General Specifications

Analyzer Bus System

GS 11B5A1-01E

General

Process analyzers are typically maintained by maintenance personnel from the front of the analyzer. However, with the implementation of an analyzer bus system, maintenance can now be done entirely by monitoring and operating the analyzers from a remote location. A personal computer can be used as a terminal for controlling the analyzers, enabling the maintenance person to operate the gas chromatograph and field analyzers from a comprehensive computer screen interface instead of the conventional gas chromatograph processor and chromatographic recorder.

The analyzer bus system offers the following benefits:

- *Comprehensive and centrally located remote maintenance of analyzers.*
- *Reduction in the cost of wiring (among field panels).*
- *Ease of expansion that is not limited by the physical number of available DCS process inputs.*

Features

- 2.5 Mbps, the world's fastest communication rate in the process analyzer industry.
  This high transfer rate allows for the monitoring of not only the analysis results and alarms but also the real-time chromatogram for two simultaneous detectors.
- High reliability network that is suitable for continuous process analysis.
  Real-time data acquisition without loss of data packages is guaranteed by 1) Use of Token-ring protocol, 2)A completely redundant network, and 3) Eliminating interference by external noise through the use of a 16 Volt peak-to-peak signal level with coaxial cables.
- Up to 240 analyzers with a maximum transmission distance of 6 km can be connected within the system. (Extension cab be configured)
  Suitable for both small and large scale systems. Data highway system makes it easy and cost effective for future expansion.
- Work Station runs on any Microsoft Windows* personal computer.
  Standard personal computers can be used to monitor, control and maintain field analyzers. Analysis results are exportable in comma delimited ASCII files for importing into spreadsheet software which can then be configured to evaluate data and generate reports
- Dedicated network server exclusively used for the archiving of analysis results, centralized maintenance of analyzers, and single serial communication to other process computers. Redundant servers are easily configurable.
- Data highway signal safety measures.
  The explosion protection of each analyzer is monitored by the GCHUB. In the unlikely event that the explosion protection function of the analyzer cannot be maintained (for example the loss of purge air), the communication signal for just that channel is shut off by a relay to ensure safety.
- Remote maintenance from around the world.
  Besides the centralized PC workstation, a modem installed on the PC allows for off-site monitoring and troubleshooting from any location in the world that has a telephone.
  This network analyzer bus system was developed to provide such a remote maintenance function for analyzer maintenance in the future.

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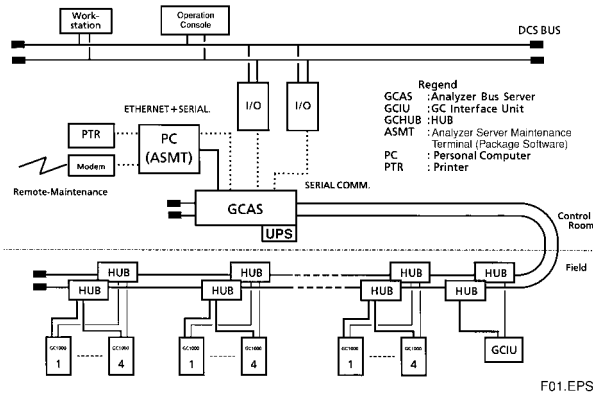
1. System Configuration



Analyzer bus system: Used to connect gas chromatographs and field analyzers into a centralized data network. Totally redundant configuration is used to ensure high performance and reliability.

GCAS (Analyzer Server): The central computer for the monitoring and control of the entire network. Data is archived automatically and allows for single gateway communication to the DCS.

ASMT (Analyzer Server Maintenance Terminal): This is the software package that is run from any personal computer. The user can then operate the gas chromatograph in the field from this remote PC via the GCAS.

GCIU (GC Interface Unit): This interface device allows for the monitoring and control of other manufacturer's field analyzers via the analyzer bus system.

GCHUB: This device multiplexes up to four gas chromatographs/GCIU into the network. Repeater type HUBs are used to extend distances or multiplex signals from multiple loops.

UPS (Uninterruptible Power Supply):

This battery backed device protects the hard disk of the GCAS from power surges and accidental loss of power.

2. System Specifications

2.1 Communication Specifications

GC1000 process gas chromatographs and GCAS are networked via redundant dual communication lines. This makes it possible to remotely operate and perform maintenance on multiple GC1000s.

2.1.1 Network specification

Communication rate:	2.5 Mbps
Connection type:	Loop network using repeater-type GCHUBs.
Network cabling:	Coaxial, twisted pair, and/or fiber optic cable
Max. number of nodes:	254 per network (240 per network for analyzers, 14 per network for the analyzer server)

Max. connection distance:

500 m (coaxial cable, between Repeater HUBs and HUB-GCAS)

200 m (twisted cable, between Repeater HUBs and HUB-GC1000 (GCIU), and HUB-GCAS)

Twisted cable min. connection distance: 10 m

3000 m (optical cable, between Repeater HUBs)

Total network length <6,000 (m) Extension can be configured.

Length (m) = Main loop + (Max. length of Branch network connected to loop) + (2nd Max. length of Branch network connected to loop) + (Number of Repeater HUB)*60

Calculation example is showed at item 4

• Note:

When the optical fiber cable is used, the distance for the calculation need to be multipled by 1.25 times of the actual distance, for example, 1,250m for the calculation formula is applied when 1,000m of the optical fiber cable is usd.

Furthermore 125 is applied insted of 60 in the above formula.

These values are for ARC-HUB32/N/C/3K made by Toyo micro systems.

Network Protocol: ARCNET token-ring(TCP/IP)

Redundant highways: Automatic switchover upon loss of one channel and supports up to 14 GCAS on one analyzer bus network ensuring complete data redundancy.

2.1.2 Functional capacity per GCAS

The following table summarizes the processing capability of a single GCAS

Function	Number of connected analyzers		
	32 units or less	64 units or less	240 units or less
Sending/receiving of analysis results and alarms/commands to/from DCS and ASMT	Yes	Yes	64 units (max.)
Display of chromatogram and status data in real time:	Yes	31 units (max.)	31 units (max.)
LCD emulation:	1 unit selected	1 unit selected	1 unit selected
Time synchronization:	Yes	Yes	Yes

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2.1.3 Cable Specifications

1) Coaxial cable (Reference supplier: Fujikura)

Model: RG-62A/U (diameter: 6.15)

Characteristic impedance: 93 ohms at 10 MHz

Attenuation: 5.5 dB/1000 ft at 5 MHz

Connector-related items

(Reference supplier: Nippon AMP)

Connector: 1-221128-1

Contact bonding tool: 58433-2

Stripper: 603995-6 (Blue Cassette)

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2) Optical fiber cable

(Reference supplier: Duppont)

3K type: Silica type G1 (50/125micro m)
Connector: DL type (plug) locking type 2-wire/JIS F08 type
Driver: DLR-AN6100

3) Twisted pair cable (between HUB and GC1000)

(Reference supplier: BELDEN WIRE & Cable Corp.)

Twisted pair PT#02159 (Shielded twisted pair cable)
Twisting number: Twice (min.)/foot
DC conductor resistance: 28.6 ohms/1000 ft max.
Characteristic impedance: 105 ohms +/-10% at 1 MHz
Attenuation: 16 dB/1000 ft max. at 5 MHz

2.2 GCAS

The GCAS analyzer server is a computer system that is connected to an analyzer bus. The server has a host system gateway function, data saving function for GC1000 maintenance, and communication function for the ASMT maintenance terminal. Usually, this server is installed in a room such as a central measuring instrument room.

2.2.1 Basic Specifications

Max. number of analyzers connected:	240
Hard disk capacity:	2 GB or more
Main memory DRAM:	4 MB (additional 4 MB for more than 16 monitored analyzers)
Floppy disk:	1.44 MB/3.5-inch
Power supply:	100 to 240 VAC +/-10%, 50/60 Hz +/-5%
Power consumption:	Max 70 W
Operating ambient temperature:	0 to 40°C, 80% R.H or less
Storage condition:	-40 to 85°C, no condensation
Weight:	Approx. 20 kg
Installation location:	Well-ventilated place indoors, free of vibration.

