General Specifications

Clean-room Gas Monitor
CM500 Series
Model CM501

CM500

GS 12Y04F01-01E

■ GENERAL

As the degree of integration of LSI increase as well as large scaled FPD production is driving forward, removal of gaseous contaminants such as ammonia and acid gases in clean room has become an important issue. To cope with this requirement, monitoring of air borne contaminants and periodic check of chemical performance at chemical filter is vital measure.

This system measures ammonia and acid gases continuously at high sensitivity by utilizing a diffusion scrubber and an ion chromatograph. Diffusion scrubber is to absorb ammonia/acid gases in water. Then these are analyzed with an ion chromatograph. The CM501 Clean room gas monitor realize contamination-free, on-line air borne monitoring. Optional multi-stream type (16 points) is also abailable.

■ FEATURES

- Ammonia gas is measured at a sensitivity of 0.01 μg/m3.
- Acidic gases (hydrogen chloride, sulfur dioxide, etc.) are measured at a sensitivity of 0.02 μg/m3.
- Ion chromatography, a highly reliable analyzing technique, is used.
- Unique diffusion scrubber tecknique minimizes contamination of samples.
- Eluent consumption is minimal and replacement of eluent is required only once a month.
- The results are monitored on a trend graph from a workstation.
- Filter life prediction software is available.
- Samples from up to 16 points are measured (optional).

■ SYSTEM CONFIGURATION

This system consists of a gas collection unit with a diffusion scrubber, an ion chromatograph unit and a workstation (personal computer) as human interface.

1. Gas Collection Unit

The gas collection unit is composed of a stream selector (optional) and a gas collector.

Stream Selector (optional)

The stream selector for 16 points is available. Sampling time is selectable.
Maximum supply tube length is 50 m.
To minimize “memory effect” due to absorption of samples to the surface of the tube, the system is provided with a function to wash the tube from the stream selector valve to the diffusion scrubber with pure water.

Gas Collector

Ammonia gas introduced to the gas collector is absorbed into the pure water through the diffusion scrubber and the absorbed liquid is delivered to the ion chromatograph unit.
The diffusion scrubber consists of a double tube. The inner tube is porous poly-tetra fluoro ethylene PTFE and the outer tube is glass. Gas is passed through the inner tube and pure water is passed through the gap between the inner and outer tubes. The properties of the porous PTFE tube allow gas to permeate through the tube, and thus the inside gas is absorbed into the outside pure water over the diffusion scrubber to become ions. In addition, particle components are not diffused into the pure water and just flow through to the exhaust.

YOKOGAWA

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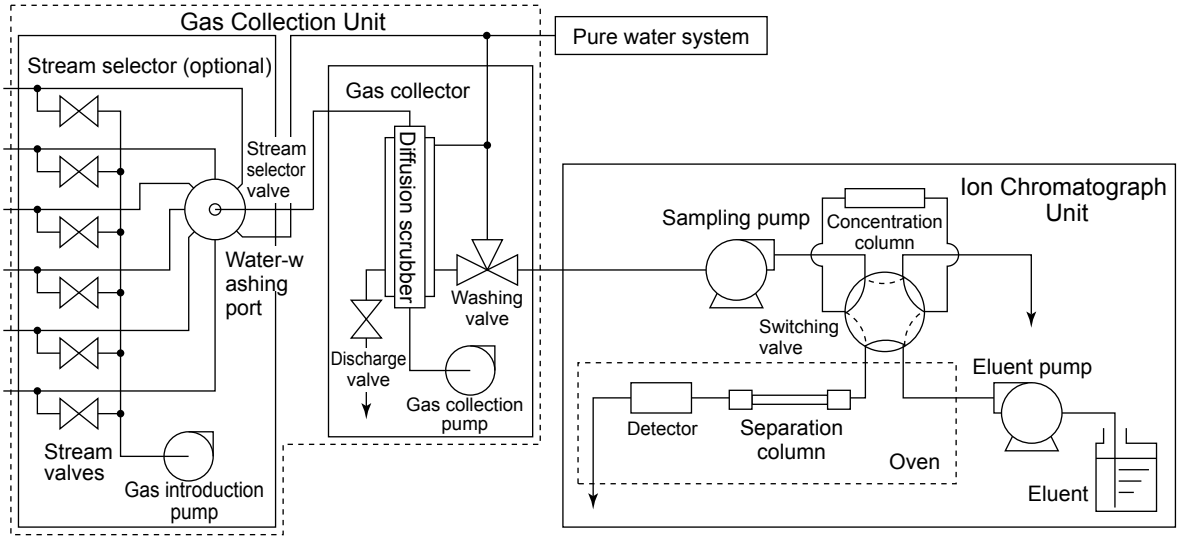

