Design Specification

Development Theme		Document Number	ＳＳ－ＰＰ３７８		
Development of GX-2012 Mark 2		Issue	Product Engineering Department		
			Authorizer	Examiner	Author
Development control number	７７ＰＰ３７８ＰＰ２				Gogami Furudate Ikarashi Nashimoto
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1. Purpose of development

Confirm the requirements input into the design with respect to the product, and clarify the purpose of product development.

①Development of inexpensive suction-type 4-component portable mainly for overseas markets.
②The IrDA module used in GX-2012 has been discontinued and is currently only available for 1 year and 8 months.
③Explosion-proof grade downgrade of GX-2012 (Ex ia ⅡC T4 Ga ⇒ Ex ia ⅡB T4 Ga)

2. Purpose of use, place of use, and method of use of the product

2. 1 Intended use

・Leak detection of flammable and toxic gases, monitoring of oxygen concentration

2. 2 Location of use

・Petrochemicals / Oil and gas / Sewage (manhole), etc.

2. 3 usage rules

・It measures the concentration of toxic and combustible gases and oxygen that are being exposed, and when the concentration reaches a set alarm level, an alarm is triggered to warn of the danger of gas poisoning or oxygen deficiency.

3. Applicable laws and regulations

Identify requirements that have been input into the design with respect to the product and clarify regulations and standards related to the requirements.

3. 1 Regulations and standards related to requirements

ATEX Directive	EN IEC 60079-0 : 2018 EN 60079-1 : 2014 EN 60079-11 : 2012
IECEx standard	IEC 60079-0 : 2017 IEC 60079-1 : 2014 IEC 60079-11 : 2011
ＪＰＥｘ	JNIOSH-TR-46-1 : 2020 general rules JNIOSH-TR-46-2 : 2018 pressure-resistant explosion-proof structure JNIOSH-TR-46-6 : 2015 Essential Safety Explosion-proof Construction
Performance Related	IEC/EN 60079-29-1 ~~EN 45544-3~~ EN 50104 JIS T8206

	JIS T8201 JIS T8205
EMC Directive	EN 50270 : 2015 (Type 2)
RoHS Directive	EN IEC 63000 : 2018

3．2．Matters concerning the environmental management system

3．2．1 Items related to resource and energy conservation

①Design considering material recycling and reuse

・Adoption of common parts
・Structure that allows easy disassembly of structural parts, printed circuit boards, and sensors without special tools

②Maintenance Conformity Design

・Design to allow easy replacement of sensors, filters, and pumps
・Cartridges for interference gas removal filters

③Compact and lightweight design

・Design with fewer parts than GX-2012

④Conservation of electric power

・Energy saving is achieved by minimizing the number of necessary functions

⑤Labor-saving maintenance

・Design with fewer periodic replacement parts

3．2．2 Relates to environmental impact at time of disposal

①Designed for degradability

・Structure that allows easy disassembly of structural components, printed circuit boards, and sensors without special tools

②Pollution Prevention Design

・Does not emit toxic gases during use or storage
・Reduce waste by using RoHS compliant parts, downsizing, and reducing the number of parts

3．3 Matters related to the SDGs

See Exhibit 2.

4. Target specifications

The target specifications shall be determined in accordance with the following.

(a) Confirm the requirements input into the design with respect to the product, and clarify that the basic specifications, functions, conditions of use, etc. are appropriate for the intended use.

(b) In order to improve process capability and product characteristics, information on defects and nonconformities of similar products pointed out by the "ISO Report" issued by the Quality Control Center will be reflected in the design.

(c) Clarify the scope of specifications (options) that can be specially added in addition to the standard range of specifications.

4. 1 Basic Specifications<<Target Specification>>

Note１：The items are representative items and should be added or subtracted as appropriate to suit the required use.

Note２：Details of each item should be attached.

