

NV-400, 410, 500, 600

## Combustible Gas Detection System

### Installation Manual

- This manual is for NV-400, 410, 500 and 600.
- Thoroughly read this instruction manual before using the equipment so that it can be used safely and correctly.
- Keep this instruction manual where it is readily accessible



Installation manual No.. GAE-024 Jan. 2006
--

## Table of Contents

<b>1. INTRODUCTION.....</b>	<b>2</b>
<b>2. SAFE OPERATION .....</b>	<b>2</b>
<b>3. UNPACKING.....</b>	<b>3</b>
<b>4. INSTALLATION AND WIRING .....</b>	<b>4</b>
<b>4-1 How to Install the Indicator and Alarm Unit .....</b>	<b>4</b>
<b>4-2 How to Install the Gas Detector .....</b>	<b>6</b>
<b>4-3 Wiring .....</b>	<b>9</b>
<b>4-4 Wiring and Connection.....</b>	<b>12</b>
<b>5. INDICATOR ALARM CIRCUIT DIAGRAM.....</b>	<b>17</b>
<b>5-1 100 to 240V AC Input .....</b>	<b>17</b>
<b>5-2 24V DC Input .....</b>	<b>19</b>
<b>6. GLOSSARY.....</b>	<b>21</b>

## 1. Introduction

Thank you very much for purchasing NV-400, 410, 500, 600, that is a gas detection /alarm system.




This system is used to prevent leakage of combustible gas. This equipment continuously monitors for leakage of combustible gas, and indicates when a preset level has been exceeded by a lamp and sound. Thoroughly read this instruction manual before using the equipment so it can be used correctly. Read the instruction manual of the gas detector as well.

---

### Symbols

---

The following symbols are used for safety purposes:

-  **DANGER:** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
-  **WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
-  **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.
- MEMO** Operational advice and or instruction.

## 2. Safe Operation

Carefully read the following so you can use the equipment correctly. Read and understand all applicable laws and regulations and ensure that you are in complete compliance with the said laws and regulation before installing or operating the equipment. Qualified persons, following all applicable federal, state, and local health and safety laws and regulations including OSHA, should carry out installing, wiring, and other works concerning the equipment.

 **WARNING**

- Ground the equipment in order to prevent electric shocks
- When wiring and taking the indicator alarm unit and detector head off, be sure to switch off the indicator alarm unit or stop the power supply in order to avoid electric shocks.
- In order to prevent thunderbolts, take lightning protections.
- The Indicator and alarm unit is not explosion-proof. Install it in a non-hazardous location.

 **CAUTION**

- Do not disassemble, alter the equipment or change its structure and electric circuit. It may affect the performance of the equipment.
- The equipment is not waterproof. Install it in a place where it will not get wet.
- Follow all the related laws and regulations when using the equipment.

### 3. Unpacking

The following standard components are packed together with the Gas Detector/alarm. Carefully check the contents against the list when unpacking. If any components are missing or damaged, contact our dealer / agency.

NV-□□□ main body		1
Gas detector head KD-5 (Diffusion type) PE-2DC(Suction type)		Ordered quantity
Fuse	2 points:2.4 A	1 ea.
	4 –12 points: 4 A	2
L shaped-wrench	For Diffusion type gas detector head 2,3,4mm	1 ea.
	For Suction type gas detector head 2,4,5,8mm	1 ea.
Install place seal(NV-500 only)		1
Parts to embed the panel (embedded panel only)		1 set
Air filter FC-32 with flow checker (for Suction type gas detector head only)		1 ea.
Rainproof cap KW-22(for NV-500 only, for Diffusion type gas detector head only)		1 ea.
Sample gas collector PE-N3 (for Suction type gas detector head only)		1 ea.
NV-□□□ instruction manual		1
NV-400, 410, 500, 600 installation manual (this book)		1
Test results of the equipment		1

#### Optional items (separately sold)

Rainproof cover	KW-15 for Diffusion type gas detector head KD-5-N	Ordered quantity
	PW-51 for Suction type gas detector head PE-2DC	Ordered quantity
Rain proof cap	KW-22 for KD-5	Ordered quantity
Outer alarm	EB-5	Ordered quantity
Zener barrier for outer alarm	BT-150	Ordered quantity
Auto drain	AD-40	Ordered quantity

## 4. Installation and Wiring

### 4-1 How to Install the Indicator and Alarm Unit

The equipment can be hung on the wall or embedded.



#### WARNING

The indicator and alarm unit is not an explosion-proof construction. Install it in a non-hazardous area.



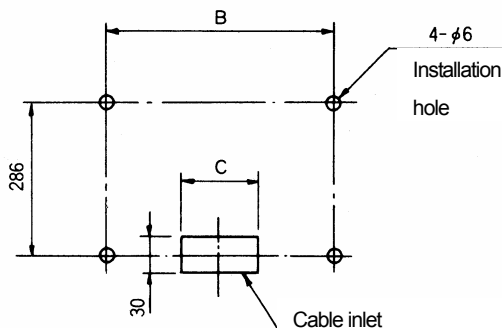
#### CAUTION

- The indicator and alarm units must be installed in a place where someone is always present and is easy to read so that taking countermeasures and notifying others in case of an alarm is possible
- Do not place the indicator and alarm unit in a place with vibration, electric noise, or corrosive gas. Avoid places with a high temperature or humidity as well.

#### (1) How to install on the wall

1) Make holes on the wall as shown in Fig 1.

Installation hole size



	B	C
NV-□□□-2A	152	100
-2B	230	100
-4	343	240
-6	417	240
-8	491	240
-10	565	360
-12	639	360

**Fig.1 Dimension for hanging the Equipment on the wall**

**MEMO**

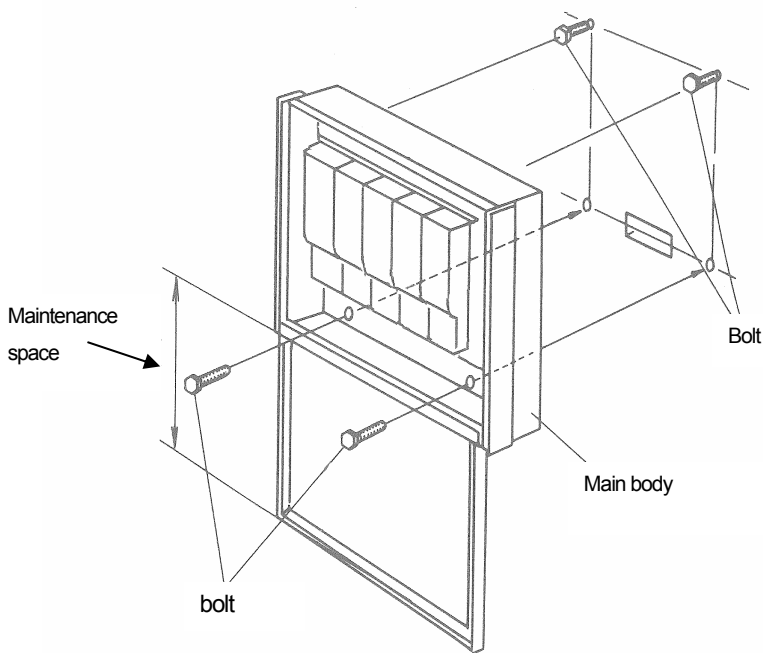
Cable wiring can be done in the back or bottom. To hide the cable, you may connect it through Backside.

