

January 2020

Continuously Evolving TAWERS!

The Arc Welding Robot System

TAWERS



Separate Type

Through-Arm Type

External Type

TS series

TM series

TL series

Torch type selectable to fit your application!

WGIII/WGHI

TM-1400WGIII

TM series



Separate Type

Superior wire feedability and reduced cable interference



Through-Arm Type

Focused on reducing cable interference



External Type

Focused on wire feedability

TM
1100
1400
1600
1800
2000

Space saving & high payload!

TS-950

WGIII/WGHI

TS
800
950

Payload

8 kg

TS-800/950



External Type

Through-Arm Type

Long-arm & high payload!

WGIII/WGHI

TL
1800
2000

Payload

8 kg

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).

WGHI: 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)

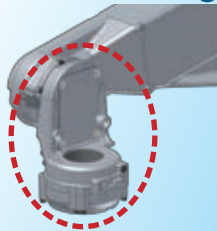
Extended Reach

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

Feature 2 (TS/TM) Arm Specialized for Welding

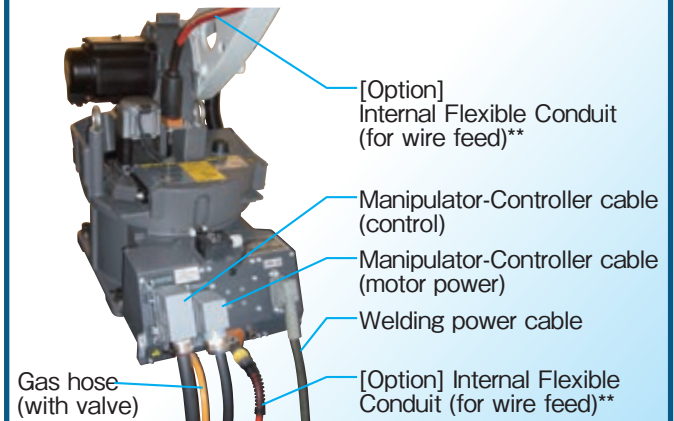
Cantilever Structure

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.

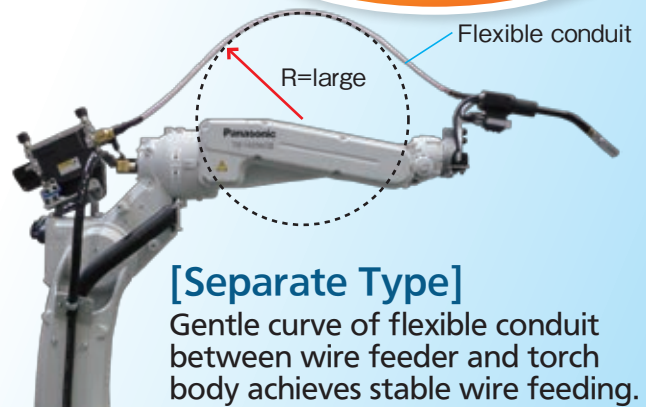
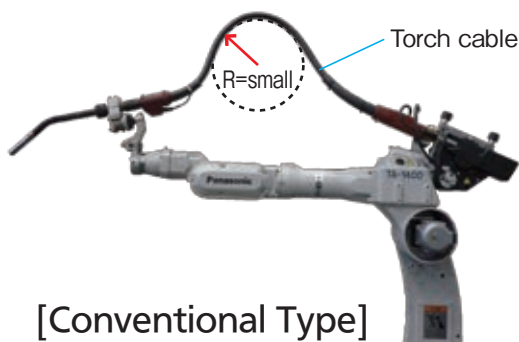
In addition to Through-Arm Type and External Type,

A third choice—Separate Type (TM series)

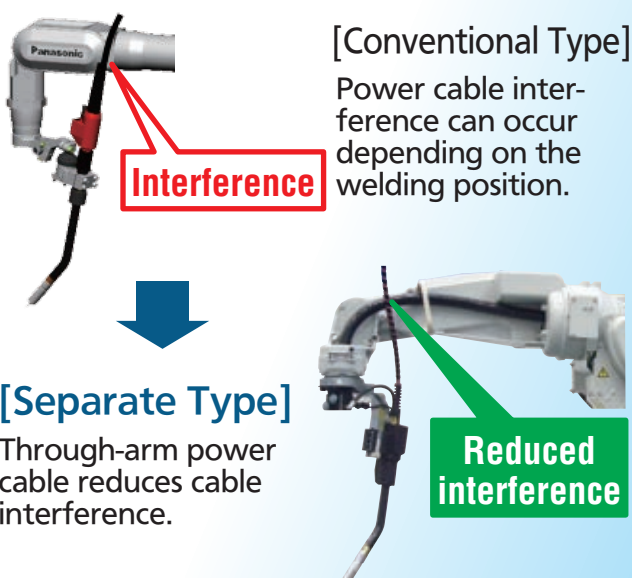
Revolutionary new type of arc welding robot with advantages of both Through-Arm Type and External Type.

