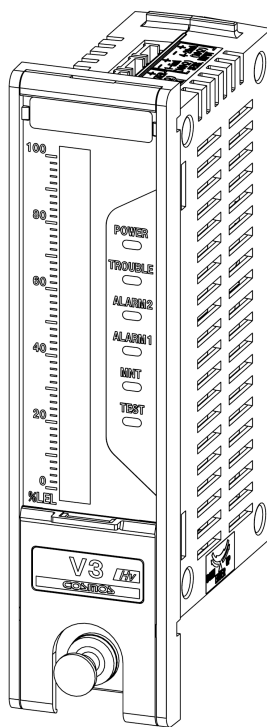# Indicator Unit
Model V3
Instruction Manual

- ・ Keep this manual handy for future reference.
- ・ Read this manual thoroughly before using the indicator unit to ensure safe and correct operation.
- ・ This manual provides standard specifications. If your unit is nonstandard, the delivery specifications precede the specifications in this manual.

NEW COSMOS ELECTRIC CO.,LTD.

Table of Contents

1. Introduction

Thank you for purchasing the New Cosmos Indicator Unit, Model V3.

Read this instruction manual to ensure safe and correct operation and to prevent possible accidents.

The indicator unit, Model V3, is used as a part of a gas detection/alarm system that detects various gases including combustible gases. Usually, the system consists of one alarm unit (Model VAS or VAL, which both have alarm functions such as a buzzer) and several indicator units. Each indicator unit is connected to a gas detector (or gas detector head) which is installed on site. The gas detector measures a gas concentration, converts it into electric signals and sends them to the indicator unit.

When the gas detector detects a leak of a target gas or a decrease in the oxygen concentration, the indicator unit will display the gas concentration on bar graph meter. If the gas concentration goes beyond the limit, the indicator unit will alarm by turning on alarm lamps, and the alarm unit will alarm by intermittent sounds.

Periodical maintenance and inspection are crucial for maintaining the reliability of this indicator unit. Be sure to conduct the maintenance and inspection on a regular basis as described in this manual.

The V3 indicator units are categorized into the following four groups, according to the specifications of the gas detectors connected.

Group 1	Group 2	Group 3	Group 4
Type Hv	Type O	Type M	Type Hi
Type Cv	Type D		Type Ci
Type Tv			Type Ti

Wiring and adjustment methods partly vary depending on the group. The group is specified for its applicable wiring and adjustment methods in this manual. Follow the wiring and adjustment methods applicable to your indicator unit. Note that a combination of V3 indicator unit, Type M and metal housing, Model V-SC-4A is CE-certified product.

Symbols Used in this Instruction Manual

The following symbols are used in this manual to ensure safe use of this indicator unit.

⚠ 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, may result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor injury or property damage.
MEMO	Provides advice on handling the product.

2. Precautions

- To ensure proper use, read this manual carefully before using this indicator unit.
- Follow all applicable laws and regulations when using this indicator unit.

⚠ **WARNING**

- To prevent electric shock, ensure that the indicator unit is correctly grounded.
- If there is a gas leak alarm, take the necessary measures specified by your company.
- This indicator unit is not explosion-protected equipment. Ensure that it is installed in a non-hazardous area.

⚠ **CAUTION**

- Only qualified personnel should perform necessary works including installation and wiring in accordance with the applicable engineernig standards for electrical installation.
- Do not disassemble or modify the indicator unit, or alter its structure or electric circuits as this may compromise the performance of the indicator unit.
- This indicator unit is not a drip-proof device. Ensure that the indicator unit is kept clear of water or moisture.
- Follow all applicable laws and regulations when using this indicator unit.

3. Package Contents

The standard package contains the following components. Check that all the components are contained in the package before using this indicator unit. If any component is damaged, defective or missing, please contact us.

Standard Package

Component	Quantity
Indicator Unit	1
Fuse (1.0 A)	1
Instruction Manual	1[*1]

*1: One manual will be provided per order.

Metal Housing (Optional)

Component	Quantity
Metal Housing	1
Screw	2

Accessories for Metal Housing (Optional)

Component	Quantity
Partition Board[*2]	As per system configuration
Clamp with Two Fixing Screws	As per system configuration
Flat Cable Assembly[*3]	As per system configuration
Reset Relay Terminal[*4]	As per system configuration

*2: Necessary when multiple metal housings are installed adjacent to one another.

*3: Special cable used to connect indicator units, alarm unit and/or reset relay terminal.

*4: Necessary for cancelling alarm without using the alarm unit.

4. System Configurations

(1) Typical System Configuration for Group 1 (Type: Hv, Cv, Tv)

Power Source ┄┄> Noise Filter

Flat Cable Assembly (FAS)

Metal Housing

Alarm Unit
VAS

Indicator
Unit, V3

Type Hv
Type Cv
Type Tv

Indicator
Unit, V3

Type Hv
Type Cv
Type Tv

External Control Devices ← Individual Alarm Contacts

Recorder ← Analog Output

Instrument Panel Terminal Block

Instrument Panel

Ground

3-core Shield Cable

5-core Shield Cable*

OUT

E

Ground

GAS IN

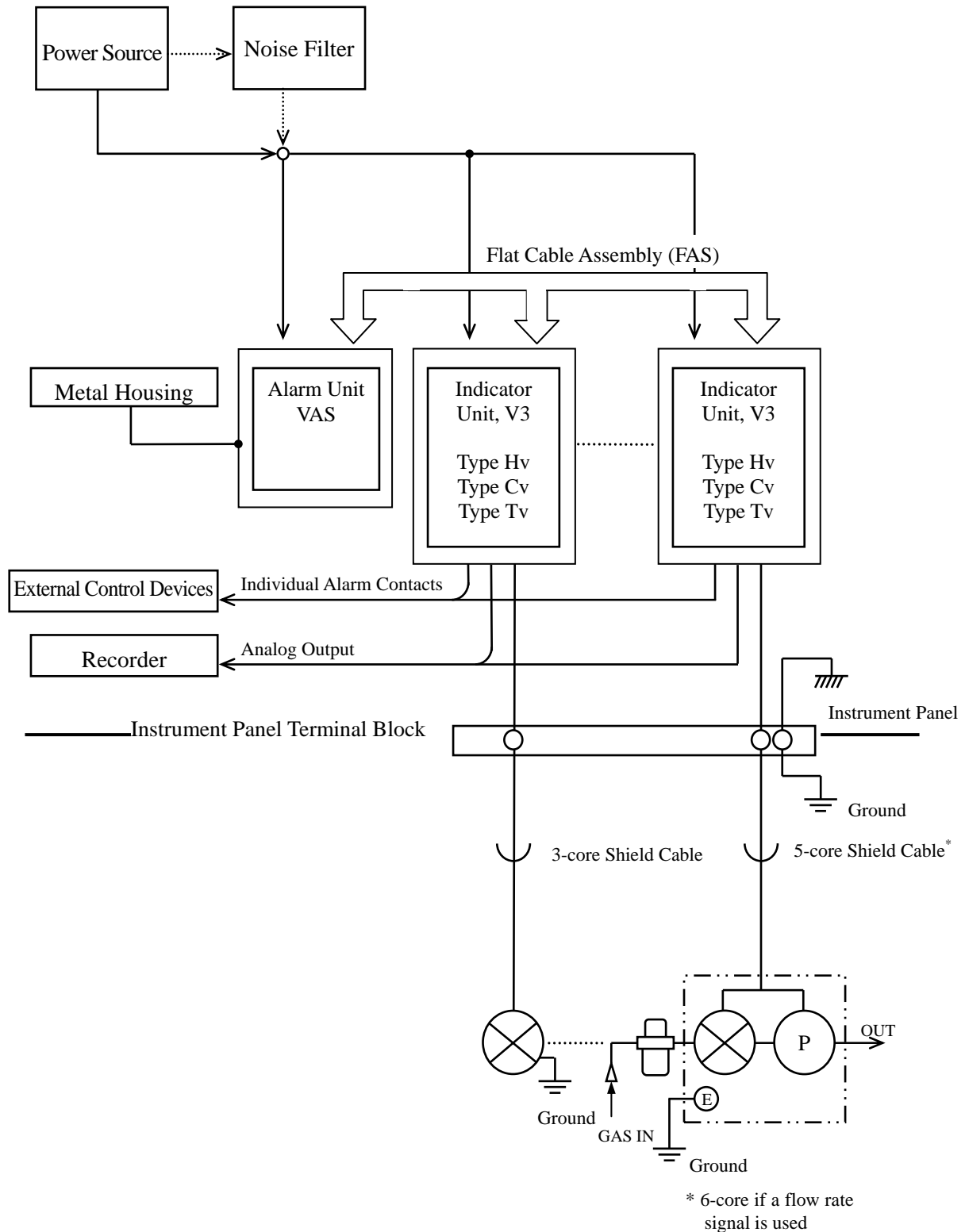Ground

* 6-core if a flow rate
signal is used

Figure 1. Typical System Configuration for Group 1

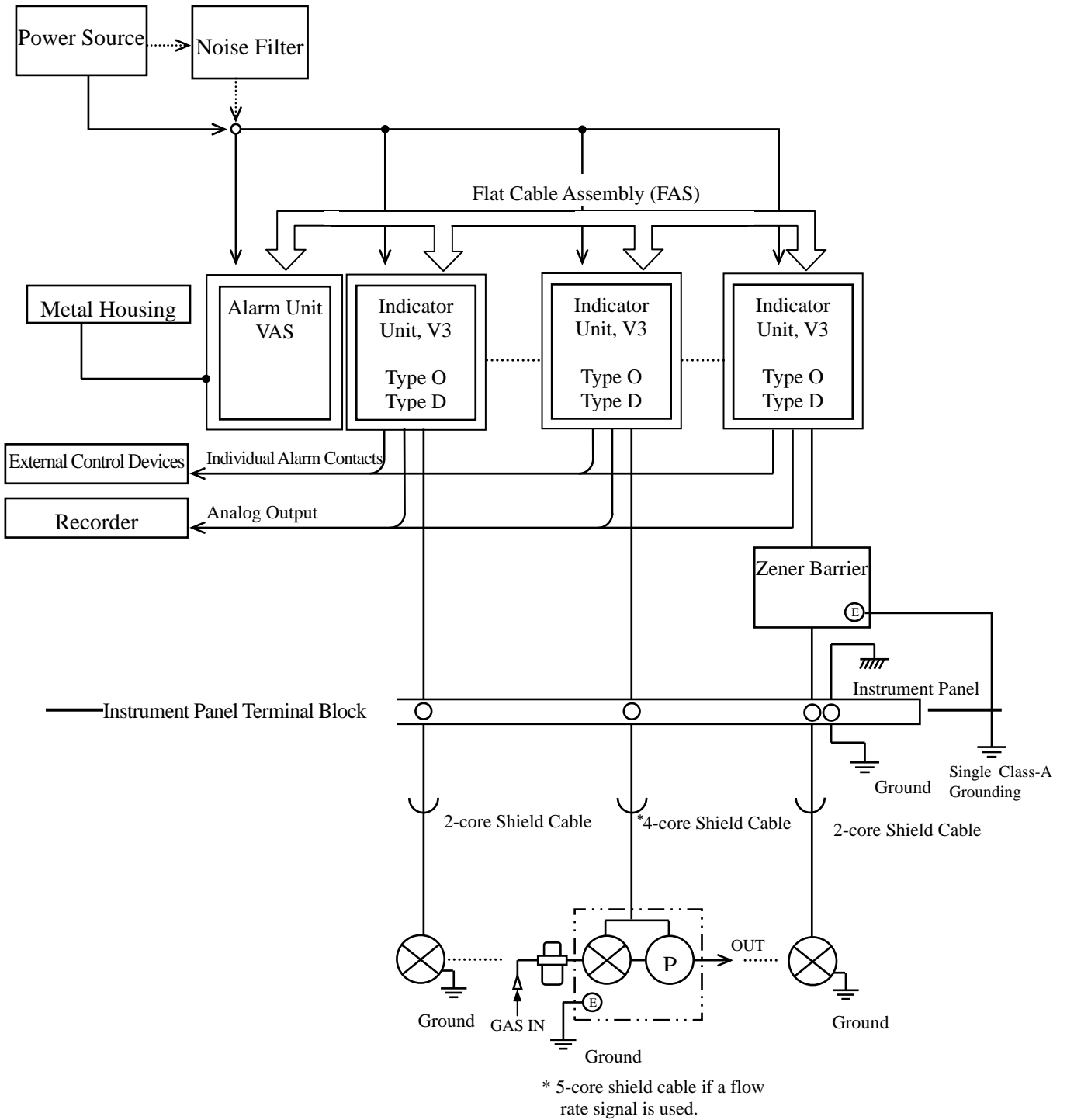(2) Typical System Configuration for Group 2 (Type: O, D)