2) After setting the anchors into all the installation holes, put the bolts on upper areas(2 points).Open the main body panel and grapple the bolts to the upper and lower areas, then screw the 4 bolts tight (upper and lower areas =4 points)

**MEMO**

Use an anchor and fix it securely so that the indicator unit will not come off from a wall by any shock ,such as an earthquake (Recommended bolt size M 6 × 2 0)

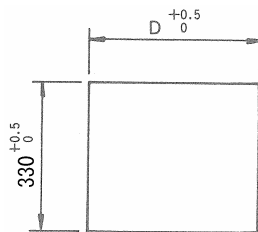
**Fig.2 indicator alarm unit installation**



**MEMO**

Leave a 40 cm space under the equipment's body for maintenance work.

- (2) How to install Flush mount type panel  
 1) Cut a panel as shown in Fig 3.

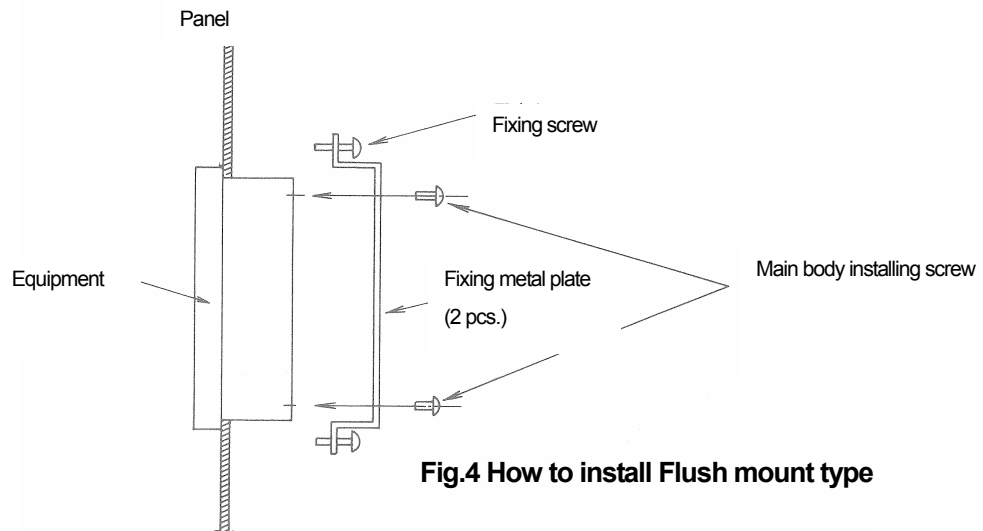


**Fig.3 Dimensions to Cut a Panel**

	D
NV-□□□-2A	214
-2B	292
-4	415
-6	489
-8	563
-10	637
-12	711

- 2) Insert the equipment into the opening from front.

Attach the back plate on the back of equipment with the attaching screws and fasten it to the panel with fixing screws. The equipment can be fixed on a 1.6 to 6 mm thick panel.



**Fig.4 How to install Flush mount type**

## 4-2 How to Install the Gas Detector



### CAUTION

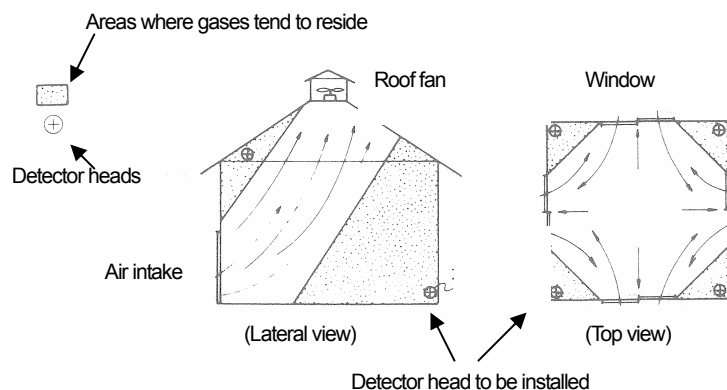
- The gas detector must be handled with care to avoid damaging the explosion proof construction.
- Do not install the Gas detector in locations listed below:
  - Location where the ambient temperature may drop lower than  $-3\text{ }^{\circ}\text{C}$  or exceed  $4\text{ }^{\circ}\text{C}$ .
  - Location where dew condensation may occur.
  - Location where it could be exposed to direct water.
  - Location where corrosive gases may exist.
  - Location where get sunshine directly.
  - Location where the ambient temperature could change drastically.
  - Location where nearby a source of electrical noises.(high frequency, magnetic noises)
- Do not install the Gas detector in an atmosphere contaminated with silicon compounds, as silicon could poison and/or impair the sensitivity of the sensor.
- The gas detector should be installed in a location free from vibration.
- Avoid severe shocks and /or mechanical impact to the gas detector.
- When the gas detector is to be installed in an outside location, make sure to use a rain protective cover or cap.
- Use Auto drain (optional item) when use the Suction type detector in a location where the detector could be watered.
- The height of the installation of the detector head is an important factor and related to the gas to be detected, refer to table below.

Kind of gas	Installation height	Remarks
Gases heavier than air ,such as LPG	About 10cm above the floor level	For maintenance purpose allow at least 7cm space from floor level
Gases lighter than air, such as H <sub>2</sub> , CH <sub>4</sub> , town gas, natural gas.	Near the ceiling	Select a location where maintenance can be easily conducted.

### (1) Diffusion type gas detector

Use Suction type gas detector head in a location where is hard to access for maintenances such as inside Pit or Duct as well as a location where the gas detector head could be watered.

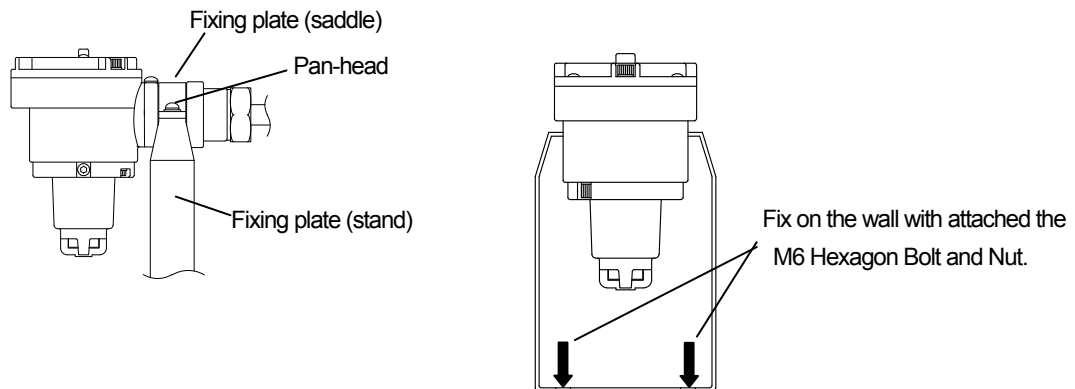
#### • Installation



**Fig.5 Diffusion type gas detector head**

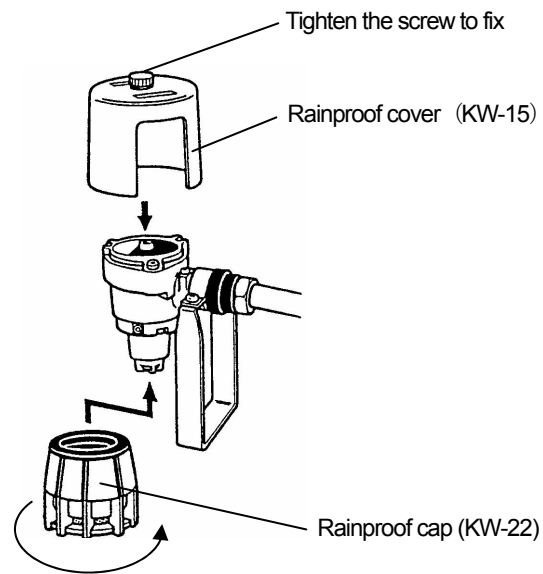
• **How to install the fixing plates**

Locate the gas detector head between the fixing plates (Saddle and Stand) and tighten the pan-head screw to fix.



