



PT2E-1680

Gas Detector
GD-70D-NT Series

System Construction Manual

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1. Introduction

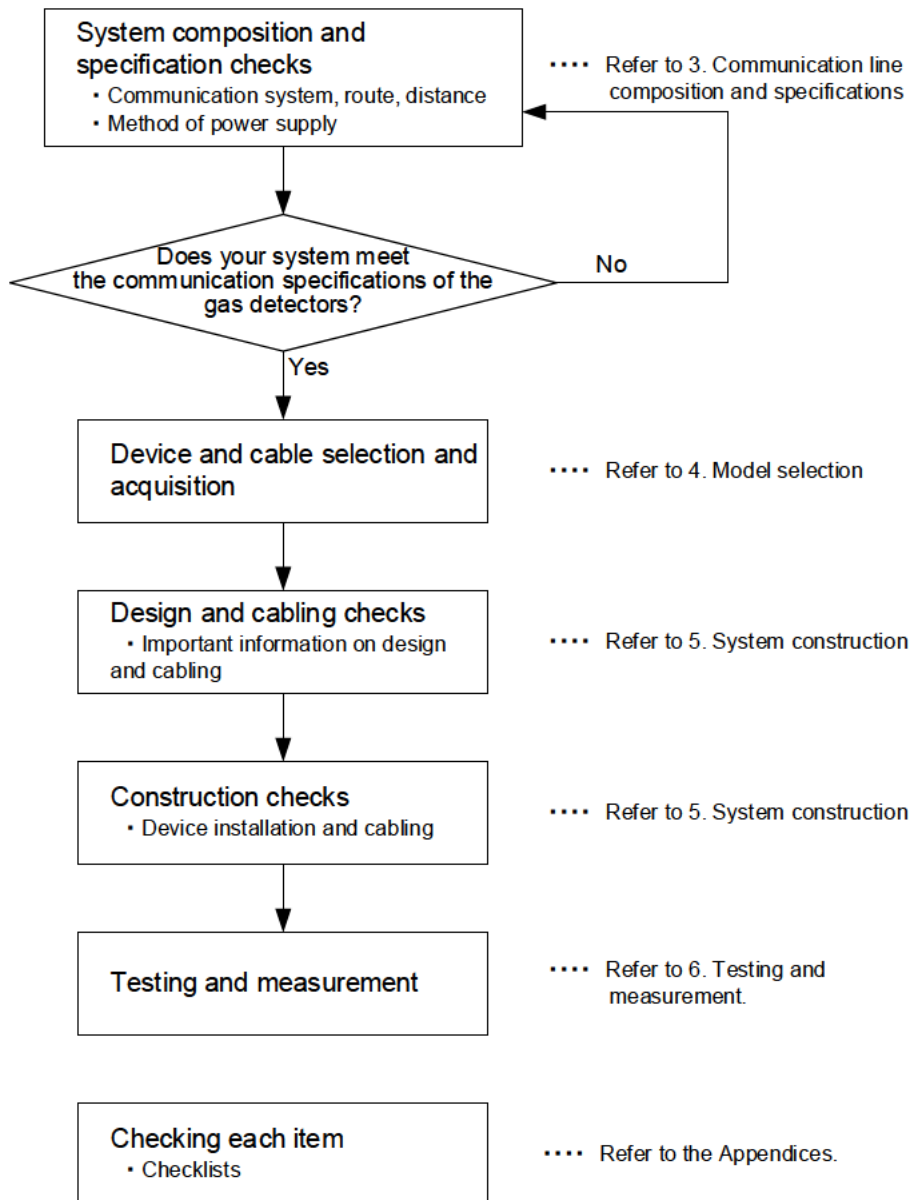
This document has been prepared to help you configure a system with the DC Power-Line Communication Gas Detector (GD-70D-NT) and Signal Converter (SD-70SC-NT).

This document describes information required for system construction, including the procedures and check items required to ensure trouble-free design and construction and to prevent problems on start-up. We recommend that both experienced users and users new to the product read this document thoroughly to ensure the required product knowledge, familiarity, and understanding before proceeding with design and construction.

Additionally, refer to the separately provided GD-70D Series Operating Manual for information on using the gas detector and the separately provided RM-70NT Communication Function Manual for information on settings related to communication data.

1-1. Procedures for laying NT communication line

This manual is organized as follows:



2. Important Notices on Safety

2-1. DANGER, WARNING, CAUTION, and NOTE

▲ DANGER	The DANGER sign indicates that improper handling of the product may result in death, severe injury, or serious property damage.
▲ WARNING	The WARNING sign indicates that improper handling of the product may result in severe injury or serious property damage.
▲ CAUTION	The CAUTION sign indicates that improper handling of the product may result in minor injury or minor property damage.
* NOTE	The NOTE sign indicates recommendations for product handling.

2-2. Warnings

▲ WARNING

Power supply

Before turning on power for the product, be sure to confirm that the power source meets the specified voltage requirements. Avoid using unstable power sources; doing so may lead to malfunctions.

Protective grounding required

Do not cut the protective grounding line of the product or disconnect the protective grounding terminal.

Defects involving protective functions

Before operating the product, check the protective functions for defects. Do not operate the product if you find potential defects in protective functions, including protective grounding.

External connections

Be sure to provide secure protective grounding before connecting the product to the detection target or external control circuit.

3. NT communication line composition and specifications

3-1. Overview of communication line configurations

This product is configured to allow two types of communication. The multi-display unit (MDU: model RM-70NT) is the core component.

- Communication line specifications

Communication type	Description
RS-485	Performs communications between the MDU and the upstream systems. This is for dedicated communications with the gas detector and should not be connected to any device other than the MDU.
DC power-line communication	Performs communications between the MDU and gas detector, as well as supplying power. For dedicated communication with the gas detector Pass the 24 V DC power through a dedicated noise filter. Connect the communication line to the output port. Models that can be connected <ul style="list-style-type: none"> MDU (RM-70NT) GD-70D-NT/SD-70SC-NT PLU-70 (pyrolyzer unit) It is also possible to create a configuration involving a mix of existing models. <ul style="list-style-type: none"> GD-77/71-NT series = existing model series MDU (RM-77NT) = existing model

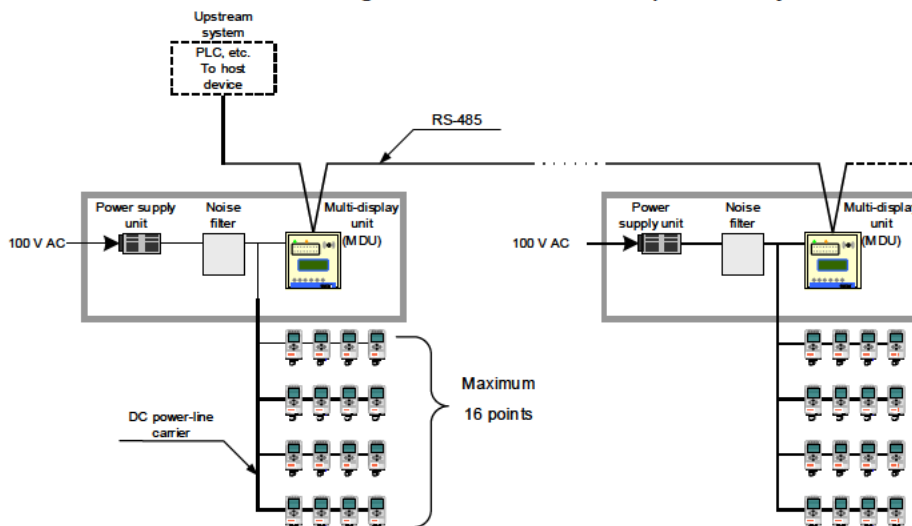
- Communication line wiring methods

Communication type	Method
RS-485	Multi-drop
DC power-line communication	Free topology

- Number of devices connected

Communication type	Description
RS-485	You can connect a maximum of 16 MDUs per system. (A maximum of 256 gas detectors can be connected.)
DC power-line communication	You can connect a maximum of 16 gas detectors per system (Connect 1 MDU.) You can connect up to four PLU-70s (pyrolyzer unit) (Not included in the number of detectors)

In addition to monitoring alarms at 16 points, the MDU can also function as a bidirectional communications interface between the gas detectors and the upstream system.