Figure 2. Typical System Configuration for Group 2

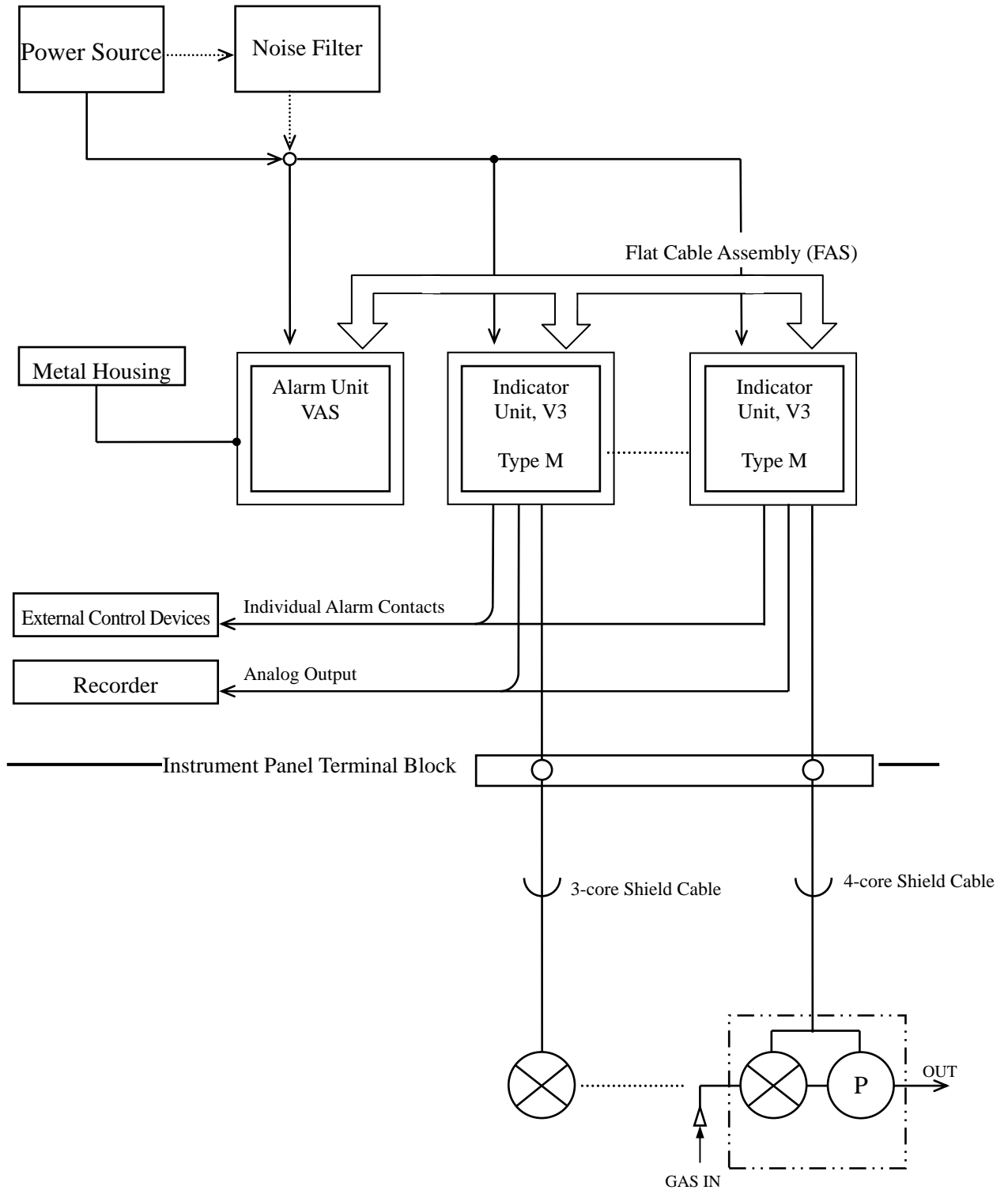(3) Typical System Configuration for Group 3 (Type: M)

Figure 3. Typical System Configuration for Group 3

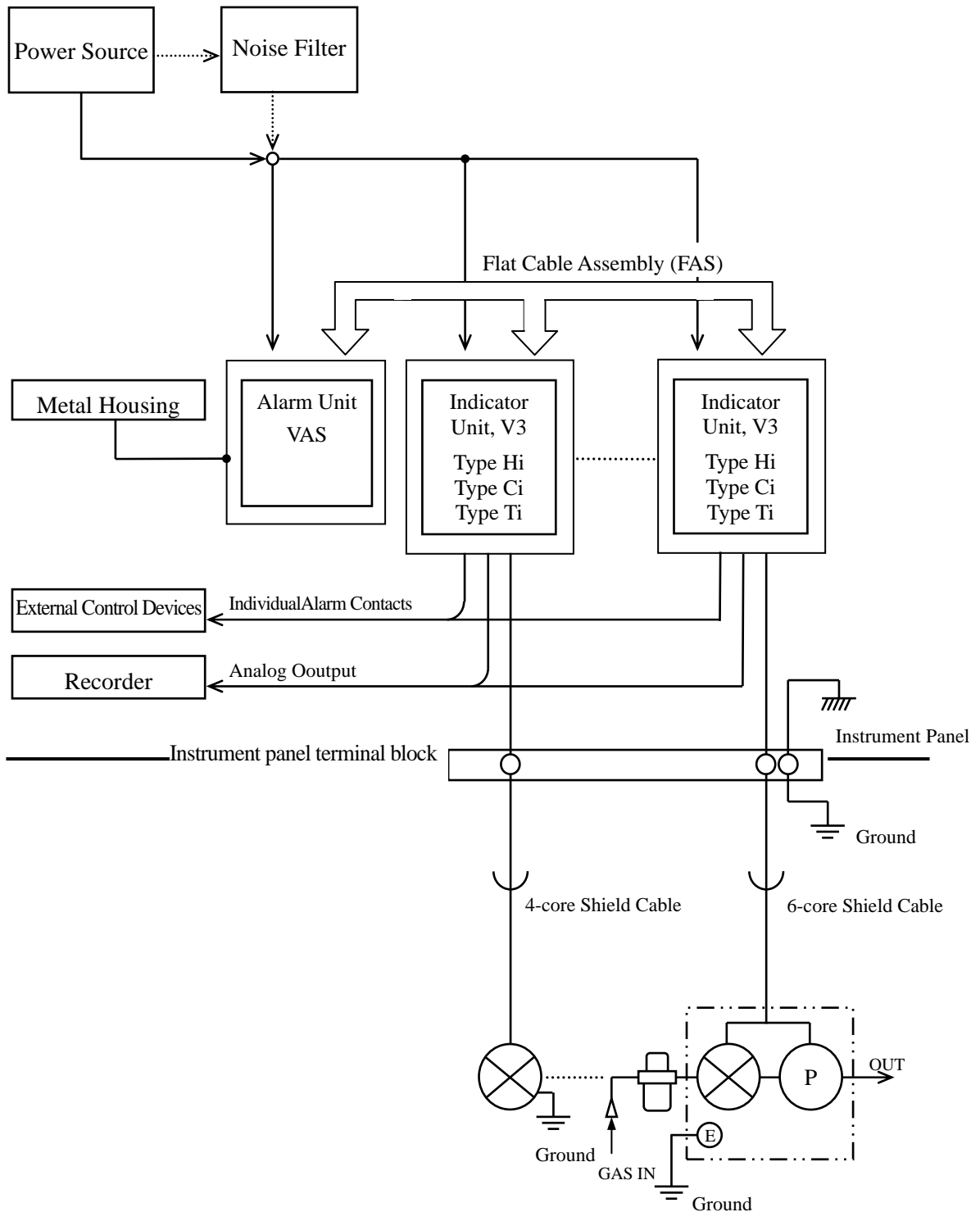(4) Typical System Configuration for Group 4 (Type: Hi, Ci, Ti)

Figure 4. Typical System Configuration for Group 4
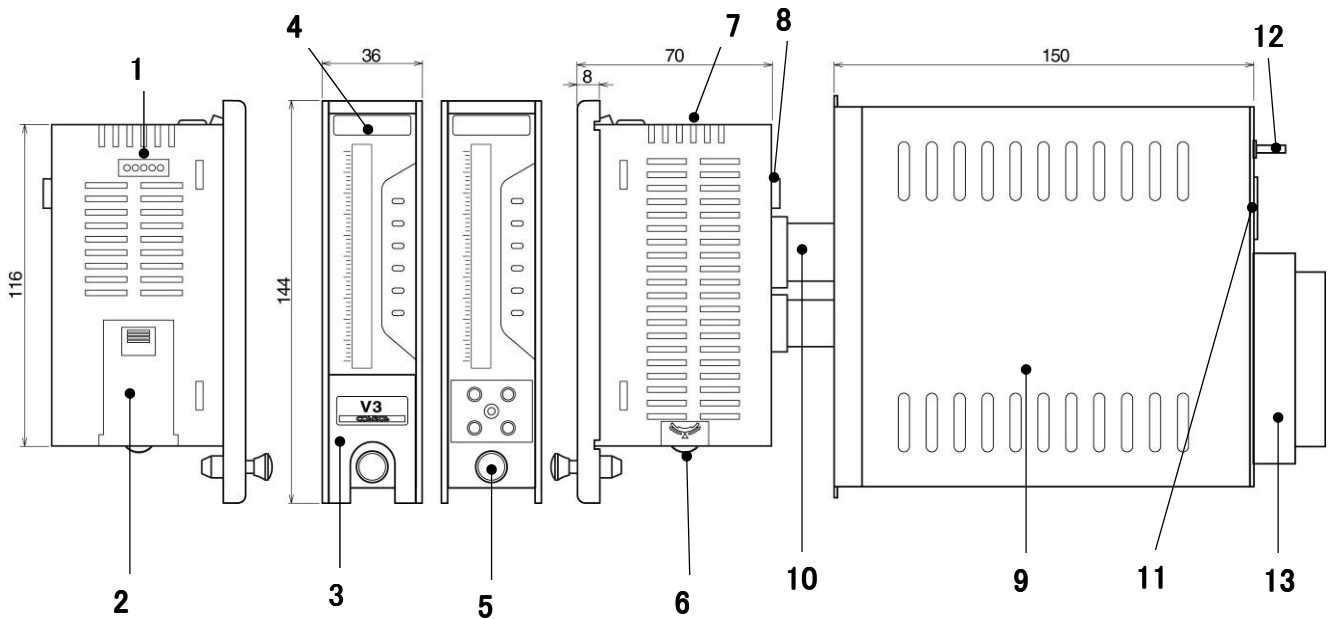
5. Outer Appearance and Component Names

Figure 5. Outer Appearance of Indicator Unit

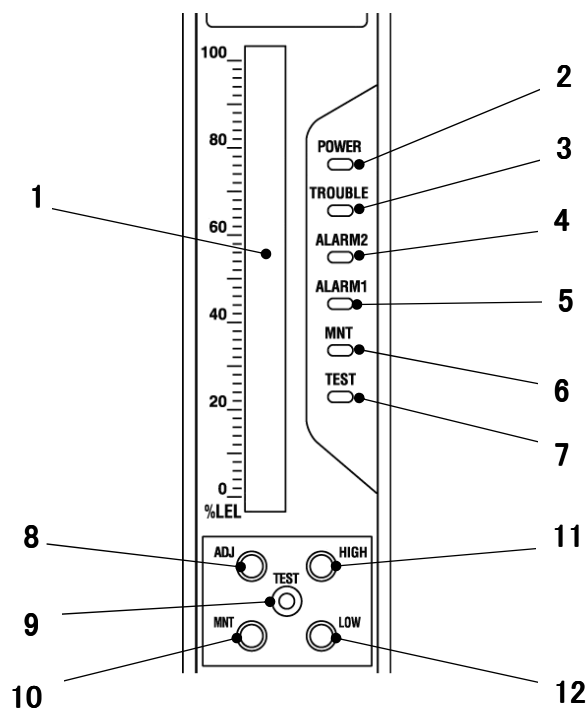| No.	Component Name	Function
1	Mode LEDs (Nos. 1 to 5)	When the mode is selected, the corresponding LED will light up.
2	Side Cover	Remove this cover to replace the external EEPROM.
3	Front Cover	Open this cover to use the operation buttons behind it.
4	Tag Number Plate	Used to fill in the name or number of the detection location.
5	Panel Lock Knob	Push in the knob to lock the indicator unit, and pull it out to unlock the indicator unit.
6	Multi-functional Switch	Located on the bottom of the indicator unit. Turn this switch forward or backward ("down" or "up" marked near the switch) or press it up to select your desired mode or make other adjustments.
7	Connector Terminal	Used to check the heater current and sensor input (4-20mA and 1-5mA).
8	Fuse	ϕ 5.2 mm $\times$ 20ℓ, 1A
9	Metal Housing	Case dedicated to house a single indicator unit.
10	Connector A	Located on the metal housing and used for internal connection.
11	Connector B	Used to connect with an alarm unit.
12	Power Switch	Used to turn on the indicator unit.
13	Terminal Block	Used for external wiring.

Figure 6. Operation Panel of Indicator Unit

| No.	Component Name	Function
1	Bar Graph Meter	Displays the gas concentration and alarm set points.
2	POWER Lamp (green)	This lamp is on while the indicator unit is on.
3	TROUBLE Lamp (yellow)	This lamp starts flashing when a failure occurs in the indicator unit.
4	ALARM 2 Lamp (red) (2nd-stage Alarm)	This lamp starts flashing when the gas concentration exceeds the 2nd-stage alarm set point.
5	ALARM 1 Lamp (red) (1st-stage Alarm)	This lamp starts flashing when the gas concentration exceeds the 1st-stage alarm set point.
6	MNT (Maintenance) Lamp (red)	This lamp is on or flashing during the maintenance mode.
7	TEST Lamp (red)	This lamp is flashing during the test mode. For Group 4, the lamp will turn on when zero adjustment is normally completed.
8	ADJ (Adjustment) Button	Used to make one-touch zero adjustment. Refer to page 27 for more information on the one-touch zero adjustment.
9	TEST Button	Used to test the alarm function. Use a stick with a round tip for pressing this button.
10	MNT (Maintenance) Button	Used to switch to the maintenance mode.
11	HIGH Button	Used to adjust the test level during the test mode.
12	LOW Button	Same as above.

6. Installation

(1) When you prepare a panel to amount metal housings with indicator/alarm units by yourself, take the following steps.

Prepare a panel (1.6 to 6 mm thick) and cut out a square hole on it.   Refer to the drawing below for the cut-out size.

$38.5 \times n + d$

$137 \, {}^{+1}_{-0}$
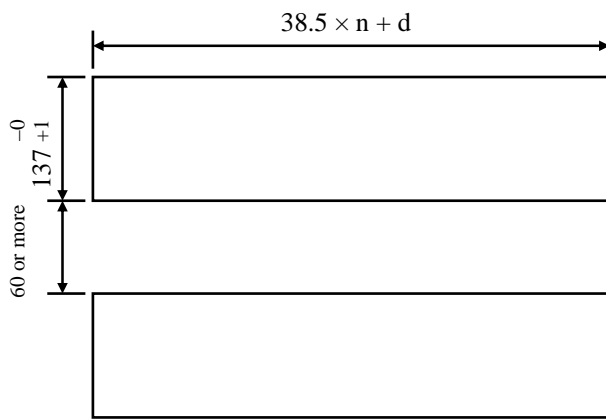
60 or more

n: Number of indicator and alarm units to be mounted.	
d: Allowable tolerance.	
n = 1 to 10	d = 3
n = 11 to 15	d = 4
n = 16 to 20	d = 5
n = 21 to 25	d = 6
n = 26 to 30	d = 7

Panel Cut Size (Unit: mm)

Note: Keep 60mm or more between two square holes for two-stage installation.

(2) Loosely install the clamp on each end with two fixing screws.

