CKD

New Products

Auto Tool Changer
KHBC Series

More Flexible Robot Handling

CKD Corporation
CC-1663AA

Auto tool changer

KHBC Series

Auto changing of tip tools by the robot itself

Significant reduction in changeover work-hours

Automatic replacement of robots and automatic connection of air and electricity. Piping and wiring work is not required.

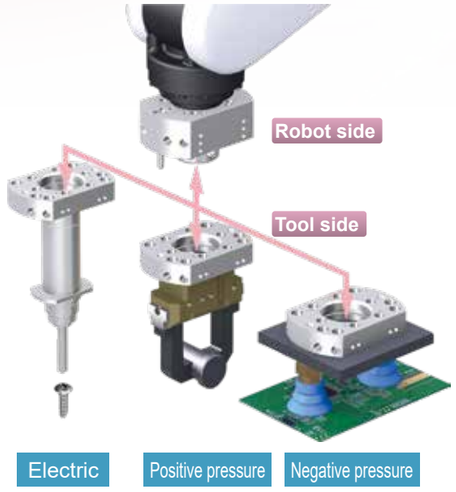
Increased robot functionality and productivity

Automatic tool replacement enables handling of multiple workpieces and multiple operations with a single robot.

Working image

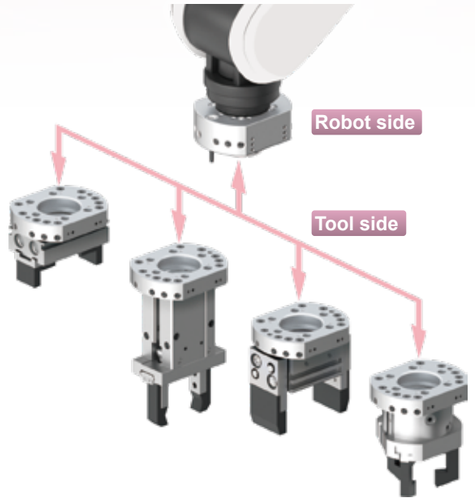
Multi-functionalization

The robot can change tools by itself, including air hands, suction pads, and electric screwdrivers, enabling automatic changeover.



Supports various models

The hand chuck can be automatically replaced according to the workpiece shape.



Wide range of size variations

Total of 11 sizes can be used with various sizes of robots from small to large.

min.
1 kg
Payload

max.
300 kg
Payload

High rigidity

The taper cam's wedge effect allows the steel balls to be pressed against each other for better connection.

Connected axial force
max.
5 times*

*Comparison with our CHC Series

High precision

The spring tension type positioning pin realizes high precision connection always with no play.

Repeatability
±0.003 mm

Enhanced safety

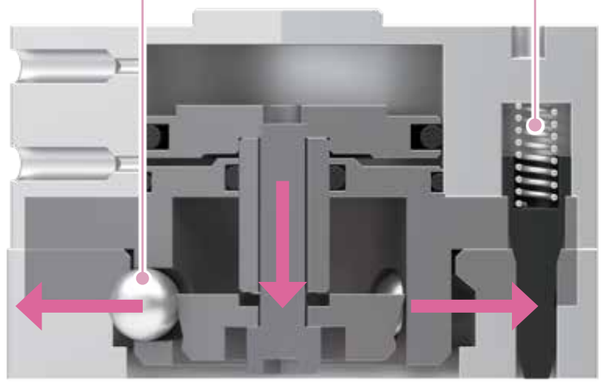
With position locking function

The steel ball retains its position even when the air is down to prevent the tool from falling.

Stable operation

With forced separation function

The reaction force of the spring makes it possible to reliably separate even for light-weight tools.



Compact / Lightweight

To reduce the load on the robot, it has been reduced in size and weight.

CHC-1 KHBC-1

Total length when connected	O.D.	Weight
max. -36%*	max. -33%*	max. -69%*

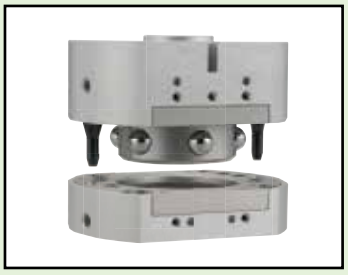
*Compared with our CHC Series

Increased flexibility in design

12 diverse module options!

In addition to the standard air piping, various electric and air connections are possible.

- Cylinder switch signal
- Large flow rate port for air blow, etc.



Auto tool changer

KHBC Series

● Payload: 1, 3, 7, 12, 25, 45, 60, 120, 180, 230, 300 kg

RoHS

How to Order

・Robot side

KHBC - 045 R - B - C - NN - A4

- KHBC: Model No.
- 045: ❶ Payload
- B: ❷ Robot side option 1
- C: ❸ Robot side option 2
- NN: ❹ Module option 1
- A4: ❺ Module option 2

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 over.
✳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

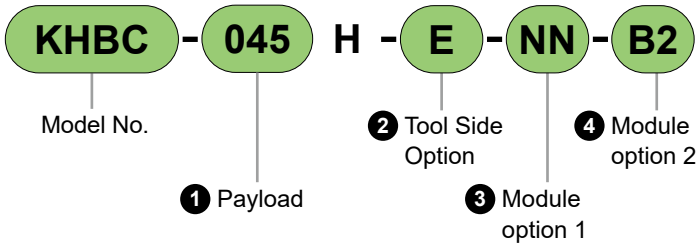
Code	Description
NN	No option
A1	1A electrode (4-core) round connector
A2	3A electrode (8-core) cable
A3	3A electrode (15-core) cable
A4	3A electrode (15-core) D-sub-connector
A5	5A electrode (15-core) D-sub-connector
A6	10A electrode (10-core) round connector
B1	Expansion port (Rc1/4, 1-port)
B2	Expansion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



1 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

2 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.

3 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)

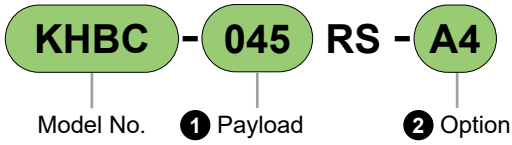
4 Module option 2

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.

・Individual Option Part No.

・Individual Robot Side Option



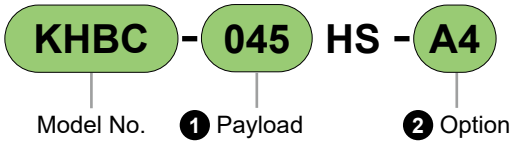
1 Payload

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

2 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)

・Individual Tool Side Option



1 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

2 Option

Code	Description
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)

・Recommended model No. of close contact confirmation switch for option E MHPS-05-2NYTL-B-GW2
✳Refer to "Sensors and Controllers" (catalog No.RJ-008AA) for details on sensors.

Specifications

Item			KHBC				
Payload		kg	1	3	7	12	25
Bore size		mm	ø30	ø40	ø51	ø55	ø78
Total length when connected		mm	23	27	34.5	36.5	43.5
Working fluid			Compressed air				
Max. working pressure		MPa	0.7				
Min. working pressure		MPa	0.3				
Ambient temperature		°C	5 to 60				
Repeatability		mm	±0.003				
Connected axial force (0.5 MPa)		N	440	620	1000	1600	2700
Max. load moment (At 0.5 MPa)		N·m	5.3	23	29.3	81.9	210
Max. load torque (at 0.5 MPa)		N·m	9.1	14	39.9	45	140
Weight	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
Connection port size			M3		M5		
Air Interface ✳1	No. of Ports		2	4	6		
	Port size		M3		M5		
	Orifice size	mm	ø1.2		ø1.8 (ø1.2 when check valve is selected)		
Number of close contact confirmation ports			None				

Item			KHBC					
Payload		kg	45	60	120	180	230	300
Bore size		mm	ø109	ø125	ø160	ø192	ø192	ø253
Total length when connected		mm	57	64.5	76.2	88.2	97.7	118.2
Working fluid			Compressed air					
Max. working pressure		MPa	0.7					
Min. working pressure		MPa	0.3					
Ambient temperature		°C	5 to 60					
Repeatability		mm	±0.003					
Connected axial force (0.5 MPa)		N	4300	6900	11000	17000	24000	32000
Max. load moment(At 0.5 MPa)		N·m	440	720	1600	3500	4300	6300
Max. load torque (at 0.5 MPa)		N·m	360	430	970	2100	2200	3000
Weight	Robot side (R)	kg	1	1.51	3.24	5.53	6.11	13.33
	Tool side (H)	kg	0.44	0.73	1.3	2.12	2.39	5.91
Connection port size			Rc1/8			Rc1/4		
Air Interface ✳1	No. of Ports		4	8		12	10	14
	Port size		Rc1/8			Rc1/4		
	Orifice size	mm	ø4.0 (or ø3.7 when check valve is selected)					
Number of close contact confirmation ports ✳2			2 (Orifice size ø1.5 mm)					

✳1: Working pressure range is -100 KPa to 0.7 MPa, but vacuum cannot be retained.
✳2: When not used for close contact confirmation, it can also be used as a port for the air interface. Even if check valve option is selected, a check valve is not attached to the close contact confirmation port.

Option C Docking Confirmation Sensor Specifications

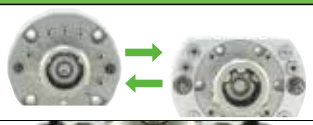
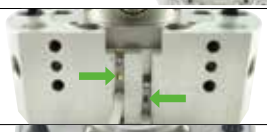
Item	2-wire proximity F2H/F2V
Applications	Dedicated for programmable controller
Power supply voltage	–
Load voltage	10 to 30 VDC
Load current ✳1	5 to 20 mA
Current consumption	–
Internal voltage drop	4 V or less
Indicator lamp	Yellow LED (Lit when ON)
Leakage current	1 mA or less
Lead wire length	1 m (oil resistant vinyl cabtyre cable 2-core 0.15 mm²)
Shock resistance	980 m/s2
Insulation resistance	20 MΩ and over with 500 VDC megger
Withstand voltage	1000 VAC: No failure after 1 minute
Ambient temperature	-10 to 60°C
Degree of Protection	IEC standards IP67, JIS C0920 (water-tight)
Weight	10 g

✳1: Max. load current: 20 mA at 25°C. The current is lower than 20 mA if the ambient temperature around the switch is higher than 25°C. (5 to 10 mA at 60°C.)

Option D Seating Confirmation Sensor Specification

Item		E2EC-CR8D1 2M (OMRON Corporation)
Detection distance		0.8 mm±15%
Setting distance		0 to 0.56 mm
Power supply voltage		12 to 24 VDC ripple 10% or less
Current consumption		–
Leakage current		0.8 mA or less
Control output	Open/close capacity	5 to 100 mA
	Residual voltage	3 V or less
Indicator lamp		Operation display: Red setting display: Green
Operation mode		NO
Ambient temperature		-25 to 70°C (no freezing or condensation)
Ambient humidity		35 to 95% RH (no condensation)
Insulation resistance		50 MΩ and over with 500 VDC megger
Degree of Protection		IEC standards IP67
Connection		DC 2-wire cord length 2 m
Weight		Approx. 45 g
Material		Case: brass detection side: ABS

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	

KHBC 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)

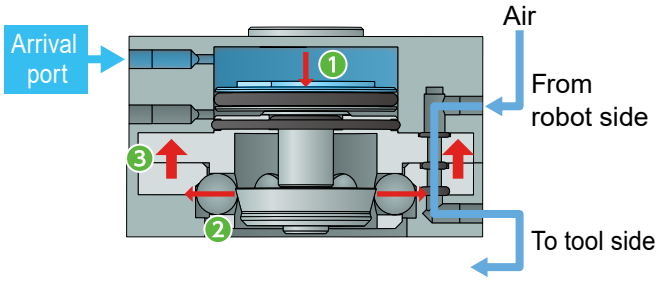
Code	Type	Port	Quantity	Payload (kg)										
				Only 1 pc. can be mounted					Up to 2 pcs. can be mounted					
				1	3	7	12	25	45	60	120	180	230	300
A1	1A electrode	Round connector	4-core	○	○	○	○	○						
A2	3A electrode	Loose wire	8-core	○	○	○	○	○						
A3	3A electrode	Loose wire	15-core			○	○	○						
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.

