NEW

Introduction of FD19 controller

① Robotization request to break away from manual

The market is expanding, but it has not been able to deliver products that meet its needs.

[e.g.] Major customers in Indonesia, India and Thailand have not expanded from Japanese-owned motorcycle and car manufacture for 10 years. Japanese SMEs have decided that securing human resources overseas if better than introducing robots.

Issue

1) Inconsistent cost-effectiveness
2) Uneasy to operate, difficult to use
3) Insufficient maintenance and support system
   etc.

Content to be strengthened

Efforts to lower the hurdles of introduction

- Easy operation
- Manual less and training less
- Support operation and maintenance any time

DAIHEN

Advanced automation

- Standardization of the latest safety functions
- Standardization of handling functions
- Easy-to-cooperate with other companies' units
- Various OPs can be added by SIer.
- Improvement of basic robot performance

Breaking from manual work

Efforts to lower the hurdles of introduction

- Easy operation
- Realization of instruction manual less and training less
- Support operations and maintenance any time

It is expensive to improve safety

FD19 controller with solution

For smartphones I can use it.
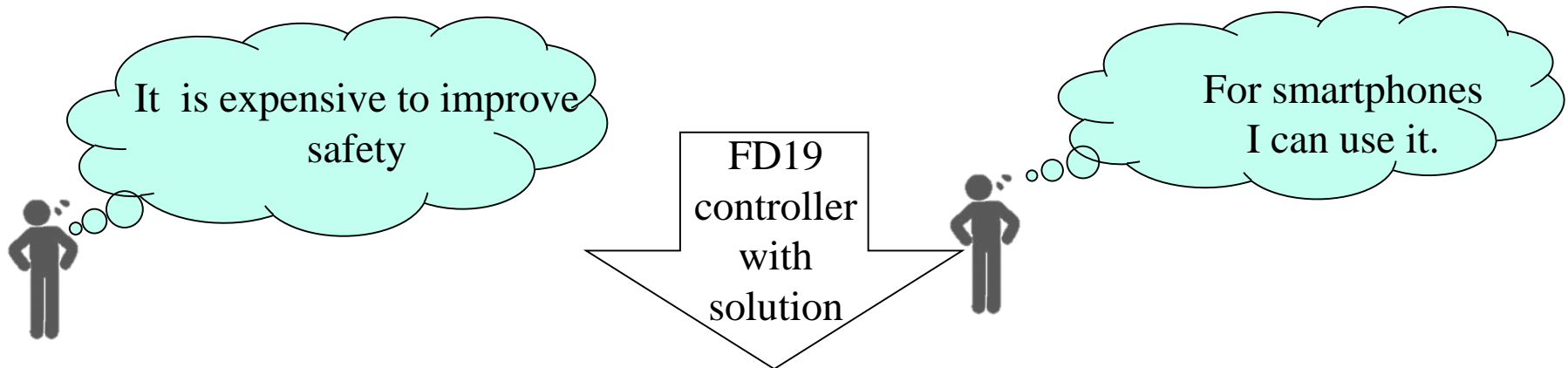
Meeting the growing automation needs by FD19
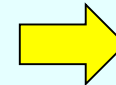
Aims of the New Robotic Controller

Enhance the system integration ability, provide a robot controller capable of meeting various field automation requirements.

Advanced automated production system aimed at unmanned operation
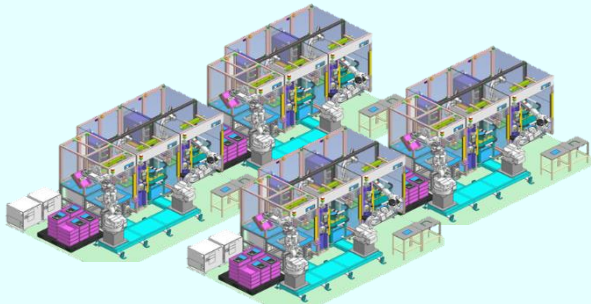
Support to both

Robotization for braking out from manual work

- Advancement of system needs in Japan, Europe, the United States and China
- Robots that SIer can easily upgrade

- Promote robotization in Emerging Countries
- Easy-to-install and easy-to-use robots (No Instruction Manual, No Training)

Features of the new controller FD19

System Integration

- High-scalability
- Standardization of the latest safety functions
- Extensive cooperation with external devices and systems
- Improvement of Basic Performance

New controller FD19

Easy to use for first time persons

- New easy-to-use TP
- Tablet-like operability
- Support by Remote Maintenance

![DAIHEN logo]

Features of the New Control Unit
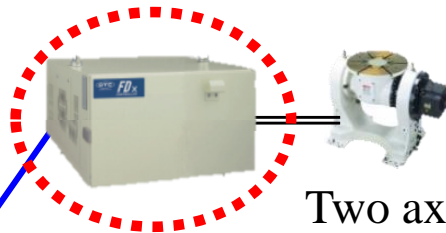
System Integration

Good extensibility and compact controller

● Compact implementation of required specifications

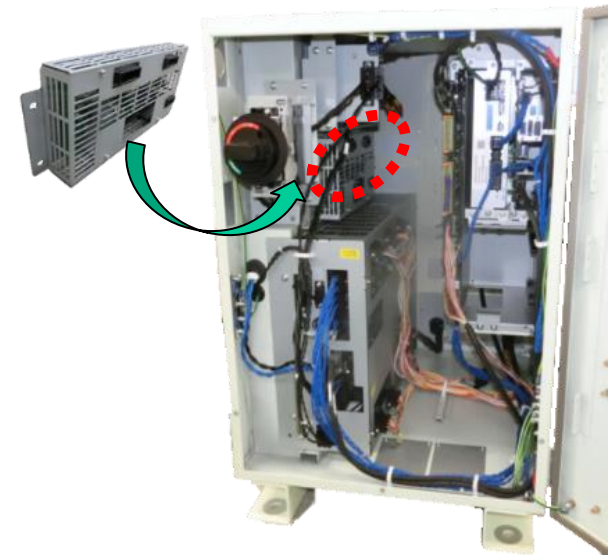■ Additional axis configuration with superior scalability
- Independent two-axis controller: Contributing to size and cost reduction
- Up to 7 kW motor × 2 axes can be controlled by an independent 2-axes controller.
- Easy installation of additional axis module installation man-hours 60% reduction
- Five controllers can be connected.

