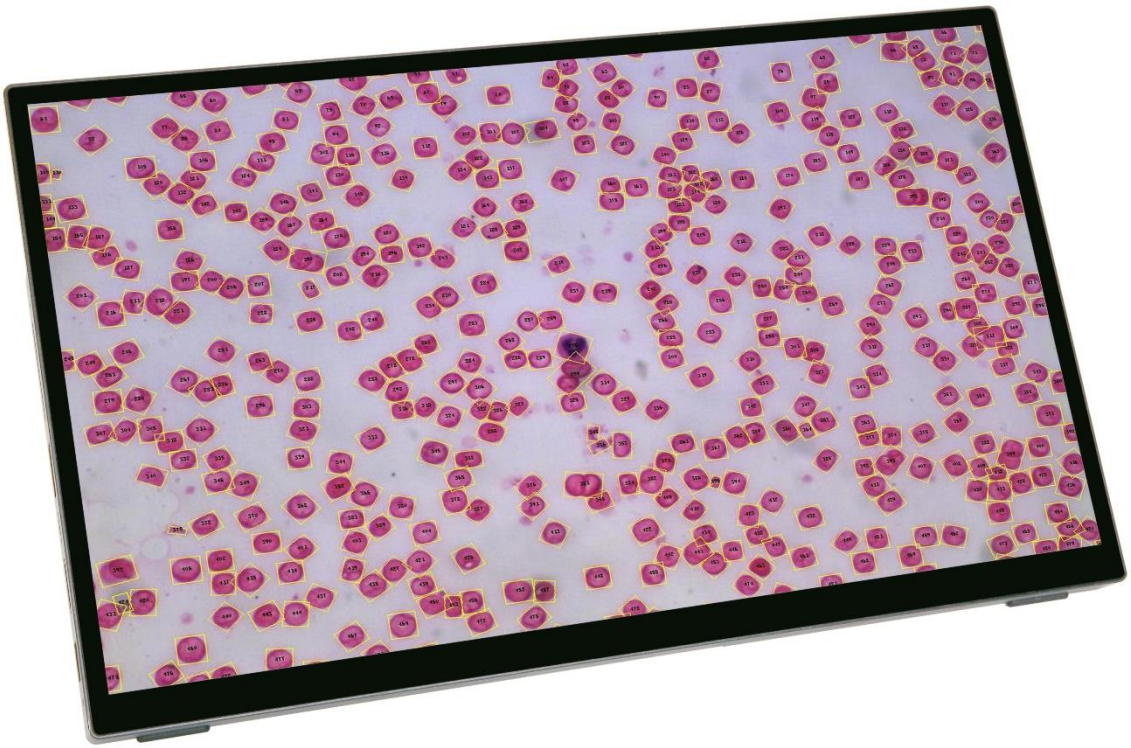


Figure 18 CamPI and Cell Counter

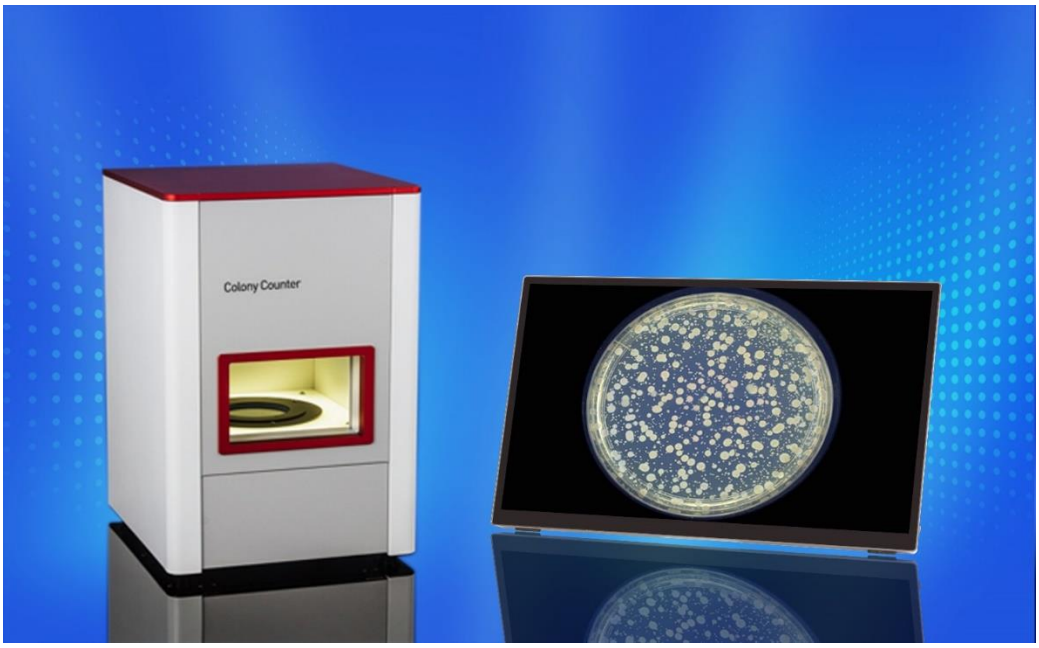


Figure 19 CamPI and Colony Counter

4 Packing Information

Standard Packing List	
A	A set of CamPI camera intelligent control platform
B	One HCMOS series camera
C	One HDMI cable

5 Introduction to CamView's Functions

CamView is the standard software for HCMOS series camera run on the CamPI camera intelligent control platform, which mainly realizes the control of the camera, the capture of images or videos, and the processing of imaeg or video.

The main interface of CamView includes the camera function control group dial in the lower right corner, the camera function shortcut control toolbar on the left, the browsing button in the upper right corner and the camera status bar in the lower left corner. The details are shown in Figure 20.

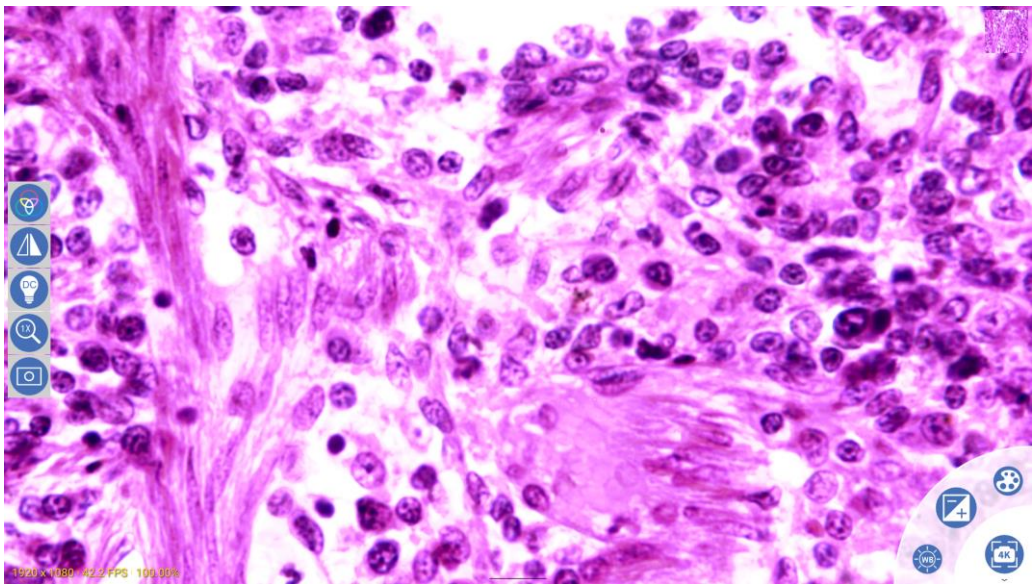


Figure 20 CamView Main UI

5.1 CamView Gestures

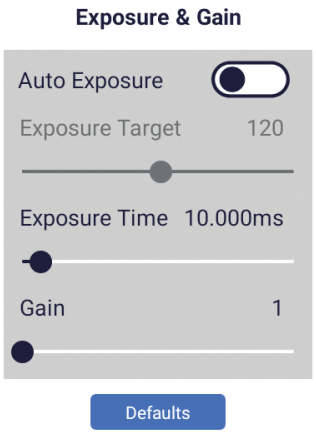
Gestures	Descriptions
Single finger tap	Tap on the outside area of the auto exposure rectangular or white balance rectangular with one finger on the screen to hide/display the camera function shortcut control tool bar and camera function control group dial; Tap on the area of the auto-exposure rectangle or white balance rectangle with one finger on the screen to select the auto-exposure rectangle or white balance rectangle.
Single finger movement	Move one finger within the auto exposure rectangle or white balance rectangle on the screen to move the position of the auto exposure rectangle or white balance rectangle; Move one finger on the control point of the auto exposure rectangle or white balance rectangle on the screen to modify the size of the rectangle to which the current control point belongs; Move one finger on the outside area of the auto exposure rectangular or white balance rectangular on the screen. If the preview image/video is already enlarged, you can control the display area of the enlarged preview image/video.

