

**DT450G
Dust Monitor**

IM 11K01C01-01E

vigilantplant.™

Introduction

The DT450G Dust Monitor is a process instrument designed to detect solid particles in gas and integrates a control unit and a sensor probe into a compact enclosure. The DT450G can be used in a wide variety of applications, including continuous monitoring of the dust content of the exhaust gas.

This manual describes the procedures for installing, operating, inspecting and maintaining the DT450G Dust Monitor. Before using the instruments, thoroughly read the manual to ensure optimum performance.

This manual consists of six chapters. For your reference, the following table shows the outlines of each chapter and indicates which chapters should be read for installation, operation or maintenance work.

Table of Contents

Chapter	Outline	Relates to		
		Installation	Operation	Maintenance
1. Overview	Standard specifications, Model and Suffix codes (or part number), and dimensions.	○	△	○
2. Installation	Installation procedures, etc.	◎		△
3. Piping/Wiring	Piping and wiring procedures.	◎		△
4. Operation	Operation and display in detail.		◎	△
5. Inspection/Maintenance	Inspection items and replacement procedures.		○	◎
6. Troubleshooting	Failures, possible causes, and remedies		△	◎
CMPL	User replaceable parts list.		△	○

CMPL: Customer Maintenance Parts List

Intro.eps

- ◎ : Carefully read and fully understand before work
- : Read through before work and whenever necessary
- △ : Recommended to read

◆ For the safe use of this equipment



DANGER

Connect the power supply cord only after confirming that the supply voltage matches the rating of this equipment. In addition, confirm that the power is switched off when connecting power supply.

Some process gas is dangerous to people. When removing this equipment from the process line for maintenance or other reasons, protect yourself from potential poisoning by using a protective mask or ventilating the area well.

(1) About This Manual

- This manual should be passed on to the end user.
- The contents of this manual are subject to change without prior notice.
- The contents of this manual shall not be reproduced or copied, in part or in whole, without permission.
- This manual explains the functions contained in this product, but does not warrant that those will suit the particular purpose of the user.
- Every effort has been made to ensure accuracy in the preparation of this manual. However, should any errors or omissions come to the attention of the user, please contact the nearest Yokogawa Electric representative or sales office.
- This manual does not cover the special specifications. This manual may not be changed on any change of specification, construction and parts when the change does not affect the functions or performance of the product.
- If the product is used in a manner not specified in this manual, the safety of this product may be impaired.

(2) Safety and Modification Precautions

- Follow the safety precautions in this manual when using the product to ensure protection and safety of personnel, product and system containing the product.

(3) The following safety symbols are used on the product as well as in this manual.

 **DANGER**

This symbol indicates that the operator must follow the instructions laid out in this manual in order to avoid the risk of personnel injury electric shock, or fatalities. The manual describes what special care the operator must exercise to avoid such risks.

 **WARNING**

This symbol indicates that the operator must refer to the instructions in this manual in order to prevent the instrument (hardware) or software from being damaged, or a system failure from occurring.

 **CAUTION**

This symbol draws attention to information essential for understanding the operation and functions.


 **Tip**


This symbol gives information that complements the present topic.

 **SEE ALSO**

This symbol identifies a source to which to refer.

 Protective Conductor Terminal

 Function Earth Terminal (Do not use this terminal as the protective conductor terminal.)

 Alternating current

- Special descriptions in this manual

This manual indicates operation keys, displays and drawings on the product as follows:

- Displays on the panel " ".
(Ex. message display → " BASE ")
(Ex. data display → " 102 ")

◆ NOTICE

- Specification check

When the instrument arrives, carefully unpack and check that the instrument has not been damaged during transportation. Please make sure that the product received meet the purchase order specifications and all the accessories are present. Specifications can be checked by the model codes indicated on the nameplate. For details of the model codes, refer to Chapter 1, “Overview.”

- Details on operation parameters

The DT450G is preset with defaults prior factory shipment. Before measurement, verify that these factory default settings meet the operating conditions and if necessary, reconfigure parameters. For checking the parameter settings, refer to Chapter 4. It is recommended that the reconfigured parameter settings be recorded.

◆ After-Sales Warranty

- Do not modify the product.
- During the warranty period, for repair under warranty carry or send the product to the local sales representative or service office. Yokogawa will replace or repair any damaged parts and return the product to you.
- Before returning a product for repair under warranty, provide us with the model name and serial number and a description of the problem. Any diagrams or data explaining the problem would also be appreciated.
- If we replace the product with a new one, we won't provide you with a repair report.
- Yokogawa warrants the product for the period stated in the pre-purchase quotation. Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located outside of the service area, a fee for dispatching the maintenance engineer will be charged to the customer.
- In the following cases, customer will be charged repair fee regardless of warranty period.
 - Failure of components which are out of scope of warranty stated in instruction manual.
 - Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa Electric did not supply.
 - Failure due to improper or insufficient maintenance by user.
 - Failure due to modification, misuse or outside-of-specifications operation which Yokogawa does not authorize.
 - Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
 - Failure caused by any usage out of scope of recommended usage.
 - Any damage from fire, earthquake, storms and floods, lightning, disturbances, riots, warfare, radiation and other natural changes.
- Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.
- Yokogawa Electric will not bear responsibility when the user configures the product into systems or resells the product.
- Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair for this product, please contact the nearest sales office described in this instruction manual.

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1. Overview

This chapter discusses the following topics.

- Product overview
- Specifications
- Model and suffix code
- Dimensions

1.1 Product Overview

Powder is used in many industries including ceramics, cement, chemicals, pharmaceutical and food. In their processes, powder is collected in order to reduce the loss incurred in the process. Dust emissions from industrial plants are limited by the air pollution control law, local regulations or other guidelines. Each industrial facility is required to be maintained so that its dust emissions do not exceed the allowable level.

Air pollution control systems such as bag filters and electrostatic precipitators are used to separate particulate or dust from the gas stream before it is exhausted into the atmosphere. To maintain the dust concentration of the emission gas below the specified level through effective operation of the control system, it is essential to continuously monitor the dust concentration of the exhaust gas.

Based on installation and application experiences with the existing DT400G model, the microprocessor-based DT450G Dust Monitor features improved operability and reliability. Features include one-touch automatic range setup in response to process conditions and automatic drift compensation. Also, the DT450G can measure at a process temperature of up to 250°C, allowing it to cover a wide range of applications.

● Measuring Principle

When two solid particles come into contact with each other, charge transfer takes place between them. This charge transfer is known as the principle of triboelectrification or contact electrification and the DT450G utilizes this principle. More specifically, charge transfer occurs when particles in a gas stream collide with (or pass nearby) the sensor probe, producing an electric current. The DT450G amplifies this current to convert it into its output current. The electric current produced by frictional electricity is subject to the effects of the following factors:

- Amount of the particles' electrostatic charge and a change in the polarity
- Particle size
- Velocity of particles
- Components of particles

The behaviors of these factors vary widely depending on the object of measurement and their effects are in no way uniform. In the case of fixed-position measurement in a particular plant however, measurement conditions, such as the components of particles, are almost constant and therefore the effects are usually marginal. Dust concentration is also constant in the case of gases emitted from a bag filter, cyclone or electrostatic dust collector.

A current-mode input signal obtained at the detector block is transferred to the converter block, where the signal is converted to a 4-20 mA DC analog output signal. The converter block outputs an alarm contact signal at a desired level, in addition to the analog output signal.

1.2 Specifications

Measurement objects: Solid particles in gas

Particle size : 0.3 μm or greater

Measurement range: 0.1 mg/m^3 to 1 kg/m^3

Measurement principle: Triboelectric detection

Process conditions :

Temperature : 250 $^{\circ}\text{C}$ or less

Pressure : 200 kPa or less

Gas flow rate : 4 m/s or greater (approx. 30 m/s max)

Humidity : 40 %RH or less

Input surge voltage : 100 V or less (if 500 V or greater, converter may be damaged.)

Note : When installing downstream of ESP, see Item 2.1.

Measurement range:

Range setup : One-touch automatic setup or manual setup (Measurement range does not directly represent dust concentration. To know the absolute value of dust concentration, the relationship between the output signal and the dust concentration should be obtained by laboratory analysis or relevant way.)

Note : With one-touch automatic setup function, measurement range is set so that the dust concentration of the process corresponds to a setpoint of setting level. In manual setup, the measurement range is set by gain (x1, x10, x100, x1000, x10000).

Setup range level:

Variable (10 to 50%, 10% step)

Analog output signal :

4-20 mA DC, insulated, load resistance; 500 V

Contact output signal (high/low alarm):

Contact capacity : 5A, 240 V AC or 24 V DC

Setting range : 1 to 99% (1% step) of measurement span

Contact type:

NO (closed when alarm contact is activated) or NC, 2 outputs

Note : Relay is energized when alarm contact is activated.

