Panasonic
BUSINESS

6 Axis Articulated Arc Welding Robots

TAWERS Series

January 2020

Continuously Evolving TAWERS!

The Arc Welding Robot System TAWERS

Separate Type | Through-Arm Type | External Type

TS series | TM series | TL series

TAWERS WGⅢ/WGHⅢ

Robot Systems with Integrated Welding Power Source Technology

TM series

Torch type selectable to fit your application!

WGⅢ/WGHⅢ

TM-1400WGⅢ

TM
1100
1400
1600
1800
2000

Separate Type

Superior wire feedability and reduced cable interference

Through-Arm Type

Focused on reducing cable interference

External Type

Focused on wire feedability

TS series

Space saving & high payload!

TS-950

WGⅢ/WGHⅢ

TS
800
950

Payload 8 kg TS-800/950

External Type

Through-Arm Type

TL series

Long-arm & high payload!

WGⅢ/WGHⅢ

TL
1800
2000

Payload TL-1800: 8 kg TL-2000: 6 kg

External Type

■Manipulator Lineup (as of January 2020)

	TS series		TM series					TL series	
	800	950	1100	1400	1600	1800	2000	1800	2000
Separate	–	–	○	○	○	○	○	–	–
Through-Arm	○	○	○	○	○	○	○	–	–
External	○	○	○	○	–	–	–	○	○
Payload	8 kg		6 kg		4 kg	6 kg		8 kg	6 kg

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

A variety of features specialized for arc welding

Feature 1 (TM/TL) 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)

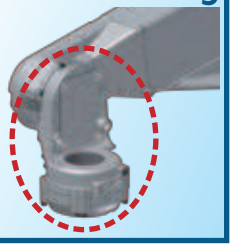
Extended Reach

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

Feature 2 (TS/TM) Arm Specialized for Welding

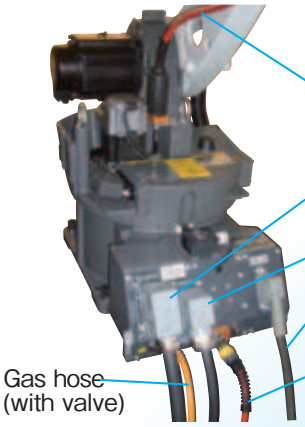
Cantilever Structure

makes arm compact and improves accessibility to workpieces.



Feature 3 (TM/TL) Structure Specialized for Welding

Clean Cable Management!



**For use with drum packing wire only.

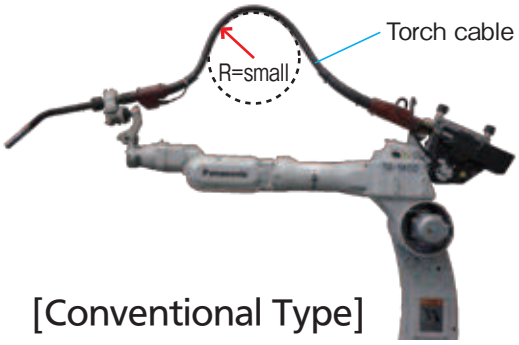
In addition to Through-Arm Type and External Type,

A third choice—Separate Type (TM series)

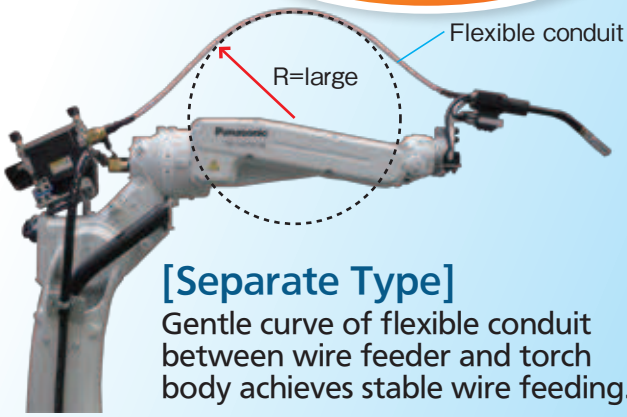
High Wire Feedability
Less Cable Interference

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

Feature 1 External Flexible Conduit



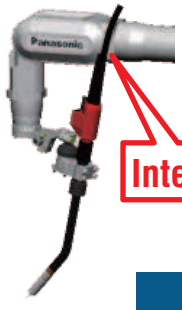
[Conventional Type]



[Separate Type]

Gentle curve of flexible conduit between wire feeder and torch body achieves stable wire feeding.

Feature 2 Through-Arm Power Cable

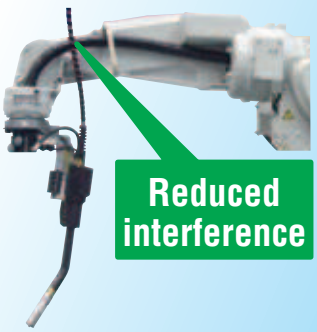


[Conventional Type]

Power cable interference can occur depending on the welding position.

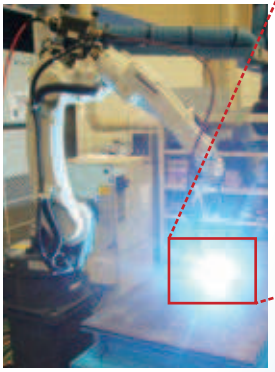
[Separate Type]

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.

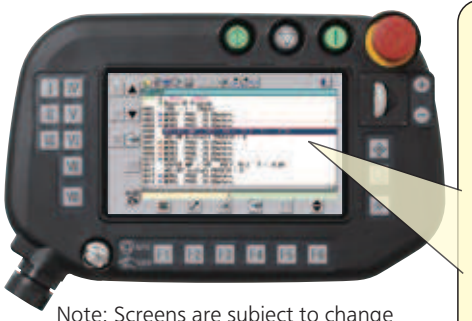
TAWERS WGⅢ/WGHⅢ

Robot Systems with Integrated Welding Power Source Technology

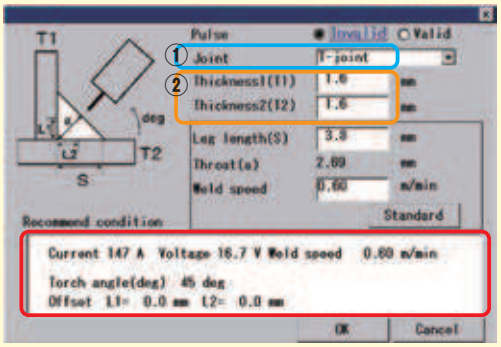
"Weld Navigation" allows easy parameter setting (Standard)

Weld Navigation

Easy setting with Teach Pendant



Note: Screens are subject to change without notice.



