GX-Force
FMEA
(Failure Mode Effects Analysis)

Document No.GX-Force_SW207

Approval	Review	Preparation
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No.	Date	Version	Revised content	Remarks
Ex.	20XX/XX/XX	RevX.X	Create New	
1	2021/1/15	Rev1.0	Create New	
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No.	Request number	System name
1	req 1-1	NC (Combustible gas) concentration calculation
2	req 1-2	EC (Oxygen/Toxic Gas) concentration calculation
3	req 1-3	Calibration curve processing
4	req 1-9	Average calculation
5	req 1-10	STEL value calculation
6	req 1-12	TWA value calculation
7	req 1-14	Cumulative (AVRG) value calculation
8	req 2-1	Gas warning notification
9	req 3-1	Fault warning notification
10	req 3-2	Self-diagnosis
11	req 13-6	A/D converter
12	req 14-8	Buzzer
13	req 14-15	NC (Combustible) sensor
14	req 14-16	EC (Oxygen / Toxicity) sensor

System name reg1 - 1 NC (combustible gas) concentration calculation

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	Responsible	Schedule	(13) Result
1	**Concentration calculation** Calculate concentration value	1	Does not update concentration	1	No calculation processing yet	1	RAM error	Does not retain previous concentration nor detects gas	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
		2	Calculation result error	1	Sensor output error	1	Sensor output error	Concentration value uncertain	Nothing	4	1	C3	B	Verification conducted by simulation	Ikarashi	10/24	OK
						2	Abnormal temperature value	↑	Nothing	4	1	C3	B	Fix temperature calculation range	Ikarashi	10/24	OK
				2	Zero point error	1	RAM error	Concentration value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
				3	Span coefficient error	1	RAM error	Concentration value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
				4	Temperature compensation coefficient error	1	RAM error	Concentration value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
2	**Temperature compensation processing**	1	Calculation result error	1	Temperature compensation coefficient error	1	RAM error	Concentration value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	1	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
3	**Intermittent measurement**	1	Does not energize at specified period	1	Periodic counter fault	1	RAM error	Sensor output cannot be obtained correctly	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	Timer error	↑	Nothing	4	1	C3	B	Monitor with WDT	Ikarashi	10/24	OK
				2	Flammable sensor is set to OFF	1	RAM error	Sensor output cannot be obtained correctly	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg 1 - 2 Calculation of EC (Oxygen/Toxic Gas) Concentration

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) Probable cause No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Countermeasure Responsible	(12) Countermeasure Schedule	(13) Result
1	**Concentration calculation** Calculate concentration value	1	Does not update concentration	1	Not calculated	1	RAM error	Previous concentration value retained, no gas detected	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
		2	Calculation result error	1	Sensor output error	1	Sensor output error	Concentration value uncertain	Nothing	4	1	C3	B	Verification conducted by simulation	Ikarashi	10/24	OK
						2	Abnormal temperature value	↑	Nothing	4	1	C3	B	Fix temperature calculation range	Ikarashi	10/24	OK
				2	Zero point error	1	RAM error	Concentration value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
				3	Span coefficient error	1	RAM error	Concentration value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
				4	Temperature compensation coefficient error	1	RAM error	Concentration value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
2	**Temperature compensation processing**	1	Calculation result error	1	Temperature compensation coefficient error	1	RAM error	Concentration value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	1	C3	B	SUM check of FRAM	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg 1-3 Calibration curve processing

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**Calibration curve processing** Calibration curve data is applied to sensor output and linear sensor output is calculated	1	Calculation result error	1	Calibration curve data error	1	RAM error	Sensor output value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
				1	Gas data error	1	RAM error	Sensor output value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
2	**Reverse calibration curve processing** Calibration curve data is applied to sensor output and linear sensor output is calculated	1	Calculation result error	1	Calibration curve data error	1	RAM error	Sensor output value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
				1	Gas data error	1	RAM error	Sensor output value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment Criteria	Product assessment Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg1 - 9 average value calculation