■ Model

Model : ＧＸ－Ｆｏｒｃｅ

■Input (１１)

Measuring Principle・Sensors : New Ceramic Type (ＮＣＲ－６３０９)

Constant potential electrolysis type (ＥＳＲ－Ａ１ＤＰ／Ａ１３Ｐ／Ａ１３ｉ／Ａ１３Ｐ／Ａ１ＣＰ)

Gases to be measured/detected : combustible gas、Ｏ２、ＣＯ、Ｈ２Ｓ、ＳＯ２

Measurement/detection concentration range : Depends on gas specification

Gas sampling : Suction by internal pump

Zero point adjustment : Following the GX-3R

Span adjustment : Following the GX-3R

■Output (１２)

Output signal type : Screen display、BLE

Allowable additional resistance : ㎀

Zero point adjustment range : Depends on gas specification

Span adjustment range : Depends on gas specification

Isolation (insulation) : None

Alarm test : existence

■Alarm (１３)

Accuracy : Depends on sensor

Set point : Depends on sensor

Alarm delay (hours) : Depends on sensor

Type : LED、Buzzer

Method : Self-holding

Number of steps : 3

Display : LCD、LED

Output : BLE

Contact capacity : ㎀

Alarm delay time : 0

Differential gap : ㎀

■Signal processing・Manual settings（１４）

Linearize : existence

Zero suppression : existence

Initial clear time : 25 second

Alarm delay time : 0

Zero tracking function : existence

■Display・Instruct・Record（１５）

Display Devices : ＬＣＤ

Display Contents : Gas name, concentration, unit, clock, status, battery level

■Performance（１６）

Standard performance

Detection (indication) accuracy : Depends on sensor

repeatability : 〃

duplicability : 〃

Suction flow rate : About ２５０ｍＬ／ｍｉｎ

Response time : Depends on sensor

Change over time : 〃

Warm-up time : 〃

Insulation resistance : ㇓

Withstand voltage : ㇓

Environmental impact :

Interference Effects : Depends on sensor

High concentration gas contact : 〃

Influence of atmospheric pressure : 〃

Temperature effect : 〃

Humidity effect : 〃

Direct sunlight characteristics : Within indication accuracy range, no embrittlement, display visible

Corrosion resistance : None in particular

Effects of voltage fluctuations : Battery-powered, within the indication accuracy range

Effect of frequency fluctuation : Battery-powered

Effects of momentary power failure : Drop Endurance、Power OFF

Vibration Effects : CSA Bounce Durability

Impact effect : 3m drop

Equipment vibration・noise : Only the pump sound is 75db (30cm) or less

Temperature rise : 15℃ or less

Tiltability (Influence of mounting angle) : None

Immunity : IEC61326

■Source of supply（１７）

Power : Lithium-ion battery pack
Type : Lithium-ion battery
Voltage : 3.6V
Frequency : DC
Power consumption : 300mW

■Environmental conditions for use（１８）

Operating temperature range (℃) : －２０℃～＋５０℃
Operating humidity range (%RH) : ０%ＲＨ～９５%ＲＨ（センサによる）
Sample gas specification
Flow rate : 350mL/min
Temperature・Humidity : above
Pressure : 80-120kPa
Maximum pipe length : 30m
Maximum cable length : 〃
Transport・storage conditions : 〃

■Mounting・Structure（１９）

Mounting method : 〃
Drip-proof and water-resistant : Equivalent to IPX7
Dust resistance (outer skin protection type) : Equivalent to IP6X
Explosion-proof : Ｅｘ ｄａ ｉａ ⅡＣ Ｔ４ Ｇａ
Wiring : 〃
Piping : 〃
Paint color : 〃
External dimensions (mm) : Equivalent to or less than GX-2012
Mass（ｋｇ） : Equivalent to or less than GX-2012

■Option range（２０） : BLE

■Accessory（２１）

Standard accessories : Packing box only（ＥＸ／ＲＫＩ）For domestic use, separate discussions will be held.
Special accessories (optional) : Taper nozzle, strap, belt clip, AC adapter for chargin,
USB cable, data logger software, various probes, leather case,
Various replacement filter sets

４．２ Function

In addition to the standard features, the scope of options should be clearly stated separately for hardware and software.

