# 1. Introduction

1.1 Overview

OTOS Co. Ltd manufactures two kinds of welding camera models for automatic or semi-automatic arc welding(robot or carriage welding). The first model's name is WGC200 and the second model's name is WGC400. These models differ only in the communication method, and all other specifications are almost same. These camera models are cameras that apply high dynamic range(HDR) technology, a technique that darkens extremely bright images and brightens dark areas around the arc in arc welding.

These camera models can capture much clearer images than other HDR cameras on the market. Most comparable HDR cameras on the market are equipped with auxiliary lighting and cooling systems, so they are heavier and larger than Autos' welding camera. Therefore, because Autos cameras are the smallest, they are almost unaffected by interference from JIGs in automatic arc welding. These cameras are used by attaching them to a torch mounted on a robot or carriage, or to a head to which a torch is attached. Most HDR cameras that can be compared are black and white cameras, while Autos' cameras are color cameras. The image resolution of comparable HDR cameras is 1440x1024 or lower. Autos' welding cameras can capture clearer images because they have Full HD resolution (1920x1080). Comparable HDR cameras do not allow users to adjust the images they capture. Autos' welding cameras provide users with the ability to easily adjust the image quality to their desired quality.
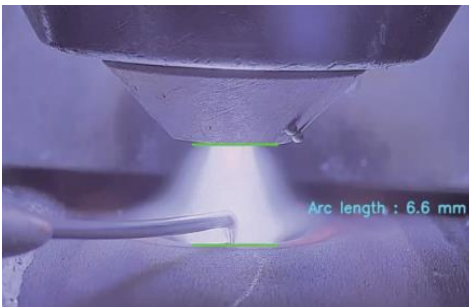
[FIG. 1.1.1] GTAW   [FIG. 1.1.2] PAW   [FIG. 1.1.3] GMAW

WGC200 uses HD-SDI communication method, and WGC400 can use both HD-SDI communication method and Wi-Fi communication method.

These cameras are equipped with image sensors that can control dynamic range. When the camera's shutter operates, three images with three different exposure time lengths are captured almost simultaneously. When compositing the three captured images, the bright part is taken from the image captured with a short exposure time, the image part with a medium bright area is taken

from the image captured with a medium exposure time, and the image part with a medium bright area is taken from the image captured with a long exposure time. This involves taking image parts in dark areas from an image and compositing them. Therefore, these cameras have ultra high dynamic range (U-HDR) characteristics of over 140 dB.

WGC200 (WGC400) can overcome very strong arc light and obtain clear images around the weld zone (melted zone). Therefore, it is possible to extract the width of the weld bead, the arc length, and the amount of error in the position between the electrode position and the welding seam from the real-time captured image.

WGC200 (WGC400) provides four types of focusing lenses (focal lengths of 8, 12, 16, and 32mm) to accommodate the user's shooting environment. Users can adjust the distance between the camera and the welding point and capture images of the field of view they want by installing an appropriate focusing lens.

[FIG. 1.1.4] WGC200   [FIG. 1.1.5] WGC400

1.2 Features of the WGC200 (WGC400) camera

WGC200 (WGC400) is a camera with the following features:

1.2.1 Image clarity
- Color camera with Full HD (1920×1080) resolution.
- 140+ dB U-HDR which composite 3 images captured at 3 different exposure times.

1.2.2 Various Field of View (FOV)
- Three types of imaging lenses with focal lengths of 8, 12, and 16mm are provided as standard.
- A lens with a specific focal length can be applied, allowing the user to acquire images of the desired FOV.

1.2.3 External transmission method of captured video

● If the PC's image grabber board or PC has an HD-SDI communication port, captured video can be transmitted directly to the PC.

● If your PC does not have an HD-SDI port, captured video can be transmitted to the PC through an **SDI to USB converter**.

● Captured video can be transmitted without loss even at a long distance (100m)

● If multiple cameras are used, captured video can be transmitted to a PC at the same time up to 4 channels using the **QVM converter**.

● **QVM converter** converts HD-SDI communication to HDMI, USB3 and GiGE communication.

1.2.4 Adjustment of video image quality

● If the image is captured upside down when the camera is mounted on the torch mount, the captured image can be flipped vertically.

● If the left and right sides of the captured image appear reversed, you can adjust the horizontally captured image to be reversed.

● Helps set the camera's shooting angle by displaying horizontal and vertical grid lines on the captured video image.

● The sensitivity of the **photo sensor** can be adjusted to recognize arc on/off.

● By adjusting the luminance of the captured video image, the overall image can be captured brightly or darkly to achieve the image quality desired by the user.

1.2.5 Auxiliary lighting

● Do not use any Auxiliary lighting.

● Capturing clear images with U-HDR control by using only arc light as a light source

● Since auxiliary lighting is not used, a cooling system is not required (camera miniaturization)

1.2.6 Application to arc welding process

● Securing durability against high voltage and high frequency generated from Gas Tungsten Arc Welding (GTAW) or Plasma Arc Welding (PAW)

● Automatic switching between arc on and arc off modes

● Can be mounted on a welding torch.

● Minimized interference from welding automation peripheral devices due to ultra-small size.

● Ease of installation using a dedicated camera mounting jig.

1.2.7 Extraction of real-time welding information from arc welding video

● Clear welding video images can be captured even in flux cored arc welding (FCAW), where a

large amount of fume is generated during welding.

● When using an appropriate image processing program based on a clear image of the weld periphery, the arc length, width of weld pool (width of bead), and the amount of error in the position between the electrode position and the welding seam can be extracted in real time.

● In GTAW or PAW, it is possible to control a constant arc length by using arc length information from video images rather than using voltage information to control the arc length.

● Since the melting amount can be recognized using bead width information, the welding speed of the carriage or robot or the current setting value of the welding power supply can be automatically adjusted to control the desired melting amount.

● If information such as bead width information, welding current, and welding speed is used, depth of weld or weld strength can be predicted through deep learning.

● It is possible to track the welding line of a carriage or robot using the positional error amount information between the position of the electrode and the welding seam. Therefore, welding defects do not occur fundamentally.

1.3 Benefits of WGC200 (WGC400)

1.3.1 Clear video image

The welding arc and its surroundings, which were too bright to be seen, can now be clearly seen.

● Real-time, high-quality visualization of the welding process

● All details can be seen clearly without being affected by the strong bright light generated during the welding process.

1.3.2 Welding process control in real time

It is easy to extract the information necessary for controlling the welding process from the captured clear

image using an image processing algorithm.

● It is easy to extract the information necessary for controlling the welding process from the captured clear image using an image processing algorithm.

● Seam tracking control is possible without using a laser vision sensor.

● Melting amount can be controlled using bead width information.

1.3.3 Management of welding phenomena (quality)

By storing the extracted images, information, and predicted quality on the server, you can quickly identify the cause and respond when a defect in welding quality occurs.

● Problems and defects in the welding process can be recognized from saved images.

● The gap, the position of the welding electrode, the balance of the melt pool, and the feeding

status of the welding wire can be checked.

● It is possible to document reports for quality assurance to customers.

1.3.4 Efficiency of production resources

It is possible to optimize and increase efficiency of various costs invested in the production of welded products.

● Saving time and resources (materials, work processes)

● Reduced costs of downtime or production loss due to defects and increased productivity

● Reduction of non-destructive testing costs through welding quality assurance

● Quick problem solving

1.4 Application areas of WGC200 (WGC400)

1.4.1 Real-time control/management field

1) Arc welding

● Automatic or semi-automatic Arc Welding (GTAW, GMAW, Plasma Arc Welding (PAW), Hardfacing or overlay welding) using robots and carriages.

● Laser welding

2) Additive manufacturing

● Laser additive manufacturing with wire

● Arc additive manufacturing

3) Metal melting

● Arc melting furnace

4) Coating

● Plasma coating

1.4.2 Welding education field

1) Arc welding

● With the saved video displayed on a large screen, it is possible to provide training for beginners or unskilled people on various welding condition settings, welding process, phenomenon, and precautions during the welding process.

● It is possible to educate the current welding operation process.

● It is possible to educate welding quality phenomena that occur when welding conditions change.

