CKD

SM－439169－A

INSTRUCTION MANUAL

BALANCER UNIT (FIXED PRESSURE ADJUSTMENT CONTROL BOX SEPARATE TYPE, INTEGRATED TYPE)

BBS－O/OB Series

- Please read this instruction manual carefully before using this product, particularly the section describing safety.
- Retain this instruction manual with the product for further consultation whenever necessary.

CKD Corporation
The first edition

For Safety Use

To use this product safety, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (to the level pursuant to JIS B 8370 Pneumatic System Rules).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

Our customers use this product for a very wide range of applications, and we cannot keep track of all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents, **read this operation manual carefully for proper operation.**

Observe the cautions on handling described in this manual, as well as the following instructions:

⚠ CAUTION :

- Before performing an overhaul inspection on the actuator, deactivate residual pressure completely.
- While the actuator is operating, do not step into or place hands in the driving mechanism.
- To prevent an electric shock, do not touch the electric wiring connections (exposed live parts) of the actuator equipped with a solenoid valve or switch.
  Perform an overhaul inspection with the power off. Also, do not touch these live parts with wet hands.

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BBS-O Series

Balancer Unit

Manual No. SM-439169-A

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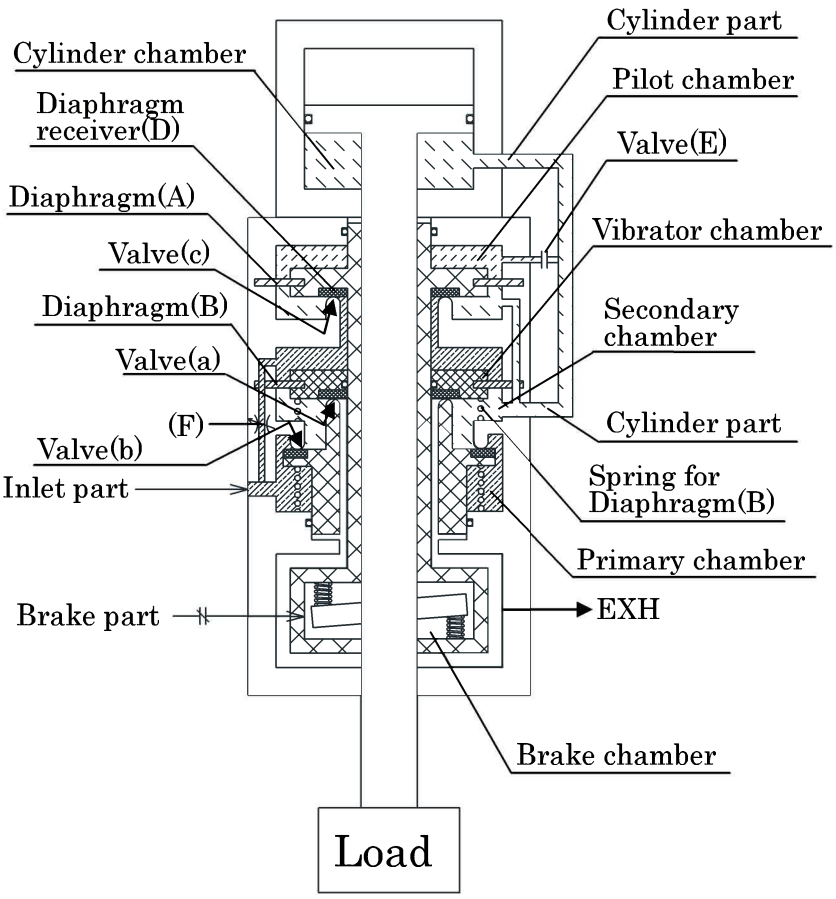
1. PRODUCT

1.1 Description of Principle

As shown in Figure, this unit is designed with Diaphragm Receiver (D) suspended from the brake chamber.