Note: Torch angle and aiming point also calculated

Two Easy Steps:

1. Select weld joint. The figure changes according to the joint.

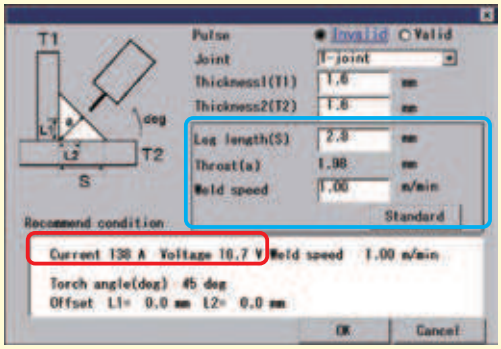
2. Select plate thicknesses. That's all!

Rich welding parameter database developed through our long experience

"Weld Navigation" reduces parameter setting 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.

WGⅢ controller with high performance

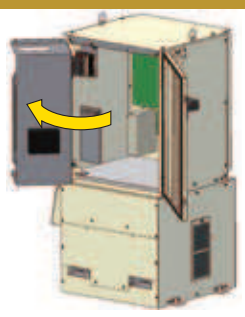
- Compared to the conventional model, 6 times faster main CPU and 4 times more memory capacity reduce start-up time by 50 % to **about 30 seconds.**

WGⅢ

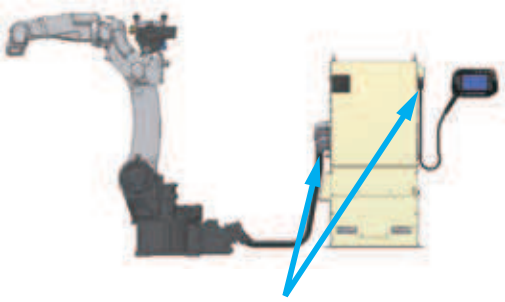
WGHⅢ

Improved maintainability

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



Swivel rack



Cables with connectors on both ends

TAWERS WGⅢ/WGHⅢ

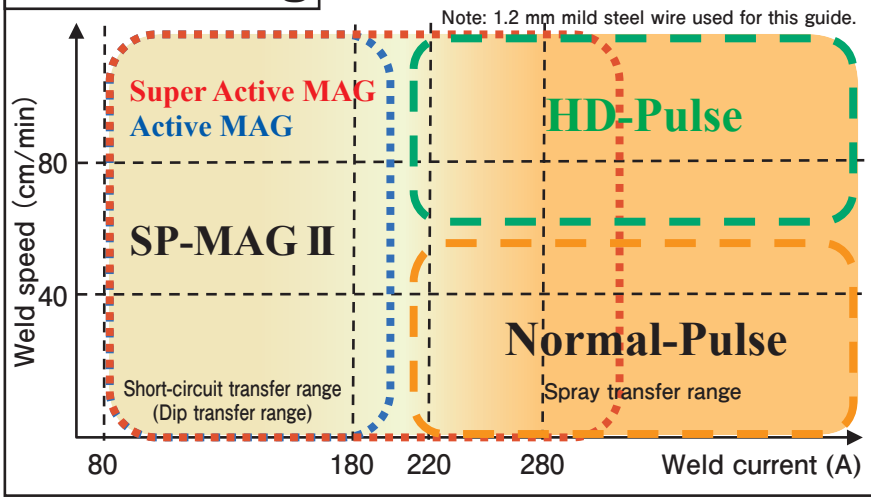
TAWERS Technology— Various Welding Processes

- **SP-MAGⅡ** 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-CO_2** for CO_2 welding

TAWERS Welding Process Guide

MAG welding

Standard



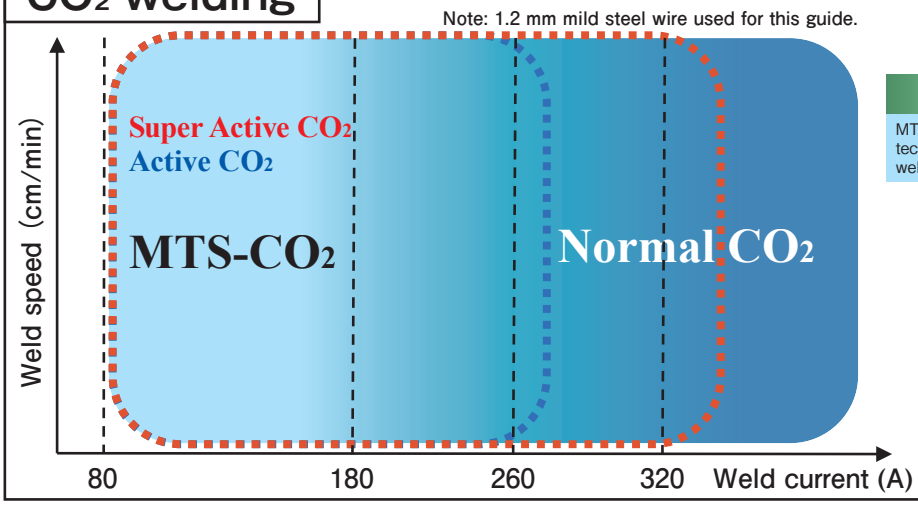
SP-MAG II
Secondary switching and SP/HS control achieve stable arc and low spatter welding.
Low spatter in low-current range

HD-Pulse
Short-circuit transfer (1 pulse-1 dip) minimizes undercuts in high speed welding.
Low spatter and high speed in high-current range

Normal-Pulse
Droplet transfer (1 pulse-1 drop) achieves low spatter.
Low spatter in high-current range

CO_2 welding

Standard



MTS-CO_2
MTS control added to SP-MAG technology reduces spatter of CO_2 welding.
Low spatter in low-current range

APPLICATION TYPE

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 CO_2

See the page of "Super Active TAWERS" for details.