● Welder's certification training

2. Drawings of WGC200 & WGC400 welding cameras
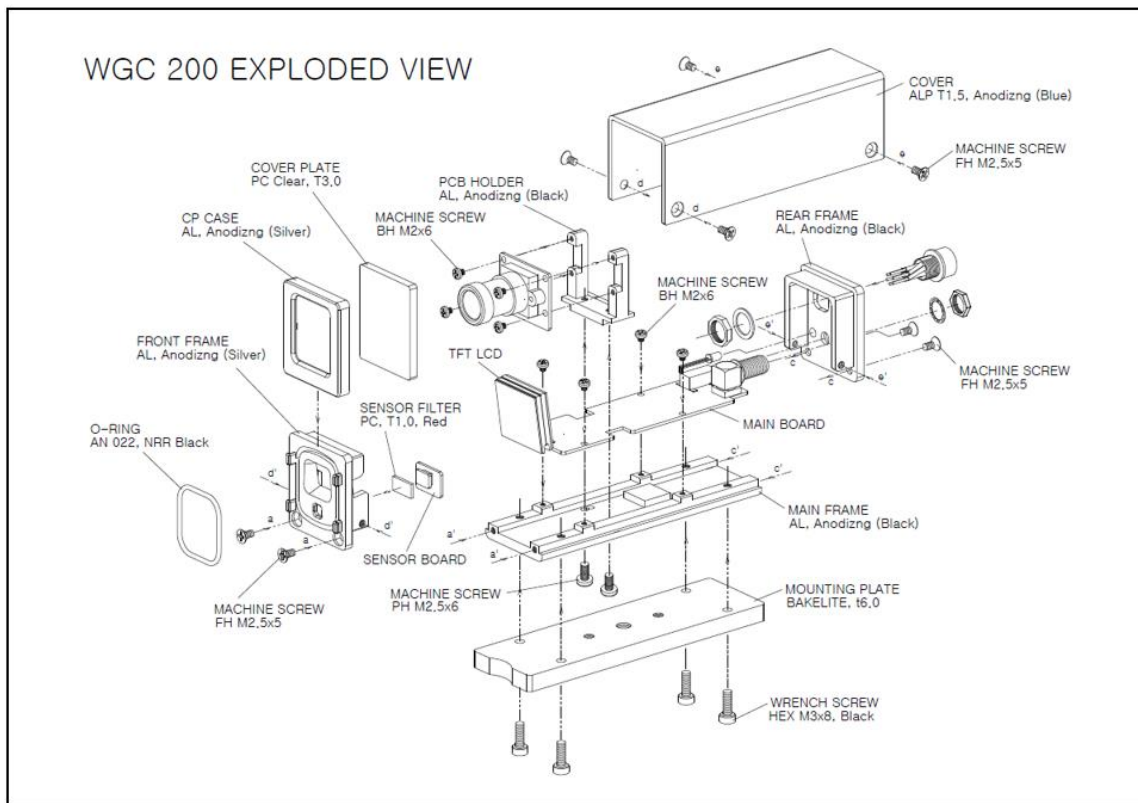
2.1 WGC200 & WGC400 mechanical Drawings
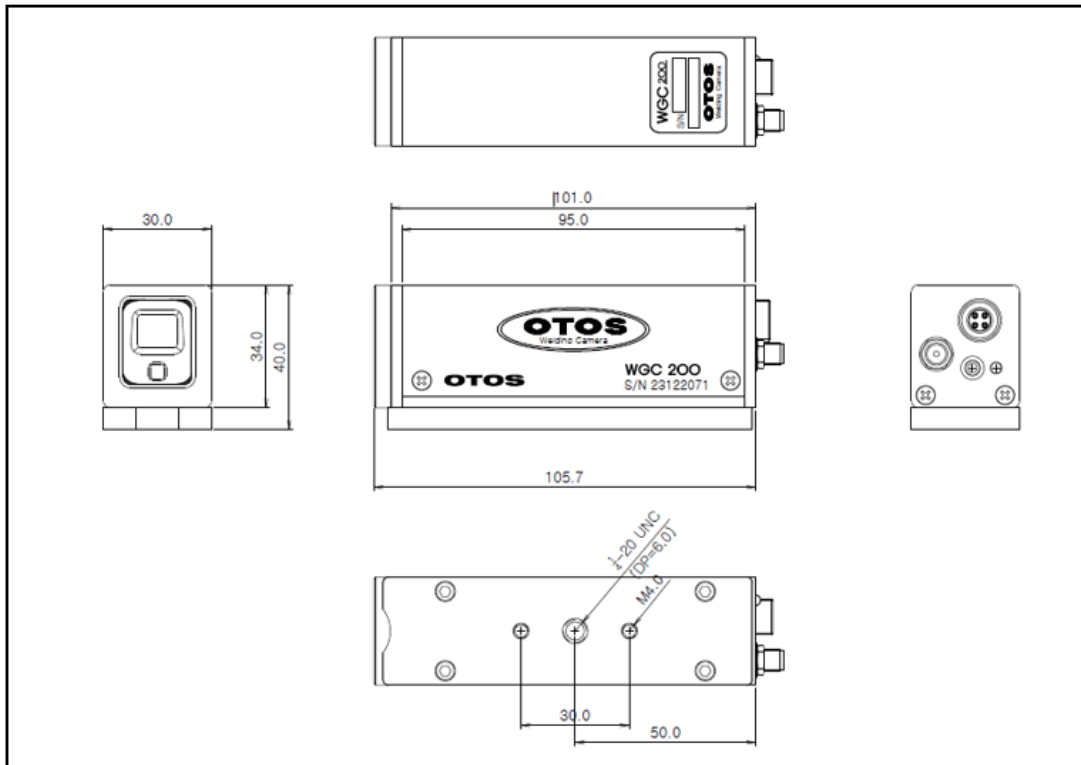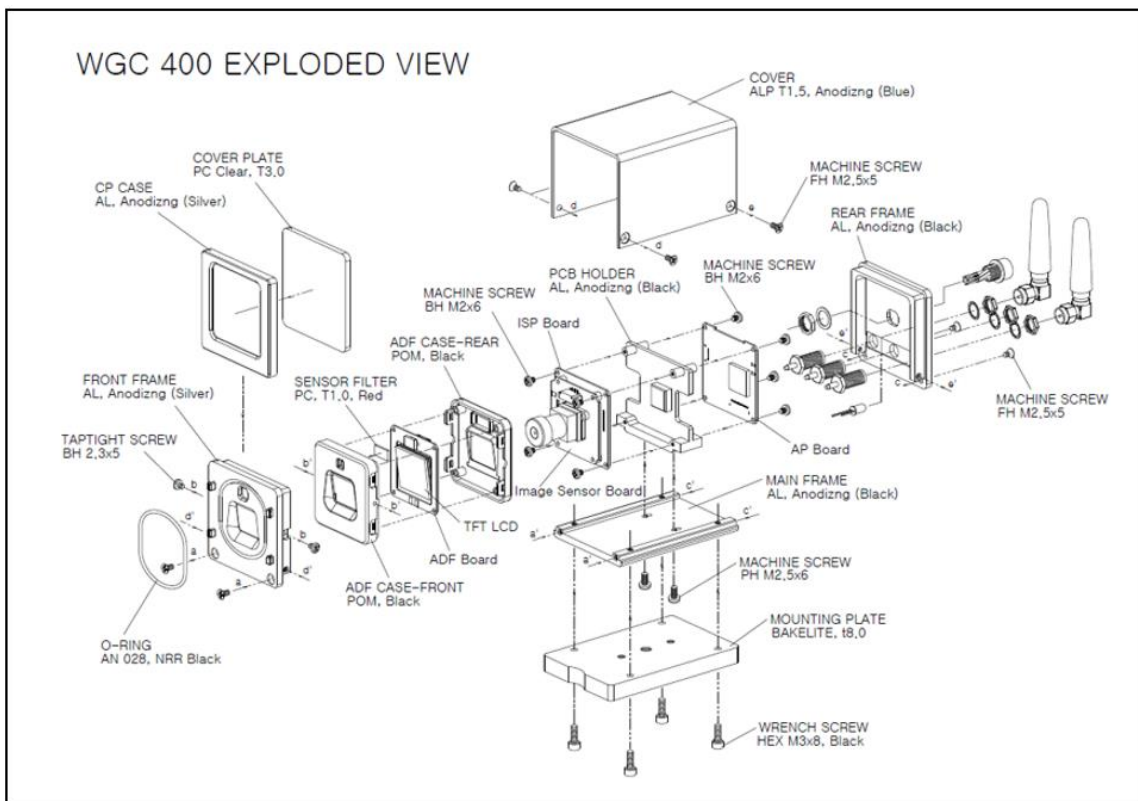

[FIG. 2.1.1] WGC200 Drawing
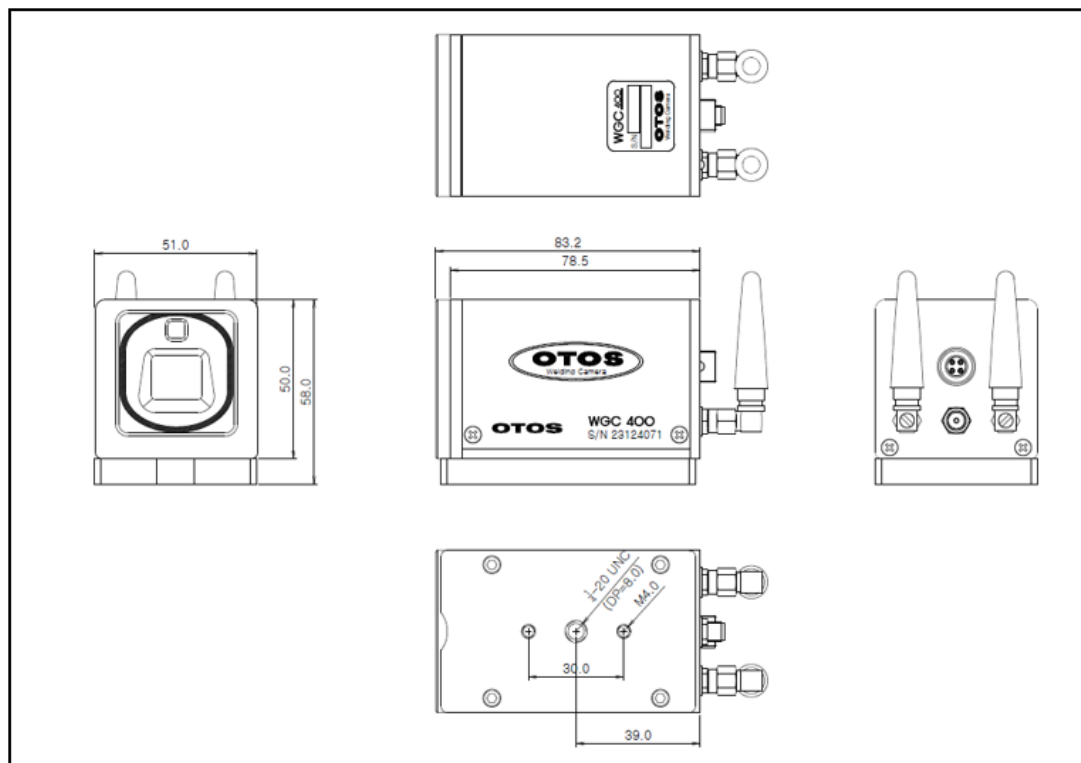
[FIG. 2.1.2] WGC400 Drawing

2.2 WGC200 and WGC400 assembly diagrams

[FIG. 2.2.1] WGC200 assembly diagram
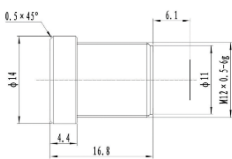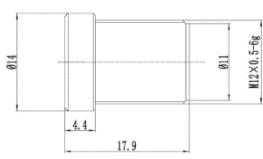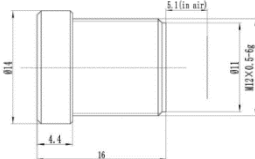