4. Model selection

4-1. Device and cable selection

Power unit

Item	Description
Power supply capacity	<p>* NOTE</p> <p>Depending on the number of units used, capacity may change significantly when using the pyrolyzer unit (PLU-70) to detect NF3, TEOS, etc.</p> <p>[Reference] Number of connected gas detectors x 5.5 W (MAX.) ≤ Total power supply capacity Power consumption per gas detector = 4 W to 5.5 W The specifics will differ depending on the sensor unit. Refer to the separate specification sheet for more information.</p> <p>25 W (MAX.) per each connected PLU-70 Adds the value per unit.</p> <p>MDU power consumption = 5.5 W (MAX.) Adds the value for one unit.</p>

Cable (for RS-485)

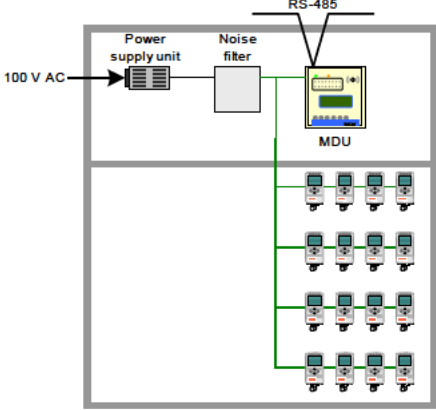
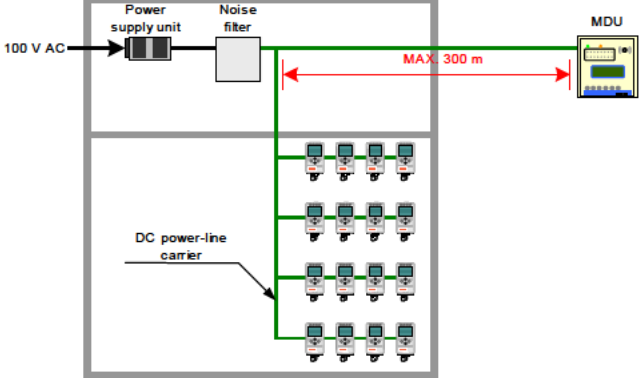
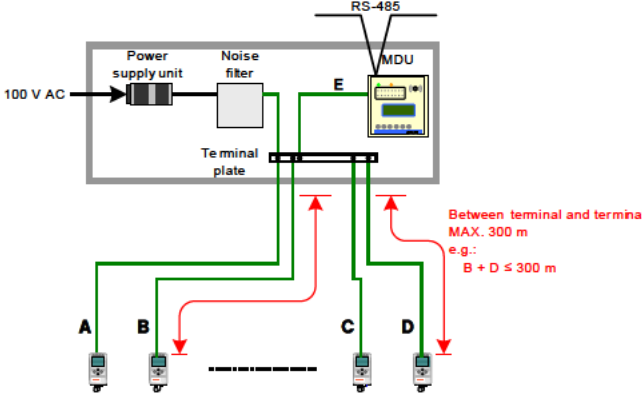
Item	Description
Cable used	<p>Shielded twisted pair</p> <ul style="list-style-type: none"> • KPEVS-1.25 mm²-1P, or CPEVS-0.9Φ-1P <p>* NOTE</p> <p>Use one type of cable throughout the system. Do not mix different types of cables.</p>

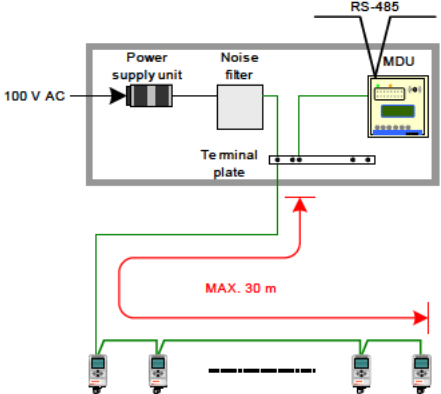
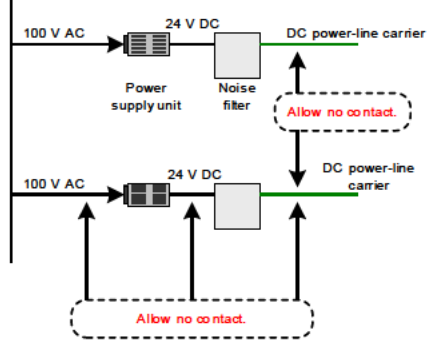
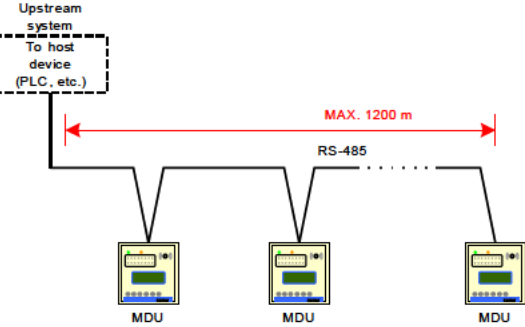
Cable (for DC power-line communication)

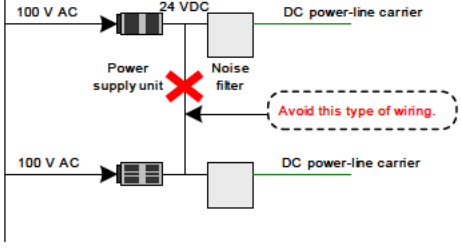
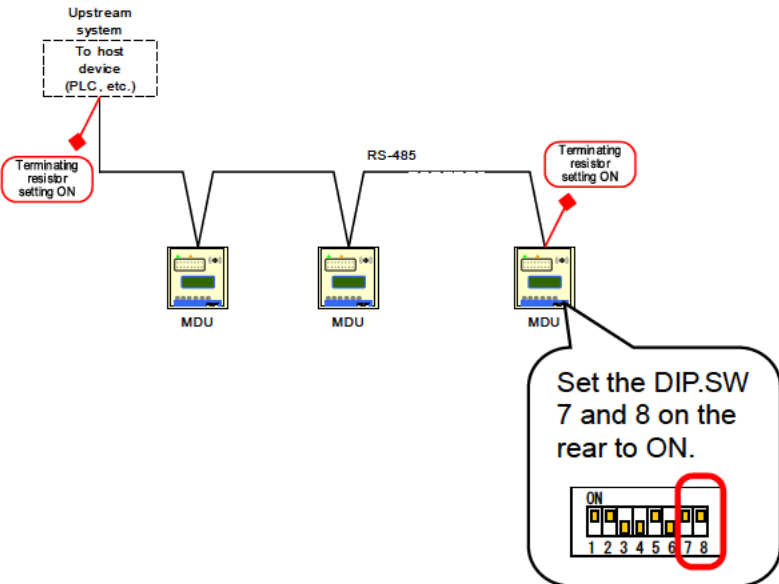
Item	Description
Cable used	<p>Shielded twisted pair</p> <ul style="list-style-type: none"> • KPEVS-1.25 mm²-1P, or CPEVS-0.9Φ-1P <p>* NOTE</p> <p>Use one type of cable throughout the system. Do not mix different types of cables. (In situations where the points connected are close to each other—for example, for configurations on a single gas detector rack—you can also use shielded cables like the MVVS-0.75 mm² 1P.)</p>

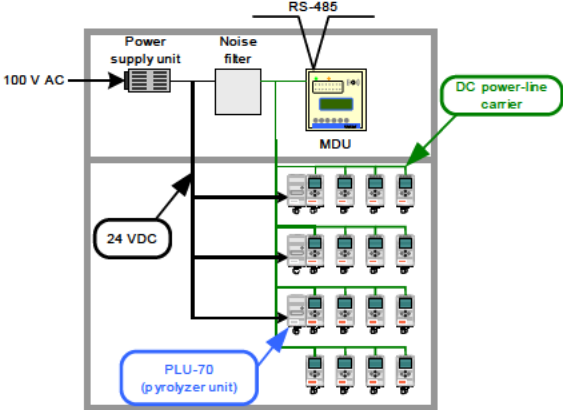
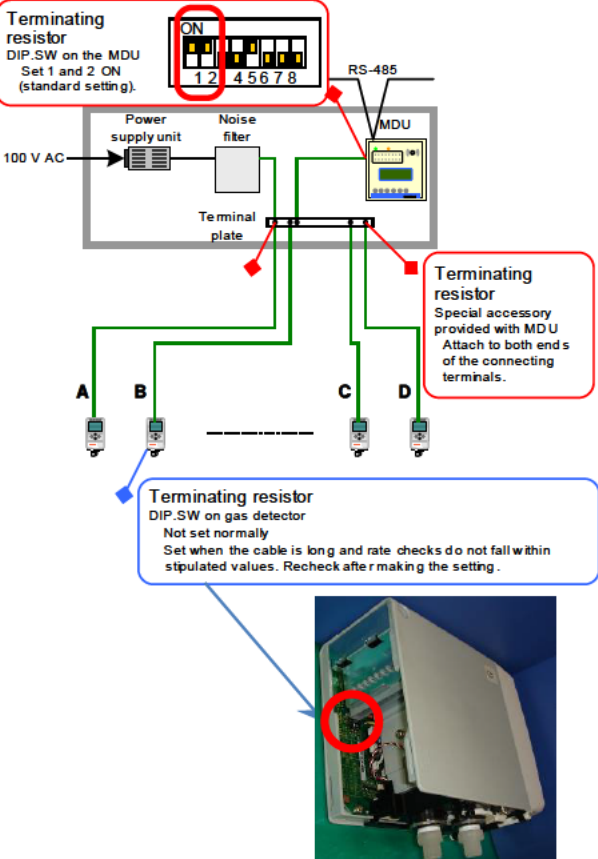
5. System construction

5-1. Important information on design and cabling

No	Item	Description
1	DC power-line communication Communication line configuration 1 (Integrated in gas detector rack)	 <p>All devices on the DC power-line communication line are located on the same gas detector rack. Note that short distances place no limits on length, junctioning, or multi-drop connections.</p>
2	DC power-line communication Communication line configuration 2 (MDU only separated)	 <p>Only the MDU is separate from the other devices on the DC power-line communication line. Lay the cable so that the extension distance is no more than 300 m. (This configuration requires no gas detectors to be separated.) Considering voltage drops, install the power supply unit on the gas detector side with the most connected units.</p>
3	DC power-line communication Communication line configuration 3 (Gas detectors are dispersed.)	 <p>If the gas detectors are dispersed, lay cabling so there is no more than 300 m of cable distance between two devices on a communication line.</p>