Fixing Screw (2 Places)

Clamp
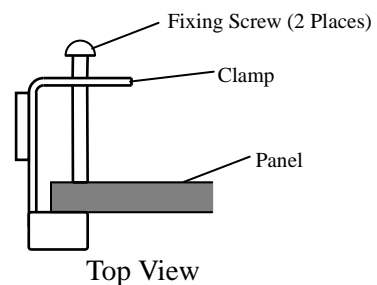
Panel

Top View

(3) Insert the metal housing(s) in the front side of the panel through the square cutout.
When installing more than one metal housing, insert a partition board between each pair of metal housings.
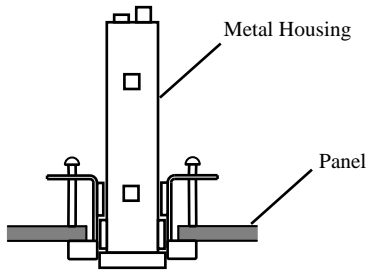
Installation of One Metal Housing
Top View
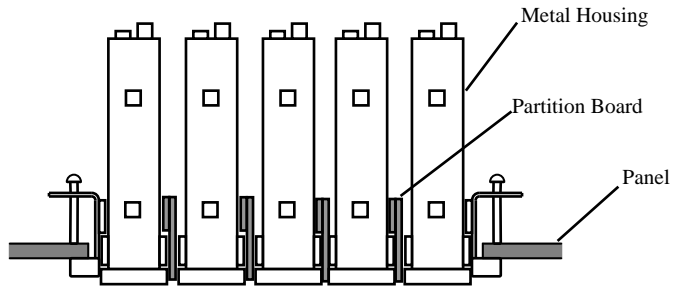
Installation of More than One Metal Housing
Top View

(4) Secure each metal housing to the panel by tightening two screws with a minus driver as shown in the drawing below.
When installing more than one metal housing, tighten the screws until there is no gap between the metal housings and partition boards, while moving the metal housings toward the center.
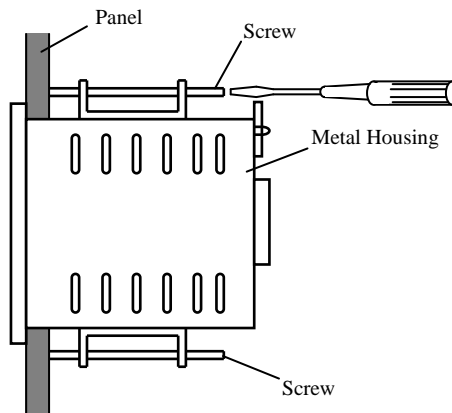
Side View

(5) Adjust the position of the clamps and firmly tighten the fixing screws into the panel until there is no gap between the metal housing and the clamp.

| MEMO | Be sure to tighten the screws evenly and firmly. |

7. Wiring Connections

On the back side of the metal housing are two rows of an 8-way terminal block. Use this terminal block to connect the indicator unit to a gas detector, power source, and external control devices. Note that this terminal block is compact in size and is therefore not suitable for external wiring. Establish a separate terminal block using M3-size round solderless terminals (outer dimension of 6.4 or less) to accommodate such wiring.

To connect the indicator unit to an alarm unit, use the connectors included in the standard package and a flat cable assembly (optional).

Connector

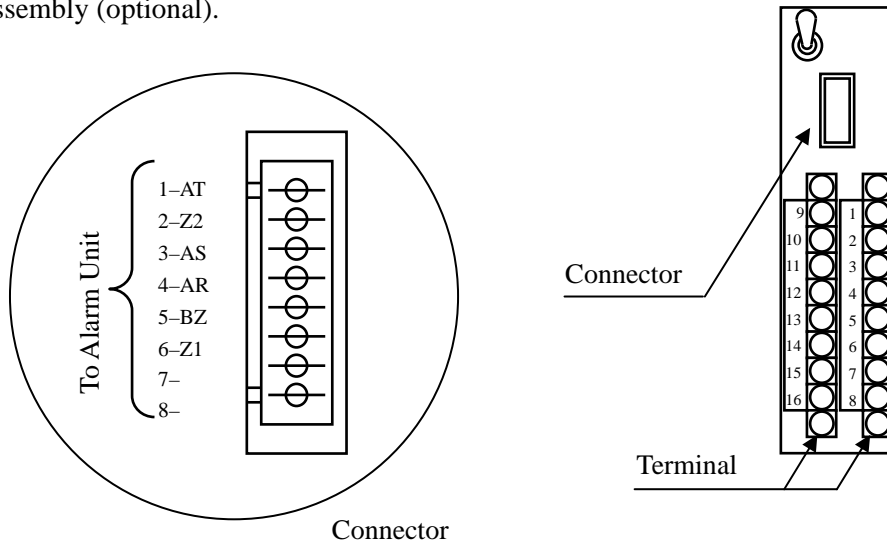| Term inal No.	Metal Housing: V-SC-4A			Metal Housing: V-SC-1		
1	P (+)	Power source 24VDC		P (+)	Power source 24VDC	
2	N (−)			N (−)		
3	PA (+)	Pump power output 24VDC		PA (+)	Pump power output 24VDC	
4	PB (−)			PB (−)		
5	A (F)	Gas detector		A (F)	Gas detector	
6	B			B		
7	C			C		
8	D			D		
9	AC2	2nd-stage alarm "Open" or "closed" during normal operation *1	Contact output 100VAC, 1A 24VDC, 1A	ZC	Common	Contact output 100VAC, 1A 24VDC, 1A
10	ZA2			ZA2	2nd-stage alarm 1c contact	
11	ZC1	1st-stage alarm "Open" or "closed" during normal operation *1		ZB2		
12	ZA1			ZA1	1st-stage alarm 1c contact	
13	TC	Trouble alarm "Open" or "closed" during normal operation *1		ZB1		
14	TZ			TZ	Trouble 1a contact	
15	G (+)	Analog output		G (+)	Analog output	
16	H (−)			H (−)		

*1: As per metal housing specifications.

Figure 7. Terminal and Connector Pin Assignment

> **MEMO**
> ・Output terminals (Nos.3 and 4) are only used for connecting a suction-type gas detector with a built-in 24VDC pump and NOT a 100VAC pump.
> ・Do not use the pump power output for any purpose other than to supply power to suction-type gas detectors.

7-1. Connection with Gas Detectors

⚠ CAUTION

- Ensure that the cables are connected correctly by referring to the marking between the indicator unit and the gas detector.

- Make sure that cables are connected as far away from the electric power line as possible.

- When wiring a gas detector at a hazardous location, be sure to us explosion-proof wiring. Refer to the insturction manual for the gas detector for the installation of explosion-proof wiring.

Figures 8, 9, and 10 show the connections between metal housings and gas detectors. Make sure that the number on the tag number plate of the indicator unit and the number on the loop number sticker of the gas detector match before connecting.

Connect the pump power source for suction-type gas detectors (pump power source 24 VDC) to the terminals PA (+) and PB (-) (Terminal Nos.3 and 4).

| MEMO | Refer to the instruction manual of the gas detector for information on cable length. |

(1) Typical Wiring Connection with Gas Detectors for Group 1 (Type: Hv, Cv, Tv)

Figure 8. Wiring Connection with Gas Detectors (Group 1)

(2) Typical Wiring Connection with Gas Detectors for Group 2 (Type: O, D)
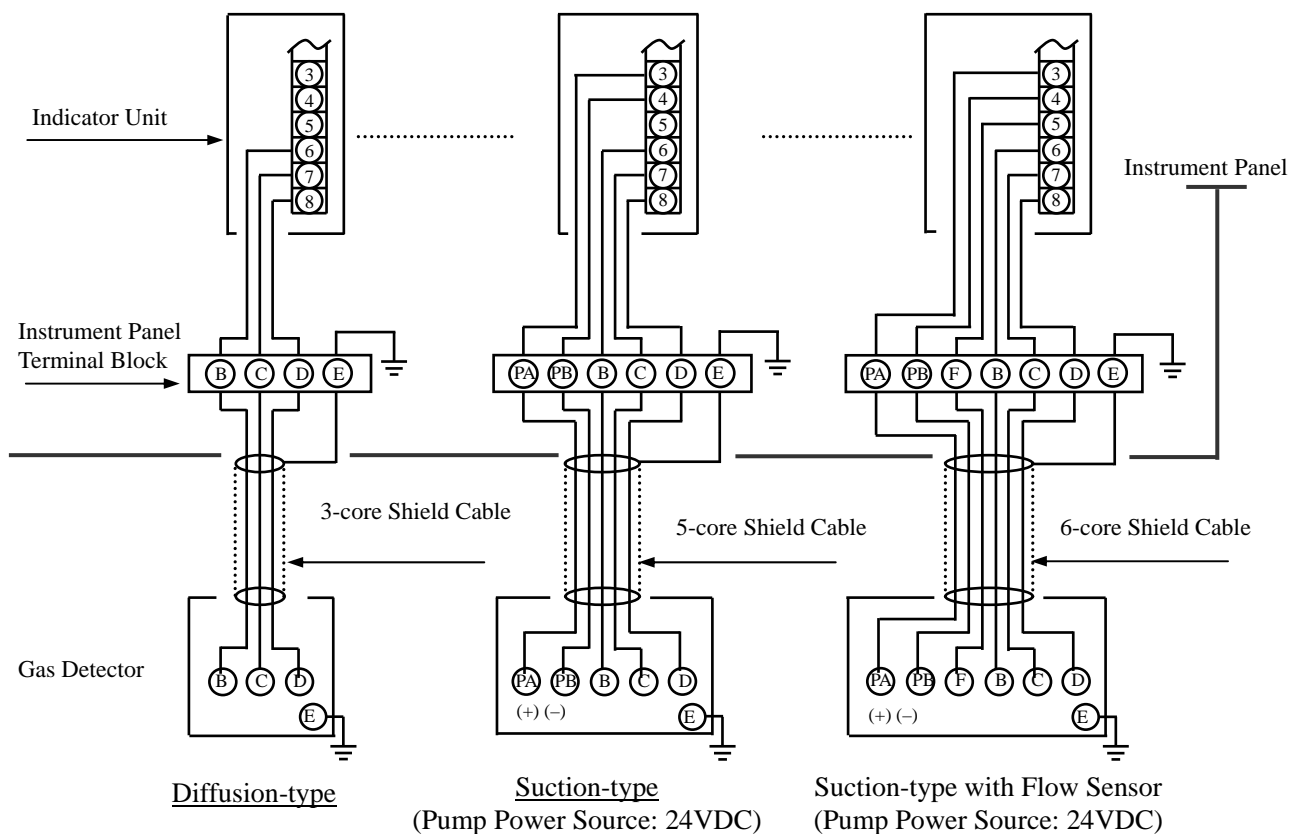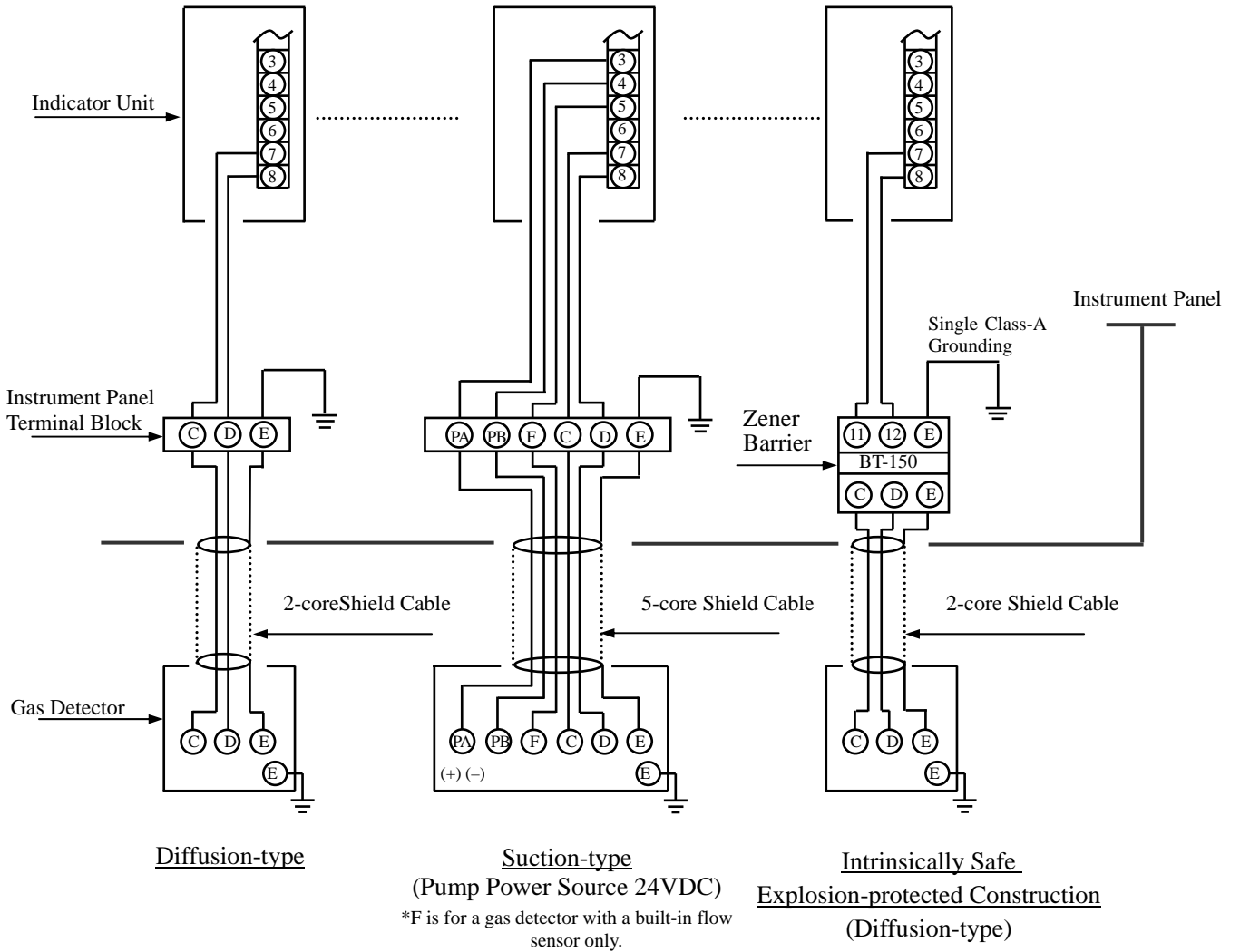