**Fig .6 How to install the fixing plates**

• **How to install the Rainproof cover (optional item) and Rainproof cap(optional item)**



**Fig.7 KW-15, KW-22 Installation**

(2) Suction type gas detector head

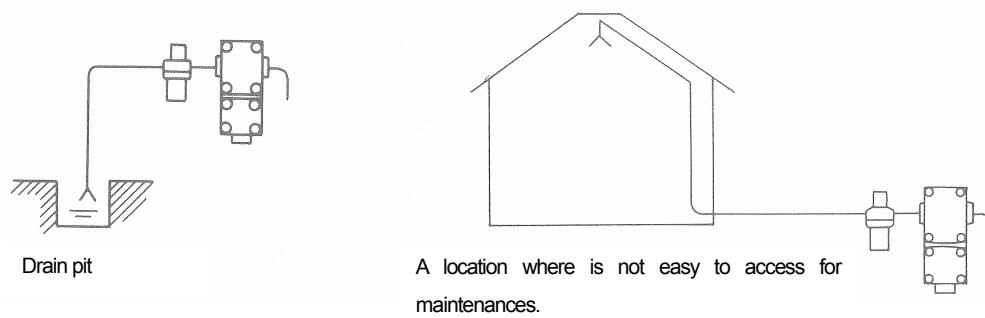
Suction type gas detector should be used in locations as follows.

- 1) Inside a piping pit or location where is shut tightly.
- 2) Furnace sampling
- 3) Location where the ambient temperature is high or low
- 4) Location where is high

Use 6Ø×4 Ø pipe work for the Suction type gas detector head and the length should be 30m or less. And the gas detector head should be installed in a location where is easy to access for maintenance.



• Example : locations to install



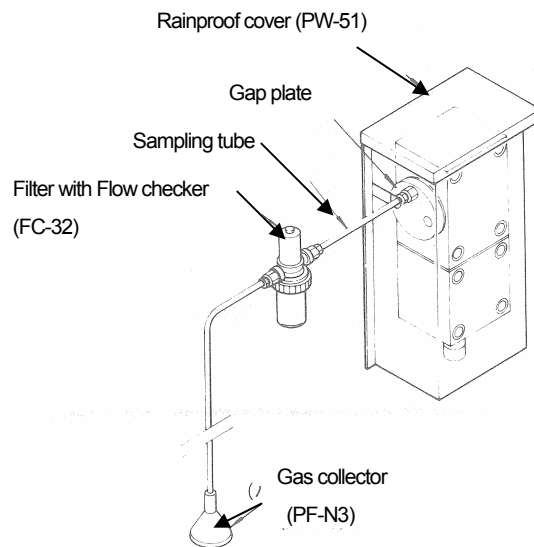
**Fig.8 Example-location for suction type gas detector head**



**CAUTION**

- Sample gas collector should be installed at high location where is free from sucking water.

• Installation for Rainproof cover(PW-51)



**Fig. 9 Example - installation for PW-51**



**CAUTION**

- Fix the Rainproof cover tight in case of strong winds such as a typhoon.

### 4-3 Wiring

Use explosion-proof wiring in all potentially hazardous places.

- (1) Refer to the following (KD-5, PE-2DC) with regard to wiring for explosion-proof metal conduits.



#### WARNING

- When wiring, be sure to turn the indicator and alarm unit off before opening the cover of Gas Detector, otherwise it may become a source of ignition.



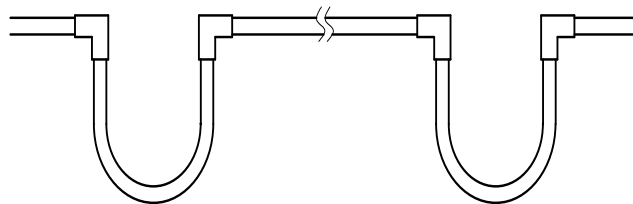
#### CAUTION

- Refer to the explosion-proof guidelines for factory electrical equipment for the wiring connection of the Gas Detector.
- Do not use cables for wiring in explosion-proof metal conduits.
- Select the most suitable material from among rubber, vinyl, polyethylene, etc., for the insulating material of insulated wiring in accordance with the conditions in the location of use, e.g., the existence of corrosive substances, the amount of humidity, the ambient temperature, etc.
- Route the wiring through rigid steel conduits (JIS C 8305), and provide sealing fittings and compound to seal the pipeline in order to prevent explosive gases or the flames of an explosion from flowing along the pipeline.
- Do not use silicon compound because it has an adverse effect on gas sensors.
- When flexibility is required, use waterproof flexible fittings with an explosion-proof structure. If rainwater or other moisture enters the Gas Detector, it may cause a loss of function or malfunction.
- Provide waterproofing treatment for the joints of wiring ducts and other parts. If rainwater or other moisture enters the Gas Detector, it may cause a loss of function or malfunction.

#### NOTE

- Cable breaks may occur as secondary damage following disasters such as an earthquake. This problem can be prevented by providing U-shaped dampers along the cable route.

Example:



- When connecting a wiring conduit to a wiring conduit accessory or terminal block, use a JIS B 0202 pipe parallel thread (New Cosmos explosion-proof instruments generally use PF3/4 (G3/4) threads). Join the parts by using at least five threads of the effective thread portion, then secure the joint tightly with a lock nut.

• Mounting Example (KD-5 Diffusion Type Detector)

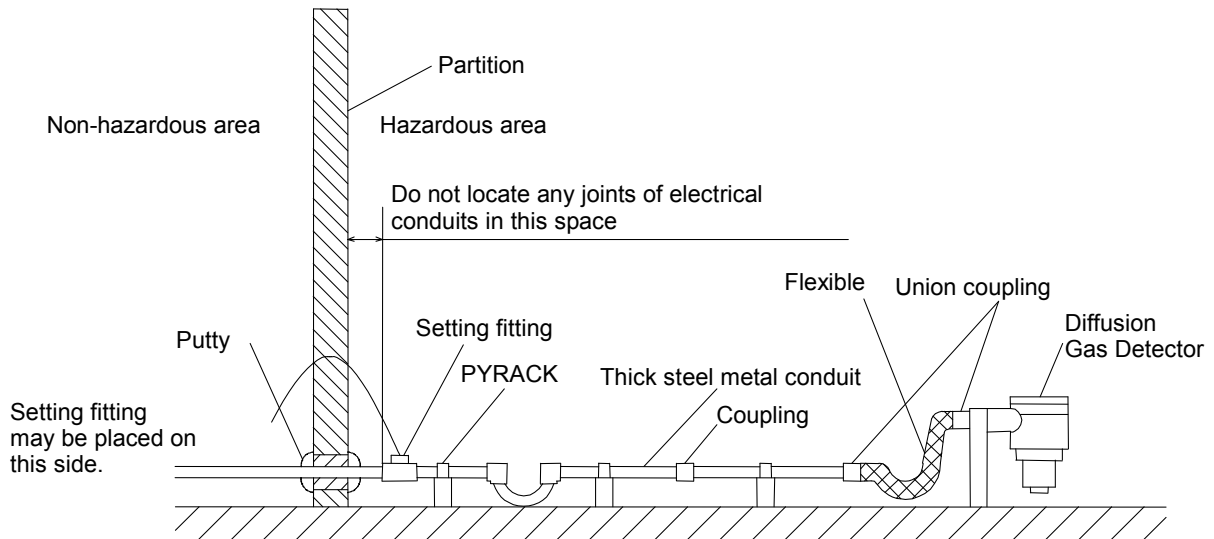


Figure 10

• Mounting Example (PE-2DC Suction Type Detector)

