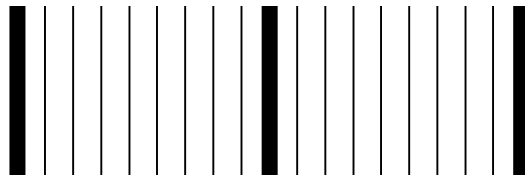
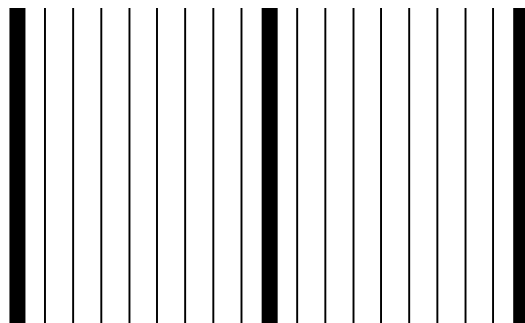


Ref. No. TTD-2000-1011
December, 2000

BOBBIN CHANGER TECHNICAL DOCUMENT



(2000.12)



FOREWORD

The technical document covering electric circuit diagrams and voltage check points of each harness in addition to operation and adjustment procedure of a bobbin changer is completed. Please use this book as the reference for correct bobbin changer operation as well as the guide book for after sale services.

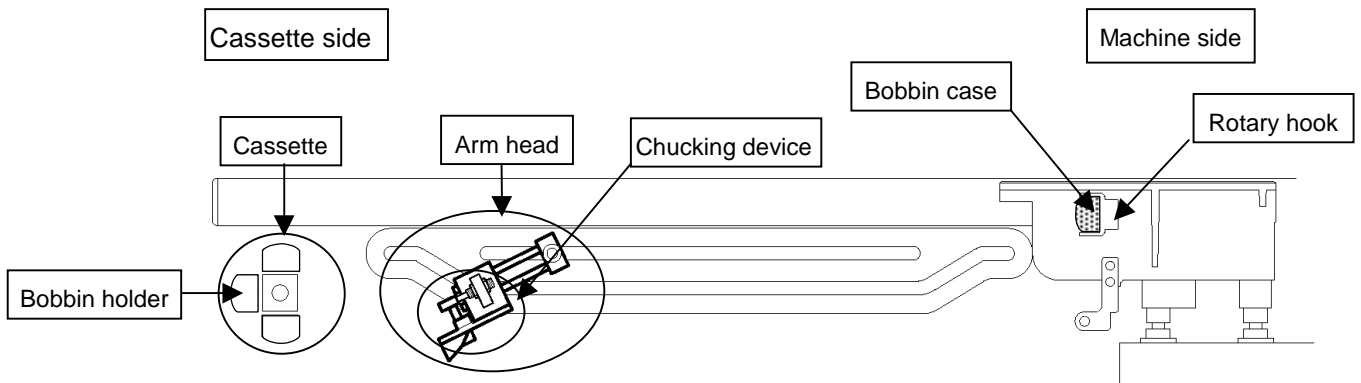
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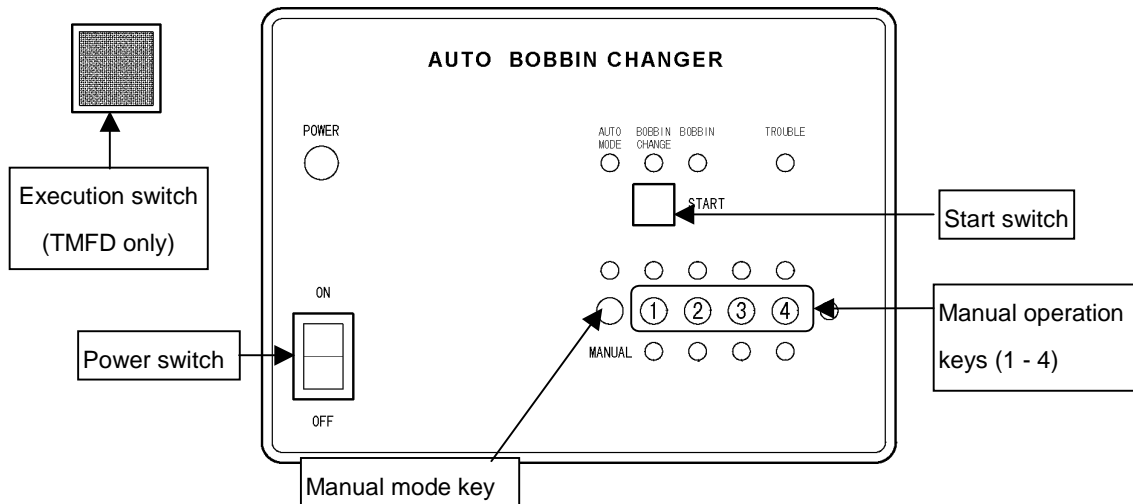
A. OPERATION INSTRUCTIONS AND ADJUSTMENT PROCEDURE

1. Part Names of Bobbin Changer

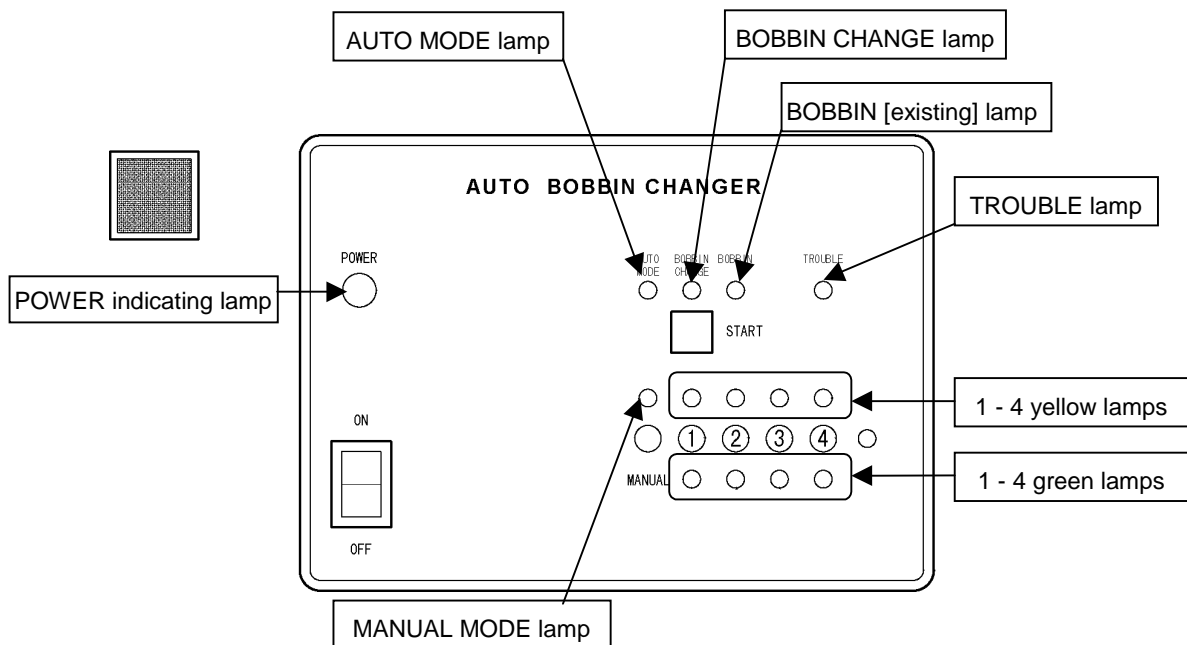
(1) Drive System



(2) Switches on the Control Box



(3) Indicating Lamps on the Control Box



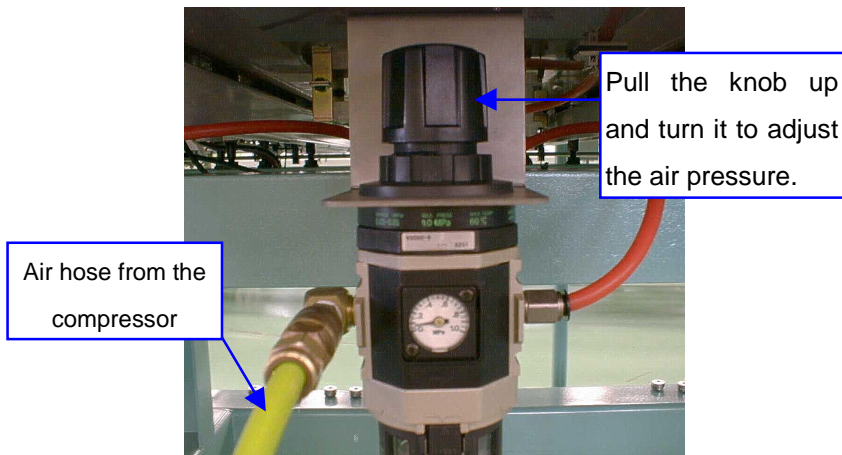
2. Connecting to the Compressor and Adjusting the Pressure

The bobbin changer operates pneumatically using the compressed air supplied by the compressor. Adjust the pressure of the compressed air to be supplied to the bobbin changer by the regulator.

- (1) Connect the air hose of the compressor to the filter/regulator at the machine.
- (2) Pull up the regulator knob and turn it CW/CCW to adjust the air pressure.

Pressure specification: 4 - 5 kgf/cm²

After obtaining the correct pressure, push down the knob.

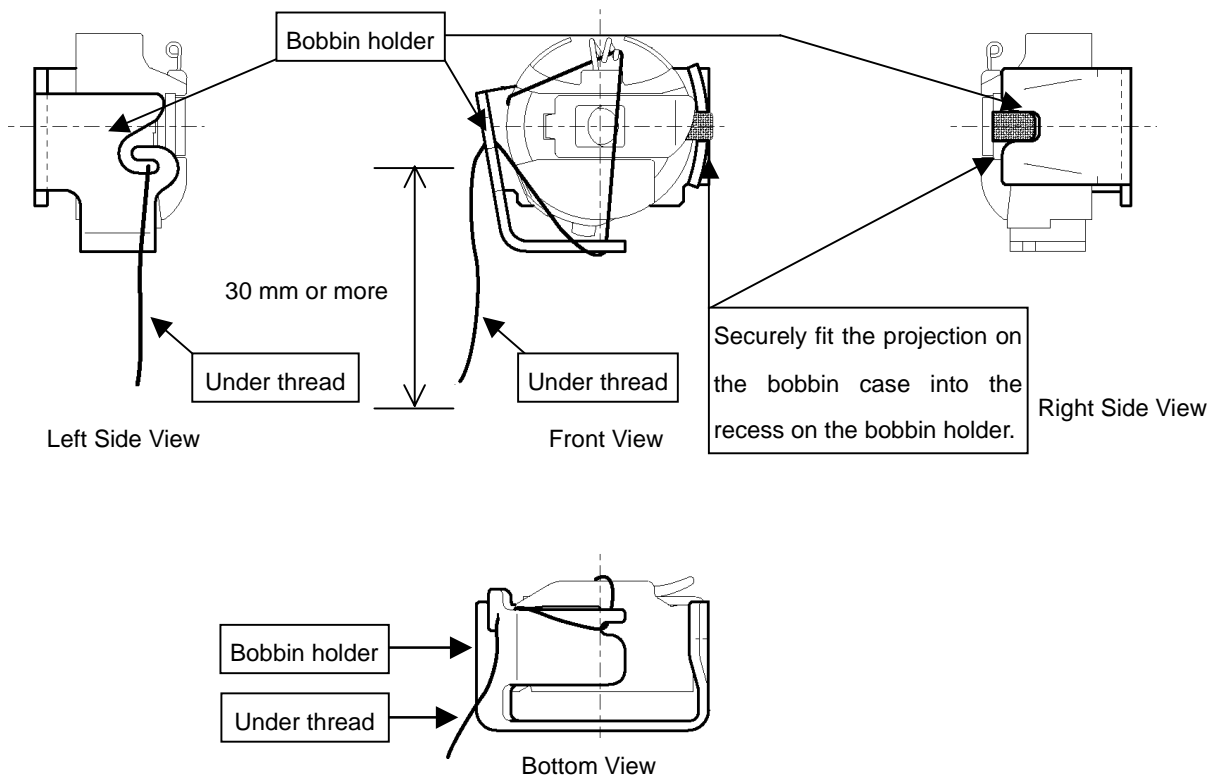


External View of Regulator

3. Setting the Bobbin Case

Set the under thread and a bobbin case in the bobbin holder correctly as shown below.

If they are not set correctly, sewing will not start correctly or chucking error (the chucking device fails to hold a bobbin) will take place.