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**Average value calculation processing** Calculate the average concentration with the concentration data every second for every minute	1	Calculation result error	1	Cumulative concentration error	1	RAM error	Average value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	Concentration error	↑	Nothing	4	2	C3	B	Do not perform average processing at concentrations exceeding F. S.	Ikarashi	10/24	OK
				1	Cumulative count fault	1	RAM error	Average value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
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Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
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	Problems that occurred during development.
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(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg 1 - 10 STEL value calculation

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**STEL value calculation processing** Calculate the average concentration of 15 minutes from the concentration calculated every second	1	Calculation result error	1	Cumulative concentration error	1	RAM error	Average value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	Concentration error	↑	Nothing	4	2	C3	B	Do not perform average processing at concentrations exceeding F. S.	Ikarashi	10/24	OK
				1	Cumulative count fault	1	RAM error	Average value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment Criteria	Product assessment Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
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(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg1 - 12 TWA value calculation

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**TWA value calculation processing** Calculate the average concentration in 8 hours from the concentration calculated every second	1	Calculation result error	1	Cumulative concentration error	1	RAM error	Average value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	Concentration error	↑	Nothing	4	2	C3	B	Do not perform average processing at concentrations exceeding F. S.	Ikarashi	10/24	OK
				1	Cumulative count fault	1	RAM error	Average value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment Criteria	Product assessment Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
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(10) Risk avoidability

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(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg1 - 14 Cumulative (AVRG) value calculation

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**Integrated value calculation processing** Calculate the average concentration in 1 hour from the concentration calculated every second	1	Calculation result error	1	Cumulative concentration error	1	RAM error	Average value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	Concentration error	↑	Nothing	4	2	C3	B	Do not perform average processing at concentrations exceeding F. S.	Ikarashi	10/24	OK
				1	Cumulative count fault	1	RAM error	Average value uncertain	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment Criteria	Product assessment Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
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(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg 2 - 1 Gas warning report

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.		(4) Probable cause No.	(Why) Primary cause	No.	(Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	Responsible	Schedule	(13) Result
1	**Gas warning decision** Perform judgment of warning	1	Cannot judge the gas alarm	1	Current concentration value error	1	Concentration calculation error	Gas alarm does not appear/false alarm	Nothing	4	1	C3	B	Verification conducted by simulation	Ikarashi	10/24	OK
				2	Gas warning point fault	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
2	**Gas alarm output Output to** LED/buzzer/vibration	1	Outputs even though the alarm is stopped	1	Output device error	1	Device error	Outputs when uncertain	Nothing	3	2	C3	B	Device confirmation at startup	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	3	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						3	FRAM fault	↑	Nothing	3	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
		2	No output although in alarm state	1	Output device error	1	Device error	No output at gas alarm	Nothing	4	2	C3	B	Device confirmation at startup	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						3	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
		3	Output persists	1	RAM error	1	RAM error	Outputs when uncertain	Nothing	3	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
3	**Gas alarm cancellation judgment** Decide to cancel alarm	1	Cannot judge to cancel gas alarm	1	Current concentration value error	1	Concentration calculation error	Gas alarm is not cancelled	Nothing	3	1	C3	B	Verification conducted by simulation	Ikarashi	10/24	OK
				2	Gas warning point fault	1	RAM error	↑	Nothing	3	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	3	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
4	**Message display** Display gas alarm	1	Does not display even though an alarm is	1	RAM error	1	RAM error	Misunderstood alarm level	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name req 3 - 1 Fault warning notification