Damping time constant :

10 to 300 seconds, 10 second step

Relay output time constant :

10 to 180 seconds, 10 second step

Ambient conditions:

Temperature : -20 to 45 $^{\circ}\text{C}$

Humidity : 95 %RH or less (non-condensing)

Vibration : 5 m/s^2 (0.5G) or less

Construction:

Converter : Integrated with detector, protection rating IP 64

Sensor probe : Direct insertion

Materials:

Sensor probe :Stains steel (316SS)
Insulation of sensor:PEEK
Case :Aluminum

Finish :

Polyester resin coated

Colors:

Case :Silver gray (Munsell 3.2PB 7.4/1.2)
Cover :Mint green (Munsell 5.6PG 3.3/2.9)

Power supply:

Rating :100 to 120 VAC, 200 to 240 VAC
Operating voltage range :90 to 132 VAC, 180 to 264 VAC

Power consumption : 8 VA**Wiring connection : 2 ports**

- DIN with PG11 cable gland (applicable to cable with 5 to 10 mm OD)
for power wiring
- DIN with PG11 cable gland (applicable to cable with 5 to 10 mm OD)
for output wiring

Note: Use one cable for analog output and contact signals.

Air purge:

Connection : Rc 1/4
Air source : Clean, dry air equivalent to instrument air
at process pressure + 50 kPa
Air consumption :approx. 50 NI/min

Mounting :Socket (dedicated) or flange

Weight :Approx. 2.3 kg (excluding flange)

Dimensions :172W × 173H × 672D mm

1.3 Model and Suffix Codes

1.3.1 Dust Monitor

Model	Suffix Code	Option Code	Description
DT450G	-----	-----	Dust monitor (heat resistant up to 250°C)
Analog output	-5	-----	4-20 mA DC analog output + fine adjustment for measuring range
Power supply	-2	-----	200-240V AC, 50/60Hz
	-5	-----	100-120V AC, 50/60Hz
Probe length	-05	-----	460mm
Sensor material	-1	-----	316SS
Air purge	-A	-----	With air purge
Instruction Manual	-J	-----	Japanese
	-E	-----	English
Mounting	-W	-----	Socket mounting (welding socket)
	-A	-----	Flange mounting (ANSI Class 150 2 1/2 RF)
	-K	-----	Flange mounting (JIS 5K 65 FF)
	-M	-----	Flange mounting (JIS 10K 80 FF)
	-P	-----	Flange mounting (JIS 10K 100 FF)
	-T	-----	Flange mounting (JPI Class 150 2 1/2 RF)
	-A	-----	Always -A
Option		/TC	Probe: Teflon coated

MS-code.eps

Note: Teflon coated probe (option code "/TC") is recommended to prevent the insufficient insulation by dust and moisture deposited on sensor probe ensure better insulation of sensor probe.
Teflon coated probe is designed to operate at a temperature not exceeding approximately 150 °C.

1.3.2 Spare Parts

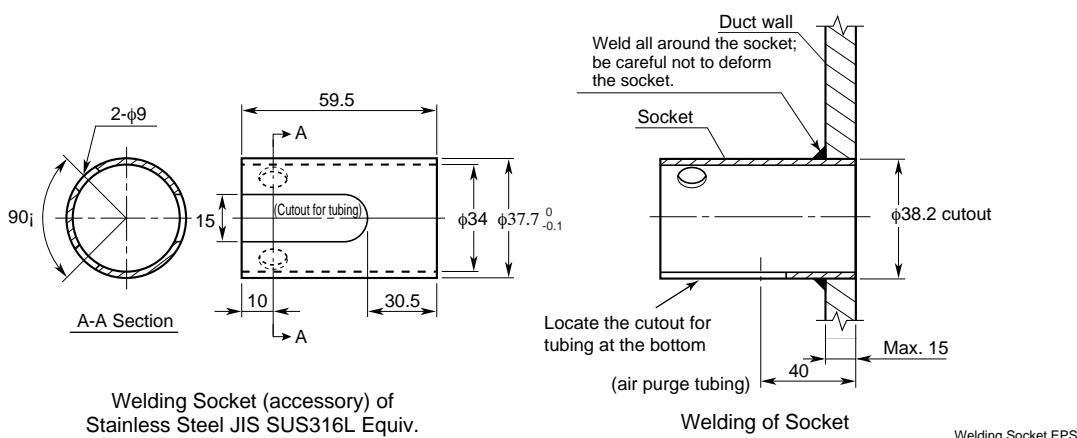
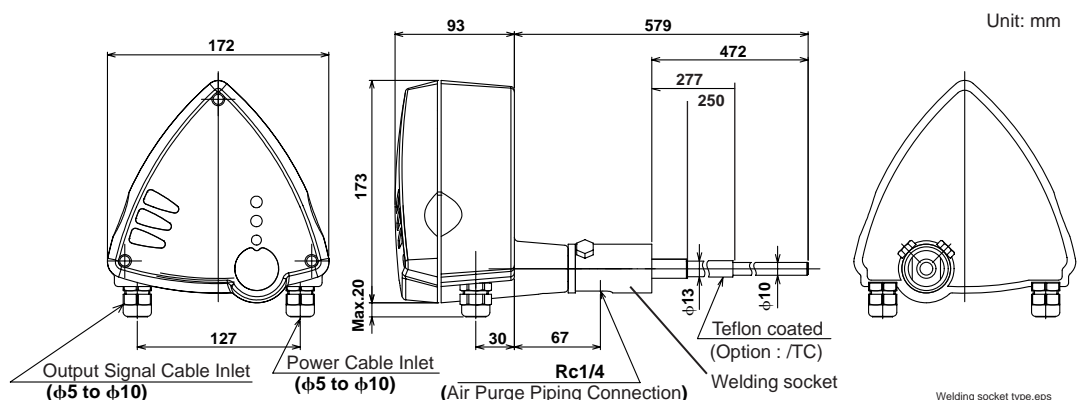
Item	Part Number	Qty
O-ring	B1026ER	1
Flange assembly:		
JIS 5K 65 FF	K9479DA	1
JIS 10K 80 FF	K9479DB	1
JIS 10K 100 FF	K9479DC	1
JPI Class 150 2 1/2 RF	K9479DE	1
ANSI Class 150 2 1/2 RF	K9479DD	1
Socket	K9479CA	1
Bolt	L9800TC	2

SpareParts.eps

Note: The sensor assembly can be replaced only at the manufacturer's shop.

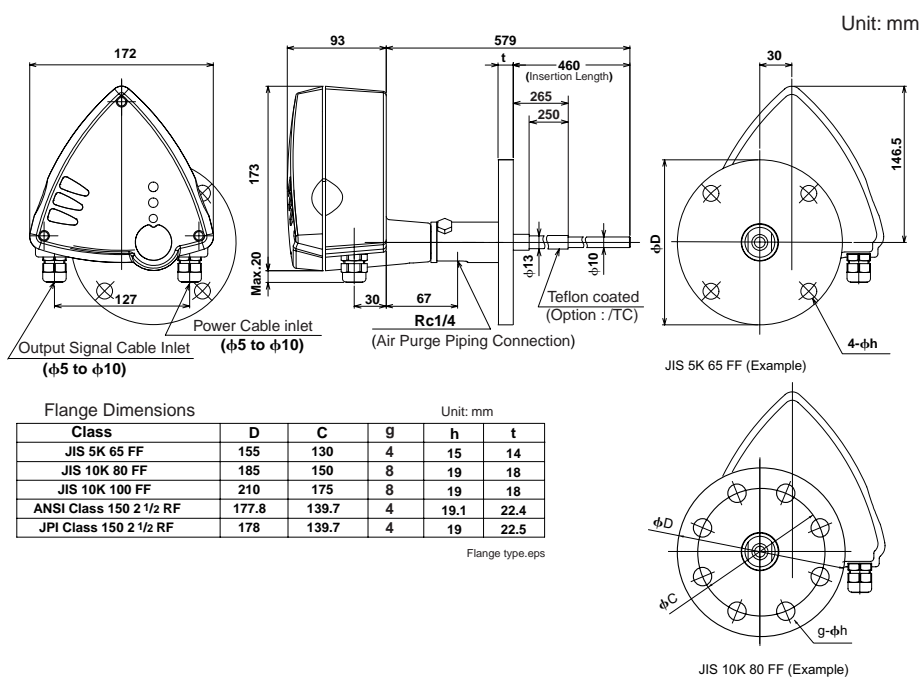
1.4 Dimensions

● Welding Socket Mounted Model



Dimensions of DT450G Dust Monitor (Flange Mounted Model)

● Flange Mounted Model



Dimensions of DT450G Dust Monitor (Welding Socket Mounted Model)

2. Installation

The DT450G is designed for indoor installation or installation in an outdoor location free from splashes of rainwater and direct sunlight.

This chapter explains how to install the DT450G in the following order of topics.