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2. Ion Chromatograph Unit (Pi501)

The ion chromatograph unit traps the collected ions in the concentration column. After that, those ions are forwarded to the separation column by operating the switching valve.
The separation column is filled with a packing material with ion exchanger. The ion components entering the column will be separated by its electrical/physical characteristics respectively and then flow is to the detector. The detector measures concentration of those respective ions separated.

3. Workstation (PC)

The workstation is used for operation and data displays, such as system running and operation commands, running status display, chromatogram indication, display of history of analyzed values, alarm indication, a function notifying remaining service life of filter, setting of various parameters, etc.

■ STANDARD SPECIFICATIONS

Model: CM501 Clean Room Gas Monitor

- **System Specifications**

Measurement: Either ammonia gas or acidic gas (anion analysis: hydrogen chloride, sulfur dioxide, etc.)
Gas collection method:
Diffusion scrubber system
Analysis method:
Ion chromatography
Measuring range:
0 to 50 μg/m^3
Minimum detection limit *:
0.01 μg/m^3 (Ammonia)
0.02 μg/m^3 (Acid gas)
*: Minimum detection limit means the calculated value by the sense and noise (S/N > 2)
Measurement cycle: Minimum 30 min (at overlap measurement)
Measuring points:
One point or up to 16 points (optional)
Measurement method:
Overlap measurement , series measurement
Calibration:
Calibration using standard solutions, automatic calibration
External contact input:
Measuring stream skip signal, external alarm signal, and external alarm reset signal
External output:
Abnormal concentration signal (for every stream, relay contact), system alarm signal (relay contact), measuring stream signal (binary, relay contact), re-measurement signal (relay contact), liquid leakage signal (relay contact), alarm buzzer signal, and alarm light signal

Utility

Electric Power

Power supply:
100 V to 120 V AC, 50/60 Hz or 200 V to 240 V AC, 50/60 Hz

Power consumption:
CM501; 0.25 kVA, for internal pure water system type, add about 0.1 kVA. (only for 100 V supply)
For Personal computer (notebook PC), a power line in separate power source is required.

Wiring material:
3-wire shielded cable of outer diameter 10 to 16.5 mm

Grounding:
Independent grounding (grounding resistance 100 ohm or less)

Pure Water

- **External pure water inlet type**
  Purity: 18 Mohm/cm or more
  Pressure: 0.2 to 0.3 MPa
  Flowrate: 1 to 2 L/min.
  Connection port:
  SUPER type Pillar Fitting,
  Tube size:
  OD 6.35 mm, ID 4.35 mm
- **Internal pure water system type**
  Purity: 18 Mohm/cm or more
  Water supply:
  Pure water (18 Mohm/cm or more)
  Operating temperature range:
  5 °C to 40 °C
  Pure water tank:
  20 L come with low level sensor

Reagent (Eluent)

(1) Ammonia measurement
1 mmol/L nitric acid (HNO_3), 0.2 ml/min.
Supply frequency:
Approx. once a month, replacement

(2) Anion measurement
4.5 mmol/L sodium carbonate (Na_2CO_3), 0.2 ml/min.
Supply frequency:
Once a month, replacement

Waste Water

- **Chemical effluent**
  (1) Ammonia measurement
  Nitric acid solution, approx. pH 5, 1.2 ml/min.
  (2) Anion measurement
  Sodium-carbonate solution, approx. pH 10, 1.2 ml/min.
- **For direct connection to factory waste water line**
  Effluent: Mixture of Chemical effluent and pure water drainage (about 1 to 2 L/min.)
  Piping: The wastewater is not pressurized and so the wastewater pipe must be positioned below the analyzer
  Piping material:
  Corrosion-resistant material such as stainless steel
  Connection port: Rc 1/2
- **Use of effluent tank inside the system**
  Frequency of tank discharge:
  Once every ten days, discharge from the 20 L tank.

