Continuously Evolving TAWERS!

The Arc Welding Robot System

TAWERS

January 2020
Robot Systems with Integrated Welding Power Source Technology

Torch type selectable to fit your application!

Separate Type
Through-Arm Type
External Type

Superior wire feedability and reduced cable interference
Focused on reducing cable interference
Focused on wire feedability

Space saving & high payload!

Long-arm & high payload!

External Type
Through-Arm Type
External Type

Manipulator Lineup (as of January 2020)

<table>
<thead>
<tr>
<th></th>
<th>TS series</th>
<th>TM series</th>
<th>TL series</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>800</td>
<td>950</td>
<td>1100</td>
</tr>
<tr>
<td>Separate</td>
<td>–</td>
<td>–</td>
<td>○</td>
</tr>
<tr>
<td>Through-Arm</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>External</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Payload</td>
<td>8 kg</td>
<td>6 kg</td>
<td>4 kg</td>
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</table>

Rated Welding Output:
WGⅢ: 350 A @ 80 % duty cycle (CV), 350 A @ 60 % duty cycle (pulse).
WGⅢ: 450 A @ 100 % duty cycle (CV/pulse)

Through-arm power cable reduces cable interference.

Suppresses twist of wire!

Flexible conduit between wire feeder and torch body achieves stable wire feeding.

Clean Cable Management!

Manipulator-Controller cable

Flexible conduit (TS/TM)

(Option)

Gas hose (with valve)

Welding power cable

(Option) Internal Flexible Conduit (for wire feed) **

For use with drum packing wire only.

Manipulator-Controller cable

(Option) Manipulator-Controller cable (control)

Manipulator-Controller cable

(Option) Manipulator-Controller cable (motor power)

Cantilever Structure

Increased Motion Speed makes arm compact and improves accessibility to workpieces.

TM-1400: Speed of main 3 axes increased by 22 % on average. (approx. 42° /s more than TA type)

Extended Reach

TM-1400: 1 437 mm (63 mm more than TA type)

Arm Specialized for Welding

Feature 1

External Flexible Conduit

Feature 2

Through-Arm Power Cable

Feature 3

Enhanced Basic Performance

Structure Specialized for Welding

Flexible conduit (TM/TL)

Flexible conduit (TS/TM)

Flexible conduit (TM/TL)

Flexible conduit (TM/TL)

Internal Flexible Conduit (for wire feed) **

For use with drum packing wire only.
A variety of features specialized for arc welding

**Feature 1:** Enhanced Basic Performance

- **Increased Motion Speed**
  TM-1400: Speed of main 3 axes increased by 22% on average.
  (approx. 42°/s more than TA type)
- **Extended Reach**
  TM-1400: 1437 mm (63 mm more than TA type)

**Feature 2:** Arm Specialized for Welding

- **Cantilever Structure**
  Makes arm compact and improves accessibility to workpieces.

In addition to Through-Arm Type and External Type, A third choice—Separate Type (TM series)

Revolutionary new type of arc welding robot with advantages of both Through-Arm Type and External Type.

**Feature 3:** Structure Specialized for Welding

- **Clean Cable Management!**
  - [Option] Internal Flexible Conduit (for wire feed)**
  - Manipulator-Controller cable (control)
  - Manipulator-Controller cable (motor power)
  - Welding power cable
  - Gas hose (with valve)

**For use with drum packing wire only.**

**High Wire Feedability**
Less Cable Interference

**Feature 1:** External Flexible Conduit

- [Conventional Type]
  - Torch cable

- [Separate Type]
  - Gentle curve of flexible conduit between wire feeder and torch body achieves stable wire feeding.

**Feature 2:** Through-Arm Power Cable

- [Conventional Type]
  - Power cable interference can occur depending on the welding position.

- [Separate Type]
  - Through-arm power cable reduces cable interference.

**An example of circumferential welding**

- **Suppresses twist of wire!**

- **Reduces target position error at weld start and end points!**

New type welding robot achieves even higher quality welds.
"Weld Navigation" allows easy parameter setting

**Easy setting with Teach Pendant**

Rich welding parameter database developed through our long experience

"Weld Navigation" reduces parameter setting time.

