ARC WELDING AND HANDLING ROBOTS

MV SERIES
MV6 / MV6L / MV16

MV Series Robot
Total Solutions from the Single Source Provider
Remarkable Enhancements in Motion Performance

High Speed - Smooth Movement Shortens Production Time
- Faster, yet smoother motion - reduce cycle time by new servo control system with advanced acceleration method.
- Independently articulated arm - no link to impede articulation for a full range of motion.
- Vibration restraining control - virtually eliminates vibration when stopping at maximum speed.

Our Best Selling Arc Welding Robot
Offers a wide working range with an independently articulated arm.

Long Arm Arc Welding Robot
Extended reach up to 78.98" (2006mm). The optimum solution for welding large workpieces.

Multi-Purpose Handling Robot
High performance, smooth handling of workpieces up to 35 lbs. (16kg).
HIGH QUALITY MAG / CO2 WELDING

- Virtually Spatter Free - High Speed Welding
  Arc voltage tolerance and arc stability are drastically improved when using mixed shielding gases or 100% CO²
- Optional AC Servo Wire Feed System
  By using an AC servo pull type wire feeder / torch, wire feedability is improved during high-speed welding
- Optional RD (Retract Start) Control
  Improves instantaneous arc start ratio and bead profile at the arc start point

TANDEM PULSED MAG WELDING

- High-Speed Tandem Pulsed MAG Welding
  Very fast travel speeds are easily attainable
- Two Independent Electrodes
  Each controlled separately and synchronously to maintain arc stability and reduce spatter
- High Deposition Rate
  Achievable for thin and thick plate applications
- Tandem MIG
  Available for high-speed aluminum applications
Optional Features

- **Retract Start Function-RS Control**
  Arc start failures and spatter generation are dramatically reduced even when using soft aluminum wire.

- **Synchro MIG and FC (Feed Control) MIG Functions**
  Beautiful TIG-like bead appearance is made easily and efficiently at higher travel speeds of MIG welding.

- **4 Drive Roll AC Servo Pull Feeder / Torch**
  Stable wire feeding is accomplished with the highly responsive wire feed system.

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**RS Arc Start Function (Retract Start)**

With high wire feeding response of the AC servo pull torch, the following arc start function is executed. Here is how it works in three steps:

1. Wire touches part
2. Wire retracts quickly
3. Wire feeds and arc is generated

**RS improves arc starting by 5 times on aluminum!**

- **Instant**
- **Short delay**
- **Long start delay**

**Spatter is reduced significantly**

- **RS**
- **Conventional**

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**Synchro MIG**

By synchronizing the welding current pulse cycle, heat input into the base metal can be precisely controlled. Excellent for welding dissimilar thicknesses.

**Lap joint welding using Synchro MIG**

Synchro pulse: 2 Hz – 100A – 20V – 20 IPM.

**FC MIG (feed control)**

Wire feed speed is synchronized with low frequency pulsed current for high quality welding of even very thin aluminum.

Ideal for aluminum applications requiring TIG-like bead appearance with higher efficiency of MIG.
Significant Development in GTAW Applications

ULTRA PRECISION TIG WELDING

Standard Features

* New Digitally Controlled Power Sources
Pulse waveforms are programmed with the robot teach pendant improving repeatability and making parameter setting easy

* Newly Designed TIG Torch
Compact, rigid, and incorporates a built-in shock sensor that stops the robot instantly in the event of an accidental crash

* Compact Wire Guide
Simplifies teaching in narrow or confined spaces

Optional Features

* Pulsed TIG and Synchro TIG Functions
Ultra high quality with excellent bead appearance is easily attainable

* AC Servo Wire Feed System
Synchronizes wire feeding with pulsed current utilizing an AC servo wire feeder

### Pulsed TIG Welding Function
Synchronized pulsed welding current and pulsed wire feed.

![Pulsed TIG Welding Function Diagram](image)

### Synchro TIG Function
Pulsed welding current and pulsed wire feed is synchronized with weaving frequency.

![Synchro TIG Function Diagram](image)

- Total control of process with incredible bead appearance.
- Ensures high repeatability with accuracy.

### AC Servo Wire Feeder
- Wire feeding is always stable and unaffected by robot movement
- Synchronizing wire feed with pulsed current improves the welding of thin aluminum, even with gaps

### Current Waveform Function
Sine wave, square wave, or combinations of the two can be taught directly from the teach pendant.

- **AC Standard Mode** – wide application from thick to thin materials

![AC Standard Mode Diagram](image)

- **AC Hard Arc Mode** – focused arc for thin sheet, fillet joints and outside corner joints.

![AC Hard Arc Mode Diagram](image)

- **AC Soft Arc Mode** – best suited for butt joint welding of sheet metal with low vibration of molten pool.