TAWERS WGⅢ/WGHⅢ

TAWERS Technology— Various Welding Processes

- **SP-MAGⅡ** for short-circuit mixed gas welding on thin plates
- **MTS-CO2** for CO_2 welding

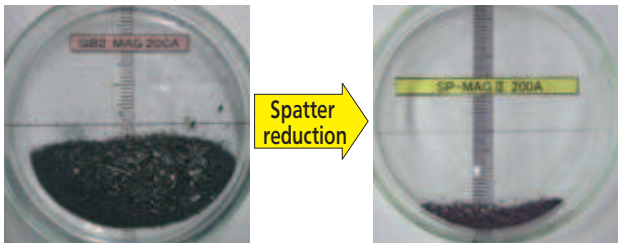
SP-MAG Ⅱ (Super-imposition Control)

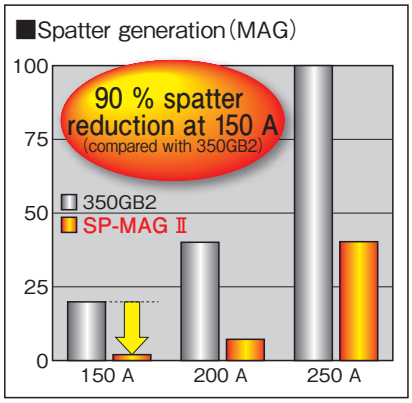
Greatly reduces spatter in mixed gas (MAG) welding on thin plates

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

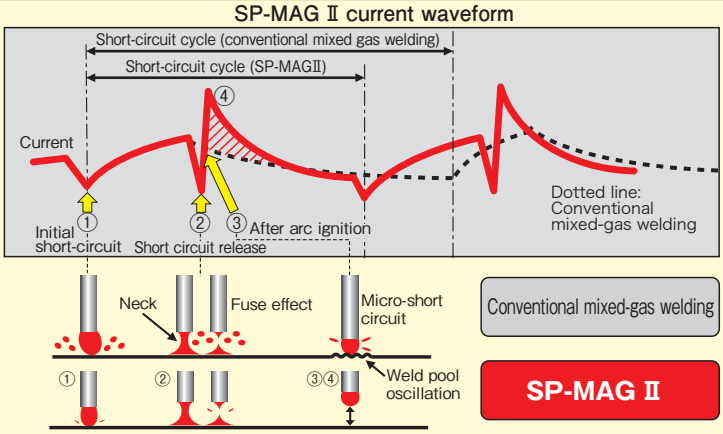
■ Spatter comparison (1 minute at 200 A)

Conventional welder (350GB2) TAWERS (SP-MAG Ⅱ)





Recommended Panasonic wire YM-50MT used.



① **Initial short-circuit control**
Detects initial short-circuit and then the secondary switching* circuit reduces weld current rapidly to prevent micro-short circuit that causes spatter.

② **Neck control**
Detects a neck of the droplet and then the secondary switching* circuit reduces weld current rapidly to prevent fuse effect that causes spatter.

③ **HS control**
Suppresses weld pool oscillation and prevents micro-short circuit that causes spatter.

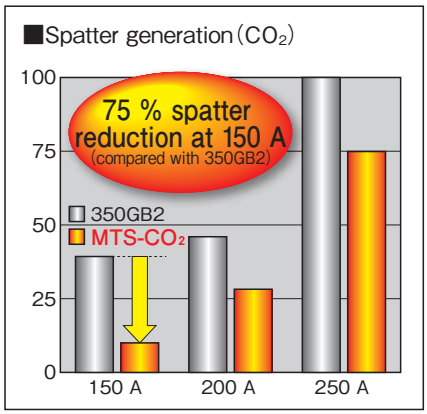
④ **SP control**
Superimposes the current immediately after a short-circuit release and allows for higher wire-melting speed. This makes the next short circuit smooth and also makes the short-circuit cycle shorter.

*Secondary switching is the spatter reduction process that rapidly reduces weld current immediately before and after shot-circuit and allows for smooth transitions between arc and short circuit.

MTS-CO2 (Metal Transfer Stabilization Control)

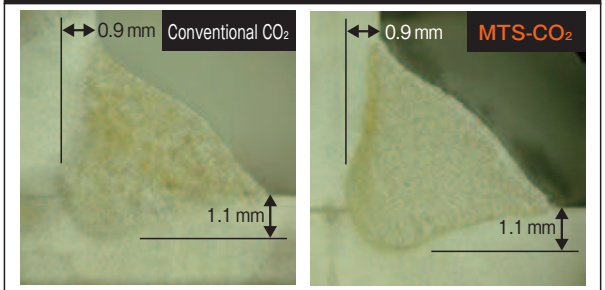
Reduces spatter by up to 75 % using inexpensive CO_2 gas

MTS control added to SP-MAG technology reduces spatter of CO_2 welding.



CO_2 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: CO_2

TAWERS WGⅢ/WGHⅢ

TAWERS Technology— Various Welding Processes

- **Normal pulse** for ultra-low spatter welding
- **HD-Pulse** for high-speed and low-spatter welding

HD-Pulse (Hyper Dip-Pulse Control)

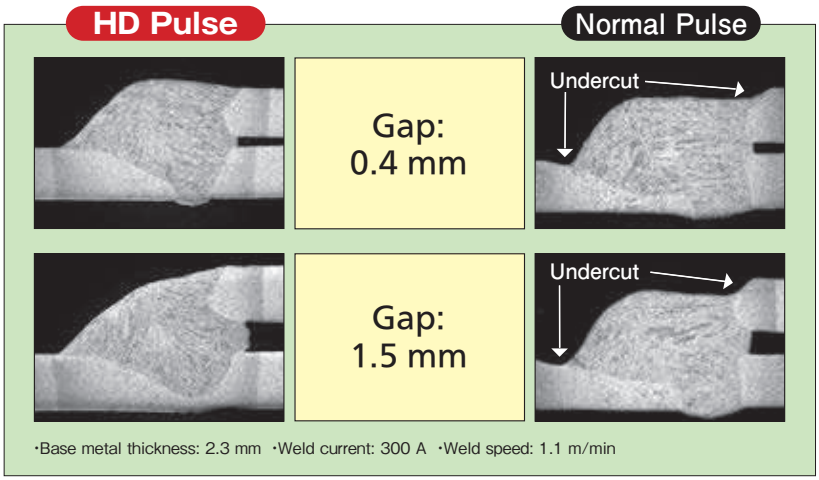
Achieves high-speed pulsed welding

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

■HD-Pulse advantages:

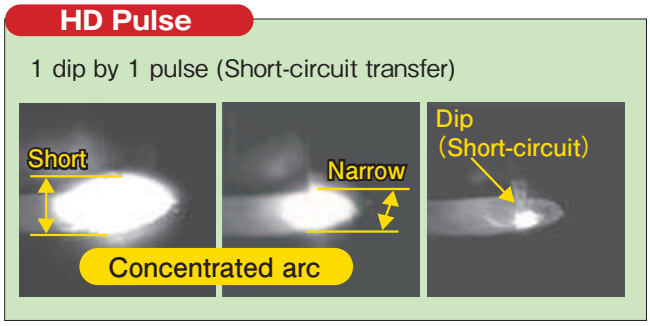
- Preventing undercuts during high speed welding.
- Dip (Short circuit) transfer enabling lower heat input with better gap handling capability.
- Precisely controlled dip timing reducing spatter.