- Selection of installation location
- Machining of inlet for sensor probe
- Installation of DT450G

2.1 Selection of Installation Location

The DT450G is designed for mounting on a duct with a width of 650 to 4000 mm (when the standard probe length is 460 mm) or other alternative locations. Install the DT450G in a location where optimal measurement can be carried out and inspection and maintenance is easy. When selecting an installation location, make sure it also satisfies the measuring and ambient environmental conditions described in Section 1.2. In addition, the installation location must meet the following requirements.

- **Availability of Typical Dust Concentration**

The most suitable location along a duct is where there is no flowmeter or valve that may disturb the gas flow and where the duct is straight and the length is adequate in comparison with the inside width of the duct. (Ideally, the straight portion should be no less than eight times the length of the width. Locate the probe inlet in a position $\frac{3}{8}$ the length of the straight portion from the downstream edge and $\frac{5}{8}$ the length from the upstream edge.)

Note: Insert the sensor probe into the inlet so that it is perpendicular to the stream of gas. The DT450G can be positioned in such a manner that its sensor probe is level or facing downward at an angle up to 90° .

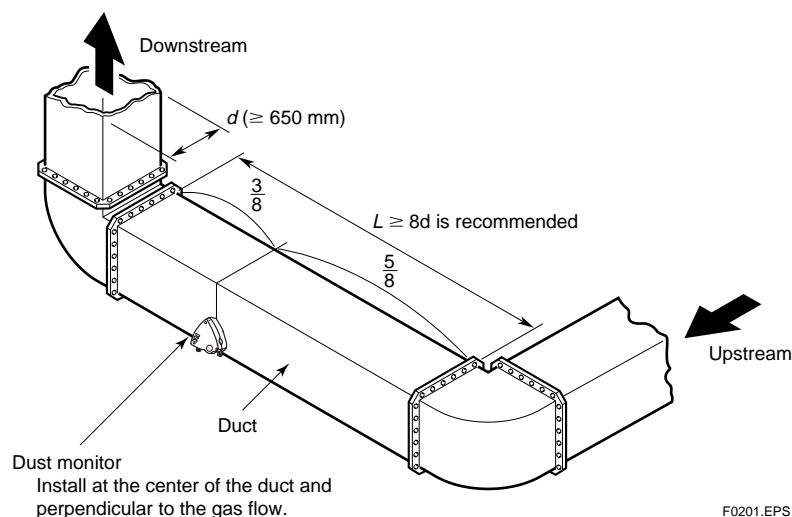


Figure 2.1 Installation of Dust Monitor on Straight Part of Duct

- **No Noise Effects**

Make sure the output signal will not be affected by noise arising from plant equipment or other structures. In an electrostatic dust collector is used, locate the DT450G at least 20 m away from the dust collector. When monitoring such dust collectors as a bag filter, locate the DT450G in the upstream of the blower.

- **Minimal Vibration**

For reasons of sensor structure, avoid installing the DT450G in a location exposed to mechanical vibration at a level greater than 5 m/s².

Note: It is virtually impossible for vibration to affect the measured value.

- **No Splashes of Rainwater, Direct Sunlight or Abnormal Temperature Rises due to Heat Radiation from Equipment**

The DT450G may be installed outdoors. However, avoid installing the monitor in a location exposed to direct sunlight or heat radiated from equipment, in order to prevent the temperature of the main unit's casing from rising above 45°C.

Note: The DT450G can be operated within an ambient temperature range of -20°C to 45°C.

If the part of the duct assigned for the probe inlet is covered with insulating material that is likely to contribute to a temperature rise in the casing, remove the insulating material around the probe inlet in an area approximately 20 cm wide across the inlet.

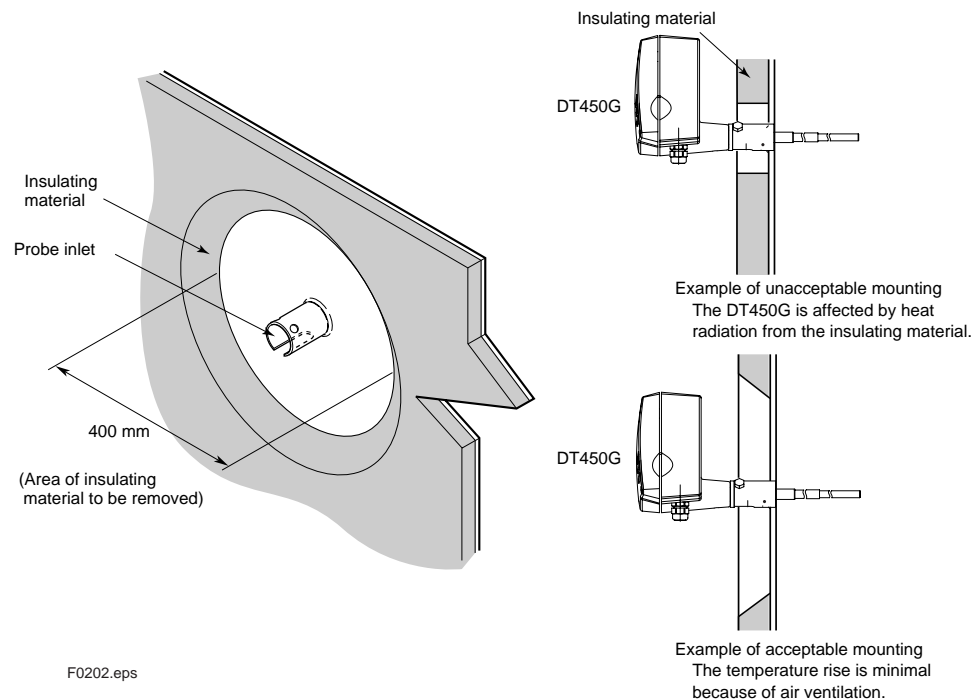


Figure 2.2 Measures to Take When the Temperature of the DT450G's Casing Is Likely to Rise due to Insulating Material

- **Ease of Inspection and Maintenance**

The DT450G dust monitor must be detached for cleaning the sensor probe. For safe operation of these maintenance works, a sufficient maintenance space as shown below is required (See Figure 2.3).

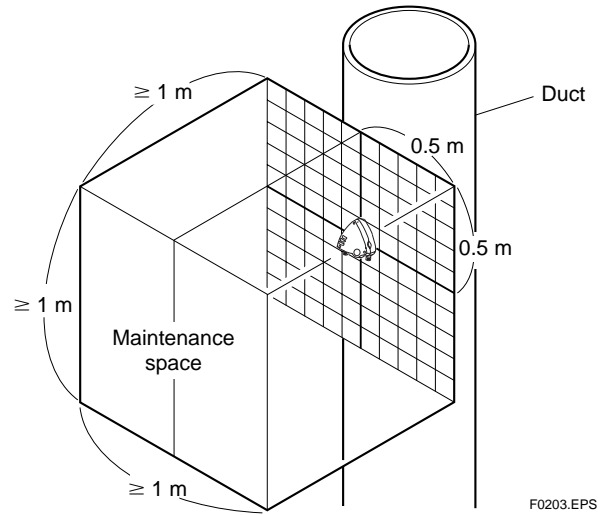


Figure 2.3 Maintenance Space at Installation Location of DT450G Dust Monitor

2.2 Machining of Probe Inlet

The DT450G is designed for mounting on a socket or flange attached to an inlet on a duct or other alternative facility. Equip the inlet with a socket or flange that complies with the specifications of the DT450G. At this point, make sure the DT450G's casing and the duct are in electrical continuity.

● When Mounting to Socket

Use the socket that comes with the DT450G for installation. Weld this socket paying attention to the following precautions.

- The standard insertion length of the sensor probe is 460 mm.
- For welding the socket, cut out a 38.0 mm diameter hole on the duct or pipe. (The socket's outer diameter is 37.7 mm.)
- Weld all around the socket (stainless steel JIS SUS316L). Make sure there are no spots not welded. Be careful not to deform the socket while welding. Be careful about the orientation of the socket. When installing the dust monitor on a vertical plane, place the cutout for air tubing at the bottom.