![AC Soft Arc Mode Diagram](image)

- **AC/DC Hybrid Mode** – AC + DCEP drastically reduces consumption of electrode and provides deep penetration.
**HIGH QUALITY PLASMA CUTTING**

- **High Speed and Heavy-Duty Capacity**
  Zips through thin and medium gauge material at incredible speeds
  High quality cuts up to 2-inch thick material

- **Maximum Duty Cycle**
  Plasma torch for the D-12000 is water cooled and offers 100% duty cycle

- **Long Life Consumables**
  Water cooled electrodes and high durability cutting tips reduces down time for changing consumables

- **Built-in Torch Guard Function**
  Alarm indicates replacement time of tip and electrode

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**D-12000 cutting chart**

<table>
<thead>
<tr>
<th>Cutting Thickness (in.)</th>
<th>1/2</th>
<th>3/4</th>
<th>1</th>
<th>1-1/2</th>
<th>2</th>
<th>2-1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Steel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stainless Steel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TYPICAL SYSTEM CONFIGURATION**

1. Manipulator
2. Controller
3. Teach Pendant
4. Operation Box
5. Welding Power Source
6. Welding Torch
7. Wire Feeder
8. Coaxial Power Cable
9. Conduit
10. Wire Reel Stand
**CONTROLLER FEATURES**

- **Open Architecture**
  PC-based controller provides more flexibility to adapt to customized systems (Windows™ NT embedded)

- **Compatible to Abundant Applications**
  Arc welding, cutting, spot welding, material handling, sealing ...

- **User Friendly Operation by Visual Display**
  Friendly assistance and guidance by built-in tutorial function

- **Advanced PLC Functions**
  Edit ladder diagram on the teach pendant - offline editing through commercial programming tool

- **Enhanced System Configuration Ability**
  Up to 54 axes and 9 mechanisms (up to 6 manipulators) can be controlled by one controller

- **Large Memory Capacity and I/O Control Signals**
  Standard memory capacity is 160,000 teach points - I/O control signal can be optionally enhanced up to 64 IN/OUT

- **Incredible New Functions for Arc Welding**
  Optional “RS” Retract Start, Synchro MIG & TIG, FC-MEG, and more

- **Network Capability**
  Optional Ethernet, Device-Net, and Proﬁ-bus network connections

- **Multilingual Feature**
  Select two languages from 10 available languages

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**MAINTENANCE & SOFTWARE FEATURES**

**On-Screen Service Guides**
Complete Instruction Manuals built-in, plus Optional On-Screen Guides as shown below.

- On-screen illustrations define problem areas.
- Illustrated parts replacement procedures.
- Oscilloscopic function for motion, servo and I/O related data.

**Software PLC**

- **Software PLC (Standard)**
  Control peripheral devices on the teach pendant screen

**Other Optional Software**

- **Synchro-Motion**
  Synchronously controls manipulator and peripheral devices to improve cycle time and torch attitude

- **Multi-Tasking**
  Improves job efficiency by performing multiple programs

- **Offline Programming**
  Program robots from your desktop PC for greater efficiency
# MANIPULATOR

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MV6</th>
<th>MV6L</th>
<th>MV16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Vertical Articulated Type</td>
<td>Vertical Articulated Type</td>
<td>Vertical Articulated Type</td>
</tr>
<tr>
<td>Number of Axes</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Maximum Allowed Load Weight</td>
<td>13.2 lb (6 kg)</td>
<td>13.2 lb (6 kg)</td>
<td>35.2 lb (16 kg)</td>
</tr>
<tr>
<td>Positional Repeatability</td>
<td>±0.003 in. (±0.08 mm)</td>
<td>±0.004 in. (±0.1 mm)</td>
<td>±0.004 in. (±0.1 mm)</td>
</tr>
<tr>
<td>Drive System</td>
<td>AC Servo Motor</td>
<td>AC Servo Motor</td>
<td>AC Servo Motor</td>
</tr>
<tr>
<td>Drive Capacity</td>
<td>2750W</td>
<td>5200W</td>
<td>5600W</td>
</tr>
<tr>
<td>Position Feedback</td>
<td>Absolute Encoder</td>
<td>Absolute Encoder</td>
<td>Absolute Encoder</td>
</tr>
</tbody>
</table>

## Operating Range

<table>
<thead>
<tr>
<th>Arm</th>
<th>1st axis rotation</th>
<th>2nd axis lower arm</th>
<th>3rd axis upper arm</th>
<th>4th axis swing</th>
<th>5th axis bending</th>
<th>6th axis twist</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV6</td>
<td>±170° ±50°**</td>
<td>-90°~ +155°</td>
<td>-170°~ +205°</td>
<td>±180°</td>
<td>-50°~ +230°</td>
<td>±360°</td>
</tr>
<tr>
<td>MV6L</td>
<td>±170° ±50°**</td>
<td>-90°~ +155°</td>
<td>-170°~ +205°</td>
<td>±180°</td>
<td>-50°~ +230°</td>
<td>±360°</td>
</tr>
<tr>
<td>MV16</td>
<td>±170° ±50°**</td>
<td>-100°~ +155°</td>
<td>-100°~ +155°</td>
<td>±180°</td>
<td>-50°~ +230°</td>
<td>±360°</td>
</tr>
</tbody>
</table>