**WGⅢ controller with high performance**

- Compared to the conventional model, 6 times faster main CPU and 4 times more memory capacity reduce start-up time by 50% to **about 30 seconds**.

**Improved maintainability**

- Swivel rack in the case makes maintenance easy and saves space.
- Cables with connectors on both ends reduce Cable exchange time.

The right parameters automatically

Leg length and weld speed are also adjustable.

Weld Navigation recalculates weld current and voltage according to the changes.

Notes:
- Parameters by Weld Navigation are guideline only and do not guarantee welding result.
- Consult us for material and processes available with Weld Navigation.

**Two Easy Steps:**

1. Select weld joint. The figure changes according to the joint.
2. Select plate thicknesses. That’s all!

Note: Torch angle and aiming point also calculated

Note: Screens are subject to change without notice.

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**Robot Systems with Integrated Welding Power Source Technology**

"Weld Navigation" allows easy parameter setting (Standard)
**TAWERS Technology—Various Welding Processes**

- **SP-MAG II** for short-circuit mixed gas welding on thin plates
- **HD-Pulse** for high-speed and low-spatter in high-current pulsed mixed gas welding
- **MTS-CO₂** for CO₂ welding

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**TAWERS Welding Process Guide**

**MAG welding**

<table>
<thead>
<tr>
<th>Weld current (A)</th>
<th>Weld speed (cm/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>180</td>
<td>40</td>
</tr>
<tr>
<td>220</td>
<td>40</td>
</tr>
<tr>
<td>280</td>
<td>40</td>
</tr>
<tr>
<td>320</td>
<td>40</td>
</tr>
</tbody>
</table>

- **Super Active MAG**
- **Active MAG**
- **SP-MAG II**
- **HD-Pulse**
- **Normal-Pulse**

Note: 1.2 mm mild steel wire used for this guide.

- **SP-MAG II**: Secondary switching and SP/HS control achieve stable arc and low spatter welding.
- **HD-Pulse**: Short-circuit transfer (1 pulse-1 dip) minimizes undercuts in high speed welding.
- **Normal-Pulse**: Droplet transfer (1 pulse-1 drop) achieves low spatter.

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**CO₂ welding**

<table>
<thead>
<tr>
<th>Weld current (A)</th>
<th>Weld speed (cm/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>180</td>
<td>40</td>
</tr>
<tr>
<td>260</td>
<td>40</td>
</tr>
<tr>
<td>320</td>
<td>40</td>
</tr>
</tbody>
</table>

- **Super Active CO₂**
- **Active CO₂**
- **MTS-CO₂**
- **Normal CO₂**

Note: 1.2 mm mild steel wire used for this guide.

- **MTS-CO₂**: MTS control added to SP-MAG technology reduces spatter of CO₂ welding.

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**APPLICATION**

**Super Active TAWERS**

**Super Active Wire Feed Process**

Achieves even lower spatter with high-precision control of wire feed speed.

- **Super Active MAG**
- **Super Active CO₂**

See the page of "Super Active TAWERS" for details.
TAWERS Technology—Various Welding Processes

- SP-MAG II for short-circuit mixed gas welding on thin plates
- MTS-CO₂ for CO₂ welding

SP-MAG II
(Super-imposition Control)

Greatly reduces spatter in mixed gas (MAG) welding on thin plates

Welding waveform control achieves low spatter in short-circuit transfer range.

Spatter comparison (1 minute at 200 A)

<table>
<thead>
<tr>
<th>Conventional welder (350GB2)</th>
<th>TAWERS (SP-MAG II)</th>
</tr>
</thead>
</table>

![Image of spatter comparison](image)

MTS-CO₂
(Metal Transfer Stabilization Control)

Reduces spatter by up to 75% using inexpensive CO₂ gas

MTS control added to SP-MAG technology reduces spatter of CO₂ welding.