High Wire Feedability
Less Cable Interference

Feature 1 External Flexible Conduit

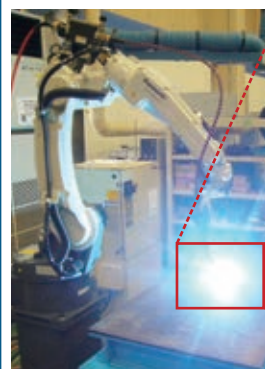


Feature 2 Through-Arm Power Cable



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 Standard



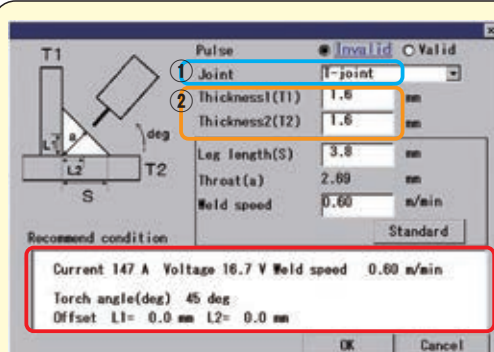
Easy setting with Teach Pendant



Note: Screens are subject to change without notice.

Rich welding parameter database developed through our long experience

"Weld Navigation" reduces parameter setting time.



Note: Torch angle and aiming point also calculated

Two Easy Steps:

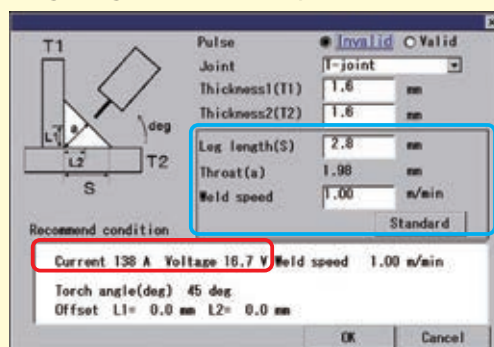
1. Select weld joint. The figure changes according to the joint.



2. Select plate thicknesses. That's all!

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.

