GX-Force
Software Function Document

Document No.GX-Force_SW601

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1. Revision history

No.	Date	Version	Revised content	Remarks
Ex.	20XX/XX/XX	RevX.X	Create new	
1	2021/9/17	Rev1.0	Create new	
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Description

2. Software function

Product model   : GX-Force
Program version   : 07244, 07245

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                    ┌──────────────┐
                    │   Start-up   │
                    └──────┬───────┘
                           │
              ┌────────────┼──────────────────────────┐
         ┌────┴─────┐      │        ┌──────────────┐   │   ┌──────────────┐
         │ Password │──────┼───────▶│ Maintenance  │   │   │ Factory mode │
         │          │      │        │    mode      │   │   │              │
         └────┬─────┘      │        └──────────────┘   ▼   └──────────────┘
              │            │
         ┌────┴─────┐      │        ┌──────────────┐
         │User mode │      │        │Gas select    │
         │          │      │        │   mode       │
         └──────────┘      │        └──────────────┘
                           │
   ┌──────────────┐   ┌────┴─────┐
   │Communication │◀──│  Initial │
   │    mode      │   │          │
   └──────────────┘   └────┬─────┘
                           │
                     ┌─────┴─────┐      ┌──────────────┐
                     │ Measuring │◀────▶│ Display mode │
                     └───────────┘      └──────────────┘
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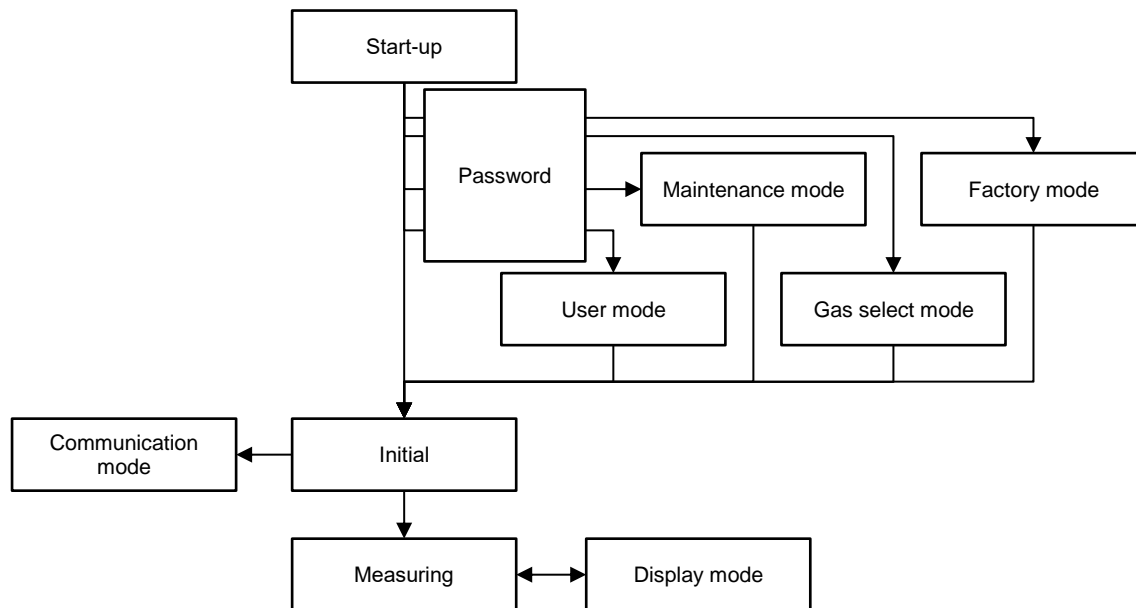
Note: The left and right LEDs blink every 4 seconds during other than measurement
and display mode or during AIR calibration.
Note: In low battery conditions, the left and right LEDs and buzzer operate every 4 seconds.

2.1 Initial

When each item of the initial can be displayed, it is displayed in order.
After each item is displayed, if all the sensors are not in error, the process proceeds to measurement.
When some of the sensors have an error, each item is displayed, and then the fact that there has been an error is displayed.

2.1.1 Full screen at startup

Display the full screen. (Approx. 4.5 seconds)
Operate the LED, buzzer, and vibration motor.

2.1.2 Resume (lunch break) display

Displays resume (lunch break).
When the lunch break function ON/OFF setting is on, a function to select whether to continue or initialize the previous setting at the time of starting the initialization.
After the selection, the selected set value is displayed for 2 seconds.
When 5 seconds have elapsed while the selection screen is displayed, it is automatically continued, and the screen shifts to the next item of the initial screen.
In the case of continuation, the following numerical values are continued.
・ Maximum density (PMAX)
・ Minimum density (PMIN)
・ Date and time of occurrence of maximum concentration value
・ Date and time of occurrence of minimum concentration value
・ Integrated value of the average value every 60 seconds
・ Mean value over the entire measurement time
・ Fraction from the start of measurement
・ TWA value
When the lunch break setting is OFF, it is not displayed.
Continuation: MODE
Initialization: AIR

2.1.3 Maintenance notification display

Displays maintenance notification. (Approximately 3 seconds for settings that do nothing less than the deadline or do nothing.)
This function checks whether the maintenance notice expires at start-up and displays it.
The date and time for maintenance notice is used for calculation of the number of days.
The date and time for maintenance notification is overwritten when the calibration succeeds.
・ Use after confirmation
   Displays that the expiration date has expired, and moves to the next item by pressing the AIR key.
・ Prohibition of use
   Indicates that the expiration date has expired and does not shift to measurement mode.
・ Do nothing
   Displays that the expiration date has expired and automatically shifts to the next item.
This message is not displayed when the Maintenance Notification function is set to OFF.

2.1.4 Calibration expiration date display

Displays calibration expiration. (Approximately 3 seconds for settings that do nothing less than the deadline or do nothing.)
Function to check and display whether the calibration period has expired at startup.
The gas calibration date and time is used for the calculation of the number of days.
User has option to switch to user mode if maintenance has expired.
・ Use after confirmation
   Displays that the expiration date has expired, and moves to the next item by pressing the AIR key.
   Press the MODE key to change the mode to the user mode.
・ Prohibition of use
   Indicates that the expiration date has expired and does not shift to measurement mode.
   Press the MODE key to change the mode to the user mode.
・ Do nothing
   Displays that the expiration date has expired and automatically shifts to the next item.
   Press the MODE key to change the mode to the user mode.
When the calibration deadline function is set to OFF, it is not displayed.

2.1.5 Bump expiration date display

Displays bump expiration. (Approximately 3 seconds for settings that do nothing less than the deadline or do nothing.)
This function confirms whether the bump expiration date has expired at the time of start-up and displays it.
Bump date and time is used for calculation of the number of days.
User has option to switch to user mode if maintenance has expired.
・ Use after confirmation
   Displays that the expiration date has expired, and moves to the next item by pressing the AIR key.
   Press the MODE key to change the mode to the user mode.
・ Prohibition of use
   Indicates that the expiration date has expired and does not shift to measurement mode.
   Press the MODE key to change the mode to the user mode.
・ Do nothing
   Displays that the expiration date has expired and automatically shifts to the next item.
   Press the MODE key to change the mode to the user mode.
When the bump expiration function is set to OFF, it is not displayed.

2.1.6 Display date and time

Displays the date and time. (Approx. 4 seconds)
Simultaneously pressing the AIR+ MODE key shifts the mode to the communication mode.
When a USB communication partner is detected, the system automatically shifts to communication mode.(2.8.1)

2.1.7 Battery voltage alarm operation display

Battery voltage and alarm operation are displayed. (Approximately 4 seconds. Approximately 3 seconds if the bump expiration function is ON and within the expiration date.)
Simultaneously pressing the AIR+ MODE key shifts the mode to the communication mode.
When a USB communication partner is detected, the system automatically shifts to communication mode.(2.8.1)
 Alarm operation
   AL-L: Self-retention
   AL-A: Auto return

2.1.8 Flammable sensor limit mode

Indicates that the flammability sensor is in limit mode. (Approx. 5 seconds)

When the element A cannot be calibrated at the time of calibration of the combustible sensor, the limit mode is set.

