

## MANIPULATOR INSTRUCTIONS

FOR EXPLOSION-PROOF SPECIFICATIONS

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This instructions describes the details of explosion-proof specifications.

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MOTOMAN INSTRUCTIONS FOR EXPLOSION-PROOF SPECIFICATIONS

MANIPULATOR INSTRUCTIONS EXPLOSION-PROOF SPECIFICATIONS  
DX200 INSTRUCTIONS FOR EXPLOSION-PROOF SPECIFICATIONS

Part Number: 180142-1CD  
Revision: 0

MANUAL NO.

**HW1483978** ◆

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## MANDATORY

- This instruction manual is intended to explain mainly on the mechanical part of the manipulator for the application to the actual operation and for proper maintenance and inspection. It describes on safety and handling, details on specifications, necessary items on maintenance and inspection, to explain operating instructions and maintenance procedures. Be sure to read and understand this instruction manual thoroughly before installing and operating the manipulator.
- General items related to safety are listed in Chapter 1: Safety of the DX200 Instructions. To ensure correct and safe operation, carefully read the DX200 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.

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association

900 Victors Way

P.O. Box 3724

Ann Arbor, Michigan 48106

TEL: (734) 994-6088

FAX: (734) 994-3338

[www.roboticsonline.com](http://www.roboticsonline.com)

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. **NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!**

We recommend approved YASKAWA training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

## 1 Notes for Safe Operation

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

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



**DANGER**

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



**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 “DANGER”, “WARNING” and “CAUTION”.



**DANGER**

- Maintenance and inspection must be performed by specified personnel.

Failure to observe this caution may result in electric shock or injury.

- For disassembly or repair, contact your Yaskawa representative.
- Do not remove the motor, and do not release the brake.

Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.

## 2 Indications on Electric Equipment

### 2.1 Explosion-Proof Indication Label and Warning Label

Warning labels are attached on the manipulator body.

For the details of the warning labels, refer to “Explanation of Warning Labels” part in the INSTRUCTIONS of the corresponding manipulator and strictly observe the items mentioned.

Also, identification labels with important information are placed on the body of the manipulator. Prior to operating the manipulator, thoroughly understand the contents of the label.

### 2.2 Standards

This manipulator meets the following requirements:

- IEC60079-0:  
for electrical apparatus for explosive gas atmospheres  
- Part 0: General requirements
- IEC 60079-2:  
for electrical apparatus for explosive gas atmospheres  
- Part 2: Pressurized enclosures “p”
- IEC60079-11:  
for electrical apparatus for explosive gas atmospheres  
- Part 11: Intrinsic safety “i”

\*For the issue dates of standards, refer to “Standards” part in the INSTRUCTIONS of the corresponding manipulator.

#### ■ For TIIS Certification Type

“Recommended Practices for Explosion-Protected Electrical Installations in General Industries” issued from The National Institute of Occupational Safety and Health, Japan.

- JNIOOSH-TR-46-1:  
– Part 1: General requirement
- JNIOOSH-TR-46-3:  
– Part 3: Equipment protection by pressurized enclosure “p”
- JNIOOSH-TR-46-6:  
– Part 6: Equipment protection by intrinsic safety “i”

In special cases, or if you are not sure about the specification of areas with the risk of explosion, contact the competent authorities or YASKAWA and have them decide.

## 2.3 Customer Service, Repairs and Modifications

Only have repairs to the manipulator carried out by YASKAWA'S customer service responsible.

Use only genuine parts from YASKAWA for maintenance work.

We are not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

Any modification of the manipulator itself, and of the following system components is strictly prohibited:

- Explosion-proof devices and system installation
- Safeguards and the safety devices mounted on these safeguards
- Emergency stop button and other safety devices
- Manipulator control system such as the DX200, the manipulator handling drive section and the power transmission section

If you need assistance with any aspect of your Manipulator Explosion-Proof Specifications system, please contact YASKAWA Customer Support at the following 24-hour telephone number:

**(937) 847-3200**

For **routine** technical inquiries, you can also contact YASKAWA Customer Support at the following e-mail address:

[techsupport@motoman.com](mailto:techsupport@motoman.com)

When using e-mail to contact YASKAWA Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.



Please use e-mail for **routine** inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact YASKAWA Customer Support at the telephone number shown above.

Please have the following information ready before you call Customer Support:

- |                            |  |
|----------------------------|--|
| • System                   | Manipulator Explosion-Proof Specifications   |
| • Primary Application      | _____  |
| • Controller               | DX200  |
| • Software Version         | Access this information on the Programming Pendant's LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION} |
| • Robot Serial Number      | Located on the robot data plate  |
| • Robot Sales Order Number | Located on the DX200 controller data plate   |



## 3 System Configuration

### 3.1 Manipulator

The explosion-proof manipulator is to be installed in hazardous locations such as in the painting booth and performs operations to workpieces.

The manipulator is driven by the servo motor in vertically articulated operation mode on the manipulator base.

(To its encoder, a capacitor with withstand voltage of less than 500V is mounted.)