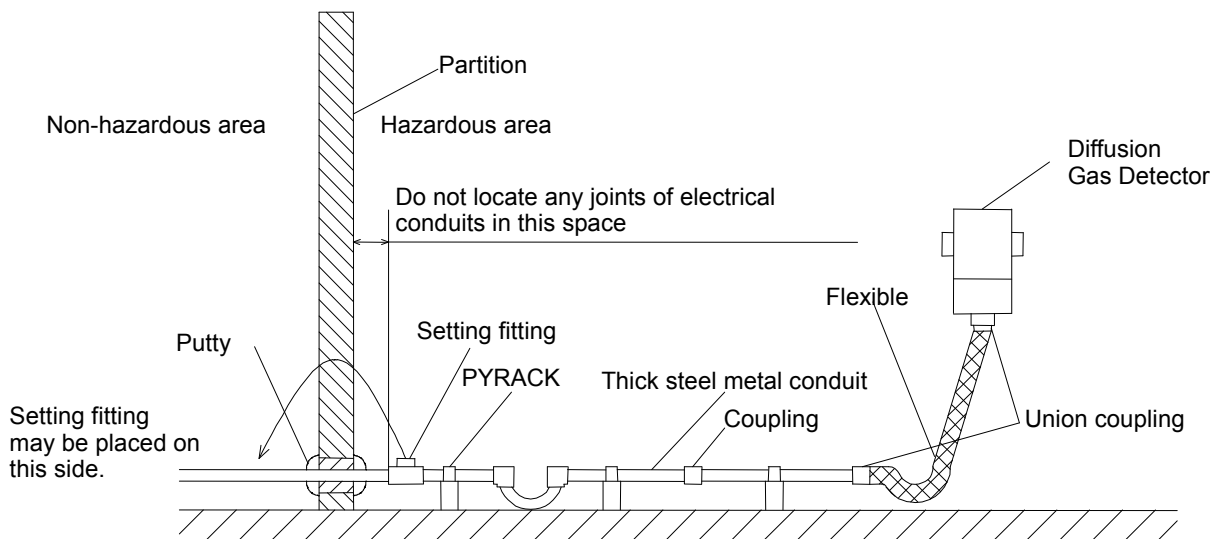


Figure 11

(2) Cable Installation (KD-5 and PE-2DC)

- Use cables with a rubber or plastic outer covering or with a metal covering suitable to the environment in the place of installation. The cross section of each cable must be circular and the surface of the sheath must be free of any unevenness. Lay the cable in a protective pipe, such as a metal conduit or carbon steel pipe, or a metal or concrete duct as needed to protect the cable from external damage.
- Avoid connecting cables together as much as possible. If the direct or branch connection of cables is unavoidable, use a connection box of pressure- and explosion-proof construction and connect the cables inside the box.
- The pressure-proof packing type of lead-in method may be used, provided that the finished outer diameter of the cable fits the inner diameter of the packing (see the table below). In that case, tighten and lock the packing gland securely to prevent any leakage of explosive gas or flames.

KD-5 Diffusion Type Detector

Cable outer diameter	Packing hole diameter	Washer hole diameter
11 to 11.9	12	12

PE-2DC Suction Type Detector

Cable outer diameter	Packing hole diameter	Washer hole diameter
12 to 12.9	13	14
13 to 13.9	14	14
14 to 14.9	15	15

## 4-4 Wiring and Connection

### (1) Gas Detector Wiring and Connection

#### WARNING

- When wiring, be sure to turn off the indicator and alarm unit before opening the cover of Gas Detector, otherwise it may become a source of ignition.
- Be sure to ground the indicator alarm block along with the Gas Detector.

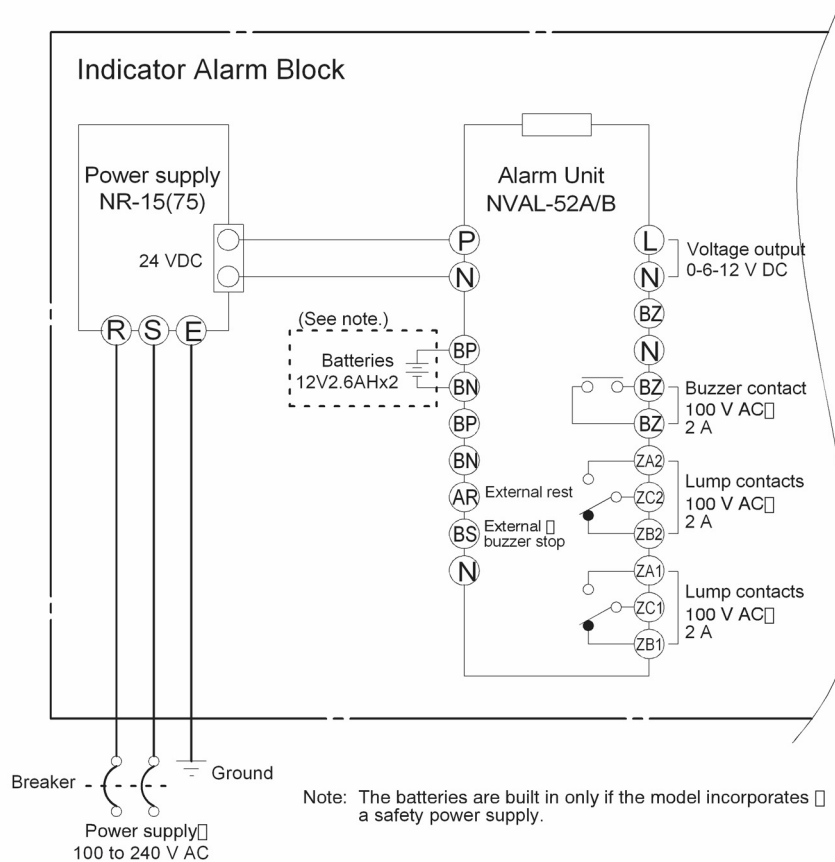
#### CAUTION

- Check the terminal codes on the indicator alarm block and the Gas Detector block and wire the blocks correctly.
- Separate connection cables from power lines as far as possible.
- Refer to the explosion-proof guidelines for factory electrical equipment for wiring the Gas Detector connection.

### 1) Power Supply Wiring

Install a dedicated breaker to the power supply wiring for the indicator alarm block.

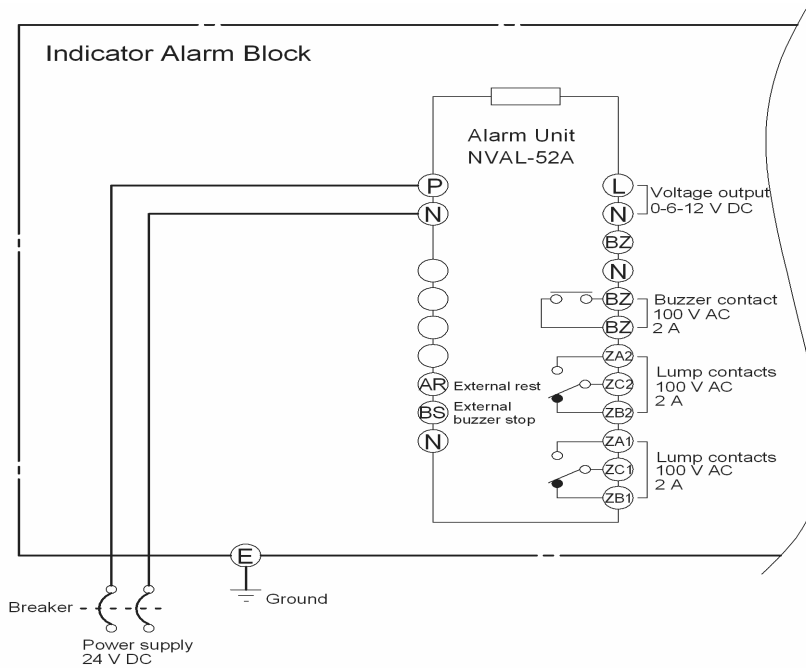
#### 100 to 240V AC



#### Memorandum

Use round terminals for the wire ends in the indicator alarm block so that the wires will not be disconnected from the terminal block as a result of an earthquake or other vibration. Furthermore, provide a margin in the length of each wire so that no force will be directly imposed on the terminal block.