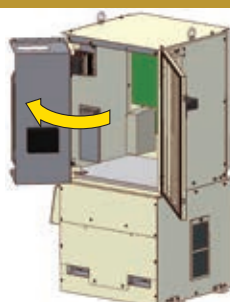
WGIII controller with high performance

- 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.**

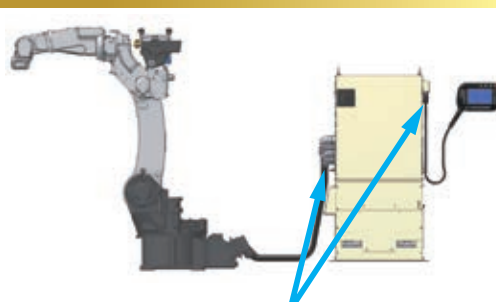


Improved maintainability

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



Swivel rack

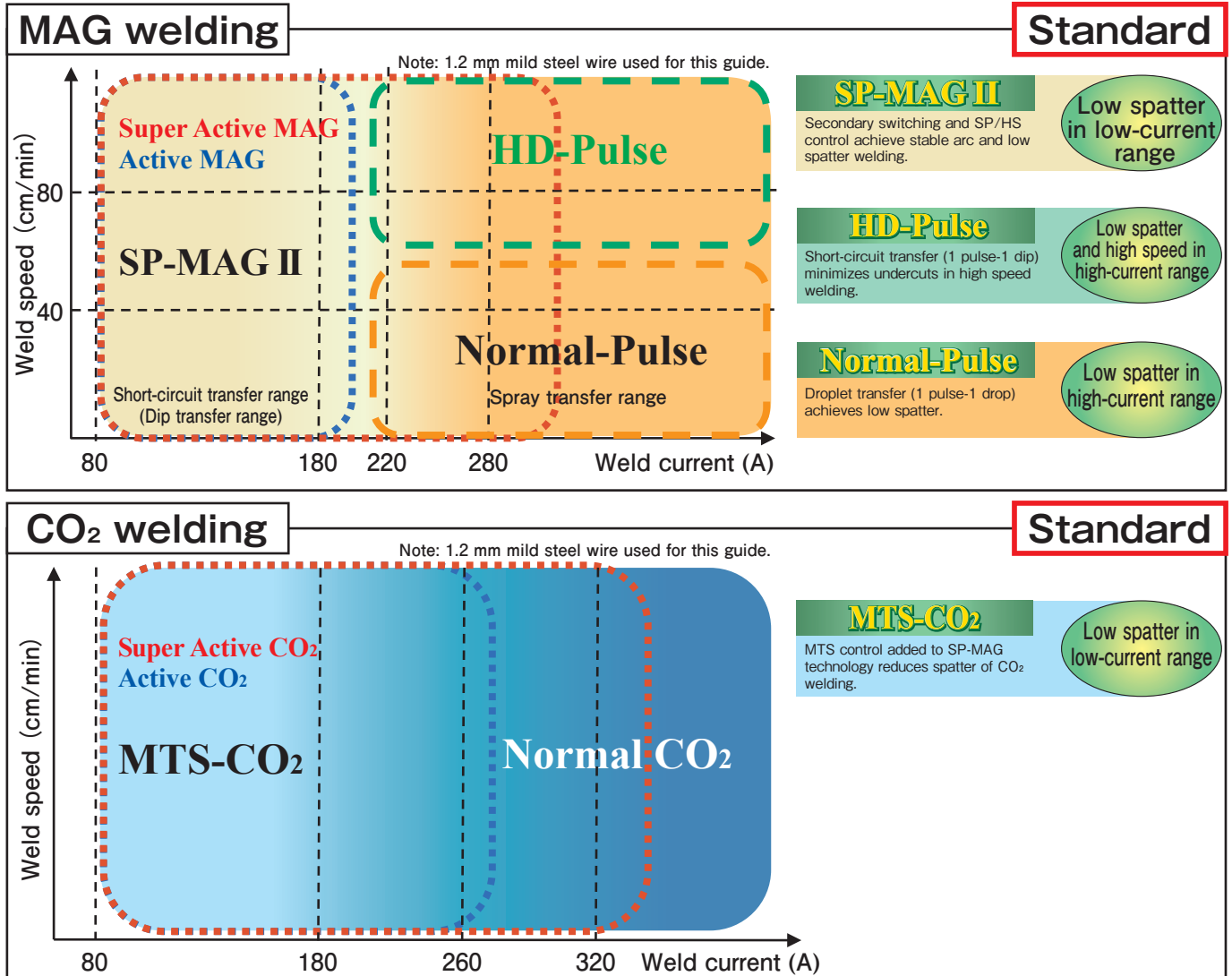


Cables with connectors on both ends

TAWERS 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-CO₂** for CO₂ welding

TAWERS Welding Process Guide



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 CO₂



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

TAWERS WGII/WGHI

TAWERS Technology— Various Welding Processes

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

SP-MAG II

(Super-imposition Control)

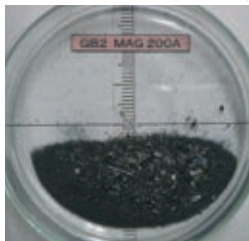
Greatly reduces spatter in mixed gas (MAG) welding on thin plates

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

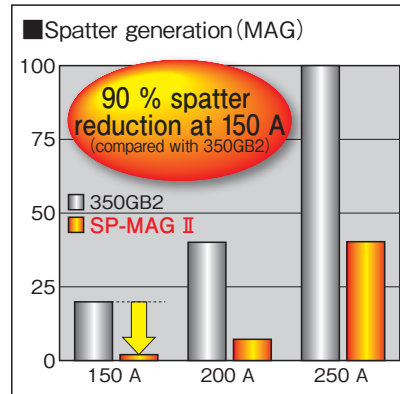
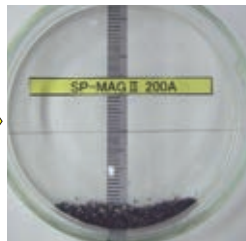
■ Spatter comparison (1 minute at 200 A)

Conventional welder (350GB2)

TAWERS (SP-MAG II)



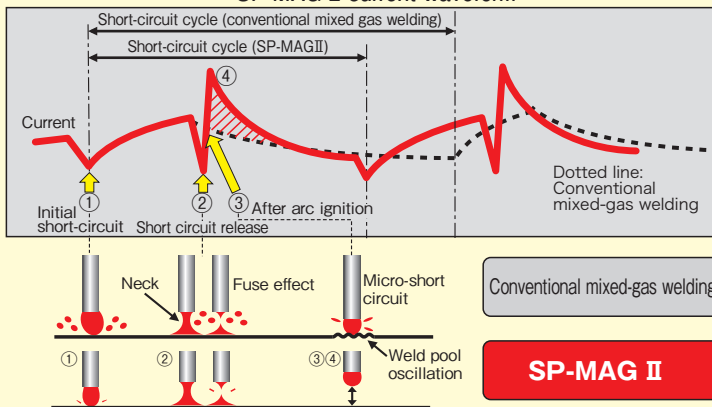
Spatter reduction



Recommended Panasonic wire YM-50MT used.



SP-MAG II current waveform



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.

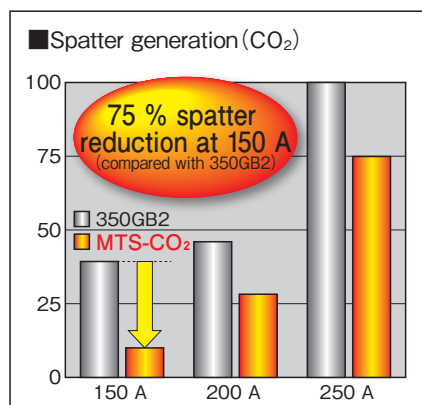
*Secondary switching is the spatter reduction process that rapidly reduces weld current immediately before and after short-circuit and allows for smooth transitions between arc and short circuit.

MTS-CO₂

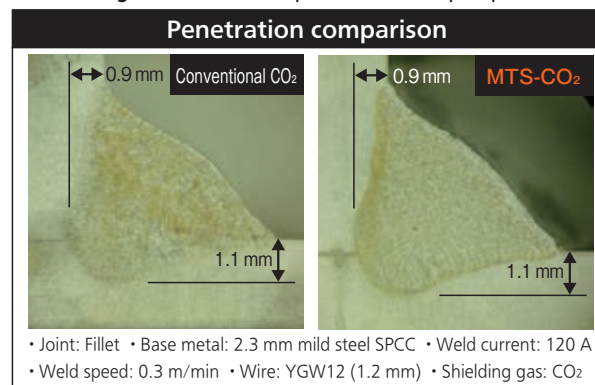
(Metal Transfer Stabilization Control)

Reduces spatter by up to 75 % using inexpensive CO₂ gas

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



CO₂ welding delivers uniform pan-bottom shaped penetration.