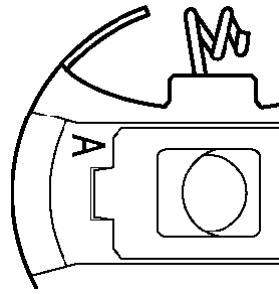
4. Bobbin Case

With the bobbin changer, usual bobbin cases cannot be used but the special bobbin cases must be used. The bobbin cases to be used with the bobbin changer are classified into two types - bobbin case for paper bobbins and bobbin case for aluminum bobbin.

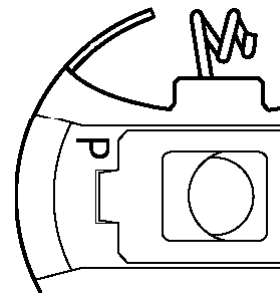
Make sure to use the bobbin case that meets the bobbin to be used.

(1) Identifying Bobbin Types

An alphabetic letter, representing a bobbin type, is stamped at the front of a bobbin case.



A: For aluminum bobbin



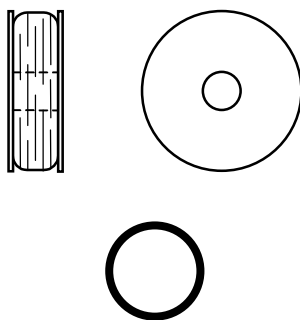
P: For paper

Note: If you use a bobbin case that has no such bobbin type identification letter, i.e., a usual bobbin case, it will cause a chucking error (the chucking device fails to hold a bobbin) and further operation error of the bobbin changer. Therefore, never use a usual bobbin.

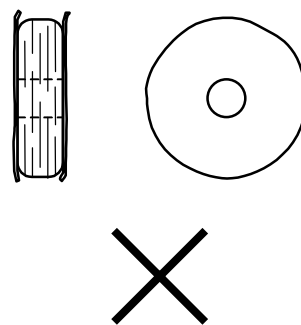
5. Paper Bobbins

Do not use a paper bobbin with deteriorated or deformed side bases since such a paper bobbin may cause disengagement of a bobbin from the chucking device during bobbin changing operation. Note that a paper bobbin that has no side bases must not be used.

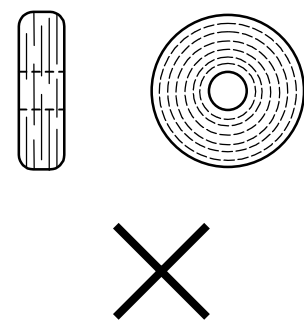
Normal paper bobbin



Paper bobbin with deteriorated or deformed side bases



Paper bobbin without side bases



6. Automatic Mode Operation

In usual operation, the bobbin changer should be operated in the automatic mode.

For the locations of the bobbin changer parts, switches, etc., refer to 1. "Part Names of Bobbin Changer".

(1) Operation Procedure

- 1) Make sure that the bobbin is correctly set in the bobbin holder at the cassette section.
- 2) At the control box, make sure that the four green lamps, the AUTO MODE lamp and the BOBBIN [existing] lamp are all lit with the TROUBLE lamp OFF.
- 3) Press the START switch at the control box. Press the execution switch after that (only for TMFD).
- 4) The bobbin changer starts operating to change bobbins.
- 5) Change the used bobbin, unloaded from the machine, with a new one.

(2) Cautions

- 1) Before starting the operation in the automatic mode, make sure to check that the lamps at the control box are ON or OFF correctly.
- 2) Do not operate switches etc. on the control box while the machine is operating.
- 3) When you change a bobbin while the machine is running, do so only in the state the machine is stopped.

Also keep in mind that bobbin change operation differs depending on machine models.

TMFD:

In bobbin change operation, thread is not automatically trimmed.

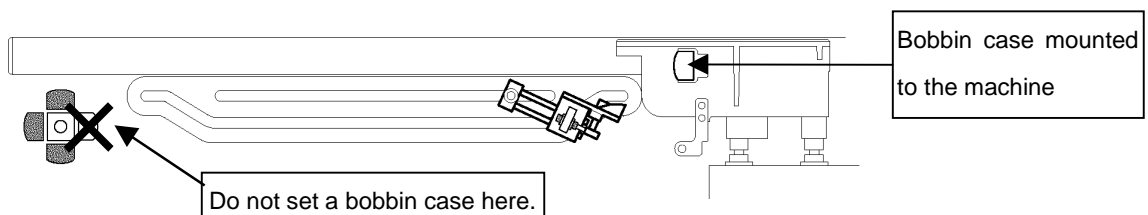
Trim the thread manually before performing bobbin change operation. If the bobbin changer starts operating although the thread has not been trimmed, the thread will entangle on the bobbin changer drive system to make arm head operation heavy, resulting in machine damages.

TMFX and TMFN:

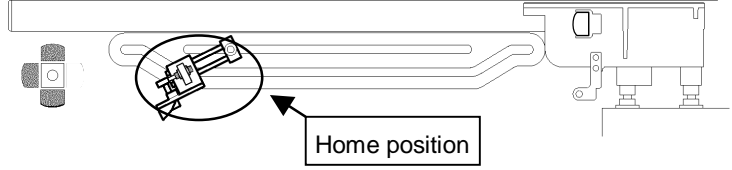
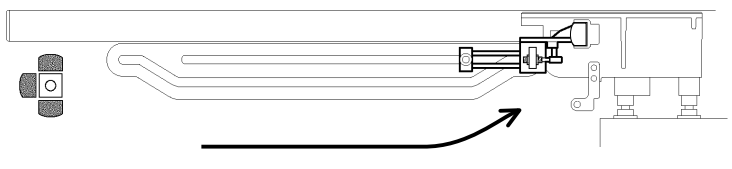
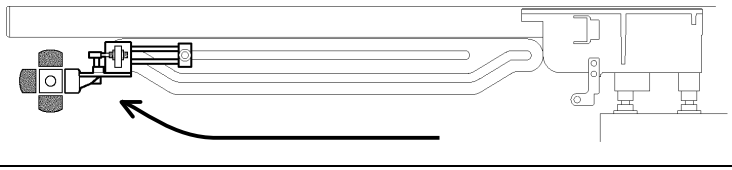
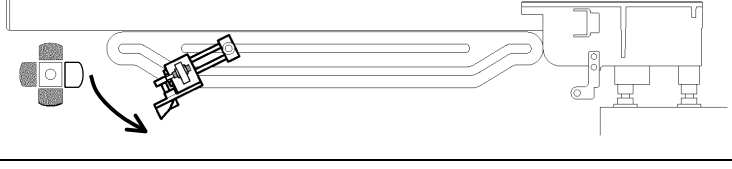
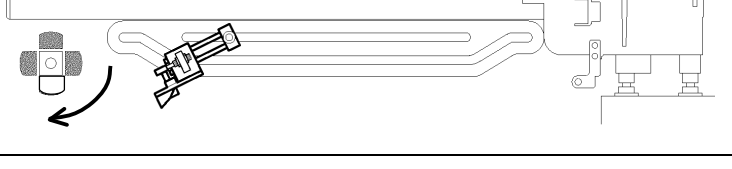
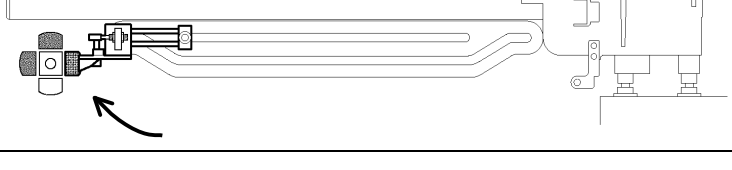
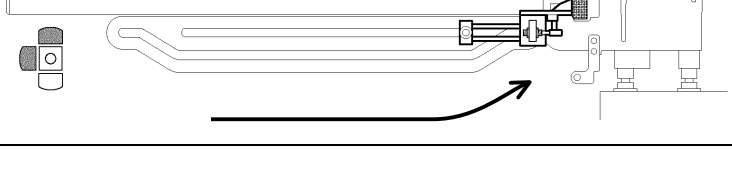
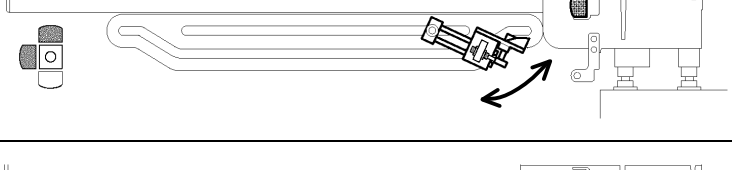
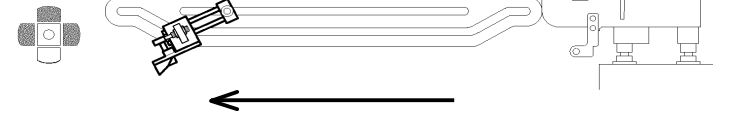
Bobbin change operation includes thread trimming (under thread only).

If you operate the bobbin changer after manually trimming the thread, bobbin change operation starts skipping the automatic thread trimming step.

- 4) If a bobbin case is mounted to the rotary hook at the machine side, do not set a bobbin case at the rear end side of the bobbin holder.



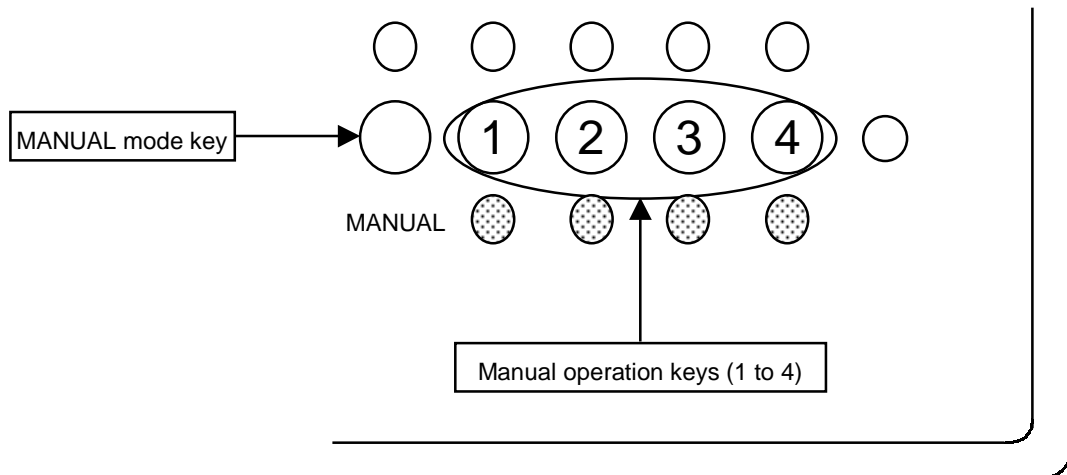
(3) Bobbin Changer Operating Sequence in Automatic Mode

Step	Operation	Arm Head Movements
1	Starting movements from the cassette side retraction position (home position)	 <p>The diagram shows the arm head assembly in its retracted position on the left side of the machine. A callout box labeled "Home position" points to the assembly. A small arrow indicates a slight upward movement of the arm head.</p>
2	Chucking the bobbin case at the machine side	 <p>The arm head assembly is shown moving from the left towards the right side of the machine. A curved arrow below the arm indicates its forward movement.</p>
3	Transferring the bobbin case from the machine side to the cassette side	 <p>The arm head assembly is shown moving from the right side back towards the left side of the machine. A curved arrow below the arm indicates its backward movement.</p>
4	Temporarily returning to the cassette side retraction position (home position)	 <p>The arm head assembly is shown returning to its retracted position on the left side. A curved arrow below the arm indicates its backward movement.</p>
5	The cassette rotates 90 deg.	 <p>The arm head assembly is shown in its retracted position. A curved arrow below the cassette indicates a 90-degree rotation.</p>
6	Chucking a new bobbin case in the cassette side	 <p>The arm head assembly is shown moving forward from its retracted position towards the cassette. A curved arrow below the arm indicates its forward movement.</p>
7	Setting the bobbin case in the machine side rotary hook	 <p>The arm head assembly is shown moving from the left towards the right side of the machine. A curved arrow below the arm indicates its forward movement.</p>
8	Repeating movements between the machine side retraction position and the machine side bobbin catching position once	 <p>The arm head assembly is shown moving from the right side back towards the left side of the machine. A curved arrow below the arm indicates its backward movement.</p>
9	Returning to the home position (end of bobbin change operation)	 <p>The arm head assembly is shown moving from the right side back towards the left side of the machine. A straight arrow below the arm indicates its backward movement.</p>

7. Manual Mode Operation

(1) Changing the Operation Mode from Automatic to Manual

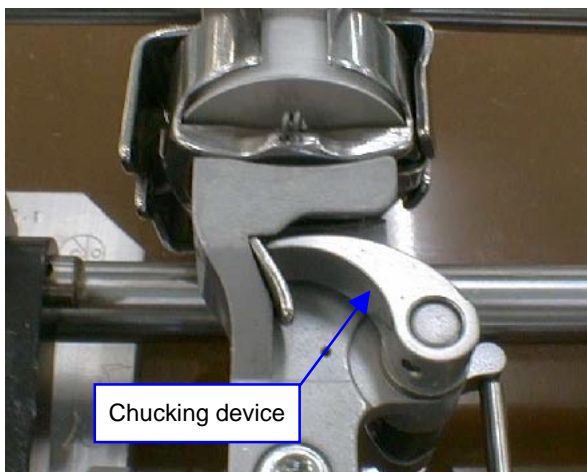
Usually, the bobbin changer is in the automatic operation mode. To change the operation mode to the manual mode, press the MANUAL mode key at the control box. After the selection of the manual mode, manual operation keys 1 to 4 are enabled.



