



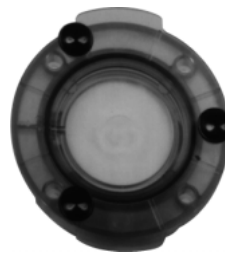
Instruction Manual

GAS FILTER/CLEANER

TYPE: ZBB



Mist filter
(ZBBK)



Membrane filter
(ZBBM)



Gas filter
(ZBBB)

PREFACE

Thank you very much for purchasing Fuji's Sampling Devices for Analyzer (Gas Filter/Cleaner, Type: ZBB).

- Be sure to read this instruction manual carefully before performing installation, operation, and maintenance of the sampling devices. Improper handling may result in accidents or injury.
- The specifications of this sampling devices are subject to change without prior notice for further product improvement.
- Modification of this sampling devices is strictly prohibited unless a written approval is obtained from the manufacturer. Fuji will not bear any responsibility for a trouble caused by such a modification.
- The person who actually operates the sampling devices should keep this instruction manual.
- After reading through the manual, be sure to keep it near at hand for future reference.
- This instruction manual should be delivered to the end user without fail.

Manufacturer: Fuji Electric Co., Ltd.
Type: Described in nameplate on main frame
Date of manufacture: Described in nameplate on main frame
Country of manufacture: Japan

Request

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- Description in this manual is subject to change without prior notice for further improvement.




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SAFETY PRECAUTIONS

Read this “Safety Precautions” carefully before using the instrument.

These precautions contain essential information regarding product safety and must be followed at all times. Those safety precautions are ranked in 3 levels, “DANGER”, “CAUTION” and “PROHIBITION”.

 DANGER	If operation is incorrect, a dangerous situation may occur, resulting in death or serious injuries.
 CAUTION	If operation is incorrect, a dangerous situation may occur, resulting in minor to medium injuries or only physical damage to equipment.
 PROHIBITION	Items which must not be done are noted.

 DANGER	<ul style="list-style-type: none"> • Close the valve for the calibration gas during replacement of sampling equipments. Also, when the valve for the sampling gas is located at the inlet of analyzer, close the valve before operation. Otherwise, it may lead to gas leakage that causes disaster such as fire hazards. Always turn the exhaust fan ON before performing maintenance on the analyzer. • When the inside of chimney or funnel is positive pressure, sufficiently beware of sample gas jetting-out when replacing the filter. Before replacement, close the valve on the analyzer inlet, if provided, and turn OFF the gas aspirator of sample gas. Otherwise, intoxication or accident may occur.
 CAUTION	<ul style="list-style-type: none"> • Request qualified specialists or the seller to process installation, wiring and piping. Poor mounting may cause drop of the instrument, electric shock or injury. • Analyzer should be turned OFF when wiring, maintenance or inspection is carried out. Otherwise, it may cause electric shocks and injury. • Use appropriate wire rod and diameter that meets the ratings. Wrong ones may cause electric shock or fire. • Equipments that require ground wires must be provided with class three grounding. Inappropriate grounding may cause electric shock hazard. • Do not insert any metal rod or finger into power supply terminals. Otherwise, electric shock or injury may occur. • Before working, take off wrist watch and other metallic objects to prevent electric shocks. • For piping, use pipes and couplings specified in the instruction manual. Otherwise, a gas leakage may occur. • Use replacement parts that are specified by the manufacturer. Otherwise, the instrument could not exhibit its performance fully and, furthermore, accidents or faults may be caused. • If any trouble cannot be located upon referring to the instruction manual, be sure to ask the sales agent or our serviceman to correct it. Disassembling the instrument carelessly may cause an injury. • Dispose of eliminated faulty parts and the like as incombustible objects.

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1. OUTLINE

A gas filter/cleaner is used for eliminating dust and interfering gases from a gas sampling system.

- (1) Mist filter (Type: ZBBK)
This is a secondary filter, which is arranged after a gas extractor (primary filter), for separating drain produced in a gas pipe, or eliminating dust and mist which are not eliminated with a primary filter.
- (2) Membrane filter (Type: ZBBM)
The membrane filter is arranged at the last stage in a gas analyzer for eliminating fine dust particles.
- (3) Gas filter (Type: ZBBB)
This is used for eliminating dust and interfering gases from samples such as atmosphere containing no drain.
- (4) Gas-washing separator (Type: ZBBF)
The separator is arranged just under a washing nozzle to separate a sample gas from washing water and provide the former only.
- (5) Washing nozzle (Type: ZBBH)
When a sample contains a large quantity of dust, the washing nozzle is combined with the gas-washing separator and arranged immediately after a gas extractor for eliminating dust and water-soluble corrosive components from a sample gas by washing with water.

2. SPECIFICATIONS

Refer to the appendix attached to the last part of this manual.

3. INSTALLATION

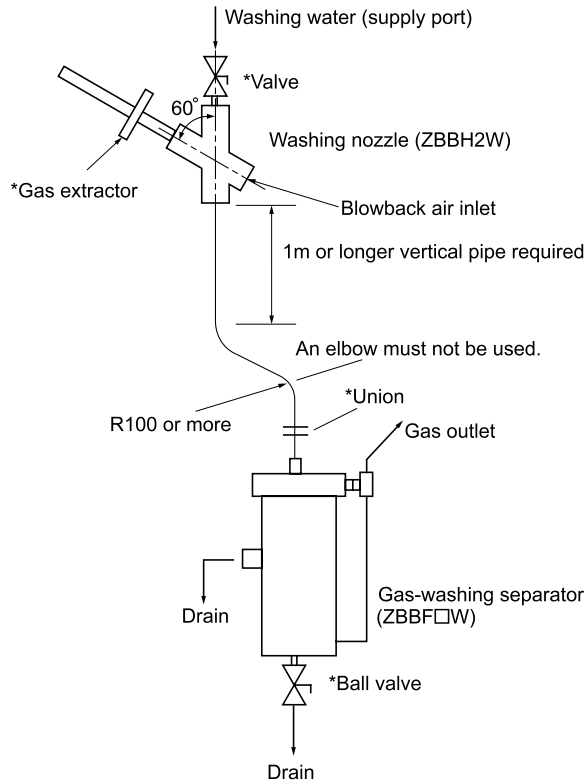
For installing the gas filter/cleaner, select a location which can satisfy the requirements listed below.

