

# DX100 OPTIONS INSTRUCTIONS

FOR GUN TEACHING POSITION CORRECTION FUNCTION

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Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

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## MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS  
DX100 INSTRUCTIONS  
DX100 OPERATOR'S MANUAL  
DX100 MAINTENANCE MANUAL

The DX100 operator's manual above corresponds to specific usage.  
Be sure to use the appropriate manual.

Part Number: 158254-1CD  
Revision: 1



## MANDATORY

- This manual explains the gun teaching position correction function of the DX100 system and general operations. Read this manual carefully and be sure to understand its contents before handling the DX100.
- General items related to safety are listed in Chapter 1: Safety of the DX100 Instructions. To ensure correct and safe operation, carefully read the DX100 Instructions before reading this manual.



## CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

## Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX100.

In this manual, the Notes for Safe Operation are classified as "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".



### WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



### CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.



### MANDATORY

Always be sure to follow explicitly the items listed under this heading.



### PROHIBITED

Must never be performed.

Even items described as "CAUTION" may result in a serious accident in some situations.

At any rate, be sure to follow these important items



To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as "CAUTION" and "WARNING".



## WARNING

- Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX100 and the programming pendant. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

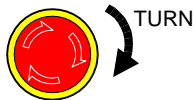
*Figure 1: Emergency Stop Button*



- Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

*Figure 2: Release of Emergency Stop*



- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Keep in mind the emergency response measures against the manipulator's unexpected motion toward you.
  - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning ON the power for the DX100.
  - Moving the manipulator with the programming pendant.
  - Running the system in the check mode.
  - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem.

The emergency stop buttons are located on the right of front door of the DX100 and the programming pendant.



## CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the cabinet of the DX100 after use.

The programming pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the DX100 Instructions before operating the manipulator:

## Definition of Terms Used Often in This Manual


The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and supply cables.

In this manual, the equipment is designated as follows:

| Equipment  | Manual Designation  |
|--|---------------------|
| DX100 controller                                 | DX100               |
| DX100 programming pendant                        | Programming pendant |
| Cable between the manipulator and the controller | Manipulator cable   |

Descriptions of the programming pendant, buttons, and displays are shown as follows:

| Equipment           | Manual Designation   |
|---------------------|--|
| Programming Pendant | Character Keys<br>The keys which have characters printed on them are denoted with [ ].<br>ex. [ENTER]  |
|                     | Symbol Keys<br>The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture.<br>ex. page key <br>The cursor key is an exception, and a picture is not shown. |
|                     | Axis Keys<br>Number Keys<br>"Axis Keys" and "Number Keys" are generic names for the keys for axis operation and number input.  |
|                     | Keys pressed simultaneously<br>When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them, ex. [SHIFT]+[COORD]  |
|                     | Displays<br>The menu displayed in the programming pendant is denoted with { }.<br>ex. {JOB}  |

## Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select ●●●" means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

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## 1 Overview

The gun teaching position correction function is an automatically corrects SVSPOTMOV registered in the job.

This function can be used to automatically correct the misalignment of workpiece in the direction of Z axis of tool.

This function can be executed in the teach or play mode.



## 2 Preparations

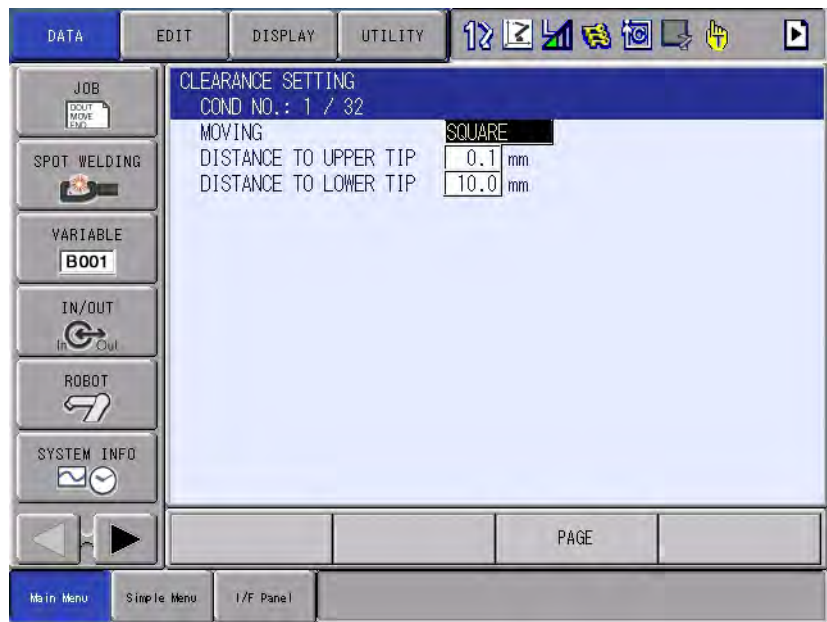
- Correctly perform wear compensation before executing this function. For further details, refer to Section 9.7 “Electrode Wear Detection and Wear Compensation” of coordinates in the “DX100 OPERATOR’S MANUAL” (155509-1CD).
- Correctly setting the gun pushing coefficient, and then teaching of SVSPOTMOV. For further details, refer to Section 9.8.14 “Setting the Gun Pushing Coefficient” of coordinates “DX100 OPERATOR’S MANUAL” (155509-1CD).

## 3 Setup

Make the following settings before using this function.

### 3.1 Clearance Setting

1. Select {SPOT WELDING} under the main menu.
2. Select {CLEARANCE SETTING}.
3. Separate the lower chip by 10.0 mm or more.