When the brake is applied to open Valve (E) and to apply the primary pressure to the inlet port, the vibrator chamber is pressurized to lower Diaphragm (B) and open Valve (b) by means of air previously regulated in Primary Chamber (F) and continuously fed to the vibrator chamber (Figure 1)



As a result, the pressure applied to the secondary chamber, pilot chamber, and cylinder chamber is increased to lift the load, elevate Diaphragm (A), open Valve (c), apply the same pressure to the vibrator chamber as in the secondary chamber (Figure 2), elevate Diaphragm (B), and release pressure from Valve (b) (Figure 3)

The pressure in the secondary chamber is then reduced for Diaphragm (A) to shut off Valve (c) (Figure 4).

During manual operation

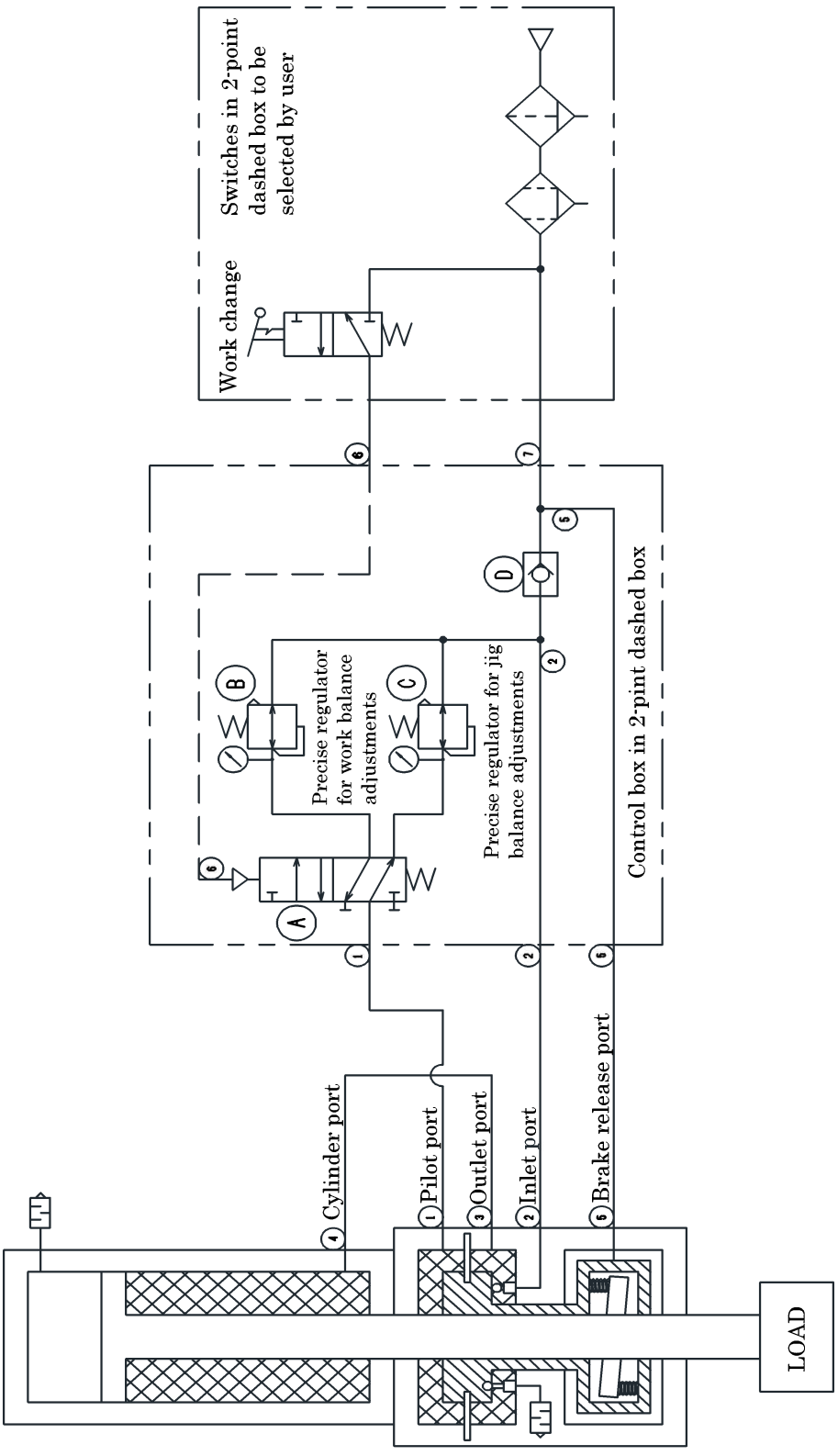
When Valve (E) is shut off, the load can manually be handled (Figure 5). If the load is elevated, the pressure in the secondary chamber is reduced to lower Diaphragm (B), open Valve (a), apply pressure to the secondary chamber, and elevate the load.