2.2.2 Input/Output Specifications

1) DCS communication

Number of ports:	2 (up to 4 simultaneous ports can be configured)
Communication method:	Serial communication
Distance between analyzer server and DCS:	Must be 10 m or less
Protocol:	Modbus or Y-protocol (For the data format, refer to the GS.)
Transmission rate:	1200, 2400, 4800, 9600, 19200bps user selectable
Data length:	7 bit(Y-protocol), 8 bit(modbus)
Parity bit:	even(Y-protocol), selectable(modbus)
Stop bit:	1 bit

2) Contact input/output

Number of contact inputs:	16
Rating:	Dry contact, ON signal 200 ohms or less; OFF signal 100 k ohms or more; Short-circuited on request Contact rating, voltage 5 VDC or more; current 20 mA or more
Number of contact outputs:	16
Rating:	Dry contact, 30 VDC, 500 mA

3) PC communication input/output (ASMT)

ASMT communication port: Ethernet 10Base T(UTP RJ45), AUI, or 10Base 2(coaxial)
GCAS configuration: RS232C serial port, DB25-Female

2.2.3 Data Handlings

1) Analyzer Bus Monitoring.

Network connection node status are automatically monitored for troubleshooting purposes. Where implemented, both channels are monitored all the time with automatic switchover upon failure of one.

2) Automatic data archving for future retrieval.

a) Consentration and retention time results for all peaks every cycle for one year are archived. (actual duration is dependent on number of configured peaks.)
b) Calibration chromatograms and coefficients for the last 10 calibrations are saved.
c) GC and GCAS parameter tables are retrievable and can be stored on the PC hard disk indefinitely.
d) Chromatograms for every cycle for the past week are stored.
e) Alarm history with date/time stamps for up to 128 alarms for each analyzer.

3) DCS Serial communication

All real-time data can be transmitted via Modbus or Y-protocol.
a) Data includes analysis values, retention times, calibration coefficients, and operation start time.
b) Status includes the Operational status (Pattern) and alarm status
c) Commands include start/stop requests, mode change, and date & time setting

4) Contact input and outputs

a) Status outputs like mode and active pattern, alarms and operation timing can be sent out.
b) Input commands to start/stop and change patterns can be directly hard-wired to the DI's.

2.3 ASMT

The analyzer server maintenance terminal (ASMT) is a Window based PC software that uses an analyzer bus system.

2.3.1 PC operation environment

Machine type:	IBM PC compatible desktop computer
Processor:	Pentium 100 MHz or better
Main memory:	32 MB or more
Hard disk:	20 MB or more (free space)
CRT:	SVGA (1024x768) 17-inch or larger
OS:	Windows 95/98, or Windows NT4.0
Other:	Ethernet card and printer required

2.3.2 Communication standard

Ethernet:	Communication rate 10 Mbps
RS-232C:	Communication rate 9600 bps (Distance between analyzer and PC is 10 m or less)
Parameter:	8 data bits + 1 stop bit, no parity, XON/OFF control

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2.3.3 Screen display

a) Overview (8 Groups of up to 16 analyzers each can be user-selected to monitor overall analyzer status)
b) Analyzer Operation (allows complete control and monitoring of selected analyzer)
c) Analysis Result (displays last cycle analytical results or up to 250 cycles of concentration values or retention time in tables or repeatability graphs)
d) Chromatogram (live updates of both detector signals with facilities to overlay up to 8 real-time or saved chromatograms)
e) Alarm Status (Active alarms and history alarms, time and date stamped. Includes fault resolving tips and user-configurable messages)
f) Anabus Watch (Reports channel/node status and monitors successful/error transmissions for each node and highway channel)
g) LCD Emulator (Identical functionality to LCD panel on front of GC1000 which then allows complete GC control from remote location via GCAS)
h) Access to oparation or parameter changing is password protected.
i) Parameter tables can be uploaded to PC or downloaded back to GC1000.

2.4 GCIU

GC interface unit connects to an analyzer bus. It is used to fetch analog signals (4 to 20 mA) that are output from analyzers (pH meter, O2 meter, etc.), pressure transmitters, etc. into the analyzer bus.

2.4.1 Basic Specifications

Power supply: 100 to 240 VAC +/-10%, 50/60 Hz +/-5%
Power consumption: Max. 100 W
Purging air: Required volume: About 50 Nl/min
Pressure: 0.5 to 0.9 MPa
Cleanliness: No dust, corrosive or poisonous elements
Condensation: -20°C or less
Operating ambient temperature: -10 to 50°C, 95% R.H or less
Storage condition: -40 to 85°C, no condensation
Weight: Approx. 30 kg
Installation location: Well-ventilated place indoors, free of vibration, direct sunlight, and reflected light and heat
Explosion protection: CENELEC ATEX(KEMA) EExpd IIB+H_2 T4

2.4.2 Input/output specifications

1) Analog input:

Type: 1 to 5 V, 4 to 20 mA (without 30 VDC), 4 to 20 mA (with 30 VDC)
Number of points: max. 16 (Selectable by each 4 ch)

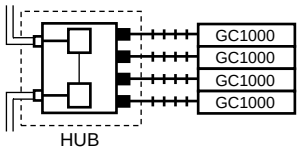
2) Contact and input/output

Contact input: 16 points
Rating: Dry contact, ON signal 200 ohms or less; OFF signal 100 kohms or more; Short-circuited on request
Contact rating, voltage 5 VDC or more; current 20 mA or more
Contact output: 18 points (including one system alarm and one inner pressure drop alarm)
Rating: Dry contact
Voltage: 30 VDC
Current: 500 mA or less

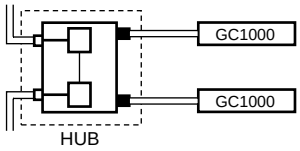
2.5 GCHUB

The GCHUB has a pressure and explosion resistant structure designed for use in such an environment. For connecting the HUB to analyzers, an explosion protection status line to monitor the explosion protection status of each analyzer is required. With this line, the HUB can disconnect a channel and shut off the power from the communication line if an analyzer stops abnormally.

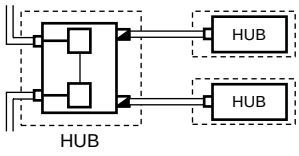
1. *Analyzer connection HUB i1 to 4 units j*



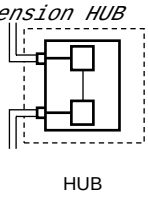
2. *Analyzer connection HUB i1 or 2 units j*



3. *Branching HUB i1 or 2 ports j*



4. *Extension HUB*



Coax
TR. PR
Backbone (coaxial) dedicated explosio
status (12V): Not needed
Explosion protection status (12V): Pr
Explosion protection status (12V): No
Pressuried enclosure

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Power supply: 100 to 240 VAC +/-10%, 50/60 Hz +/-5%. Power supply must not exceed 250 V.
Operating ambient temperature: -10 to 50°C when the voltage is 100 to 200 V. -10 to 40°C when the voltage is 220 to 250 V.
Storage condition: -40 to 85°C, no condensation
Power consumption: Approx. 30 W

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Explosion protection standard:	
	JIS Exd II (B+H_2) T6
	FM /CSA Class 1, Div. 1, Group B, C, D, T6
	CENELEC ATEX(KEMA) EExd IIB+H_2 T6 GroupII Category 2G
Wiring method:	JIS, Sealing fitting or packing adapter type; number of wiring ports, 4 : Fitting screw, 3/4NPT or G 3/4
	FM /CSA Sealing fitting to be done by customer; Fitting screw, 3/4 NPT; Number of wiring ports, 4
	CENELEC, Packing adapter; Fitting screw, 3/4NPT, PG21 or M25; Number of wiring ports,4
Weight:	Approx. 15 kg
Installation location:	Well-ventilated place indoors, free of vibration, direct sunlight, and reflected light and heat

2.6 UPS(Uninterruptible Power Supply unit)

During normal operation, data is continuously stored on the hard disk of the GCAS requiring for files to often be in an open state. This UPS configuration is to ensure these open files are not damaged by the unexpected loss of power or brown-outs to the GCAS. Furtermore it allows for the safe shutdown of the GCAS by using the external switch.

2.6.1 Basic Specification

Power Supply: 120V AC or 120V AC or 220/230/240V AC(3 type)

2.6.2 Functions

1) Momentary Power Failure

Continuous 1 (one) hour operation shall be possible in the momentary power failure, if UPS is full charged.

