

Smart Gas Detector

S2B-300

User Manual



nodeTalks

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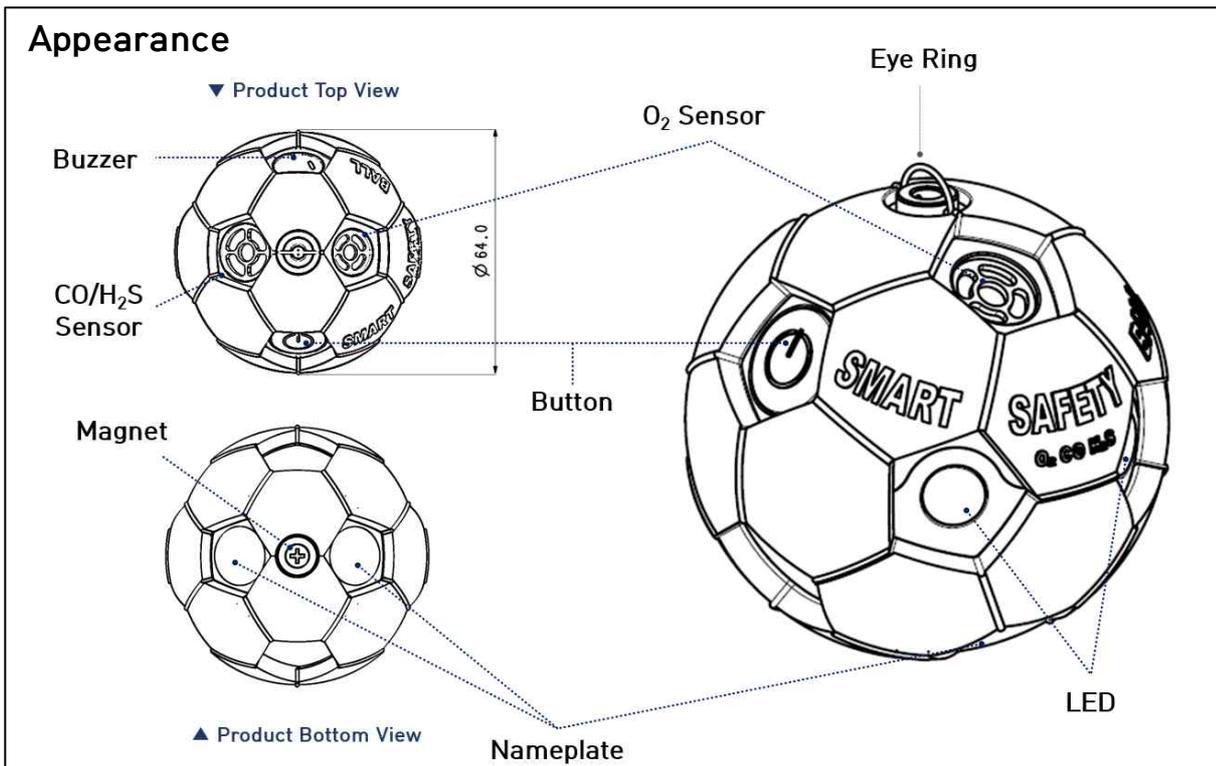
1. Product Overview

Thank you for purchasing a smart gas detector, **Smart Safety Ball (S2B-300)**.

With the newly designed portable gas detector, Smart Safety Ball, workers can roll or hang down this gas-detecting ball into the enclosed area before entering the space. They can monitor the gas concentration of oxygen(O₂) and toxic gas(CO, H₂S) remotely in real time using a smartphone application. Therefore, the workers can be notified the presence of harmful gas beforehand.

Main Features

- ◆ Smart Safety Ball is easy to carry on, since it is small and light (“about 99.5g”), and continuously operates “for 2 years” without charging or battery replacement.
- ◆ As mentioned above, three types of gases (“O₂, CO, H₂S”) can be measured simultaneously, and remote monitoring can be performed in the range of 30 ~ 100 meters (depending on the circumstances).
- ◆ This new shape of gas detector is developed for an use-case at the enclosed and narrow space, before entering themselves, by rolling (or hanging down with a strap) the product inside.
- ◆ Also, in the case that a user wants to monitor gas concentration at a fixed spot, the user can attach the Smart Safety Ball to any metallic equipment nearby using the magnetic of the product.



2. Product Specification

Type of Gas	Oxygen (O ₂)	Carbon monoxide(CO)	Hydrogen sulfide (H ₂ S)
Scope of measurement [Display Resolution]	0 ~ 25% Vol [0.1% Vol]	0 ~ 500 ppm [1 ppm]	0 ~ 100 ppm [0.1 ppm]
Type of Sensor	Electrochemical Type		
Measuring Principle	Diffusion type		
Reaction Time	Within 30 seconds (T90)		
Display & Alarm Signal Size	Display: no (use smartphone app) / alarm volume: 85 dB @ 10cm		
Operating Temperature	Ta: - 20 ~ + 50°C		
Humidity	10 ~ 90% relative humidity (without condensation)		
Battery	3.6V Li-SOCl ₂ battery (ER14250, EVE Energy Co., Ltd.) 2EA, non-replaceable		
Continuous operation time (Life)	2 years (based on alarm operation for 2 minutes a day, activation required within 3 months after purchase)		
Size & Weight	64 mm (diameter) / 99.5g (including battery)		

■ IECEx (IECEx KSCP 21.0018X)

1) Ex 2) ia 3) IIC 4) T4 5) Ga

- 1) Explosion protected.
- 2) Type of protection: "ia" - intrinsic safety
- 3) Gas group: Acetylene, Hydrogen, Carbon Disulfide
- 4) Temperature classification: Ignition temperature of gas or vapor > 135 °C
- 5) Equipment protection level

■ KCs (21-GA2BO-0393X)

■ KC (R-R-N54-S2B)



3. User Precautions

[WARNING]

DO NOT OPEN OR REPLACE BATTERY WHEN EXPLOSIVE ATMOSPHERE IS PRESENT. POTENTIAL ELECTROSTATIC CHARGING HAZARD - CLEANING SHALL BE DONE WITH A DAMP CLOTH.



Warning

- When operating **Smart Safety Ball** for the first time, or turning it on again after not using it for a long period of time, it takes some time for stabilization until it indicates accurate results. (Turn on the product in the clean atmospheric environment without harmful gas)
- Do not use this product for gas measurement or as gas analyzer since it is a detection and alarm device. In addition, since it is a portable device, we are not responsible for any problem that may occur if it is used as a fixed or mobile device.
- Arbitrary disassembling of products or replacement of parts may cause detrimental damage on the products. Direct touch of internal circuit may cause static electricity, resulting in circuit damage. Contact manufacturer if the sensor or the battery require replacement.
- Do not power off the product(for a long time) since this product carries out automatic calibration of the gas sensor. It is recommended to keep the gas detector in a safe place with the power on when not in use.
- Improper handling or use of the product may cause reduction of the service life or inaccurate gas detection. *(Example of improper handling: storage near hot, flammable or toxic substance, soaking in the water or impact on the product case or gas measurement hole, etc.)*
- This product has been manufactured without its display and you can check the detection results of oxygen and toxic gas using “**Safety Ball**”, the dedicated Bluetooth application(hereinafter **dedicated app**) at your smartphone. You can download the dedicated app at Google PlayStore or Apple AppStore for free. Be sure to download it in a safe place(explosion-proof area).
- This product operates as a stand-alone gas alarm and gives an alarm according to situation in case of oxygen deficiency or toxic gas leakage. Be sure to keep the dedicated app of the smartphone running when using this product in order to escape the place quickly in case of emergency and to automatically respond to it.
- Some functions such as sending situation message may be restricted in the shielded places where incoming and outgoing call of smartphone is not possible.
- Various functions implemented through the smartphone may be lost if distance between this product and smartphone is so far that Bluetooth signal cannot reach. Use it only within the communication distance between the devices, and check the normal operation of app.

4. How to Use

Product Type: Smart Gas Detector

Model: S2B-300

Measuring Gas: Oxygen (O₂) / Carbon monoxide (CO) / Hydrogen sulfide (H₂S)

4.1. Device Startup (Activation)

- ◆ Press the button for about 3 seconds to turn on the power(green LED on). Release the button when red LED turns on with startup alarm sound. After that, red LED will blink in the interval of 3 seconds and normal operation will start.
- ◆ Press the button for about 10 seconds to turn off the power(LED turns on). The product power is cut off with shutdown alarm sound. (Power shutdown is not recommended unless there is a special purpose such as calibration.)