For the details of basic specifications, dimensions, or range of motion of the manipulator, refer to "Basic Specifications" part in the INSTRUCTIONS of the corresponding manipulator.

#### 3.1.1 Requirements to Gaskets Used in the Manipulator

Manipulator makes use of (liquid-) gaskets shown below.

Their performance should be considered with respect to the chemicals that may be present in the hazardous area.

1. Threebond 1206C
2. NBR

### 3.2 DX200

The DX200 has a built-in microcomputer that controls all motion of the manipulator by saving motion signals when teaching and sending these signals to the manipulator. The power unit that supplies power to the manipulator is also built into the DX200.



## DANGER

- The power supply of the DX200 is 200/220 VAC. Be sure to turn OFF the primary power supply of the DX200 before starting maintenance.

Failure to observe this warning may result in electric shock.

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### 3.3 Pressure Switch Unit

The pressure switch unit supplies protective air or gas to the manipulator to prevent explosive gas from entering into the manipulator.

For the details of the pressure switch unit, refer to "Connection" part in the INSTRUCTIONS of the corresponding manipulator.

The distance of up to 20 m is allowed between the manipulator and the pressure switch unit.

Adjust the length of the air tube to be as same length as the distance between them.

Never disassemble/remodel the pressure switch unit.

It is very dangerous to disassemble/remodel the pressure switch unit or to operate a manipulator in the explosive environment after removing the pressure switch unit.

It should be kept free of obstacles around the pressure switch unit when purging.

## 4 Installation

### 4.1 Requirements

Prepare the power supply, the air supply, and the grounding according to the descriptions in "Requirement" part in the INSTRUCTIONS of the corresponding manipulator.



#### CAUTION

Use dry air for the pressurized explosion-proof enclosure. Moisture in the air supply may damage the electronic parts.

### 4.2 Installation Site

Only devices that are approved as explosion-proof can be installed in hazardous locations. Refer to the local regulations and safety codes for the definition of a hazardous location. Install the DX200 and control panels in a location free from water drops, dust, and dirt.

For the details of the installation site, refer to "Installation Site" part in the INSTRUCTIONS of the corresponding manipulator.



#### DANGER

In case installing the manipulator in the hazardous area, classify the manipulator environment by following the local explosion-proof standard and then, on the basis of the explosion-proof structure notation on the manipulator confirm that the manipulator is possible to install in that area.



#### WARNING

Devices that are not explosion-proof must not be installed in hazardous locations. Failure to observe this warning may result in a fire.

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### 4.3 Transport and Installation

Carry out the operation safely observing the following precautions.

- I) Signs indicating prohibitions such as, "The lighting of fires is prohibited"
- II) Clean working place that is clearly defined and free of obstacles
- III) Appointment of personnel in charge
- IV) Company working regulations for safe operation

#### 4.3.1 Manipulator and Pressure Switch Unit

Installation of the manipulator and pressure switch unit should be performed by an authorized or certified personnel by YASKAWA or a YASKAWA service company personnel, refer to "Installation" part in the INSTRUCTIONS of the corresponding manipulator.

#### 4.3.2 DX200 and Programming Pendant

- The DX200 and the programming pendant are not explosion-proof (the explosion-proof programming pendant is available as an option). Never install the DX200 and the programming pendant that are not explosion-proof in a hazardous location.
- Secure a space around the DX200 for maintenance. When the sufficient space is not available, perform maintenance by pulling out the corresponding part for the maintenance.
- Do not install the DX200 and programming pendant close to any noise source such as the power supply for other devices.
- Install the DX200 in a location where the optimum atmosphere, temperature, and humidity are assured and provide protection against water drops or thinner. If necessary, install a control room to supply clean and temperature-controlled air.

## 5 Connection



### DANGER

- For the manipulator main body, due to its explosion-proof structure, motors and connectors in the pressurized enclosure (arm) are protected from the explosive gases.

However, power cables that connect the manipulator's main body with the DX200 are not protected by the pressurized air.

In case the power cable, which is not protected, is split over large amount of solvent or the covering of the cable is damaged, fire may outbreak due to short-circuit or ground.

In this regard, whenever connecting the power cable, fixed type or movable type, please be sure to provide protection materials to it.

For protecting the cable, use flexible tubes to the movable type cable and wire blade (optional) or hard covering materials, etc. to the fixed type cable.

- Please do not fail to check the surface of the power cable and its coverings. In case any abnormalities are found, immediately stop the operation and replace it with the new cable.
- For the movable type power cable, replace it in every 24,000 hours regardless of any damages.
- For the fixed type power cable, it is recommend to replace it in every 36,000 hours regardless of any damages.



### DANGER

For the cable gland, it is required to use the specified one for the explosion-proof certification manipulator.

It is highly recommend to use the cable gland prepared by YASKAWA which is the exclusive one.

Also, please do not remove reassemble or remodel the cable gland since it is already an assembled parts.

Contact your YASKAWA representatives when any abnormalities are found.

**WARNING**

- Ground resistance must be 100  $\Omega$  or less.
- Failure to observe this warning may result in fire or electric shock.
- Before wiring, make sure to turn the primary power supply OFF, and put up a warning sign. (ex. DO NOT TURN THE POWER ON.)
- Failure to observe this warning may result in fire or electric shock.

