





YASKAWA software solutions offer greater performance, easier integration into production systems, further control functions and additional benefits for your robot!

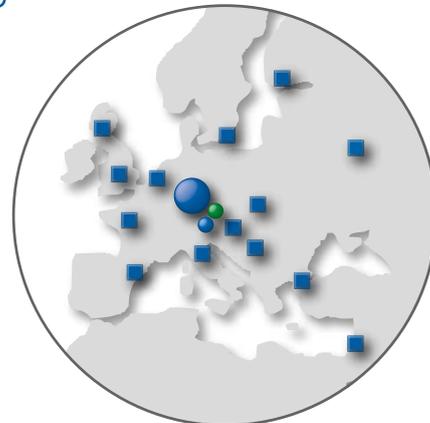
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# YASKAWA – Global Leader in Automation, Drive Technology and Robotics

YASKAWA Electric is one of the world’s leading manufacturers in the fields of drive technology, industrial automation and robotics. Founded in 1915, we see ourselves as a pioneer in these sectors, always striving to optimise the productivity and efficiency of machines and industrial systems with our innovations.

Today we produce more than 2.0 million inverters per year. Furthermore, with a yearly production of more than 1.5 million servo motors and 25,000 robots we offer a wide range of products for drive automation processes in many different industries like the automotive, packaging, wood, textile, and semi-conductor industry.



# VIPA – Specialist for Automation Technology and System Solutions

The company VIPA, founded in 1985, with headquarters in Herzogenaurach, is a global player with branches in 60 countries. VIPA ideally complements the YASKAWA product portfolio. As a developer of the most advanced products in the PLC-field and some of the world’s fastest hard PLCs of their class, VIPA offers exactly those components which combine proven YASKAWA products to a highly efficient total solution.

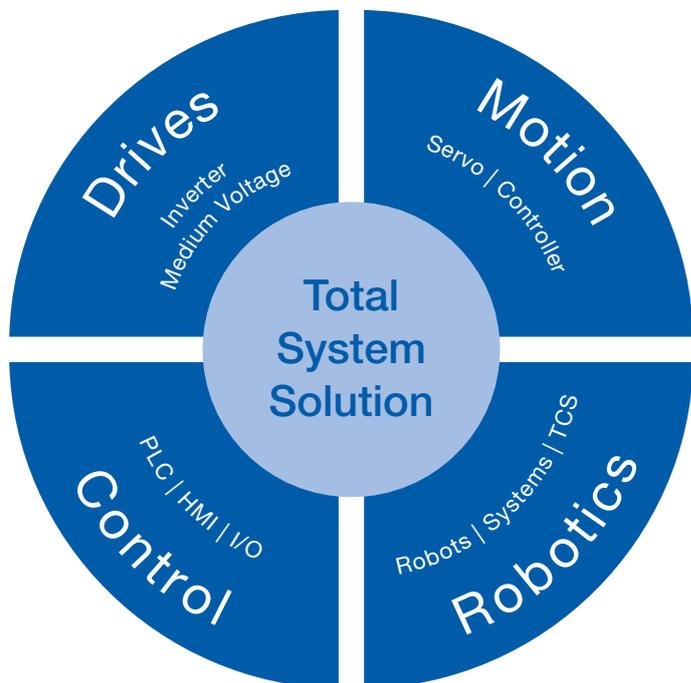
VIPA now is not only a strong and worthy member of the YASKAWA family, it is a full-fledged One-Stop-Shop of all important components and possesses the know-how to master almost any challenge in automation.



YASKAWA, Allershausen



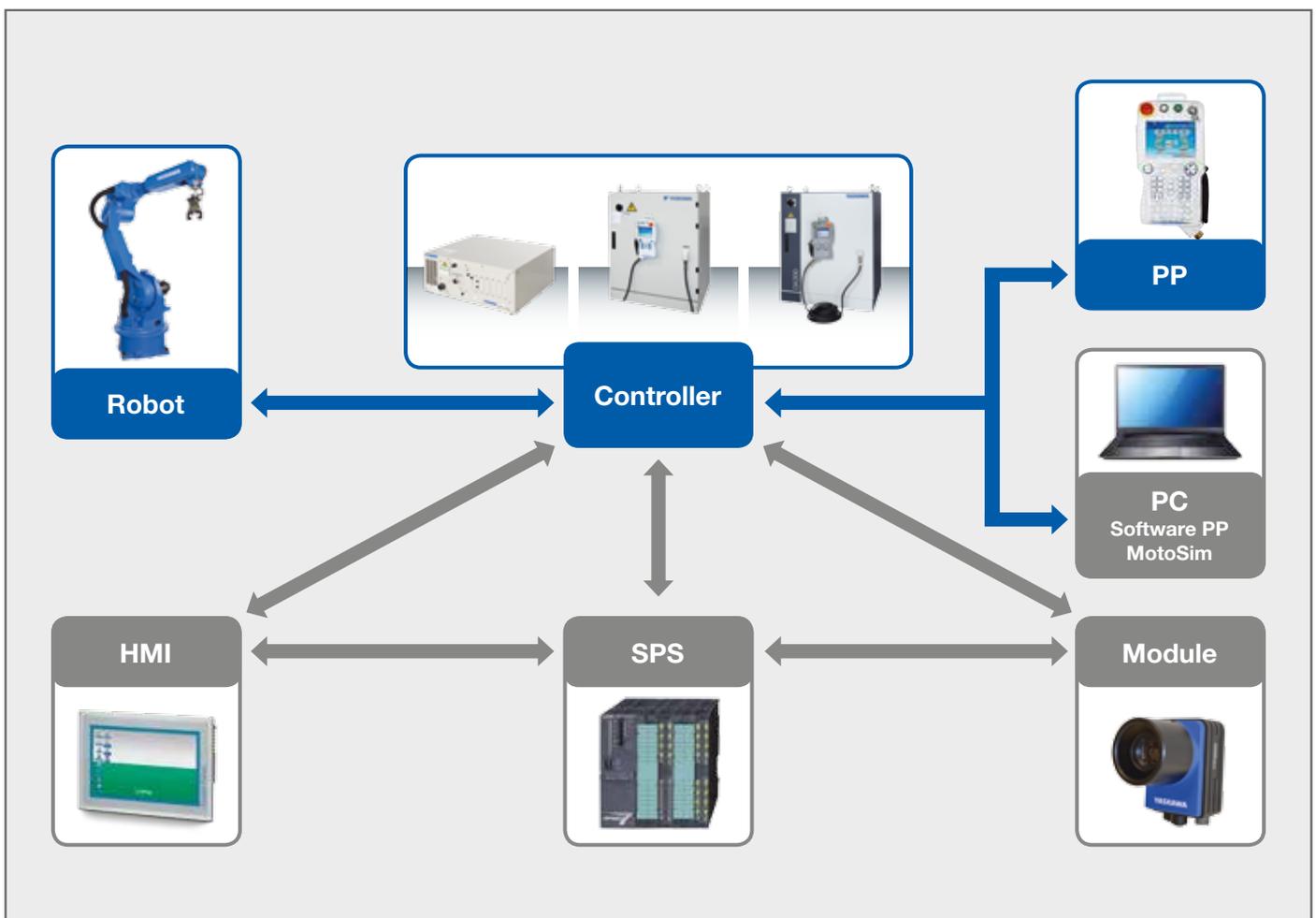
VIPA, Herzogenaurach



# Expand the Horizon of your Robot and your System!

MOTOMAN software offers user-friendly functions in a variety of application fields and provides uncomplicated and efficient assistance in every production phase.

## Overview of Communication Functions



**MOTOMAN robot controllers are open controllers. From the NX100 controller generation onwards, both the RS232 interface and the Ethernet interface have come as standard. Depending on the specific controller generation, many expansion cards are optionally available in addition to these interfaces, as both master and slave versions, for supporting industrial bus communication. Bus communication replaces conventional 24 V I/O wiring. With some exceptions (e.g. MOTOMAN Sync), access is accordingly restricted to the I/O level. While the bus interfaces are thus generally used for exchanging Boolean data values (On/Off), RS232 and Ethernet are used for exchanging higher-level data types (such as positions, status messages, etc.).**

### **Standard interfaces RS232 and Ethernet**

The standard interfaces RS232 and Ethernet initially describe the lower levels (refer to OSI-layer model) of a communication. The decisive factor for communication however is the application level, i. e. the protocols of the upper level. MOTOMAN controllers have a whole range of application protocols enabling communication with the outside world. These include standard protocols such as FTP and HTTP as well as YASKAWA-specific protocols BSC, Ethernet Server, High Speed Ethernet Server, etc. The available protocols can be grouped in client and server protocols. The client, as the communication master, initiates communication by sending queries to a server. The server returns the requested data. Between the queries the server is in standby mode.

### **Server protocols**

Server protocols serve to retrieve data from the robot controller by means of an external device. These can be different data. For example, server protocols are used to connect HMIs. MOTOMAN controllers have the following server protocols:

#### **FTP Server**

The FTP protocol is a protocol for file transfer. In the case of MOTOMAN robots these can be program data (job files), system data (tool data, conditional files, etc.) or parameter data.

#### **BSC Server (Host mode)**

The BSC protocol is the earliest YASKAWA communication protocol. The advantage of this is that the protocol has been continuously supported by all controller generations since ERC. This guarantees investment security since created applications can be transferred to other controller generations with no or only minor modifications. The BSC Server protocol is a "General Purpose" protocol. It offers functions for access to variables, IO signals, files, motions, alarms, etc. The protocol supports Ethernet and RS232. Only the RS232 variant (Data Transmission Function) is open. The MotoCom SDK however is an implementation in the form of a Windows Functional Library (DLL).

#### **Ethernet Server**

The Ethernet Server protocol is an improvement of the BSC protocol in terms of performance and Multiclient support. The functionality is identical to that of the BSC Server protocol. The protocol exclusively supports the Ethernet interface. It is open and also finds an implementation MotoCom SDK. Only there is also a high compatibility with the BSC protocol. In most cases, earlier BSC-based MotoCom applications can therefore be quickly incorporated in Ethernet server-based applications.

### High Speed Ethernet Server

The High Speed Ethernet Server protocol is the current "General Purpose" protocol of the MOTOMAN robot controllers. Compared with the Ethernet Server protocol, performance and functionality are improved. The High Speed Ethernet Server protocol is the standard protocol of the controller types DX100, DX200 and FS100 and future generations.

A simple application of the protocol can also be achieved here using MotoCom SDK.

### MotoLogix

MotoLogix represents a software and hardware interface that enables users to control and program the robot through PLC and offers an innovative approach for a control of all-axis coordinated robot motion, similarly to traditional robot controller.

The difference between PLC controlled robot and conventional robot control is that PLC issues the motion commands for the robot, while the robot controller performs calculations of motion kinematics. The DX200 robot controller is reduced to the role of a motion controller and the actual program execution and the definition of the motion are carried out by the PLC. This therefore eliminates the need to learn the robot language and allows the programmer to use the PLC language he already knows.

### Client protocols

Client protocols serve to retrieve data from an external device. A frequent example of the robot as a client is e.g. the communication with vision systems.

### FTP Client

In addition to the FTP Server function, MOTOMAN controllers also have FTP Client function. It cooperates with common FTP servers (IIS, Filezilla, etc.). The FTP protocol is a special favourite of system administrators since it is an internet standard protocol with a wide range of experiences and tools.

### BSC Client (DCI mode)

In the Client mode of the BSC protocol only variables and files can be transferred. This is done in the course of a job (Data Communication by Instruction). This means that the transfer is started by a corresponding instruction (e. g. LOADJ) and carried out synchronously with execution of the program. One application example is the dynamic reloading during program transfers to PCs. Corresponding server components can be created by the user on the basis of MotoCom SDK or purchased (see MotoDCI). The properties of the protocol correspond to those of the server variant.

### Vision interface

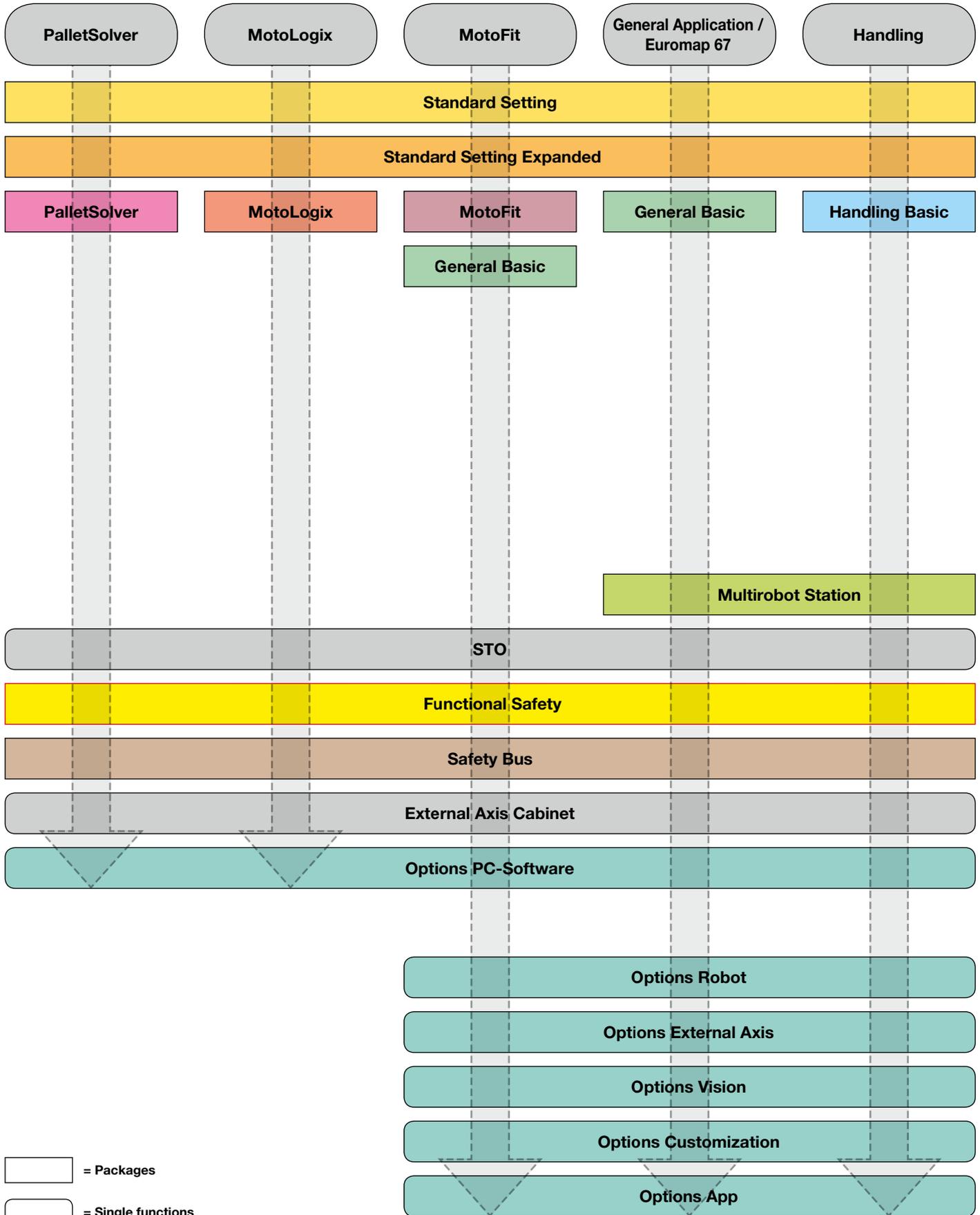
VSTART is an inform instruction. Inform is the programming language of the MOTOMAN controllers. It maps the vision interface of the MOTOMAN robot controllers. It maps the communication protocols of a variety of selected vision systems and works, dependent on these, on the basis of Ethernet or RS232. Compatible cameras are systems from Cognex (Insight Native Mode), Keyence and Omron to name but a few. In practice, this instruction is used to trigger the image recording within job application programs and to transfer the position data.

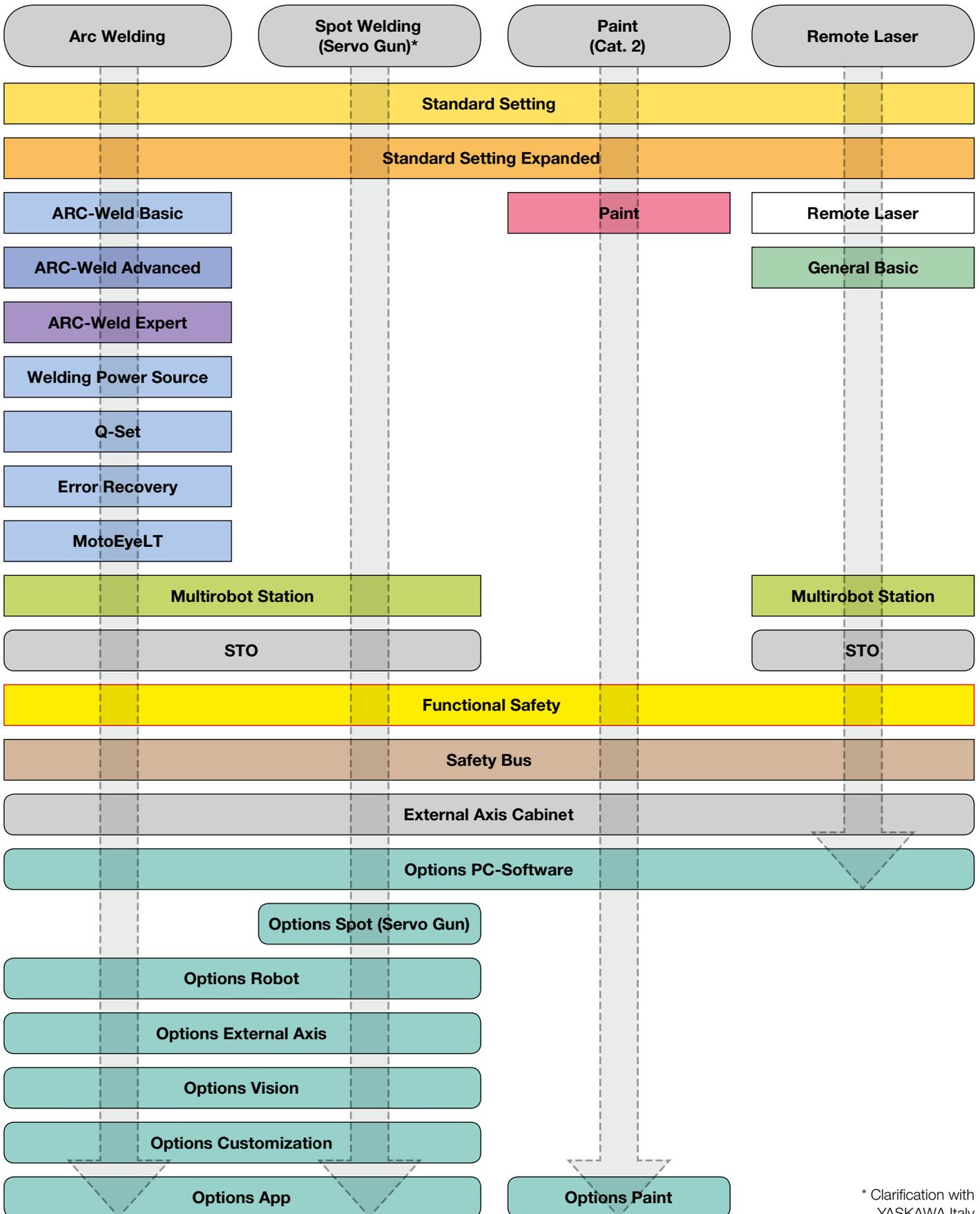
### Socket communication

Socket communication refers to the communication using arbitrary sockets on the basis of user-defined protocols. Unlike the above mentioned permanently defined protocols, this allows for free communication on TCP/IP Ethernet (or RS232). This enables the connection of any kind of device (vision systems, sensors, etc.)