No	Item	Description
4	DC power-line communication Communication line configuration 4 (Multi-drop type)	 <p>Account for voltage drops and limit cabling to 30 m (16 connected points).</p> <p>This is not recommended when using a pyrolyzer (PLU-70) due to the increase in power supply requirements. Design the system after referring to “No. 3 Gas detectors are dispersed” on the previous page. Make sure the power supply voltage does not drop below 24 V +/- 10% for the gas detectors and the MDU.</p>
5	DC power-line communication Communication line configuration 5 (Cable laying)	 <p>Measures to prevent crosstalk</p> <p>Wiring on the board</p> <p>As a rule, there should be only one DC power-line communication line system housed in a case.</p> <p>If two systems are housed in a single case:</p> <ol style="list-style-type: none"> ① Ground the shielded line in the communication line. ② Make sure there is no contact between the 100 V power supply, 24 V DC power supply, and DC power-line communication line. Separate when using ducting. ③ Make sure there is no contact between the DC power-line communication lines for different systems. Separate when using ducting. In particular, avoid contact at locations where the shield coating has been stripped. <p>Wiring outside the board</p> <p>Lay cabling so that DC power-line communication lines from different systems do not run parallel.</p>
6	RS-485 Communication line configurations (Cable laying)	 <p>Design using the multi-drop method. (No junctioning allowed) Design with no more than 1,200 m.</p>

No	Item	Description
7	Power supply	 <p>Power supply unit In light of power supply capacity and maintenance requirements, we recommend providing <u>one power supply unit for each DC power-line communication line system.</u></p>
8	Anti-noise measures	<p>To prevent or reduce noise interference, install the cables as far from noise sources as possible. Use racks dedicated for communication to isolate the cables as much as possible. [Reference]</p> <ul style="list-style-type: none"> ▪ From transformers and motors: 120 cm or more ▪ From AC power cables: 30 cm or more ▪ From high voltage cables: 60 cm or more ▪ From fluorescent lamps: 13 cm or more
9	Terminating resistor settings (RS-485)	 <p>Install or configure terminating resistors on the devices at both ends of the communication line.</p> <p>Upstream system: Configure as instructed by the person in charge of the system.</p> <p>On the MDU: Set with the DIP.SW on the rear. Set 7 and 8 to "ON".</p>

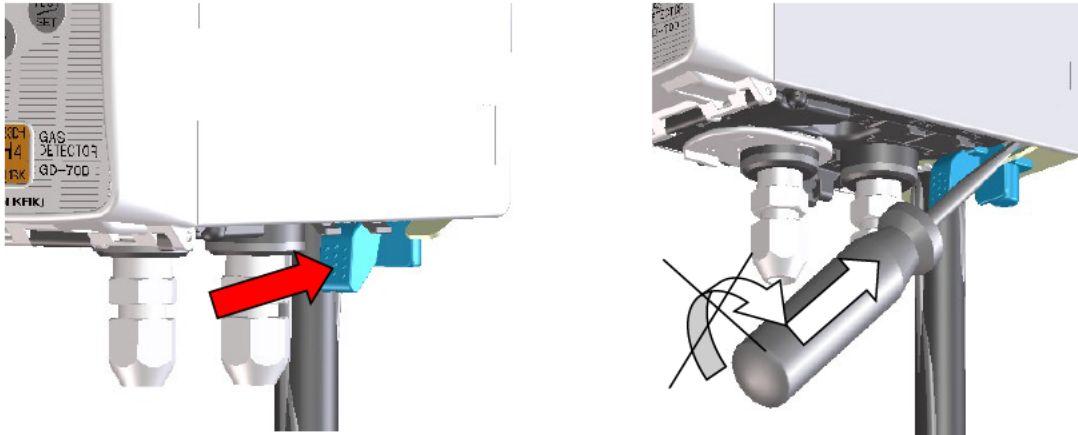
№	Item	Description
10	Power supply for PLU-70 (pyrolyzer unit)	 <p>Power supply for the PLU-70 should not be taken from DC power-line communication line, but, as shown in the diagram above, should be supplied with a 24 V DC power supply. If there is no alternative but to take the power supply from the DC power-line communication line, then the maximum number should be kept to 4 units per system.</p>
11	Terminating resistor settings (DC power-line communication)	 <p>Terminating resistor DIP.SW on the MDU Set 1 and 2 ON (standard setting).</p> <p>Terminating resistor Special accessory provided with MDU Attach to both ends of the connecting terminals.</p> <p>Terminating resistor DIP.SW on gas detector Not set normally Set when the cable is long and rate checks do not fall within stipulated values. Recheck after making the setting.</p> <p>After referring to the diagram above, install and configure the terminating resistor. (Basic three locations up to a maximum of about 5 locations)</p> <ul style="list-style-type: none"> * Purpose of installing a terminating resistor If a signal with a high frequency is sent down the communication cable with the terminal cut off, the signal reflected from the cut surface can mix with the original signal, making it impossible to read the signal. The purpose of installing a terminating resistor is to avoid this phenomenon. If it is necessary to have more than just the basic 3 locations, there is no set location in which to install them, so install where the condition of communication becomes appropriate. * If the terminating resistor is set with the DIP.SW on the gas detector, make sure rules are made so that this can be properly managed, and mark the main unit so that this can be visually confirmed.

5-2. Gas detector installation and wiring

1) Detaching and Attaching Main Unit

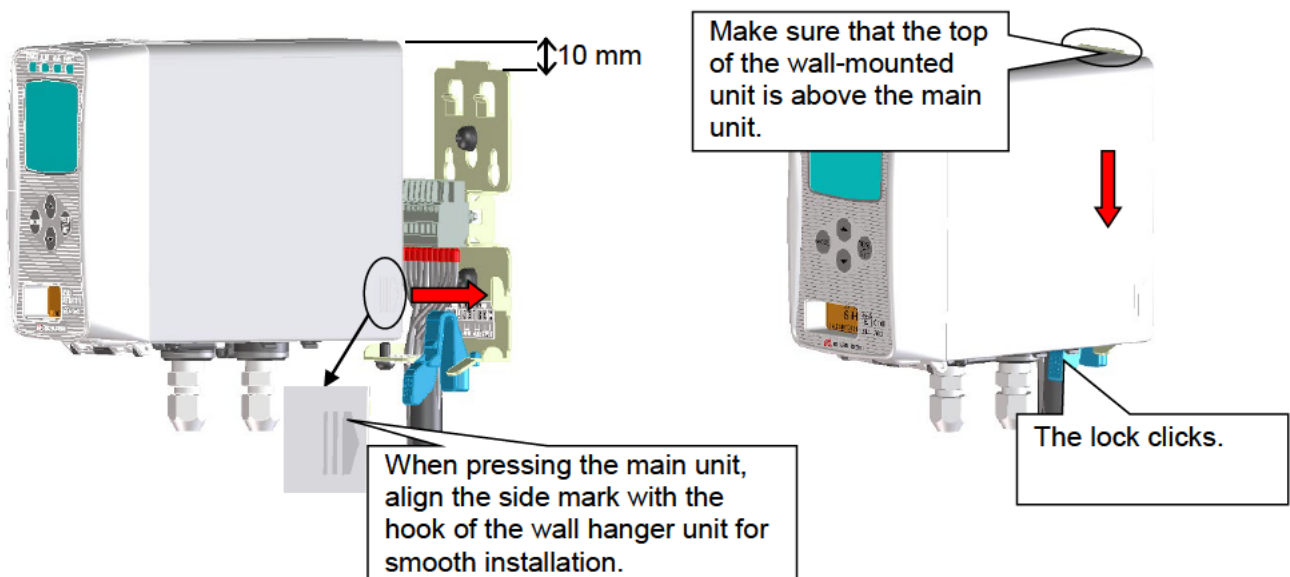
Detaching Main Unit

While pushing the sky blue lock lever toward the wall-mounted unit, hold up the main unit. If you cannot move the main unit, insert a larger flathead screwdriver while pushing the lock lever, and you can easily detach it as shown below. Do not rotate or move up and down the flathead screwdriver. Simply insert it into the wall-mounted unit.



Attaching Main Unit

At the position 10 mm above the wall-mounted unit, press the main unit onto the wall-mounted unit. Be sure to fit both side hooks of the wall-mounted unit in the grooves of the main unit. Then press down the main unit to fix it. The lock at the bottom of the main unit clicks to fix it properly. Make sure that the top center of the wall hanger unit is above the main unit as viewed from front.



CAUTION

- Be careful not to drop the main unit when detaching it. Also, check the secure installation of the main unit after attaching it to the wall-mounted unit. If the main unit is not securely installed, it might fall, causing an unexpected injury or a damage of the unit.
- Turn the power off before detaching or attaching the main unit.