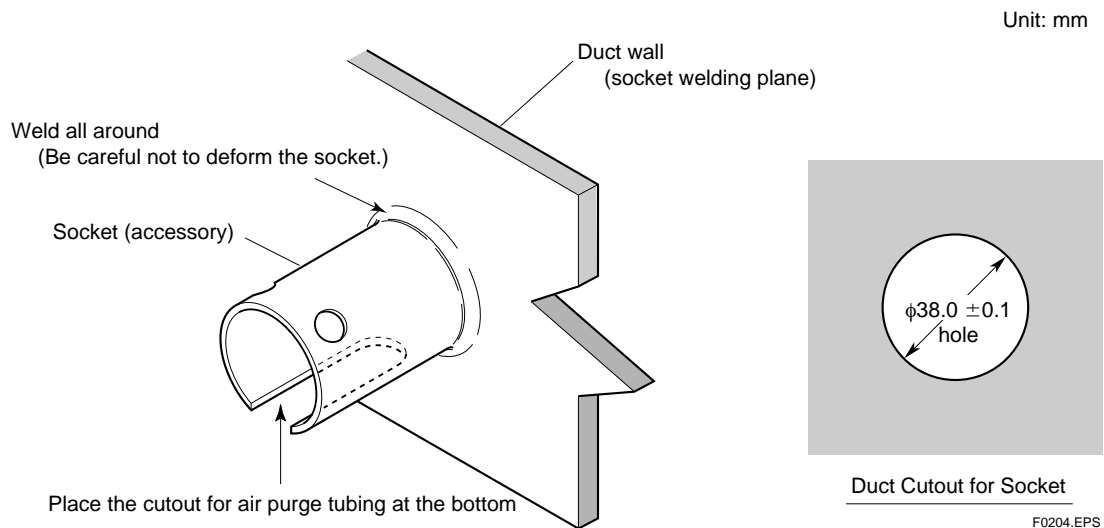
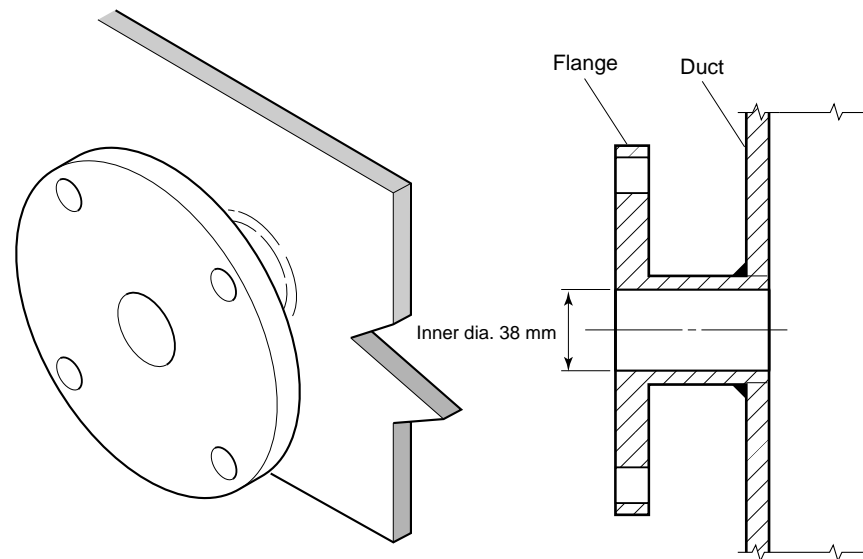


Figure 2.4 Connection Port for Socket Mounting Model

● When Mounting to Flange

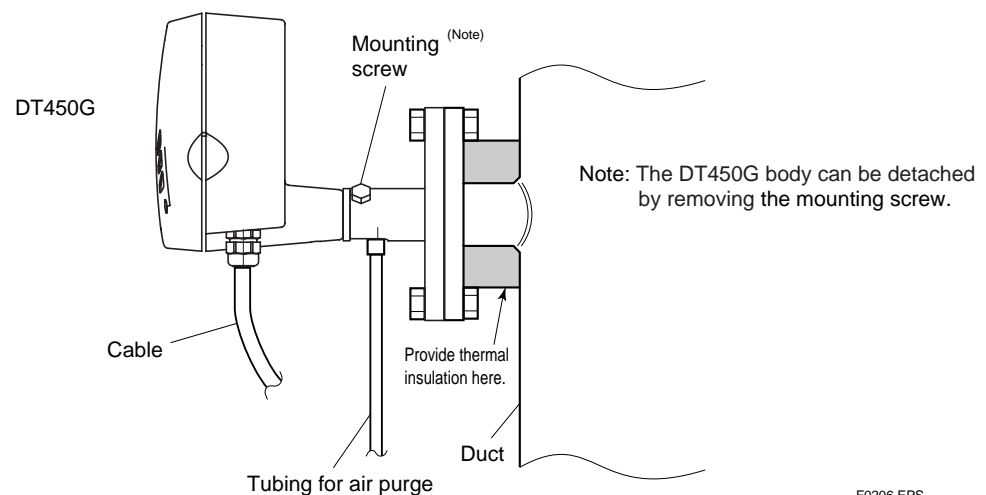
Prepare the DT450G with a flange that meets the specified standard. Prepare the tie-in flange at the connection port of the duct or pipe. Note that the standard sensor probe insertion length is 460mm on the flange specification.



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Figure 2.5 Connection Port for Flange Mounted Model

A drop of water on the insulated part of the sensor probe will prevent correct measurement. If the process gas is cooled down around the sensor connection port when measuring high-temperature and high-humidity gas, be sure to purge the air in order to prevent condensation at the neck of the sensor connection flange. If there is a possibility of the ambient temperature decreasing to 0°C or less, provide thermal insulation at the neck of the connection flange.



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Figure 2.6 Thermal Installation for Preventing Condensation

2.3 Installing the DT450G

Securely fix the DT450G onto a socket or flange on the probe inlet. When fixing the DT450G onto a socket, use the supplied two M8-size bolts. When fixing the DT450G onto a flange, use bolts having a size that conforms to the flange specifications.

Be careful not to damage the O-ring when mounting the DT450G onto a socket.



CAUTION

If the gas to be measured is flowing constantly through a duct where the DT450G is mounted, air-purge the monitor as instructed in subsection 4.2.2. If you leave the monitor exposed to the gas for a prolonged period without air purging the monitor, the resistance of the insulated part of the sensor probe will decrease. This may result in a failure of the monitor to start smoothly.

3. Piping and Wiring

Before operating the DT450G, the pipe for air purge and wires for output signals must be connected.

This chapter explains how to connect the pipe and wires to DT450G in the following order of topics.

- Connecting the pipe for air purge
- Connecting the wires for the power supply
- Connecting the wires for the output signals
- Grounding of a duct or other alternative facilities where the DT450G is mounted

3.1 Connecting the Pipe for Air Purge

As a rule, the insulated part of the sensor probe should be air-purged before the DT450G is put into use. Air purge is mandatory if any of the following cases apply:

- The concentration of dust in a gas is extremely high and the resistance of the insulated part of the sensor probe is likely to decrease due to dust accumulation.
- The gas temperature at the probe inlet is likely to drop, resulting in condensation.

Note that clean air, such as air specified for instruments, must be used for air purge. (If air is not available, use gas such as nitrogen instead.)

Note: For reasons of the measurement principle, any dust accumulating on the insulated part of the sensor probe can cause malfunction. The purpose of air purge is to prevent such dust accumulation. Care must be taken since an air purge with air containing moisture or oil mist causes the same phenomenon as dust accumulation.

Air purge is normally carried out by continuously supplying air to the DT450G with a pressure of approximately 50 kPa higher than that of the gas being measured. If the effect of air purge is inadequate, due to the presence of moisture in the gas being measured, the DT450G may require air purge at a higher pressure. For air purge, use an air source with a sufficiently large capacity. (The normal rate of air consumption is approx. 50 NI/min. under the pressure of 50kPa).

When connecting the pipe to the DT450G for air purge, note the following.

- The DT450G may be removed during inspection or maintenance. When connecting the pipe to the DT450G, use a one touch connector and/or a pipe made of flexible material to ensure easy maintenance.
- Install a stop valve or pressure reducing valve in a position as close as possible to the DT450G.
- Connect a pipe with an inside diameter of 6 to 8 mm to the DT450G. Note that the pipe connection of the DT450G is Rc1/4 threaded.

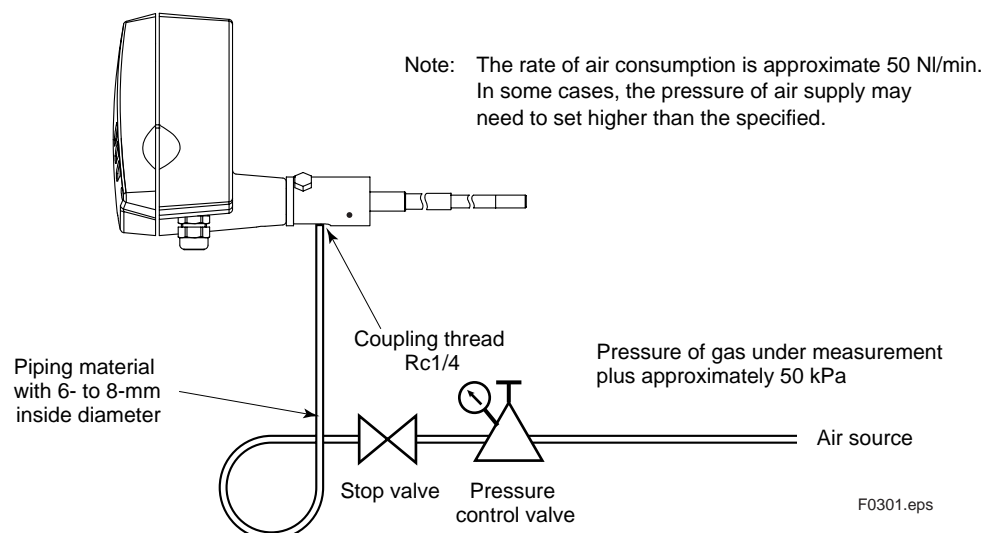


Figure 3.1 Method of Piping for Air Purge

If air purge need not be carried out, attach a blind plug to the pipe connection.

