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USERS GUIDE
MAINTENANCE & INSTRUCTION
MANUAL

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REFERENCE DRAWINGS

PRECAUTIONARY NOTES

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This manual contains all the information about XC-120 for proper operation and maintenance.
Please, make sure that all the personnel read and understand this manual throughly before using the XChange XC-120 system, and certainly hand this manual to the person who operates this system.

Please, check the inside of packages, and make sure about next 2 items are inside of the shipment.

1. Installing bolts and washers

2. Preliminary parts (depending on special arrangement)

We carefully pack our shipments. But, unfortunately you find any missing parts, please contact with our offices on the cover of this manual.

Thank you for choosing our XChange system.

1. EQUIPMENT DESCRIPTION

The XChange system is the pneumatic auto-tool exchanger. It is made up of two parts : a Robot Adaptor and a Tooling Adaptor. The system can be attached to any tooling by a optional adaptor plate, and also equips chucking mechanisms such as connecting pins.

1-1 Robot Adaptor

The Robot Adaptor is the basic part of the XChange system.
This adaptor equips the sensor, which indicates the state of chucking mechanisms. This sensor outputs "CHUCK", "UNCHUCK" and "FACE" signals.

[Chucking Mechanism]

The Robot Adaptor and the Tool Adaptor are connected each other by cams. These cams have special mechanism, which automatically continues to adjust for any dimensional error that may occur during chucking for a long time. These cams are driven by air cylinders, and designed so that they will not release even if the units is subjected to more than its rated load capacity. If an extreme load is applied, the chucking surfaces of both the robot and tooling adaptors separate slightly but never release.
And the inside spring works as fail-safe mechanism which avoids falling the tooling adaptor off even if the units looses its air pressure accidentally.

[Chucking Sensing Signals]

- Chuck complete signal (CHUCK)

  This signal indicates that both adaptors are completely chucked. That is, it indicates that the robot can move the Tooling Adaptor from the tool storage fixture.

- Cam released signal (UNCHUCK)

  This signal indicates that the locking cam is retracted in the Robot Adaptor. That is, it indicates that the cams are at the proper position to allow the Robot Adaptor to approach or unchuck the Tooling Adaptor.

- Face contact (FACE)

  This signal indicates that the faces of both adaptors are in contact each other.
  That is, it indicates that the chucking surfaces of both adaptors are properly contacted, so that the cams can be brought into engagement.

[Interfaces]

20 electrical signal contacts(standard version) and eight pneumatic are provided in the XChange XC-120.

1-2 Tooling Adaptor

The Tooling Adaptor is another basic part of the XChange system and allows your tools to be attached.
The locking cams of the Robot Adaptor will be engaged to the lock pins of this adaptor.

1-3 Option

Please ask us about the details of non-standard options such as signal-pin module, electric module and pneumatic module.

2. COMPONENTS

This system is composed of the XC-120 Body and connector assembly.
This connector assembly consists of 20 electrical signal contacts (standard version) with spring contact pin.

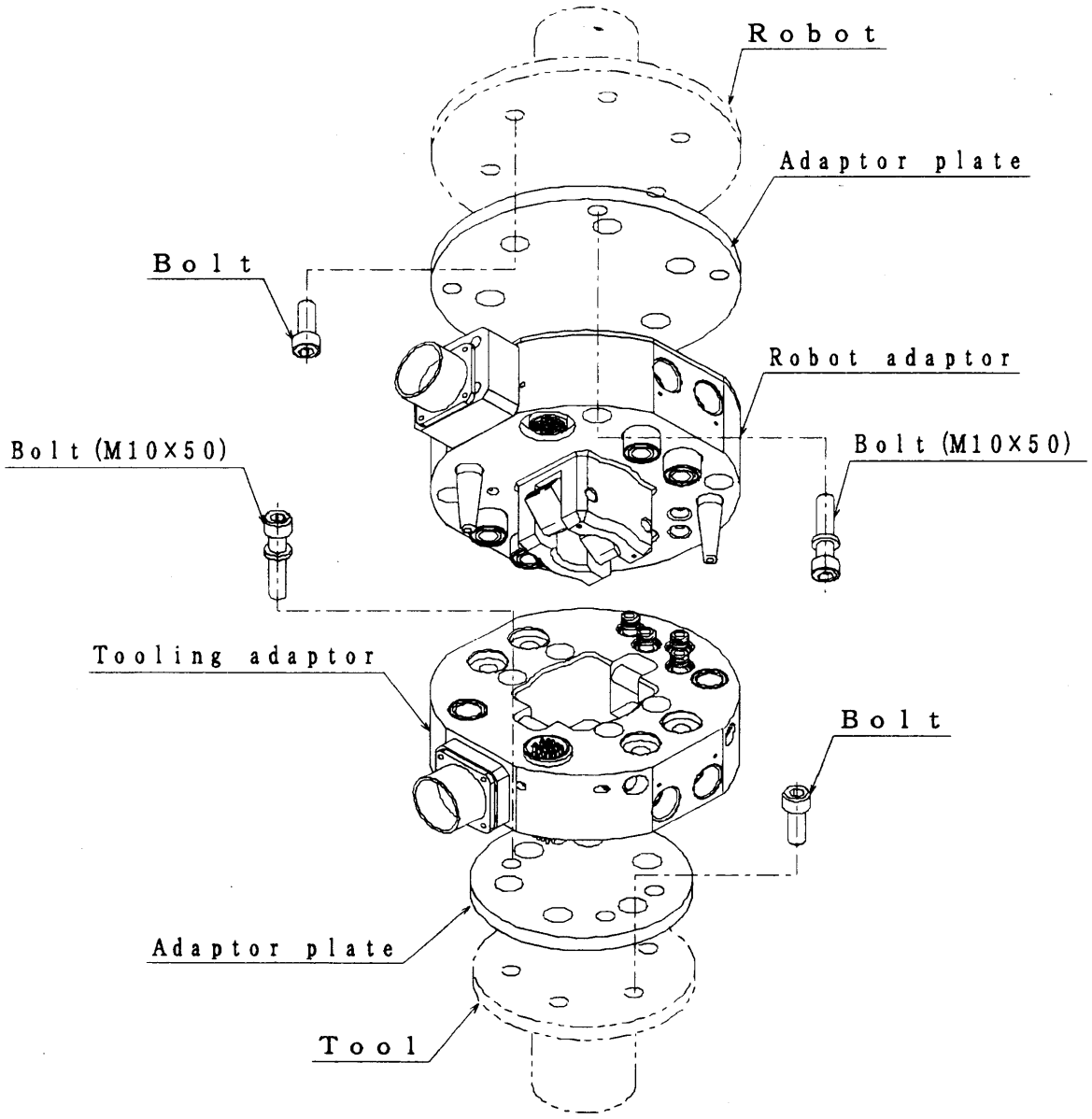


Fig. 1 System

3. STANDARD SPECIFICATION

3-1 XC-120 Main Body specification.