2) Power Shut-down

Following shut-down procedure shall be carried out automatically in the power shut-down.
UPS send HALT command to GCAS (DI #16) when rest capacity of the battery is less than 2 minutes operation.
GCAS (DO #15) send power-off command to UPS after completion of HALT procedure in the GCAS. Then UPS shall be power-off automatically.
This procedure takes about 30 seconds.

3) GCAS Power-off Operation

Power-off operation of GCAS shall be to operate the status of the external switch to CLOSE. About 30 seconds later, UPS shall be power-off automatically.

4) Recovery / Start-up of GCAS

Recovery / start-up operation of UPS, which would be in power-off condition after the above item-2 or 3 procedure, shall be to operate the ON / TEST switch of UPS front panel. Then UPS will start the power supply to GCAS.

5) Checking

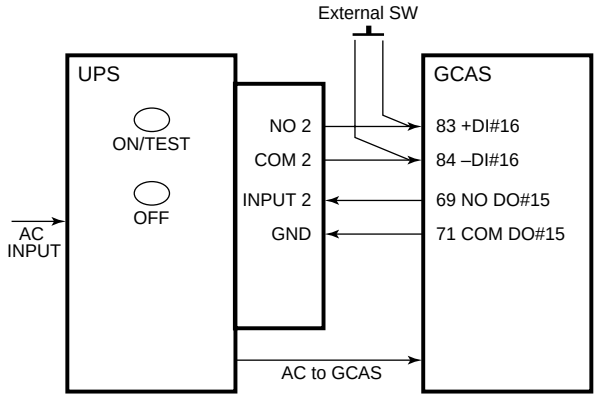
In this operation, followings shall be checked before the operation.

a) to check the condition of power supply to UPS.

b) to check the status of external switch, in OPEN position. It shall be necessary to turn the switch CLOSE to OPEN, after above item-3 operation.

c) to check the rest capacity of the UPS battery, recharged enough. It shall be necessary after above item-2 procedure.

2.6.3 Wiring



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2.6.4 Caution

During the GCAS operation, do not operate the OFF switch of UPS front panel. If operated, it shall stop the power supply of UPS for GCAS at once.

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3. Model Codes

3.1 GCAS

[Style: S2]

Type	Basic Specification Code	Option Code	Specification
GCAS	• • •

3.3 GCIU

Type	Basic Specification Code	Specification
GCIU	•••••••••••••••••••••••••••••	Field interface unit
1. Explosion protection	-Y •••••••••••••••••••••••••• -A ••••••••••••••••••••••••••	General purpose CENELEC
2. Wiring method	N •••••••••••••••••••••••• A •••••••••••••••••••••••• B •••••••••••••••••••••••• C •••••••••••••••••••••••• D ••••••••••••••••••••••••	None NPT M25 × 1.5 PG21 G3/4
3. Installation method	W ••••••••••••••••••••••	Wall mounting
4. Language	J •••••••••••••••••• E ••••••••••••••••••	Japanese English
5. Analyzer bus connection	-1 •••••••••••••••• -2 •••••••••••••••• -3 •••••••••••••••• -4 ••••••••••••••••	Twisted pair (dual channel) Coaxial (dual channel) Twisted pair (single channel) Coaxial (single channel)
6. A/I 1-5 [V]	N •••••••••••••• 1 •••••••••••••• 2 •••••••••••••• 3 •••••••••••••• 4 ••••••••••••••	None *1 Max. 4 channels *1 Max. 8 channels *1 Max. 12 channels *1 Max. 16 channels *1
7. A/I 4-20 [mA]	N •••••••••••• 1 •••••••••••• 2 •••••••••••• 3 •••••••••••• 4 ••••••••••••	None *1 Max. 4 channels *1 Max. 8 channels *1 Max. 12 channels *1 Max. 16 channels *1
8. A/I 4 to 20 [mA] 2-wire with 30 [V]	N •••••••••• 1 •••••••••• 2 •••••••••• 3 •••••••••• 4 ••••••••••	None *1 Max. 4 channels *1 Max. 8 channels *1 Max. 12 channels *1 Max. 16 channels *1
9. Always -N	-N •••••••	Always -N
10. Always N	N •••••	Always N
11. Always N	N •••	Always N

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*1: The total number of A/I channels must be 16 or less.

<Selection example>
GCIU-YAWE-12N2-NNN

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3.4 GCHUB

Type	Basic Specification Code	Option	Specification
GCHUB	•••••••••••••••••••••••	•••••	HUB
1. Explosion protection	-C •••••••••••••••••••••• -F •••••••••••••••••••••• -J •••••••••••••••••••••••	••••• ••••• •••••	CENELEC explosion protection FM explosion protection JIS explosion protection
2. Wiring method	N •••••••••••••••••••••• A •••••••••••••••••••••• F •••••••••••••••••••••• G •••••••••••••••••••••• P •••••••••••••••••••••• Q •••••••••••••••••••••• R •••••••••••••••••••••• S •••••••••••••••••••••••	••••• ••••• ••••• ••••• ••••• ••••• ••••• •••••	None FM/CSA explosion protection (NPT) *1 Conduit wiring (PF) *2 Conduit wiring (NPT) *2 Cable packing (PF) *2 *7 Cable packing (NPT) *2 *7 Cable packing (M) *7 Cable packing (PG) *7
3. Power supply	A •••••••••••••••••••• B •••••••••••••••••••• C •••••••••••••••••••• D •••••••••••••••••••• E •••••••••••••••••••• F •••••••••••••••••••• G •••••••••••••••••••• H •••••••••••••••••••••	••••• ••••• ••••• ••••• ••••• ••••• ••••• •••••	AC100V±10% *3 AC110V±10% *3 AC115V±10% *3 AC120V±10% *3 AC200V±10% *3 AC220V±10% *4 AC230V–10% to 250Vmax *4 AC240V–10% to 250Vmax *4
4. Backbone	1 •••••••••••••••••••	•••••	Repeater type
5. Connection	-N••••••••••••• -1 ••••••••••••• -3 •••••••••••••	••••• ••••• •••••	None *5 Twisted pair 4 ports Coaxial 2 ports *6
6. Explosion protection status port	N•••••••••••• 1 ••••••••••••	••••• •••••	None Provided
7. Installation method	1 ••••••••	•••••	Wall mounting
8. Always N	N •••••	•••••	Always N
9. Always -NN	-NN •	•••••	Always -NN
10. Optional code		/CSA	CSA explosion protection

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*1: This can be specified only when “1. Explosion protection” specifies “FM explosion protection”.
*2: This can be specified only when “1. Explosion protection” specifies “JIS explosion protection”.
*3: The range of the ambient temperature installed is from –10 to 50 degree C.
*4: The range of the ambient temperature installed is from –10 to 40 degree C.
*5: This can be specified only when “4. Backbone” specifies “Repeater type”. “N... None” must be selected for “6. Explosion protection status port”.
*6: This can be specified only when “4. Backbone” specifies “Repeater type”.
*7: This can be specified only when “1. Explosion protection” specifies “CENELEC explosion protection”.

Explanation of Terms

Backbone: Connection line between GCAS-HUB or HUB-HUB using a coaxial cable.

Repeater type: Connection type in which GCAS and HUB or HUB and HUB are connected 1:1. This type is suitable for a large distributed network having a maximum length of 500 m.

Connection: Form of connection between GCHUB and GC1000

Explosion protection status port:

Port for connecting GCHUB to GC1000 to maintain the GC1000 explosion protection status

The number of ports provided is set for “5. Connection”.