Conventional CO₂ process (350GB2)



MTS-CO₂



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

HD-Pulse

(Hyper Dip-Pulse Control)

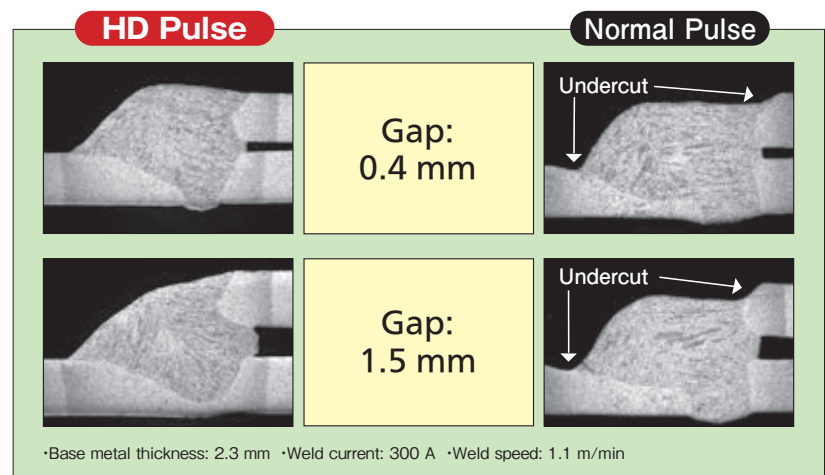
Achieves high-speed pulsed welding

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

■ HD-Pulse advantages:

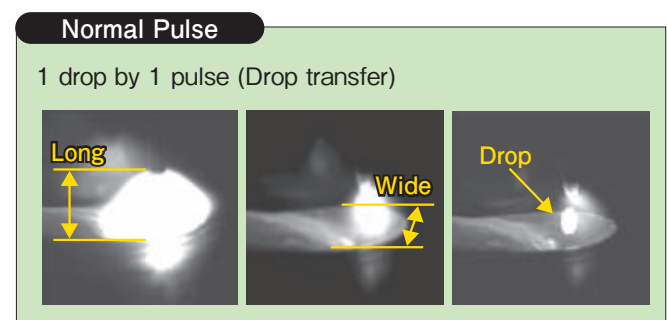
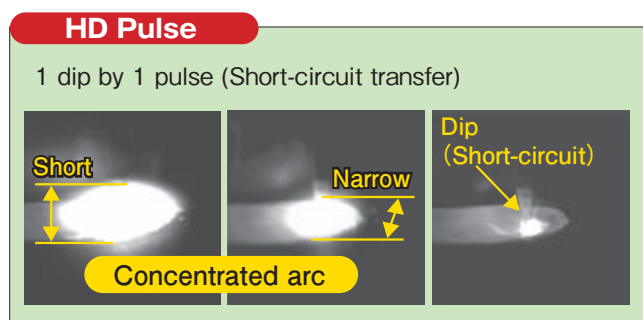
- Preventing undercuts during high speed welding.
- Dip (Short circuit) transfer enabling lower heat input with better gap handling capability.
- Precisely controlled dip timing reducing spatter.

■ 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 WGII/WGHI

Standard Features

External Communication (Ethernet)

Production and Quality Control on LAN

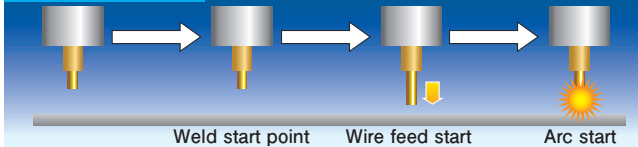
The LAN connection allows you to share welding data with other robots and improve production and quality control.



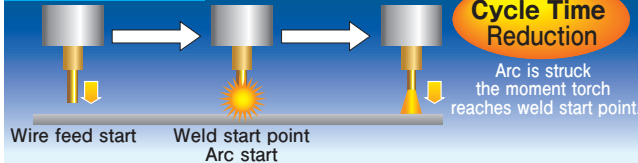
Flying Start

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

Standard Arc Start

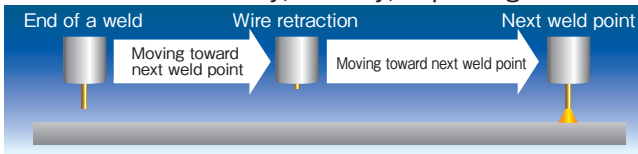


Flying Start



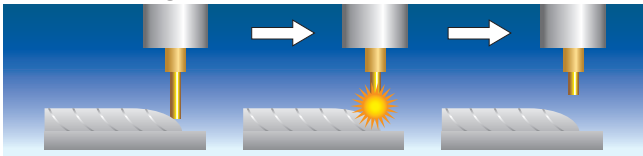
Wire Auto Retract

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



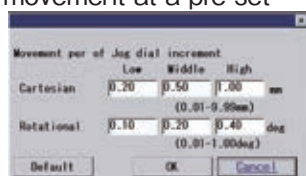
Wire Stick Auto Release (for CO₂/MAG)

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.