![Image of MTS-CO₂](image)

CO₂ welding delivers uniform pan-bottom shaped penetration.

Penetration comparison

- Joint: Fillet
- Base metal: 2.3 mm mild steel SPCC
- Weld current: 120 A
- Weld speed: 0.3 m/min
- Wire: YGW12 (1.2 mm)
- Shielding gas: CO₂

![Image of penetration comparison](image)
**HD-Pulse**

(Accelerated Dip-Pulse Control)

Achieves high-speed pulsed welding

Short and narrow arc prevents undercuts during high-speed welding.

- **HD-Pulse advantages:**
  - Preventing undercuts during high speed welding.
  - Dip (Short circuit) transfer enabling lower heat input with better gap handling capability.
  - Precisely controlled dip timing reducing spatter.

- **High speed welding**

  - **HD Pulse**
    - Gap: 0.4 mm
      - Undercut
    - Gap: 1.5 mm
      - Undercut
  - *Base metal thickness: 2.3 mm  *Weld current: 300 A  *Weld speed: 1.1 m/min

Preventing undercuts with ideal penetration!

- **Type of the droplet transfer**

  - **HD Pulse**
    - 1 dip by 1 pulse (Short-circuit transfer)
      - Short
      - Narrow
      - Concentrated arc
    - Dip (Short-circuit)
  - **Normal Pulse**
    - 1 drop by 1 pulse (Drop transfer)
      - Long
      - Wide
      - Drop

- **Spray transfer range: 280 A or more**

<table>
<thead>
<tr>
<th>Weld process</th>
<th>SP-MAG II</th>
<th>Normal-Pulse</th>
<th>HD-Pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weld speed</td>
<td>good</td>
<td>good</td>
<td>excellent</td>
</tr>
<tr>
<td>Spatter</td>
<td>good-fair</td>
<td>excellent</td>
<td>good</td>
</tr>
<tr>
<td>Penetration pattern</td>
<td>fair</td>
<td>good-fair</td>
<td>excellent</td>
</tr>
<tr>
<td>Undercut</td>
<td>fair</td>
<td>fair</td>
<td>good</td>
</tr>
<tr>
<td>Heat input</td>
<td>fair</td>
<td>fair</td>
<td>good</td>
</tr>
<tr>
<td>Gap handling</td>
<td>fair</td>
<td>fair</td>
<td>good</td>
</tr>
<tr>
<td>Overall</td>
<td>fair</td>
<td>fair</td>
<td>excellent</td>
</tr>
</tbody>
</table>

- **SP-MAG II disadvantage:**
  - Spatter in high-current range.
- **Normal-pulse disadvantage:**
  - Undercuts in high-speed welding.

HD-Pulse process is ideal for high-current and high-speed welding.
External Communication (Ethernet)

**Production and Quality Control on LAN**
The LAN connection allows you to share welding data with other robots and improve production and quality control.

**Flying Start**
Executes arc-on/off programs a little before the torch reaches the weld start/end point to reduce cycle times.

**Standard Arc Start**
- Weld start point
- Wire feed start
- Arc start

**Flying Start**
- Wire feed start
- Weld start point
- Arc start

**Cycle Time Reduction**
Arc is struck the moment torch reaches weld start point.

**Wire Auto Retract**
As the robot moves to weld start points, the wire is retracted automatically; thereby, improving arc start.

**Wire Stick Auto Release (for CO₂/MAG)**
Automatically detects a wire stuck at the end of a weld and re-ignites the arc to release the wire.

**Pitch Movement ("Jog settings")**
This function enables robot movement at a pre-set distance by every click of the jog dial. This is useful when working in narrow, constricted spaces or in fine-tuning robot position.

**Lift Start / Lift End**
**Quality Weld Starts and Ends. Spatter and Cycle Time Reduction.**
The robot lifts up the welding torch quickly at the start and end of the weld. By coordinating the robot motion with the welding waveform and wire feed control, quality and cycle time are improved. (Much quicker than wire retraction.)