		XChange Spec.	XC－120	
1.	Main System			
	1. Type	Robot Adaptor	Refer to the drawing	
		Tooling Adaptor	Refer to the drawing	
	2. Rating	Handling capacity	120 kg	
		Allowable moment	1079Nm{11000 kgf·cm}	
		Allowable torque	1079Nm{11000 kgf·cm}	
		Operation pressure	0.39~0.85Mpa{4~8.7 kgf/cm^2}	
	3.Position Repeating Accuracy		0.050 mm	
	4. Interface	Number of electric contact	Refer to the drawing	
		Electric capacity	3 A	
		Quantity of pneumatic port	PT1／2×4 PT1／4×4	
		Hydraulic pressure	0.85 MPa {8.75kg/cm^2}	
		Effective spectional area(cv value)	64mm^2×4 13mm^2×4	
	6. Dimension	Robot Adaptor	Refer to the drawing	
		Tooling Adaptor	Refer to the drawing	
	Option (Special Order)			

3-2 Sensor specification

3-2-1 Face contact sensor

Appellation	Spatter resisting proximity switch
Class	Shield DC double line
Responsing frequency	More than 800 Hz
Operation state	N.O (normal open)
ON/OFF capacity	4~50mA
Source voltage	DC12/24V
Leakage current	Less than 1.0mA
Residual voltage	Less than 3.3V

3-2-2 Chuck /Unchuck sensor

Appellation	Proximity switch
Class	DC double line
Responsing frequency	More than 1 kHz
Operation state	N.O (normal open)
ON/OFF capacity	4~100mA
Source voltage	DC12/24V
Leakage current	Less than 1.0mA
Residual voltage	Less than 3.3V

3-3 Load Allowance and Installation Notes

The specified rating load, moment and torque of XChange XC-120 expresses the active state after the system is installed on a robot.

The system should be set with consideration of inertia and acceleration generated by movements of the robot, so that the maximum load of normal operation will never be over those ratings.

The rating load, moment and torque are explained on figure 2.

carrying load $W = 120kg$

eccentricity $L = \sqrt{lm^2+lt^2}$

allowable bending moment $M = L \times W \times G_R$ (note)

$= 0.61 \times 120 \times 1.5 \times 9.8 \leqq 1076N \cdot m$

(11000kgf·cm)

allowable twisting torque $T = lt \times W \times G_R$ (note)

$= 0.61 \times 120 \times 1.5 \times 9.8 \leqq 1076N \cdot m$

(11000kgf·cm)

(note) G_R represents the acceleration of the Robot at normal motion in automatic operations. G_R value of a robot will be different on each other. Please refer to the manufacture of your robots about the precise G_R value.(Generally, G_R is set between 1.5 to 2.0G)

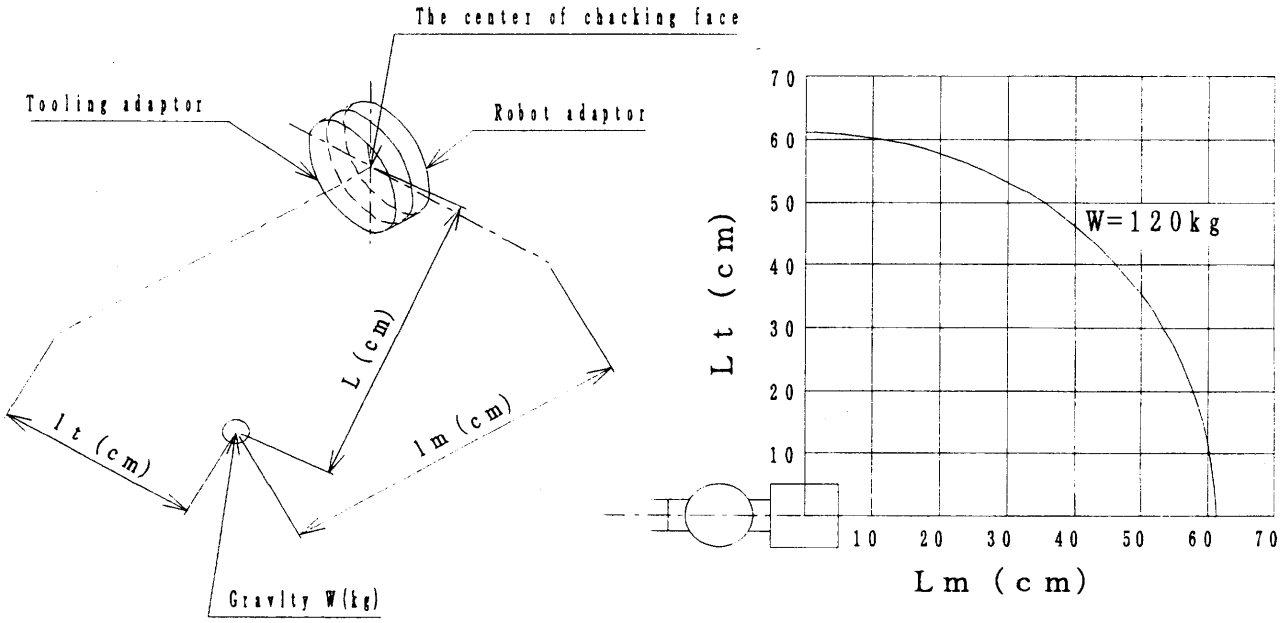
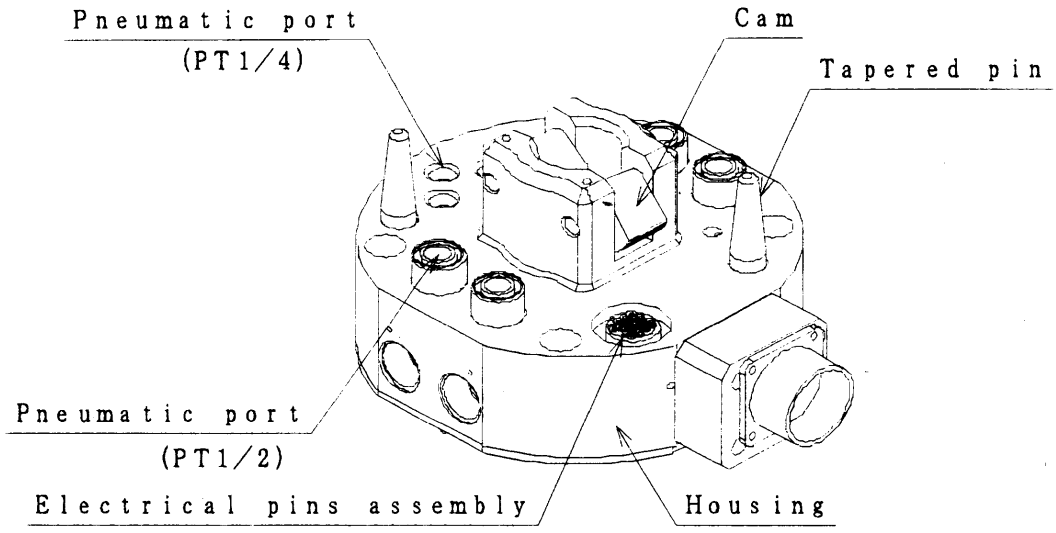


Fig. 2 Definition of load rating

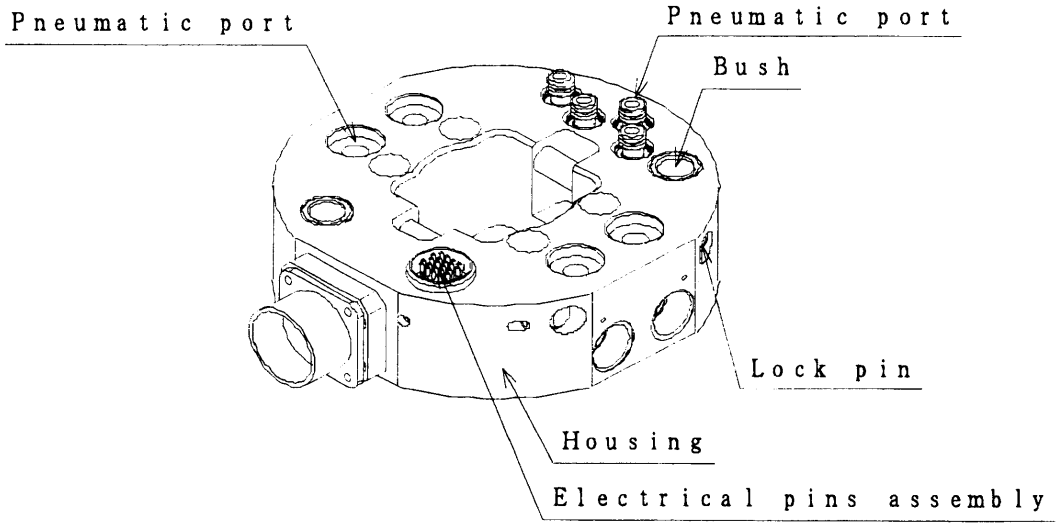
3-4 Power Load Allowance

The XChange XC-120 can carry 13A of the maximum current in all, when it has the standard signal-pin assembly (22 connecting pins). And it can carry 3A, 110V per a pin. However, the current over 3A should not be applied on adjacent pins at the same time when the plural number of user signal pins are used.