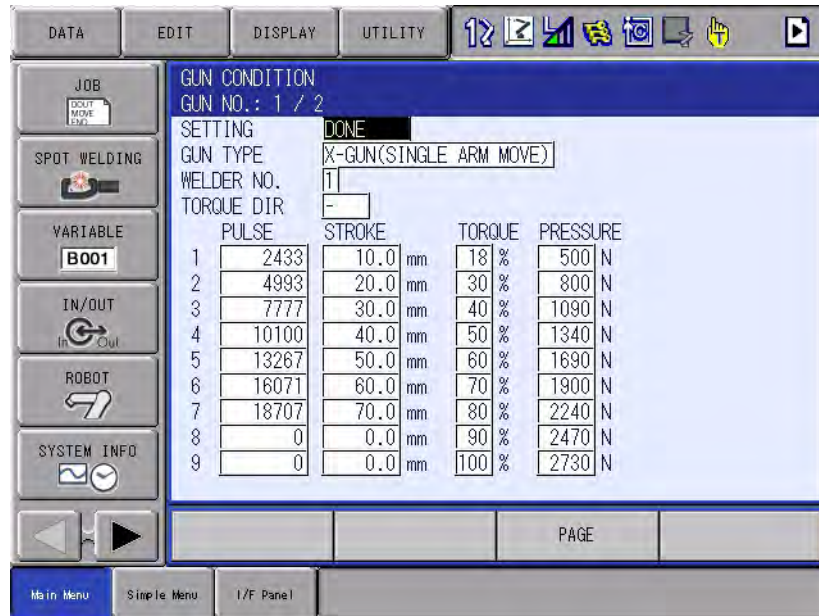
For further details, refer to Section 9.8.6.3 "Setting the Clearance Files" of the coordinates in the "DX100 OPERATOR'S MANUAL" (155509-1CD).



To ensure the detection precision, separate the lower chip by 10.0 mm and use the specified condition number as the clearance file number of SVSPOTMOV.

### 3.2 Gun Condition File Setting

1. Select {SPOT WELDING} under the {main menu}.
2. Select {GUN CONDITION}.
3. Specify the gun type, torque direction, pulse/stroke, and torque/gun pressure.

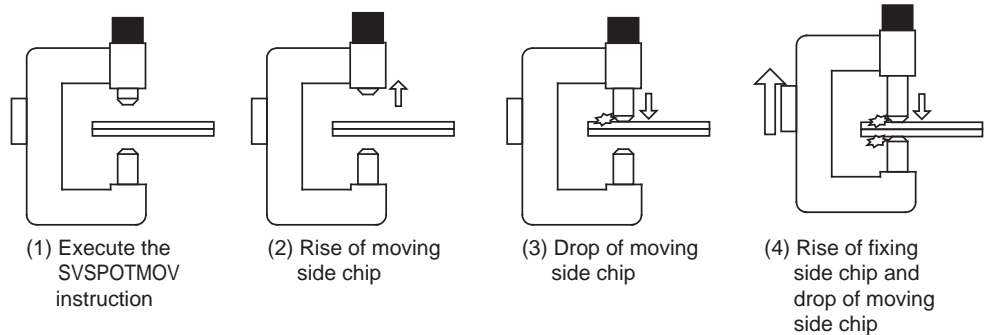


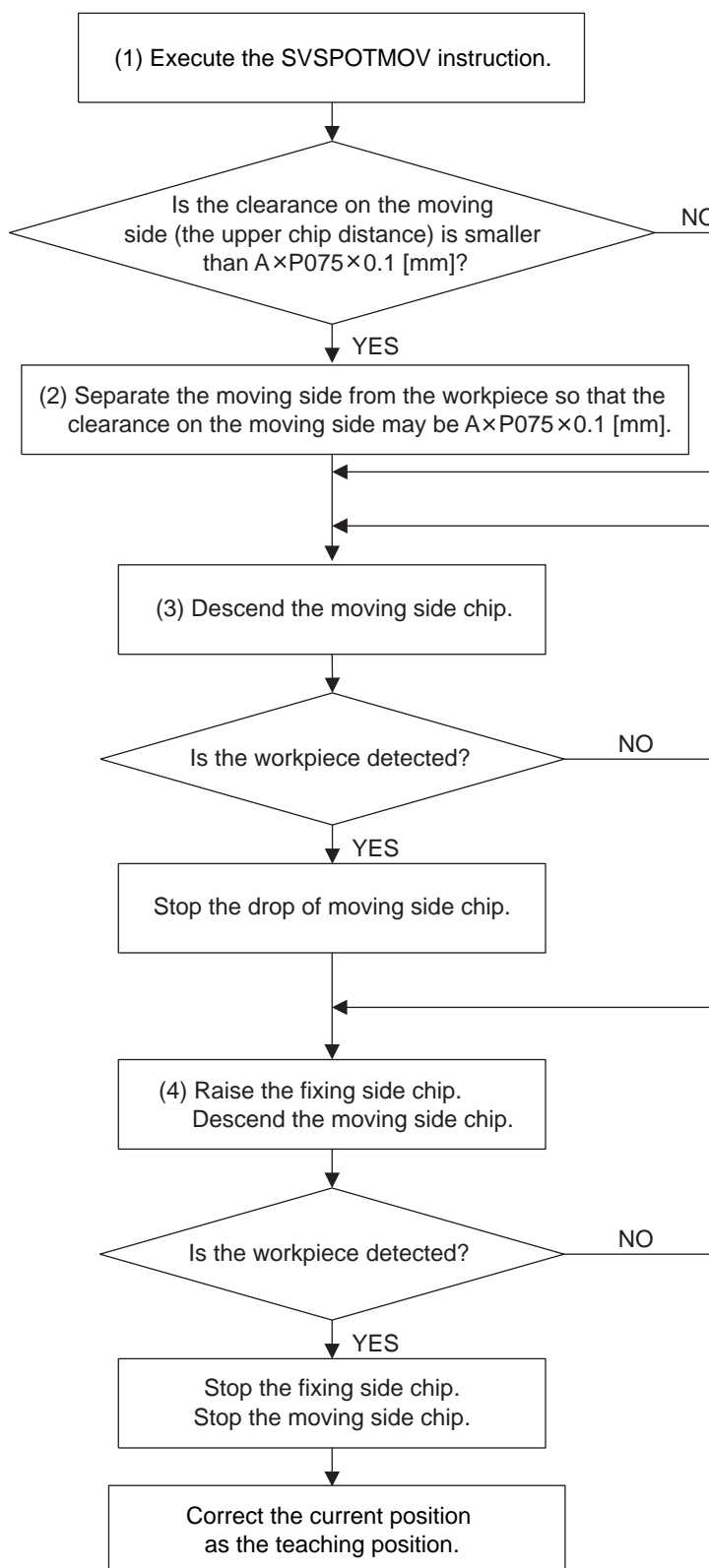
For further details, refer to Section 9.10.1 “Gun Condition File” of the coordinates in the “DX100 OPERATOR’S MANUAL” (155509-1CD).

## 4 Operation

This section describes the operation of gun and manipulator when this function is enabled.

