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Mitsubishi Electric Corporation **Industrial** Robot

MELFA Technical News

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Subject: Precautions of replacement from RH-6SDH to RH-6FRH-D

Applicable to: RH-6SDH
RH-6FRH-D

Thank you for your continued support of Mitsubishi industrial MELFA series robots. This Technical News explains in detail the precautions for the replacement of **RH-6SDH** horizontal multiple-joint type robots with **RH-6FRH-D** robots.

Contents

- 1. Configurations of the models (Compatible models for replacement) 2
- 2. Specifications comparison 2
 - 2. 1 Specifications of the robot arm 2
 - 2. 2 Dimensions of the robot arm and diagram of the operating range 3
 - 2. 3 Specifications of the controller 6
 - 2. 4 Outside dimensions of the controller 6
 - 2. 5 Options 7
- 3. Compatibility 8
 - 3. 1 Compatibility of the robot arm 8
 - 3. 2 Compatibility of the controller 8
 - 3. 3 Precautions of the extension function for GOT direct connection 8

Precautions for the replacement of RH-6SDH with RH-6FRH.

1. Configurations of the models (Compatible model for replacement)

The following shows the compatible models of robot arms and controllers for the replacement of RH-6SDH to RH-6FRH-D.

Model	Controller	⇒	Model	Controller
RH-6SDH	CR1DA-761		RH-6FRH-D	CR800-06HD

2. Specifications comparison

2.1 Specifications of the robot arm

The following table compares the robot arm specifications between old and new models.

Type	Unit	Specifications					
		Old models			New models		
Model		RH-6SDH35xx/M/C	RH-6SDH45xx/M/C	RH-6SDH55xx/M/C	RH-6FRH35xx/M/C-D	RH-6FRH45xx/M/C-D	RH-6FRH55xx/M/C-D
Machine class		None: Standard/M: Oil mist Note 4)C: Clean Note 5)					
Protection degree		Standard: IP20/M: IP54/C: Class 10 (0.3µm)			Standard: IP20/M: IP65/C: ISO class 3		
Degree of freedom		4			4		
Installation style		Floor type					
Structure		Horizontal multiple-joint type					
Drive system		AC servo motor					
Position detection method		Absolute encoder					
Maximum load capacity (rating)	kg	6 (2)			6 (3)		
Arm length	No. 1 arm	125	225	325	125	225	325
	No. 2 arm	225					
Maximum reach radius	mm	350	450	550	350	450	550
Operating range	J1	254 (±127)			340 (±170)		
	J2	274 (±137)	290 (±145)			290 (±145)	
	J3 (Z)	xx = 20 : 200 / xx = 32 : 320 (standard)			xx=20 :200 / xx=34 :340		
	J4 (θ)	xx = 17 : 170 / xx = 27 : 270 (M specification/C specification)					
Maximum speed Note 6)	J1	375			400		
	J2	612			670		
	J3 (Z)	1177			2400		
	J4 (θ)	2411			2500		
Maximum composite speed Note 1)	mm/sec	6473	7128	7782	6900	7600	8300
Cycle time Note 2)		0.42		0.43		0.29	
	X-Y composite	±0.02			±0.010		
	J3 (Z)	mm			±0.01		
Positioning repeatability	J4 (θ)	deg			±0.004		
		±0.02			±0.004		
Ambient temperature	°C	0 to 40					
Mass	kg	Approx. 20		Approx. 21		36	37
Tolerable amount of inertia (rating)	J4 (θ) kg, m2	0.04 (0.01)			0.12 (0.01)		
Tool wiring		Hand: 8 input points/8 output points (forearm), 8 spare wires: AWG#24 (0.2mm ²)			Hand: 8 input points/8 output points (20 pins total) Serial signal cable for parallel I/O (2-pin + 2-pin power line) LAN × 1<100BASE-TX> (8-pin) Note 3)		
Tool pneumatic piping		Primary: φ6 × 2 Secondary: φ4 × 8					
Machine cable		5m (connector on both ends)					
Paint		Color: Light gray (Reference Munsell color: 0.08GY7.64/0.81)			Color: Light gray (Reference Munsell color: 0.6B7.6/0.2)		

Note 1) The value assumes composition of J1, J2, and J4.