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**Failure warning judgment** Perform judgment of warning	1	Cannot judge a fault alarm	1	It is judged that maintenance is underway and no self-diagnosis is carried out	1	RAM error	No fault alarm is issued	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
				2	Self-diagnosis error judgment	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
2	**Fault alarm output** Output to LED/buzzer/vibration	1	Outputs even though alarm is stopped	1	Output device error	1	Device error	Outputs when uncertain	Nothing	3	2	C3	B	Device confirmation at startup	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	3	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						3	FRAM fault	↑	Nothing	3	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
		2	Does not output although it is alarming	1	Output device error	1	Device error	Outputs when uncertain	Nothing	4	2	C3	B	Device confirmation at startup	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						3	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK
		3	Persistent output	1	RAM error	1	RAM error	Outputs when uncertain	Nothing	3	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
3	**Failure alarm cancellation judgment** Decide to cancel alarm	1	Cannot judge cancellation of fault alarm	1	Self-diagnosis error judgment	1	RAM error	Will false alarm	Nothing	3	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
4	**Alarm message display** Display gas alarm	1	Does not display even though an alarm is	1	RAM error	1	RAM error	Misunderstand the details of the fault	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name req3 - 2 Self-diagnosis

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**System check** ROM/RAM/FRAM/FLASH	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
2	**Built-in clock check** RTC	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	2	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	2	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
3	**Circuit voltage check** Circuit voltage	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
4	**Thermistor check** Thermistor	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
5	**Sensor check** Gas sensor	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
6	**EC connection check** EC gas sensor	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
7	**Battery voltage check** Power supply voltage sensor	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
8	**Sensor circuit error check** Sensor circuit	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
9	**Flow error check** Pressure sensor	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
10	**Pump error check** Pump	1	Misjudge as failure	1	Judgment error	1	RAM error	Cannot perform due to misjudgment when normal	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	Cannot judge a failure	1	Judgment error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg 13 - 6 A/D converter

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**ADC setting** Set operation setting value	1	Cannot set prescribed value	1	Microcomputer error	1	ADC fault	Cannot acquire A/D value normally	Nothing	4	1	C3	B	Verification conducted by simulation	Ikarashi	10/24	OK
				2	Setting value error	1	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
2	**Acquire A/D** Acquire sensor output	1	Cannot get the A/D value	1	Sensor output error	1	Sensor error	Cannot acquire A/D value normally	Nothing	4	1	C3	B	Verification conducted by simulation	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	A/D value is abnormal	1	Outside acquisition range of A/D value	1	Sensor error	Cannot acquire A/D value normally	Nothing	4	2	C3	B	Verification conducted by simulation	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
				2	ADC setting error	1	RAM error	Cannot acquire A/D value normally	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg 14 - 8 Buzzer

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**PWM output** Buzzer output	1	Buzzer does not sound	1	Device error	1	Piezoelectric element error	Buzzer does not sound when alarming	Nothing	4	1	C3	B	Device confirmation at startup	Ikarashi	10/24	OK
						2	PWM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
				2	Frequency is different	2	RAM error	Buzzer does not sound when alarming	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
		2	An abnormal sound is heard	1	Device error	1	Piezoelectric element error	An abnormal sound is heard	Nothing	4	1	C3	B	Device confirmation at startup	Ikarashi	10/24	OK
						2	PWM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
				2	Frequency is different	2	RAM error	An abnormal sound is heard	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
2	**Frequency setting** Set buzzer frequency	1	Frequency cannot be set	1	PWM function is abnormal	1	Microcomputer error	Buzzer does not sound	Nothing	4	1	C3	B	Device confirmation at startup	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name: reg 14 - 15 NC (combustible) sensor