Operational explanation

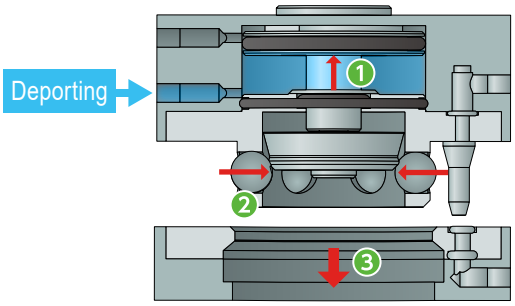
Arrival

①When air is supplied to the arrival port, the piston lowers.
②The cam is lowered in conjunction with the piston and the steel ball is pushed out by the tapered part of the cam.
③A steel ball enters the taper section on the tool side and is retracted to the robot side to engage.



Removal

①When air is supplied to the de-port, the piston rises.
②The cam is raised in conjunction with the piston and the steel ball is freed.
③The steel ball is no longer supported and the tool side is dislocated.

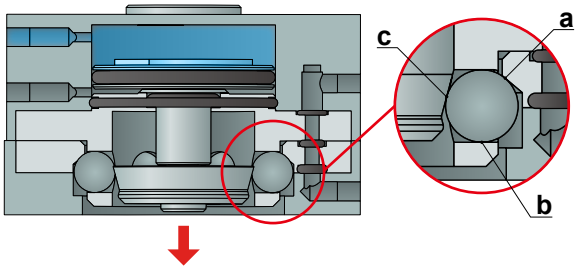


When air port for tool is reached

The air port is connected when the switch is in contact, enabling air supply from the robot side to the tool side.

Condition of position locking

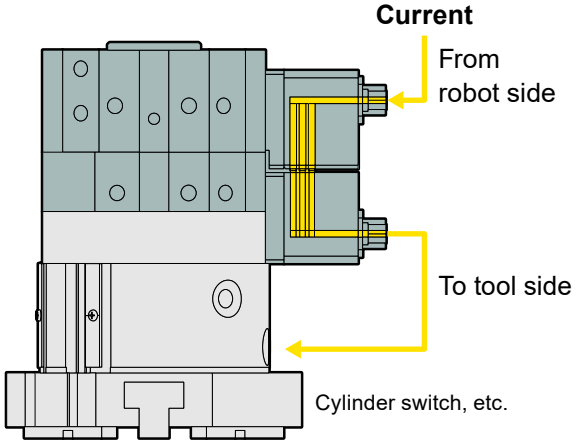
In a state with no air, the weight of the tool is applied as the load in the direction of the arrow. This prevents the tool from falling because it is held at the three points a, b, and c of the steel ball.
(Note that the piston may fall if it moves due to external load such as vibration.)



Module option

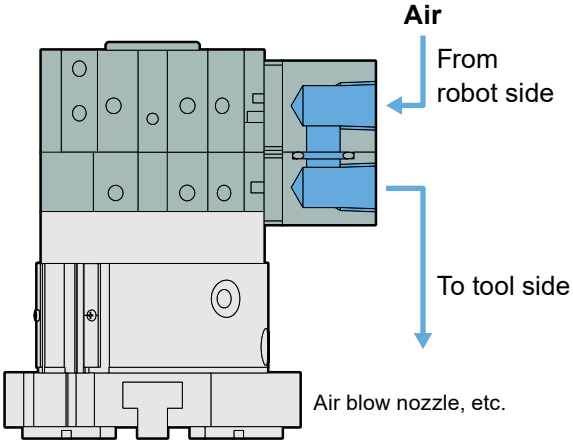
When electrical module is installed

When the switch is landed, the electric module is connected to enable communication of electric signals and power supply between the robot side and tool side.



When air module is installed

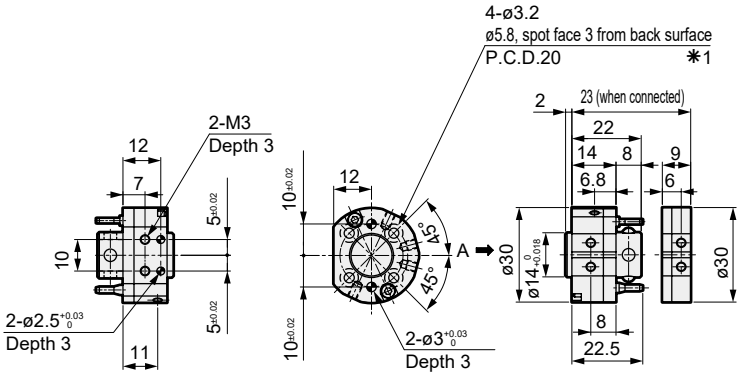
The air module is connected when the switch is in contact, and air can be supplied from the robot side to the tool side.

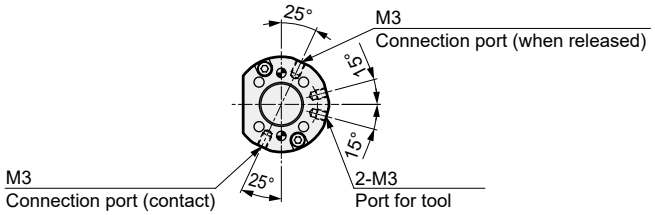


Dimensions

●KHBC-001

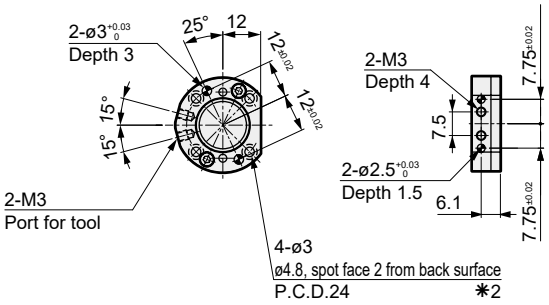
・Robot side KHBC-001R





Piping port layout drawing (A part arrow view)

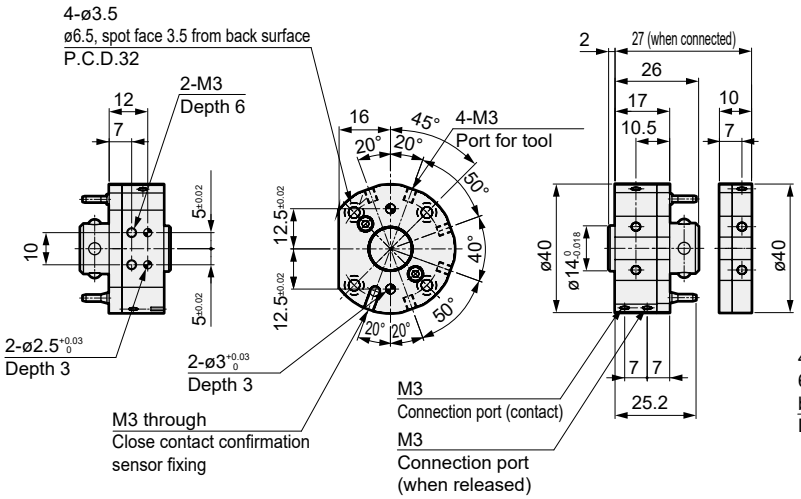
・Tool side KHBC-001H



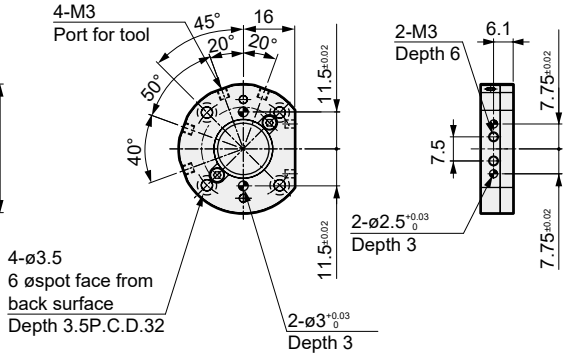
✳1: Low head hexagon socket bolt (M3×16) included
✳2: Low head hexagon socket bolt (M2.5×10) included