**Arc Start Retry (for CO₂/MAG)**
Detecting a failure of arc start, the robot automatically starts arc ignition again.

**Torch Angle Display (Teach Pendant)**
Torch angle is displayed on the screen, making it possible to reduce teaching time and obtain consistent bead appearance.

**Program Test**
In Teach mode, operator can safely verify taught program including welding without switching to Auto mode.
Detecting a failure of arc start, the robot automatically starts arc ignition again.

The LAN connection allows you to share welding data with other robots and improve production and quality control.

Automatically detects a wire stuck at the end of a weld and re-ignites the arc to release the wire.

Failure of arc start
Arc re-start

Torch Angle Display (Teach Pendant)

Wire Auto Retract

As the robot moves to weld start points, the wire is retracted automatically; thereby, improving arc start.

Lift Start / Lift End
External Communication (Ethernet)

Program Test

In Teach mode, operator can safely verify taught program including welding without switching to Auto mode.

Pitch Movement (“Jog settings”)

Moving toward next weld point
End of a weld
Wire retraction
Next weld point

Flying Start

Executes arc-on/off programs a little before the torch reaches the weld start/end point to reduce cycle times.

Wire Stick Auto Release (for CO₂/MAG)

Arc Start Retry (for CO₂/MAG)

Quality Weld Starts and Ends.
Spatter and Cycle Time Reduction.

The robot lifts up the welding torch quickly at the start and end of the weld. By coordinating the robot motion with the welding waveform and wire feed control, quality and cycle time are improved. (Much quicker than wire retraction.)

Contact Lifting up
Lifting up
Cycle time reduction
Lift Start
Lift End

Torch angle is displayed on the screen, making it possible to reduce teaching time and obtain consistent bead appearance.

This function enables robot movement at a pre-set distance by every click of the jog dial. This is useful when working in narrow, constricted spaces or in fine-tuning robot position.

Production and Quality Control on LAN

Standard Arc Start

Arc start
Wire feed start
Weld start point
Flying Start
Wire feed start
Weld start point
Arc start

Arc is struck the moment torch reaches weld start point.

Cycle Time Reduction

At arc end

Spatter
Reduction
At arc start

Weld Data Management

Big progress toward ideal production and quality control. Samples weld data with a interval of up to 50 micro seconds, allowing high-precision monitoring and status/error output. The data can be stored and used for quality control.

Weld Monitor
Standard

Monitors data such as weld current, voltage and wire feed speed constantly and warns when abnormality is detected.

Weld Data Management
Optional Software

• Weld Monitoring (Expanded function)
Up to 50 weld monitoring conditions can be defined.

• Weld Data Logging/Recording
Data such as weld current, voltage and wire feed speed can be logged according to the preset triggers. The log data can be graphed on the teach pendant and recorded on SD memory card.

Welding Data Log
Optional Software

Logs data of weld sections. The log data can be saved for analysis.

Example of log data analysis

Wire target position misalignment caused by production lot change

Changes of average current/voltage

Available for defect rate reduction

More advanced welding system available

Utilize features such as external communication and large capacity memory.

Auto Extension Control
Optional Software

Compensates heat distortion or teaching error of odd-shaped work.
Robots detects changes in wire extension and compensates automatically.

Synchronous Weaving Low Pulse (Spiral Weaving Included)

Spiral weaving movement
Torch movement

- Weld current
- Wire feed speed
- Alternates condition A/B during weaving, which is ideal for welding of different thickness plates. (One for thin plate, the other for thick plate)

Cooperative Multi-Robot Control

Allows cooperative control between two robots.

Optional Features
Small Type Arc Welding Robots

TS-Series

Payload: 8 kg
TS-800/950

Succeed TAWERS’ welding performance

● Various welding styles
  Super Active TAWERS / TAWERS-TIG / TAWERS or others
  [TW axis: Hollow arm]
  Torch type selectable between through-arm and external

Improve small work productivity

● Space saving
  48% smaller footprint
  (example of one customer, compared with our TM-1100)
  Floor/Wall/Ceiling mount
  (Ceiling mount type is special specification.)

