YASKAWA

# Robot Optimized for Arc Welding
# MOTOMAN-VA and MA Series


## VA, MA Series

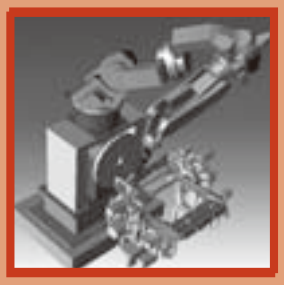
Robots optimized for arc welding can also be used for handling and other applications.

Certified for ISO9001 and ISO14001

JAB QMS Accreditation R009

JQA-0813

JQA-EM0202



# Compatible with DX200 controller! Yaskawa has set a new standard with its revolutionary “short processing“ concept for arc welding.

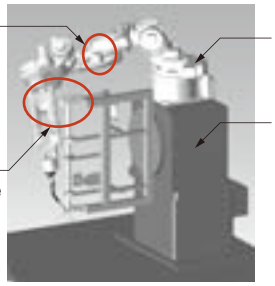
## Save Space Energy

Structures, performance, and functions designed for optimum application help you downsize production facilities and save energy.

### Hardware

## MOTOMAN-VA1400Ⅱ (The industry's first 7-axis robot)

● Example : Mounted on single axis positioner




*1: Maintain the optimum welding posture for a workpiece in a jig as positioner coordinates with the robot.

### Easily avoid interference.

With the 7th axis (E-axis), the arm can easily avoid interference with workpieces and jigs as well as keep the optimal torch posture by going around to the back of the workpiece. Large workpieces can be handled, and welding can be done inside the workpiece.

### Use 50% less space with high density layout.

With the robot on a shelf or on the top of the positioner, welding can start from the top of the workpiece, and the installation space can be halved. If the robots are in close proximity, the arms can be easily posed to avoid interference, and several robots can be placed in a small space.

### Increased operability and maintainability with built-in cables.

Not only are the torch cables inside the U-arm, but the welding earth cable as well as the gas and air hoses are inside the base. This reduces the space in which the cables can move and stretches the cable's life.

## Robot Controller DX200

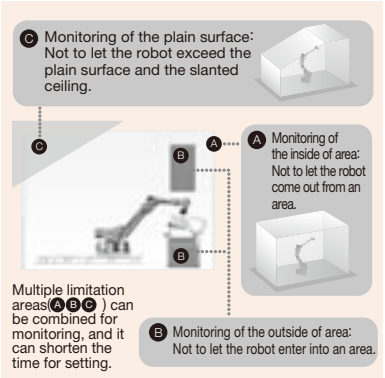
Installation space for the controller is reduced by 50%.

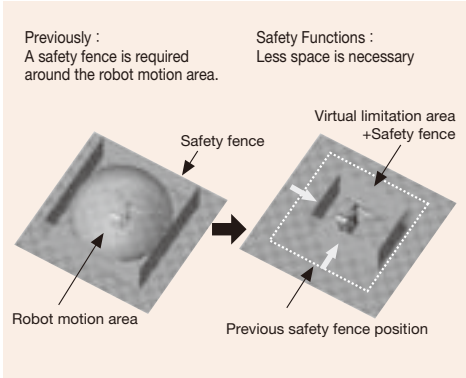
The DX200 is a low-floor robot controller developed with Yaskawa's expertise acquired through the development of products for various applications. The amplifier for three external axes and other options that previously required attachment tools can now be housed inside a standard cabinet, reducing the required space for installation by up to 50%. The safety functions have been strengthened by improving the safety performance of the speed limiting function and tool switching monitoring function.

### Software

## Minimized Safety Barrier*2 Optional

Movements of the robot can be limited within an optimal range for the attached tool by monitoring positions of the robot and tool with the functional safety module equipped with two CPUs. With this function, the safety fence can be installed for an area that is smaller than the motion range of the robot, which reduces the required installation space for production equipment.