- (1) Execute the SVSPOTMOV instruction.
- (2) Compare the clearance amount on the moving side with  $AxP075 \times 0.1$ . If  $AxP075 \times 0.1$  value is higher, separate the chip on the moving side from the workpiece so that the clearance amount may be  $AxP075 \times 0.1$  [mm].
  - The clearance amount on the moving side indicates the upper chip distance, which can be viewed by selecting [Main Menu] -> [Spot Welding] -> [Clearance Setting].
- (3) The moving side chip descends and detects the workpiece.
- (4) Raise the fixing side chip at the same time when the moving side chip descends and detect the workpiece position.



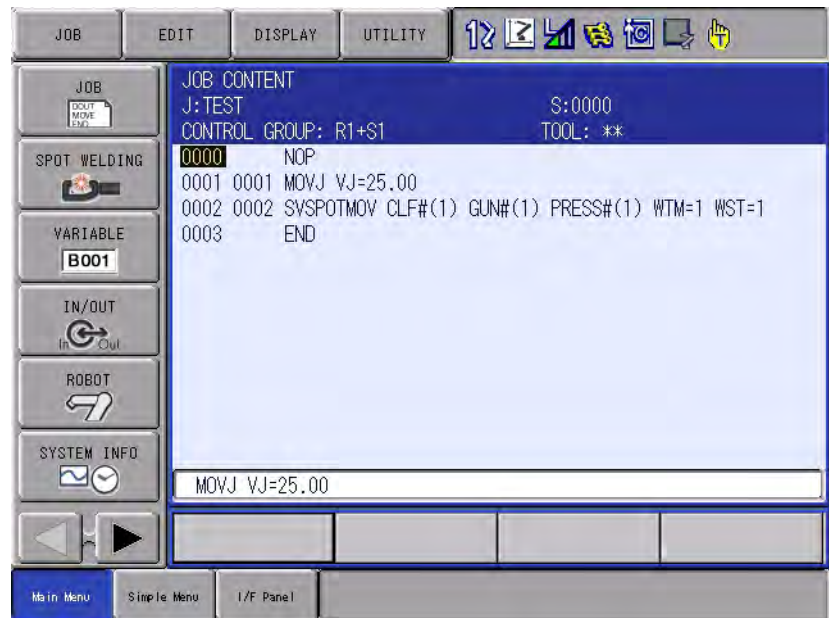


The operating speeds (1) through (4) cannot be specified. An operating speed other than that specified in the job is used to ensure the detection precision.

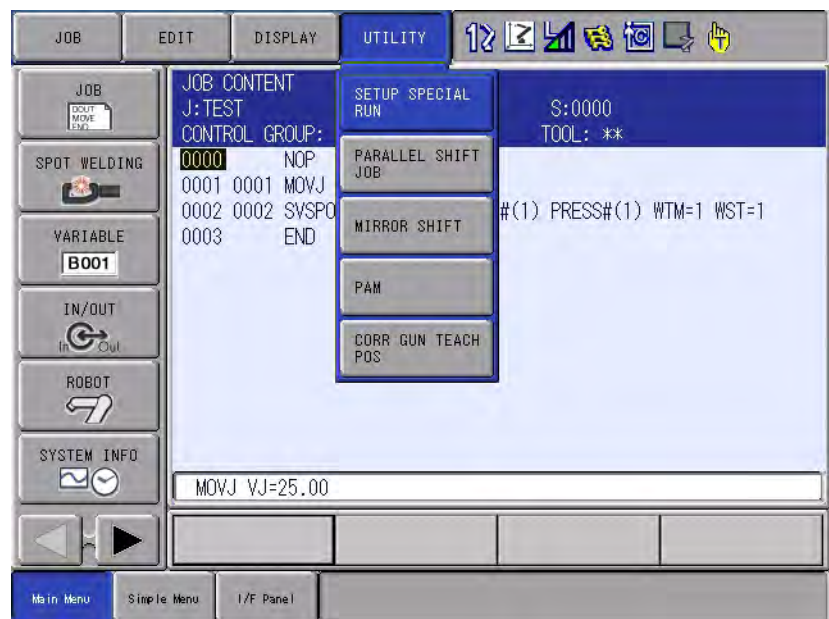
## 5 Enabling or Disabling the Function

### 5.1 Setup by the programming pendant

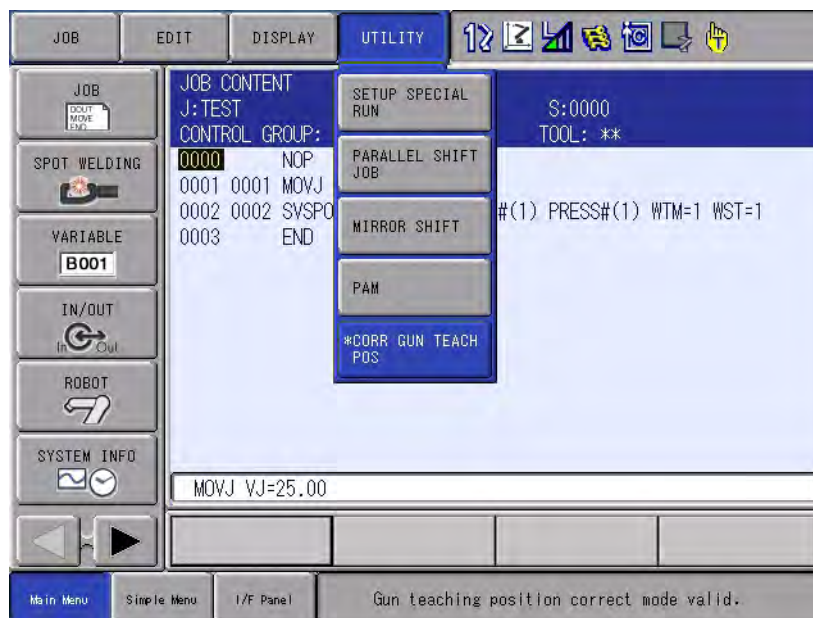
1. Select the Job menu.



2. Select {UTILITY} under the menu.
  - The pull-down menu appears.



3. Select {CORR GUN TEACH POS}.
  - An asterisk (\*) is attached and the message saying "Gun teaching position correct mode valid" appears.
  - To disable the function, select [Gun Teaching Position Correction] again. The asterisk (\*) and "Gun teaching position correct mode valid" message disappear.