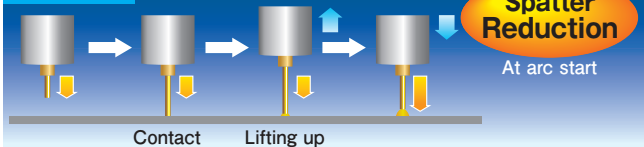


Lift Start / Lift End

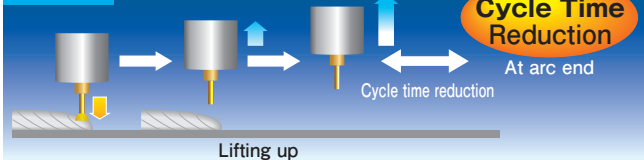
Quality Weld Starts and Ends. Spatter and Cycle Time Reduction.

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.)

Lift Start

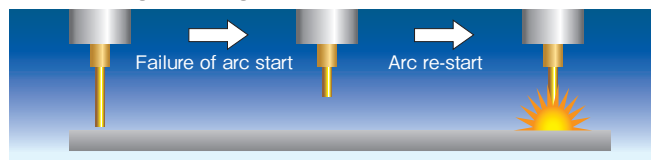


Lift End



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.



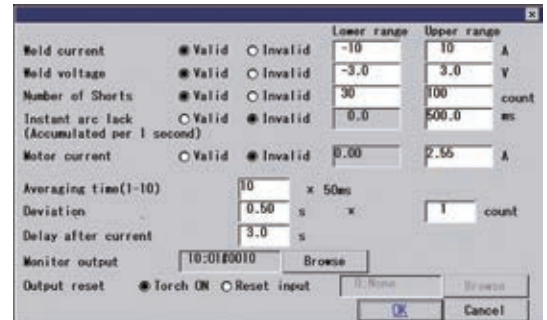
Weld Data Management

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

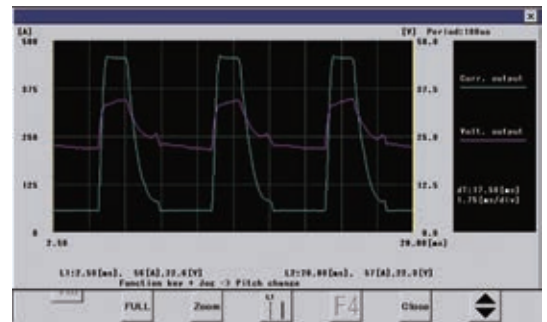
Optional Software

●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.

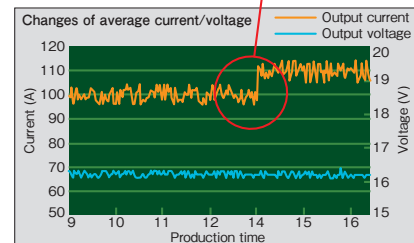
溶接データ											
Time	Prog	Post	A	V	Speed	Back	Thrd	Error	AD	VD	TD
12.12.44	Prog001	P2	120	16.1	0.50	121	16.1	20	0	0	0
12.12.44	Prog001	P4	140	16.8	0.50	141	16.8	30	0	0	0
12.12.46	Prog002	P2	120	16.1	0.50	122	16.1	26	0	0	0
12.12.47	Prog002	P4	120	16.1	0.50	116	16.1	21	0	0	0
12.12.48	Prog002	P4	140	16.8	0.50	139	16.7	27	0	0	0
12.12.49	Prog002	P2	120	16.1	0.50	122	16.2	26	0	0	0
12.12.50	Prog002	P4	120	16.1	0.50	122	16.2	26	0	0	0
12.12.51	Prog002	P4	140	16.8	0.50	141	16.8	30	0	0	0
12.12.52	Prog002	P2	120	16.1	0.50	123	16.2	26	0	0	0
12.12.53	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.54	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.55	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.56	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.57	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.58	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.59	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.60	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.61	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.62	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
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12.12.68	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
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12.12.98	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0
12.12.99	Prog002	P4	140	16.8	0.50	146	16.9	26	0	0	0

データ保存

閉じる

Example of log data analysis

Wire target position misalignment caused by production lot change



Available for defect rate reduction

More advanced welding system available

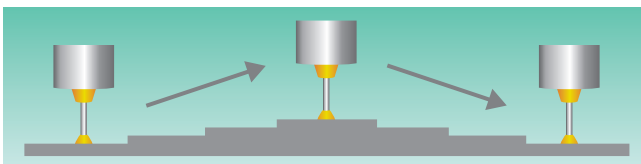
Utilize features such as external communication and large capacity memory.

Auto Extension Control

Optional Software

Compensates heat distortion or teaching error of odd-shaped work.

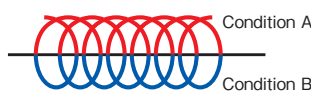
Robots detects changes in wire extension and compensates automatically.