Installation Environment

Must be installed in the clean room or in a place which is as clean as possible
Sample gas is discharged downward from the back of the CM501. An exhaust system may be required separately.

Ambient temperature:
10 °C to 30 °C. Temperature changes during measurement should be minimal.

Ambient humidity:
20 to 80 % RH, no vapor condensation

Altitude: 2000 m above sea level or less

Others: No dust, No vibration, No tilting, No exposure to direct sunlight, No direct air blown from an air conditioner, No corrosive or explosive atmosphere, Must be fixed as an anti-seismic measure.

Sample Gas conditions

Upper detection limit:
100 µg/m^3

Measuring port pressure:
-0.05 MPa or more

Flow rate: 1 L/min. (per stream)

Tube: To be prepared by customers
Tube material PE
Tube size OD 6.0 mm, ID 4.0 mm, length up to 50 m.

The inside of the tube must be cleaned with pure water.

● Cabinet Specifications

Construction:
Stand-alone non-closed type (fixed to the floor with anchor bolts) with front door and key, for indoor installation

External dimensions:
860 (W) X 730 (D) X 1060 (H) mm

Material: Body; Steel plate, Door; Steel plate

Coating: Epoxy resin baked finish

Coating color:
Roof; Munsell N-3.5-0, semi-gloss, Front and side plates; Munsell 2.5Y 7/4, semi-gloss

Weight: Approx. 170 kg
Except for chemical solution, workstation and pure water system

• Main Component Unit Specifications

• Gas Collection Unit

Stream selector valve (optional):
16-points selection
Selection period: Variable
Pure water washing function:
Setting for every stream possible
Gas introduction pump:
2 pumps, Flow rate About 10 L/min.
Diffusion scrubber: 1 units
Gas collection pump: 1 pump
Flowrate range 0.1 to 2 L/min. (practical flow rate 1 L/min.)

• Ion Chromatograph Unit

Model: Pi501
Eluent feeding pump:
1 set of double plunger, active damper system
Suppressor:
Used except Ammonia measurement
Sampling pump:
With cleaning mechanism, 1 set
Oven: Temperature 45 °C
Electrical conductivity detector:
1 unit, measuring range 0 to 5 mS/cm
Automatic switching valve: 1 unit
Main column: 1 column
Concentration column: 1 column
Dimensions:
370 (W) X 460 (D) X 230 (H) mm without suppressor
410 (W) X 460 (D) X 230 (H) mm with suppressor
Weight: Approx. 24 kg

• Workstation (notebook PC)

To be prepared by customer.
Recommended specifications are,

Item	OS	
	MIcrosoft Windows 2000 SP4, Microsoft Windows XP SP2	**Microsoft Windows Vista Business Edition**
PC	IBM PC /AT compatible	
CPU	Pentium II 300 MHz or higher	1 GHz or higher
HDD	4 GB or more	15 GB or more for OS 10 GB or more for Application
RAM	256 MB or more	1 GB or more
Language	English or Japanese	
Display	800 x 600 VGA or higher, and be viewable with equal to or more than 256 colors	
Serial port	One RS-232C port for connection to each analyzer; one port for the single analyzer edition of PI500 Workstation, and two for the dual-analyzer edition.	