3.1 Mist Filter (ZBBK), Gas Filter (ZBBB) and Membrane Filter (ZBBM)

Requirement	Mist filter	Gas filter	Membrane filter
(1) Location convenient for replacement of the filter elements	○	○	○
(2) A space of at least 200mm for replacement of the filter elements	○	○	—
(3) Spaces for installing drain pot (ZBH13, ZBH3) and safety drain trap (ZBH51). (The drain pipe must be inclined as required.)	○	○	—
(4) The filters are to be mounted on a vertical board with the drain outlet kept lower.	○	○	—
(5) The filters are to be mounted on a vertical board with the arrow on the cover directed upward (gas inlet kept lower).	—	—	○

3.2 Washing Nozzle and Gas-Washing Separator

- (1) A pipe 15A (1/2B) as short as possible should be connected between the extractor and washing nozzle. The pipe connected between the extractor and washing nozzle will not be washed with water. The washing nozzle should be mounted almost vertically in the vicinity of the extractor (see Fig.3-1). Set the angle to approximately 60° to prevent entry of washing water into the extractor. When the pipe may be clogged by condensed water or dust, it should be heated. Washing water supply pipe (15A), water discharge pipe (25A) and drain pipe (15A) should be connected easily. The washing water supply pipe should desirably be equipped with a pressure gauge (0 to 1MPa) for convenient monitoring.
- (2) Use a pipe 1/2B between the washing nozzle and gas-washing separator. The pipe must be vertical for section of at least 1m after the washing nozzle and have sufficient inclination with R100 or larger. A pipe joint elbow must not be used. The gas-washing separator should be mounted vertically, desirably right under the washing nozzle (see Fig.3-1). A space must be reserved for drawing out upward the inner pipe of the gas-washing separator for cleaning its interior.
- (3) The outlet tube of the gas-washing separator with the inside diameter of more than 8mm must have sufficient inclination to prevent condensed water from accumulating.
- (4) When exhaust gas contains corrosive gas, use pipes made of anticorrosive material such as SUS tube. Take consideration for preventing corrosion especially for the pipes connected to the gas-washing separator.



* The asterisked parts and pipes are optional parts.

Fig.3-1 Reference drawing of mounting

4. PIPING PROCEDURES AND REMARKS

4.1 Mist Filter, Gas Filter and Membrane Filter

Requirement	Mist filter	Gas filter	Membrane filter	
			ZBBM2V, 4V	ZBBM6V, 7V
(1) The gas inlet and outlet are tapped Rc1/4. For piping, screw in nipples or union joints matched with the materials of the pipes.	○	○	○	—
(2) The pipe connected to the gas inlet should be inclined downward at an angle as large as possible so that drain produced in the pipe will flow into the drain pot without stagnation.	○	○	—	—
(3) The gas inlet and outlet are designed as hose nipples having an outside diameter of 6.4mm. Connect elastic tubes having an inside diameter of about 5mm.	—	—	—	○
(4) The drain outlet is tapped Rc1/4. A drain pipe must have an inside diameter of at least 8mm. Prepare a joint matched with the drain pipe. Use a hose nipple having an inside diameter of at least 5mm. The drain pipe should be arranged so as to have no slack or horizontal section in its course.	○	○	—	—
(5) The gas outlet pipe must be raised about 200mm for replacing the filter element. Consideration must be taken so that such movement will cause no hindrance to the piping.	○	—	—	—

5. OPERATING PROCEDURES AND REMARKS

5.1 Mist Filter, Gas Filter and Membrane Filter

- (1) Make sure that the filters are arranged correctly.
- (2) Make sure that the butterfly bolts are tightened firmly on the mist filter and gas filter.
Also make sure that the night latch or butterfly nut is tightened firmly on the membrane filter.

5.2 Washing Nozzle and Gas-Washing Separator

- (1) Start supplying washing water to the washing nozzle.
 - Type : Washing water (arranged a strainer when it may contain dust)
 - Pressure : 100 to 200kPa as measured at the inlet of the washing nozzle
 - Flow rate : Approx. 5 to 10L/min (adjust in accordance with gas aspirating rate)
- (2) To prevent dust from being accumulated in the gas-washing separator, open the draining ball valve a little to flow the washing water at such a rate that the overflow from the upper water discharge port is not stopped.
- (3) The discharge water contains bubbles of the aspirated gas. When a sample gas contains poisonous gas such as CO, separate the gas from the discharge water once again.

Refer to the appendix attached to the last part of this manual.

6. MAINTENANCE AND CHECKS

6.1 Replacement of Mist Filter Element

- (1) Stop the gas aspirator (pump).
- (2) When the sample gas is kept under a positive pressure, close the valves, etc. arranged at the preceding stages to prevent the sample gas from spurting out during replacement of the filter element.
- (3) After loosening the butterfly bolts, pull out the filter head upward from the vessel.
- (4) Loosen the clamp nut (Fig. 6-1) and remove the contaminated filter element while taking care not to lose the O-ring.
- (5) Assemble a new filter element by following the reverse to the disassembling procedures described above.
- (6) The filter element should be replaced with a new one once every two to six months (depending on the diameter of filter and dust concentration at the preceding stage).