When this screen is displayed, if the reading is set to a gas type that cannot be read in the limit mode, it is automatically returned to the calibration gas type.

This is displayed when the combustible sensor is in the limit mode.

2.1.9 Measurement gas name display

Displays the measurement gas name. (Approximately 3.5 seconds; approximately 3 seconds if the bump expiration function is ON and within the expiration date.)

If the combustible gas is other than CH4 and H2, the detailed gas names are displayed at the bottom of the screen.

If reading is being changed, display HC in the concentration part, and display the name of the gas to be read in the bottom part of the screen.

2.1.10 Full scale display

Displays the full scale of the measured gases and the flammable LEL setpoint (STD/IEC/ISO). (Display time is described below.)

When the flammable LEL set value is STD, the LEL set value is not displayed.

Display time

    When the measurement gas type is only combustible gas and oxygen: Approx. 12 seconds

    The measurement gas type is not combustible gas and oxygen, and the cumulative alarm is OFF.

      With TWA: Approx. 4 seconds

      Without TWA: Approx. 8 seconds

    The measurement gas type is not combustible gas and oxygen, and the cumulative alarm is ON.

      With TWA: Approx. 3 seconds

      Without TWA: Approx. 6 seconds

    When the bump expiration function is ON and within the expiration date, 1 second is minus the value described above.

2.1.11 1st alarm point display

Displays 1st alarm point. (Display time is described below.)

Display time

    About 4 second

    If the Maintenance Notification function is ON and within the deadline, one second shall be minus one second as described above.

    When the calibration deadline function is ON and within the deadline, one second is minus one second as described above.

2.1.12 2nd alarm point display

Displays 2nd alarm point. (Display time is described below.)

Display time

    About 4 second

    If the Maintenance Notification function is ON and within the deadline, one second shall be minus one second as described above.

    When the calibration deadline function is ON and within the deadline, one second is minus one second as described above.

2.1.13 3rd alarm point display

Displays 3rd alarm point. (Display time is described below.)
Display time
About 4 second
If the Maintenance Notification function is ON and within the deadline, one second shall be minus one second as described above.
When the calibration deadline function is ON and within the deadline, one second is minus one second as described above.

2.1.14 STEL alarm point display

Displays the STEL alarm point. (When the cumulative alarm is ON: approximately 3 seconds; when the cumulative alarm is OFF: approximately 4 seconds)
If the measurement gas type is other than combustible gas or oxygen, it is displayed.
When the STEL is set to OFF for gases other than combustible gases and oxygens, OFF is displayed in the density area.
STEL = (mean value for 1 minute for 15 minutes)/15

2.1.15 TWA alarm point display

Displays the TWA alarm point. (When the cumulative alarm is OFF: approximately 4 seconds; when the cumulative alarm is ON: approximately 3 seconds)
If the measurement gas type is other than combustible gas or oxygen, it is displayed.
This is not displayed when the cumulative alarm is ON and the type of gas to be measured is other than combustible gas, oxygen, and CO.
When TWA is set to OFF for gases other than combustible gas and oxygen, OFF is displayed in the concentration portion.
When the cumulative setting is ON, CO does not display.
TWA=(1 minute average value integrated from start)/480

2.1.16 CO integration alarm point display

Displays the CO integration warning point. (Approx. 3 seconds)
Displays when a CO sensor is installed and the cumulative setting is ON.
Accumulation = (the value obtained by integrating the average value for one minute from start-up)/60

2.1.17 User ID display

Displays the user ID. (Approx. 1.5 seconds)
Displays when the ID display setting is ON.

2.1.18 Station ID display

Displays the station ID. (Approx. 1.5 seconds)
Displays when the ID display setting is ON.

2.1.19 Auto zero calibration

Performs auto zero calibration.
MODE key: YES
AIR key: NO
Displays when the auto zero setting is ON.
If no key selection is made for 15 seconds, the selection defaults to NO.

2.2 During measurement

The gas concentration is measured.
When an abnormality is found at the initial time, the sensor displays "---" and concentration measurement is not performed.

2.2.1 Flammable sensor protection

When the combustible gas concentration reaches an OVER state, the sensor is deenergized to suppress abnormal combustion of the sensor.
The sensor can be reenergized with a key press or will reenergize after 30 seconds has passed with an oxygen concentration of 20.0% or greater.

2.2.2 Flammable gas reading conversion process

The reading can be converted to a pre-registered gas species concentration.
This can be selected only when the calibration gas is CH4 or i-C4H10 %LEL.
In the case of i-C4H10, some gas types can not be converted.
In the case of the JG specification, some gas types are unreadable. (Factor 0.6 to 2.0)
When the power supply is started in the limit mode, the gas type that cannot be read in the limit mode returns the reading replacement gas to the calibration gas type.
In the case of the limit mode, gas species that cannot be read in the limit mode cannot be read in the limit mode.

	Name of gas	Chemical formula	Convert from methane	Convert from isobutane	For JG specifications	Can not be read in limit mode
1	Methane	CH4	-	No	Yes	Yes
2	Isobutane	i-C4H10	Yes	-	Yes	Yes
3	Hydrogen	H2	Yes	Yes	Yes	Yes
4	Methanol	CH3OH	Yes	Yes	No	No
5	Acetylene	C2H2	Yes	Yes	Yes	Yes
6	Ethylene	C2H4	Yes	Yes	Yes	Yes
7	Ethane	C2H6	Yes	No	Yes	Yes
8	Ethanol	C2H5OH	Yes	Yes	No	No
9	Propylene	C3H6	Yes	Yes	Yes	Yes
10	Acetone	C3H6O	Yes	Yes	No	No
11	Propane	C3H8	Yes	No	Yes	Yes
12	BUDITAENE	C4H6	Yes	Yes	Yes	Yes
13	Cyclopentane	C5H10	Yes	Yes	Yes	Yes
14	Benzene	C6H6	Yes	Yes	No	No
15	n-hexane	n-C6H14	Yes	Yes	No	Yes
16	Toluene	C7H8	Yes	Yes	No	No
17	n-heptane	n-C7H16	Yes	Yes	No	Yes
18	Xylene	C8H10	Yes	Yes	No	No
19	n-nonane	n-C9H20	Yes	Yes	No	No
20	Ethyl acetate	EtAc	Yes	Yes	No	No
21	Isopropyl alcohol	IPA	Yes	Yes	Yes	No
22	Methyl ethyl ketone	MEK	Yes	Yes	No	No
23	Methyl methacrylate	MMA	Yes	Yes	No	No
24	Dimethyl ether	DME	Yes	Yes	Yes	No
25	Methyl-isobutyl-ketone	MIBK	Yes	Yes	No	No
26	Tetrahydrofuran	THF	Yes	Yes	No	No
27	n-pentane	n-C5H12	Yes	Yes	Yes	Yes

2.2.3 Gas alarm notification

If the gas concentration exceeds the alarm point (1st and 2nd of oxygen are below) an alarm is generated.

Flash the gas so that it can be seen which type of gas is issuing an alarm.

When an alarm is issued, the alarm name with the highest priority is displayed on the screen in consideration of the priority of the alarm.

1st < 2nd < 3rd < negative F.S. (failure alarm) < F.S. < 1H < TWA < STEL

The part of the gas concentration that is being reported blinks. If the gas concentration exceeds F.S., the "∩∩∩" indication is displayed.

The stoppage of the gas alarm depends on the setting of the self-holding/automatic return setting.