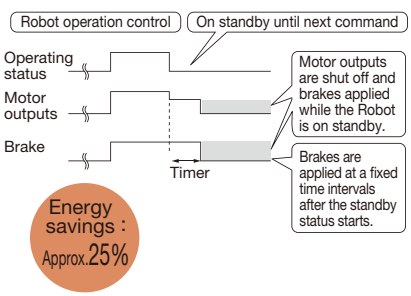




## Saving Energy

Reduced power consumption helps lower running costs.

- The servos are turned OFF automatically when the Robot is stopped for a long period of time.

〈Conditions〉
Twenty-four-hour operation in which the Robot is operating for 16 hours and on standby for 8 hours




* 2: Contact the Yaskawa sales department about manipulator models that support this function.

## Short processing

Increased freedom in operation or compact and slim design have made the new robots more optimized for specific applications. High-density installation has contributed customers production line to saving space. The facility which enables integrated process, rapid production and saving space is called “short processing”.

**New robot solutions**

- Slimmer design enables closer mounting.
- Seven axes design provides more flexibility.
- Smaller Controller saves space.
- Multiple Robot Controller prevents robots from collisions.
- Installation space reduced by safety function (restricting the range of Robot operation).

**Short processing**

- Shorter production lines.
- Reduced number of processes.

**Customer advantages**

- Highly efficient production.
- Better quality.
- Saving energy.

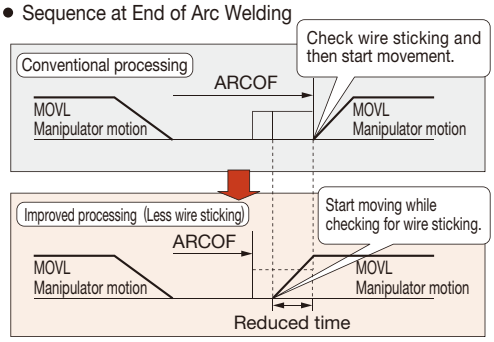
# High Productivity Quality

Faster and higher quality arc welding with wide variety of functions reduces wasted motion and cycle times.

## Quicker Welding

The welding time per bead can be reduced by starting the next motion while checking to make sure no wire sticking occurred at the end of the arc welding process.

- Sequence at End of Arc Welding

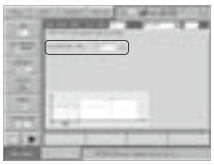



## Settings for Welding Conditions

Improve welding quality by defining the preflow and postflow of the gas as well as the slope (transition) when setting the conditions for the start and the end of arc welding.

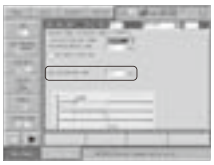
- Preflow Gas Settings

The gas preflow can be set as the arc start conditions so the gas can be filled up to the tip of the wire before starting arc welding.



- Postflow Gas Settings

The gas postflow can be set as the arc end conditions so the gas can be filled up at the end of welding to prevent the tip of the wire from being oxidized.



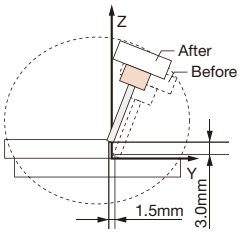
- Slope Settings

Attain high-precision welding by setting the distance or time as a condition for the slope.

## Shift Function in Coordinate System Optional

Simplify teaching by using numerical values to adjust or shift the target position and attain high-quality welding.

- Example




① Teach the joint center, and then the welding motion starts on the position shifted for the set value from the taught position. (The target position can be controlled by the numerical value.)

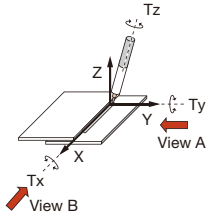
② Deviations from the welding path in a specified zone can be corrected all together. (Expanded function of the conventional parallel job shift)

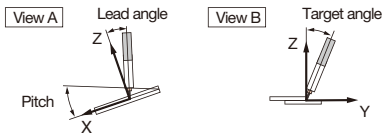
Example : Y=−1.5mm, Z=3.0mm

## Torch Angle Display Optional

Teaching operation becomes easier by viewing the torch angle on the programming pendant.