4. IDENTIFYING THE



Robot adaptor



Tooling adaptor

Fig.3 identification

5. INSTALLATION

5-1 Robot Adaptor

Robot Adaptor is composed of Robot Adaptor Body and Adaptor Plate. To install Robot Adaptor to your robot, Remove Robot Adaptor Plate from Robot Adaptor Body ,first. Next, machine mating holes in Robot Adaptor Plate and then, attach the plate to your robot. Last, attach Robot Adaptor Body to Adaptor Plate by 6 bolts.
(Refer to fig.1)

Installation Bolts M10 length 50mm × 4
(※ tighten with spring washers)

5-2 Tooling Adaptor

Tooling Adaptor is also composed of Tooling Adaptor Body and Tooling Adaptor Plate. To install Tooling Adaptor, remove Tooling Adaptor Plate from Tooling Adaptor Body. And machine mating holes in Tooling Adaptor Plate. Then, attach the plate to Tooling Adaptor.
(Refer to fig.1)

Installation Bolts M10 length 50mm × 4
(※ tighten with spring washers)

>>>>>>>>>>>>>>>>>>>>CAUTION<<<<<<<<<<<<<<<<<<<<

- EVEN IF A REMOVING OF THE ADAPTOR PLATE FROM THE ADAPTOR BODY IS NOT NECESSARY FOR INSTALLATION, UNSCREW THE INSTALLING BOLTS AND APPLY A COAT OF THE LOCKING TIGHT ON THE BOLTS BEFORE TIGHTENING THEM ON THE BODY AGAIN. MAKE SURE THIS PROCESS BECAUSE THE INSTALLING BOLTS ARE NOT COMPLETELY TIGHTEND WHEN THE SYSTEM IS SHIPPED.
- BE SURE TO COUNTERSINK THE SCREW HOLES DEEP ENOUGH SO THAT THE MOUNTING SCREWS WILL NOT PROJECT BEYOND THE ADAPTOR PLATE SURFACE.

>>

5-3 Chuck/Unchuck Port Connections

Use a solenoid valve for the chucking mechanism ports "CHUCK" and "UNCHUCK." Be sure to take the normally pressurized line (solenoid de-energized) to the port "CHUCK" so that the chucking mechanism will remain in the chucked state in the event of a power failure.

5-4 Wiring

Refer to the appropriate electrical schematic in the Reference Drawings section of this manual and wire your robot inputs and outputs as required by your application through the electrical connector on the body of the Robot Adaptor.
Be sure to incorporate the XChange internal sensors within your robot (line, etc.) control program.
These signals can be accessed at the electrical connector mentioned above.

>>>>>>>>>>>>>>>>>>>>CAUTION<<<<<<<<<<<<<<<<<<<<

・TOOL CHANGER AIR CONNECTIONS.

PLEASE, USE AIR LINES WITH A CONNECTION OF AIR VALVES WHICH IS NOT ALLOWING THE AIR FLOW INTO "UNCHUCK" PORTS WHEN A POWER FAILURE OF THE AIR VALVE OCCURS, ALTHOUGH THE TOOL CHANGER IS PROVIDED WITH A FAIL-SAFE MECHANISM WHICH PREVENTS FALLING OFF OF THE TOOL EVEN IF THE PRESSURE OF AIR LINE IS UNEXPECTEDLY LOST.

>>

5-5 Piping in air port

Please lay piping in the air port in the main body of the robot adaptor according to the specification of work (material handling and gun, etc.).

These ports have placed to the main body of the robot adaptor as a standard specification.

5-6 Cable Settlement

Damage of conectors or connector assy, or breakage of wires may occur when a extreme force of stress is applied. Fix the cables of robot side at a place around the connector of the Robot Adaptor by using spiraltubes or bands, etc.

Make sure that a excessive force is not applied on the cables or hoses during your robot is rotating its hand.

An example of fixing cable with brackets is showing on figure 4.

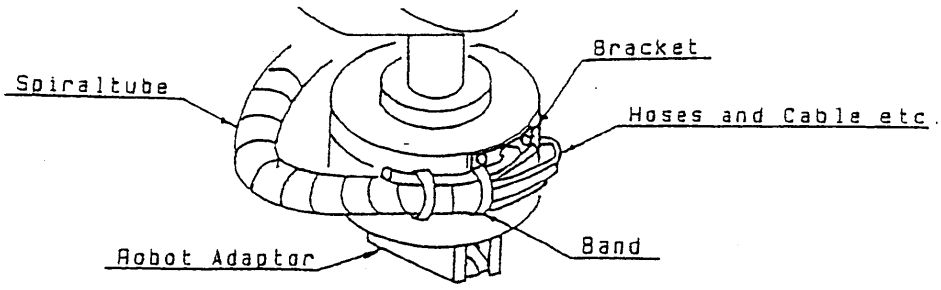


Fig.4 An example of cable fixation

5-7 Tool Changer Installing Considerations

5-7-1 Tool Changer Application

It is suggested that the center of load is on a line which has the same direction of the cam on the tool changer to minimize a gap between the chucking surfaces.

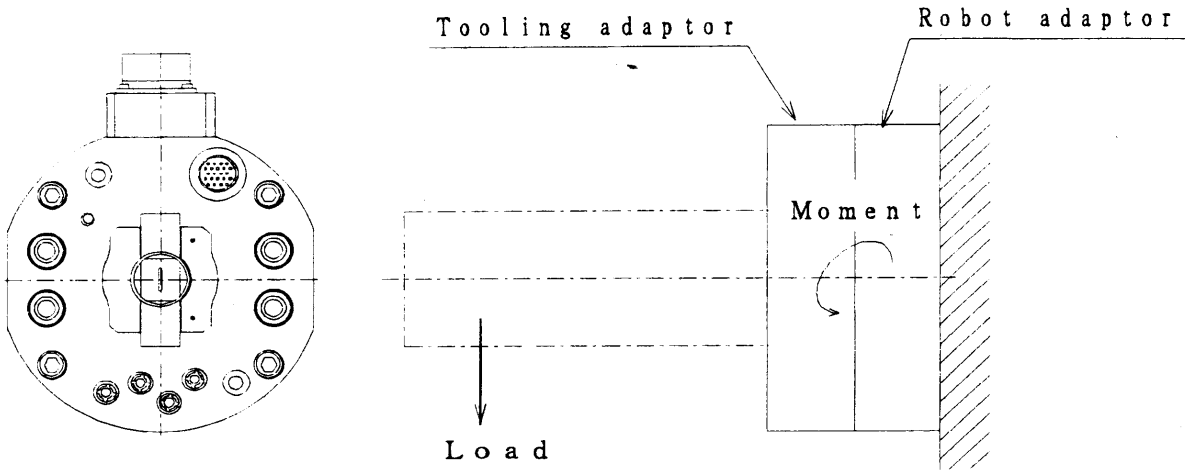


Fig. 5 Tool Changer Installing Direction

5-7-2 Tool Changer Surroundings

The Tool Changer can be manually detached in urgent. The Tool changer can not be detached if any object obstructs an insertion of the jig into the hole, which is provided, on the Tooling Adaptor for detaching.
Beware of that there is no object such as a terminal box on the material handling apparatus around the hole.