(2) Manual Operation

1) Opening/closing the chucking device

Press the [1] key at the control box to operate (open/close) the chucking device. The chucking device holds a bobbin case when it closes and releases a bobbin case when it opens.



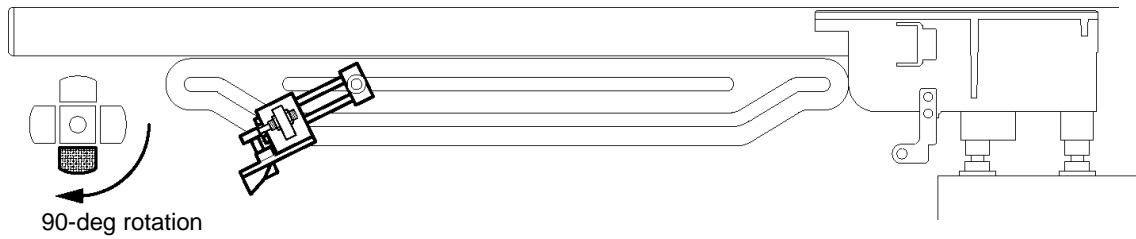
Chucking Device Closed
(Bobbin case is held by the chucking device)



Chucking Device Opened
(Bobbin case is released)

2) Rotating the cassette

The cassette rotates in 90 degree intervals each time the [2] key at the control box is pressed.

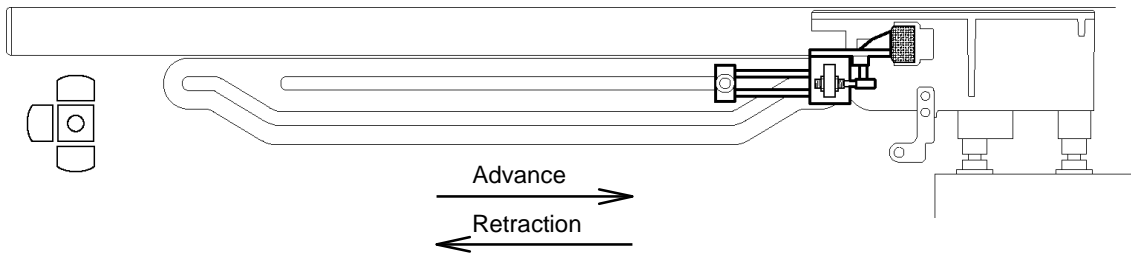


3) Advancing/retracting the arm head

Arm head movements are controlled by the [3] and [4] keys at the control box.

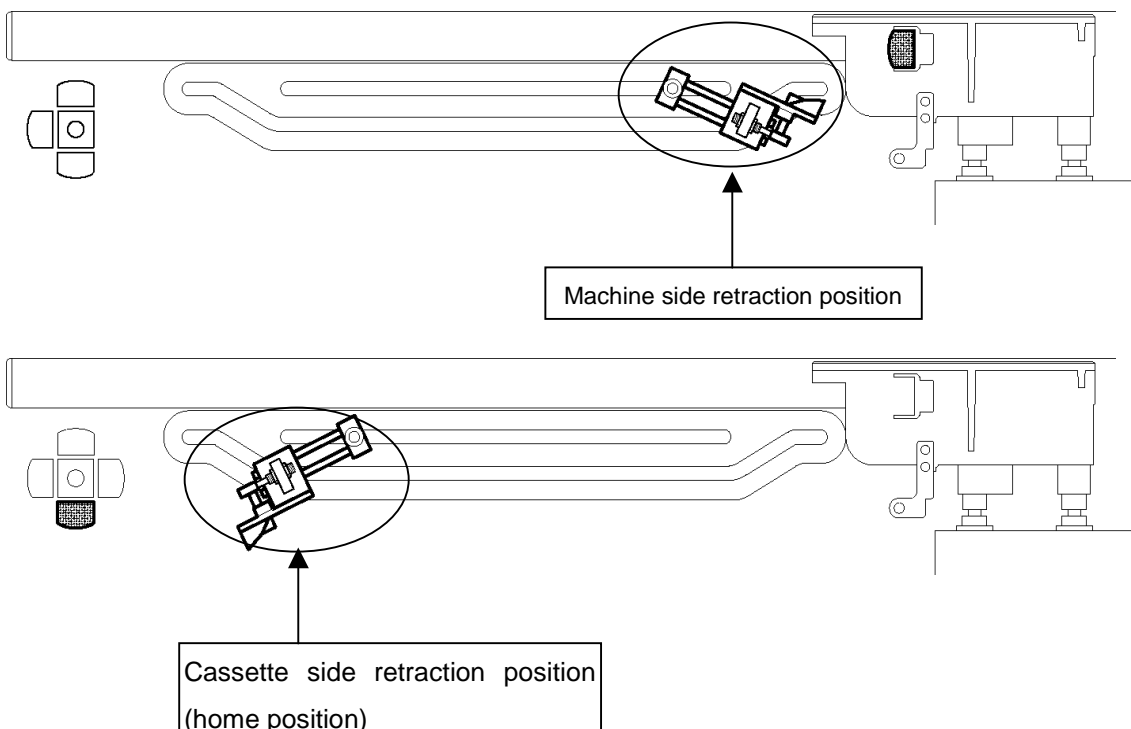
· [3] key:

The arm head advances or retracts at each pressing of the [3] key.

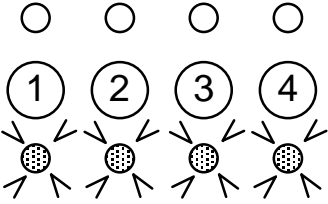
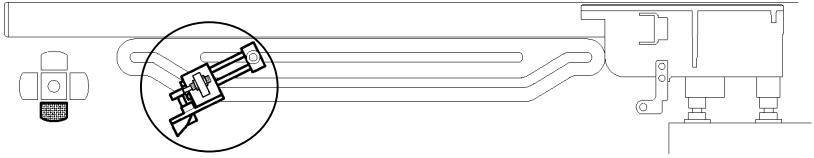
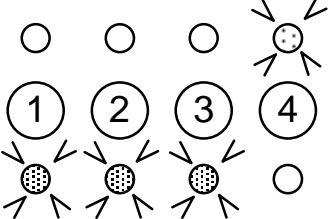
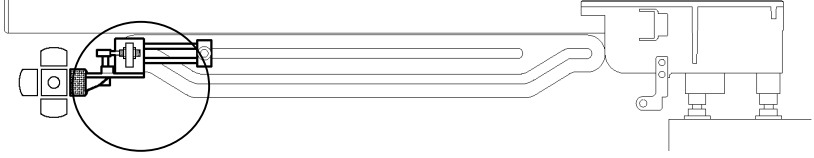
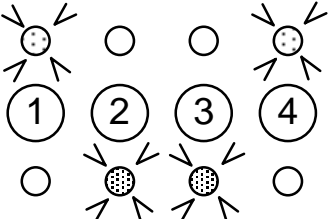

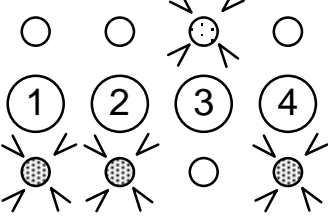
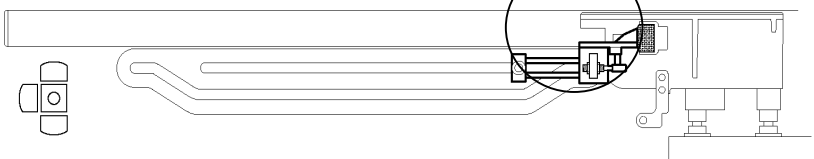
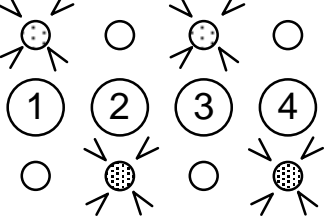
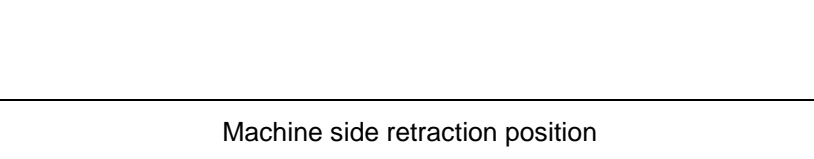


· [4] key:

The arm head moves to the retraction position nearest from the present position at each pressing of the [4] key.



(3) Indication of Arm Head Position by Lamps

Lamp ON/OFF Status	Arm Head Position
<p data-bbox="263 235 525 264">Lamp ON/OFF Status</p> 	<p data-bbox="715 271 1289 300">Cassette side retraction position (home position)</p> 
<p data-bbox="252 551 544 580">Chucking device opened</p> 	<p data-bbox="778 701 1225 730">At the cassette side chucking position</p> 
<p data-bbox="252 831 544 860">Chucking device closed</p> 	<p data-bbox="778 1256 1225 1285">At the machine side chucking position</p> 
<p data-bbox="252 1111 544 1140">Chucking device opened</p> 	<p data-bbox="810 1671 1193 1700">Machine side retraction position</p> 
<p data-bbox="252 1391 544 1420">Chucking device closed</p> 	<p data-bbox="810 1671 1193 1700">Machine side retraction position</p> 

8. Bobbin Changer Adjustments

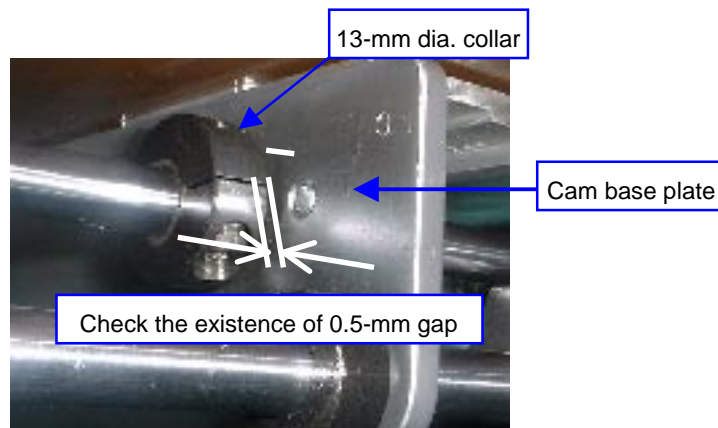
Check and adjust the bobbin changer in the manner indicated below at the setting up of the machine, after the adjustment of the rotary hook, or if the bobbin changer operates incorrectly. For the part names of the bobbin changer, refer to 1. "Part Names of Bobbin Changer" and for the operation of the chucking device and the arm head, refer to item (2) of 7. "Manual Mode Operation".

(1) Checkups before Turning the Air ON

1) Checking the arm head movements

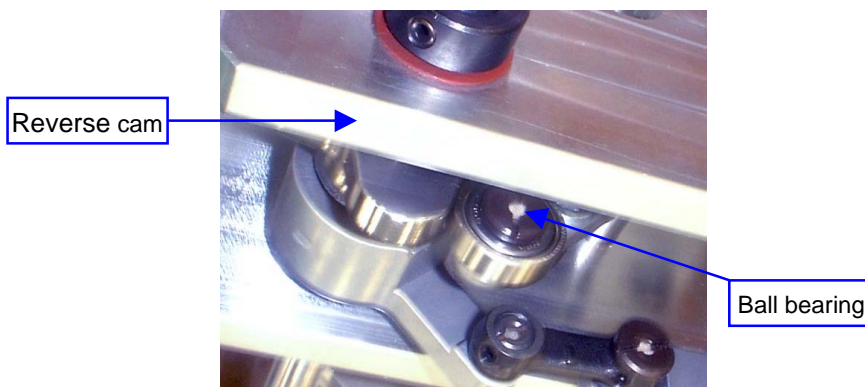
Manually move the arm head to check if the arm head moves smoothly. If the arm head fails to move smoothly, check the items indicated below.