Note 2) Value for a maximum load capacity of 2kg. The cycle time may increase if specific requirements apply such as high work positioning accuracy, or depending on the operating position. (The cycle time is based on back-and-forth movement over a vertical distance of 25mm and horizontal distance of 300mm.)

Note 3) Can also be used as a spare line (0.2sq 4-pair cable) for conventional models.

Note 4) Please contact a Mitsubishi Electric dealer since the environment resistance may not be secured depending on the characteristics of oil you use. Direct jet to the bellows is excluded.

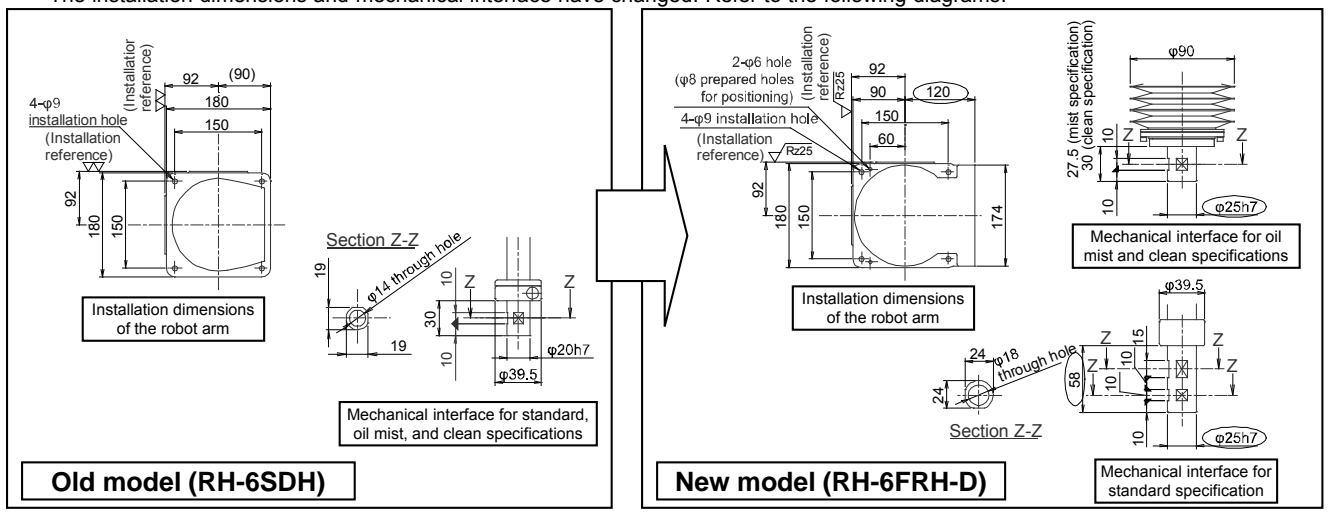
Note 5) Preservation of cleanliness levels depends on conditions of a downstream flow of 0.3m/s in the clean room and internal robot suctioning. A φ8-mm coupler for suctioning is provided at the back of the base.

Note 6) The value of when M/Tune2 (high-speed mode) is applied.

2.2 Dimensions of the robot arm and diagram of the operating range

1) Robot arm installation dimensions and mechanical interface

The installation dimensions and mechanical interface have changed. Refer to the following diagrams.



2) Dimensions of the robot arm and diagram of the operating range

For the dimensions of the robot arm and diagram of the operating range, refer to the following.

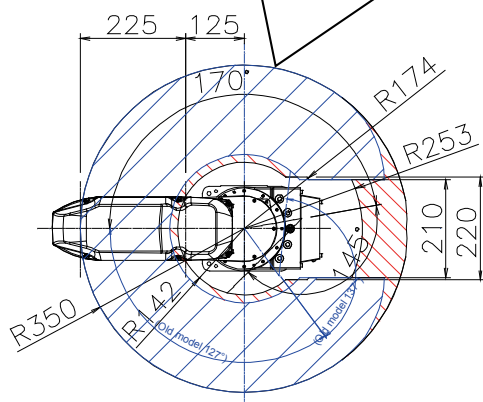
Operating range difference

RH-6FRH35xx-D:

(Shaded area with lines upward to the right + shaded area with lines downward to the right)

RH-6SDH35xx:

(Shaded area with lines upward to the right)