Figure 9. Wiring Connection with Gas Detectors (Group 2)

(3) Typical Wiring Connection with Gas Detectors for Group 3 (Type: M)
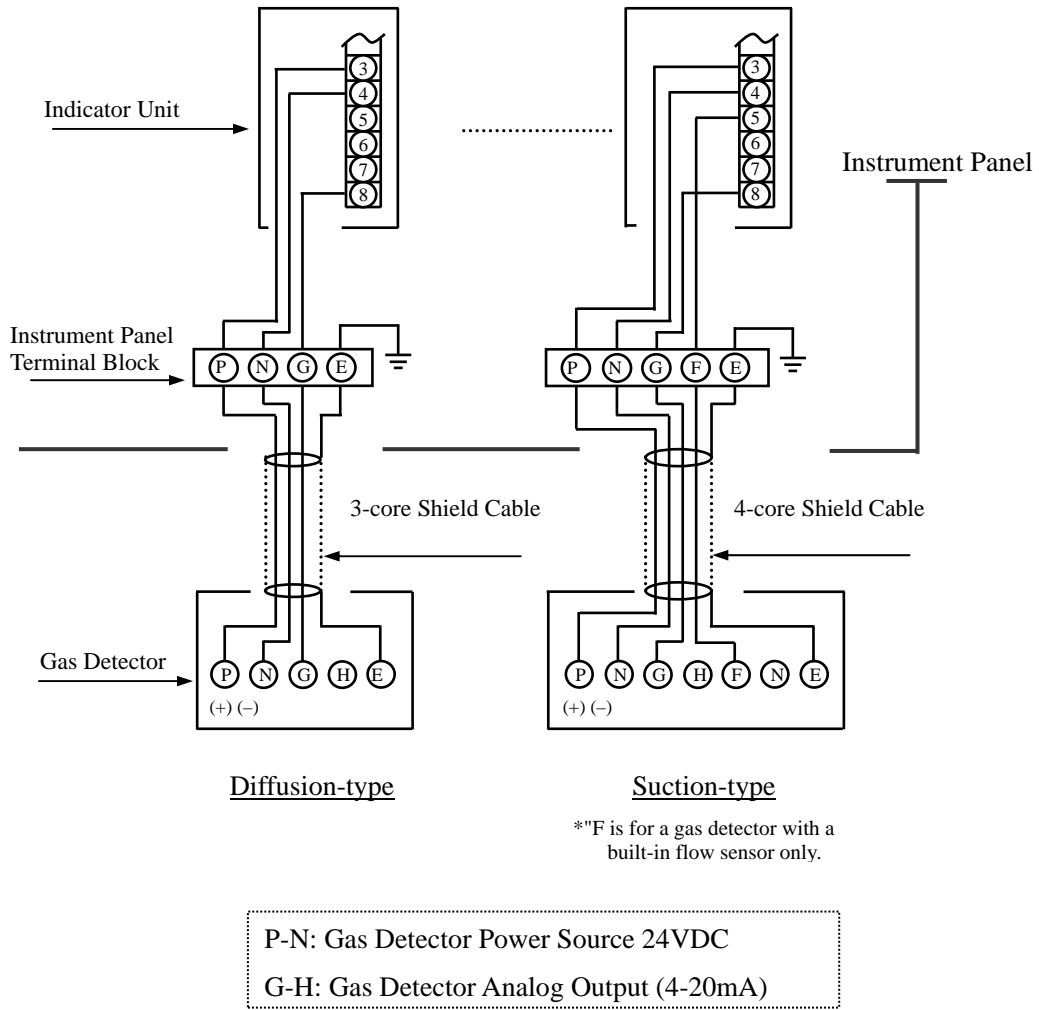
Figure 10. Wiring Connection with Gas Detectors (Group 3)

(4) Typical Wiring Connection with Gas Detectors for Group 4 (Type: Hi, Ci, Ti)
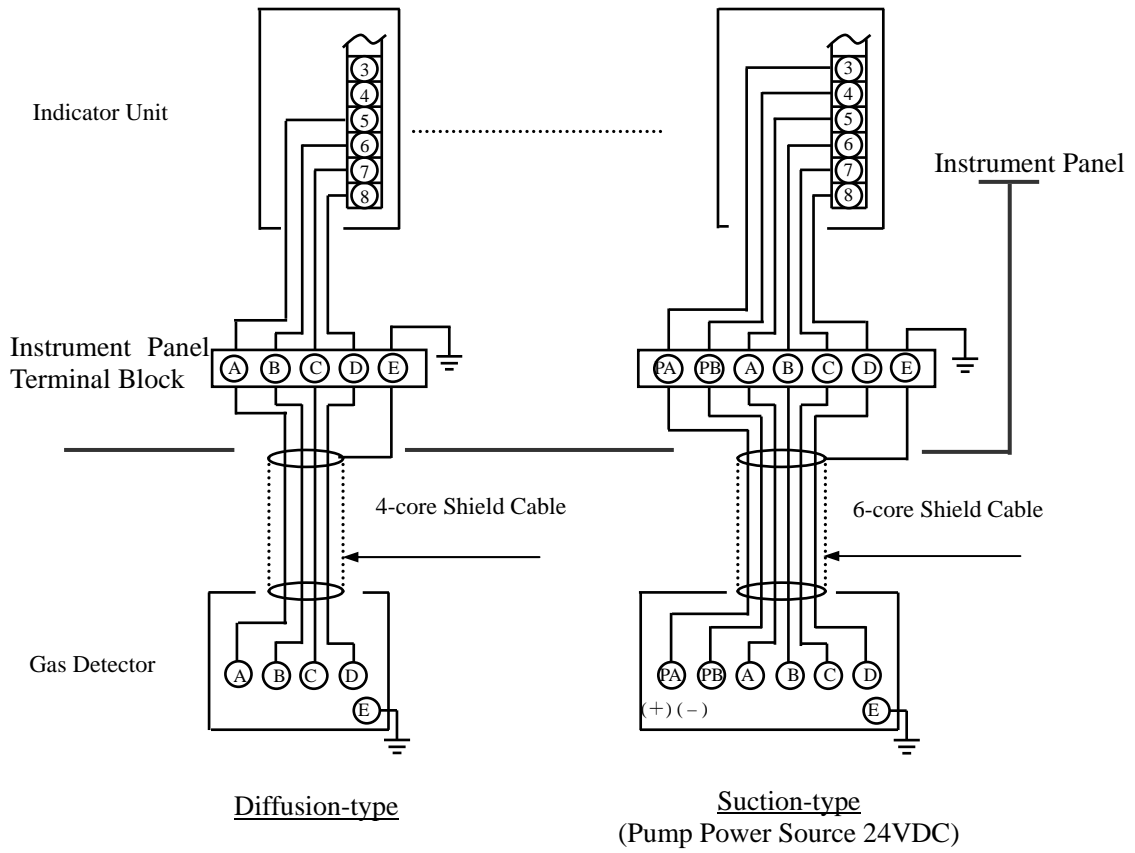
Figure 11. Wiring Connection with Gas Detectors (Group 4)

7-2. Connection with Alarm Unit

Connect indicator units to an alarm unit by using flat cable assemblies (optional).

The number of connectors on the flat cable assembly (FAS-1) is equivalent to the total number of indicator units and an alarm unit to be connected. Connect these connectors to the connectors on the rear sides of the metal housings.

When indicator units are mounted in two stages, a flat cable assembly (FAS-2) with two flat cable assembly connectors (FAS-3) is required to connect the top and bottom stages. In this case, the number of connectors required for a flat cable assembly (FAS-1) is equivalent to the total number of indicator units and an alarm unit plus one for each stage.

First Stage of Indicator Units

Connectors

Rear Side of
Alarm Unit

Rear Sides of
Indicator Units

Flat Cable Assembly

(FAS-1)

Flat Cable Assembly

(FAS-2)

Flat Cable Assembly Connector (2 Places)

(FAS-3)

To Flat Cable Assembly (FAS-1) on
Second Stage.
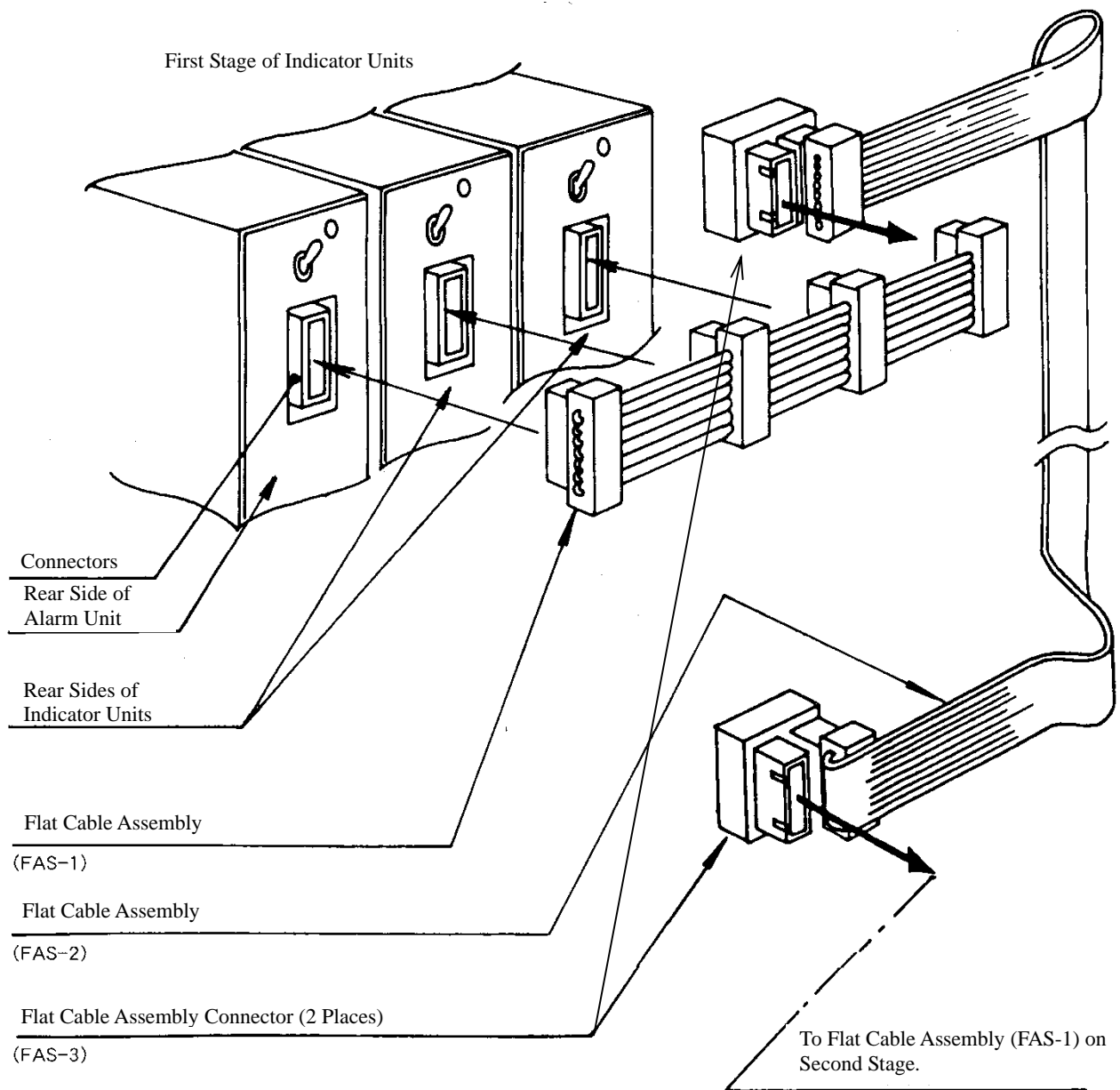
Figure 12. Wiring Connection with Alarm Unit

7-3. Connection with Power Source

A 24 VDC power source needs to be connected between the terminals P (+) and N (-) (Terminal Nos.1 and 2). If 24 VDC is not available, connect to a special VPW-type power source unit (sold separately) for use with 100 VAC commercially-available power source.

> ## ⚠ **CAUTION**
>
> - When a large number of units are employed, monitor the current capacity and voltage drop of the wiring cables while connecting.
> - Make sure that the polarities are correct.

7-4. Connection with External Control Devices or Annunciators

The terminal assignment changes according to the model of the metal housing. For example, when using a metal housing, Model V-SC-1, the terminals (Nos.9 to 13) (1c dry contact) are assigned to 1st-stage and 2nd-stage alarms as shown in the drawing below. (Note that the terminal (No.9) is a common terminal.)
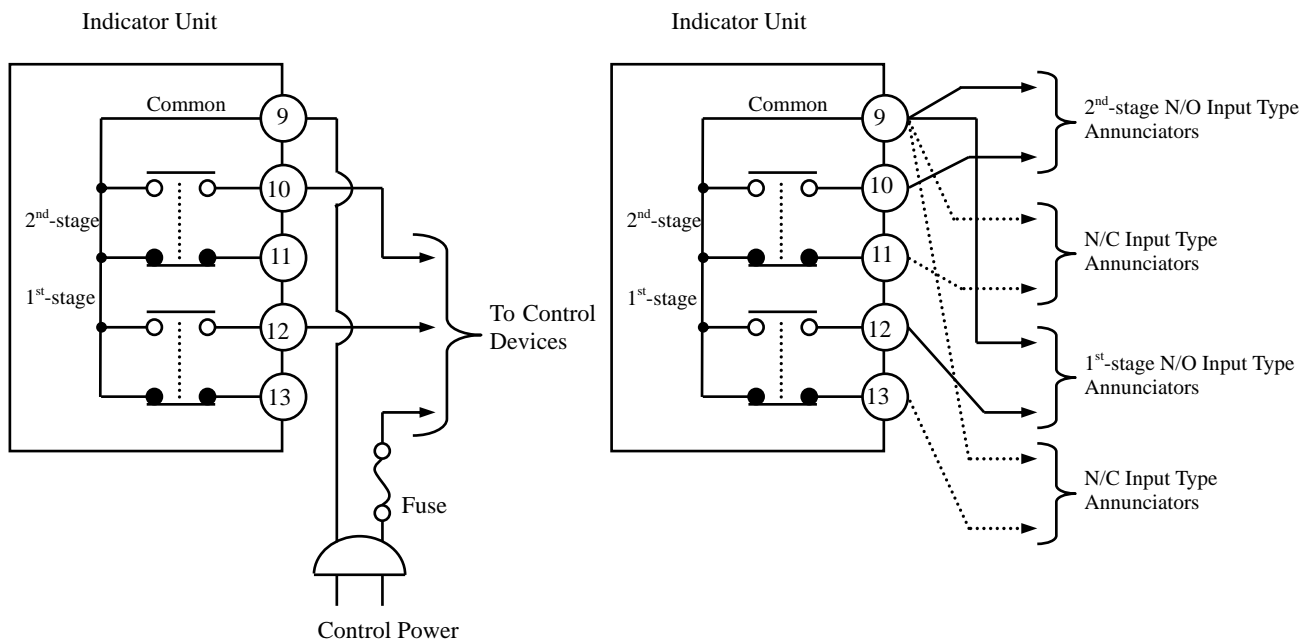
Figure 13. Wiring Connections for Alarm Contact Output Terminals

7-5. Connection with Analog Output

Analog signals ranging from 4 to 20 mA, depending on the gas concentration, are transmitted from the terminals (Nos.15 and 16). The polarities (Nos.15 and 16) are + and –, respectively.