## Maximum Speed

<table>
<thead>
<tr>
<th>Arm</th>
<th>1st axis rotation</th>
<th>2nd axis lower arm</th>
<th>3rd axis upper arm</th>
<th>4th axis swing</th>
<th>5th axis bending</th>
<th>6th axis twist</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV6</td>
<td>150°/sec</td>
<td>160°/sec</td>
<td>170°/sec</td>
<td>340°/sec</td>
<td>340°/sec</td>
<td>520°/sec</td>
</tr>
<tr>
<td>MV6L</td>
<td>165°/sec (150°/sec**)</td>
<td>165°/sec</td>
<td>175°/sec</td>
<td>350°/sec</td>
<td>350°/sec</td>
<td>520°/sec</td>
</tr>
<tr>
<td>MV16</td>
<td>165°/sec (150°/sec**)</td>
<td>175°/sec</td>
<td>175°/sec</td>
<td>335°/sec</td>
<td>335°/sec</td>
<td>520°/sec</td>
</tr>
</tbody>
</table>

## Ambience Temperature

<table>
<thead>
<tr>
<th>MV6</th>
<th>MV6L</th>
<th>MV16</th>
</tr>
</thead>
<tbody>
<tr>
<td>0° ~ 45°C 20 ~ 80%RH</td>
<td>0° ~ 45°C 20 ~ 80%RH</td>
<td>0° ~ 45°C 20 ~ 80%RH</td>
</tr>
</tbody>
</table>

## Mass (weight)

<table>
<thead>
<tr>
<th>MV6</th>
<th>MV6L</th>
<th>MV16</th>
</tr>
</thead>
<tbody>
<tr>
<td>341 lb (155 kg)</td>
<td>550 lb (250 kg)</td>
<td>550 lb (250 kg)</td>
</tr>
</tbody>
</table>

## Installation Method

| Floor, Hanging, Upside Down | Floor, Hanging, Upside Down | Floor, Hanging, Upside Down |

Note: The positional repeatability shows the measured value in a status where automatic operation is repeated and the action conditions of the manipulator are stabilized.

**Values are for wall or inverted installations.

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# AX-C CONTROLLER

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SPECIFICATION</th>
<th>ITEM</th>
<th>SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching system</td>
<td>Teaching playback</td>
<td>Program Capacity</td>
<td>32K Word</td>
</tr>
<tr>
<td>Drive system</td>
<td>AC servo system</td>
<td>Sequence Command</td>
<td>Supports 5 languages in IEC1131-3</td>
</tr>
<tr>
<td>No. of control axes</td>
<td>Max. 54 axes</td>
<td>Protective Function</td>
<td>Shock sensor, servo shock sensor (option), mechanical stopper, overrun limit switch</td>
</tr>
<tr>
<td>Coordinates</td>
<td>Articulated, cartesian</td>
<td>Input / Output Signal</td>
<td>Special physical I/O</td>
</tr>
<tr>
<td>Edit function</td>
<td>Copy, add, cut &amp; paste</td>
<td>General physical I/O</td>
<td>Out 4 / In 7 points</td>
</tr>
<tr>
<td>Shift function</td>
<td>Parallel, cylindrical, symetric, external axis shift (OP)</td>
<td>Input power</td>
<td>3 phase, AC200V±10%, -15%</td>
</tr>
<tr>
<td>Program control</td>
<td>Call, jump, condition jump</td>
<td>Outside dimensions</td>
<td>22(W) x 19.8(D) x 34(H) inch</td>
</tr>
<tr>
<td>Memory element</td>
<td>Compact flash card</td>
<td>Physical</td>
<td>Mass</td>
</tr>
<tr>
<td>Memory capacity</td>
<td>160,000 instructions</td>
<td></td>
<td>Approx. 176 lbs (80 kg)</td>
</tr>
<tr>
<td>No. of programs</td>
<td>9999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External memory</td>
<td>Compact flash card (OP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applications</td>
<td>Arc welding, spot welding, cutting, handling, sealing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety function</td>
<td>Door interlock, teach &amp; auto mode interlock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Standard transformer supplied for AC230/460V input

For more information visit the Nachi Robotic Systems Inc. website at [www.nachirobotics.com](http://www.nachirobotics.com), or e-mail to info@nachirobotics.com

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STANDARD SPECIFICATIONS