Independent two-axis controller

Robot controller (up to 8 axes)

Two axes

Additional two-axis module

Two axes

6 axes

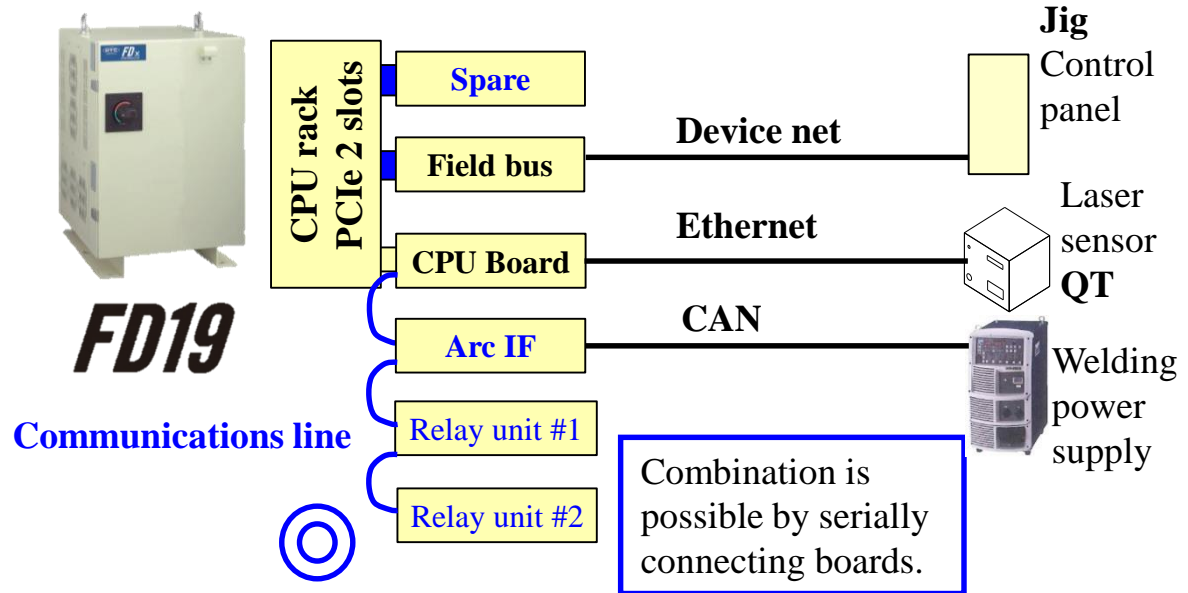Width: 580 mm

Width: 440mm,
25% reduction from FD11

High-scalability

- Enhancing automation levels with free optional equipment combinations

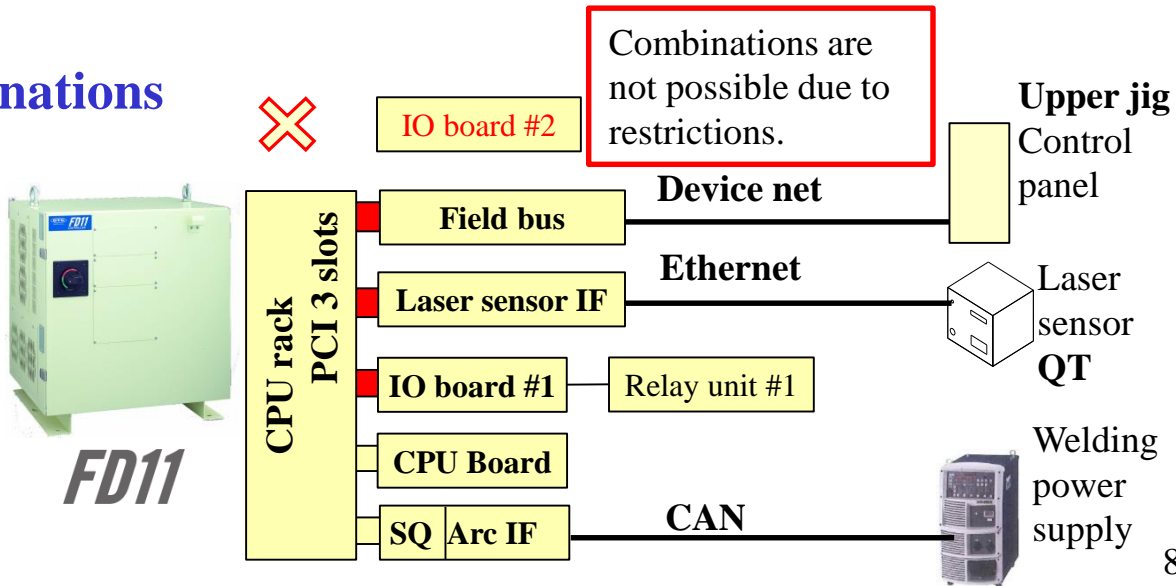## ■ Increased scalability

- **Connecting the optional equipment to enable a variety of combinations.**

FD19

Communications line

CPU rack PCIe 2 slots	Spare	
	Field bus	Device net
	CPU Board	Ethernet
	Arc IF	CAN
	Relay unit #1	
	Relay unit #2	

Combination is possible by serially connecting boards.

Jig Control panel

Laser sensor **QT**

Welding power supply

■ Limited number of combinations

- There are combinations that cannot be constructed due to hardware limitations.

FD11

IO board #2

Combinations are not possible due to restrictions.

CPU rack PCI 3 slots	Field bus	Device net
	Laser sensor IF	Ethernet
	IO board #1 — Relay unit #1	
	CPU Board	
	SQ Arc IF	CAN

Upper jig Control panel

Laser sensor **QT**

Welding power supply

8

Advanced safety functions

● Advanced Safety Functions as Standard Equipment

■ Standardized safety requirements[1] from major automotive customer

■ The RMU function can be easily added with a position monitoring board.

■ Space-saving facilities can be constructed with RMU functions.