<Selection example>

GCHUB-JFA1-11IN-NN

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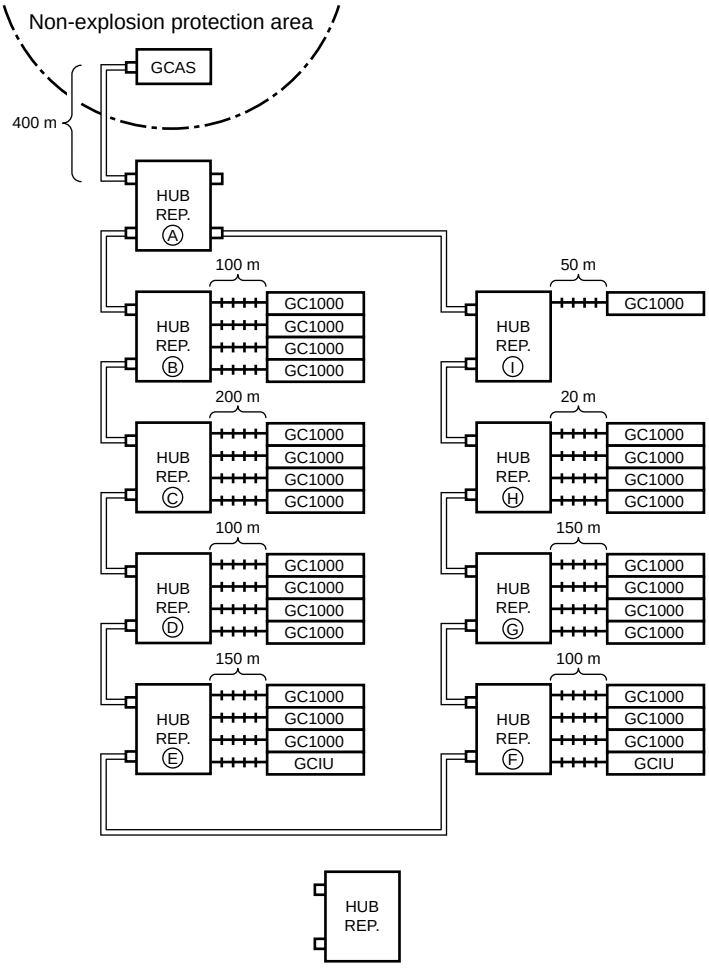
4. Connection Examples and Cables Used

Loop Network Example (for repeater connection type HUB used)

If HUB " Ⓕ " is something wrong, there is no effect for the communication between other HUB and GCAS.



Example:)

- Total loop length: 3,000 m
  (HUB Ⓐ to HUB Ⓘ)
- Total length (m) $= 3.000 + 400 + 200 + 9 \times 60$
  $= 4.140 < 6.000$

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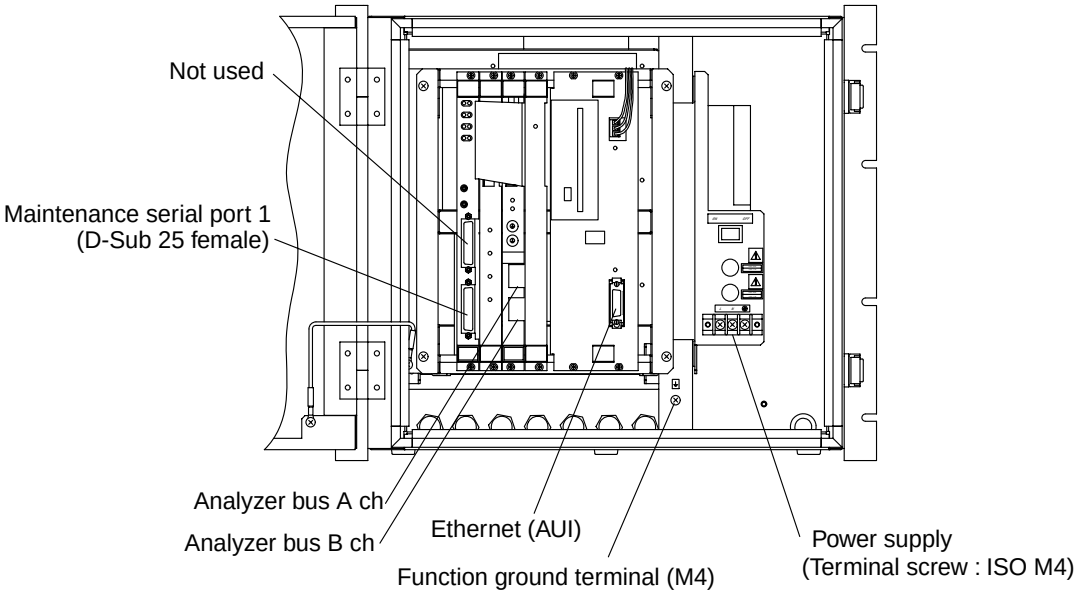
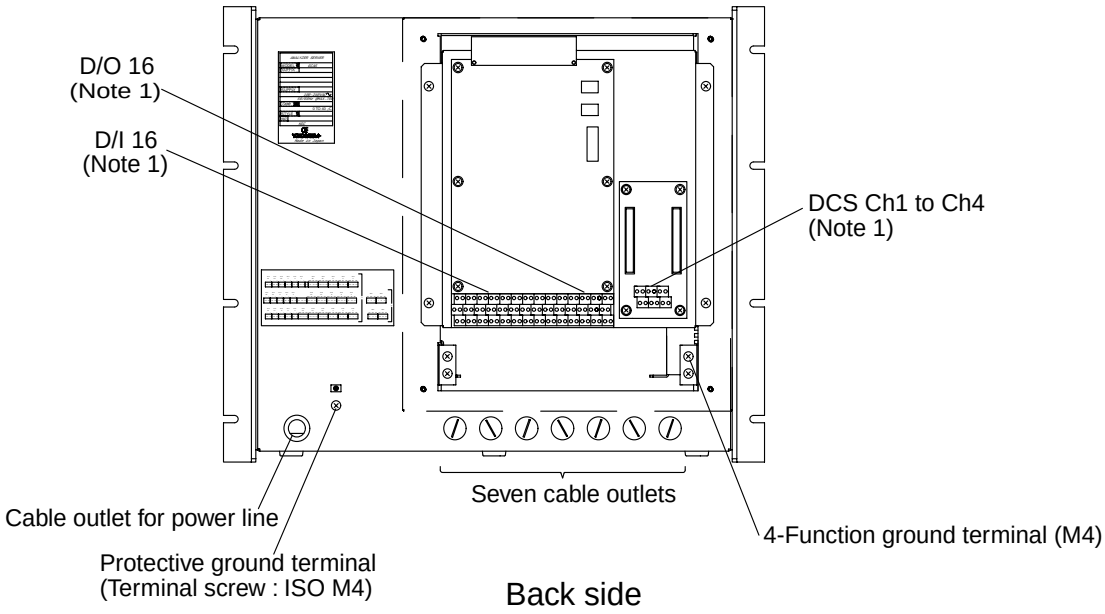
5. Terminal Assignment

5.1 GCAS



Front side



Back side

Note 1 : PHOENIX CONTACT
MK3DSN 1.5/2-5.08 Max 1.25mm^2

F0501.EPS

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5.2 PC-GCAS Connection

5.2.1 Ethernet connection example

for CE Marking

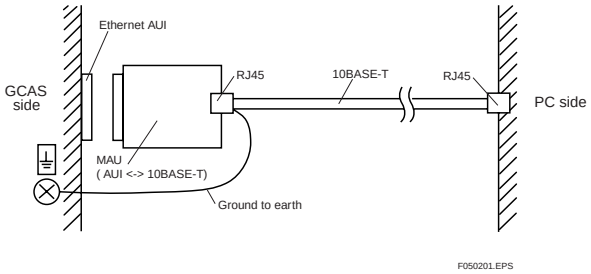

Fig. 1 Ethernet Connection Example

Adapter: Supplied
(MAU/server side: AUI-10BASE-T)
10BASE-T cable (20 m): Supplied
(between server and PC)

for without CE Marking

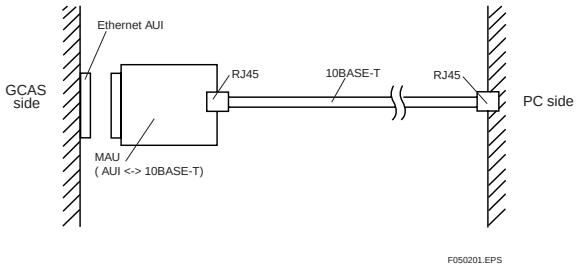

Fig. 1.1 Ethernet Connection Example

Adapter: Supplied
(MAU/server side: AUI-10BASE-T)
10BASE-T cable: Not supplied
(between server and PC: cross cable)