I/O: D-Sub 9 pin RS-232-C port
Cable: RS-232-C cross cable

• Workstation Software PIWS

For operation and display of CM501
Language to be displayed:
Choice of English or Japanese
Media of software: CD-ROM

■ PRODUCT MODEL CODES

• Model CM501 Clean-room Gas Monitor

Model	Basic Code	Option Code	Descriptions
CM501	----------	----------	Clean-room Gas Monitor
Area to be used	-L	----------	Standard specifications
	-C	----------	European specifications
Pure water supply	-N	----------	External pure water inlet type
	-U	----------	Internal pure water system type
Ion to be measured	-A1	----------	Anion (with suppressor)
	-C1	----------	Cation (ammonia)
Display language	-E	----------	English
	-J	----------	Japanese
---	-N	----------	Always “-N”
---	-N	----------	Always “-N”
---	-N	----------	Always “-N”
Option		/EX	16-streams measurement

- **Model Pi501 Process Ion Chromatograph**

Model	Basic Code	Option Code	Descriptions
PI501	----------	----------	Process Ion Chromatograph
EL pump	-P1	----------	Always "-P1"
Oven	-V1	----------	Always "-V1"
Measurement	-A1-A-B -C1-N-A	---------- ----------	Anion measurement Ammonia measurement
Display language	-E -J	---------- ----------	English Japanese
---	-N	----------	Always “-N”
---	-N	----------	Always “-N”
---	-N	----------	Always “-N”

- **Model PIWS Workstation Software**

Model	Basic Code	Option Code	Descriptions
PIWS	----------	----------	Workstation software for Pi500
Display language	-E -J	---------- ----------	English Japanese
Number of analyzer	1	----------	1
---	-0	----------	Always "0"
---	1	----------	Always “1”
---	-N	----------	Always “-N”
---	N	----------	Always “N”
---	N	----------	Always “N”

■ ACCESSORIES AND SPARES

1. Standard accessories

Name		Part number	Qty	Description
Ammonia	Eluent *1	---		Please purchase it from chemical company.
	Standard solution *1	K9601LB	1	NH_4^+ 10 mg/L, 50 ml
	System check solution *1	K9601LC	1	NH_4^+ 1 mg/L, 100 ml
Anion	Eluent *1	---		Please purchase it from chemical company.
	Standard solution System check solution *1	K9601LG	2	Standard solution 50 mL (mg/L) F^-:5, Cl^-:10, NO_2^-:15, Br^-:10, NO_3^-:30, PO_4^{3-}:30, SO_4^{2-}:40 (mg/L)
Anchor bolt set		K9613MA	1	
TUBE working jig		K9613MC	1	Tool for tube connection
Tank 10 L		K9603ZJ	1	Eluent tank
Fuse		S9517VK	2	3 A
Fuse		A1288EF	2	1 A
Fuse		L9019EF	2	3 A, for Pi501
Fuse		A1174EF	2	1.25 A
Ferrite core		K9607MU	7	For CM501 power supply (2) and DO (5)
Ferrite core		K9607MV	2	Between PC and Pi501
Tank 20 L *2		K9603RF	1	For pure water
Accessories kit *2		K9601BG	1	For pure water
User's manual CM501 Clean-room Gas Monitor				

*1: Depend on the system specifications
*2: Attached only when the internal pure water system

2. Spare parts and consumables

Recommended replacement Interval	Item	Part Number	Qty	
			Ammonia	Anion
3 months	Ammonia measurement: concentration column *1*2	K9601GA	1	
	Ammonia measurement: separation column *1*2	K9601FA	1	
	Anion measurement: concentration column *1*3	J9732DX		1
	Anion measurement: separation column *1*2	J9732DF		1
	Anion/fluoride/organic acid/boron measurement: suppressor *1*3	J9732DU		1
	Line filter	K9601DC	1	1
4 months	Diaphragm for effluent pump	K9601BH	1*4	1*4
6 months	Plunger seal for eluent pump	K9600HZ	2	2
	Plunger seal for sample pump: for reagent line	K9600NY	2	2
	Plunger seal for sample pump: for wash line	K9600NZ	2	2
1 year	Rotor seal for concentration valve	K9600QC	1	1
	Plunger for eluent pump (for ammonia/anion/fluoride/organic acid/boron measurement) *1	K9600HY	2	2
	Check valve for eluent pump: pump inlet *1	K9600HA	1	1
	Check valve for eluent pump: pump outlet *1	K9600GV	1	1
	Plunger for sample pump *1	L9869DJ	2	2
	Check valve for sample pump: pump inlet *1	K9600NG	1	1
	Check valve for sample pump: pump outlet *1	K9600NB	1	1
	Gas collection pump *1	K9608GJ	1	1
	Degassing module *1	K9603PB	1	1
	Diffusion scrubber *1	K9603NA	1	1
	Cartridge for pure water supply system: Q Guard TL *5	QGARDTL01	1	

