フラッグシップフルサイズミラーレスカメラ「ニコン Z 9」の開発

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Development of Flagship Full-Size Mirrorless Camera with Interchangeable Lenses: Nikon Z 9

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ニコンの最先端技術を結集させ，静止画・動画ともにニコン史上最高の機能・性能を備えた「ニコン Z マウント」を採用した初のフラッグシップモデルとなるフルサイズ（ニコン FX フォーマット）ミラーレスカメラ「ニコン　Z 9」を2021年12月に発売した．ここでは，Z 9 の様々な開発要素について説明する．

In December, 2021, we launched the sales of the full-frame (Nikon FX-format) mirrorless camera Nikon Z 9. The Z 9 is the first flagship model of the Z series mirrorless cameras, combining Nikon's leading-edge technologies to deliver the best still and video features and performance in Nikon's history. Here, we explain the various development elements of the Z 9.

Key words レンズ交換式，ミラーレスカメラ
interchangeable lenses, mirrorless camera

1 Introduction

In December 2021, Nikon released its first flagship model, the Nikon Z 9, an FX-format mirrorless camera. This paper describes the various development elements of the Z 9.

Fig. 1　Nikon Z 9

2 AF and Continuous Shooting Performance

High-performance autofocus (AF) is supported by three technologies. They are Nikon's first AF calculations at the high speed of 120/s, superior subject detection developed using deep learning technology, and high-speed AF information communication unique to the Z-mount. The combination of these technologies enables high-dimensional AF tracking performance that accurately captures randomly moving subjects even during high-speed continuous shooting. Accurate AF calculations at the high speed of 120/s are achieved by the combination of high-speed readout by the new CMOS sensor and high-speed processing by EXPEED 7. Through an algorithm developed using deep learning technology, nine types of subjects can be detected: people, dogs, cats, birds, cars, motorcycles, bicycles, trains, and airplanes. The person detection function detects smaller pupils than before and can even detect them through goggles or sunglasses, or when the face is upside down. Highly accurate AF is achieved by transmitting distance information between the camera body and the lens in each frame. In addition, the CFexpress Type B high-speed writing enables continuous shooting of over 1000 frames at approximately 20 fps in JPEG FINE (L) or high-efficiency RAW setting. Combined with the AF performance, it is possible to shoot continuously for extended periods without concern for the buffer.

Fig. 2　Detectable subject images

3 Electronic Viewfinder

The Real-Live Viewfinder and Quad-VGA panel supporting a high brightness of 3000 cd/m^2 represent a major evolution from the conventional electronic viewfinder. The Real-Live Viewfinder displays all the moments that were previously lost with a conventional electronic viewfinder or with an SLR camera owing to the loss of image caused by mirror lock-up. Unlike conventional blackout-free shooting, which displays the same image to prevent the loss of viewfinder image, the actual movement of the subject is always displayed as it is. Nikon's newly developed Dual Stream technology enables the simultaneous processing of still image data for recording on a memory card and live-view data for display on the electronic viewfinder and image monitor. This has enabled processing specialized to live-view, which makes it possible for the Real-Live Viewfinder to allow the user to view every moment. The newly equipped Quad-VGA panel, which can adjust brightness up to 3000 cd/m^2, enables clear confirmation of subjects even in bright surroundings where it was previously difficult to view the details of subjects. The subject is visible even in very bright scenes, such as a midsummer beach or a sunny snowfield.