● High speed despite 8 kg payload
  Maximum motion speed: 540°/s
  (average for all axes)

Dimensions & Work Envelope

For working envelope of point O, consult us.

(Unit: mm)

<table>
<thead>
<tr>
<th>Model Type</th>
<th>TS-800</th>
<th>TS-950</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Short arm</td>
<td>Short arm</td>
</tr>
<tr>
<td>Structure</td>
<td>6 axis articulated</td>
<td>arm</td>
</tr>
<tr>
<td>Payload</td>
<td>8 kg</td>
<td></td>
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<tr>
<td>Maximum Reach</td>
<td>841 mm</td>
<td>971 mm</td>
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<tr>
<td>Minimum Reach</td>
<td>159 mm</td>
<td>190 mm</td>
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<tr>
<td>Working Range</td>
<td>682 mm</td>
<td>781 mm</td>
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<tr>
<td>Max. Motion Speed</td>
<td>RT (Rotating Trunk)</td>
<td>326°/s</td>
</tr>
<tr>
<td></td>
<td>UA (Upper Arm)</td>
<td>326°/s</td>
</tr>
<tr>
<td></td>
<td>RA (Rear Arm)</td>
<td>510°/s</td>
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<tr>
<td></td>
<td>RW (Rotating Wrist)</td>
<td>518°/s</td>
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<tr>
<td></td>
<td>TW (Twisting Wrist)</td>
<td>1040°/s</td>
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<tr>
<td>Position Repeatability</td>
<td>±0.05 mm</td>
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<tr>
<td>Motors</td>
<td>Total Power</td>
<td>2 100 W</td>
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<td></td>
<td>Brakes</td>
<td>All axes</td>
</tr>
<tr>
<td>Mounting</td>
<td>Floor/Ceiling<em>1/Wall</em>2</td>
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<tr>
<td>Weight</td>
<td>55 kg</td>
<td>56 kg</td>
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</tbody>
</table>

*1: Ceiling mount type is factory optional.
*2: Setting by service personnel is necessary. *Working range of RT axis is limited.

TS-800 TS-950

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## Manipulator General Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Short arm</td>
<td>Standard arm</td>
<td>Middle arm</td>
<td>Long arm</td>
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<tr>
<td>Payload</td>
<td>6 kg</td>
<td>4 kg</td>
<td>6 kg</td>
<td>8 kg</td>
<td>6 kg</td>
<td>6 kg</td>
<td>6 kg</td>
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<td>Maximum Reach</td>
<td>1 163 mm</td>
<td>1 437 mm</td>
<td>1 639 mm</td>
<td>1 809 mm</td>
<td>2 011 mm</td>
<td>1 801 mm</td>
<td>1 999 mm</td>
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<tr>
<td>Minimum Reach</td>
<td>418 mm</td>
<td>404 mm</td>
<td>513 mm</td>
<td>430 mm</td>
<td>550 mm</td>
<td>383 mm</td>
<td>491 mm</td>
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<tr>
<td>Working Range</td>
<td>745 mm</td>
<td>1 033 mm</td>
<td>1 126 mm</td>
<td>1 379 mm</td>
<td>1 461 mm</td>
<td>1 418 mm</td>
<td>1 508 mm</td>
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<tr>
<td>Max. Motion Speed</td>
<td>RT (Rotating trunk)</td>
<td>225°/s</td>
<td>210°/s</td>
<td>195°/s</td>
<td>195°/s</td>
<td>195°/s</td>
<td>195°/s</td>
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<tr>
<td></td>
<td>UA (Upper arm)</td>
<td>225°/s</td>
<td>210°/s</td>
<td>197°/s</td>
<td>197°/s</td>
<td>197°/s</td>
<td>197°/s</td>
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<tr>
<td></td>
<td>FA (Forearm)</td>
<td>225°/s</td>
<td>215°/s</td>
<td>205°/s</td>
<td>205°/s</td>
<td>205°/s</td>
<td>205°/s</td>
</tr>
<tr>
<td></td>
<td>RW (Rotating wrist)</td>
<td>425°/s</td>
<td>425°/s</td>
<td>425°/s</td>
<td>425°/s</td>
<td>425°/s</td>
<td>375°/s</td>
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<tr>
<td></td>
<td>BW (Bending wrist)</td>
<td>425°/s</td>
<td>425°/s</td>
<td>425°/s</td>
<td>425°/s</td>
<td>425°/s</td>
<td>375°/s</td>
</tr>
<tr>
<td></td>
<td>TW (Twisting wrist)</td>
<td>629°/s</td>
<td>629°/s</td>
<td>629°/s</td>
<td>629°/s</td>
<td>629°/s</td>
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<tr>
<td>Position Repeatability</td>
<td>±0.08 mm</td>
<td>±0.10 mm</td>
<td>±0.08 mm</td>
<td>±0.15 mm</td>
<td>±0.08 mm</td>
<td>±0.15 mm</td>
<td>±0.15 mm</td>
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<tr>
<td>Motors</td>
<td>Total Power</td>
<td>3 400 W</td>
<td>4 700 W</td>
<td>5 050 W</td>
<td>All axes</td>
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<tr>
<td>Brakes</td>
<td></td>
<td>All axes</td>
<td>All axes</td>
<td>All axes</td>
<td>All axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td></td>
<td>Floor / Ceiling*</td>
<td>Floor / Ceiling*</td>
<td>Floor / Ceiling*</td>
<td>Floor / Ceiling*</td>
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<tr>
<td>Weight</td>
<td>156 kg</td>
<td>170 kg</td>
<td>180 kg</td>
<td>215 kg</td>
<td>217 kg</td>
<td>215 kg</td>
<td>216 kg</td>
</tr>
</tbody>
</table>