●KHBC-003

・Robot side KHBC-003R



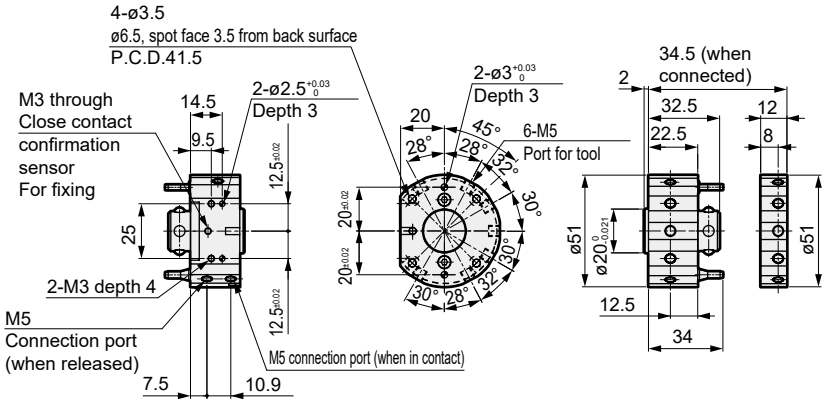
・Tool side KHBC-003H



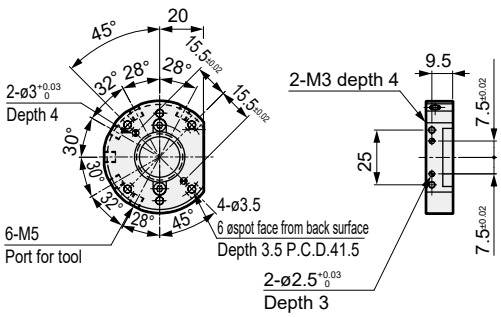
Dimensions

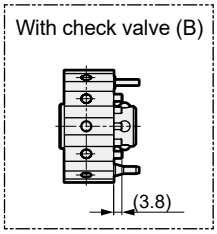
●KHBC-007

• Robot side KHBC-007R



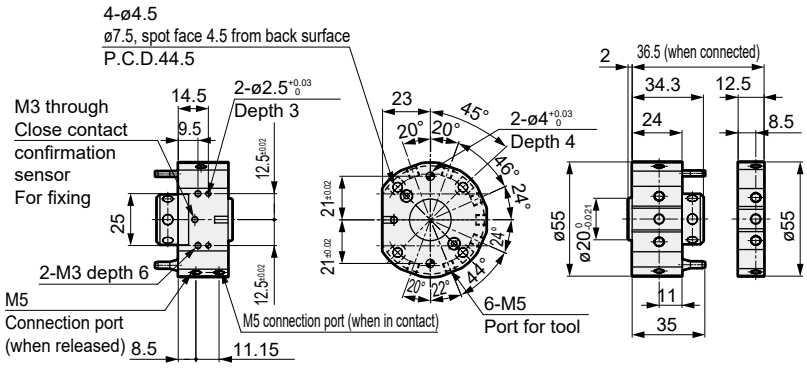
• Tool side KHBC-007H



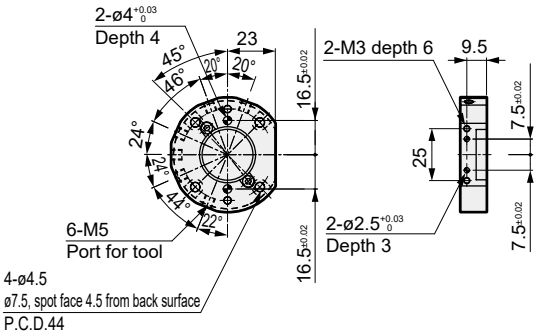


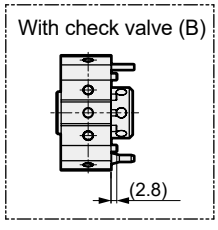
●KHBC-012

• Robot side KHBC-012R



• Tool side KHBC-012H

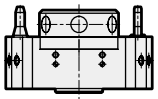




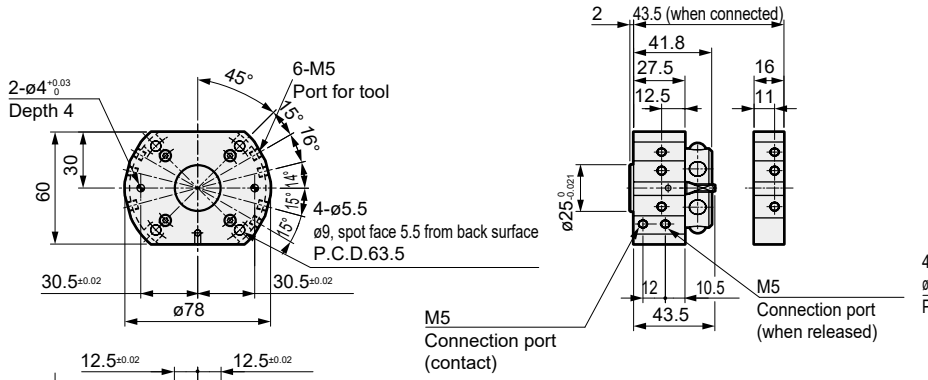
Dimensions

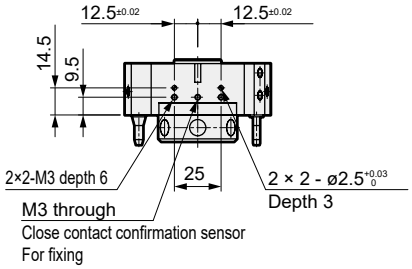
●KHBC-025

・Robot side KHBC-025R

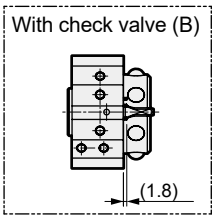


Module option 1 mounting side

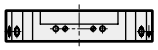




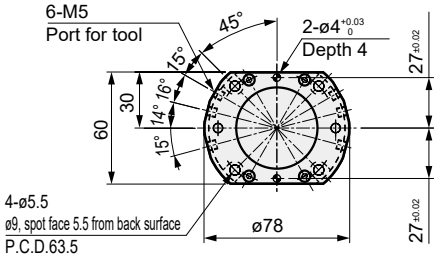
Module option 2 mounting side

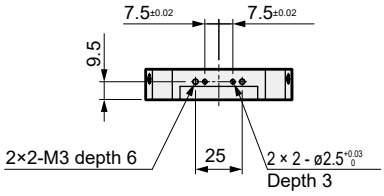


・Tool side KHBC-025H



Module option 1 mounting side

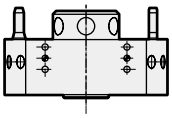




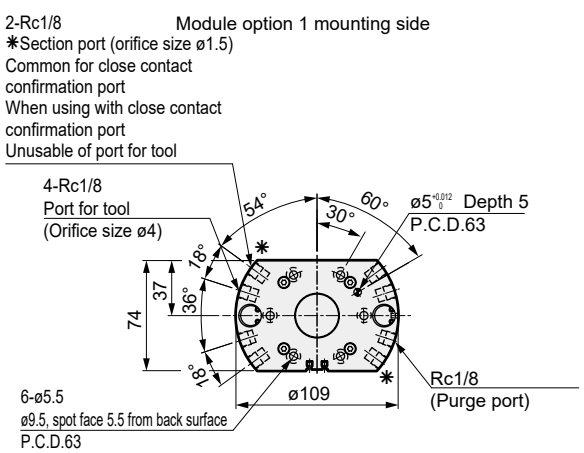
Module option 2 mounting side

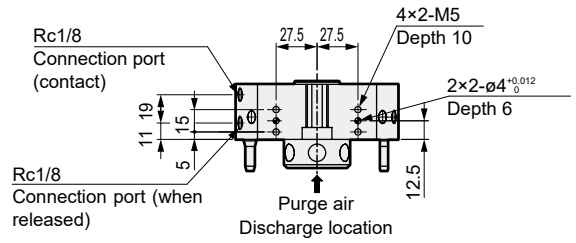
●KHBC-045

・Robot side KHBC-045R

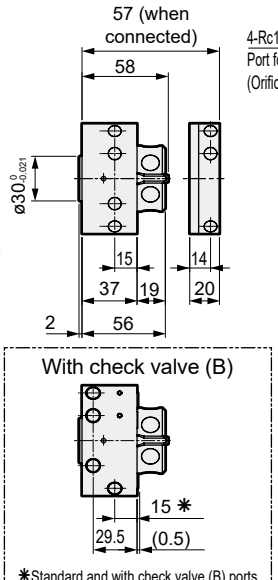


Module option 1 mounting side



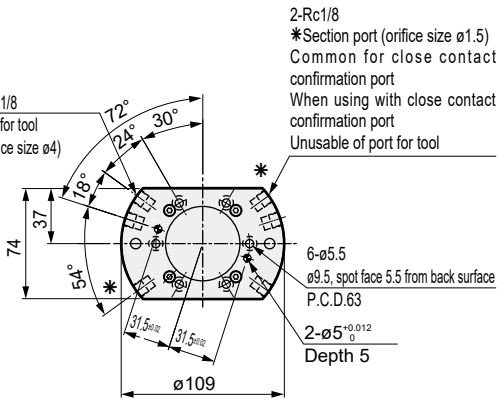


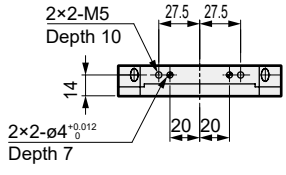
Module option 2 mounting side



・Tool side KHBC-045H

Module option 1 mounting side



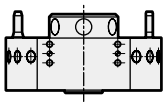


Module option 2 mounting side

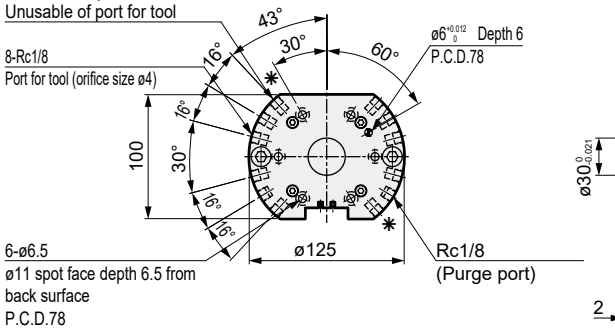
Dimensions

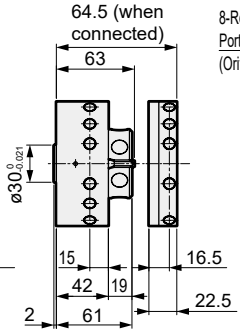
●KHBC-060

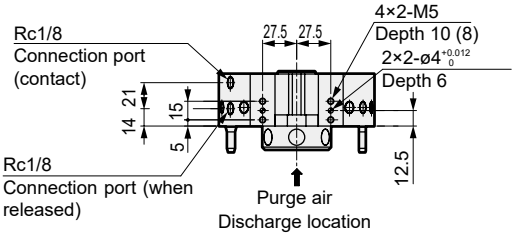
・Robot side KHBC-060R



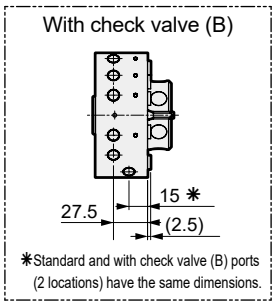
Module option 1 mounting side





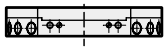


Module option 2 mounting side
(8) is the dimensions with check valve (B).

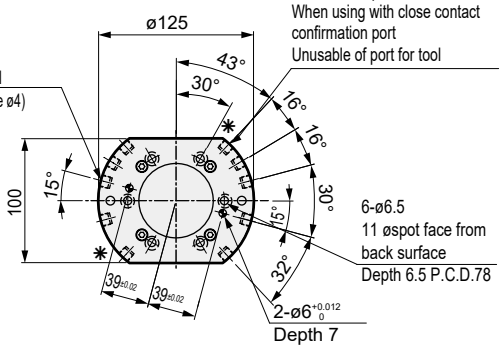


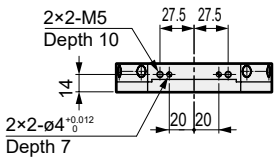
✳Standard and with check valve (B) ports (2 locations) have the same dimensions.

・Tool side KHBC-060H



Module option 1 mounting side

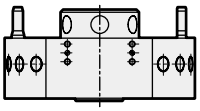




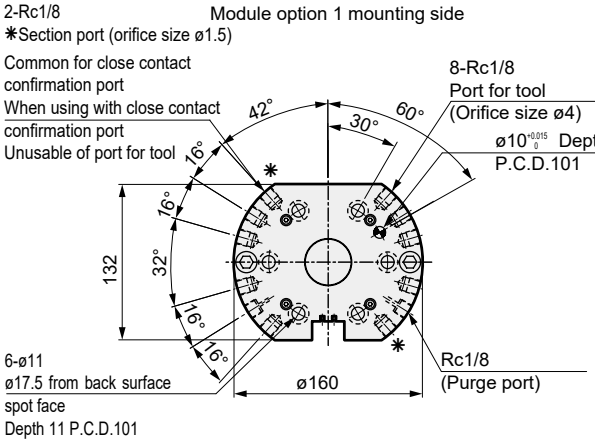
Module option 2 mounting side

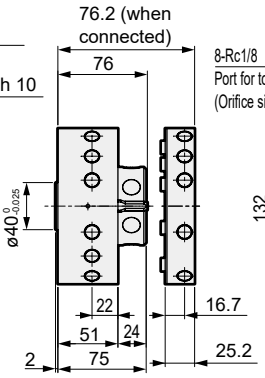
●KHBC-120

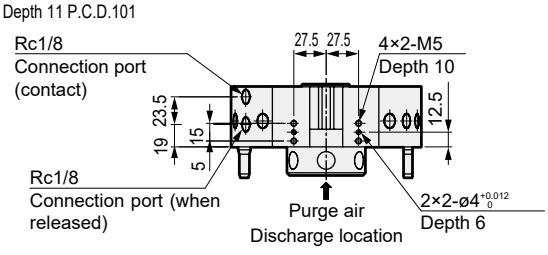
・Robot side KHBC-120R



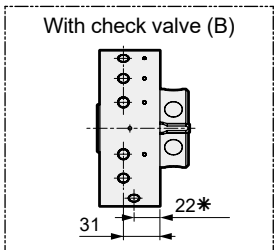
Module option 1 mounting side





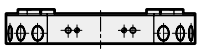


Module option 2 mounting side

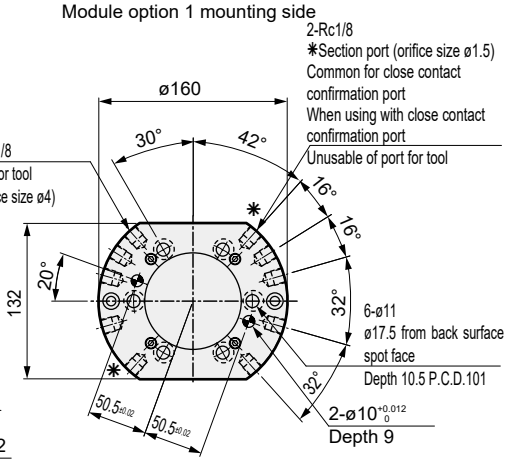


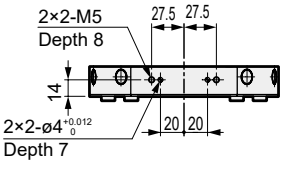
✳Standard and with check valve (B) ports (2 locations) have the same dimensions.

