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A camera that can shoot 360-degree spherical images in a single shot
“RICOH THETA V”

The series high-end model achieving 360-degree 4K video and spatial audio recording

Ricoh Company, Ltd.
Ricoh Imaging Company, Ltd.

TOKYO, August 31, 2017 — RICOH COMPANY, LTD and RICOH IMAGING COMPANY, LTD. announced today the launch of the “RICOH THETA V”, which supports features that include 360-degree 4K video capture, immersive spatial audio recording, and high-speed transfer as a high-end model of the 360-degree “RICOH THETA” camera series.

Since the RICOH THETA was first launched on the market in 2013 as the world’s first 360-degree single shot camera^{*1}, it has been used in a variety of visual fields as an exceptional imaging tool, with fully spherical images creating unique, completely unexpected visual expression. This 360-degree visual space, which exceeds the conventional concepts of photography, referred to as shooting composition enables people to capture images of 360-degree atmosphere with them in the shot so that others can experience the same atmosphere later in the future and also family and friends who are far away can experience it as though they were actually with the person in that place. Furthermore, due to the rapid growth of the virtual reality (VR) market, the expansion of social media sites that support 360-degree image, and the increase in the need for 360-degree image in the business market, the demand for 360-degree spherical image capturing devices is expected to grow further in the near future.

The “RICOH THETA V” is designed based on the concept of being compact, lightweight and easy to carry around anywhere. Furthermore, it achieves high-speed transfer that can comfortably process large volumes of data, high sound quality recording compatible with 360° spatial audio, and shoot 360-degree 4K video. The camera can connect to a mobile device using either Bluetooth or wireless LAN to allow for flexible operation based on user preferences. In addition, this product has a highly expandable operating system so that it can receive future performance enhancements through firmware updates after it has launched, which results in a fitting high-end model camera.

This product is first introduced at “IFA 2017”, the world’s largest consumer electronics show, held in Berlin, Germany from September 1st – 6th, 2017.

*1. As a mass-produced consumer product capable of capturing the scene around, above and below the device in a fully spherical image (as of October, 2013, based on Ricoh research).

<Main Features of the new RICOH THETA V>

1. High-resolution 360-degree spherical still images and video

- Both the image quality of still images and video have been significantly improved and power consumption has been reduced by adopting a new image sensor that supports high-speed shot image data readout and the Qualcomm® Connected Camera Platform with a Qualcomm® Snapdragon™ processor. Furthermore, we have completely changed the exposure accuracy and white balance algorithm by combining image processing technology cultivated through the development of high performance cameras that include Ricoh’s digital SLR camera and GR. We have also performed tuning to obtain accurate and natural portrayal of high-definition 360-degree spherical images with an approximately 14.0 effective megapixel output for still images even when using auto shoot.

Users can directly post 360-degree spherical images shot using the camera to Facebook and LINE, or upload them to the theta360.com dedicated website and share them on social networks such as Twitter and Tumblr. Unique cropped image can also be shared on Instagram. It is also possible to submit captured spherical videos to YouTube™ 360-degree channel and images to Google Maps™.

2. 4K compatible high resolution 360-degree video

•The camera can shoot high-definition smooth 360-degree video at 30 frames per second at a resolution of 3840 x 1920 pixels, which is equivalent to 4K. Users can enjoy greater realism by creating immersive VR video content and watching video on a large screen. In addition to supporting the H.264 file format for video recording, the more recent video compression standard of H.265^{*2} is also supported.

*2. The dedicated app only supports H.264. H.265 is a specification supported in anticipation of future applications based on the API release.

3. 360-degree spatial audio recording that reproduces overwhelming realism

The camera has a 4-channel microphone that supports 360-degree spatial audio recording built into its body. Recording omnidirectional audio including, not just in the horizontal direction but also in the vertical direction, makes it possible to reproduce sound and video as it was in the environment where the video was shot by linking 360-degree video and audio together. Furthermore, using the dedicated accessory “3D Microphone TA-1” (optional)^{*3} scheduled for launch at the same time will allow users to pick up natural sound with a large volume of information at low to high frequency.