5.2.2 Serial communication connection example

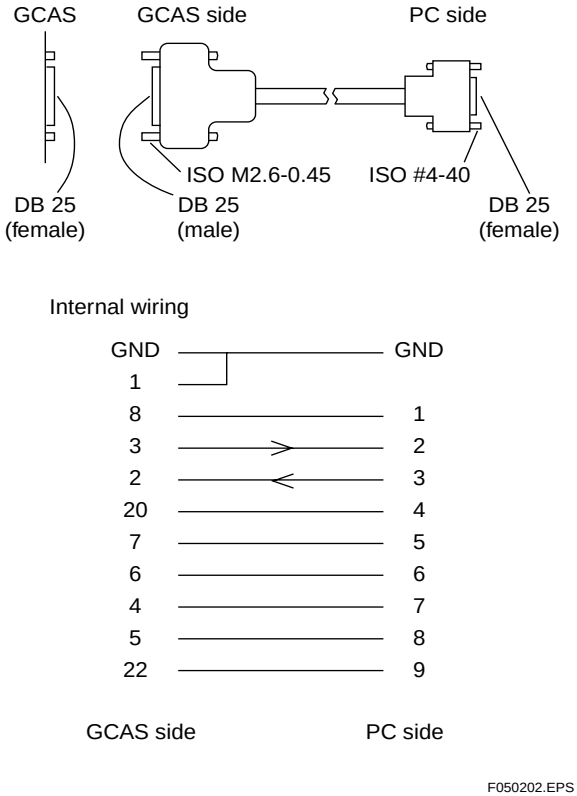

Fig. 2 Serial Communication Connection

Personal computer cable or commercial RS-232C straight cable. Use a D-sub 25-pin female connector on the server side.
Serial (PC) cable D-sub 25-pin male-D-sub 9-pin female
Straight cable: 3 m
Arbel Corp. 075-312-9801 AC124

5.3 GCAS-DCS Connection

The connection with Yokogawa-DCS is as follows.

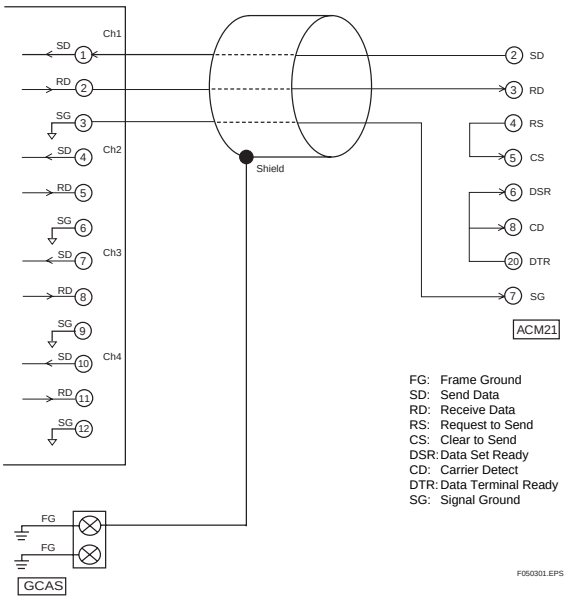

Fig. 3 DCS Connection

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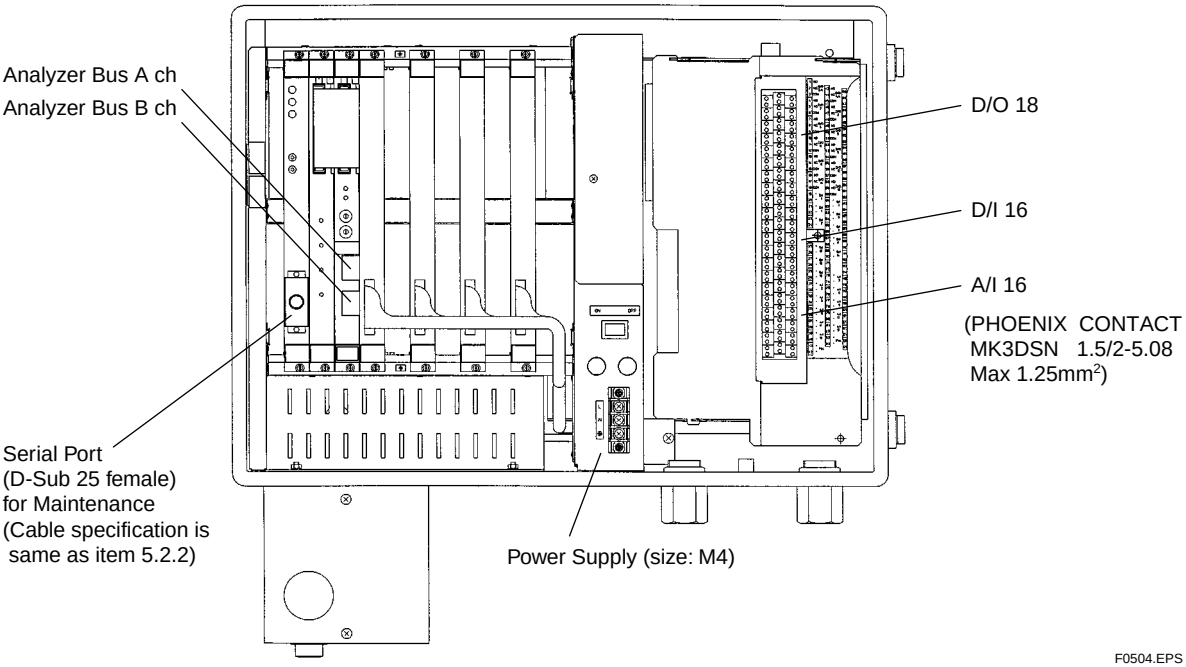
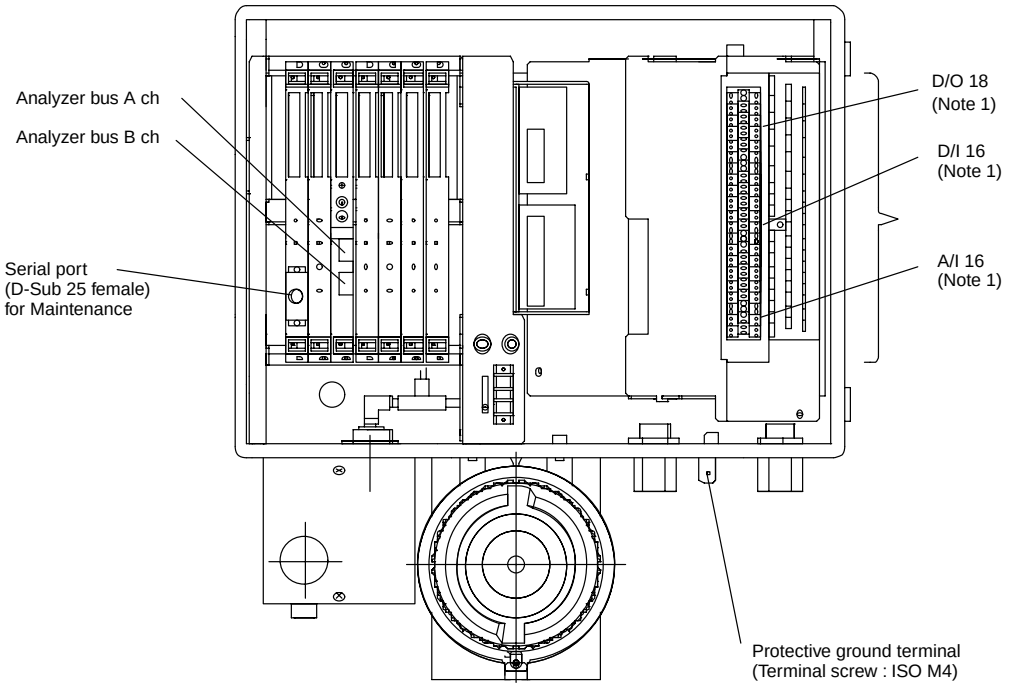
5.4 GCIU