・Tool side KHBC-120H



Module option 1 mounting side



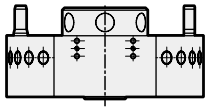


Module option 2 mounting side

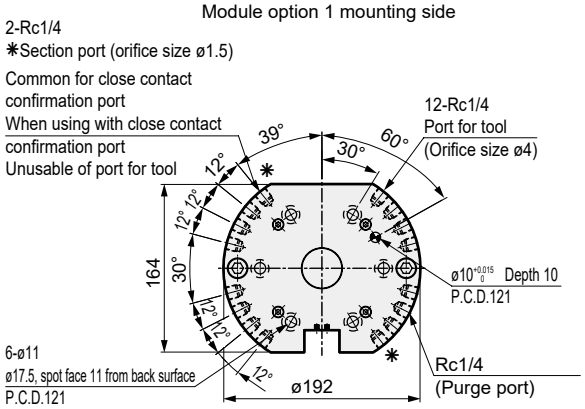
Dimensions

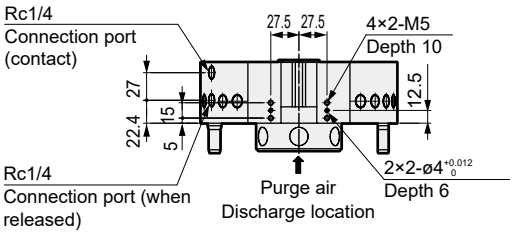
●KHBC-180

• Robot side KHBC-180R



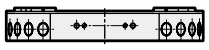
Module option 1 mounting side



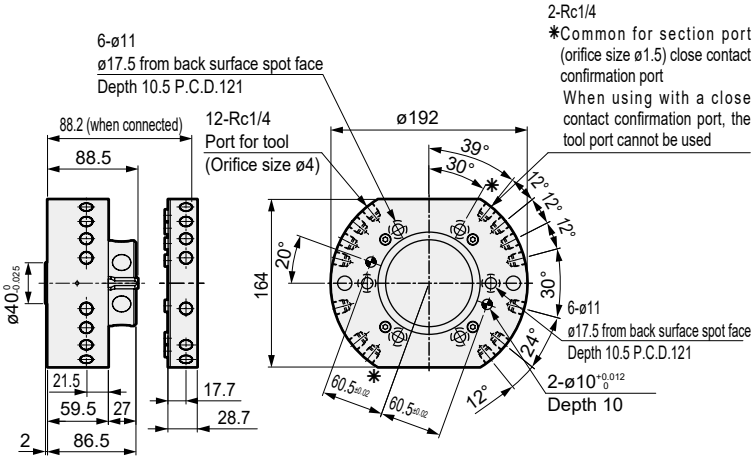


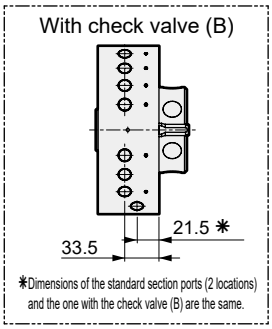
Module option 2 mounting side

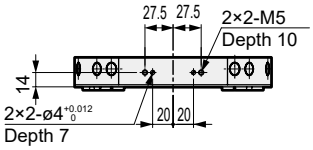
• Tool side KHBC-180H



Module option 1 mounting side



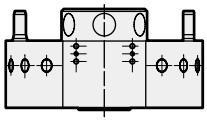




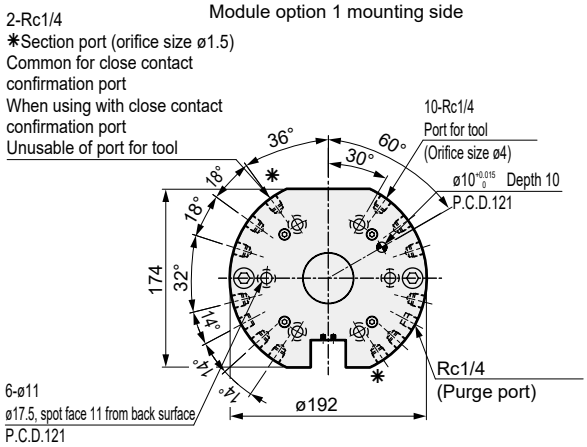
Module option 2 mounting side

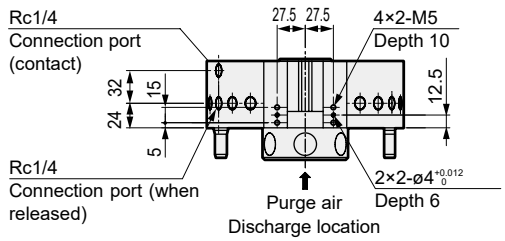
●KHBC-230

• Robot side KHBC-230R



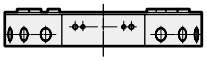
Module option 1 mounting side



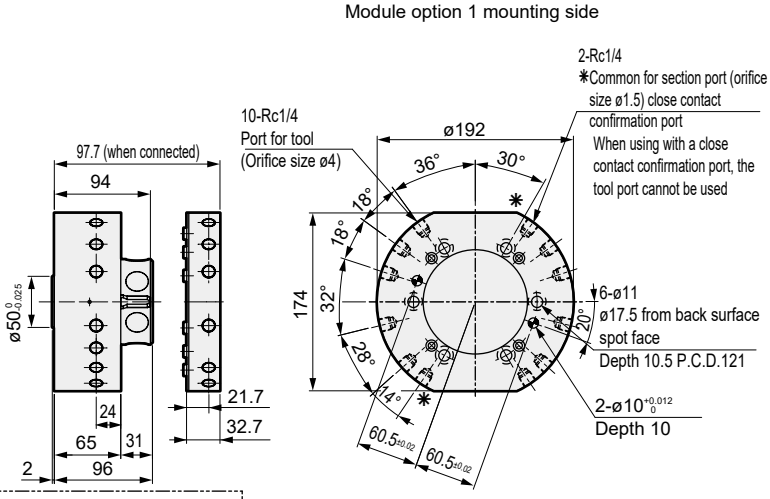


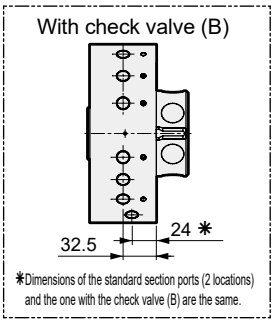
Module option 2 mounting side

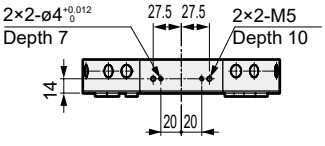
• Tool side KHBC-230H



Module option 1 mounting side





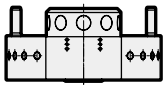


Module option 2 mounting side

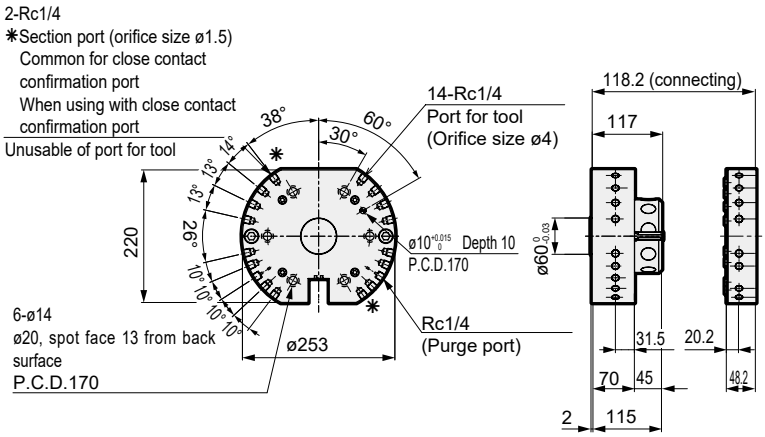
Dimensions

● KHBC-300

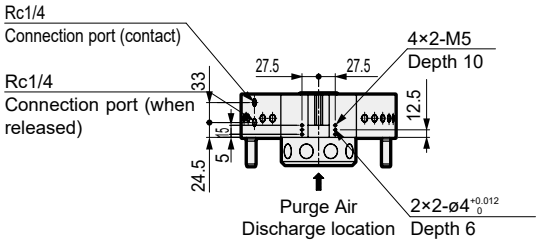
• Robot side KHBC-300R



Module option 1 mounting side

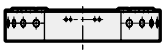


The dimensions are the same when a check valve (B) is attached.

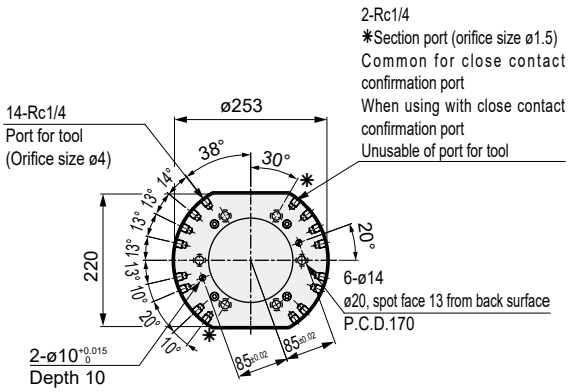


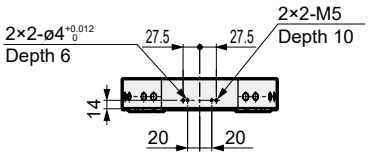
Module option 2 mounting side

• Tool side KHBC-300H



Module option 1 mounting side





Module option 2 mounting side

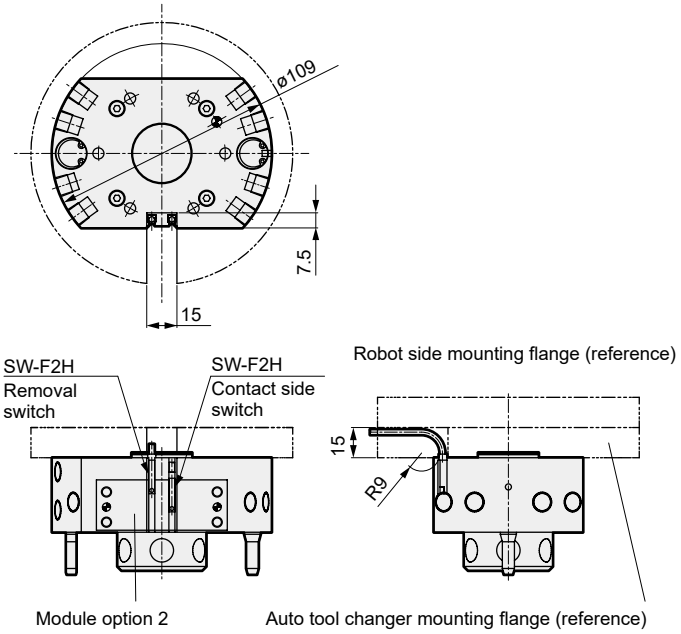
Optional dimensions

Robot side option

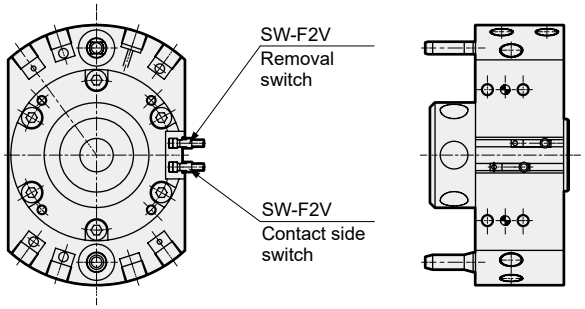
● Docking Confirmation Sensor C

The magnet in the cylinder is used to detect when the switch is in contact or off.