The robot can optionally act as client as well as server. MOTOMAN robot controllers allow socket communication via MotoPlus technology. From the user's point of view, the protocols can either be implemented in the form of a MotoPlus application or a MotoGSI application. Beyond this, the corresponding SDKs (Software Development Kits) are available (see MotoPlus SDK or MotoGSI SDK). In the case of MotoGSI, implementation is carried out on the job level in the programming language Inform. In the case of MotoPlus, on the other hand, in the high-level programming language C using a PC-based development environment (MotoPlus IDE in the package of MotoPlus SDK).

# Overview of Single Functions and Packages





\* Clarification with YASKAWA Italy

## Standard Settings

### Standard Setting SAP: 163962

SAP	Function
163897	Relative Job
163902	Multi-Tasking (Independent control)
163904	Coordinated motion
163924	Welding in teach mode
163926	Macro command
163928	Automatic backup
163934	Structured language
163937	Logging function
163938	Job editing during playback
163939	External IO Allocation
163944	Alarm details displaying
163947	CMOS Save with FTP
163956	Configuration parameter for setup menu
164058	Data transmission
164059	Ethernet
164060	Ethernet FTP
164061	Ethernet WWW
164062	High Speed Ethernet Server
164063	Ethernet Server

### Standard Setting Expanded SAP: 163963

SAP	Function
163898	External reference point control
163901	System Job
163908	Interrupt job
163910	TCP
163942	Ladder Editor
164055	Tag data replace

## MotoFit

### Appl. MotoFit SAP: 178619

SAP	Function
175396	MotoFit Basic
	<b>Only available for B&amp;R and Rockwell (AB)</b>

## MotoLogix

Appl. MotoLogix  
SAP: 176052

SAP	Function
163953	IO Output timing control
164720	Feedback position based PL (FPL)
176049	MotoLogix

## PalletSolver

Appl. PalletSolver  
SAP: 175399

SAP	Function
163901	System job
163905	Search function
163943	Manual brake release
175397	PalletSolver Basic

## General

General Basic  
SAP: 163975

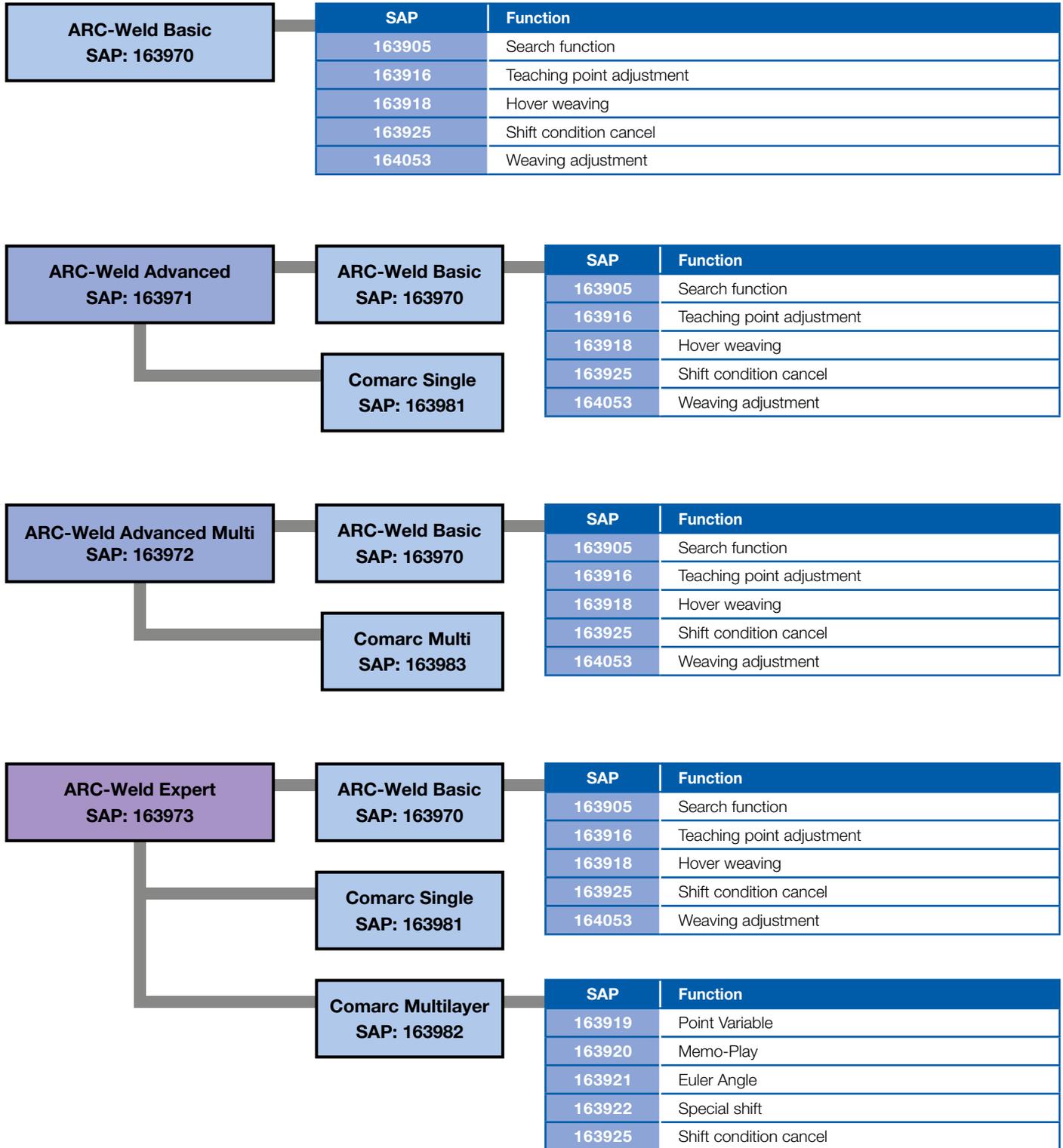
SAP	Function
163905	Search function
163916	Teaching point adjustment
163925	Shift condition cancel
163933	IF Panel
163919	Point variable
163927	Search function in continuous mode
164052	Numerical input screen display with direct open
164053	Weaving adjustment

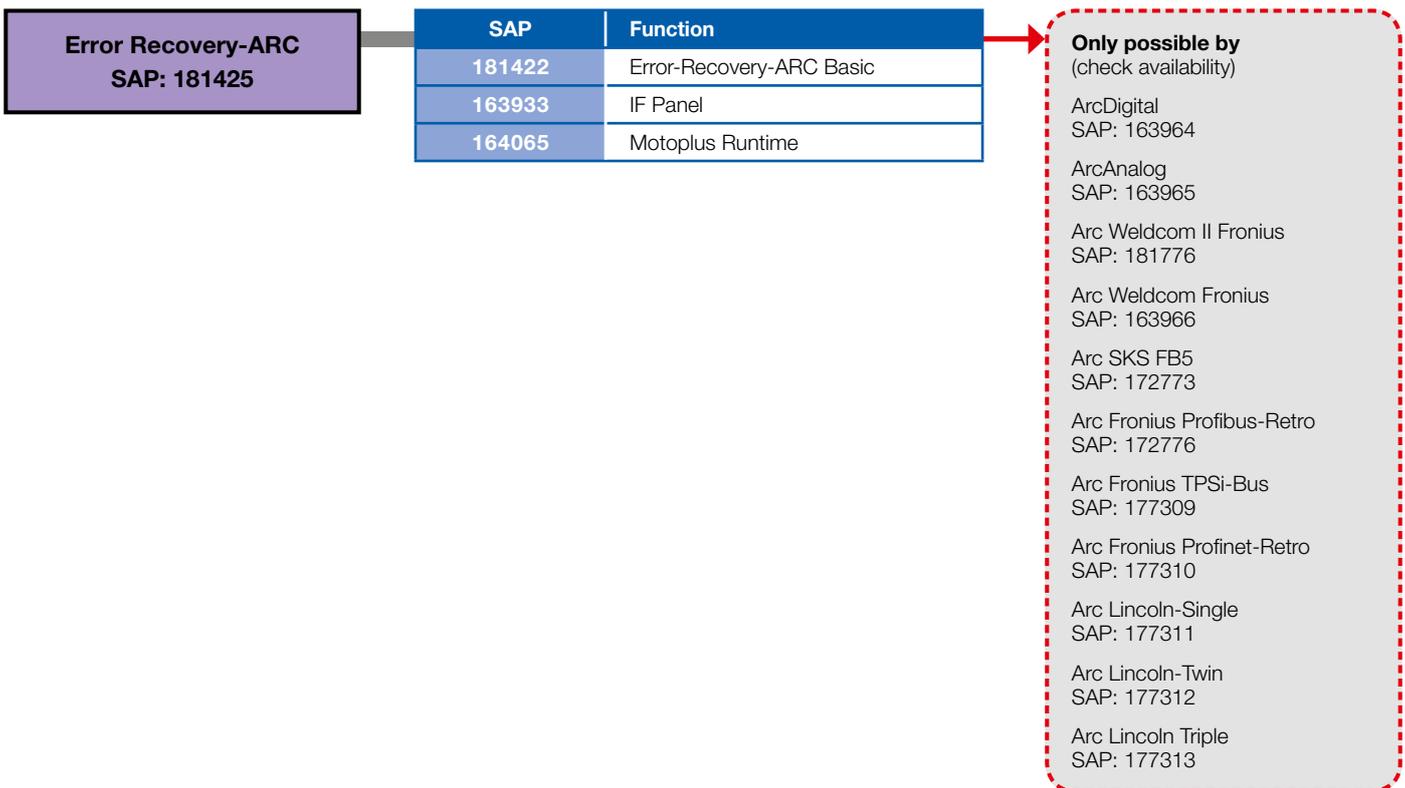
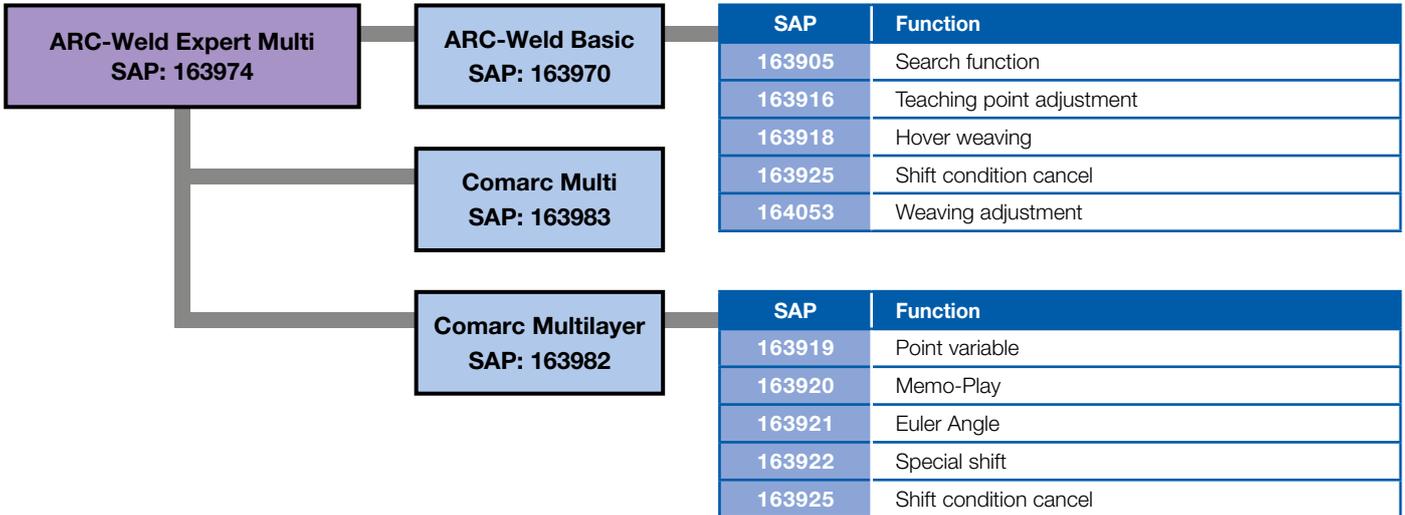
## Handling

Handling Basic  
SAP: 163977

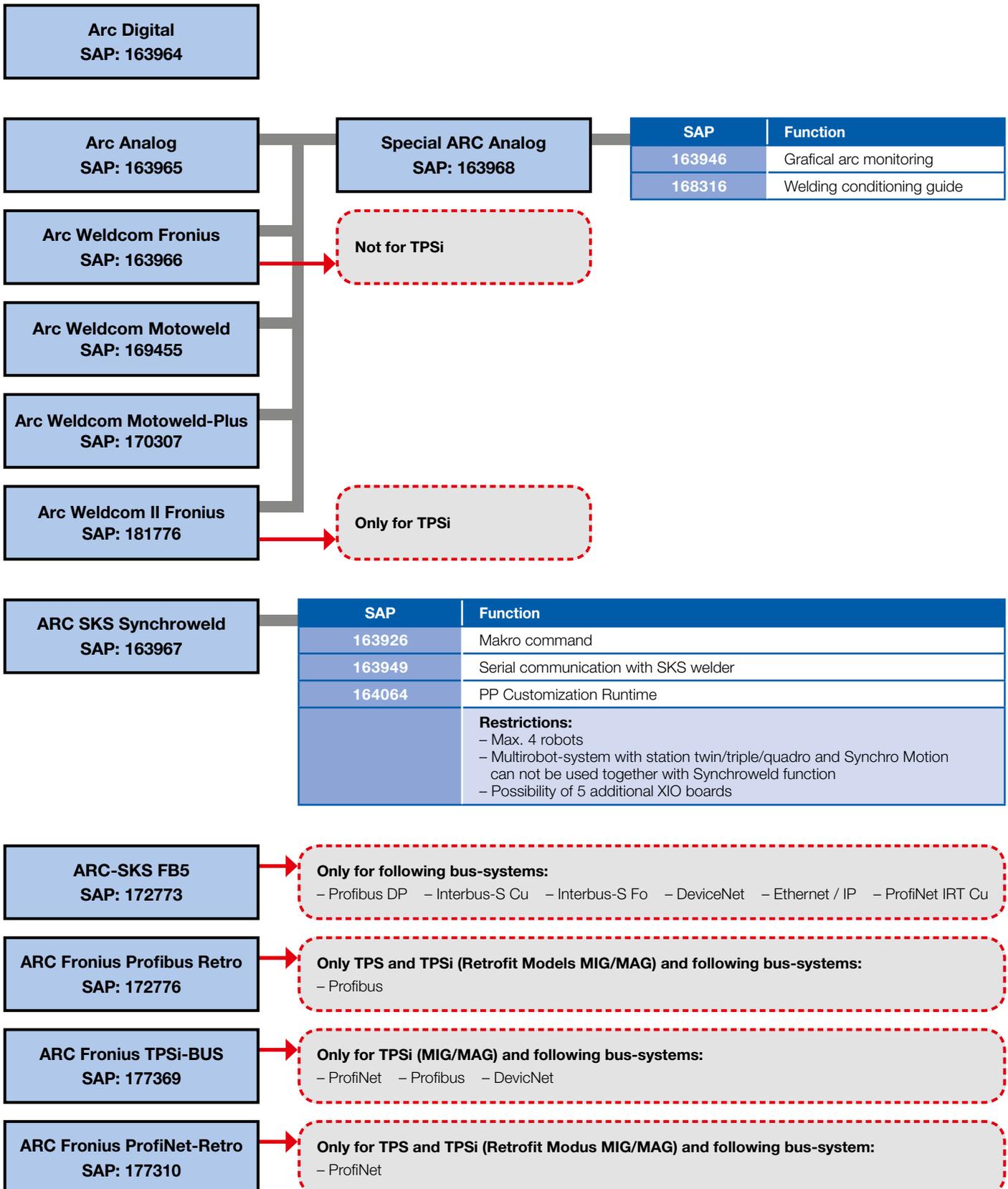
SAP	Function
163905	Search function
163916	Teaching point adjustment
163919	Point variable
163925	Shift condition cancel
163927	Search function in continuous mode
163933	IF Panel
164052	Numerical input screen display with direct open
	<b>CIO (Ladder): Only 16 IP instead of 24</b> <b>Special Handling Signals:</b> <ul style="list-style-type: none"> <li>- Hand instruction</li> <li>- HSEN instruction</li> <li>- Shock Sensor Function</li> <li>- Low Air pressure Input Signal</li> </ul>