5.4.1 General purpose



F0504.EPS

5.4.2 CENELEC



Note 1 : PHOENIX CONTACT
MK3DSN 1.5/2-5.08 Max 1.25mm ²

F0504_1.EPS

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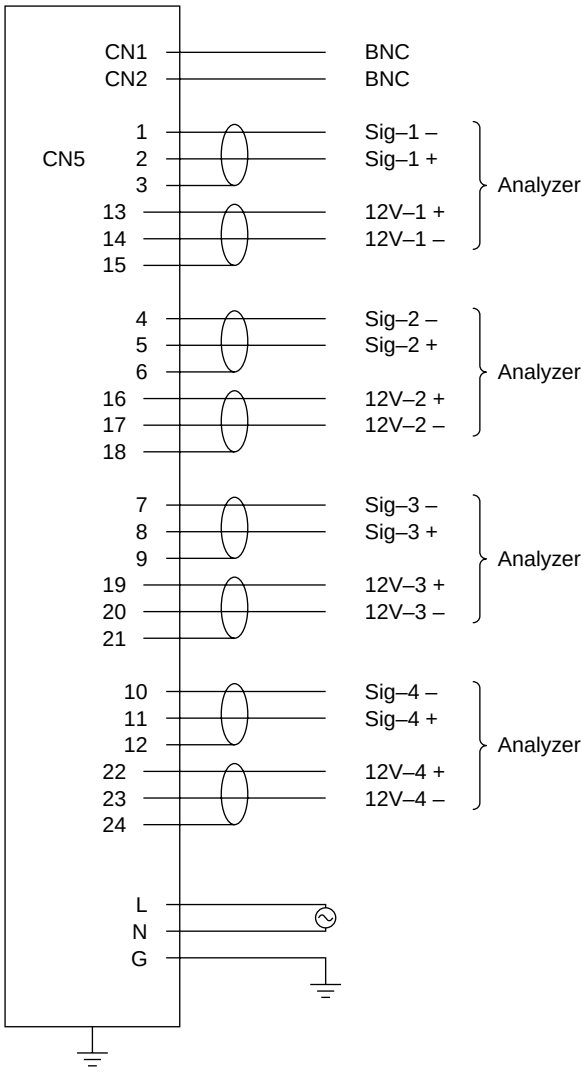
5.5 GCHUB

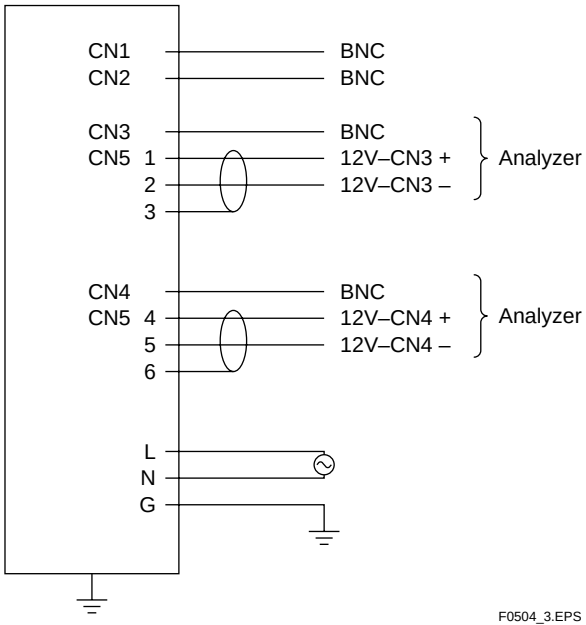
Terminal type and size
L, N, G: M4
CN1-CN4: BNC
CN5: PHOENIX CONTACT MKKDSN 1.5/3-5.08
Max. 1.25mm²

1. GCHUB (for analyzer connection using twist pair cable)



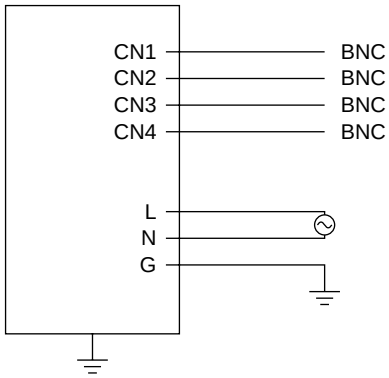
F0504_4.EPS

2. GCHUB (for analyzer connection using coaxial cable)



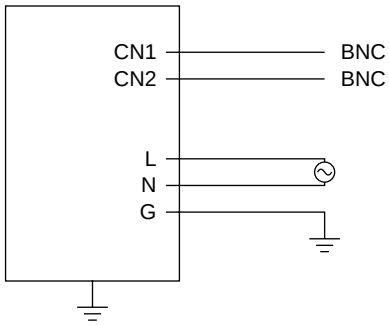
F0504_3.EPS

3. GCHUB (for branch)



F0504_1.EPS

4. GCHUB (for extension)



F0504_2.EPS

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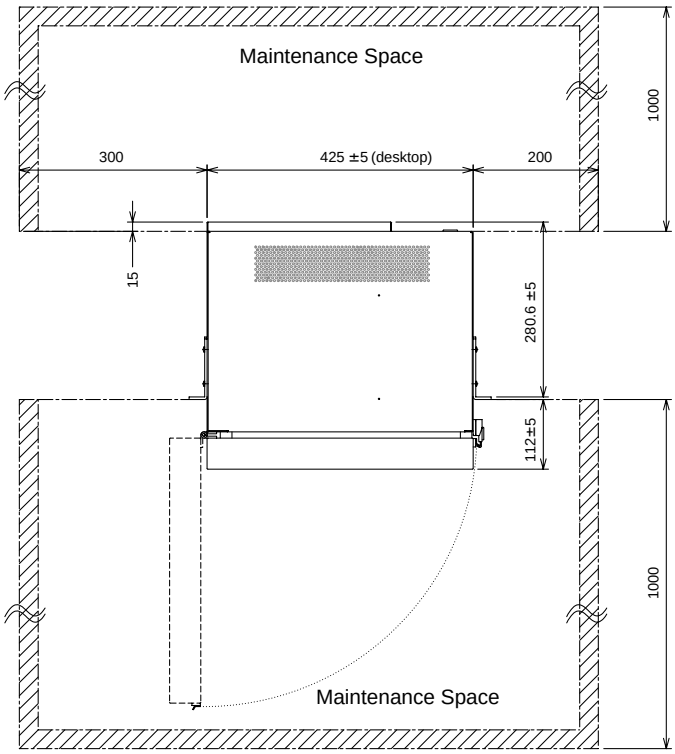
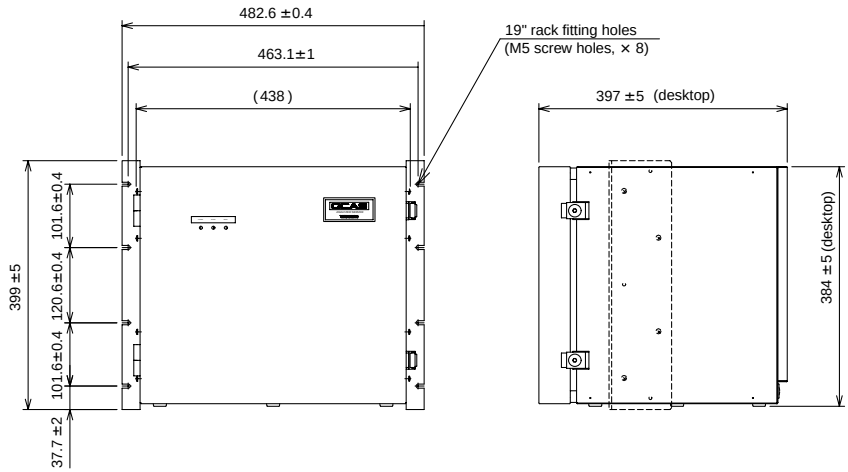
6. External View