- Check the cam base plate whether or not waste thread is entangled on it.
- Check the air tube if it is caught by the cover, etc.
- Check the gap between the 13-mm dia. collar and the cam base plate if the amount of gap is approximately 0.5 mm.



2) Checking the cassette drive system

Make sure that the reverse cam and the ball bearing are securely set in the cassette drive system.



(2) Adjusting the Arm Head

When you make position adjustments at the machine side, detach the needle plate before adjustments.

- 1) After attaching the bobbin case to the rotary hook, turn on the power for the bobbin changer.
- 2) Manually move the arm head to the machine side chucking position to chuck a bobbin case.

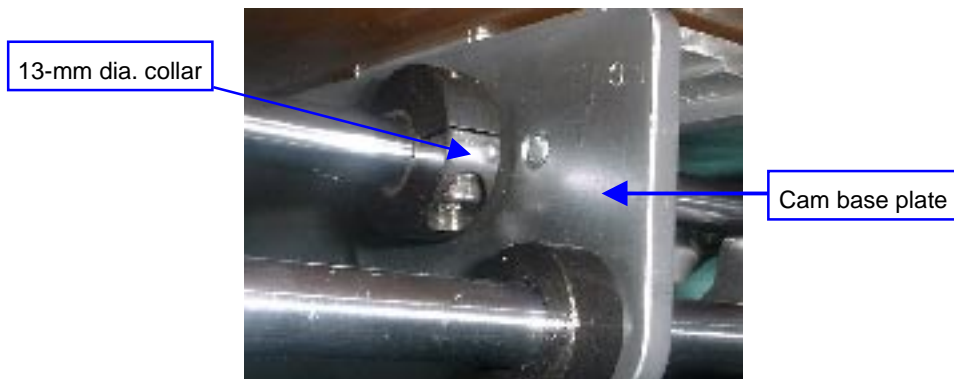


Bobbin Case - Chucked at the Machine Side

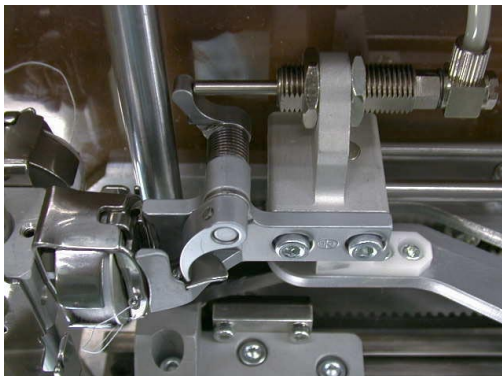
- 3) If the arm head fails to hold the bobbin even if the chucking device is closed or if the arm head operated manually after opening the chucking device fails to move smoothly, make adjustments for each head by following the procedure shown below.

Adjustment procedure:

- a) Loosen the 13-mm dia. collar at the side of the cam base plate.



- b) Move the drive block by hand in the state the bobbin case is chucked to check if the bobbin case is smoothly fit at both the cassette side and the machine side. (Confirmation of alignment)



Cassette Side



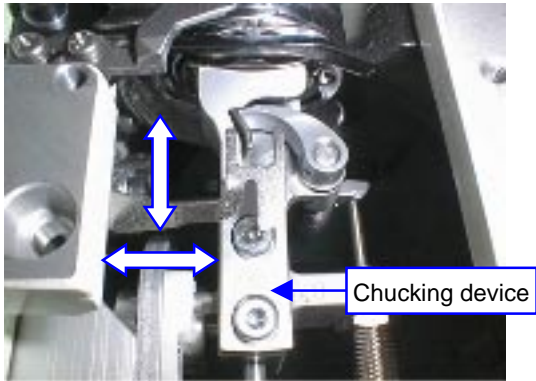
Machine Side

- c) If alignment is not correct, make position adjustments at both the machine side and the cassette side.

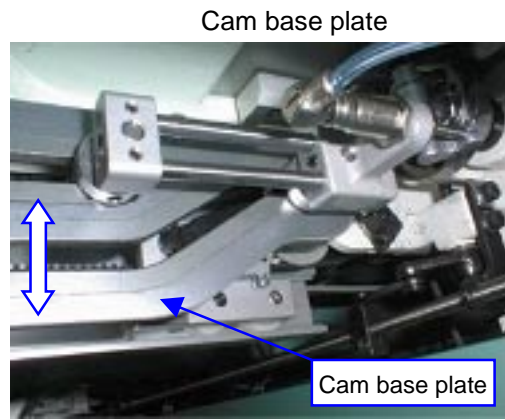
Alignment adjustment at the machine side:

Adjustment in the back/forth, and right/left direction: Chucking device

Adjustment in the vertical direction:



Chucking Device - Adjustment in the Back/Forth and Right/Left

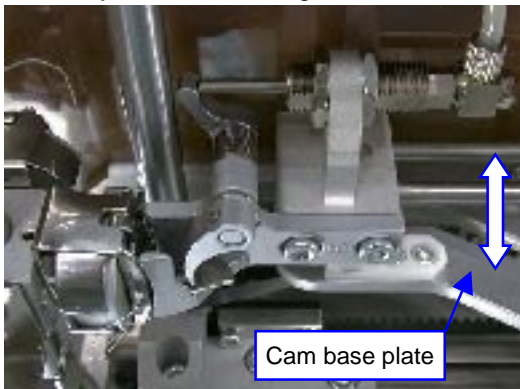


Cam Base Plate - Adjustment in the Vertical Direction

Alignment adjustment at the cassette side:

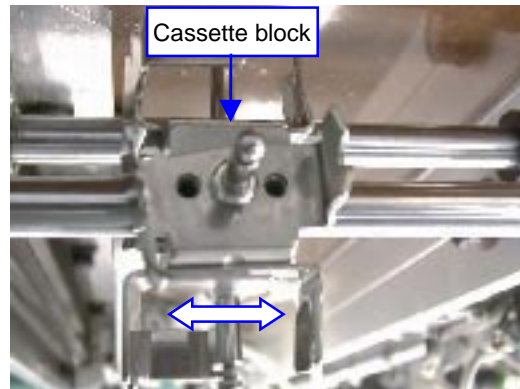
Adjustment in the vertical direction: Cam base plate

Adjustment in the right/left direction:



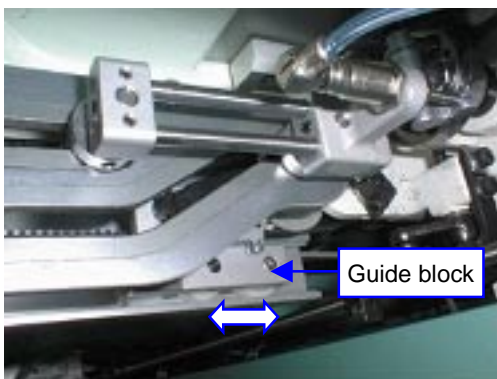
Cam Base Plate - Adjustment in the Vertical Direction

Cassette block

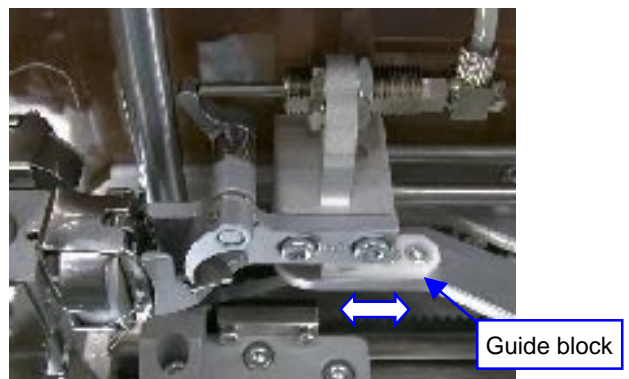


Cassette Block - Adjustment in the Right/Left

- d) After confirming the alignment, carry out fine adjustment in the back and forth direction using the guide block at the machine side and the cassette side.

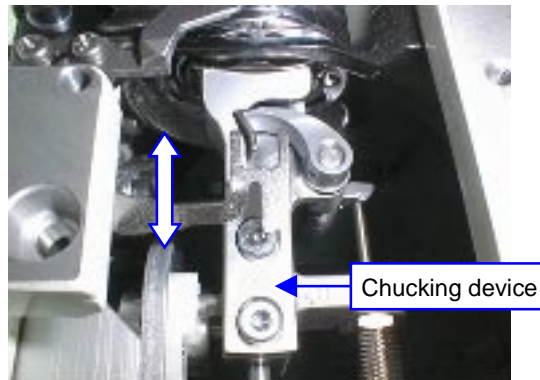


Machine Side Guide Block



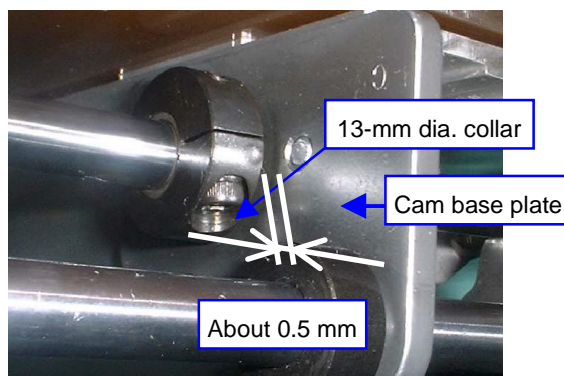
Cassette Side Guide Block

- e) If positional error cannot be corrected by fine adjustment in step d), readjust in the back and forth direction using the chucking device.

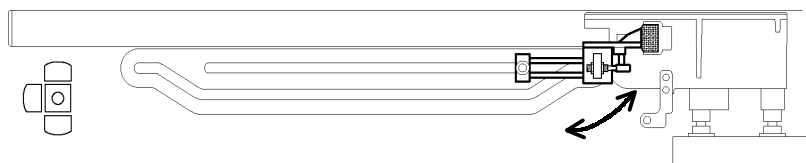


Chucking Device - Adjustment in the Back/Forth Direction

- f) Clamp the 13-mm dia. collar by securing about 0.5-mm gap to the assembly base.

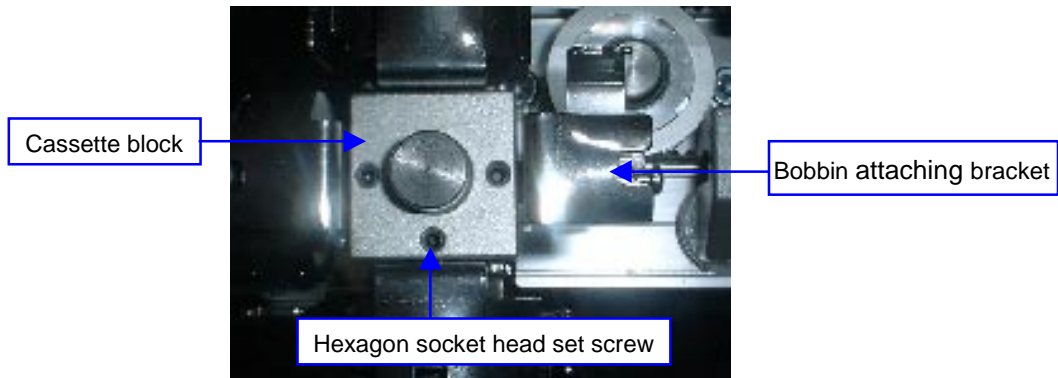


- 4) Repeat opening and closing of the chucking device in manual operation to check that the bobbin case is correctly held.
- 5) Move the arm head to the machine side retraction position and to the cassette side retraction position alternately in manual operation to check that the bobbin case is correctly fit in the rotary hook.



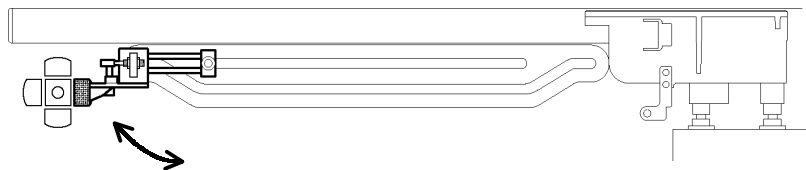
(3) Adjustment at the Cassette Side

- 1) After turning ON the power at the control box, set the bobbin case in the cassette.
- 2) Manually move the chucking device to the cassette chucking position to chuck the bobbin case.
- 3) If the arm head fails to chuck the bobbin case or if the arm head when moved manually fails to move smoothly, adjust the bobbin attaching bracket inclination and/or its position in the back/for the direction. After loosening the hexagon socket head set screw, adjust the bobbin attaching bracket so that the chucking device comes into light contact with the bobbin case.