## 24V DC Input (with NVAL-52A Alarm Unit)



### 2) Wiring between Indicator Alarm Block and Gas Detector

Use 600V vinyl-insulated electric cords (1V) or cables, such as the VCT and CVV (0.75 to 2 mm<sup>2</sup> in diameter).

The wiring length must be within the following ranges:

Wire with 0.75 mm<sup>2</sup> dia.: 200 m max.

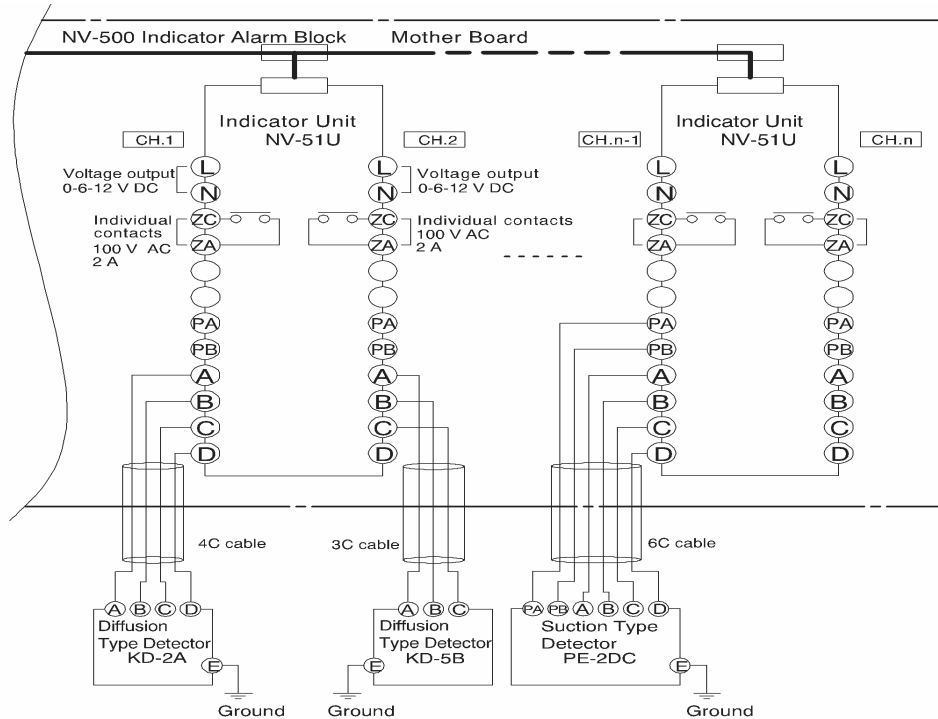
Wire with 1.25 mm<sup>2</sup> dia.: 600 m max.

Wire with 2.00 mm<sup>2</sup> dia.: 1 km max.



- Connect the Indicator Alarm Block and Gas Detector so that the channel numbers of each indicator Unit coincide with the corresponding loop number seals of the Gas detector. The channel numbers of the Indicator Unit are in alphabetical order with 1 from the leftmost side.

## NV-4□□,500,600 Indicator Alarm Block



### (2) Connection of External Buzzer Contacts



- Use external contacts for external buzzers or alarm indicators only.
- Check that the load current or voltage will not be in excess of the contact capacity.
- If interlock or other control is performed through the external buzzer contacts, we shall NOT take any responsibility for any injury or damage caused.

#### 1) Alarm Unit

Lump alarm signal contacts: Non-voltage SPDT (2A resistive load at 100V AC) Z A 1 Z B 1 Z C 1  
 (The NV-500 does not use ZA1, ZB1, or ZC1.)

Non-voltage SPDT (2A resistive load at 100V AC) Z A 2 Z B 2 Z C 2

External buzzer output: Voltage intermittent signal (10mA at 12V DC) B Z N

The dedicated EB-5 External Buzzer can be connected to an external buzzer output.

Voltage output for centralized monitor panels (20mA at 0, 6, or 12V) L N

The EB-700 Cosmos Centralized Monitor Panel can be connected to a centralized monitor panel output.

External reset (AR) and external buzzer stop (BS) terminal A R B S N

By connecting an external switch, external buzzer reset and stop control will be possible.

#### 2) Indicator Unit

Individual buzzer alarm output: Voltage output (20mA at 0, 6, or 12V) L N

Individual alarm contacts • NV-4□□

Non-voltage SPST (2A resistive load 100V AC) Z A 1 Z C 1

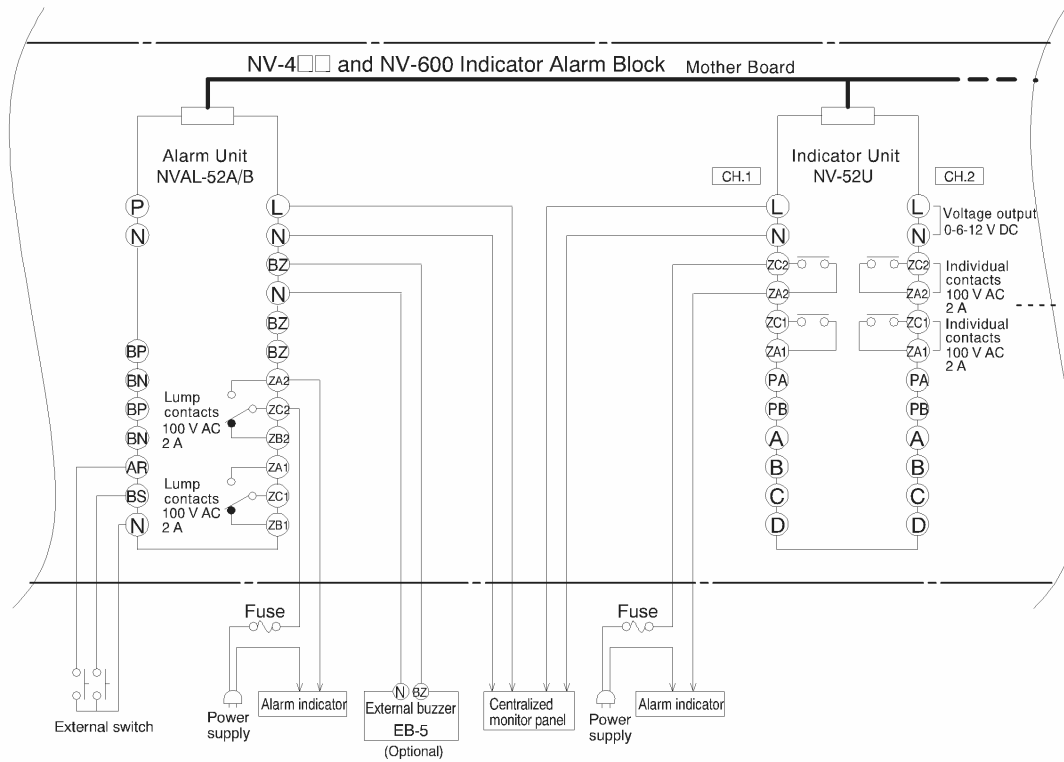
Non-voltage SPST (2A resistive load 100V AC) Z A 2 Z C 2