•KHBC-045R



•KHBC-060R to 300R



✳For KHBC-045R only, the lead wire is a straight type (Switch model: F2H). Since the switch cable section protrudes, please design the auto tool changer side mounting flange to include a relief groove with dimensions exceeding those shown in the diagram. The min. bending radius of the switch lead wire is 9 mm.

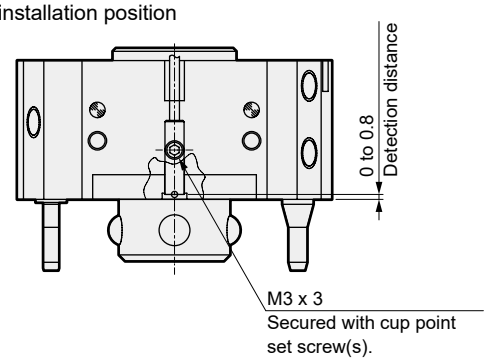
Robot side option

● Seating Confirmation Sensor D

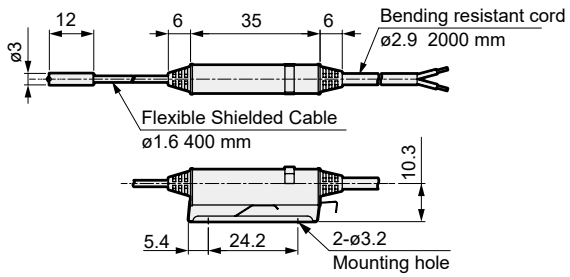
Check seating when connecting the robot side and tool side.

•KHBC-003R to 025R

• Sensor installation position



• Sensor dimensions



Sensor: E2EC-CR8D12M (OMRON)

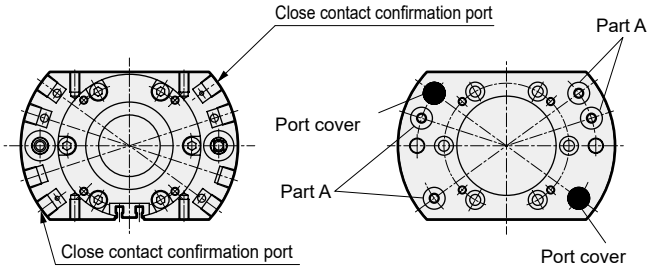
Tool Side Option

● With Seating Confirmation Port Cover E

Reliable seating confirmation can be performed by connecting a seating confirmation switch to the seating confirmation port and utilizing changes in air pressure.

•KHBC-045H to 300H

• Robot side (connection surface) • Tool side (connection surface)



✳If option E is selected, the cover shown in the figure below is attached to part A.

OptionE 

✳If Option E is not selected, this can be used as a tool port. (Note that the orifice size is small.)

No option  Orifice size ø1.5 (A part only)

Refer to the Dimensions diagram for details.

✳Please arrange for the seating confirmation switch separately (customer-supplied). Recommended model No.: MHPS-05-2NYTL-B-GW2

Electric Module Option Outline Dimension Drawing

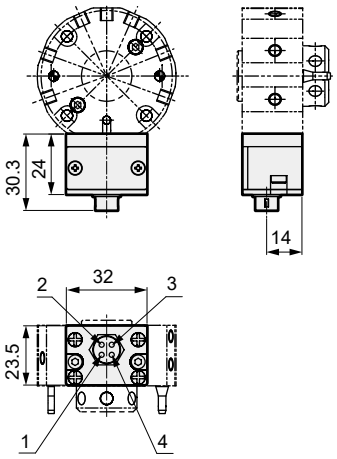
When the robot side and tool side are connected, it is possible to power supply electric signals.

● A1

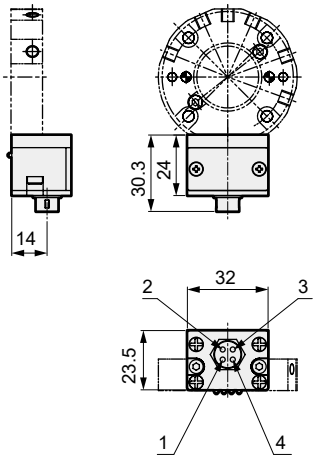
Allowable current value (1 pc.): 1A Electrical connections: Round connector 4-core

KHBC-001 to 025-A1

• Robot side



• Tool side



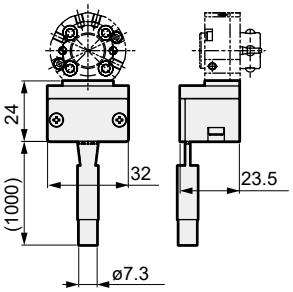
Mating side straight connector: HR10-7P-4P (Hirose Electric Co., Ltd.)

● A2

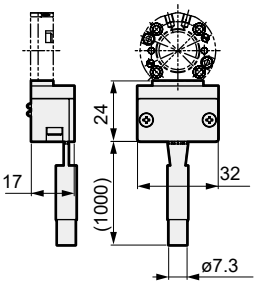
Allowable current value (1 pc.): 3A Electrical connections: Loose wire 8-core

KHBC-001, 003-A2

• Robot side

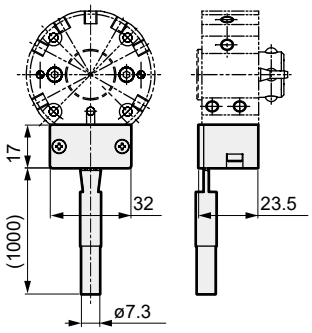


• Tool side

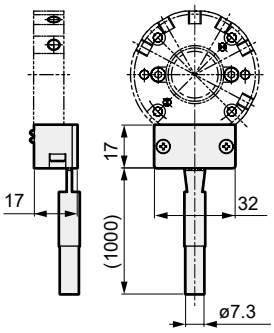


KHBC-007 to 025-A2

• Robot side



• Tool side

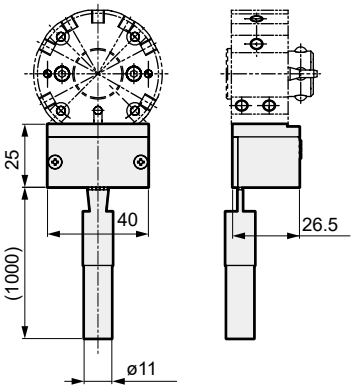


● A3

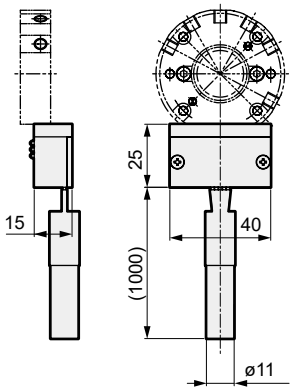
Allowable current value (1 pc.): 3A Electrical connections: Loose wire 15-core

KHBC-007 to 025-A3

• Robot side



• Tool side



Electric Module Option Outline Dimension Drawing

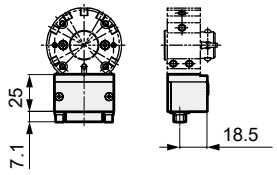
When the robot side and tool side are connected, it is possible to power supply electric signals.

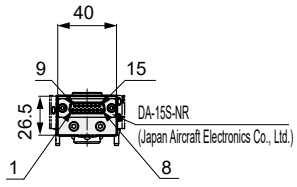
● A4

Allowable current value (1 pc.): 3A Electrical connections: D-sub-connector 15-core

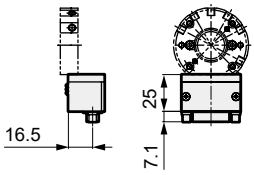
KHBC-007 to 025-A4

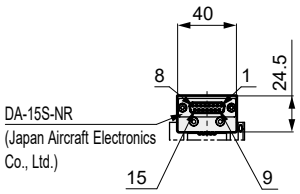
• Robot side





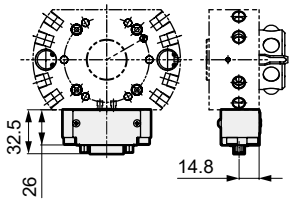
• Tool side

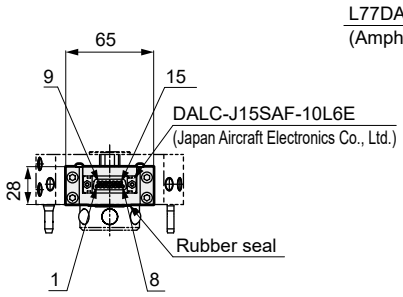




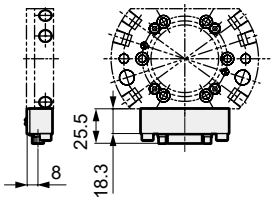
KHBC-045 to 300-A4 (around electrode part with rubber seal)

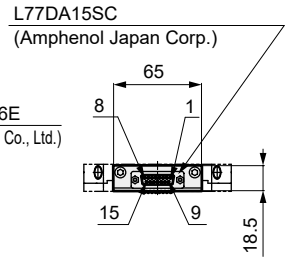
• Robot side





• Tool side





Mating side straight connector: DA-15P-NR (Japan Aircraft Electronics Industries Co., Ltd.)

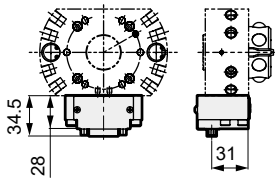
Mating side straight connector: DA-15PF-N (Japan Aircraft Electronics Industries Co., Ltd.)

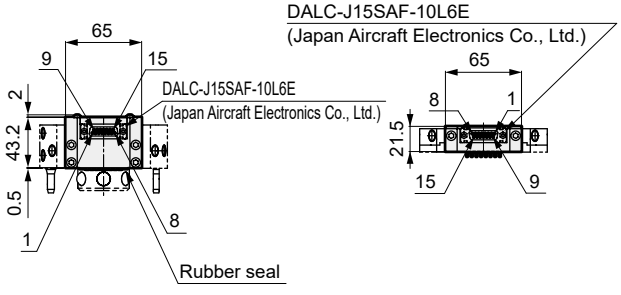
● A5

Allowable current value (1 pc.): 5A Electrical connections: D-sub-connector 15-core

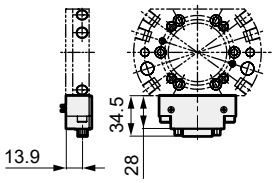
KHBC-045 to 300-A5 (around electrode part with rubber seal)

• Robot side





• Tool side



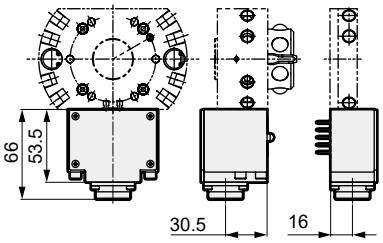
Mating side straight connector: DA-15PF-N (Japan Aircraft Electronics Industries Co., Ltd.)

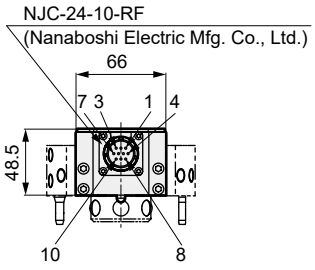
● A6

Allowable current value (1 pc.): 10A Electrical connections: Round connector 10-core

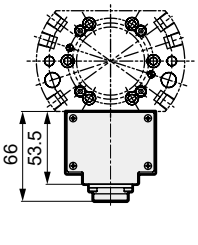
KHBC-045 to 300-A6

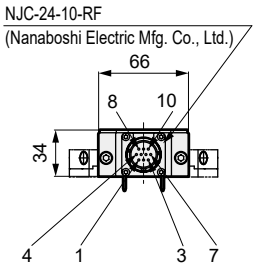
• Robot side





• Tool side





Mating side straight connector: NJC-24-10-PM (Nanaboshi Electric Mfg. Co, Ltd.)