6.1 GCAS

Unit: mm





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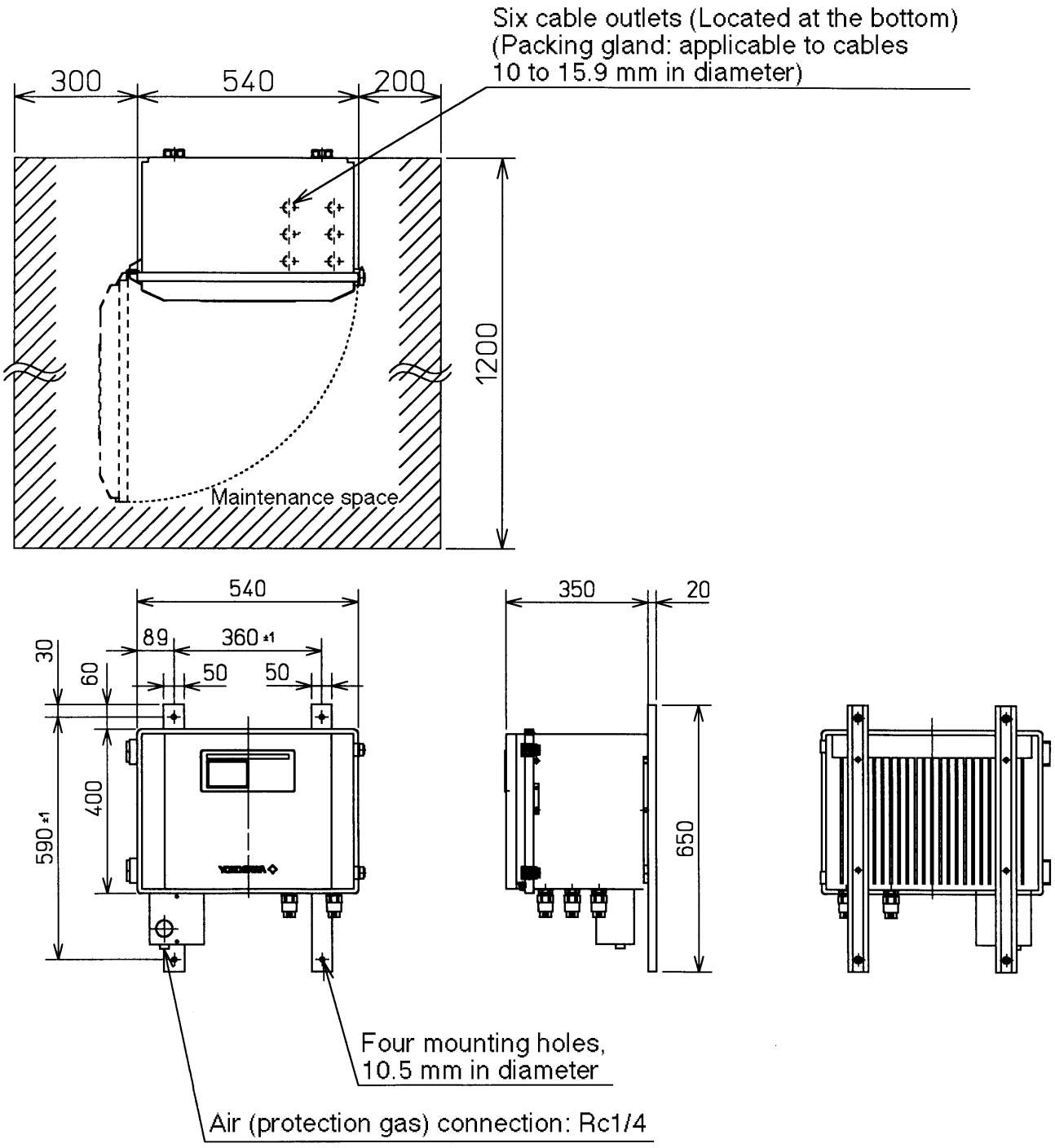
6.2 GCIU

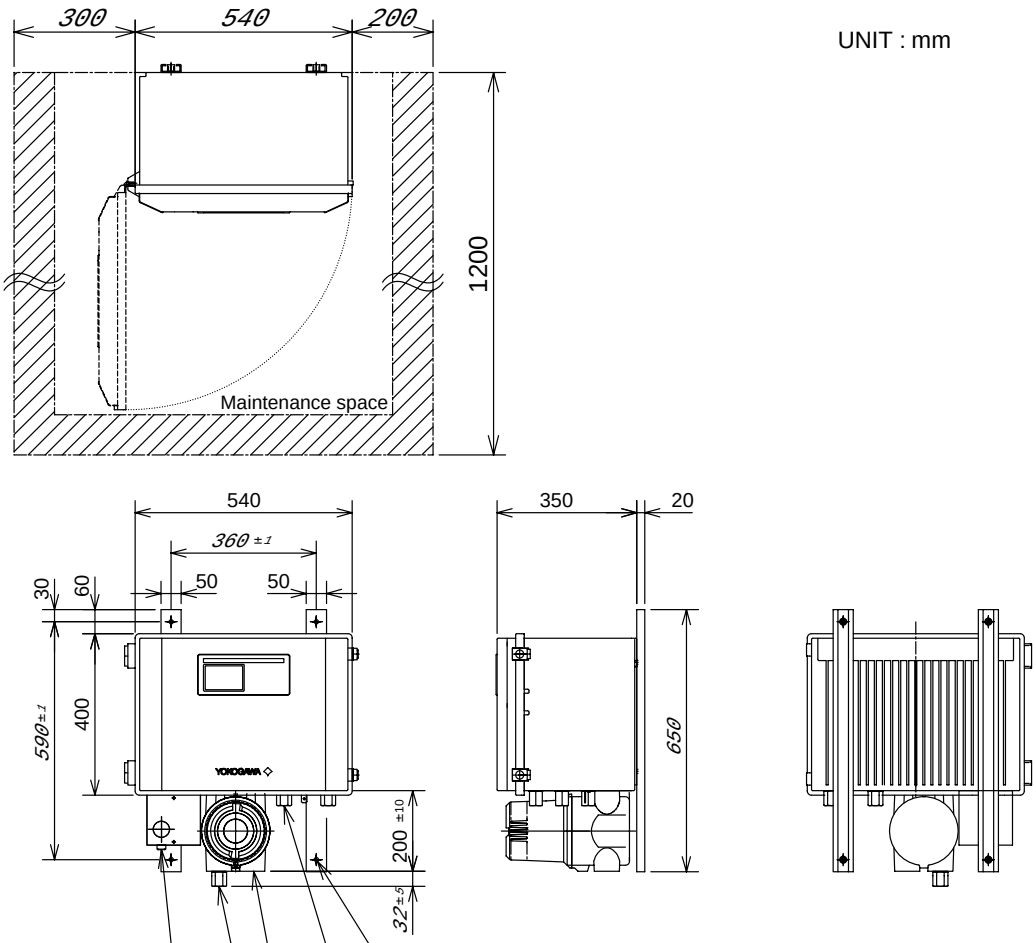
6.2.1 General Purpose

Unit: mm



6.2.2 CENELEC

UNIT : mm



Note1: Connectors are installed when the following screw size is used.
- 3/4 NPT
- PG 21
- G 3/4