- Torch Angle




Target angle : The slant angle of the torch in relation to the Z-axis, as shown in View B.( The angle is larger as the torch moves away from the Z-axis.)

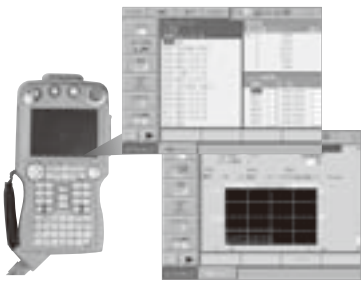
Lead angle : The slant angle of the torch in relation to the Z-axis, as shown in View A. (The positive (+) side is the side of the torch head that faces the direction in which welding will progress.)

Pitch : The slant angle from the horizontal surface (the base coordinates) of the welding path. The slant angle of the tangential line at the present location when on a circular trajectory. (The positive (+) side is the side of the torch head that faces downwards.)

# Easy Operation Simulation

Operability of teaching and simulation have been improved to reduce time required for system startup.

## Programming Pendant



- Multi-window Display

Improve efficiency by checking the programmed motion with the I/O data and variables displayed during teaching or trial operations. When an alarm occurs, the type of error, its cause, and a suggested remedy are displayed.

- Arc Monitoring (Optional)

Easily check the welding results with a graphic display of the welding current and voltage.

## MotoSimEG-VRC Simulator Optional

The Simulator has evolved from merely simulating Robot operation to a Virtual Controller that reproduces the functions, operations, and displays of the actual Robot. Easy simulation is possible by anyone with an understanding of Robot operation.

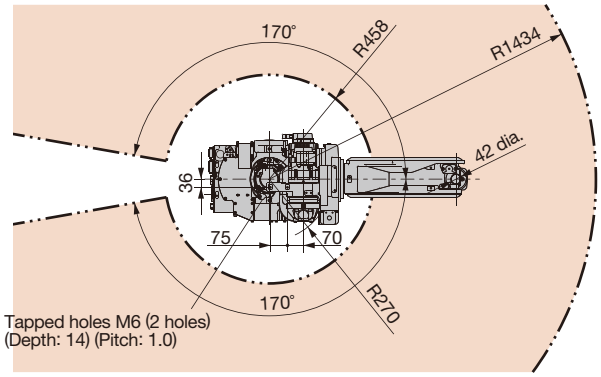
# MOTOMAN-VA1400Ⅱ

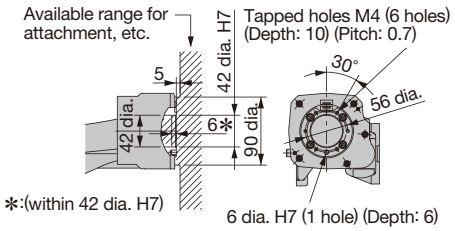
## 3 kg payload, R1434 mm maximum reach

The industry's first 7-axis robot optimized for arc welding

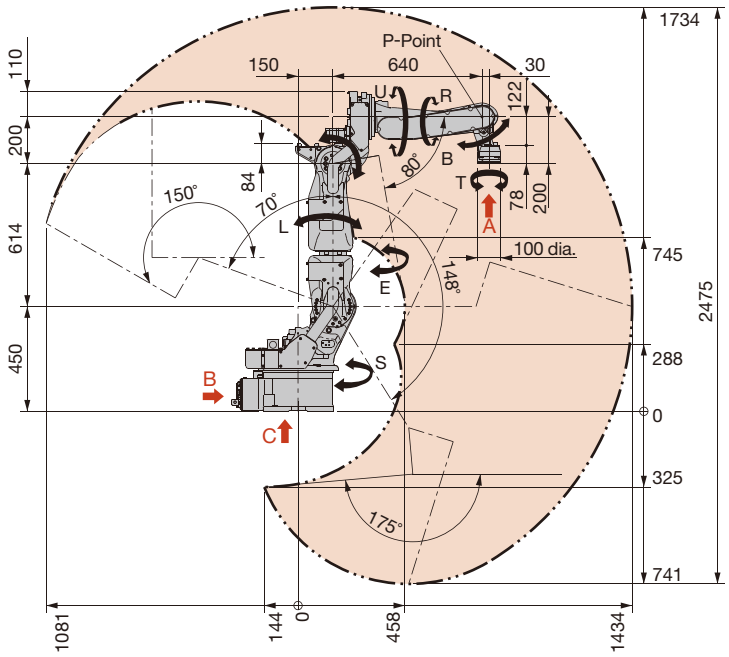
- New 7-axis configuration enables welding quality to be increased by maintaining the optimum welding posture at all times.
- Save space by having the cables in the arm and base part to reduce interference with the jigs and workpieces and to enable high-density layouts.
- Increase productivity with fastest motion in its class and wider motion range.