If the load is lowered, a higher pressure is applied to the secondary chamber to elevate Diaphragm (B), open Valve (a), and release pressure.

1.2 Specifications

Model / Item	BBS-O/OB			
Bore size mm	φ50	φ63	φ80	φ100
Usage environment	Indoor use (However, excluding bad environments such as water and dust.)			
Working fluid	Clean compressed air			
Max. working pressure MPa	0.6			
Min. working pressure MPa	0.25			
Proof pressure MPa	0.9			
Ambient temperature ℃	−5 to 50 (No freezing)			
Port size (in port)	Rc3/8	Rc3/8	Rc1/2	Rc1/2
Port size (brake port)	Rc1/8	Rc1/8	Rc1/8	Rc1/8
Pilot valve pilot port	Rc1/8	Rc1/8	Rc1/8	Rc1/8
Cylinder port	Rc1/4	Rc1/4	Rc3/8	Rc1/2
Working piston speed mm/s	1 to 200			
Cushion	Rubber cushion			
Lubrication	Not available			
Max. stroke length mm	1500			
Min. stroke length mm	BBS-O:100,BBS-OB:300			
Max. load range kg	70	115	180	285
Min. load range kg	10	16	25	40
Holding force N	1539		3940	

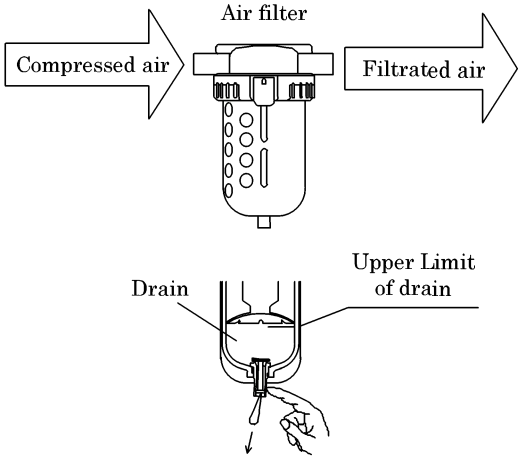
1.3 Air Circuit



Circuit diagram above is the case that the load direction is the extend side (D), and piping of cylinder is head side.
When the load direction is retracting side (U), piping of cylinder is head side.

2. INSTRUCTIONS

2.1 Fluid



1) It is necessary to use dehumidified air that has been filtered from compressed air. Carefully select an adequate filter that has an adequate filtration rate (preferably 5μm or less), flow rate and its mounting location (as nearest to the directional control valve as possible).

2) Be sure to drain out the accumu- lation in the filter periodically.

3) Note that the intrusion of carbide for the compressor oil (such as carbon or tarry substance) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.

4) This cylinder does not require lubrication. Oiling it could cause problems.

