CKD

Auto Hand Changer

KHBC Series

Handling Instructions

SM-B07599-A

- Before using the product, be sure to read this instruction manual.
- Read this manual carefully, especially the safety instructions.
- Store this instruction manual in a safe place so that it can be easily retrieved and read whenever necessary.

CKD株式会社

Introduction

Thank you very much for purchasing our **KHBC series automatic hand changer**. This instruction manual describes basic information on installation, usage, etc., to ensure full performance of this product. Please read it carefully and use the product properly.
Please keep this instruction manual in a safe place and do not lose it.

Specifications and appearance described in this instruction manual are subject to change without notice.

- This product is intended for use by persons with basic knowledge of pneumatic equipment, including materials, piping, electricity, and mechanisms. We assume no responsibility for accidents resulting from the selection or use of this product by persons who are not knowledgeable or adequately trained.
- Due to the wide variety of applications in which our customers use our products, we are unable to know all of them. Depending on the application and method of use, the product may not perform well or may cause accidents due to fluid or piping conditions. It is the customer's responsibility to confirm product specifications for the application and method of use and to determine the method of use.

For Safe Use

When designing or manufacturing equipment using this product, you are obligated to manufacture a safe device. To this end, make sure that the mechanical mechanism of the equipment, each fluid control circuit, and the system that electrically controls these circuits are safe.

Please be sure to observe the organization's standards, regulations, etc. regarding safety in the design and management of the equipment.

ISO 4414, JIS B 8370, JFPS 2008 (the latest version of each standard)
High Pressure Gas Safety Law, Industrial Safety and Health Law, other safety regulations, organization standards, laws, etc.

In order to use our products safely, it is important to properly select, use, handle, and maintain our products.
To ensure the safety of the equipment, please be sure to observe the warnings and precautions described in this instruction manual.

Although various safety measures have been implemented for this product, mishandling by the customer may result in an accident. In order to prevent such an accident from occurring,

Please be sure to read this instruction manual carefully and fully understand its contents before using the product.

Precautions are classified into three categories: “DANGER,” “WARNING,” and “CAUTION” to clearly indicate the magnitude of harm or damage and the degree of likelihood of occurrence.

DANGER	Items which, if mishandled, may result in imminent danger of death or serious injury to persons.
WARNING	Items that may cause death or serious injury if mishandled.
CAUTION	Items that may cause injury to persons or damage to property if mishandled.

Note that even the items listed under “CAUTION” may have serious consequences depending on the situation.
All of these items are important and must be observed.

Other general precautions and tips for use are listed with the following icons.

	Represents general precautions and usage tips.

Precautions on Product Use

⚠ WARNING

The product must be handled by a qualified person who has extensive knowledge and experience.

The product is designed and manufactured as a device or part for general industrial machinery.

Use the product within the specifications.

The product must not be used beyond its specifications. Also, the product must not be modified and additional work on the product must not be performed.

The product is intended for use in devices or parts for general industrial machinery. It is not intended for use outdoors or in the conditions or environment listed below.

- In applications for nuclear power, railroad system, aviation, ship, vehicle, medical equipment, and equipment that directly touches beverage or food.
- For special applications that require safety including amusement equipment, emergency shut-off circuit, press machine, brake circuit, and safety measures.
- For applications where life or properties may be adversely affected and special safety measures are required.

(Exception is made if the customer consults with CKD prior to use and understands the specifications of the product. However, even in that case, safety measures must be taken to avoid danger in case of a possible failure.)

Do not handle the product or remove pipes and devices until confirming safety.

- Inspect and service the machine and devices after confirming the safety of the entire system. Also, turn off the energy source (air supply or water supply) and power to the relevant facility. Release compressed air from the system and use extreme care to avoid water or electric leakage.
- Since there may be hot or live parts even after operation has stopped, use extreme care when handling the product or removing pipes and devices.
- When starting or restarting a machine or device that incorporates pneumatic components, make sure that a safety measure (such as a pop-out prevention mechanism) is in place and system safety is secured.

Precautions on Product Disposal

⚠ CAUTION

When disposing of the product, comply with laws related to waste disposal and cleanup, and ask a specialized waste disposal company to dispose of the product.

Table of Contents

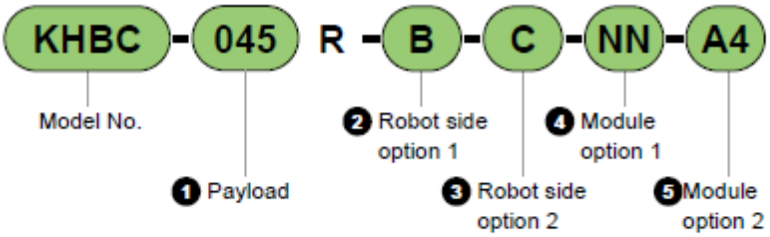
1. Product Overview

1.1 Model Number Indication

1.1.1 Product Model Number

■ **Example of model number display**

<Robot side>



❶ Payload

Code	Description
001	1 kg
003	3 kg
007	7 kg
012	12 kg
025	25 kg
045	45 kg
060	60 kg
120	120 kg
180	180 kg
230	230 kg
300	300 kg

❷ Robot side option 1

Code	Description
N	No option
B	With check valve

✱1: ❶B cannot be selected for payload of 3 kg or less.

❸ Robot side option 2

Code	Description
N	No option
C	Attachment/detachment confirmation sensor
D	Close contact confirmation sensor

✱1: ❶C can be selected if the payload is 45 kg and ov
✱2: ❶D can be selected for payload 3 to 25 kg.
✱3: The Docking Confirmation Sensor (SW-F2H/V) is assembled at shipment.