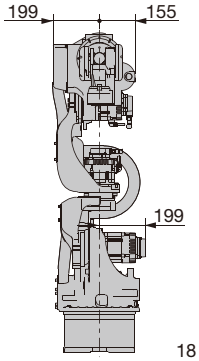
## Dimensions Units : mm ⬚ : P-point Maximum Envelope

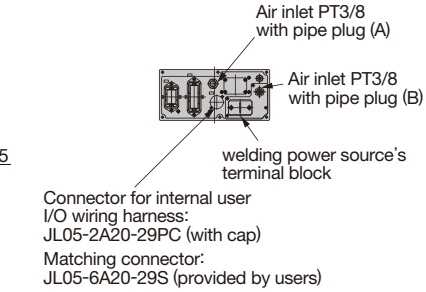


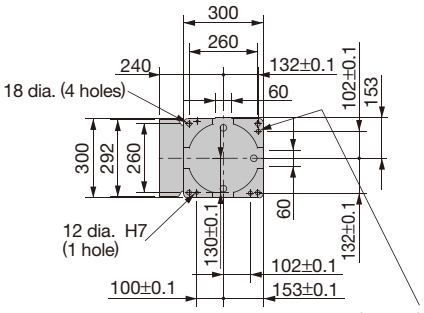

View A




View B




View C

## Manipulator Specifications

| | | |
|---|---|---|
| Model | | MOTOMAN-VA1400Ⅱ |
| Type | | YR-VA01400-J00 |
| Controlled Axis | | 7 (Vertically articulated) |
| Payload | | 3 kg |
| Repeatability *1 | | ±0.08 mm |
| Range of Motion | S-axis (turning) | −170° – +170° |
| | L-axis (lower arm) | −70° – +148° |
| | E-axis (elbow) | −90° – +90° |
| | U-axis (upper arm) | −175° – +150° |
| | R-axis (wrist roll) | −150° – +150° |
| | B-axis (wrist pitch/yaw) | −45° – +180° |
| | T-axis (wrist twist) | −200° – +200° |
| Maximum Speed | S-axis (turning) | 3.84 rad/s, 220°/s |
| | L-axis (lower arm) | 3.49 rad/s, 200°/s |
| | E-axis (elbow) | 3.84 rad/s, 220°/s |
| | U-axis (upper arm) | 3.84 rad/s, 220°/s |
| | R-axis (wrist roll) | 7.16 rad/s, 410°/s |
| | B-axis (wrist pitch/yaw) | 7.16 rad/s, 410°/s |
| | T-axis (wrist twist) | 10.65 rad/s, 610°/s |

| | | |
|---|---|---|
| Allowable Moment | R-axis (wrist roll) | 8.8 N·m |
| | B-axis (wrist pitch/yaw) | 8.8 N·m |
| | T-axis (wrist twist) | 2.9 N·m |
| Allowable Inertia ($GD^2/4$) | R-axis (wrist roll) | 0.27 kg·m² |
| | B-axis (wrist pitch/yaw) | 0.27 kg·m² |
| | T-axis (wrist twist) | 0.03 kg·m² |
| Mass | | 150 kg |
| Ambient Conditions | Temperature | 0℃ to +45℃ |
| | Humidity | 20% to 80%RH (non-condensing) |
| | Vibration | 4.9 m/s² or less |
| | Others | • Free from corrosive gas or liquid, or explosive gas or liquid<br>• Free from exposure to water, oil, or dust<br>• Free from excessive electrical noise (plasma) |
| Power Requirements *2 | | 1.5 kVA |

*1 : Conforms to ISO 9283.
*2 : Varies in accordance with applications and motion patterns.
Note : SI units are used for specifications.