4.2. Standby Mode

- ◆ Right after the power is on, S2B-300 operates in Stand-by mode.
- ◆ In the standby mode, S2B-300 does not operate as a gas detector and performs internal error diagnosis and sensor stabilization.
- ◆ When stabilization is over, the standby mode automatically exits and S2B-300 enters the detection mode.
- ◆ When span calibration or firmware update is required, it could be performed in this standby mode.(See “Appendix D” of this manual for details.)

[LED Operation Pattern]: red LED blinks in the interval of 3 seconds

4.3. Detection Mode

- ◆ In Detection mode, Smart Safety Ball operates as a gas detector.
- ◆ To check the concentration of detection, turn on the Bluetooth function of smartphone and run the dedicated app.
- ◆ When the concentration of gas is beyond the certain level, the product triggers the alarm. If the dedicated app is on, alarm also works on the dedicated app.
- ◆ See Clause 4.4 on page 7 for criteria of alarm triggering and operation pattern.

[LED Operation Pattern]: green LED blinks every 3 seconds

4.4. Alarm Mode

- ♦ Red LED blinks according to the buzzer pattern in Alarm Mode.
- ♦ In case of **A1/A2** alarm, press the button to temporarily turn off the buzzer sound. If the concentration of gas returns to the normal value, the alarm is automatically terminated.
- ♦ **TWA** (8 hour cumulative concentration) and **STEL** (15 minute cumulative concentration) value are defined for concentration of toxic gas (CO or H₂S). Use the dedicated app to turn off the alarm. See the user’s manual of dedicated app for details.

Classification of Alarm	Criteria of Occurrence			Buzzer Button
	O ₂	CO	H ₂ S	
A1		30 ppm	10 ppm	1 time per second (On-Time: 300 ms)
A2	Less than 19.5% or greater than 23.5%	60 ppm	20 ppm	2 times per second
TWA		30 ppm	10 ppm	1 time per second (On-Time: 600 ms)
STEL		200 ppm	15 ppm	4 times per second

4.5. Recommended Usage

- ♦ **“Be sure to”** check the LED pattern before using the product to see whether Smart Safety Ball operates in detection mode(**green LED blinks**). If there is no separate operation, the product operates in the detection mode and measures the concentration of gas real time.
- ♦ Since this product can operated **“continuously for 2 years”** and performs long-time automatic calibration of the oxygen sensor, it is recommended to keep Smart Safety Ball with power on in a safe place when not in use.
- ♦ Since this product does not require **“battery replacement or charging”**, you can **wear this on “safety helmet, clothes and equipment”** using the accessory clip provided with this product and always carry the gas detector in the working environment.
- ♦ In case of an alarm, respond to the situation properly such as evacuation from the relevant place in order to prevent suffocation.

※ Cautions on Performance of Gas Detector

- ◆ Refer to “**Product Specification**” page and use this product within the recommended temperature, humidity and air pressure.
- ◆ Results of detection may be inaccurate in the “**environment**” where temperature, humidity or air pressure **rapidly change**. Adapt to the environment and use after the indication of the gas concentration is stabilized.
- ◆ Do not use in “**high-concentration environment**” or for the gas beyond measurement scope when detecting the concentration of gas. This may shorten the service life of gas sensor inside the product and require additional calibration.
- ◆ Do not use this product near the place where “**strong electromagnetic waves**” exist (ex: base station). It may cause an error in the results of gas detection, connection with or operation of smartphone.

※ Specific Conditions of use

- i. The equipment is a hand-held & portable device. Where a static-generating mechanism is identified, such as repeated brushing against clothing, then suitable precautions shall be taken, e.g. the use of anti-static footwear.
- ii. As aluminum is used at this equipment, ignition sources due to impact and friction sparks could occur, this shall be taken into account when the requirement is used in zone 0 location
- iii. Also, the included Bluetooth is only for use in the safe area. It means that the measured gas value can not be confirmed, when the user enters to zone 0 location or a place where possessing smart-phone is not permitted. However, the product operates independently without smart-phone and alert an alarm when a warning situation occurs.

5. Maintenance and Management

Storage

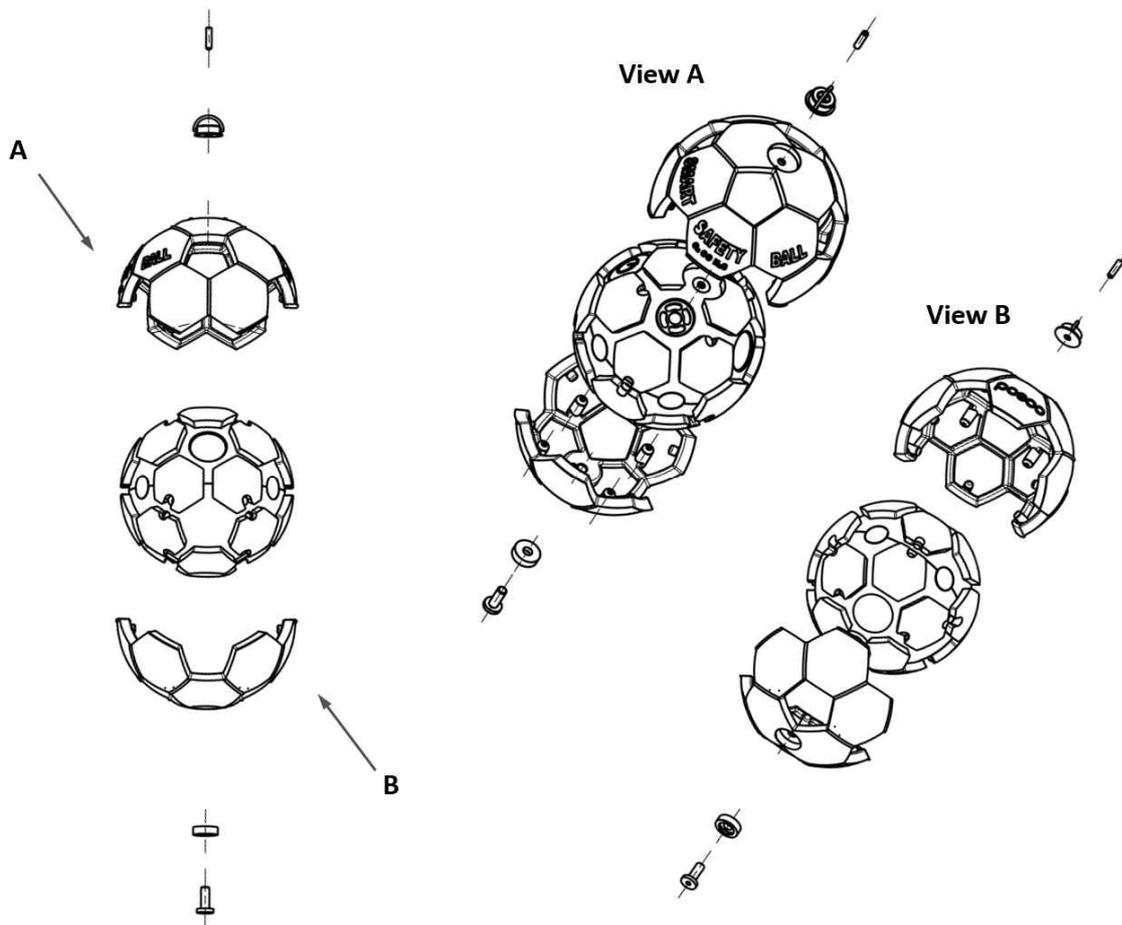
- ♦ It is recommended to keep the power on when storing the product after activation and to store in the clean and safe place.
- ♦ Keep the area around the measurement hole of gas sensor clean.

Calibration

- ♦ It is recommended to perform calibration every 6 months after start-up(activation).
- ♦ Calibration is conducted using the dedicated app and test gas of specific concentration is required.
- ♦ See “Appendix D” of this manual for the calibration process.