❹ Module option 1

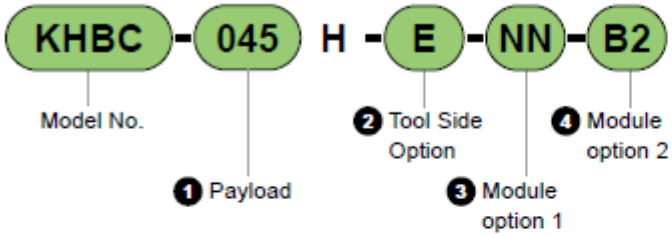
Code	Description
NN	No option
A1	1A electrode (4-core) round connector
A2	3A electrode (8-core) cable
A3	3A electrode (15-core) cable
A4	3A electrode (15-core) D-sub-connector
A5	5A electrode (15-core) D-sub-connector
A6	10A electrode (10-core) round connector
B1	Expansion port (Rc1/4, 1-port)
B2	Expansion port (Rc1/4, 2-port)
B3	Expansion port (Rc1/4, 4-port)
B4	Expansion port (Rc3/8, 1-port)
B5	Expansion port (Rc3/8, 2-port)
B6	Expansion port (Rc3/8, 4-port)

❺ Module option 2

Code	Description
NN	No option
A1	1A electrode (4-core) round connector
A2	3A electrode (8-core) cable
A3	3A electrode (15-core) cable
A4	3A electrode (15-core) D-sub-connector
A5	5A electrode (15-core) D-sub-connector
A6	10A electrode (10-core) round connector
B1	Expansion port (Rc1/4, 1-port)
B2	Expansion port (Rc1/4, 2-port)
B3	Expansion port (Rc1/4, 4-port)
B4	Expansion port (Rc3/8, 1-port)
B5	Expansion port (Rc3/8, 2-port)
B6	Expansion port (Rc3/8, 4-port)

✱1: ❶When the payload is 1 to 12 kg, only module option 1 can be selected. When the payload is 25 to 300 kg, module options 1 and 2 can be selected.
✱2: Refer to Dimensions diagrams on page 7 and subsequent pages for the mounting position relationship of module options 1 and 2.
✱3: The mounting position of module options 1 and 2 can be changed after purchase.
✱4: The selectable options differ depending on the payload. Refer to the KHBC option compatibility table on page 5.
✱5: Refer to page 4 for details on module option specifications.

<Tool side>



❶ Payload

Code	Description
001	1 kg
003	3 kg
007	7 kg
012	12 kg
025	25 kg
045	45 kg
060	60 kg
120	120 kg
180	180 kg
230	230 kg
300	300 kg

❷ Tool Side Option

Code	Description
N	No option
E	With close contact confirmation port cover

✱1: ❶E cannot be selected when payload is 25 kg or less.

❸ Module option 1

Code	Description
NN	No option
A1	1A electrode (4-core) round connector
A2	3A electrode (8-core) cable
A3	3A electrode (15-core) cable
A4	3A electrode (15-core) D-sub-connector
A5	5A electrode (15-core) D-sub-connector
A6	10A electrode (10-core) round connector
B1	Expansion port (Rc1/4, 1-port)
B2	Expansion port (Rc1/4, 2-port)
B3	Expansion port (Rc1/4, 4-port)
B4	Expansion port (Rc3/8, 1-port)
B5	Expansion port (Rc3/8, 2-port)
B6	Expansion port (Rc3/8, 4-port)

❹ Module option 2

Code	Description
NN	No option
A1	1A electrode (4-core) round connector
A2	3A electrode (8-core) cable
A3	3A electrode (15-core) cable
A4	3A electrode (15-core) D-sub-connector
A5	5A electrode (15-core) D-sub-connector
A6	10A electrode (10-core) round connector
B1	Expansion port (Rc1/4, 1-port)
B2	Expansion port (Rc1/4, 2-port)
B3	Expansion port (Rc1/4, 4-port)
B4	Expansion port (Rc3/8, 1-port)
B5	Expansion port (Rc3/8, 2-port)
B6	Expansion port (Rc3/8, 4-port)

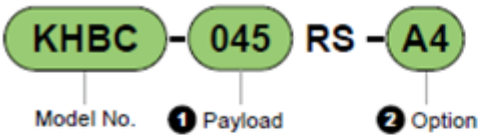
✱1: ❶When the payload is 1 to 12 kg, only module option 1 can be selected. When the payload is 25 to 300 kg, module options 1 and 2 can be selected.
✱2: Refer to Dimensions diagrams on page 7 and subsequent pages for the mounting position relationship of module options 1 and 2.
✱3: The mounting position of module options 1 and 2 can be changed after purchase.
✱4: The selectable options differ depending on the payload. Refer to the KHBC option compatibility table on page 5.
✱5: Refer to page 4 for details on module option specifications.

Recommended model number of contact check switch for option E MHPS-05-2NYTL-BGW2
*Refer to “Sensor Controller” (catalog No. RJ-008) for details on sensors.