3.2 Connecting the Wires for the Power Supply

CAUTION

The DT450G has no power switch. For reasons of safety during inspection and maintenance, install a double-pole switch in the power line.

CAUTION

Since the DT450G may be removed for inspection or maintenance, allow each cable to have a sufficient margin of length.

Connect a power supply that conforms to the voltage and frequency in the specifications of the DT450G. For wiring, use a three-core cable of a 5 to 10 mm outside diameter with the nominal cross-section of the conductor being at least 1.5 mm². Ground one core appropriately. Lead the cable from the power supply through the DT450G's cable connection fitted with a Pg11 cable gland into the DT450G's inner assembly. Then, connect the cable to the AC1 terminal (non-grounded side) and AC2 terminal (grounded side).

Terminate the end of the grounding wire with an M5 crimp terminal and then connect it to the ground terminal inside the enclosure. The ground resistance should be 100 Ω or less (JIS Class D grounding).

Note: The DT450G main unit and the duct on which the monitor is mounted are in electrical continuity. Should the measured value be adversely affected by the method of two point grounding at the duct (see Section 3.4) and the terminal, remove either of the two grounding lines.

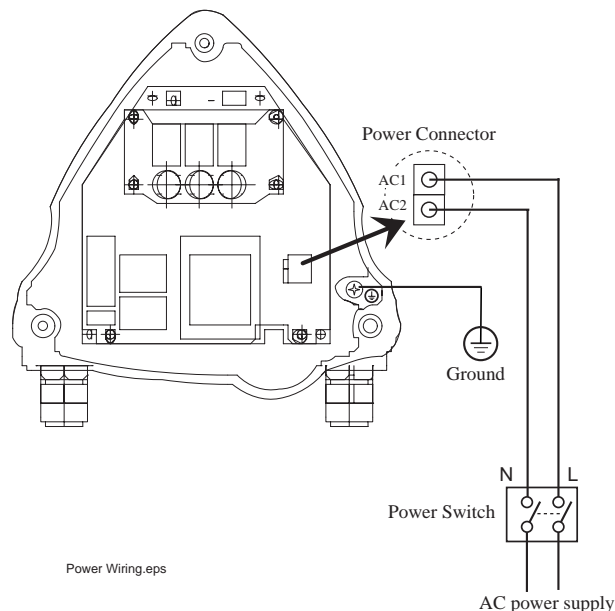


Figure 3.2 Wiring diagram of the DT450G to a power supply

3.3 Connection of Wires for the Output Signals

This section discusses the wiring necessary to transmit analog output signals and alarm contact signals to each device.

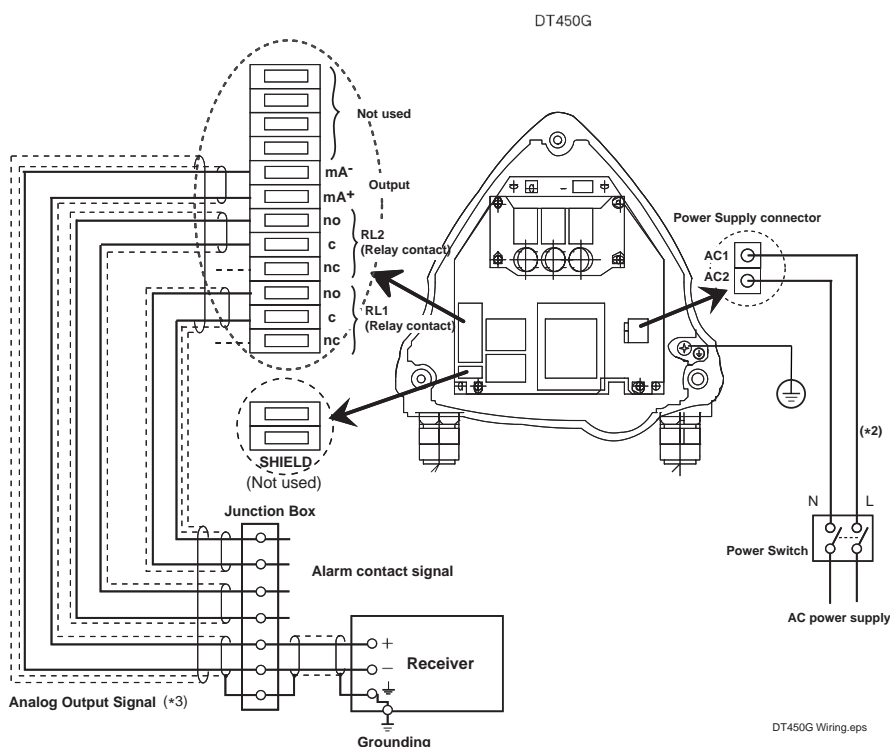
Wire the analog output and alarm contact signals of the DT450G using a single cable. Use a cable with an outside diameter of 5 to 10 mm, comprising three shielded twisted-pair wires with the nominal cross-section of the conductor being not more than 0.5 mm². If only the analog output signal is used and it is unlikely to be affected by noise (as the signal is wired at a location distant from the power line), it is not always necessary to use twisted-pair wires.

Insert the cable through the cable connection fitted with a Pg11 cable gland into the internal assembly of the DT450G. Connect the core wires of the analog output signal to the mA+ (positive side) and mA- (negative side) terminals. Also, connect the core wires of the alarm contact signal to the c of RL1 or RL2 and nc terminals (for an open contact upon alarm output) or to the c and no terminals (for a closed contact upon alarm output). Ground the shielded wires of the cable on the receiver side.



CAUTION

The output signal may be mixed with electric noise if the cable swings. If the cable is likely to be affected by wind, fix the cable.



(*1) The nominal cross-section of each conductor should be 1.5 mm²

(*2) The nominal cross-section of each conductor should be not more than 0.5 mm²

(*3) This terminal is used for the grounding on the receiver side.

Notes:

- The above wiring diagram shows the one when using no contacts. Connect wires to terminals nc and c when using nc contacts.

Figure 3.3 Wiring Diagram

3.4 Grounding the Duct



CAUTION

When such equipment as an electrostatic dust collector is used, be sure to ground both the duct and the DT450G. Otherwise, there may be a danger of electrical shock due to high potential static electricity.

If a duct or other alternative facility where the DT450G is mounted is charged with electricity, the electricity will serve as noise, possibly affecting the signal under measurement. Ground the duct where the DT450G is mounted, as well as other nearby structures, in order to prevent the duct from being charged with electricity.

4. Operation

The ranges and other parameters of the DT450G must be configured before you start operation.

This chapter explains how to operate the DT450G, including preparations, in the following order of topics.

- Components and their functions
- Preparation for operation
- Regular operation

4.1 Components and Their Functions

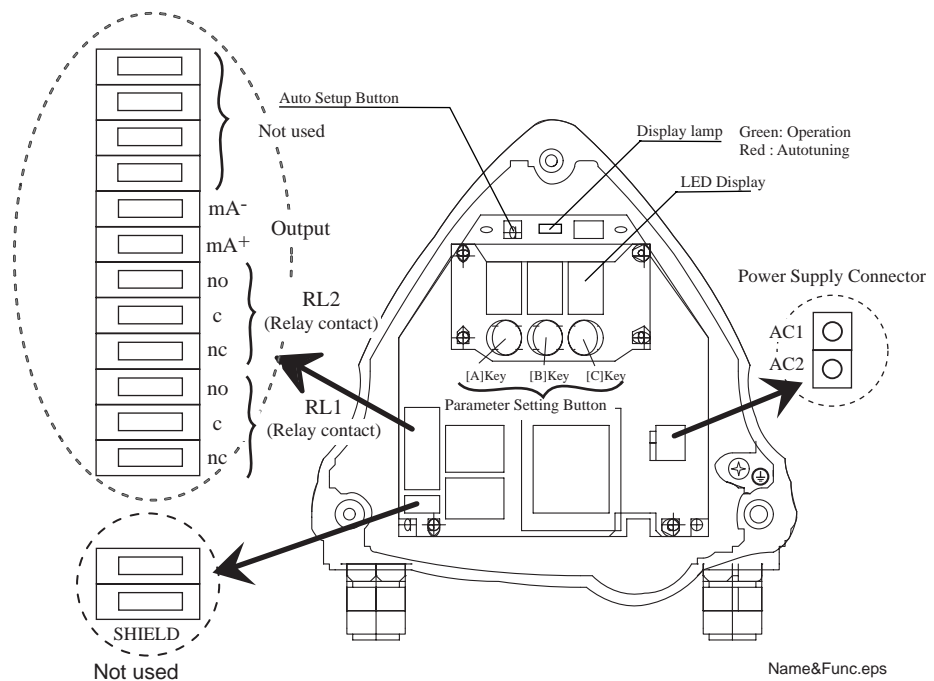


Figure 4.1 Components of the DT450G and Their Functions

4.2 Preparation for Operation

Before you start operating the DT450G, carry out the following tasks.