2) How to install

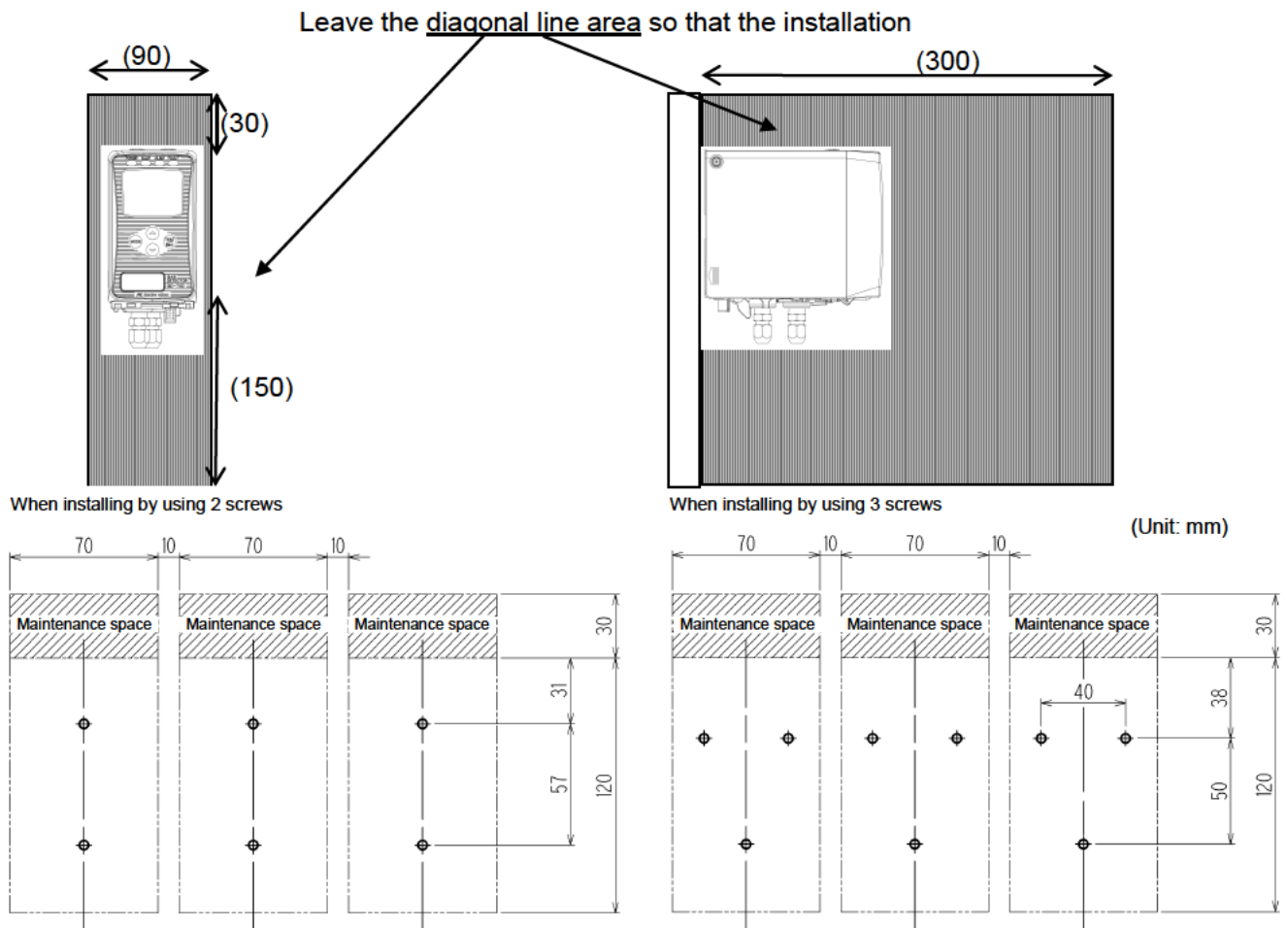
* NOTE

To use the pyrolyzer unit (PLU-70), see also the separate operating manual.

⚠ CAUTION

Before installing the detector, remove the protective rubber caps from GAS IN and GAS OUT. If the detector is turned on with the rubber caps remaining while the installation, applied overload may damage the pump and sensor. Never fail to remove the caps.

<Installation Dimensions and Maintenance Space>



⚠ CAUTION

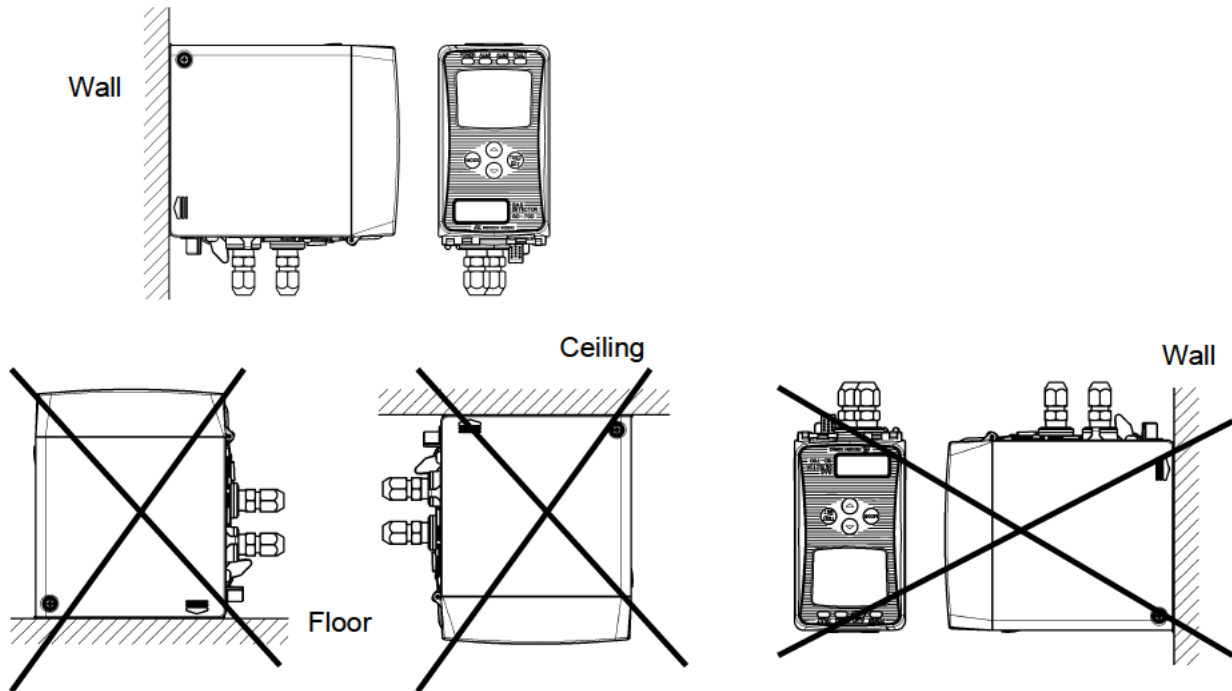
- It is recommended that installation points should be away from each other for 10 mm or more. Intervals between installation points must be at least 5 mm.
- When you install more than one unit of the detector in a line, install them in a rack or wall that are not influenced by vibrations.

When the power supply units are installed side-by-side, if the rack or wall in which the units are installed do not have enough strength, vibrations from the pumps inside the units cause resonance between them. In this case, take preventive actions, for example, reinforcing the rack or wall.

CAUTION

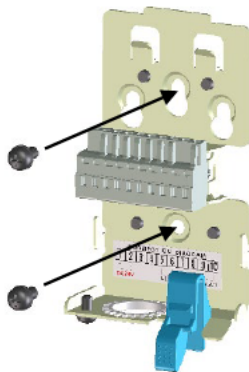
The detector must be installed in the right direction to ensure its performance. Install the detector as shown on the following example, and adjust its position so that it is placed horizontally. (* The direction of the detector must also be kept during transportation, including when it is removed temporarily or relocated.)

<Right Installation Direction>



<Installation of Wall-mounted Unit>

Attach the wall-mounted unit in the installation surface using two or three M5 screws.



Recommended mounting screw (M5)
Length: 8 mm or more
Flat washer of $\Phi 10$ mm or less (small round)

After the wall-mounted unit is attached to the wall, install the main unit in the wall-mounted unit.

CAUTION

Install the unit so that its surface is in intimate contact with the wall-mounted unit. A space between the unit and the wall-mounted unit may invite unnecessary vibrations and noises.

3) How to wire

* NOTE

To use the pyrolyzer unit (PLU-70), see also the separate operating manual.

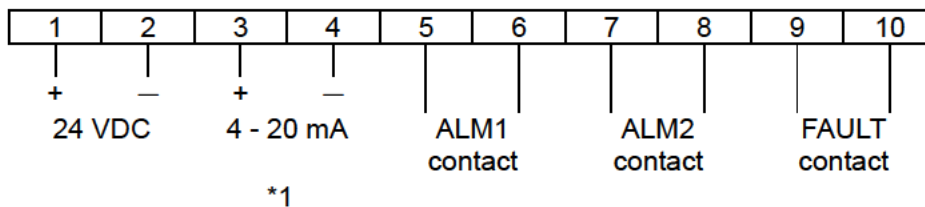
⚠ CAUTION

- Be careful not to damage the internal electronic circuit when wiring. In addition, be careful not to apply stresses on the detector when (overweight) cables are installed.
- The power cables and signal cables must not be installed together with the motor power cables, etc. When these cables must be installed together for unavoidable reasons, put the power cables and signal cables in a metal conduit. The conduit must be connected to a grounding circuit.
- When stranded wires are used, prevent wires from contacting each other.
- Use the dedicated handling lever to wire.

<Recommended Cables>

DC power-line communication (shared with power)	Shielded twisted-pair cable of KPEV-S, etc. (1.25 mm ²) - 1P
For contact	Cable of CVV, etc. (1.25mm ²) - max. 6-core

<Terminal Plate>



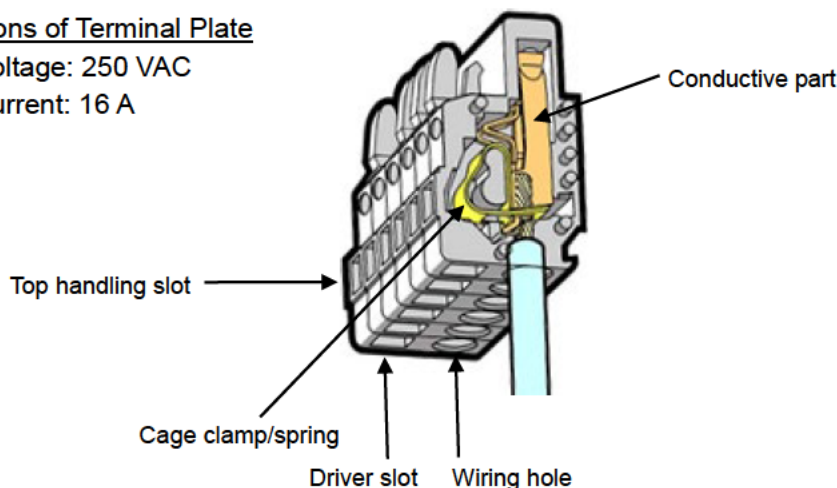
* NOTE

*1: Not used with gas detector (GD-70D-NT)
Signal input at 4 mA to 20 mA for the signal converter (SD-70SC-NT) (Refer to the separate operating manual.)