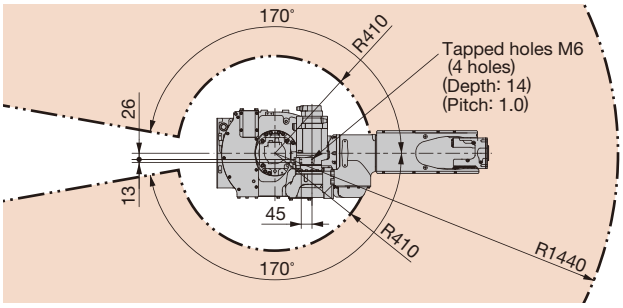
# MOTOMAN-MA1440

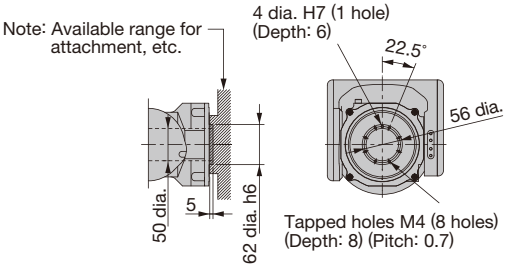
## 6 kg payload, R1440 mm maximum reach

Streamlined robot optimized for arc welding for higher productivity

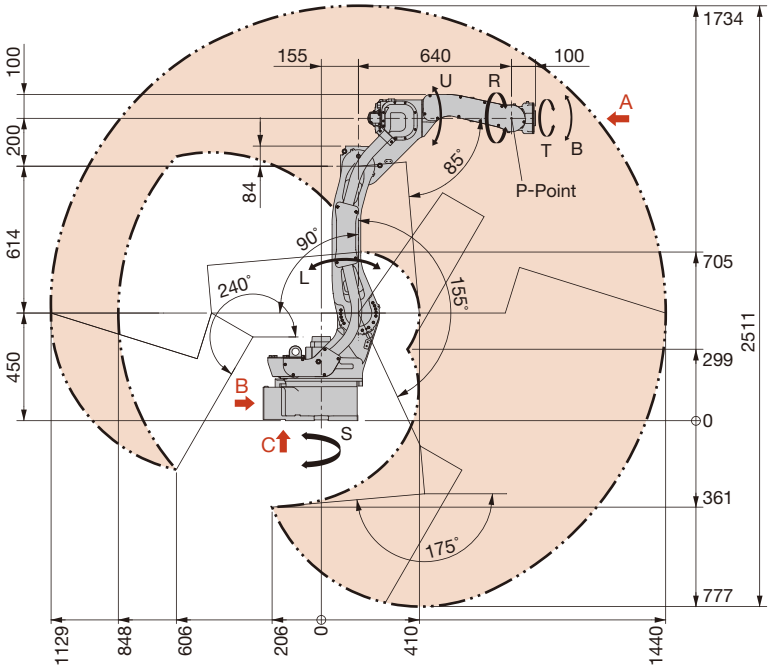
- Sensors and a servo torch can be mounted with an increased payload of 6 kg.
- Interference with workpieces and jigs decreased with the use of the streamlined arms.
- Torch cables can be routed either inside or outside the robot.