In the task program
Working range

Position Monitoring board

FD19
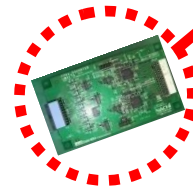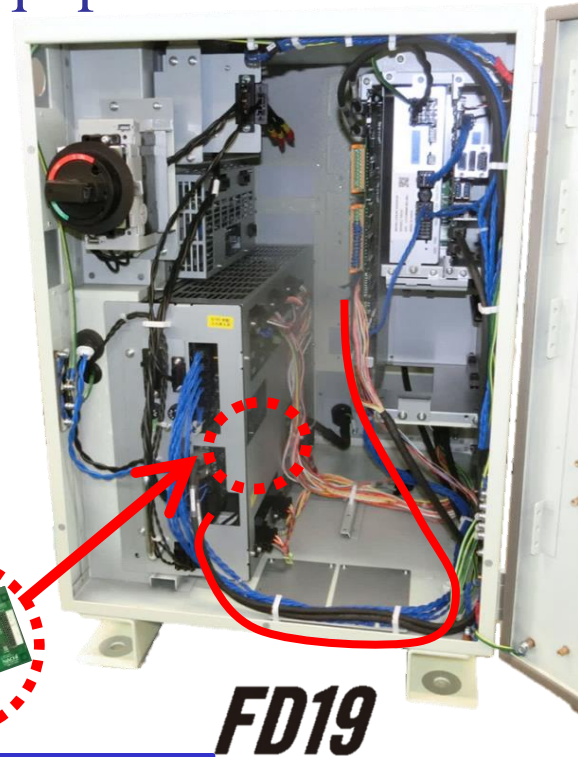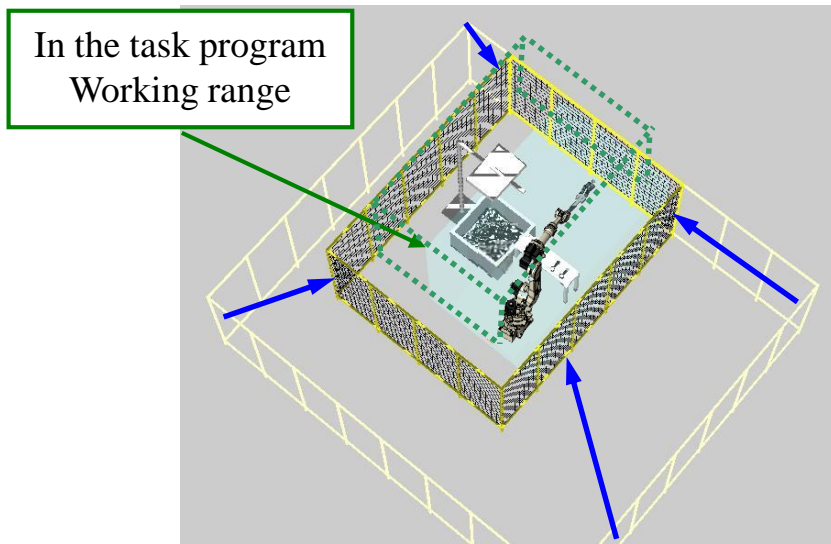
*1 Industry's highest level of safety function (Emergency stop functions of Cat. 4, PLe, and SIL3) are certified by third parties.

● Systems using virtual safety fence capabilities

Smooth information linkage with host systems

The robots required by our customers' production control systems can be easily processed. Supports advanced automation such as Industry 4.0.

Production control systems

Robot's internal information

Example of internal robot information

■ Robot operation information
- Robotic data (angles, speeds, motor currents, temperature, etc.)
- Controller data (operating modes, input/output signals, variables, etc.)

■ Application data
- Construction information (construction time, work piece information, abnormality information, etc.)
- Measured values (welding current, voltages, wire feed load, etc.)

Factory network

Customers' production facilities

(OPC-UA response Software PLC built-in)

* The internal information of the robot to be output is selected by TP.

Smooth cooperation with CAD/CAM

It is no longer necessary to divide the data generated by the CAD/CAM.

① Capturing CAD Drawings (FD-ST)

② Automatically Generate task program

■ In FD11...
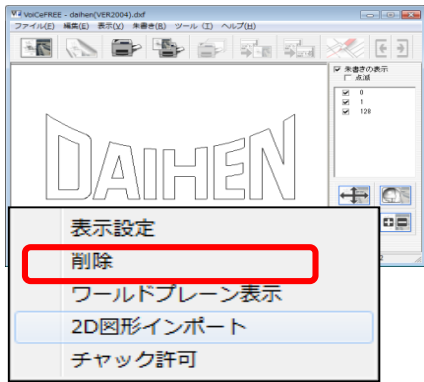
Need to split programs and call (CALLP)
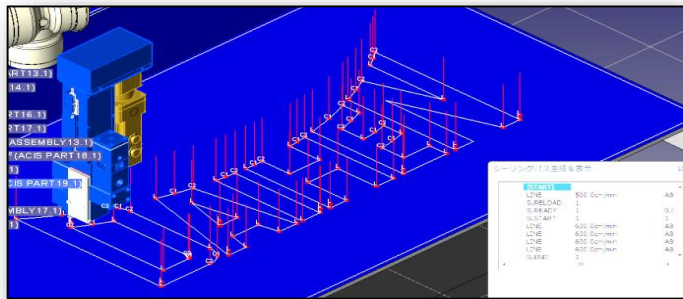
■ In FD19

Recordable by one program
(No need for program division)

- For memory capacity per task program
  Extend by 256 times
- User data
  Total memory capacity increased 40 times (10GB)

Convenient software PLC

Built-in software PLC can be program creation and edited on PCs.

- Software PLC's PC editing software ISaGRAF ※1 Workbench is provided as a standard.
- Strongly Supported Developing PLC program

PC

Ethernet
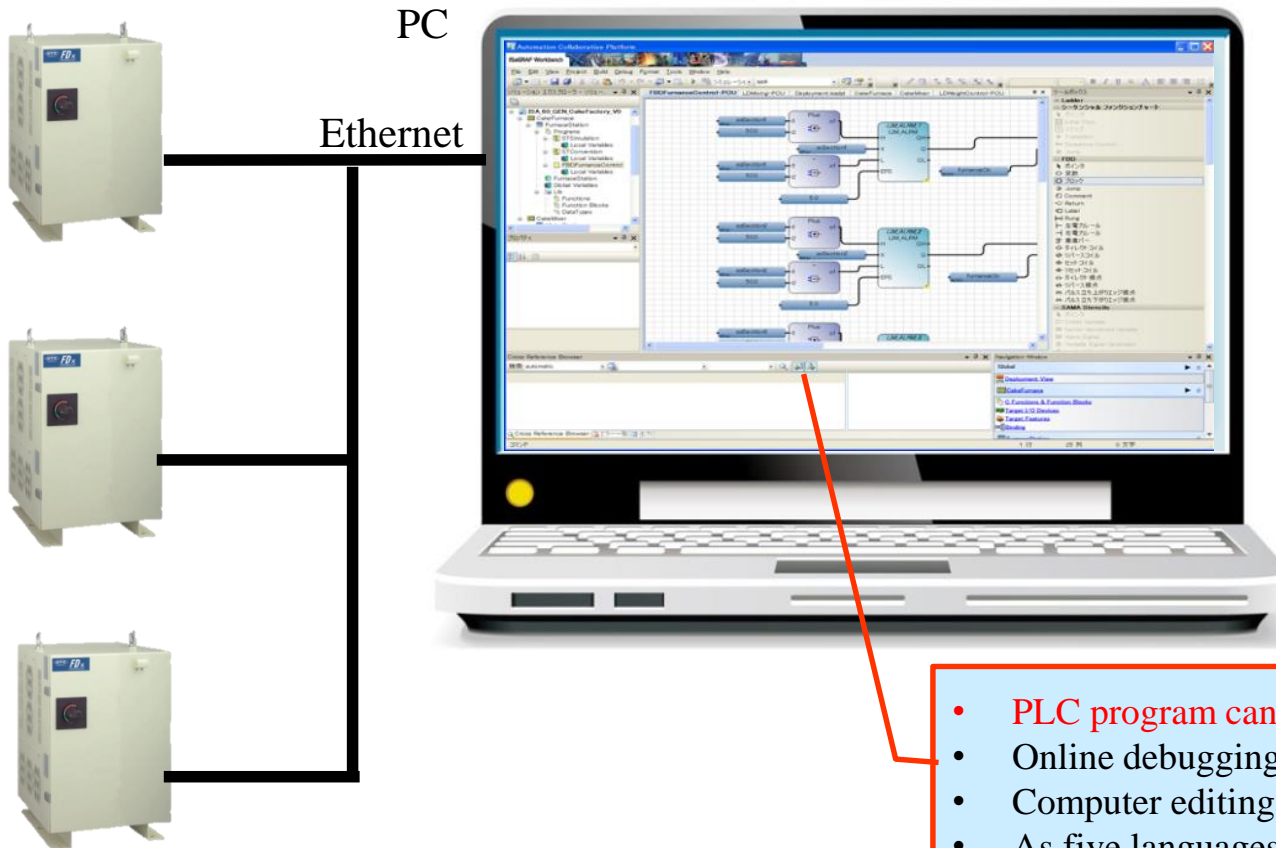
ISaGRAF
A Rockwell Automation Company