Single finger double tap	Double-tap on the preview image/video with one finger to restore the enlarged preview image to its original size.
Two-finger pinch/spread	Pinch/spread two fingers on the preview image/video to zoom out/enlarge the preview image.
Two finger tap	In the auto exposure or white balance adjustment state, double-finger tap on the preview image/video to move the auto exposure or white balance rectangle to the two-finger tap position.

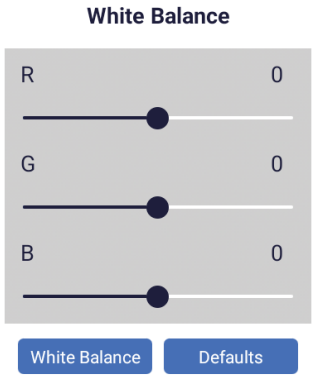
5.2 Camera Function Control Group Dial

Icon	Function Description
	**Exposure and gain control group button** Tap to control the hiding/display of the exposure and gain control panel.
	**White balance control group button** Tap to control the hiding/display of the white balance control panel.
	**Color adjustment control group button** Tap to control the hiding and showing of the color adjustments control group panel.
	**Sharpening and denoising control group button** Tap to control the hiding/display of the sharpening and denoising control panel.
	**Regular capture button** Tap to complete image capture with the currently set camera mode; Long press, the icon will switch to the 4K capture button icon; Swipe down with one finger on the icon, and the icon will switch to the start recording button icon.
	**4K capture button** Tap to complete the shooting of 4K images with the currently set camera mode; Long press, the icon will switch to the normal shooting button icon; Swipe down with one finger on the icon, and the icon will switch to the start recording button icon.
	**Start recording button** Tap to start recording preview video; Swipe down on the icon with one finger, and the icon will switch to the normal shooting button or 4K shooting button icon.
	**Stop recording/capture button** Tap to stop recording video/stop the current continuous shooting/timing/time-lapse plan.

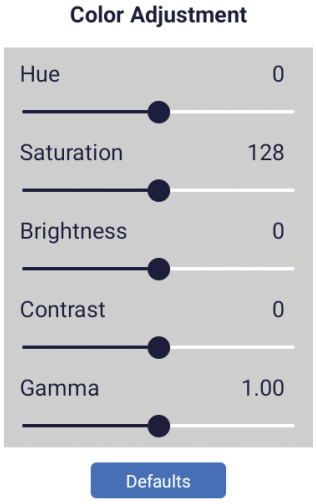
5.2.1 Exposure and Gain Control Panel

Exposure and Gain Control Panel	Function	Function Description
	Auto exposure	Select auto exposure, the system will automatically adjust the exposure time and gain according to the exposure target and the image data at the position of the current auto exposure rectangle to achieve the appropriate image brightness.
	Exposure target	It is valid during auto exposure, dragging the slider left and right will perform exposure compensation according to the current image brightness to achieve a suitable image brightness.
	Exposure time	It is valid when auto exposure is not selected, drag the slider left or right to decrease or increase the exposure time to reduce or increase the image brightness.
	Gain	Drag the slider left or right to decrease or increase the gain to decrease or increase image brightness.
	Defaults	Restores exposure target, exposure time and gain to factory defaults.

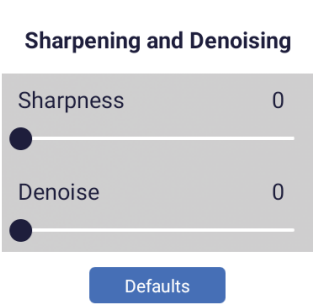
5.2.2 White Balance Control Panel

White Balance Control Panel	Function	Function Description
	Red	Drag the slider left or right to decrease or increase the red component in the image.
	Green	Drag the slider left or right to decrease or increase the amount of green in the image.
	Blue	Drag the slider left or right to decrease or increase the blue component in the image.
	White Balance	Using the image data at the position of the current white balance rectangle as a reference, a white balance calculation is automatically completed, and the red, green and blue components are updated.
	Defaults	Restores red, green and blue components to factory defaults.