Cover Replacement

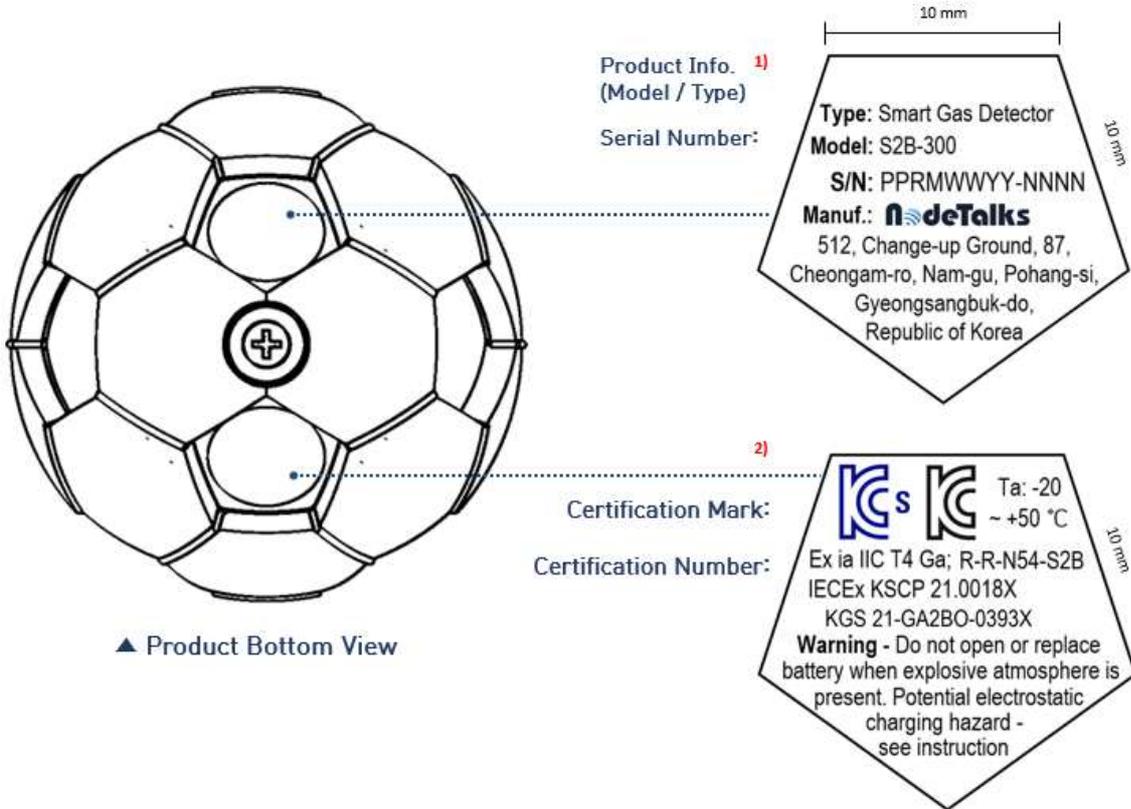
- ♦ See the following figure when replacing the outer covers.
- ♦ a one additional cover is supplied when first purchase.



6. Product Name Plate

Product Nameplate

- Nameplate of this product is attached on the back of the product as shown below.



Product Serial Number	PP: Unique code for the product
PPR M WW YY - NNNN	/ R: Revision Number
	/ M: Manufacturer (Supplier) code
	/ WW: Manufactured Week (01-52)
	/ YY: Manufactured Year (20YY)
	/ NNNN: Product ID (0000-9999)

A. Warranty and Repair

A manufacturer, **NodeTalks Corp.**, guarantees the quality of Smart Safety Ball, for 1 year from the date of shipment after product purchase. This means that there is no problem in the function and components of the products if the customers uses the products normally by complying with the precautions indicated in the user's manual and that free A/S service is provided for any defective product during the warranty period.

This warranty applies to the **product purchaser only** and not to the products purchased through any route other than the headquarter or official distributors. In addition, the warranty is limited to the replacement of products or parts, repair of product defects. See the **following notes** for details on quality warranty.

- We may request the purchaser to provide evidence materials to confirm whether the product is within the warranty period. If relevant information is not confirmed, free service may not be provided.
- The user should bear the cost for the repair of the product defect or damage occurred due to negligence of user even during the warranty period.
- The user should bear the cost for repair of products or replacement of parts after warranty period in principle.
- We are not held responsible for any damage of customers caused by toxic gas leakage, suffocation or various accidents not directly attributable to this product while using this product.
- We are not held responsible for any problems caused by improper handling, misuse or negligence of the purchaser (or a 3rd party).

***If you suspect product malfunction or require repair, contact us.**

NodeTalks Corp.

Website: www.nodetalks.co.kr

inquiry: office@nodetalks.co.kr

B. Certification Details

Our smart gas detector, Smart Safety Ball (S2B-300), has obtained explosion-proof certification for **intrinsic safety** and complies with the following standards.

IEC 60079-0:2017

IEC 60079-11:2011

KS C IEC 60079-0:2019

KS C IEC 60079-11:2020

- KCS (21-GA2B0-0393X)

Ex ia IIC T4

Ta: -20 ~ 50°C



- KC (R-R-N54-S2B)



- IECEX (IECEX KSCP 21.0018X)

Ex ia IIC T4 Ga

Ta: -20 ~ 50°C

- IP Protection Level: IP 67

C. Smart Gas Sniffer Manual

C.1 Install Smart Gas Sniffer

Install the smart gas sniffer app(hereinafter “dedicated app”) on your smartphone in advance in order to check the detection results of **Smart Safety Ball**, our smart gas detector.

- **Android:** launch Google PlayStore and then search for “Smart Gas Sniffer.” After selecting the app, press the “Install” button to start downloading.
- **iOS:** launch AppStore and then search for “Smart Gas Sniffer”. Press the “Get” button to download the app, and then press the “Install” button to install the app.



Cautions

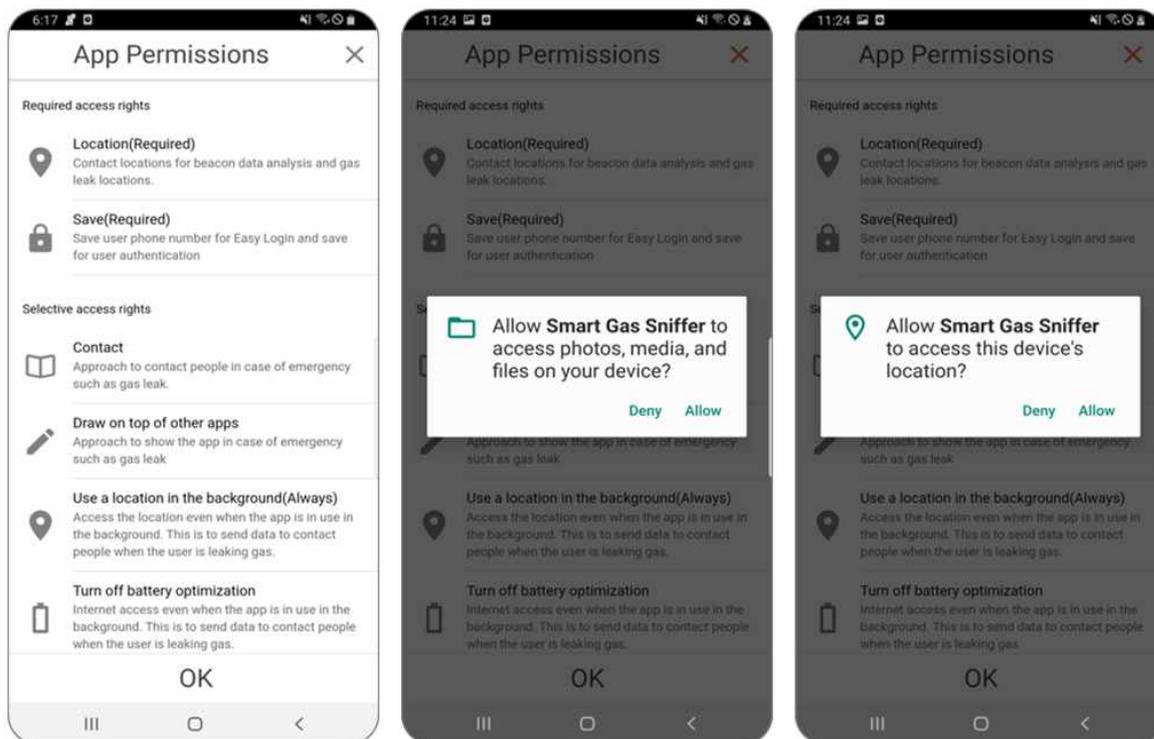
- ◆ Be sure to **allow location access permission** when installing the app, in order to use the Smart Gas Sniffer app normally. Ignoring this process may result in malfunction of emergency contact and alarm location check provided by the app other than detection of gas concentration. We are not responsible for any problems caused by such negligence.
- ◆ If you do not accept the location access, file access permission, terms and conditions of dedicated app, you cannot use this app. (**See C.2 Allow Permission and Accept Terms and Conditions**).
- ◆ The latest model phone(**Android 10 or over, as of Feb. 2021**) may request the drawing permission over other app. If you do not accept the permission, you may not use the app normally.
- ◆ If you do not enter the phone number actually used in the process of agreement and authentication, there may be restriction on use of app. We are not responsible for any problem caused by this(It may take up to 1 minute to receive verification text message.)
- ◆ This manual is prepared based on Android Smartphone. All the functions indicated in the manual may not be guaranteed in iPhone. We are not responsible for any problems that may occur due to functional difference between OS of Android and iPhone.
- ◆ Detailed structure and function of this dedicated app is subject to change without prior notice.