• NV-500

Non-voltage SPST (2A resistive load 100V AC) Z A Z C

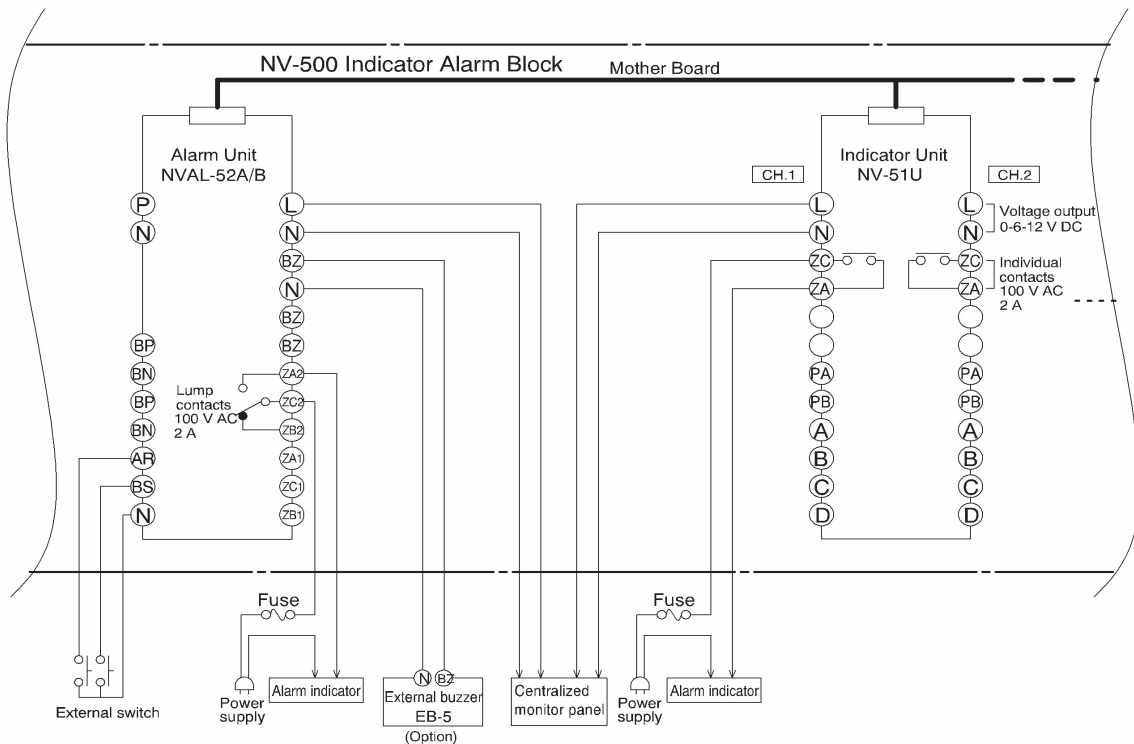
## Connection examples of alarm output terminals.

### • NV-4□□ or NV-600 Indicator Alarm Block



### • NV-500 Indicator Alarm Block

#### • NV-500





(3) Connection of the External Buzzer EB-5B

By connecting the Zener Barrier for external buzzer output, the EB-5 External Buzzer will have a safety explosion-proof feature and can be used in hazardous places, such as gas filling sites.



- The EB-5 External Buzzer itself does not have an explosion-proof construction. Do not use the EB-5 in hazardous places without the BT-150 Zener Barrier.
- The BT-150 Zener Barrier needs to be grounded at a resistance not exceeding 10  $\Omega$ .

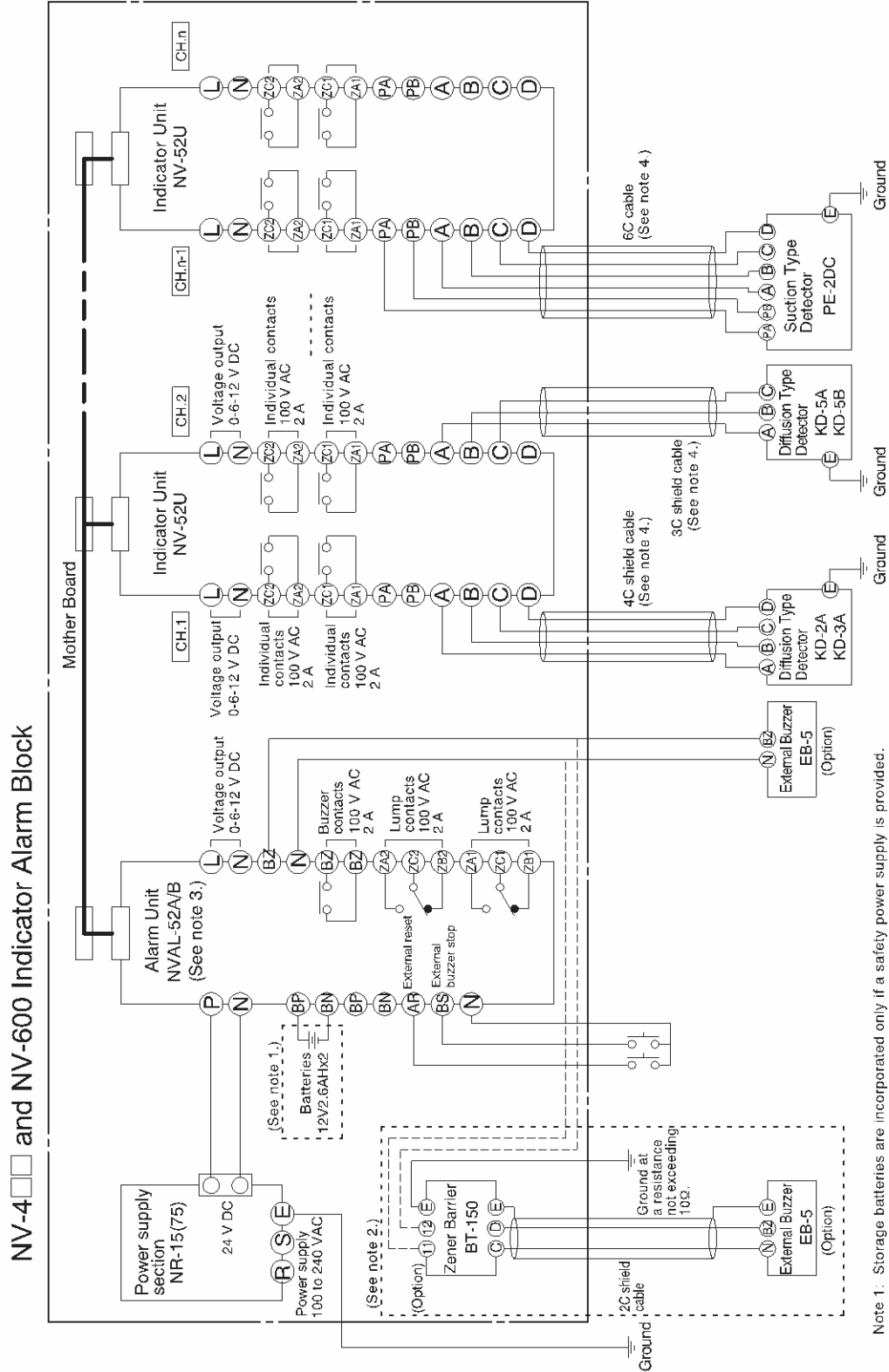
Refer to 5. *Indicator Alarm Circuit Diagram* to add the safety explosion-proof feature to the External Buzzer.  
Refer to the Operation Manual for information on using this feature.

## 5. Indicator Alarm Circuit Diagram

A standard circuit diagram is shown below. The circuit diagram may vary depending on the specifications. In this case, refer to the relevant specifications.