Adjusting Bobbin attaching Bracket Inclination
and Position in Back/Forth Direction

- 4) Repeat opening and closing of the chucking device in manual operation to check that the bobbin case is correctly held.
- 5) Move the arm head to the machine side retraction position and to the cassette side retraction position (home position) alternately in manual operation to check that the bobbin case is correctly set in the bobbin holder.



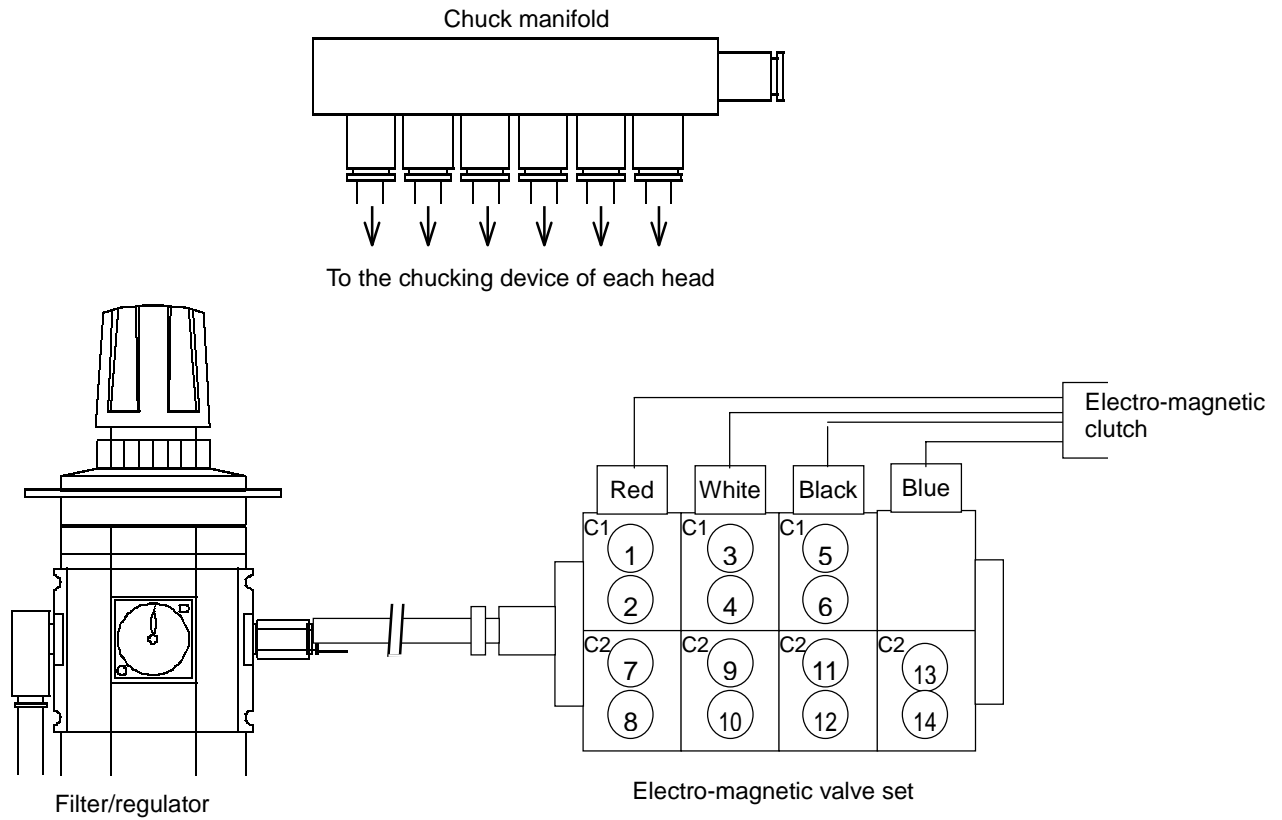
(4) Operation Check

After completing the adjustment, check the bobbin changer operation in automatic mode.

(5) Tube piping

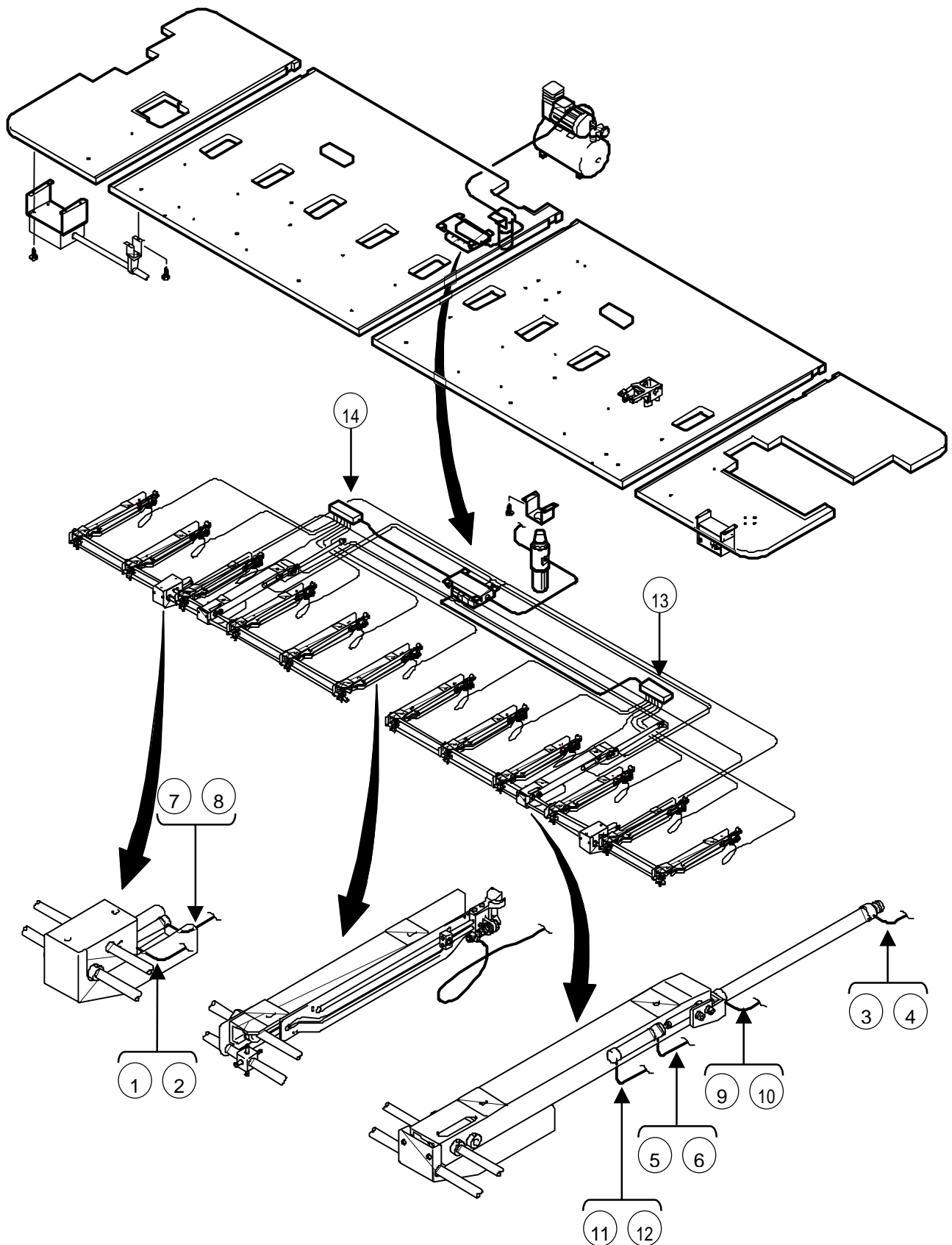
Tubes are connected to the drive systems from the electro-magnetic valve set.

1) Tube connection



No.	Cable Destination	Tube
① ②	Cassette drive system (advance)	4-mm dia., white
③ ④	Arm head drive system (advance in rotation)	6-mm dia., black
⑤ ⑥	Arm head drive system (retraction)	4-mm dia., black
⑦ ⑧	Cassette drive system (retraction)	4-mm dia., black
⑨ ⑩	Arm head drive system (retraction in rotation)	6-mm dia., white
⑪ ⑫	Arm head drive system (advance)	4-mm dia., white
⑬ ⑭	Chuck manifold	8-mm dia., black

2) Tube connection destination



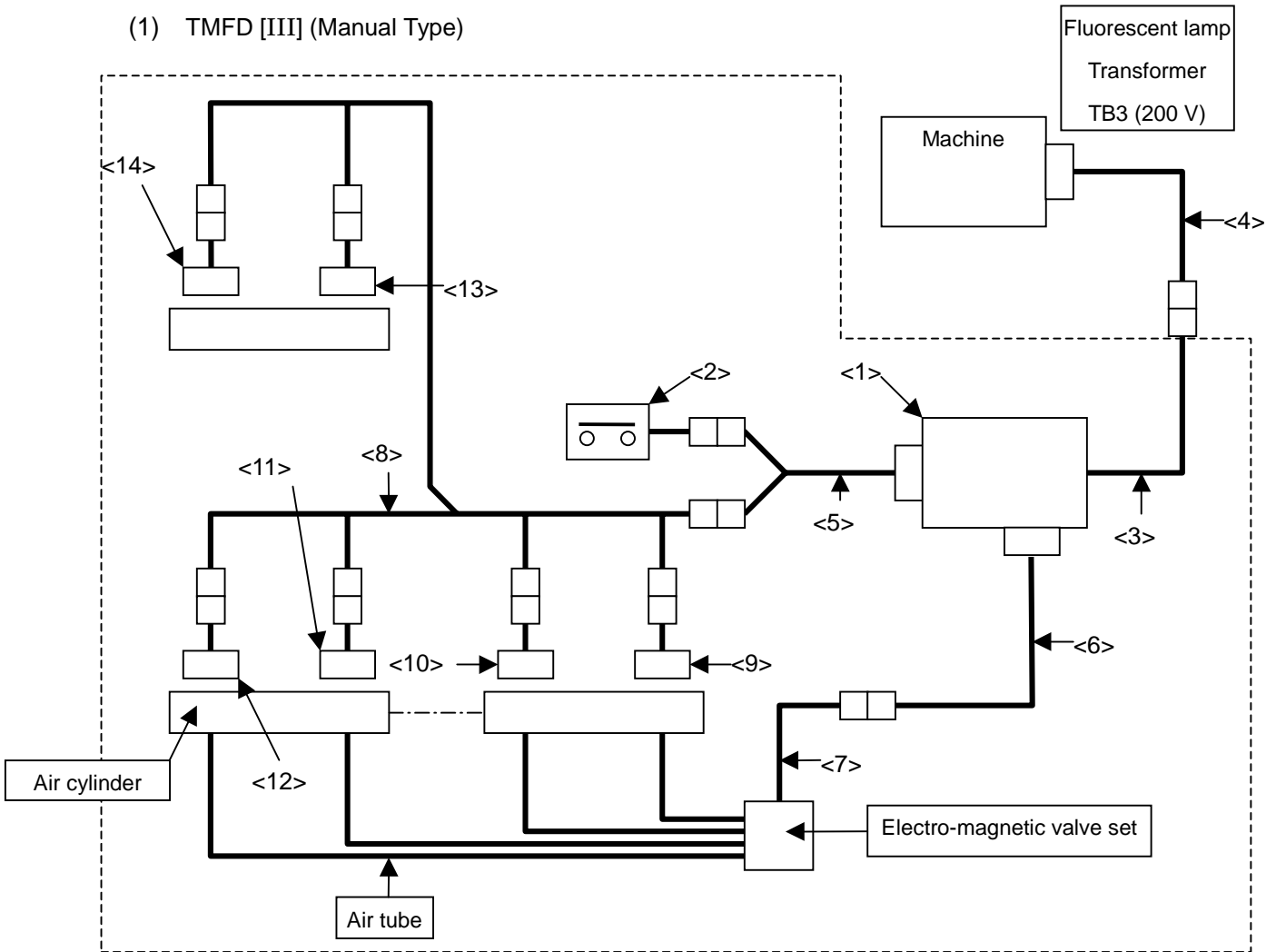
9. Troubleshooting

Trouble	Cause	Corrective Action
Only a bobbin falls while the arm head is moving.	Thread trimming operation has not been performed. (TMFD only)	Perform manual thread trimming.
Error at the start of sewing, after bobbin change.	A bobbin case is not set in the bobbin holder correctly.	Set the bobbin case in the bobbin holder correctly by referring to 1-3 "Setting the Bobbin Case".
A bobbin case falls while the arm head is moving, or the chucking device fails to hold a bobbin.	Arm head stroke is insufficient.	Adjust the bobbin changer by referring to items (2) and (3) in 8. "Bobbin Changer Adjustments".
	Cassette position is offset right or left a little.	
	Air is not supplied sufficiently.	Check the air pressure. The air pressure should be 4 - 5 kgf/cm ² .