Note: The required allowable horizontal dimension during connection is ±0.3mm.

Air Module Option Outline Dimension Drawing

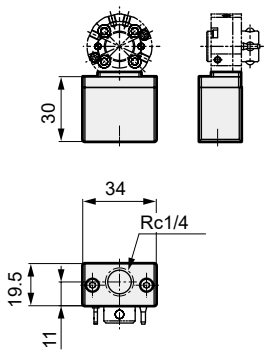
Please use when a large air flow rate is required, such as for air blowing or air motors.

●B1

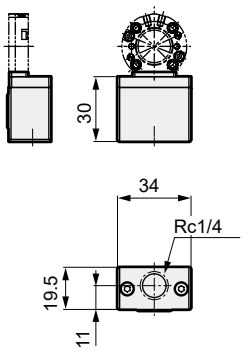
No. of Ports: 1 Min. bore size: ø9

KHBC-001, 003-B1

• Robot side

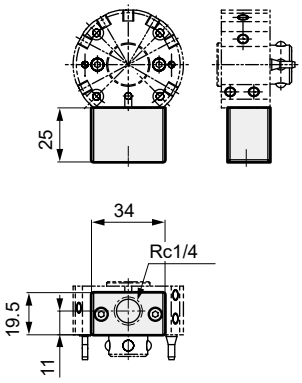


• Tool side

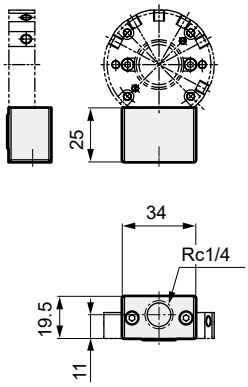


KHBC-007 to 025-B1

• Robot side



• Tool side

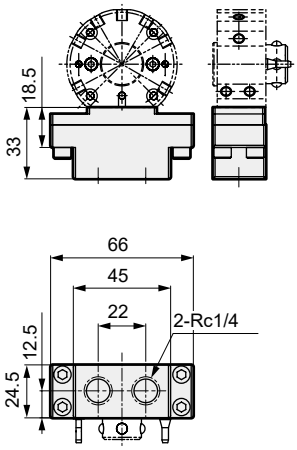


● B2

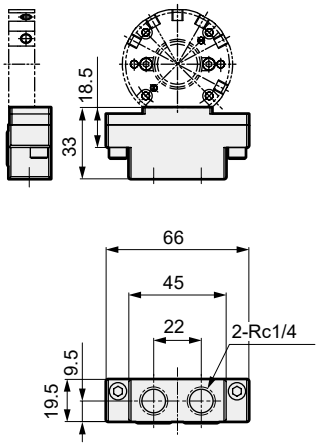
No. of Ports: 2 Min. bore size: ø9

KHBC-007-B2

• Robot side

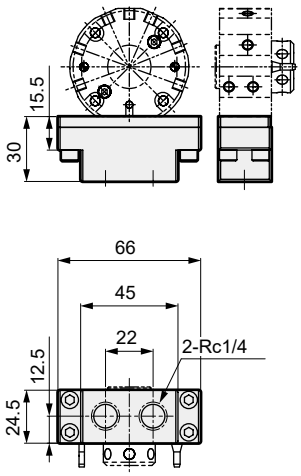


• Tool side

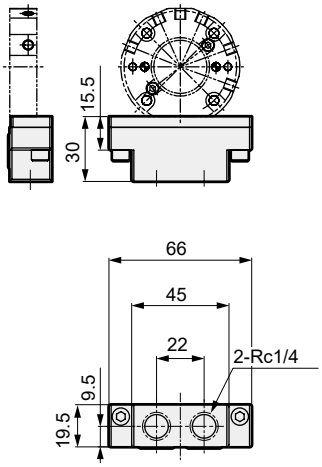


KHBC-012 to 025-B2

• Robot side

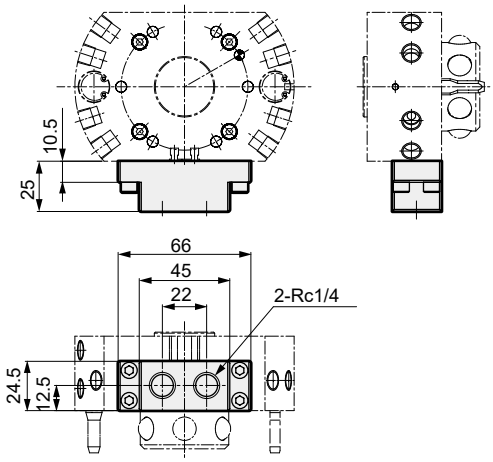


• Tool side

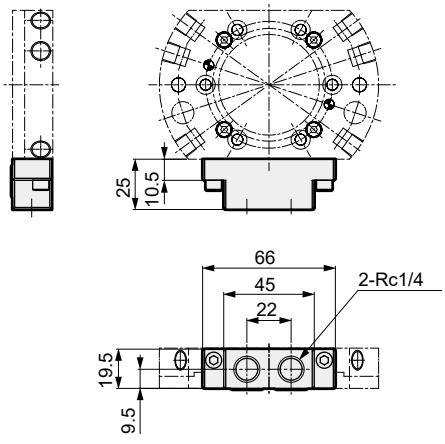


KHBC-045 to 300-B2

• Robot side



• Tool side



Air Module Option Outline Dimension Drawing

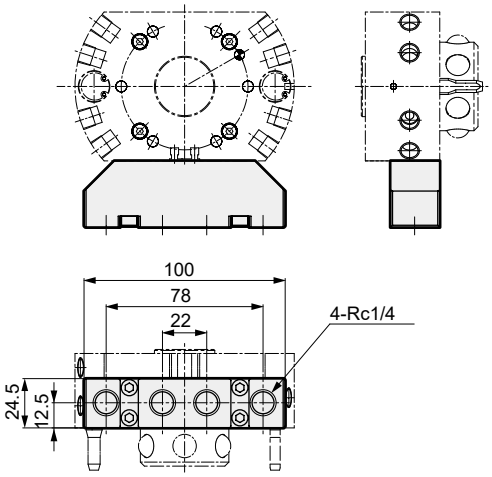
Please use when a large air flow rate is required, such as for air blowing or air motors.

● B3

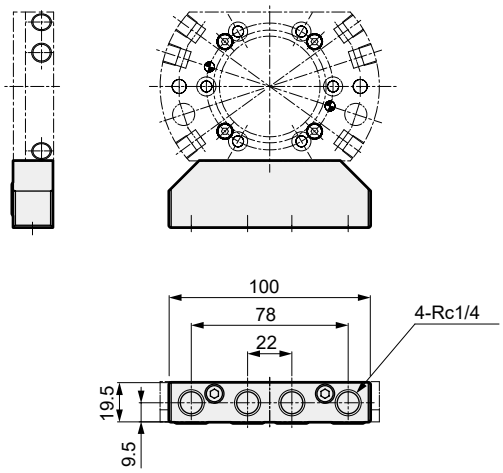
No. of Ports: 4 Min. bore size: ø9

KHBC-045 to 300-B3

• Robot side



• Tool side

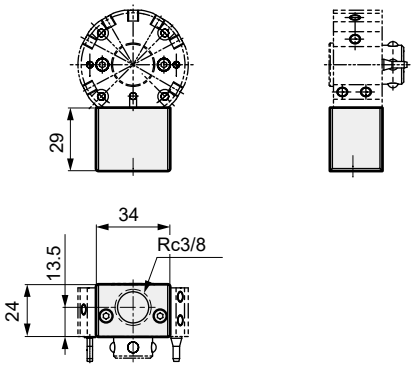


● B4

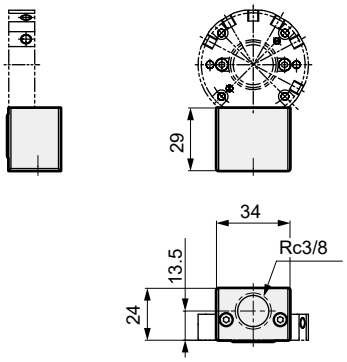
No. of Ports: 1 Min. bore size: ø12

KHBC-007 to 025-B4

• Robot side



• Tool side

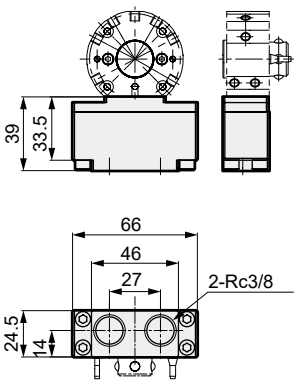


● B5

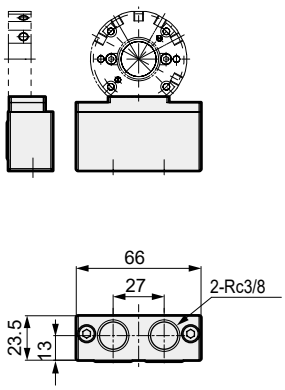
No. of Ports: 2 Min. bore size: ø12

KHBC-007-B5

• Robot side

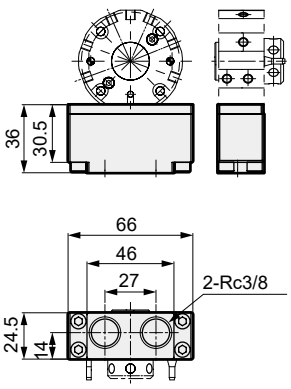


• Tool side

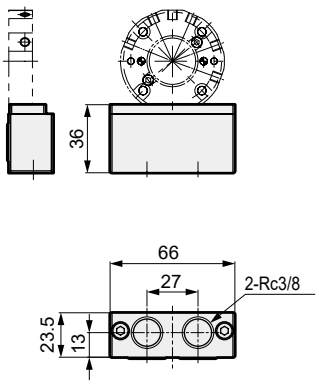


KHBC-012 to 025-B5

• Robot side



• Tool side



Air Module Option Outline Dimension Drawing

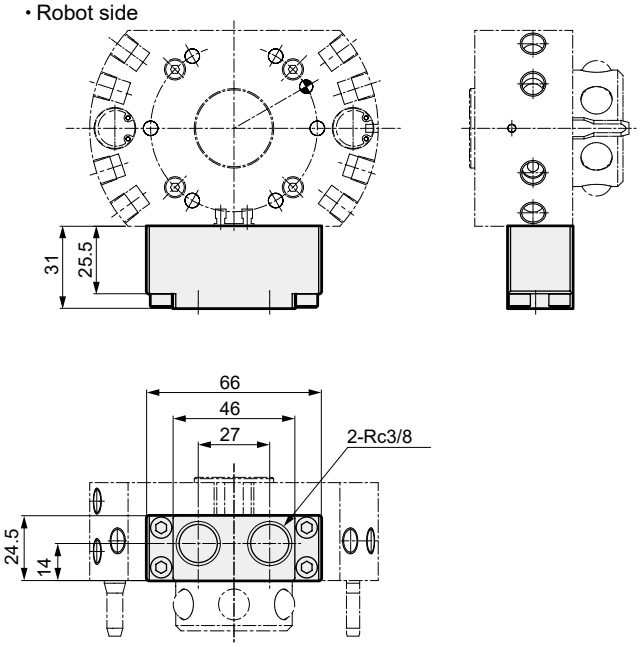
Please use when a large air flow rate is required, such as for air blowing or air motors.