Operating System(OS) for Smart Gas Sniffer App

- Android OS: 5 or over
- iOS: 11.0 or over (* iPhone 5 or over supported)

C.2 Allow Permission and Accept Terms and Conditions

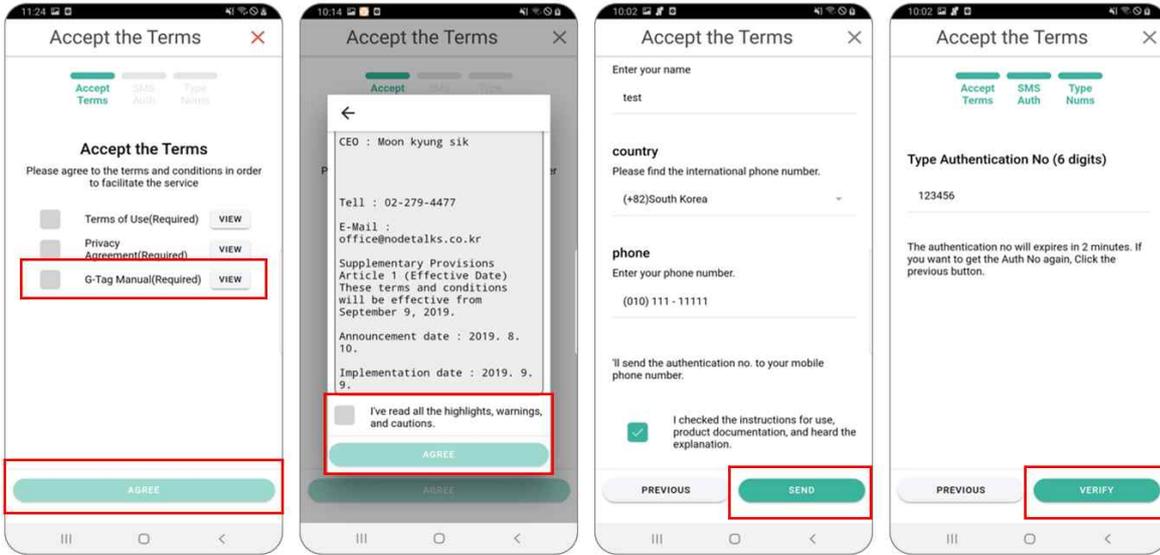
The following figures show the permission screens that appear when you first run the app after installing it. Press the “OK” button and then “Allow” the file access permission and location access permission.



The figure on the top of the next page (p. 15) shows the screen for agreement of terms and conditions for app use. Press “View” button to check the details of each item. After checking all the contents of each item, tick the ‘I have read all the main contents, warnings and cautions.’ checkbox, press “Agree” button that becomes activated to agree each.

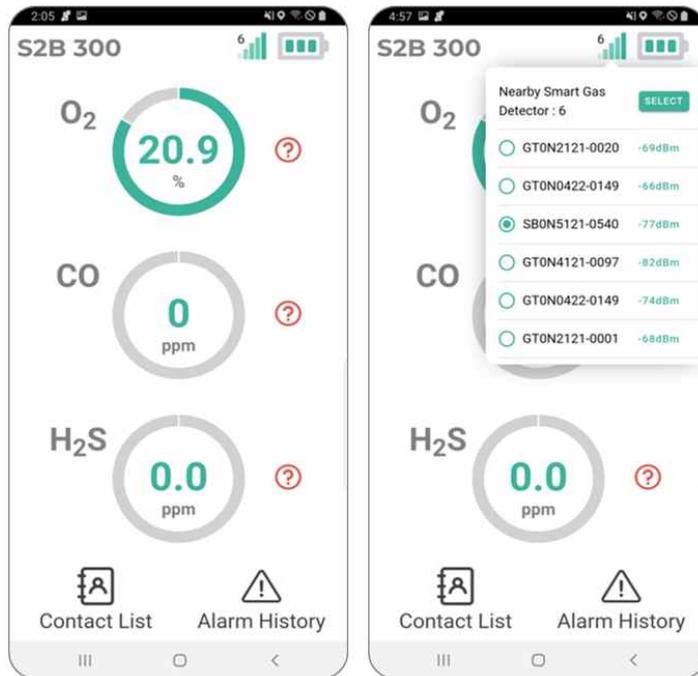
Press the “Agree” button on the bottom that becomes activated when you agree to all the contents on the Agreement of Terms and Conditions to go to the next page. After entering the name, nationality and phone number of the user, press ‘Send Verification Number’ button and 6 digit verification number will be sent to the device of the user.

After entering the verification number received, press the “Confirm Verification” button and then basic preparation for agreement of terms and conditions and the app use is completed.



C.3 Basic Method of Using App

Run the app while **Smart Safety Ball** is normally turned on, and the basic screen appears as shown below. Concentration value will blink during normal operation whenever receiving the data.



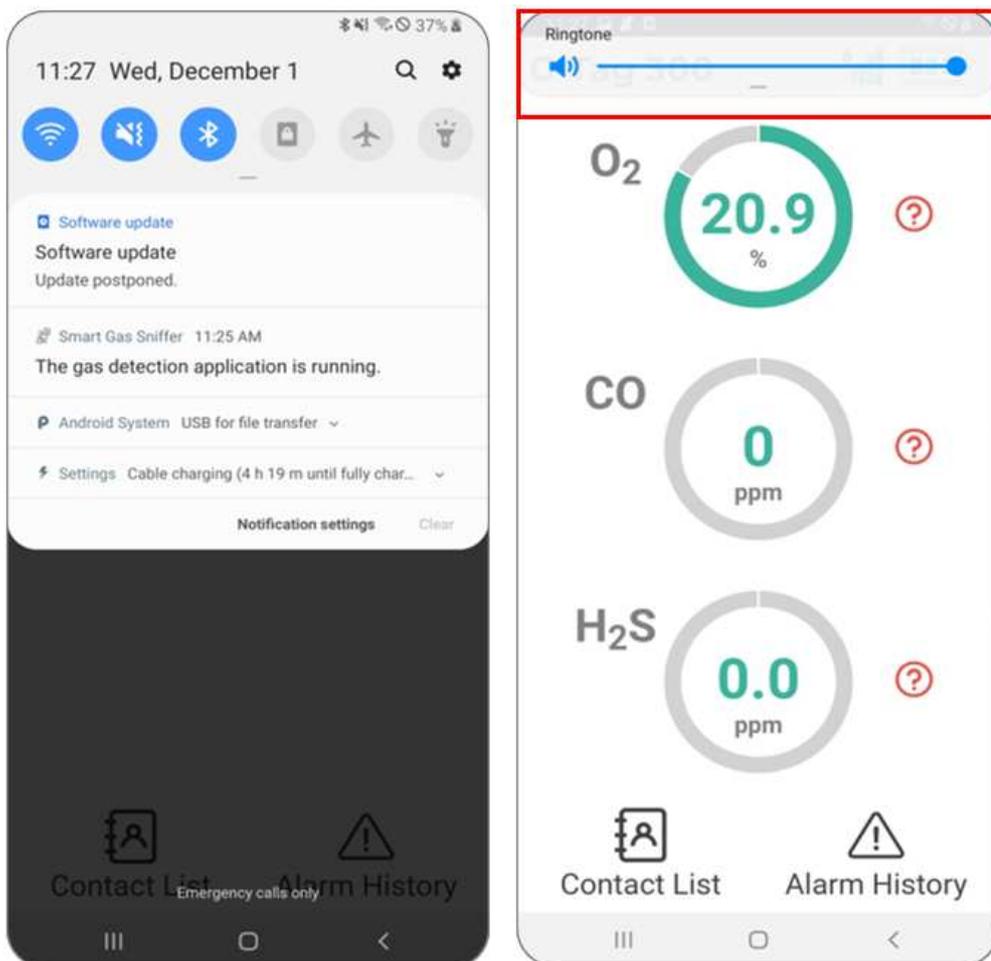
NOTE::

- Smart gas sniffer app does not require separate connection(pairing) process with **Smart Safety Ball**.
- Detection results of **Smart Safety Ball** are displayed at the center of the screen and the measurement gas will be automatically displayed.
- Strength of wireless connection to **Smart Safety Ball** and remaining batter level are displayed on the right upper part.

If the app is running, the text indicating the app running status is displayed in the notification area at the top of the smartphone (**figure on the bottom left**). To show the information rapidly in case of alarm, the app will not be terminated even if you click the Back button. Press the home(center) button of the smartphone to switch the app to the background model.