Synchronous Weaving Low Pulse (Spiral Weaving Included)

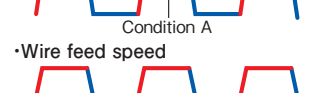
【Spiral weaving movement】

Torch movement



•Weld current

•Wire feed speed



•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

T-S Series

Payload:
8 kg
TS-800/950



TS-800

TS-950

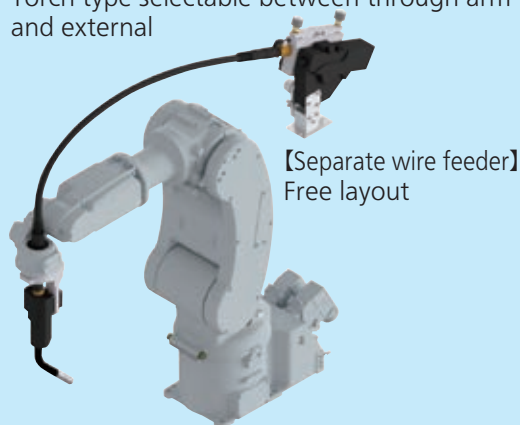
Succeed TAWERS' welding performance

● 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

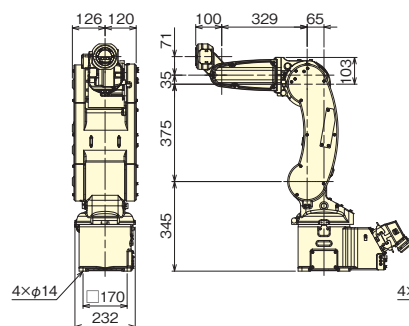
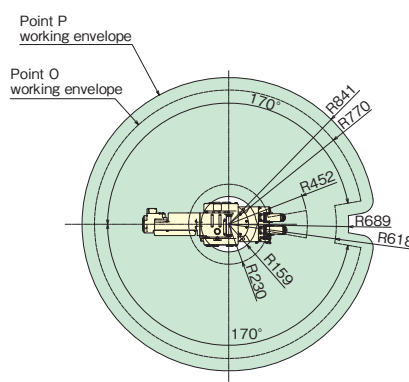
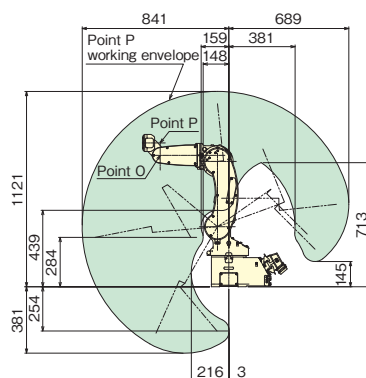
(average for all axes)

Dimensions & Work Envelope

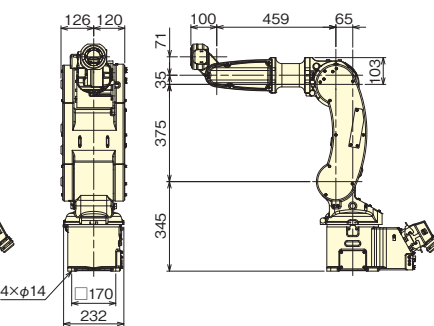
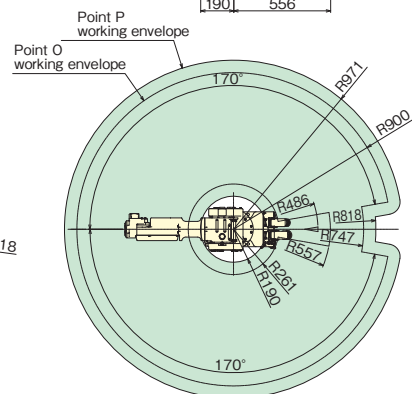
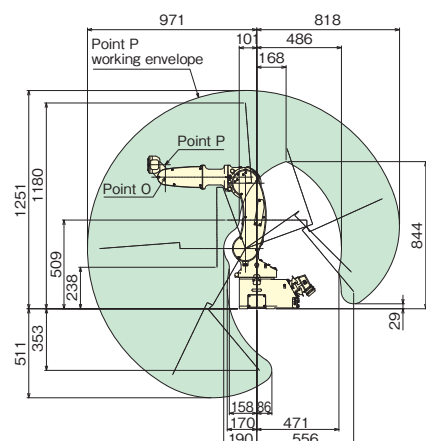
For working envelope of point O, consult us.

(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

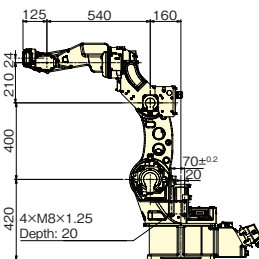
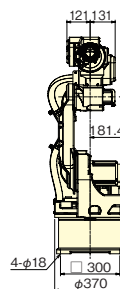
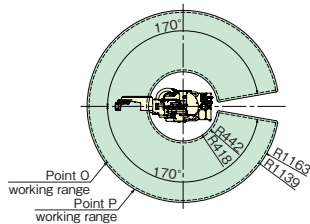
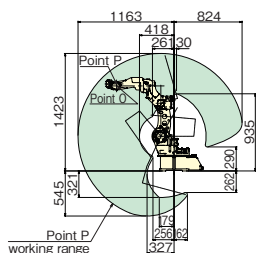
*1: Ceiling mount type is factory optional.