6. OPERATION AND PROGRAMMING

6-1 Operation and Programming

This chapter shows the example of the interlock signals surrounding the XC-120.
Exchanging signals, which synchronize the robot with surrounding systems or confirm movements of the robot are necessary to maintain reliance and safety on the XC-120.
The XC-120 has three sensors for detecting movements of itself. Refer to "1.EQUIPMENT DESCRIPTION" For details.

6-2 Basic Flow of The XChange System

Please adjust the interlocks of your robot with refering to this flow chart

Table 1.Basic flow of the XChange system

Robot motion		Input		Robot Output		External input	
		OMEGA4 Chucking Sensor		Controlling solenoid valve		Fixture Limit switch	
		Face	Chuck	Unchuck	Chuck	Unchuck	Tool side
CHUCKING	Waiting position	OFF	OFF	ON	OFF	ON	ON
	↓						
	Moving	↓	↓	↓	↓	↓	↓
	↓						
	Near by chucking position	[↓]	[↓]	[↓]	↓	↓	[↓]
	↓					↓	
	Approaching	[↓]	[↓]	[↓]	↓		[↓]
	↓						
	Chucking position	[ON]	[↓]	[↓]	↓	↓	[↓]
	↓						
	Chuck	[↓]	[ON]	[OFF]	ON	OFF	[↓]
	↓						
	Chucking completion	[↓]	[↓]	[↓]	↓	↓	[↓]
	↓						
	Moving	[↓]	[↓]	[↓]	↓	↓	OFF
	↓						
	Working	[↓]	[↓]	[↓]	↓	↓	↓
UNCHUCKING	Working	[ON]	[ON]	[OFF]	ON	OFF	OFF
	↓						
	Moving	[↓]	[↓]	[↓]	↓	↓	[↓]
	↓						
	Unchuck position	[↓]	[↓]	[↓]	↓	↓	[ON]
	↓						
	Unchuck	[↓]	[OFF]	[ON]	OFF	ON	[↓]
	↓						
	Leaving	[OFF]	[↓]	[↓]	↓	↓	[↓]
	↓						
	Near by unchucking position	[↓]	[↓]	[↓]	↓	↓	[↓]
	↓						
	Moving	↓	↓	↓	↓	↓	↓
	↓						
	Waiting	↓	↓	↓	↓	↓	↓

[ ] Indicates processing condition.

During Robot is working, condition the signal as "Face ON."

6-3 XChange System Interlocks

Setting next four signals are suggested for safe and smooth operation of the Tool Changer.

1) Low Pneumatic Detection Signal
This is a signal, which warns lost of the Tool Changer pneumatics. It stops a manner of the robot when the signal is off.

2) Tool existence detection signal
This is a signal, which detects existence of the tools on the Tool Storage Fixture.
This Interlock signal allows the Unchuck valve open only when all the tools are on the Fixture.
So, it prevents falling off of the tools for the event of unexpected situation.

3) Tool Number Identification Signal
This is a signal, which check the matching between the equiped tool and its programmed number.
So, the signal is useful when several robots chuck with the Material Handling apparatus from the same Tool Storage Fixture.

4) Tool changer Manner Indication Lamp
Setting lamps, which indicate the ON/OFF state of signal such as the Chuck, Unchuck, Face, or User signal are suggested for understanding condition of the system for trouble detection.

6-4 Operation Considerations

The Tool Changer requires that the chucking surfaces of both the Robot and the Tooling Adaptors are in parallel during chucking action. If the interface parallelism is not obtained, chucking or separation difficulties may occur. A compliant Tool Support Fixture is recommended when the parallelism of the Robot or the Fixture can not be obtained.
When the fixture has compliance, teaching the chucking can be done by that the robot presses the Robot Adaptor against the Tooling Adaptor as if both faces of the Adaptors cohere each other (design a compliance with consid erations about such thing as thrust of the robot, weight of the tool, flatness, and discrepancy of the center).
A partial load of the tool or reaction forces on electric connections and ports for pneumatic or cooling water cause to leaning of the Tooling Adaptor followed by twisting of a part of the chucking mechanism at their separation, so that the Adaptors will not separate completely.
In this case, it is necessary for the robot to press the Robot Adaptor against the Tooling Adaptor, as same as the application of chucking, in order to keep a fixed position of the Tooling Adaptor just after the separation. (Preventing lean, shift, etc.) At this time of the separation movement, the tool should be certainly on the Fixture. Teach the separation movement to the robot by smooth retreating of the Robot Adaptor without being trapped.
For avoid these troubles, it is recommended that the Fixture of the Tool Changer is set in horizontal.
But, if a vertical setting is the only plan to be allowed because of available space, be sure with next considerations.

1) No jolting of the Tool Storage Fixture (without compliance).
2) No shifting of the Tool (Material Handling Apparatus, etc.) during chucking/separation movement.
(A structure should be supported at a point as close as possible to the Tooling Adaptor)
3) Satisfying the rigidity of the fixture not to be bent and the anchor bolts of the Fixture should not be pulled out or loosen by pressure application of the Tooling Adaptor during chucking.
4) Wear resistance of the Fixture support parts at the Tooling Side.
Using exchangeable parts are suggested.

WHEN THE TOOLING ADAPTOR IS NOT AT THE FIXED POSITION FOR THE TOOLING STORAGE FIXTURE, DO NOT INADVERTENTLY OPERATE THE CAMS. RELEASING THE TOOLING ADAPTOR WHEN THE TOOLING ADAPTOR IS NOT AT THE FIXED POSITION FOR THE TOOLING STORAGE FIXTURE MAY NOT ONLY DAMAGE THE TOOLING ADAPTOR UNIT AND PERIPHERAL EQUIPMENT BUT ALSO CAUSE HARM TO THE OPERATOR.

When using the XChange system for burring or other material removal operations, be sure to position the Tooling Adaptor Support Fixture so that the Tooling Adaptors are protected from contamination by removed material, coolants, and so forth.

Use a self-open/close cover (XChange Cover) for the Tool Adaptor protection if the Fixture is exposed to bad environment such as spatter, drops and dust.

For oily environment, keep good contact on signal pins by cleaning with blowings, etc.

Nitta Corporation is providing standardized surrounding equipments of the XChange system.

Please ask for such equipments the Fixture, the Xchange Cover, and the Falling off Prevention system, etc. when you need.

6-5 Emergency

6-5-1 Manual Separation of XC-120

① The falling preventions should be strong enough so that the Tooling will not fall.
(Example, suspending Tools by Rope)

② Confirm the air application on "UNCHUCK" port

③ Set screw (Refer to Figure 6) two places of the tool side housing can be detached, and the tool compulsion separate by the thing to begin to beat two lock pins.