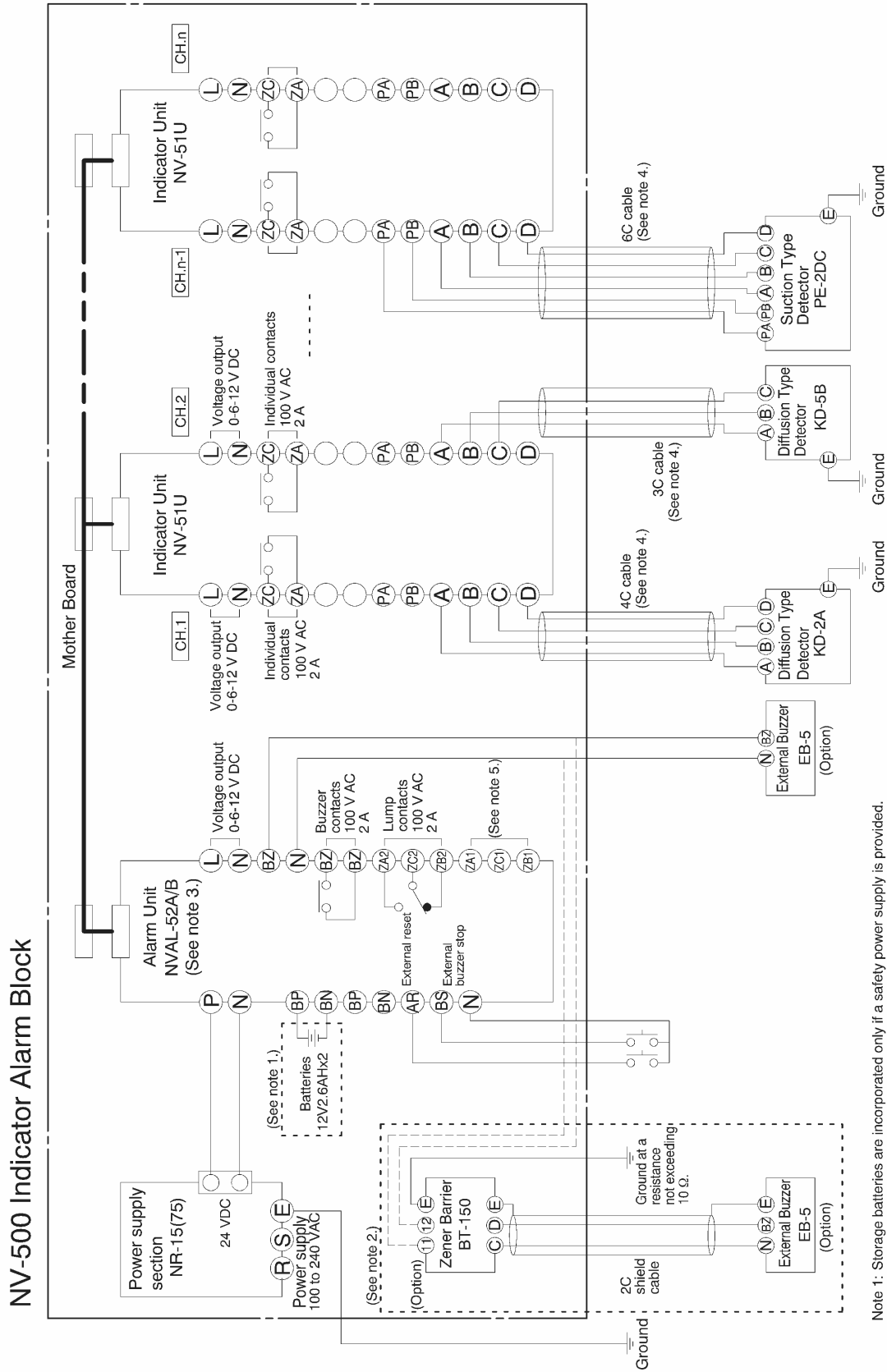
### 5-1 100 to 240V AC Input

#### NV-4□□ or NV-600 Indicator Alarm Block



- Note 1. Storage batteries are incorporated only if a safety power supply is provided.  
 2. Add the options if the safety explosion-proof feature is required.  
 3. The NVAL-52A is not provided with a safety power supply. The NVAL-52B is provided with a safety power supply.  
 4. The number of cable conductors varies with the Gas Detector model.