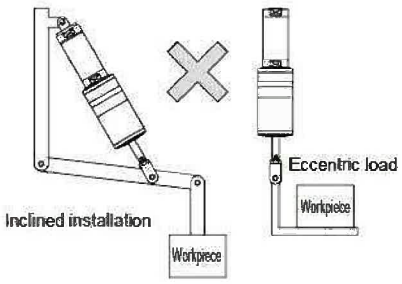
2.2 How to use

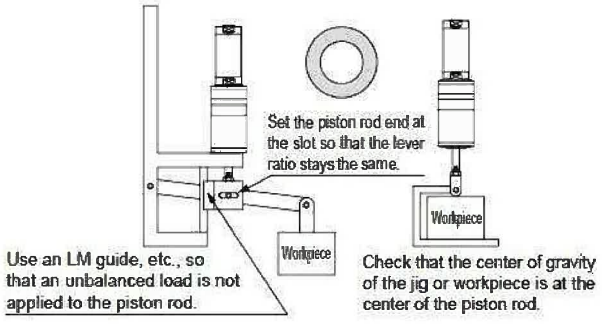
1) Ensure to use this balancer unit indoors as a general rule. You can move and use the unit outdoors provided that it is returned and stored indoors after use.

2) If you leave the unit in the middle of work, ensure that its brake is applied to prevent any possible accident such as a dropped workpiece or fixture.

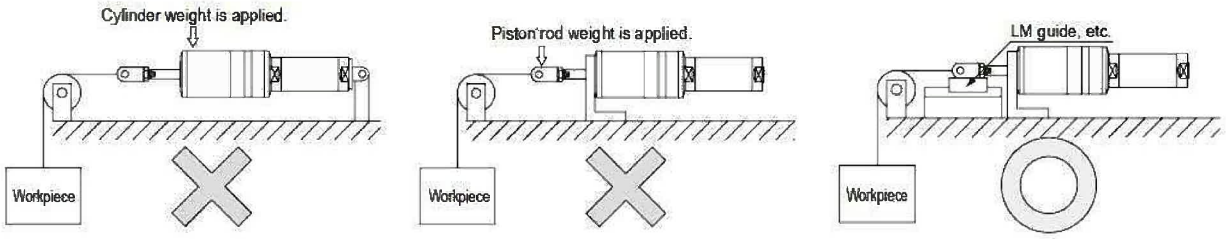
2.3 Installation

1) Please install the balancer unit so that no unbalanced load is applied to the piston rod.

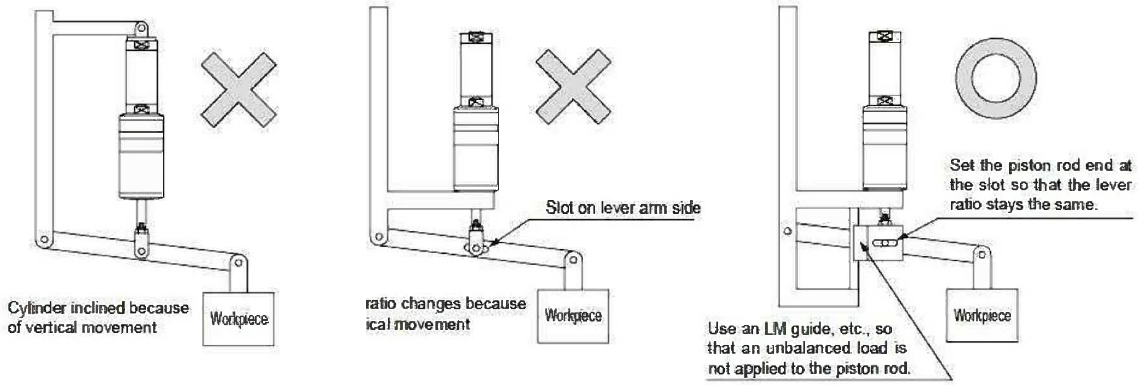




2) If the balancer is used in a horizontal posture, make sure that the piston rod is free from the moment of its weight and no floating connector is used



3) If the unit is used on a link basis, make sure that a constant lever ratio is maintained (for example, on a mobile fulcrum basis). If the lever ratio varies in a vertical motion, the load will ascend or descend depending on the position of detection, regardless of manual operation.