B. ELECTRICAL PARTS

1. Electric Circuit Diagrams

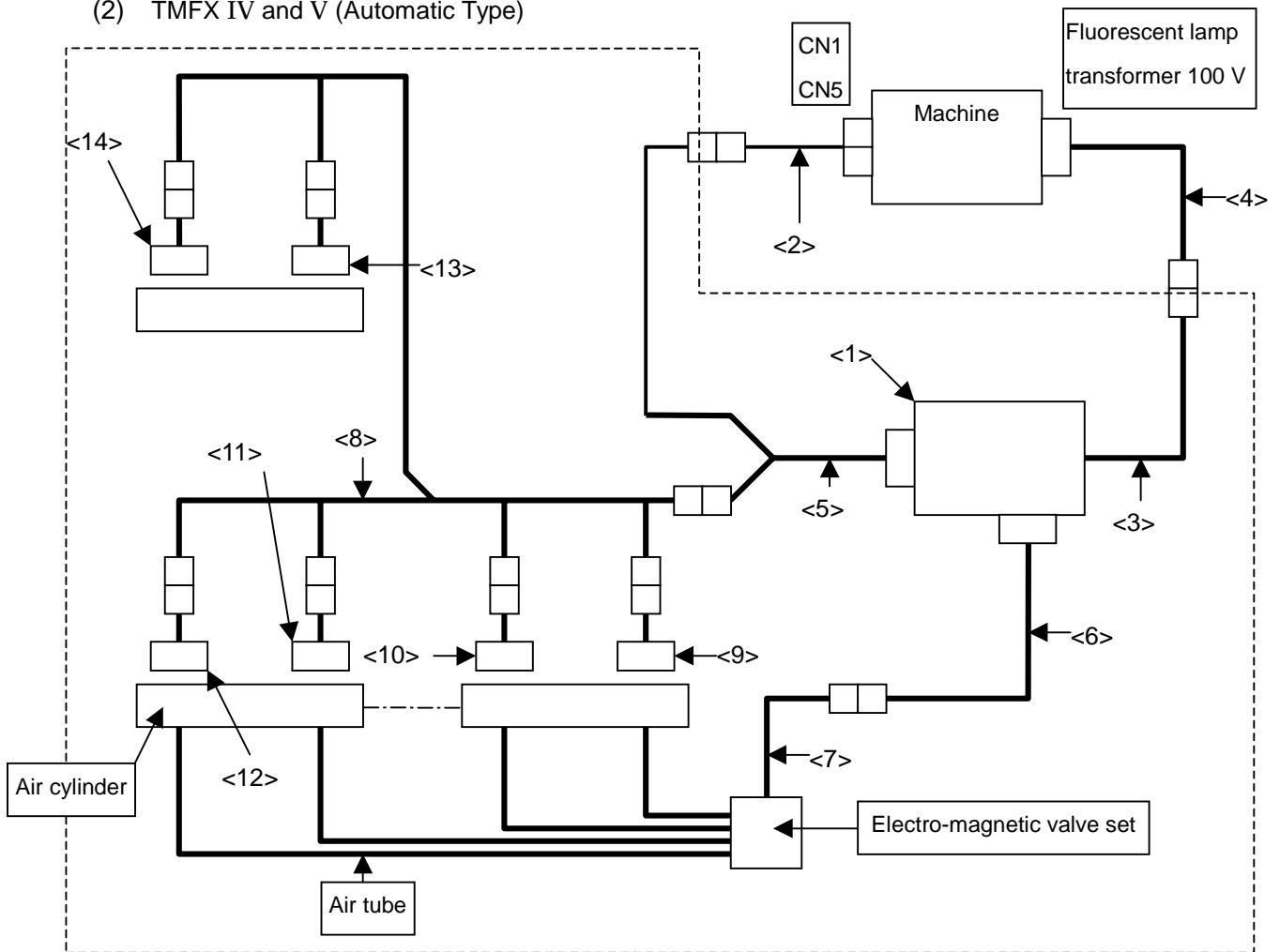
(1) TMFD [III] (Manual Type)



Note: The number of air cylinders and auto-switches used differs depending on the number of heads. The number of them increases in each 6 sets of heads.

ID No.	Part Name	Part No.
<1>	Control box	BC5201000000
<2>	Push-button switch	PB004800SP00
<3>	Bobbin changer power harness A	BC7601000000
<4>	Bobbin changer power harness B	ED7612000000
<5>	Bobbin changer signal harness A	BC7602000000
<6>	Electro-magnetic valve control harness A	BC7603000000
<7>	Electro-magnetic valve control harness B	BC760400****
<8>	Cylinder sensor relay harness	BC760500****
<9>	Auto-switch A	PB0004A0SC00
<10>	Auto-switch B	PB0004B0SC00
<11>	Auto-switch C	PB0004C0SC00
<12>	Auto-switch D	PB0004D0SC00
<13>	Auto-switch E	PB0004E0SC00
<14>	Auto-switch F	PB0004F0SC00

(2) TMFX IV and V (Automatic Type)



Note: The number of air cylinders and auto-switches used differs depending on the number of heads. The number of them increases in each 6 sets of heads

ID No.	Part Name	Part No.
<1>	Control box	BC5201000000
<2>	Bobbin changer signal harness C	HX7605000000(*1)
		JX7608000000(*2)
<3>	Bobbin changer power harness A	BC7601000000
<4>	Bobbin changer power harness C	HX7604000000(*1)
		JX7607000000(*2)
<5>	Bobbin changer signal harness A	BC7602000000
<6>	Electro-magnetic valve control harness A	BC7603000000
<7>	Electro-magnetic valve control harness B	BC760400****
<8>	Cylinder sensor relay harness	BC760500****
<9>	Auto-switch A	PB0004A0SC00
<10>	Auto-switch B	PB0004B0SC00
<11>	Auto-switch C	PB0004C0SC00
<12>	Auto-switch D	PB0004D0SC00
<13>	Auto-switch E	PB0004E0SC00
<14>	Auto-switch F	PB0004F0SC00

(*1) For TMFX IV, (*2) For TMFX V

2. Checking the Source Voltage

- (1) To check the voltage of the bobbin changer power source, measure the voltage at the connector of bobbin changer power harness A using an analog tester or a digital tester.

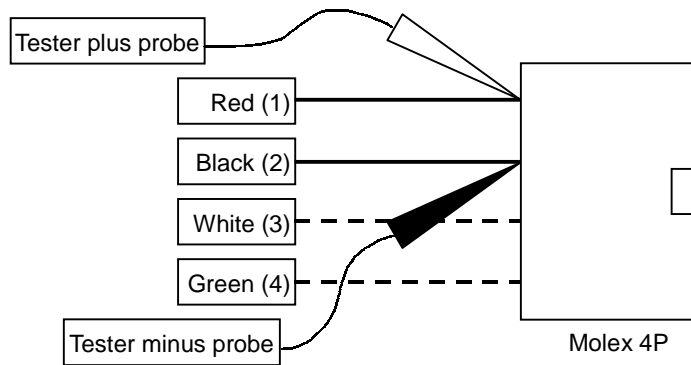
Set the tester in the AC voltage range.

Note: Measure the voltage in the state the main power of the machine is ON and the machine is stopped.

- (2) Check Points

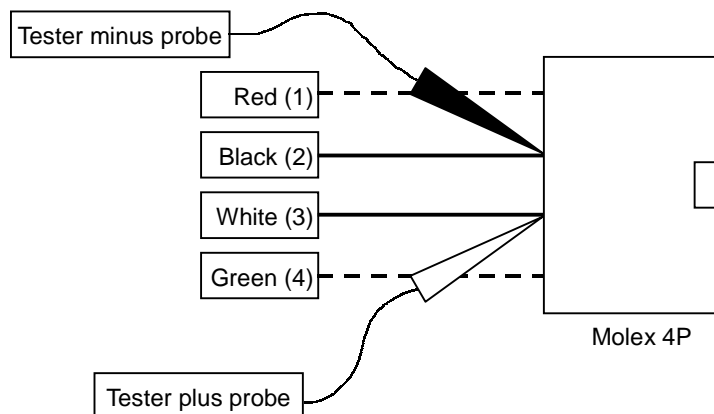
1) TMFD [III] and TMFN

Check Points		Specification
Harness A connector (bobbin changer power harness)	#1 pin (red) - #2 pin (black)	180 - 220 VAC



2) TMFX IV and TMFX V

Check Points		Specification
Harness A connector (bobbin changer power harness)	#3 pin (white) - #2 pin (black)	90 - 110 VAC



3. Checking the Input/Output Signals

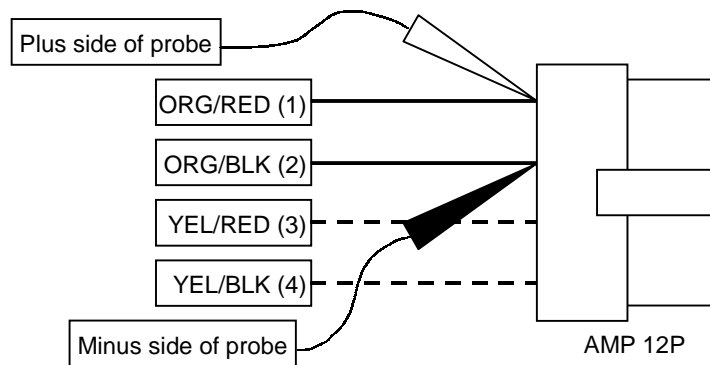
(1) To check the input/output signals between the bobbin changer and the machine, observe the waveform at the 12-pin connector of the bobbin changer signal harness A using an oscilloscope.

(2) Check Points

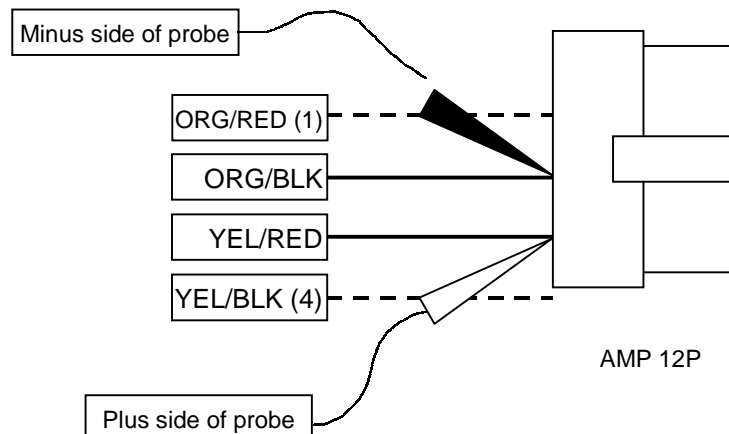
Signal Name		Check Points (12-pin connector of the bobbin changer signal harness A)	
		Plus Side of Probe	Minus Side of Probe
Input signals	Machine in-operation signal	#1 pin	#2 pin
	Bobbin change command signal	#3 pin	
Output signals	Start signal	#4 pin	#5 pin
	Machine operation disable command signal	#6 pin	
	Bobbin changer error signal	#7 pin	