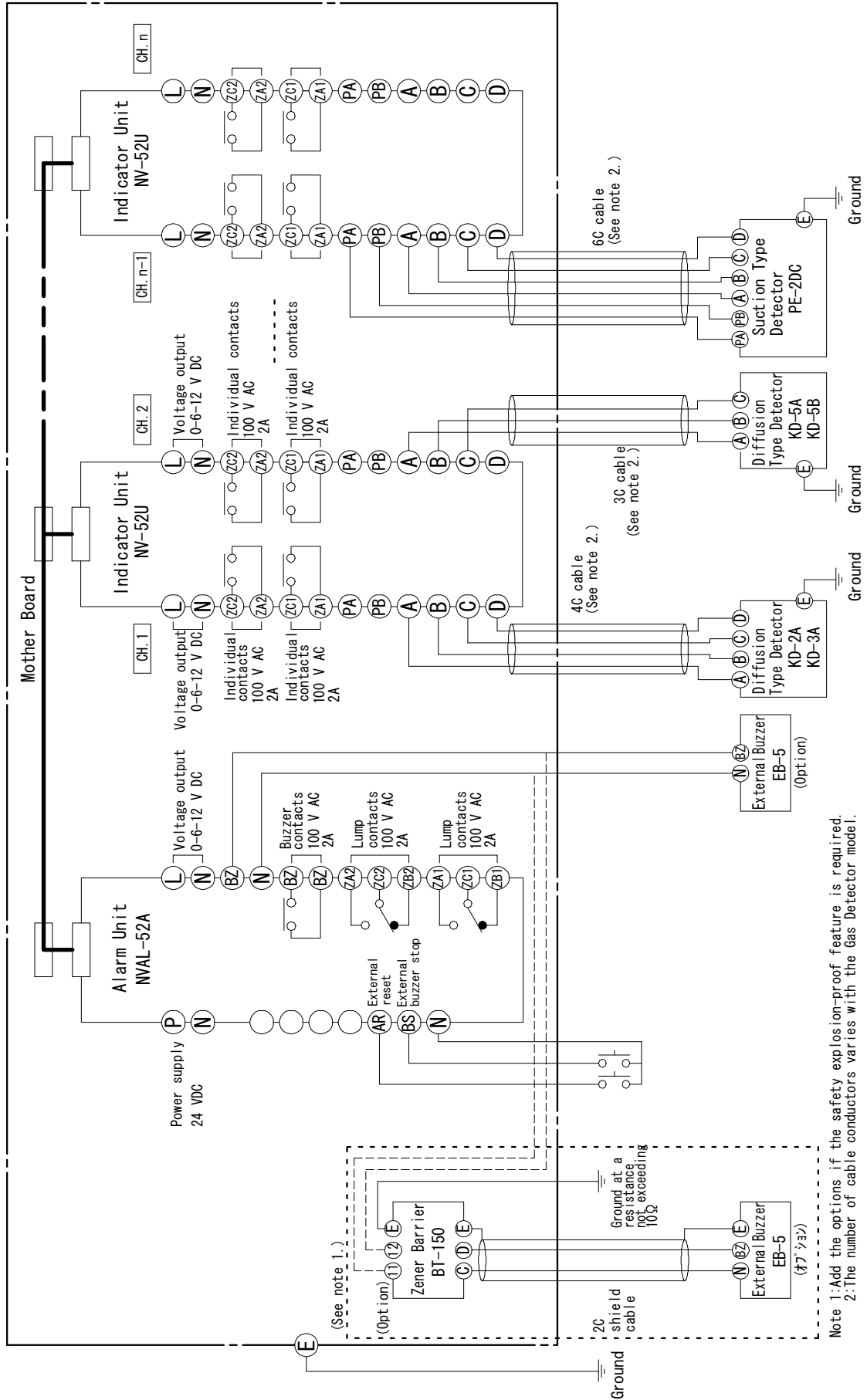
# NV-500 Indicator Alarm Block



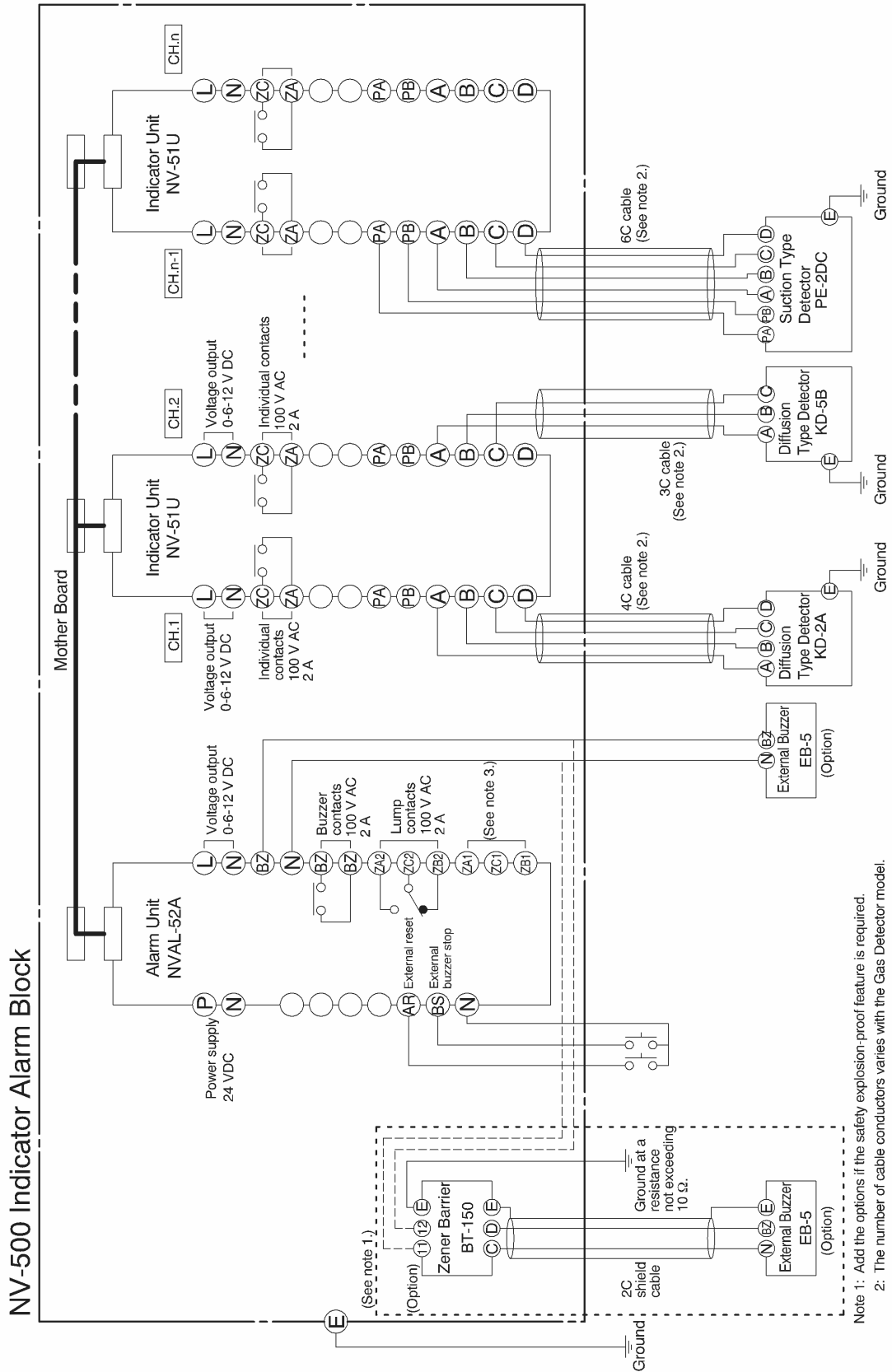
- Note 1: Storage batteries are incorporated only if a safety power supply is provided.  
 2: Add the options if the safety explosion-proof feature is required.  
 3: The NVAL-52A is not provided with a safety power supply. The NVAL-52B is provided with a safety power supply.  
 4: The number of cable conductors varies with the Gas Detector model.  
 5: ZA1, ZB1, or ZC1 are not used.

NV-4□□ or NV-600 Indicator Alarm Block

NV-4□□ and NV-600 Indicator Alarm Block



# NV-500 Indicator Alarm Block



- Note 1: Add the options if the safety explosion-proof feature is required.  
 Note 2: The number of cable conductors varies with the Gas Detector model.  
 Note 3: ZA1, ZB1, or ZC1 are not used.

## 6. Glossary

Indicator / Alarm unit:	A unit that receives signals from the gas detector and indicates gas concentration and alarms.
Detector:	A unit that detects gas concentration and converts it to electric signals.
Backup power source device:	A device that supplies power to the gas detector, indicator / alarm unit in order to maintain its performance during a power failure.
Flow meter:	A meter to measure air flow in gas sampling pipe.
Gas collector:	A gas collecting probe that enhances gas collection efficiency and blocks water and dust.
Diffusion type:	A method to detect gas by utilizing convection and diffusion of gas.
Explosion proof construction:	A totally enclosed structure. When an explosive gas explodes in a container, the container can resist the pressure and prevent the ignition of explosive gases outside of it.
Preset alarm value:	A preset value for the alarm to go off when gas concentration reaches a certain value.
Gas to be detected:	Gas that is detected and indicated which sets off an alarm.
Detection range:	Range of gas's concentration that can be indicated and set off an alarm.
Alarm accuracy:	Difference between the preset alarm value and gas concentration when an alarm actually occurs or as the percentage of the difference compared to the preset alarm value.
Response time:	Time it takes from when the gas detector is exposed to a gas with a concentration higher (lower) than the preset alarm value until an alarm goes off.
Temperature range:	Range of temperature where the equipment can perform its functions.
Maintenance and inspections:	Work to guarantee that the equipment perform its required functions.
Calibration gas:	Gas used to calibrate scales of the equipment.
Peak hold:	A function to constantly update and hold the peak value of input signals.
Hazardous area:	An area in a plant or facility with a dangerous atmosphere where explosive gases may mix with air and explode or start a fire. An area where gas may be present.
Non hazardous area:	An area where electric equipment that has no potential to create a dangerous atmosphere.
Dangerous atmosphere:	Atmosphere within the explosive limit where explosive gas and air are mixed.
LEL: Lower Explosive Limit.	The lowest concentration of flammable gas that will explode when mixed with air and ignited.

(Quoted from gas detection terms and detector tube gas meter terms used by the Industrial Gas Detector Alarm Association.)

**Manual Revision History**

<b>Edition No.</b>	<b>Date</b>	<b>Revisions</b>
GAE-022	Jan. 2006	00

Additional copies of this Operation Manual are available.  
Contact the following address for ordering information.

**Distributor:****Manufacturer:**

New Cosmos Electric Co., Ltd.  
2-5-4 Mitsuya-naka Yodogawa-ku  
Osaka 532-0036, Japan  
Phone 81-6-6309-1505  
Fax 81-6-6309-1514  
Email [e-info@new-cosmos.co.jp](mailto:e-info@new-cosmos.co.jp)  
<http://www.new-cosmos.co.jp>