- Inspection of the state of installation
- Supply of purge air
- Supply of power
- Parameter (Setting of measurement range. Setting of alarm points, Setting of damping action)

4.2.1 Inspection of the State of Installation

Check that all the specifications are completely satisfied with the installation of the DT450G. Also check that the DT450G wiring and piping have been correctly connected. Especially, make sure the following are true.

- The DT450G is securely mounted onto the probe inlet and is free from effects of strong mechanical vibration. In addition, the short tubing of the probe inlet is adequately heat-insulated and the main unit's casing is not exposed to direct sunlight that causes an abnormal temperature rise or subject to heat radiated from other equipment.
- The duct or other alternative facilities where the DT450G is mounted is reliably grounded.
- Wires are correctly connected to the terminals of the DT450G. In addition, the cables are securely fixed by cable glands so as to prevent any corrosive gas or moisture from entering the monitor.
- The air-purge piping and each cable connected to the DT450G have a sufficient margin of length necessary for maintenance.

4.2.2 Supply of Purge Air

Using the pressure control valve, adjust the supply pressure of purge air as noted below. Then, fully open the stop valve.

- Supply pressure = Pressure of gas under measurement + approximately 50 kPa

4.2.3 Supply of Power

Turn on the power switch installed in the power line to feed power to the DT450G.

When the power is turned on, the green LED indicator lamp on the monitor comes on. It takes approximately 30 minutes for the DT450G to reach steady-state operation.

4.2.4 Setting of Parameters

The dust monitor has a 4-20 mA output and two relay contact alarm outputs. The effect of sudden change of measured value can be removed by setting a user configurable time constant. The output current of the 4-20 mA signal can be trimmed.

The relay output(s) change their state when the measured dust concentration exceeds a user selected alarm trigger level. The relay output(s) are also protected against the effect of sudden change of input signal, with a user configurable time constant, common for both relays.

All the user selectable parameters have factory default values, which in many cases will suffice. If your application requires changing parameters, proceed as follows.

How to Change Parameters

Open the cover of the dust monitor. You see a front panel, a display unit and three parameter buttons (A, B and C).

It is needed to enter PIN code before setting parameters.

1. Press (A) key and select first PIN code digit 0 to 9.
2. Press (B) key and select second PIN code digit 0 to 9.
3. Press (C) key and select third PIN code digit 0 to 9.

Factory default for PIN code is 1.1.1..

Parameters can be changed after the right PIN code is selected and simultaneously press and hold down (B) and (C) key for one second. (Parameter setting mode)

Press the leftmost (A) key of the three keys below the display, until the leftmost digit indicates the number of the parameter you wish to change (refer to Table 4-1). The two other display digits now show the parameter value. Pressing the middle (B) key and rightmost (C) key, you may now change the parameter value. See instructions below for each individual parameter.

When you have set all the parameters, press the leftmost (A) key again until the display shows “-SP.” Press one of the other keys (B or C) to save all the parameters.

NOTE: All parameters must be as you wish to have them, when you save them. If you want to make more changes, or decide not to save the parameter you have changed, press the left most (A) key again.

Table 4-1 Parameter Change Table

Parameter	Display Left Number	Range	Key Effect Key B	Key Effect Key C	Factory Default
Alarm contact (relay 1)	1	1 to 99%	Increase number by 10 %	Increase number by 1 %	5%
Alarm contact (relay 2)	2	1 to 99%	Increase number by 10 %	Increase number by 1 %	60%
4 mA trim	3		Increase number	Decrease number	Set to 4 mA
20 mA trim	4		Increase number	Decrease number	Set to 20 mA
Alarm contact time constant	5	10 to 180 s	Increase number by 10 s	Decrease number by 10 s	10 s
Analog output signal time constant	6	10 to 300 s	Increase number by 10 s	Decrease number by 10 s	10 s
Percent level of full range	7	10 to 50%	Increase number by 10 %	Decrease number by 10 %	20%
	8	Not available			
	9				
Fine adjustment for measuring range	0.	1 to 100%	Increase number	Decrease number	20
	10.*	Not available			
Pin code	1.				
Set measuring range	1.0*	0 to 5	Increase number	Decrease number	0
Save parameters	-SP*		Save all	Save all	-

*1.0, 10., in 2 digits -sp in 3 digits

T0402.eps

Do not set parameters except “0” for the leftmost digit “8”, “9” and “10.”.

Setting Alarm Contacts

Press the leftmost (A) key until the leftmost digit shows “1” or “2”. Set the alarm contact of relay 1 or 2 in percent of the output full scale value. Each press of the middle (B) or the rightmost (C) key only increases the number, which will roll back to 1% after it reaches 99%. The percentage is displayed by the two rightmost display digits.

Trimming Analog Output Signals (4 mA and 20 mA)

Press the leftmost (A) key until the leftmost digit shows “3” or “4”. Increase or decrease the output current. The display shows the nominal mA value with its two rightmost digits. Connect a calibrated mA meter to the analog output terminal to check the actual current value. Allow 30 minutes warm up time before trimming the mA output.

Setting Time Constants

Press the leftmost (A) key until the leftmost digit shows “5” or “6”. Change the time constant of the alarm contact or the analog output signal in increments of 10 seconds. The alarm contact time constant will change back to 0 s from 180 s, the analog output signal time constant from 300 s. The two leftmost digits of the value are displayed by the two rightmost display digits.

Setting of the Measuring Range

The measuring range can be set manually or by Auto Setup button.

(1) Manual Setting

In manual setting the measuring range is set by amplifying the signal detected by the sensor in 5 stages.

Press the leftmost (A) key until the leftmost digit shows “1.0”, and press the middle (B) or the rightmost (C) key until the rightmost digit shows the number of the desired parameter. Table 4-2 shows that the rightmost digit number and its parameter.

Table 4-2 Measuring Range Setting

Display Right Number	Parameter Description
0	Automatic range setup
1	Maximum range (For high concentration of dust)
2	Gain x 10
3	Gain x 100
4	Gain x 1000
5	Gain x 10000 (For low concentration of dust)

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When parameter 1 is selected, the measuring range is maximized. If the dust concentration is high, select this parameter. The output sensitivity becomes higher as the parameter number increases from “1” to “5”. Chose the most appropriate parameter for your process.

(2) Auto Setup

In the process where the dust concentration is a certain level and stable during normal operation, range setting by Auto Setup button is also available.

Before the Auto Setup, the setting level should be confirmed.

The dust monitor has an Automatic Setup function. You can change the default percent of full range (20%) in steps of 10% from 10 to 50%. Press the leftmost (A) key until the leftmost digit shows “7” and increase or decrease the value using the middle (B) or the rightmost (C) key.

The setpoint of 20% means that the 4-20 mA output at the typical dust concentration will be $4 \text{ mA} + (20 \text{ mA} - 4 \text{ mA}) \times 20\%$ which makes 7.2 mA. If the dust concentration is five times the typical value or higher, the output will be 20 mA, and if the dust concentration is zero, the output will be 4 mA.

Next, the measuring range should be set. Press the leftmost (A) key until the leftmost digit shows "1.0". Press the middle (B) key or the rightmost (C) key to increase or decrease the value until the rightmost digit shows "0" (see Table4-1). Last, press the leftmost (A) key until the display shows "-SP." Press the middle (B) or the rightmost (C) key to save the setting.

For Automatic Setup, make sure that the process is running with a normal dust concentration. Then open the cover of the dust monitor. After move the parameters setting mode, initiate Automatic Setup by pressing the small key button near the indicator lamp on the lower printed circuit board (see Figure 4.1). Note: The indicator lamp should be green before you press the key.

Note: Initiate Automatic Setup in parameters setting mode.

Collecting data of the dust concentration will take an hour or less. The three digit display counts down towards zero, and the indicator lamp is red as long as the data are being collected. To avoid interference from the background electrical noise, you should close the cover of the enclosure right after having initiated the Automatic Setup. After an hour, the setup is ready and the dust monitor is in normal operation. The indicator turns back to green when setup is ready.

Note: The setting level is valid only when the automatic range setup (parameter "0") is used.

(3) Fine adjustment for measuring range

Fine adjustment adjusts measuring range from 1-100%. Press the leftmost (A) key until the leftmost digit shows "0.", set the value from 1-100% .