Note2: Connection size
- 6- M25x1.5(F)
- 6- 3/4 NPT
- 6- PG 21
- 6- G 3/4

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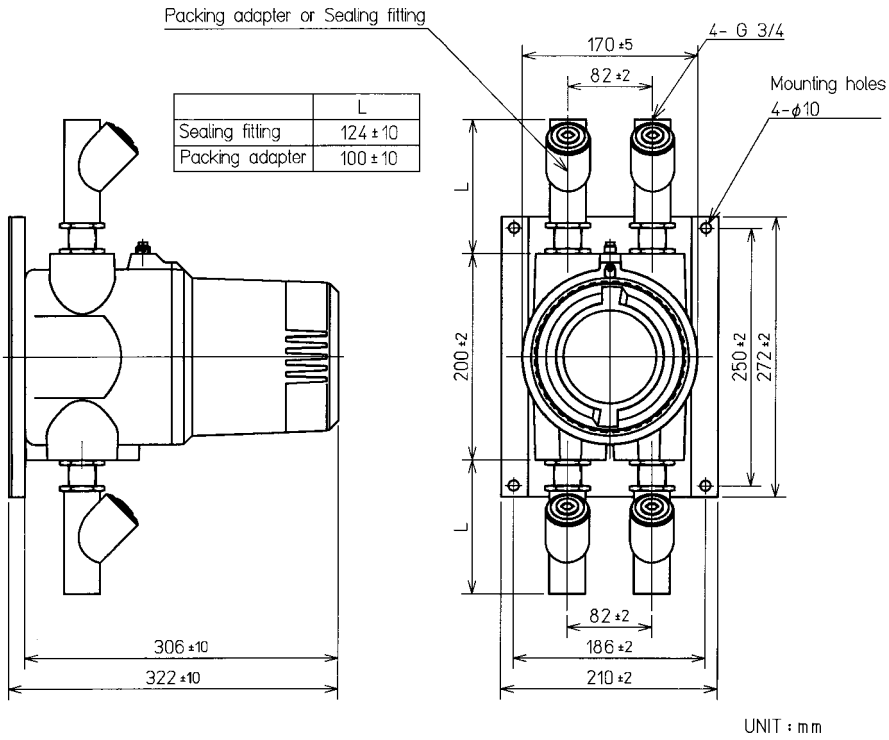
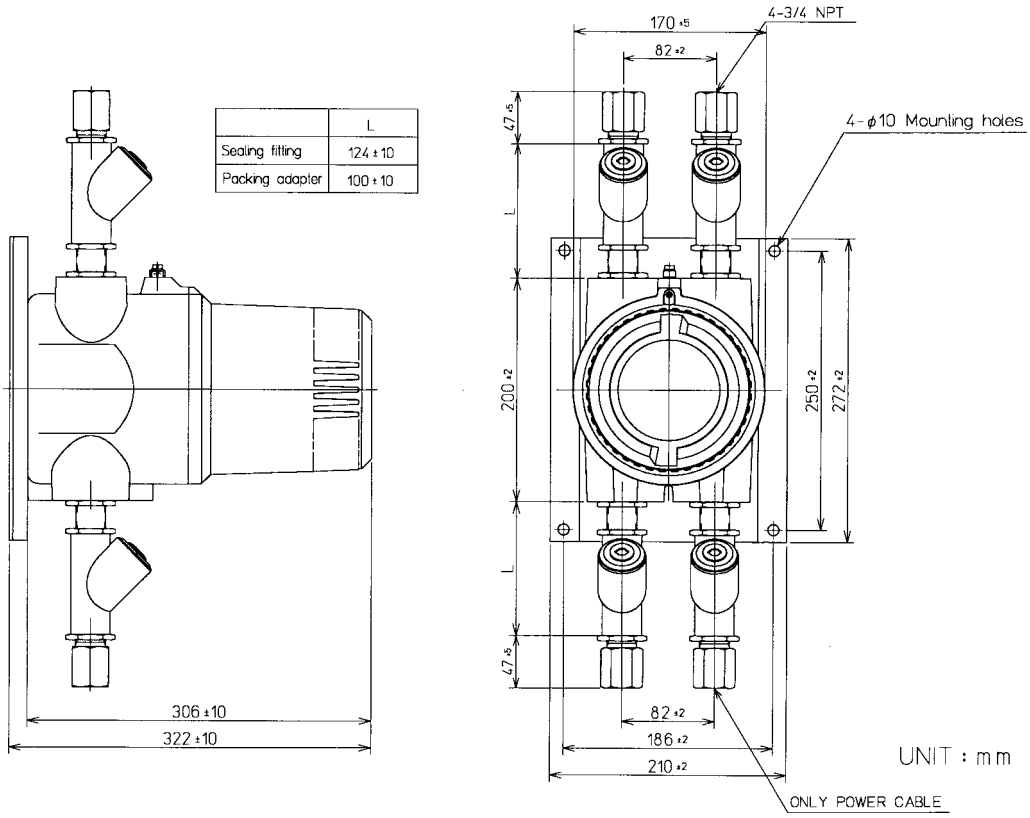
6.3 GCHUB

6.3.1 JIS explosion protection case [G(PF)]



For JIS (PF) explosion protection

6.3.2 JIS explosion protection (NPT connection)



For JIS (NPT) explosion protection

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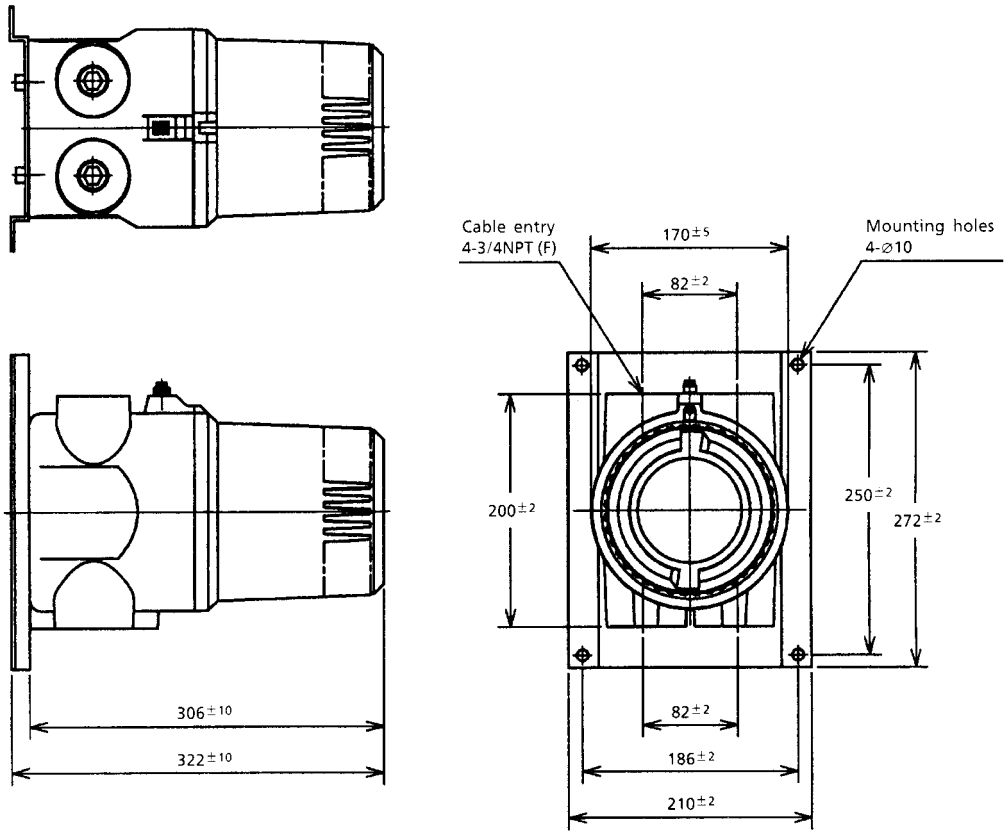
6.3.3 FM/CSA

Unit: mm



For FM/CSA explosion protection

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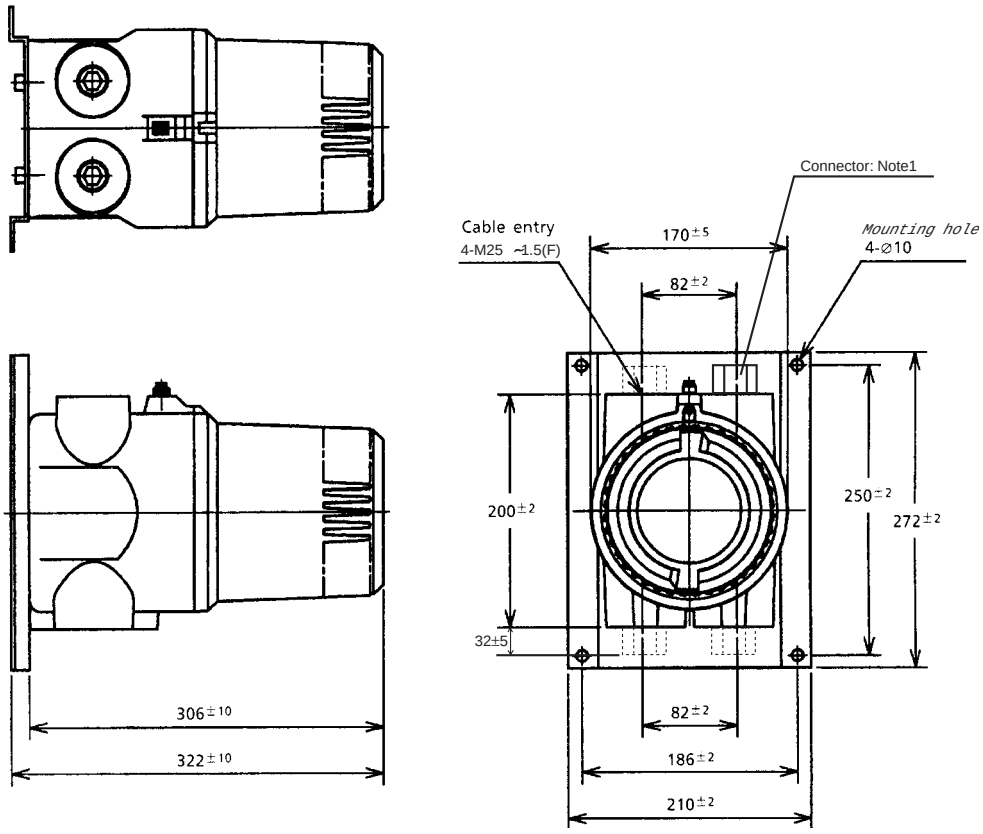
6.3.4 CENELEC

Unit: mm



For CENELEC explosion protection

Note1: Connectors are installed when the following screw size is used.

3/4 NPT

PG 21

G 3/4

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Subject to change without notice