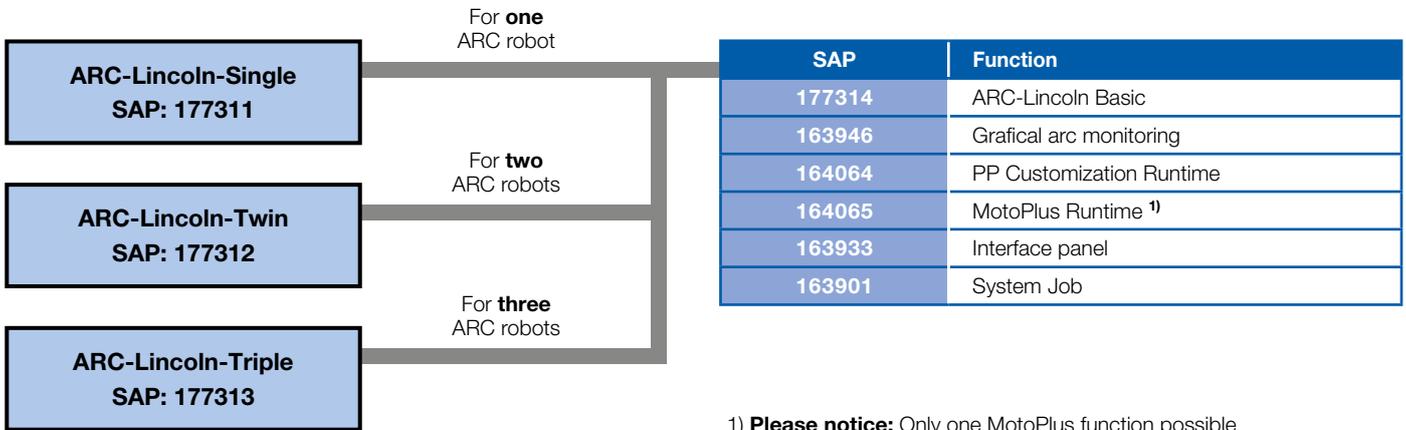
## Arc Welding





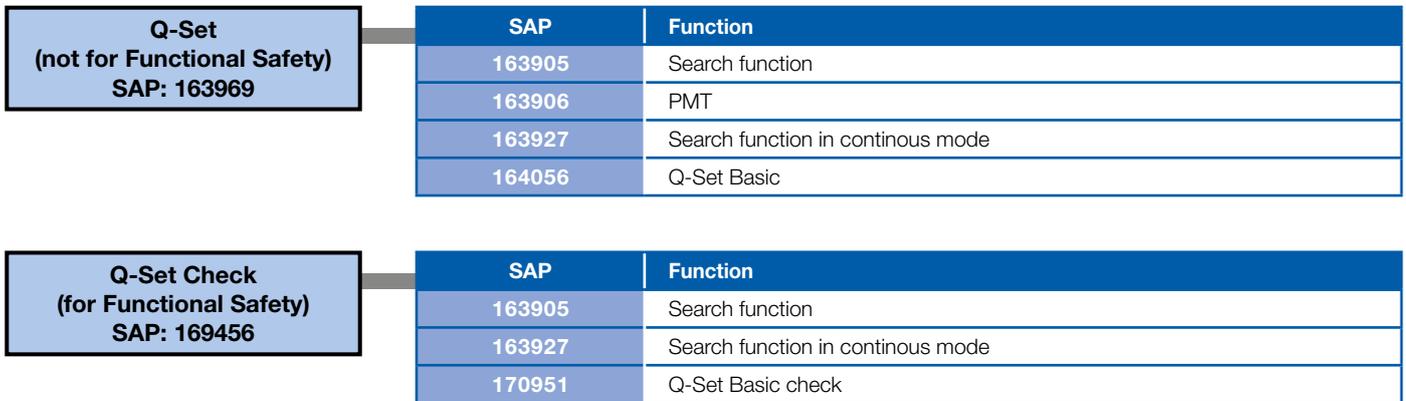
## Welding Power Source (Interface)





1) **Please notice:** Only one MotoPlus function possible

## Q-Set



## MotoEye LT

<b>MotoEye LT Meta</b> SAP: 178272	SAP	Function
	178267	MotoEye LT Basic
	164065	Motoplus Runtime
	178268	SMotoEye LT Meta

<b>MotoEye LT ServoRobot</b> SAP: 178273	SAP	Function
	178267	MotoEye LT Basic
	164065	Motoplus Runtime
	178269	MotoEye LT ServoRobot

<b>MotoEyeLT Scansonic</b> SAP: 178274	SAP	Function
	178267	MotoEye LT Basic
	164065	Motoplus Runtime
	178270	MotoEyeLT Scansonic

<b>MotoEyeLT Falldorf</b> SAP: 178275	SAP	Function
	178267	MotoEye LT Basic
	164065	Motoplus Runtime
	178271	MotoEye LT Falldorf

<b>MotoEyeLT MotoSense</b> SAP: 180786	SAP	Function
	178267	MotoEye LT Basic
	164065	Motoplus Runtime
	180798	MotoEye LT MotoSense

## Multi-Robot-Station

<b>Multirobot Station Basic</b> SAP: 163960	SAP	Function
	164057	Station with twin/triple/quad synchronous function

<b>Multirobot Station Advanced</b> SAP: 163961	SAP	Function
	163929	Advanced control group
	164057	Station with twin/triple/quad synchronous function

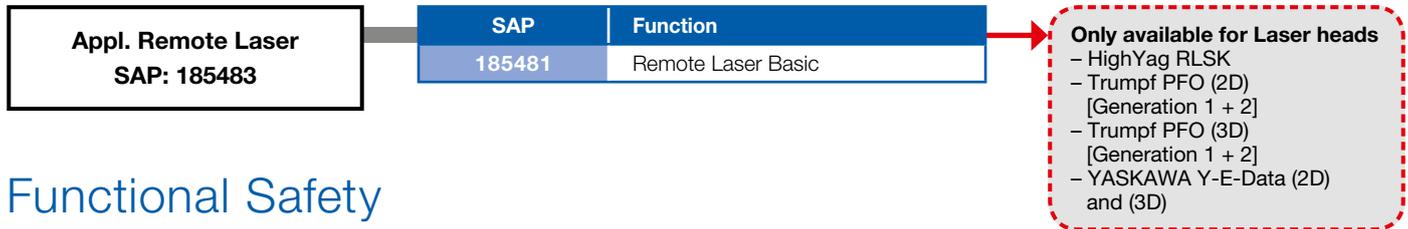
## Paint

<b>Appl. Paint</b> SAP: 177900	SAP	Function
	163963	Standard Setting expanded (see page 10)

	SAP	Function
	163953	IO Output timing control
	177897	Paint Basic Setting

## Remote Laser



## Functional Safety

**Functional Safety Single**  
**SAP: 167549**

**Functional Safety Multi**  
**SAP: 168964**

## Functional Safety Single und Multi

### Not supported by FSU

SAP	Function
163899	External axis endless
163900	T-Axis endless
163906	PMT included in
163969	Q-Set
163914	Twin Drive (only by request)
163931	Group Change Function
172771	Multi Encoder Twin drive included in
167529	Twin Drive Multi Station
174457	Speed Control
175076	Gun-change
167528	Multi Encoder

### With restrictions

SAP	Function	SAP	Function
163911	Link Servo Float	163907	Conveyor synchronized with Shift-Basic implement in
163912	Link & Linear Servo Float	163988	Conveyor Shift Single &
167527	Link Servo Float (Multi)	163990	Conveyor Shift Multi
163913	Link & Linear Servo Float (Multi)	163909	Comarc Basic implement in
167546	Zeroing	163971	Arc-Weld Advanced
167547	Zeroing External Axis	163972	Arc-Weld Advanced Multi
163963	Standard setting	163973	Arc-Weld Expert
164058	Data transmission	163974	Arc-Weld Expert Multi
164059	Ethernet	164065	MotoPlus Runtime implement in
164060	Ethernet/FTP	164071	MotoGSI
164063	Ethernet Server	167731	MotoModbus
164062	High-Speed Ethernet Server	169635	MotoSight2D Interface
163947	CMOS Save with FTP	171403	ROS-I and MOTOMAN
164064	PP Customization Runtime implement	178619	Appl. MotoFit
177311	ARC Lincoln-Single	175399	Appl. PalletSolver
177312	ARC-Lincoln-Twin	176542	MotoSight2D MS100 Interface
177313	ARC-Lincoln-Triple	176543	MotoSight2D MS200 Interface
163967	ARC SKS Synchroweld	176544	MotoSight2D MS300 Interface
164066	Advanced PP custom. Runtime	177311	Error Recovery ARC
178541	Full Speed Test (T2)	178272	MotoEye LT Meta
163921	Euler Angle	178273	MotoEye LT ServoRobot
163982	Multilayer	178274	MotoEye LT Scansonic
163973	Arc-Weld Expert	178275	MotoEye LT Falldorf
163974	Arc-Weld Expert Multi	180786	MotoEye LT MotoSense
		177311	ARC Lincoln-Single
		177312	ARC Lincoln-Twin
		177313	ARC Lincoln-Triple

## Safety BUS



## Options

### Options Robot

SAP	Function
163900	T-axis endless
163903	Independent control avdvanved
163906	PMT
163911	Link Servo Float
163912	Link & Linear Servo Float
163913	Link & Linear Servo Float (Multi)
163917	Form cutting (parameter must be ordered)
163932	Master tool user coordinates
163933	Interface panel
163941	Password protection
163943	Manual brake release
163945	Arm Interference with specified cube area check
163951	Arm Interference check (Only for Multi Robot)
163952	Pendant OSCI
163953	IO output timing control
163955	Safety re-teach
163988	Conveyor synchronized with Shift-SINGLE (1 Robot – 1 CV)
163990	Conveyor synchronized with Shift-MULTI (Multi-Robot and/or up to 3CV)
163991	General Sensor – fix wiring ★
163992	General Sensor – universal wiring ★
164054	Analog output corresponding to speed
164720	Feedback position based PL-control
167527	Link Servo Float (Multi)
167546	Zeroing
169302	Ethernet IP – CPU
174457	Speed control
178541	Full Speed Test (T2)
178881	Conveyor Standard Single (1 Robot, 1 Controller)
178882	Conveyor Standard Multi (Multi Robot for up to 3 Controller)
176009	Macro with 16 characters
164722	High-Speed Accuracy Motion
163953	IO output timing control
164720	Feedback position based PL-control
	<b>★ General sensor restrictions for multirobot-systems:</b> <ul style="list-style-type: none"> <li>– Sensor function cannot be used of all robots simultaneously</li> <li>– One general file for all robots</li> <li>– It is necessary to define in advance for commissioning which robots will use the sensor function</li> </ul>

## Options

### Options External Axis

SAP	Function
163899	External axis endless
163914	Twin Drive
163923	I/O JOG operation in play-mode
163931	Group change function
163932	Master tool user frame
163943	Manual break release
167528	Multi Encoder
167529	Twin Drive Multi System
167547	Zeroing external axis
174457	Speed control

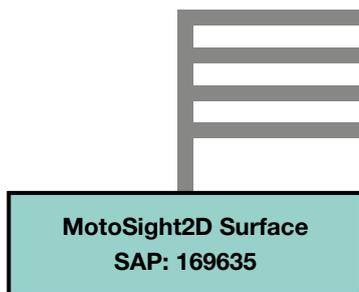
### Options PC Software

SAP	Function
	Please see YASKAWA software brochure

### Options Customization

SAP	Function
164064	PP Customization Runtime
164065	MotoPlus Runtime <sup>1)</sup>
164066	Advanced PP Customization Runtime

### Options Vision



SAP	Function packages
164068	Camera interface (Vision)
169635	Motosight 2 Surface (for further Cognex cameras)
176942	Motosight 2D MS100 Surface
176943	Motosight 2D MS200 Surface
176944	Motosight 2D MS300 Surface

SAP	Function
163906	PMT
164064	PP Customization Runtime
164065	MotoPlus Runtime <sup>1)</sup>
164067	MotoSight 2D Basic

1) **Please notice:** Only one MotoPlus function possible

## Options APP

<b>Moto GSI</b> <b>SAP: 164071</b>	SAP	Function
	164064	PP customization Runtime
	164065	MotoPlus Runtime <sup>1)</sup>
	164069	MotoGSI Basic

<b>Moto Modbus</b> <b>SAP: 167731</b>	SAP	Function
	164065	MotoPlus Runtime <sup>1)</sup>
	167730	MotoModBus Basic

<b>ROS-I and MOTOMAN</b> <b>SAP: 171403</b>	SAP	Function
	164065	MotoPlus Runtime <sup>1)</sup>
	171400	ROS-I and MOTOMAN

## Options Paint

<b>Feedback of FGP Motors</b> <b>SAP: 177901</b>	SAP	Function
	177898	Parameter for FGP Motors
	178173	Speed-Feedback for FGP
	164065	MotoPlus Runtime <sup>1)</sup>
	177899	IO Speed control

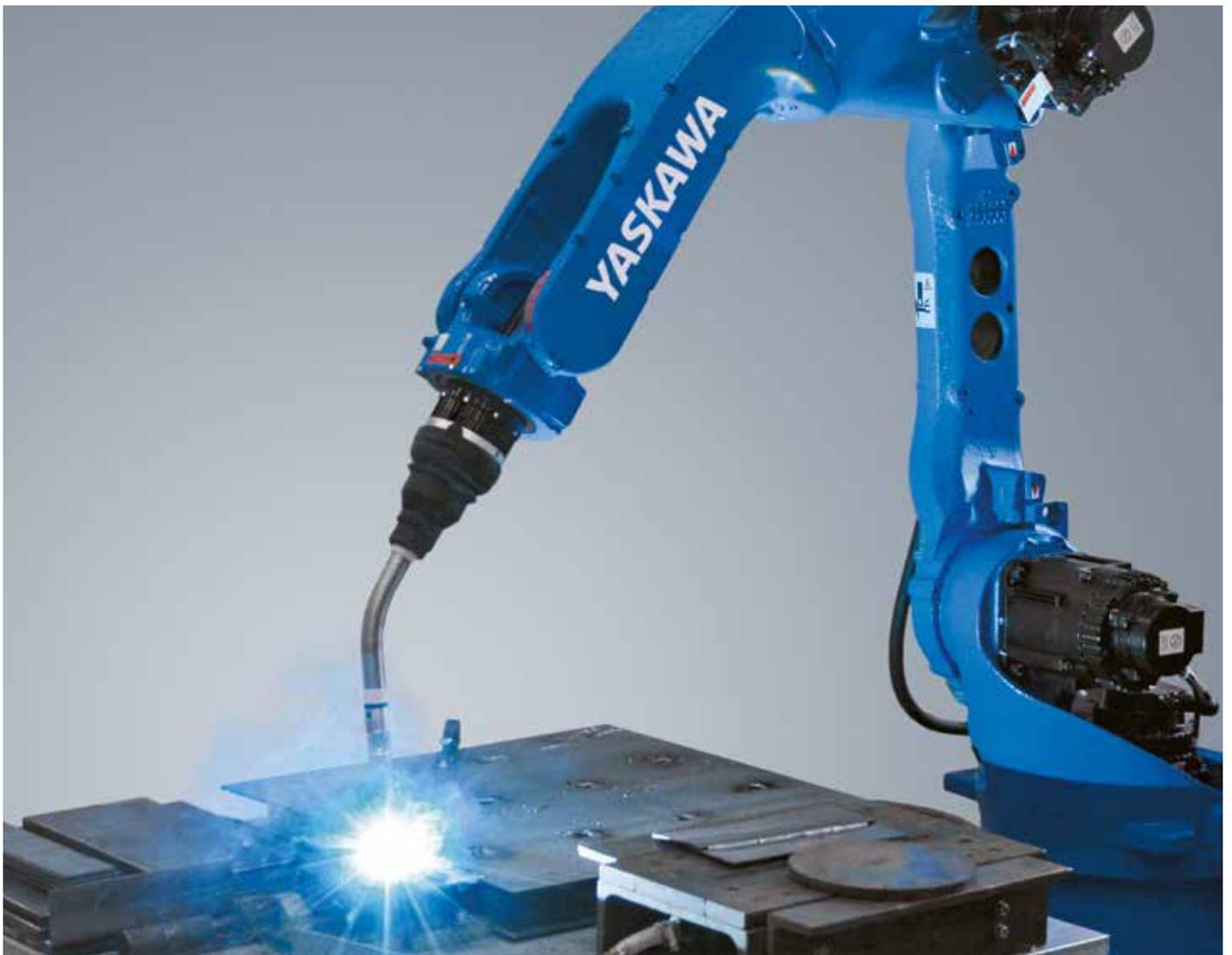
<b>Conveyor Standard Single</b> <b>(1 Robot, 1 Controller)</b> <b>SAP: 178881</b>	SAP	Function
178880	Conveyor Standard Single	

Options Spot Welding  
(Servo Gun)

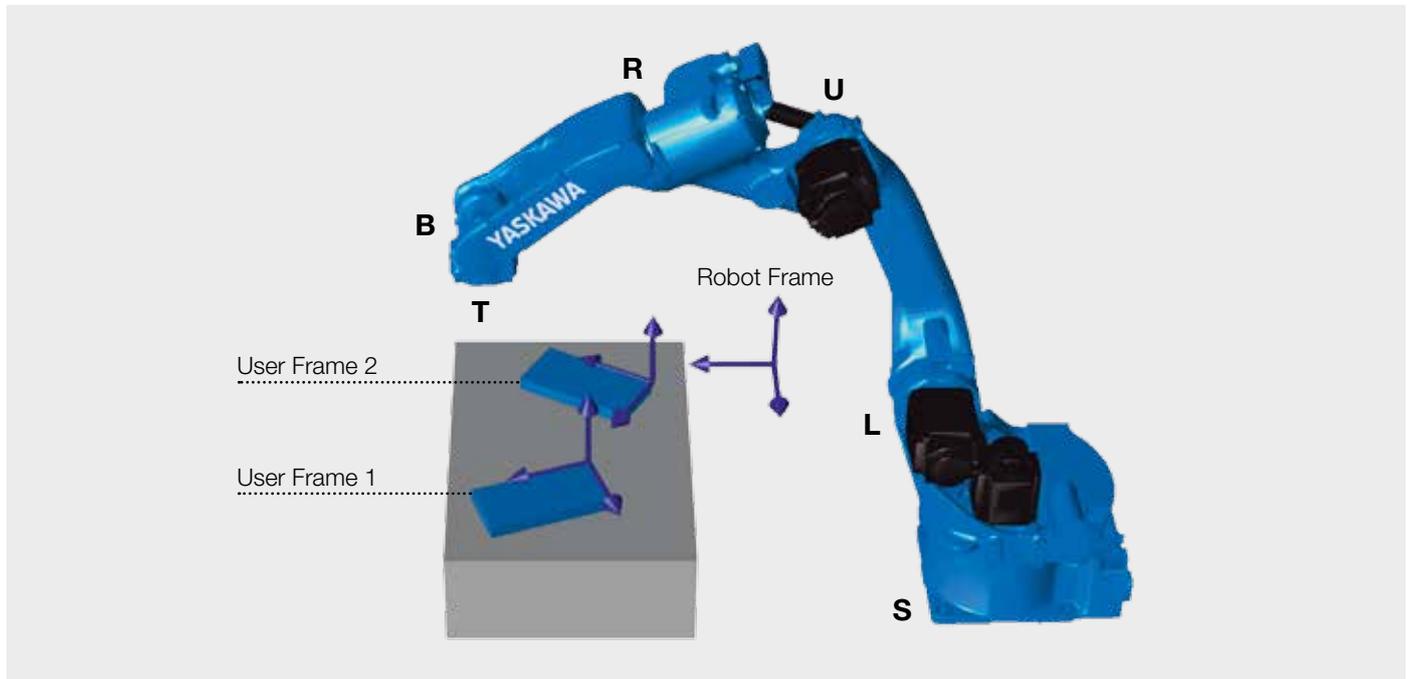
SAP	Function
175076	Gun Change
175077	Gun Teaching Pos. Correct
175078	Multi Step Pressure
175079	Spot Monitor
185872	Learning Control