● B5

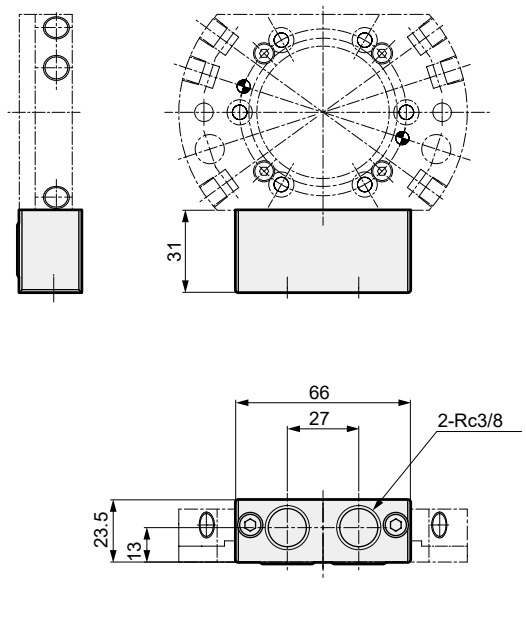
No. of Ports: 2 Min. bore size: ø12

KHBC-045 to 300-B5

• Robot side



• Tool side

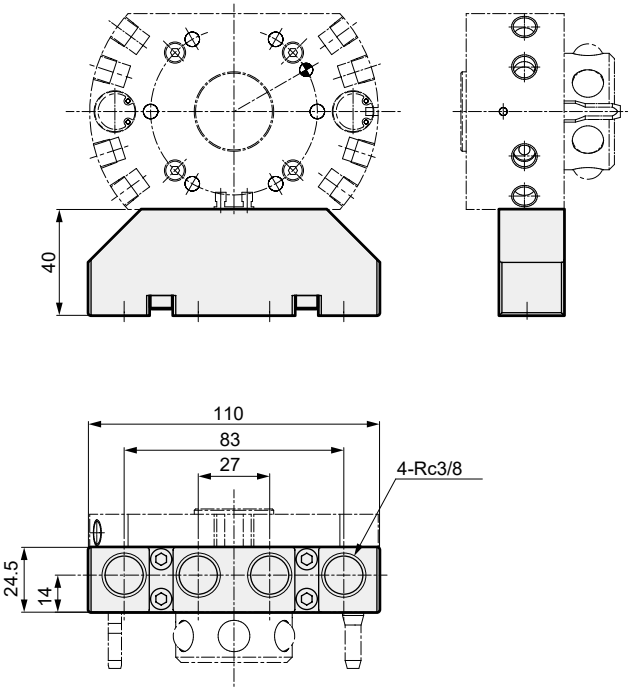


● B6

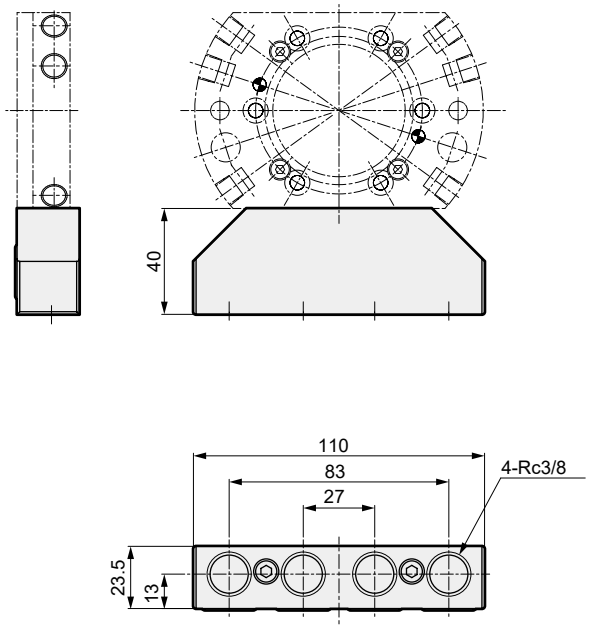
No. of Ports: 4 Min. bore size: ø12

KHBC-045 to 300-B6

• Robot side



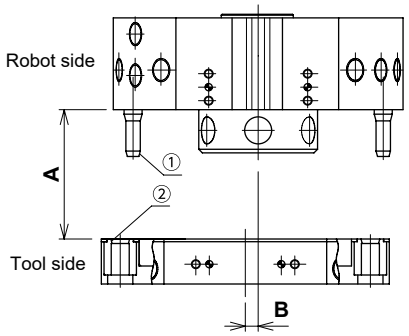
• Tool side

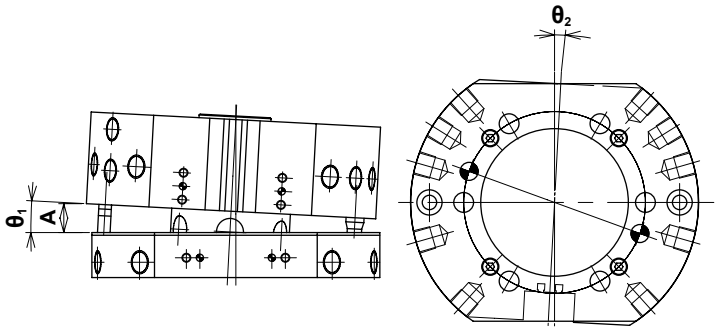


Technical data

■ Teaching allowable dimensions

∗Allowable dimensions for the robot side and tool side are determined by the taper in ①②. Set the dimensions equal to or less than the dimensions in the table below. In this case, the tool side and tool base are not completely fixed, and movement within the allowable dimension is required.





Min. clearance when connected

Model No.	Allowable dimensions
KHBC-001	A=0 to 0.5 mm
KHBC-003	
KHBC-007	
KHBC-012	
KHBC-025	A=0 to 1.2 mm
KHBC-045	
KHBC-060	
KHBC-120	
KHBC-180	
KHBC-230	
KHBC-300	

Horizontal tolerance dimensions

Model No.	Allowable dimensions
KHBC-001	B=±0.8 mm
KHBC-003	
KHBC-007	B=±1.0 mm
KHBC-012	
KHBC-025	B=±1.5 mm
KHBC-045	
KHBC-060	
KHBC-120	
KHBC-180	
KHBC-230	
KHBC-300	

Slope tolerance dimensions

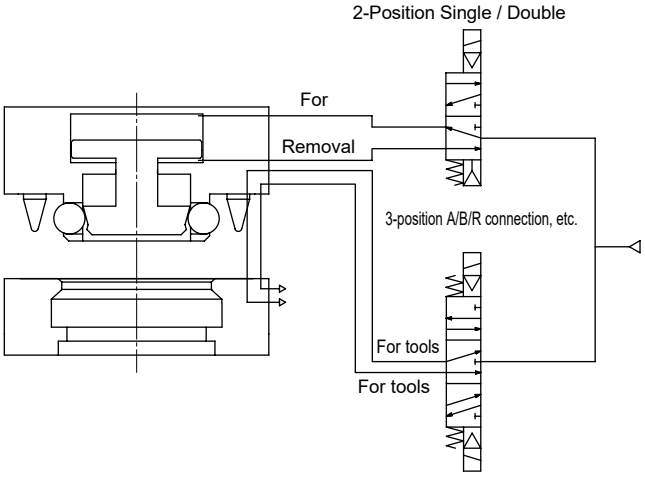
Model No.	Allowable dimensions
KHBC-001	θ_1 = 0.9°
KHBC-003	θ_1 = 0.7°
KHBC-007	θ_1 = 1.1°
KHBC-012	θ_1 = 1.0°
KHBC-025	θ_1 = 0.9°
KHBC-045	θ_1 = 0.4°
KHBC-060	θ_1 = 0.3°
KHBC-120	θ_1 = 0.3°
KHBC-180	θ_1 = 0.3°
KHBC-230	θ_1 = 0.25°
KHBC-300	θ_1 = 0.15°

Allowable dimensions in rotation direction

Model No.	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°

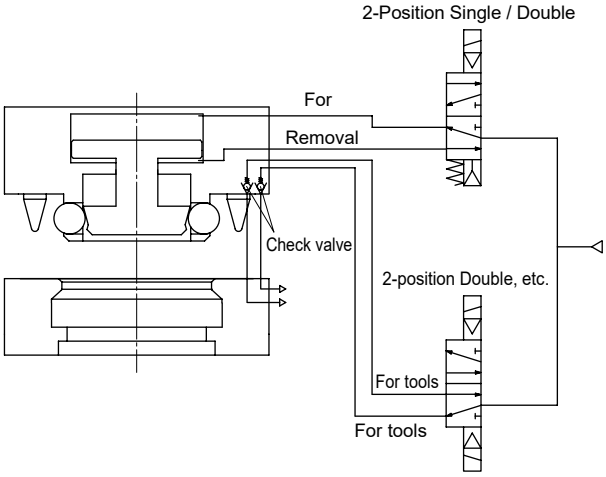
■ Example of circuit

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.

■ Auto tool changer selection method

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

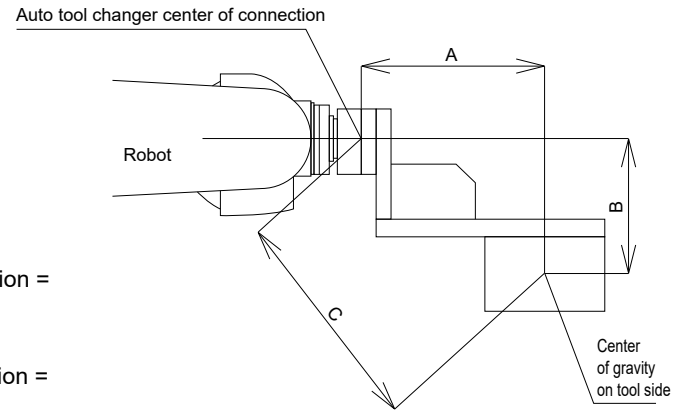
■ Conditions to consider when selecting the tool changer

- ● 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.

Safety Precautions

Be sure to read this section before use.

When designing and manufacturing a device using CKD products, the manufacturer is obligated to check that device safety mechanism, pneumatic control circuit, or water control circuit and the system operated by electrical control that controls the devices is secured.
It is important to select, use, handle and maintain the product appropriately to ensure that the CKD product is used safely.
Observe warnings and precautions to ensure device safety.
Check that device safety is ensured, and manufacture a safe device.

WARNING

1 This product is designed and manufactured as a general industrial machine part.
It must be handled by an operator having sufficient knowledge and experience.

2 Use this product in accordance with specifications.

This product must be used within its stated specifications. In addition, never modify or additionally machine this product.
This product is intended for use in general industrial machinery equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments.
(Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)

❶ Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
❷ Use for applications where life or assets could be significantly affected, and special safety measures are required.

3 Observe organization standards and regulations, etc., related to the safety of device design and control, etc.

ISO4414, JIS B 8370 (Pneumatics fluid power - General rules and safety requirements for systems and their components)
JFPS2008 (Principles for pneumatic cylinder selection and use)
Including the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.

4 Do not handle, pipe, or remove devices before confirming safety.

❶ Inspect and service the machine and devices after confirming safety of all systems related to this product.
❷ Note that there may be hot or charged sections even after operation is stopped.
❸ When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility.Discharge any compressed air from the system, and pay attention to possible water leakage and leakage of electricity.
❹ When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.

5 Observe warnings and cautions in the following pages to prevent accidents.

■ The precautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.

DANGER: When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, and when there is a high degree of emergency to a warning.

WARNING: If handled incorrectly, a dangerous situation may occur, resulting in death or serious injury.

CAUTION: When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "CAUTION" may lead to serious results depending on the situation.
Every item provides important information and must be observed.

Warranty

1 Warranty period

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

2 Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified above, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

1) Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or the Instruction Manual.
2) Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
3) Failure not caused by the product.
4) Failure caused by use not intended for the product.
5) Failure caused by modifications/alterations or repairs not carried out by CKD.
6) Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
7) Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.
Note: For details on the durability and consumable parts, contact your nearest CKD sales office.