<Terminal plate specifications>

Specifications of Terminal Plate

- Rated voltage: 250 VAC
- Rated current: 16 A



Connection conditions

- Cable: 0.08 - 2.5 mm²
- Bare wire length: 8 - 9 mm
- Connecting tool: Dedicated handling lever (accessory)

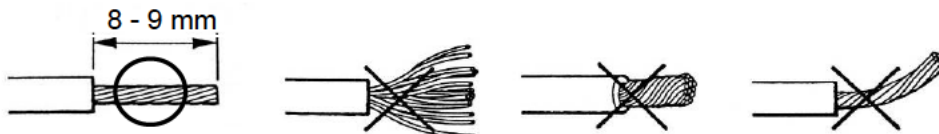


⚠ CAUTION

The specified bare wire length must be observed when the wire insulation is peeled off. Improper clamping of the wire due to a shorter bare wire length may cause defective electric conduction or heating.

Catching the wire insulation due to a shorter bare wire length may cause defective electric conduction or heating.

Exposing the wire due to a longer bare wire length may cause defective insulation or a short circuit. Be careful not to break up the wire. If the wire is broken up when inserted to the terminal, this may cause defective insulation or heating.



Compatible bar terminal

For a bar terminal, the following items are available.

- Bar terminal (ferrule): Model 216 Series (manufactured by WAGO)
- Crimping tool: Model VarioCrimp 4 (206-204) (manufactured by WAGO)

⚠ CAUTION

A bar terminal of the specified model must be used. Using other bar terminals invalidates the warranty of the performance.

<How to Connect to Terminal Plate>

When cables are connected to the connectors, use the dedicated lever or a flathead screwdriver to do it as shown below.

⚠ CAUTION

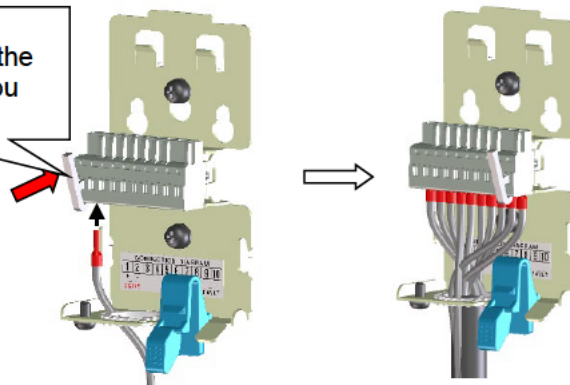
The right tools must be used.

In principle, one wire can be connected to one wiring hole.

When the wire is inserted into the driver slot by mistake, it does not contact the conductive part. This may cause defective electric conduction or heating.

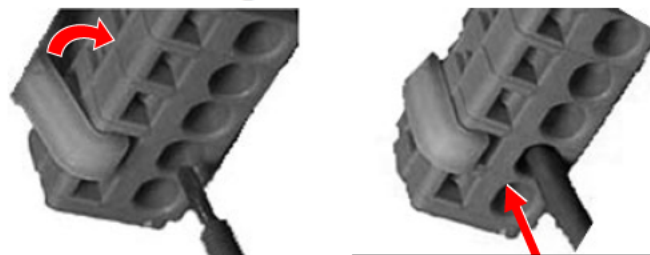
When the wire is inserted under the spring by mistake, it does not contact the conductive part. This may cause defective electric conduction or heating.

Push the dedicated handling lever to open the terminals, into which you can insert wires



* NOTE

<How to Use the Dedicated Handling Lever>



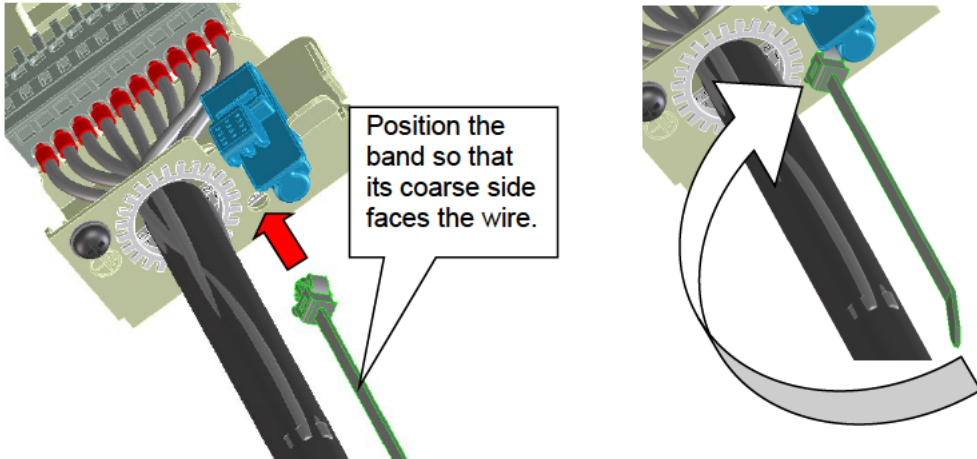
Push the lever with your finger to lower the spring in its inside.

While holding down the lever, insert the wire into the (round) wiring hole until it reaches the deepest point. Once the lever is released, the wire is secured.

To check whether the wire is connected securely, pull the wire gently. (Do not pull the wire strongly.)

<How to Clamp Cables>

Insert the supplied fastening-band to the hole on the wall-mounted unit as shown in the figure. Position the band so that its coarse side faces the wire. After inserting the fastening-band, fix the wire together.



* NOTE

When an optional cable gland is used, it must be attached to the external wiring hole.

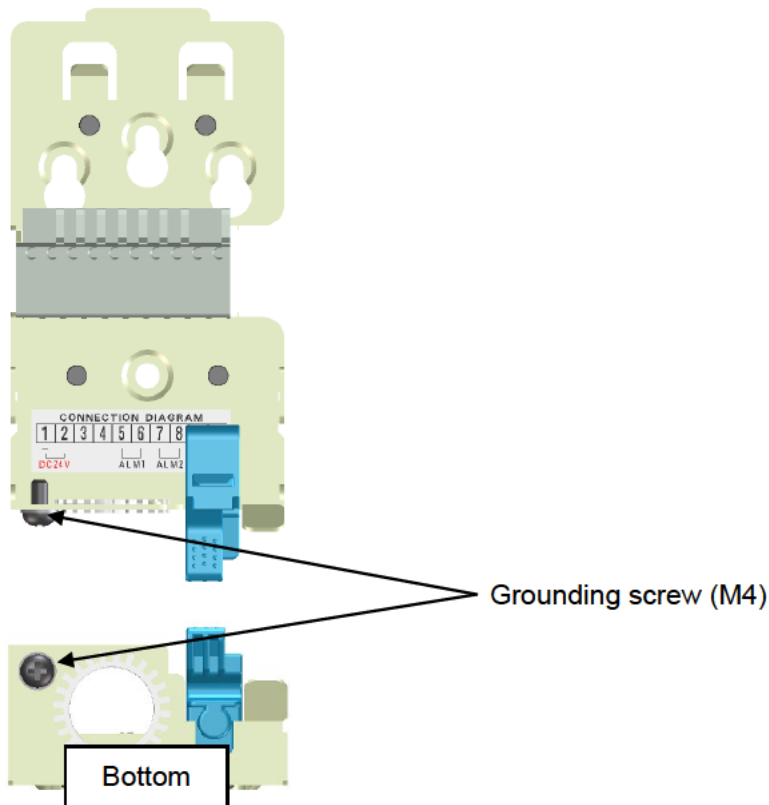


<Grounding>

Connect the detector to your grounding terminal.