1) **Please notice:** Only one MotoPlus function possible

# Masters of Robotics, Motion and Control

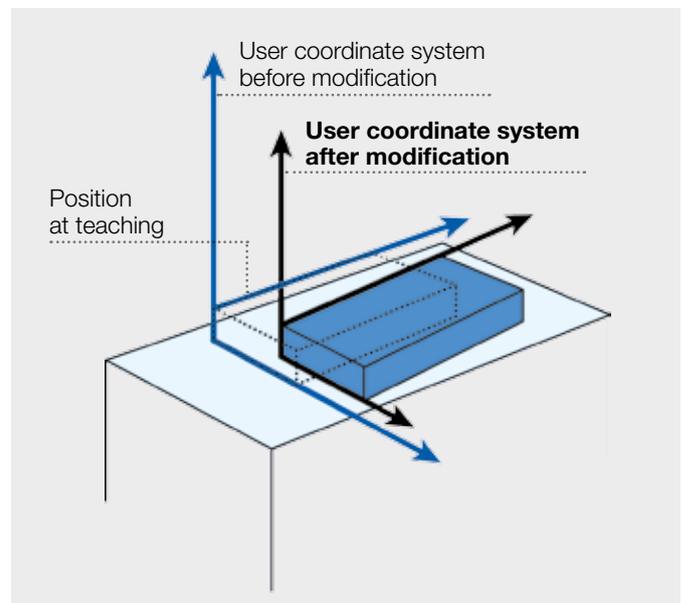


# Relative Job (163897)



The robot usually stores position data for the operation in the form of pulse-type data (motor rotation pulse amount of each axis). The job (program) consisting of the pulse-type data is called “standard job”. In contrast to the standard job, the program consisting of position data in the direction of X, Y, and Z, in reference to the origin in a coordinate system (such as base coordinate and user coordinate) is called “relative job”. Converting the standard job creates the relative job.

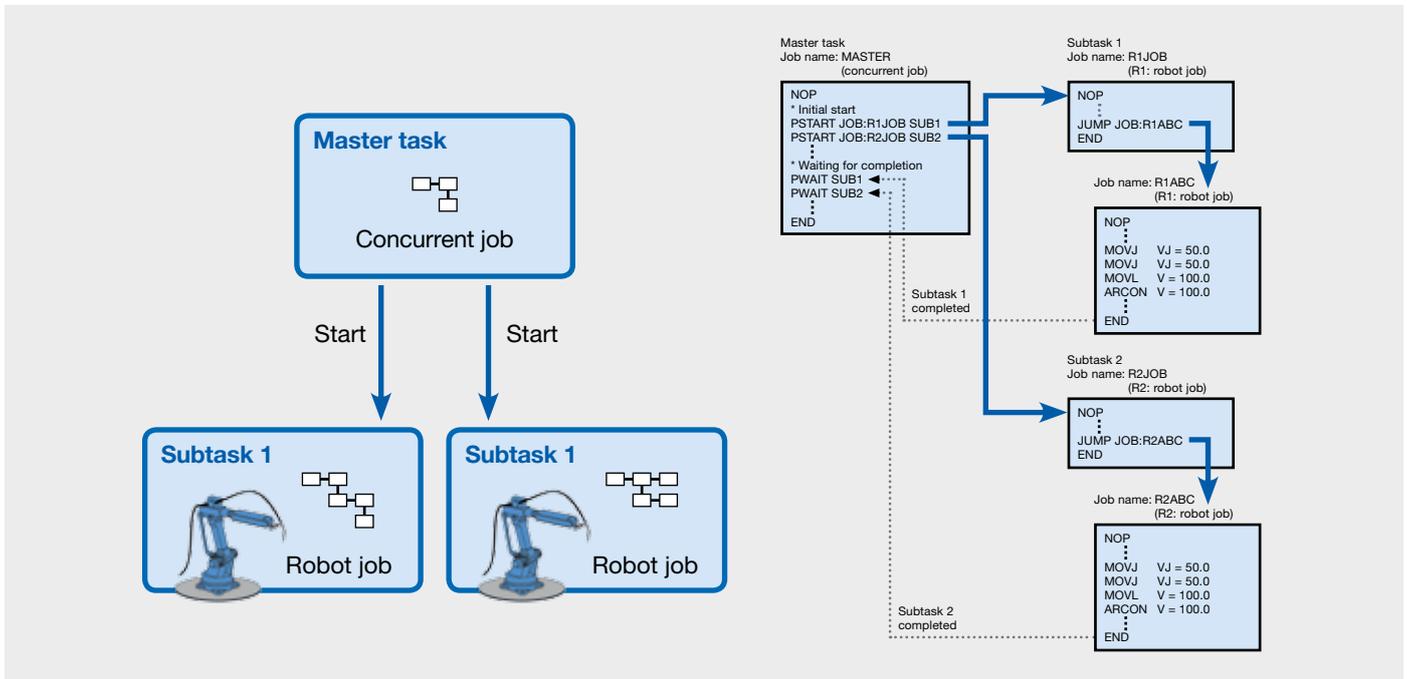
Although movement of the relative job itself is no different from the standard job, the relative job has a useful function called “relative job shift” to shift the same movement in another. In the relative job in the user coordinate system, when a user coordinate is created by changing defined points, the movement shifted to the changed coordinate can be performed in the execution of the instruction.



## KEY BENEFITS

- Change a pulse-type Job to a coordinatedtype Job
- All points are stored in X, Y, Z
- With “relative job shift” function, complete jobs can be shifted in different frames

# Independent Control (163902)



DX controller can control a maximum of 8 robots and plural stations (jig) through one controller. The “independent control function” allows two robots or the robot and jig to operate independently with different programs.

The DX controller has a function for decoding and executing a maximum of 8 jobs (extendable up to 16 jobs (optional) individually. The multitask control performed in this function is called independent control.

For instance, a two-robot system can be constructed that consists of one welding robot welding the work piece and the other robot transferring unwelded work pieces and welded work pieces.

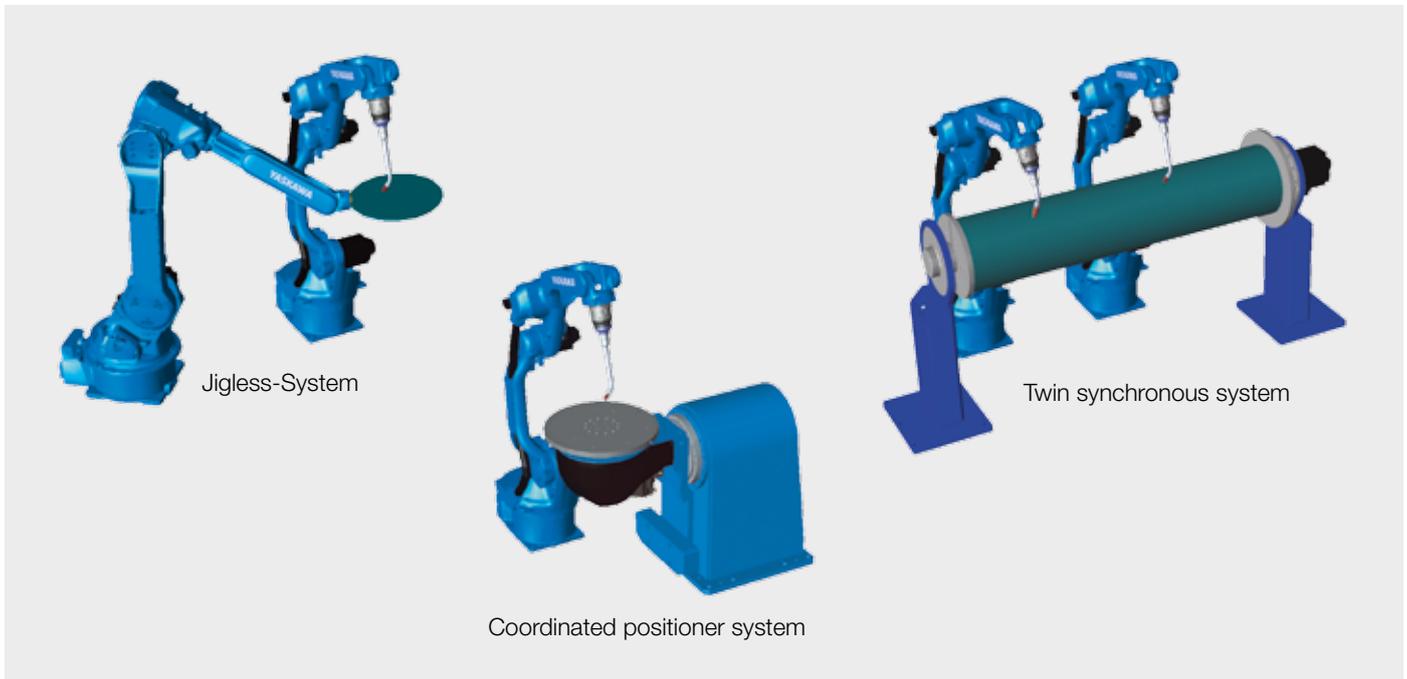
The system can be freely combined with applications for arc and non arc application. The teachbox key sheets are available on the basis of the master application.

Also, independent operation of the robot and station (external jig) can be performed. As an external axis motor, however, the motor for YASKAWA robot must be used.

## KEY BENEFITS

- Multitask of 8 jobs (extendable up to 16 jobs) individually
- Maximum of 8 robots and plural station through one controller
- Freely combined with applications

# Coordinated Motion (163904)



The “station coordinated function” enables the station to hold the work piece and the robot has the working tool, and both of them work cooperatively.

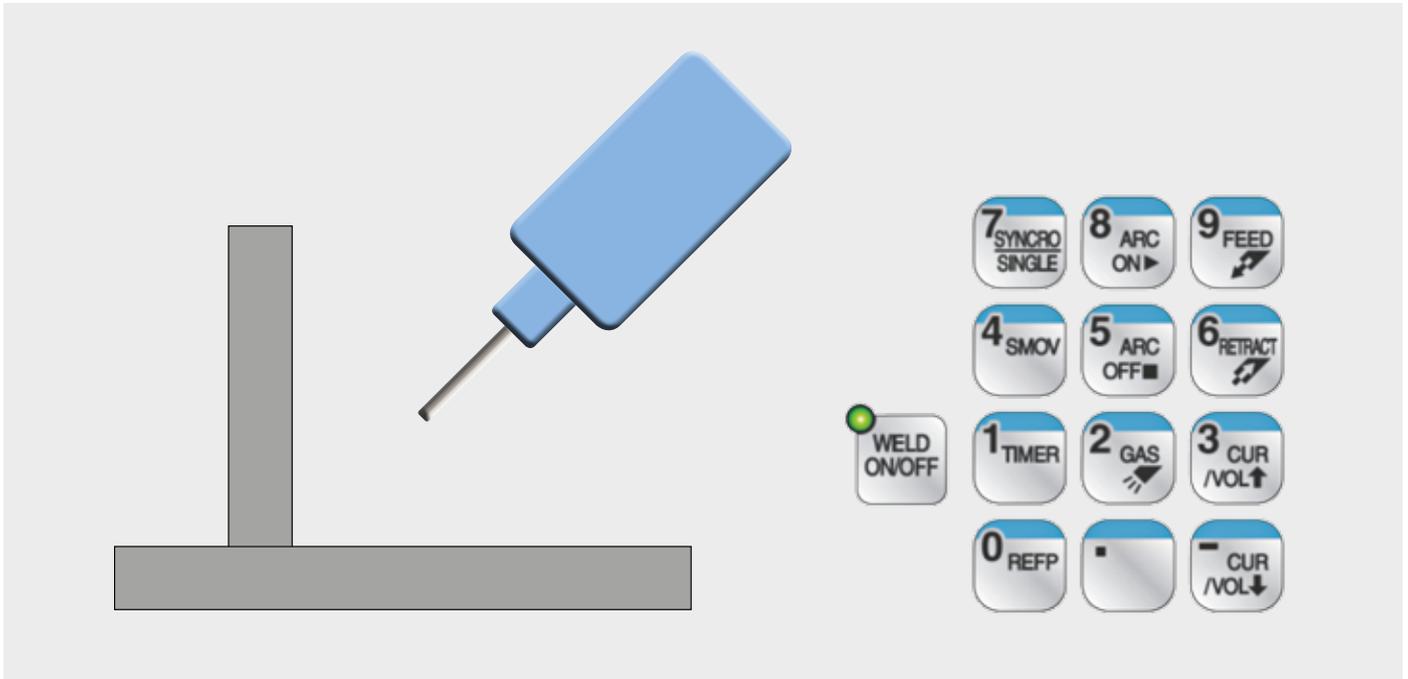
The “jig less system” enables the first robot to hold the work piece and a second robot has the torch, and both of them work cooperatively. (The concept is the same as the station coordinated.)

To operate the station and robot or two robots at the same time, the coordinated job must be taught. Coordinated job is available in the coordinated interpolation that performs the relative interpolation with the station and robot related to master and slave, respectively, and in the individual interpolation that performs individual operation.

## KEY BENEFITS

- Robot and station work cooperatively
- 2 robots work cooperatively
- Jigless welding of two robots

# Welding in Teach Mode (163924)



This function enables execution of ARCON/ARCOF instructions not only during automatic mode but also in teach mode.

Welding conditions can be checked directly during programming.

Changing to automatic mode isn't necessary.

Activating by one-button-push on special application button of programming pendant.

## KEY BENEFITS

- Check welding conditions and results immediately during programming
- No need to change to automatic mode
- Status information by optical and acoustical signal avoids mistakenly use
- Test run function can be executed as usual

# Macro Command (163926)

## Example of macro instruction registry: SEALON

### Line Step

```
000 NOP
001 MOVJ VJ 100.0
002 WAIT IN#(1) ON
003 MOVJ VJ 50.0
004 SEALON WIDTH=8
005 MOVL V=125
006 MOVL V=95
```

## Example of macro job registry: SEALON

### Line Step

```
000 NOP
001 GETARG LI000 IARG#(1) : Store 1st argument data '8' to LI000.
002 DOUT OT#(10) ON      : Turn ON general output 10.
003 MUL LI000 10        : Multiply the number of LI000 by 10. 8×10 80
004 WAIT N#(10) ON     : Wait for general input 10 to be ON.
005 AOUT AO#(1) LI000  : Output '80' to the analog output 1.
006 END
```

Macro instruction is the function for creating, registering, and executing one instruction from plural INFORM, that corresponds to each system.

An argument tag can be added to a macro command like a normal instruction. Macro commands and their argument tags can be easily programmed at will in the job data display.

Instruction creation procedure: Create a macro job (in normal teaching method) and register the macro job as a macro instruction. (In the macro instruction setting screen)

Instruction to obtain argument for macro instruction (GETARG): When the macro instruction is executed, argument data added to the macro instruction is obtained and stored into the specified local variable to use the data in the macro job.

If a post-processing is required when a macro command is interrupted, it is possible to add an interruption macro job (SUSPEND JOB) to the program.

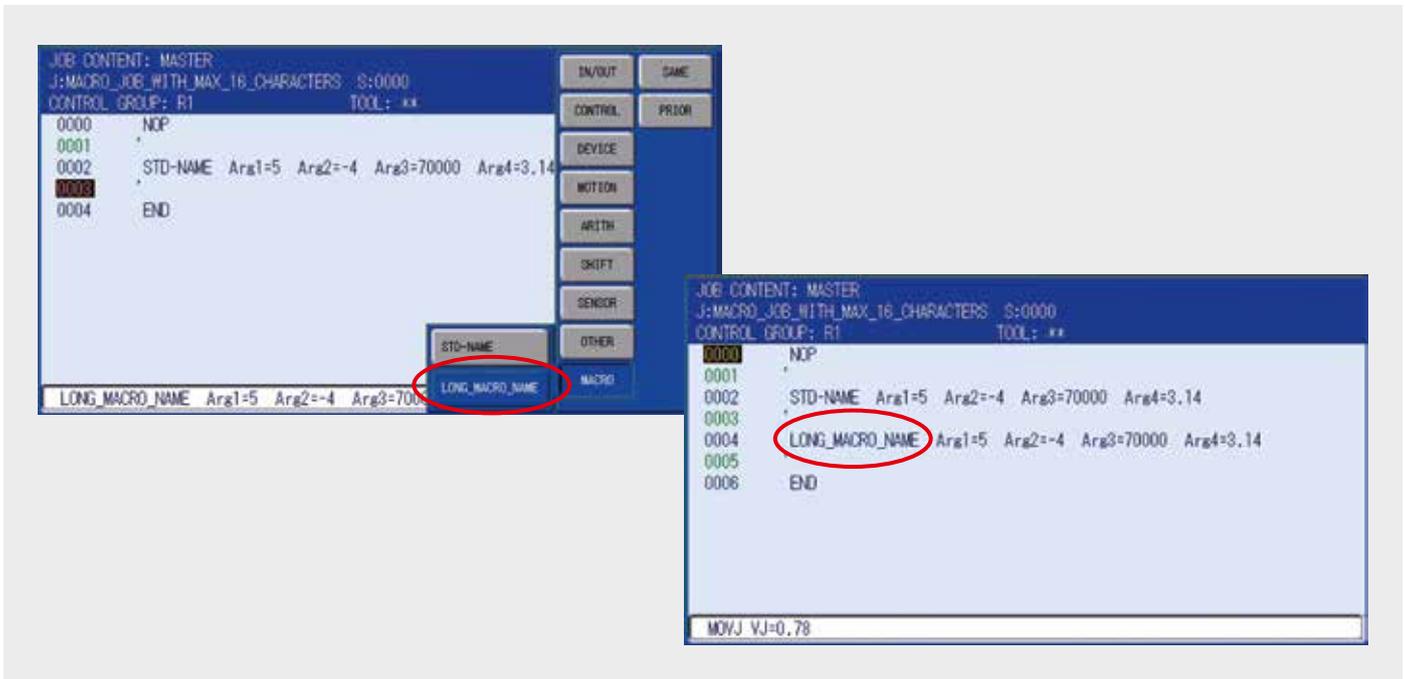
The interruption macro job is carried out when a macro command that includes the interruption macro job is interrupted by being putting on a status such as hold, emergency stop, or mode switching.