[FIG. 2.2.2] WGC400 assembly diagram

3. Specification of WGC200 & WGC400 welding cameras and lens

3.1 WGC200 & WGC400 Specification

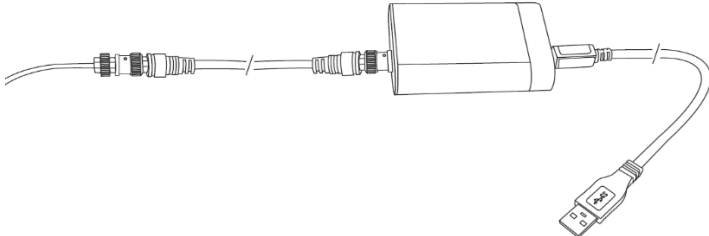| ITEM	WGC-200	WGC400
Dimension(mm)	30mm x 40mm x 104mm	51mm x 58mm x 83mm
Resolution	1920 x 1080(Full HD), Color	
Focus Type	Fixed focus	
Shutter Type	Electronic Rolling Shutter	
Lens Mount	M12 Mount	
Filter	UV + IR cut Filter (Internal)	
Dynamic Range	140+ dB	
Video output	HD-SDI	
External terminal	50Ω SMA Connector/ Power control: 4pin round screw connector	
Wireless	-	Wifi 802/.11ax
Operating Temp.	-10° ~ 60°	
Power Consumption	MAX 3W	
Power supply	9V 1A adapter	

3.2 Specifications of focus lens
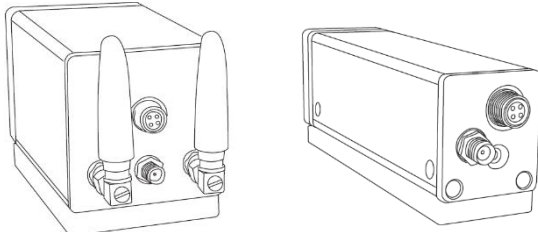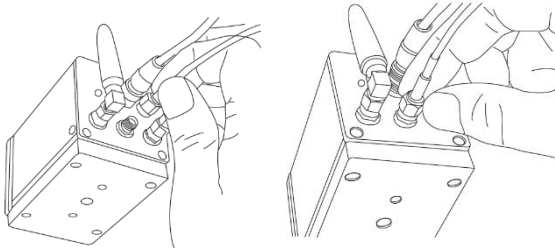
When you purchase a WGC200 or WGC400 welding camera, imaging lenses with focal lengths of 4, 8, and 12mm are provided as standard. When these lenses are installed, the field of view varies depending on the distance from the camera to the welding target as shown in the table below. The user must refer to the table below to select a lens with an appropriate focal length and determine the distance between the camera and the welding object.

Focal Length	8mm	12mm	16mm
MODEL			
Pixel	3MP	5MP	5MP

LENS FOV			
Focal length	Working Distance(mm)	Field of View (H x V) (mm)	pixel resolution(um)
8mm	200	139.2 x 78.3	72.5
	300	208.8 x 117.45	108.75
12mm	200	92.8 x 52.2	48.333
	300	139.2 x 78.3	72.5
16mm	200	69.6 x 39.15	36.25
	300	104.4 x 58.725	54.375

4. Interface between WGC cameras & External devices

4.1 Power supply connection

1) If the PC's image grabber board is equipped with an HD-SDI terminal, you can directly connect the camera and the image grabber board using an SDI cable.

2) If there is no PC image grabber board, at least one channel of **SDI to USB converter** must be used to transmit video signals between the PC and the camera. The output video signal from camera is transmitted to 1ch **SDI to USB converter** through SDI cable (SMA female). If user want to use long distance extension, user can use **SMA male to BNC extension cable**(Fig. 4.2.2).

3) If you want to use multiple cameras, you can use **QVM converter** with 4 channels. **QVM converter** can output HDMI, USB and GigE signals from HD-SDI signal.

1. Connect Power	2. SDI cable connection

3. Conversion from SDI to USB

4. Cable extension   SMA to BNC   BNC Cable(option)   USB convertor

[FIG. 4.1.1] External interface connection

4.2 Fine tuning focusing method of WGC camera

According to the distance between camera and arc, the image clarity may be changed. If you can not satisfy image quality, you can adjust focus as following procedures.

4.2.1 Procedures

1) Use a screwdriver to separate the camera cover case from the camera like Fig. 5.1.1.
2) Separate the camera cover from the camera as shown in Fig. 5.1.2.
3) On a camera with the cover removed, adjust the focus by rotating the lens by hand (clockwise/counterclockwise).

1. Case disassemble (remove bolt)	2. Case disassemble
3. Lens position	4. Focus adjustment
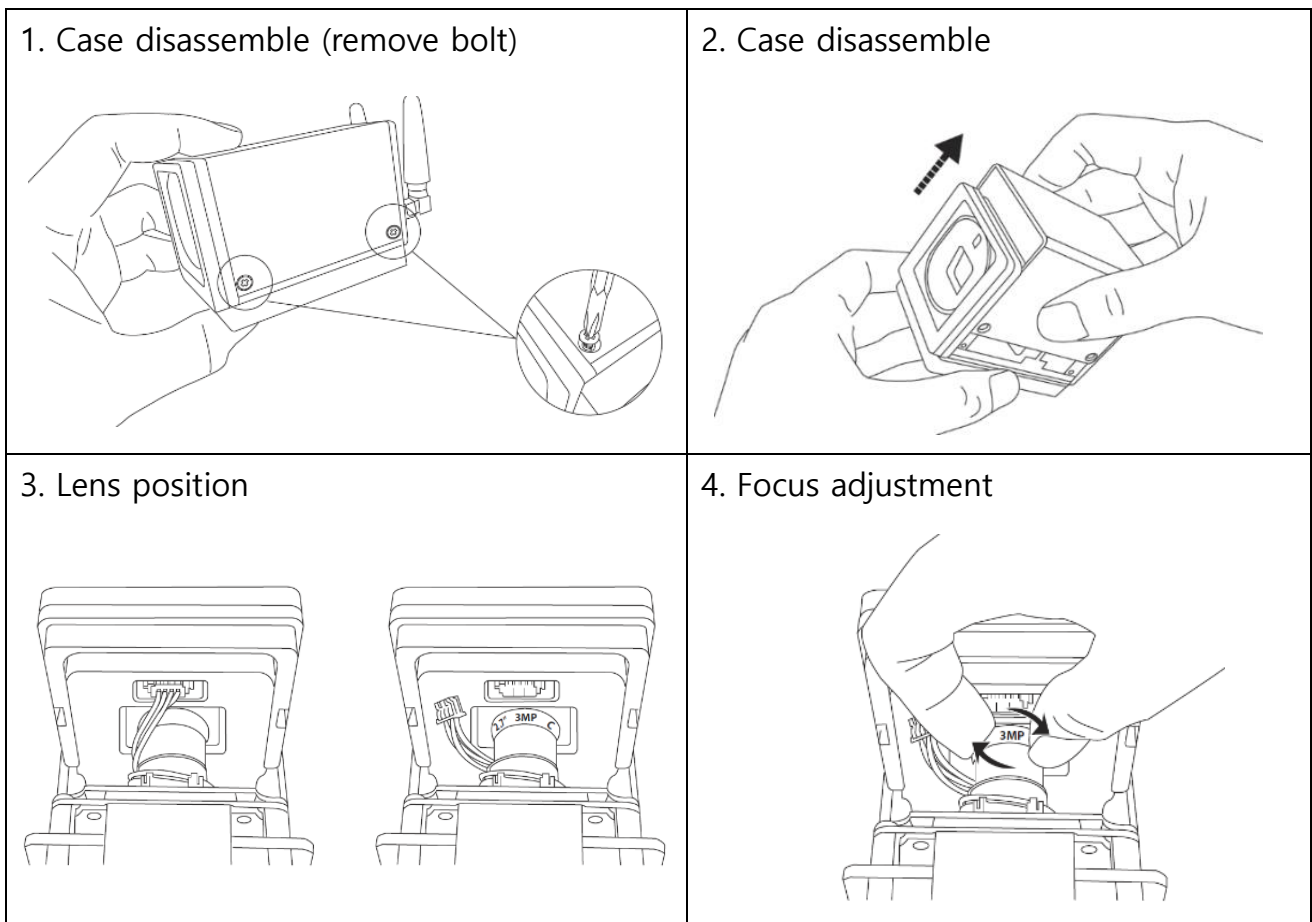
[FIG. 4.2.1] Camera Focusing

4.3 Front cover plate replacement

The WGC camera is equipped with a protective glass at the front of the camera to prevent contamination of the camera lens from fume or spatter during welding. If welding continues for a certain period of time, this protective glass also becomes contaminated. When replacing the front protective glass, the user must follow the following procedures.

4.3.1 Procedures

1) Slide the front protective glass up from the camera to separate it from the camera.

2) Separate the case and glass from the separated protective glass parts.

3) Install new protective glass on the case.

4) Reassemble the front protective glass parts to the camera.