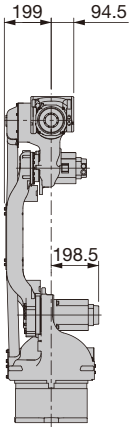
## Dimensions Units : mm : P-point Maximum Envelope

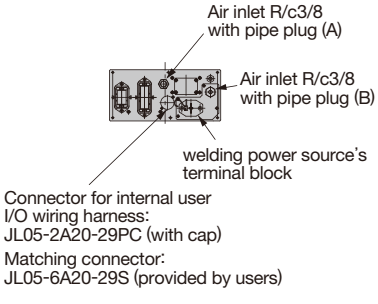


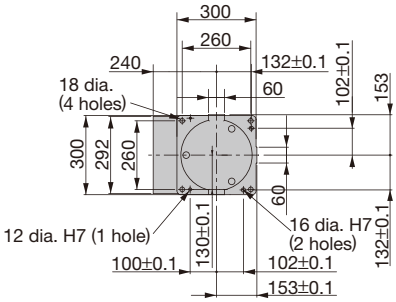

View A




View B




View C

## Manipulator Specifications

| | | |
|---|---|---|
| Model | | MOTOMAN-MA1440 |
| Type | | YR-MA1440/ MH12-A00 |
| Controlled Axis | | 6 (Vertically articulated) |
| Payload | | 6 kg |
| Repeatability *1 | | ±0.08 mm |
| Range of Motion | S-axis (turning) | −170° – +170° |
| | L-axis (lower arm) | −90° – +155° |
| | U-axis (upper arm) | −175° – +240° |
| | R-axis (wrist roll) | −150° – +150° |
| | B-axis (wrist pitch/yaw) | −135° – +90° |
| | T-axis (wrist twist) | −210° – +210° |
| Maximum Speed | S-axis (turning) | 4.01 rad/s, 230°/s |
| | L-axis (lower arm) | 3.49 rad/s, 200°/s |
| | U-axis (upper arm) | 4.01 rad/s, 230°/s |
| | R-axis (wrist roll) | 7.50 rad/s, 430°/s |
| | B-axis (wrist pitch/yaw) | 7.50 rad/s, 430°/s |
| | T-axis (wrist twist) | 11.00 rad/s, 630°/s |

| | | |
|---|---|---|
| Allowable Moment | R-axis (wrist roll) | 10.5 N·m |
| | B-axis (wrist pitch/yaw) | 10.5 N·m |
| | T-axis (wrist twist) | 3.2 N·m |
| Allowable Inertia ($GD^2/4$) | R-axis (wrist roll) | 0.28 kg·m² |
| | B-axis (wrist pitch/yaw) | 0.28 kg·m² |
| | T-axis (wrist twist) | 0.06 kg·m² |
| Mass | | 130 kg |
| Ambient Conditions | Temperature | 0℃ to +45℃ |
| | Humidity | 20% to 80%RH (non-condensing) |
| | Vibration | 4.9 m/s² or less |
| | Others | • Free from corrosive gas or liquid, or explosive gas or liquid<br>• Free from exposure to water, oil, or dust<br>• Free from excessive electrical noise (plasma) |
| Power Requirements *2 | | 1.5 kVA |

*1 : Conforms to ISO 9283.
*2 : Varies in accordance with applications and motion patterns.
Note : SI units are used for specifications.

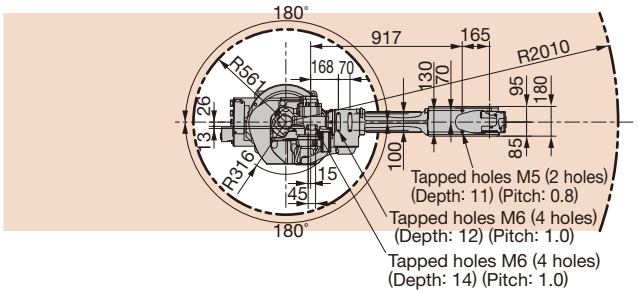
# MOTOMAN-MA2010

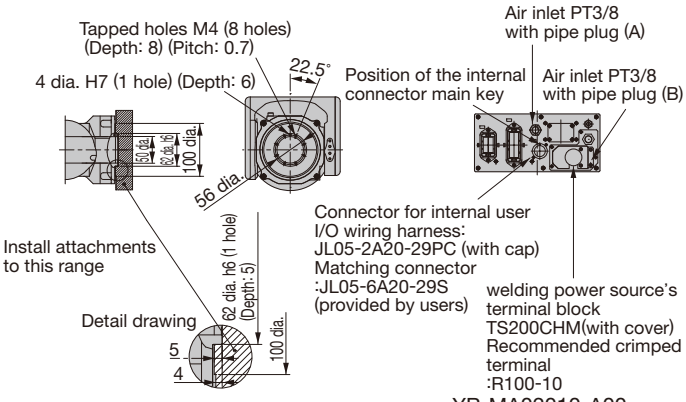
## 10 kg payload, R2010 mm maximum reach