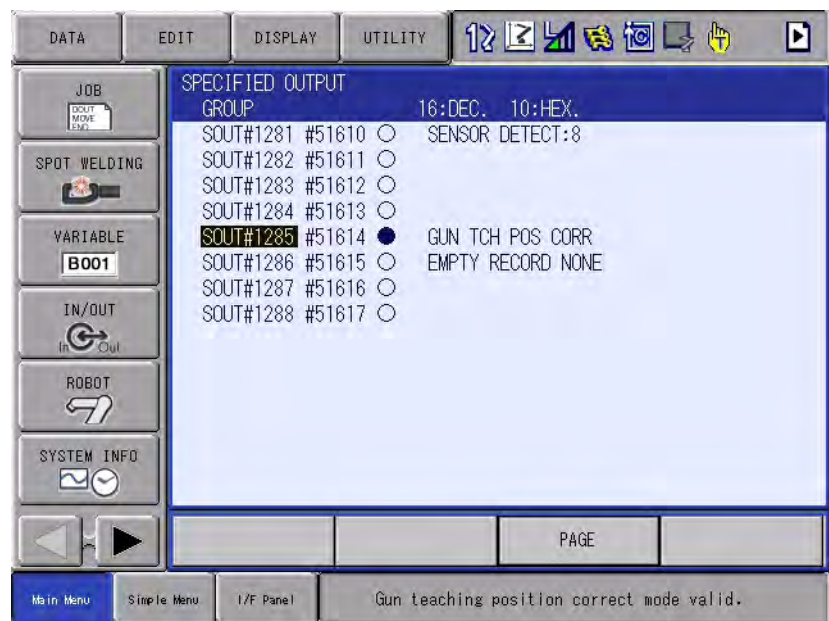
## 5.2 Setup and Confirmation Using the Dedicated I/O Signal

### 5.2.1 Setup by the Dedicated Input Signal

- Enable the function at the rising edge to the dedicated input signal (#41231) and disable it at the falling edge.
- If the dedicated input signal (#41231) is turned off during operation, the operation stops and the message saying "Operation stops because the gun teaching position function is disabled" appears.
- If signals are input to the dedicated input signal (#41231) during operation, the function remains disable until the operation stops. Enable the function after the operation stops.
- When the function is enabled or disabled, the operation by the dedicated input takes priority over the operation by the programming pendant.

**5.2.2 Setup by the Dedicated Output Signal**

1. Select {IN/OUT} under the main menu.
2. Select {SPECIFIED OUTPUT}.
3. Display SOUT#1285(#51614) by pressing the page key or selection button.
  - It indicates that the gun teaching position correction function is enabled.
  - This signal is ON while the gun teaching position correction function is enabled.



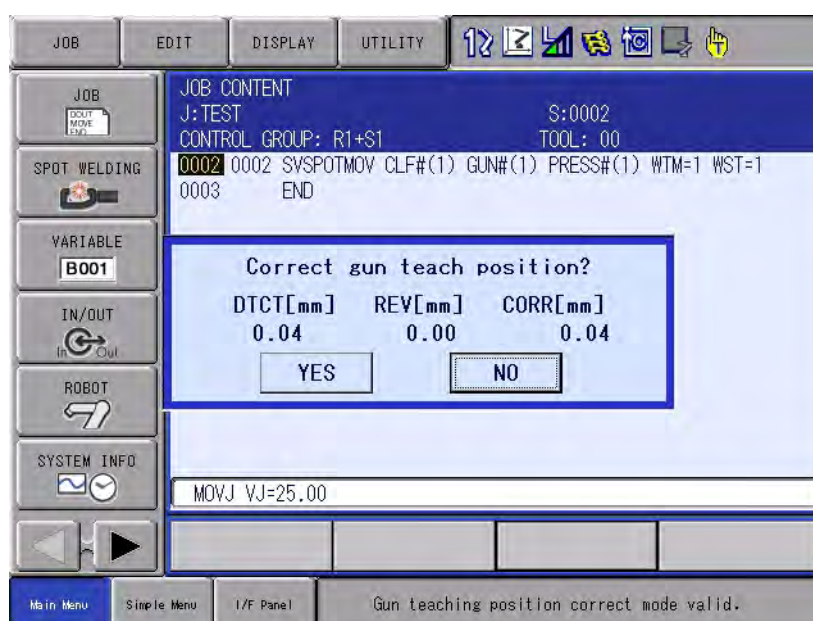


## 6 Operation explanation

### 6.1 Teach Mode

This function can be executed in the teach mode.

1. Enable the function by referring to *Chapter 5 "Enabling or Disabling the Function"*
2. Select the job with which SVSPOTMOV is registered.
3. Execute the SVSPOTMOV instruction at test operation by pressing [Interlock + 9].
4. The moving side chip operates and then the fixing side chip operates to search for the workpiece position.
5. When the workpiece position is detected, the following dialog appears.



6. Select [Yes] to correct the teaching position for the SVSPOTMOV instruction.
  - Select [No] not to correct the teaching position for the SVSPOTMOV instruction.
7. Select [Yes] and perform the test operation to execute the SVSPOTMOV instruction. It can check that the teaching position is properly corrected.

Detection amount: Indicates the misalignment amount of workpiece in the direction of Z axis of tool.

Revision amount: The detection result can be corrected by this amount. Up to  $\pm 20$  [mm] can be specified. This can be specified with the parameter AxP078.

Parameter AxP078 Revision amount

AxP078 $\times$ 0.1[mm]

<Example> If AxP078 = 100, the revision amount is 10 [mm].

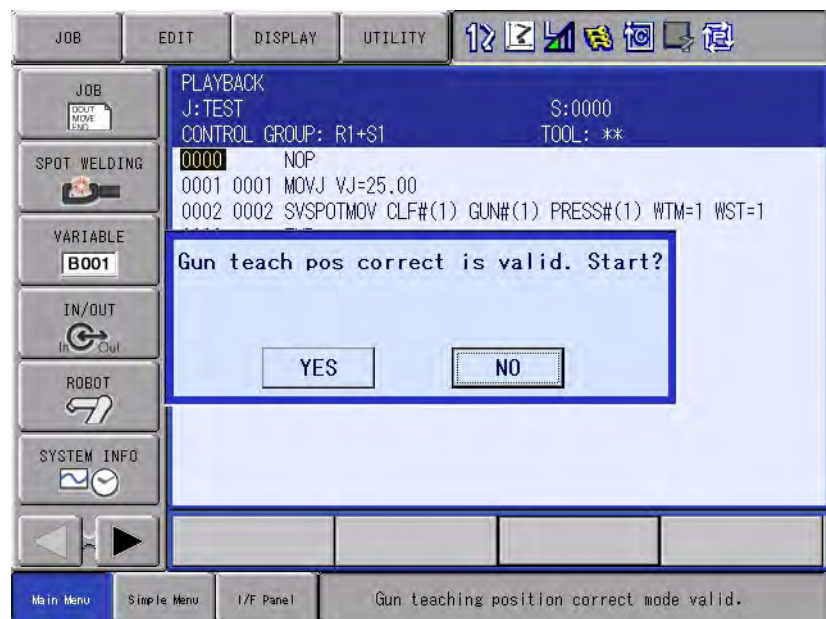
Correction amount: Indicates the correction amount of workpiece in the direction of Z axis of tool. This is the sum of detection amount and revision amount.