1.1.2 Product Model Number

<Individual Option Part No.>

· Individual Robot Side Option



· Individual Tool Side Option

❶ Payload

Code	Description
001	1 kg
003	3 kg
007	7 kg
012	12 kg
025	25 kg
045	45 kg
060	60 kg
120	120 kg
180	180 kg
230	230 kg
300	300 kg

❷ Option

Code	Description
C	Attachment/detachment confirmation sensor
D	Close contact confirmation sensor
A1	1A electrode (4-core) round connector
A2	3A electrode (8-core) cable
A3	3A electrode (15-core) cable
A4	3A electrode (15-core) D-sub-connector
A5	5A electrode (15-core) D-sub-connector
A6	10A electrode (10-core) round connector
B1	Expansion port (Rc1/4, 1-port)
B2	Expansion port (Rc1/4, 2-port)
B3	Expansion port (Rc1/4, 4-port)
B4	Expansion port (Rc3/8, 1-port)
B5	Expansion port (Rc3/8, 2-port)
B6	Expansion port (Rc3/8, 4-port)

・Option compatibility table

Robot side option (R)

Code	Type	Port	Quantity	Payload (kg)										
				1	3	7	12	25	45	60	120	180	230	300
B	With check valve		4 to 14			○	○	○	○	○	○	○	○	○
C	Docking confirmation sensor	Loose wire	2-core						○	○	○	○	○	○
D	Close contact confirmation sensor	Loose wire	2-core		○	○	○	○						

Tool side option (H)

Code	Type	Port	Quantity	Payload (kg)										
				1	3	7	12	25	45	60	120	180	230	300
E	With close contact confirmation port cover		2-port						○	○	○	○	○	○

Module option (common for R/H)

Code	Type	Port	Quantity	Payload (kg)										
				Only 1 pc. can be mounted					Up to 2 pcs. can be mounted					
				1	3	7	12	25	45	60	120	180	230	300
A1	1A electrode	Round connector	4-core	○	○	○	○	○						
A2	3A electrode	Loose wire	8-core	○	○	○	○	○						
A3	3A electrode	Loose wire	15-core			○	○	○						
A4	3A electrode	D-sub-connector	15-core			○	○	○	○	○	○	○	○	○
A5	5A electrode	D-sub-connector	15-core						○	○	○	○	○	○
A6	10A plug-in electrode	Round connector	10-core						○	○	○	○	○	○
B1	Air expansion port	Rc1/4	1-port	△	△	○	○	○						
B2	Air expansion port	Rc1/4	2-port			△	△	○	○	○	○	○	○	○
B3	Air expansion port	Rc1/4	4-port						○	○	○	○	○	○
B4	Air expansion port	Rc3/8	1-port			○	○	○						
B5	Air expansion port	Rc3/8	2-port			△	△	△	○	○	○	○	○	○
B6	Air expansion port	Rc3/8	4-port						△	○	○	○	○	○

△: Only negative pressure can be used. Positive pressure is not supported.

Type number selection procedure

● **To select the auto tool changer, make a selection with sufficient margin based on the following conditions.**

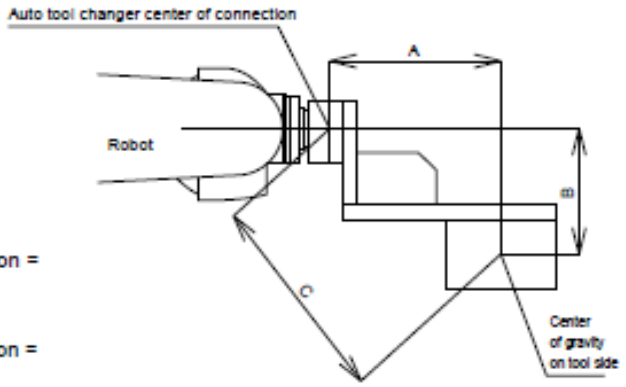
■ Conditions to consider when selecting the tool changer

- ● Tool side weight W
- ● Max. acceleration α
- ● Distance A from the center of connection to the center of gravity on the tool side in the same axis direction
- ● Distance from center of connection to center of gravity on eccentric tool side B
- ● Distance from center of connection to center of gravity on tool side C

■ Calculation Example

● Conditions

A=0.5 [m] W=40 [kg]
B=0.14 [m] α=0.5 G [m/s²]
C=0.52 [m] G is center of gravity acceleration 9.8 [m/s²]



● Formula

- Calculating load moment
  Tool side weight × C dimension × Maximum acceleration =
  40 kg × 0.52 m × (0.5 × 9.8) = 101.9 N·m
- Calculation of load torque
  Tool side weight × B dimension × Maximum acceleration =
  40 kg × 0.14 m × (0.5 × 9.8) = 27.5 N·m

● Results

Tool side weight > 40 kg
Load moment > N·m 101.9
✱ load torque > 27.5 N·m

✱ When applying load in the direction of rotation, please consider it to be approximately 1/15 of the maximum load torque.

Therefore, 27.5 N·m ×15 = 412.5 N·m,
Select KHBC-060.

	KHBC-045	KHBC-060
Load capacity	45 kg	60 kg
Max. load moment	440 N·m	720 N·m
Max. load torque	360 N·m	430 N·m

Note that this may differ depending on the working environment.

■ Caution

- ● Select the maximum acceleration of the robot during automatic operation so that the load of the robot is not exceeded.
- ● The details of the acceleration generated when the robot is automatically operated differ depending on the load capacity. Check with the manufacturer before setting the details.
- ● When performing rotary motion by turning the robot's wrist or rotary motion by extending the robot arm, take the moment of inertia into consideration when setting the acceleration.