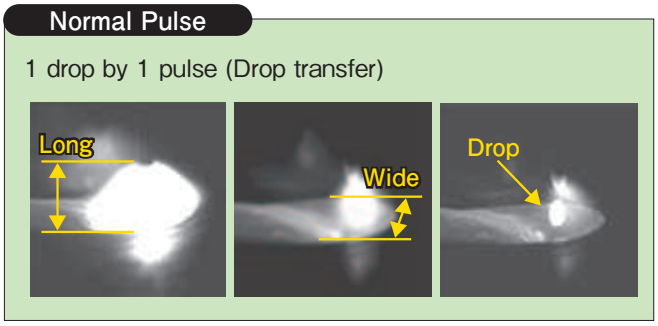
■High speed welding



Preventing undercuts with ideal penetration!

■Type of the droplet transfer





■Spray transfer range: 280 A or more

Weld process	SP-MAG Ⅱ	Normal-Pulse	HD-Pulse
Weld speed	good	good	excellent
Spatter	good-fair	excellent	good
Penetration pattern	fair	good-fair	excellent
Undercut	fair	fair	excellent
Heat input	fair	fair	good
Gap handling	fair	fair	good
Overall	fair	fair	excellent

- **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.

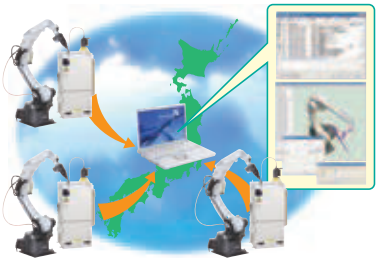
TAWERS WGIII/WGHIII

Standard Features

External Communication (Ethernet)

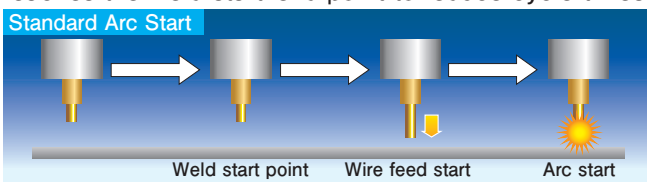
Production and Quality Control on LAN

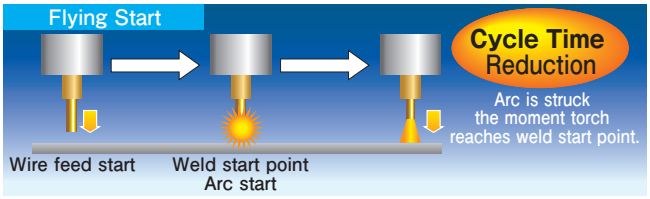
The LAN connection allows you to share welding data with other robots and improve production and quality control.



Flying Start

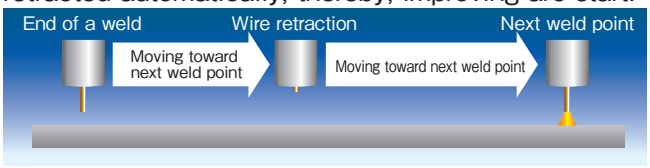
Executes arc-on/off programs a little before the torch reaches the weld start/end point to reduce cycle times.





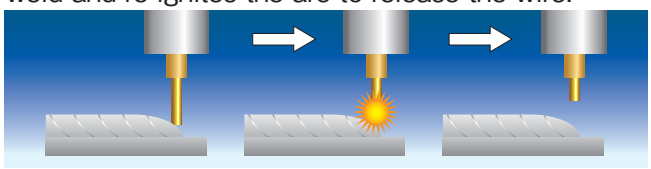
Wire Auto Retract

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



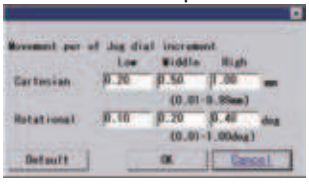
Wire Stick Auto Release (for CO_2/MAG)

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



Pitch Movement ("Jog settings")

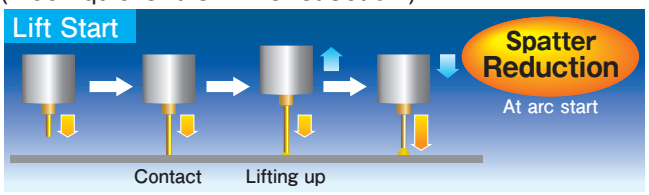
This function enables robot movement at a pre-set distance by every click of the jog dial. This is useful when working in narrow, constricted spaces or in fine-tuning robot position.

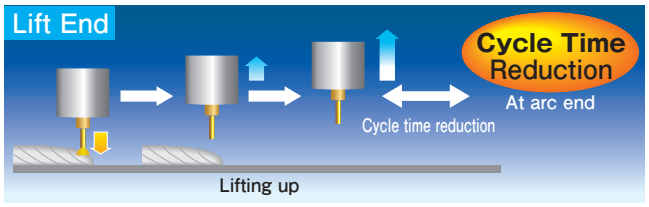


Lift Start / Lift End

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

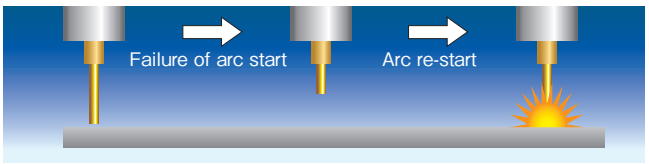
The robot lifts up the welding torch quickly at the start and end of the weld. By coordinating the robot motion with the welding waveform and wire feed control, quality and cycle time are improved.
(Much quicker than wire retraction.)





Arc Start Retry (for CO_2/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.