- For example, if this value is 2 [mm], the teaching position is shifted from the original position by 2 [mm] in the positive Z axis direction before registration.

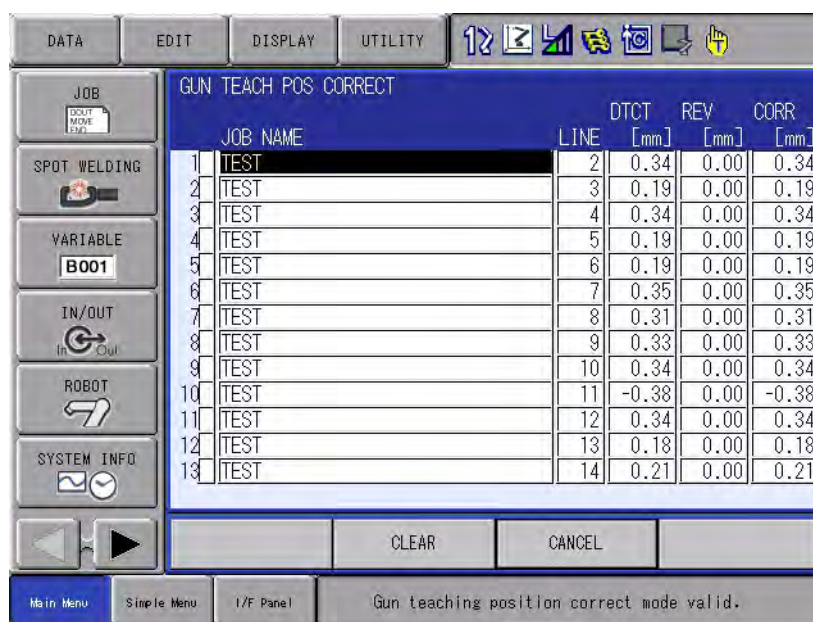
## 6.2 Play Mode

This function can be executed in the play mode.

1. Enable the function by referring to *Chapter 5 "Enabling or Disabling the Function"*
2. Select the job with which SVSPOTMOV is registered.
3. Enter into the play mode and start the job.
  - If the parameter AxP081 is 1, the confirmation dialog appears.
  - Select [Yes] and restart the job.
  - If you select [No], the operation is aborted.

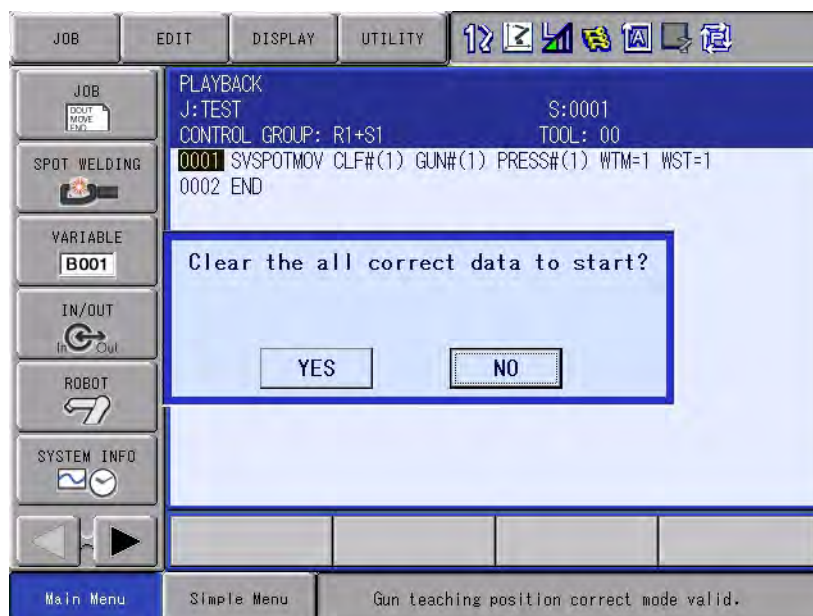


4. When the SVSPOTMOV instruction is executed, the moving side chip operates and then the fixing side chip operates to detect the workpiece position.
5. Every time the SVSPOTMOV instruction is executed, the detection result is displayed on the {GUN TEACH POS CORRECT} screen.
  - To open the {GUN TEACH POS CORRECT} screen, select {SPOT WELDING} -> {GUN TEACH POS CORRECT}.



| JOB NAME | LINE | DTCT [mm] | REV [mm] | CORR [mm] |
|----------|------|-----------|----------|-----------|
| TEST     | 2    | 0.34      | 0.00     | 0.34      |
| TEST     | 3    | 0.19      | 0.00     | 0.19      |
| TEST     | 4    | 0.34      | 0.00     | 0.34      |
| TEST     | 5    | 0.19      | 0.00     | 0.19      |
| TEST     | 6    | 0.19      | 0.00     | 0.19      |
| TEST     | 7    | 0.35      | 0.00     | 0.35      |
| TEST     | 8    | 0.31      | 0.00     | 0.31      |
| TEST     | 9    | 0.33      | 0.00     | 0.33      |
| TEST     | 10   | 0.34      | 0.00     | 0.34      |
| TEST     | 11   | -0.38     | 0.00     | -0.38     |
| TEST     | 12   | 0.34      | 0.00     | 0.34      |
| TEST     | 13   | 0.18      | 0.00     | 0.18      |
| TEST     | 14   | 0.21      | 0.00     | 0.21      |