A recorder or PLC is connected to the analog output terminals, as necessary.
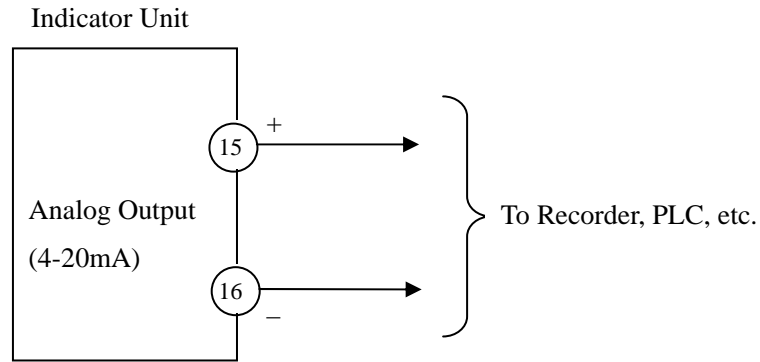
Figure 14. Wiring Connection for Analog Output Terminals

7-6. Connection with Instrument Panel Reset Switch

A flat cable assembly (FAS-1) and a reset relay terminal (optional) are required to connect reset signals to the reset switch on the instrument panel without using an alarm unit.

The reset relay terminal is installed by removing the screws of the metal housing on the right of the panel's rear side. The number of connectors attached to flat cable assemblies (FAS-1) is equivalent to the number of indicator units plus one. Attach the flat cable assemblies to the connectors on the rear side of the metal housings and the reset relay terminal.

> **MEMO** For an external reset operation using an alarm unit, refer to the instruction manual for the alarmu unit.
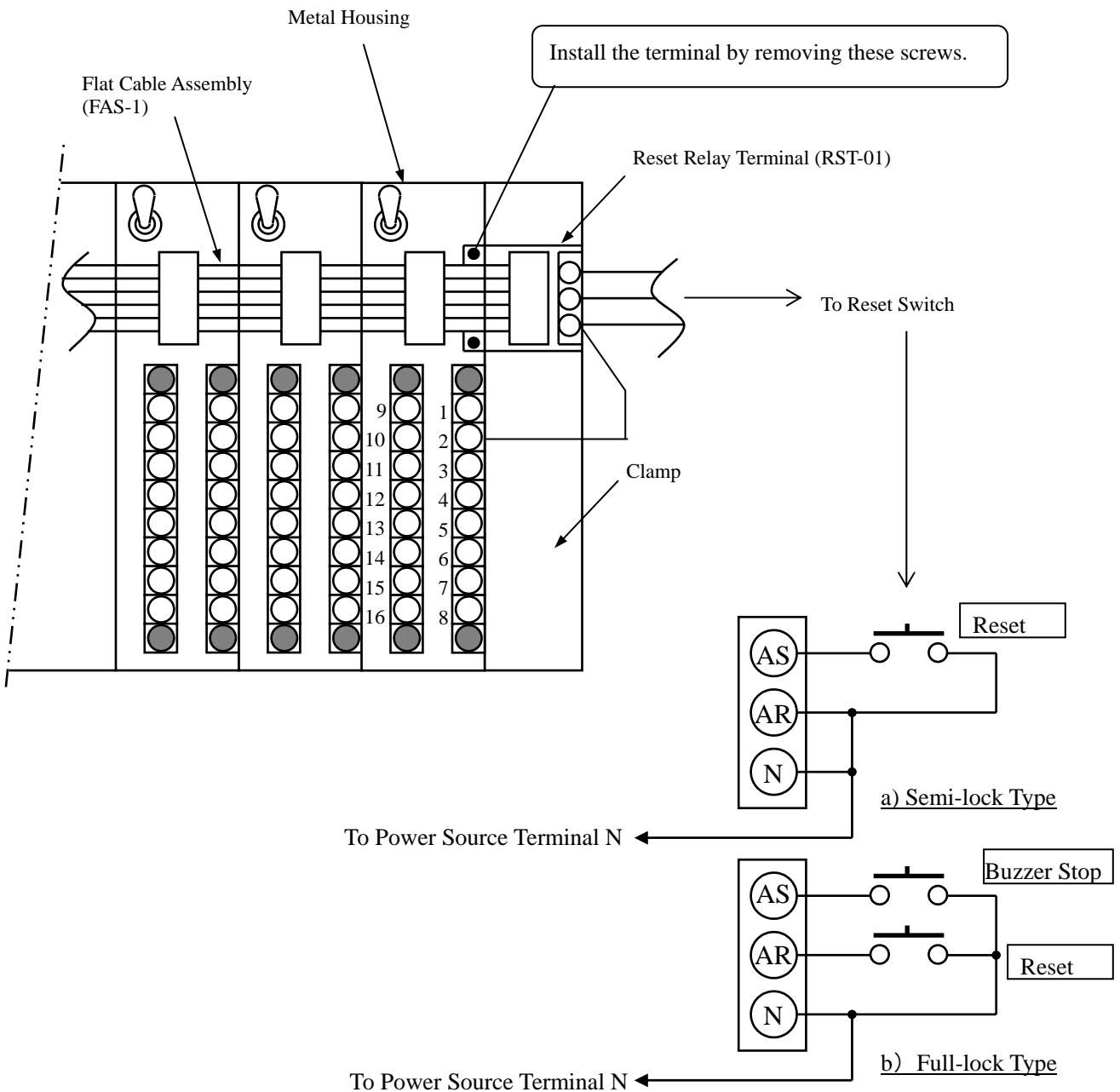
Figure 15. Wiring Connection with Panel Reset Switch

8. Operating Procedures

8-1. Start-up Operation

Important

The start-up operation should be carried out by New Cosmos authorized personnel. Please contact us for the start-up operation. Checks and adjustments performed at start-up (e.g., zero/span adjustments, operational checks using actual gas) are extremely important for the reliability of gas detection/alarm systems, and accuracy of adjustment is crucial. Moreover, use of actual gas (e.g., combustible gas, toxic gas) is extremely hazardous.

⚠ CAUTION

- Before turning on the unit, refer to Section 7 "Wiring Connections" on page 12 to check that all the components are connected correctly. Also check your delivery specifications, if you have received it.

Do the following steps to operate the indicator after making sure that the power source voltage and the wiring are correct.

(1) Power-on
   Turn the power switch to the on position. The POWER lamp (green) will begin flashing and the warm-up operation will begin.
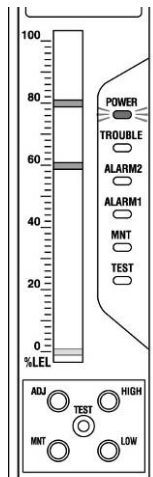
(2) Warm-up Operation
   After the power is turned on and the warm-up operation is completed, the POWER lamp (green) will stop flashing and become continuously lit. Normal operation will begin.
   The duration of the warm-up operation varies from one sensor unit to another. Refer to the instruction manual of your gas detector.

   Once the warm-up operation is completed, the indicator unit is ready for normal operation.
   If further adjustment is necessary, refer to 8-2 "Maintenance Mode".

8-2. Maintenance Mode

During the maintenance mode, the alarm contact output and the alarm function of the alarm unit are disabled. Set the indicator unit in the maintenance mode to make adjustments, check the alarm function using the TEST buttons, or perform an operational check using actual gas.

There are two types of maintenance modes in this indicator unit: Maintenance Mode 1 and Maintenance Mode 2. The differences between the two modes are described in the table below:

Indicator Unit (V3)

	Maintenance Mode 1	Maintenance Mode 2
Gas Alarm Contact	Disabled	Disabled
TROUBLE Alarm	Enabled	Disabled
Analog Output	Output corresponding to gas concentration	Output set during Mode 2-4 (Refer to page 31)
Bar Graph Meter	Displays gas concentration	Displays gas concentration

Alarm Unit (VAS)

	Maintenance Mode 1	Maintenance Mode 2
ALARM Lamp	Off	Off
Alarm Buzzer	Sounds for three seconds when an alarm occurs.	No sound.
TROUBLE Lamp	On when a trouble occurs.	Off even when a trouble occurs.

How to Enter the Maintenance Mode

<1> Open the front cover.
<2> Press the MNT button to enter Maintenance Mode 1. Press the MNT button for about 3 seconds to enter Maintenance Mode 2.

Flashing during Maintenance Mode 1.
Remains lit during Maintenance Mode 2.
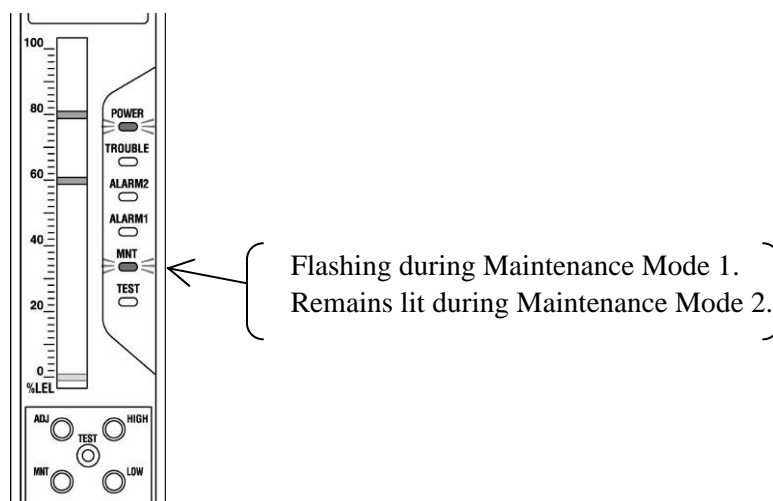
<3> To exit the maintenance mode, press and hold the MNT button until the MNT lamp turns off.

8-3. Adjustment Procedures

(1) Flow Rate Adjustment

When a suction-type gas detector is connected, make sure that the center of the sphere of the flow meter of the gas detector aligns with the red line. If not, adjust the flow with the gas detector. For details, refer to the instruction manual of the gas detector.

(2) Modes

<1> Release of Mode Lock

Before starting manual zero/span/other adjustments, the mode lock should be released.
The unlock procedure is given below.

```
－Unlock Procedure－

1. Press and hold the HIGH button (more than 3 seconds).

2. Press the ADJ button.

3. Press the LOW button.

4. Press the HIGH button.
```

When the mode lock is released, the POWER lamp (green) will begin flashing rapidly.
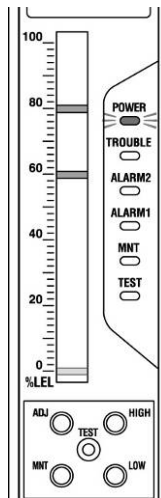
When the lock is released, the POWER lamp turns on and begins flashing rapidly.

> **MEMO** The mode lock cannot be released during the test mode.
> To use the test mode (page 28) while the mode lock is released, cancel the test mode once, then release the lock to re-enter the test mode.

<2> Mode Selection (How to select the mode)

Release the mode lock so that the mode can be selected. Pull and remove the indicator unit out of the metal housing to locate five LEDs (Nos.1-5) on the left side of the indicator unit. The number printed next to each LED represents the corresponding main mode (1 to 5). Only one LED is on at a time. The light in these LEDs moves from left to right or vice versa by turning the multi-functional switch backward/forward. Select the desired main mode by turning the switch.

Light in LED indicator moves from left to right.

Turn the multi-functional switch backward or forward.
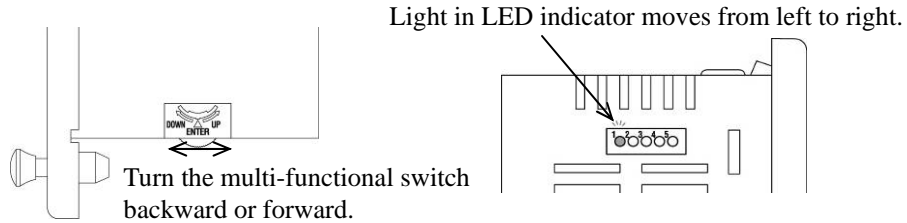
Press up the switch once. The TROBULE lamp on the front side of the indicator unit will turn on. The five lamps on the front TORUBLE, ALARM", ALARM, MNT and TEST, represent their corresponding sub-modes. Refer to Table 1 for more details.

The sub-mode can be changed by pressing up the multi-functional switch. Select the desired sub-mode by pressing it up. (e.g. When 1 is selected for main mode and the TROUBLE lamp is on, Mode 1-1 is selected.)

The TORUBLE, ALARM",
ALARM, MNT and TEST
lamps corresond to sub-modes.
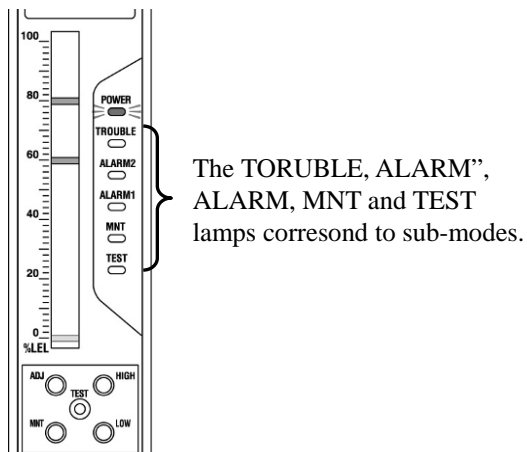
Press and hold the switch until the POWER lamp will go off for a few seconds. The current setting is saved. The Power lamp starts flashing.