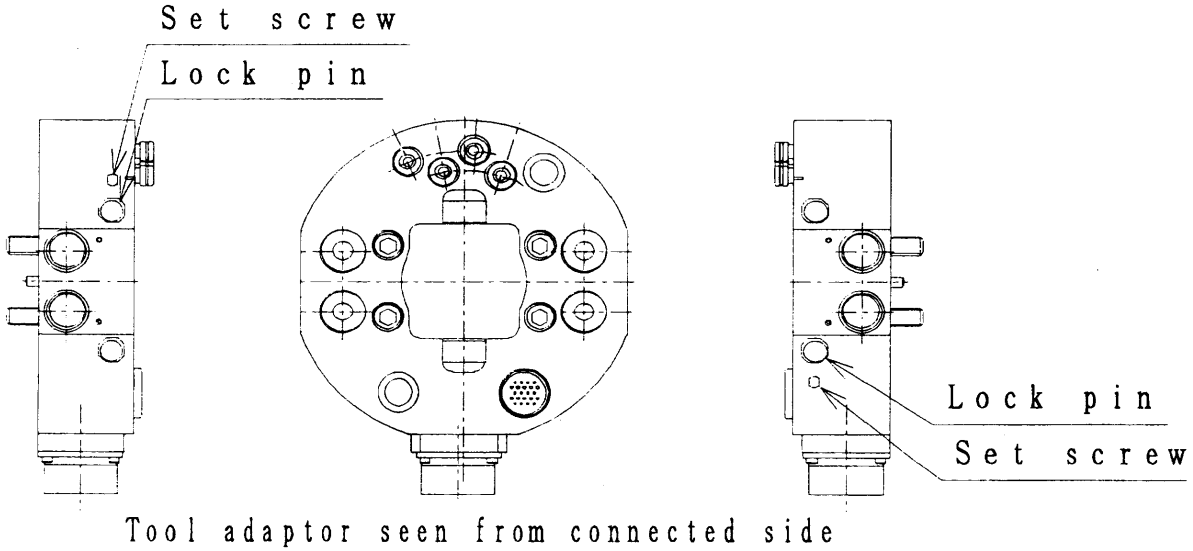


Fig. 6 Manual separation

6-5-2 Collision or Interference Managements

When a robot or the jigs (gun, transformer, etc.) on the robot collides or interfere with the Work, do the checks and the treatments as the following chart.

A collision applies excessive force which cause to deterioration of the durable years on the Xchange system. Therefore, making an earlier periodic inspection is suggested even though the any disorder is not found on the system.

Refer the chapter "7.Maintenance and Inspection" about replacing the body and damaged parts.

Interference, collision treatment

	Inspection points	Method	Disorder management
1	Crack	Visually check	Body replacement
2	Housing distortion	Visually check	Body replacement
3	Bolt looseness	Check the part	Tighten up
4	Cam chuck/unchuck movement and signals	Manually turn ON/OFF the valv e with checking the signal and the movement	Body replacement
5	Gap between chucking surfaces	Visually check the damages on cam surface, lock pin, pivot pin, and interface.	Replacing damaged parts
6	Jolt for rotating	Visually check the damage of taper pin, bushing, the looseness of bolt	Replacing damaged parts
7	Damage on electric signal pin, connector and cable	Visually check check signals on I/O plate	Body replacement or replacing damaged parts

6-5-3 Water splashing treatment

Avoid splashing with water for long period. The system does not matter with little spattering. But, if the system is covered with water, do the checks and treatments showing below.

Water splashing treatment

	Inspection points	Method	Treatment
1	Electric points and proximity switch signals	Check any short on I/O unit side. Visually check standing water	Wipe off with cloth
2	Cam, lock-pin tapered pin	Visually check	Apply grease
3	O-Ring fitting part	Visually check	Apply grease
4	Other points covered with water	Visually check with standing water	Wipe and apply oil on naked part of metal

7. INSPECTION AND MAINTENANCE

7-1 Inspection and Maintenance Schedule

Basic inspections are scheduled as six stages such as daily, monthly, every 3 months, every 6 months, yearly, and overhaul. Inspection points are added as the stage of inspection is proceeding.

Refer the chart on next page about the Inspection points on each stage.

A proper maintenance in time, not only saves wearing of mechanisms but also prevents disorders and secures safety.

Observe periodic Inspections according to the schedule.

This Inspection schedule is based on the one shift system as a standard time so that the schedule should be adjusted depending on the frequency of the robot use.

For example, A monthly inspection should be done by every two weeks (every 10000 use) if the robot is used in the two shift system.

Standard cycle time:

$$1^{use}/_{min} \times 60^{min}/_{hr} \times 8^{hrs}/_{day} \times 22^{day}/_{month}$$

$$=10560\ ^{use}/_{month}$$

7-2 Inspection Spots

Inspections are distinguished with six stages as shown on the chart 1, which indicates points of inspection. Refer to the inspection points, which is mentioned later about maintenance method.

Chart 1, Inspection Points

Period	Inspection points	Method
Daily	Checking signal-pins	Visually
	Checking air leakage	Touching
	Checking parallelism of interface (no gap)	Visually
	Checking foreign matters on the chucking surfaces	Visually
	Lubricating chucking parts and sliding parts	Refer 7-3-1
1 month	Lubricating cams, lock pins, tapered pins, and bushes.	Refer 7-3-1
	Checking tightness of the installation bolts	Refer 5-1,2
	Checking tightness of the electric connector connections	Tighten up
	Checking smoothness of the cams movements	Visually
	Please confirm whether air leaks from main body robot adaptor air port O-ring.	Visually、Touching
3 months	Proximity switch fixation	Touching
	Pivot-pin, lock-pin and housing fixation	Touching
6 months	Cam, Tapered pin, Bushing, and Interface fatigue	Visually
1 year	Cleaning spring pin contact	Refer 7-3-2
	O-ring of the robot tool air port is substituted.	Refer 7-3-3
4 years	Overhaul	Contact NITTA

7-3 Maintenance outlines

Daily maintenance without removing the Adaptors from the system is mentioned in this chapter.

7-3-1 Lubrication on the XC-120 Body

Apply a coating of Epnoc grease (Nihon-Sekiyu), Sumitech 731(Sumikou – Junkatuzai), or equivalent to the sliding surfaces shown in the figure below.(Do not apply molybdenum - based grease)

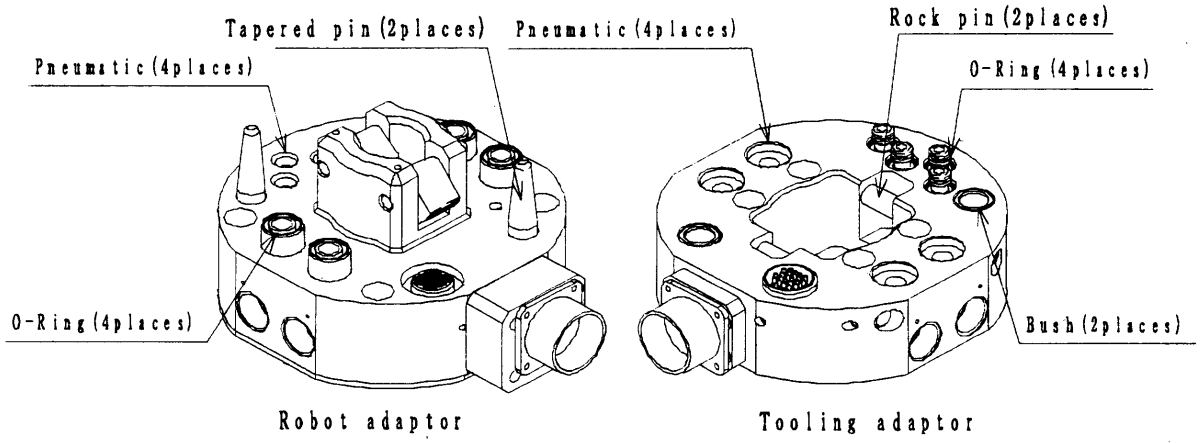


Fig.7 XC-120 Lubricating spots

7-3-2 Replacing electrical contacts of the Tooling Adaptor

Grasp the tip of contact and pull directly upward, the pointed end and its brass receptacle will come off.