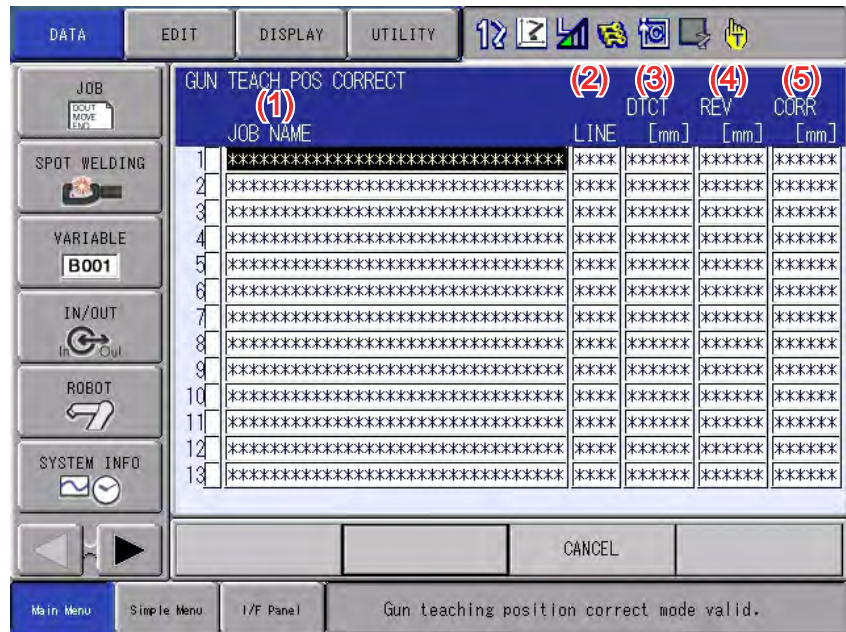
- The 50-point SVSPOTMOV instruction can be corrected. When the 50-point SVSPOTMOV instruction is executed, the start lamp goes off and the operation of robot and gun stops.
- If the 50th point is reached, the message saying "The number of the teaching positions corrected by svspotmov exceeded the limit" appears.
- If there are 50 data items at the time of operation, the following confirmation dialog appears.
  - Select [Yes] to clear 50 data items and execute the job.
  - Select [No] to not clear data and abort the operation.



## 7 Teaching Position Correction Screen

### 7.1 About the screen

If the SVSPOTMOV instruction is executed when this function is enabled in the play mode, the detection result is displayed on the {GUN TEACH POS CORRECT} screen. Select {SPOT WELDING} -> {GUN TEACH POS CORRECT} to open this screen.



- (1) Job name: Indicates the job name of the SVSPOTMOV instruction.
- (2) Line number: Indicates the line number of the SVSPOTMOV instruction.
- (3) Detection amount: Indicates the misalignment amount of workpiece in the direction of Z axis of tool.
- (4) Revision amount: The detection result can be corrected by this amount. Up to  $\pm 20$  [mm] can be specified. This can be specified with the parameter AxP078.

Parameter AxP078 Revision amount

AxP078x0.1 [mm]

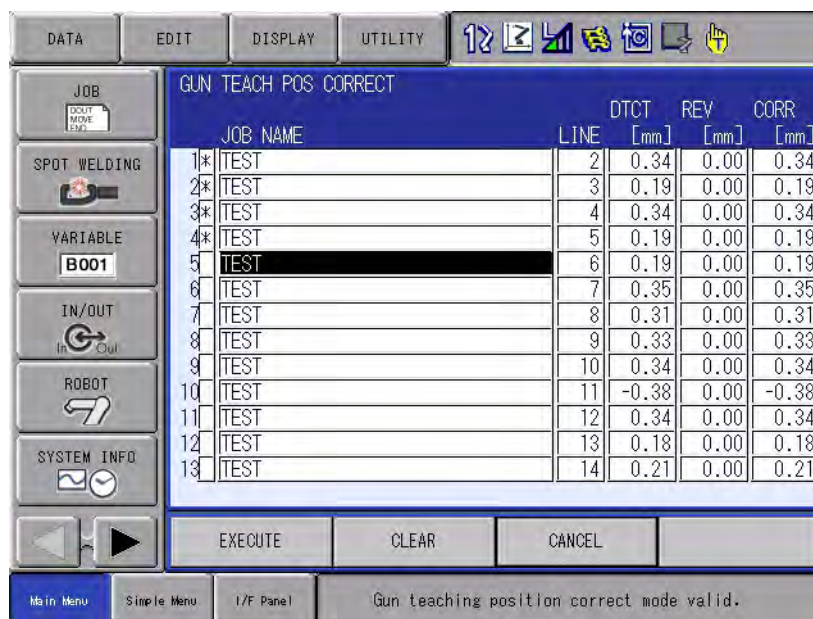
<Example> If AxP078 = 100, the revision amount is 10 [mm].

- (5) Correction amount: Indicates the correction amount of workpiece in the direction of Z axis of tool. This is the sum of detection amount and revision amount.
- For example, if this value is 2 [mm], the teaching position is shifted from the original position by 2 mm in the positive Z axis direction before teaching.

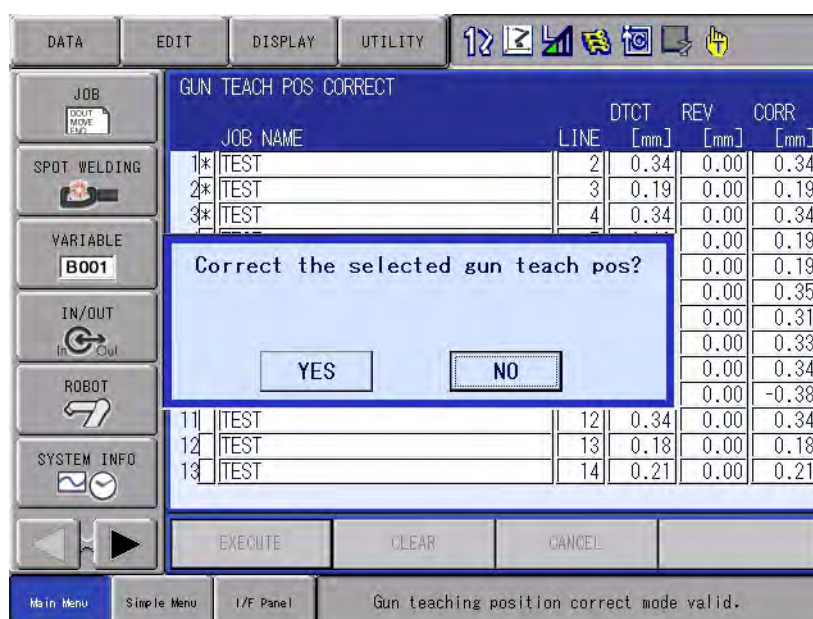


## 7.2 Correction Procedures

1. Select {SPOT WELDING} under the main menu.
2. Select {GUN TEACH POS CORRECT}.
3. Move the cursor to the item for which teaching position you want to correct and press "Select". An asterisk (\*) is then displayed.
4. When an item is selected, the "EXECUTE" button appears.