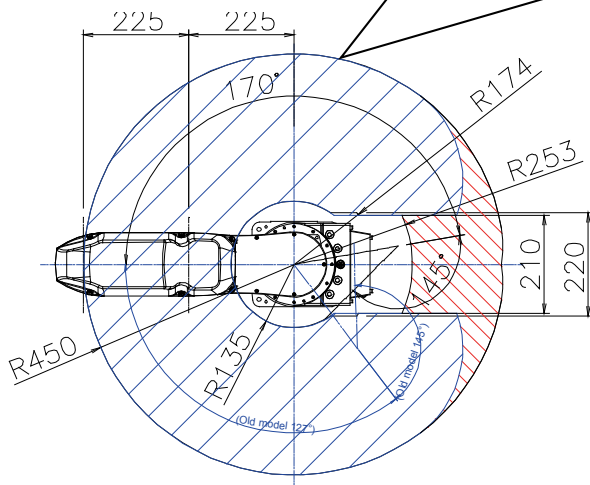
Operating range difference

RH-6FRH45xx-D:

(Shaded area with lines upward to the right + shaded area with lines downward to the right)

RH-6SDH45xx:

(Shaded area with lines upward to the right)



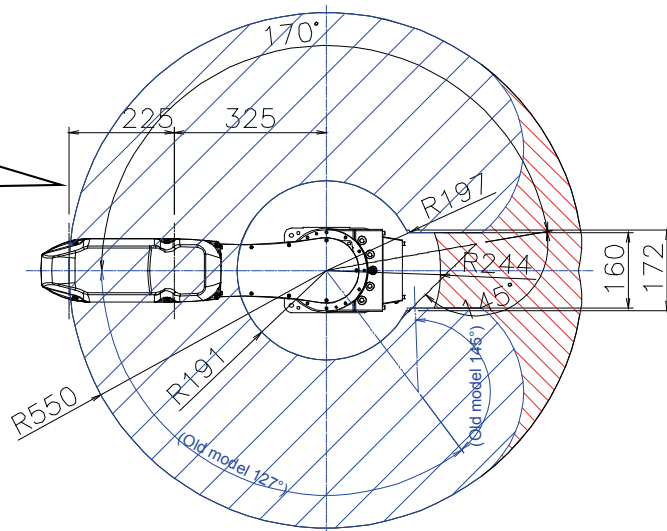
Operating range difference

RH-6FRH55xx-D:

(Shaded area with lines upward to the right + shaded area with lines downward to the right)

RH-6SDH55xx:

(Shaded area with lines upward to the right)



Overall height difference: 90mm

RH-6FRH5534: 938mm

RH-6SDH5532: 848mm

Overall height difference: 70mm

RH-6FRH5520: 798mm

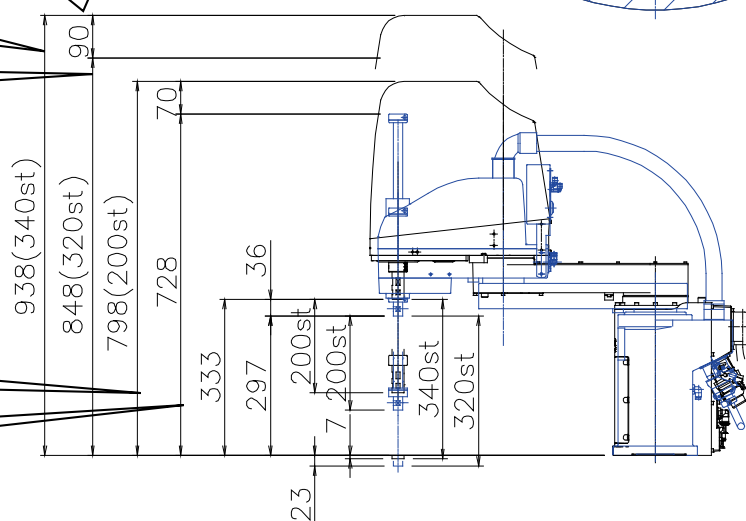
RH-6SDH5520: 728mm

RH-6FRH5534-D

RH-6SDH5532

RH-6FRH5520-D

RH-6SDH5520



Note that the height described above is for RH-6FRH55xx. The overall height of RH-6FRH35xx/6FRH45xx are the same as the above.