FMEA Table

Component: GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**Obtain sensor output**	1	Sensor output cannot be acquired	1	ADC fault	1	ADC device error	The concentration cannot be calculated normally	Nothing	4	1	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
				2	Abnormal sensor	1	Sensor disconnection	The concentration cannot be calculated normally	Nothing	4	2	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	Sensor deterioration	↑	Nothing	4	2	C3	B	Check if it is within the output specification range during calibration	Ikarashi	10/24	OK
		2	Acquire abnormal sensor output	1	ADC fault	1	ADC device error	The concentration cannot be calculated normally	Nothing	4	1	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
				2	Abnormal sensor	1	Sensor disconnection	The concentration cannot be calculated normally	Nothing	4	2	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	Sensor deterioration	↑	Nothing	4	2	C3	B	Check if it is within the output specification range during calibration	Ikarashi	10/24	OK
3	**Element energization** Energize the elements of the sensor	1	The element is not energized	1	Device error	1	PORT fault	Cannot detect gas	Nothing	4	1	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	Sensor power supply error	↑	Nothing	4	1	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						3	Sensor disconnection	↑	Nothing	4	2	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
				2	Flammable sensor is set to OFF	1	RAM error	Cannot detect gas	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
						2	FRAM fault	↑	Nothing	4	2	C3	B	SUM check of FRAM	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
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(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
C2: Usually avoidable (Avoidable more than 90% of the time)
C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result

System name reg 14 - 16 EC (Oxygen / Toxicity) sensor

FMEA Table

Component GX-Force

(1) No.	(2) Component and function	(3) Failure mode No.	(3) Failure mode	(4) Probable cause No.	(4) (Why) Primary cause	(4) No.	(4) (Why) Secondary cause	Impact of failure (5) Component (Primary)	(7) Detectability of failure (Are there signs?)	(8) Severity	(9) Frequency	(10) Avoidability	(11) Counter-measure	(12) Countermeasure Details	(12) Responsible	(12) Schedule	(13) Result
1	**Obtain sensor output**	1	Sensor output cannot be acquired	1	ADC fault	1	ADC device error	The concentration cannot be calculated normally	Nothing	4	1	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
				2	Abnormal sensor	1	Sensor disconnection	The concentration cannot be calculated normally	Nothing	4	2	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	Sensor deterioration	↑	Nothing	4	2	C3	B	Check if it is within the output specification range during calibration	Ikarashi	10/24	OK
		2	Acquire abnormal sensor output	1	ADC fault	1	ADC device error	The concentration cannot be calculated normally	Nothing	4	1	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	RAM error	↑	Nothing	4	1	C3	B	RAM check at startup	Ikarashi	10/24	OK
				2	Abnormal sensor	1	Sensor disconnection	The concentration cannot be calculated normally	Nothing	4	2	C3	B	Monitor the A/D value	Ikarashi	10/24	OK
						2	Sensor deterioration	↑	Nothing	4	2	C3	B	Check if it is within the output specification range during calibration	Ikarashi	10/24	OK

FMEA Table Instruction

For each numbered column, enter the following:
(1) Sequential number.
(2) The component and its function (below the component name). Be specific.
(3) The Failure mode that negates function in (2).
(4) The cause of failure (3). Write as many possible causes considering the conditioins during manufacturing, assembly, transport, usage, and servicing.

(5) The impact of failure mode (4) on the component. This may be omitted if impact is obvious.
(7) The detectability of failure.
(8) The failure mode severity.

Severity	Safety assessment	Product assessment
	Criteria	Criteria
4 Catastrophic (Inevitable)	Involves deaths	Inoperative; Unbearable
3 Critical	Critical loss of function	Inoperative; Uncomfortable
2 Minor	Partial loss of function	Some functions inoperative
1 Very minor	Almost no impact	Almost no impact
Impact to safety and product integrity related to laws and regulations are Severity Level 4 (Catastrophic)		

(9) Frequency per cause

Frequency	Approach
4 Frequent	Same structure as things that caused problems in the past.
3 Reasonably possible	A structure similar to a thing that caused a problem in the past.
	Problems that occurred during development.
2 Occasional	It is a similar structure to mass production, but it is new.
1 Extremely unlikely	It is judged that it will not occur by desk inference.

(10) Risk avoidability

C1: Easily avoidable (Avoidable more than 99% of the time)
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C3: Impossible or difficult to avoide (Avoidalbe less than 90% of the time)

(11) Countermeasure level

A: Design change
B: Assessment of test result or study
C: No action

(12) Countermeasure.
(13) Countermeasure implementation result