*3. “3D Microphone TA-1” is equipped with a microphone unit developed by Audio-Technica Corporation.

4. High-speed data transfer

The communication speed is now up to around 2.5 times faster^{*4} than conventional models, which was achieved by improving the wireless communication module and increasing the data processing speed. Large volume of image data that accompanies the change to higher resolutions can also be comfortably transferred and browsed.

*4. Actual value when compared to “RICOH THETA S” using data of the same size. Based on Ricoh testing.

5. The World’s-first^{*5}, “Remote Playback” to enjoy 360-degree image on a large screen monitor

“Remote Playback” for 360-degree video is installed as a plug-in. Using a general-purpose receiver equipment^{*6} such as a compatible wireless display adapters it is possible to mirror playback of 360-degree still images and video data stored on the camera. This allows users to enjoy powerful 360-degree video on large displays or over projectors by operating the camera.

*5. As a commercially marketed, fully spherical camera. Based on RICOH research.

*6. Please check the Ricoh website for equipment that have been confirmed to operate with this feature.

6. Bluetooth and wireless LAN dual communication

The camera can always be connected to a smartphone using Bluetooth low energy. Image can be shot from a smartphone while connected only using Bluetooth low energy, and the power of the camera can be turned on from the basic application when it enters sleep mode. This function provides improvements in usability. With wireless LAN connection, all functions such as live-view display on a smartphone and image transfer can be used. User can select either Bluetooth or wireless LAN connection as needed depending on the shooting scene.

7. Functions can be added using plug-ins

Using the Android base operating system achieves excellent extensibility with a high degree of freedom. Adopting various plug-ins such as “external memory recording” that are under development, including the newly added “Remote Playback” feature, means that it is possible in the near future to use the camera in a variety of ways such as being able to switch over and

use a variety of expanded functions from a smartphone application. An environment that can add and use plug-ins released by general developers is also planned for the future.

8. Scheduled future updates using function expansions

The camera has high extensibility that enables regular performance enhancements using firmware updates for the application.

[Update functions currently being developed and scheduled for release in 2017]

- A function that significantly speeds up the transfer speed by performing a composite process for 360-degree video shot in a camera fixed in position within the camera first and not during the time of transfer
- A client mode that allows the camera to operate as a client and simultaneously connect to the Internet over a wireless LAN router environment

9. Support for 4K 360-degree live streaming output

Real time output of high resolution 360-degree spherical image equivalent to 4K is supported. It is possible to share the atmosphere as though you are actually at the shooting location by viewing live streamed^{*7} 360-degree spherical image over the Internet.

*7: Requires a computer with high performance image processing and a high speed communication environment to transmit.

10. Other features

- Can shoot using an ultra-high shutter speed of up to 1/25000 seconds
- Supports high sensitivity shooting at ISO3200 (using manual mode with still image)
- Internal large capacity memory of approximately 19 GB which can shoot around 4,800 still images
- THETA+ application can be used to edit still images and export image data files for printing
- THETA+ Video application is a specialized smartphone app for editing 360 degree videos taken with the RICOH THETA
- Improved accuracy for top/bottom correction processing using a combination of a newly equipped gyro sensor and internal acceleration sensor
- The minimum interval with interval shooting has been reduced which enables shooting at an interval of 4 seconds, approximately half the time of conventional models
- Using an underwater housing (optional), 360-degree underwater shooting can be done up to a depth of 30 meters

[Quotations]

Qualcomm Technologies, Inc., Raj Talluri, Senior Vice President, Product Management

"Qualcomm Technologies is empowering a comprehensive 360/VR ecosystem from our connected camera platforms to VR HMDs, aiming to allow manufacturers to deliver solutions for content creation, communication, and consumption," said Raj Talluri, Senior Vice President, Product Management, Qualcomm Technologies, Inc. "With the launch of the RICOH THETA V 360 camera, built on the Qualcomm Connected Camera Platform, we are very excited to bring superior connectivity and powerful compute capabilities to the 360 camera industry which we believe will be an important content generator for VR."