The table below lists the main modes and sub-modes that can be selected. Refer to the following pages for the use and adjustment procedures for them.

Table 1. List of Modes

To lock the current settings, press up and hold the multi-functional switch.

Main mode	Function	Sub-mode		Lamp Status
1	Input Adjustment	1	Coarse zero adjustment	TROUBLE lamp is on.
		2	Fine zero adjustment	ALARM 2 lamp is on.
		3	Span adjustment	ALARM 1 lamp is on.
		4	For Groups 1, 2, and 3: One-man maintenance (span adjustment) For Group 4: Fine span adjustment	MNT lamp is on.
		5	One-touch zero adjustment	TEST lamp is on.
2	Analog Output Adjustment	1	Zero adjustment	TROUBLE lamp is on.
		2	Span adjustment	ALARM 2 lamp is on.
		3	Selection of 4-20 mA/1-5 V	ALARM 1 lamp is on.
		4	Analog output adjustment for Maintenance Mode 2	MNT lamp is on.
		5	Analog output adjustment for initial delay	TEST lamp is on.
3	For Manufacturer Use only	1	———	———
		2	———	———
		3	———	———
		4	———	———
		5	———	———
4	Other Adjustment	1	Setting the alarm set point	TROUBLE lamp is on.
		2	Heater current adjustment	ALARM 2 lamp is on.
		3	Switching the intensity level of the LED bar graph meter between 'high' and 'low'.	ALARM 1 lamp is on.
		4	Display of linear data (for reference only)	MNT lamp is on.
		5	———	———
5	For Manufacturer Use only	1	———	———
		2	———	———
		3	———	———
		4	———	———
		5	———	———

(3) Checking and adjusting the current of sensor heater (for Groups 1 and 4 only)

Pull the panel lock knob to remove the indicator unit from the metal housing. Connect a voltmeter having a high internal resistance (min.100 kΩ) to the test terminal of the heater, which is located at the top of the indicator unit. Measure the heater current. A standard resistor (1Ω) is installed in between the (+) and (-) test terminals. Therefore, for example, if the measured voltage is 180 mV, it means the current is 180 mA. A heater current sticker is attached on the right side of the indicator unit. Check that the measured current is ±2 mA of the value specified in the sticker. If the measured current is out of the specified range, enter Mode 4-2 (heater current adjustment), and turn the multi-functional switch forward or backward to adjust the heater current so that it will be within the specified range. To save the current settings, press up and hold the multi-functional switch until the POWER lamp goes off.

Heater Current Sticker

Voltmeter

Heater Current
Test Terminal

Pull to remove indicator unit
from meta housing.
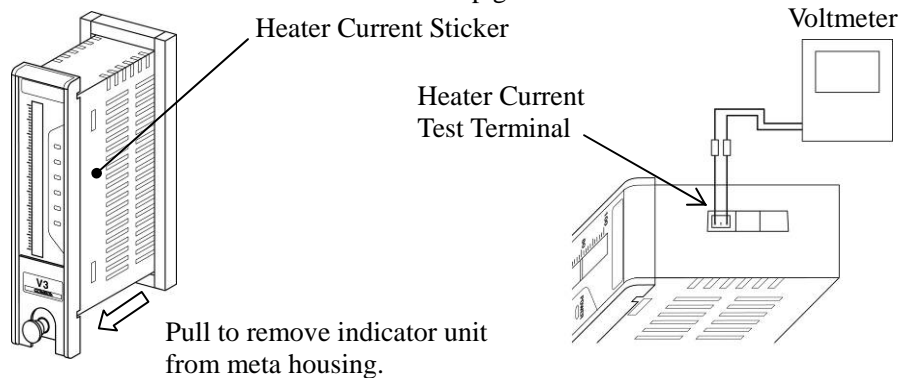
(4) Zero check and adjustment of gas detector (21.0 vol.% for oxygen detector)

If the bar graph meter does not show "0" after the warm-up operation, introduce clean air into the gas detector and make zero adjustment on the gas detector. For oxygen detection, if the bar graph meter does not show 21.0 vol.%, introduce clean into the gas detector and adjust the value to 21.0 vol.%. For zero adjustment on the gas detector, refer to the instruction manual for the gas detector.

(5) Zero/span adjustment of indicator unit

MEMO	· If the power of the gas detector has been off for a long period of time (i.e., between shipment and the first energization), it may take longer for the reading of the bar graph meter to stabilize. · For types M, O, and D, make adjustment on the gas detector. If the indicator unit (type O) does not show 21.0 vol.% after the adjustment on the gas detector, turn the indicator unit off and on again. If it dos not show 21.0 vol.% again at this point, make adjustment on the indicator unit.

The zero/span adjustments of the indicator unit have been made at the time of shipment and normally they do not need to be performed again. When the bar graph meter on the indicator unit does not show zero (or 21.0 vol.% for oxygen detector) after operation check of the gas detector using the test mode, make zero/span checks and adjustments on the indicator unit by doing the following steps.

Note that different adjustment method should be used to adjust the indicator unit which is equipped with linearizer and zero suppression functions.

⚠ CAUTION

• When making a zero adjustment, always make sure that the air around the gas detector is clean.
  Proper adjustments cannot be performed in gas atomosphere.

Zero Suppression Function

For the indicator unit with zero suppression function, the bar graph meter will continue to indicate "0" until the concentration of the target gas detected by the gas detector exceeds the pre-set value. The zero suppression value (pre-set value) is given in the specifications for the gas detector.

<1> One-touch Zero Adjustment (Perform manual zero adjustment for Group 4, which has no one-touch zero adjustment function. Refer to <2>-B for the procedure.)

Make sure that the atmosphere in the vicinity of the gas detector is gas-free, and press and hold the ADJ button on the front panel until the POWER lamp turns off. The POWER lamp will temporarily turn off, and the zero adjustment procedure will begin. Once the adjustment is completed, the POWER lamp flashes once. If the zero adjustment fails, the POWER lamp slowly flashes three times. If the adjustment is unsuccessful, perform a manual zero adjustment described in <2> below.

One-touch zero adjustment is also available by using Mode 1-5. (Press up and hold the multi-functional switch to lock the current settings after the adjustment with Mode 1-5.)

Press and hold the ADJ button.

Display in Normal Operation   Display in Mode 1-5
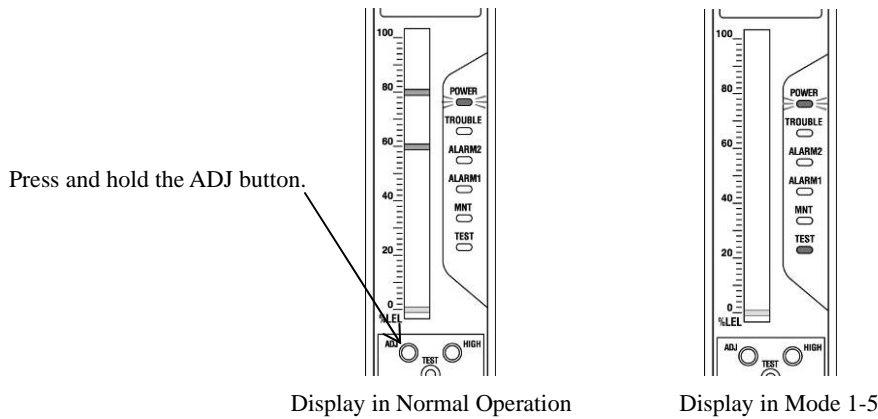
<2>-A. Manual Zero Adjustment (for Groups 1, 2, and 3)

If the one-touch zero adjustment described in <1> fails, perform the zero adjustment manually by doing the following steps:

Release the mode lock by following the procedure in (2) <1> on page 23.

Refer to Table 1, "List of Modes" on page 25, and select Mode 1-1 (coarse zero adjustment) or Mode 1-2 (fine zero adjustment). Be sure to perform the zero adjustment before performing the span adjustment.

Turn the multi-functional switch so that the lamp for "mode 1" will turn on.
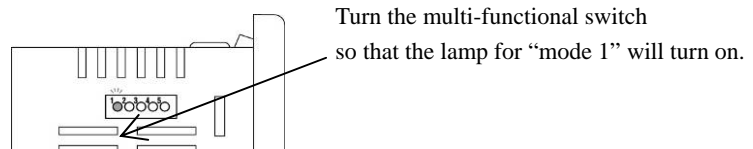
Make sure that the atmosphere in the vicinity of the gas detector is gas-free. Select Mode 1-1 (coarse zero adjustment) or Mode 1-2 (fine zero adjustment) Turn the multi-functional switch forward or backward to adjust the value of the bar graph meter to "0."
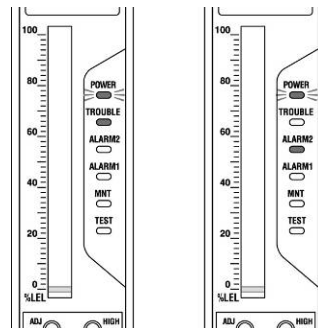
Coarse Zero Adjustment (Left)   Fine Zero Adjustment (Right)

When the adjustment is completed, press up and hold the multi-functional switch until the POWER lamp turns off. The set value will be saved. Be sure to perform this step each time the adjustment is completed. To cancel the adjusted value, either press up the multi-functional switch once or press the LOW button before pressing up and holding the multi-functional switch. The setting will be cancelled.

To perform a span adjustment after completing the zero adjustment, press up the multi-functional switch once to select Mode 1-3 (span adjustment) and make the adjustment by following the procedure in <3> below.

To perform setting and adjustment in a different mode, press the LOW button on the front side of the indicator unit. The current mode will end and another mode can be selected.

To complete the adjustment procedure, press and hold the HIGH button on the front side of the indicator unit. The currently selected mode will be locked and normal operation will resume.

<2>-B. Manual Zero Adjustment (for Group 4)

Release the mode lock by following the procedure in (2) <1> on page 23.

Refer to Table 1, "List of Modes" on page 25, and select Mode 1-1 (coarse zero adjustment). Be sure to perform the zero adjustment before performing the span adjustment.

Turn the multi-functional switch
so that the lamp for "mode 1" will turn on.
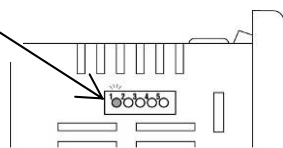
Make sure that no gas is found in the vicinity of the gas detector. Turn the multi-functional switch forward or backward to adjust the bar graph meter until the TEST lamp turns on.

Once the adjustment is completed, press up and hold the multi-functional switch until the POWER lamp turns off. The set value will be saved. Be sure to perform this step each time the adjustment is completed. To cancel the adjusted value, either press up the multi-functional switch once or press the LOW button before pressing up and holding the multi-functional switch. The setting will be cancelled.

Refer to Table 1, "List of Modes" on page 25, and select Mode 1-2 (fine zero adjustment).

Make sure that no gas is found in the vicinity of the gas detector. Turn the multi-functional switch forward or backward to adjust the value of the bar graph meter to "0."
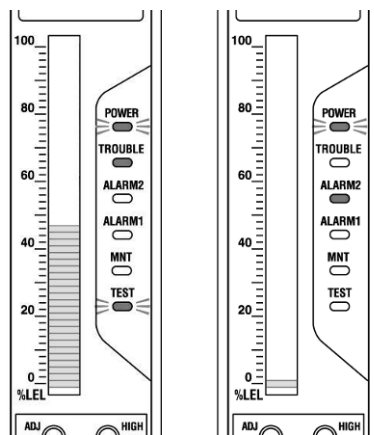
Zero Coarse Adjustment (left)   Fine Zero Adjustment (right)

Once the adjustment is completed, press up and hold the multi-functional switch until the POWER lamp turns off. The set value will be saved. Be sure to perform this step each time the adjustment is completed.

To perform a span adjustment after completing the zero adjustment, press up the multi-functional switch once to select Mode 1-3 (span adjustment) and make the adjustment by following the procedure in <3> below.
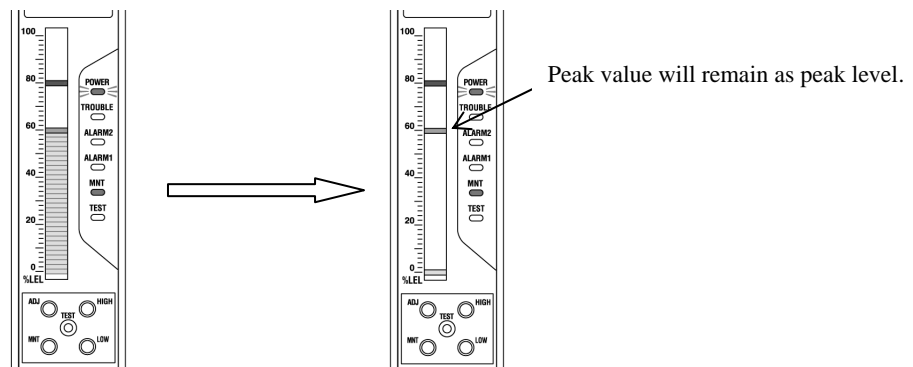
<3> Span Adjustment

<3>-A. Span Adjustment for One-man Maintenance (not available for Group 4. Perform the span adjustment in <3>-2)

Span adjustment for one-man maintenance is a function that allows one operator to perform the span adjustment using the peak hold function by doing the following steps.

1. Set the indicator unit to the maintenance mode (page 22) and release the mode lock by following the procedure in (2) <1> on page 23.

2. Refer to Table 1, "List of Modes" on page 25, and set the indicator unit to Mode 1-4 (span adjustment for one-man maintenance).

3. First decide the target value to be set by span adjustment. A red line is now shown on the bar graph meter. Using the multi-functional switch, adjust the position of this red line according to the concentration of the target gas to be detected by the gas detector. Once the value is decided, save the value by pressing up and holding the multi-functional switch until the POWER lamp turns off.