For self-holding setting

Even if the gas concentration falls below the alarm point, the alarm operation is not stopped unless the MODE key is pressed.

Auto return setting

When the gas concentration falls below the alarm point, the alarm operation is automatically stopped.

Alarm operation

Alarm	Buzzer	LED	Vibration
1st	Strong and weak sounds with a period of about 1 second	Blinking for a period of about 1 second	Vibration with a period of about 1 second
2nd	Strong and weak sounds with a period of about 0.5 second	Blinking for a period of about 0.5 seconds	Vibration with a period of about 1 second
3rd	Strong and weak sounds with a period of about 0.5 second	Blinking for a period of about 0.5 seconds	Vibration with a period of about 1 second
F.S.	Strong and weak sounds with a period of about 0.5 second	Blinking for a period of about 0.5 seconds	Vibration with a period of about 1 second
1H	Strong and weak sounds with a period of about 1 and 0.5 second	Blinking in about 1 and 0.5 second cycles	Vibration with a period of about 1 second
TWA	Strong and weak sounds with a period of about 1 second	Blinking for a period of about 1 second	Vibration with a period of about 1 second
STEL	Strong and weak sounds with a period of about 1 second	Blinking for a period of about 1 second	Vibration with a period of about 1 second

2.2.4 Fault alarm notification

If a failure occurs, an alarm is issued.

If a failure occurs, the user can restart the measurement after confirmation, or it depends on the type of the failure.

Only the negative F.S. failure is the same operation as the gas alarm, unlike other failures.

Each fault has a priority, and if a fault occurs at the same time, a fault with a higher priority is displayed.

Faults with equal priority are displayed alternately.

Fault Alarm Operation

   Buzzer: Intermittent sounding with a cycle of about 1 second

   LED: Flashes with a cycle of about 1 second

   Vibration: No operation

Failure	Fault number	Priority 0: High to 5:Low	Home operation	Diagnostic location	Failure factor
ROM failure	000	0	Self-holding	Every 24 hours at startup and measurement	The SUM of the recalculated ROM does not match the configured SUM.
RAM failure	010	0	Self-holding	Every 24 hours at startup and measurement	Write bit pattern (0x55,0xAA), compare read values and do not match
FRAM failure	021	2	Self-holding	Every 24 hours at startup, writing, and measurement	Inconsistency of reversed binary values The recalculated SUM of the data area does not match the configured SUM.
FLASH error	031	2	Recovery after confirmation	During writing	Write failed twice.
Circuit voltage error	080	3	Self-holding	During start-up and measurement	If the circuit voltage is out of range SV(AN004), MV(AN005) : Outside the range of 1320 to 1480mV ECV1(AN006) : Outside the range of 540 to 660mV ECV2(AN007) : Outside the range of 1120 to 1280mV ECV3(AN024) : Outside the range of 2100 to 2300mV HCV(AN025) : Outside the range of 930 to 1100mV PZF(AN026) : Outside the range of 1900 to 2100mV When 2.8V becomes 2.48V or less for 5 seconds or more with the LVD function
Sensor circuit error	081	3	Self-holding	During start-up and measurement	When communication fails more than three times Abnormal status of the sensor MCU
Thermistor error	082	3	Self-holding	During start-up and measurement	If the sensor circuit is not abnormal, When the thermistor A/D value is outside the threshold of mV equivalent to-55℃ to +85℃
Clock error	050	3	Recovery after confirmation	Startup	Calendar values not available at startup Communication error with RTC
Backup battery error	051	3	Recovery after confirmation	Startup	When there is evidence that the backup voltage has dropped since the previous power was turned off at startup.
IN side flow rate drop error	500	3	Recovery after confirmation	At all times (starts 3 seconds after pump starts)	When the pressure sensor output difference between when the pump is OFF and when it is ON is 400mV or more
Pump disconnection error	503	3	Recovery after confirmation	Starts 3 seconds after pump starts	When the pressure sensor output difference between when the pump is OFF and when the pump is ON is less than 5mV
Battery voltage low Li	091	1	Self-holding	At all times	When the battery voltage is 3400mV or less
NC sensor disconnection	100	3	Self-holding	During start-up and measurement	When the A/D value after 1 sec of energization is 15 mV or less

O2 sensor disconnection	110	3	Self-holding	30 seconds after start-up: When the Lo side output (AN003) becomes 2100mV or more during measurement	When the difference between the Hi-side output (AN002) before the 10msec pulse and the Hi-side output (AN002) after 50sec after the pulse is less than 5mV
3-channel sensor disconnection	120	3	Self-holding	10 seconds after start-up and every 15 minutes during measurement	When the difference between the pre-pulse sensor A/D value for 10 msec and the post-pulse sensor A/D value for 10 sec is less than 5 mV
4-channel sensor disconnected	130	3	Self-holding	10 seconds after start-up and every 15 minutes during measurement	When the difference between the pre-pulse sensor A/D value for 10 msec and the post-pulse sensor A/D value for 10 sec is less than 5 mV
BUMP error	1+ch+7	4	Recovery after confirmation	BUMP run time	Outside BUMP thresholds
AIR calibration error	1+ch+9	4	Recovery after confirmation	During AIR calibration	Outside the AIR calibration threshold
SPAN calibration error	1+ch+8	4	Recovery after confirmation	During SPAN calibration	Out of SPAN calibration thresholds
Negative F.S.	-	-	-	During measurement	Concentrations below the negative F.S. failure point

2.2.5 Flammable conversion gas name display

Displays the conversion gas name below the measurement display when gas conversion has been selected.

2.2.6 Time display

Displays the current date and time at the top of the LCD display.

2.2.7 AIR calibration

Press and hold the AIR key to perform AIR calibration.
If the AIR key is released before the AIR calibration is confirmed, the measurement is returned without performing the AIR calibration.

2.2.8 Snap log record

Press and hold AIR + MODE keys simultaneously during measurement to switch to snap log recording.
MODE key : Record snap log
AIR key : Return to measurement screen

2.2.9 Conformation beep

During measurement and during display mode, the LED, buzzer and vibration motor operates at specified times according to the settings.

2.2.10 Out of service temperature range warning

If the temperature outside the operating temperature range (-20°C to 50°C) ± 3°C lasts for 20 minutes, a warning of outside the operating temperature range is issued.
The alarm sound (buzzer, LED, vibration) can be reset by key operation for 1 hour from outside the range.
During the period from outside the range to 1 hour, a warning sound is re-issued every 20 minutes, and cannot be reset when 1 hour has elapsed.
From 20 minutes to 1 hour after the temperature is out of the range, "TMP.WARN" is displayed on the measurement screen, and thereafter "TEMP NG" is displayed on the measurement screen.
The display and the current temperature are displayed in flicker.
If the temperature returns to within the operating temperature range, the warning sound is automatically released after 5 minutes and the warning display disappears.

2.2.11 Purging process

When the power is turned off, if the gas concentration other than oxygen is higher than 5% F.S., purge processing is performed for a maximum of 30 seconds to clean the inside of the detector. The power is automatically turned off 30 seconds after the purge process starts. If the gas concentration drops below 5% F.S. before 30 seconds have passed, the power is automatically turned off at that point.
Purge processing is executed only when the power is turned off in measurement mode or display mode.

2.3 Display mode

Displays various settings.
When the MODE key is pressed in the measuring mode, the display mode is shifted to the display mode.
Use the MODE keys to change the display modes.
When the MODE key is pressed in the last item, the measurement mode is shifted to the measurement mode.
After 20 seconds of no operation, the display defaults to measurement mode.
When a gas alarm is generated during the display mode, it is automatically shifted to the measurement mode.
Any settings will be discarded when the display defaulst to measurement mode.
During a gas alarm, the display mode cannot be changed.

2.3.1 Light on/off

Turn the light on/off.
MODE key: Moves to next item
AIR key: Switch on/off
The light will automatically turn off after about 2 minutes.