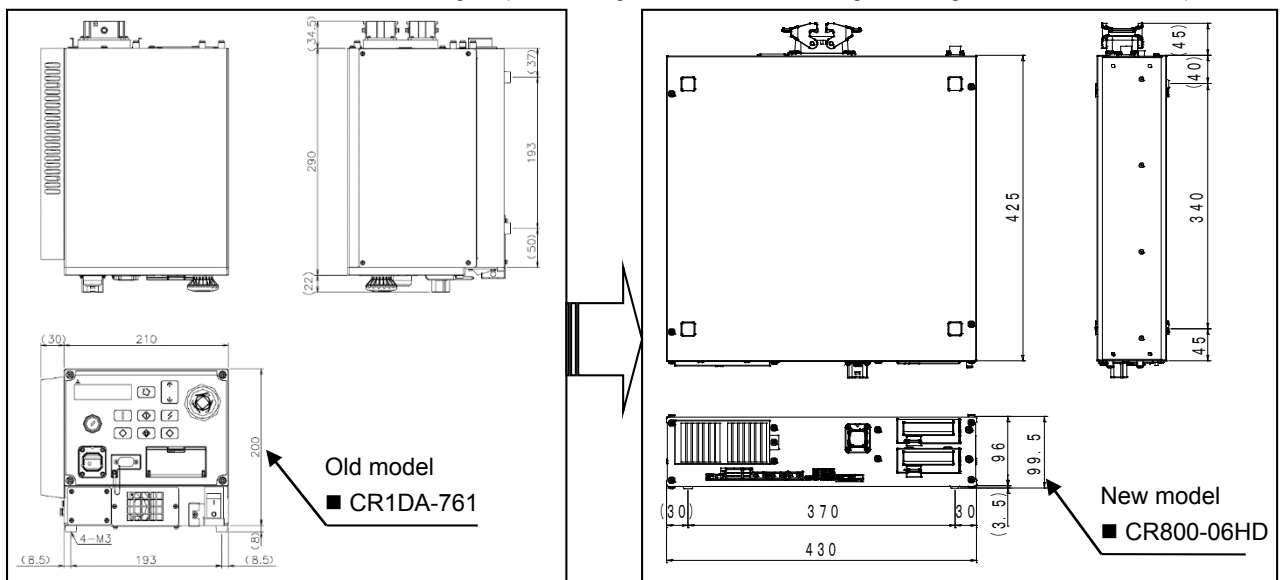
2.3 Specifications of the controller

Please note that the controller model is new, and the dimensions and others have changed. For the details, refer to the following.

Item	Unit	Specifications		
		Old model	New model	
		RH-6SDH	RH-6FRH-D	
Controller model		CR1DA-761	CR800-06HD	
Routing control method		PTP control, CP control		
Number of control axis		Simultaneously 4		
Programming language		MELFA-BASIC V	MELFA-BASIC VI	
Memory capacity	Programmed positions	point	13,000	39,000
	Number of steps	step	26,000	78,000
	Number of programs		256	512
External input/output (standard)	General-purpose input/output	point	Input 0/output 0 (Max. 256/256: option)	Input 0/output 0 (Max. 256/256: option)
	Dedicated input/output		Assigned to general-purpose input/output	Assigned to general-purpose input/output
	Dedicated stop input		1	1
	Hand open/close		Input 8/output 8 (when using pneumatic hand interface: 8/8)	Input 8/output 8
	Emergency stop input		1 (duplication)	1 (duplication)
	Door switch input		1 (duplication)	1 (duplication)
	Enabling device input		1 (duplication)	0
	Emergency stop output		1 (duplication)	1 (duplication)
	Mode output		1 (duplication)	1 (duplication)
	Robot error output		1 (duplication)	1 (duplication)
	Mode selector switch input		0	1 (duplication)
	Additional axis synchronization		1 (duplication)	1 (duplication)
	Interface	RS-232	port	1
RS-422		port	1 (for T/B)	1 (for T/B)
Ethernet		port	1 10BASE-T/100BASE-TX	1 (for T/B)/ 1 (for customer) 10BASE-T/100BASE-TX/1000BASE-T
USB		port	1	1
Memory expansion slot		SLOT	1	-
Expansion slot		SLOT	1	2
Robot input/output link		ch	1	1
Additional axis function		ch	1 (SSCNETIII)	1 (SSCNETIII/H)
Encoder input		ch	2	2
Input power supply	Voltage range	V	Single phase 180 to 253 VAC	Single phase 200 to 230 VAC
	Power capacity	kVA	0.5	1
Outside dimensions	mm	240(W)×290(D)×200(H)	430(W)×425(D)×99.5(H)	
Mass	kg	Approx. 9	Approx. 12.5	
Construction [Protection specification]		Self-contained floor type, open type [IP20]		
Grounding	Ω	100 or less (D class grounding)		