- In case of setting 10%, the maximum range is 2 times higher than current range.
- In case of setting 50%, the maximum range is 0.4 times higher than current range.
- In case of setting 100%, the maximum range is 0.2 times higher than current range.

The following is relationship between the setting value and multiplication for measuring range.

$$(\text{Multiplication for measuring range}) = \frac{20}{(\text{Setting value})}$$

• Relay connection and parameter setting mode

- (1) When both relays connected to NO
Relay 1 contact : Open Relay 2 contact : Close
- (2) When relay 1 connected to NO and relay 2 connected to NC
Relay 1 contact : Open Relay 2 contact : Open
- (3) When relay 1 connected to NC and relay 2 connected to NO
Relay 1 contact : Close Relay 2 contact : Close
- (4) When both relays connected to NC
Relay 1 contact : Close Relay 2 contact : Open

4.3 Steady-state Operation

Proceed to steady-state operation after making sure there is no problem with the DT450G during start-up.

Before going into steady-state operation, make sure the cover is securely attached to the DT450G main unit. Moisture or corrosive gas entering into the DT450G may result in malfunction.

This section discusses the following topics concerning the handling of the DT450G during steady-state operation.

- Examination of operating condition (carried out only at the beginning of operation)
- Shutdown
- Restart

4.3.1 Examining the Operating Condition

At the beginning of operation, examine the following points to ensure that the DT450G continues to operate in its optimum condition.

- **Effects of External Noise, Etc.**

If the DT450G is being affected by noise to such a degree that normal operation becomes problematic, first make sure the DT450G is installed and wired correctly as instructed by this manual. Then, take appropriate noise countermeasures.

- **State of Dust Accumulation**

Accumulation of a large amount of dust on the sensor probe of the DT450G may adversely affect its normal operation. If the measured value is found to be abnormal, remove the DT450G and examine the state of dust contamination of the sensor probe. If the cause of the abnormal measured value is dust accumulation, clean the sensor probe periodically. If you are using the DT450G in a high-temperature or moist gas atmosphere, also examine the effectiveness of air purge. If the amount of dust accumulating on the outlet of purge air is found to be gradually increasing, increase the supply pressure of purge air. If condensation is observed around the probe inlet, it is advisable that heat insulation measures be taken.

4.3.2 Shutdown

To shut down the DT450G, turn off the power switch installed in the power line. If the DT450G will not be used for a prolonged period, only turn off the power switch without turning off the air-purge line. The air-purge line need not be left turned on if there is no flow of gas to be measured (provided that the ambient humidity is not too high).

4.3.3 Restart

There is nothing in particular that needs to be done before restarting the DT450G. If the DT450G has not been in use for a prolonged period however, make sure there are no abnormalities with the sensor probe before you restart the DT450G. When there are no abnormalities with the DT450G, it will come into steady-state operation in approximately 30 minutes after power-on.

5. Inspection and Maintenance



WARNING

If the DT450G is installed in the downstream of an electrostatic dust collector, there is a danger of serious injury or death from electric shock due to high-potential static electricity. Carry out maintenance without disconnecting the grounding line that was connected when the DT450G was installed. If the DT450G is not yet grounded with a grounding line, ground it before you start maintenance.

This chapter explains inspection and maintenance carried out to repair or replace worn-out or deteriorated parts and thereby maintain the DT450G in its optimal operating condition.



CAUTION

When inspecting and maintaining the DT450G, remove it from where it is installed. Be careful not to inflict severe impact to the monitor during inspection and maintenance, otherwise it may be damaged.

5.1 Periodic Maintenance

If the sensor probe is contaminated with a large amount of dust or significantly worn out by dust, the output signal level for the same dust concentration may differ from the level when the DT450G was initially put into operation. To be able to revert to the initial output signal level, the sensor probe must be cleaned or the measurement range must be reset. Do not disassemble such components as the printed circuit board from the internal unit of the DT450G; otherwise, the DT450G may fail to operate correctly.

5.1.1 Cleaning the Sensor Probe

If the sensor probe tends to gather a significant amount of dust, it is advisable that the probe be cleaned periodically. If dust accumulation is not very serious, its effect on the output signal is in most cases negligible; therefore, it is not necessary to clean the sensor probe frequently.

Remove dust on the sensor probe with a dry cloth. For correct and normal measurement, keep the insulation resistance of the purge-air outlet at a high level. To ensure this, completely remove contaminants from the outlet. When cleaning the sensor probe, also remove dust that has accumulated on the probe inlet.

5.1.2 Correcting (Resetting) the Measurement Range

The sensor probe may be worn out by dust contained in the gas under measurement. Although wear in the sensor probe may not directly lead to the inability to measure, the level of current arising from frictional electricity may change, affecting the output signal. If you need to know precise dust concentration, correct (or reset) the measurement range according to your degree of necessity. Correct (reset) the measurement range according to the procedure of measurement range setting discussed in subsection 4.2.4. If the wear on the sensor probe is extreme, it must be replaced.

5.2 Replacing Parts

In order to keep the DT450G serviceable over a prolonged period, you must replace parts that are worn out or have deteriorated as a result of the gas under measurement.

5.2.1 Replacing the O-rings

The O-ring that needs replacement is the one that prevents leakage of the gas under measurement from the probe inlet. If the O-ring is found to be damaged in any way, such as scratches, or cracks or permanent deformity due to deterioration, replace it.

Note: O-rings are also used in the DT450G main unit and on the contact surfaces of the sensor probe, though they are not visible from outside. Ask Yokogawa Electric Corporation for replacement of these O-rings.

5.2.2 Replacing the Sensor Probe

Even if the sensor probe becomes worn, it does not fall into a state of being totally unable to take measurements. If wear of the sensor probe is extreme however, replace the whole sensor assembly. Determine the time of replacement on a case-by-case basis, by judging from what degree of correction has been made to the measurement range set when the DT450G was first put into use, whether the sensor probe is still adequately rigid, and so on. Yokogawa Electric should be asked to carry out any replacement of the sensor assembly.

6. Troubleshooting

This chapter explains measures that should be taken when the output signal gives abnormal readings. Note that not all anomalies are due to failure (disorder or malfunction) in the DT450G. Some of them may be due to a change in the physical properties (types of components, the flow velocity, etc.) of the gas being measured. If such a change is likely, first check for the following.

Table 6.1 Causes of Failure and Corrective Actions

State of Failure	Cause	Corrective Action
The output signal overshoots toward the 20mA side.	<ul style="list-style-type: none"> • Air purge is not effective. • Condensation occurs at the probe inlet. 	<ul style="list-style-type: none"> • Check that the gap at the purge-air exit is as specified. If the exit is contaminated with dust, increase the purge pressure (remove the dust on the exit). • Take appropriate heat insulation measures.
The output signal gives abnormal readings.	<ul style="list-style-type: none"> • The purge-air exit is contaminated with dust. • The sensor probe is in a state of insulation failure because of inappropriate purge air (e.g., contains moisture). • The gas under measurement has entered the purge-air piping, causing an insulation failure in the sensor probe. 	<ul style="list-style-type: none"> • Clean the exit (see subsection 5.1.1). • Use normal, dry purge air. • Set the pressure relatively higher and continue air purge for a while. (If contaminants still remain in the piping, contact Yokogawa Electric for assistance.)
The output signal does not stabilize.	<ul style="list-style-type: none"> • The flow velocity of the gas under measurement is not constant. • The humidity of the gas under measurement changes. 	<ul style="list-style-type: none"> • Change the measurement point to a position in the straight portion of the duct where the flow of gas is regular. • If the change occurs constantly, check if measuring the gas is practicable at all.
The output signal becomes disturbed momentarily.	<ul style="list-style-type: none"> • The wiring is inappropriate and therefore picks up noise. • There is equipment nearby serving as a source of noise. 	<ul style="list-style-type: none"> • Check the states of grounding and wiring and correct a problem if there is any. • Take measures for protecting the DT450G from the source of noise.
There is no output signal.	<ul style="list-style-type: none"> • The fuse is blown or there is something wrong with the wiring connections. • There is something wrong with the electric circuit components. 	<ul style="list-style-type: none"> • Turn off the power switch temporarily if the green indicator lamp is unlit. Then, examine the wiring connections and check if the fuse has blown. Consult Yokogawa if the fuse has blown. • Request repair to be carried out by Yokogawa.