1. Disassemble cover	2. Remove PC (polycarbonate)
3. Install PC (polycarbonate)	4. Assemble cover
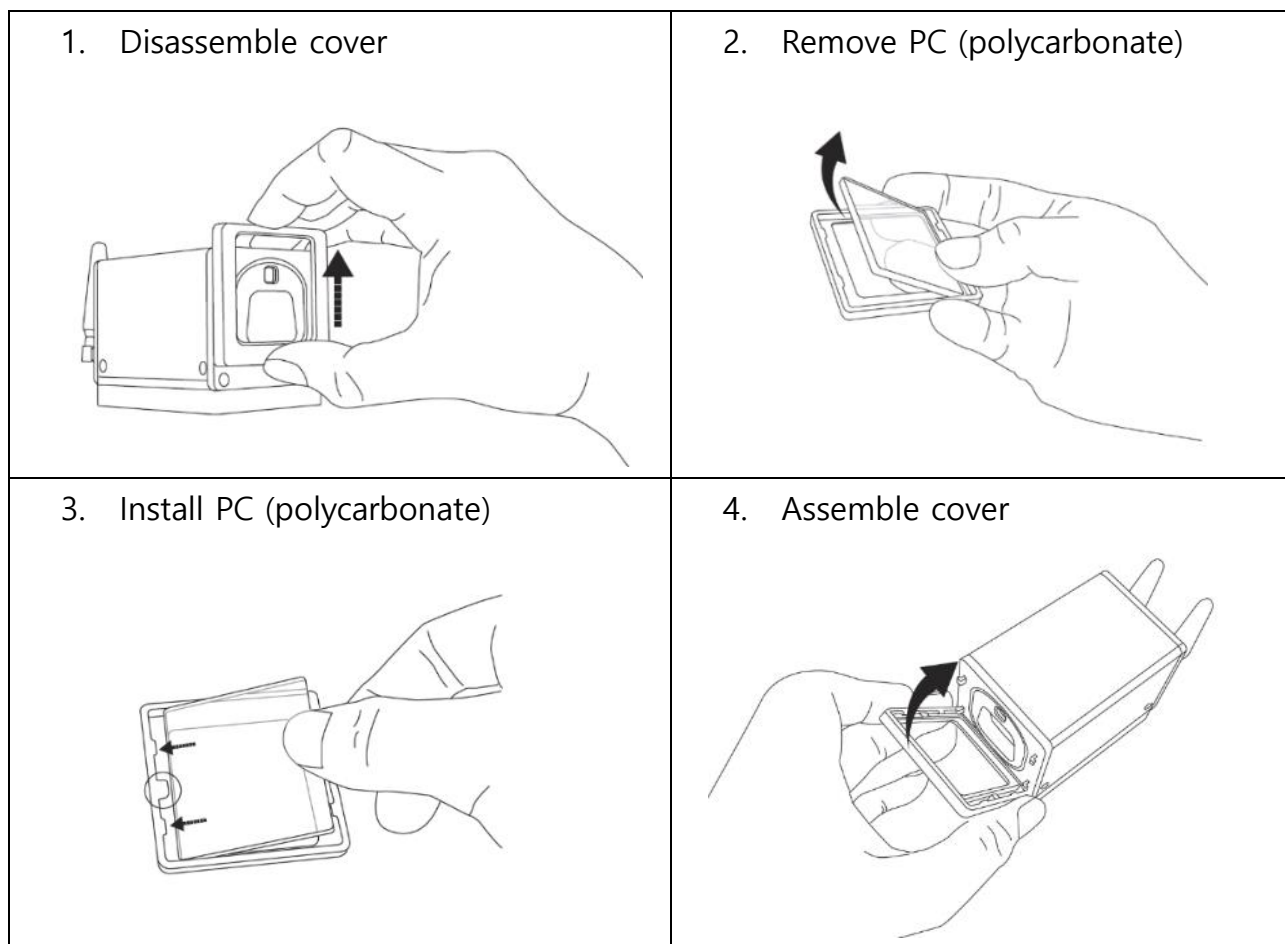
[FIG. 4.3.1] Cover plate replacement

5. How to adjust the quality by UART communication in WGC200 camera

The WGC200 welding camera is equipped with a UART communication terminal at the back of the camera. OTOS also provides a program that can adjust the quality of the video image of the WGC200 welding camera. When a user wants to correct the direction of a video image or adjust the brightness of the image, user can use the program provided by OTOS to adjust the video image to the user's preference. In this case, the video image can be adjusted by connecting to the UART terminal mounted on the rear of the WGC200 camera. The procedure is as follows.

5.1 Installation

1) Connect the PC and WGC200 welding camera using a serial communication cable.
2) Run the program wgc200.exe rovided by OTOS
3) When the program is executed, a directional movement window for selecting various menus of the video image is displayed (Fig 5.1.1), and a window with various adjustment menus is displayed on the video image currently captured by the WGC welding camera (Fig 5.1.1)
4) First, check the activated serial terminal in the Port combo box as shown in (Fig. 5.1.2)
5) Next, click the Port combo box icon and select the serial terminal connected to the camera, as shown in (Fig. 5.1.2)
6) If you click the icon that moves the menu direction up, down, left, or right in (Fig. 5.1.2) the menu and value in (Fig. 5.1.2) change. When you click the Enter symbol, the quality of the video image captured from the WGC welding camera changes.
7) When you click EXIT, the menu at the bottom of (Fig 5.1.1) the window in (Fig. 5.1.2) will disappear. Additionally, various menus and values displayed above the video image in (Fig 5.1.1) disappear.
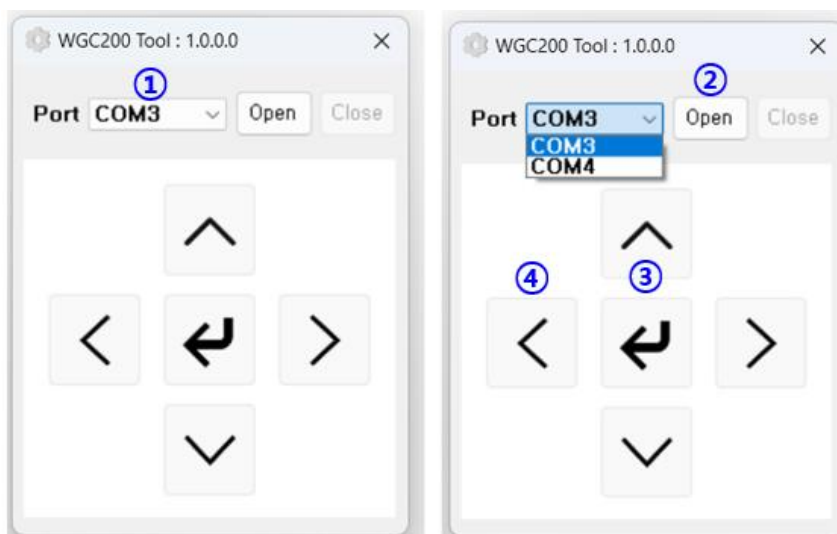

[FIG. 5.1.1] UART control Program

5.2 Meaning of menus and values that control video image quality

1) SHADE

- **SHADE** is a menu that adjusts the brightness of the captured video image.
- The brightness of the video image in **SHADE** can be adjusted from LEVEL 4 to LEVEL 13.
- Higher level numbers make the video image darker and lower level numbers make it brighter.

2) SENSITIVITY

- **SENSITIVITY** is a menu that adjust the reaction speed of the photo sensor that recognizes when the arc is turned on or off.
- The value of **SENSITIVITY** can be selected from 0 level to 10 level.
- When the **SENSITIVITY** value is high, the photo sensor reacts sensitively to arc ON/OFF, and when the **SENSITIVITY** value is low, it reacts insensitively.
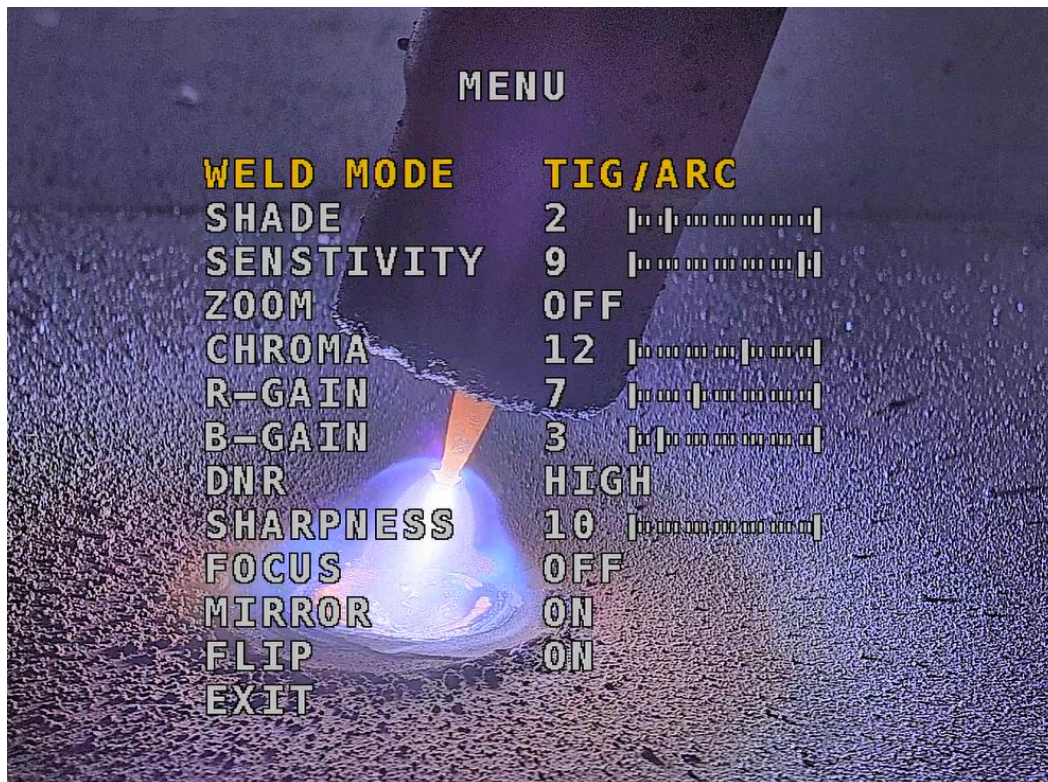
[FIG. 5.1.2] MENU

6. WGC400 Android Application

The WGC400 welding camera has Wifi communication function. Therefore, when using the WGC400welding camera, users can easily adjust the quality of the captured video images using their Android mobile phone. For users using the WGC400 welding camera, OTOS provides a program to adjust the quality of images captured using Android mobile phones. This program allows you to control the quality of the video image of the WGC400 welding camera from your mobile phone.

6.1 How to install the program

1) The program that adjusts the quality of the captured video image of the WGC400 welding camera using an Android mobile phone is **OTOS-release-2.0.4.apk**. OTOS provides this program to the Android mobile phones of users who purchase the WGC400 welding camera.

2) When this program is transmitted from OTOS, files as shown in (Fig 6.1.1) are displayed in the receiving file folder of the user's Android mobile phone.

6.2 How to run the program

1) Save the received **OTOS-release-2.0.4.apk** to a folder of your choice.

2) When you click the saved **OTOS-release-2.0.4.apk** file, a screen in (Fig 6.1.2) is displayed.

3) When you click the **install** button on the screen in (Fig 6.1. 2) the screen in (Fig 6.1.3) is displayed.

4) When you click the **ignore and install** button on the screen in (Fig 6.1.3) the screen in (Fig 6.1.4) is displayed.

5) When you click the **ignore and install** button on the screen in (Fig 6.1.4), the screen in (Fig 6.1.5) is displayed.