1.2 Specifications

1.2.1 Product specifications

Items			KHBC				
Portable mass		kg	1	3	7	12	25
Outer Diameter Dimensions		mm	ϕ30	ϕ40	ϕ51	ϕ55	ϕ78
Total length when connected		mm	23	27	34.5	36.5	43.5
Fluid used			Compressed air				
Max. working pressure		MPa	0.7				
Min. working pressure		MPa	0.3				
Ambient temperature		℃	5～60				
Repeatability		mm	±0.003				
Coupling axial force (at 0.5 MPa)		N	440	620	1000	1600	2700
Maximum load moment (at 0.5MPa)		N・m	5.3	23	29.3	81.9	210
Maximum load torque (at 0.5 MPa)		N・m	9.1	14	39.9	45	140
Mass	Robot side (R)	kg	0.042	0.08	0.154	0.2	0.472
	Tool side (H)	kg	0.016	0.038	0.07	0.082	0.162
Coupling Port Connection Bore Diameter			M3		M5		
Air Interface Note1	Number of ports		2	4	6		
	Bore size		M3		M5		
	Orifice diameter	mm	ϕ1.2		ϕ1.8 (ϕ1.2 when check valve is selected)		
Number of ports for adhesion confirmation			None				

Items			KHBC					
Portable mass		kg	45	60	120	180	230	300
Outer Diameter Dimensions		mm	ϕ109	ϕ125	ϕ160	ϕ192	ϕ192	ϕ253
Total length when connected		mm	57	64.5	76.2	88.2	97.7	118.2
Fluid used			Compressed air					
Max. working pressure		MPa	0.7					
Min. working pressure		MPa	0.3					
Ambient temperature		℃	5～60					
Repeatability		mm	±0.003					
Coupling axial force (at 0.5 MPa)		N	4300	6900	11000	17000	24000	32000
Maximum load moment (at 0.5MPa)		N・m	440	720	1600	3500	4300	6300
Maximum load torque (at 0.5 MPa)		N・m	360	430	970	2100	2200	3000
Mass	Robot side (R)	kg	1	1.51	3.24	5.53	6.11	13.33
0	Tool side (H)	kg	0.44	0.73	1.3	2.12	2.39	5.91
Coupling Port Connection Bore Diameter			Rc1/8			Rc1/4		
Air interface Note1	Number of ports		4	8		12	10	14
	Bore size		Rc1/8			Rc1/4		
	Orifice diameter	mm	ϕ4.0（ϕ3.7 when check valve is selected）					
Number of ports for adhesion confirmation		Note2	2（Orifice diameter：ϕ1.5）					

Note1：Operating pressure range -100KPa to 0.7MPa, but not vacuum holding.

Note2：When not used for adhesion verification, it can also be used as a port for air interface.

Even if the check valve option is selected, no check valve is attached to the port for checking adhesion.

1.2.2 Switch specifications

Option C : Detachment confirmation sensor specification

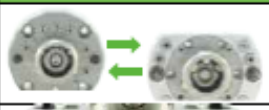
Items	Non-contact 2-wire type
	F2H/F2V
Use	Dedicated to programmable controllers
Supply voltage	-
Load voltage	DC10～30V
Load current Note1	5～20mA
Current Consumption	-
Internal drop voltage	4V or less
Signal light	Yellow LED (lights up when ON)
Leakage current	1mA or less
Lead wire length	1m (2-core 0.15mm2 oil-resistant vinyl cabtyre cord)
Shock resistance	980m/s2
Insulation resistance	20 MΩ min. at 500 VDC megger
Voltage resistance	No abnormality at 1000V AC for 1 minute
Ambient temperature	-10～+60°C
Protective structure	IEC standard IP67, JIS C0920 (immersion-proof type)
Mass	10g

Note1：The maximum load current value of 20 mA is for 25° C. If the temperature around the switch is higher than 25° C, the value will be lower than 20 mA. （5 to 10 mA at 60° C).

Option D : Adhesion Confirmation Sensor Specifications

Type		E2EC-CR8D1 2M(OMRON)
Detecting distance		0.8mm±15%
Setting distance		0～0.56mm
Supply voltage		DC12 to 24V ripple 10% max.
Current consumption		-
Leakage current		0.8mA or less
Control output	Opening and closing capacity	5～100mA
	Residual voltage	3V or less
Indicator lamp		Motion: Red, Setting: Green
Operating mode		NO
Ambient temperature		-25～+70°C (No freezing and no condensation)
Ambient humidity		35～95%RH (No condensation)
Insulation resistance		50 MΩ min. at 500 VDC megger
Protection structure		IEC standard IP67
Connection method		DC 2-wire type, cord length 2m
Mass		Approx. 45g
Material		Brass, ABS

1.2.3 Optional specifications

	Code	Photo	Specifications		Port	Quantity	Remarks
Body option	B		With check valve			4 to 14 ports	Air is shut off from the tool port when separated
	C		Attachment/detachment confirmation sensor		Loose wire	2-core 1 each	Check mounting and removal
	D		Close contact confirmation sensor		Loose wire	2-core	Close contact confirmation
	E		With close contact confirmation port cover Recommended close contact confirmation switch: HPS Series (Must be prepared separately by the customer.)			2-port	Close contact confirmation
Electrical module option	A1		Contact electrode Degree of protection [None]	1A electrode	Round connector	4-core	Power supply of electric signals
	A2			3A electrode	Loose wire	8-core	Power supply of electric signals
	A3			3A electrode	Loose wire	15-core	Power supply of electric signals
	A4			3A electrode (For 45 kg and over payload, rubber seal for dust-proof is provided around the electrode.)	D-sub-connector	15-core	Power supply of electric signals
	A5			5A electrode (Rubber dust-proof seal is provided around the electrode)	D-sub-connector	15-core	Power supply of electric signals
	A6			10A electrode (Insertion type)	Round connector	10-core	Supply of electric signals and power supplies that require advanced stability
Air module option	B1		Air expansion port Working pressure: -100 kPa to 0.7 MPa* Note that vacuum cannot be retained. *Depending on the payload, some combinations are not compatible with positive pressure. For details, please refer to the 'Option Compatibility Table' on P. 5.		Rc 1/4 Min. bore size: ø9	1-port	Air blow Air purge Air motor Suction transport Used for high flow rate applications (e.g., suction blower conveyance) or when expanding beyond the standard tool port(s).
	B2					2-port	
	B3					4-port	
	B4				Rc3/8 Min. bore size: ø12	1-port	
	B5					2-port	
	B6					4-port	