2.4 Outside dimensions of the controller

The controller's outside dimensions have changed. (Left drawing: RH-6SDH controller, right drawing: RH-6FRH-D controller)



2.5 Options

(1) Robot arm options comparison

Item	Specifications		Specifications and supplementary explanation	Compatibility
	Old model	New model		
	RH-6SDH	RH-6FRH-D		
Solenoid valve set	1S-VD0□M-04 (Sink type) 1S-VD0□ME-04 (Source type) □: 1 to 4	1F-VD0□-01 (Sink type) 1F-VD0□E-01 (Source type) □: 1 to 4	Solenoid valve set for the pneumatic hand (1 to 4 sets, sink type) Solenoid valve set for the pneumatic hand (1 to 4 sets, source type)	×
Hand output cable	1S-GR35S-02	1F-GR60S-01	The robot side has a connector, and the other side has output cables for unprocessed solenoid valve connection.	×
Hand input cable	1S-HC35C-02	1F-HC35C-01	The robot side has a connector, and the other side has input cables for unprocessed hand sensor connection.	×
Hand curl tube	1E-ST0408C-300	1E-ST0408C-300	φ4 × 8 pics, curl pneumatic tube for 4-set solenoid valve connection	○
Internal wiring/piping set for hand	-	1F-HS408S-01	8 hand inputs, φ4 x 8 tip axis built-in wiring piping set (with fixed plate), for Z stroke of 200mm	-
	-	1F-HS408S-02	8 hand inputs, φ4 x 8 tip axis built-in wiring piping set (with fixed plate), for Z stroke of 340mm	-
User external wiring/piping box	-	1F-UT-BOX	Box for hand I/O wiring of 4-set solenoid valves and for external pullout of φ4 (8 pics) hand pipes	-
J1-axis operating range change	-	1S-DH-01	Stopper part for J1-axis operating range change	-
2m machine cable (replacement type)	1S-02UCBL-03	-	Fixed type (Set of 2 cables for power supply and signals), 2m (Provided as substitute for standard 5m cables.)	-
Machine cable (replacement type) (fixed type)	-	1F-□□UCBL-41 □□: 02, 10, 15, 20	Fixed type: 2m, 10m, 15m, 20m	-
Machine cable (replacement type) (flexed type)	-	1F-□□LUCBL-41 □□: 10, 15, 20	Flexed type: 10m, 15m, 20m	-
Machine cable extension (Fixed type)	1S-□□CBL-03 □□: 05, 10, 15	-	Fixed type (Set of 2 cables for power supply and signals), 5m, 10m, 15m (Used for adding to standard 5m cables.)	-
Machine cable extension (Flexed type)	1S-□□L CBL-03 □□: 05, 10, 15	-	Flexed type (Set of 2 cables for power supply and signals), 5m, 10m, 15m (Used for adding to standard 5m cables.)	-

Meaning of symbols in table:
○: Same product
×: Incompatible
-: Not supported

(2) Robot controller options comparison

Item	Specifications		CR1DA-761/CR800-D compatibility	Remarks
	Old models	New models		
	CR1DA-761	CR800-06HD		
Pneumatic hand interface	2A-RZ365 (Sink) 2A-RZ375 (Source)	☆	○	
Expansion I/O unit	2A-RZ361 (Sink) 2A-RZ371 (Source)	2A-RZ361 (Sink) 2A-RZ371 (Source)	○	
External I/O cable	2A-CBL□□□	2A-CBL□□□	○	For expansion I/O unit
Build-in I/O interface	2D-TZ368 (Sink) 2D-TZ378 (Source)	2D-TZ368 (Sink) 2D-TZ378 (Source)	○	
External I/O cable	2D-CBL□□□	2D-CBL□□□	○	For built-in I/O interface
CC-Link interface	2D-TZ576	2D-TZ576	○	Ver. 2 compatible
Additional axis interface	☆	☆	☆	
Ethernet interface	☆	☆	☆	
Tracking function	☆	☆	☆	
Expansion memory	2D-TZ454	-	-	
Controller protection box	CR1D-MB	CR800-MB	×	
Teaching box		R32TB	○	
High-functionality teaching box		R56TB	○	
RS-232 cable (for PC support)	2D-232CBL03M	-	-	
Force sensor set	-	4F-FS002H-W200/4F-FS002H-W1000	-	
PC support software	3D-1□C-WINJ	3F-14C-WINJ	-	RT ToolBox3 Standard
		3F-15C-WINJ	-	RT ToolBox3min
		3F-16D-WINJ	-	RT ToolBox3Pro
Simulator (MELFA-Works)	3D-21C-WINJ	-	-	-