(3) Details of Check Points

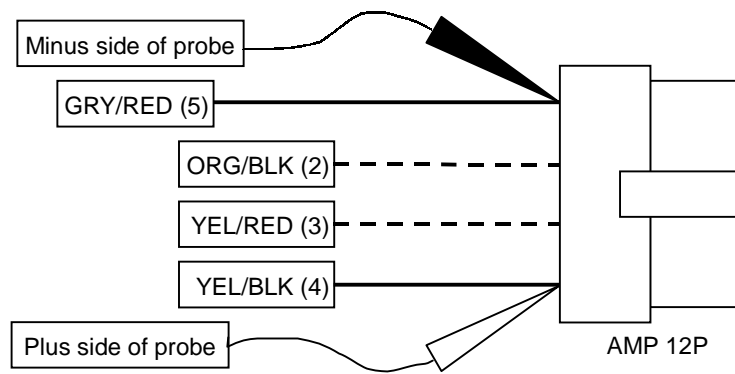
1) Machine in-operation signal



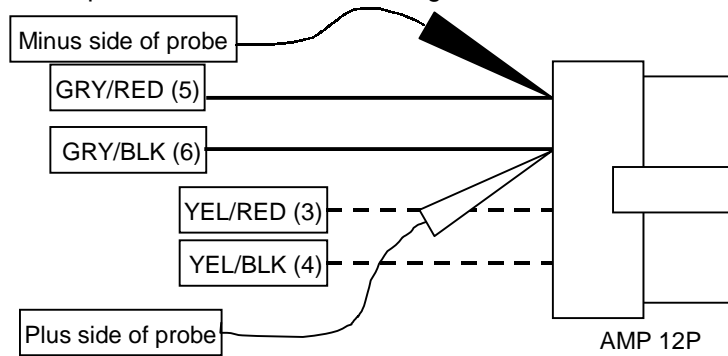
2) Bobbin change command signal



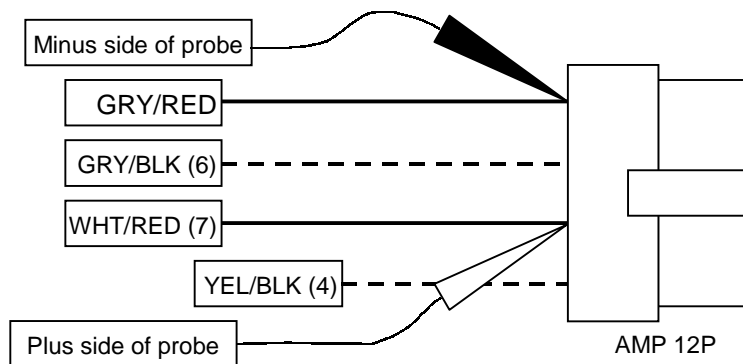
3) Start signal



4) Machine operation disable command signal

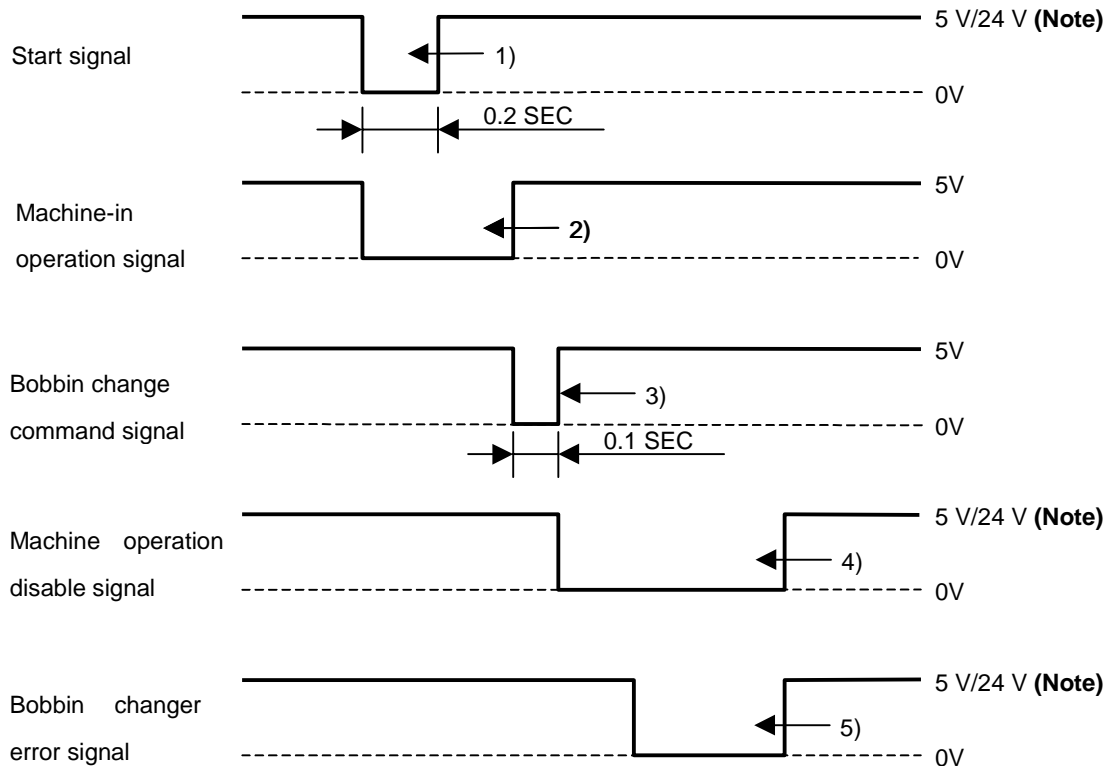


5) Bobbin changer error signal



(4) Waveform

The measured waveforms should be as shown below (for automatic type)



Note: 5 V for TMFX IV and TMFX V, and 24 V for TMFN.

- 1) The start signal is output to the machine when the START switch at the control box is pressed.
- 2) While the machine is operating, the machine in-operation signal is input from the machine to the bobbin changer.
- 3) After the completion of machine operation, the bobbin change command signal is input from the machine to the bobbin changer.
- 4) After the confirmation of the bobbin change command signal, the bobbin changer outputs the machine operation disable signal to the machine and starts bobbin change operation.
- 5) If an error occurs during bobbin change operation, the bobbin changer error signal is output.

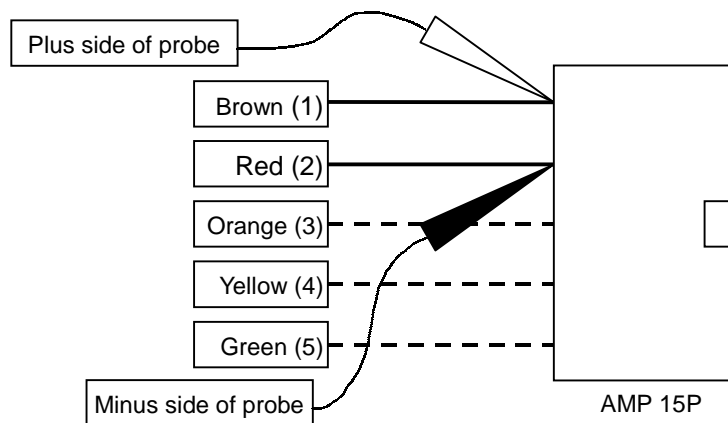
4. Checking the Air Cylinder Auto-Switch Signals

(1) Air cylinder operation is sensed by the auto-switches. Auto-switch signals to confirm air cylinder operating position can be checked at the 15-pin connector of the bobbin changer signal harness A using an oscilloscope.

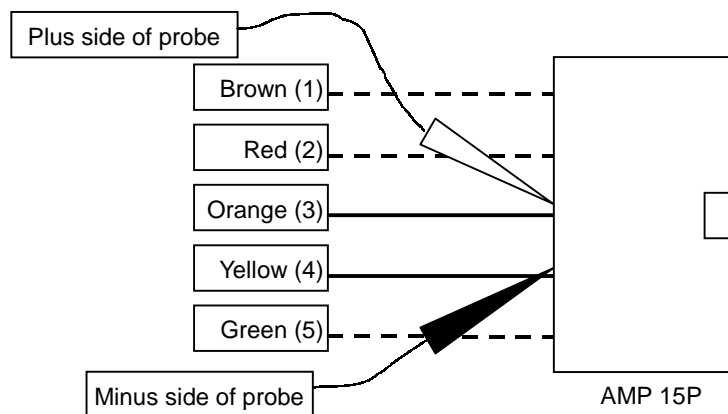
(2) Check Points

Signal Name	Check Points (15-pin connector of the bobbin changer signal harness A)	
	Plus Side of Probe	Minus Side of Probe
Arm advance end (advance/retraction)	#1 pin	#2 pin
Arm retraction end (advance/retraction)	#3 pin	#4 pin
Index advance end	#5 pin	#6 pin
Index retraction end	#7 pin	#8 pin
Arm advance end (rotation)	#9 pin	#10 pin
Arm retraction end (rotation)	#13 pin	#14 pin

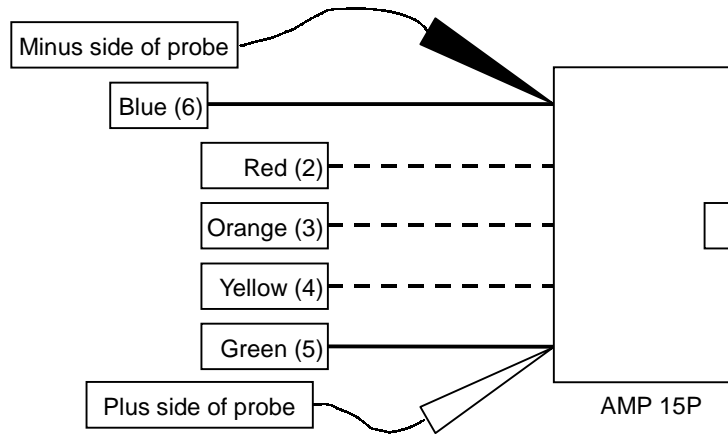
1) Arm advance end (advance/retraction)



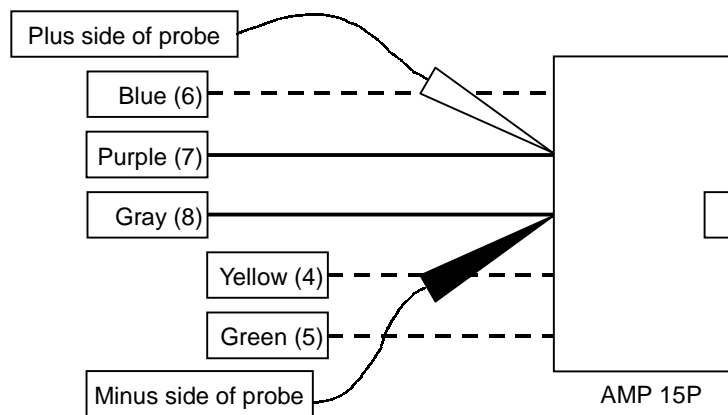
2) Arm retraction end (advance/retraction)



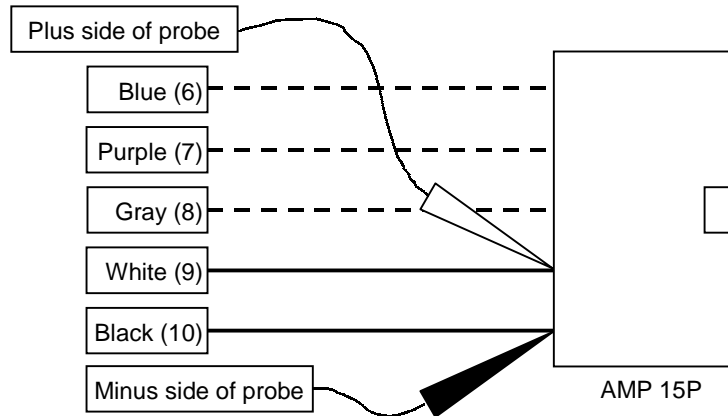
3) Index advance end



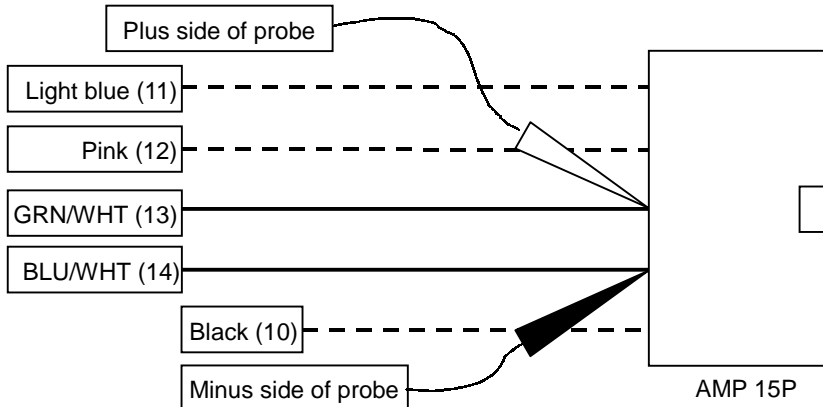
4) Index retraction end



5) Arm advance end (rotation)