2.4 Pipe Laying

1) In laying lines between the balance unit cylinder and control box, take the flow rate of supplied air into consideration to select appropriate pipes and use matched line numbers.
In addition, install the control box as close to the balancer as possible to minimize the length of the lines. Note that any degraded flow rate or extended line will result in a higher operation force required.

3. INSTALLATION

3.1 Piping

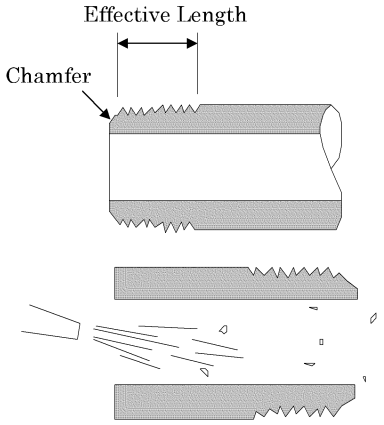
1) For piping beyond the filter, use pipes that are tough against corrosion such as galvanized pipes, nylon tubes, rubber tubes, etc.

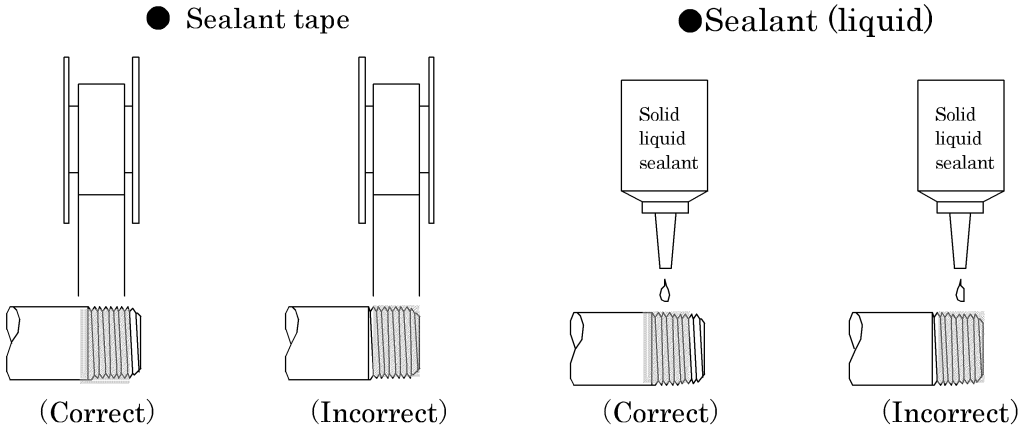
2) See to it that the pipe connecting cylinder and solenoid valve has effective sectional area which is needed for the cylinder to drive at the specified speed.

3) Install filter preferably adjacent to the upper-stream to the solenoid valve for eliminating rust, foreign substance in the drain of the pipe.

4) Be sure observe the effective thread length of gas pipe and give a chamfer of approx. 1/2 pitch from the threaded end.

5) Flush air into the pipe to blow out foreign substances and chips before piping.





6) Refrain from applying sealant or sealing tape approx. Two pitches of thread off the tip of pipe to avoid residual substances from falling into piping system.

3.2 Installation

1) Note that ambient temperatures of -5℃ to 60℃ are most preferable for using the balancer system. For a temperature below 0℃, where water in the circuit can freeze to result in an accident, measures must be adopted to avoid freezing.

2) Keep the unit free from dust or water application.

3) To ensure that the tubing is free from distortion or center runout, avoid hitting the cylinder with an object or applying excess force to the cylinder.

4) How to manually reset the brake

To reset the brake, remove the dustproof covering and drive a bolt into the internal thread on the top of the brake disengagement plate to pull the bolt close to you.

Ensure to vertically pull the bolt close to you. If it is obliquely pulled, a problem may arise.

For further information, see Paragraph 4), How to manually reset the brake, 4-1, Section 4, Operation-Related Section.