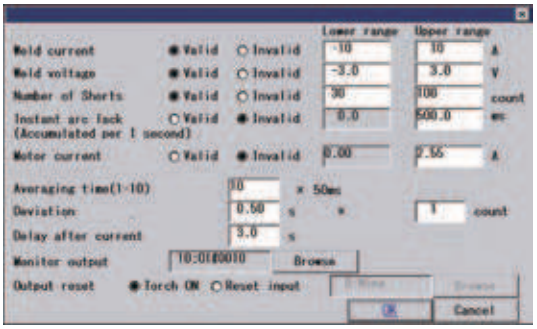
Program Test

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

Optional Features

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.

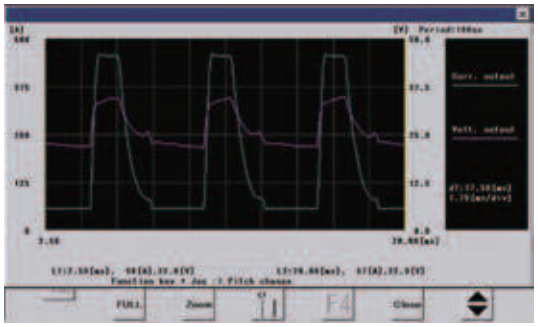


Weld Monitor — Standard

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

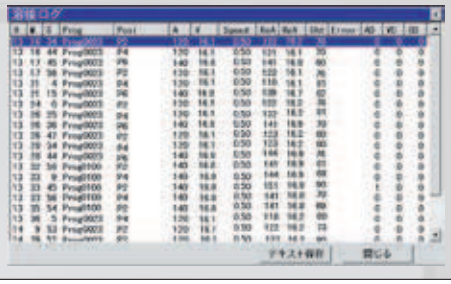
Weld Data Management — Optional Software

- **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.



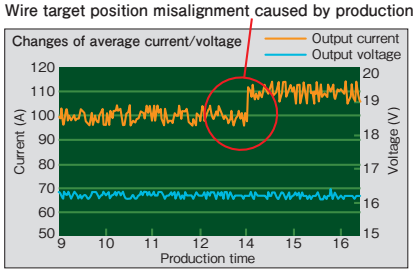
Welding Data Log — Optional Software

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



Available for defect rate reduction

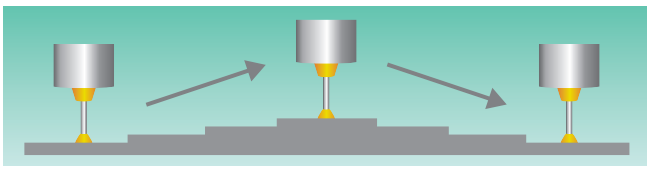
More advanced welding system available

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.

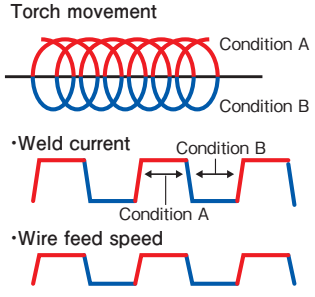
Robots detects changes in wire extension and compensates automatically.



Synchronous Weaving Low Pulse (Spiral Weaving Included)

【Spiral weaving movement】

Torch movement



- ·Synchronizes weld current, wire feed speed and weaving completely.
- ·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.

Small Type Arc Welding Robots

TS Series

Payload: 8 kg TS-800/950

TS-800　　TS-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

【Separate wire feeder】
Free layout

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.)

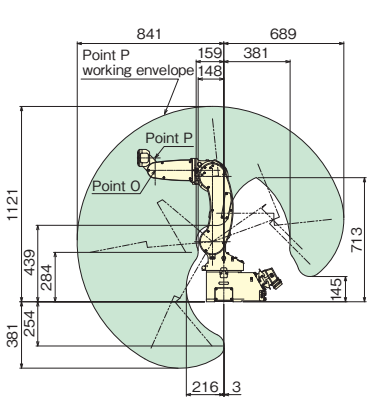
●High speed despite 8 kg payload

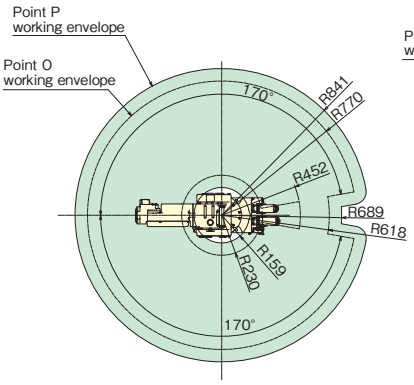
Maximum motion speed: 540°/s
(average for all axes)

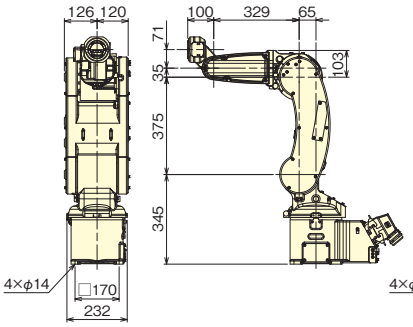
Dimensions & Work Envelope

For working envelope of point O, consult us.　　(Unit: mm)