Google Street View, Charles Armstrong, Product Manager

"The Ricoh Theta V is the first *Street View mobile ready* camera to be certified by Google. This distinction means that Theta V owners will be the first to experience the all-new auto mode which allows you to create Street View imagery while you walk, bike or even drive—a huge improvement over having to photograph and connect individual 360 photos." Says Charles Armstrong, product manager for Google Street View: "The Ricoh Theta line of 360 cameras have

consistently set the bar for combining quality, convenience, and affordability in a single product. We're excited to offer our avid contributor community such a powerful new option for Street View authoring." In addition to the new Theta V certification, Ricoh's existing Theta S and SC cameras have also gained new distinction: the Theta S and SC have now been certified as *Street View workflow ready* for their abilities to shoot individual 360 photos and publish them to Street View. "

[Optional accessories]

"3D Microphone TA-1"

- A "RICOH THETA V" dedicated 3D microphone. Equipped with a microphone unit developed by Audio-Technica Corporation, a company recognized for its high technological strength and reliability. The microphone can pick up deep sounds at middle to low frequency due to the directional microphone with a large aperture at approximately 10 mm, compared to built-in microphones. This makes it suitable for shooting musical performances. Also, attaching the included wind screen to the microphone allows video to be shot with reduced wind noise when outdoors.
- Accessories: Wind screen and pouch
- Body color: Black

"Underwater case TW-1"

- An underwater housing that is waterproof up to a depth of 30 meters (equivalent to JIS Class 8 waterproof standard) to achieve 360-degree underwater shooting.
- Supports the 3 camera types: RICOH THETA V, SC and S
- Has a hard coating and Anti-Reflection coating on the surface of the case which is scratch resistant and stops reflections.
- Equipped with a tripod socket to allow installation on various camera accessories.
- Accessories: Carry case, strap, silicon frame (for installing on THETA S)
- Compatible models: "RICOH THETA V, THETA SC and THETA S"

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| **About Ricoh** |

Ricoh is empowering digital workplaces using innovative technologies and services enabling individuals to work smarter. For more than 80 years, Ricoh has been driving innovation and is a leading provider of document management solutions, IT services, commercial and industrial printing, digital cameras, and industrial systems.

Headquartered in Tokyo, Ricoh Group operates in approximately 200 countries and regions. In the financial year ended March 2017, Ricoh Group had worldwide sales of 2,028 billion yen (approx. 18.2 billion USD).

For further information, please visit www.ricoh.com

| **About Ricoh IMAGING EUROPE S.A.S.** |

RICOH IMAGING EUROPE S.A.S. is the leading supplier of recreational and professional imaging equipment, with a long standing brand heritage in both Pentax and Ricoh branded products. Its product range is extensive and includes state of the art digital SLR, covering a large spectrum of interchangeable lens systems such a medium format, full frame and APS-C sensor sizes. In addition, it supplies expert and outdoor compact cameras, high performance lenses and accessories as well as an extensive range of binoculars and spotting scopes, suitable for a variety of activities. In September 2013, Ricoh announced the first mass-produced imaging device that encapsulates fully spherical scenes, the RICOH THETA and thereby becoming a pioneer in the manufacturing of 360° imaging devices.

The company traces its roots to 1919, when as Asahi Optical Joint Stock Co., it was established in the Nishi-Sugamo district of Tokyo to manufacture lenses for eyeglasses. In 1938, the company expanded its portfolio of products and services to include lens design, photographic lenses and binoculars under the name of Asahi Optical CO. LTD., and eventually was renamed again as PENTAX in 2002. Six years later, the company integrated with optical glass manufacturer HOYA CORPORATION. On October 1st, 2011, the company became a 100% subsidiary of Ricoh Company, Ltd. and operates as Ricoh Imaging Company, Ltd. as of August 1, 2013.

For further information, please visit: www.ricoh-imaging.eu

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