Long arm type robot optimized for welding and capable of handling large workpieces

- This robot can be used for welding systems that require high-current, water-cooled torches used in high operation rates, and the EAGL welding method for low spatter.
- Longest reach in its class and high-speed motions (Maximum reach : 2010mm Composite speed : 2027°/s)
- The streamlined arm design (L and U axes) reduces the interference area.

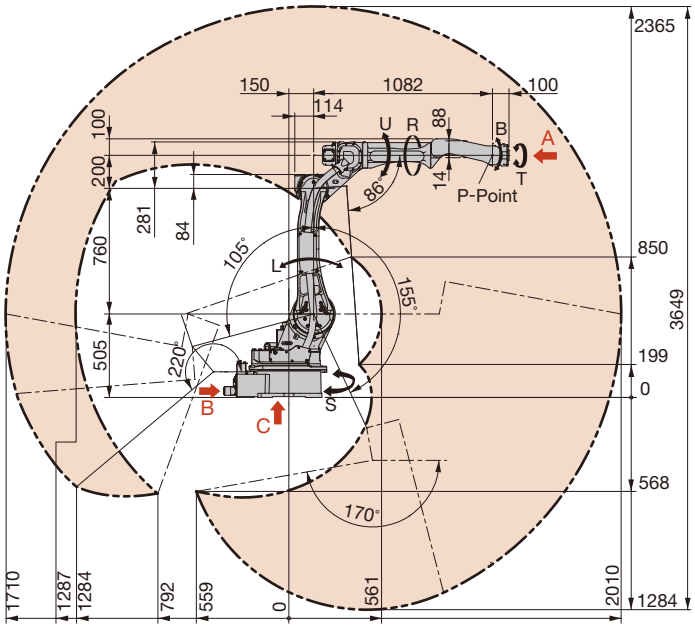
## Dimensions Units : mm : P-point Maximum Envelope