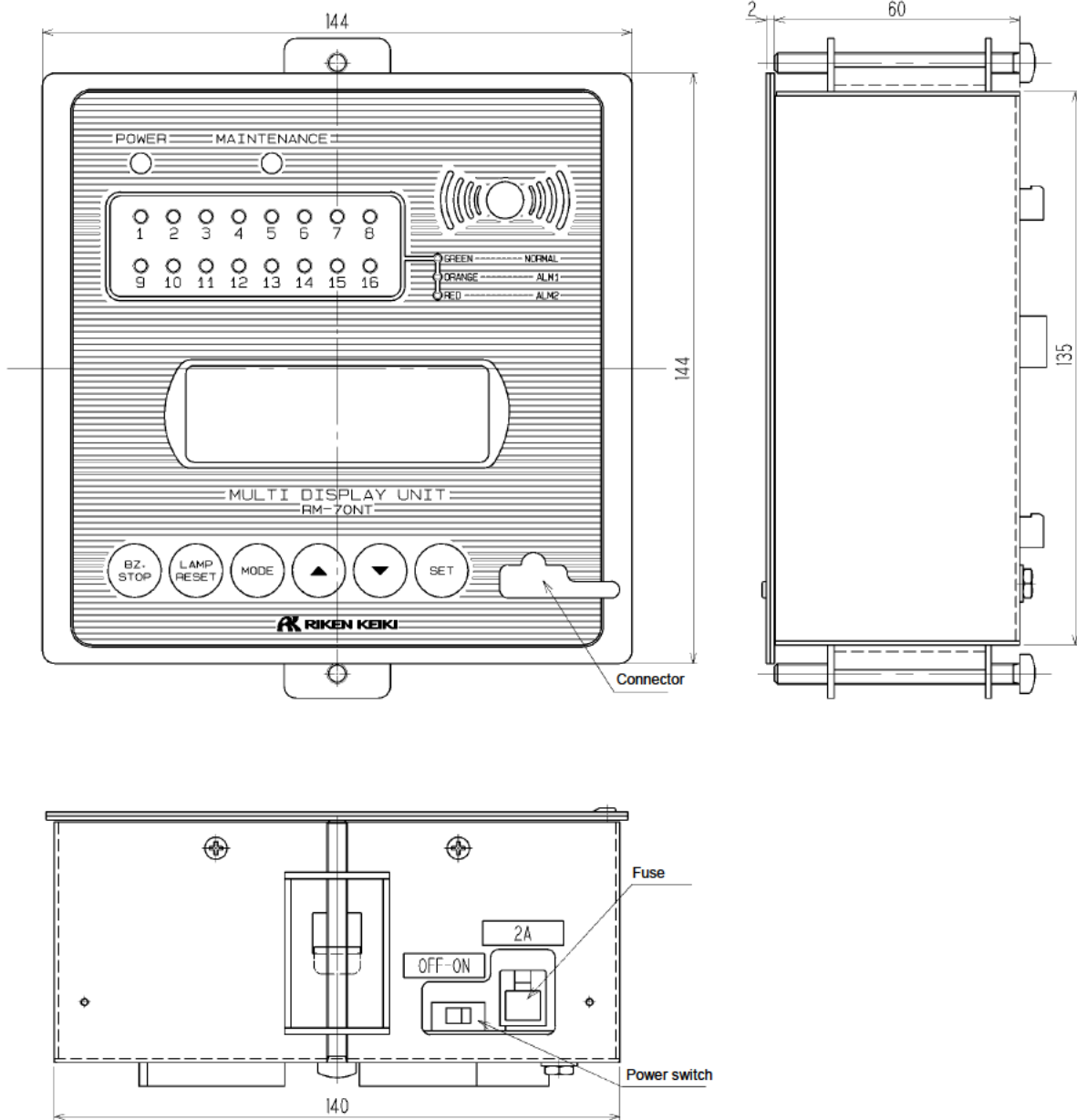
⚠ WARNING

Before turning on the detector, never fail to connect it to a grounding terminal. For stable operation of the detector and safety, it must be connected to a grounding terminal. Do not connect the grounding wire to a gas pipe. The grounding must be made as D type grounding (below 100 Ω of grounding resistance).