For macro job, executive commands such as "JUMP", "CALL" and "PSTART" cannot be registered. For interruption macro job, additionally TIMER instruction and WAIT instruction.

## KEY BENEFITS

- Creating own functions and routines in INFORM list

# Macro Name with up to 16 Characters (176009)



The standard macro function can use maximum 8 characters for the macro name. Often names must be shortened, which are difficult to read.

This function is an Add-On for Macro Function and expands the number of characters to a maximum of 16.

## KEY BENEFITS

- Simple naming for macro jobs
- Better readability of program lines with macro

# Automatic Backup (163928)



The system data can be collectively backed up so that the data can be immediately loaded and restored in case of an unexpected trouble such as data loss.

The automatic backup function saves the internally stored data in a single file in advance for the smooth restoration from unexpected troubles.

Backup can be stored on the Compact Flash of the programming pendant, the internal CompactFlash of the controller or the internal RAM AREA (accessible through High Speed EServer).

Four ways to perform the automatic backup are available: cycle backup, backup when switching modes, backup on controller start-up, backup when inputting specified signals.

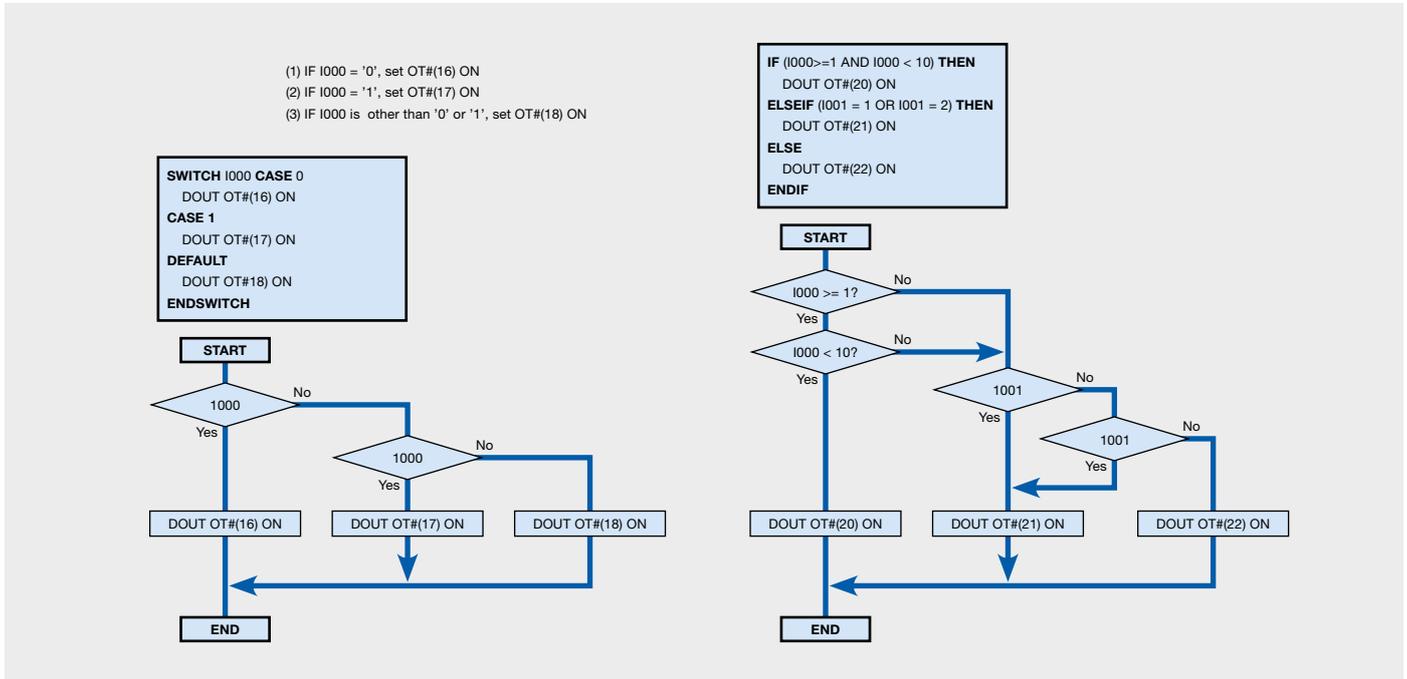
## KEY BENEFITS

- The system data can be collectively backed up, it saves the internally stored data in a single file
- The automatic backup function is for the restoration from unexpected troubles
- Various backup locations supported (Pendant CF card, internal CF card, internal RAM)
- Adjustable number of backups that reside on the CF card (for backups on the pendants CF card)

## OPTIONAL FUNCTIONS

- 163947\_Funktion DX200 CMOS Save with FTP – Allows to access the backed up data by FTP client

# Structured Language (163934)



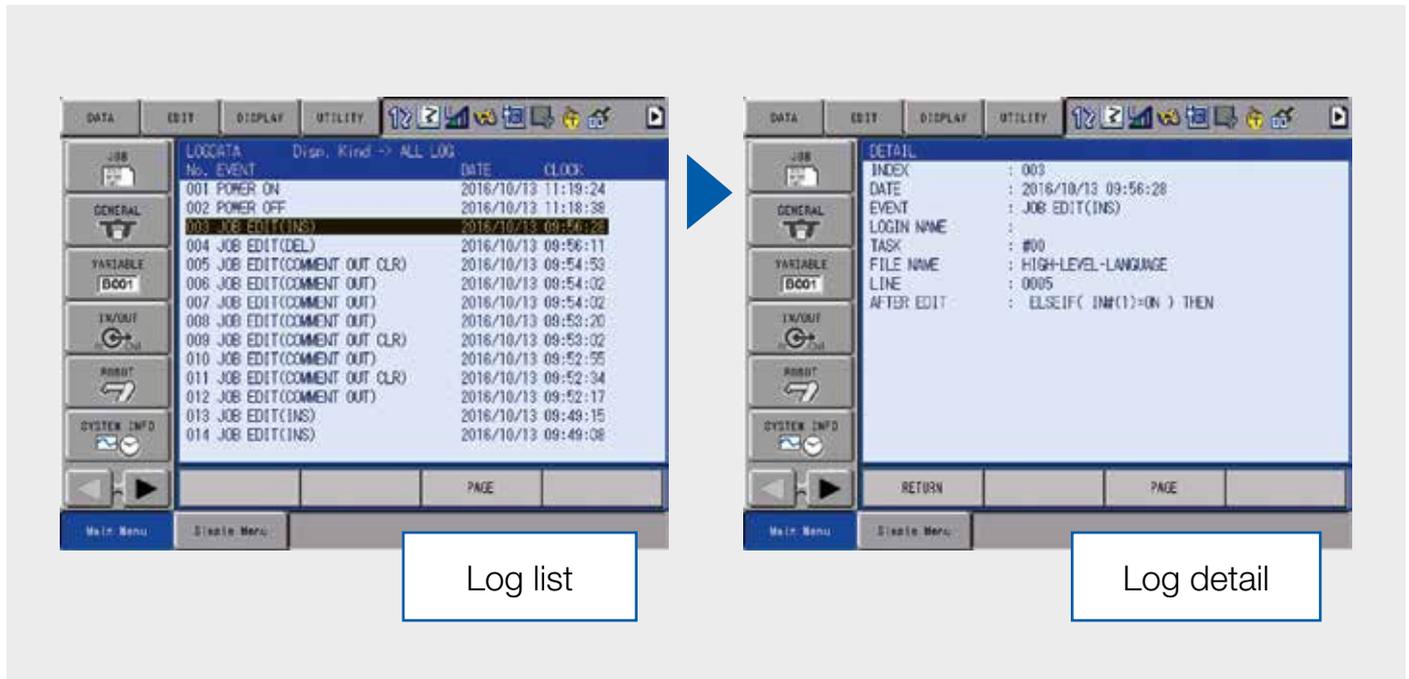
With the Structured language function it is possible to create clearly arranged programmes based on high level language with the following instructions:

- IFTHEN-ELSEIF-ELSE-ENDIF
- WHILE-ENDWHILE
- FOR-NEXT
- SWITCH-CASE-ENDSWITCH

## KEY BENEFITS

- Shorten programs
- Structured program overview
- Complex functionality, easy to implement

# Logging Function (163937)



This function stores and displays the edit such as editing data of the robot controller program (job) and welding condition and the history (log) of programming pendant operation such as job execution.

This function also facilitates troubleshooting by ensuring the data traceability.

Stores 200 Data edit files (job concurrent IO ladder, Various condition files, edit of parameters, variables and others).

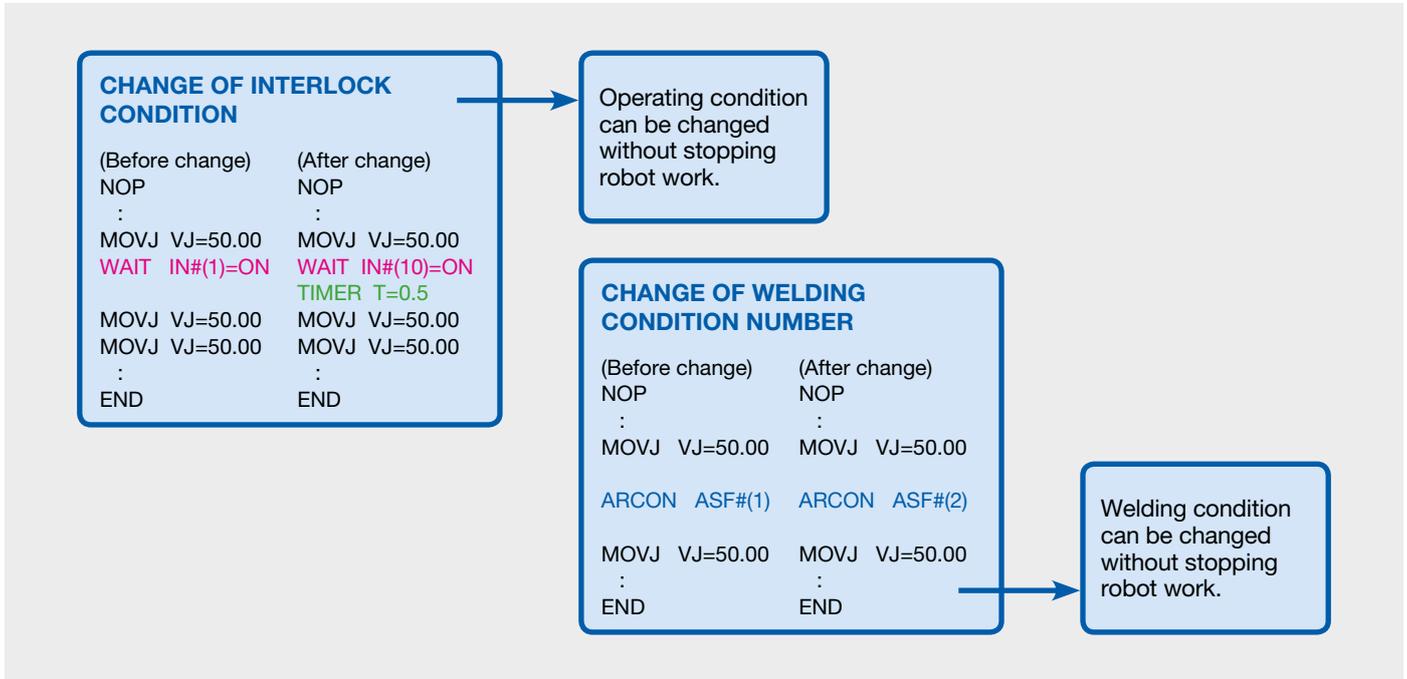
Stores 200 Pendant operations (job start, hold, emergency stop external memory load and save, and others).

It is also possible to extract and display only the log of data edit or pendant operation

## KEY BENEFITS

- History of programming pendant operation can be checked
- Easy error diagnostic

# Job Editing during Play (163938)



Even when the line is in operation, Job edit is possible.

A job can be edited even when the robot is producing or line is in operation, fine adjustment such as changing signal numbers, operating conditions and work conditions without stopping robot work.

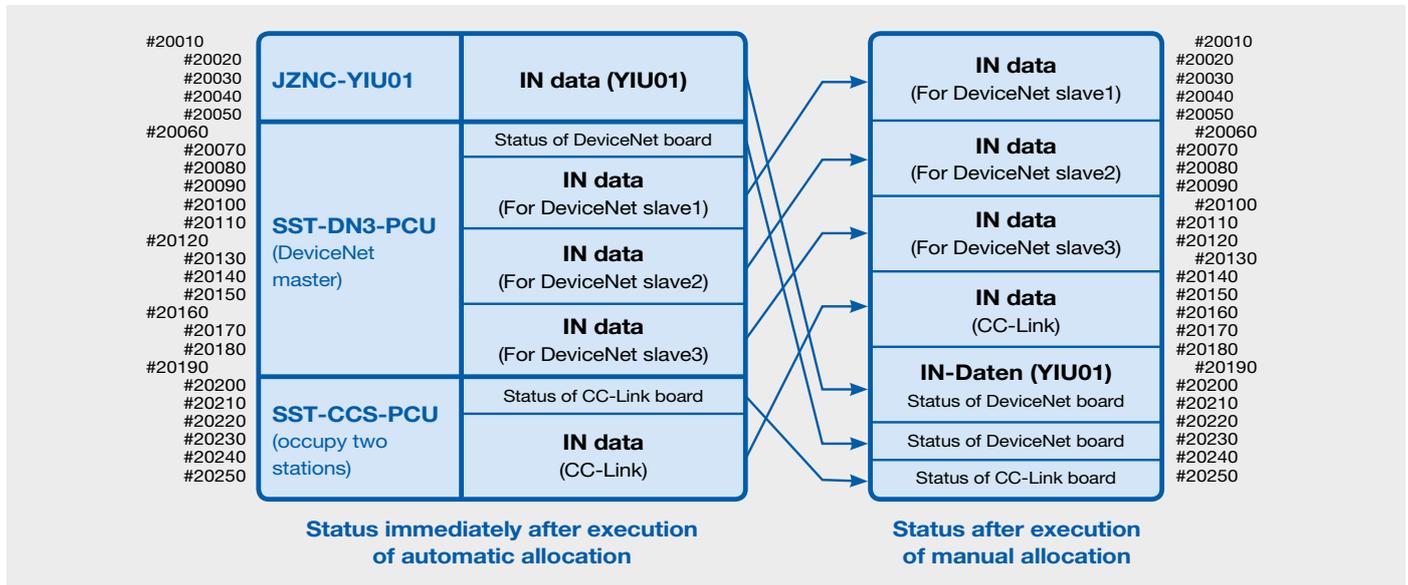
## KEY BENEFITS

- Cycle time can be reduced
- Operating conditions can be changed without stopping during his working time

# External IO Allocation (163939)

STB	CH	MAC ID	ADDR	BYTE	NAME
#20010	14	0	0	5	YIU01
#20060	16	0	254	0	DN3-PCU-1
#20070	16	0	1	1	DN3-PCU-1
#20120	16	0	2	6	DN3-PCU-1
#20160	16	0	3	10	DN3-PCU-1
#20190	17	0	254	0	CCS-PCU
#20200	17	0	0	1	CCS-PCU

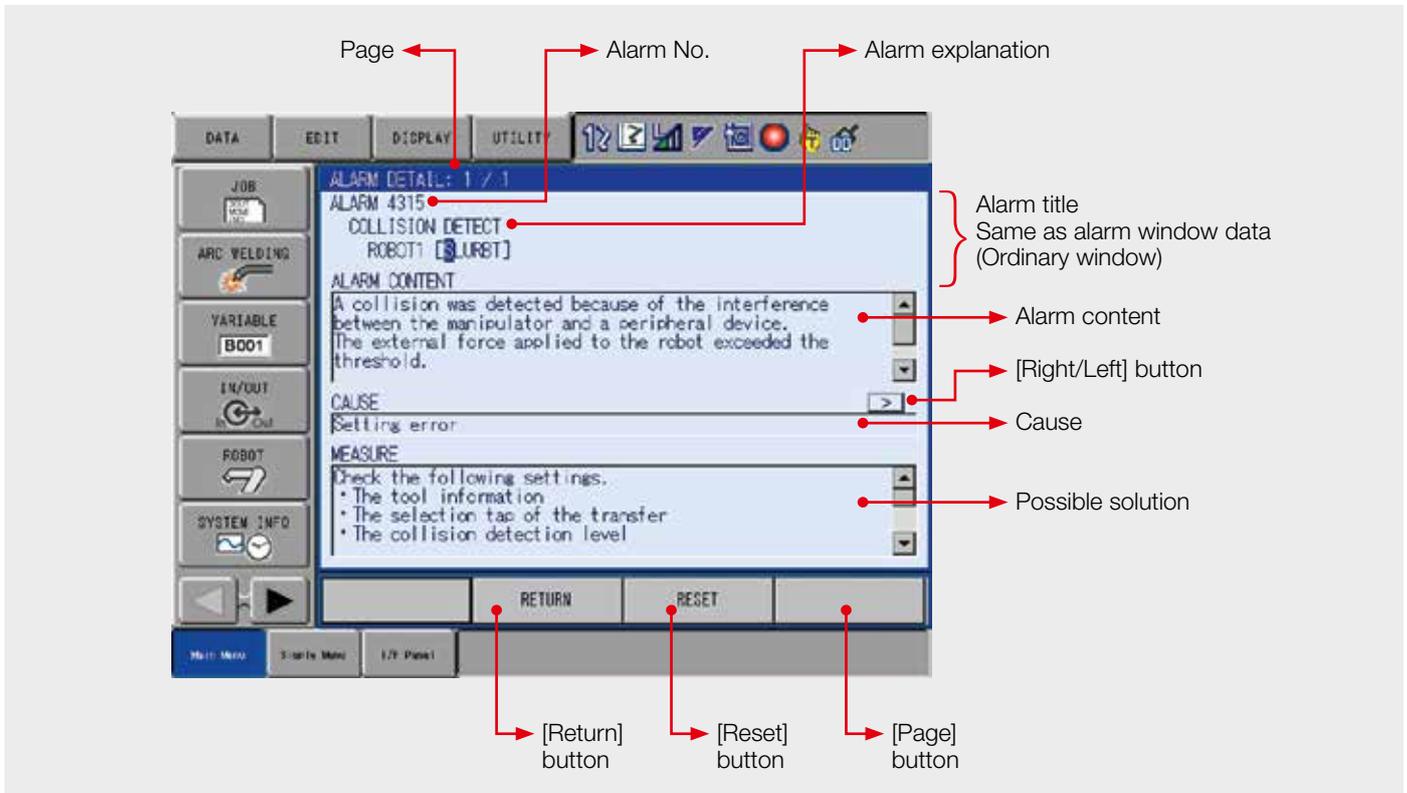
I/O mapping for each I/O- or fieldbus board possible:



## KEY BENEFITS

- I/O area for each I/O board or fieldbus(ProfiNet, DeviceNet etc) can be customized
- Easy to create standard I/O interface depending on application or customer requests

# Alarm Detail Displaying (163944)



## User can specify the window to be shown in case of alarm occurrence:

- ALARM window (standard)  
=> Press [SELECT] key to show ALARM DETAILS window
- ALARM DETAIL (parameter set)

Displays possible causes of the occurring alarm in descending order of frequency to help users find the countermeasure for each cause immediately.