2. Installation

2.1 Installation Environment

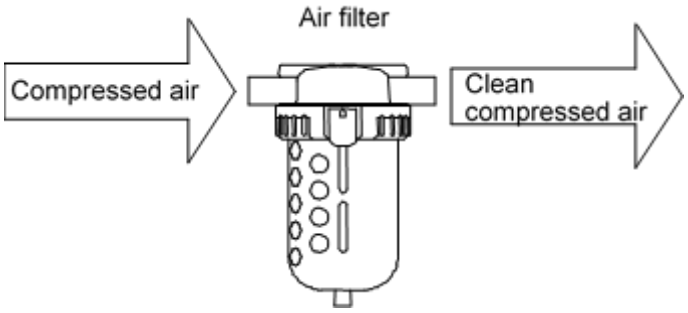
⚠ CAUTION

When using the product in a cutting, casting, or welding plant, install a cover to prevent foreign matters such as cutting fluid, chips, powder, and dust from entering.

Do not use the equipment in the following environments.

- Where cutting oil can splash onto the product (abrasives and polishing powder in the oil can abrade the sliding section)
- Where organic solvents, chemicals, acids, alkalis, and kerosene are present
- Where water can splash onto the product

- Use at the following ambient temperatures.
  5～60°C (without freezing)
- Use clean, moisture-free air that has passed through an air filter for compressed air.
  For this reason, use an air filter in the circuit and pay attention to the filtering degree (5 μm or less is desirable), flow rate, and mounting position (closer to the directional control valve).



- Use a working pressure within the specification range. Excessively high pressure may cause deterioration of durability, failure and damage.
  Also, use clean dry air as the supply air.

2.2 Unpacking

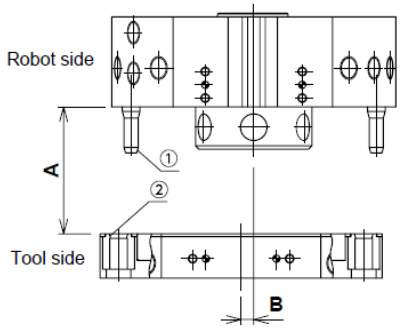
- Please confirm that the product part number you ordered and the part number displayed on the product are identical.
- Make sure there is no external damage to the product.
- Store the cylinder with a seal plug to prevent foreign matter from entering the cylinder through the piping port, and remove the plug when piping.

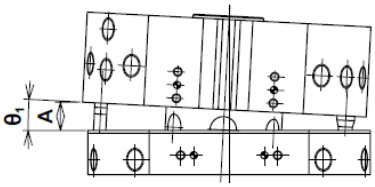
2.3 Mounting Method

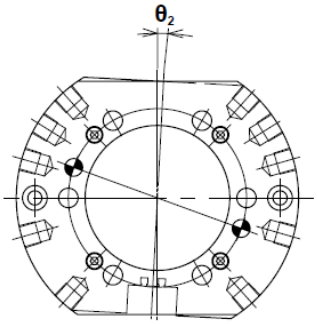
⚠ CAUTION

Do not enter the actuator drive or put your hand inside the actuator drive when the actuator is driven.

※The allowable dimensions on the robot side and tool side are determined by the taper of (1) and (2). Set the dimensions below those shown in the table below.
In this case, the tool side and the tool rest must not be completely fixed, but must have a movement allowance less than the allowable dimension.
Provide a clearance less than or equal to the following allowable dimensions.







Minimum gap dimensions when connected

Model number	Allowable dimensions
KHBC-001	A=0~0.5mm
KHBC-003	
KHBC-007	
KHBC-012	
KHBC-025	A=0~1.2mm
KHBC-045	
KHBC-060	
KHBC-120	
KHBC-180	
KHBC-230	
KHBC-300	

Allowable horizontal dimension

Model number	Allowable dimensions
KHBC-001	B=±0.8mm
KHBC-003	
KHBC-007	B=±1.0mm
KHBC-012	
KHBC-025	B=±1.5mm
KHBC-045	
KHBC-060	
KHBC-120	
KHBC-180	
KHBC-230	
KHBC-300	

Allowable dimension in inclined direction

Model number	Allowable dimensions
KHBC-001	θ_1=0.9°
KHBC-003	θ_1=0.7°
KHBC-007	θ_1=1.1°
KHBC-012	θ_1=1.0°
KHBC-025	θ_1=0.9°
KHBC-045	θ_1=0.4°
KHBC-060	θ_1=0.3°
KHBC-120	θ_1=0.3°
KHBC-180	θ_1=0.3°
KHBC-230	θ_1=0.25°
KHBC-300	θ_1=0.15°

Allowable dimension in rotational direction

Model number	Allowable dimensions
KHBC-001	θ_2=3.3°
KHBC-003	θ_2=3.0°
KHBC-007	θ_2=3.2°
KHBC-012	θ_2=2.9°
KHBC-025	θ_2=2.7°
KHBC-045	θ_2=2.0°
KHBC-060	θ_2=1.7°
KHBC-120	θ_2=1.3°
KHBC-180	θ_2=1.1°
KHBC-230	θ_2=1.1°
KHBC-300	θ_2=1.0°

・When tightening the screws at the time of product installation, use the following torque values for proper tightening. Tightening with a value higher than the specified torque value may cause malfunction, and insufficient tightening may cause misalignment or drop of the product.