The antenna on the upper right displays the strength of wireless connection with **Smart Safety Ball**. X mark will appear if the connection strength becomes weakened and it is a temporary phenomenon. If X mark continues and indicates **“Disconnected from Smart Safety Ball. Please check the operation status and distance of the device.”** at the center of the screen, check the distance with the device first and examine whether **Smart Safety Ball** is turned on or Bluetooth is turned on. Once connected, the concentration indication will blink whenever receiving data from **Smart Safety Ball**.

The volume of media sound is changed to the maximum whenever the app is launched so that the user can identify the alarm even in the poor surroundings(**Figure on the bottom right**). (the volume can be freely adjusted after running the app).





Cautions

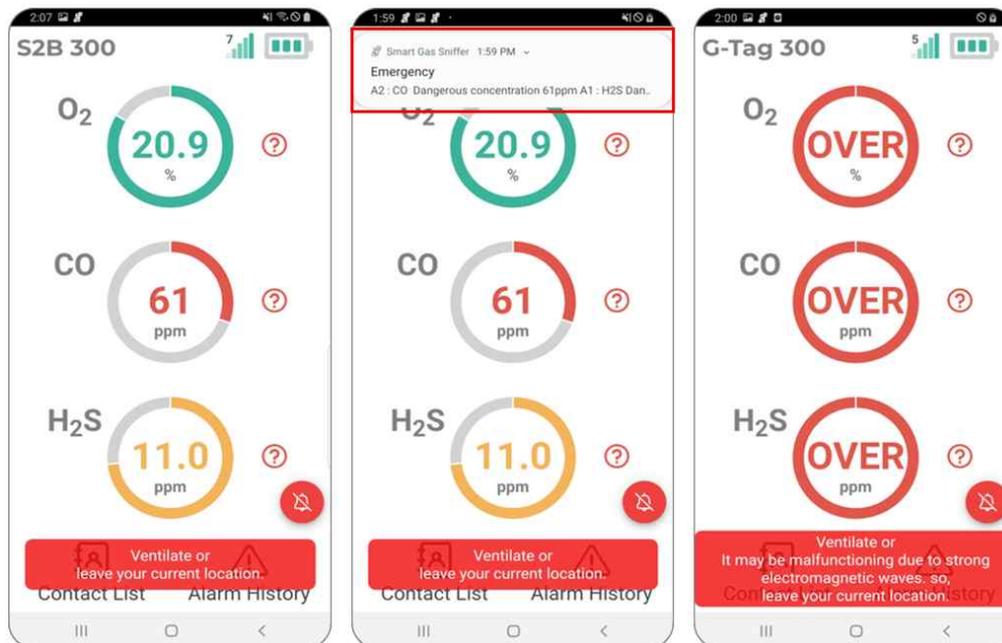
- ◆ Turn on the Bluetooth function of the smartphone before using the app.
- ◆ If you run the app while Bluetooth is off, it requests the permission for Bluetooth function and sets it to turn on Bluetooth with 'Use' button.
- ◆ If use of Bluetooth is not allowed, data of **Smart Safety Ball** cannot be received.
- ◆ It is recommended to run the app after switching the location information of smartphone to "Enable". If this function is not enabled, it switches to the page for activation of location information in the stage of running app.
- ◆ The same information is displayed to the app user within the transmission distance of **Smart Safety Ball**. (as the feature of beacon method, information sent from 1 unit of **Smart Safety Ball** can be checked simultaneously by multiple app users.)
- ◆ If there exist several units of **Smart Safety Ball** around the user, information from several units of **Smart Safety Ball** may be displayed in turns. However, when alarm occurs from **Smart Safety Ball** possessed by the user, only user's information is displayed first so that there is less risk of confusion with information from nearby **Smart Safety Ball** in case of emergency.
- ◆ Communication distance between **Smart Safety Ball** and smartphone may vary depending on surrounding environment. Communication status can be checked through indication of concentration that blinks at certain time and strength of wireless connection of the app.

C.4 App Operation in case of Alarm

When receiving warning concentration from **Smart Safety Ball**, the dedicated app notifies the user of the danger by vibration along with its own alarm sound through the smartphone. Detection result will be displayed in green in normal situation; in orange in warning situation; and red in dangerous situation(Figure on upper left part of page 18).

A text "Please ventilate or leave the current location" is displayed when entering the dangerous situation or in case of warning. If the app operates in the background, the dedicated app screen appears along with the indication text on the upper part of the app(figure on the upper center part of page 18).

If there exists strong electromagnetic waves such as base station at a close range, it causes malfunction of the gas detector, resulting in rapid increase and abnormal variation of all values(figure on the upper right part of page 18). In this case, leave the location and it will return to normal operation again.



If a recipient is added in the emergency contact network, it automatically notifies of the dangerous situation of the app user by text message. concentration of gas currently exposed, name, phone number and location information of app user is sent to the contact of the recipient saved earlier.

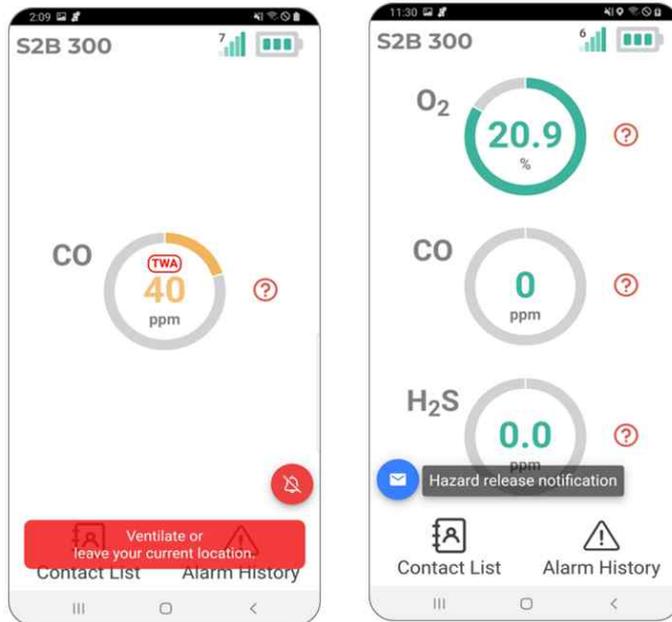
- In case of A1/A2 alarm, the color is changed according to the degree of

danger of gas and a button [] appears on the lower right part, which enables to turn off the alarm sound of the app temporarily (60 seconds). Press the button to turn off the alarm temporarily and to use normal function of smartphone. For example, you can scroll down the app(click home button) and use the call function to alert you about dangerous situation. *(In general, if the app is turned on and activated, it will forcefully switch to the dedicated app screen and to restrict conversion to other app when dangerous situation occurs.)*

- However, alarm sound will operate again regardless of standby time of 60 seconds if A2 alarm is generated even if you turn off the alarm sound in A1 situation.

- If A2 alarm occurs simultaneously in over 2 sensors including the oxygen sensor, text “malfunction due to strong electromagnetic waves” may be added, assuming that it is exposed to strong electromagnetic waves.(See the figure on the upper right part)

- As shown in the figure on the upper part of page 19, it displays the gas of which warning concentration occurs in the situation of time-weighted average exposure alarm(TWA or STEL), and separately displays type of alarm(see the figure on the upper left part of page 19). You can temporarily turn off the time-weighted average exposure alarm for 60 seconds using the button on the lower left in the dedicated app, but alarm of **Smart Safety Ball** is not released before it leaves the gas leakage area.



NOTE::

- ◆ If the gas detection concentration value is out of measurement range, it is replaced with OVER text (refer to Figure on the upper of the page 18).
- ◆ If there is no recipient registered in the emergency contact network, danger text is not sent. In this case, a text “Failed to bring the emergency contact network. Please register the emergency contact network” is displayed at the center of the app.