Table6.1.eps

Table 6.2 Corrective Action against Errors at Automatic Setup

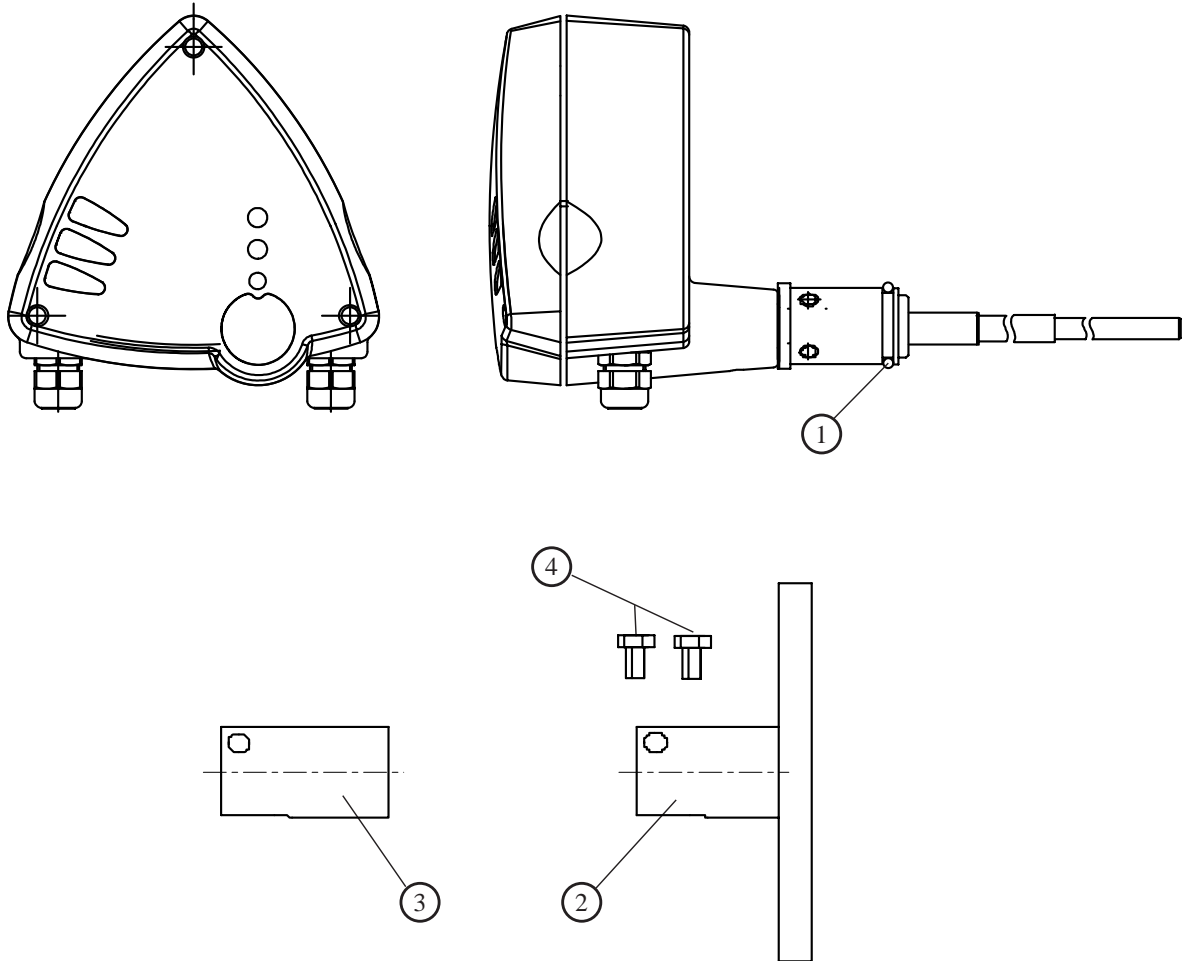
Display	Description	Corrective action
-E1	Input signal is too low	Try Automatic Setup again Manully set measurement range to Range 5
-E2	Input signal is too High	Try Automatic Setup again Manully set measurement range to Range 1

Table6.2.eps

Customer Maintenance Parts List

Model DT450
Dust Monitor

EXADT



Item	Part Number	Qty	Description
1	B1026ER	1	O-ring
2	—		Flange assembly:
	K9479DA	1	JIS 5K 65 FF
	K9479DB	1	JIS 10K 80 FF
	K9479DC	1	JIS 10K 100 FF
	K9479DE	1	JPI Class 150-2 1/2 RF
	K9479DD	1	ANSI Class 150-2 1/2 RF
3	K9479CA	1	Socket
4	L9800TC	2	Bolt

DT450G for CMPL.eps

Revision Record

Manual Title : DT450G Dust Monitor

Manual Number : IM 11K01C01-01E

Edition	Date	Remark (s)
1st	Sep. 2005	Newly published
2nd	Apr. 2007	<p>p. 2-2, Deleted some descriptions in "No Noise Effects."</p> <p>p. 2-4, Section 2.2, "Machining of Probe Inlet": Deleted some descriptions in "When Mounting to Socket."</p> <p>p. 3-3, Section 3.2, "Connecting the Wires for the Power Supply": Deleted some descriptions.</p> <p>p. 3-4, Section 3.3, "Connection of Wires for the Output Signals": Deleted "Note."</p> <p>p. 3-5, Section 3.4, "Grounding the Duct": Deleted Figure 3.4 and some descriptions.</p> <p>pp. 4-4 and 4-5, "Setting Time Constants," "Automatic Range Setup" and "Manual Setting of the Measuring Range": Fully revised.</p>
3rd	Jul. 2009	<p>p. 1-2, Section 1.2, "Specifications": Added item of DT450G-5.</p> <p>p. 1-4, Section 1.3.1, "Dust Monitor" table: Added suffix code for Analog output in "-5".</p> <p>p. 3-4, Section 3.3, "Conection of Wires for the Output Signals"Figure 3.3: Added item DT450G-5 in (*1).</p> <p>p. 4-3, Section 4.2.4, "Setting of Parameters": Added item of DT450G-5.</p> <p>p. 4-4, Section 4.2.4, "Setting of Parameters": Added table 4-3.</p> <p>p. 4-6, Section 4.2.4, "Setting of Parameters": Added item (3).</p>
4th	Apr. 2012	<p>p. 1-2, Section 1.2, "Specification" Seiup level: Deleted of the description.</p> <p>p. 1-4, Section 1.3.1, "Dust Monitor" Table: Deleted of the suffix code (-1, -3).</p> <p>Section 1.3.2, "Spaer parts": Deleted of the parts number.</p> <p>p. 3-4, Section 3.3, "Connection of Wires for the Output Signals" Figure 3.3: Change of the description with * mark.</p> <p>p. 4-3, Section 4.2.4, "Setting of parameters": Deleted of the description, and the table 4-1 and 4-2.</p> <p>p. 4-5, Section 4.2.4, "Setting of parameters" (2) Auto Setup: Deleted of the description.</p> <p>CMPL "CMPL 11K01C01-01E": Revision to 2nd edition.</p>

Thank you for selecting our DT450G Dust Monitor.

In User's Manual, IM 11K01C01-01E, 4th Edition, supplied with the product, some corrections/additions have been made. Please replace the corresponding pages in your copy with the attached, revised pages.

Revisions

- p. 1-2, Section 1.2, "Specifications,"Measurement principle: Change of the description.

1.2 Specifications

Measurement objects: Solid particles in gas

Particle size : 0.3 μm or greater

Measurement range: 0.1 mg/m^3 to 1 kg/m^3

Measurement principle: Inductive Electrification

Process conditions :

Temperature : 250 $^{\circ}\text{C}$ or less

Pressure : 200 kPa or less

Gas flow rate : 4 m/s or greater (approx. 30 m/s max)

Humidity : 40 %RH or less

Input surge voltage : 100 V or less (if 500 V or greater, converter may be damaged.)

Note : When installing downstream of ESP, see Item 2.1.

Measurement range:

Range setup : One-touch automatic setup or manual setup (Measurement range does not directly represent dust concentration. To know the absolute value of dust concentration, the relationship between the output signal and the dust concentration should be obtained by laboratory analysis or relevant way.)

Note : With one-touch automatic setup function, measurement range is set so that the dust concentration of the process corresponds to a setpoint of setting level. In manual setup, the measurement range is set by gain (x1, x10, x100, x1000, x10000).

Setup range level:

Variable (10 to 50%, 10% step)

Drift:

Zero drift : $\pm 2\%$ /month

Span drift : $\pm 2\%$ /month

Analog output signal :

4-20 mA DC, insulated, load resistance; 500 Ω

Contact output signal (high/low alarm):

Contact capacity : 5A, 240 V AC or 24 V DC

Setting range : 1 to 99% (1% step) of measurement span

Contact type:

NO (closed when alarm contact is activated) or NC, 2 outputs

Note : Relay is energized when alarm contact is activated.

Damping time constant :

10 to 300 seconds, 10 second step

Relay output time constant :

10 to 180 seconds, 10 second step

Ambient conditions:

Temperature : -20 to 45 $^{\circ}\text{C}$

Humidity : 95 %RH or less (non-condensing)

Vibration : 5 m/s^2 (0.5G) or less

Construction:

Converter : Integrated with detector, protection rating IP 64

Sensor probe : Direct insertion