2.3.2 PEAK display

Displays the PEAK gas concentration value from the start of measurement to the present.
MODE key: Moves to next item
AIR key: Clears peak value with press and hold (3 seconds)
All sensors excluding oxygen display the MAX value while oxygen displays the MIN value.
To reset, press and hold the AIR key (except when password protection is ON).

2.3.3 STEL display

Displays the current STEL concentration value.
MODE key: Moves to next item
AIR key: No action
Not displayed when only flammable gas and oxygen sensors are used.

2.3.4 TWA display

Displays the current TWA concentration value.
MODE key: Moves to next item
AIR key: No action
Not displayed when only flammable gas and oxygen sensors are used.

2.3.5 CO cumulative display

Displays the current CO accumulated value.
MODE key: Moves to next item
AIR key: No action
Displays only when the CO sensor is installed and the cumulative alarm setting is ON.

2.3.6 Flammable gas conversion selection

Selects the flammable gas reading conversion.
MODE key: Confirm
AIR key: Selects conversion gas
Displays only when the calibration gas is CH4 or i-C4H10.
Not displayed when the display mode setting is OFF.
Destination specifications limit readable gas types.
List of gas types in "Flammable Replacement of Terms" section.
In the case of the limit mode, gas species that cannot be read in the limit mode cannot be read in the limit mode.

2.3.7 Flammable Long Energy (Long Life) Setting

Enables/disables flammable gas sensor long energy (long life).
MODE key:　　　　　Confirm
AIR key:　　　　　　ON/OFF switch
When ON, the concentration update interval changes to once every 15 seconds from once every 5 seconds.
In this mode, determination of contact with high concentration gas is difficult since catalytic combustion sensor readings characteristically drop to a negative OVER. To compensate, the
± poles are reversed and the concentration is doubled, making it easier to issue an OVER alarm.
Due to the above handling, the device is not EN compliant when long-energy mode is selected.
Not displayed when the display mode setting is OFF.
When this function is ON, the icon of the L mark is turned on.
If the setting display function is off, this function is not displayed.

2.3.8 Pump off

Stop pumping and indicate that pumping has stopped.
MODE key : Start pump operation and return to display mode
AIR key: None
Alarm judgment is not performed while the pump is stopped. Also, logger data is not recorded.
The LED flashes while the pump is stopped.
Not displayed when the pump setting display is OFF.
If the setting display function is off, this function is not displayed.

2.3.9 User ID selection

Selects a User ID from the list.
MODE key:　　　　　Confirm
AIR key:　　　　　　Selects the User ID
Displays when the ID display setting is ON.
Selects the desired User ID from a pre-registered list of 128 IDs.
Not displayed when the display mode setting is OFF.

2.3.10 Station ID selection

Selects the station ID from the list.
MODE key:　　　　　Confirm
AIR key:　　　　　　Selects the Station ID
Displays when ID display setting is ON.
Selects the desired Station ID is selected from a pre-registered list of 128 IDs.
Not displayed when the display mode setting is OFF.

2.3.11 Calibration record Display

Displays the last calibration result.
MODE key:　　　　　Moves to next item
AIR key:　　　　　　Selects the gas to be displayed
Displays when the calibration expiration date function is ON.
Displays the last successful calibration date for each gas.

2.3.12 Bump record display

Displays the last bump test result.
MODE key:　　　　　Confirm
AIR key:　　　　　　Selects the gas to be displayed
Displays when the bump expiration function is ON.
Displays the last successful bump test date for each gas.

2.3.13 Snaplog display

View recorded snaplogs.
MODE key: Switches between recording date/time display and recording concentration display
AIR key: Select record number
MODE + AIR key: Change the increase/decrease of the record number
MODE + AIR key (1 second): Return to display mode
Displays the date and time of recording, recording number, recording density, and station ID at the time of recording.
If there is no snaplog record, display that there is no record.

2.3.14 Date and time temperature display

Displays the current date, time, and temperature.
MODE key: Moves to next item
AIR key: No action
When NCR is installed, the temperature −2℃ from the temperature inside the microcomputer is displayed.

2.3.15 Alarm point display

Displays each alarm point and performs alarm tests.
MODE key: Moves to next item
AIR key: Switches the display alarm point (F.S, 1st, 2nd, 3rd, STEL, TWA, and 1H)
MODE + AIR key: Performs alarm test for the displayed alarm point.
To stop the alarm test, press something.

2.4 User mode

2.4.1 Bump test

Performs bump test.
MODE key: Executes bump test
AIR key: Moves to next item
Enables bump tests.
Bump tests are performed for each auto-calibrated cylinder configuration.
Tests are dependent on the bump setting.
If the bump calibration function is ON, if the bump test fails, perform bump calibration.
The results are expressed as P(PASS) and F(FAIL).
When the NCR sensor enters the limit mode after the bump calibration, a message to that effect is displayed.

2.4.2 AIR calibration

Performs AIR calibration.
MODE key: Returns to the gas calibration menu
AIR key: Executes AIR calibration with press and hold (3 seconds)
Takes the current sensor output and deems it to be AIR with 20.9% O2 with all other concentrations set to 0.

2.4.3 Auto calibration

Each gas is calibrated at a preset level.
MODE key: Performing auto calibration
AIR key: Moves to next item
Use the AIR key to move the items in the order of Calibration (only when there is gas set in A to E), Start measurement, Calibration Concentration Setting, Cylinder Setting, and Return to Previous Items.

Calibration
Calibration of the gas species set for the selected cylinder is performed.
Gases are introduced and calibrated with the present sensor outputs by pressing the MODE keys after a specified period.
When the calibration is successful, the density value after the calibration is displayed.
If the calibration fails, a message indicating the failure is displayed, and the coefficient is not updated.
When all the gas types of the selected cylinder are calibrated, if the residual force value display function is ON, the residual force value is displayed.
If the NCR sensor enters the limit mode after calibration, this is indicated.

Start measurement
The full screen is displayed at startup and transitions to the measurement screen.

Calibration concentration setting
Select the type of gas (including returning items) with AIRs, and select the type of gas to be changed with MODE keys.
Use the AIR key to select the calibration density and use the MODE key to determine the calibration density.
When the OFF concentration selected, even if the cylinder is selected, the calibration cannot be performed.
Calibration Concentration Upper and Lower Limits

Gas species	Upper limit	Lower limit	Digit
Combustible sensor	75%LEL	1%LEL	1%LEL
O2	18.0%	0.0%	0.1%
H2S	200.0ppm	0.5ppm	0.1ppm
CO	2000ppm	12ppm	1ppm
H2(ESR-A1CP)	2000ppm	25ppm	1ppm

Cylinder setting
Cylinders A to E can be set for each gas type.
Select the type of gas (including returning items) with AIRs, and select the type of gas to be changed with MODE keys.
Select A to E with the AIR key and decide with the MODE key.

2.4.4 Calibration expiration date display ON/OFF

Sets the calibration expiration date display.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for calibration expiration date function.
When ON, the calibration deadline is displayed in the initial portion, and the calibration date and time are displayed in the display mode.
Not displayed when the destination setting is Japan.

2.4.5 Calibration expiration setting

Sets the no. of days to calibration expiration.
MODE key: Confirm
AIR key: Sets no. of days to expiration
Set the number of days of the calibration expiration function in units of 1 day to 1,000 days.
Not displayed when the destination setting is Japan.

2.4.6 Calibration expiration action setting

Sets calibration expiration action.
MODE key: Confirm
AIR key: Sets calibration expiration action
Configures the action when the period set in the calibration expiration function passes.
Not displayed when the destination setting is Japan.
Three selectable actions available: Use after confirmation; Prohibit use; Do nothing.