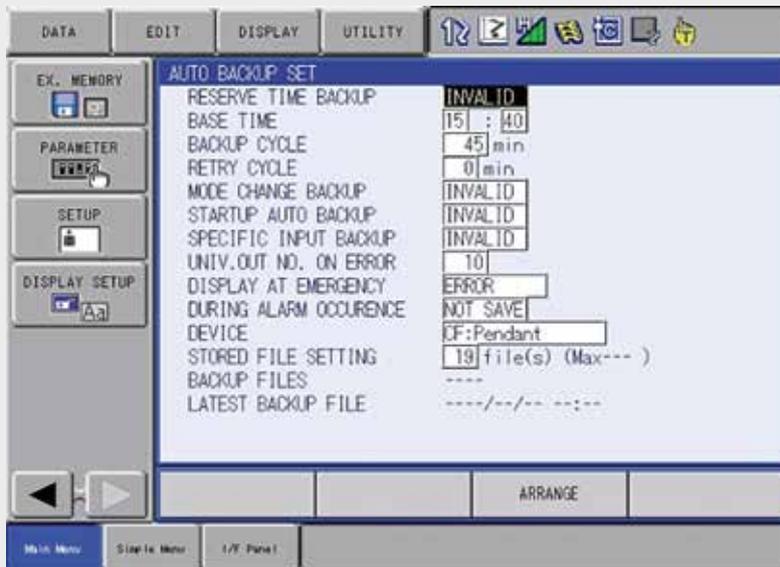
If there are some possible causes and countermeasures for an alarm, press [Left/Right] buttons or [Left/Right] keys to see next "cause" and "measure". The "cause" and "measure" are displayed in the order to be executed.

If multiple alarms occur simultaneously, press [Page] button or key to switch to next alarm.

## KEY BENEFITS

- Displays possible causes of occurring alarms
- Help user to find the cause of error immediately

# CMOS Save with FTP (163947)



This function extends the functionality of the automatic backup function. It provides access to a generated CMOS backup by any FTP client. A notification message can be send whenever a new backup is available. To receive this notification message the backup client has to open a TCP server socket on a specified port.

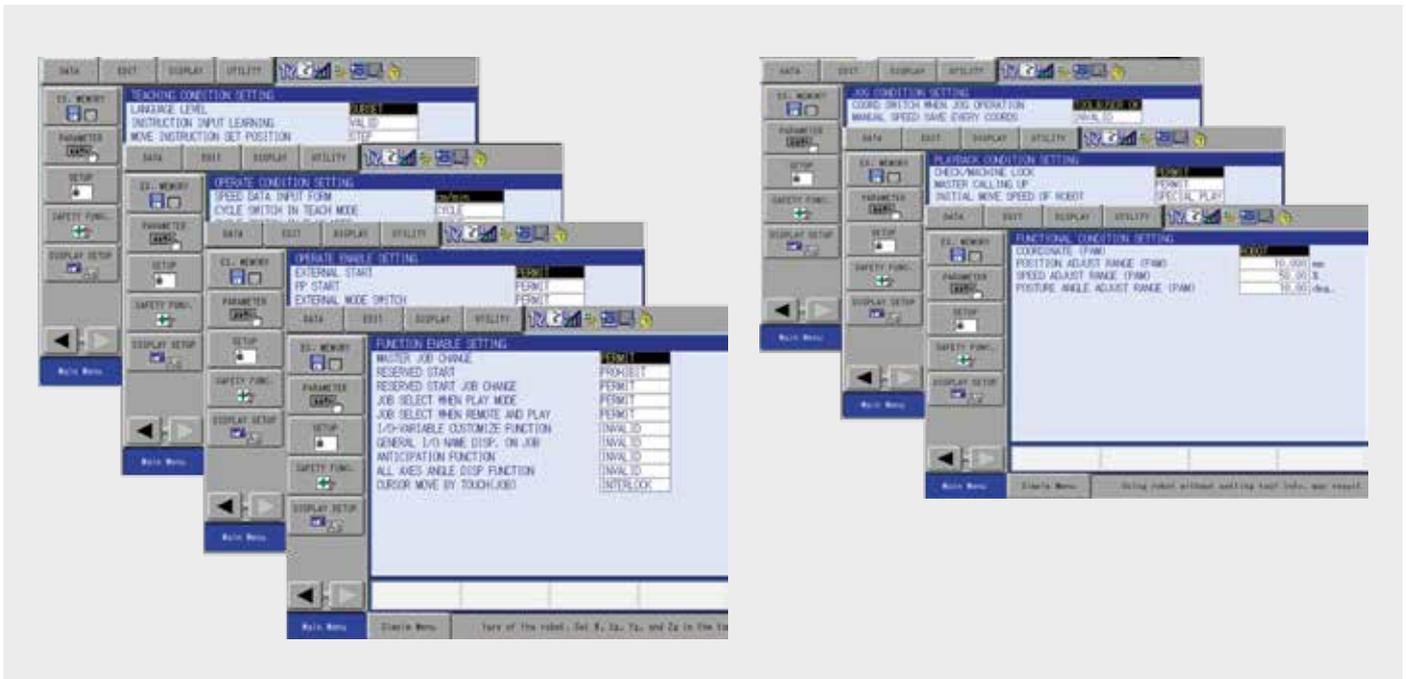
## KEY BENEFITS

- Allows to access the generated CMOS backup through any FTP client
- Get a notification message whenever a new CMOS backup is ready to download

## REQUIRED SOFTWARE

- 164060\_Funktion DX200 Ethernet FTP
- 163928\_Funktion DX200 Automatic backup

# Configuration Parameter (163956)

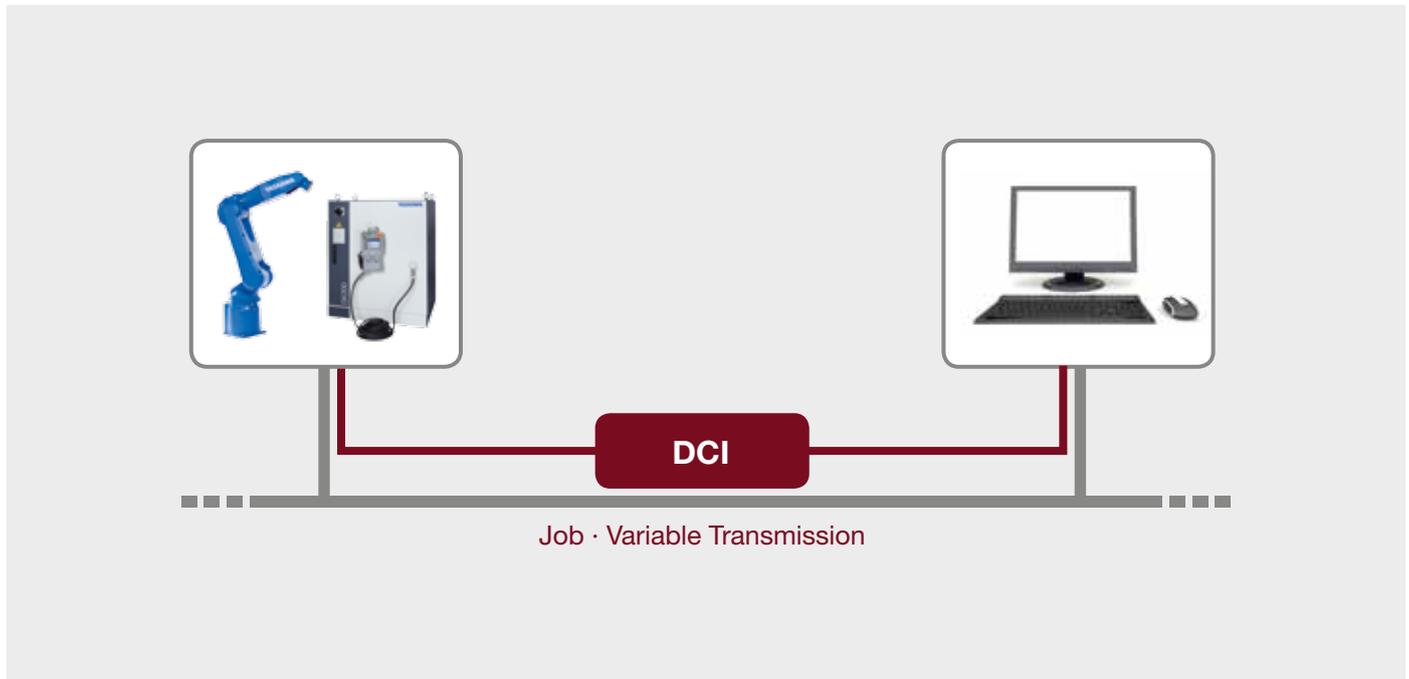


- Recommended settings
- YEU standard system configuration  
e.g. The behavior of the Teachbox, setup menu settings, comfort settings, etc.
- These settings can be adjusted by the customer in the controller itself

## KEY BENEFITS

- Recommended settings

# Data Transmission (164058)



The data transmission function (DCI) is developed for communication with a host computer such as a personal computer in BSC complying protocol. The DCI function executes instructions described in a robot job to perform data transmission with a host computer.

## Main functions

- Job transmission (Load, save and delete jobs)
- Variable transmission (Load and save variables)

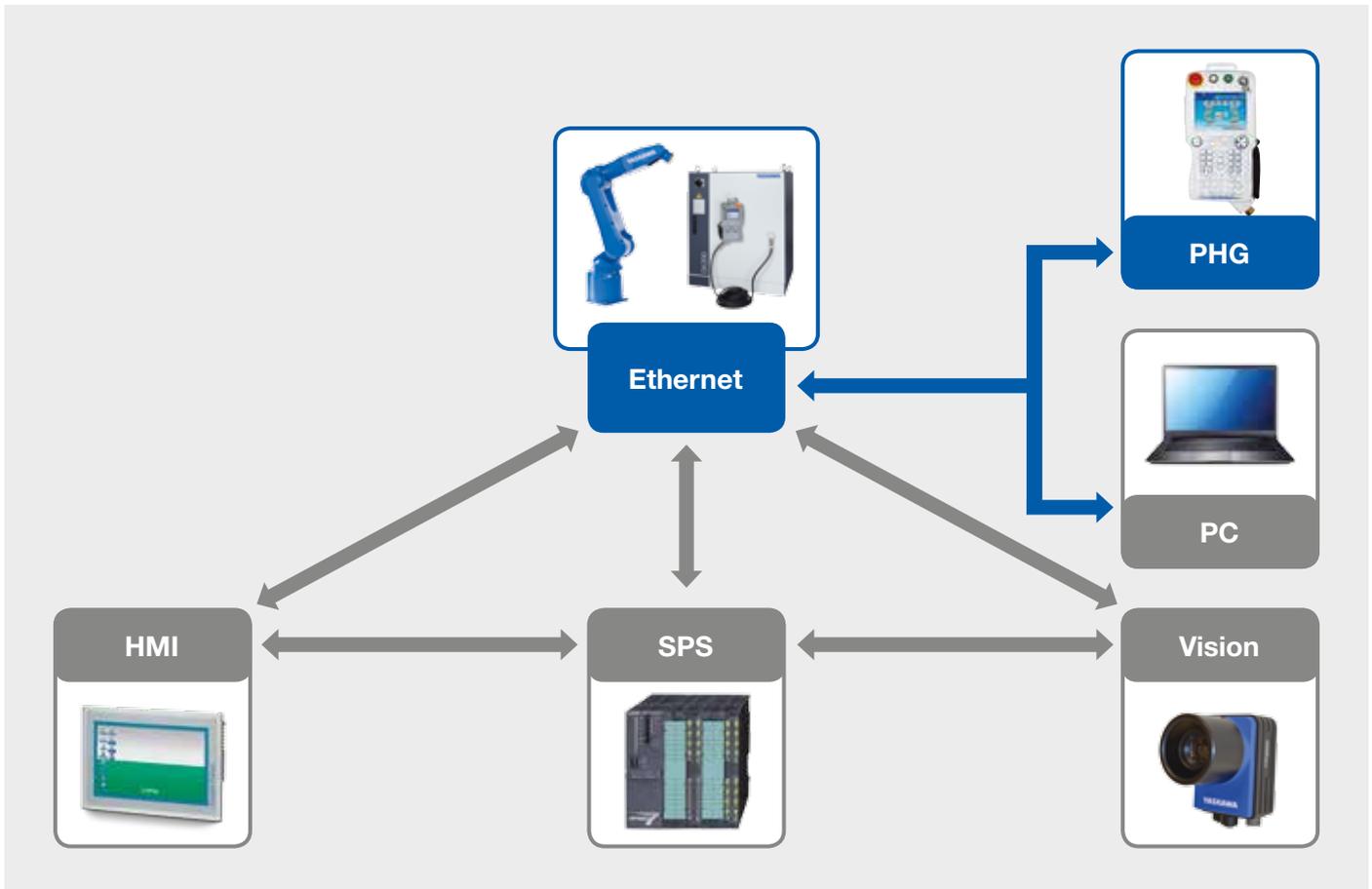
## KEY BENEFITS

- Job and variable transmission to a host computer
- Based on BSC protocol
- Robot is communication master
- DCI instructions are embedded in robot jobs
- DCI server side can be implemented using MotoCom32 SDK or use existing software "MotoDCI32"

## REQUIRED SOFTWARE

- MotoCom32 – The SDK provides the functionality for accessing YASKAWA robot controllers by a Windows-PC using BSC, EServer or High Speed EServer protocol or
- MotoDCI32 – Software to store robot jobs on a host computer

# Ethernet (164059)



The DX200 is provided with the Ethernet connector RJ-45 for data transmission as standard equipment. Therefore, the Ethernet function can be used without adding any extra hardware. The Ethernet function with Ethernet (10/100 Mbps) for the transmission medium enables a faster transmission compared to RS-232C (max. 9600 bps).

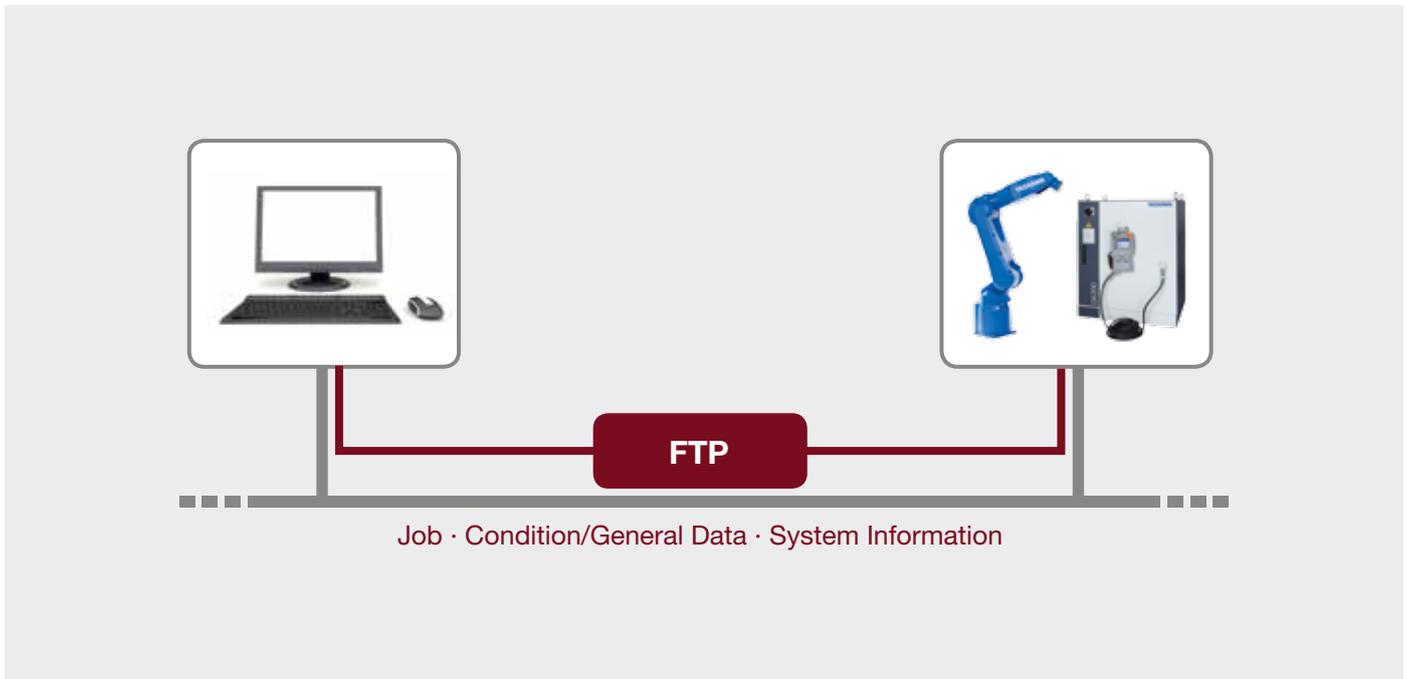
## KEY BENEFITS

- 10 Mbps/100 Mbps (Automatically recognized when the power is turned on)
- IPv4
- Connector CN104 (RJ-45 8-pin modular jack)

## ADDITIONAL FUNCTIONS

- 164063\_Funktion DX200 Ethernet Server
- 164062\_Funktion DX200 High Speed Ethernet Server
- 164060\_Funktion DX200 Ethernet FTP
- 164058\_Funktion DX200 Data Transmission

# Ethernet FTP (164060)



FTP is a common protocol for file transfer through Ethernet. The DX200 controller can act as FTP server and also as FTP Client. Depending on the mode it supports upload, download and deletion of files and grants access to jobs, system files and parameter files. Thus the protocol can be used for a single file backup.