*1: Replacement interval may vary depending on operating condition. Should be replaced as needed.
*2: Shelf life is 6 months when stored in a clean place, out of direct sunlight, at 15 to 28 °C.
*3: Shelf life is 3 months when stored in a clean place, out of direct sunlight, at 15 to 28 °C.
*4: Only for internal pure water system type.
*5: Only for internal pure water system type.
Should be purchased directly from Nihon Millipore K.K. Listed part numbers are the catalogue numbers of Nihon Millipore K.K.

3. Reagents

Reagents should be purchased directly from Kanto Chemical Co., Inc. and/or Wako Pure Chemical Industries, Ltd.

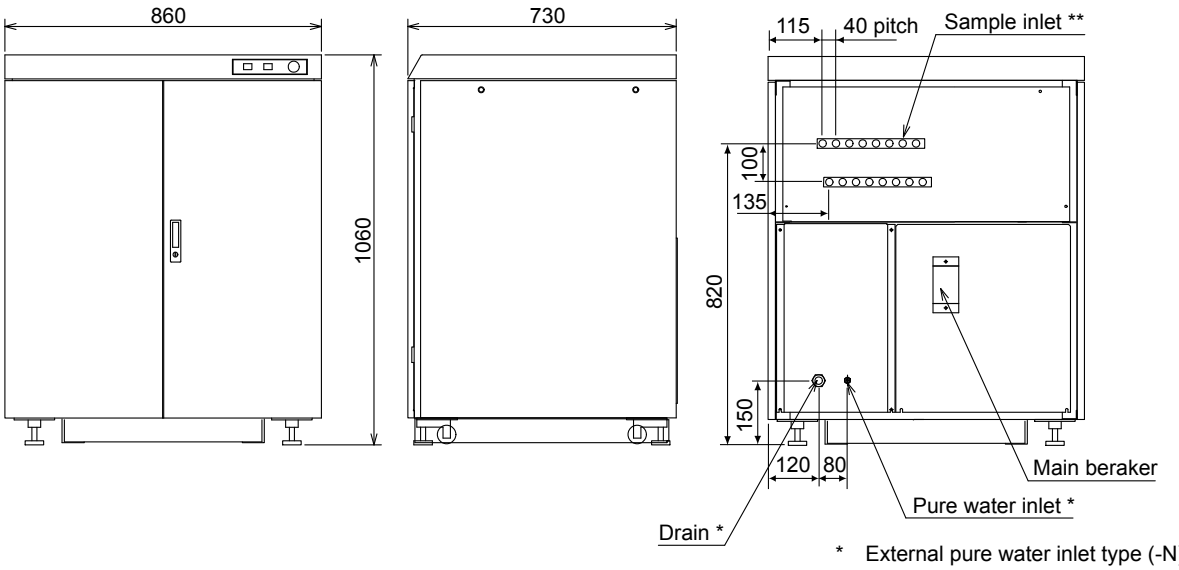
Measurement	Item	Description	Size	Part Number *1	Quantity Consumed
Ammonia	Eluent	HNO_3, 1 mmol/L	10 L	14701-84 (Kanto)	1 bottle/month
	Standard solution	NH_4^+, 10 mg/L	50 ml	38107-96 (Kanto)	1 bottle/month
	System check solution	NH_4^+, 1 mg/L	100 ml	38108-96 (Kanto)	1 bottle/month
Anion	Eluent	Na_2CO_3, 4.5 mmol/L	10 L	38085-84 (Kanto)	1 bottle/month
	Standard solution	Mixed anion standard solution (mg/L) F^-: 5, Cl^-: 10, NO_2^-: 15, Br^-: 10, NO_3^-: 30, PO_4^{3-}: 30, SO_4^{2-}: 40	50 ml	01856-96 (Kanto)	1 bottle each/ month
	System check solution				

*1: Product numbers of Kanto Chemical Co..