6) When you click the **complete and open** button on the screen in (Fig 6.1.5), all installation processes are completed.

7) If installation of the **OTOS-release-2.0.4.apk** file is successfully completed, a **OTOS MASK** icon like (Fig 6.2.1) is displayed.
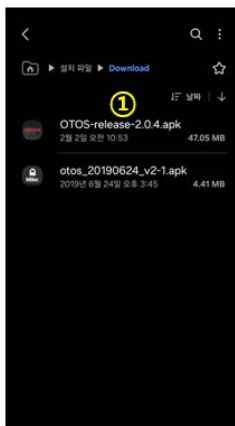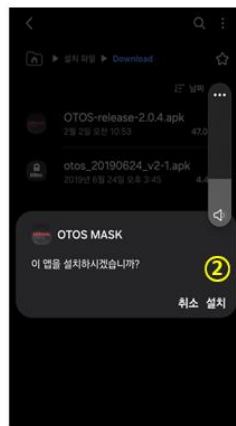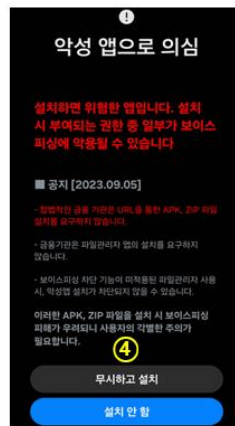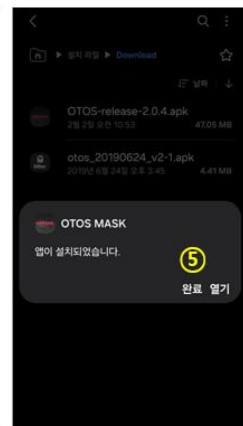

[FIG. 6.1.1]   [FIG. 6.1.2]   [FIG. 6.1.3]   [FIG. 6.1.4]   [FIG. 6.1.5]

6.3 Setting file access permissions

1) Access rights must be set for the properties of information files (photos or video files) received through WiFi communication.

2) If you click the app in (Fig 6.1.5), the screen in (Fig 6.2.2) is displayed.

3) When you click the **setting** button in (Fig 6.2.2), the screen in (Fig 6.2.3) is display

4) When you click the **permission** button, the second item in (Fig 6.2.3), the screen in (Fig 6.2.4) is displayed.

5) Clicking the **permit** button in (Fig 6.2.4) allows access to photos and video files, and the screen in (Fig 6.2.5) is displayed.

6) If you click the **Allow only while using the app** button on the screen in (Fig 6.2.5), all settings for file access permissions are completed.

7) When you click the **Return to previous screen** button at the bottom right of the user's mobile phone, the screen in (Fig 6.3.1) is displayed.
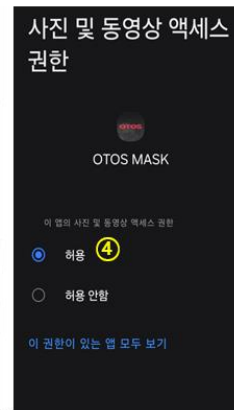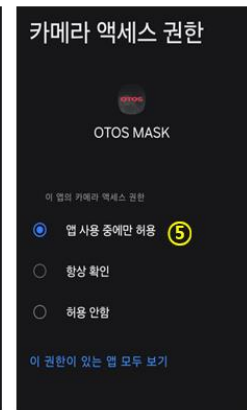
8)
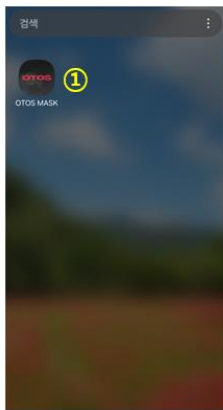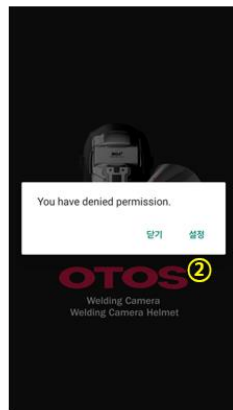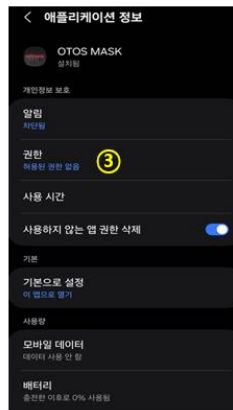
| [FIG. 6.2.1] | [FIG. 6.2.2] | [FIG. 6.2.3] | [FIG. 6.2.4] | [FIG. 6.2.5] |

6.4 Wifi communication connection

1) When using an Android mobile phone to adjust the quality of the video image of the WGC400 welding camera, Wifi communication must be connected between the mobile phone and the WGC400 welding camera.

2) To set up a Wifi communication connection, you must click the **CONNECT TO MASK** button on the mobile phone screen in Fig 8.3.5. Clicking this button displays the screen in (Fig 6.3.2)

3) The screen in (Fig 6.3.2) displays the SSIDs of all peripheral devices that are currently connected or disconnected from Wi-Fi communication. Among these devices, you must find the one displayed as **WELD_XX:XX:XX:XX:XX:XX**, which is the SSID of the WGC400 welding camera. The current SSID of the WGC400 welding camera is **WELD_40:80:E1:CA:6C:03**.

4) When you click **WELD_40:80:E1:CA:6C:03** in (Fig 6.3.2), the screen in (Fig 6.3.3) is displayed.

5) In the screen of (Fig 6.3.3), you must enter the **password** of the WGC400 welding camera given by OTOS in the **password** field. The password given by OTOS is an 8-digit numeric password (for example, 12345678).

6) When you enter the password on the screen in (Fig 6.3.3) and click the **CONNECT** button, the screen in (Fig 6.3.4) is displayed.

7) If you click the **Internet connection not sure** item on the screen in (Fig 6.3.4), the Wifi connection is completed.

8) Once the Wifi connection is successfully completed, you should return to (Fig 6.3.5).

9) When you click the **Return to previous screen** button at the bottom right of the user's mobile phone, the screen in (Fig 6.3.5) is displayed.
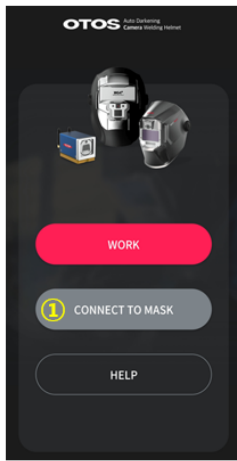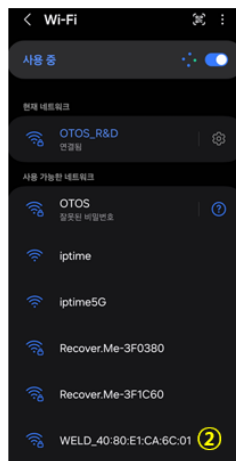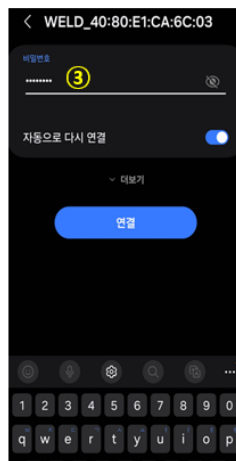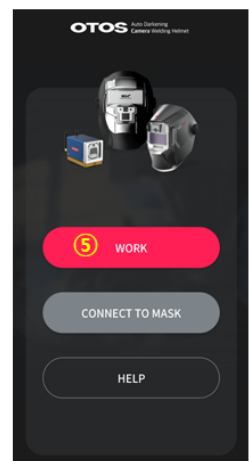
[FIG. 6.3.1]   [FIG. 6.3.2]   [FIG. 6.3.3]   [FIG. 6.3.4]   [FIG. 6.3.5]

6.5 Camera video on android mobile phone screen

1) When you click the **WORK** button on the screen in (Fig 6.4.1), the screen in (Fig 6.4.1)is displayed.

2) Through the screen in (Fig 6.4.1) of the Android mobile phone, users can observe real-time welding video images.

3) The screen in (Fig 6.4.1) displays the video image currently being captured by the WGC400 welding camera.

4) On the screen in (Fig 6.4.1), the user can record all captured video images of the welding process or adjust the quality of the video images.

5) The SSID of the current Wifi communication of the WGC400 welding camera is displayed at the top center of the screen in (Fig 6.4.1).

6) When you click the **REC** button at the bottom right of (Fig 6.4.1), all video images captured until the next click are recorded and saved.

[FIG. 6.4.1]

6.6 How to adjust the quality of video image

1) If the user wants to adjust the quality of the video image captured from the WGC400 welding camera using an Android mobile phone, the user must click the icon( ) in the upper left corner of the screen in (Fig. 6.4.1).

2) When user click the icon( ), the screen in (Fig. 6.5.1) is displayed.

3) The items that can adjust the quality of video images captured using an Android mobile phone are as follows.
   - **FLIP**
   - **MIRROR**
   - **Show Grid**
   - **SENSITIVITY**
   - **CARTRIDGE SHADE**

4) If a user wants to do the Wifi communication with another WGC400 welding camera using an Android mobile phone, the Value item of **CHANGE SSID** must be changed.

5) To apply the change results of the above five quality items to the WGC400 welding camera, click the **CONFIRM** button at the bottom center of (Fig. 6.5.1).

6) If the user wants to return to the previous screen (Fig 6.5.1) after completing the quality adjustment of the video image, click the icon( ) in the upper left corner of (Fig 6.5.1) or click **Return to previous screen** button on the bottom right corner of the screen of the user's mobile phone.

6.6.1. FLIP

1) **FLIP** is a menu that flips the captured video image vertically up and down.

2) If you click the icon to the right of the **FLIP** item once, the captured video image will be flipped vertically up and down. If you click the icon once more, the vertically flipped image will return to the state of the original captured image.

6.6.2. MIRROR

1) **MIRROR** is a menu that reverses the captured video image left and right horizontally.

2) If you click the icon to the right of the **MIRROR** item once, the captured video image will be flipped horizontally left and right. If you click the icon once more, the horizontally flipped image will return to the state of the original captured image.

6.6.3. Show Grid

1) **Show Grid** helps adjust the camera's shooting angle so that the captured video image matches the horizontal and vertical of the weld zone.