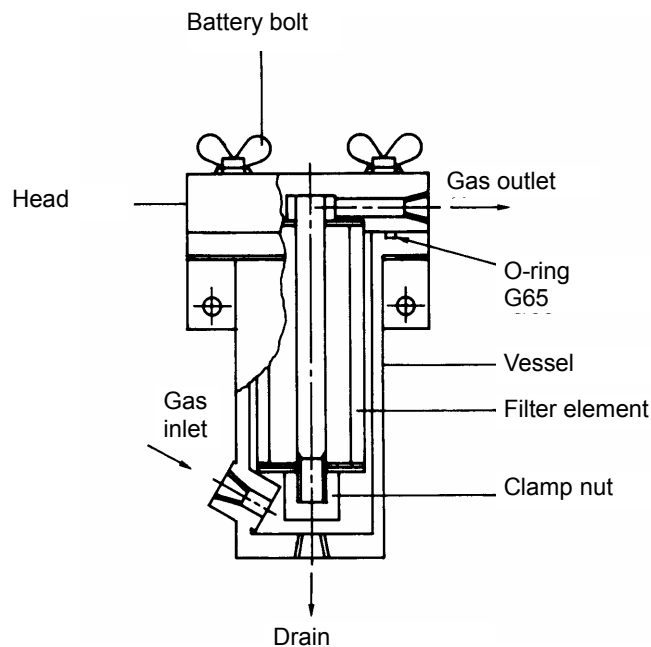


Fig.6-1 Structural Diagram of Mist Filter

6.2 Replacement of Gas Filter

- (1) Stop the gas aspirator (pump).
- (2) When the sample gas is kept under a positive pressure, close the valves, etc. arranged at the preceding stages to prevent the sample gas from spurting out during replacement of the filter (glass wool filter or steel wool filter).
- (3) After loosening the butterfly bolt, detach the cover.
- (4) Pull out the drawer rod and take out the filter.
- (5) Assemble a new filter by following the reverse to the disassembling procedures described above.
- (6) In case of glass wool filters (Type: ZBBB1V), insert the drawer rod into the hole formed at center of the disks and set them into the case. (Set 5 to 6 disk-like glass wool filter.) In case of a steel wool filter (Type: ZBBB2V), set it into the case while winding it around the drawer rod.
- (7) The glass wool filters should be replaced with new ones when about half the packed wool comes contaminated. The steel wool filter should be replaced with a new one when it is torn into pieces.

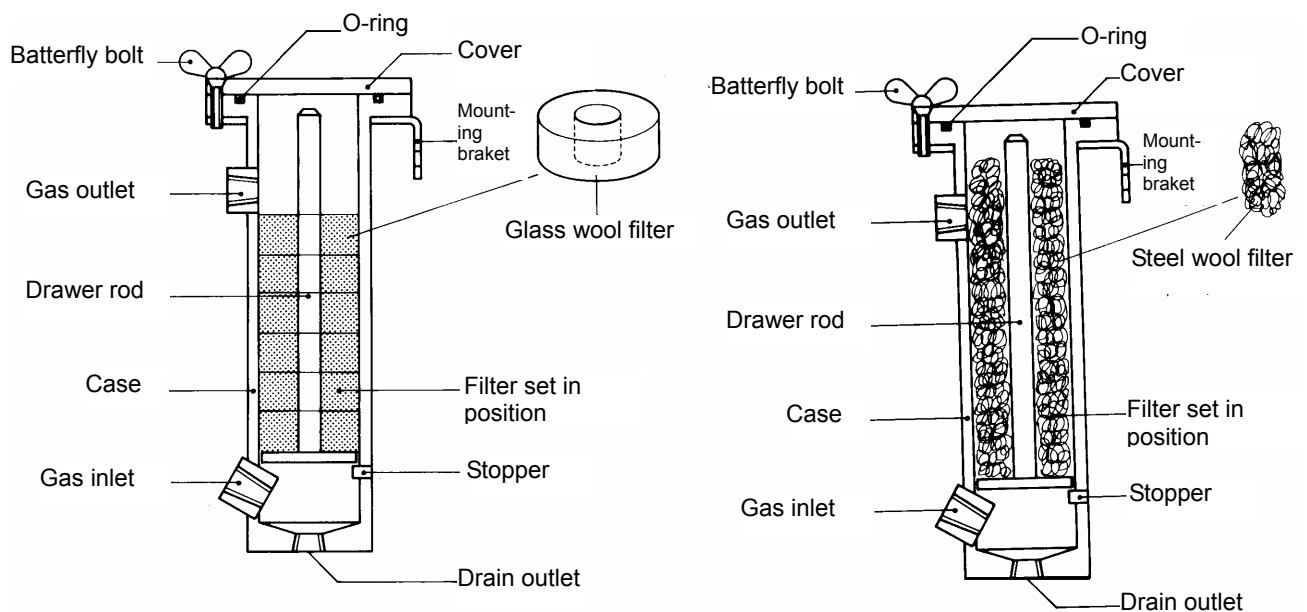


Fig.6-2 Structural Diagram of Gas Filter

6.3 Replacement of Membrane Filter

- (1) Turn OFF the gas aspirator (pump) power switch or close the valves, etc. at the stages preceding the membrane filter to prevent the sample gas from spurting out.
- (2) In case of Type ZBBM2, 4, detach the cover gradually while holding its collar after strongly pulling the plunger (or loosening the butterfly bolt). If the cover won't be detached, insert tip of a blade screwdriver between the filter body and cover, and lightly turn the screwdriver. The cover can easily be detached in this procedure.
In case of Type ZBBM6, 7, detach the cover by turning it.
- (3) Remove the internal O-ring and replace the filter (paper filter or Fluoropore filter paper) with a new one.
- (4) Wipe off dust from the case interior with a piece of clean cloth. At this step, take care not to allow dust to enter the gas outlet.
- (5) Assemble the new filter element by following the reverse to the disassembling procedures described above.
- (6) The Fluoropore filter paper (ZBBM4, ZBBM7) should be set in close contact with the filter support metal.
- (7) The membrane filter element should be replaced with a new one once every 7 to 90 days (depending on the condition of sample gas).