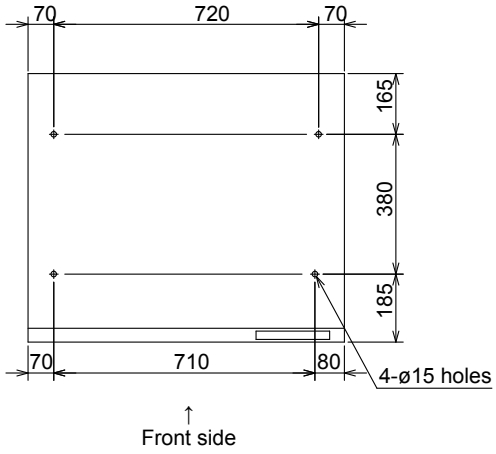
Unopened reagents are stable for 6 months.

■ EXTERNAL DIMENSIONS, INSTALLATION SPACE AND EXTERNAL INPUT/OUTPUT

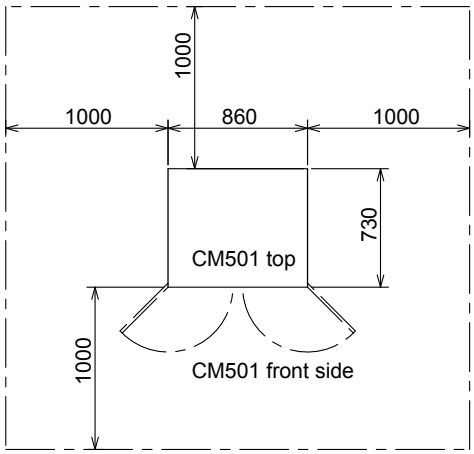
Unit: mm



* External pure water inlet type (-N)
** 16-streams measurement (/EX)



Bottom (anchor bolt position)



Maintenance space

External Input/Output Terminal Arrangement

Terminal board switch number			Terminal number	Stream number		Terminal number	Stream number		Terminal number	Stream number	
		Measurement Strream Skip Input	3	#1	A	2	#1	B	1	No Connection	
			6	#2		5	#2		4		
			9	#3		8	#3		7		
			12	#4		11	#4		10		
			15	#5		14	#5		13		
			18	#6		17	#6		16		
			21	#7		20	#7		19		
			24	#8		23	#8		22		
			27	#9		26	#9		25		
			30	#10		29	#10		28		
			33	#11		32	#11		31		
			36	#12		35	#12		34		
			39	#13		38	#13		37		
			42	#14		41	#14		40		
			45	#15		44	#15		43		
			48	#16		47	#16		46		
		Alarm Input	51	A		50	B		49		
		Alarm Reset Input	54	A		53	B		52		
		Leakage Water Alarm Output	57	Normally Open (*1)		56	Common		55	Normally Close (*1)	
		Alarm Buzzer Output	60	GND		59	+24V		58	No Connection	
		Alarm Light Output	63	GND		62	+24V		61		
	1	Retry Measurement Output	66	D/O (*2)		65	D/O Common		64	D/O (*2)	
	2	Alarm Output	69	D/O (*2)		68	D/O Common		67	D/O (*2)	
	3		72			71			70		
	4		75			74			73		
	5		78			77			76		
	6		81			80			79		
	7	Measurement Stream Bit Output	84	Bit 0	D/O (*2)	83	Bit 0	D/O Common	82	Bit 0	D/O (*2)
	8		87	Bit 1		86	Bit 1		85	Bit 1	
	9		90	Bit 2		89	Bit 2		88	Bit 2	
	10		93	Bit 3		92	Bit 3		91	Bit 3	
	11		96	Bit 4		95	Bit 4		94	Bit 4	
	12	Stream Alarm Output	99	#1	D/O (*2)	98	#1	D/O Common	97	#1	D/O (*2)
	13		102	#2		101	#2		100	#2	
	14		105	#3		104	#3		103	#3	
	15		108	#4		107	#4		106	#4	
	16		111	#5		110	#5		109	#5	
	17		114	#6		113	#6		112	#6	
	18		117	#7		116	#7		115	#7	
	19		120	#8		119	#8		118	#8	
	20		123	#9		122	#9		121	#9	
	21		126	#10		125	#10		124	#10	
	22		129	#11		128	#11		127	#11	
	23		132	#12		131	#12		130	#12	
	24		135	#13		134	#13		133	#13	
	25		138	#14		137	#14		136	#14	
	26		141	#15		140	#15		139	#15	
	27		144	#16		143	#16		142	#16	