3 Compatibility check

The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.

Pneumatic Components

Safety Precautions

Be sure to read this section before use.
For general cylinders and cylinder switches, please refer to the Pneumatic Cylinders ⑤ (Catalog No. RJ-006AA).

Product-specific cautions: Auto tool changer KHBC Series

Design / Selection

⚠ CAUTION

■ The optional electrode part is a consumable part. Replace if necessary. Wire the cable so that it is free of local bends, repeated bends, or tension.

■ Working environment

At cutting, casting, or welding plants, there is a risk of foreign matter, such as cutting fluid, chips, powder and dust, entering the equipment. Use covers and such to prevent this as much as possible. Do not use the equipment under the following environments.

- ●Exposed to cutting oil (because the sliding section is abraded by abrasive or polishing debris in the liquid)
- ●organic solvents, chemicals, acids, alkalis, kerosene, and similar substances contained in atmospheres are included
- ●Exposed to water

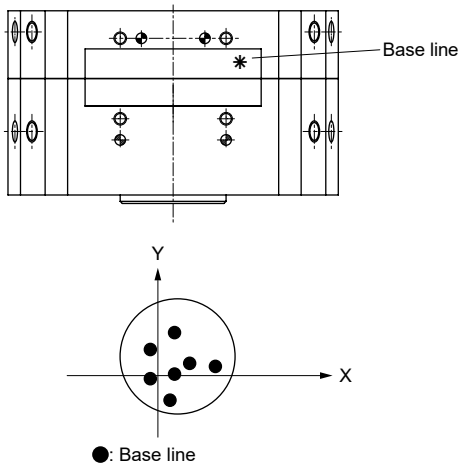
■ Do not disassemble or modify the body.

■ Do not apply load to the body without applying pressure. The specified values for connecting axial force, maximum load moment, and maximum load torque are based on 0.5 MPa pressure.

■ Select the maximum acceleration of the robot during automatic operation so that the load is not exceeded.
Refer to the technical data (auto tool changer selection method) on page 20.

■ Repeatability

The repeatability here indicates the displacement used as the reference when the auto tool changer is repeatedly attached and detached under the same conditions (e.g., fixing the auto tool changer: see below).
Conditions
· Workpiece dimensions, shape, weight
· Robot operation
· Air pressure, etc.



■ Optional electrode section

- ●Be sure to turn the power OFF before installing or removing the auto tool changer. If the filter is attached/detached while power is ON, electric discharge is generated between the opposing electrodes. This discharge causes the tip of the contact probe or electrode pin to burn or melt, and the gold plating to oxidize or wear, causing conduction failure.
- ●To improve electrode durability, it is recommended to use multiple electrodes in parallel when performing continuous energizing that exceeds 40 to 60% of the rated current.
- ●When wiring various electric signals, it is recommended to arrange the weak electric signal line and power signal line as far away as possible. This is because noise may be transmitted from the power signal line to the feeble electric signal line. Also, wires and cables connected to the electrode option should be placed as far apart as possible, as bundling these signal wires together may transmit noise.
- ●If a contact fault occurs during use, inspect and clean the electrical contact section. Dirt or dust adhering to the electrical contact section may lead to conduction failure. Clean with a clean cloth or rag soaked with organic solvents such as IPA, and then blow it with air.

For precautions regarding mounting, installation, adjustment, operation, and maintenance, please refer to the 'Usage Notes' section in this catalog and the CKD Equipment Product Site (https://www.ckd.co.jp/kiki/en/) → 'Model Number' → Instruction Manual.

Related products

Handling components guide for robots

Catalog No. CC-1478AA

- Handling components that can be used at the tip of robot arms, etc.
- Electric gripping, air gripping, vacuum suction products, etc.

Electric gripper

2-Finger Gripper

FLSH Series

"The same dimensions and gripping force as Air

DLSH Series

Gripping force is continuously generated even when power is not energized.

2-Finger Gripper

FFLD Series

High gripping force and long stroke ideal for robot arms.

3-Finger Gripper

GCKW Series

"The same dimensions and gripping force as Air

DCKW Series

Gripping force is continuously generated even when power is not energized.

Air hand / Air chuck

A lineup of 52 models with various shapes and diverse functions

Gripping force: 1.5 to 2000 N Stroke: 4 to 200 mm

Parallel hand

Basic type with a wide range of hands.

Low profile parallel hand

Low profile body contributes to a more compact device.

Wide parallel hand

Wide opening is ideal for large workpieces.

180° open/close fulcrum hand

Fingers open and close 180 degrees to avoid interference with workpieces.

3-way chuck

Uses a 3-way grip, making it ideal for cylindrical or round workpieces.

Suction Pad

Lineup of 11 types of shapes and 16 types of rubber materials

Pad diameter: 0.7 to 200 mm

Vacuum ejector

Single unit

VSY Series

Compact and lightweight with integrated ejector and vacuum burst function.

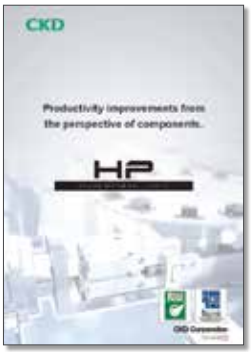
Unit type

VSNM Series

Vacuum ejector unit with high speed operation.

HP Series General Catalog

Catalog No.CC-1421AA



- Actuator for high frequency use (HP1)
  Same dimensions and longer service life as conventional products (more than 4 times longer than conventional products)
- Actuator for dusty environments (G-HP1)
  Improved durability in dusty environments (more than 4 times that of conventional models)

Recommended hand chuck HP series

Optimized sliding parts. Does not break even with high frequency use.

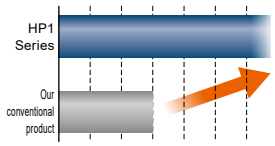
Linear Slide Hand	Low-profile long stroke hand	Wide parallel hand	3-way chuck
LSH-HP1 Series	**LST-HP1** Series	**HMC-HP1** Series	**CKW-HP1** Series




Long service life

Highly advanced sliding technology has enabled durability more than 4 times longer than conventional models.

Operational cycle

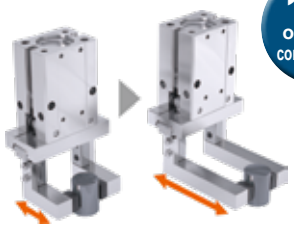


4x or more conventional

✳The HMC-HP1 Series and CKW-HP1 Series are more than twice the conventional models.

High rigidity

The design of the guide has been revised to improve the rigidity of the guide.



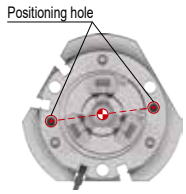
1.3x or more conventional

Significant reduction in replacement time

High precision positioning hole ±0.025 mm

The addition of "positioning holes" with the grip center as reference allows the centering precision to be easily reproduced.

✳Excluding HMC-HP1 Series.



Grips and Measures length simultaneously, and Predictive Maintenance.

Measuring hand	Low-profile long stroke hand with length measuring function
LSHM-HP2 Series	**LSTM-HP2** Series

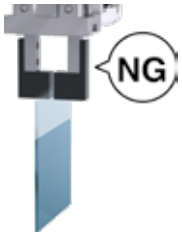

Integrated structure

Finger positioning with high precision analog output. The hand body has a built-in stroke detection sensor and amplifier. The integrated structure achieves high-precision.

Repeatability LSHM: ±0.02 mm
LSTM: ±0.04 mm

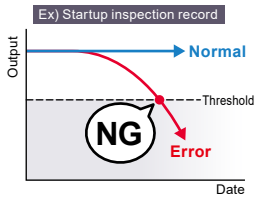
Micro-workpiece gripping/miss detection

Accurately judges whether even tiny workpieces were gripped or missed.



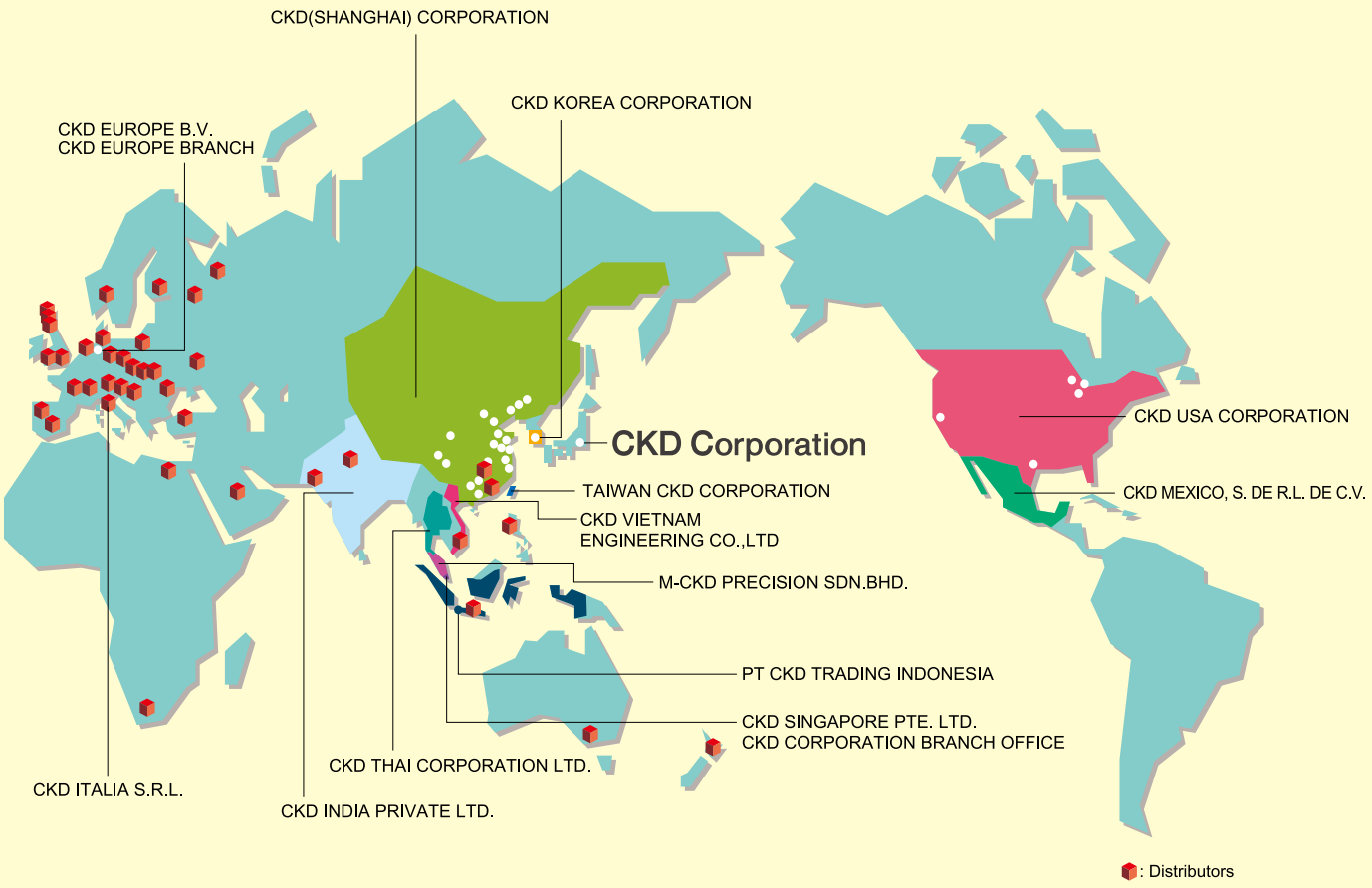
Predictive maintenance

Monitors attachments for abnormal wear and deformation of fingers and jigs through changes in output to prevent equipment and robot damage.



For details, refer to CKD Components Product site (https://www.ckd.co.jp/kiki/en/) → "Model No."

WORLD-NETWORK



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