Main unit mounting

(data) item	Bolt used	Tightening torque(N・m)
KHBC-1R	M3×0.5	1.06
KHBC-1H	M2.5×0.45	0.579
KHBC-3	M3×0.5	1.06
KHBC-7	M3×0.5	1.06
KHBC-12	M4×0.7	2.45
KHBC-25	M5×0.8	5.1
KHBC-45	M5×0.8	5.1
KHBC-60	M6×1.0	8.63
KHBC-120	M10×1.5	43.1
KHBC-180	M10×1.5	43.1
KHBC-230	M10×1.5	43.1
KHBC-300	M12×1.75	75.5

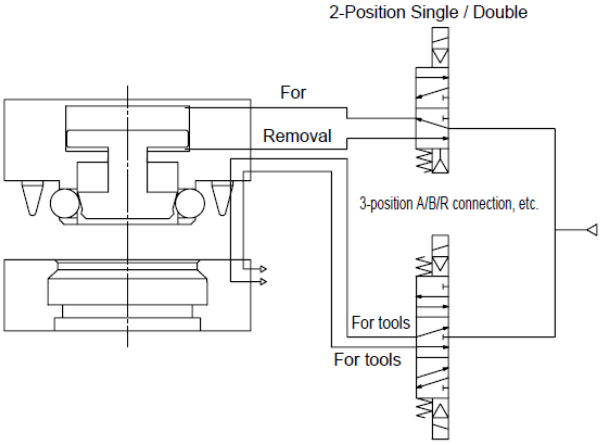
Module option installation

(data) item	Bolt used	Tightening torque(N・m)
A1	M3×0.5	0.588
A2	M3×0.5	0.588
A3	M3×0.5	0.588
A4(001～025)	M3×0.5	0.588
A4(045～300)	M5×0.8	2.84
A5	M5×0.8	2.84
A6	M5×0.8	2.84
B1～6	M5×0.8	2.84

2.4 Piping method

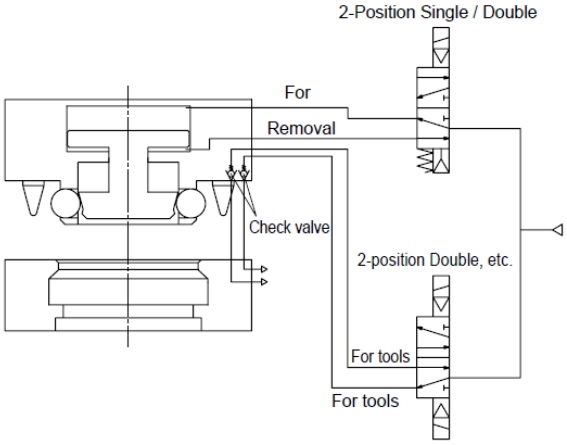
2.4.1 Recommended air circuit diagram

Standard recommended air circuit diagram



- Although the tool unit is designed not to drop even if the air supply is interrupted, as a safety precaution, please configure the solenoid valve used for attachment/detachment so that air is supplied to the attachment port when the valve is de-energized.
- The port for tool does not have a check valve mechanism, so air is released when separating. Therefore, it is necessary to use a 3-port valve or a 3-position A/B/R connection for the solenoid valve for the tool.

When check valve option (B) is selected
Recommended air circuit diagram



- As with the standard recommended air circuit diagram, for safety, use a solenoid valve for attachment and removal so that air is supplied to the port when not energized.
- The check valve mechanism is equipped on the tool port section to prevent air from being released even when separated. 3-position A/B/R connection type is not required for this reason.

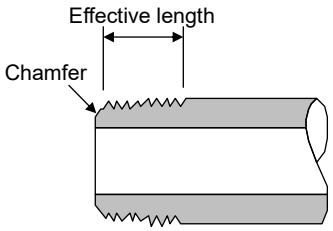
- This product is equipped with a drop prevention mechanism to prevent the tool side from falling during air down, but the drop prevention mechanism only holds the tool side and does not work as a coupling force. However, the fall prevention mechanism only holds the tool side and does not work as a coupling force.
  However, the drop prevention mechanism only holds the tool side and does not work as a coupling force.

2.4.2 Piping

WARNING

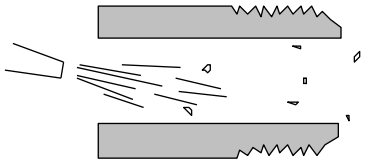
Insert the tube into the fitting until it firmly rests on the tube end and make sure that the tube does not come off before use.

- Use pipes that are made of corrosion-resistant materials after the filter such as zinc-plated pipes, nylon tubes, and rubber tubes.
- Use pipes with an effective cross-sectional area that allows the cylinder to achieve the predetermined piston speed.
- Install the filter for removing rust, foreign matters, and drainage from the piping as close as possible to the solenoid valve.
- Observe the effective thread length for the gas pipes.
- In addition, chamfer the threaded end of the pipes by about a 1/2 pitch.



■ Pipe cleaning

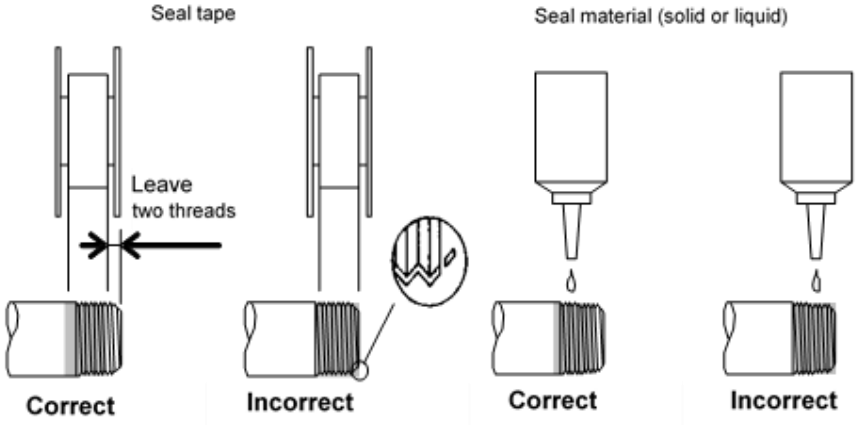
Before piping, blow air into the pipes to clean the interior and to remove cutting chips and foreign matters.