5.2.3 Color Adjustment Control Panel

Color Adjustment Control Panel	Function	Function Description
	Hue	Drag the slider left or right to decrease or increase the tone of the image.
	Saturation	Drag the slider left or right to desaturate or increase the saturation of the image.
	Brightness	Drag the slider left or right to decrease or increase the brightness of the image.
	Contrast	Drag the slider left or right to decrease or increase the contrast of the image.
	Gamma	Drag the slider left or right to decrease or increase the gamma of the image.
	Defaults	Restores Hue, Saturation, Brightness, Contrast, and Gamma to factory defaults.

5.2.4 Sharpening and Denoising Control Panel

Sharpening and Denoising Control Panel	Function	Function Description
	Sharpness	Drag the slider left or right to decrease or increase the sharpness of the image.
	Denoise	Drag the slider left or right to decrease or increase the denoising strength of the image.
	Defaults	Restores sharpness and denoising to factory defaults.

5.3 Camera Function Shortcut Control Toolbar

Icon	Function

	**Color mode button** Tap to pop up the color mode options.
	**Color mode button** Tap to set the camera to work in color mode.
	**Monochrome mode button** Tap to set the camera to work in monochrome mode.
	**Flip button** Tap to pop up horizontal flip and vertical flip options.
	**Horizontal flip button** Tap to enable horizontal flipping of the camera image/video.
	**Vertical flip button** Tap to enable vertical flipping of the camera image/video.
	**Light source frequency button** Tap to pop up the light source frequency options.
	**DC button** Tap to set the light source frequency to DC.
	**AC 50Hz button** Tap to set the light source frequency to AC 50Hz.
	**AC 60Hz button** Tap to set the light source frequency to AC 60Hz.
	**Magnification button** Tap to pop up the magnification option.
	**Zoom 1x button** Tap to set the zoom ratio of the current view to 1 times
	**Zoom 2x button** Tap to set the zoom ratio of the current view to 2 times.
	**Zoom 4x button** Tap to set the zoom ratio of the current view to 4 times.
	**Zoom 5x button** Tap to set the zoom ratio of the current view to 5 times.
	**Zoom 10x button** Tap to set the zoom ratio of the current view to 10 times.
	**Adapt to the screen zoom button** Tap to calculate and set the zoom ratio to fit the screen according to the image/video and screen size.
	**Camera mode button** Tap to pop up the photo mode options.
	**Single button** Tap to set the capture mode to single mode. *Note:* When in single capture mode, tap the capture button to take an image instantly.
	Burst button Tap to set the camera mode as continuous shooting mode; Long press to set the number of continuous shots.

	Note: When in the continuous shooting mode, tap the shooting button to start shooting and storing images one by one according to the set number of continuous shooting.
	**Timer button** Tap to set the capture mode as timing mode; Long press to set the timing cycle seconds. *Note:* When in the timing photo mode, tap the shooting button to start taking an image every set time.
	**Delay button** Tap to set the capture mode as time-lapse mode; Long press to set the delay in seconds. *Note:* When in the time-lapse photo mode, tap the capture button to take an image immediately after the set delay time is reached.

5.4 Gallery Browsing Page

Browse button is displayed on the upper right corner of the screen for browsing and managing captured image or videos.

Icon	Function
	**Back button** Tap to return to the previous page.
	**Select button** Tap to switch the gallery browsing page to the picture/video selection page.
	**Select all button** Tap to select all images/videos in the gallery.
	**Deselect all button** Tap to deselect all images/videos in the gallery.
	**Information button** Tap to display the detailed information of the current preview image/video.
	**Export button** Tap to export the selected images/videos to an external USB flash drive.
	**Share button** Tap to share selected images/videos to third-party applications. *The function is not yet available.*
	**Delete button** Tap to delete the selected images/videos.
	**Play button** Tap to start playback of the video.
	**Pause button** Tap to pause playback of the video.
	**Stop button** Tap to stop playback of the video.

6 ToupTek®-- Contact Information

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