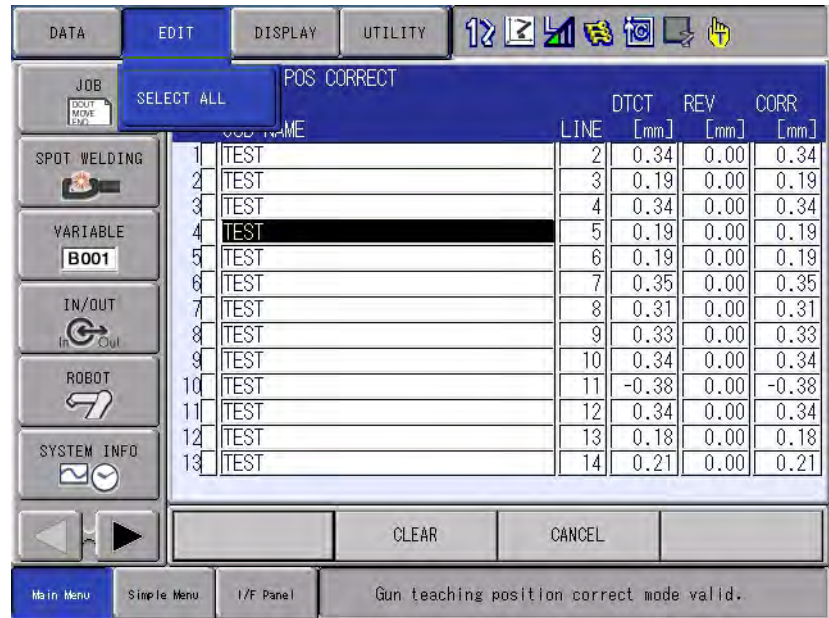


5. Select "EXECUTE" button.
  - The confirmation dialog box appears.
  - Select [YES] to correct the teaching position with asterisk (\*).  
The item that has already been corrected cannot be selected.
  - Select [NO] to abort the operation.

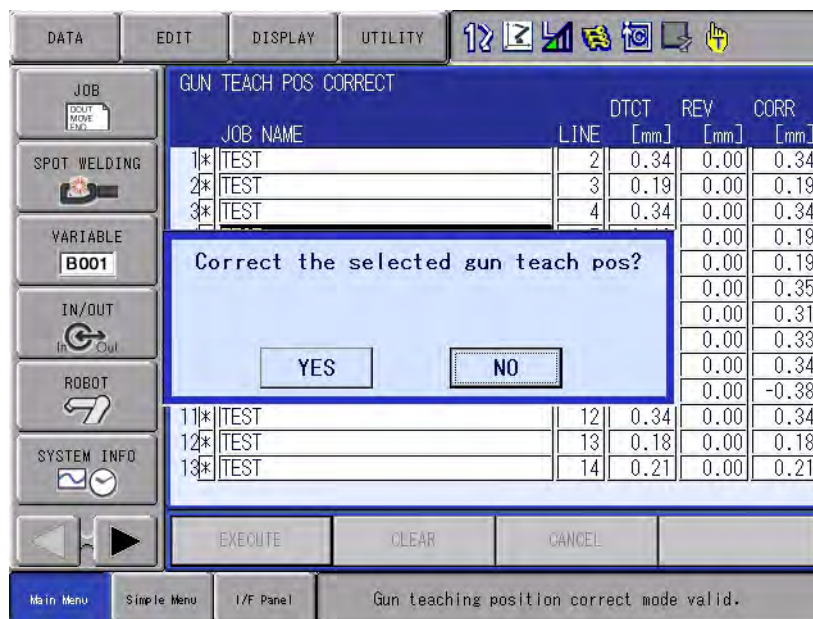


### 7.3 Batch Correction Procedure

1. Select [SPOT WELDING] under the main menu.
2. Select [GUN TEACH POS CORRECT].
3. Select [EDIT] under the menu.
  - The pull-down menu appears.



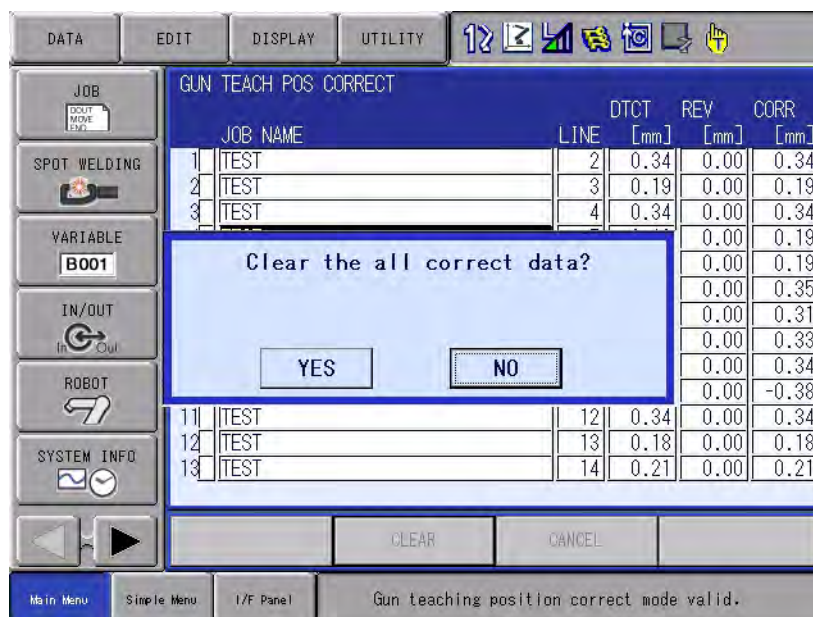
4. Select [SELECT ALL].
  - Asterisks "\*" are attached to all the items and all data is selected.
  - To deselect data, select [EDIT] -> [DESELECT] on the menu.
5. The [EXECUTE] button appears.
6. Select [EXECUTE] button.
  - The confirmation dialog box appears.
  - Select [YES] to correct the teaching position with asterisk (\*).  
The item that has already been corrected cannot be selected.
  - Select [NO] to abort the operation.