*Ceiling mount type is factory optional.
### Dimensions & Work Envelope

**Middle Type**

- **TM-1600**
  - Dimensions: 553 mm x 550 mm x H 1181 mm
  - Working Range: 90° 361 mm
  - Payload: 6 kg
  - Structure: Long arm
  - Type: Middle arm

- **TM-1400**
  - Dimensions: 553 mm x 550 mm x H 1319 mm
  - Working Range: 1163 mm
  - Payload: 8 kg
  - Structure: Long arm
  - Type: Long arm

- **TM-1100**
  - Dimensions: 553 mm x 550 mm x H 1461 mm
  - Working Range: 1319 mm
  - Payload: 10 kg
  - Structure: Long arm
  - Type: Long arm

**Long Type**

- **TM-2000**
  - Dimensions: W 553 mm x D 550 mm x H 1407 mm
  - Working Range: 1801 mm
  - Payload: 135 kg
  - Structure: Long arm
  - Type: Long arm

- **TL-1800**
  - Dimensions: W 553 mm x D 550 mm x H 1407 mm
  - Working Range: 1801 mm
  - Payload: 135 kg
  - Structure: Long arm
  - Type: Long arm

- **TL-2000**
  - Dimensions: W 553 mm x D 550 mm x H 1407 mm
  - Working Range: 1801 mm
  - Payload: 171 kg
  - Structure: Long arm
  - Type: Long arm