Cautions

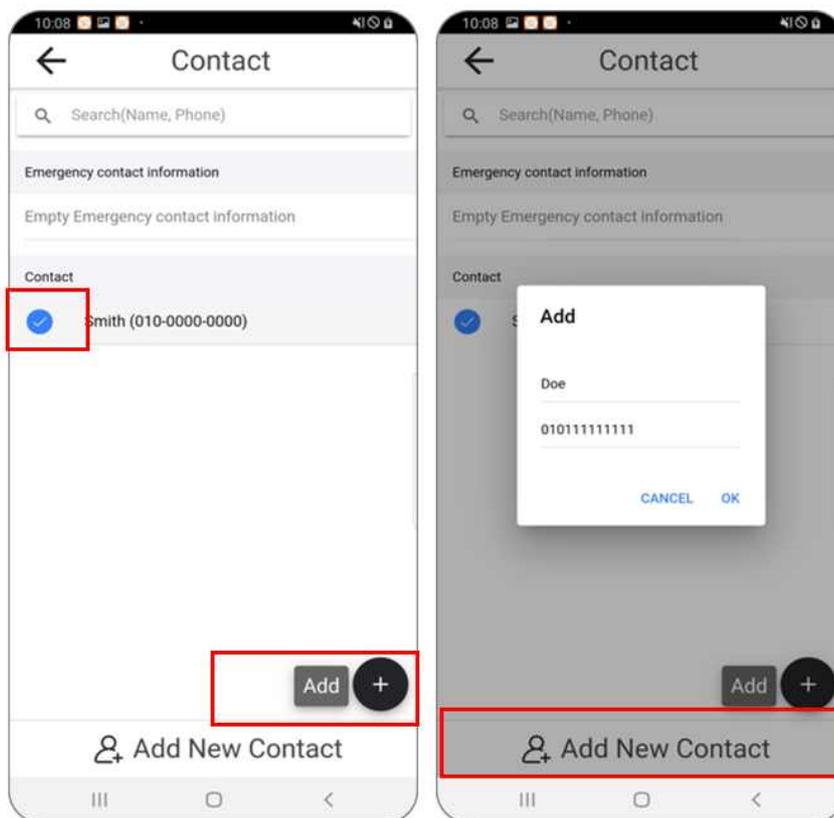
- ◆ If the relevant toxic gas is exposed while time-weighted average exposure concentration exceeds the thresholds, TWA or STEL alarm will sound. (Ex: if detecting CO₂ gas over 30ppm actually while the cumulative concentration value of CO gas for 8 hour is 200 ppm, TWA alarm will operate instead of A1 alarm)
- ◆ If TWA or STEL alarm occurs, the relevant alarm cannot be turned off with the button of **Smart Safety Ball**. If the cumulative concentration value falls below the threshold, evacuate to the area with good ventilation and clean air.
- ◆ If the user does not move for over 30 seconds while alarm continues to occur in **Smart Safety Ball** (if possessing the smartphone with dedicated app running), it considers the user to be in dangerous situation and continues to send warning text to the recipients saved in the emergency contact network every 30 seconds to ask for help.
- ◆ Since a text is sent to the recipient to notify safe situation if you press “Notification of release of dangerous situation” button that is displayed on the screen when the alarm occurs, use it properly after “dangerous situation is solved clearly”.

C.5 Other Functions

c.5.1 Register Network of Emergency Contact

You can register or delete the targets to send a danger text when receiving warning alarm in the emergency contact network of the dedicated app. Click the contact in the address book and then click the Register button that appears on the lower right, the relevant recipient will be registered in the emergency contact network (left figure). You can check the address book saved in the smartphone by allowing the contact access permission(access) of the dedicated app.

If you want to newly add a person who is not in the contact , click “**Add New Contact**” button on the lower part of app to register the name and phone number(Right figure). If you want to delete the person added in the emergency contact network, click the x mark on the right to delete.

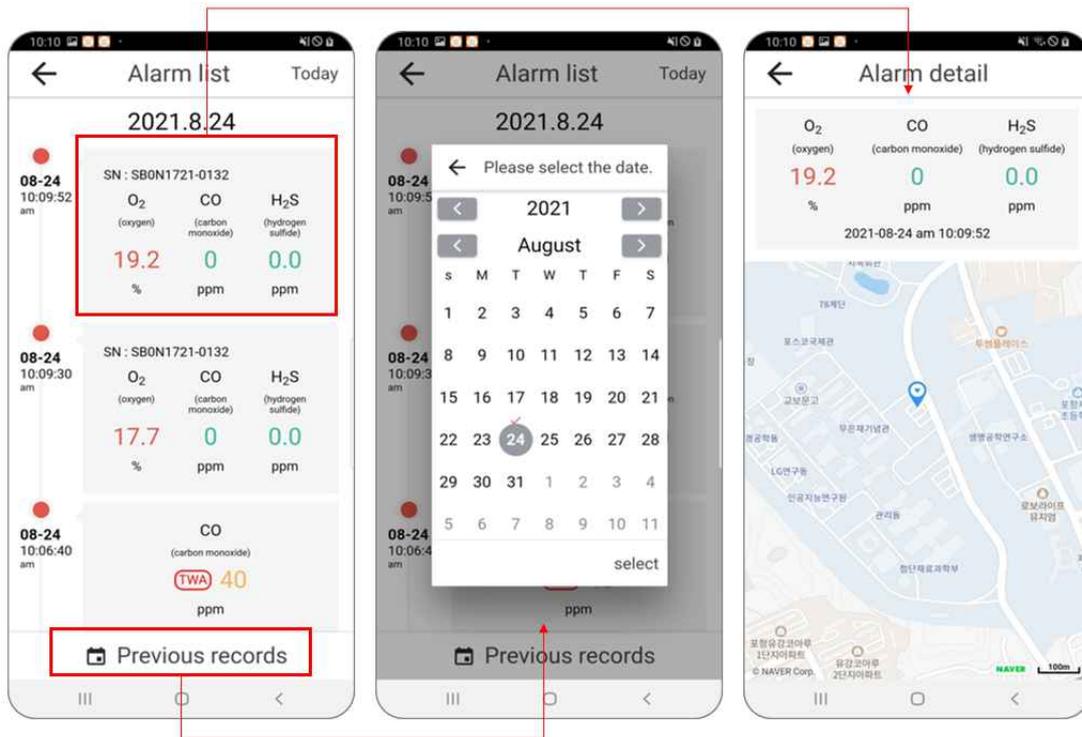


C.5.2 Check Warning History

You can check the alarm data such as date of occurrence, concentration of gas and location received from **Smart Safety Ball**. In addition, if the serial number of device is checked, the serial number is also displayed so that you can check which device the alarm sounds from. If there is no alarm received for the day, a text “**No data. Please select a date**” is displayed.

NOTE::

- concentration recorded means the maximum value in case of oxygen excess or alarm of toxic gas; and minimum value in case of oxygen deficiency alarm.
- When checking the data of other date, click the “View Previous Record” at the lower part of app. At this time, red check mark appears on the date when the alarm history exists. Click the history you want in the warning history, and it will go to the alarm detail page where you can check the date of alarm, concentration of gas and location of alarm.
- Location accuracy may be reduced at the indoor environment or a place with congested wireless signal, and may be affected depending on service providers.



C.5.3 App Information

Click the **Smart Safety Ball** logo on the left upper part of the app main screen to check the version, name and company information of app. You can check the terms and conditions of app and the privacy policy of the app. Click the company logo and address of company website to move to the website of the company. In addition, you can get the user’s manual of the products.

D. How to Calibrate Gas Concentration

The following is the description on how to calibrate the gas concentration of **Smart Safety Ball**, the smart gas detector. The gas concentration of this product is calibrated using the dedicated app (Smart Gas Sniffer) of Bluetooth of the company. Separate test gas is required to perform span calibration.

D.1 Terminology

D.1.1 Calibration

The process of adjusting the sensor output reading to the actual gas concentration.

D.1.2 Zero calibration

The process of concentration in the condition of Oxygen 20.9% and toxic gas concentration 0 ppm.

D.1.3 Span calibration

The process of output at the relevant concentration after injection of specific test gas.

D.1.4 Test gas

Standard gas used in span calibration(Ex: Oxygen 18%, Carbon monoxide 100 ppm, Hydrogen sulfide 25ppm gas)



Cautions

- ◆ If oxygen 20.9%, toxic gas 0 ppm value are not detected at room temperature or 50% relative humidity, perform zero calibration.
- ◆ Span calibration should be performed at least every 6 months for accurate detection results. Separate test gas is required for span calibration.
- ◆ Contact NodeTalks Corp.. if any problem occurs during calibration.