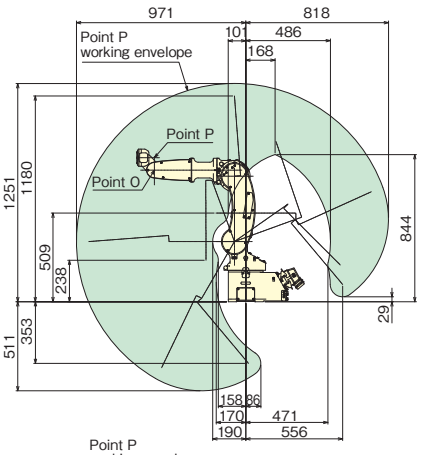
Short Type TS-800

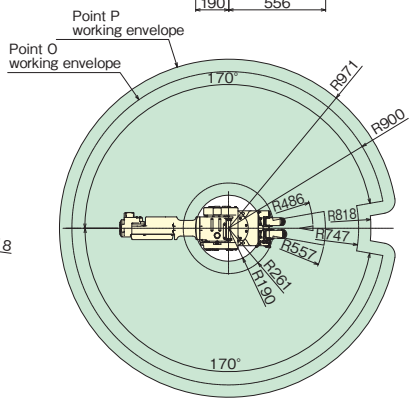


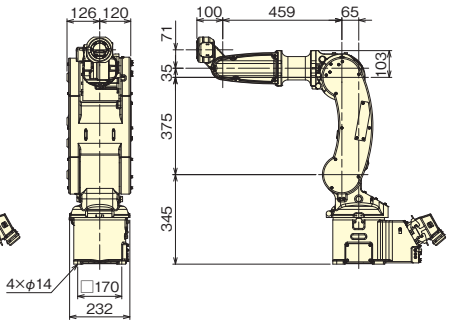




Short Type TS-950







■Manipulator General Specifications

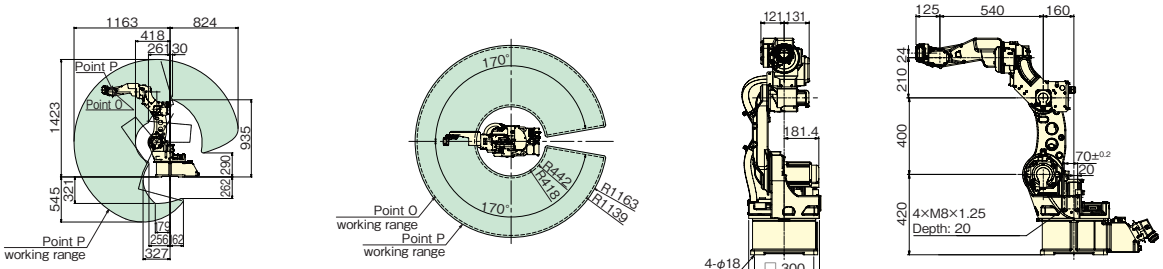
Model		TS-800	TS-950
Type		Short arm	Short arm
Structure		6 axis articulated	
Payload		8 kg	
Maximum Reach		841 mm	971 mm
Minimum Reach		159 mm	190 mm
Working Range		682 mm	781 mm
Max. Motion Speed	RT (Rotating Trunk)	326°/s	
	UA (Upper Arm)	326°/s	
	FA (Forearm)	510°/s	
	RW (Rotating Wrist)	518°/s	
	BW (Bending Wrist)	518°/s	
	TW (Twisting Wrist)	1 040°/s	
Position Repeatability		±0.05 mm	
Motors	Total Power	2 100 W	
	Brakes	All axes	
Mounting		Floor/Ceiling*1/Wall*2	
Weight		55 kg	56 kg

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

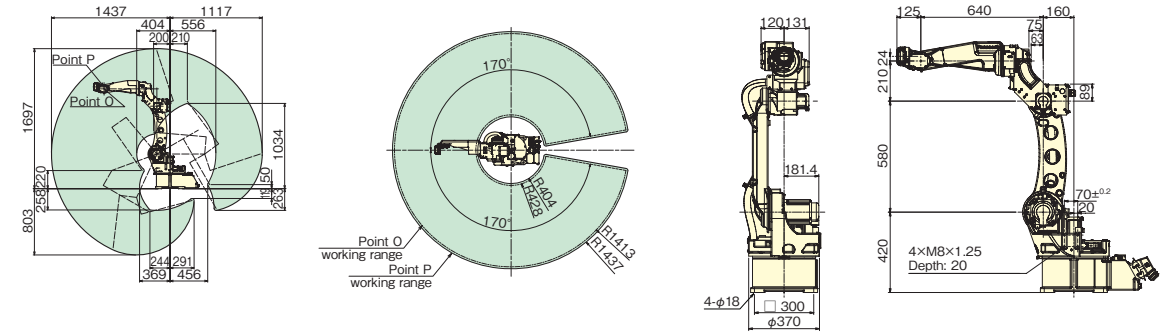
Dimensions & Work Envelope

(Unit: mm)