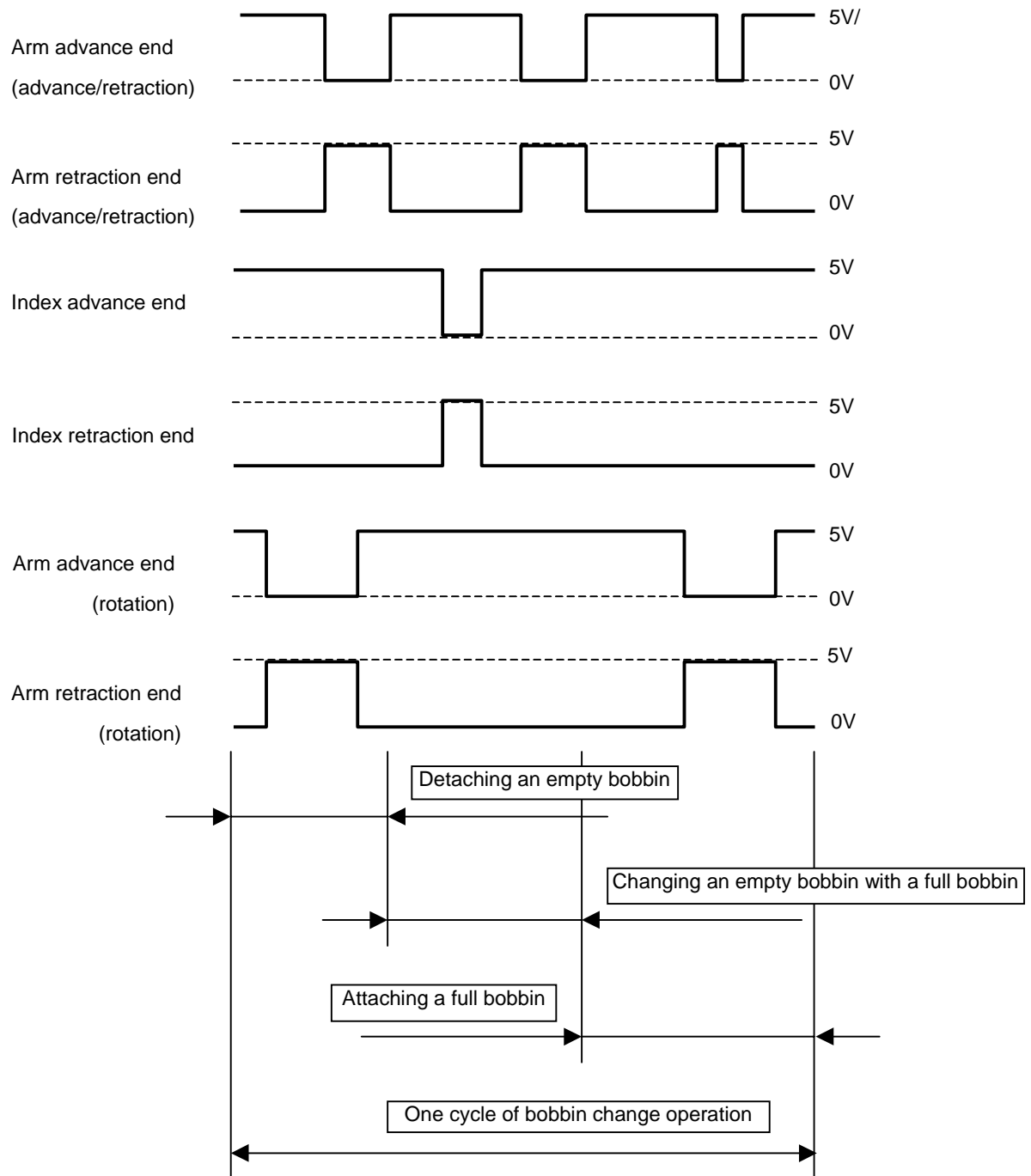


6) Arm retraction end (rotation)



(3) Waveform

The measured waveforms should be as shown below.



5. Checking the Air Cylinder Electro-Magnetic Valve Signals

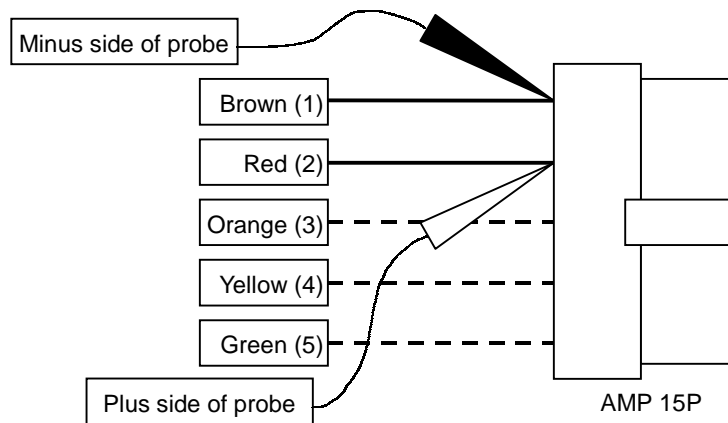
(1) To check the signals of the electro-magnetic valves that control the air cylinders, observe the signal waveform at the 15-pin connector of the electro-magnetic valve control harness A using an oscilloscope.

(2) Check Points

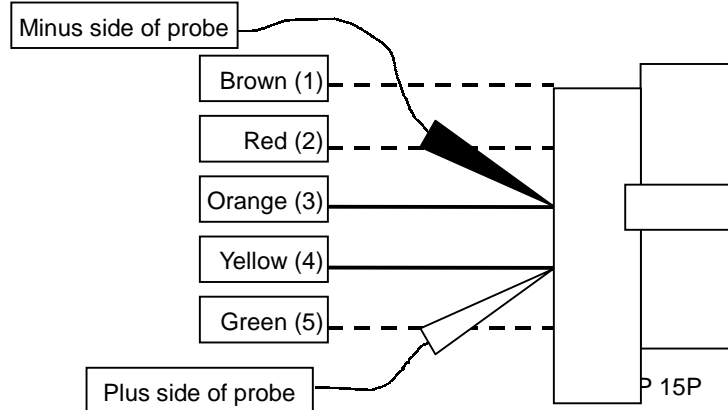
Signal Name	Check Points (15-pin connector of the electro-magnetic valve control harness A)	
	Plus Side of Probe	Minus Side of Probe
Clamp electro-magnetic valve	#2 pin	#1 pin
Index electro-magnetic valve	#4 pin	#3 pin
Arm rotation electro-magnetic valve	#6 pin	#5 pin
Arm advance/retraction electro-magnetic valve	#8 pin	#7 pin

(3) Details of Check Points

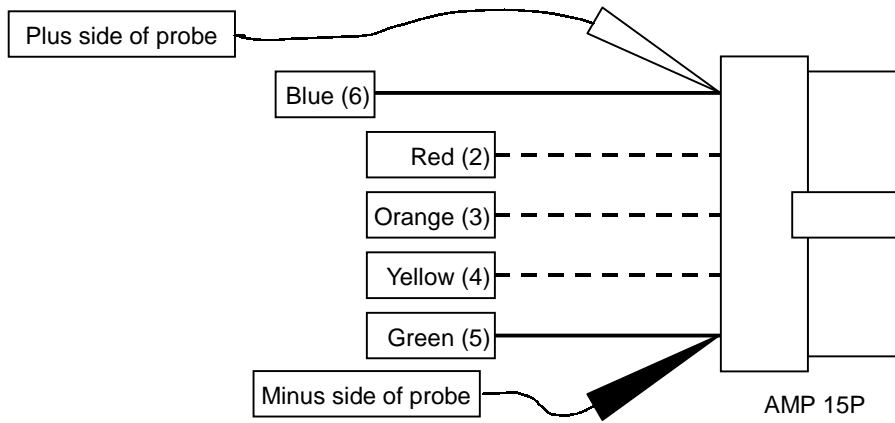
1) Clamp electro-magnetic valve



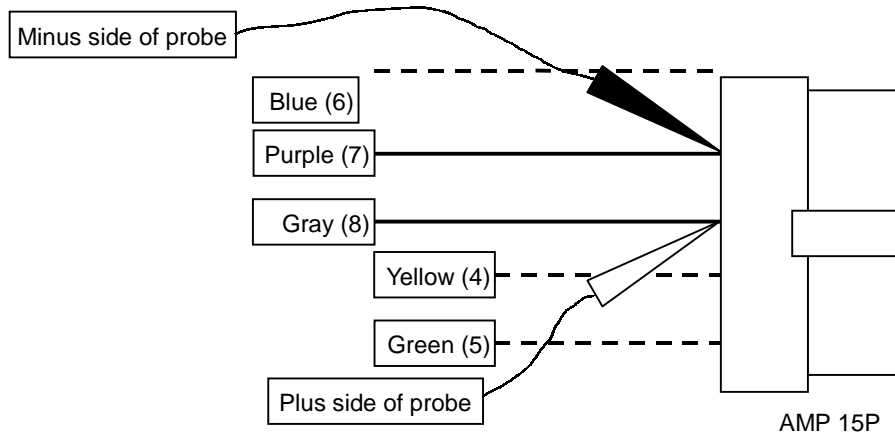
2) Index electro-magnetic valve



3) Arm rotation electro-magnetic valve

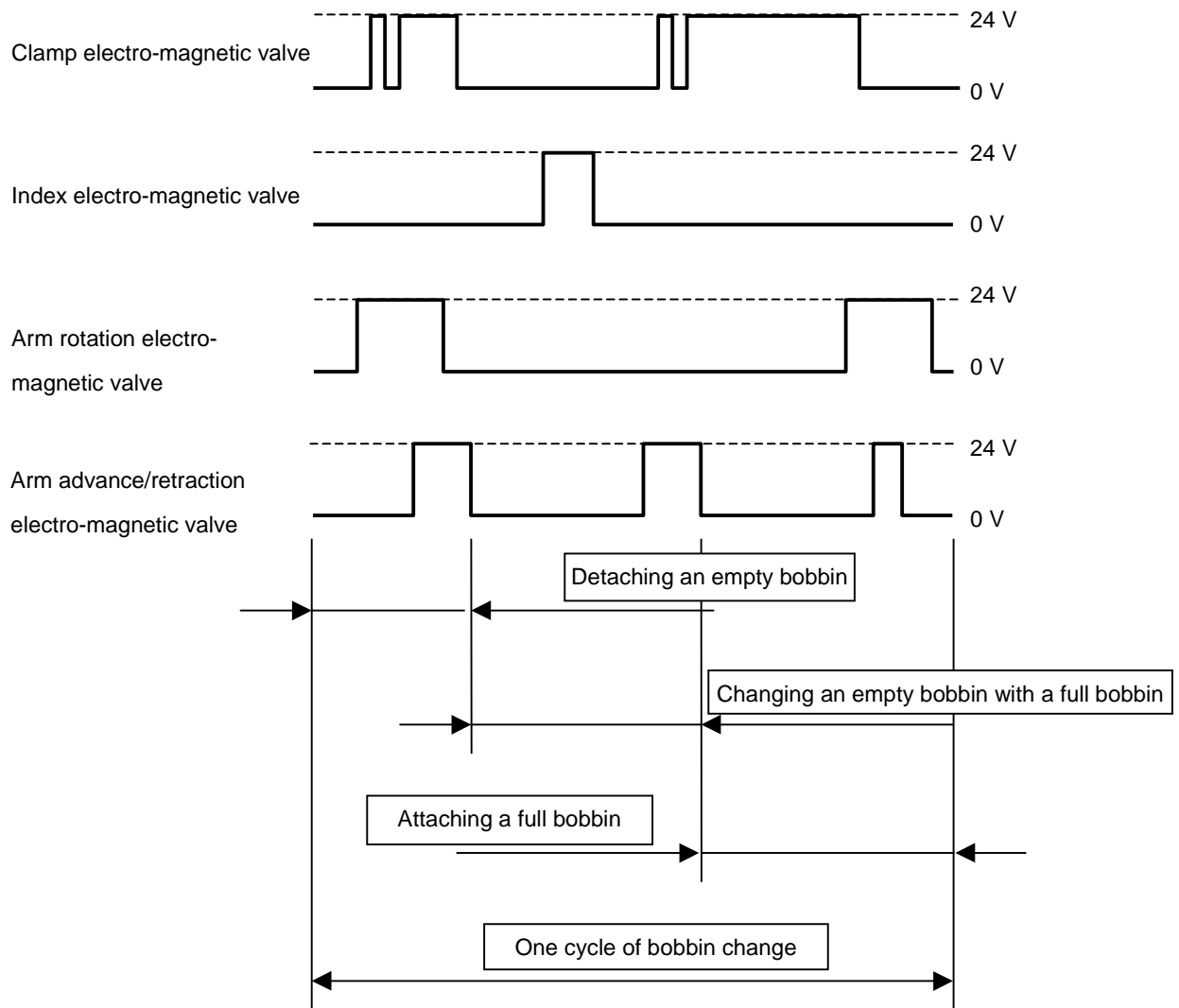


4) Arm advance/retraction electro-magnetic valve



(4) Waveform

The measured waveforms should be as shown below.



Note: After the completion of bobbin change operation, the arm advance/retraction electro-magnetic valve operates once as the final operation confirmation.