### Controller / Welder Technical Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>WGGIII</th>
<th>WGHIII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions*</td>
<td>W 553 mm x D 550 mm x H 1181 mm</td>
<td>W 553 mm x D 550 mm x H 1407 mm</td>
</tr>
<tr>
<td>Weight**</td>
<td>135 kg</td>
<td>171 kg</td>
</tr>
<tr>
<td>Memory Capacity</td>
<td>40 000 points</td>
<td>40 000 points</td>
</tr>
<tr>
<td>Position Control</td>
<td>Software servo control</td>
<td>Software servo control</td>
</tr>
<tr>
<td>External Memory</td>
<td>Teach Pendant: one SD memory card slot, two USB 2.0 ports (USB 2.0, Hi-Speed not supported)</td>
<td>Teach Pendant: one SD memory card slot, two USB 2.0 ports (USB 2.0, Hi-Speed not supported)</td>
</tr>
<tr>
<td>Control Axes</td>
<td>6 axes simultaneously (Max. 27 axes)</td>
<td>6 axes simultaneously (Max. 27 axes)</td>
</tr>
<tr>
<td>Input and Output</td>
<td>Input: 40 points (Optionally expandable up to 2048 points) Output: 40 points (Optionally expandable up to 2048 points)</td>
<td>Input: 40 points (Optionally expandable up to 2048 points) Output: 40 points (Optionally expandable up to 2048 points)</td>
</tr>
<tr>
<td>Input Power</td>
<td>3 phase, 200 V AC±20 V AC, 22.5 kVA, 50/60 Hz</td>
<td>3 phase, 200 V AC±20 V AC, 30.5 kVA, 50/60 Hz</td>
</tr>
<tr>
<td>Welding Process</td>
<td>CO₂ / MAG / Stainless steel MIG / Pulse MAG / Stainless pulse MIG</td>
<td>CO₂ / MAG / Stainless steel MIG / Pulse MAG / Stainless pulse MIG</td>
</tr>
<tr>
<td>Output Current Range</td>
<td>30 to 350 A DC</td>
<td>30 to 450 A DC</td>
</tr>
<tr>
<td>Output Voltage Range</td>
<td>12 to 36 V DC</td>
<td>12 to 42 V DC</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>CV: 80 % @ 350 A Pulse: 60 % @ 350 A</td>
<td>CV: 80 % @ 350 A Pulse: 60 % @ 350 A</td>
</tr>
</tbody>
</table>

*Protruding portions not included. **Teach pendant and connection cable not included.

Note: For details on the power connection, refer to "Connecting primary power source" in the arc welding robot controller manual.
Large Robot Series (GⅢ Controller)

Great material handling capability!

Coordinated multi-robot movement for flexible system without jig.

- Coordinated movement with WGI/GII robot(s)
  Allows to build flexible system without jig.
  Maximum configuration:
  - Arc welding robot x 2
  - Large robot x 1

- GⅢ controller for large robots
  Same operation, maintenance and options as conventional robots

<table>
<thead>
<tr>
<th>Model</th>
<th>YS-080GⅢ</th>
<th>HS-220GⅢ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>6 axis articulated robot</td>
<td></td>
</tr>
<tr>
<td>Payload</td>
<td>80 kg</td>
<td>220 kg</td>
</tr>
<tr>
<td>Working Range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT (Rotating trunk)</td>
<td>±180°</td>
<td>±178°</td>
</tr>
<tr>
<td>UA (Upper arm)</td>
<td>-80° ~ +155°</td>
<td>-65° ~ +80°</td>
</tr>
<tr>
<td>FA (Forearm)</td>
<td>-140° ~ +230°</td>
<td>-130° ~ +230°</td>
</tr>
<tr>
<td>RW (Rotating wrist)</td>
<td>±125°</td>
<td>±128°</td>
</tr>
<tr>
<td>TW (Twisting wrist)</td>
<td>±130°</td>
<td>±130°</td>
</tr>
<tr>
<td>Max. Motion Speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT (Rotating trunk)</td>
<td>170°/s</td>
<td>120°/s</td>
</tr>
<tr>
<td>UA (Upper arm)</td>
<td>140°/s</td>
<td>105°/s</td>
</tr>
<tr>
<td>FA (Forearm)</td>
<td>160°/s</td>
<td>110°/s</td>
</tr>
<tr>
<td>RW (Rotating wrist)</td>
<td>230°/s</td>
<td>145°/s</td>
</tr>
<tr>
<td>BW (Bending wrist)</td>
<td>230°/s</td>
<td>145°/s</td>
</tr>
<tr>
<td>TW (Twisting wrist)</td>
<td>350°/s</td>
<td>220°/s</td>
</tr>
<tr>
<td>Position Repeatability</td>
<td>±0.15 mm</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>645 kg</td>
<td>955 kg</td>
</tr>
</tbody>
</table>