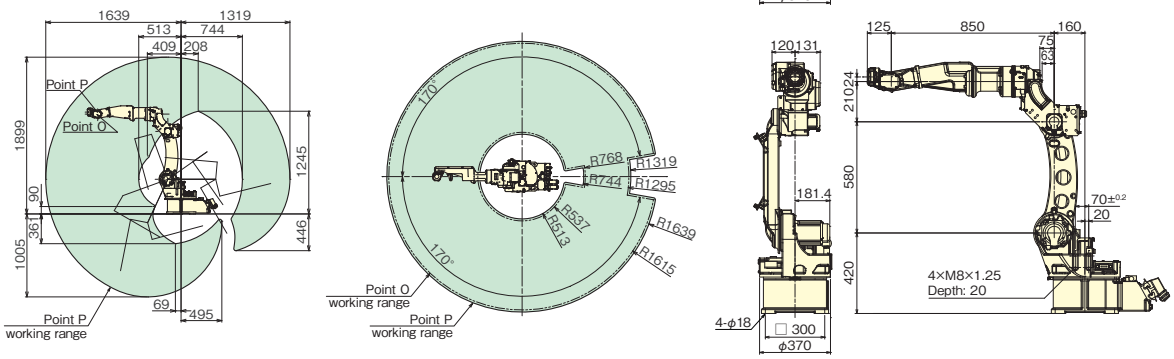
Short Type TM-1100



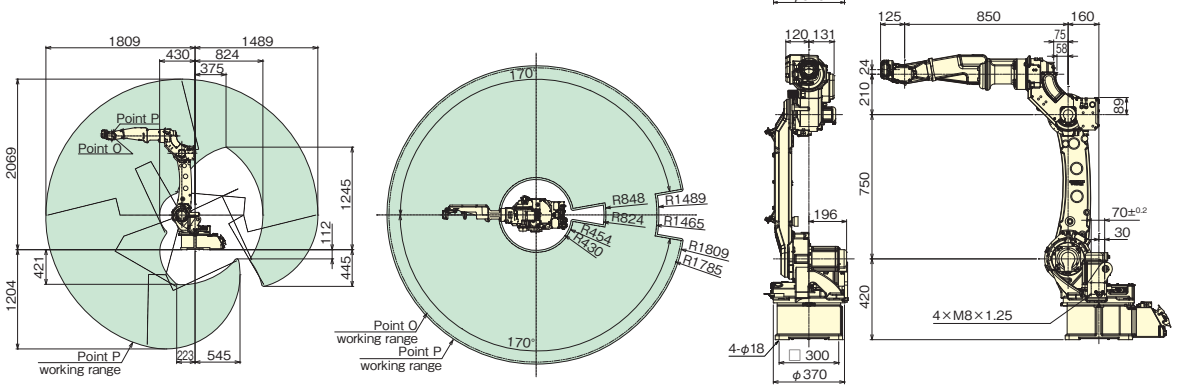
Standard Type TM-1400



Middle Type TM-1600



Long Type TM-1800



■ Manipulator General Specifications

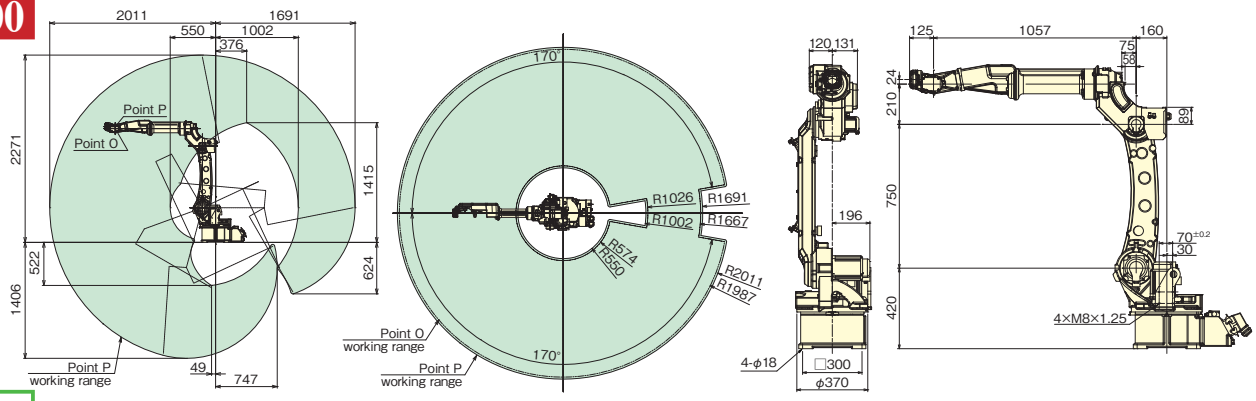
Model		TM-1100	TM-1400	TM-1600	TM-1800	TM-2000	TL-1800	TL-2000
Type		Short arm	Standard arm	Middle arm	Long arm	Long arm	Long arm	Long arm
Structure		6 axis articulated						
Payload		6 kg		4 kg	6 kg		8 kg	6 kg
Maximum Reach		1 163 mm	1 437 mm	1 639 mm	1 809 mm	2 011 mm	1 801 mm	1 999 mm
Minimum Reach		418 mm	404 mm	513 mm	430 mm	550 mm	383 mm	491 mm
Working Range		745 mm	1 033 mm	1 126 mm	1 379 mm	1 461 mm	1 418 mm	1 508 mm
Max. Motion Speed	RT (Rotating trunk)	225°/s		210°/s	195°/s		195°/s	
	UA (Upper arm)	225°/s		210°/s	197°/s		197°/s	
	FA (Forearm)	225°/s		215°/s	205°/s		205°/s	
	RW (Rotating wrist)	425°/s		425°/s	425°/s		385°/s	
	BW (Bending wrist)	425°/s		425°/s	425°/s		375°/s	
	TW (Twisting wrist)	629°/s		629°/s	629°/s		624°/s	
Position Repeatability		±0.08 mm				±0.10 mm	±0.08 mm	±0.15 mm
Motors	Total Power	3 400 W			4 700 W		5 050 W	
	Brakes	All axes						
Mounting		Floor / Ceiling*						
Weight		156 kg	170 kg	180 kg	215 kg	217 kg	215 kg	216 kg

*Ceiling mount type is factory optional.

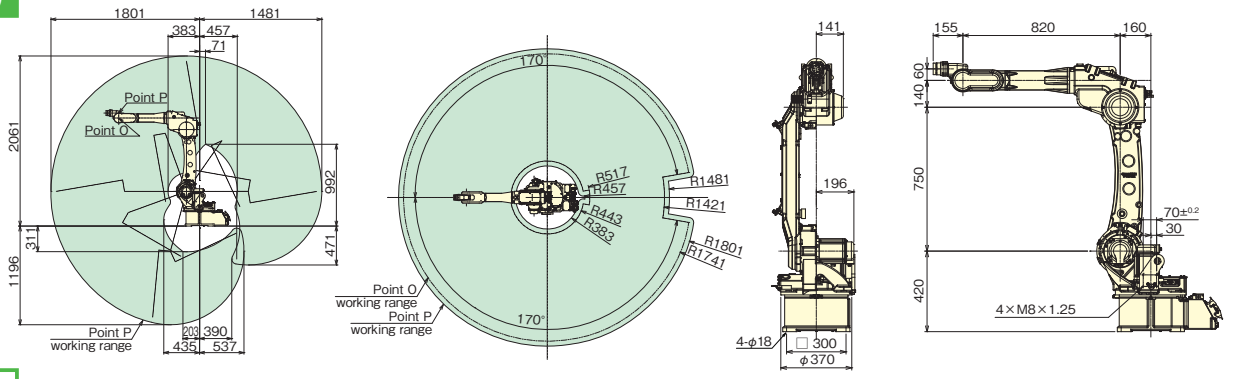
Dimensions & Work Envelope

(Unit: mm)