Adjust the red line and press and press and hold the multi-functional switch for a while.
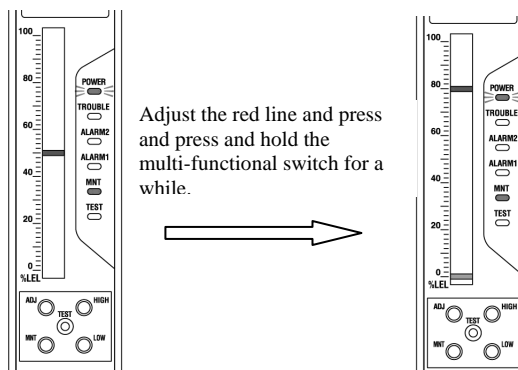
4. Once the span-adjusted value is saved, the current gas concentration and the red line indicating the set value will be shown. The gas concentration bar is shown in green except the peak value, which is shown in orange. Once this display is shown, introduce the gas into the gas detector. When the gas is no longer supplied, the concentration level will drop, but the peak value will remain as the orange line.

Peak value will remain as peak level.

5. If the red and orange lines are not aligned, press up and hold the multi-functional switch until the POWER lamp turns off. The red line will turn into an orange line. Span adjustment is now completed.

Red line turns into an orange line.
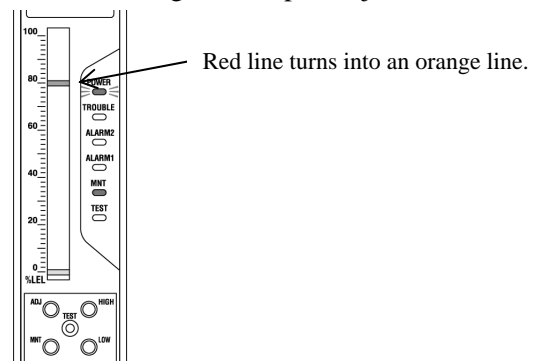
6. Finally, if you desire to enter the other mode and make other setting, press the LOW button on the front side of the indicator unit. If not, press and hold the HIGH button to complete the procedure.

<3>-B. Span Adjustment to be Performed by at Least Two Operators (for Groups 1-4)

Introduce the calibration gas to the gas detector. Once the display on the bar graph meter stabilizes, select Mode 1-3 (span adjustment) and adjust the value to the correct value corresponding to the calibration gas by using the multi-functional switch. (Refer to the instruction manual for the gas detector for details on how to inject gas into the gas detector.)
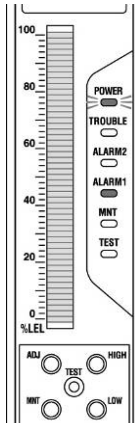
Once the adjustment is completed, press up and hold the multi-functional switch until the POWER lamp turns off. The set value will be saved. Be sure to perform this step each time the adjustment is completed.

<3>-C. Fine Span Adjustment (for Group 4 only)

If span adjustment cannot be completed in the procedure above, use the following steps to perform fine span adjustment.

Select Mode 1-4 (fine span adjustment) and adjust the value of the bar graph meter to the correct value corresponding to the calibration gas by using the multi-functional switch.

Once the adjustment is completed, press up and hold the multi-functional switch until the POWER lamp turns off. The set value will be saved. Be sure to perform this step each time the adjustment is completed.

(6) Zero/span Adjustments for Analog Output
   Follow the procedure in (2) <1> on page 23 to release the mode lock.
   As per Table 1 on page 25, enter Mode 2-1 for zero adjustment and Mode 2-2 for span adjustment, and connect a tester to the terminals (Nos.15 and 16) on the rear side of the metal housing.

   Once the mode is entered, an analog output under the current zero or span adjustment is shown. If the reading is not 4 mA or 20 mA, turn the multi-funct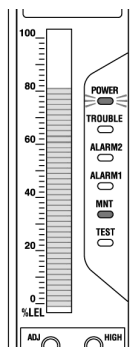ional switch forward or backward to make necessary adjustments. Once the adjustment is completed, press up and hold the multi-functional switch until the POWER lamp turns off. The set value will be saved.

   Using the same procedure, the analog output for Maintenance Mode 2 can be set (Mode 2-4). Make adjustment for your purpose if necessary.

(7) Operational Check using TEST button on Indicator Unit
 <1> Press the MNT button to enter the maintenance mode. (Refer 8-2 "Maintenance Mode.")

 <2> Press the TEST button on the indicator unit to enter the test mode. Use a stick with a round tip for pressing this button. Once the test mode is entered, the bar graph meter switches to the test level display.
   Change the test level by using the HIGH/LOW buttons on the front side of the indicator unit.
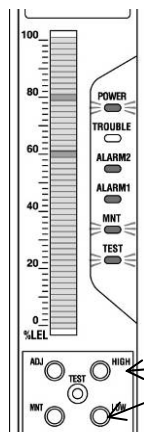
Adjust the test level using the HIGH and LOW buttons.

 <3> Before exiting the test mode, be sure to set the test level below the alarm set point; when the test mode is entered again, the test level set during the previous test mode will be kept. Then press the TEST button to cancel the test mode. The test mode is also cancelled if no operation is performed for 10 minutes.

 <4> If the maintenance mode has been selected, press the MNT button for about 3 seconds after the operational check to resume normal operation.

⚠ **DANGER**

● Be sure to cancel the maintenance mode after completing the operational check in the test mode. If the maintenance mode is kept, the alarm contact output and the output to the alarm unit will not function even if the gas detector detects the target gas at a concentration above the alarm set point.

(8) Alarm Set Point

While the alarm set point is set at the time of shipping, check that the reading on the bar graph meter displays the alarm set point corresponding to the specifications of the indicator unit. If not, release the mode lock to make adjustments in Mode 4-1. When Mode 4-1 is entered, initially an orange line indicating the 1st-stage alarm set point will flash. Turn the multi-functional switch forward or backward to adjust the alarm set point. Once the adjustment is completed, press up and hold the multi-functional switch for about 3 seconds. The POWER lamp (green) will start flashing, turn off, then start flashing again. The setup for the 1st-stage alarm set point is now completed, and a red line indicating the 2nd-stage alarm set point will start flashing. Similarly, turn the multi-functional switch forward or backward to adjust the alarm set point. When the adjustment is completed, press up and hold the multi-functional switch for about 3 seconds to save the set value.
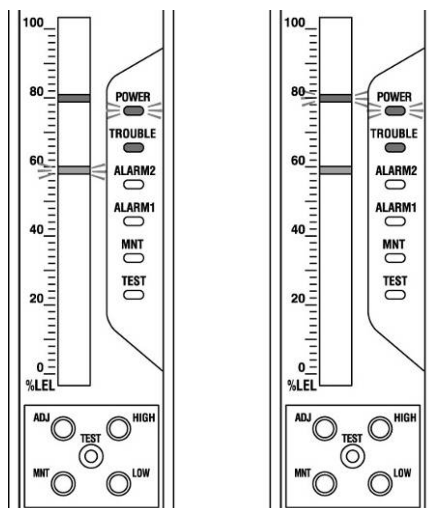
(9) Operation of Trouble Alarm

Check that the trouble alarm will be activated when the connection for the terminal (No.8) (D) on the rear side of the metal housing is removed. To stop the trouble alarm, reconnect the cable wire.
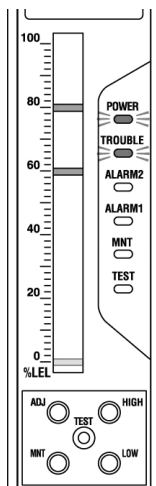
⚠ CAUTION

● Since the operational check of the trouble alarm is performed while the power is turned on, there is a risk of electric shock. Do not perform this check since it has already been performed at the time of shipping.

(10) Operational Check Using Actual Gas

Inject the calibration gas into the gas detector to check that the bar graph meter correctly displays the concentration level and that the alarm functions appropriately.

⚠ DANGER

● When performing an operational check using actual gas, such as combustible gas that has a risk of explosion or a toxic gas harmful to human health, incorrect handling may be extremely hazardous. Make sure that qualified and experienced personnel or our company's operators perform the check.

(11) Intensity of LED Bar Graph Meter

It is possible to switch the intensity of the bar graph meter between high and low by turning the multi-functional switch backward or forward during Mode 4-3.

⚠ CAUTION

● Be sure to check the power capacity of your facility as the high-intensity display consumes higher electricity.

(12) Deactivation of Zero Suppression and Pre-calibration Functions

<1> Deactivation of Zero Suppression Function
　　　Release the mode lock by following the procedure in (2) <1> on page 23.
　　　Select "Mode 1" by following the procedure in (2) <2> on page 24.

Multi-selector Switch

Turn the multi-functional switch so that the LED (No.1) for "Mode 1" will turn on.
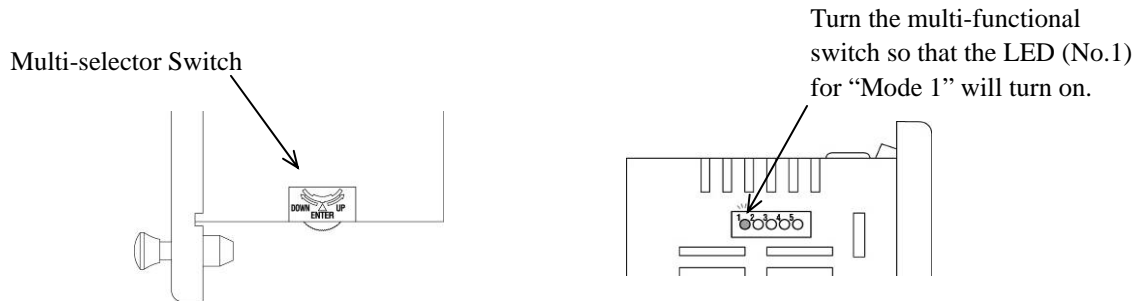
　　　While "Mode 1" is selected, the zero suppression function is deactivated.

<2> Deactivation of Pre-calibration Function
　　　Release the mode lock by following the procedure in (2) <1> on page 23.
　　　Select "Mode 1-1", "Mode 1-2" or "Mode 1-3" by following the procedure in (2) <2> on page 24.

Turn the multi-functional switch so that the LED (No.1) for "Mode 1" will turn on.

Select
Mode 1-1, Mode 1-2, or Mode 1-3.
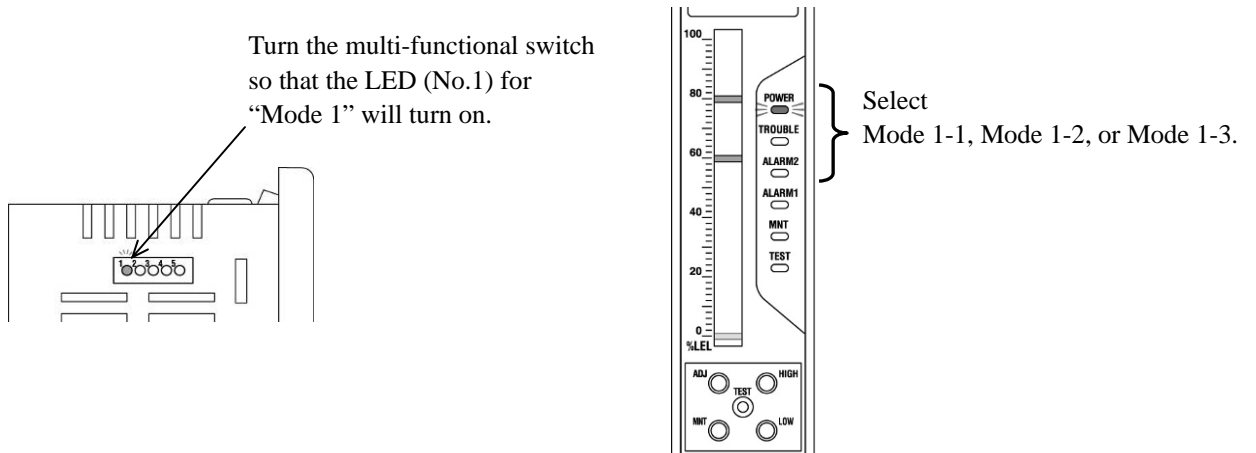
　　　Press and hold the TEST button. While holding the button down, the calibration function is deactivated.
　　　Note: Use a stick with a round tip to press the TEST button.

MEMO	Even though the TEST button is pressed during Mode 1-1, Mode 1-2 or Mode 1-3, the test mode will not be activated.

8-4. Instructions on Alarm Functions

<1> When the bar on the bar graph meter exceeds the 1st-stage alarm set point (or falls below the alarm set point if it is the lower limit), the bar graph display will turn orange. The 1st-stage ALARM lamp (red) will begin flashing and the 1st-stage alarm contact output will be activated.

- Alarm Operation of Alarm Unit
  The alarm uuit operates in conjunction with the indicator units and, ALARM 1 (red) lights up and an intermittent "beep" starts sounding.
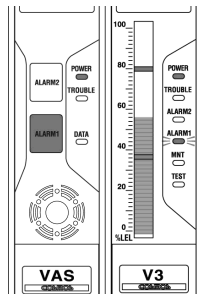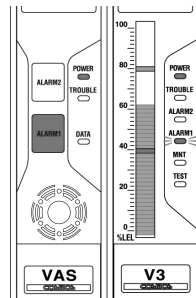
Upper Limit Alarm   Lower Limit Alarm

<2> When the bar on the bar graph meter exceeds the 2nd-stage alarm set point (or falls below the alarm set point if it is the lower limit), the bar graph display will turn red. The 1st-stage ALARM lamp (red) and the 2nd-stage ALARM lamp (red) will begin flashing and the 1st-stage alarm contact output and the 2nd-stage alarm contact output will be activated.

- Alarm Operation of Alarm Unit
  The alarm unit operates in conjunction with the indicator unit and both the ALARM 1 (red) and ALARM 2 (red) lamps light up and an intermittent "beep" starts sounding.
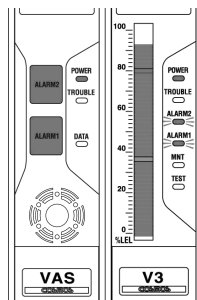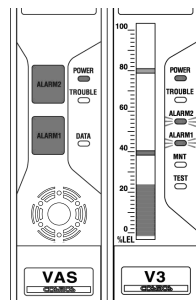
Upper limit alarm   Lower limit alarm

⚠ DANGER

- When the indicator unit begins to sound an alarm, stay calm and check that there is no fire in the vicinity. Do not touch any electric switches under any circumstances. Sparks from turning the switch on or off may cause ignition.