- PLC program can be created on a PC
- Online debugging is also possible.
- Computer editing software provided as standard
- As five languages (SFC/FBD/LD/ST/IL)
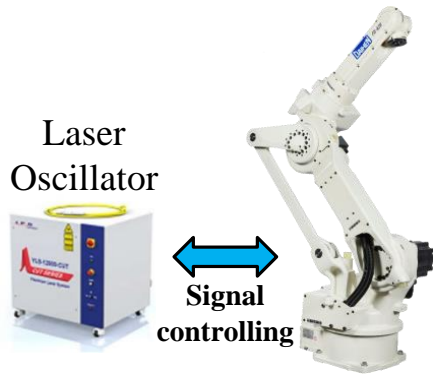- Support for FC (flow chart)

※ 1 ISaGRAF is a registered trademark of Rockwell Automation.

Improvement of basic performance

- Six-fold improvement in the accuracy of output signal position reproduction. High-precision machining is possible.
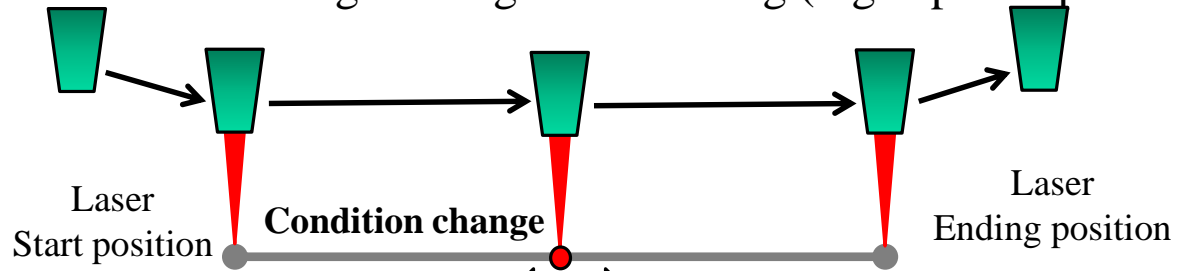
For example

Variation in the position of condition change during laser welding (high speed operation) is approximately 1/6.
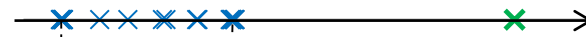
Laser Oscillator

Signal controlling

High-precision robot

(Linear locus accuracy ±0.15 mm or less)

Laser Start position

Condition change

Laser Ending position

Variations are reduced to approximately 1/6.

Variation (Max. error)

FD11

4.2mm
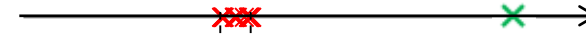
FD19

0.7mm

✕ SET

✕ FD11[5ms]

✕ FD19[2ms]

-12   -7   -2

Distance from the teaching point[Mm]

Moving direction (Speed 10 m/min)

(with PLC)

13
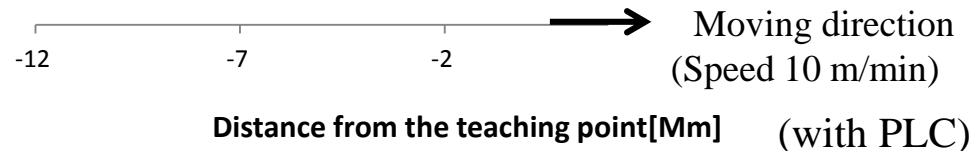
Increased freedom in multiple robots

The robot can be operated in the desired combination.

Extending the number of registrable logical system configurations (units) **from 9 to 32**

At the same time, **9 logical system** configurations (units) can be start.
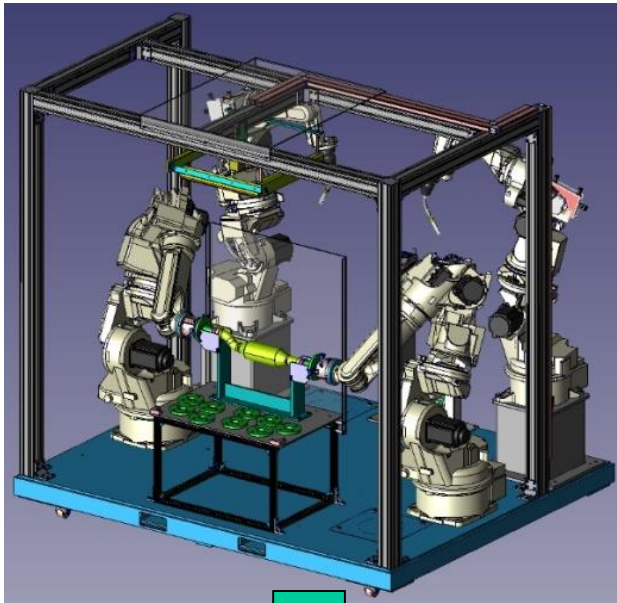
For a four-robot system...