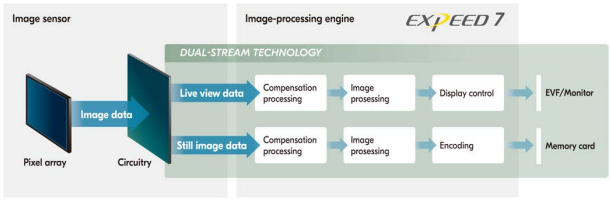

Fig. 3　Mechanism of Real-Live Viewfinder

4 Video

The heat dissipation path from the heat source to the exterior cover has been optimized, and the front and rear covers are integrated with the bottom cover to reduce parting lines and improve heat transfer efficiency, enabling the recording of approximately 125 min of 8K UHD/30p video on a memory card in the camera body without forced air cooling. Combined with an S-Line NIKKOR Z lens, which has excellent resolving power, this setup delivers a high descriptive performance to every corner of the image. Moreover, 4K UHD/120p/60p/30p is supported to meet the diverse video production needs of video creators. The Z 9 can shoot 4K UHD/120p video without screen cropping, allowing video editing with the same angle of view even if the video is shot at different frame rates. The camera supports 12-bit RAW video including over 8K/60p that exceeds high-resolution 4K UHD/60p given by 8K oversampling. Nikon's original 10-bit N-Log, Hybrid Log-Gamma (HLG), and N-RAW recording are also supported. The ProRes 422 HQ recording format is supported to meet a wide range of video production needs. In addition, the detection of nine types of subjects is supported in movie recording.

Fig. 4　Internal recording of 8K UHD/30p, 4K UHD video supported

5 High Image Quality

The Nikon Z 9 is equipped with a stacked CMOS image sensor with an effective 45.71 MP. The standard sensitivity is ISO 64 to 25600 and it can also be set to 1 EV (equivalent to ISO 32) below ISO 64 and to 2 EV (equivalent to ISO 102400) above ISO 25600. Auto ISO sensitivity control is also available. At high sensitivity, noise is processed at different

Fig. 5　Stacked Nikon FX format CMOS sensor

intensities for flat areas, such as a night sky, and for details, such as illuminated buildings, effectively reducing the rough noise that tends to occur in areas of night sky while maintaining the high resolution of fine details.

6 Design

The design of the Nikon Z 9 was the culmination of the pursuit of ease of use and high reliability as a tool for professional photographers who cannot afford mistakes when shooting. The integrated vertical grip ensures comfortable operation in both horizontal and vertical positions, and high reliability is achieved by improving the strength and rigidity of the body. The Z 9 has been designed so that professionals would find it easy to use. Several buttons with customizable settings have been added.

Menus with deep hierarchies tire professional users with repeated button presses because they take several pictures in a day. In such cases, the more buttons with a direct operation, the more the load on the photographer can be reduced. While meeting these needs, the Nikon Z 9 is approximately 20% lower in volume than the D6.

Fig. 6 Nikon Z 9, which is approximately 20% lower in volume than the D6

7 Operability and Reliability

The Z 9 is the first Nikon camera with a four-axis tilt image monitor, which provides high operability when shooting from high or low angles in either portrait or landscape mode. When shooting in the portrait mode, the still image live-view user interface automatically switches to the portrait mode, making it easy to check the display and operate the monitor. The buttons necessary for menu settings and image confirmation are illuminated, allowing operation in the dark as smoothly as in daylight. Reliability is ensured by the high scan rate, which suppresses rolling shutter distortion and eliminates the need for a mechanical shutter. This enables a large number of photos to be taken freely, without worrying about durability or the risk of malfunction, and eliminates dust from shutter wear. The optical filter in front of the image sensor is double coated, with a conductive coating to reduce dust adhesion and a fluorine coating to facilitate wiping off dust that does adhere. In addition, the Nikon Z 9 is equipped with a sensor shield that can be closed when it is turned off, preventing dust adhesion when changing lenses, and also preventing fingers from coming into contact with it. The top, front, and rear covers are made of a magnesium alloy, achieving Nikon's best-in-class robustness equivalent to that of the D6 and high dustproof and splash-proof performance. A review of the component parts reveals cold resistance that enables operation even at minus 10°C.

Fig. 7.1 Nikon's first four-axis tiltable image monitor with a high degree of angle freedom

Fig. 7.2 Body incorporating magnesium alloy

8 Summary

The Nikon Z 9 is Nikon's flagship mirrorless camera that incorporates all of Nikon's current technologies for both still and moving images, making it the perfect camera for professional photographers who demand the best performance from their cameras in any situation or place, and at any time.

We have already received considerable feedback on how the Nikon Z 9 enables the shooting of subjects that was previously impossible for the user. Nikon will continue to produce products that meet and exceed user expectations, without being satisfied with the status quo.

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