## MAIN FUNCTIONS

- FTP client mode. In client mode the DX200 is capable of uploading and downloading files to/from a ftp server using the teach pendant
- FTP Server mode. In server mode any FTP client is capable of uploading and downloading files to/from DX200 controller

## KEY BENEFITS

- Common protocol for file transfer
- Supports client and server mode (cannot be used at the same time)
- Supports single file backup through FTP
- Supports upload, download and deletion of files

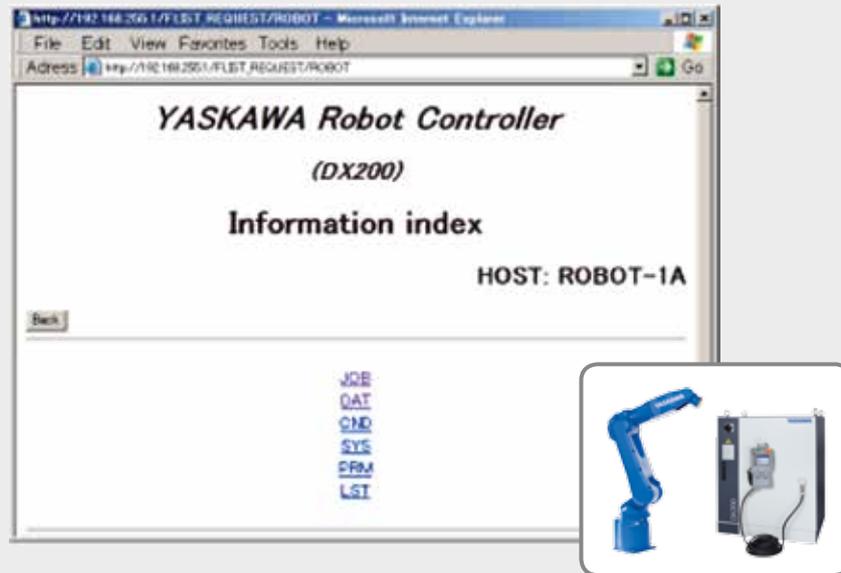
## REQUIRED FUNCTION

- 164059\_Function DX200 Ethernet

## OPTIONAL FUNCTION

- 163947\_Funktion DX200 CMOS Save with FTP

# Ethernet WWW (164061)



The Ethernet WWW function allows to access the internal data of the DX200 by any web browser.

## MAIN FUNCTIONS

- Browsing the internal data of DX200
- View jobs, parameters and system files by any web browser

## KEY BENEFITS

- Easy access to DX200 internal data
- Uses the standard Ethernet Port.  
No additional hardware required

## REQUIRED FUNCTIONS

- 164059\_Function DX200 Ethernet

# High Speed Ethernet Server (164062)



The High Speed Ethernet Server protocol is the current “General purpose” protocol for communication between the DX200 and external devices. It provides a higher performance and functionality over the older protocols like EServer thus it’s the recommended protocol for developing new applications.

## MAIN FUNCTIONS

- Read robot status (Current position, Alarm, Error, Servo Status, ...)
- Control the system (Servo on, Start, Hold, Job call, ...)
- Read or write Variables, Registers and I/O signals
- File control (Load, Save, and Delete jobs/files), access backup data

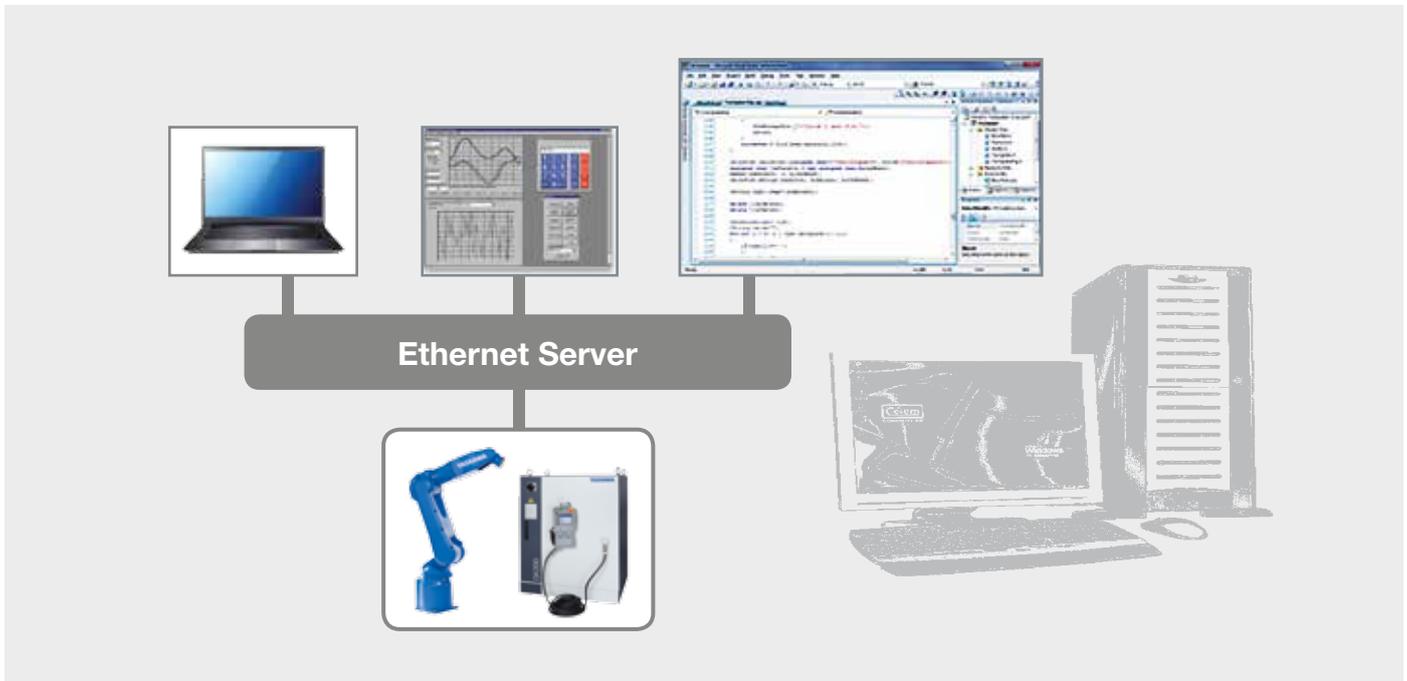
## KEY BENEFITS

- Main protocol of DX200 is “High Speed Ethernet Server” based on UDP
- Use in custom projects by implementing the protocol or by using the MotoCom32 SDK
- Faster communication than using the older protocols (Ethernet Server)
- Uses the standard Ethernet Port. No additional hardware required
- Protocol is also available on DX100, DX200 and FS100
- The “High Speed Ethernet Server” function is recommended for developing new communication applications

## OPTIONAL SOFTWARE

- MotoCom32 – The SDK provides the functionality for accessing YASKAWA robot controllers by a Windows-PC using BSC, Ethernet Server or High Speed Ethernet Server protocol

# Ethernet Server (164063)



The Ethernet Server protocol is an improvement of the BSC protocol concerning performance and multi-client support. The functionality is identical to the BSC protocol.

## MAIN FUNCTIONS

- Read robot status (Current position, Alarm, Error, Servo Status, ...)
- Control the system (Servo on, Start, Hold, Job call, ...)
- Read or write Variables, Registers and I/O signals
- File control (Load, Save, and Delete jobs/files)

## KEY BENEFITS

- Protocol is based on TCP/IP
- Use in custom projects by implementing the protocol or by using the MotoCom32 SDK
- Uses the standard Ethernet Port. No additional hardware required
- Protocol is also available on DX100, DX200 and FS100
- Multi-client support

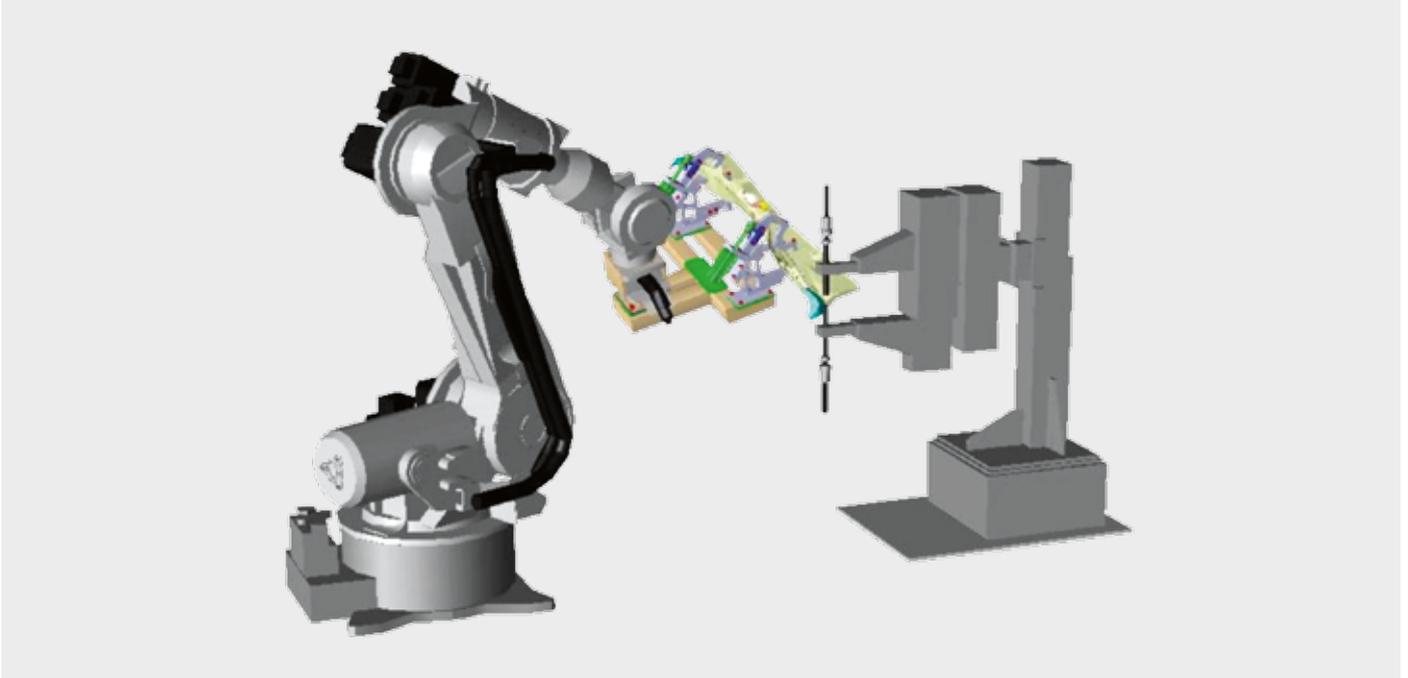
## OPTIONAL FUNCTIONS

- 164062\_Funktion DX200 High Speed Ethernet Server – The “High Speed Ethernet Server” function is recommended for developing new communication applications

## OPTIONAL SOFTWARE

- MotoCom32 – The SDK provides the functionality for accessing YASKAWA robot controllers by a Windows-PC using BSC, EServer or High Speed EServer protocol

# External Reference Point (163898)

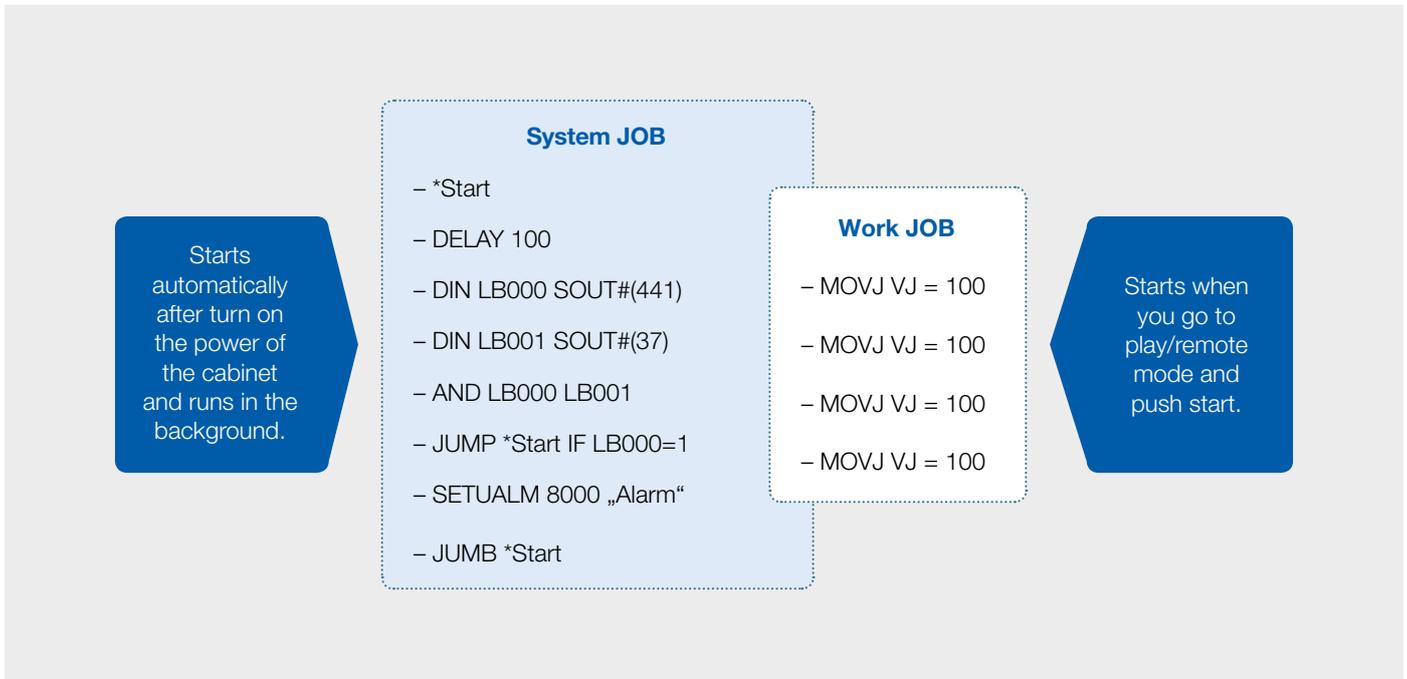


The external reference point control function performs teaching and playback, regarding one point in space as the control point of the manipulator. This one point in space is called the external reference point. Specifically, the point is used in the cases where sealing in the work piece supporting work or spot welding with the stationary tool is performed. In this case, operation such as changing the posture of a work piece can be easily carried out by setting the tip of tool, nozzle or gun to the reference point. Naturally, during playback, interpolation is performed by controlling the relative speed and relative position between the external reference point and the work piece.

## KEY BENEFITS

- Quality is improved even for work piece supporting work with a fixed tool
- Teaching time can be reduced
- Applicable to more than one tool, gun or nozzle (63 external reference point)

# System Job (163901)



A system Task is a task that is started immediately and automatically after the controller has started. In comparison to a normal task (user task) neither start nor a stop is required to control such a task. So it is independent from operation mode (Play/ Teach/Operating) and Servo On status. While usually motion or operation sequences (work-flow) are programmed in normal tasks a system task is used to process cyclic tasks in the background. Up to 4 system tasks can be registered and run simultaneously in addition to normal job tasks.

Programs running in a system task are called system jobs. A system job is very similar to a normal job (user job) using the same Inform programming language but with a limited instruction set. For example motion commands are not available. On the other side due to its similar characteristics it is sometimes used as a replacement for the internal ladder program. While the access of a ladder program is limited to IOs and Registers, system jobs can process all available resources like Variables, System Variables, IOs and Registers.