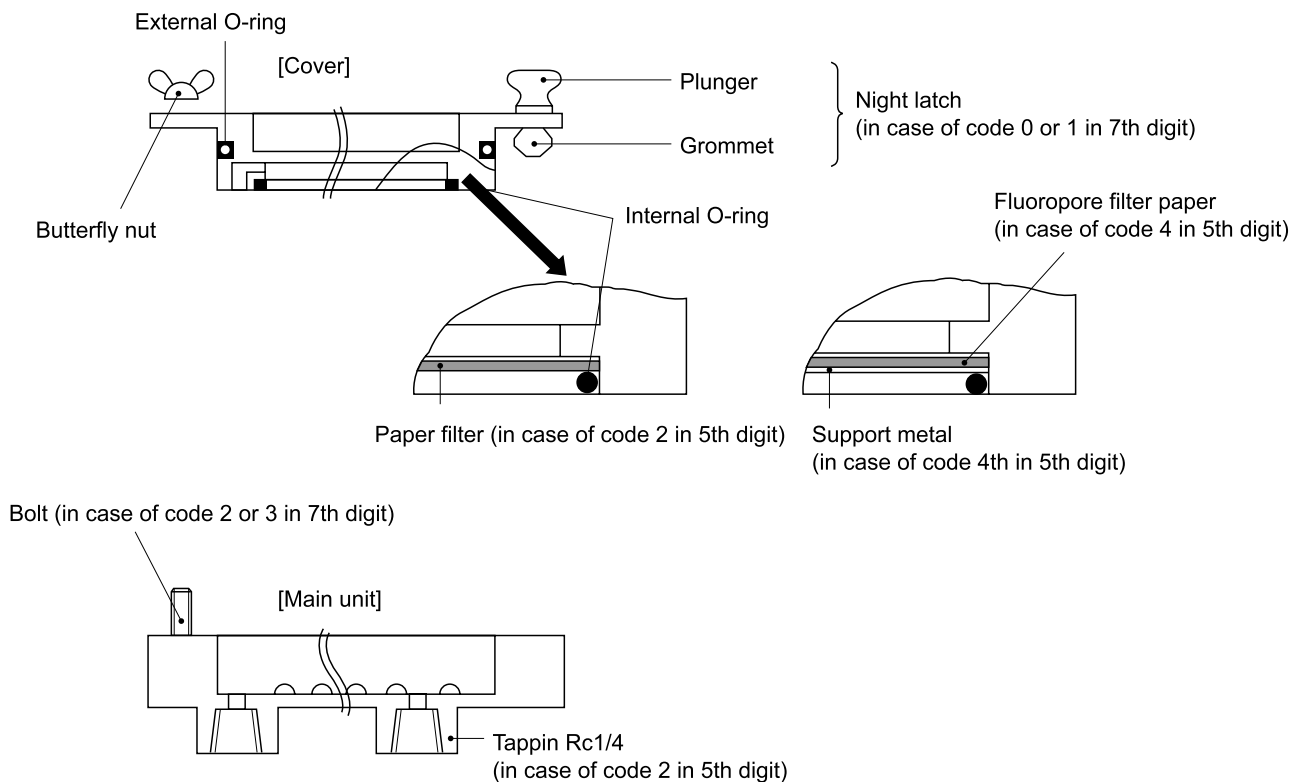


Fig.6-3 Structural Diagram of Membrane Filter (ZBBM2, 4)

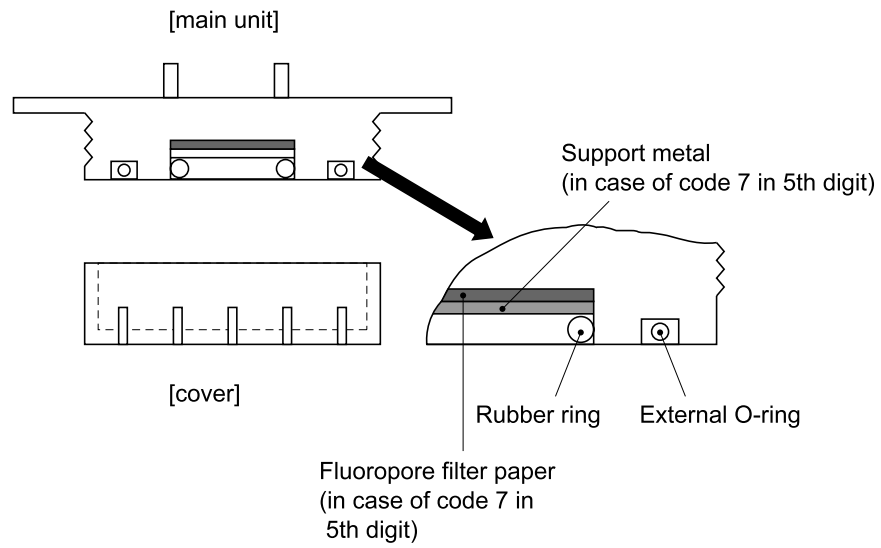
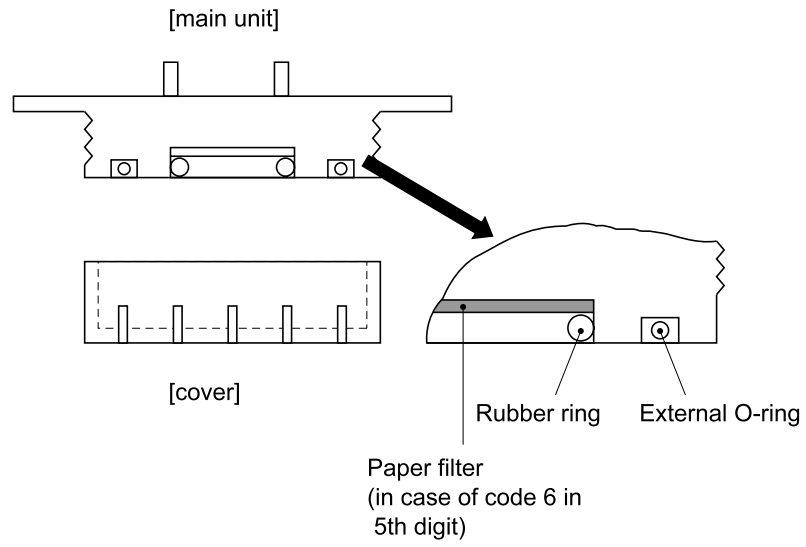


Fig.6-4 Structural Diagram of Membrane Filter (ZBBM6, 7)

6.4 Washing Nozzle and Gas-Washing Separator

- (1) Check whether or not water is overflowing from the upper water discharge port of the gas-washing separator.
- (2) When gas aspirating rate becomes too low, perform the following checks:
 - (a) The pipe connected to the gas extractor is clogged?
 - (b) Washing water is supplied at sufficient rate?
 - (c) Washing water is overflowing sufficiently from the water discharge port of the water-gas separator?
- (3) Fully open the water discharge ball valve to discharge accumulated dust once every 7 to 30 days.

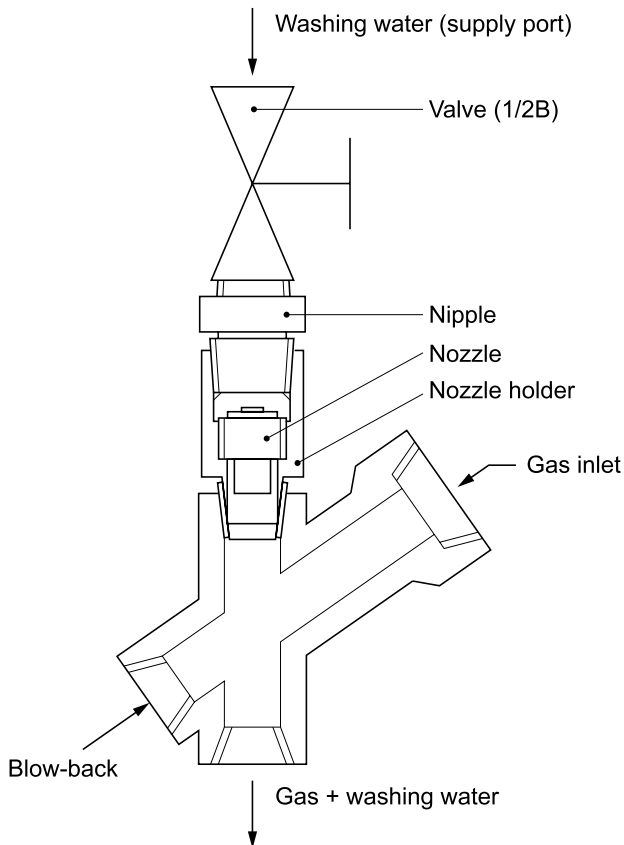


Fig.6-5 Structural Diagram of Washing Nozzle

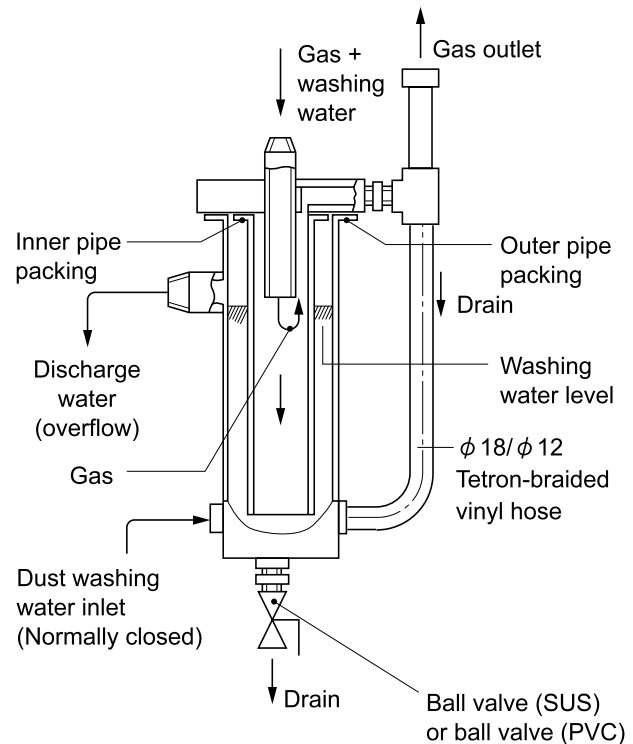


Fig.6-6 Structural Diagram of Water-Gas Separator

6.5 Others

- (1) Apply vacuum grease to the O-rings and rubber rings used in the mist filter, gas filter and membrane filter once every three to six months.

7. PARTS FOR MAINTENANCE

7.1 Mist Filter

No	Part name	Part code	Remarks
1	Filter element	ZBNH1002	For ZBBK1V03
2	Filter element	ZBNH2002	For ZBBK2V03
3	O-ring	8553765	G65 chloroprene

7.2 Gas Filter

No	Part name	Part code	Remarks
1	Glass wool filter	ZBN3BB12	36 filters and 2 G65 neoprene O-rings for ZBBB1V03
2	Steel wool filter	ZBN3BB22	3 steel filters and 2 G65 neoprene O-rings for ZBBB2V03

7.3 Membrane Filter

No	Part name	Part code	Remarks
1	Paper filter	ZBNC6102	100 sheets for ZBBM2, ZBBM6
2	Fluoropore filter paper (0.2 μ)	ZBNC6302	10 sheets for ZBBM4 and ZBBM7
3	External O-ring	8553765	G65 neoprene for ZBBM2, 4, 6, 7
4	Internal O-ring	8552749	P49 neoprene for ZBBM2, 4
5	Support metal	TK738382P1	For ZBBM4 and ZBBM7
6	Rubber ring	TK733572P1	Neoprene for ZBBM6, 7

7.4 Washing Nozzle and Gas-Washing Separator

No	Part name	Part code	Remarks	
1	Outer pipe packing	TK7K9822P1		For ZBBF
2	Inner pipe packing	TK7K9821P1		
3	Tetron braided vinyl hose	4154418P12	Length to be specified	
4	Gas outlet joint	TK745559P2	For Teflon tube ϕ 10/ ϕ 8	
5	Gas outlet hose nipple	TK622565P3	For tube I.D. ϕ 8	
6	Ball valve (for drain port)	ZBFB4003	SUS	
7	Ball valve (for drain port)	TK762609P1	PVC	

8. APPENDIX

SPECIFICATIONS

1. Gas Filter

Model	ZBBB1V03-0 / ZBBB1V13-2	ZBBB2V03-0	ZBBB3V03-0 / ZBBB4V03-0
Application	Primary filter for gas without drain	For elimination of SO ₂ and SO ₃	For elimination of SO ₃
Filter material	Glass wool	Steel wool (Bonstar #0) (about 200 g)	Ceramic
Materials of gas-contacting parts	PVC (transparent) , chloroprene (O-ring)		PVC (transparent)
Operating temperature	0°C to 45°C		
Withstanding pressure	50kPa		
Filter replacement	Required when about half of the filter element is contaminated by dust. Steel wool filter requires replacement when it is deteriorated.		At SO ₃ concentration of 30ppm: Replace once in 4 months (ZBBB3). Replace once in 8 months (ZBBB4).
Connection port	Gas inlet and outlet Rc 1/4		Hose end ø6, Upright attachment
Mass (approx.)	0.8 kg / 0.6 kg	1 kg	0.1 kg / 0.3 kg
Response time (at flow rate 1L/min)	About 30 sec for 90% indication		
Pressure resistance	About 0.1 kPa (at 5L/min)		About 4 kPa (at 1L/min)

CONSUMABLE AND SPARE PARTS

For 1-year analysis

ZBN3BB12 (for ZBBB1V03)
Glass wool × 36, O-ring (G65) × 2
ZBN3BBC2 (for ZBBB1V13)
Glass wool × 12, O-ring (G65) × 2
ZBN3BB22 (for ZBBB2V)
Steel wool × 3, O-ring × 2

ZBN3BB82 (for ZBBB3V)
Replacement mist catcher × 3,
Ancillary fitting × 1
ZBN3BB92 (for ZBBB4V)
Replacement mist catcher × 2,
Ancillary fitting × 1

2. Membrane Filter

Type	ZBBM2V□3-0	ZBBM6V03-0	ZBBM4V□3-0	ZBBM7V03-0
Application	Final-stage filter and monitoring filter of analyzer			
Main materials of gas-contacting parts	Filter : Glass fiber O-ring : Chloroprene Body : PVC (transparent)		Filter element: Teflon O-ring : Chloroprene Body : PVC (transparent)	
Connection port	Gas inlet and outlet Rc1/4	Gas inlet and outlet ø6.4 hose port	Gas inlet and outlet Rc1/4	Gas inlet and outlet ø6.4 hose port
Operating temperature	-10°C to 45°C			
Withstanding pressure	30 kPa (7th code 2 or 3) 5 kPa (7th code 0)			
Response for 90% indication	Approx. 3 sec (at 1L/min) with standard type (7th code 0) Approx. 1.5 sec (at 1L/min) with high speed type (7th code 1 or 3)			
Installation	On vertical panel face (gas inlet being bottom, outlet being top)			
Mass	Approx. 160 g			
Pressure resistance	Approx. 0.1 kPa (at 1L/min)		Approx. 4.3 kPa (at 1L/min)	

□: CODE
0 : general
1 : small volume type
2 : 30kpa pressure type
3 : 1+ 2

CONSUMABLE AND SPARE PARTS

Part name	Body type				Remarks
	ZBBM2V	ZBBM6V	ZBBM4V	ZBBM7V	
Paper filter ZBNC6102	12 to 50 sheet /year				100 sheet / 1 box
Fluoropore filter paper ZBN C6302			6 to 24 sheets /year		10 sheet / 1 box

For 1-year analysis
ZBN3BB52 (for ZBBM2)
Paper filter 25 sheets, O-ring G65 x 1, P49 x 1
ZBN3BB72 (for ZBBM4)
Fluoropore filter paper 12 sheets, O-ring G65 x 1, P49 x 1
ZBN3BBA2 (for ZBBM6)
Paper Filter 25 sheets, O-ring G65 x 1, Rubber ring x 1
ZBN3BBB2 (for ZBBM7)
Fluoropore filter paper 12 sheets,
O-ring G65 x 1, Rubber ring x 1

3. Mist Filter

Model	ZBBK1V03-0	ZBBK2V03-0	ZBBK4V03-0
Application	Drain separation, mist/dust removal, for general exhaust gas	Drain separation, dust removal, for SO ₂ analysis, for comparatively clean exhaust gas	Same as left (with space for drain separation)
Main materials of gas-contacting parts	Glass fiber Cellulose Phenol resin Chloroprene PVC	Polyethylene Chloroprene PVC	
Pore size	Double structure of approx. 40 and 5µm	approx. 5µm	
Operating temperature	0°C to 45°C		
Connection port	Rc1/4		Inlet/outlet Rc1/4 Drain port: ø13 hose port
Withstanding pressure	20kPa		
Internal volume	Approx. 200 cm ³		Approx. 300 cm ³
Response time	Approx. 4 sec for 90% indication (at flow rate 5L/min)		Approx. 7 sec
Installation	Vertical installation on wall face		
Mass	Approx. 0.6 kg		
Pressure resistance	(Dry)	Approx. 0.1 kPa (flow rate 5L/min)	Approx. 0.35 kPa (flow rate 5L/min)
	(Wet)	Approx. 0.4 kPa (flow rate 5L/min)	Approx. 2.6 kPa (flow rate 5L/min)

CONSUMABLE AND SPARE PARTS

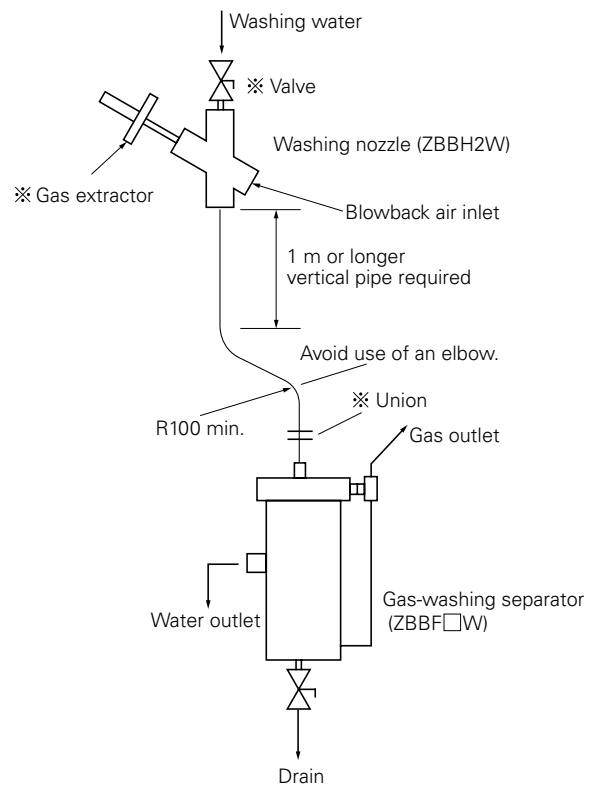
- (1) Filter element
 - ZBNH2012 (for ZBBK2, 4) 2 pcs/set
 - ZBNH1002 (for ZBBK1) 1 pc./set
 - ZBNH2002 (for ZBBK2) 1 pc./set
- (2) O-ring (JISG65)
 - ZBNN1012 (For ZBBK1, 2, 4) (10 pcs/set)
- (3) Requirement for 1 year (guide-line when used for oil burning exhaust gas)
 - ZBN3BB32 (for ZBBK1) (Filter ×3, O-ring G65×2)
 - ZBN3BB42 (for ZBBK2, 4) (Filter ×3, O-ring G65×2)