2) When the user clicks once on the icon to the right of the **Show Grid** item, horizontal and vertical lines are displayed on the captured video image.

3) When the user clicks the icon on the right side of the **Show Grid** item again, the horizontal and vertical lines displayed on the captured video image disappear.

6.6.4. SENSITIVITY

1) **SENSITIVITY** is a menu that adjust the reaction speed of the photo sensor that recognizes when the arc is turned on or off.

2) If the user wants to change the value of **SENSITIVITY**, the user must change the value of the combo box to the right of the **SENSITIVITY** item.

3) When clicking the combo box icon, several values are displayed, and the user can select an appropriate value among them.

4) The value of **SENSITIVITY** can be selected from 0 level to 10 level.

5) When the **SENSITIVITY** value is high, the photo sensor reacts sensitively to arc ON/OFF, and when the **SENSITIVITY** value is low, it reacts insensitively.

6.6.5. CARTRIDGE SHADE

1) **CARTRIDGE SHADE** is a menu that adjusts the brightness of the captured video image.

2) If the user wants to change the value of **CARTRIDGE SHADE**, the user must click the combo box icon to the right of the **CARTRIDGE SHADE** item.

3) When the user clicks the combo box icon, several values are displayed, and the user can select an appropriate value among them.

4) The value of **CARTRIDGE SHADE** can be selected from 4 levels to 13 levels.

5) Higher level numbers make the video image darker and lower level numbers make it brighter.
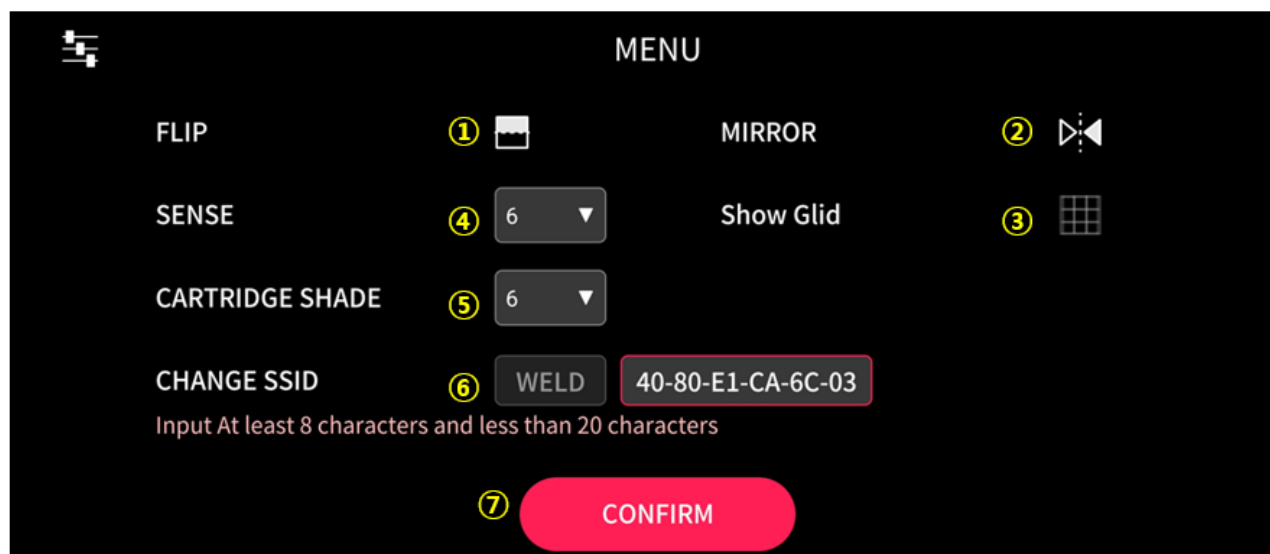
[FIG. 6.5.1]

7. WGC400 Web Program instruction

The WGC400 welding camera has Wifi communication function. Therefore, when using the WGC400welding camera, users can easily adjust the quality of the captured video images using their Android mobile phone. For users using the WGC400 welding camera, OTOS provides a program to adjust the quality of images captured using Android mobile phones. This program allows you to control the quality of the video image of the WGC400 welding camera from your mobile phone.

7.1 PC WIFI connection

1) Turn on the WGC400 welding camera.
2) When you click the Windows icon on your PC, the settings icon appears. When you click the icon, the screen in (Fig 7.1.1) is displayed.
3) When you click **Network and Internet** on the screen in (Fig 7.1.1), the screen in (Fig 7.1.2) is displayed.
4) When you click the Wifi icon on the screen in (Fig 7.1.1), the screen in (Fig 7.1.2) is displayed.
5) On the screen in Fig 9.2.3, set the Wifi switch at the top to the on position.
6) When you click "Show available networks" on the screen in (Fig 7.1.1) a list of connectable external devices is displayed on the PC screen (the SSID of the currently connectable WGC400 welding camera is **WELD_40:80:E1:CA:6C:03**).
7) When you click **WELD_XX:XX:XX:XX:XX:XX**, which is the SSID of the WGC400 welding camera from the list of these external devices, the small window screen in (Fig 7.1.2) is displayed.
8) You must enter the security key of the SSID of the WGC400 welding camera. The security key must consist of an 8-digit number (e.g. 12345678)
9) Click the **Next** button to complete the Wifi communication setup between the PC and the WGC400 welding camera.
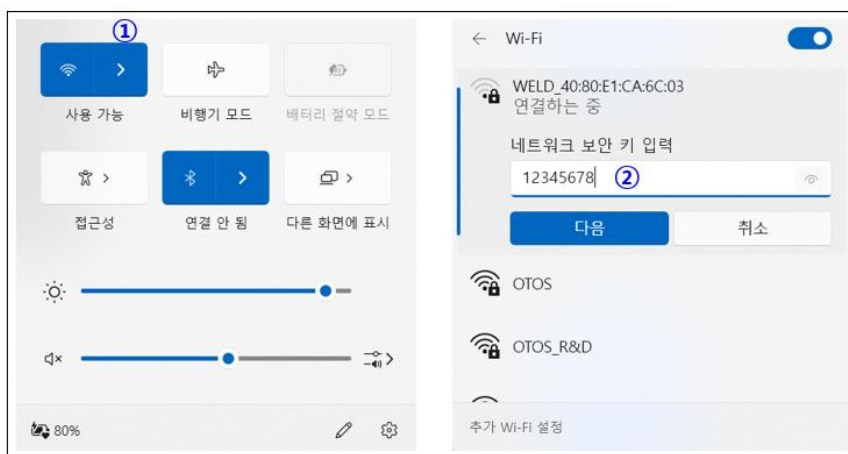
[FIG. 7.1.1]   [FIG. 7.1.2]

7.2 Web Page connection

1) To adjust the quality of the video image of the WGC400 welding camera through Wifi communication on a desktop PC, you must use a web browser.

2) Double-click an Internet web browser such as Internet Explorer or Google Chrome that is already installed on the PC's desktop.

3) Run the Internet web browser

4) When you enter **http://192.168.254.1** in the web homepage address location and press the Enter key , the screen in (Fig 7.2.1) is displayed on the PC screen.

5) On the screen in (Fig 7.2.1), the model name of the camera, the camera's Wifi Mac Address, and the version of the firmware that controls the quality of the video image are displayed
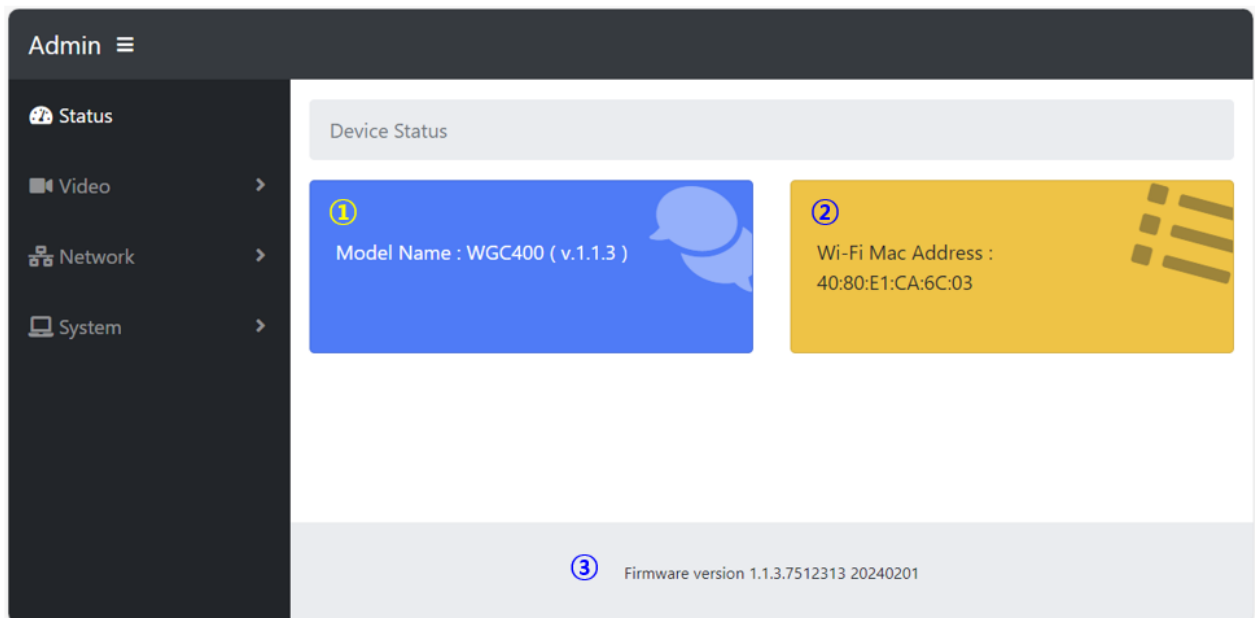

[FIG. 7.2.1]

7.3 How to adjust the quality of the video image

1) When you click **video** on the left side of the screen in (Fig 7.3.1), **Disp** is displayed as in (Fig 7.3.1).

2) When you click **Disp** in (Fig 7.3.1), the window in (Fig 7.3.2) is displayed.