2.4.7 Bump conditions setting

Configures bump conditions.
MODE key: Executes items
AIR key: Moves to next item
Configures the following bump test conditions:
・ Bump test time
   Time at which the bump is run.
   30/45/60/90sec
・ Bump test threshold
   Reference value determined during bump execution
   Calibration level ± (Calibration concentration × Permissible rate) if other than oxygen
   For oxygen, calibration concentration ± (difference of 20.9% from calibration concentration × permissible rate)
   10/20/30/40/50%
・ Bump calibration time
   If the setting is ON when the bump fails, the time until the calibration is performed.
   Time from bump start, not from bump failure.
   90/120sec
・ ON/OFF of bump-calibrating function
   Setting whether to perform calibration automatically in case of bump failure.
   ON/OFF

2.4.8 Bumping expiration display ON/OFF

Sets bump expiration display.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for the bump expiration function.
In the case of ON, the bump expiration date is displayed in the initial portion, and the bump date and time are displayed in the display mode.

2.4.9 Bump expiration setting

Sets the no. of days to bump expiration.
MODE key: Confirm
AIR key: Sets no. of days to bump expiration
The number of expiration days of the bump expiration function is set in units of one day from
0 to 365 days.

2.4.10 Bump expiration action setting

Sets bump expiration action.
MODE key: Confirm
AIR key: Sets bump expiration action
Configures the action when the period set in the bump expiration function passes.
Three selectable actions available: Use after confirmation; Prohibit use; Do nothing.

2.4.11 Gas alarm point setting

Sets alarm points for each gas.
MODE key: Confirm
AIR key: Moves to next item; Configures alarm point
Sets all gas alarm points.
This menu item enables reverting the current alarm point to the saved factory reset alarm point.
However, the reset item is not displayed if the gas data (gas species or full scale, etec.) does not match.
When the AIR key is pressed, the AIR key is displayed in the order of gas type, reset, and return, and the AIR key is determined by the MODE key.

Gases other than oxygen					
Lower limit		Set value		Upper limit	
Alarm setting lower limit value	$\leqq$	1st alarm point	$\leqq$	2nd alarm point	
1st alarm point	$\leqq$	2nd alarm point	$\leqq$	3rd alarm point	
2nd alarm point	$\leqq$	3rd alarm point	$\leqq$	Alarm point setting upper limit value	
STEL alarm setting lower limit value	$\leqq$	STEL alarm point	$\leqq$	STEL alarm point setting upper limit value	
TWA alarm setting lower limit value	$\leqq$	TWA alarm point	$\leqq$	TWA alarm point setting upper limit value	
Oxygen					
Lower limit	$\leqq$	Set value	$\leqq$	Upper limit	
2nd alarm point	$\leqq$	1st alarm point	$\leqq$	20.0%	
0.0%	$\leqq$	2nd alarm point	$\leqq$	1st alarm point	
21.8%	$\leqq$	3rd alarm point	$\leqq$	25.0%	

Gas species	Upper limit	Lower limit	Digit
Combustible sensor	60%LEL	1%LEL	1%LEL
O2	H:25.0% L:20.0%	H:21.8% L:0.0%	0.1%
H2S	200.0ppm	0.5ppm	0.1ppm
CO	2000ppm	12ppm	1ppm
H2(ESR-A1CP)	-	-	-

2.4.12 Lunch break ON/OFF setting

Sets the lunch break setting.
MODE key: Confirm
AIR key: ON/OFF switch
Sets the ON/OFF of whether the lunch break function is displayed as an initial.

2.4.13 Conformation beep function setting

Sets confirmation beep settings.
MODE key: Confirm
AIR key: Changes item and operation settings
Sets the following for confirmation beep:
・ OFF, LED, BUZZER, LED + BUZ, BMP/CAL, ALM.ALRT, B/C/ALM
   operation setting.
・ Set the operation interval time "0.5 or 1 to 99 minutes (in units of 1 minute)" of the confirmation beep.
Operation
  OFF
    The confirmation beep does not operate.
  LED
    The LED and vibration are activated twice at each activation interval.
  BUZZER
    The buzzer and vibration are operated twice at each operation interval.
  LED+BUZ
    The LED, buzzer and vibration are operated twice at each operating interval.
  BMP/CAL
    Operates when the bump due date is ON and expired, or the calibration due date is ON
    and expired.
    Operation is equivalent to B/C/ALM.
    Operation stop condition is the same as B/C/ALM.
  ALM.ALRT
    Operates when a negative over or a gas alarm is issued.
    Operation is equivalent to B/C/ALM.
    Operation stop condition is the same as B/C/ALM.
  B/C/ALM
    Operates when Bump Deadline is ON and Expired, Calibration Deadline is ON
    and Expired, Negative Over or Alarm is issued When all gas types are calibrated or bumped,
    the operation is stopped.
    The LED is operated once at each operation interval.
    When all gas types are calibrated or bumped, the operation is stopped when
    a "history read completion command" is received (When set to ON).

2.4.14 LCD Backlight Lighting Time Setting

Sets the timer for the LCD backlight.
MODE key: Confirm
AIR key: Changes the settings
Sets the timer in seconds for keeping the LCD backlight on after illumination.
Settings can be made from OFFor 1 seconds to 255 seconds (in units of one second).

2.4.15 Key operation sound setting

Sets key sounds.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for the key operation sounds.

2.4.16 Display mode setting item display ON/OFF

Sets the display mode settings.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for displaying configurable items in display mode.
In the case of OFF setting, the following display mode items are not displayed.
    ・ Flammable replacement gas selection

- ・ Flammable Long Energy (Long Life) Setting
- ・ Pump off
- ・ User ID selection
- ・ Station ID selection

2.4.17 Suppress ON/OFF

Sets suppression settings.
MODE key: Confirm
AIR key: Switches items, ON/OFF switch
ON/OFF selection for each sensor's suppression processing.
Displayed only when the setting for displaying the suppress ON/OFF setting is on.
Even if suppression is ON, suppression processing will not be performed outside of measurement mode and display mode.

2.4.18 Zero tracking ON/OFF

Set zero tracking settings.
MODE key: Confirm
AIR key: Switches items, ON/OFF switch
ON/OFF selection for each sensor's zero tracking processing.
Displayed only when the setting for displaying the zero-tracking ON/OFF setting is on.
Oxygen is not selectable since zero tracking is not performed for oxygen.
Even if zero tracking is ON, zero tracking will not be performed outside of measurement mode and display mode.

2.4.19 Date and time setting

Sets the date and time.
MODE key: Confirm
AIR key: Changes settings
Sets the device date/time by year, month, day, hour, and minute.

2.4.20 User mode password setting

Sets/changes the user password.
MODE key: Confirm
AIR key: ON/OFF switch, changes value
ON/OFF selection for password activation in user mode (activates password when ON).
When turned ON, the user is presented a 4 digit password screen where the password can be changed.
Even if the password is changed, 0405 can be used as a backdoor password.
When OFF is selected, the password value is not set, and the setting is completed.

2.4.21 ROM/SUM display

Displays ROM/SUM and version.
MODE key: Return
AIR key: No action
Displays the ROM number, SUM value and version of the main microcomputer and sensor microcomputer.
Displays "----"   during SUM value calculation.

2.4.22 Start measurement

Starts measurement.
MODE key: No action
AIR key: No action
Transitions from user mode to initial mode.

2.5 Maintenance mode

2.5.1 Gas test

Displays gas test.
MODE key: Return
AIR key: No action
Displays the concentration calculated from the present sensor output.
An alarm issued in gas test mode will only activate the LED and the vibration motor without sounding the buzzer.
Displays the concentration between 0% and -5% of the fullscale to verify zero uncertainty.
No suppression treatment is performed.