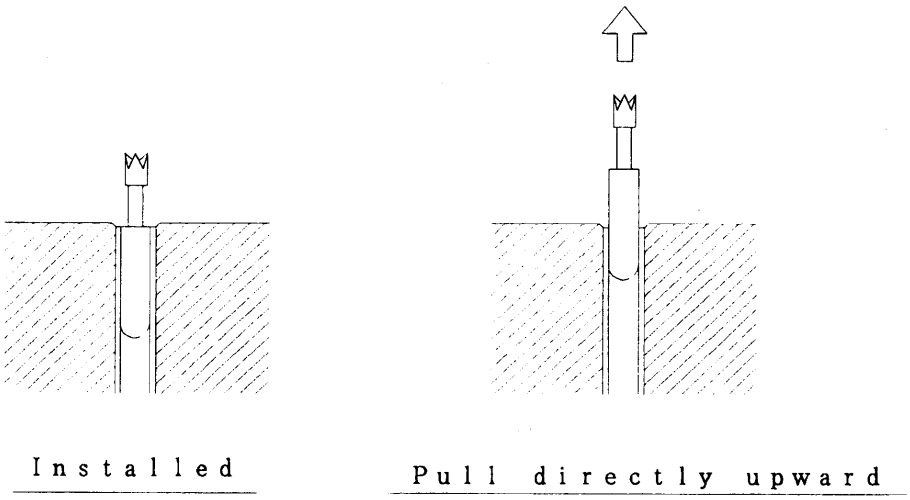


Fig.8 Replacing the electrical contacts of the Tooling Adaptor

This work can be done with hands, but using a tool such as pliers makes it easy.
After removing the damaged contact, a new pin is installed by fully pushing its receptacle into the body of the module. Check height and movement of the pins. If a pin is broken in the receptacle, use a pointed file (ϕ 2~3mm, mid) to pull out the pin.

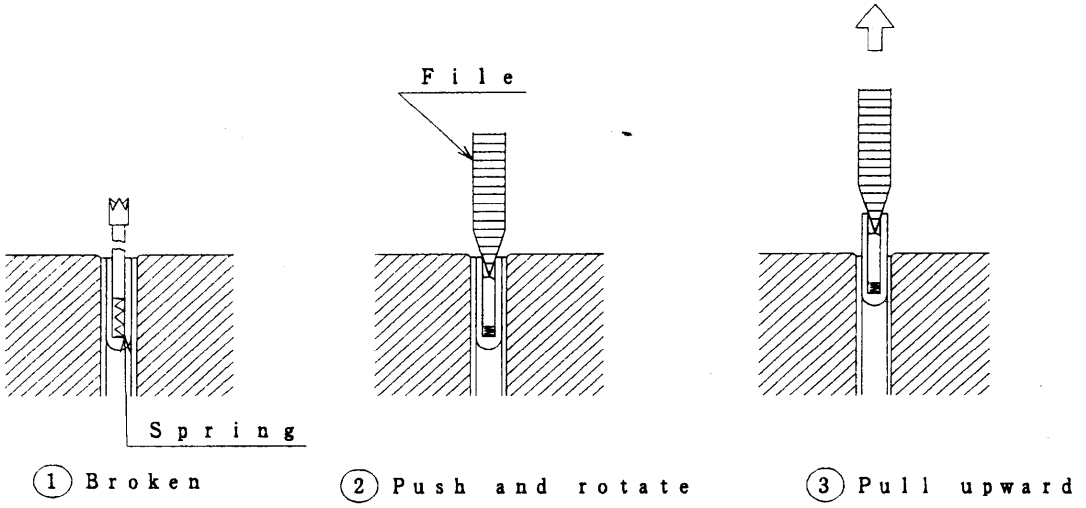


Fig. 9 Removing a broken pin

7-3-3. Replace O-ring for air port

O-ring is installed on connected side for the robot side air port as shown in Figure 11.
Replace O-ring for the new article if there is damage.
Dtach an old O-ring with the needle etc.
At this time, note that the wound does not place to air ASSY.
Sread grease (Epnoc grease or equal goods) when you install O-ring on air ASSY.
Confirm can the twist and not caught to O-ring this time.
There is a possibility that O-ring in air ASSY is cut, and consult our company, when there is an air leakage in connected part.
When O-ring cutting happens frequently, damage, a taper pin in the robot side air part, and wear-out and a defective program of Bush are thought.
(About the program, 6-4 references) .

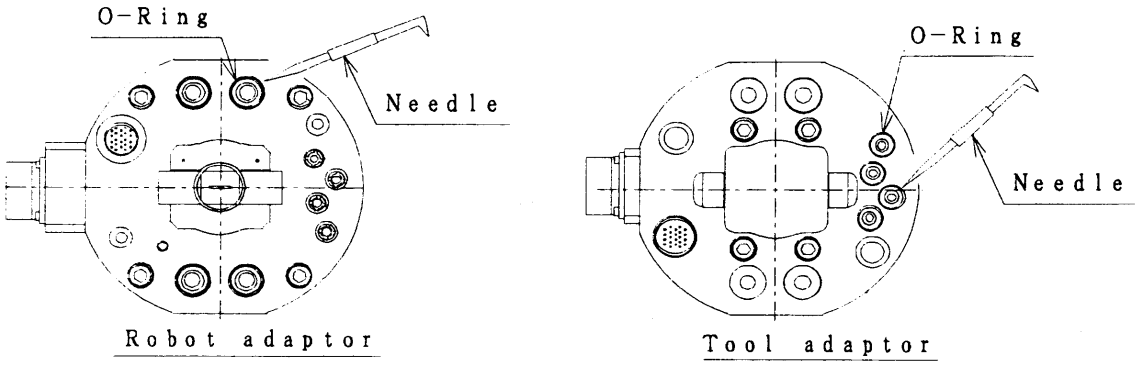


Fig. 11 Replacing Tapered Pins

7-3-4 Checking Chucking Sensor

Apply the power on the chucking sensor by sequencer, etc. Refer with the electrical schematic about connections.

	CHUCK	UNCHUCK	FACE
ATC DISCONNECT (Unchuck)	OFF	ON	OFF
ATC CONNECT (Unchuck)	OFF	ON	ON
ATC CONNECT (Chuck)	ON	OFF	ON

7-3-5 Replacing Tapered Pin

Tapered pins are screwed on the Robot Adaptor body. For removing a tapered pin, take off the installations bolt from inside of the Robot Adaptor first, then strike the pin out with punch, etc.
For assembling, apply a coating of Locktight 242 (medium strength) on the tapered pin before screwing its installation bolt, and also check that the tapered pin project out for 46mm.