3) There are five items that adjust the quality of the captured video image of the WGC400 welding camera through the web on the PC: **FLIP**, **MIRROR**, **CARTRIDGE SHADE**, **SENSITIVITY** and **Show Grid**.
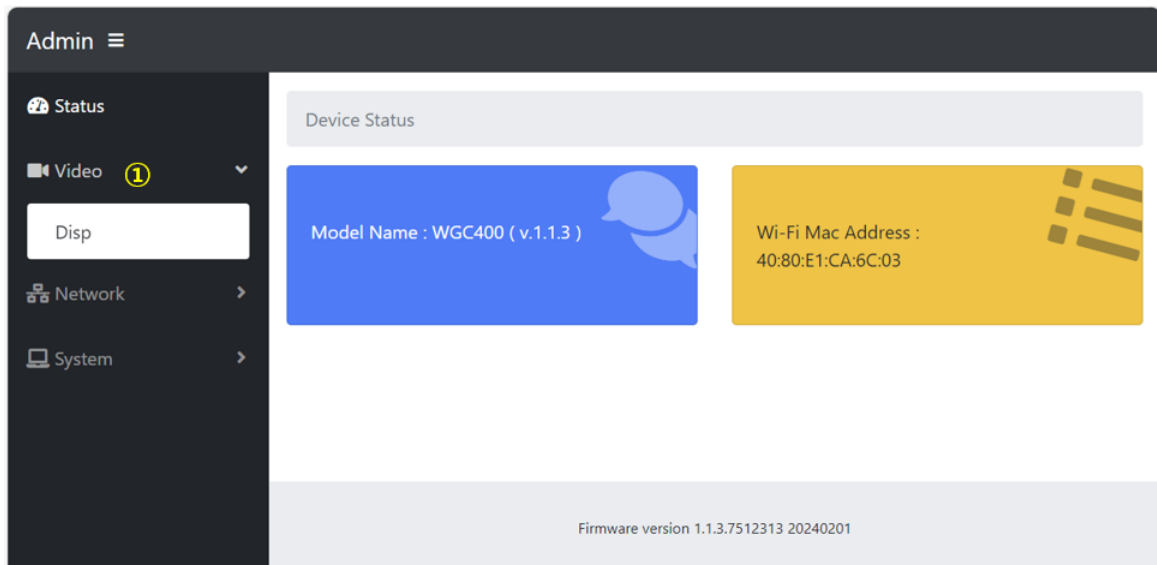
[FIG. 7.3.1]

4) The user sets the values of the items the user wants to adjust among the five items that adjust the quality of the five video images.
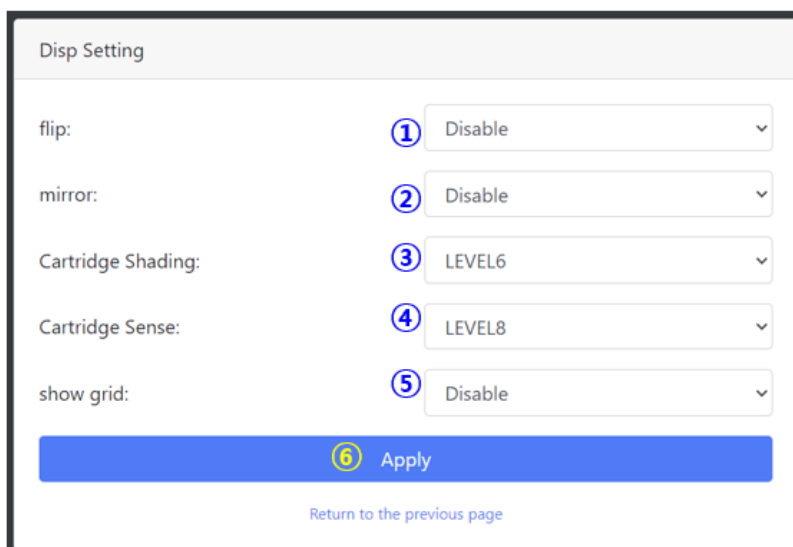
[FIG. 7.3.2]

- **FLIP**
1) **FLIP** is a menu that flips the captured video image vertically up and down.
2) When the user clicks the combo box icon to the right of the **FLIP** item, **Able** and **Disable** are displayed.
3) The user must select one of these two selection values.
4) If the user selects **Able,** the video image captured by the WGC400 welding camera is transmitted to the PC as a vertically inverted video image.
5) If the user selects **Disable**, the WGC400 welding camera transmits the captured video image to the PC as is.

- **MIRROR**
1) **MIRROR** is a menu that reverses the captured video image left and right horizontally.
2) When the user clicks the combo box icon to the right of the **MIRROR** item, **Able** and **Disable** are displayed.
3) The user must select one of these two selection values.
4) If the user selects **Able,** the video image captured by the WGC400 welding camera is transmitted to the PC as a horizontally inverted video image.
5) If the user selects **Disable**, the WGC400 welding camera transmits the captured video image to the PC as is.

- **9.4.3 CARTRIDGE SHADE**
1) **CARTRIDGE SHADE** is a menu that adjusts the brightness of the captured video image.
2) If the user wants to change the value of **CARTRIDGE SHADE**, the user must click the combo box icon to the right of the **CARTRIDGE SHADE** item.
3) When the user clicks the combo box icon, several LEVEL values are displayed, and the user can select an appropriate value among them.
4) The value of **CARTRIDGE SHADE** can be selected from LEVEL 4 to LEVEL 13.
5) Higher level numbers make the video image darker and lower level numbers make it brighter.

- **9.4.4 SENSITIVITY**
1) **SENSITIVITY** is a menu that adjust the reaction speed of the photo sensor that recognizes when the arc is turned on or off.
2) If the user wants to change the value of **SENSITIVITY**, the user must change the value of the combo box icon to the right of the **SENSITIVITY** item.
3) When clicking the combo box icon, several values are displayed, and the user can select an appropriate value among them.

4) The value of **SENSITIVITY** can be selected from LEVEL0 level to LEVEL10.

5) When the **SENSITIVITY** value is a higher LEVEL, the photo sensor reacts sensitively to arc ON/OFF, and when the **SENSITIVITY** value is a lower LEVEL, it reacts insensitively.

- **9.4.5 Show Grid**

1) **Show Grid** helps adjust the camera's shooting angle so that the captured video image matches the horizontal and vertical of the weld zone.

2) When the user clicks the combo box icon to the right of the **Show Grid** item, **Able** and **Disable** are displayed.

3) The user must select one of these two selection values.

4) If the user selects **Able,** Horizontal and vertical lines are displayed on the captured video image.

5) If the user selects **Disable**, The captured video image is displayed on the PC screen as is.

7.4 How to change SSID

1) When you click **Network** on the left side of the screen in (Fig 7.4.1), **Wi-Fi** is displayed as in (Fig 7.4.2).
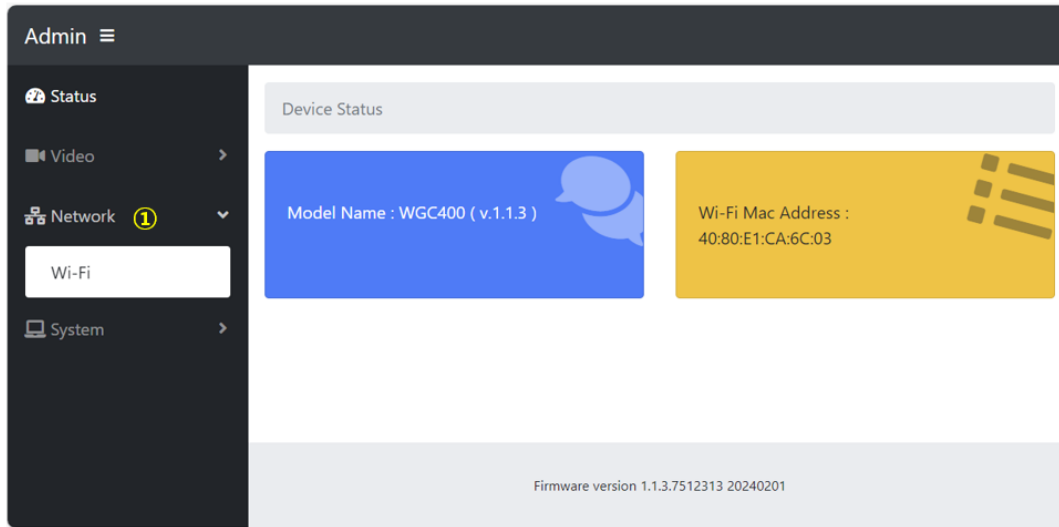

[FIG. 7.4.1]

1) When you click **Wi-Fi** in (Fig 7.4.1), the window in (Fig 7.4.2) is displayed.
2) In Fig 9.5.2, enter the SSID data of the WGC400 welding camera that the user wants to connect.
3) SSID data consists of 8 to 20 characters.
4) If you click the **Apply** button at the bottom in Fig 9.5.2, it will be connected to the changed WGC400 welding camera.
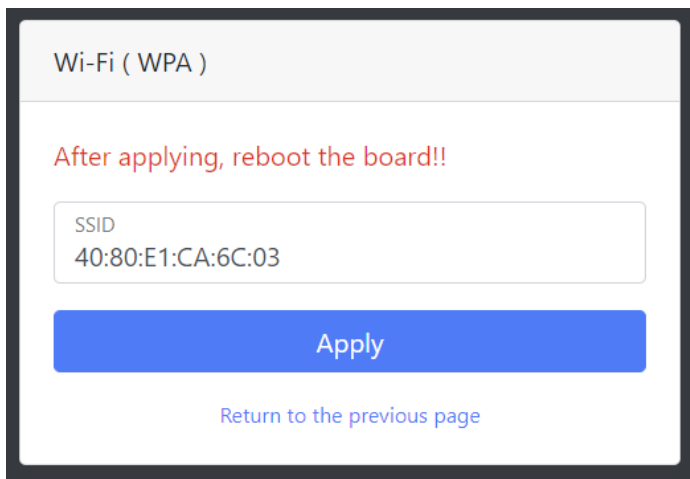

[FIG. 7.4.2]

7.5 How to upgrade the firmware

1) When the firmware that controls the operation of the WGC400 welding camera is upgraded, the user can apply the upgraded file to the WGC400 welding camera through the web.