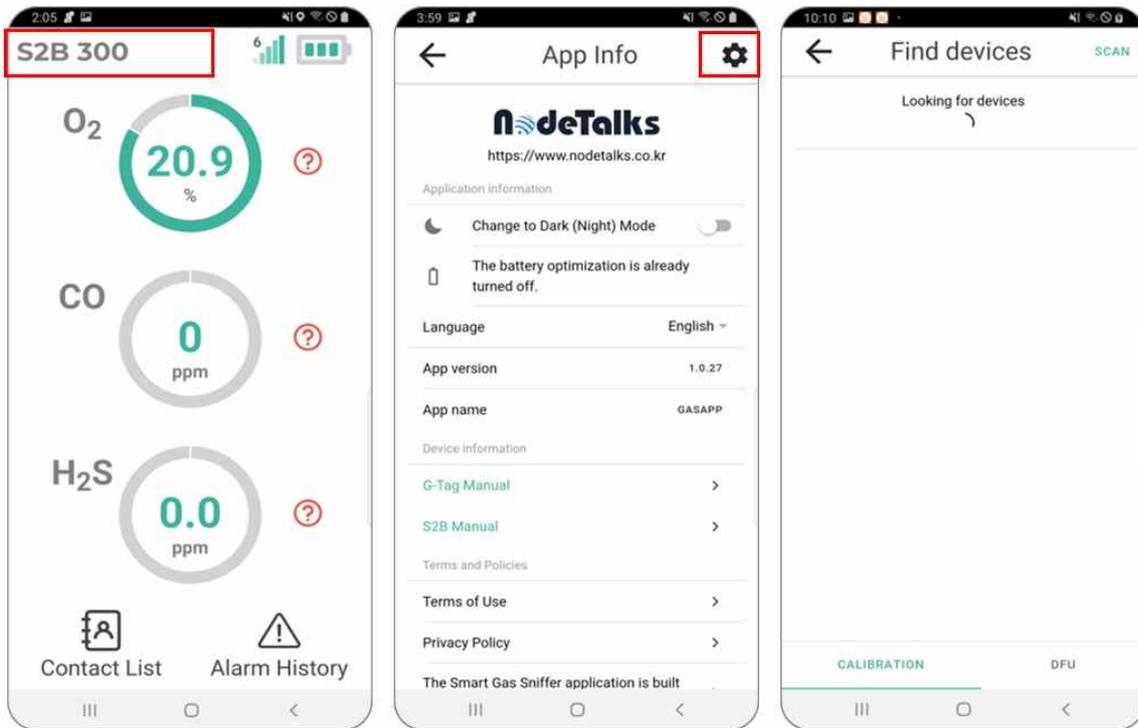
※ User Precautions for Calibration

i. It is recommended to calibrate the gas concentration in a room temperature. Since toxic gas over certain concentration should be used for span calibration of toxic gas sensor(CO/H₂S), ventilate the surrounding area sufficiently and perform in the environment with vent for toxic gas.

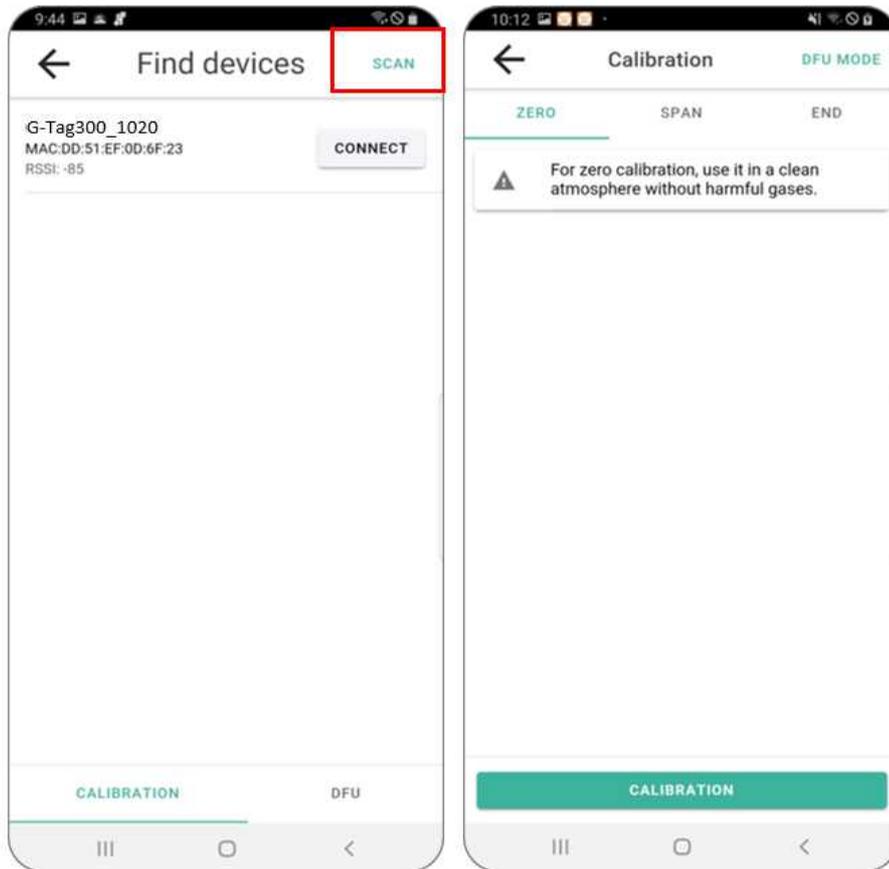
ii. Since our Bluetooth dedicated app should be used with the smartphone for calibration, such process should be performed in a safe place (explosion-proof area).

D.2 Prepare for Calibration

- **Smartphone Setting:** after running “Smart Gas Sniffer”, our Bluetooth dedicated app, click the **Smart Safety Ball** logo on the left upper part of the app main screen to enter app information page. After entering the app information page, click the gear-shaped setting button on the right upper part to enter the Find Device page as shown in the following figure. Set the **Smart Safety Ball** in this stage.



- **Smart Safety Ball Setting:** Gas concentration calibration process of **Smart Safety Ball** starts in the standby mode. Accordingly, after powering off the **Smart Safety Ball** in reference to “4.1 Device Start-up (Activation)” of this manual for product calibration, check whether the product power is completely shut off and turn on the power of the product again.



When you turn on the power of **Smart Safety Ball** again, the name of device available for connection is displayed as shown in the following figure on page 21 (*if it is not displayed in the list of device available for connection right after turning on the power of Smart Safety Ball again, press the Scan button on the right upper part*). Next, press “Connect” button of **Smart Safety Ball** device name (ex, **S2B-300_1020**) and it will be connected to the device and enter the page as shown in the right figure below on page 21.

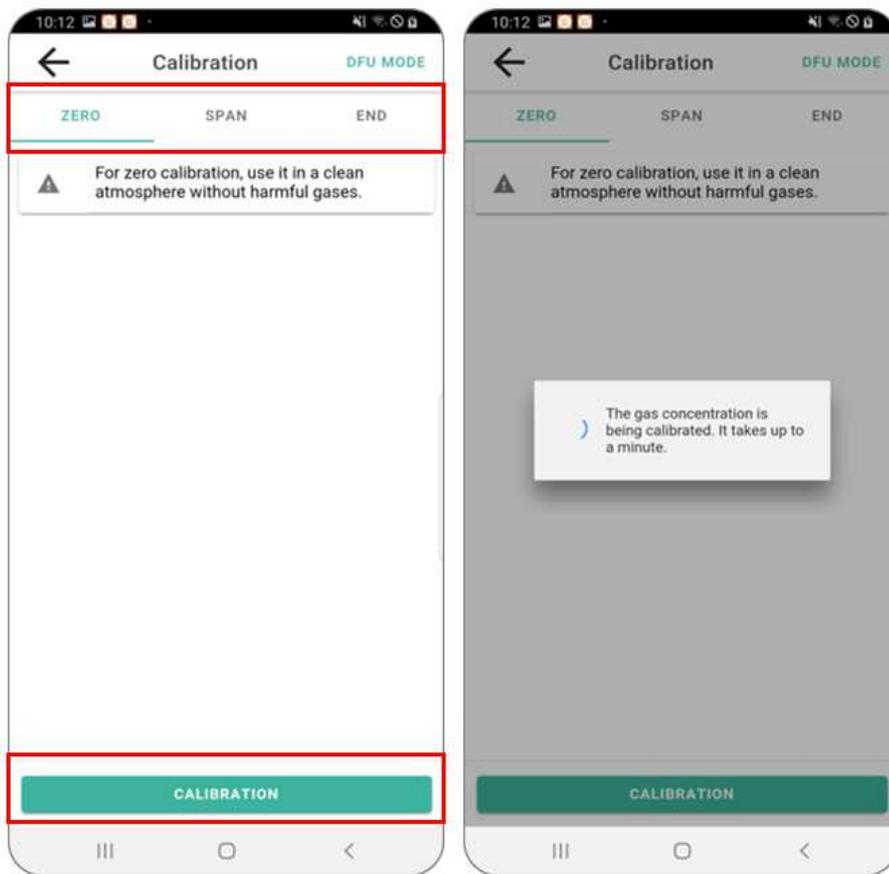


Cautions

- ◆ If there is no Bluetooth connection after starting **Smart Safety Ball**, it enters the detection mode from the standby mode where you cannot operate through Bluetooth connection with the dedicated app.(feature of beacon wireless communication)
- ◆ If connection is terminated without starting zero or span calibration after connection in standby mode, the device enters the detection mode after certain time.
- ◆ Accordingly, after setting the dedicated app first in the process of preparing the gas concentration calibration as mentioned above, it is recommended to prepare for calibration in the order of starting **Smart Safety Ball** again.