*2: *Setting by service personnel is necessary. *Working range of RT axis is limited.

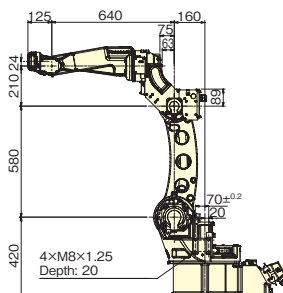
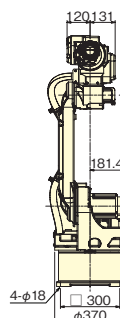
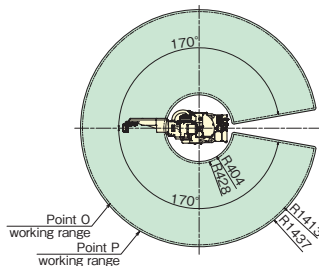
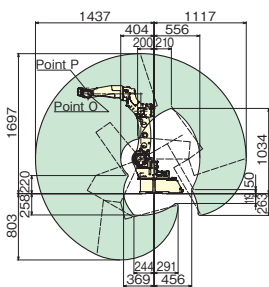
Dimensions & Work Envelope

(Unit: mm)

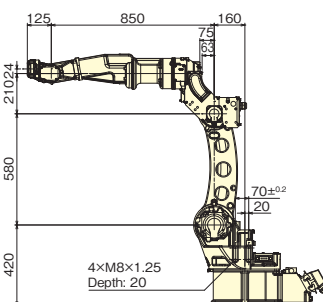
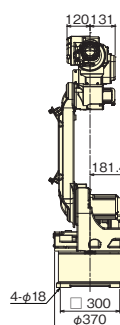
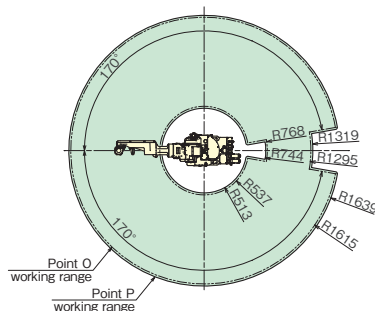
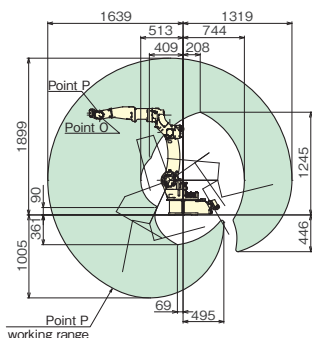
Short Type TM-1100



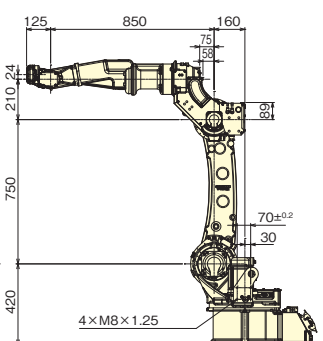
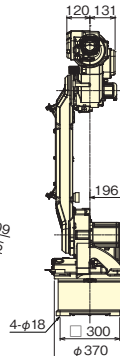
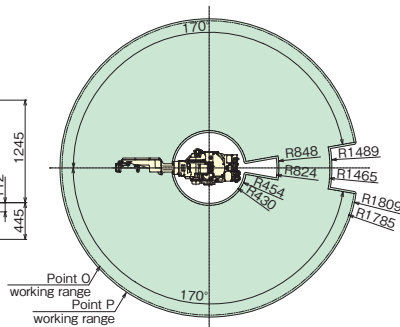
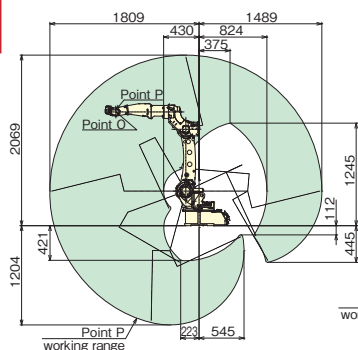
Standard Type TM-1400