4 robots cooperative	1 unit
3 robots cooperative	4 units
2 robots cooperative	6 units
1 robot multitask	4 units
Management unit	1 unit
	Total of 16 units

e.g. Combined robots (two robots)

Functions suitable for laser machining
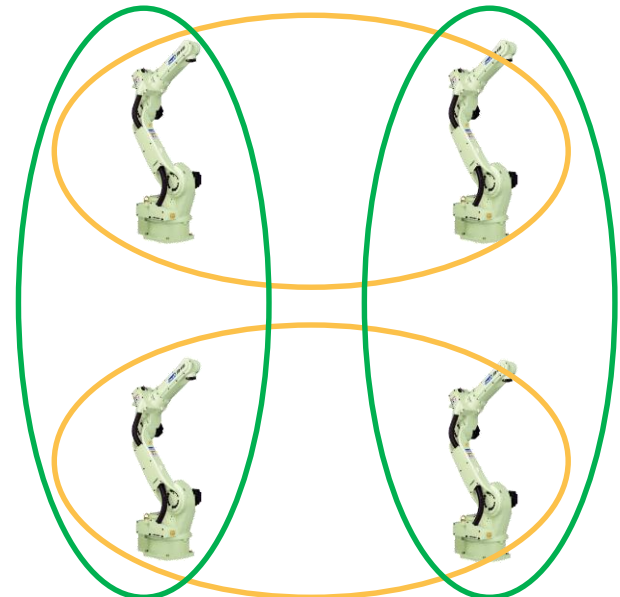
Laser-oscillator manufacturer exclusive use interface

- **Equipped with standard I/F from major laser oscillator manufacturers**

  e.g. IPG Photonics

- **Setup is completed only by selecting the manufacturer.**

  ⇒ **Large reduction in startup man-hours**

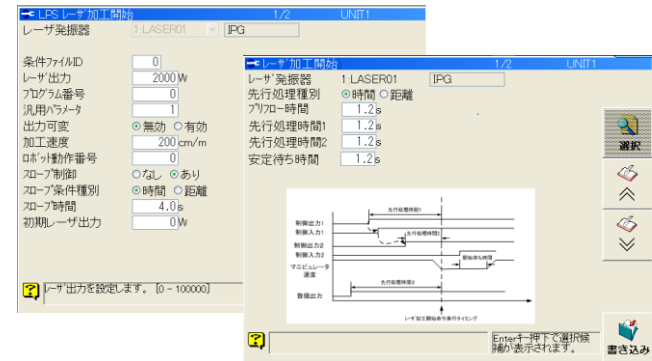- **The interface can be easily extended by adding a definition file.**

Examples of I/F Functions with Laser Oscillator (IPG Photoincs)

Functions suitable for laser machining

Laser-machining exclusive use command
- Laser-machining exclusive use command standardized
- **Optimal control of laser machining timing**
  Ex. Laser ON/OFF, laser power control, and Gas on/off
- Optimal robot operation for laser machining

Laser machining start command

Laser machining end command

Examples of teachings of laser-machining exclusive use instructions

Functions suitable for laser machining

Automatic teaching of cutting programming

- The basic cutting pattern program is automatically generated by one touch.
- Automatic programming with center position teaching and radius setting for arc
- Automatic programming, including piercing
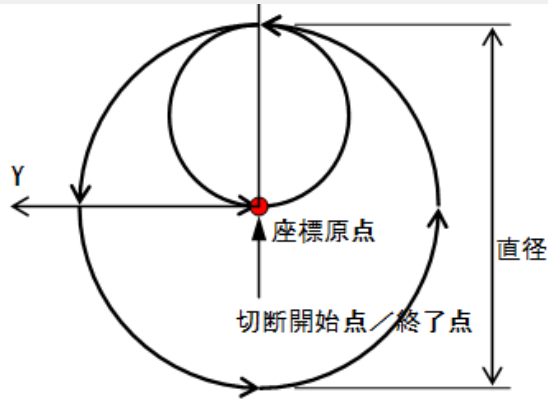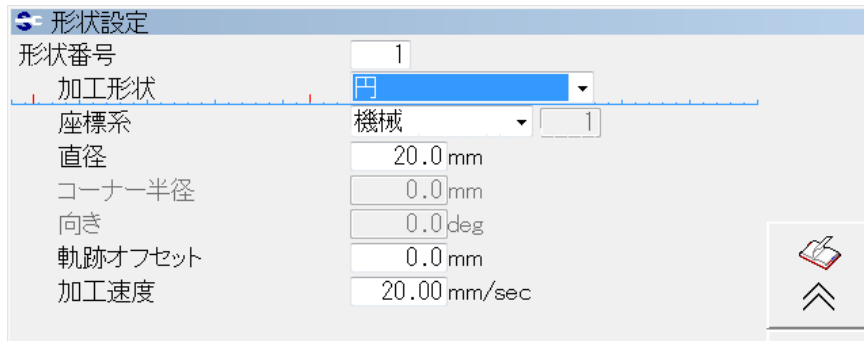
Arc cutting
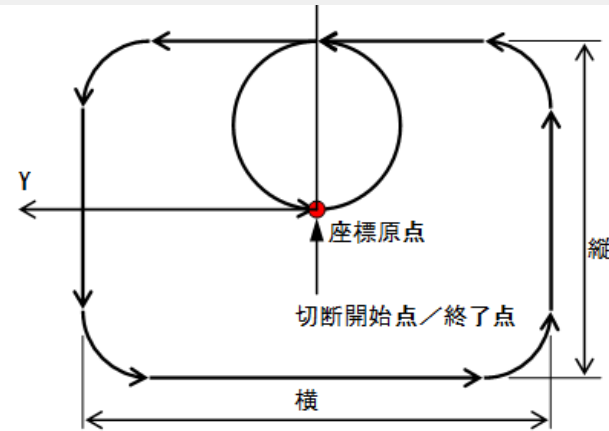
Rectangular cut with R

Example of shape cutting teaching

●	Piercing position
←	Machining pass
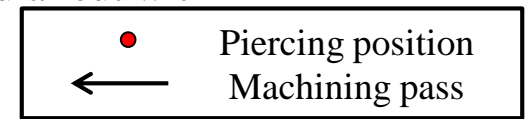
Visual sensor (2D/3D)

Automating the work carried in from people

- **For 2D sensor → planar geometry recognition applications**
- **For bin picking of the 3D sensor and bulk components**
- **Easy to connect to the FD19!**

3D visual sensor

2D visual sensor


FD19

Bulk picking

**Picking/placing
Correction of misalignment of grip, etc.**

Visual sensor teaching

■ Visual sensor can be used with the same operability as arc's teaching.

- The communication setting is completed only by selecting the sensor. Cumbersome communication setup is not required.
- Visual Sensor specific instructions can be used for imaging and receiving measured value. Complicated language programming is not required.

Communication library with various visual sensors is installed. ⇒ Only selecting the sensor type to communicate!