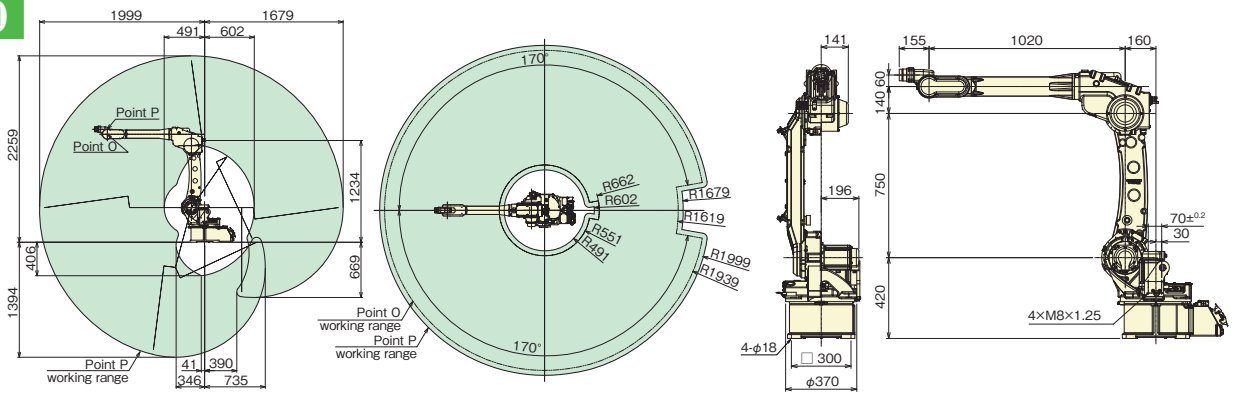
Long Type TM-2000



Long Type TL-1800



Long Type TL-2000



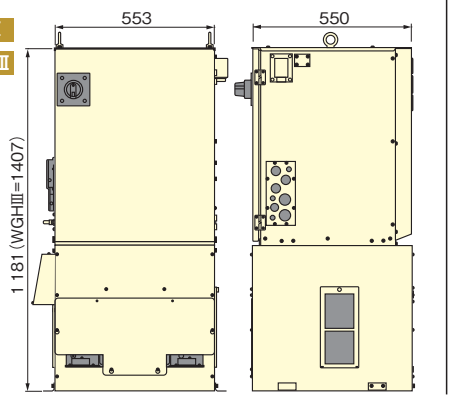
■Controller / Welder Technical Specifications

Model	WGⅢ	WGHⅢ
Dimensions*	W 553 mm x D 550 mm x H 1181 mm	W 553 mm x D 550 mm x H 1407 mm
Weight**	135 kg	171 kg
Memory Capacity	40 000 points	
Position Control	Software servo control	
External Memory	Teach Pendant: one SD memory card slot, two USB 2.0 ports (USB 2.0. Hi-Speed not supported)	
Control Axes	6 axes simultaneously (Max. 27 axes)	
Input and Output	Input: 40 points (Optionally expandable up to 2048 points) Output: 40 points (Optionally expandable up to 2048 points)	
Input Power	3 phase, 200 V AC±20 V AC, 22 kVA, 50/60 Hz	3 phase, 200 V AC±20 V AC, 30.5 kVA, 50/60 Hz
	50/60 Hz (Max. current at servo on: 246 A/5.6 ms)	
Welding Process	CO_2 / MAG / Stainless steel MIG / Pulse MAG / Stainless pulse MIG	
Output Current Range	30 to 350 A DC	30 to 450 A DC
Output Voltage Range	12 to 36 V DC	12 to 42 V DC
Duty Cycle	CV: 80 % @ 350 A Pulse: 60 % @ 350 A	100 %

*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.

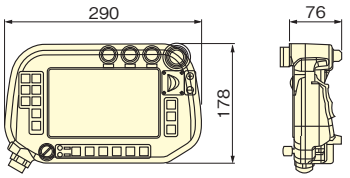
■Controller (with power unit)

WGⅢ
WGHⅢ
(mm)



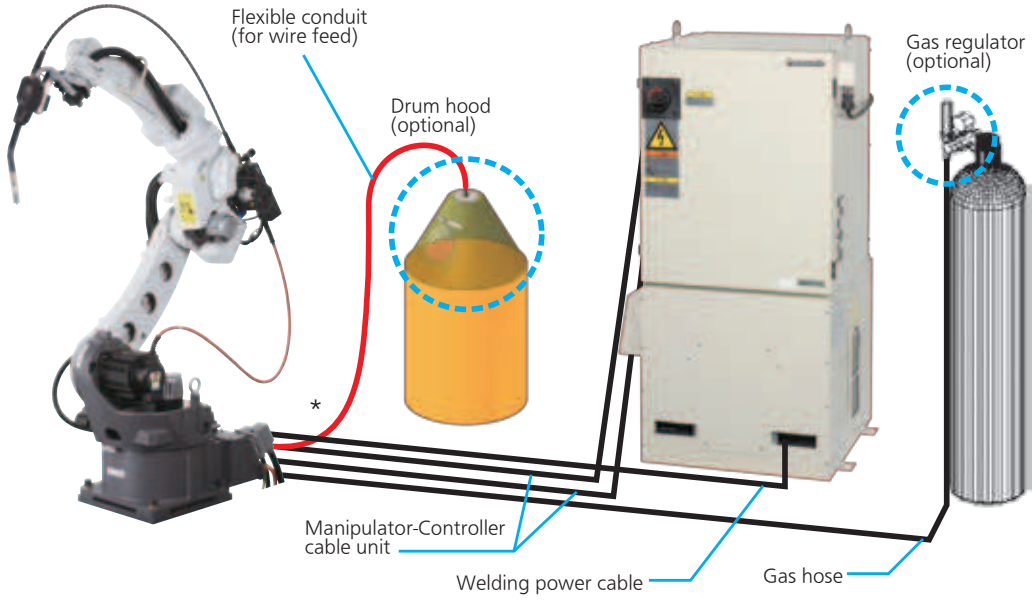
■Teach Pendant

WGⅢ
WGHⅢ
(mm)



■ Connection Diagram

TM-1400WGⅢ (Separate Type)



*For use with drum packing wire only.

Large Robot Series (GⅢ Controller)

Great material handling capability!

Coordinated multi-robot movement for flexible system without jig.

YS-080GⅢ　　HS-220GⅢ

■Manipulator General Specifications

Model			YS-080GⅢ	HS-220GⅢ
Type			6 axis articulated robot	
Payload			80 kg	220 kg
Working Range	RT (Rotating trunk)		±180 °	±178 °
	UA (Upper arm)		-80 ° ~ +155 °	-65 ° ~ +80 °
	FA (Forearm)	Referenced from Horizontal	-140 ° ~ +230 °	-130 ° ~ +230 °
		Referenced from upper arm	-80 ° ~ +180 °	-73° ~ +190 °
	RW (Rotating wrist)		±360 °	±360 °
	BW (Bending wrist)		±125 °	±128 °
	TW (Twisting wrist)		±360 °	±360 °
Max. Motion Speed	RT (Rotating trunk)		170°/s	120°/s
	UA (Upper arm)		140°/s	105°/s
	FA (Forearm)		160°/s	110°/s
	RW (Rotating wrist)		230°/s	145°/s
	BW (Bending wrist)		230°/s	145°/s
	TW (Twisting wrist)		350°/s	220°/s
Position Repeatability			±0.15 mm	
Weight			645 kg	955 kg

● Coordinated movement with WGⅢ/GⅢ 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