*1 :

When power is turned off:	Open	Common	Close

*2 : Select either terminal board switch A or B

For A	Power Off	Open	Common	Close
	Without event	Open	Common	Close
	With event	Close	Common	Open
For B	Power Off	Open	Common	Close
	Without event	Close	Common	Open
	With event	Open	Common	Close

terminal board switch A 101 and 102

Power Off	Open
Without event	Open
With event	Close

Contact input

Resistance between A and B	200 Ω or less	ON
	100 kΩ or more	OFF
	200 Ω to 100 kΩ	No operation garanteed

Contact output
Alarm Buzzer, Alarm Light

Power Off	0V
Without event	Less than +1V
With event	+24V

Protection circuit is not provided.

Use the contact at 30V DC, 0.5A or less expect for Alarm Buzzer, Alarm Light.

- **Measurement Stream Skip Input**
  Used when any stream measurement is skipped.
- **Retry Measurement Output**
  Outputs from the relay contact when the same stream is measured again due to an abnormality in the measured result. (No output at overlap measurement)
- **Alarm Buzzer Output**
  The terminal for sounding the buzzer when an alarm is generated. Power of +24 V DC is applied. The buzzer is provided as standard.
- **Alarm Light Output**
  The terminal for lighting a rotating warning light and the like when an alarm is generated. Power of +24 V DC is applied. Normally, the light is not mounted. The user should not use this terminal.
- **Leakage Water Alarm Output**
  When liquid leakage occurs in the CM501 (except within Pi501), an alarm is output from a relay contact.
- **Alarm Output**
  When a high level alarm occurs, alarm is output from relay contacts (5 points).
- **Measurement Stream Bit Output**
  Measurement streams are expressed and identified with bits and are output from relay contacts.

Measurement Stream	Bit0	Bit1	Bit2	Bit3	Bit4
1	1	0	0	0	0
2	0	1	0	0	0
3	1	1	0	0	0
4	0	0	1	0	0
5	1	0	1	0	0
6	0	1	1	0	0
7	1	1	1	0	0
8	0	0	0	1	0
9	1	0	0	1	0
10	0	1	0	1	0
11	1	1	0	1	0
12	0	0	1	1	0
13	1	0	1	1	0
14	0	1	1	1	0
15	1	1	1	1	0
16	0	0	0	0	1

- **Stream Alarm Output**
  The abnormal concentration signal for each measurement stream is output from a relay contact.

Clean-room Gas Monitor Inquiry Specifications

For any inquiries concerning the Yokogawa Clean-room Gas Monitor, enter the check marks (√) in relevant boxes, and in the underlined parts, write the prescribed items.

1. General

(1) Name of your firm: _____
(2) Person in charge: _____ Department: _____ Phone: _____
(3) Name of the factory: _____
(4) Measuring point(s): _____
(5) Power supply: _____ V AC, _____ Hz

2. Measuring Condition

(1) Gas to be measured: _____
(2) Number of measuring points: _____ Point(s)
(3) Gas concentration: _____ μg/m^3, (ppb)
_____ μg/m^3, (ppb)
_____ μg/m^3, (ppb)
_____ μg/m^3, (ppb)
_____ μg/m^3, (ppb)
(4) Others: _____

3. Location of Installation

(1) Environment: ☐ In a clean room, ☐ Sub-clean room, ☐ Outside a clean room
(2) Ambient temperature: _____ to _____ °C
(3) Others: _____

4. Other Requirements: _____

Caution

For safe and correct use of this product be sure to thoroughly read the instruction manuals.
“Windows”, "Windows XP" and "Windows Vista" are registered trademarks of Microsoft Corporation.
“Pentium” is a registered trademark of Intel Corporation.
Other product names and the like are registered trademarks or trademarks of each company concerned.