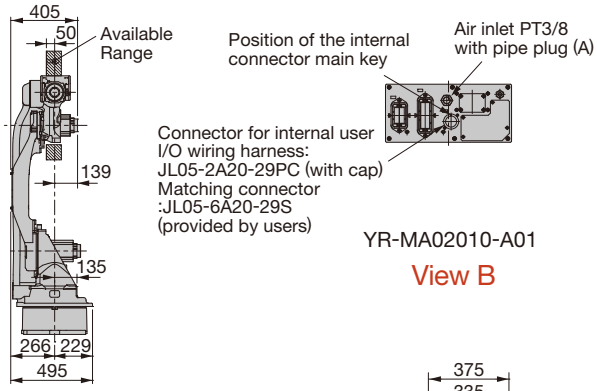


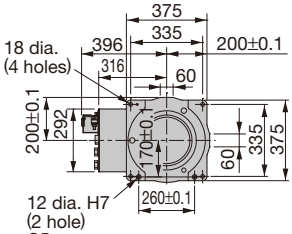

View A

View B




View B




View C

## Manipulator Specifications

| | | |
|---|---|---|
| Model | | MOTOMAN-MA2010 |
| Type | | YR-MA02010-A00 (with arc welding power cable inside the base)<br>YR-MA02010-A01 (without arc welding power cable inside the base) |
| Controlled Axis | | 6 (Vertically articulated) |
| Payload | | 10 kg |
| Repeatability*1 | | ±0.08 mm |
| Range of Motion | S-axis (turning) | −180° – +180° |
| | L-axis (lower arm) | −105° – +155° |
| | U-axis (upper arm) | −170° – +220° |
| | R-axis (wrist roll) | −150° – +150° |
| | B-axis (wrist pitch/yaw) | −135° – +90° |
| | T-axis (wrist twist) | −210° – +210° |
| Maximum Speed | S-axis (turning) | 3.44 rad/s, 197°/s |
| | L-axis (lower arm) | 3.32 rad/s, 190°/s |
| | U-axis (upper arm) | 3.67 rad/s, 210°/s |
| | R-axis (wrist roll) | 7.16 rad/s, 410°/s |
| | B-axis (wrist pitch/yaw) | 7.16 rad/s, 410°/s |
| | T-axis (wrist twist) | 10.6 rad/s, 610°/s |

| | | |
|---|---|---|
| Allowable Moment | R-axis (wrist roll) | 22.0 N·m |
| | B-axis (wrist pitch/yaw) | 22.0 N·m |
| | T-axis (wrist twist) | 9.8 N·m |
| Allowable Inertia ($GD^2/4$) | R-axis (wrist roll) | 0.65 kg·m² |
| | B-axis (wrist pitch/yaw) | 0.65 kg·m² |
| | T-axis (wrist twist) | 0.17 kg·m² |
| Mass | | 280 kg |
| Ambient Conditions | Temperature | 0℃ to +45℃ |
| | Humidity | 20% to 80%RH (non-condensing) |
| | Vibration | 4.9 m/s² or less |
| | Others | • Free from corrosive gas or liquid, or explosive gas or liquid<br>• Free from exposure to water, oil, or dust<br>• Free from excessive electrical noise (plasma) |
| Power Requirements *2 | | 2.0 kVA |

*1 : Conforms to ISO 9283.
*2 : Varies in accordance with applications and motion patterns.
Note : SI units are used for specifications.

# DX200 Robot Controller

## Specifications

### DX200 Controller

| Items | Specifications |
|---|---|
| Configuration | Dust proof IP54 |
| Dimensions | 600 (W)×520 (D)×730 (H) mm |
| Mass | 100 kg max. |
| Cooling System | Indirect cooling |
| Ambient Temperature | During operation : 0℃ to +45℃<br>During storage : −10℃ to +60℃ |
| Relative Humidity | 10% to 90%RH (non-condensing) |
| Power Supply | Three-phase 200 VAC (+10%, −15%), 50/60 Hz (±2%)<br>Three-phase 220 VAC (+10%, −15%), 60 Hz (±2%) |
| Grounding | Grounding resistance : 100 Ωor less |
| Digital I/Os | Specialized signals : 28 inputs and 7 outputs<br>General signals : 40 inputs and 40 outputs<br>Max. I/O (optional) : 4096 inputs and 4096 outputs |
| Positioning System | Serial communications (absolute encoder) |
| Programming Capacity | JOB : 200,000 steps, 10,000 instructions<br>CIO ladder : 20,000 steps |
| Expansion Slots | PCI : 2 slots |
| LAN (Connection to Host) | 1 (10BASE-T/100BASE-TX) |
| Interface | RS-232C : 1ch |
| Control Method | Software servo control |
| Drive Units | SERVOPACK for AC servomotors<br>(can control up to 9 axes) |

### Programming Pendant

| Items | Specifications |
|---|---|
| Dimensions | 169 (W)×50 (D)×314.5 (H) mm |
| Mass | 0.990 kg |
| Material | Reinforced plastics |
| Operation Device | Select keys, axis keys, numerical/application keys, mode selector switch with keys (mode : teach, play, and remote), emergency stop button, enable switch, compact flash card interface device (compact flash is optional.), USB port (1 port) |
| Display | 5.7-inch color LCD, touch panel 640×480 pixels (Alphanumeric characters, Chinese characters, Japanese letters, Others) |
| IEC Protection Class | IP65 |
| Cable Length | Standard : 8 m,<br>Max. : 36 m (with optional extension cable) |

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LITERATURE NO. KAEP C940440 20B <9>-0

Published in Japan September 2017
16-8-43