2.5.2 Sensor replacement date and time setting

Sets the sensor replacement date and time.
MODE key: Confirm
AIR key: Moves to next item, changes setting
Used to set the date each sensor, pump and batteries were replaced.
Confirming the entry records the current date as the replacement date.

2.5.3 Gas alarm latching/auto reset setting

Sets the gas alarm latching or auto reset setting.
MODE key: Confirm
AIR key: ON/OFF switch
Selection for gas alarm to either latch or auto reset.

2.5.4 Alarm silence ON/OFF

Set alarm silence.
MODE key: Confirm
AIR key: ON/OFF switching
ON/OFF setting of the function to stop the buzzer by key operation in gas alarm condition during measurement.

2.5.5 Demand zero ON/OFF

Sets Demand zero.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for enabling AIR calibration during measurement.

2.5.6 Auto zero ON/OFF

Sets auto zero.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection to prompt to perform AIR calibration during transition from initial to measurement mode.
Prompts with YES/NO to perform AIR calibration at the end of initialization when ON.

2.5.7 ID display ON/OFF

Sets the ID display.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for displaying ID on initial mode or display mode.

2.5.8 Maintenance notification period reset

Resets the period for maintenance notification.
MODE key: YES
AIR key: NO
Resets the date of the calibration success date used for the Maintenance Notification function.
Resets the internal date to "0 year 0 month 0 day", which is overwritten by the date and time of next powered activation.
Displayed only when the destination setting is domestic or JG.

2.5.9 Maintenance notification display ON/OFF

Sets the maintenance notification display.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for the maintenance notification function.
Displayed only when the destination setting is domestic or JG.

2.5.10 Maintenance notification period setting

Sets the no. of days for maintenance notification.
MODE key: Confirm
AIR key: Changes the settings
Sets the no. of days for maintenance notification expiration from 1 to 1000 days.
Displayed only when the destination setting is domestic or JG.

2.5.11 Maintenance notification action setting

Sets the maintenance notification action.
MODE key: Return
AIR key: No action
Selectable maintenance notification actions when expiration has passed are the following.
·Use after confirmation
·Prohibit use
·Do nothing
Displayed only when the destination setting is domestic or JG.

2.5.12 Suppress display ON/OFF

Sets the suppression display setting.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection to display the user mode suppression ON/OFF setting.

2.5.13 Zero tracking display ON/OFF

Sets the zero tracking display setting.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection to display the user mode zero tracking ON/OFF setting.

2.5.14 Pump setting display ON/OFF

Set the pump settings display.
MODE key: Confirm
AIR key: ON/OFF switching
Sets ON/OFF whether to display the pump OFF item in the display mode.

2.5.15 Maintenance mode password setting

Sets/changes the maintenance password.
MODE key: Confirm
AIR key: ON/OFF switch, changes the setting
ON/OFF selection for password activation in maintenance mode (activates password when ON).
When turned ON, the user is presented a 4 digit password screen where the password can be changed.
When OFF is selected, the password value is not set and the setting is completed.
Even if the password is changed, 2202 can be used as a backdoor password.

2.5.16 Flow reduction setting

Set flow reduction.
MODE key: Confirm
AIR key: Change set value
Stop the pump and zero the pressure sensor.
Displays the pressure sensor output and set value when the pump is stopped.
After setting with the MODE key, the pump starts operating and displays the current pressure sensor output and the pressure sensor output when the pump is stopped.
In the case of judgment of flow rate decrease, display to that effect is provided.
The set value is recorded by confirming again with the MODE key.

2.5.17 Reset to factory settings

Resets to factory settings
MODE key: YES
AIR key: NO
Resets settings to the saved factory settings at time of shipment.
The ID information, date and time, and data logger information are not returned.

2.6 Gas select mode

2.6.1 Gas combination setting

Sets gas combinations.
MODE key: Confirm
AIR key: Moves to next item
Sets the gas type to be measured by each sensor.
Changing the numerical value in this setting will reset all gas-related settings such as calibration values and alarm points.
Calibration and alarm points must be configured.

2.6.2 Initial alarm point storage

Initialize the recording of the alarm point for reset.
MODE key: YES
AIR key: NO
Stores the current alarm point as a reset alarm point.
The reset alarm point is used to reset the alarm point of the alarm point setting item.

2.6.3 Sensor life remaining display ON/OFF

Sets the remaining life display setting.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for displaying the remaining sensor life after auto calibration.
For oxygen, the remaining life concentration is defined to be between the calibration concentration and 2x the calibration concentration OR 25%.
For non-oxygen gases, it is defined as between the calibration concentration and 2x the calibration concentration OR the fullscale concentration.

2.6.4 Stealth ON/OFF

Sets stealth and vibration settings.
MODE key: Confirm
AIR key: ON/OFF switch
ON/OFF selection for the stealth function and for ON/OFF selection for the vibration motor when when the stealth function is turned ON.
When the stealth function is ON, the buzzer, the LED and the backlight do not activate.
ON/OFF selection for the vibration motor is universal.
In the case of ON setting, the S icon lights up on the display.

2.6.5 Flammability LEL value setting

Sets the flammable gas LEL values.
MODE key: Confirm
AIR key: Selects LEL value
100%LEL values for combustible gases are substituted with ppm units. Select an appropriate valute from STD/IEC/ISO.

Gas name	Chemical formula	STD	IEC	ISO
Methane	CH4	50000	44000	44000
Isobutane	i-C4H10	18000	13000	15000
Hydrogen	H2	40000	40000	40000
Methanol	CH3OH	55000	60000	60000
Acetylene	C2H2	15000	23000	23000
Ethylene	C2H4	27000	23000	24000
Ethane	C2H6	30000	24000	24000
Ethanol	C2H5OH	33000	31000	31000
Propylene	C3H6	20000	20000	18000
Acetone	C3H6O	21500	25000	25000
Propane	C3H8	20000	17000	17000
Butadiene	C4H6	11000	14000	14000
Cyclopentane	C5H10	14000	14000	14000
Benzene	C6H6	12000	12000	12000
n-hexane	n-C6H14	12000	10000	10000
Toluene	C7H8	12000	10000	10000
n-heptane	n-C7H16	11000	8500	8000
Xylene	C8H10	10000	10000	10000
n-nonane	n-C9H20	7000	7000	7000
Ethyl acetate	EtAc	21000	20000	20000
Isopropyl alcohol	IPA	20000	20000	20000
Methyl ethyl ketone	MEK	18000	15000	15000
Methyl methacrylate	MMA	17000	17000	17000
Dimethyl ether	DME	30000	27000	27000
Methyl-isobutyl-ketone	MIBK	12000	12000	12000
Tetrahydrofuran	THF	20000	15000	15000
n-pentane	n-C5H12	15000	11000	11000

2.7 Factory mode

2.7.1 A/D value display

Displays the A/D value.
MODE key: Return
AIR key: Change screen
Displays the input sensor output (mV).

Page number	Description
0. BAT/PS	Lithium ion battery voltage / Pressure sensor voltage
1. OXH/L	O2(AMP_HI) sensor voltage / O2(AMP_LO) sensor voltage
2. SV/MV	Power supply voltage (SV) / Power supply voltage (MV)
3. ECV1/2	Reference Voltage (ECV1) / Reference Voltage (ECV2)
4. ECV3	Reference voltage (ECV3)
5. HCV/PZ	Combustible element voltage / PS_DAC output voltage
6. NC0.1	NC sensor 0.1 sec output (A element)
7. NC0.5	NC sensor 0.5 sec output (A element)
8. NC1.0	NC sensor 1.0 sec output (A element)
9. NC1.1	NC sensor 1.1 sec output (B element)
A. NC1.5	NC sensor 1.5 sec output (B element)
B. NC2.0	NC sensor 2.0 sec output (B element)
C. E1 O2	O2(AMP_LO) sensor output
D. E2 CO	CO sensor output
E. E3 H2S	H2S sensor output
F. TEMP	Temperature sensor output (temperature value)

2.7.2 Factory shipment status storage

Resets to the stored factory settings.
MODE key: YES
AIR key: NO
Record the current setting value as the factory default setting value.
Also sets reset alarm point.