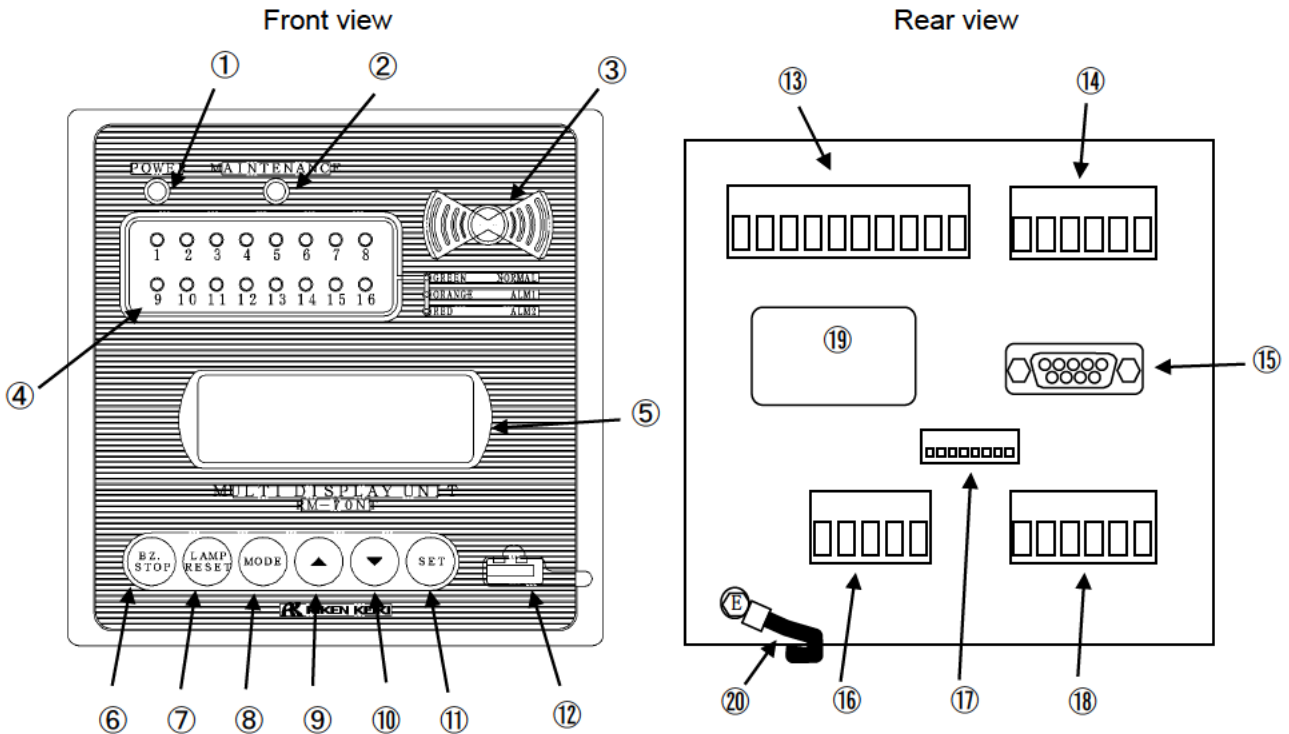


5-3. MDU installation and wiring

1) Exterior diagram



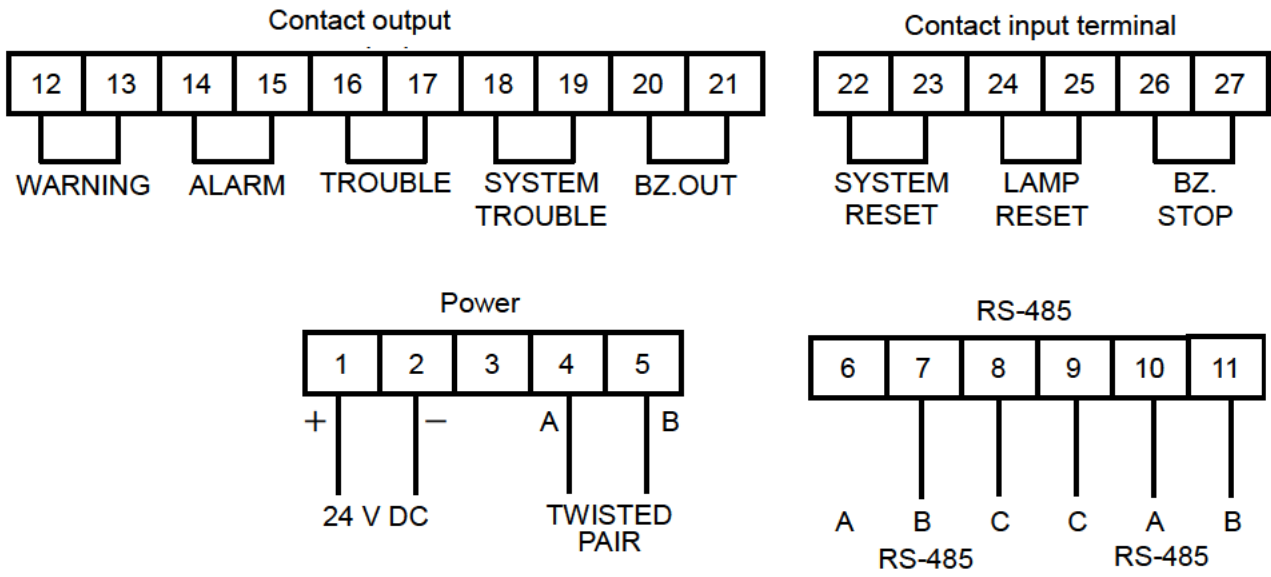
2) Names and functions for each part



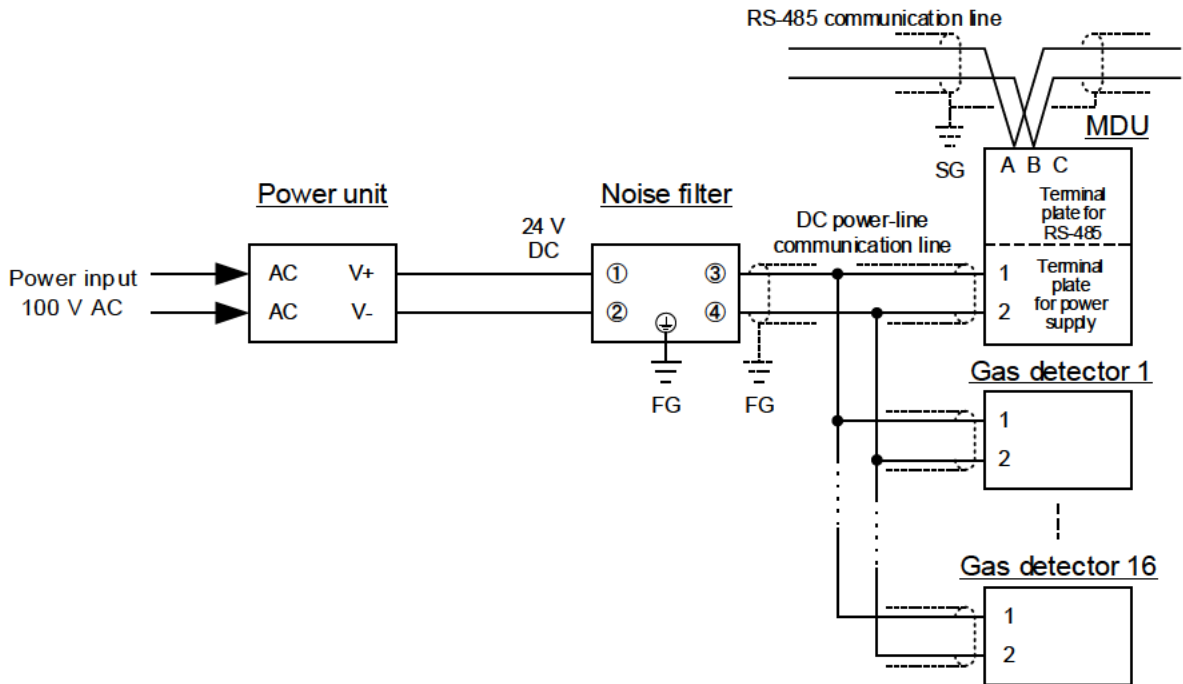
- | | |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ① POWER lamp | : This is the power supply lamp. It blinks when there is a problem with the main unit. |
| ② MAINTENANCE lamp | : Blinks when maintenance mode is entered, indicating that the unit is in maintenance mode. |
| ③ Buzzer | : This is the alarm buzzer. |
| ④ Status lamp | : Indicates the status of connected devices. (3-color LED) |
| ⑤ LCD display | : Displays 20 characters × 4 lines. Equipped with LED backlight. |
| ⑥ BZ. STOP switch | : Press when the buzzer is sounding to stop the buzzer. The alarm lamp also changes from blinking to lighting. |
| ⑦ LAMP RESET switch | : This is enabled after pressing BZ.STOP when self-latching lock-in occurs. The lamps and contacts are cleared by pressing this after alarms are reset. |
| ⑧ MODE switch | : Used when entering or exiting maintenance mode (press and hold for 3 seconds), and for canceling each function, etc. |
| ⑨ Δ switch | : Used when entering the selection display, and also for selecting the functions and modifying settings, etc. |
| ⑩ ∇ switch | : Same as the Δ switch. |
| ⑪ SET switch | : Used to enter menu mode and to make the settings (confirm) for the functions. |
| ⑫ Connector for setting device | : This is a connector (with cover) for connecting setting devices. Use dedicated cables for connection. |
| ⑬ Contact output terminal | : No-voltage contact |
| ⑭ Contact input terminal | |
| ⑮ Connector for RS-232C | : D-sub 9P (female). Used to connect a host computer, etc., via RS-232C. |
| ⑯ Power supply terminal | : This is the input terminal for the power supply. It also acts as the network terminal. |
| ⑰ DIP switch | : Set the network termination. |
| ⑱ Terminal for RS-485 | : This is the terminal for RS-485. Input and output connection is possible with the half-duplex system. |
| ⑲ Terminal plate name plate | : Has the names of each of the terminals. |
| ⑳ SG cable | : Under normal circumstances, connecting to the earth terminal (E) improves anti-noise performance. However, do not connect when conducting insulation resistance and voltage resistance testing. |

3) Wiring

<Terminal plate diagram>

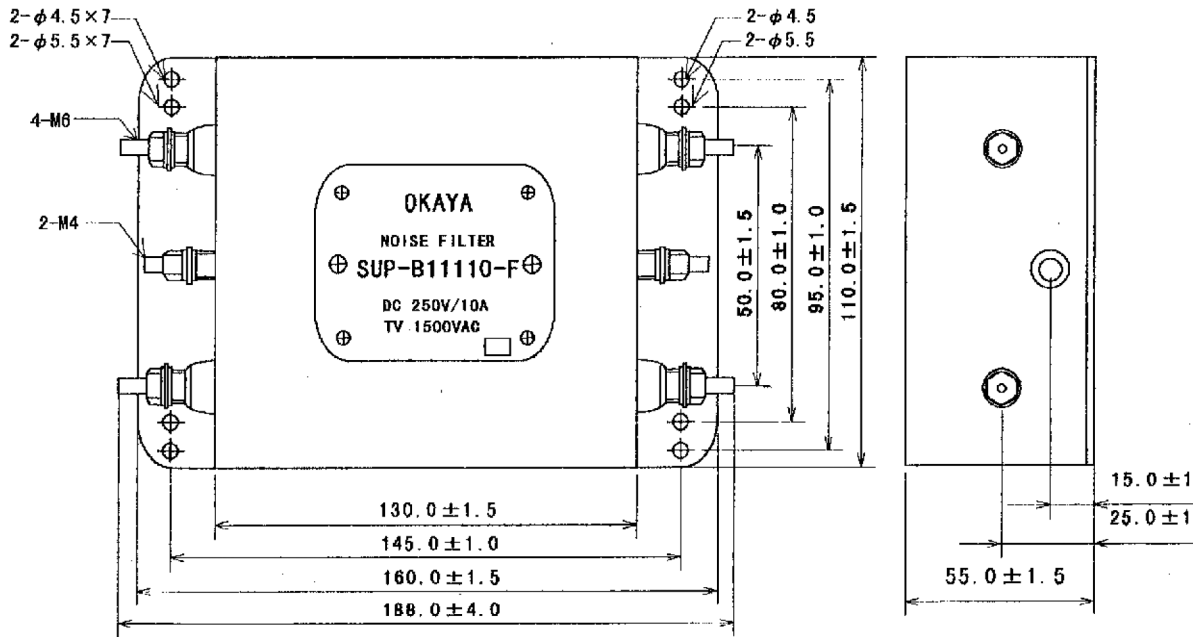


<Wire connection>

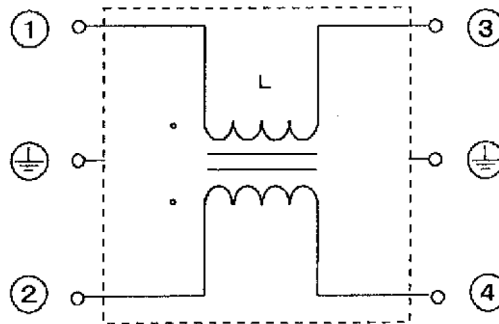


5-4. Noise filter specifications and exterior diagram

Exterior diagram (unit: mm)



Circuit diagram



Ratings

Model	SUP-B11110-F	
Rated voltage	250 V DC	
Rated current	10 A	
Voltage resistance	Between terminals and case	1,500 Vrms 50/60 Hz 60 sec
Insulation resistance	Between terminals and case	6,000 MΩ or more (at 500 V DC)
Leakage current	10 μA or less (at 250 Vrms 60Hz)	
Voltage drop	3.0 Vrms or less	
Temperature increase	70°C or less	
Operating temperature range	-25 to +50°C	

6. Testing and measurement

6-1. Measurement and testing after cabling

Measure and test the communication line cable both visually and using a commercially available tester.

Item	Description
Wire connection (RS-485)	Polarity is correctly wired
Wire connection (DC power-line communication)	+ and - are correctly wired
Cable failure	No cracking, wire breaks, or short circuits
Power supply voltage (DC power-line communication)	24 V DC +/- 10% or less
Shielded cable grounding (RS-485, DC power-line communication)	There is one point of grounding (there are not two points of grounding).
Terminating resistor (RS-485, DC power-line communication)	Fitted in the specified location or configured

6-2. Communication test for entire DC power-line network

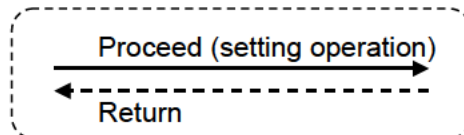
Check to confirm there are no communication failures or noise due to construction and that normal communication is possible when the system operates. It is possible to confirm the condition of communications by performing an MDU rate check.

⚠ CAUTION

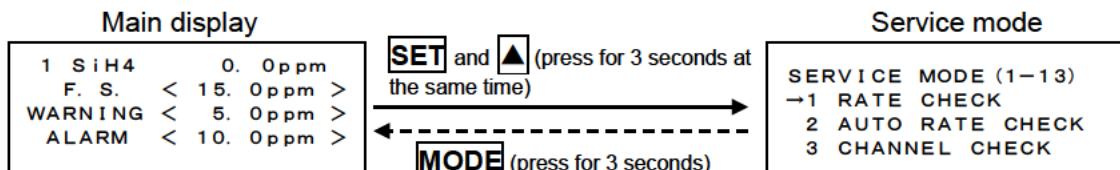
The monitoring status in the upstream system will be affected by performing this test. Conduct the test as instructed by the person in charge of the system.

① Rate check operating procedures

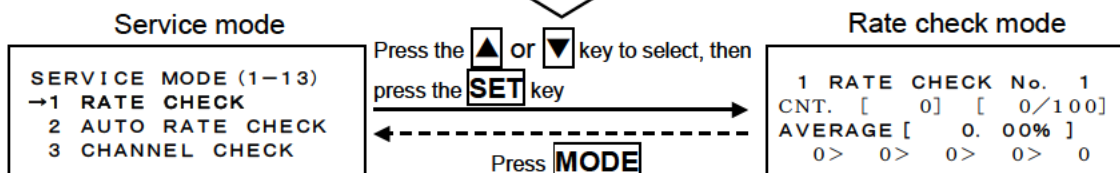
Operation is with the buttons on the MDU display section. Refer to the flow shown below.