Visual Sensor specific instructions "imaging executed"

Visual Sensor specific instructions "Receive measured value"

Select sensor type
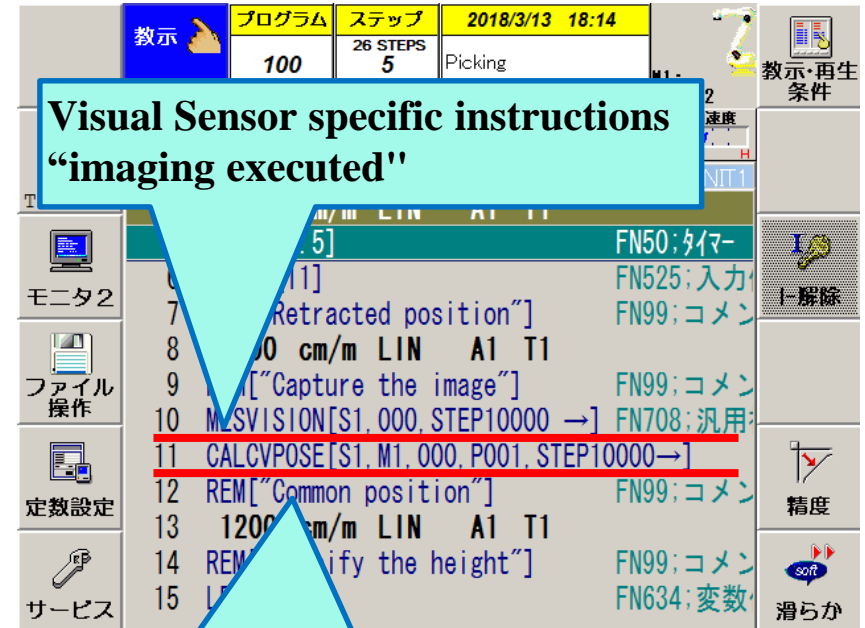
Examples of teaching specific instructions

19

Conveyor synchronize and visual compensation conveyor synchronize

Automation of sorting and boxing operations that relied on people

- **Flow work on the conveyor**
- **Robotization of work sorting process**
- **Continuous picking without stopping conveyor**
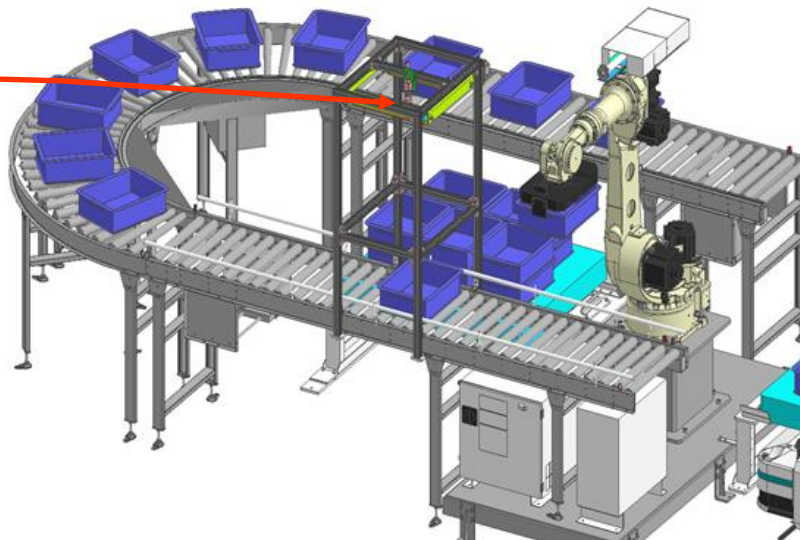- **Automatic sorting by detecting non-defective/defective products**
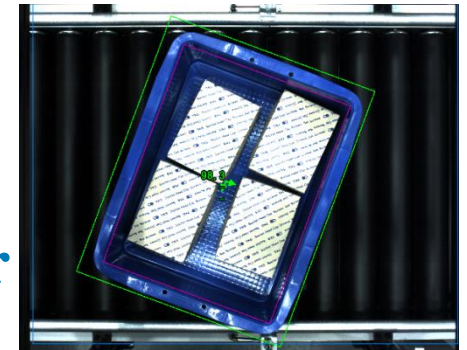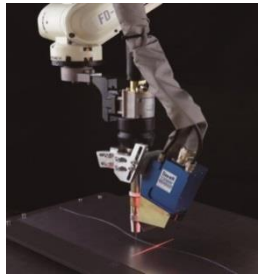

Work piece flowing through the conveyor

Vision sensor

Robot picking

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Sensor lineup for arc welding

	Touch sensor **FD-WD** **FD-WD-H**	Laser search **FD-QD**	Laser search **FD-QF**	Arc sensor **FD-AR**	TIG arc sensor **FD-TR**	Laser sensor **FD-QT**
Work Position-detection/ detection time	✓ about 3.6 sec	✓ about 2.6 sec	✓ about 0.3 sec	-	-	✓ about 0.2 sec
Weld line Seam tracking	-	-	-	✓	✓ Height only	✓
Groove shape Recognize	-	✓	✓	-	-	✓
Applicable work thickness	3.2 mm or more	1.0 mm or more	0.5 mm or more	3.2 mm or more	1.0 mm or more	0.5 mm or more
Detection accuracy	±0.5mm	±0.5mm	±0.2mm	±1.0mm	±0.5mm	±0.4mm
Work Material	Conductive Materials	Non Surface gloss materials	Non Surface gloss materials	Iron / Stainless steel	Weldable Materials	Non Surface gloss Materials
Appearance						

Features of the New Controller

Easy to use for the first time

New TP that is becoming easier to use

DAIHEN

Easy to see

Clear letters with increased transparency

FD11 (60%)   **FD19 (80%)**

JOINT   JOINT

Easy to press

- Lightly pressed key (half press force)
- Handle blind touch with protrusion

Easy to hold

- 15% weight reduction (820g) compared with FD11
- Ergonomic shape for easy grip reduce arm fatigue to 1/3 (Myopotential Measurement)