Standard feature

Hardware: Pressure resistance + Intrinsically safe explosion-proof structure

Software: Same basic functions as GX-3R. Suction type.

４．３ Terms of use

Specify the conditions of use that should be restricted with respect to specifications and functions. For preventive maintenance, including parts with a deteriorated life span, set regular inspection and maintenance standards, guide the implementation of regular inspections in instruction manuals, etc., and at the same time, sales recommend regular inspections to customers.

４．４ Confirmation of quality information

・Clarify the causes and effects of abnormal device behavior (false alarms, fault alarm function abnormalities) and incorporate them into product development.
・Review the selection criteria for purchasing parts and grasp the deterioration life.

Analysis of the influence of characteristic factors on abnormal behavior

Defect information

・See attached SSM design CL

Nonconformity information

・See attached SSM design CL

Repair information

・See attached SSM design CL

４．５ Confirmation of sales quality information

Confirm the contents of requests from sales (customers) and incorporate them into product development.

・3m drop resistance

４．６ Confirmation of service improvement suggestions

Check the contents of requests from the service department (customers) and incorporate them into product development.

・Unification of wire mesh replacement cycle（３２０ＲＥ２１－０３８１）

5 Product configuration

Confirm the requirements input into the product design and clarify the configuration when used as a single item or as a system.

For single use： single use

For system:

6. Confirmation of harmful substances

We will verify substances that are harmful to the human body and work (processes) that affect the human body, and clarify that they should be handled properly.

6．1 Identification of hazardous substances

・None

6．2 Identification of locations where hazardous substances are used (manufacturing process/assembly process/shipping process/maintenance process)

・None

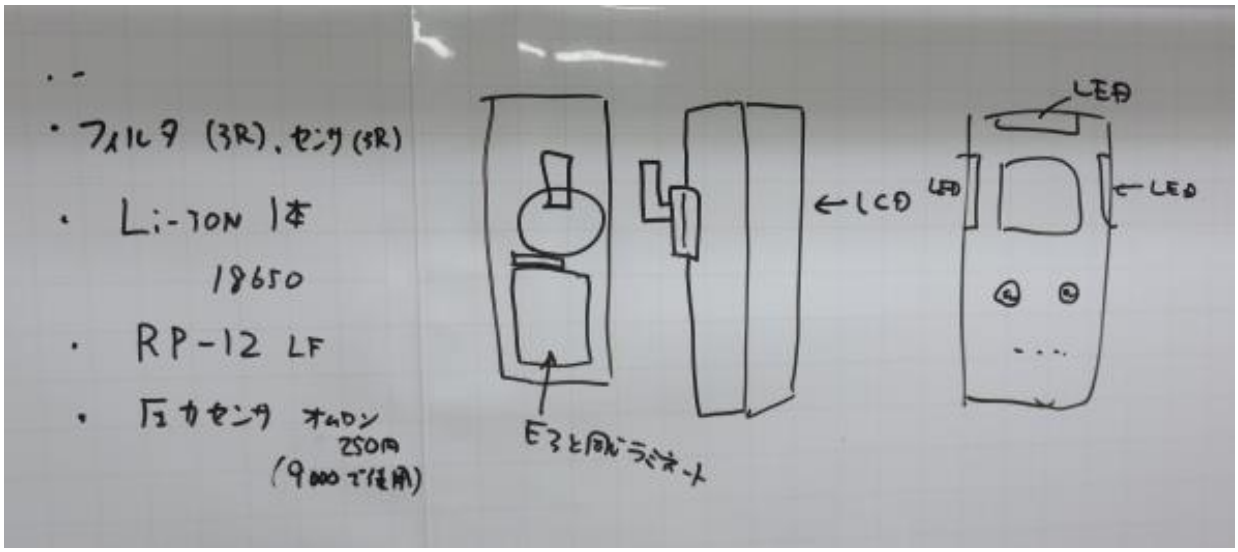
6．3 Consideration of control measures (avoidance/reduction/acceptance) for the use of hazardous substances

・None

7. Appearance image

Confirm the requirements input into the design with respect to the product and clarify that the methods of operation, labeling, installation work, etc., meet the requirements.