■ Seal material

Use a seal tape or a seal material to stop leakage from piping.
Apply a seal tape or seal material to the screw threads leaving two or more threads at the pipe end uncovered or uncoated. If the pipe end is fully covered or coated, a shred of seal tape or residue of seal material may enter inside of the pipes or device and cause a failure.

When using a seal tape, wind it around the screw threads in the direction opposite from the screw threads and press it down with your fingers to attach it firmly.
When using a liquid seal material, be careful not to apply it to resin parts. The resin parts can become damaged and this may lead to a failure or malfunction.
Also, do not apply seal material to the internal threads.

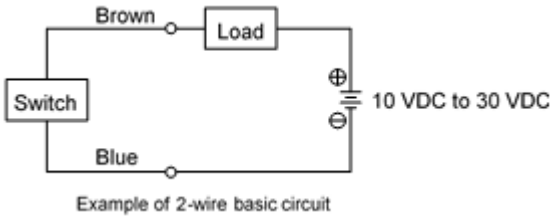


2.5 Wiring Method

2.5.1 Detachable confirmation sensor

■ Lead wire connection

Connect correctly according to the color coding of the lead wires. At this time, be sure to turn off the power to the equipment on the connecting electrical circuit. Working while the power is on may result in damage to the switch load electrical circuit.
In addition, mis-wiring or short-circuiting the load can lead to damage not only to the switch but also to the load-side electrical circuit.

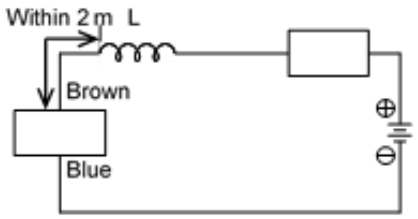


Example of 2-wire basic circuit

In the following cases, be sure to provide a protection circuit by referring to the diagram.
- When inductive loads (relays, solenoid valves) are connected and used:
- Since surge voltage is generated when the switch is turned off, a surge absorbing element should be used.
  When used with a capacitive load (capacitor) connected:
- A current limiting resistor should be used since a start-up current is generated when the switch is turned ON.
- When lead wire wiring length exceeds 10 m: Example 1, 2 (2-wire type)

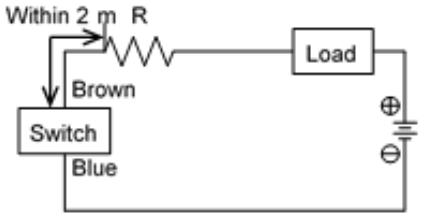
■ Output circuit protection

In the following cases, be sure to provide a protection circuit by referring to the diagram.
- When inductive loads (relays, solenoid valves) are connected and used:
- Since surge voltage is generated when the switch is turned off, a surge absorbing element should be used.
  When used with a capacitive load (capacitor) connected:
- A current limiting resistor should be used since a start-up current is generated when the switch is turned ON.
- When lead wire wiring length exceeds 10 m: Example 1, 2 (2-wire type)



Ex. 1 - Choke coil
L = Several hundred μH to several mH
Excellent high frequency characteristic

- Wire near the switch (within 2 m).

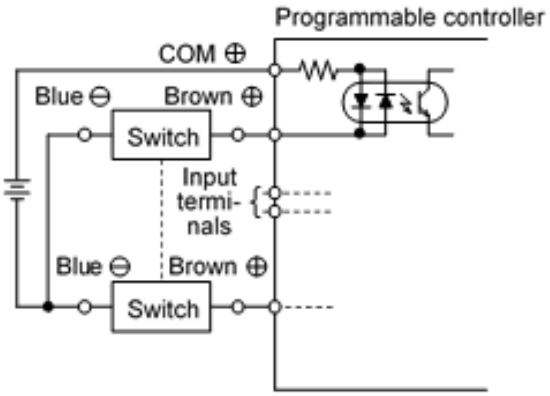


Ex. 2 - Starting current restriction resistor
R = Highest possible resistance for the load circuit.

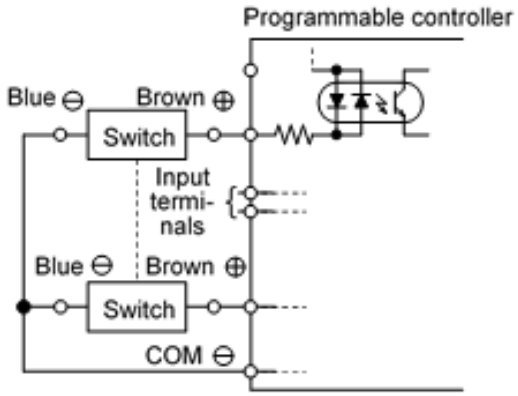
- Wire near the switch (within 2 m).