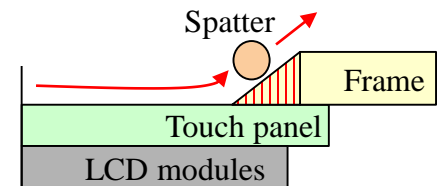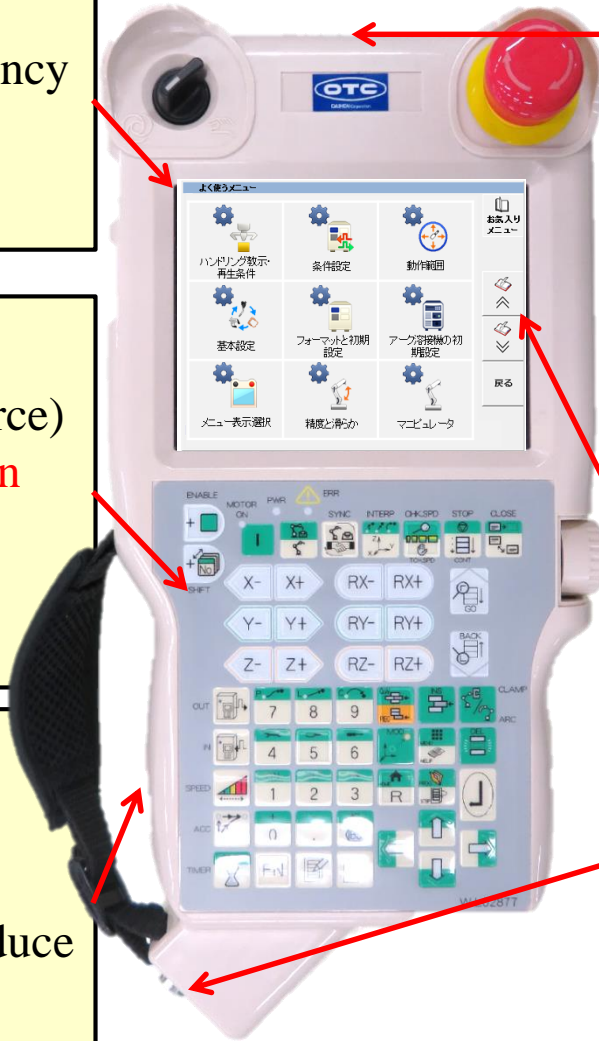## Improved Maintenance
Replaceable hook

Improvement of spatter resistance
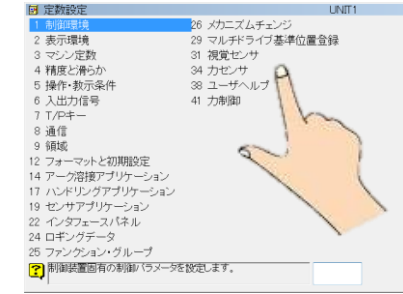Changing the structure of the screen frame

Spatter

Frame

Touch panel

LCD modules

Improved Maintenance
Cable connector
Reduced replacement time

Tablet-like TP operations

● The Icon menu for intuitive operation

New teach pendant window

Teach pendant window for FD11
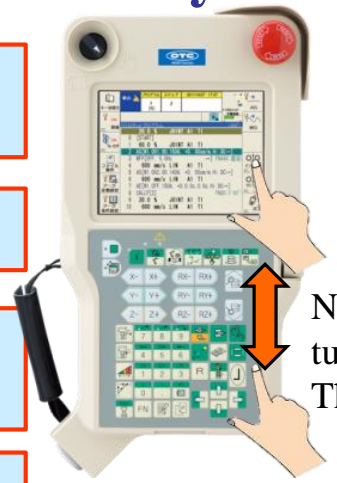
A function for automatically assigning buttons in descending order of usage frequency is also provided.

● Editing is completed by touch panel operations only.
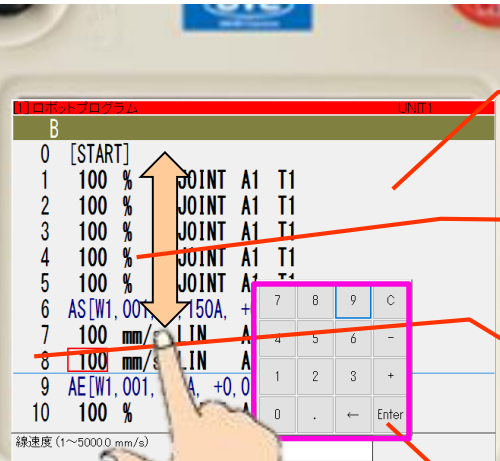
For task program editing
Full-screen display

Move screen with **swipe**

Move the parameter **directly to the cursor** by touching it.

Numerical entry with **the ten-key pad**
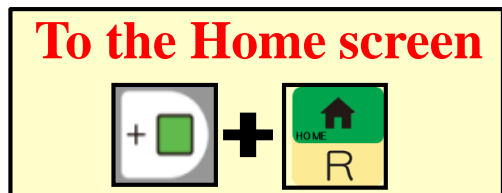
Need to turn
There was.

FD11 TP

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Improved operability of TP key

The addition of two exclusive use keys and projections increases workability.

- **You can jump to the Home or Menu screen at any time.**
- A blind touch can be made with the key protrusion.

Key protrusion for **blind touch**

To the Home screen
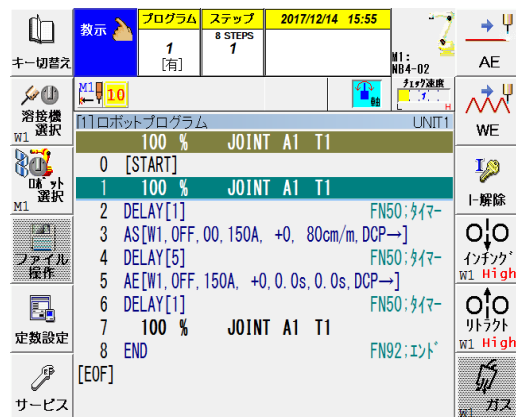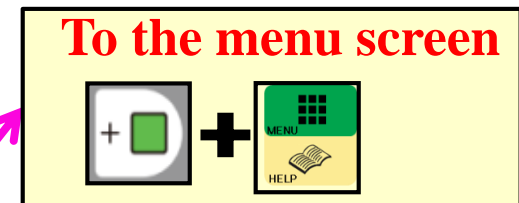
To the menu screen

Home screen

Menu screen

W-L02877
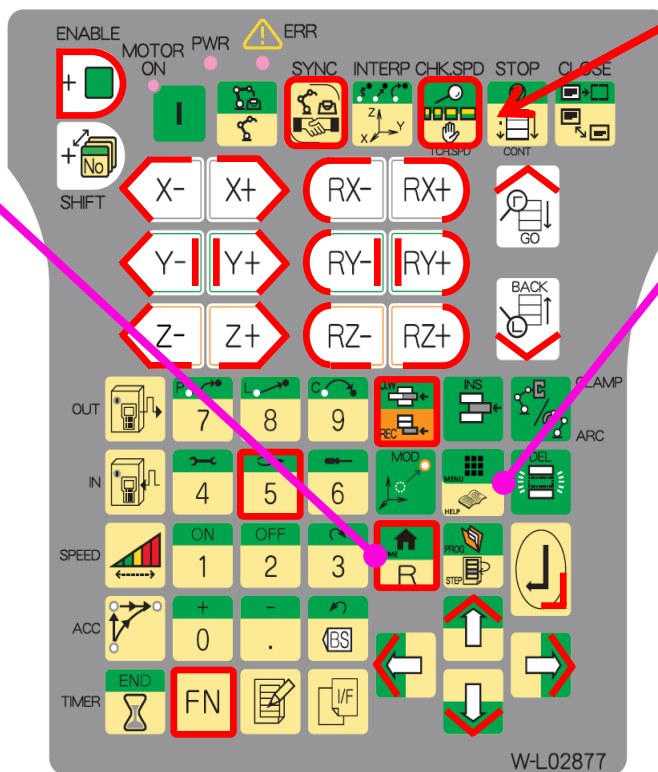
Remote maintenance

Connect the robot controller to the service center via the network in case of trouble. Rapid support is available.