**CAUTION**

- Wiring must be performed by authorized or certified personnel.
- Failure to observe this caution may result in fire or electric shock.
- Do not cover the cable with heat insulating material, and avoid multiple cabling.
- Failure to observe this caution may result in burn caused by cable heat emission failure.

**5.1 Grounding**

Perform grounding in accordance with all relevant local and national electrical codes. A ground wire of 5.5 mm<sup>2</sup> or more is recommended.

For the details of the grounding method, refer to “Grounding” part in the INSTRUCTIONS of the corresponding manipulator.

**MANDATORY**

- Don't connect the grounding wire with the wires for the electric power source, etc.
- Ground in accordance with all relevant governmental regulations when using metallic ducts, metallic conduits, and cable tray to construct the cable.

## 5.2 Cable Connection



### CAUTION

Air tubes for purging are connected to the cover part of the power cables.

In case the tube is bent or foreign substances are stuck inside the tube, air may not be appropriately supplied which would result in malfunction. For this reason, treat air tubes with great care when connecting.

For the details of the power or air tube connections to the manipulator or the intrinsically safe cable connections to the pressure switch unit, please refer to "Connection" part in the INSTRUCTIONS of the corresponding manipulator.

Refer to the DX200 INSTRUCTION Manual (165292-1CD) for the connection of the power cable and the intrinsically safe cable to the DX200. (The air tube for the pressure switch unit, intrinsically safe cable, and crimped terminals should be prepared by the customer.)

Inside the painting booth, the power supply cables are required to be protected by the wire blade prepared by Yaskawa (length should be specified) or to be put either in the ditch on the floor and be covered with the metal plate or through the metal pipe.

### 5.2.1 Connecting Position of Cables, etc.

Connecting positions for the power cable, intrinsically safe cable and pressure switch unit differ depending on the product.

For the details of the above mentioned parts, refer to "Wiring" part in the INSTRUCTIONS of the corresponding manipulator.

## 6 Operation (Initial Start-Up Included)

Prior to start operations of the manipulator, refer to “Enclosure Protection Sequence” part in the INSTRUCTIONS of the corresponding manipulator.

## 7 Daily Inspections

The painting manipulator is a precision device using advanced technology. It is important to frequently inspect the manipulator and remove any dried paint.

Conduct the daily and weekly inspections to ensure the long life of the manipulator and its performance.

For the details of maintenance and inspections such as inspection intervals, inspection items, and its operations, refer to “Maintenance and Inspection” part in the INSTRUCTIONS of the corresponding manipulator.

## 8 Maintenance and Inspection



### DANGER

- Maintenance and inspection must be performed by specified personnel.

Failure to observe this caution may result in electric shock or injury.

- For disassembly or repair, contact your Yaskawa representative.
- Do not remove the motor, and do not release the brake.

Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.



### WARNING

- Before maintenance or inspection, be sure to turn the main power supply OFF, and put up a warning sign. (ex. DO NOT TURN THE POWER ON.)

Failure to observe this warning may result in electric shock or injury.



### CAUTION

- The battery pack must be connected before removing detection connector when maintenance and inspection.

Failure to observe this caution may result in the loss of home position data.



Conduct daily and periodic inspections to ensure the long life of the manipulator and its performance.

Proper inspections are essential not only to assure that the mechanism will be able to function for a long period, but also to prevent malfunctions and assure safe operation.

For the details of maintenance and inspections such as inspection intervals, inspection items, and operations, refer to "Maintenance and Inspection" part in the INSTRUCTIONS of the corresponding manipulator.

### 8.1 Inspection of Gasket for Internal Air Pressure

Check for wear and tear of the rubber gaskets at each part.

For the details of the inspection, refer to "Inspection of Air Sealing for Internal Air Pressure" part in the INSTRUCTIONS of the corresponding manipulator.

### 8.2 Battery Replacement



#### CAUTION

Before inspection, please turn OFF the power supply to the DX200 and check that no explosive atmosphere exist around it.

Since the type of the battery unit (use one out of three in the following table), battery installation position, and battery replacement procedures differ depending on the manipulator type, prior to perform replacement operation of the battery unit, confirm the procedures by referring to "Battery Replacement" part in the INSTRUCTIONS of the corresponding manipulator.

Battery unit type	Battery type	Manufacturer
HW1372692-A -B C	ENERGIZERL91	YASKAWA Electric Corporation

### 8.3 Inspection of Pressure Switch Unit



#### CAUTION

Before inspection, please turn OFF the power supply to the DX200 and check that no explosive atmosphere exist around it.

Inspect the operation to each part of the pressure switch unit.

For the inspection, refer to "Inspection of Pressurization System" part in the INSTRUCTIONS of the corresponding manipulator.

# MANIPULATOR INSTRUCTIONS

## FOR EXPLOSION-PROOF SPECIFICATIONS

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Specifications are subject to change without notice  
for ongoing product modifications and improvements.

# YASKAWA

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