D.3 Zero Calibration

In this manual, zero calibration means the process of calibrating the output concentration in the environment of Oxygen 20.9% and toxic gas 0 ppm. Zero calibration should be performed at room temperature in the clean atmosphere without harmful gas around.



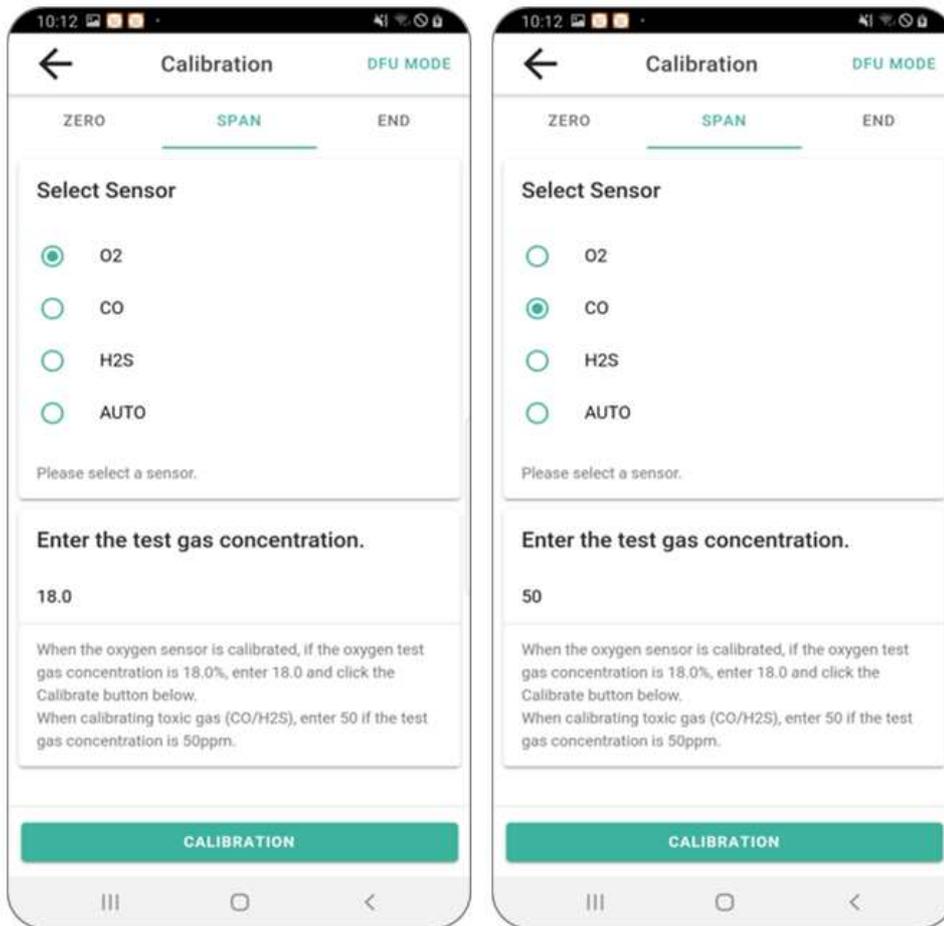
If you enter the gas concentration calibration page in the dedicated app, you can see that there are 3 types of menus such as “Zero Calibration”, “Span Calibration” and “Complete” on the upper part. After selecting the **Zero Calibration** menu, press the Calibrate button and the gas concentration calibration will start as shown in the figure on the right upper part.

NOTE::

- When calibration starts, **Smart Safety Ball** LED indicator will blink (interval of 1 second).
- When the calibration is complete, a message is displayed, indicating the calibration is complete on the upper part of app. **Smart Safety Ball** gives calibration complete alarm.

D.4 Span Calibration

Span calibration process is to calibrate so that the same concentration as test gas comes out from the gas detector after injecting the test gas of specific concentration. After selecting the “Span Calibration” menu in the calibration page of the dedicated app, enter the type of gas sensor to calibrate and the value of test gas.



Span calibration can be performed for each sensor as shown above, or all sensors can be calibrated in batches by pressing the Calibrate button after selecting AUTO. concentration of test gas used for calibration is set as shown in the following table.

Type of Gas	O ₂	CO	H ₂ S
Concentration	18%	100 ppm	25 ppm

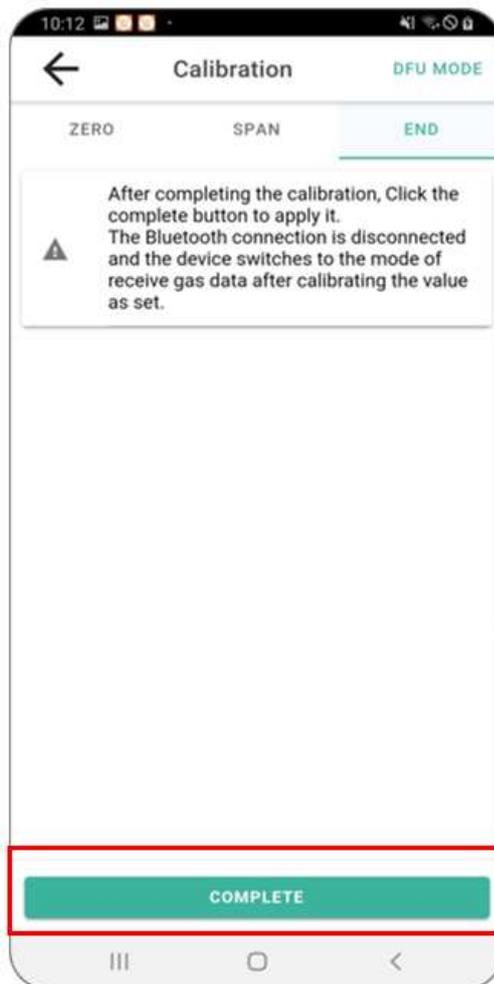


Cautions

- ◆ In case of span calibration, connect the regulator of standard gas cylinder and **Smart Safety Ball** using the adaptor and tube for calibration separately provided. Contact **NodeTalks Corp.**, for details.
- ◆ It is recommended to calibrate the gas concentration at room temperature. Calibration may not be performed normally if leaving the location during calibration, switching the dedicated app to the background mode or turning off the Bluetooth function of smartphone.

D.5 Complete

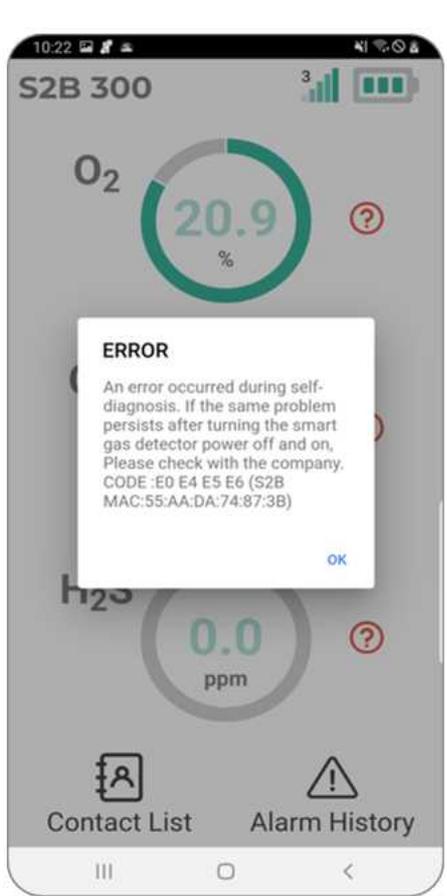
When calibration is complete, press the “Complete” button in “Complete” page to finish the calibration. After pressing the button, connection between dedicated app and **Smart Safety Ball** is automatically disconnected and the dedicated app switches to the app information page. **Smart Safety Ball** returns to the standby mode after completing calibration (red LED blinks), and enter the detection mode in 1 minute.



E. Self-Diagnosis Error Code

Smart Safety Ball performs self-diagnosis and automatic calibration after entering the detection mode, and transmits the error code to the surrounding area if any problem occurs during self-diagnosis. When the dedicated app receives self-diagnosis error code, the error code received will be displayed on the app screen as shown in the following figure. Possible error codes and causes are as shown in the following table.

Error Code	Possible Error and Causes
E0	Sensor damage or error of electromagnetic interference
E4	Oxygen(O ₂) sensor related errors
E5	Carbon monoxide(CO) sensor related errors
E6	Hydrogen sulfide(H ₂ S) sensor related errors



- If self-diagnosis error occurs, turn off the device and turn it on again.
- If the problem persists, contact NodeTalks Corp.



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Website: www.nodetalks.co.kr