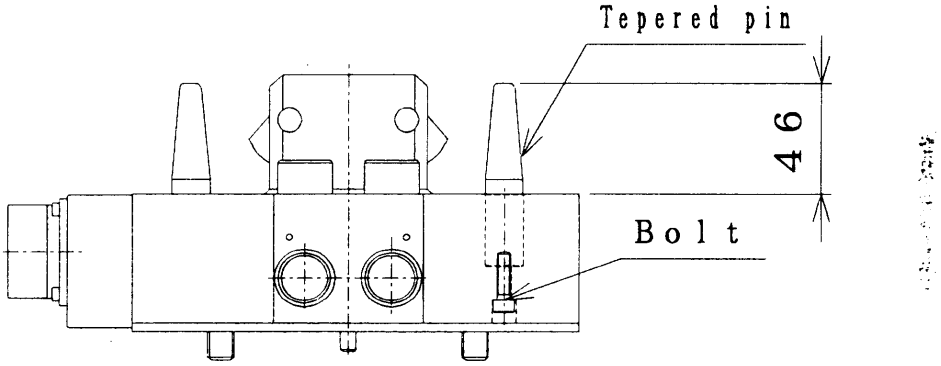


Fig. 12 Replacing Tapered Pins

7-3-6 Replacing Locating Bushings

Locating Bushings are pressed in the Tooling Adaptor body. For replacing, loose the setting screw from side and strike the Bushing out as the following drawing. For assembling, push a new Bushing into the adaptor body completely. Apply a coating of Locktight 242 (mediumstrength) on the setting screw before installation of it.

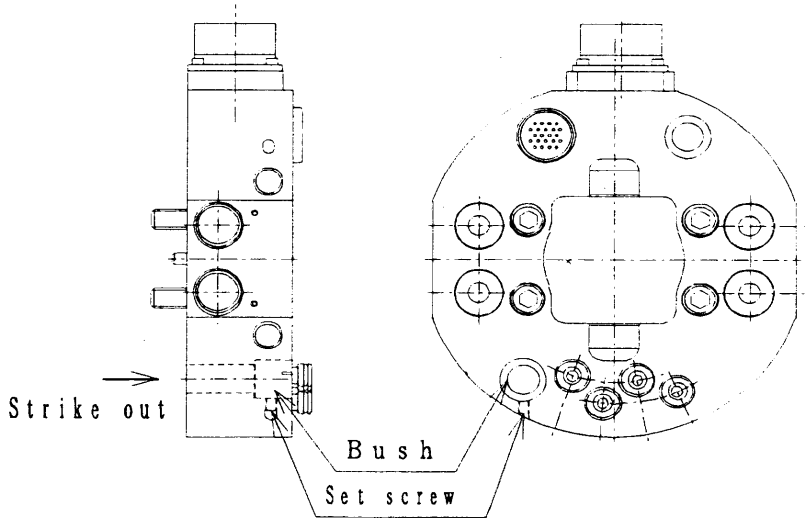


Fig. 13 Replacing Bushing

7-3-7 Replacing Tooling Adaptor Lock-pins

Lock-pins are assembled as slide fit. For Replacing, loosen the setting screw and strike the pin out. Apply small amount of Locktight 242 (mediumstrength) on the setting screw after inserting the new pin. Then, tight the setting screw with adjusting the position of the lock-pin's hole.

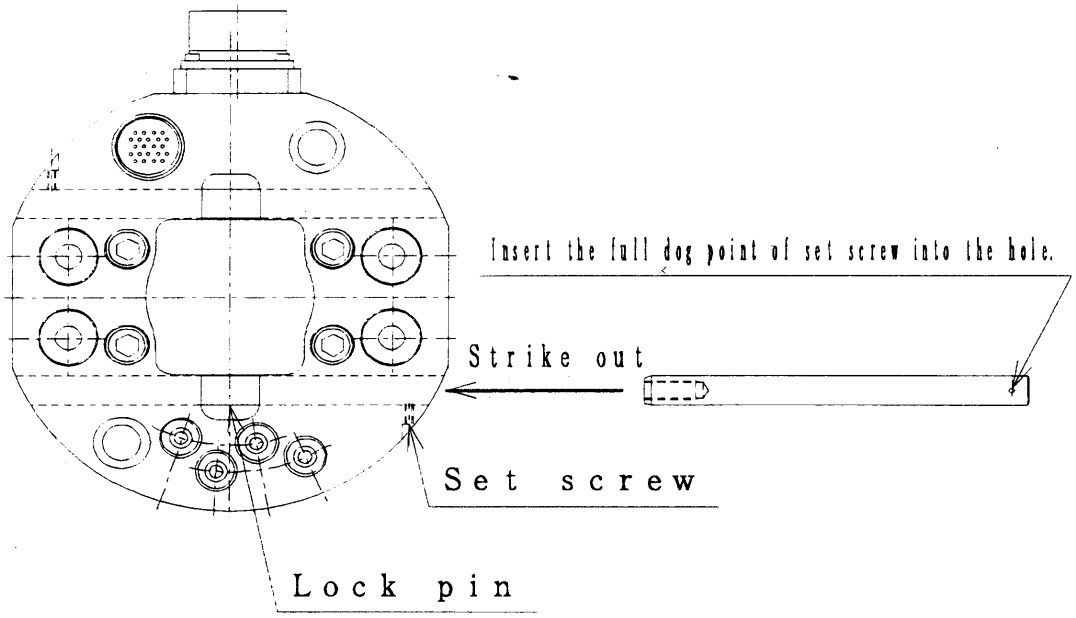


Fig. 14Replacing Lock-pins

8. SPARE PARTS

Preparing spare parts of the OMEGA4 with refering the parts ranks as defined in below is recommended. When purchasing spare parts, please ask us for the parts by their parts code (serial number).

A rank : running stores, frequently replacing parts
B rank : parts of frequently moving mechanism
C rank : important parts

〈XChange XC-120 body (standard version)〉

Rank	Parts name	Count	Material	parts code
A	Signal pin (Tool)	20	——	GCSP2M2L3R
A	O－RING (Tool)	4	Super rubber	AS568-011
C	O－RING (Robot)	4	Super rubber	P-16 #90
C	Cam (Robot)	2	Steel	3BR-002-00
C	Pivot pin (Robot)	2	Steel	3BR-003-00
C	Tapered pin (Robot)	2	Steel	BBR-002-00
C	Bush (Tool)	2	Steel	BBT-002-01
C	Lock pin (Tool)	2	Steel	5BT-002-00

For finding parts code, refer to the appropriate parts locating schematic at the back of this manual.

Note for Replacing Work
Please contact with us, if you find any damage on the changer body (housing, etc.) during parts replacement. Do not readjust or disassemble the proximity switch when replacing parts (shifting of the sensor may cause error).

9. BACK UP SYSTEM

If a Tool Changer is required to rest for long period because of the occasion such as Inspection, Maintenance and Repairation, the Tool Changer can be replaced to the other Changer.
The system is composed of not only body but also various modules. As like the changer, the module can also be replaced by it only (excluding special module).
We suggest preparing the spare parts and the spare body for the backups, to minimize downtime of the line, when the linetact is fast or the parts consumption is much.

10. TROUBLE SHOOTING

10-1 Trouble Factors (Cause Chart)

- The XChange system does not work.
  - Tools do not reposition for chucking.
  - Gap is produced at the chucking surfaces.
  - System is unable to chucked.
  - System is unable to unchucked.
- The XChange system cannot exchange signals.
  - Chuck sensor does not work.
  - Unchuck sensor does not work.
  - Face sensor does not work.
- The XChange system has air leakage.
  - Air leakage at input pneumatic port.
  - Any leakage at liquid port.
- The XChange system gets heat.
  - The Adaptor body gets heat.
- Tool (Guns, Hand,.etc.) does not work.
  - Lost of liquids.
  - Unable to exchange signals through electric signal-pins.

10-2 Trouble phenomena and shooting

10-2-1 The XChange System does not work.