USB Cable

Communications *1

Customer

Server

Communications terminal

Servicing

IoT Gateway

LAN Cable

Perform the necessary maintenance operation by completely remote operation of TP.

Call-centers
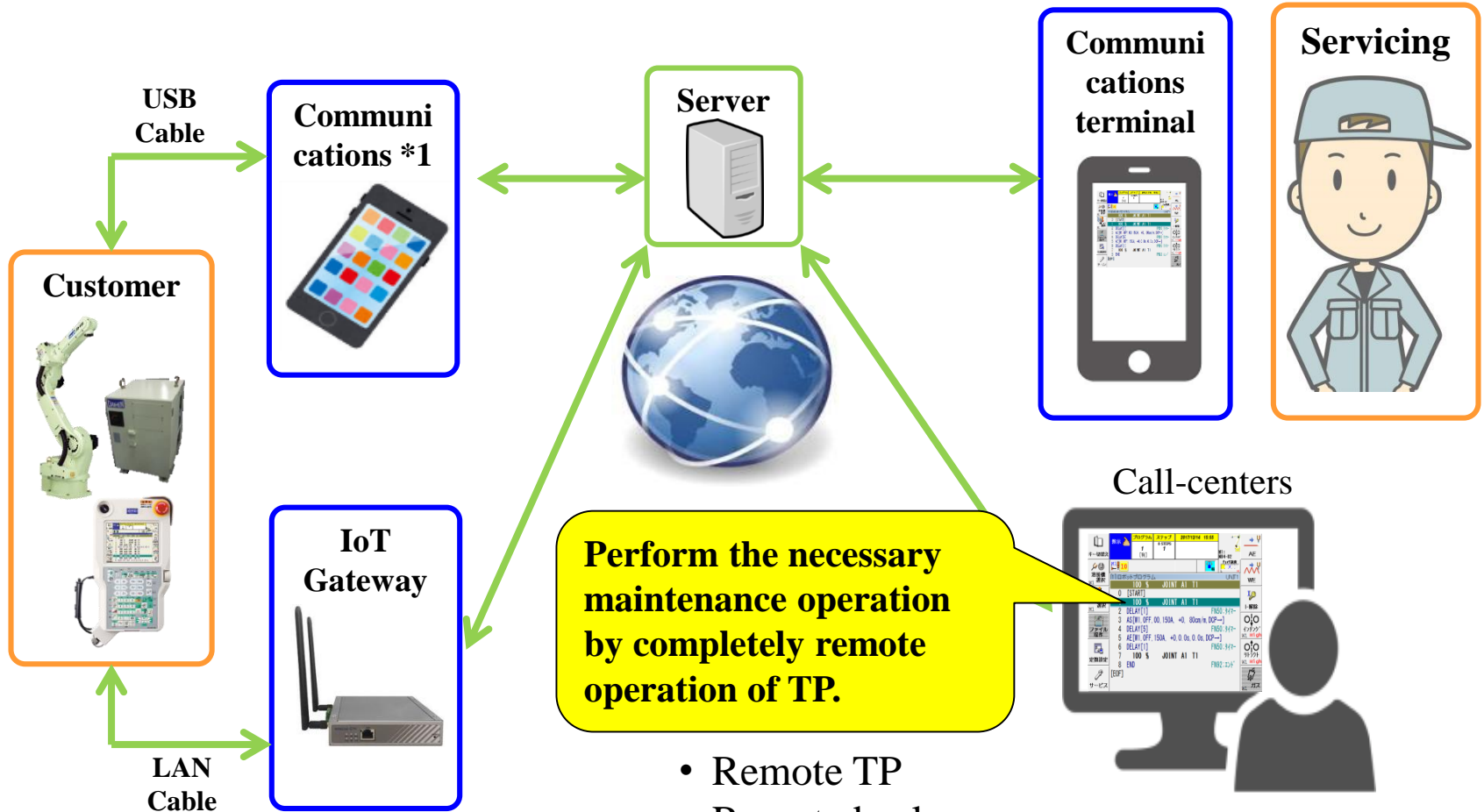
- Remote TP
- Remote backup
- Remote upgrade

*1 Only Android terminal is supported.

Pursuing ease of system upgrade
FD19 Controller

Compatibility between FD19 and FD11

FD19 and FD11 compatibility

■ **All parts and PCB in the controller are incompatible.**

FD19 uses state-of-the-art electronic devices and redesigned all PCBs. All maintenance parts are incompatible.

■ **Cables connected to the controller are incompatible.**

The cable length and connectors in the FD19 are different from FD11. Connection cables are incompatible.

■ **The manipulator, welding power supply and various sensors is the same as the FD11.**

Except for the cables connected to the controller.

■ **The teaching program of FD11 can be used with FD19 by converting it to robot language once.**

Various condition files such as welding condition file can be used as they are.

Constants Setting files are incompatible.

Comparison of specifications

Comparison of specifications

No.	Item	FD19	FD11
1	External dimensions	**440 (W) x 580(H) x 542(D)**	580 (W) x 590(H) x 542(D)
2	Installation area	**0.238㎡ (25% reduction)**	$0.314m^2$
3	Body volume	**0.138㎥ (25% reduction)**	$0.185m^3$
4	Weight of main unit	**50 kg (down 20%)**	62kg
5	Number of standard control axes	**6 axes**	6 axes
6	One housing Maximum number of control axes	**8 axes**	8 axes
7	Maximum connection Number of control units	**Five units**	Four units
8	Dustproof drip-proof	**IP54 equivalent**	Equivalent to FD11:IP5X (D) CFD:IP20
9	Safety performance of the emergency stop function	**Cat.4, PLe standards**	Cat. 3, PLd compliance RMU option Cat. 4、 PLe
10	Store system	**CFast 30 GB、 Inner user area 10 GB**	CF 1 GB、 Inner user area 256MB
11	Option slots	**PCIe**	PCI
		2 slots **Relay unit and Sensor IFs do not use slots**	Three slots

Comparison of specifications

No.	Item		FD19	FD11
12	Teach pendant	Mass	**0.82kg**	0.96kg
		LCD	5. 7 inch Color	5. 7 inch Color
		Sizing WxHxD	163×297× 75mm	170×300×65mm
		Touch panel	Standard equipment	Standard equipment
		TP main unit cable	**Connector design**	Lead-in
		RC cable	Lead-in/Connector (Op.)	Lead-in/Connector (Op.)
		Max. cable length	40m	40m
		Dust-proof structure	IP54	IP65