■ Connecting to a programmable controller

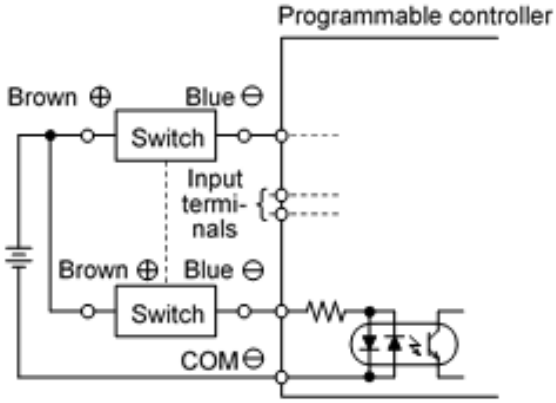
The connection method differs depending on the type of programmable controller. Connect as shown in the figure below.



2-wire connection to source input (external power)



2- wire connection to source input (internal power)



2-wire connection to sink input (external power)

■ Parallel Connection

For 2-wire switches, the leakage current increases by the number of connections, so check the input specifications of the programmable controller that is the connected load before determining the number of connections. However, the indicator light may become dim or not illuminate.

2.5.2 Adhesion Confirmation Sensor

For more information or inquiries about the sensor, please contact OMRON Corporation.

3. maintenance and inspection

⚠ Warning

Do not touch the electrical wiring connections (bare charging section).

Do not touch the charging section with bare hands.

There is a risk of electric shock.

Before disassembling or inspecting the actuator, turn off the power supply, drain the residual pressure, and confirm that there is no residual pressure.

⚠ CAUTION

Plan and perform daily and periodic inspections so that maintenance can be managed properly.

If maintenance is not properly managed, the product's functions may deteriorate significantly and this may lead to faults (such as short service life, damage, and malfunction) or accidents.

3.1 Periodic Inspection

3.1.1 Inspection items

Auto tool changers require overhaul after approx. 5 million cycles of loading/unloading.
However, in the case of an electrode-equipped tool changer, overhaul is required after approximately 1.5 million cycles.
Please contact us.

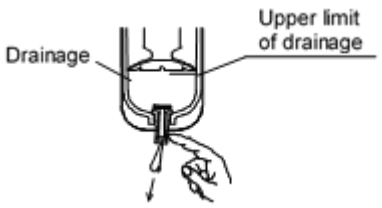
Also, inspect the following items before starting work.

- Check for loose connections between each connector.
- Check for loose joints in piping.
- Check the external appearance for “adhesion of foreign matter such as chips on the connecting surface,” “dents,” or "scratches.

In addition to the above items, once a month, grease the sliding parts (such as the inner wall of the hole where the robot's positioning pin enters) with
grease (lithium-based soap-based grease) as a periodic inspection.

3.1.2 Maintenance of the circuit

- Drainage of condensate accumulated in the air filter should be periodically drained before it exceeds the specified line.
- Foreign matter such as compressor oil carbide (carbon or tar-like material) in the circuit will cause malfunction of the solenoid valve and cylinder, so take care during maintenance and inspection of the compressor.
- This product can be used without lubrication. If oiling is required, use turbine oil Class 1 ISO VG32.-



3.1.3 Inspection of parts

Inspect the following parts. If any abnormality is found, repair or replace the parts.

- Foreign matter on fastening surface of robot side and tool side
- Loose mounting bolts
- Scratches, dirt, or foreign matter on steel balls and positioning pins on robot side

4. TROUBLESHOOTING

4.1 Problems, Causes, and Solutions

If the unit does not operate normally, inspect it according to the table below.

fault phenomenon	cause	Treatment method
No ringtone operation or unstable	Air leakage from connecting port or air piping	Check piping and repair, including hose replacement.
	Working pressure used out of specification	Set the pressure to be within the working pressure.
	Solenoid valve does not operate	Check and repair wiring, Repair or replace solenoid valve
	Foreign matter on fastening surfaces on robot and tool side	Clean with air blow or a clean cloth. Apply grease to the positioning pins.
Not deactivated or unstable	Air leakage from connecting port or air piping	Check piping and repair, including hose replacement.
	Working pressure used out of specification	Set the pressure to be within the working pressure.
	Solenoid valve does not operate	Check and repair wiring, Repair or replace solenoid valve
	Foreign matter on fastening surfaces on robot and tool side	Clean with air blow or a clean cloth. Apply grease to the positioning pins.
Misalignment.	Loose mounting bolts	Retighten to the proper torque.
	Positioning pin is not in place.	Insert the positioning pin.
	The load is heavy.	Increase the size. Lighten the load. Slow down the speed.

5. WARRANTY PROVISIONS

5.1 Warranty Conditions

■ Warranty Coverage

In the event of a malfunction that is clearly our responsibility during the warranty period below, we will provide a replacement product or necessary replacement parts for this product, or repair the product at our factory free of charge. However, the following items are excluded from the scope of this warranty

- When the product is handled or used under conditions or in environments other than those described in the catalog, specifications, or this instruction manual
- When the product has been misused or mishandled due to careless handling or other improper management
- When the failure is caused by reasons other than this product
- If the product is used in a manner other than its intended use
- If the cause is due to modifications or repairs that we are not involved in.
- Damage that could have been avoided if the Product had been used in your machine or equipment with the functions and structure that are generally accepted in the industry.
- If the reason is due to a reason that cannot be foreseen with the technology that was in practical use at the time of delivery
- In case of natural disasters, calamities, or other causes for which we are not responsible

The warranty herein refers to the warranty for the Product alone and excludes any damage induced by defects in the Product.

■ Check for conformity

It is the customer's responsibility to verify the suitability of our products for the system, machine, or equipment in which the customer will be using them.

■ Other

These Warranty Clauses set forth the basic terms and conditions.
In the event of any discrepancy between this Warranty Clause and the warranty described in the individual specification drawings or specifications, the specification drawings or specifications shall take precedence.

5.1 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.