Tools Do Not Reposition for Chucking

1) Check any gap between the Adaptors.	• • • • •	Readjust the teaching.
2) Check any damage or extreme wears of tapered pins.	• • • • •	Replace the tapered pin. (Refer 7-3-5)
3) Check any damage or extreme wear of locating bushings.	• • • • •	Replace the locating bushing. (Refer 7-3-6)
4) Check looseness of installation bolts.	• • • • •	Tighten up the bolt (Refer 5)
5) Check any overload on the body to change its shape.	• • • • •	Contact with our office.
6) Check any load over the rating.	• • • • •	Contact with our office.

Gap is produced at the Chucking Surfaces

1) Check the chucking with proper gap.	• • • • •	Chuck at the position which the FACE sensor is ON.
2) Check any foreign matter on the chucking surfaces.	• • • • •	Remove it.
3) Check any overload on the body to change its shape.	• • • • •	Contact with our office.
4) Check the application of molybdenum based grease.	• • • • •	Immediately change to Epnoc grease (Nihon-Sekiyu) or equivalents.
5) Check the application of hoses.	• • • • •	Remove it.

System is unable to be chucked

1) Check pressure of the pneumatics.	• • • • •	Apply pneumatic at pressure of 0.39~0.85MPa.
2) Check the function of solenoid valves.	• • • • •	Confirm.
3) Check the distance of Adaptors.	• • • • •	Press the Adaptors each other until FACE sensor is ON.
4) Check any object which interferes the function of cams.	• • • • •	Remove it.
5) Check air leakage from the cylinder.	• • • • •	Contact with our office.
6) Check any damage of the cylinder.	• • • • •	Contact with our office.
7) Check any overload on the cam to change its shape	• • • • •	Contact with our office.
8) Check deflection of the Fixture.	• • • • •	Raise rigidity.
9) Check looseness of the Fixture anchor bolts.	• • • • •	Tighten up the bolt.
10) Check the application of hoses.	• • • • •	Remove it.

System is unable to be unchucked

1) Check pressure of the pneumatics.	• • • • •	Apply pneumatic at pressure of 0.39~0.85Mpa
2) Check the function of solenoid valves.	• • • • •	Confirm.
3) Check any excessive partial load on the Tooling Adaptor.	• • • • •	Press the Tooling Adaptor against the Fixture until FACE sensor is ON.
4) Check the function of interlock.	• • • • •	Confirm the circuit.
5) Check any object which interferes the function of cams.	• • • • •	Remove it.
6) Check any overload which changes the shape of cams.	• • • • •	Contact with our office.
7) Check the grease on the cams.	• • • • •	Apply grease.
8) Check the proper force of pressure which is necessary to unchuck the Changer.	• • • • •	Confirm.
9) Check deflection of the Fixture.	• • • • •	Raise the rigidity.
10) Check looseness of the Fixture anchor bolts.	• • • • •	Tighten the bolts.
11) Check the application of hoses.	• • • • •	Remove it.

10-2-2 The XChange system cannot exchange signals

Chuck sensor does not work

1) Check leakage current of the Interlock plate.	• • • • •	Adjust the leakage current to less than 1.0mA.
2) Check the cam position for chucking. (chucking difficulties)	• • • • •	Start the inspection from the hole for manual separation. (Refer 6-5-1)
3) Check any gap between the Robot and Tooling Adaptors.	• • • • •	Chuck at the position which the FACE sensor is ON.
4) Check the cable connection.	• • • • •	Confirm.
5) Check any damage on cables.	• • • • •	Confirm.
6) Check the function of Interlock plate.	• • • • •	Check the circuit.
7) Check any damage or disorder of the sensors.	• • • • •	Contact with our office.
8) Check any water splashing over the Changer (short of the electric lines).	• • • • •	Contact with our office.

Unchuck sensor does not work

1) Check the leakage current of the Interlock plate.	• • • • •	Adjust the leakage current to less than 1.0mA.
2) Check the cam position for unchucking. (unchucking difficulties)	• • • • •	Start the inspection from the hole for manual separation (Refer 6-5-1)
3) Check the cable connection.	• • • • •	Confirm.
4) Check any damage on cables.	• • • • •	Confirm.
5) Check the function of Interlock plate.	• • • • •	Check the circuit.
6) Check any damage or disorder of the sensors.	• • • • •	Contact with our office.
7) Check any water splashing over the Changer (short of the electric lines).	• • • • •	Contact with our office.

Face sensor does not work

1) Check jolting of installation.	• • • • •	Contact with our office.
2) Check leakage current of the Interlock plate	• • • • •	Adjust the leakage current to less than 1.0mA.
3) Check any metal substances on the sensors	• • • • •	Remove it.
4) Check any gap over 0.5mm between the Robot and Tooling Adaptors.	• • • • •	Readjust the teaching.
5) Check the cable connection.	• • • • •	Confirm.
6) Check any damage on cables.	• • • • •	Confirm.
7) Check the function of Interlock plate.	• • • • •	Check the circuit.
8) Check any damage or disorder of the sensors.	• • • • •	Contact with our office.
9) Check any water splashing over the Changer (short on electric lines).	• • • • •	Contact with our office.

10-2-3 The XChange system has air leakage

Air leakage at input pneumatic port

1) Check pressure of pneumatics.	• • • • •	Apply pneumatic at pressure of 0.39～0.85MPa.
2) Check connection of the one touch joint of pneumatic.	• • • • •	Confirm.
3) Check the applications of hoses.	• • • • •	Confirm.

When there is an air leakage from the air port

1) Isn't there damage in O-ring of the robot tool adaptor?	• • • • •	Replace O-ring (7-3-3 references).
2) Is the fitting for piping surely installed?	• • • • •	Confirm the fitting.
3) Has the hose been surely inserted?	• • • • •	Confirm the hose.
4) Isn't there gap on suiting respect of the robot adaptor and the tool adaptor when XChange is connected?	• • • • •	Connect surely (Turn on the face sensor).

10-2-4 The XChange system gets heat

The Adaptor body gets heat

1) Check the high temperature in atmosphere.	• • • • •	Keep away from heat
2) Check the electric power on signal spring-pin.	• • • • •	Keep power application within the rating

10-2-5 Tool (Gun, Hand, etc.) does not work

When air is not supplied

1) Is pressure normal?	• • • • •	Supply pressure 6kg/cm2 or less.
2) Does an electromagnetic valve work?	• • • • •	Confirm an electromagnetic valve.
3) Are the robot adaptor and the tool adaptor surely connected?	• • • • •	Cnnect surely(Turn on connected confirmation edge sensor).
4) Is there an extreme neither bending nor can twist in the hose?	• • • • •	Cnfirm the hose.
5) Is not robot tool adaptor O-ring damaged?	• • • • •	Replace O-ring.
6) Is the port part which the robot adaptor uses corresponding to the port part of the tool adaptor?	• • • • •	Confirm the port.
7) Is not the tool damaged?	• • • • •	Confirm the tool.

Unable to exchange signals through electric signal-pins

1) check transmissions of signals to electric signal-pins.	• • • • •	Check with tester, etc.
2) Check any damage on tools.	• • • • •	Confirm.
3) Check extreme bending or twisting on the signal cables.	• • • • •	Confirm.
4) Check the connection of connectors.	• • • • •	Connect completely.
5) Check the chucking of the Robot and Tooling Adaptor.	• • • • •	Chuck completely. (FACE sensor should be ON)
6) Check any damage on the connector assy.	• • • • •	Contact with our office.
7) Check any foreign matter or damage on Signal pins.	• • • • •	Replace electric signal-pin. (Refer 7-3-2)
8) Check any projection or dent of electric signal-pin. (height of pins should be the same).	• • • • •	Contact with our office.
9) Check the movement of electric signal-pin (movement should be smooth).	• • • • •	Replace electric signal-pins. (Refer 7-3-2)