2.7.3 Default setting

Sets default settings.
MODE key: No action
AIR key: NO
MODE + AIR key: YES
Resets all instrument values to the programmed initial values.

2.8 Communication mode

Communication mode for downloading logger data and making various settings.

2.8.1 USB communication

Perform USB communication.
Operations other than power off are disabled.
When 3 minutes have elapsed without communication connection, a failure alarm is issued.
The failure alarm is stopped when the communication is connected to the communication partner.

2.9 Other

2.9.1 Password functions

When the AIR+ MODE key is pressed for a long time during startup, the password screen for shifting to the respective modes is displayed.
When the password is OFF, the mode is shifted to the mode without displaying the password screen.
User mode: Press and hold for 1 to 3 seconds (Initial password 0000, Fixed password 0405)
Maintenance mode: Press and hold for 4 to 6 seconds (Initial password 9999, Fixed password 2202)
Factory Gas Select Mode: 7 seconds or longer (Factory Password 1994, Gas Select 2014)
If the password is incorrect, an error is displayed and normal startup is performed.
Use the AIR key to increase or decrease the value, and use the MODE key to determine the value.
You can change the AIR key increment or decrement by pressing the AIR + MODE key.
It is possible to return to the previous digit by pressing and holding the AIR + MODE key.

2.9.2 Password protection feature

A function that restricts each function and allows only authorized users to operate.
When using a protected function, the same password as the user mode is requested.
Password
　　User Mode Password or 0405
When 40 seconds have elapsed during the password request or the password error display, the same transition as the password erroneous input is performed automatically.
Transition to request a password with the password protection function ON.
　・ When the display changes from the expiration display to the user mode in the calibration expiration status.
　・ When the BUMP expires and the display changes from expired to user-mode.
　※ The above two items operate even when the user mode password is OFF.
　If the password is incorrectly entered, start over from the beginning.
Function for requesting password with password protection function ON
　・ AIR calibration
　　If the password is entered incorrectly, measurement is restarted without performing AIR calibration.
　・ Alarm reset (gas alarm)
　　If the password is entered incorrectly, measurement is restarted without resetting the alarm.
　※ Flammability protection resets are not included.
　※ Valid only when self-holding is set.
　・ Power OFF (Initial mode, Measuring mode, DISP mode)
　　・ Transition of power OFF when password is erroneously input
　　　・ Initial mode: Repeat from the beginning of the initial
　　　・ Measurement mode: Transition to measurement mode.
　　　・ DISP Mode: Transition to Measurement Mode.
　※ The USER mode, MAINTE mode, GASSELECT mode, and FACT mode with activation-time password-request are not included.
Function to disable function execution by password protection function ON
　・ PEAK resetting
　※ Since the setting items in the DISP mode can be ON/OFF in the USER mode, no password is requested.

2.9.3 Displayed icon

- Heart symbol
  Repeat the operation for 0.5 second on and 0.5 second off.
- ✓ mark
  Displayed when the bump expiration function is ON and within the expiration date.
- L mark
  Displayed when the long life function of the combustible sensor is ON.
- Maintenance mark
  Displayed when in a mode other than the initial, measurement, and display modes.
- No Alarm mark
  Displayed when the alarm function is set to OFF in Initial, Measurement, and Display mode.
- Stealth mark
  Displayed when the stealth function is set to ON in Initial, Measurement, and Display mode.
- Pump operation mark
  Displays pump operating status. Rotates when normal.

2.9.4 Indicated concentration

Change the density to be displayed depending on the initial, measurement, display mode or other mode.

Initial, Measurement and Display Mode
- Operate zero tracking.
- The suppression process is performed.
- Concentration
  - Concentrations above full scale indicate full scale over.
  - 0 to-5% of the specified value shall be 0.
  - Displayed as it is from less than-5% of the specified value to-10% of the specified value.
  - If the value is less than-10% of the specified value, a negative over indication is displayed.
- Modes other than the initial, measurement, and display modes
  - Stop zero tracking.
  - No suppression treatment is performed.
  - Concentration
    - Displayed to ±120% of full scale, if exceeded, fix at ±120%.

2.9.5 Display backlight

In the case other than the measurement/display mode, the backlight is always on.
Measurement/display mode
- ・ Operation is performed when the LCD backlight lighting time setting is not OFF.
- ・ When the set time elapses after the start of the measurement or the key operation, the backlight is automatically turned off.

While connecting with the communication partner in communication mode, if the detector power supply is ON, the LCD backlight is always turned on.

2.9.6 Set value

List of Set Values by Destination

Item	Description	Destination Setting Values				
		Domestic		Overseas		OEM
		EN Not supported	Combustible JIS supported	EN Not supported	EN Supported	EN Not supported
Setting for each gas						
CH4, HC(NCR-6309)						
	Cylinder setting	A	A	A	A	A
	ON/OFF of the suppressor	ON	ON	ON	ON	ON
	Zero-tracking ON/OFF	ON	ON	ON	OFF	ON
O2(ESR-X13P)						
	Cylinder setting	A	A	A	A	A
	ON/OFF of the suppressor	ON	ON	ON	ON	ON
H2S(ESR-A1DP), H2S(ESR-A13i), H2(ESR-A1CP)						
	Cylinder setting	B※1	B※1	A※1	A※1	A※1
	ON/OFF of the suppressor	ON	ON	ON	ON	ON
	Zero-tracking ON/OFF	ON	ON	ON	ON	ON
CO(ESR-A1DP), CO(ESR-A13P), CO(ESR-A1CP)						
	Cylinder setting	A	A	A	A	A
	ON/OFF of the suppressor	ON	ON	ON	ON	ON
	Zero-tracking ON/OFF	ON	ON	ON	ON	ON
Main unit setting						
Equipment information						
	User ID	----------------				
	Station ID	----------------				
	Destination setting	Domestic	Domestic	Exportation	Exportation	OEM
LCD display related						
	Backlight time	30	30	30	30	30
Sensor-related						
	Is the Suppress ON/OFF displayed in the USER?	OFF	ON	OFF	ON	ON
	Is the zero-tracking ON/OFF displayed in the USER?	OFF	ON	OFF	ON	ON
	Whether to display long life ON / OFF in the DISP?	OFF	OFF	OFF	OFF	OFF
	ONOFF setting for long life mode	OFF	OFF	OFF	OFF	OFF
	Setting of flammable LEL value	STD	STD	STD	IEC	STD
	Residual force ON/OFF	ON	ON	OFF	OFF	OFF
Warning related						
	Alarm operation	Self-holding	Self-holding	Self-holding	Self-holding	Self-holding
	Cumulative warning ON/OFF	OFF	OFF	OFF	OFF	OFF
	Alarm function ON/OFF	ON	ON	ON	ON	ON
	Alarm silence ON/OFF	ON	ON	ON	ON	ON
	Stealth function ON/OFF	OFF	OFF	OFF	OFF	OFF
	Stealth motor setting	OFF	OFF	OFF	OFF	OFF
	Conformation Beep Selection	OFF	OFF	OFF	LED+BUZ	OFF
	Conformation Beep Time Setting	5min	5min	5min	1min	5min
	Whether to include the last BUMP history acquisition in the reset	OFF	OFF	OFF	OFF	OFF
Deadline-related						
	Calibration deadline setting value	365 days	365 days	365 days	365 days	90 days
	ON/OFF of the indication of the calibration deadline	OFF	OFF	ON	ON	ON
	Method for checking the calibration deadline	Confirm	Confirm	Confirm	Confirm	Confirm