Figure.



8. Operation flow

Confirm the requirements input into the design of the product, and clarify whether the requirements are met for the processing items, processing procedures, and processing methods for the main and secondary actions after the start of operation.

See general flow

9. Block diagram

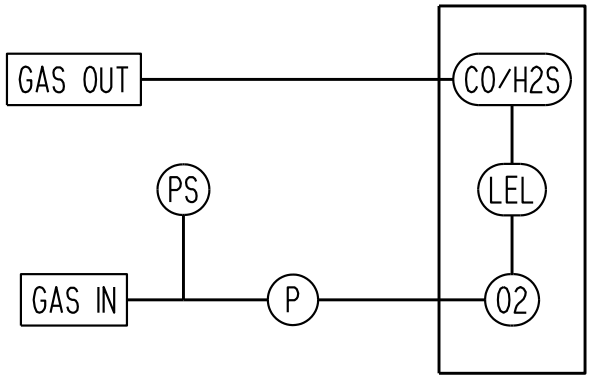
Confirm the requirements input into the design with respect to the product, and clarify that the relationships among the various functions (input, coordination, and output) that make up the product meet the requirements.

See block diagram(Fig.

１０. Gas sampling system

Confirm the requirements input into the design of the product and clarify that the properties of the detected gas, the customer's operating environment, maintenance methods, etc., meet the requirements.

Sampling system diagram



１１. Outline of manufacturing process (method)

Confirm the requirements input into the design of the product, establish a policy for the manufacturing method and equipment, etc., and confirm that it is reasonable in light of the requirements.

１１. １ Manufacturing Process

No board checker is used, but reference voltage + AD value check is used.
One-item calibration without using a gas inspection device
Partial assembly jigs are fabricated at the time of design

１２. Attachment

Depends on the work standard

２０．Input

２０．１　Measuring Principle・Sensors

Type※	Sensor type	Gas to be measured	Measuring range	Sensor Document No.
ＮＣ	ＮＣＲ－６３０９	Combustible gas	0-100%LEL	
ＯＸ	ＥＳＲ－Ｘ１３Ｐ	Ｏ２	0-40vol%	
ＥＣ	ＥＳＲ－Ａ１ＤＰ	ＣＯ／Ｈ２Ｓ	2000ppm/200.0ppm	
ＥＣ	ＥＳＲ－Ａ１３ｉ	Ｈ２Ｓ	200.0ppm	
ＥＣ	ＥＳＲ－Ａ１３Ｐ	ＣＯ	2000ppm	
ＥＣ	ＥＳＲ－Ａ１ＣＰ	ＣＯ	2000ppm	

※　ＥＣ、ＧＨ、ＧＰ、ＮＣ、ＯＸ、ＳＰ、ＴＸ、ＲＩ、Other [　　]

article

２０．２　Gas sampling

２０．２．１　Gas sampling method

・Suction type with internal pump

２０．２．２　Confirmation of flow rate

☐Flowmeter　　(☐with needle、☐Depends on external needle valve)

☐Flow checker　　(☐rough scale、☐ＯＮ／ＯＦＦ)

■Differential pressure sensor　　Pressure drop detection for clogging

☐Other

２０．３　Zero point・span adjustment

■Manual zero (depends on VR etc.)

(Adjustment range　　)

■Manual span (depends on VR etc.)

(Adjustment range　　)

■Auto　　Zero　(☐Timer　　interval、☐Manual switch)

(Adjustment range　　)

☐Auto　　Span (☐Timer　　interval、☐Manual switch)

(Set the span value in advance)

(Adjustment range　　)

■Auto processing after manual adjustment

☐Direct auto processing

☐Other