To start a normal operation, make sure that the bolt is removed and the dustproof covering is installed in position.

4. OPERATION

4.1 Operation

1) Applicable pressure range

The working pressure for this unit is 0.25 to 0.6 MPa. Operate the system within this range.

2) Force applied to the tip

Make sure that a force equal to or more than the applicable value listed below is applied to the balancer. Any insufficient pressure may cause a detection fault. Refer to the following table:

Bore size (mm)	φ 50	φ 63	φ 80	φ 100
Minimum fixture weight (kg)	10	16	25	40

These values show direct forces.

3) Force of weight

The maximum force of weight (the sum of the weights of the fixture and workpiece) varies depending on the applied pressure. Refer to the following list:

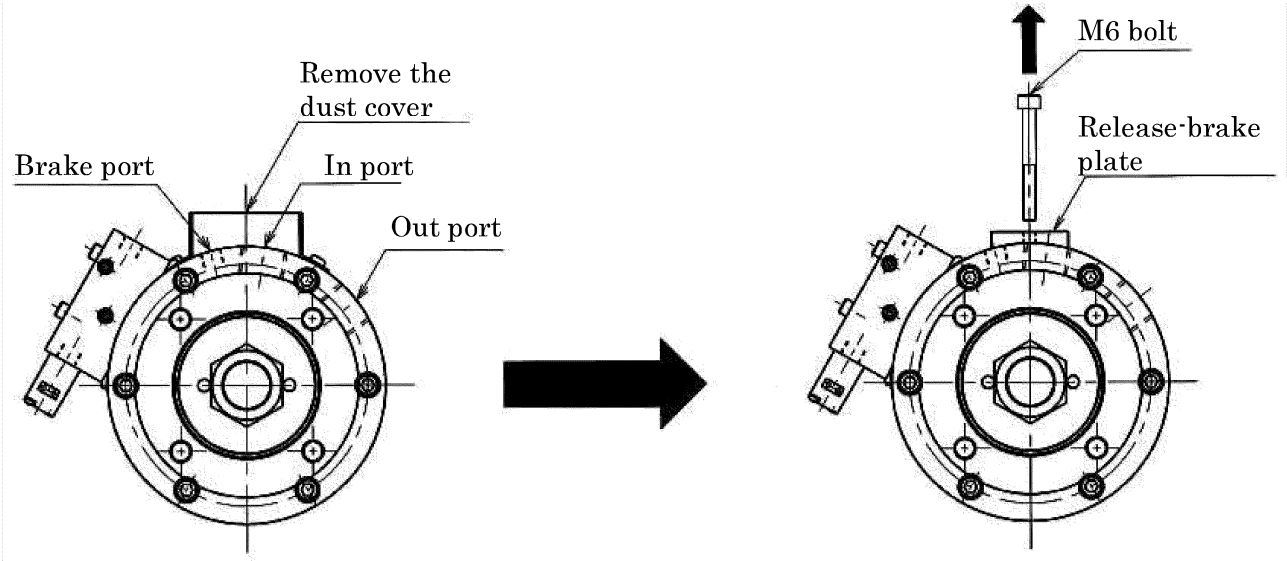
Bore size / Applied pressure	φ 50	φ 63	φ 80	φ 100
0.25 MPa	30kg	47kg	76kg	120kg
0.3 MPa	35kg	56kg	90kg	141kg
0.4 MPa	47kg	74kg	120kg	188kg
0.5 MPa	58kg	93kg	150kg	235kg
0.6 MPa	70kg	115kg	180kg	285kg

These values show direct forces.

4) How to manually reset the brake

To reset the brake, remove the dustproof covering and drive a bolt into the internal thread on the top of the brake disengagement plate to pull the bolt close to you.

Ensure to vertically pull the bolt close to you. If it is obliquely pulled, a problem may arise.



To start a normal operation, make sure that the bolt is removed and the dustproof covering is installed in position.