		Bump deadline setting value	30 days	30 days	30 days	30 days	30 days
		Bumping expiration ON/OFF	OFF	OFF	OFF	OFF	OFF
		Bump expiration operation	Confirm	Confirm	Confirm	Confirm	Confirm
		Maintenance Notification ON/OFF	ON	ON	OFF	OFF	OFF
		Maintenance Notification Expiration Operation	Confirm	Confirm	Confirm	Confirm	Confirm
		Number of maintenance notice display days	365 days	365 days	365 days	365 days	365 days
	Bump setting						
		Bump time	30 seconds	30 seconds	30 seconds	30 seconds	30 seconds
		Bump tolerance	50%	50%	50%	50%	50%
		Calibration time after bump failure	90 seconds	90 seconds	90 seconds	90 seconds	90 seconds
		Calibration ON/OFF after bumps fail	ON	ON	ON	ON	ON
	ONOFF related						
		Identification ON/OFF	OFF	OFF	OFF	OFF	OFF
		Lunchbreak ON/OFF	OFF	OFF	OFF	OFF	OFF
		Keypad sound ON/OFF	ON	ON	ON	ON	ON
		ON/OFF of DISP mode setting items	ON	OFF	ON	OFF	ON
		Auto-zero ON/OFF	OFF	OFF	OFF	OFF	OFF
		Demand-zero ON/OFF	ON	ON	ON	ON	ON
		Automatic startup after BUMP success ON/OFF	ON	ON	ON	ON	ON
		Automatic startup after calibration success ON/OFF	ON	ON	ON	ON	ON
		Whether to display pump OFF in DISP mode	OFF	OFF	OFF	OFF	OFF
	Password-related						
		User-password ON/OFF	OFF	ON	OFF	ON	OFF
		Maintenance password ON/OFF	ON	ON	ON	ON	ON
		User password number	0000	0000	0000	0000	0000
		Maintenance password number	9999	9999	9999	9999	9999
		Password-protected ON/OFF	OFF	OFF	OFF	OFF	OFF
	Logger setting						
		Interval trend period	300	300	300	300	300
		Overwrite setting	ON	ON	ON	ON	ON

※1: For H2 of ESR-A1CP sensor, it is "D".

2.9.7 Self-diagnosis list

See attachment : list of fault codes.

Attachment : List of fault codes

Type	Message		Failure number	Content	Diagnosis location	Failure factor	Return	Logger operation	Priority
Failure mode	7 segments	14 segments							(0:HIGH~5:LOW)
System error	FAIL	SYSTEM	000	ROM failure	Every 24 hours during startup and measurement	The recalculated ROM SUM does not match the configured SUM.	Self-holding	Stop	0
			010	RAM failure	Every 24 hours during startup and measurement	Write bit pattern (0x55,0xAA), compare read values and do not match.	Self-holding	Stop	0
			021	FRAM failure	Every 24 hours during startup, writing, and measurement	Inversion dihedral value mismatch. Data area recalculation SUM and configured SUM do not match.	Self-holding	Stop	2
			031	FLASH error	When writing	When writing fails twice.	Return after confirmation	Stop	2
			080	Circuit voltage error	At startup / measurement	If the circuit voltage is out of range SV(AN004), MV(AN005) : Outside the range of 1320 to 1480mV ECV1(AN006) : Outside the range of 540 to 660mV ECV2(AN007) : Outside the range of 1120 to 1280mV ECV3(AN024) : Outside the range of 2100 to 2300mV HCV(AN025) : Outside the range of 930 to 1100mV PZF(AN026) : Outside the range of 1900 to 2100mV When 2.8V becomes 2.48V or less for 5 seconds or more with the LVD function	Self-holding	Stop	3
			081	Sensor circuit error	At startup / measurement	When communication fails more than 3 times. Sensor MCU error.	Self-holding	Stop	3
			082	Thermistor error	At startup / measurement	When the thermistor A / D value is outside the threshold of mV equivalent to -55 ° C to mV equivalent to + 85 ° C, not a sensor circuit error.	Self-holding	Stop	3
CLOCK error	FAIL	CLOCK	050	Clock error	At startup	When the calendar value is not possible at startup. When case of communication error with RTC.	Return after confirmation	Stop	3
			051	Backup battery stop error	At startup	When starting up, there is evidence that the backup voltage has dropped from the previous power OFF.	Return after confirmation	-	3
Pump error	FAIL	FLOW	500	IN side flow rate drop error	At all times (starts 3 seconds after pump starts)	When the pressure sensor output difference between when the pump is OFF and when it is ON is 400mV or more	Return after confirmation	-	3
		PUMP	503	Pump disconnection error	Starts 3 seconds after pump starts	When the pressure sensor output difference between when the pump is OFF and when the pump is ON is less than 5mV	Return after confirmation	-	3
Battery voltage drop	FAIL	BATTERY	091	Lithium ion battery voltage drop	Always	When battery voltage is 3400mV or less.	Self-holding	Stop	1
Sensor error	FAIL	SENSOR HC	100	NC sensor disconnection	At startup / measurement	When the A / D value after energization is less than 15 mV.	Self-holding	Stop when measuring	3
			107	NC sensor BUMP error	At executing BUMP	When BUMP fails.	Return after confirmation	-	4
			108	NC sensor SPAN calibration error	When executing SPAN calibration	When SPAN calibration fails.	Return after confirmation	-	4
			109	NC sensor AIR calibration error	When executing AIR calibration	When AIR calibration fails.	Return after confirmation	-	4
Sensor error	FAIL	SENSOR O2	110	O2 sensor disconnection	・30 seconds after startup ・When the Lo side output (AN003) becomes 2100mV or more during measurement	When the difference between the Hi-side output (AN002) before the 10msec pulse and the Hi-side output (AN002) after 50sec after the pulse is less than 5mV	Self-holding	Stop when measuring	3
			117	O2 sensor BUMP error	At executing BUMP	When BUMP fails.	Return after confirmation	-	4
			118	O2 sensor SPAN calibration error	When executing SPAN calibration	When SPAN calibration fails.	Return after confirmation	-	4
			119	O2 sensor AIR calibration error	When executing AIR calibration	When AIR calibration fails.	Return after confirmation	-	4
Sensor error	FAIL	SENSOR H2S	120	H2S sensor disconnection	・10 seconds after startup ・Every 15 minutes during measurement	When the difference between the sensor A / D value before 10 ms pulse and the sensor A / D value 10 seconds after pulse is less than 5 mV.	Self-holding	Stop when measuring	3
			127	H2S sensor BUMP error	At executing BUMP	When BUMP fails.	Return after confirmation	-	4
			128	H2S sensor SPAN calibration error	When executing SPAN calibration	When SPAN calibration fails.	Return after confirmation	-	4
			129	H2S sensor AIR calibration error	When executing AIR calibration	When AIR calibration fails.	Return after confirmation	-	4

Sensor error	FAIL	SENSOR CO	130	CO sensor disconnection	・10 seconds after startup ・Every 15 minutes during measurement.	When the difference between the sensor A / D value before 10 ms pulse and the sensor A / D value 10 seconds after pulse is less than 5 mV.	Self-holding	Stop when measuring	3
			137	CO ensor BUMP error	At executing BUMP	When BUMP fails.	Return after confirmation	-	4
			138	CO sensor SPAN calibration error	When executing SPAN calibration	When SPAN calibration fails.	Return after confirmation	-	4
			139	CO sensor AIR calibration error	When executing AIR calibration	When AIR calibration fails.	Return after confirmation	-	4
Operating temperature warning	-	TMP.WARN	-	operating temperature error	Always outside the operating temperature range for a fixed time	20 minutes have passed outside the normal operating temperature range.	Automatic return	-	-
Minus F.S.	-	M OVER	-	Minus over	During measurement	In case of concentration below minus F.S.	Depends on settings	-	-