## KEY BENEFITS

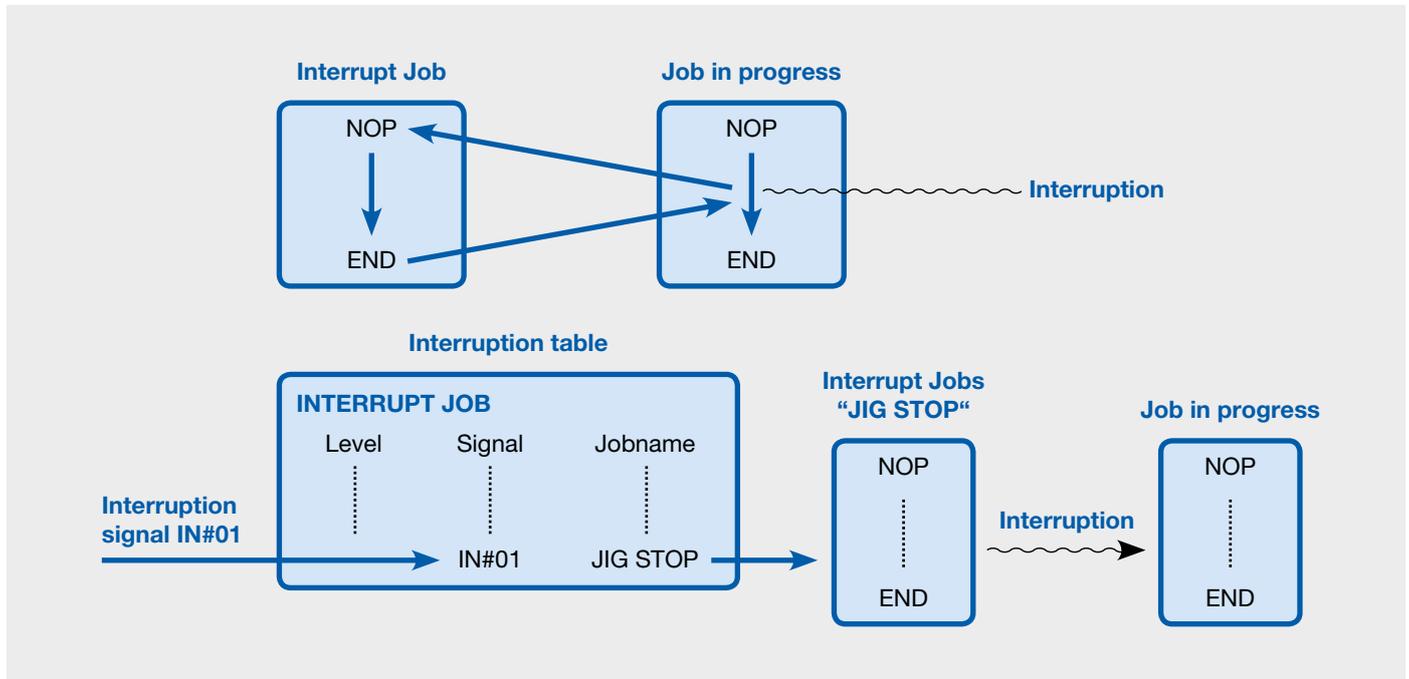
- Cyclic Background Tasks in Inform language
- Auto start and independent from Operation Status
- Access to all resources
- Cycle time depends on number code lines and CPU load

On the other side in contrast to a ladder program the cycle time of a system task is not fixed. So processing time increases with each additional code line and is depending on current CPU Load.

## Example:

- You can program a system job including a permanent check of collision detection function status
- When you are in teaching mode and the collision detection is OFF, nothing will happen. But when you are in play mode and the collision detection is OFF you will get an alarm e.g. with a reminder "Please turn ON collision detection while PLAY mode".

# Interrupt Job (163908)



The interrupt job function is a kind of call job. When a signal to interrupt the job is sent from a peripheral device or another system, this function momentarily suspends a job in progress, and executes the job corresponding to the signal.

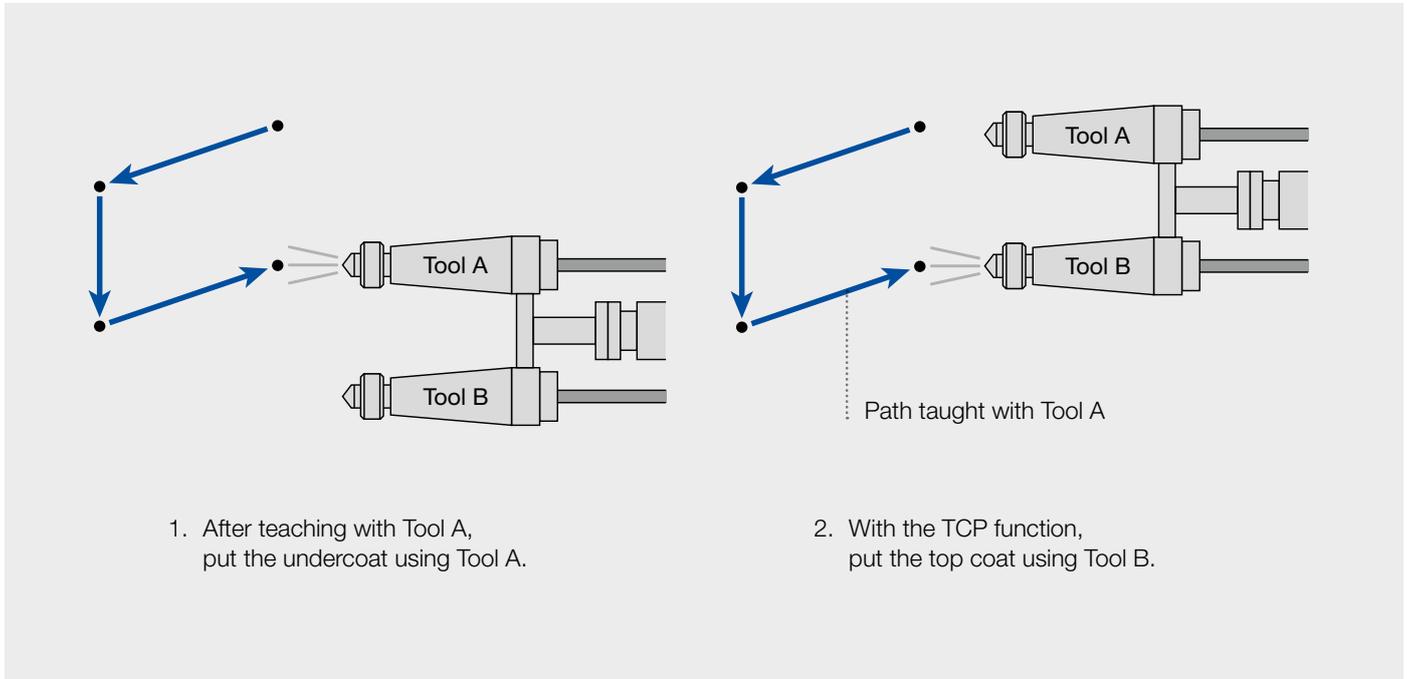
This function is useful when an error occurs in a peripheral device or in another system, or when the manipulator should be withdrawn in an emergency.

Sending a user input signal specified in the interruption table calls a job corresponding to that signal (IN#1 => job A; IN#2 => job B... etc.). When interrupt job is completed, the suspended job is restarted from the instruction line where the cursor was at the time of interruption. The instructions EI (Interrupt enabled) and DI (Interrupt disabled) are necessary to enable the interrupt observation.

## KEY BENEFITS

- Interruptions are possible during move instructions as well as timer instructions
- Tact time can be reduced
- You can observe an area from your job
- For each robot you can create 8 interrupt jobs

# TCP (163910)



The “TCP function” (TCP: Tool Center Point) moves the tool along the track that was taught by another tool.

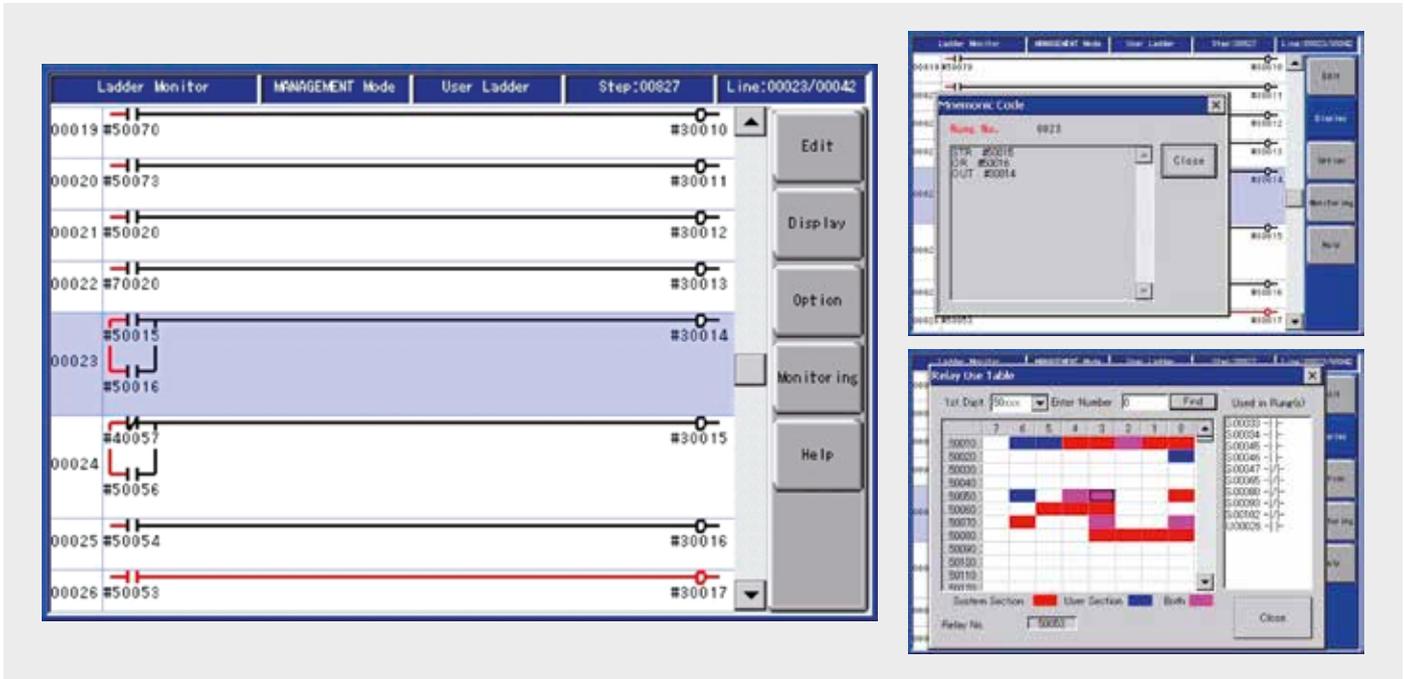
### Quick programming of jobs (example):

- The job copied from the job taught with Tool A, defined a “Job A” can be defined as “Job B”. Add the TCP instructions before and after the sections where Tool B is to be used in Job B. Set a tool file number for Tool B in the “TCPON” instruction.
- One tool is used for undercoat paint operation, the other is used for the top coat paint operation. Teach a path to either one of the two tools, then the teaching for the other tool is not necessary.

### KEY BENEFITS

- Reduction of programming time:  
When moving double-tools along the same track, only one-time teaching is applied to each tool, which allows the job creation time to be reduced
- Precise tracking of both tools

# Ladder Editor (163942)



Concurrent I/O control is an I/O control function that processes controls relative to the DX200 I/O independent of the manipulator operation (in parallel with manipulator operation).

The ladder editor displays the program as contact diagram. The user part of ladder program can be modified.

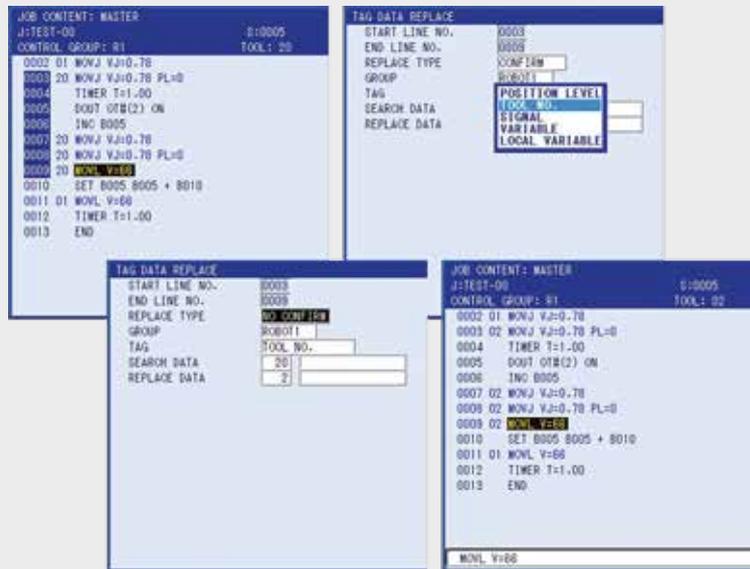
## MAIN FUNCTIONS

- Table of used relays
- Table of used register
- Online signal monitoring
- Search relays, registers, instructions
- Mnemonic code display

## KEY BENEFITS

- Online programming of internal PLC
- Online diagnostic of the signals
- Simple display by using contact diagram
- Easy editing by using touch functions

# Tag Data Replace (164055)



This edit function allows you to change data tags in one or more lines of a job at the same time.

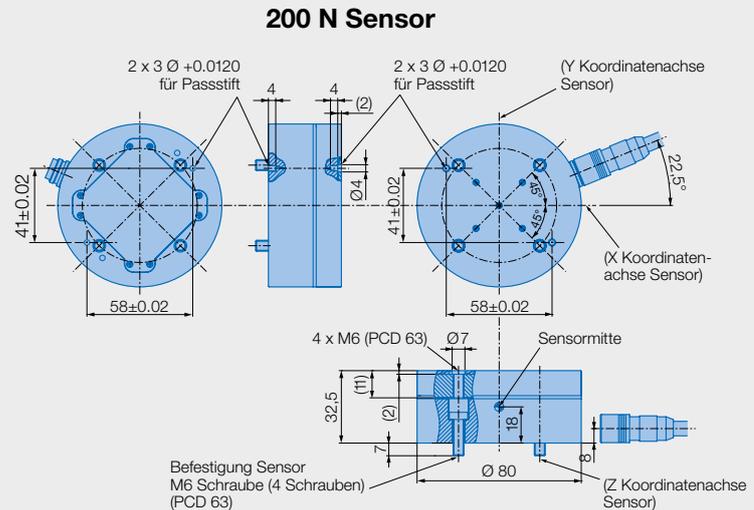
## Changeable line tags:

- Position level numbers
- Tool numbers
- Signal numbers
- Variable numbers
- Local variable numbers

## KEY BENEFITS

- Teaching modification time is significantly reduced
- Tag Data can be easily corrected in the window on the programming pendant

# MotoFit (175396)



MotoFit alters the robot's position based on the force encountered to align or assemble parts. (During normal robot operation, the robot is setup for positional control. It moves to or retains position even when external forces are applied, provided that forces do not exceed limits that would cause an error.)

The six-axis force sensor detects three translational forces and three axial moments to detect external forces during job execution. Three operations (touching, fitting and inserting) are combined to provide automatic precision fits of mating surfaces of 10 –100 µm.

High-speed fits up to 20 mm deep with h7/H7 tolerance can typically be done in five seconds. Also the force sensing control parameters can be taught quickly without unique skills. Its hole position detection and snag prevention increase reliability.

## KEY BENEFITS

- High tolerance assembly
- Built-in programming tools
- Improved reliability

The Engineering Support Tool (EST), a PC application, is used for sensor setup and job creation. It supports one or two robots, up to 24 force files, and robot or tool coordinate systems. Therefore jobs can be edited on the controller if needed.

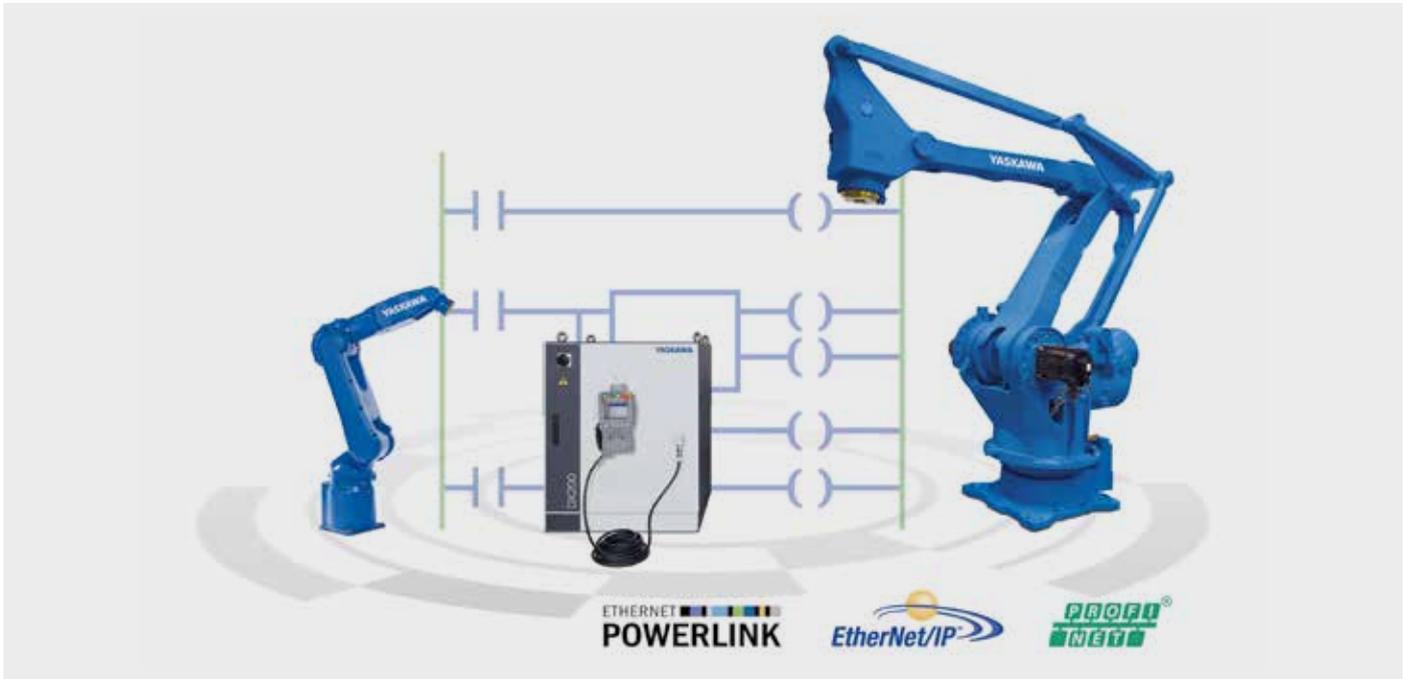
## COMPONENTS

- Six-axis sensor (200 N (V) or 1000 N (H or V))
- High-speed communication board
- Power supply box
- Robot-specific mounting flange adapter
- Engineering Support Tool software with interface panel software

## FEATURES

- Ability to enable or disable each translational force or axial moment
- Helpful graphics for troubleshooting and setup
- