

Operation and Maintenance Manual

High Speed Rotary Atomizer
SUNBELL ECO



ESA200



This manual contains important information on warnings and cautions. Read the manual thoroughly before starting to operate the equipment, and follow the instructions.

Always keep the manual handy until such time as the equipment is no longer being used.

If your manual is lost or worn badly, do not hesitate to contact our agency which is closest to you, or the Asahi Sunac Corporation, directly, and ask us to send you a new one.

Introduction

Thank you for purchasing our product High Speed Rotary Atomizer, SUNBELL ECO < ESA200>.

Please be sure to read this operation manual carefully before using this product so that you can always use it under the optimum conditions.

In particular, please fully understand the items in the specifications and use them according to the correct usage.

This product is used in combination with an electrostatic controller (BPS300).

Be sure to read the operation manual of the electrostatic controller carefully.

If you have any questions, please contact us by clearly stating the "product number" and "serial number" and contacting us on the back cover.



Please keep this operation manual in a safe place where you can easily refer to it.

Contents

1	For safe and correct use	1
2	Equipment Overview	7
3	Specifications	15
4	Installation and Connections	16
5	Operation Procedure and Precautions	27
6	Maintenance and Periodic Inspection	31
7	Parts Replacement Procedure	34
8	Troubleshooting	45
9	Exploded Diagram and Names of Parts	48
10	Maintenance Log	55
11	Warranty	56

Please understand the contents of this instruction manual and be sure to follow the handling method. If you use it without following this instruction manual, **you may injure your body or damage your equipment and fire.**

The following safety precautions should be considered as minimum basic safety measures when using our products.

● **Precautions are displayed in the following two stages.**



WARNING

Hazards that can result in death or serious injury.



CAUTION

Danger that may result in minor or moderate injury or physical damage only.

● **Other important points are indicated as follows:**

NOTE

Observations to ensure the equipment's performance and functions are fully operational.

In addition, please observe all national and local laws and regulations related to fire, electricity, and safety, as well as the rules and regulations of your own company or business division.

« **Range of use suitable for the product** »

This product is an automatic spray gun designed to be installed in the coating booth equipped with an exhaust system and used for painting with paint adjusted for rotary atomization electrostatic paint. If you use the product under conditions other than the above, it will be used improperly. Also, please be careful as it may cause an accident.

 **WARNING**

Fire and explosion



Preventing fire and explosion in coating shop

- **Do not use halogenated hydrocarbon solvents.**
The aluminum alloy contained in this product's components may undergo a chemical reaction and explode.
- **Do not use this product outside its specifications.**
Using it out of specification range may result in a fire hazard.
- **Provide adequate ventilation with ventilation equipment.**
Volatilized organic solvents and other substances may remain and ignite, creating a risk of fire.
- **Clean the coating room and exhaust system (ducts and fans) regularly.**
If the accumulated powder simply peels off, a spark may occur, which could cause a dust explosion.
In the unlikely event of a fire, paint residue etc. will make it easier for the fire to spread and result in greater damage.



Prevent fire and electric shock caused by faulty earthing

- **All conductive objects in the coating booth (paint containers, peripheral equipment, etc.) must be grounded with an earth wire.**
In an atmosphere ionized by high voltage, poorly grounded conductors can become charged, creating a risk of fire or electric shock due to spark discharge.
The earth should be **Class D grounding or higher** (ground resistance 100 Ω or less).
- **Always keep the workpiece earthed.**
Risk of fire or electric shock due to spark discharge from charged workpieces.
- **Paint hose must be grounded with an earth wire.**
Static electricity can cause spark discharge, which can result in fire or electric shock.
When paint flows through the injector and paint hose, static electricity is generated and becomes charged.
- **The paint container must be grounded with an earth wire (excluding the insulated stand specifications).**
The paint path can cause the paint container to become charged, a risk of fire or electric shock.
- **The electrostatic controller must be grounded with an earth wire.**
Static electricity can cause spark discharge, which can result in fire or electric shock.
Connect the earth wire with screws or other fasteners to prevent it from coming loose.

 **WARNING**

Fire and explosion



Prevent fire and electric shock caused by faulty earthing

- **Be sure to periodically remove any paint that has stuck to the hanger.**
If paint adheres to the contact part between the hanger and the object, there is a risk of fire or electric shock due to poor earthing.
The ground resistance value should be 1kΩ or less for metal (1MΩ or less for resin) (measurement voltage should be 500V or more).
- **Do not place any items in the coating booth that are not necessary for coating.**
Static electricity can cause spark discharge, which can result in fire or electric shock.
- **Paint operator must take precautions to prevent static electricity.**
Static electricity builds up on the human body, causing sparks to discharge, which may result in fire or electric shock.



Prevent fires caused by ignition of paints and solvents

- **When nozzle cleaning, turn off the power to the electrostatic controller.**
If high voltage is applied during nozzle cleaning, there is a risk of fire.
- **Do not bring any spark-producing devices, matches, lighters, etc.**
Risk of explosion or fire due to ignition of flammable materials.

Equipment misuse



Preventing accidents caused by poor maintenance

- **Any abnormal noise, vibration or high voltage leakage, immediately stop operation.**
Product damage may result in a fire hazard.
- **Do not operate if any parts are damaged or missing.**
Product damage may result in a fire hazard.

《Warning and precautions for safe use》

WARNING

Human protection



Protection from high voltage

- **Please wear anti-static shoes.**
Static electricity builds up on the human body, causing sparks to discharge which may result in fire or electric shock.
- **Do not approach and touch the gun body while high voltage is applied.**
Touch with high voltage parts may result in electric shock.
- **The coating work floor must have an anti-static construction with a leakage resistance of 1 MΩ or less.**
There is a risk of electric shock to the operator.
The scope of the antistatic structure is the entire work floor in a closed paint room.
In an open paint booth, it is the area surrounded by 1.5m on either side of the booth opening and 2.5m in front of it.
To maintain the antistatic effect, clean the work floor when it becomes dirty.
- **Do not use this product if you have a pacemaker.**
The high voltage of this product may cause pacemakers to malfunction or stop functioning.



Protection from solvents, air and paint pressure

- **Do not spray paint towards person**
Harmful substances may cause serious injury, including inflammation and poisoning.
Pressurized paint can cause personal injury.
- **Wear protective glasses, a protective mask, and protective gloves*¹ when handling paint.**
Harmful substances may cause serious injury, such as inflammation or poisoning.
Carefully read the safety data sheet (SDS*²) of the paint you are using and take appropriate exposure prevention and protective measures.
*¹ When using protective gloves for skin absorption protection or to prevent dirt, it is necessary to prevent static electricity from building up on the human body.
Be sure to ground it properly. (Recommended protective gloves are those specified in JIS T8118, or earth bands, etc.)
*² SDS : Safety Data Sheet
- **Clean the coating room and exhaust device (ducts and fans) regularly.**
If the exhaust device does not function properly, harmful substances may cause serious injury, including inflammation and poisoning.

《Warning and precautions for safe use》

 **WARNING**

- **Do not use this product outside its specifications.**
Using it out of specification range may result damage to the product.
- **Do not immerse the coating machine, connection/extension cable or hoses in cleaning solvent.**
Electrostatic sprayer are electrical machines, immersing them in cleaning solvents may cause break down.
- **Connection/extension cable and hose should be hung from the ceiling or side walls and not dragged across the floor.**
It may cause damage such as scratches.
When using conductive paint, be sure to suspend the paint hose from an insulating material such as a rubber tube.
- **Never use a metal brush to clean the sprayer or its components.**
It may cause scratches, breakdowns, and poor coating results.
The bell cup and bell cap are important parts of the sprayer.
If you use a metal brush to scratch it, uniform coating will not be possible.
- **Check frequently for paint leaks, air leaks, and loose screw.**
- **Do not touch the bell cup of the sprayer carelessly.**
There is a risk of injury if you come into contact with the edge of the bell cup, which is rotating at high speed. Please handle with care.

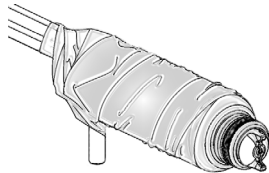


《Warning and precautions for safe use》

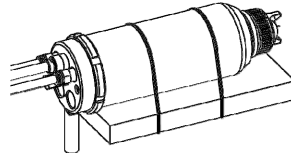
 **WARNING**

• **Do not install it like following.**

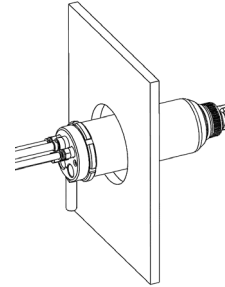
Electrostatic guns apply high voltage to the tip of the gun and the rear is earthed, make sure there are no obstacles on the main body (insulated part).



① If the gun is used with the dirt-proof sheet wrapped around it, moisture will accumulate inside, causing an overcurrent error.



② If a metal plate is attached close to the gun body, insulation breakdown may occur between the charged part of the gun and the plate.



③ If the gun body is inserted through a hole in a metal plate, insulation breakdown may occur, just as in ②.

● **A fire extinguisher should always be kept near the work area.**

In case of a fire, make sure to have equipment that has been regularly inspected installed at all times.

● **When disposing of this product, please dispose of it in accordance with the laws of your country.**

① Advantages



■ Excellent finish quality

The air cap ensures a spray pattern with a uniform particle size distribution to prevent uneven tone when coating with metallic paint. The turbine speed and electrostatic controllers maintain constant coating conditions, resulting in high-quality coating.

■ A higher transfer efficiency

A higher transfer efficiency is guaranteed by the higher atomization efficiency ensured by the centrifugal force generated by the bell cup and a stable airflow. The paint consumption as well as the booth maintenance cost can be reduced.

■ A compact body

It is a functional painting machine equipped with a reliable air spindle and electrostatic generator. It is compact but contains a spiral tube and bell cup cleaning system. It is dedicated for mounting on a robot and easily maintained.

■ Protection from contamination

The bell cup is automatically cleaned between cycles even during continuous operation to eliminate bits of paint, which would otherwise be flown out of the gun. Combined with an original body cover (shroud) shape preventing contamination in a severe operating environment, it reduces “dirt in finish.”

■ Safe operation

A compact electrostatic high-voltage generator is built in the gun and boosted inside the gun to permit the control at a lower voltage from the controllers. The voltage and current can be accurately monitored with a newly developed electrostatic controller. Safe operation is guaranteed by a high discharge rate and five failure detectors.

■ Predominant operability

The gun body can be directly mounted on the flange of a tube-contained robot to increase the robot moving area to the maximum. It is compact although containing two super-compact valves (trigger valve and drain valve) at the tube joint. Teaching is permitted in an unrestricted manner.

■ A higher cleaning efficiency

A flushing circuit is provided as standard equipment inside and outside the bell cup. Because the bell cup is cleaned with a very small quantity of paint thinner between cycles, generation of bits of paint and “dirt in finish” is reduced, resulting in a low yield rate.

② Components

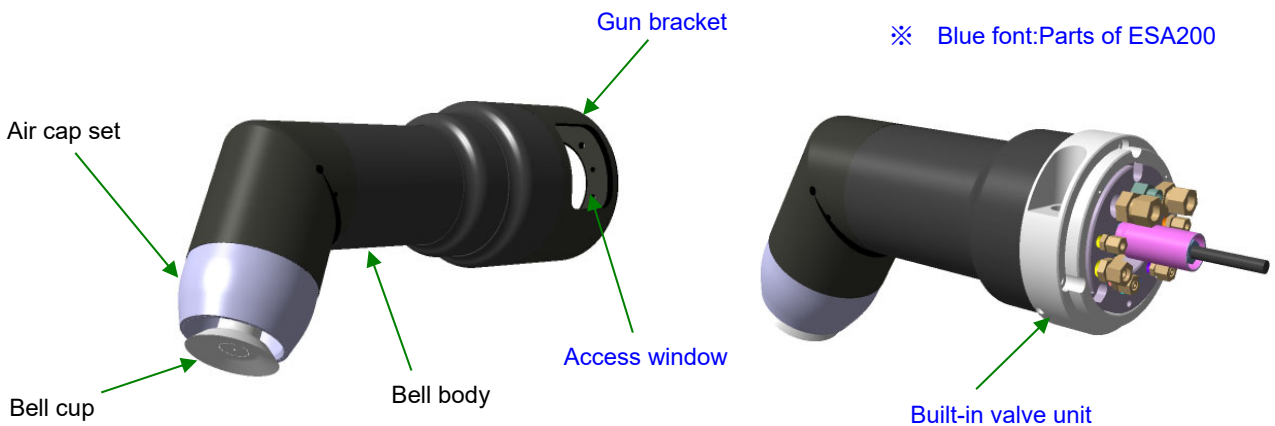
(1) Gun body

- It is made up of the air spindle, cascade (electrostatic generator), and coil tube, and is covered by the body cover (shroud).
- The fluid passages are insulated by a coil tube and grounded by a bracket, which does not allow the electrostatic coating with paint with a lower electric resistance, e.g. water-soluble paint.

(2) Bracket

- The bracket holds tube cables in place for wiring connections. By removing the bracket access is possible to the interior parts of the gun for disassembling or assembling with ease.
- A window is provided for quick access to tubes and cables.

Figure 1 Components of ESA200



(3) Paint tube within bell body

No.	Part No.	Part Name	Specification
1	13EC-015	Coil tube set, LL	Tube length 900mm, tube ID ϕ 3mm
2	13EC-115	Straight tube set	Tube length 163mm, tube ID ϕ 3mm ※This item is available optionally and only separately.

Figure 2 Coil tube set, LL



13EC-015
Coil tube set, LL



13EC-115
Straight tube set

③ Optional parts

(1) Air cap set

- Choose the appropriate model just for your purpose from among the ones shown below.

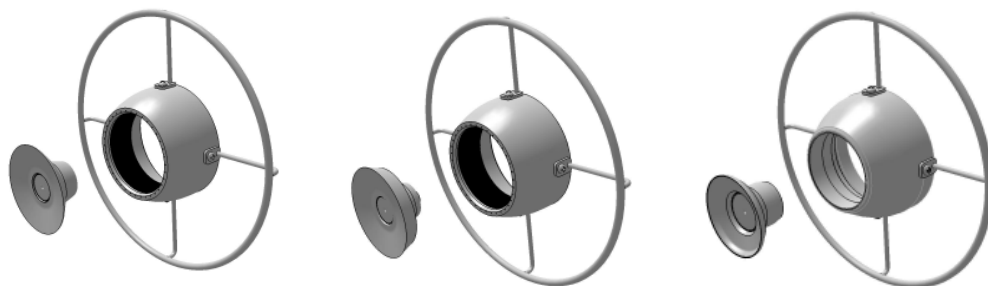
Application	Air cap set			Bell Cup to be combined	
	SA specifications	Pattern specifications	Part No.	Specifications	Part No.
Metallic base Standard type (for coating on exterior plate)	Hole type	Large	157C-1	φ 70	157C-101
		Middle	159A-1		
		Short	157E-1		
Metallic base Dust protection Type (for coating on interior plate)		Large	15CF	φ 70	15CF-001
		Middle	15EA		
		Middle / Short	15EC		
	Short	15EE			
Solid, clear Coat	Slit type	—	157F	φ 60	157F-001

- Bell cup is included in the air cap set.

- Table for selecting pattern width

No.	Set item No.	Pattern width (mm)				
		100	200	300	400	500
1	157C-1 15CF			■		
2	159A-1 15EA		■			
3	15EC		■			
4	157E-1 15EE	■				
5	157F			■		

Figure 3 Air cap set



Metallic base
Standard type

157C-1
159A-1
157E-1

Metallic base
Dust protection type

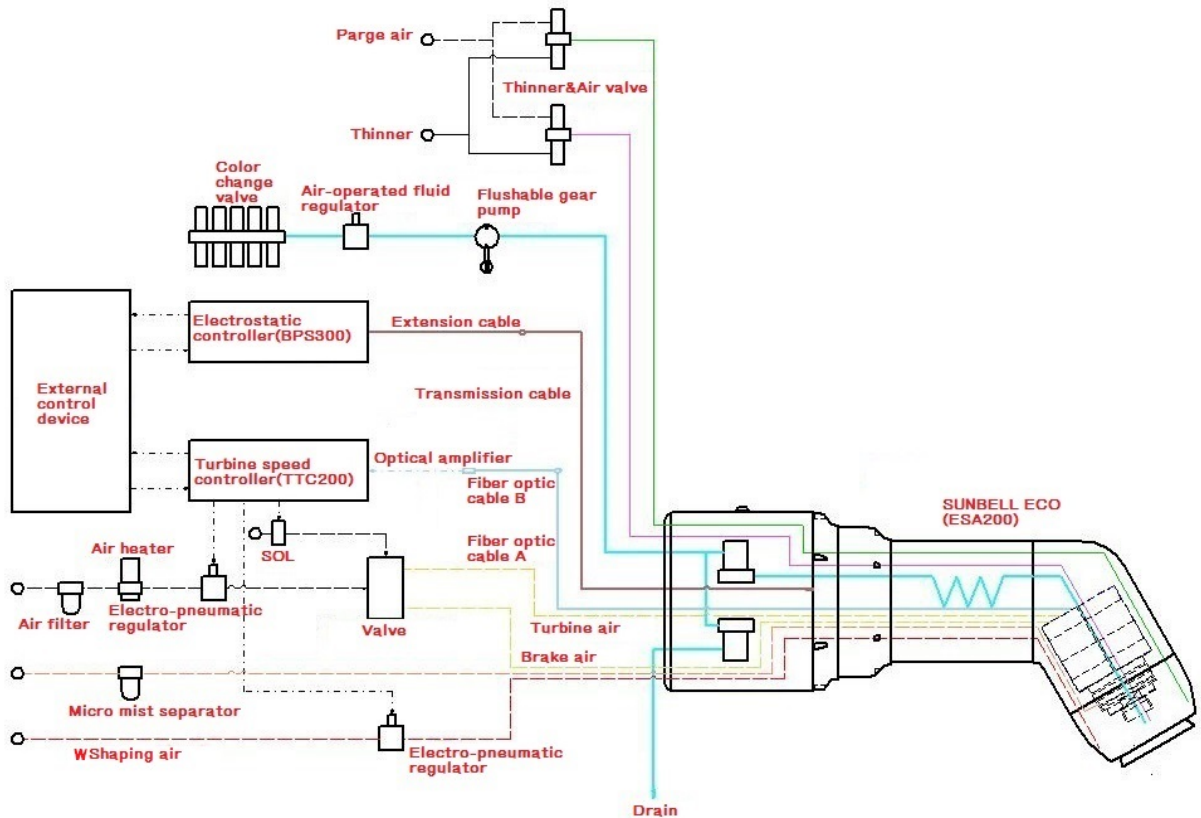
15CF
15EA
15EC
15EE

Solid, clear type
157F

④ System construction

- Separately prepare and connect signal input/output cables to the electrostatic and turbine speed controllers as well as air pipes and fluid hoses as shown in the following diagram.
- See the specification sheet for each of the system components for proper connections of electric cables, air pipes and fluid hoses.

Figure 4 ESA200 system diagram for reference



Part name	Model	Part No.	Operation manual
SUNBELL ECO	ESA200	13EC	ESA200
Electrostatic controller for painting equipment	BPS300	E-010390	BPS300
Turbine speed controller	TTC200	445-0134	TTC200
Transmission cable	LVA2	(See 2-④-(1))	ESA200
Fiber optic cable	-	(See 2-④-(2))	ESA200
Optical amplifier	F80R/XF12R	468-0025/468-0026	Amplifier unit
2-port valve	-	(See 2-④-(5))	ESA200

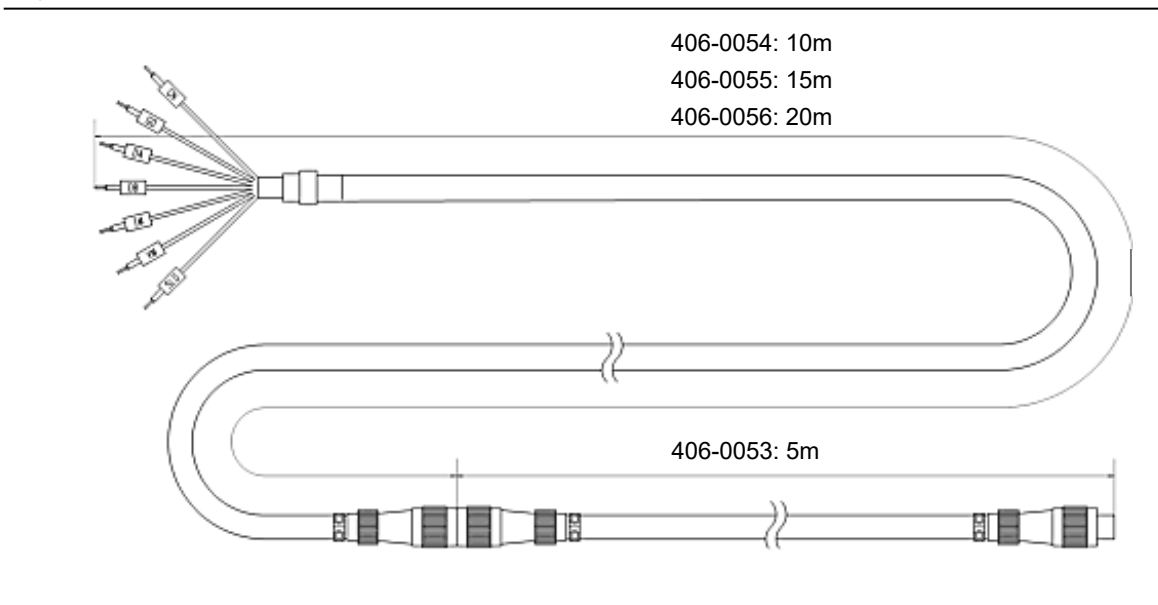
(1) Transmission cable

- It is used to make a connection between the gun and electrostatic controller, using a “transmission cable” and “extension cable” in combination that can extend up to 20m.

No.	Part No.	Part name	Model	Specifications
1	406-0053	Transmission cable	LVB5	5m

No.	Part No.	Part name	Model	Specifications
1	406-0054	Extension cable	LVA2-10	10m
2	406-0055	Extension cable	LVA2-15	15m
3	406-0056	Extension cable	LVA2-20	20m

Figure 5 Connection of transmission cable



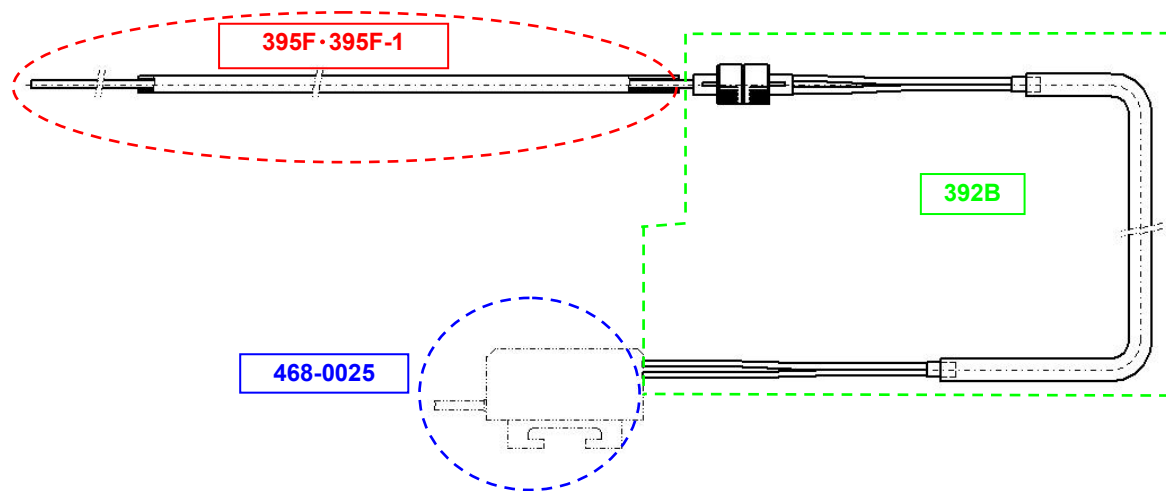
(2) Fiber optic cable

- It detects the air spindle RPM and transmits the detected information to the turbine speed controller, which adjusts the air spindle RPM in response to the signal so that the RPM setting will be maintained during the painting process.
- Please remember that the optical fiber can not be relayed midway except the pre-determined relay point.

○ Non-explosion-proof specifications

No.	Part No.	Part name	Model	Specifications
1	392A	Fiber optic cable A	-	2m (To the gun)
	392A-2		-	5m (To the gun)
2	392B	Fiber optic cable B	-	20m (To the amplifier)
3	468-0025	Fiber optic amplifier	F80R	Non-explosion –proof specifications
4	470-0007	Fiber cutter	FA500	-

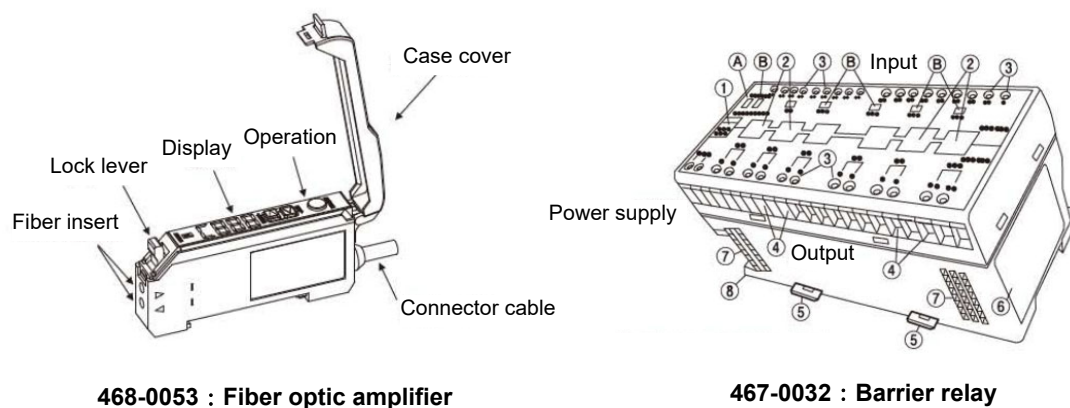
Figure 6 Connection chart for non-explosion-proof type optical fiber cable



○Explosion-proof specifications

No.	Part No.	Part name	Model	Specifications
1	468-0053	Fiber optic amplifier	XF12R-A	Explosion-proof type
2	467-0032	Barrier relay	TBD-DB201SA	Intrinsic safety explosion-proof
3	395F	Fiber optic cable A	—	2m (to the gun)
	395F-1			5m (to the gun)
4	392B-1	Fiber optic cable B	—	2m
※Fiber optic cable B with connector relay 1set and fiber cutter 1set.				
<Option>				
	470-0002	Fiber connector	FA7CN	Connection Cable A and B
	470-0007	Fiber cutter	FA500	1hole 1time use up

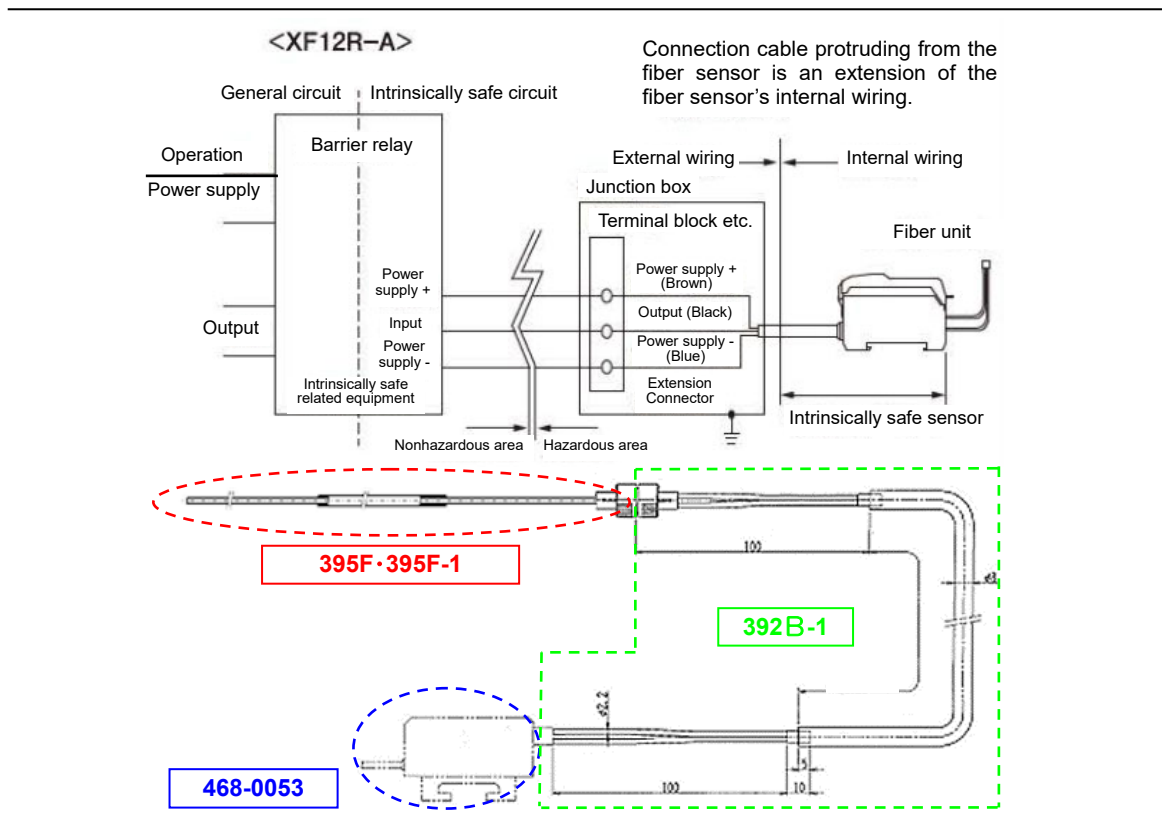
Figure 7 Outline for explosion-proof fiber optic amplifier and barrier relay



468-0053 : Fiber optic amplifier

467-0032 : Barrier relay

Figure 8 Outline for explosion-proof fiber optic cable



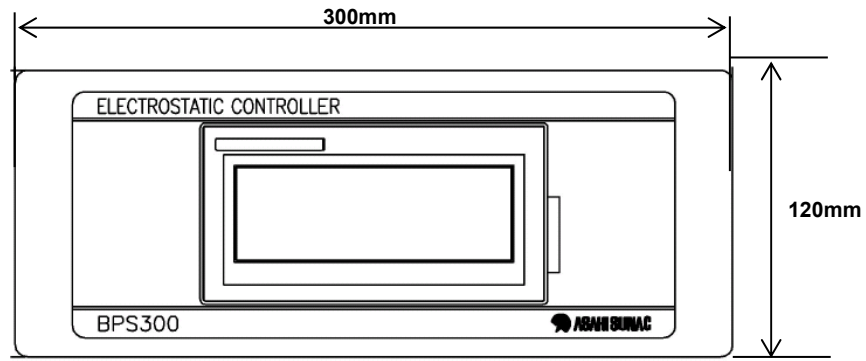
※Refer to the TDB-200 series instruction manual for the detailed wiring method of the intrinsically safe circuit.

(3) Electrostatic controller for painting equipment (model: BPS300)

- It controls the electrostatic voltage of the gun-integrated cascade (electrostatic generator).

No.	Part No.	Part name	Model
1	E-010390	Control unit for electrostatic coating	BPS300

Figure 8 Outside view of BPS300

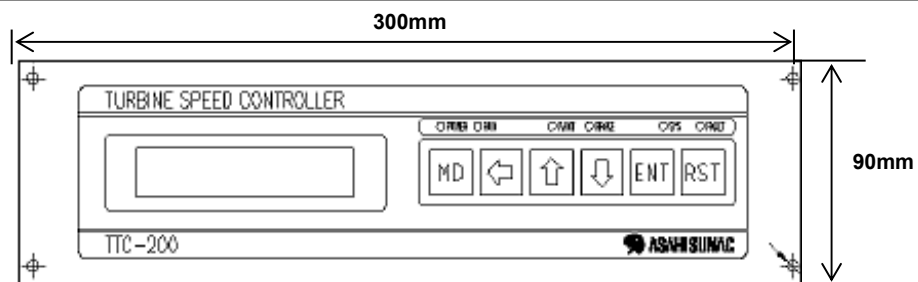


(4) Turbine speed controller (Model: TTC200)

- Sends the RPM of the bell cup via fiber optic cable and amplifier and controls the electropneumatic regulator (4-20mA) so that the RPM will be kept as specified using the control panel.

No.	Part No.	Part name	Model
1	445-0134	Turbine speed controller	TTC200

Figure 9 Outside view of TTC200



(5) Valve unit

- The fluid and drain valves are mounted in the gun to control the start/stop of the fluid supply required for coating and the supply of the passages cleaning and cup interior cleaning thinner for color change.

No.	Part No.	Part name	Model	Specifications
1	0836	2-port valve	-	Resin body

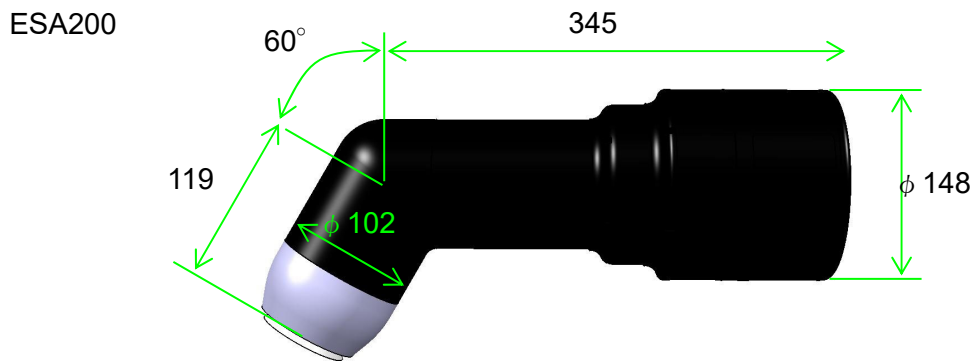
Figure 10 Outside view of 2-port valve unit



3

Specifications

Figure 11 Outside view



No.	Item		Specifications
1	Product data	Product name	SUNBELL ECO
		Model	ESA200 : Trigger, Drain valve build-in type
		Application	Robot-mounted painting
2	Appearance	Dimensions	ESA200 : $\phi 102 \times 432$ mm (Except air cap set, cable, tubes and sleeve)
		Weight	ESA200 : 5450g (Except cables, tubes and bracket for outer setting)
3 ※1)	Applicable paint and cleaning solvent	Applicable paint	Solvent type paint (paint with electric resistance $\leq 10\text{M}\Omega\text{-cm}$ cannot be used for electrostatic coating)
		Applicable cleaning solvent	Cleaning solvent with electric resistance $\geq 20\text{M}\Omega\text{-cm}$
4	Conditions of use	Temperature	5°C to 40°C
		Humidity	40% to 80%
		Air velocity through booth	0.3m/s to 0.4m/s
5	Air conditions	Bearing air	100L/min(ANR) ※ At 0.5MPa Normal pressure $\geq 0.5\text{MPa}$
		Turbine air	500L/min(ANR) (250L/min(ANR) at 40,000rpm under no load)
		Shaping air	For metallic base type: ($\phi 70$ cup), 750L/min(ANR) or less For solid clear type: ($\phi 60$ cup), 400L/min(ANR) or less
		Maximum pressure	Air passages: 0.7MPa Fluid passages: 1.0MPa
		Air supply quality	Solid particle size: 0.1 μm or less Dew point under pressure: -20°C Residual oil content : 0.01mg/m ³
6	Normal turbine speed		For metallic base type: ($\phi 70$ cup), 35,000rpm or less For solid clear type: ($\phi 60$ cup), 40,000rpm or less

No.	Item		Specifications
7	Electrostatic charge	Applied voltage	Max. -80kV
		Constant current control	Max. 150μA ※The current indicated on monitor shall be kept at or below 90μA.
8	Delivery rate	Paint	500mL/min(ANR) (viscosity 20 sec/FC#4 or less) ※ This value is shown for reference purpose only. If your conditions differ from those given for reference, conduct painting test to obtain the finish quality you are looking for.
		Cleaning thinner	Cup interior cleaning: 1,000mL/min(ANR) x 3 sec. or less Cup exterior cleaning: 300mL/min(ANR) x 0.5 sec. or less

※1) Based on the measurements taken with paint ohmmeter made by ASAHI SUNAC CORPORATION

4

Installation and Connections

① Installation of gun body

- (1) Fasten the gun securely to the reciprocator, robot arm or stationary stand.
- (2) Always ground the joint plate by connecting its grounding wire to the automatic painting machine.
(Grounding resistance should be under 1kΩ)

WARNING

Correctly install the bracket. For electrostatic coating, a high-voltage electrostatic phenomenon is used to positively generate static electricity. If the bracket is incorrectly installed, it may cause electrostatic discharge or sparks, resulting in explosion and/or fire.

- (3) Keep the metallic part of the gun tip at least 600mm away from the nearest grounded object in the paint booth, such as water tank or conveyor rail.
- (4) When installing more than one gun, keep high voltage applied parts of adjacent painting machines at least 400mm apart from each other.
- (5) Set the gun at an angle ranging from flat to straight down in terms of the direction in which the gun points.

CAUTION

If the gun is set pointing upward, the fluid may flow out of the bell cup into the air spindle, possibly resulting in damage to the air spindle.

- (6) Set the gun traveling speed **within 54m/min (900mm/s).**

CAUTION

If the gun travels too fast, it will affect the transfer efficiency and cause a failure of the gun or automatic machine.

(7) Keep the acceleration of automatic machine **within 0.3G** at reverse.

 **CAUTION**

Constant shock exceeding 0.3G will cause gun failure.

② Air passage connections

(1) Bearing air

The machine uses a precision air spindle that keeps the turbine shaft airborne with air pressure. So extreme care is necessary and you must follow the precautions described below.

 **CAUTION**

The air supplied to the air spindle shall have a quality class not lower than 131 as specified by JIS (the dew point of -20°C under pressure is equivalent to the dew point of -42°C at atmospheric pressure).

(Solid particle size 0.1µm – dew point under pressure -20°C – residual oil content 0.01mg/m³)

 **CAUTION**

- ① Install a micro mist separator as close to the gun as possible (within 10m). Make sure that each air spindle has one dedicated micro mist separator.**
- ② When installing air path downstream the micro mist separator, care should be exercised so that seal tape or liquid seal may not get into the line. Before installing the gun, fully exhaust air to remove all dust in the tube.**
- ③ Always keep the bearing air ON even after the completion of operation. It prevents seizure in case the turbine air supply turns on. It also prevents the splashed fluid or thinner from getting inside.**

(2) Other air paths

The air supply to the gun should be arranged in accordance with the following table to ensure enough air quantity and pressure.

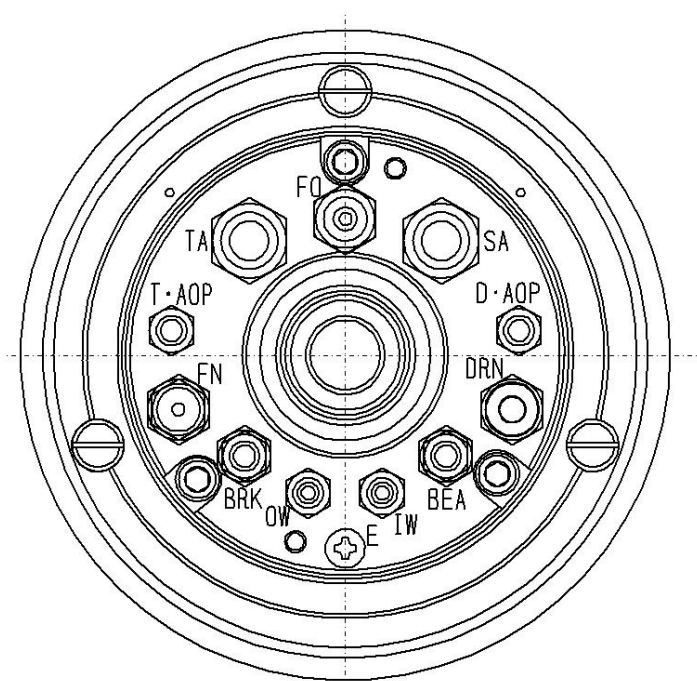
(2)-① ESA200 Air connections

Marking	Item	Function	Requirement	Joint dia.
TA	(1) Turbine air	Rotates the bearing.	500L/min(ANR)(0.4MPa)	φ 10-8
SA	(2) Shaping air	Atomization pattern adjustment	750L/min(ANR)(0.4MPa)	φ 10-8
BEA	(3) Bearing air	Supports the high-speed rotary bearing.	100L/min(ANR) (0.5MPa or more)	φ 6-4
BRK	(4) Brake air	Brakes reverse rotation.	100L/min(ANR)(0.5MPa)	φ 6-4
T·AOP	(5) Trigger air	Starts/stops the paint supply.	-	φ 4-2.5
D·AOP	(6) Drain air	Starts/stops draining.	-	φ 4-2.5

(2)-② ESA200 other connections

Marking	Item	Function	Requirement	Joint dia.
FN	(5) Paint inlet	Fluid supply	0.7MPa or less	φ6-4
OW	(6) Cup exterior cleaning thinner	Cup exterior cleaning	Up to 300mL/min × 0.5s or less 0.7MPa or less	φ4-2.5
IW	(7) Cup interior cleaning thinner ※1)	Cup interior cleaning	500 to 1000mL/min × 3s or less 0.7MPa or less	φ4-2.5
FO	(8) Fiber optic cable	Detect rotation	-	φ6-4
DRN	(9) Drain	Drain path	-	φ8-6
E	(10) Grounding	Grounds the gun.	Class D grounding	1.6mm or more
(Center)	(11)Transmission cable	Transmits power to the cascade.	-	φ6

※1) Cup exterior cleaning thinner is used when selected as option.



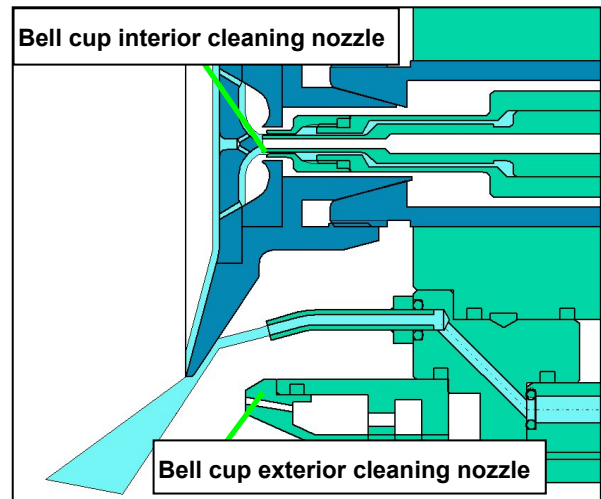
③ Color change valve installation and setup

To optimize the system functions, install and set up the color change valves and fluid lines in according with the instructions below.

- (1) Always provide an interlock so that the electrostatic controller will not be charged with static electricity when fluid lines are filled with thinner.
- (2) Always interlock the fluid valve ON/OFF solenoids so that the fluid valves will automatically turn OFF when the turbine speed drops to or below 10,000rpm.
- (3) To prevent fluid overflow from the bell cup during color change, set the turbine speed around 20,000 to 25,000rpm and set up to completely return the fluid to the drain during color change.
- (4) To prevent the purge air from flowing from the fluid hose into the bell cup during color change, minutely adjust the ON/OFF timing of each valve.

④ Bell cup cleaning thinner passages

This equipment has integrated thinner passages to clean the bell cup automatically. Nozzle hole clogging and “dirt in finish” due to scattering of paint residue can be prevented by removing fluid deposit from the bell cup.



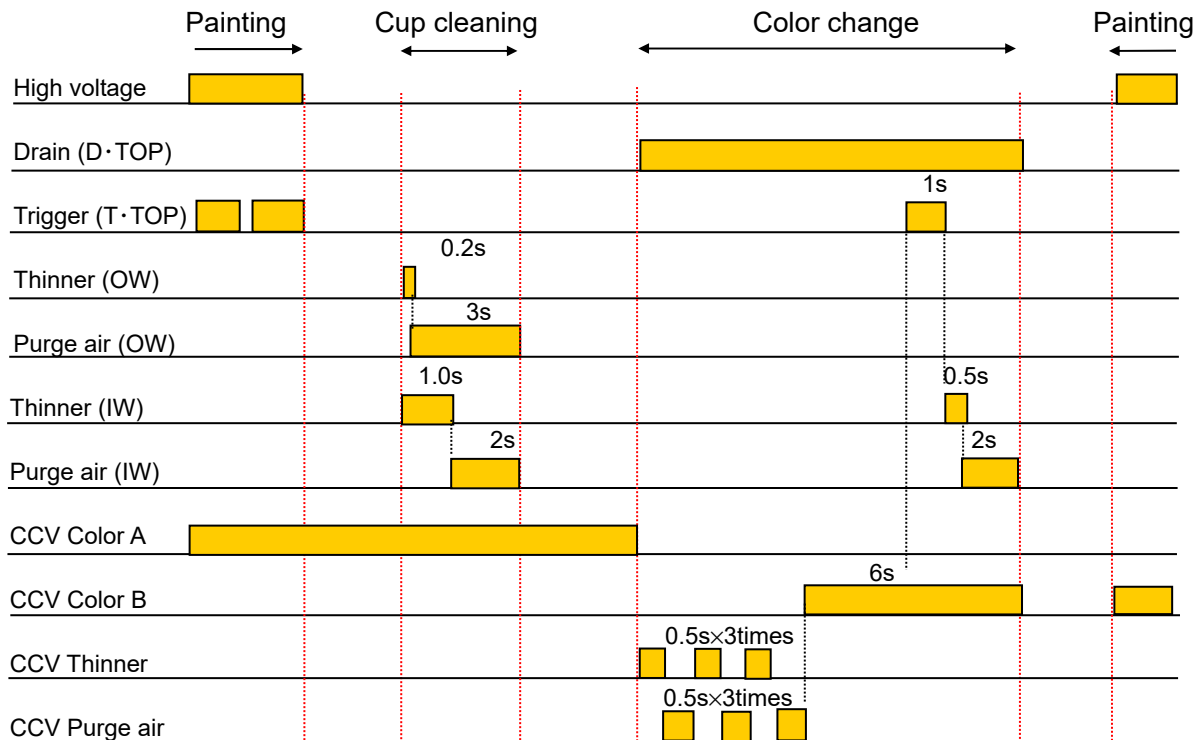
- (1) For bell cup interior cleaning, discharge thinner at the rate of 500-1000mL/min with continuous flow lasting for 3 seconds or less.

CAUTION

**If the thinner discharge rate is insufficient, the fluid, etc. tend to accumulate over time.
If accumulation grows too much, thinner may overflow from the bell cup.**

- (2) Use thinner with 100MΩ-cm or more resistance (as measured with the Asahi Sunac Electrostatic tester Part No. 2717 with measurement probe Part No. 2715-002). It prevents static electricity from leaking to the ground through the fluid passages. If the thinner resistance is lower, air-purge the fluid passages in the gun after flushing to exhaust thinner.
- (3) For cup exterior cleaning, discharge thinner at the rate of 300ml/mm or less for 0.5 second or less, to be followed by air blow (at 0.3MPa or higher). This prevents thinner from splashing over the shaping air cap as the cup revolves.
- (4) When any stain which cannot be removed by the exterior or interior cleaning of the bell cup, remove the bell cup and wipe or brush the surface gently using wiping rags or a soft brush.
- (5) In the case that an ultrasonic cleaner is used, contact the cleaning solvent manufacturer in advance to check safety and effectiveness of the cleaning solvent to be used and confirm that there is no problem.

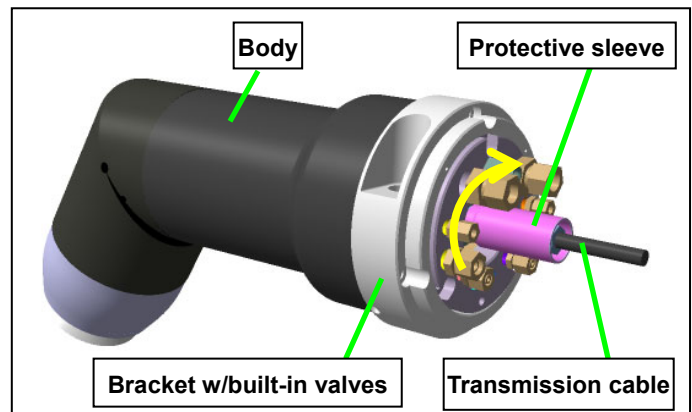
<Valve Operation Sequence Chart: Sample>



⑤ Connection of transmission cable

Connect the transmission cable with the following procedure.

- (1) Slide the protective sleeve over the transmission cable for protection against paint inflow.
- (2) Connect the transmission cable to the connector at the center of the bracket w/ built-in valves.
- (3) Install the protective sleeve slid over the transmission cable on the joint plate.
- (4) Install the connector cable so that its surface will not be caught in the machine or damaged. To prevent connector contact failure, give the cable some slack so that there will be no tension in the cable when the gun moves.
- (5) To prevent noise interference, route the connecting cable apart from other power cables.

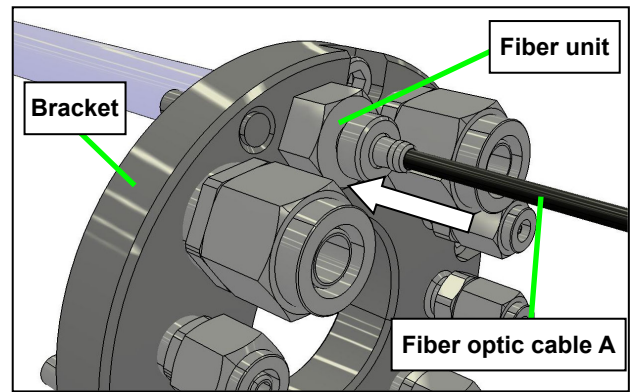


⑥ Installation of fiber optic cables to bell painting machine

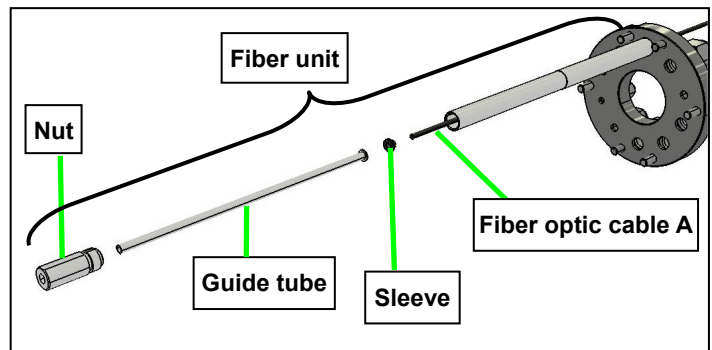
Connect the fiber optic cables with the following procedure.

- (1) Install the fiber optic cables so that they will not be bent or folded by a hose or machine. When installing, take care not to damage or contaminate the lens at each end of the fiber optic cables.

- (2) After arranging the optic fiber between the control boards as well as other tubes, insert it in the fiber optic cable A point is set up in the bracket with the connector and the protection tube passed. At this time, remove the nut, guide tube and sleeve of the fiber unit.

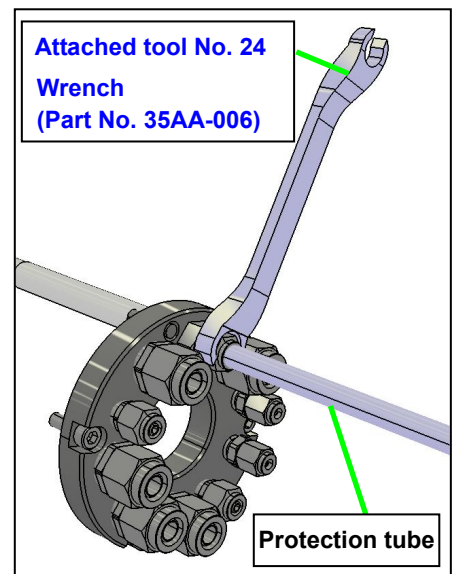


- (3) Insert it in order of the sleeve → guide tube → nut removed beforehand to fiber optic cable A that projects from the point of the holder.



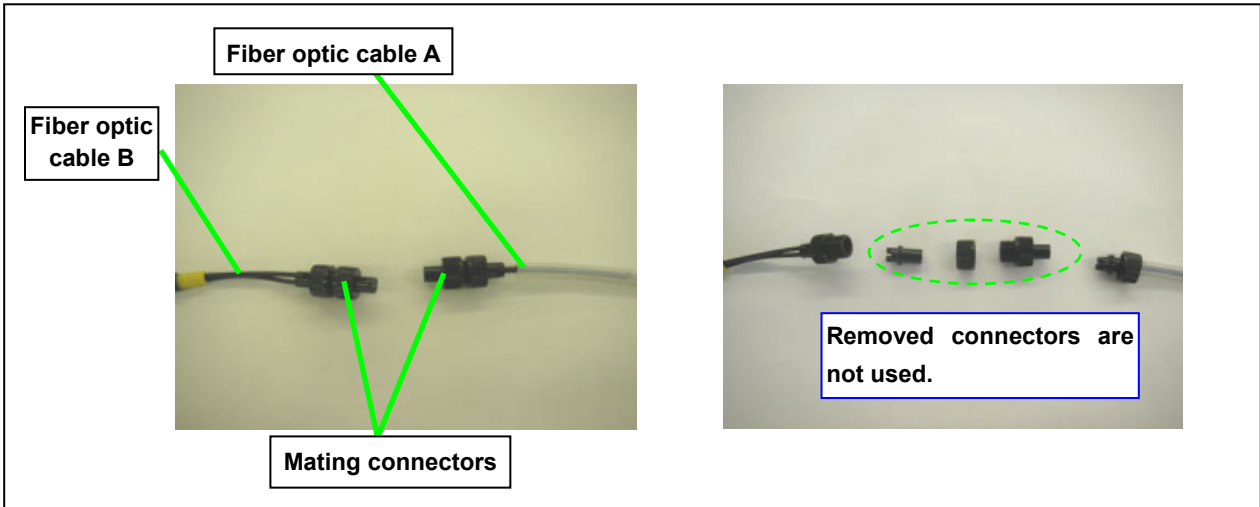
- (4) If the end of the fiber optic cable is contaminated, wipe off with a soft cloth dampened with thinner.

- (5) When fiber optic cable A adjustment is completed, after confirming the nut of fiber optic cable A is fixed, tighten with the nut and fix the protection tube to the holder of the bracket with the box-end wrench of the attached tool.

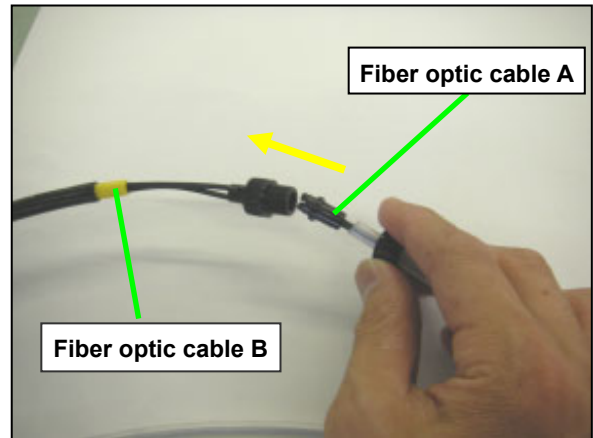


⑦ **Connection of fiber optic cables A and B (In case of non explosion-proof specifications.)**

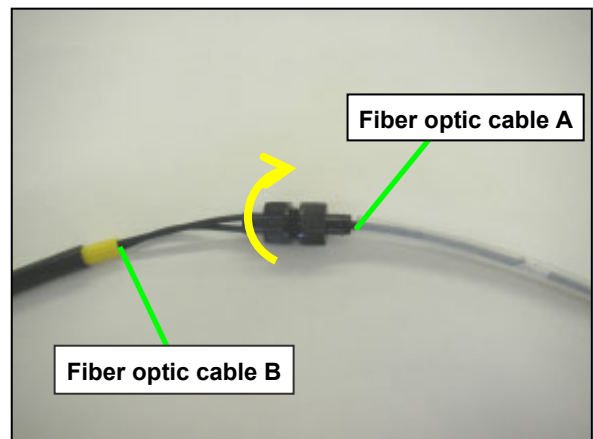
(1) Each of fiber optic cable A and B is originally provided with a mating connector as a set. When connecting the cables, remove the mating connectors.



(2) Insert fiber optic cable A into the connector on fiber optic cable B.




(3) After inserting, firmly tighten the connectors of fiber optic cables A and B.

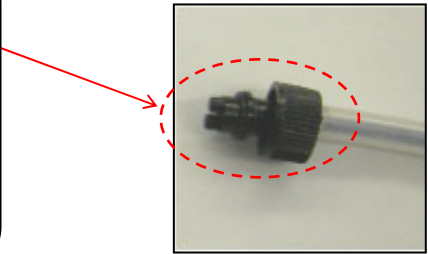


⑧ Cutting the fiber optic cables (In case of non explosion-proof specifications.)

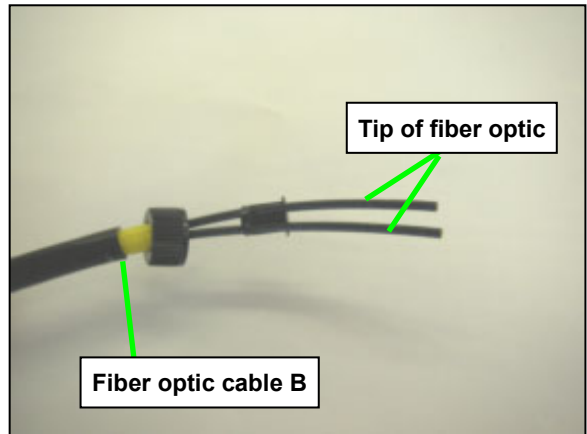
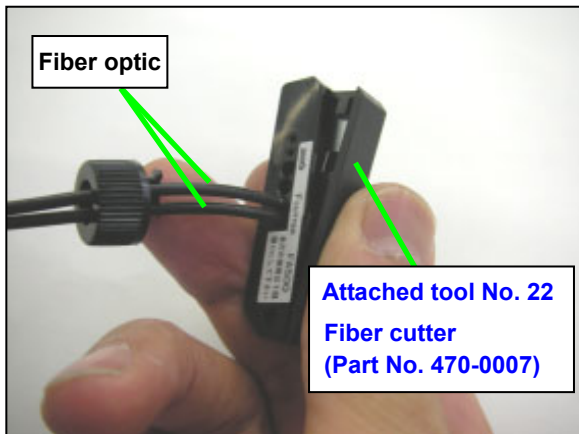
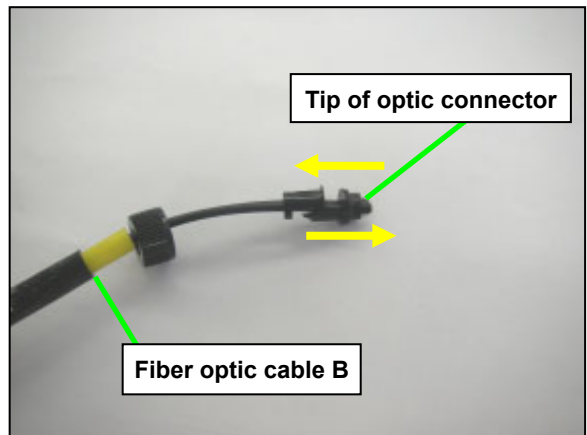
(1) If optical fibers in the connector on fiber optic cable A to be connected with fiber optic cable B are contaminated with paint, etc., they cannot be removed for cleaning as they have been secured in a special manner. Replace fiber optic cable A with a new one.

 **CAUTION**

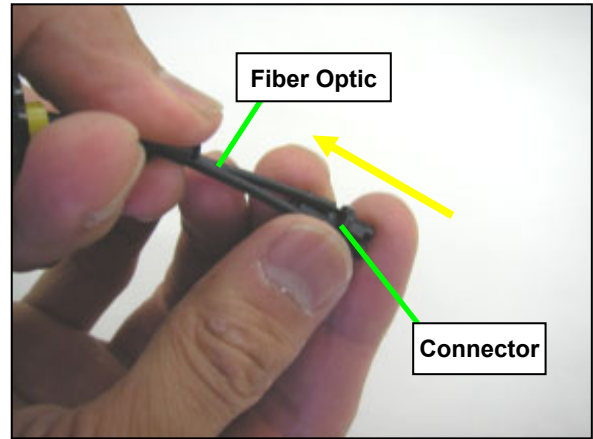
The connecting part of fiber optic cable A cannot be overhauled or replaced. If it is contaminated with paint, etc., replace fiber optic cable A as a whole.



(2) If the fiber optic cable A connecting end of fiber optic cable B is contaminated with paint, etc, divide the connector and cut the Tip of optical fibers using the attached fiber cutter.

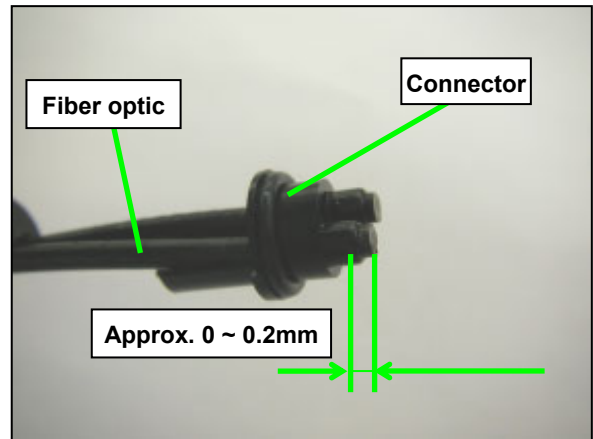


(3) After cutting the ends of fibers, extend them by about 1mm from the connector when assembling again.

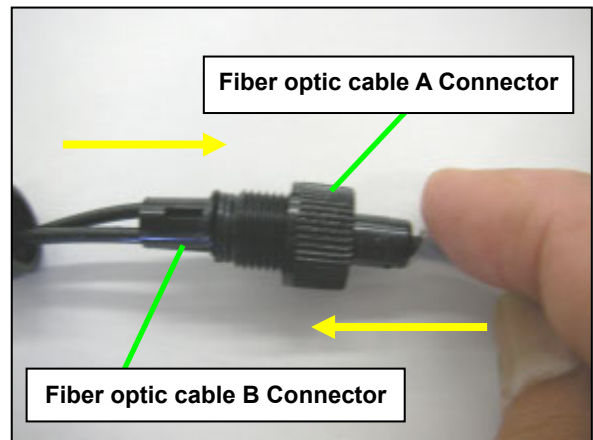


⚠ CAUTION

Too long extrusion may make end of optical fiber cable be crushed causing detection error.



(4) After setting the optical fibers to the connector, connect with fiber optic cable A.

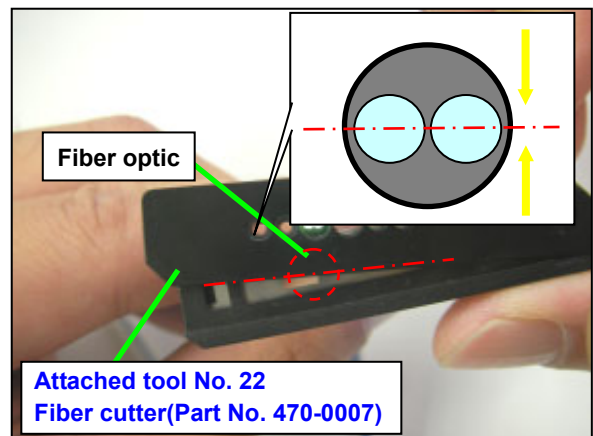


⑨ **Cutting the air spindle RPM detector connecting end of fiber optic cable A**

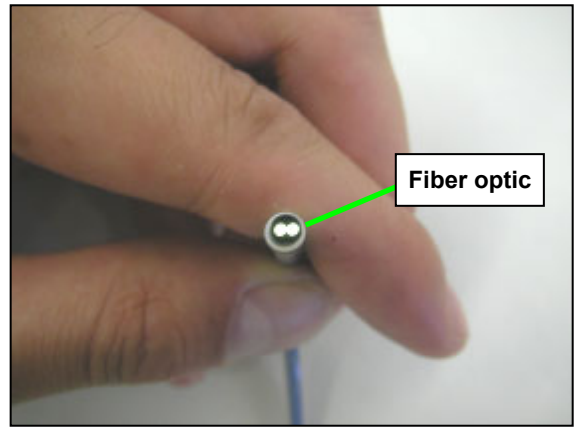
(1) If , by reverse flow of paint through the gun , front en of optical fiber in air spindle rotation To cut down the fiber , hold the cross section of it as shown on the sketch below against tooth of the cutter.

detection side of fiber optic cable A become dirty , cut down end of the optical fiber.

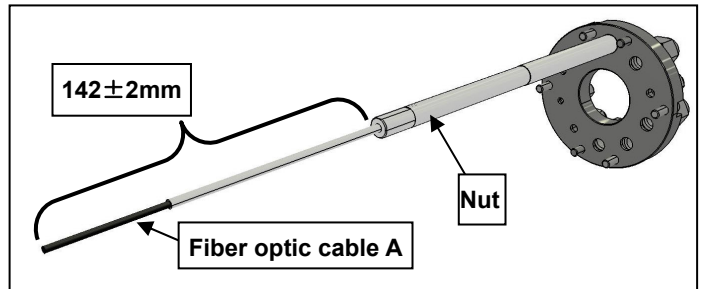
(2) To cut down the fiber , hold the cross section of it as shown on the sketch below against tooth of the cutter.



(3) After cutting, check cut sections of the optical fibers.



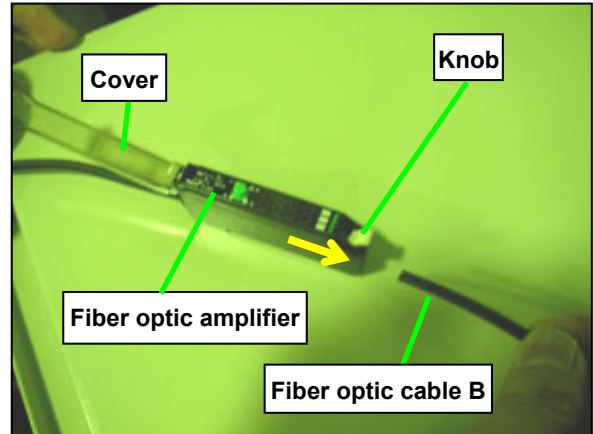
(4) After confirming the cut sections while gradually tightening the nut so that the optic fiber cable may become necessary length, it is adjusted that the projection length of the fiber optic cable A becomes 142 ± 2 mm from the nut before it fix and fix the nut.



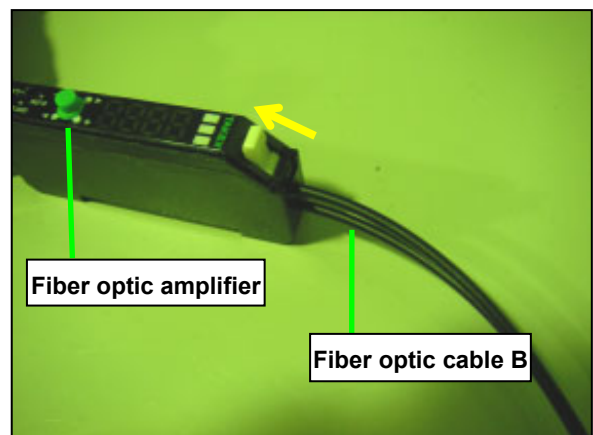
※ After the length of the optic fiber is adjusted, it installs in the gun body, it is fine-tuned that the optic fiber amplifier reaches a prescribed value, and executes auto tuning.

⑩ Connecting the fiber optic amplifier (In case of non explosion-proof specifications.)

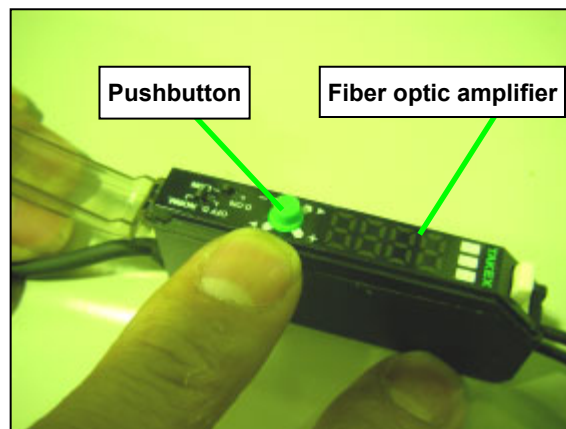
(1) Open the fiber optic amplifier cover and incline the white knob.



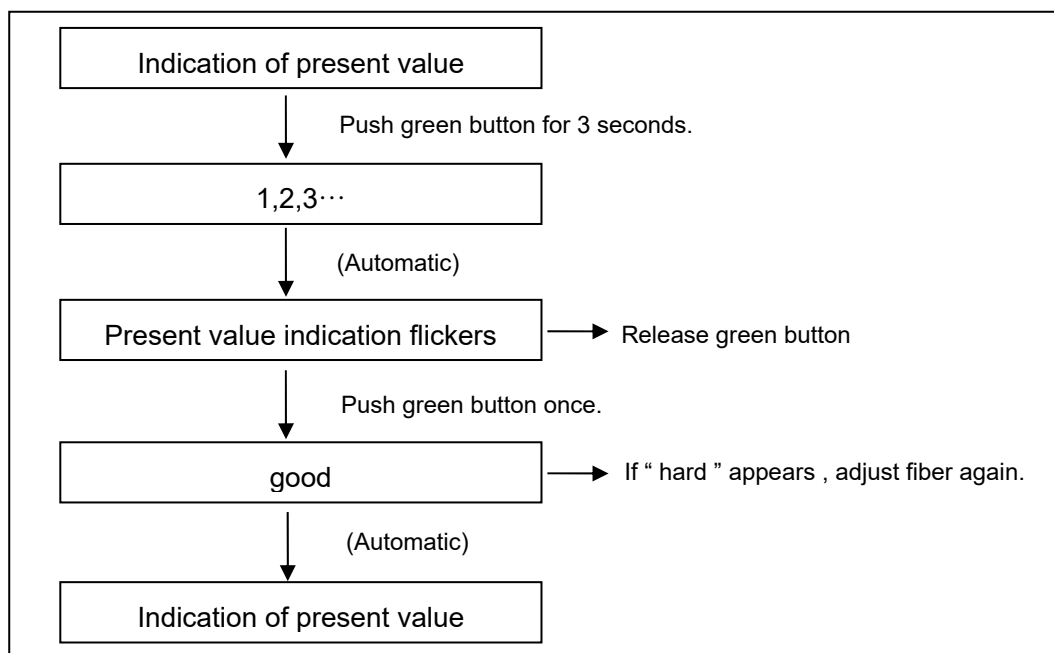
(2) Connect the fiber optic amplifier connecting end of fiber optic cable B to the fiber optic amplifier. Then, put the white knob back.



(3) After checking that they are firmly connected, press the green button on the optical fiber amplifier for 3 seconds or longer to auto-tune the threshold.

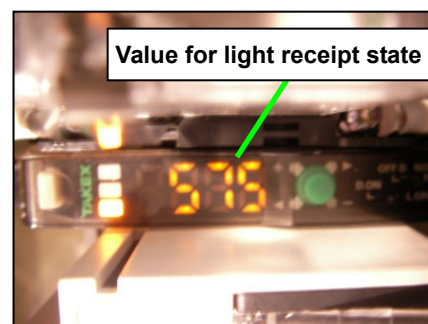


Reference) Flow chart for auto tuning of optical fiber amplifier.



① Adjustment of position of fiber optic cable (In case of non explosion-proof specifications.)

- (1) Set bell cup and rotate softly by hand.
- (2) The high value and low value alternately displayed on fiber optic amplifier when bell cup rotates.
- (3) High value shows when the volume of feedback light is big and low value shows the volume of feedback light is small. Please adjust the position of fiber optic cable to make high value more than 500 or difference between high value and low value more than 300.



※Fiber Optic amplifier should be use in “ HISPEED MODE ”.

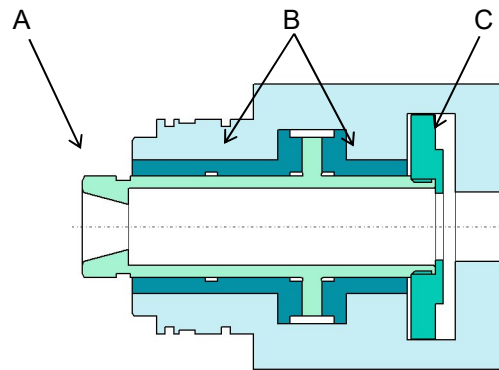
Reference) Examples of optical fiber amplifier value setting.

H Value	L Value	Difference	Judgment
1800	200	1600	Good (near to adequate)
800	70	730	Good (Adequate)
400	15	285	Require re-adjusting. (Too far or improper end face)
250	5	245	No good (Get unstable at high speed)

5

Operation Procedure and Precautions

① Air spindle



A: Shaft
B: Air bearing
C: Turbine

(1) Air spindle operation procedure and precautions

Follow the operation procedure described below.

Failure to do so may result in damage to the air bearing, causing equipment failure or breakage. Always be careful with the shaft that revolves at a high speed in order to avoid getting injured.

- 1) Before you run the air spindle, make sure that the shaft is not revolving. If it is, don't try to stop it by touching the cup by hand.

WARNING

The shaft keeps on turning for a while on inertia even after the turbine air is turned OFF. The monitor may indicate "0rpm" when the spindle is still running at around 100rpm. If you touch the bell cup or shaft by hand at this time, you may get injured.

When inspecting or servicing, always see that the bell cup and shaft have come to a complete stop.

- 2) Before turning ON the turbine air, always make sure that the bearing air pressure is 0.5MPa or higher, and that the shaft turns smoothly when lightly pushed by hand. If the turbine air supply circuit is too long, increase the hose diameter to reduce the pressure loss.
- 3) Always keep the shaft nose I.D. taper, into which the bell cup is mounted, free from paint. Each time you mount or remove the bell cup, be sure to clean it.

CAUTION

If you turn the shaft with the bell cup mounted with contaminated paint on, the air bearing may get damaged.

- 4) Be sure to provide an interlock for the ON/OFF solenoid valve of the fluid valve so that the fluid valve will be automatically shut OFF when the turbine RPM drops to or below 10,000rpm.
- 5) At the completion of an operation or when shutting OFF the air supply, always stop the turbine air and, after waiting for 3 minutes or longer, check that the shaft is no longer turning. If the bearing air supply is shut off when the shaft is still turning on inertia, the air spindle gets damaged.
- 6) When you stop the turbine air in manual mode, always make sure, in advance, that all the fluid valves are closed or no mist is coming out of the cup.

(2) Air spindle repair

If you install and use the air spindle properly, you can enjoy high performance over many years. However, when the shaft does not turn lightly by hand even with the bearing air ON, or when the air spindle does not rev up to the rated rpm, you may have to replace it with a new one or a repair may be needed. When you want to repair, send the air spindle back to us.

CAUTION

The air spindle is made up of high precision parts and, once you take them apart, you may not get its original performance back when you put them together. Please note that, once the air spindle is overhauled by a person who has not learned the maintenance procedure, it will no longer be covered by our warranty.

② Bell cup and shaping air cap

(1) Mounting and removing

Before you mount or remove the bell cup, see that, with the bearing air supplied, the rotation of the shaft is completely stopped and that electrostatic high-voltage generator has been turned OFF.

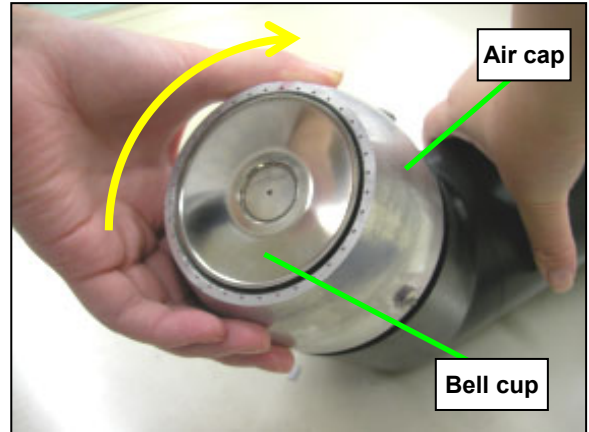
- 1) After checking that the shaft nose I.D. taper is free from contamination, hold the shaft with the attached tool, spanner A, and screw in the bell cup by hand with the attached pad (special tool No. 2 for BAC70M or No. 3 for BAC60), mounted to the bell cup.
- 2) Hold the bell cup with the attached pad and turn the bell cup by hand to fasten it. Do not use any tools other than the attached tool, like adjustable wrench, etc.
(If the width portion on the bell cup is contaminated with fluid deposits, you will have no alternative but to use a tool. When the bell cup is damaged or deformed as a result, replace it



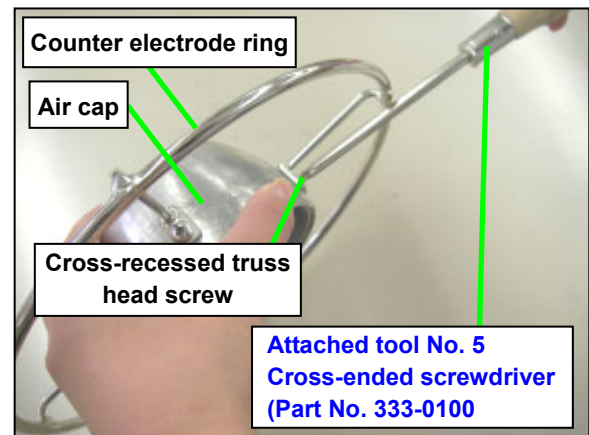
with a new one.)

- 3) Screw the shaping air cap into the gun body by hand. Then the mounting procedure has been completed.

At this time, do not hold the counter electrode ring.

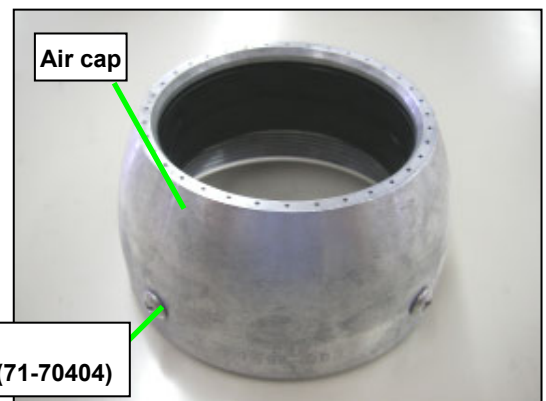


- 4) When not to use counter electrode, loosen for truss screws with the dedicated plus driver and remove the counter electrode.



- 5) After removing the counter electrode ring, install the optional cross-recessed truss head screws (part No. 71-70405) into the screw holes on the air cap and firmly tighten with the attached cross-ended screwdriver.

CAUTION
Running the equipment without installing those screws may lead to air leak through the screw holes.



(2) Handling of bell cup

This painting equipment uses a precision air bearing.

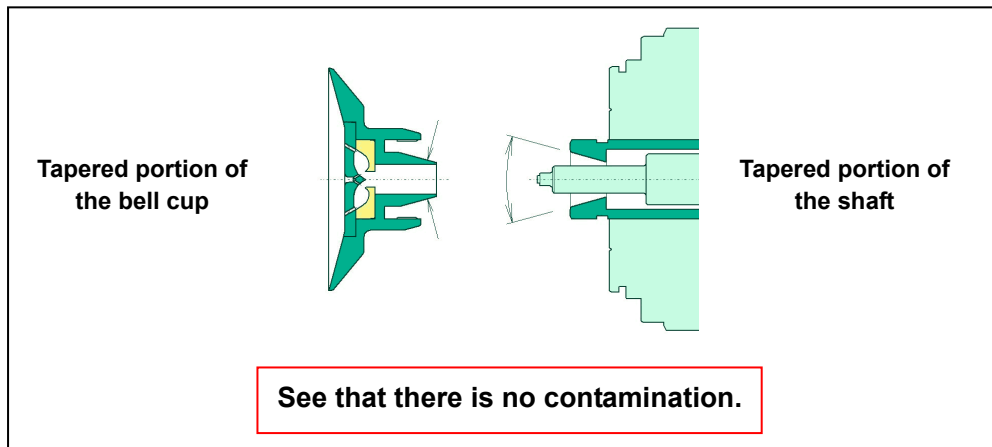
The mounted bell cup normally runs as fast as 20,000 to 40,000rpm. So, if you don't handle it properly, imbalance will occur to the bell cup, causing serious damage to the air bearing.

To operate the equipment to the best performance all the time, conduct the following inspections before and after operation.

- 1) Before mounting the bell cup, put a needle (0.8mm or smaller in dia.) through the fluid bore in the bell cup to see that it is not clogged.
- 2) To ensure the alignment between the bell cup and the shaft, always keep both male and female tapers free from fluid deposits.

 **CAUTION**

If you set the bell cup with its tapers contaminated with paint, imbalance will occur when the bell cup is rotated by the air spindle at a higher RPM, resulting in damage to the air spindle.



- 3) Wipe off the fluid deposited on the nozzle with a soft cloth when taking off the bell cup. At this time, exercise care so that fluid may not be transferred to the female taper in the shaft I.D.
- 4) At the end of each shift, every eight hours' operation as a guide, clean the bell cup with a highly soluble thinner, air blow the inner and outer surfaces and check the taper and make sure that the fluid bore is clean and free from damage.
- 5) When dipping the bell cup into thinner, take care so that nothing will come into contact with the cup. Place the bell cup carefully with the cup edge facing down.

 **CAUTION**

If you drop the bell cup or it is hit by something, be sure to replace it with a new one. With a deformed bell cup, imbalance will occur when it is rotated by the air spindle at a higher RPM, resulting in damage to the air spindle.

 **CAUTION**

The paint mist might flow to the main body side when the amount of shaping air is too low and the dirt increase of gun.

6

Maintenance and Periodic Inspection

① Post-operation cleaning

(1) Cleaning of gun body

- 1) With the air cap and bell cup mounted, carefully clean the body cover (shroud) with a clean cloth soaked with thinner.
- 2) If the contaminants do not go away, remove the body cover (shroud) and dip it into thinner for a few minutes and then wipe it off with a cloth again. (Do not immerse it in thinner too long.)

CAUTION

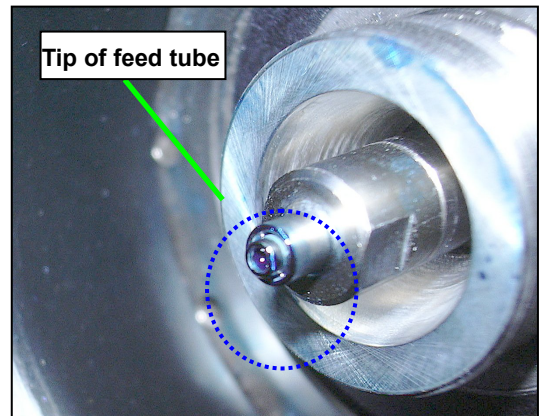
Do not use a brush or scraper for cleaning. These tools leave scratches on the surface, making it liable to have deposition of contaminants. Once the surface gets contaminated, it will help electrostatic charges at the gun nozzle leak to the ground, causing electrostatic failure.

WARNING

Some types of substances contained in the paint or solvent do harm if inhaled or brought into contact with your skin. Work in a place well ventilated to prevent the accumulation of such harmful substances.

(2) Cleaning of shaping air cap and bell cup

- 1) Clean the fluid passages inside the gun with thinner.
- 2) Make sure that electrostatic high-voltage generator has been turned OFF, remove electrostatic charges with a grounding rod, remove the shaping air cap, and remove the bell cup with the special spanner.
- 3) Clean the bell cup using clean thinner.



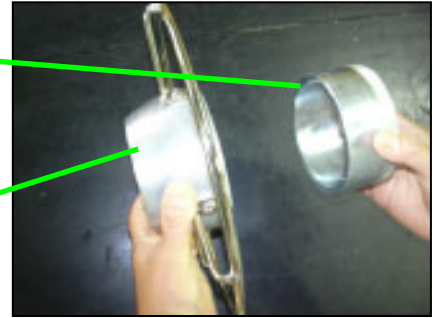
- If fluid sticks and cannot be wiped off, keep the bell cup immersed in clean thinner for a while and then wash the fluid away using a brush.
- 4) Wipe the air spindle shaft I.D. taper and the tip of the feed tube with a clean cloth soaked with thinner.
 - 5) Clean the shaping air cap surface with thinner. If contaminants do not go away easily, take the shaping air cap apart and clean it together with internal parts.

Shaping air cap set overhauling procedure

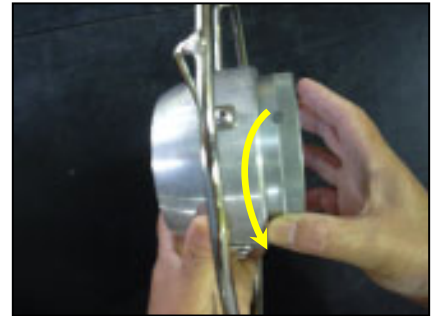
<In cases of 157C-1,159A-1,157E-1,15CF,15EA,15EE>

Attached tool No. 4
Air cap remover (Part No. 157C-011)

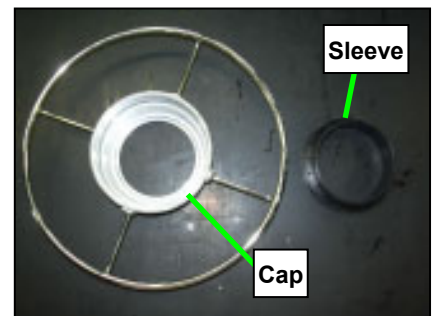
Shaping air cap



① Remove the sleeve using the attached air cap remover.



② Clean the air spray bore with a soft brush and thinner.
Finally, blow off the paint deposits and thinner accumulated inside.

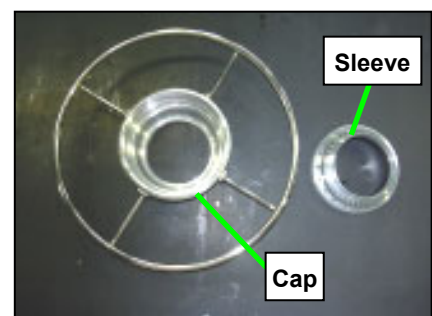


<157F>

※ This is not screwed-in as the air blowout is of slit type.

The sleeve can be removed together with the shaping air cap.

① Clean the air spray bore with a soft brush and thinner.
Finally, blow off the paint deposits and thinner accumulated inside.



6) Finally, remove the bell cup from thinner and, after thoroughly drying the inside and outside of the cup with blown air, install it to the air spindle.

② Periodic inspection

Conduct periodic inspections in accordance with the table below in order to operate the equipment to the best performance.

Items	Corrective measures	Frequency
Check body appearance.	Replace with a new one if damaged.	1 day
Check bell cup fluid hole for clogging.	Immerse in thinner and clean with blown air. If clogging persists after this, replace with a new one.	
Check feed tube end for contamination.	Remove contaminants with a soft cloth.	
Check body cover (shroud) for contamination.	Remove contaminants with a soft cloth.	
Check fiber optic cable.	Replace with a new one if damaged. If the light intensity is insufficient, check connections for poor contact.	
Check transmission cable.	Check bell cup for scratches and dents.	
Check bell cup for scratches and dents	Replace with a new one.	1 week
Check air spindle shaft nose I.D. taper for contamination.	Remove contaminants with a soft cloth.	
Check valve for proper functions.	If thinner leaks by drops from the gun nozzle when system fluid passages are filled with thinner, replace the fluid valve.	1 month
Check coil tube for internal contamination.	If paint deposits are seen over 50% or more of the entire length of tube, replace it with a new one.	
Check turbine air pressure.	If the air pressure is higher by 50% or more than the rated pressure, replace the turbine with a new one (or repair it) and exhaust any water or oil in the bearing air passages. Replace filter as well.	
Check mist separator for air spindle for contamination.	Replace filter.	1 year

③ Consumables

(1) Coil tube set

Wear of the tube inner wall due to pigments and/or pigment deposits inside the tube can cause fluid passages to get clogged or failure due to contamination. Replace the coil tube periodically.

- 1) Coil tube change (when metallic fluid is used) Every 6 months to year
(The frequency may vary depending on the fluid characteristics.)

(2) 2P Valve

After many times of on and off of trigger and drain valve ,packing in 2P valve are worn , where paint may leaks that can be observed through leakage watching hole on the valve incorporating bracket. If such leakage is found , the 2P valve should be replaced with new one.

- 1) A referential criterion for 2P valve's One million times of On / Off
(May somewhat differ depending on nature of paint.)

Besides , if any solid or foreign matter enters into the paint passage , sealing part of 2P valve may be hurt to cause paint leakage. Whenever the leakage is found , replace the 2P valve with new one.

7

Parts Replacement Procedure

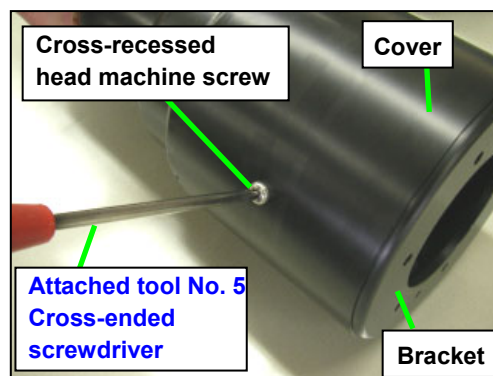
① Gun body

- Clean the fluid passages with thinner, release pressure from the fluid passages, shut OFF the turbine shaping air supply, and remove the shaping air cap and bell cup.

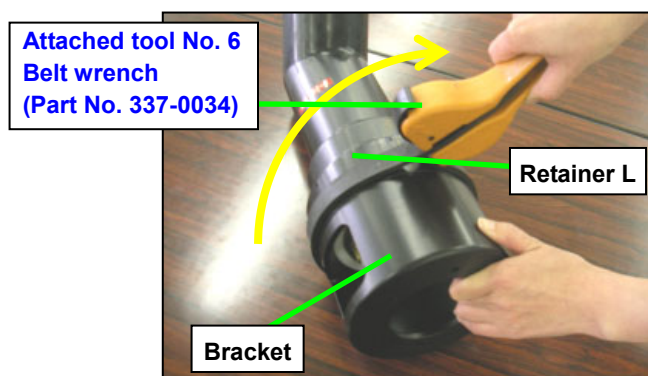
Remove the fiber optic cables, transmission cable and hoses from the back plate in advance. Failure to do so may cause damage to the cables and hoses.

② Valve unit

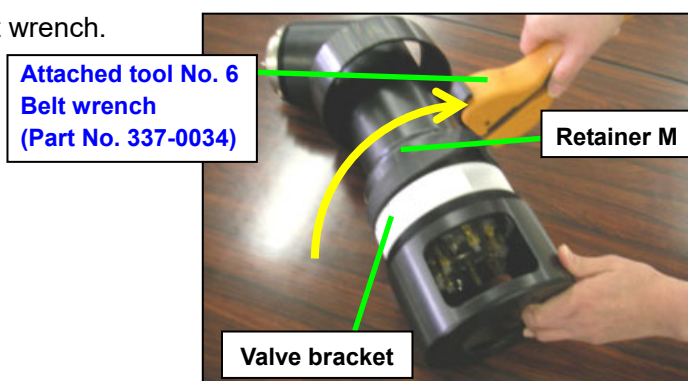
- Remove the cross-recessed head machine screw using the attached cross-ended screwdriver and remove the cover.



- Remove retainer L using the attached belt wrench.



- Remove retainer M using the attached belt wrench.



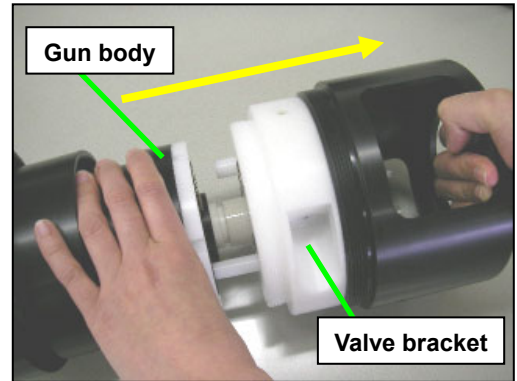
CAUTION

Before you remove the gun, always shut OFF the bearing air supply. If you do not, compressed air may gush out from the joint between the gun and the bracket to blow out thinner in a dangerous manner.

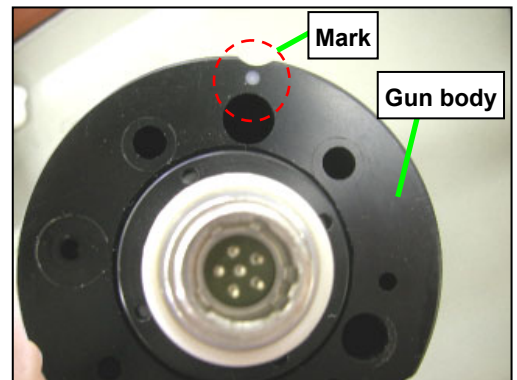
- First, disconnect the fiber optic cable connectors and remove the cables. At this time, exercise care so that fluid or thinner may not come into contact with the end of each fiber optic cable. Then, remove the valve unit.

CAUTION

The mounted O-rings may come off when the valve unit is removed. Remove the valve unit upward or work in a place where fallen parts may not be lost.

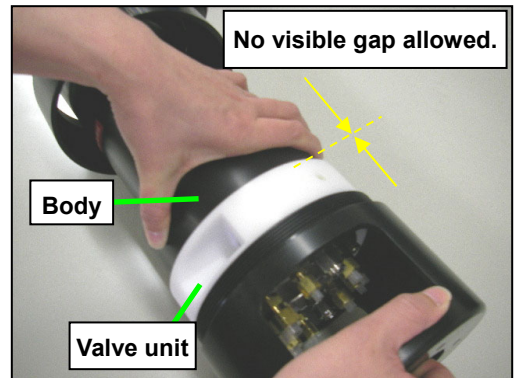


- Handle the gun with care so that shock or force may not be applied to the air spindle shaft at the front end of the gun. Keep the gun in a clean environment so that dust may not get into passages including the bearing air passage.



- When mounting, check that all the O-rings are installed on the back plate and then run the fiber optic cables through the hole with a white mark on the mating face of the gun body.

- When assembling, push the gun body onto the valve unit by hand and check that the mating faces have come in close contact with each other. Then, tighten retainer L with belt wrench to fully secure.

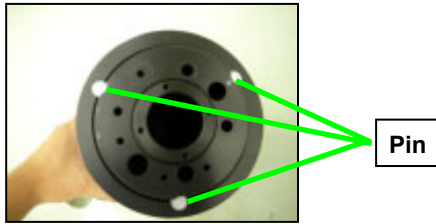


③ Shroud

- Remove retainer S, which secures the shroud, using the attached hook wrench.

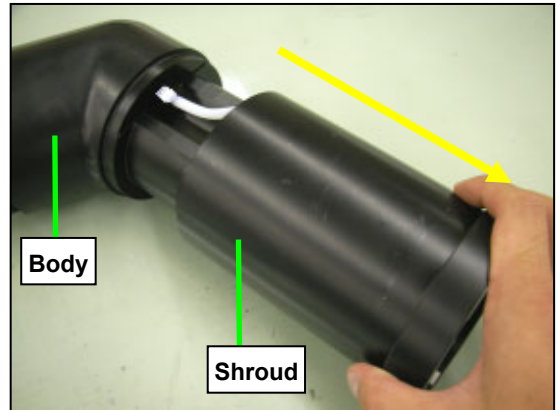


- Remove the shroud while observing the locating pins.

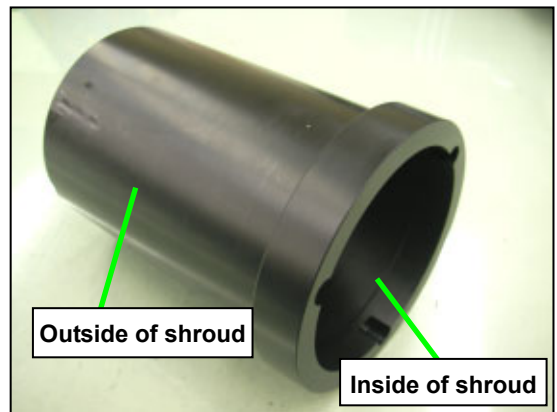


CAUTION

The pins come off when the shroud is removed. Work in a place where they may not be lost.

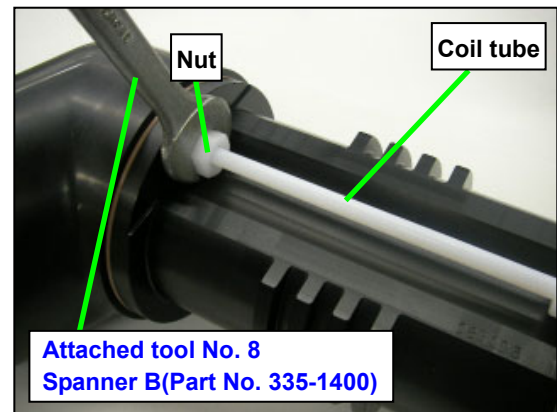


- Before assembling the shroud, clean the inside and outside of the shroud with thinner and dry it completely.
Do not fail to install the locating pins before installing retainer S.

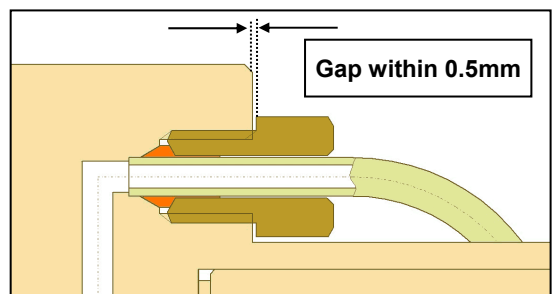


④ Coil tube

- Unscrew the nuts (Hex 14) that fasten the tube in place, using the attached tool, spanner B. Disconnect the tube end from the gun and wind the tube off.



- When connecting, fully insert the one end of the tube into the gun and tighten the nut.
At this time, see that the gap between the nut and the gun is within 0.5mm. Wind the tube around the gun and fix the other end of the tube in place.
After connecting each end, pull the tube by hand and confirm that it will not come off.



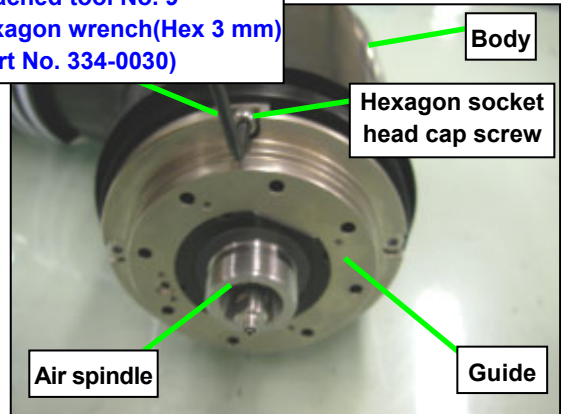
⑤ Air spindle

- Unscrew the four screws (M4x10 hexagon socket head cap screws) that secure the guide using the attached hexagon wrench (Hex 3mm).

CAUTION

The torque driver, attached tool No. 12, is specially designed for tightening.
Do not use it for loosening.
Doing so may cause damage.

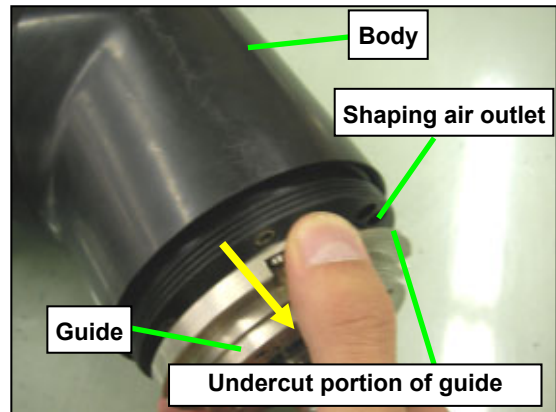
Attached tool No. 9
Hexagon wrench(Hex 3 mm)
(Part No. 334-0030)



- Holding the undercut portion of the guide near the shaping air outlet, pull off the air spindle.

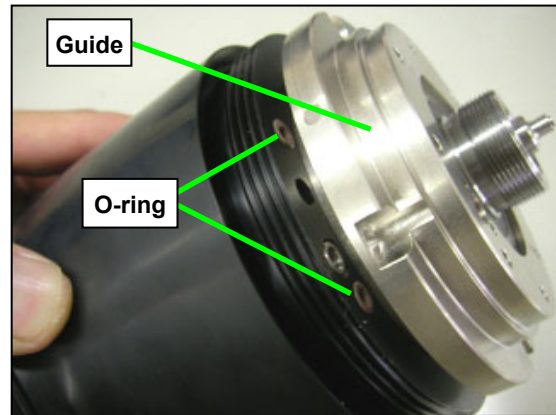
CAUTION

The two O-rings mounted on the body at the rear of the air spindle may come off when the air spindle is removed.
Remove the guide by pulling upward or work in a place where the fallen O-rings may not be lost.

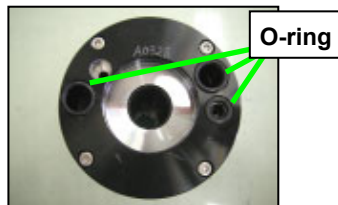


CAUTION

In pulling out the air spindle, be sure to remove the fiber optic cable beforehand.
Removing the air spindle with the fiber optic cable attached possibly results in damage to the fiber optic cable.

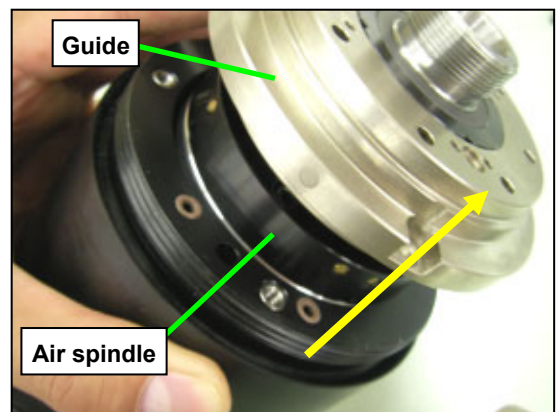


- Remove the air spindle from the body and guide.



CAUTION

Three O-rings are mounted at the rear of the air spindle.
After removing the air spindle, check for fallen O-rings.



⑥ Feed tube

- Unscrew three M5x10 hexagon socket head cap screws with the attached hexagon screwdriver (Hex 4mm) and remove the feed tube.

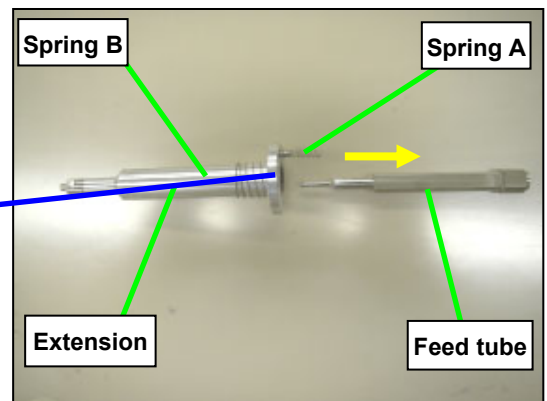
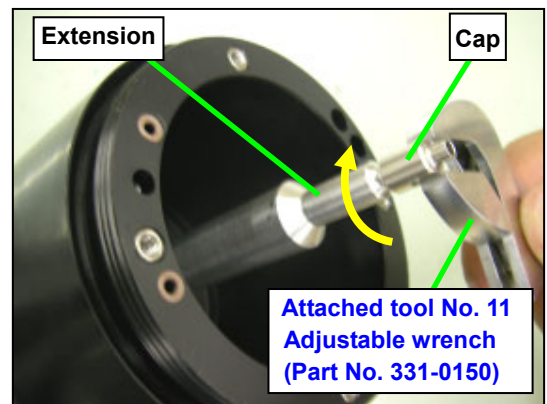
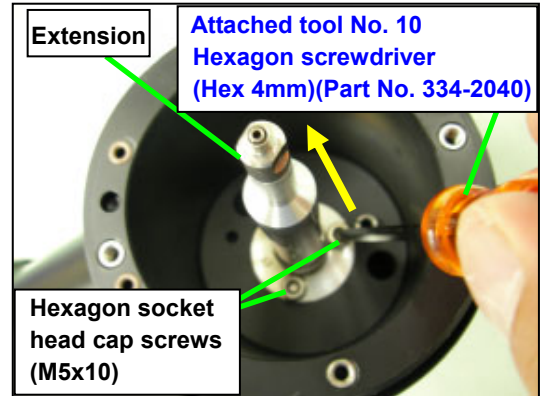
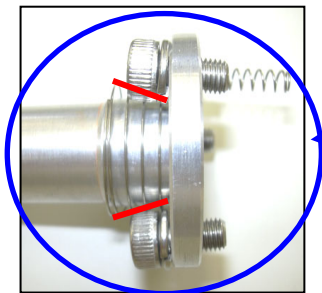
Remove the extension with the gun in the horizontal position to prevent the feed tube inside the extension from falling down.

CAUTION

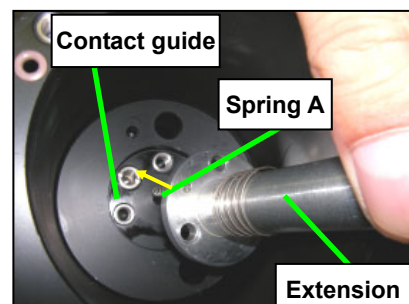
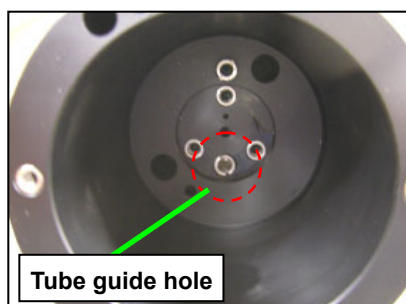
The torque driver, attached tool No. 12, is specially designed for tightening.
Do not use it for loosening.
Doing so may cause damage.

- The end cap has left-hand threads. Remove it by rotating clockwise relative to the tip of cap using the attached adjustable wrench.

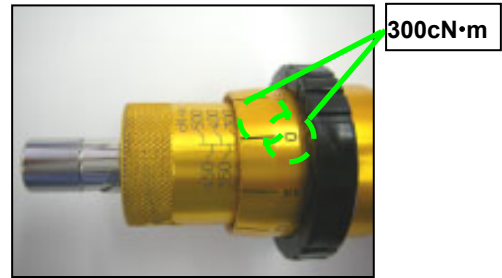
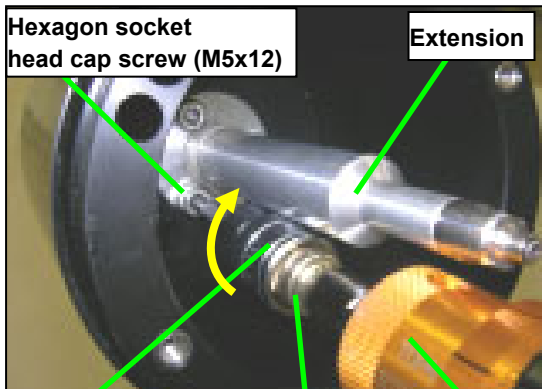
- Remove the feed tube in the extension.



- When reassembling, put all the accessory parts on the extension, set the gun horizontally, and mount the extension assembly into the gun, in a way that spring A will be inserted into the contact guide hole.



- Tighten the three M5x12 hexagon socket head cap screws to the torque of 300cN·m with the attached torque wrench and hexagon bit A.



Attached tool No. 14
Hexagon bit A
(Part No. 337-0035)

Attached tool No. 16
Socket adapter
(Part No. 337-0033)

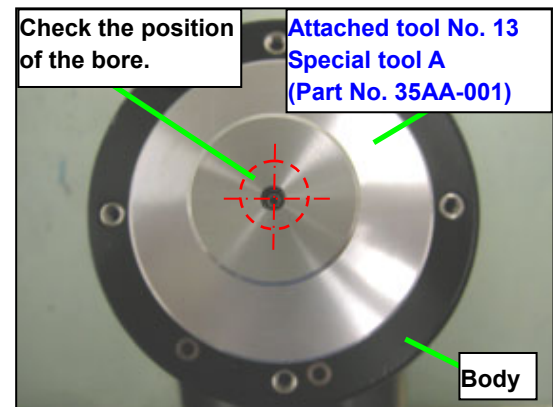
Attached tool No. 12
Torque driver
(Part No. 337-0028)

- Mount the attached tool, special tool A, to the air spindle to check that the feed tube has been centered.



Attached tool No. 13
Special tool A
(Part No. 35AA-001)

- Check that the end hole of the feed tube is seen at the center through the end bore of the attached tool, special tool A. If not, the bore may have been out of center due to the incorrectly installed extension or deformation of the cap or feed tube end. Check the extension position or replace the cap and/or feed tube.



Check the position of the bore.

Attached tool No. 13
Special tool A
(Part No. 35AA-001)

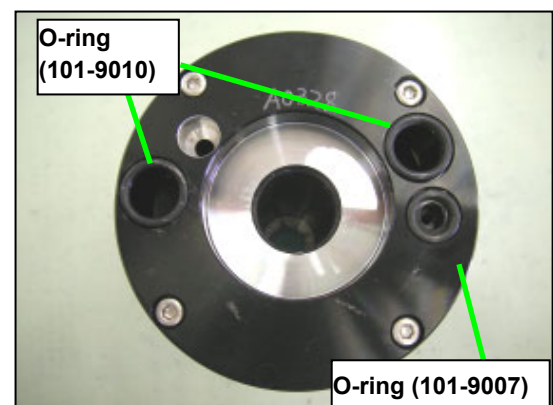
Body

⑦ Installation of air spindle

- Before installing the air spindle, check that two O-rings (101-9010) and another O-ring (101-9007) have been mounted at the rear of the air spindle.

⚠ CAUTION

Install with care not to damage the shaft slide-way and the inside of rear and front bearings.



O-ring
(101-9010)

O-ring (101-9007)

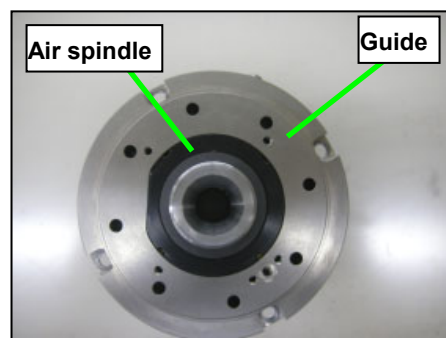
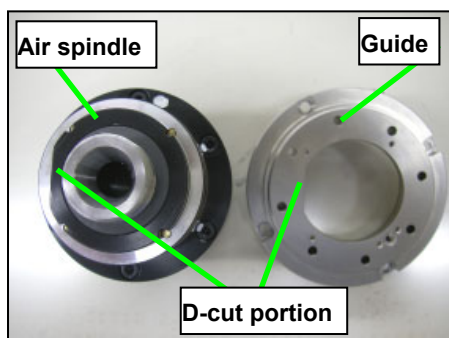
- Check the two O-rings (130-9050) mounted on the air spindle for swell or damage.

⚠ CAUTION

Swelling or damaged O-rings may cause failure of the air spindle due to bearing air leak or increase the air consumption, resulting in a pressure loss.



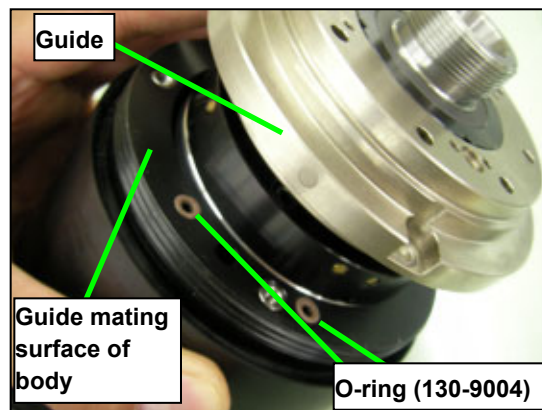
- Set the guide to the air spindle with the D-cut portion on the air spindle aligned with that on the guide.



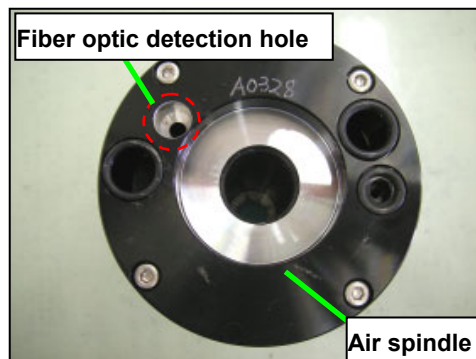
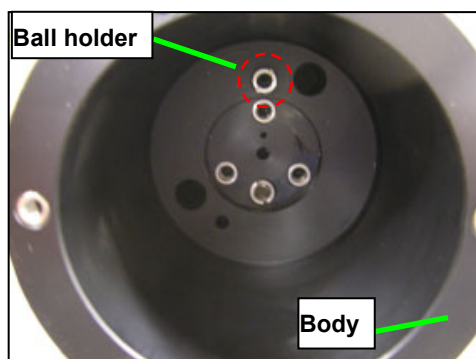
- Before setting the air spindle together with the guide to the body, check that the O-ring (130-9004) has been set on the guide mating surface of the body.

⚠ CAUTION

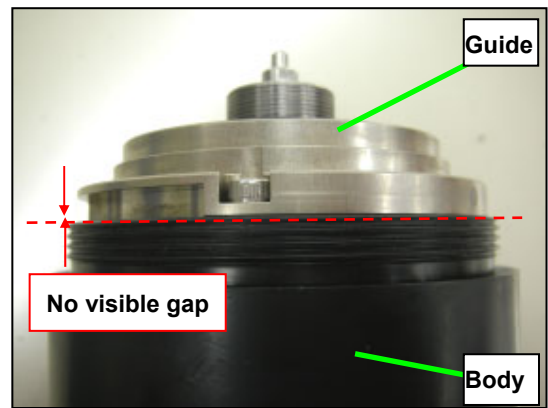
In installing the air spindle, check that the fiber optic cable has been removed. Installing the air spindle with the fiber optic cable attached possibly results in damage to the fiber optic cable.



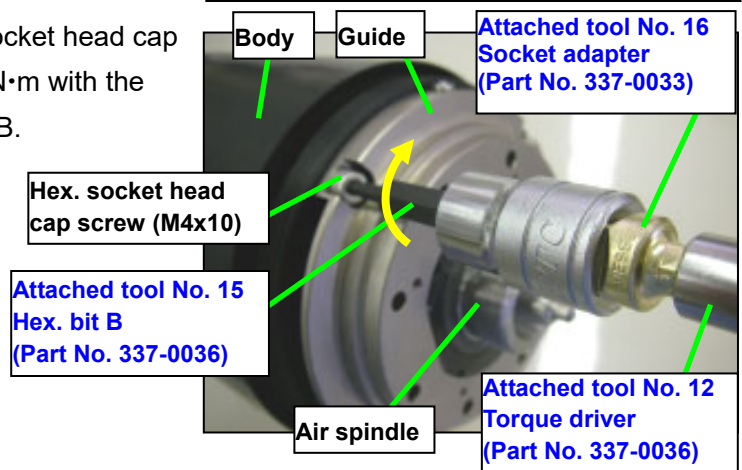
- Set the extension together with the guide to the body. When setting, align the locating ball holder in the body with the fiber optic detection bore at the rear of the air spindle.



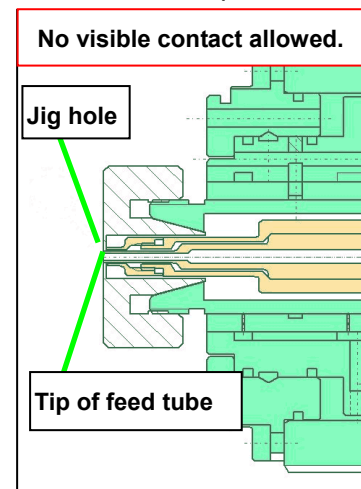
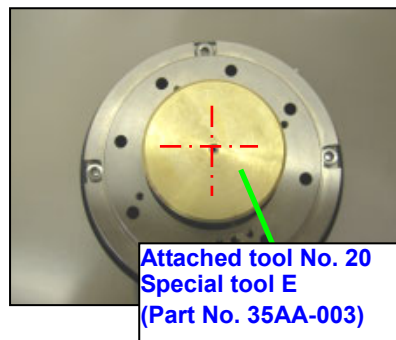
- After tightening the bolt, check for gap between the guide and the body. If any, the O-ring may be incorrectly mounted in the air spindle or the feed tube may be incorrectly installed.



- Secure the guide with four M4x10 hex. socket head cap screws and tighten to the torque of 300cN·m with the attached torque wrench and hexagon bit B.



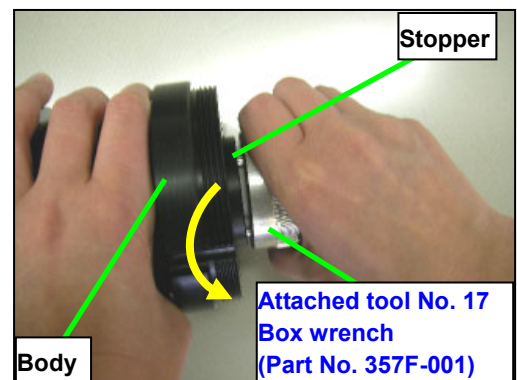
- Set the attached tool, special tool E, to the shaft and check that the center hole on special tool E is not in contact with the feed tube.



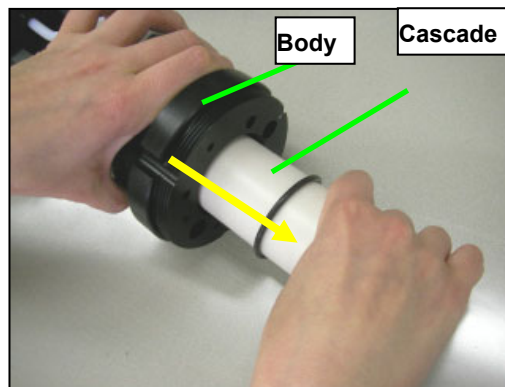
- When removing and reinstalling the air spindle, be sure to attach the fiber optic cable after reinstalling the air spindle. When the fiber optic cable is removed and reinstalled, check/adjust auto-tuning and sensitivity every time after reinstallation.

③ Cascade

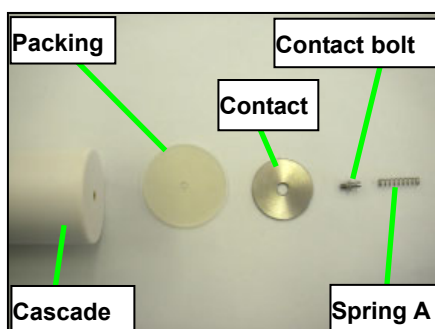
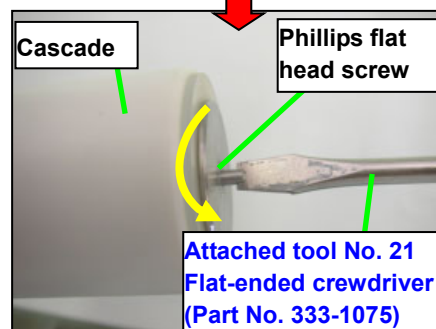
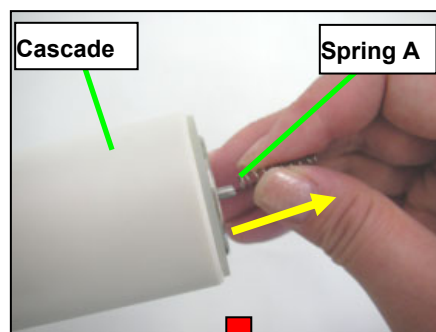
- Using the attached tool, box wrench, loosen and remove the stopper secured on the body.



- Hold the rear part of the cascade with fingers and pull it off slowly and carefully. Exercise care so that thinner may not come into contact with the cascade connector.



- Remove spring A, unscrew the Phillips flat head screw at the end of the cascade using the attached cross-ended screwdriver, and remove the packing and contact.

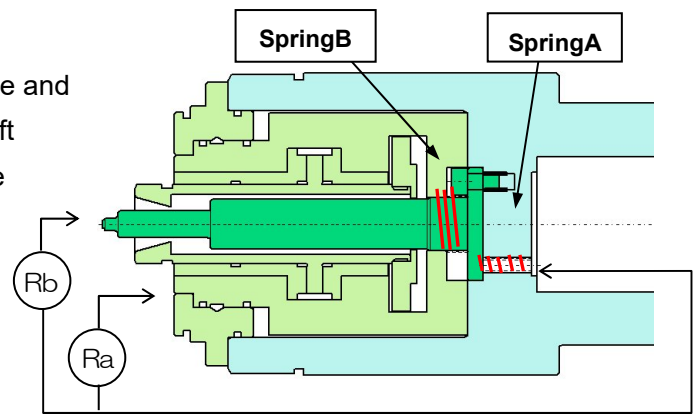


- Wipe the cascade body with a thinner soaked clean cloth. After installing the parts, wipe the body again with an alcohol such as IPA to remove oils completely and dry them well. Then, assemble again.

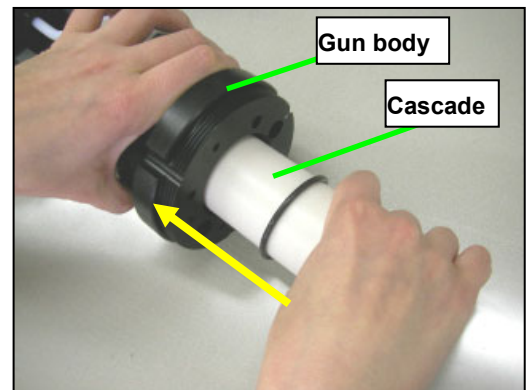
⚠ CAUTION

After wiping the cascade with thinner, do not air-blow. Oils, water and dust contained in the compressed air may stick to the cascade, resulting in an electrostatic failure.

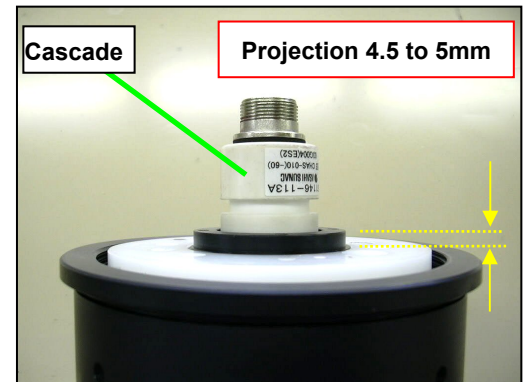
- With the cascade removed, measure the resistance between spring A and the feed tube and that between spring A and the air spindle shaft using a tester to check that neither resistance exceed 10Ω. If a higher resistance is found, polish the contacts on springs A and B respectively for cleaning.



- Put the cascade into the gun body, carefully not to touch a large diameter portion of the cascade by bare hand. Also, do not touch by bare hand the hole on the gun to which the cascade is to be inserted.



- Install the stopper using the attached tool, box wrench. At this time, see that the stopper projection from the gun end is between 4.5mm and 5mm.

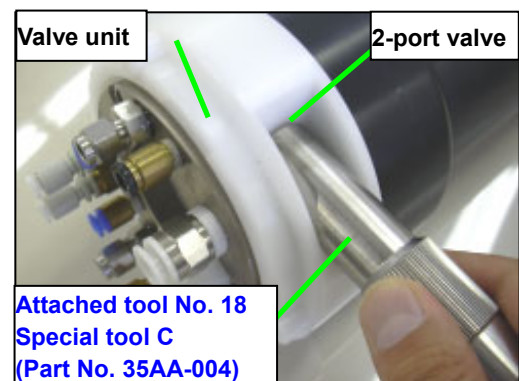


⑨ 2-port valves

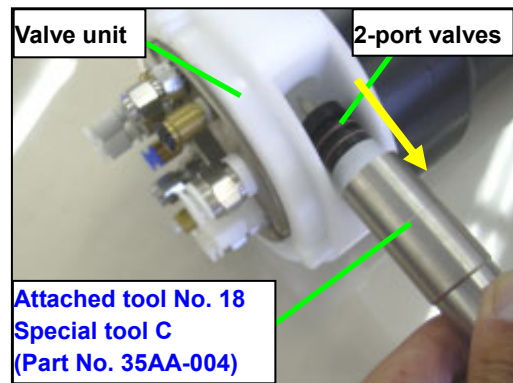
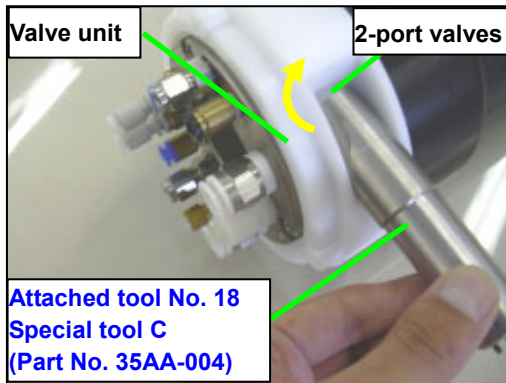
- Remove the 2-port valves from the valve unit using the attached tool, special tool C.

⚠ CAUTION

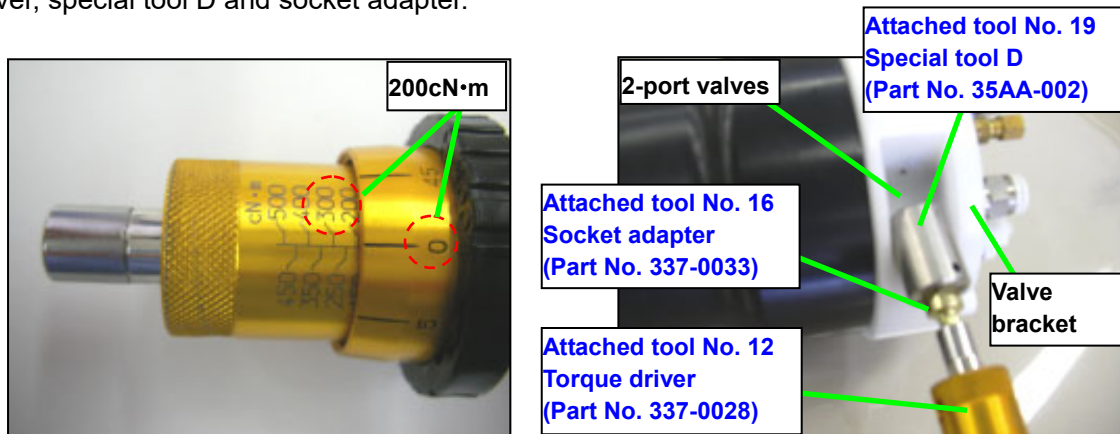
The torque driver, attached tool No. 12, is specially designed for tightening. Do not use it for loosening. Doing so may cause damage.



- If the 2-port valves cannot be removed, engage the threaded end of the attached tool, special tool C, opposite from the 2-port valve remover/installer pin, with the threaded portion of each 2-port valves and then pull the valve out.



- After setting the 2-port valves to the valve unit, tighten it to the torque of 200cN·m using a torque driver, special tool D and socket adapter.



⑩ Functional check

- Before performing a functional check, be sure to supply the bearing air and rotate the air spindle shaft by hand to check with eyes that it continues turning smoothly. If air leaks from the joint between the gun and the bracket, check connections again.

⚠ CAUTION

Supplying the turbine air with the bearing air leaking decreases the air pressure to the air spindle, resulting in a very short service life and/or damage.

- Auto-tune the electrostatic controller (BPS300) with the gun. Apply electrostatic charges with the bell cup and shaping air cap mounted and switch the electrostatic controller mode (M14). Then, the auto-tuning is completed within about a minute.

① Painting performance

Symptom	Cause	Remedy
Fluttering spray	① Fluid flow insufficient, with leak dropping from feed tube	Remove bell cup and adjust fluid flow so that fluid may flow through feed tube continuously.
	② Air gets into fluid passages	Check remaining fluid amount and pump suction seat.
Decreasing fluid flow	① Clogged fluid valve seat	Remove fluid seat and clean seat and orifice.
	② Fluid deposition on inside wall of fluid passage in valve	Take passage apart and clean.
		Review solubility of cleaning solution and cleaning method.
		Replace the coil tube set with a new one.
③ Valve functional failure	Check operating air pressure for valve.	
	Check solenoid valve for proper functioning.	
	Replace valve.	
Fluid will not stop flowing when shut off	① Fluid residue, dust on valve seat	Remove fluid seat and clean seat and orifice. At the same time, clean fluid passage.
	② Valve functional failure	Check operating air pressure for valve.
Check solenoid valve for proper functioning.		
Replace valve.		
Orange peel	① Bell cup surface too dry	Conduct bell cup thinner cleaning more frequently.
		Reduce turbine RPM.
		Make slower the dryness of thinning solvent.
Fish eye	① Fluid accumulation in bell cup groove or wear	Remove contaminants. Review cleaning method.
		Replace the bell cup with a new one.
Paint film too thick	② Scratches or dent at bell cup edge	Replace the bell cup with a new one.
		① Electrostatic not effective
② Improper painting environment	Use thinning solvent that dries slower.	
	① Electrostatic not effective	Reduce speed of gun.
Adjust paint booth air flow speed to 0.3 to 0.4m/s.		

② Equipment Operation

Symptom	Cause	Remedy
Turbine will not rotate	① Fluid backflow due to the overflow from cup into turbine	Conduct bell cup thinner cleaning more frequently.
		Clean bell cup fluid hole. Review solubility of thinning solution and cleaning method. Use thinning solution that dries slower.
		Adjust gun operating attitude to level or an angle that will get gun to point down.
	② Fluid discharged at bell cup stop flowing into turbine	Check fluid valve. Replace as required. Relieve pressure from fluid passages at the end of painting operation.
		Check to see that interlock is triggered at 10,000 rpm.
	③ Turbine seizure	Check to see that bearing air pressure is always maintained at 0.5MPa or more.
Cup imbalance due to contaminated tapered bell cup mounting surface → Clean shaft and bell cup tapered surfaces. (See “Handling of bell cup” in this manual.)		
Imbalance due to dent made when ball cup was dropped → Replace it with a new one. Look into other bell cups, as well.		
Imbalance due to accumulated pigments in bell cup → Review bell cup cleaning method.		
No turbine speed display	① Fiber optic cable comes off	Check to see that the length of fiber optic projection into gun is appropriate. Adjust so that there will be no tension in the cable as gun moves.
		② Contaminated fiber optic cable end and turbine rotor
	③ Kinked fiber optic cable	Cut end face with special cutter. Confirm that paint or thinner does not get inside the gun. (See “Fluid overflow from bell cup.”)
		Replace the fiber optic cable with a new one.

③ Electrostatic

Symptom	Cause	Remedy
Electrostatic abnormality occurs *1).	① Safety circuit in the electrostatic control is activated	Check gun-to-object distance and adjust it to a distance at which no electrostatic failure occurs. Adjust hanger or conveyor so that painting object does not sway. Check to see if gun approaches painting object too fast; take measures against object swaying.
	② Humidity too high in fluid booth	Paint with reduced voltage.
	③ Water in air passages	Purge water from air pipes and air passage in the gun.
	④ Gun contaminated with fluid	Clean cover and gun to remove fluid deposition, using thinner with high volatility *2), then air blow to dry well.
	⑤ Fluid resistance too low allowing current to flow through fluid passage to ground	Adjust fluid to appropriate resistance value *3).
	⑥ Metallic particles deposited on inside wall of fluid hose allowing current flow through fluid passage to ground	Clean fluid passages with thinner. *4) Review cleaning timing chart.
		Replace the spiral tube set with a new one.
	⑦ Poor connector cable connection or disconnection	Replace connector cable.
⑧ Noise disturbance to electrostatic controller	Take measure against noise. (See the “Electrostatic Controller” manual.)	

NOTE

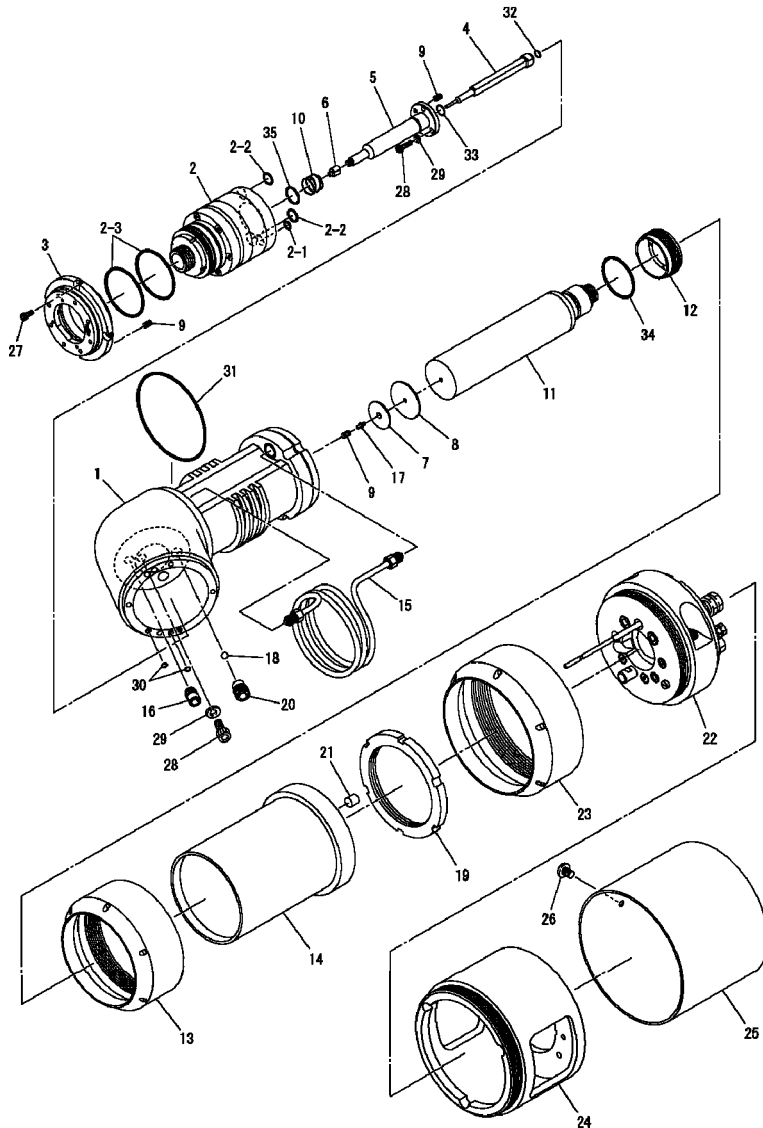
- *1) See the “Electrostatic Controller BPS300” manual for details about electrostatic failure display.
- *2) Always wipe off with a thinner soaked clean cloth. Do not spray thinner with a spray gun for cleaning.
- *3) Adjust fluid resistance value so that it can be used with 80μA or less on monitor display.
- *4) While the way metallic particles precipitate differs from one fluid to another, to play it safe, thoroughly flush fluid passages with thinner at the end of each painting operation.

9

Exploded Diagram and Names of Parts

ESA200

13EC



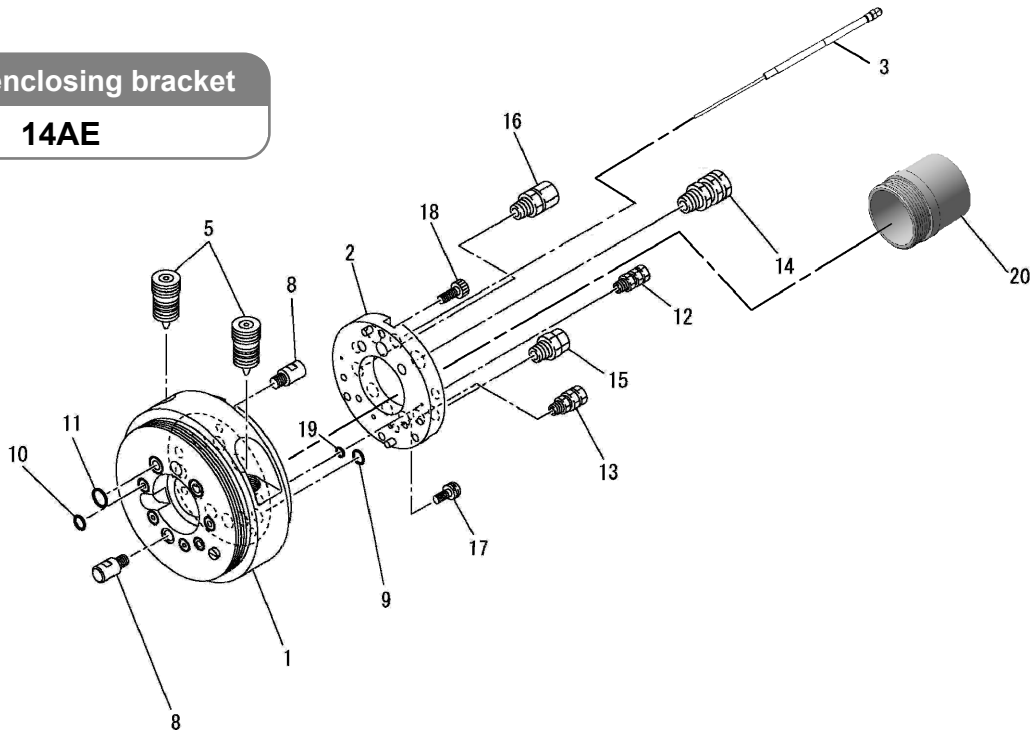
No.	Part No.	Product name	Qty	Remarks
1	13EC-001	Body	1	
2	321-0016	Air spindle	1	
2-1	101-9007	O-ring	1	
2-2	101-9010	O-ring	2	
2-3	130-9050	O-ring	2	
3	13EC-003	Guide	1	
4	13AA-004	Feed tube	1	
5	13AA-005	Extension	1	
6	13AA-006	Cap	1	
7	13AA-007	Contact	1	
8	13AA-008	Packing	1	
9	13AA-009	Spring A	3	
10	13AA-010	Spring B	1	
11	13AE-011	Cascade	1	
12	13AA-012	Stopper	1	
13	1813-013	Retainer M	1	
14	13EC-014	Shroud	1	
15	13EC-015	Coil tube set LL	1	
16	13AE-016	Tube guide	1	
17	13EC-017	Contact bolt	1	

No.	Part No	Product name	Qty	Remarks
18	2201-016	Float	1	
19	13EC-019	Retainer S	1	
20	13EC-020	Ball holder	1	
21	13EC-021	Pin	3	
22	14AE	Valve enclosing bracket	1	
23	13EC-023	Retainer L	1	
24	13EC-024	Bracket	1	
25	13EC-025	Cover	1	
26	364-0018	Screw	1	
27	03-70408	Hex. socket bolt	4	
28	03-70512	Hex. socket bolt	3	
29	360-0118	Ribbed lock washer	3	
30	130-9004	O-ring	2	
31	130-9090	O-ring	1	
32	101-9004	O-ring	1	
33	101-9014	O-ring	1	
34	102-6040	O-ring	1	
35	101-9016	O-ring	1	
36	13EC-037	Grounding wire	1	Accessories

※Attached tool, part No. 35AA, shall be separately ordered.

Valve enclosing bracket

14AE

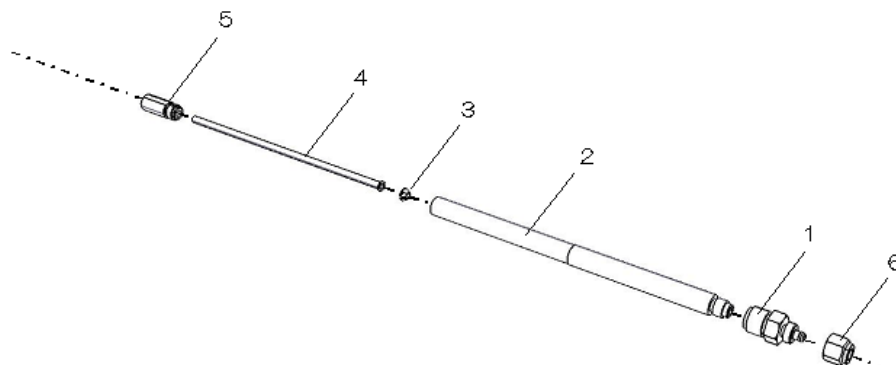


No.	Part No.	Product name	Qty	Remarks
1	14AE-001	Manifold	1	
2	14AE-002	Joint plate	1	
3	1709-1	Fiber unit	1	
4	Nil			
5	0836	2-port valve	2	
6	Nil			
7	Nil			
8	149A-005	Bolt	4	
9	101-2006	O-ring	2	
10	101-9007	O-ring	11	

No.	Part No.	Product name	Qty	Remarks
11	101-9010	O-ring	4	
12	342-0165	Connector	4	
13	345-0057	Connector	2	
14	345-0056	Connector	2	
15	342-0133	Nipple	1	
16	342-0171	Nipple	1	
17	12-10510	2-point sems screw	1	
18	03-70615	Hex. socket bolt	3	
19	101-9004	O-ring	2	
20	13EC-036	Sleeve	1	

Fiber unit

1709-1

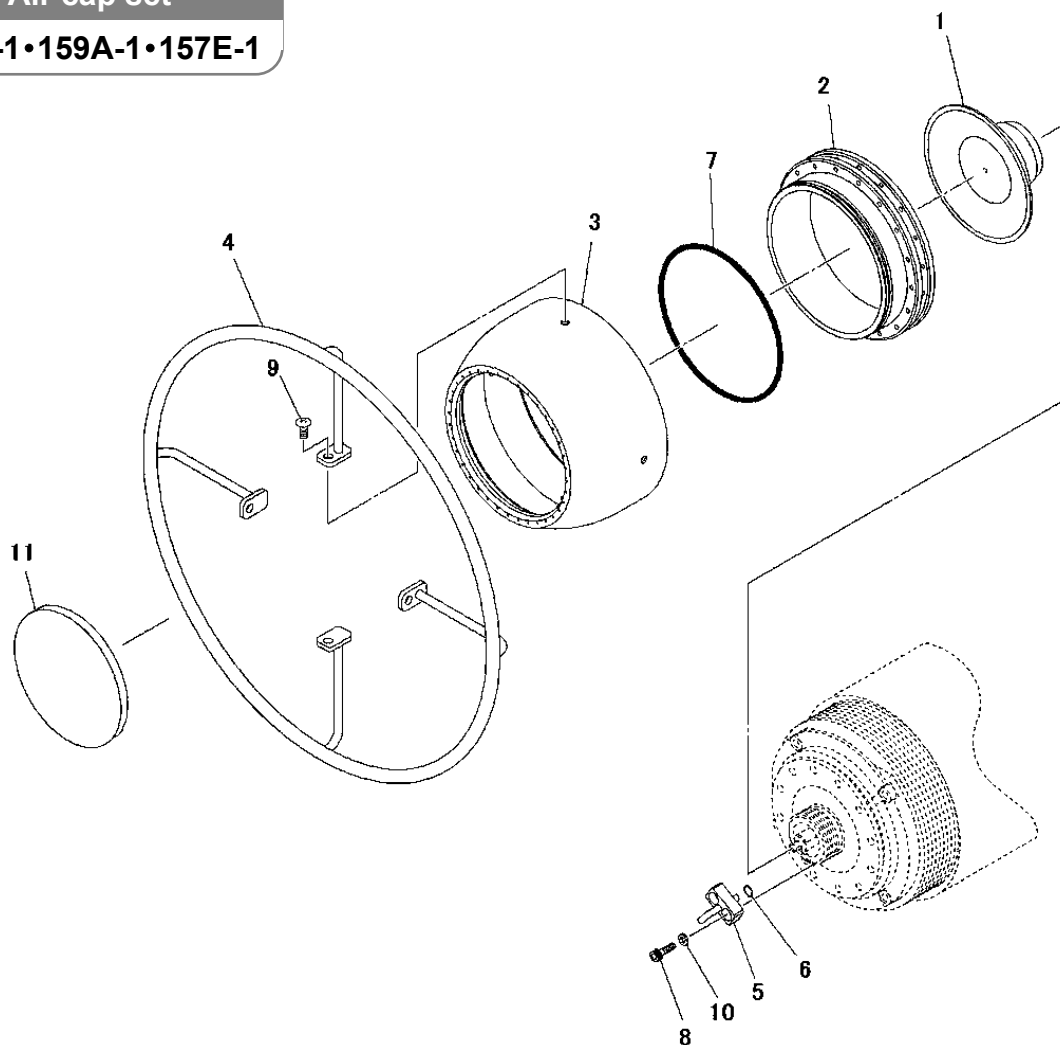


No.	Part No.	Product name	Qty	Remarks
1	14A5-001	Connector	1	
2	1709-102	Fiber holder	1	
3	1709-003	Sleeve	1	

No.	Part No.	Product name	Qty	Remarks
4	14A5-104	Teflon tube	1	
5	1709-005	Nut	1	
6	342-0162	Cap nut	1	

Air cap set

157C-1•159A-1•157E-1



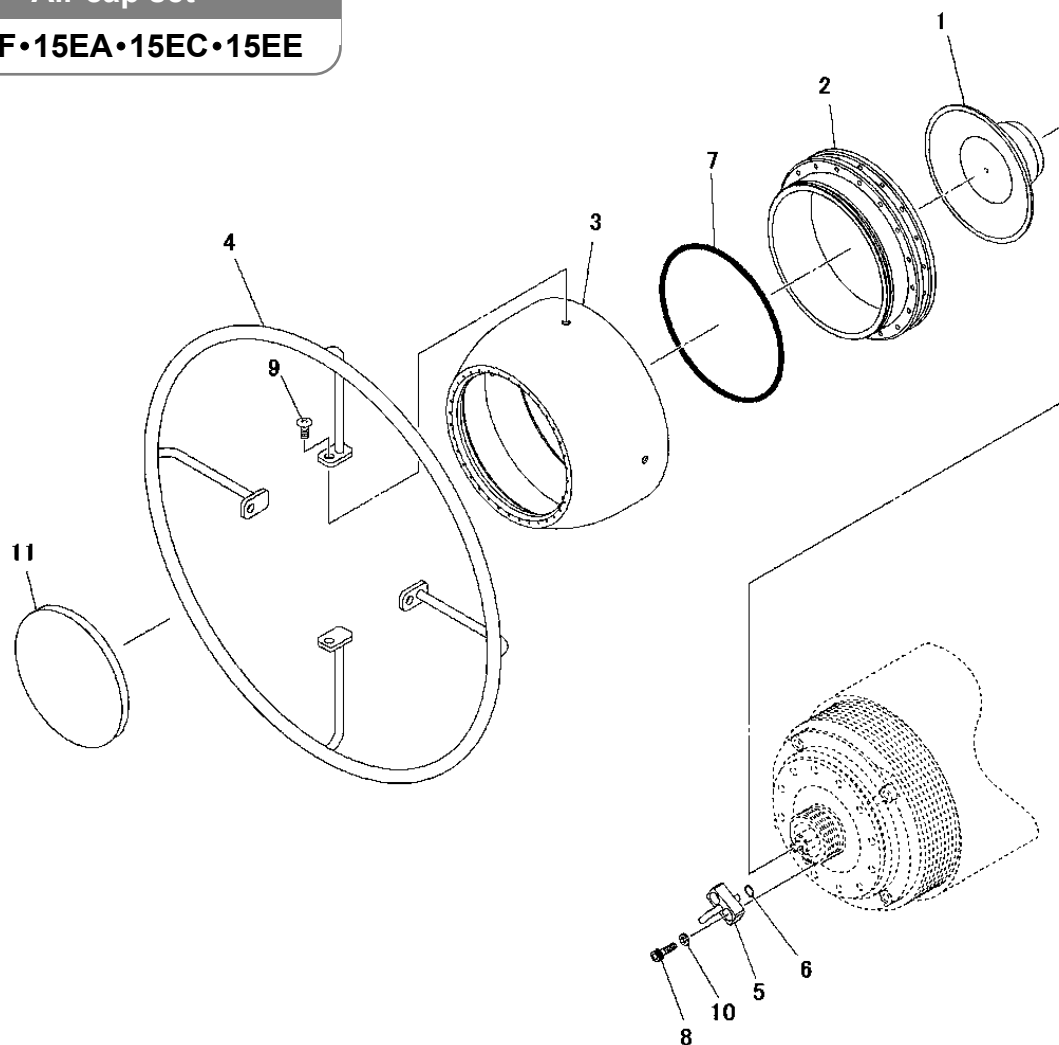
No.	Part No.	Product name	Qty	Remarks
1	157C-101	Cup	1	
2	157C-002	Sleeve	1	
3	157C-003	Cap	1	157C-1 用
	159A-003		1	159A-1 用
	157E-003		1	157E-1 用
4	157C-004	Counter electrode ring	1	※
5	157C-005	Nozzle	1	

No.	Part No.	Product name	Qty	Remarks
6	130-9004	O-ring	1	
7	130-9070	O-ring	1	
8	03-70308	Hex. socket bolt	2	
9	71-70405	Screw	4	※
10	41-70300	Spring washer	2	
11	157C-012	Pad	1	

Remark: The air cap set can be used with the counter electrode ring removed. In this case, use No. 9 screws with a shorter screw length (71-70404) in place of Part No. 9.

Air cap set

15CF•15EA•15EC•15EE



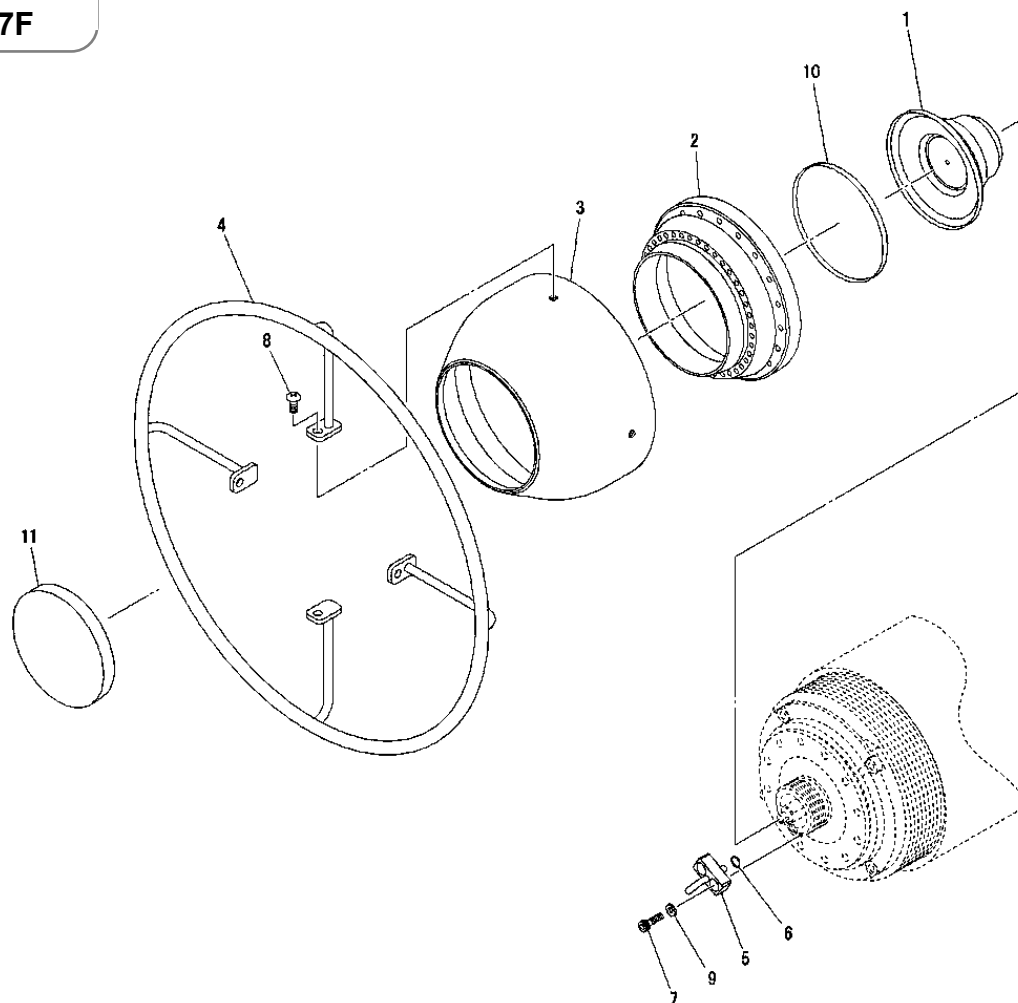
No.	Part No.	Product name	Qty	Remarks
1	15CF-001	Cup	1	
2	157C-002	Sleeve	1	
3	157C-003	Cap	1	15CF 用
	159A-003		1	15EA 用
	15EC-003		1	15EC 用
	157E-003		1	15EE 用
4	157C-004	Counter electrode ring	1	※

No.	Part No.	Product name	Qty	Remarks
5	15CF-005	Nozzle	1	
6	130-9004	O-ring	1	
7	130-9070	O-ring	1	
8	03-70308	Hex. socket bolt	2	※
9	71-70405	Screw	4	
10	41-70300	Spring washer	2	
11	157C-012	Pad	1	

Remark: The air cap set can be used with the counter electrode ring removed. In this case, use cross-recessed truss head screws with a shorter screw length (71-70404) in place of Part No. 9.

Air cap set

157F



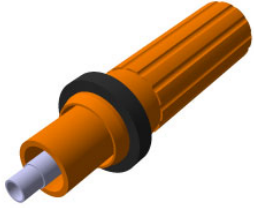




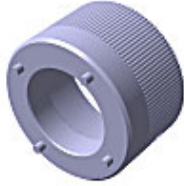






No.	Part No.	Product name	Qty	Remarks
1	157F-001	Cup	1	
2	157F-002	Sleeve	1	
3	157F-003	Cap	1	
4	157C-004	Counter electrode ring	1	※
5	157F-005	Nozzle	1	
6	130-9004	O-ring	1	

No.	Part No.	Product name	Qty	Remarks
7	03-70308	Hex. socket bolt	2	
8	71-70405	Screw	4	※
9	41-70300	Spring washer	2	
10	157F-010	Ring	1	
11	157F-011	Pad	1	

Attached tools

35AA

<p>Spanner A Part No. 357F-002 (for bell cup)</p>	<p>Pad (for $\phi 70$ cup) Part No. 157C-012 (for bell cup)</p>	<p>Pad (for $\phi 60$ cup) Part No. 157F-011 (for bell cup)</p>
		
<p>Air cap remover Part No. 157C-011 (for air cap)</p>	<p>Fixtures(D25/D40) Part No. 15F3-211</p>	<p>Cross-ended screwdriver Part No. 333-0002 (for screws)</p>
		
<p>Belt wrench Part No. 337-0034 (for body)</p>	<p>Hook wrench Part No. 336-0068 (for retainer S)</p>	<p>Spanner B Part No. 335-1400 (for coil tube)</p>
		
<p>Hex. wrench (Hex 3mm) Part No. 334-0030 (for guide)</p>	<p>Hex. screwdriver (Hex 4mm) Part No. 334-2040 (for feed tube)</p>	<p>Adjustable wrench Part No. 331-0150 (for feed tube)</p>
		

<p>Torque driver Part No. 337-0028 (for feed tube, guide and 2-port valves)</p>	<p>Special tool A Part No. 35AA-001 (for air spindle)</p>	<p>Hex. bit socket A (4mm) Part No. 337-0035 (for feed tube)</p>
		
<p>Hex. bit socket B [3mm] Part No. 337-0036 (for guide)</p>	<p>Socket adapter Part No. 337-0033 (for torque driver)</p>	<p>Box wrench Part No. 357F-001 (for cascade)</p>
		
<p>Special tool C Part No. 35AA-004 (for 2-port valves)</p>	<p>Special tool D Part No. 35AA-002 (for 2-port valves)</p>	<p>Special tool E Part No. 35AA-003 (for feed tube)</p>
		
<p>Flat-ended driver Part No. 333-1075 (for cascade)</p>	<p>Fiber cutter Part No. 470-0007 (for fiber optic cables)</p>	<p>Wrench10-12 Part No. 35AA-005 Wrench12-14 Part No. 35AA-006 Wrench14-17 Part No. 35AA-007</p>
		

ASAHI SUNAC CORPORATION (the “Company”) shall provide the original purchaser (the “Purchaser”) with warranty service for a period of one (1) year from the date of purchase of the product, as follows:

- Should you find defects in design or workmanship with regard to parts, ship them back to the Company, with freight prepaid. The Company shall repair or replace the parts free of charge and reimburse the freight charges, provided that, as a result of an inspection and investigation of the parts conducted by the Company, the defects are deemed to be attributable to the factors within the Company’s responsibility.
- In the following cases, free after-sales service is not provided.
 1. Failure resulting from an inappropriate method of installing this equipment.
 2. Failure resulting from a use method not conforming to this instruction manual or mishandling.
 3. Failure resulting from insufficient maintenance management of this equipment and incorrect handling such as non-conformance to the procedures specified in this instruction manual.
 4. Failure resulting from unauthorized alteration or structure change of this equipment without the Company’s consent.
 5. Failure due to force majeure such as earthquake, disaster, flood disaster or lightning.
 6. Warranty for consumables worn or deteriorated even in the case where this equipment is used correctly.
 7. Repair after the machine has been used outside Japan, and shipping cost.
 8. In addition to the above, failure due to circumstances beyond our control.
- As for items such as parts purchased by the Company from another manufacturer, the warranty of that manufacturer shall apply.
- As for any parts deemed to be defective, the Company shall not be held liable for any expenses beyond the provision of repair or replacement parts free of charge.
- The Company shall not be held liable for any damage to the Purchaser caused by factors not attributable to the Company, such as misuse of product, etc.

[MEMO]

-
- When a transfer of title of this equipment takes place, please see to it that this Operation and Maintenance Manual is handed over to the new owner.
 - This equipment is manufactured in compliance with the Laws and Regulations of Japan.
In the rare eventuality of this equipment being used outside Japan, compliance with the safety standards of the relevant countries is of course mandatory.
-

27th Edition: June 25, 2025

ASAHI SUNAC CORPORATION

HEAD OFFICE
5050, SHINDENBORA, ASAHIMAE-CHO,
OWARIASAHI, AICHI PREF. 488-0852, JAPAN
PHONE +81-561-52-0717 FAX +81-561-54-8847

URL : www.sunac.co.jp
E-mail : ctrd01@sunac.co.jp

Sales office



English



Chinese

27th Edition: June 25, 2025