(NOTE) After resetting the brake, once remove the load or move the workpiece to the lowermost end before using the unit.

4.2 Initial setting

Use the following operation procedure:

1) Please loosen the dial of the precision regulator of B and C to the limit.
2) Make sure that the work changeover switch is in the OFF state (jig balance side).
3) Supply compressed air. Please note that the piston rod will descend at this time.
4) Please attach the jig to the tip of the rod.
5) Adjust the jig's balance with C precision regulator in the control box.
6) Please attach the workpiece to the jig.
7) Switch the work changeover switch to ON state (work balance side).
8) Adjust the work balance with B precision regulator in the control box.

4.3 Operation procedure

Operate BBS according to the following procedures.

1) Make sure that the work changeover switch is in the OFF state (jig balance side).
2) Make the workpiece not attached to the jig.
3) Supply compressed air.
4) It is manually operable. (Jig balancing state).
5) Please set the jig on the workpiece. Switching the work changeover switch to work balance side will result in work balance.
6) It is manually operable. (Work balance state)
7) When setting the workpiece to the specified position and switching the work changeover switch to the jig balancing side, it becomes the jig balance side.
8) Go back to 4) and move on to the next operation

4.4 Control box adjustment method

About the basic circuit for BBS-O-50 to 100

Symbol	Name	Model No.	Contents	Adjustment
A	Jig, work balance switching valve	4KA211-06	Switch pressure of jig balance and work balance	None
B	Precise regulator for work balance	RP1000-8-07	Adjust according to the weight of workpiece	Adjustment
C	Precision regulator for jig balance	RP1000-8-07	Adjust according to the weight of the jig	Adjustment
D	Check valve	CHV2-10	Safety device designed to apply brake in case of failure in piping up to control box	None

5. MAINTENANCE

5.1 Periodical inspection

1) In order to upkeep this unit in optimum condition, carry out periodic inspection once or twice a year.

2) Inspection items

(1) Check the balancer bolts and nuts fitting the unit body for slackening.

(2) Check to see that the unit operates smoothly.

(2) Check the bolts and nuts fitting the piston rod end bracket and mounting bracket for slackening.

(4) Check for leakage of each piping or deteriorated pipe material of this unit and pneumatic circuit.

(5) Check the piston rod for flaw (scratch) and deformation.

(6) Check the stroke for abnormality.

See“5-2. Trouble shooting” should there be any trouble found and carry out the measurement, also carry out additional tightening if bolts, nuts, etc. are slackened.

5.2 Trouble shooting

Trouble	Causes	Remedies
Does not operate.	No pressure or inadequate pressure.	Provide an adequate pressure source.
	Too light fixture used	Add ballast to the fixture.
	Pneumatic line improperly routed	Review the pneumatic line.
Does not switch to work and jig balance	Operation switch fault	Replace the operation switch.
	Excess load applied	Review the pressure applied.
	Variation in supply pressure	Provide an adequate pressure source.
Does not function smoothly.	Improper or misalignment of installation.	Revise the installation state.
		Change the mounting style
	Excessive load.	Increase the pressure itself.
		Use the unit of larger bore.
	Exertion of transverse (lateral) load.	Revise the installation state.
		Change the supporting system.

6. HOW TO ORDER

6.1 Product number coding

(a) Model No.		(b) Load direction		(c) Mounting	
O	Control box separate	D	Push type	00	Basic
		U	Pull type	CA	Eye bracket(ϕ50, ϕ63)
OB	Control box integrated			CB	Clevis bracket(ϕ80, ϕ100)
				FA	Rod side flange
				FB	Head side flange

(d) Bore size (mm)		(e)Stroke length(mm)		(f) Accessory	
50	ϕ50	100	900	I	Rod eye
63	ϕ63	200	1000	Y	Rod clevis
80	ϕ80	300	1100		
100	ϕ100	400	1200		
		500	1300		
		600	1400		
		700	1500		
		800			

NOTE: The minimum stroke of BBS-OB is 300 mm.