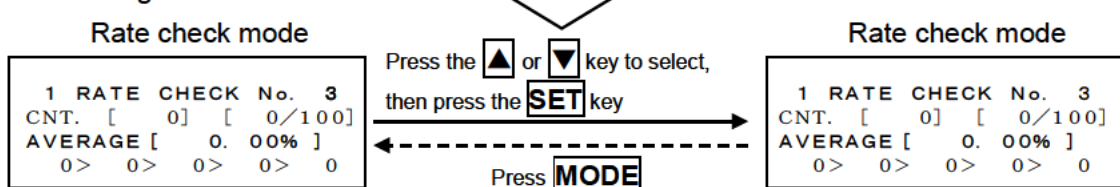
Operation 1. Enter service mode



Operation 2. Enter rate check mode

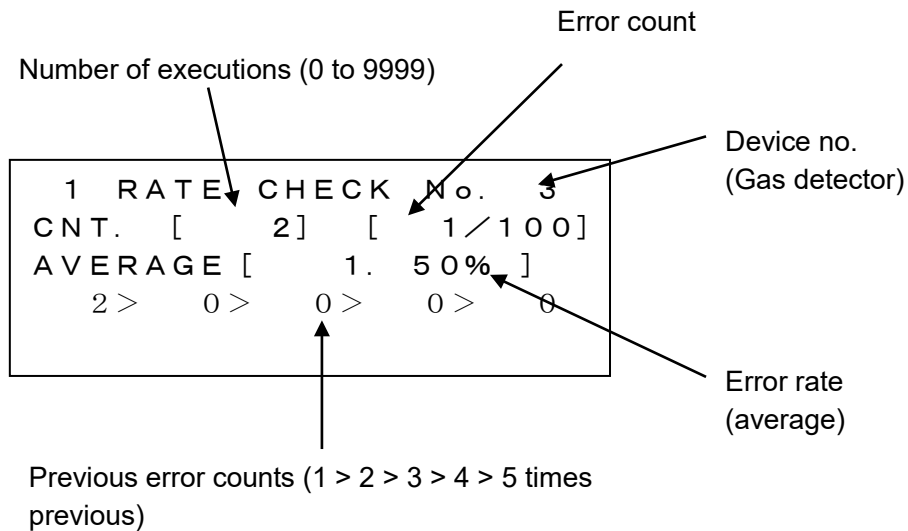


Operation 3. Select gas detector address



Press **SET** to start the check

② How to use rate check



The rate check displays the error count when 100 pieces of data are transmitted at once. The judgment criteria for a pass is the number of executions "CNT. [3]" (300 times) and the error rate is 5% or less.

When "CNT. [3]" is reached, confirm and then press the **MODE** to exit. Follow [Operation 3. Select gas detector address] on the previous page to select the next gas detector No. and repeat the rate check.

Also check that the maximum error count each time is less than 10.

If the above judgment criteria are exceeded, review wiring, installation location, the earth line, terminating resistors, etc.

7. Maintenance

The communication line plays a significant role in this system with respect to disaster prevention and security.

To maintain performance and improve reliability for disaster prevention and security, regular maintenance is recommended.

7-1. Maintenance intervals and maintenance items

Item	Description
Inspecting the state of the cable (RS-485)	The cable must be free from abnormal forces. (whether due to tension or heavy objects)
	The cable coating must be free of scratches that affect function.
	With the connector section on the rear of the MDU unit, the connector itself is not loose and the cable connection is not slack.
Inspecting the state of the cable (DC power-line communication)	The cable must be free from abnormal forces. (whether due to tension or heavy objects)
	The cable coating must be free of scratches that affect function.
	With the connector section on the rear of the MDU unit, the connector itself is not loose and the cable connection is not slack.

7-2. Securing spare parts for emergency response

This gas detector is connected via multi-display unit (MDU). Further, 1 MDU monitors and controls communications for 16 gas detectors.

It will be subjected frequently to communication cable connections and disconnections and similar procedures. If it breaks down due to the damage caused by system construction work, the results for monitoring will be significant. To minimize the effects of a failure, we recommend stocking spare parts.

Recommended spare parts

- MDU

Appendices

The appendices provide lists of check items, tools, and measuring instruments for design and construction.

The lists have been compiled to help you check the validity and prevent problems caused by system construction. Use them effectively.

Appendix 1. Checklist for configuration design

Listed below are check items before construction:

No	Item	Judgment criteria	Judgment/result
1	Power supply capacity	System design is such that the power supply capacity is not exceeded even if the maximum number of gas detectors are connected. The supply capacity has been added cumulatively when a pyrolyzer (PLU-70) has been connected.	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
2	Anti-noise measures	The cable route is isolated from noise sources.	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
3	Cable selection	Both RS-485 and DC power-line communication Shielded twisted pair <ul style="list-style-type: none"> ▪ KPEVS-1.25 mm²-1P, or CPEVS-0.9Φ-1P ▪ There are not multiple types of cable mixed in the same communication system 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
4	DC power-line communication Communication line configurations	When only the MDU is separated: <ul style="list-style-type: none"> ▪ The extension distance is MAX. 300 m. 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		When gas detectors are dispersed: <ul style="list-style-type: none"> ▪ There is no more than 300 m of cable distance between two devices on a communication line. 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		When connected using the multi-drop method: <ul style="list-style-type: none"> ▪ MAX. 30 m ▪ Pyrolyzer (PLU-70) has not been connected. 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		When two systems are housed in a single case: <ul style="list-style-type: none"> ▪ No contact between 100 V, 24 V, and DC power-line communication lines ▪ No contact between DC power-line communication lines from different systems 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		One power supply unit is provided for each individual DC power-line communication line system.	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
5	RS-485 Communication line configurations	Uses the multi-drop method with no junctioning.	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		The extension distance is a maximum of 1,200 m.	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
6	Number of devices connected	RS-485 <ul style="list-style-type: none"> ▪ Each system has 16 or fewer MDUs. 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		DC power-line communication <ul style="list-style-type: none"> ▪ Each system has one MDU. ▪ Each MDU has 16 or fewer gas detectors. 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG

Appendix 2. System construction checklist

Listed below are the check items after construction.


No	Item	Judgment criteria	Judgment/result
1	Grounding the shielded line in the communication line	Grounded	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
2	DC power-line communication line Long distance parallel cabling	The cables are not laid completely in parallel over extended distances.	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
3	Communication cable Isolation from noise sources	The cable is isolated in racks dedicated for communication or by separators.	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		The cable is kept away from noise sources. [Reference] <ul style="list-style-type: none"> ▪ From transformers and motors: 120 cm or more ▪ From AC power cables: 30 cm or more ▪ From fluorescent lamps: 13 cm or more 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
4	DC power-line communication Terminating resistor	Check to confirm that the fitting and configuration are correct. See No. 10 in "5-1. Important information on design and cabling."	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		When the gas detector has a terminating resistor <ul style="list-style-type: none"> ▪ The gas detector case has been marked. 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
5	RS-485 Terminating resistor	Check for correct fitting and configuration See No. 9 in "5-1. Important information on design and cabling."	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
6	Grounding	The gas detector case is grounded. (Equivalent to Class D grounding)	<input type="checkbox"/> OK/ <input type="checkbox"/> NG

Appendix 3. Communication failure checklist

Listed below are things to check if you encounter communication problems after the host system is started.

No	Item	Judgment criteria	Judgment/result
1	No communication	Is the communication cable correctly connected?	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		Is the power on?	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		Are any of the devices connected to the communication line not part of the system? <ul style="list-style-type: none"> • RS-485 The MDU and upstream device (PLC, etc.) are the only connected devices. • DC power-line communication Is there a device connected that is unrelated to communication? (For example, the device is connected simply for the 24 V power supply.) Excluding the PLU-70 (pyrolyzer unit) 	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		Are the address, communication speed, and other parameters set correctly? (Confirm as instructed by the person in charge of the system.)	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
2	Unstable communication	Is the cable connected correctly?	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		Are there any noise sources near the gas detector?	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
		Are there any noise sources near the cable route?	<input type="checkbox"/> OK/ <input type="checkbox"/> NG
Also refer to "Appendix 1. Checklist for configuration design" and "Appendix 2. System construction checklist" on the previous two pages.			<input type="checkbox"/> OK/ <input type="checkbox"/> NG

Appendix 4. List of measuring instruments and tools

Item	Description
Crimping tool	<p data-bbox="517 286 1150 320">For the terminal plate of the gas detector main unit</p>  <ul data-bbox="890 338 1246 562" style="list-style-type: none"><li data-bbox="890 338 1246 371">Crimping the bar terminals<li data-bbox="890 371 1246 439">• Manufacturer WAGO<li data-bbox="890 439 1246 506">• Model VarioCrimp 4 (206-204)<li data-bbox="890 506 1246 573">• Bar terminal (ferrule) Model 216 series

Appendix 5. Description of terms

Term	Description
DC power-line communication	This is also called the NT method. For dedicated communication with the Riken Keiki gas detector Connected using 1P of twisted-pair cable To reduce wiring requirements, the same cable supplies power to the gas detectors.
Free topology	This wiring method allows both multi-drop and junction connection methods.
Multi-drop	Describes a method for connecting across multiple units of communication bases in a series.
Crosstalk	Interference Crosstalk may occur; that is, the signal on shielded twisted pair cable may affect a signal on another cable resulting in different signals being mixed and received.

Manual Log

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0	First issue	2019/1/29