2) When you click **System** on the left side of the screen in (Fig 7.5.1), **F/W Upgrade** is displayed as in (Fig 7.5.1).
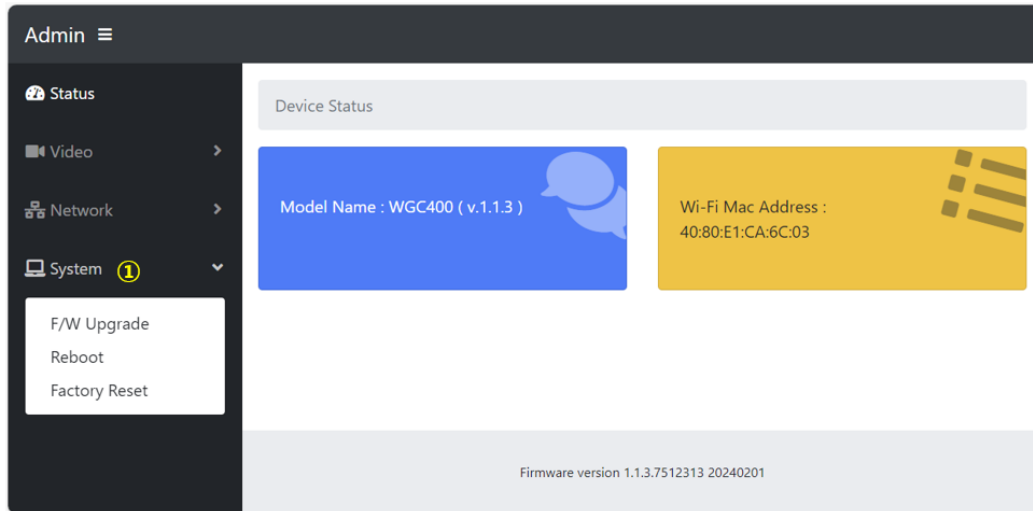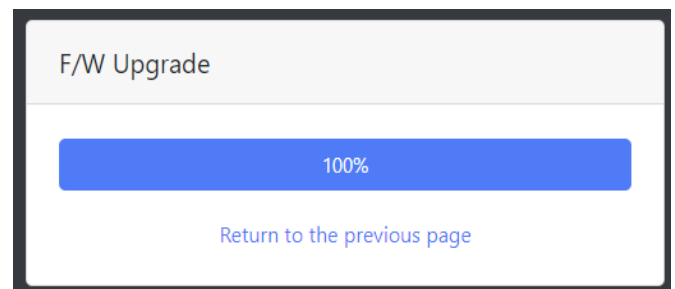

[FIG. 7.5.1]

1) When you click **F/W Upgrade** in (Fig 7.5.1), the window in (Fig 7.5.2) is displayed.

2) In (Fig 7.5.2), enter the address where the firmware is stored in the input space (**Choose file**) of the **Browser** item.

3) When you click the **Apply** button in (Fig 7.5.2) 2, the firmware that controls the WGC400 welding camera begins to be upgraded, and the progress of the upgrade is displayed as shown in (Fig 7.5.3).

4) When the upgrade is 100% complete, click the Return to Previous Screen button to return to the previous screen.
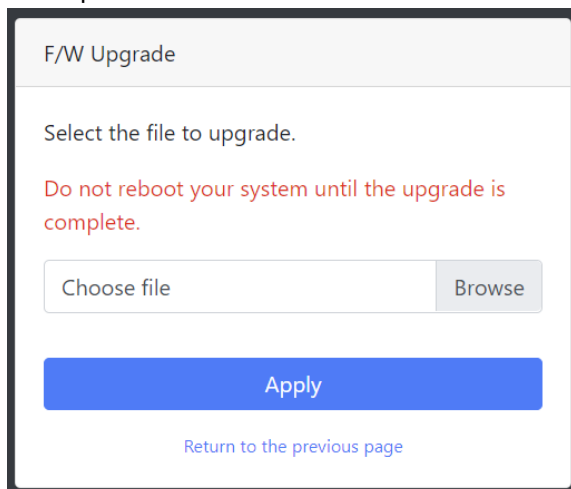

[FIG. 7.5.2]

[FIG. 7.5.3]

7.6 How to reboot

1) There are cases where the WGC400 welding camera is installed in a place that cannot be reached by the user. In this case, if the WGC400 welding camera stops working, the user must remotely turn the camera off and then turn it back on.

2) When you click **System** on the left side of the screen in (Fig 7.6.1), **Reboot** is displayed as in (Fig 7.6.2).

3) When you click **Reboot** in (Fig 7.6.1), the window in (Fig 7.6.2) is displayed.
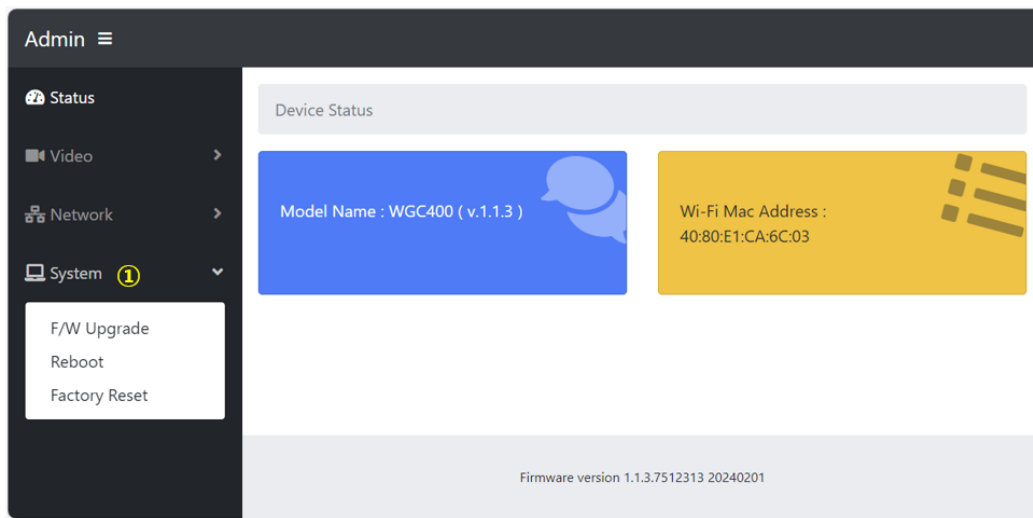
[FIG7.6.1]

1) Clicking the **Apply** button in (Fig 7.6.2) will process the reboot.
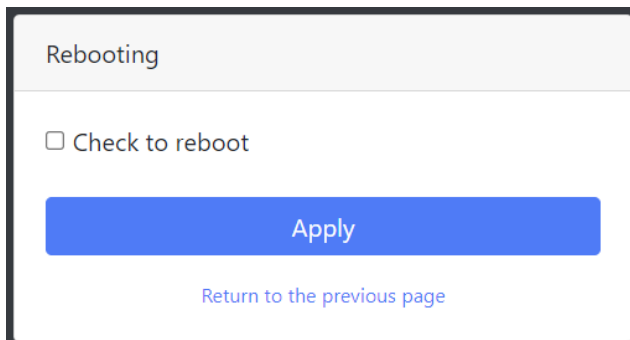
[FIG7.6.2]

7.7 How to Factory Reset

1) There are cases where the user wants to reset the settings of the WGC400 welding camera to the factory default state.

2) When you click **System** on the left side of the screen in (Fig 7.7.1), **Factory Reset** is displayed as in (Fig 7.7.2).

3) When you click **Factory Reset** in Fig 9.6.1, the window in Fig 9.8.1 is displayed.
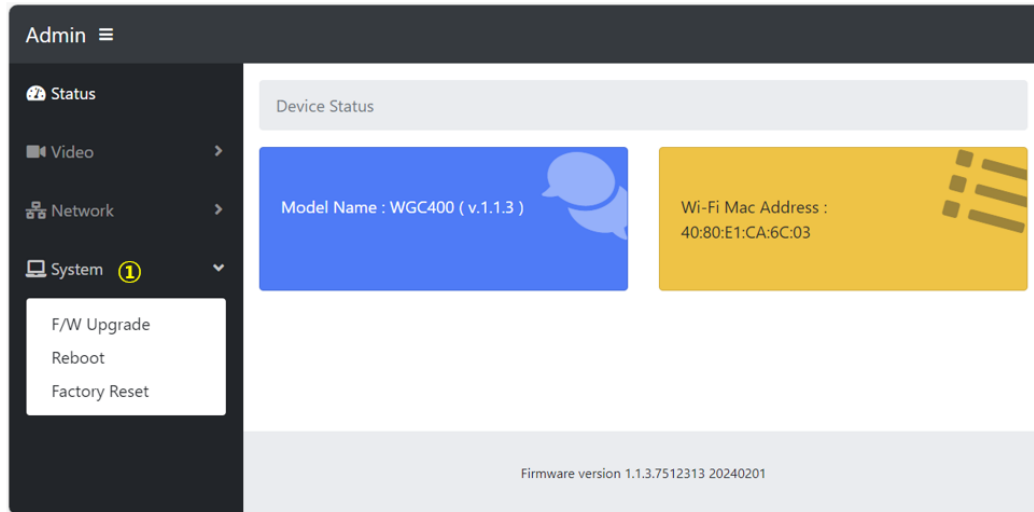
[FIG. 7.7.1]

1) Clicking the **Apply** button in (Fig 7.7.2) will process the factory reset.
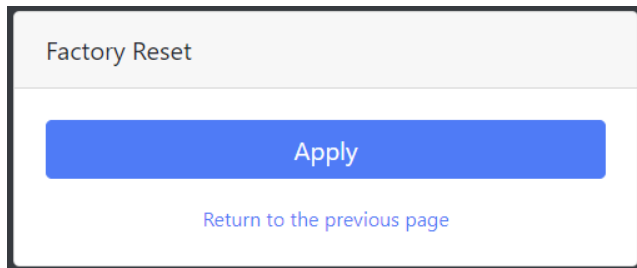
[FIG. 7.7.2]

FCC/IC Compliance Statement

This device complies with Part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION : Any Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Enonce d'Industrie Canada(IC)
Le present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisee aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

Tout changement ou modification non expressement approuve par la partie chargee de la mise en conformite peut annuler le droit de l'utilisateur a utiliser l'equipement.