4. Gas Washing Separator and Washing Nozzle

- Model:** Washing nozzle (ZBBH2 W03-0)
Gas washing separator (ZBBF□W03-△)
- Functions:** Suction of dusty gas, washing with water and separation of water and gas
- Washing water:** 100 to 200 kPa, Typically 5 to 10L/min depending on furnace pressure and sampling pressure loss
- Suction rate:** Approx. 8L/min (water volume 8R/min, 160 mm water sealing, vertical piping of 1 m length)
- Ambient temperature:** 0°C to 60°C
- Connection port:** Washing nozzle;
- | | |
|----------------------|--------------------------------|
| Washing nozzle inlet | Rc ¹ / ₂ |
| Gas inlet | Rc ¹ / ₄ |
| Outlet | Rc ¹ / ₂ |
| Blowback air inlet | Rc ¹ / ₂ |
- Gas washing separator;
- | | |
|--------------|--------------------------------|
| inlet | R ¹ / ₂ |
| Gas outlet | R ¹ / ₂ |
| Water outlet | R1 |
| Drain port | Rc ¹ / ₂ |
- Main material of gas-contacting parts:** SUS 316
- Mass:** Washing nozzle; approx. 3 kg
Gas washing separator; approx. 15 kg (ZBBF2W)
- Discharge pressure:**
2.1kPa at max. (When 2 is selected as the 5th digit of the code symbols)
5kPa at max. (When 5 is selected as the 5th digit of the code symbols)
2.1 to 6kPa (When 9 is selected as the 5th digit of the code symbols)
- Gas outlet coupling:**
None (When 0 is selected as the 9th digit of the code symbols)
For ø10/ø8 mm Teflon tube (When 2, 3 is selected as the 9th digit of the codes symbols)

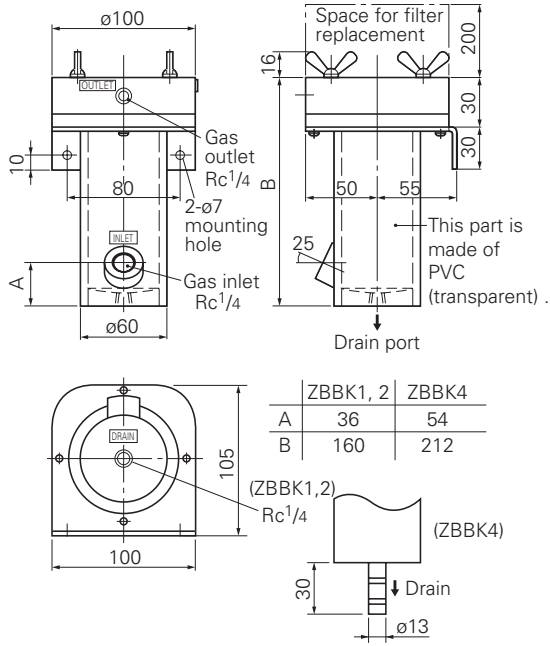
Note: For washing, use the water that has undergone degassing processing. Otherwise indication error of O₂ gauge (in the case of micro O₂ gauge) of decrease of suction flow rate may result.

Application Example

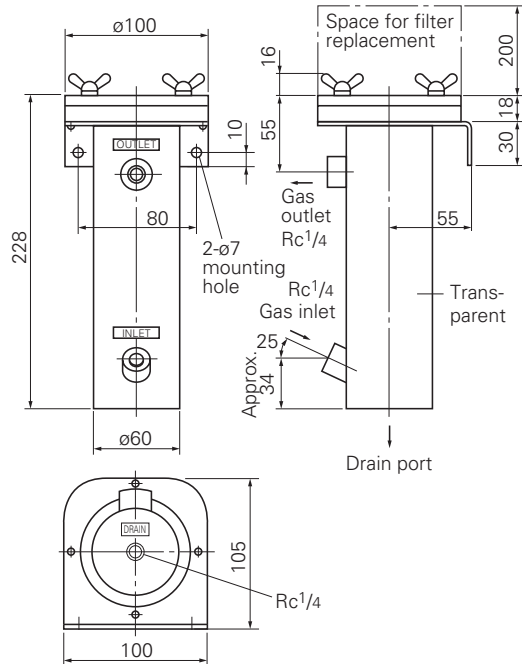


The asterisked parts and pipes are optional parts.

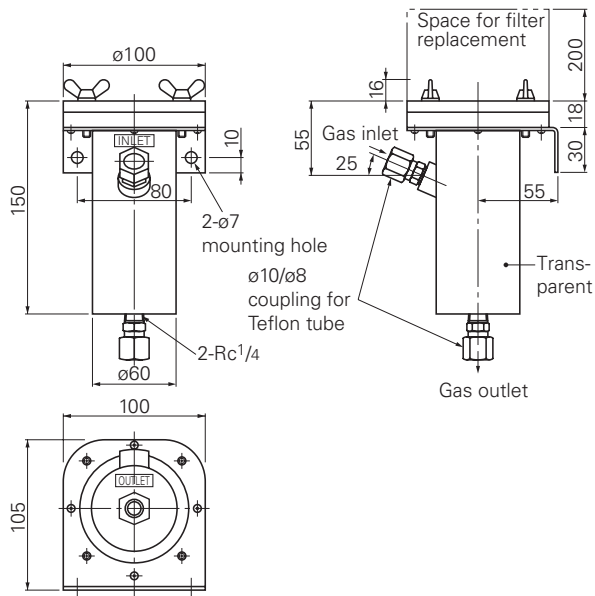
OUTLINE (Unit:mm)