Meaning of symbols in table ○: Compatible, ☆: Standard equipment, ×: Incompatible, -: Not supported

3. Compatibility

The following table provides compatibility between old and new models.

3.1 Compatibility of the robot arm

Category	Item	Specifications		Compatibility	Remarks
		Old model	New model		
		RH-6SDH	RH-6FRH-D		
Outside dimensions	Installation dimensions	Changed		△1	Only the base length (depth) is incompatible.
	Mechanical interface	Changed		×	Incompatible (different shaft diameter)
	Operating range	Changed		○	Compatible (expanded operating area)
Tooling	Hand wiring	Changed		×	
	Hand piping	No change		○	
	Backup wiring	Changed		○	Built-in LAN cable, also available as backup wiring.
Maintenance	Backup battery	A6BAT	MR-BAT6V1	×	

○: Fully compatible, ×: Incompatible, △1: Only the base length (external depth dimension + 30mm) is incompatible.

3.2 Compatibility of the controller

Category	Item	Specifications		Compatibility	Remarks
		Old model	New model		
		CR1DA-761	CR800-06HD		
Operation	TB	R32TB		○	
	High-functionality TB	R56TB		○	
	I/O map	0 to 9999	0 to 9999	○	
	Programming language	MELFA-BASIC V	MELFA-BASIC VI	×	
	PC support software	RT ToolBox2	RT ToolBox3	×	
Maintenance	Backup battery	Q6BAT	-	×	

○: Fully compatible ×: Incompatible

Precautions of controller specifications

Item	Specifications	
	Old models	FR series
	CR1DA-761	CR800-06HD
Robot language	MELFA-BASIC IV MELFA-BASIC V	MELFA-BASIC IV cannot be used directly. (RT3 converts MELFA-BASIC IV into MELFA-BASIC V or VI.) MELFA-BASIC V MELFA-BASIC VI (upper-compatible of MELFA-BASIC V) *In MELFA-BASIC VI, the description method of program is the same as MELFA-BASIC V unless the Function or Include commands are used.
Serial number of robot	Necessary to input (by using the T/B or RT2)	Not necessary to input (The data has been stored in the robot's internal ROM.)
Origin setting	Necessary to input (by using the T/B or RT2)	Not necessary to input (The data has been stored in the robot's internal ROM.)
Hand type	Sink type (initial value) It is necessary to set a parameter for selecting the source type.	Not set (initial value) It is necessary to select either sink or source type by setting a parameter. (If not set, an error will occur.)
Mode selector input	Provided	Provided (Customer needs to prepare a mode selector switch) Recommended key switch: HA1K-2C2A-2 (manufactured by IDEC)
Enabling device switch input	Provided	Not provided
Battery	Provided (Q6BAT, 1 pc.)	Not using (Not necessary to replace the battery)
TB dummy connector	Necessary	Not necessary After deadman turns on, the T/B can be removed without stopping the robot even during operation.

3.3 Precautions of the extension function for GOT direct connection

The start addresses of the GOT shared memory (CPU buffer memory) I/O are different between old and new models.

Item	Specifications		Remarks
	Old model	FR series	
	CR1DA-761	CR800-06HD	
GOT output start address (to robot)	U3E0\G10000	U3E0\G0	
Robot input signal start address	10000	10000	
Robot output signal start address	10000	10000	
GOT input start address (from robot)	U3E1\G10000	U3E1\HG0	
Memory configuration	Shared memory among GOTs	CPU buffer memory	