⚠ WARNING

- If there is a gas leak alarm, take the necessary measures specified by your company.

<3> When your indicator unit is "double range type" (Optional),

The "double-range type" indicator unit monitors the gas concentration in two ranges, low and high.

The unit indicates the gas concentration in 0 to 10% LEL for low range and 0 to 100% LEL for high range. The unit normally shows the concentration in low range. When the gas concentration reaches the maximum in low range, the TEST/RANGEx10 lamp will turn on and the unit will automatically change the indication to show the concentration in high range. When the gas concentration drops below the maximum value (full scale value) of the low range, the TEST/RANGEx10 lamp will turn off and the unit will automatically change the indication to show the concentration in low range.

When the TEST button is pressed, the test mode will be started and the TEST/RANGEx10 lamp will start flashing.
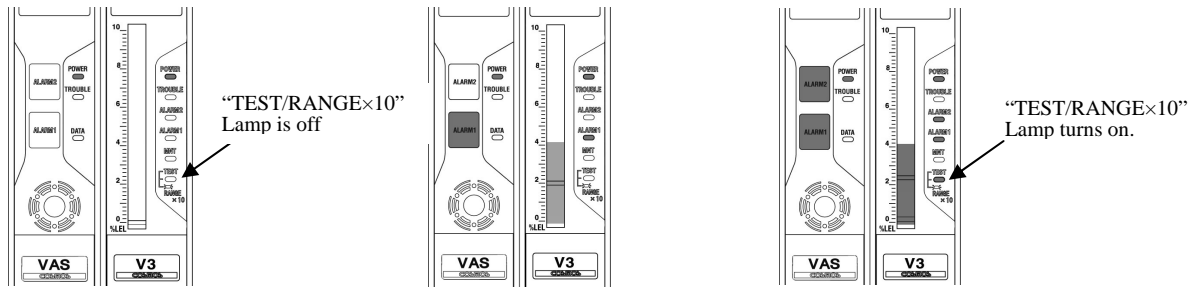
Normal Operation	Low Range	High Range

Alarm Unit and Double-range Type Indicator Unit

8-5. How to Stop Alarm

The reset button and the buzzer stop button on the alarm unit or the control panel are used to stop an alarm. Note that the procedure to clear the alarm varies depending on the alarm mode.

a) When the self-holding type indicator units and the full-lock type alarm unit are used,

<1> Press the buzzer stop button on the alarm unit. The ALARM lamp (red) on the indicator unit will turn on.

<2> Once the bar on the bar graph meter falls below the alarm set point, press the reset button on the alarm unit. The LED bar will turn green when the 1st- and 2nd-stage alarms are cleared. The ALARM lamp on the indicator unit (red) will turn off and the alarm contact output will be stopped.

Alarm Indicator/ Contact Status/Operation	Indicator Unit ALARM Lamp (red)	Indicator Unit Alarm Contact Output	Alarm Unit ALARM Lamp (red)	Alarm Unit Buzzer
When the alarm is activated	Flashing	Activated	On	Intermittent
When the buzzer stop button is pressed (the reset button is not pressed yet)	On	Activated	On	Deactivated
When the reset button is pressed (to clear the alarm)	Off	Deactivated	Off	Deactivated

b) When the self-holding type indicator units and the semi-lock type alarm unit are used

<1> Press the reset button on the alarm unit. The ALARM lamp (red) on the indicator unit will turn on.

<2> Once the bar on the bar graph meter falls below the alarm set point, the LED bar will turn green automatically (1st- and 2nd-stage alarms will be cleared), the ALARM lamp (red) will turn off and the alarm contact output will be stopped.

Alarm Indicator/ Contact Status/Operation	Indicator Unit ALARM Lamp (red)	Indicator Unit Alarm Contact Output	Alarm Unit ALARM Lamp (red)	Alarm Unit Buzzer
When the alarm is activated	Flashing	Activated	On	Intermittent
When the reset button is pressed and the bar is above the alarm set point	On	Activated	On	Deactivated
The bar drops below the alarm set point (alarm is canceled)	Off	Deactivated	Off	Deactivated

c) When the auto-recovery type indicator units are used

<1> Once the bar on the bar graph meter falls below the alarm set point, the LED bar will turn green automatically (1st- and 2nd-stage alarms will be cleared), the ALARM lamp (red) will turn off and the alarm contact output will be stopped.

<2> The buzzer will stop if the buzzer stop button is pressed. (After the buzzer stops, the ALARM lamp will become continuously lit.)

Alarm Indicator/ Contact Status/Operation	Indicator Unit ALARM Lamp (red)	Indicator Unit Alarm Contact Output	Alarm Unit ALARM Lamp (red)	Alarm Unit Buzzer
When the alarm is activated	Flashing	Activated	On	Intermittent
When the buzzer stop button is pressed and the bar is above the alarm set point.	On	Activated	On	Deactivated
The bar drops below the alarm set point (alarm is canceled)	Off	Deactivated	Off	Deactivated

8-6. Trouble Alarm

The trouble indicators and the trouble alarm output will be activated when the indicator unit detects any problem, such as a decrease in the gas concentration level detected by the gas detector or a decrease in the flow rate of the suction-type gas detector with a built-in flow sensor. Check the cause of the problem and take necessary steps.

When the trouble alarm is activated, the alarm unit will sound a continuous beep. Press the buzzer stop button on the alarm unit (or the reset button if your alarm unit is semi-lock type) to stop the buzzer.

	Indicator Unit POWER Lamp (Green)	Indicator Unit TROUBLE Lamp (Yellow)	Indicator Unit TROUBLE Alarm Contact Output	Alarm Unit TROUBLE Lamp (Yellow)	Alarm Unit Buzzer
When the trouble alarm activates.	On	Flashing	Activated	On	Continuous beep
From the time the buzzer stop button (or reset button) is pressed until the problem is fixed.	On	Flashing	Activated	On	Deactivated
The problem is fixed.	Starts flashing when the warm-up operation begins, and turns on when it is completed. (When the flow rate recovers to normal levels, it turns on immediately.)	Off	Cancelled	Off	Deactivated

－Troubleshooting－

Take the fuse out of the fuse holder and ensure that it has not blown. If not, investigate for other cause(s) and take appropriate actions.

Location of Trouble	Possible Cause	LED Lamp Status	Corrective Action
Problem in indicator unit	Blown Fuse	All lamps: Off	Take the fuse out of the fuse holder, remove the cause of excessive current, and replace it with a new one. (Refer to Section 5 "Outer Appearance and Component Names")
	Drop in power voltage	POWER lamp: On TROUBLE lamp: Flashing	If the power voltage falls to 18.0 V or below, the trouble alarm will sound. Make sure that the power voltage is 24.0 V±10%.
Problem in indicator unit or gas detector	Break in the cable between the indicator unit and the gas detector	POWER lamp: On TROUBLE lamp: Flashing	If no break in the cable is fond, make sure that the wiring is done correctly and that the connection is secure (e.g., loosening of terminal screw). (Refer to Section 7 "Wiring Connections".)
Problem in gas detector	Drop in the flow rate of the suction-type gas detector[*]	POWER lamp: On TROUBLE lamp: Flashing	Remove the clog in the suction inlet or piping of the suction-type gas detector. If the filter in a flow checker is dirty, replace it with a new one. (Refer to the instruction manual for the gas detector used.)
	Sensor failure	POWER lamp: On TROUBLE lamp: Flashing	Contact our authorized representative for sensor replacement.

*Applicable only to suction-type gas detectors with a flow sensor that emit low flow rate signals.

If none of the above causes is applicable, or the problem is not fixed after action has been taken, consult our authorized representative.

9. Maintenance and Inspection

(1) Routine Check

Perform routine check given in the table below.

Item	Frequency	Description
Routine Check (User's Responsibility)	About once every day	・POWER Lamp (green): Check that the POWER lamp turns on and that the indicator unit operates normally.
		・Display of Bar Graph Meter: Check that the display of the bar graph meter is not abnormal.
	At least once every month	・Operational Test with the TEST Button: Press the TEST button to check that an alarm will be correctly issued (alarm lamps and buzzer sounds).

(2) Periodic Inspection (to be done by our qualified service personnel)

It is necessary to perform periodic inspection at least once a year.
Consult our authorized representative.

Important Notice for Periodic Inspection

It is extremely important to conduct maintenance and periodic inspections in order to maintain the reliability of the gas detection and alarm system. It is highly recommended that you consider periodical inspections under a maintenance contract with New Cosmos authorized representative.

⚠ CAUTION

- Checking the alarm function by pressing the TEST button activates the analog output, alarm contact output, and output to the alarm unit (does not activate in the maintenance mode). For this reason, if the alarm contact output is used to interlock an external device, release the interlock beforehand. Also, notify all personnel of the inspection before starting it.
- The circuitry check (with the TEST button) on the alarm must be done more than once a month, and the check on detection and alarm must be done more than once a year in accordance with the applicable safety rules for liquefied petroleum gas and high-pressure gases.

10. Before Requesting Repair

Before requesting repairs, check the following: If any problems occur with your unit, check the following before requesting repairs.

Symptom	Cause	Action	Reference
The POWER lamp does not light up when the power switch is turned on.	・The power switch is set to off.	・Turn on the power switch.	8-1. Start-up Operation (page 21)
	・Loose wiring connection.	・Check the wiring and retighten the terminal screws.	7. Wiring Connections (page 12)
The TROUBLE lamp on the indicator unit is flashing while the TROUBLE lamp on the alarm unit is continuously lit, and the buzzer is sounding continuously.	・Blown fuse.	・Replace the fuse with a new one.	8-6. Trouble Alarm (page 38)
	・Break in the cable between the indicator unit and the gas detector or incorrect wiring.	・Check the wiring to make sure there is no break in the cable and that the wiring is correct.	
	・Sensor failure.	・Replace the sensor with a new one.	
	・The flow rate of the suction-type gas detector is low.	・Make sure that the inlet and piping of the gas detector are not clogged.	
	・The power voltage is 18 V or below.	・Check and adjust the power voltage to 24 V±10%.	

If the symptom persists after performing the action above, or the problem is not listed in the table above, contact our authorized representative for repair.

11. Specifications

Item	Description
Product Name	Indicator Unit (for gas detection/alarm system)
Model	V3
Detection Method	As per specifications of gas detector
Number of Alarm Stages	2 stages
Indicator	3-colored LED bar graph meter (50 segments)
Target Gas	As per specifications of gas detector
Indication Range	As per specifications
Alarm Set Range	As per specifications
Alarm Accuracy	As per specifications of gas detector ・Combustible gas: ±25% of the alarm set point under the same conditions ・Toxic gas: ±30% of the alarm set point under the same conditions.
Delay Time	As per specifications of gas detector ・Combustible gas: 30 seconds or less for the concentration that is 1.6 times as high as the alarm set point ・Toxic gas: 60 seconds or less for the concentration that is 1.6 times as high as the alarm set point (excluding delay time caused by piping length)
Alarm Indication	ALARM lamps: Flashes when alarm occurs; continuously lit by reset operation, Two types available, self- holding type and auto-recovery type.
Alarm Contact	1st-stage, 2nd-stage, trouble, no-voltage contact output "Open" or "closed" under the normal operation; normally excited or non-excited modes available for some specifications (Contact capacity: 100VAC 1A, 24VDC; 1A resistance load)
Analog Output	4-20 mA (standard), 1-5V (optional)
Power Source	24 VDC ± 10% (24 VDC ± 6V for some gas detectors connected)
Power Consumption	Approx. 5.0W for power source 24V; power-saving display mode; gas detectors for V2 model (Groups 1, 2, and 3) Approx. 4.0W for power source 24V; power-saving display mode; gas detectors for V1 model (Group 4) Approx. 7.0W for power source 24V + 6V; high-intensity display mode; gas detectors for V2 model (Groups 1, 2, and 3) Approx. 5.0W(for power source 24V + 6V; high-intensity display mode; gas detectors for V1 model (Group4)
Dimensions	W36 x H144 x D70mm (excluding metal housing and projections)
Weight	Approx.150g (excluding metal housing)
Operating Conditions	Operating temperature range: -10 to +40°C (no drastic temperature change) Operating humidity range：10 to 90 %RH (no drastic humidity change and no condensation)
Connection Method	By cable connectors
Installation Method	To be installed to a metal housing or a wall-mounted gas detection/alarm system
Protection Rating	IP2X in mounted condition

The above specifications are subject to change without notice for improvement.
The customized specifications, if available, precede the standard specifications listed above.

12. Warranty

New Cosmos warrants its product to be free from defects in material and workmanship during normal use and service for a period of one (1) year from the date of purchase. If the indicator unit is found to be detective or malfunctions during the warranty period although it is used in accordance with the instruction manual and specifications, we will provide repair service according to the warranty policy. For details, refer to the warranty policy.

We are not responsible for any claims or damages resulting from the use of the product in a manner inconsistent with this manual and intended purpose of the product.

13. Expected Service Life

The expected service life of our product if operated under normal conditions, is 10 years. It is merely a rough indication for the period of use estimated based on the premise that proper gas calibration is done periodically, and we do not give any warranty after one year of the warranty period . The product may fail to operate properly between one calibration and the next.

14. Terms and Definitions

Term	Definition
Gas detector	Equipment that detects gas concentration and converts it into electrical signals.
Target gas:	Gas to be detected and whose concentration is subject to indication or alarm activation.
Detection range	The range of the target gas concentration subject to display and alarm activation.
Alarm accuracy	The difference between the alarm set point and the detected gas concentration at which the alarm begins to sound, or the percentage obtained by dividing said difference by the alarm set point and multiplying the value by 100.
Delay time	Time required for an alarm to be issued after the gas whose concentration is higher (or lower) than the alarm set point reaches the gas detector.
Operating temperature and humidity ranges	The ranges of temperature and humidity in which the gas detection/alarm system can perform its intended functions.
Explosion-protected construction	Structure to prevent electrical equipment from becoming a source of ignition that causes the surrounding explosive atmosphere to ignite.
Calibration gas	Gas used to calibrate the gas detection/alarm system.
Alarm set point	Preset gas concentration value at which the alarm will be activated.
Maintenance and inspection	Works to ensure the intended performance of the equipment.

Revision History

Edition No.	Date	Revision
GAE-041	May 2012	00

Additional copies of this manual are available.

We welcome your input. If you have any comments, please contact New Cosmos or our authorized representatives. Our Contact information is given below.

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