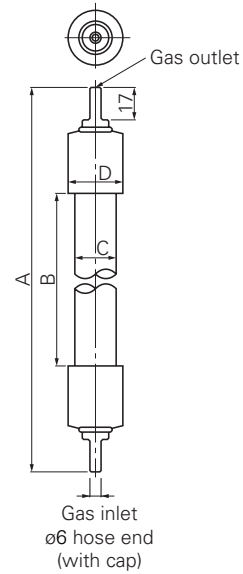
Mist filter (ZBBK)



**Gas filter
(ZBBB1V03-0)
(ZBBB2V03-0)**

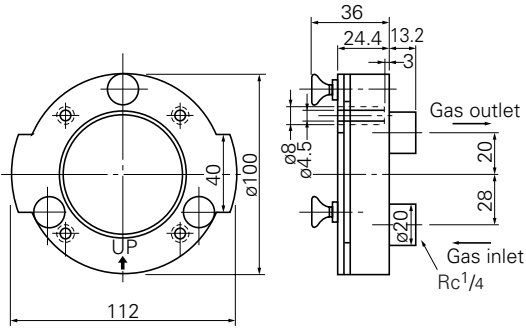


Gas filter (ZBBB1V13-2)

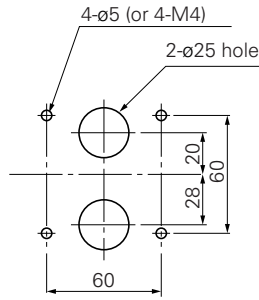


	A	B	C	D	Mass
ZBBB3	Approx. 242	Approx. 132	ø22	ø29	0.1kg
ZBBB4	Approx. 282	Approx. 118	ø48	ø57	0.3kg

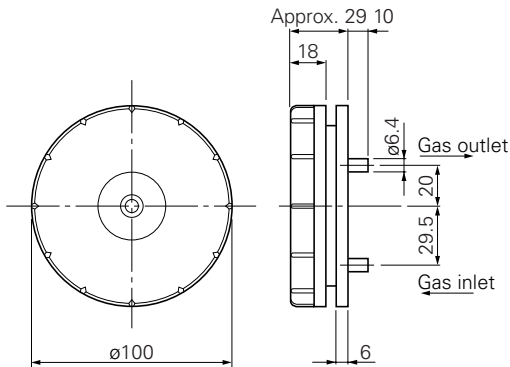
**Mist catcher
(ZBBB3V)
(ZBBB4V)**



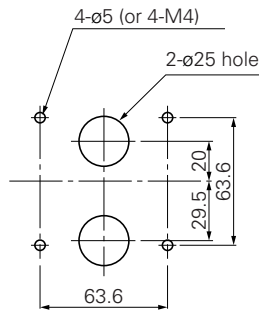
**Membrane filter
(ZBBM2V, ZBBM4V)**



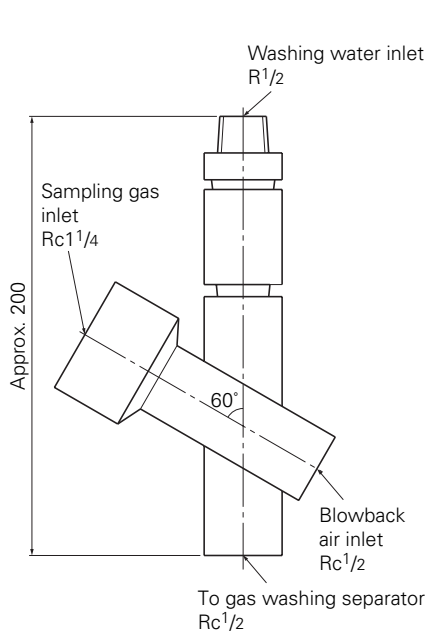
**Panel mounting
dimensions
(ZBBM2V, ZBBM4V)**



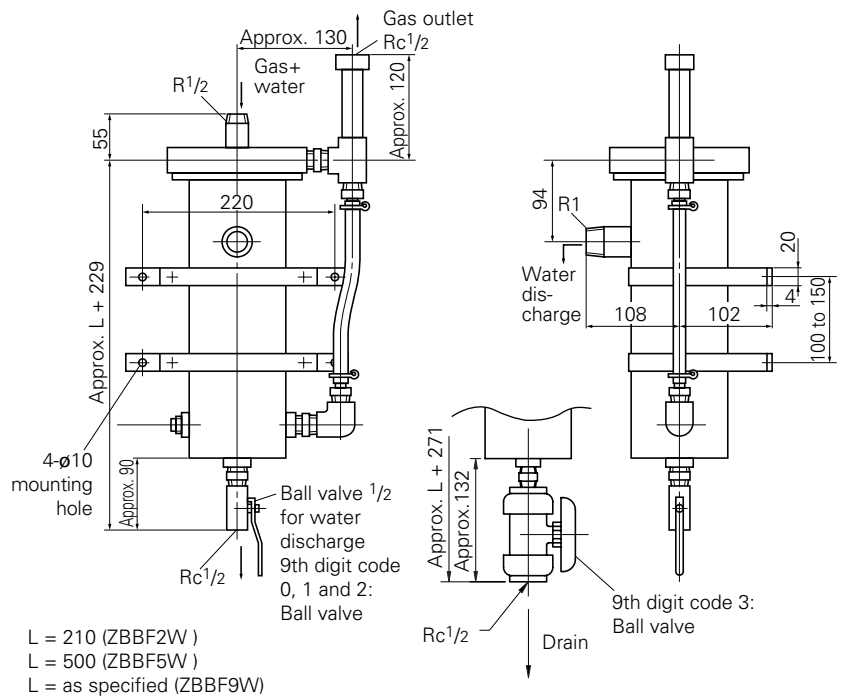
**Membrane filter
(ZBBM6V, ZBBM7V)**



**Panel mounting
dimensions
(ZBBM6V, ZBBM7V)**



Washing nozzle (ZBBH2W)



L = 210 (ZBBF2W)
L = 500 (ZBBF5W)
L = as specified (ZBBF9W)

Gas washing separator (ZBBF)

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