Middle Type TM-1600



Long Type TM-1800

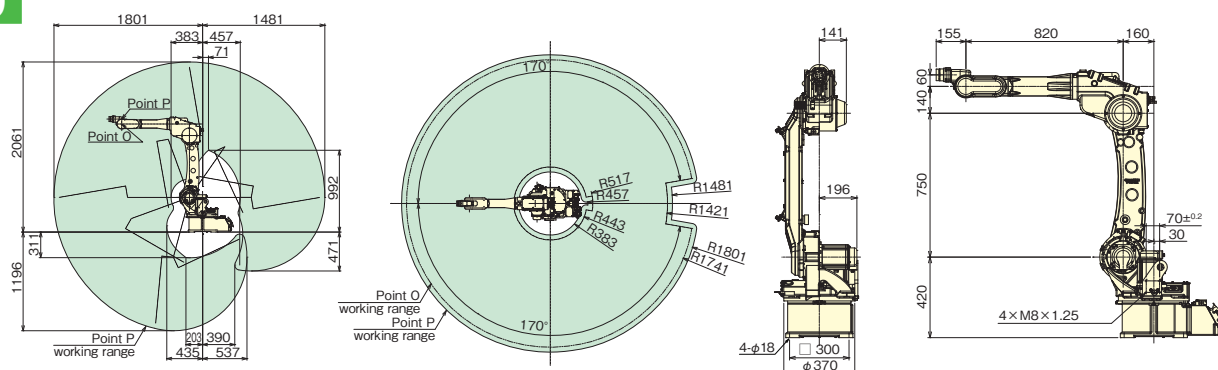


Manipulator General Specifications

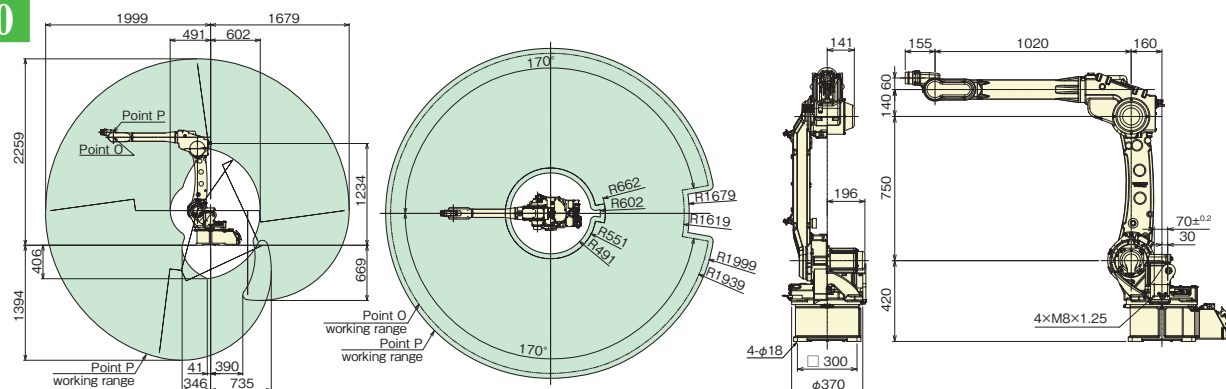
Model		TM-1100	TM-1400	TM-1600	TM-1800	TM-2000	TL-1800	TL-2000
Type		Short arm	Standard arm	Middle arm	Long arm	Long arm	Long arm	Long arm
Structure		6 axis articulated						
Payload		6 kg		4 kg	6 kg		8 kg	6 kg
Maximum Reach		1 163 mm	1 437 mm	1 639 mm	1 809 mm	2 011 mm	1 801 mm	1 999 mm
Minimum Reach		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

Long Type
TM-2000

Long Type
TL-1800



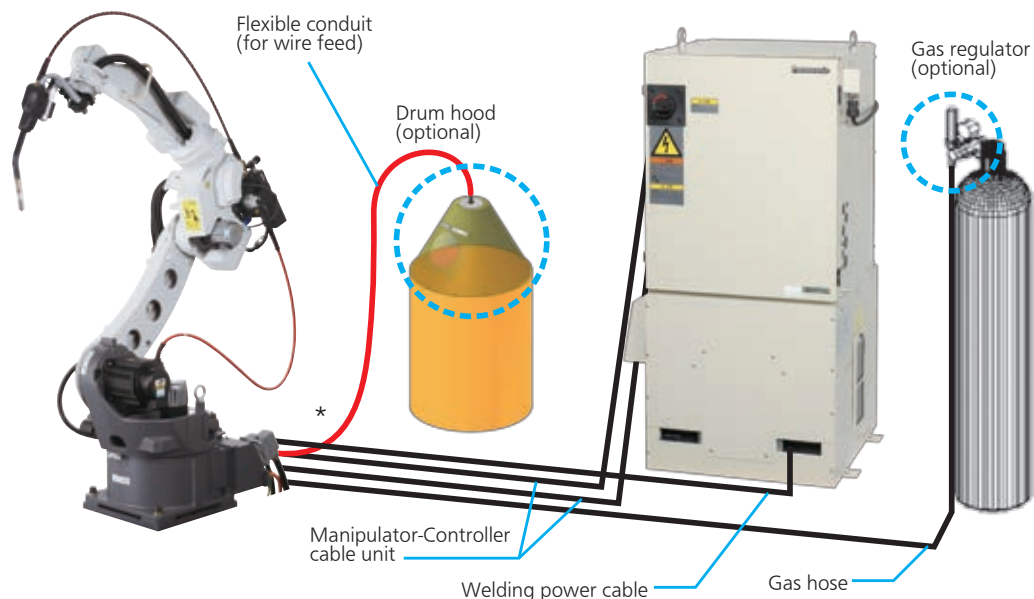
Long Type
TTL-2000



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 %

Note: For details on the power connection, refer to "Connecting primary power source" in the arc welding robot controller manual.

TM-1400WGIII (Separate Type)



Large Robot Series (GIII Controller)

Great material handling capability!

Coordinated multi-robot movement for flexible system without jig.



● 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

■ 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 °
Max. Motion Speed	TW (Twisting wrist)		±360 °	±360 °
	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