## 7.4 Clearing Data

### 7.4.1 Clearing procedure

1. Select [SPOT WELDING] under the main menu.
2. Select [GUN TEACH POS CORRECT].
3. Select [CLEAR].
  - The confirmation dialog box appears.
  - Select [YES] to clear all data.
  - Select [NO] to abort the operation.



### 7.4.2 Conditions for clearing data

Data is cleared under the following conditions.

- (1) If the [Clear] button is pressed on the **Teaching Position Correction** screen.
- (2) If this function is executed in the play mode when the **Teaching Position Correction** screen displays 50 data items.
- (3) If job correction is performed.
- (4) If this function is executed in the teach mode to correct the teaching position.
- (5) If the controller is turned off.



The confirmation dialog does not appear for conditions (3) through (5).

Correct the teaching position before performing the above operations.



Gun Teaching Position Correction 8 Alarm

## 8 Alarm

| Alarm Number | Alarm Name/ Message          | Sub Code   | Cause   | Remedy  |
|--------------|------------------------------|--|---|---|
| 4976         | GUN SEARCH DETECT RANGE OVER | Indicates the axis for which the alarm occurred. | If the space between the fixing side chip and the moving side chip (the workpiece thickness must be subtracted) exceeds the threshold value at the time of detection in the gun teaching position correction mode, an alarm occurs. | <p><b>[Software (abnormal setting)]</b><br/>Check the following settings.</p> <ul style="list-style-type: none"> <li>• Origin of gun axis</li> <li>• "Conversion between pulse and stroke" in the gun characteristics file</li> <li>• Wear correction value</li> </ul> <p><b>[External effects]</b></p> <ul style="list-style-type: none"> <li>• Check that no foreign object exists between the workpiece and the gun.</li> <li>• Check for a missing chip.</li> </ul>   |
| 4977         | GUN SEARCH POS ERROR         | Indicates the axis for which the alarm occurred. | If the detected workpiece position exceeds the threshold value in the gun teaching position correction mode, an alarm occurs.   | <p><b>[Software (abnormal setting)]</b><br/>Check the following settings.</p> <ul style="list-style-type: none"> <li>• Origin of gun axis</li> <li>• "Conversion between pulse and stroke" in the gun characteristics file</li> <li>• Wear correction value on the moving side</li> </ul> <p><b>[External effects]</b></p> <ul style="list-style-type: none"> <li>• Check the amount of the gap between workpieces position and the teaching position.</li> <li>• Check for a missing chip on the moving side.</li> </ul> |

## 9    Parameter

AxP075 : Clearance amount on the moving chip side

Specify the clearance amount of upper chip.

0: 30 mm (initial value)

others: AxP075×0.1 mm

<Example> If AxP075 = 400, the clearance amount of upper chip is 40 mm.

AxP078 : Revision amount

Specify the revision amount in the range of ±20 mm.

0: 0[mm] (initial value)

others: AxP078×0.1 mm

<Example> If AxP078 = 100, the revision amount is 10 mm.

AxP079 : Detection threshold value of GUN SEARCH POS ERROR

Specify the detection threshold value of alarm 4977  
"GUN SEARCH POS ERROR."

0: 5 mm (initial value)

others: AxP079×0.1 mm

<Example> If AxP079 = 60, the detection threshold value is 6 mm.

AxP080 : Detection threshold value when the GUN SEARCH DETECT RANGE OVER

Specify the detection threshold value when the alarm 4976  
"GUN SEARCH DETECT RANGE OVER" occurs.

0: 3 mm (initial value)

others: AxP080×0.1 mm

<Example> If AxP080 = 100, the detection threshold value is 10 mm.

AxP081 : Specification of dialog display at startup

Specify the dialog display at startup.

0: Hide the dialog (initial value)

1: Display the dialog

S1CxG175 : Workpiece detection threshold value for the moving side chip

Specify the workpiece detection threshold value for the moving side chip.

0: 1.0 [kgf]

others: S1CxG175×0.1 kgf

<Example> If S1CxG175 = 20, the detection threshold value is 2.0 kgf.



It is recommended to use the initial value (0) for AxP075 and AxP079 to ensure the detection precision.



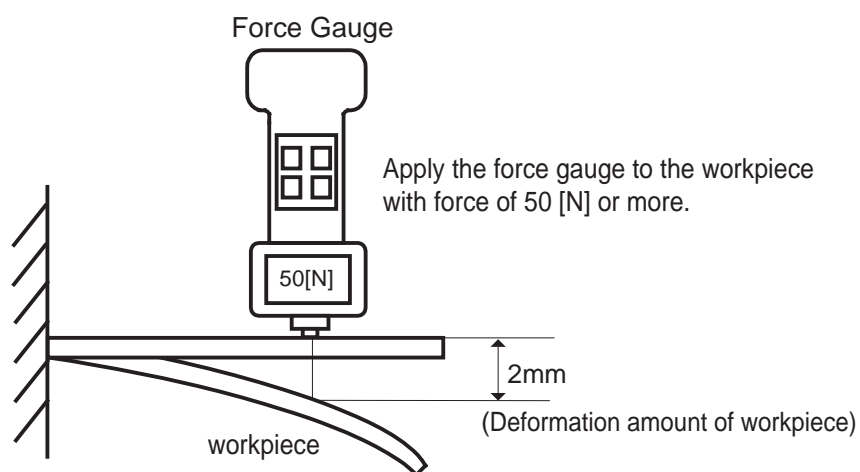
If a detection error occurs, increase S1CxG175 from the initial value by one scale until the detection error goes off. If a detection error occurs when the initial value is 0, increase S1CxG175 from 11 by one scale until the detection error goes off.

## 10 Restrictions

- This function is not available to the fixed gun.
- This function is not available to the pair gun.
- This function is not available to the double gun.
- If the rigidity of workpiece is low, the workpiece position detection precision is lowered. It is recommended to use the workpiece with the rigidity that meets the following standards.

### Recommended workpiece rigidity

The deformation amount of the workpiece to be used should be 2 mm or less when the force gauge is applied to the workpiece with force of 50N or more.



158254-1CD

Gun Teaching Position  
Correction

10 Restrictions

# DX100 OPTIONS INSTRUCTIONS

FOR SEARCH FUNCTION IN CONTINUOUS MOTION

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Specifications are subject to change without notice  
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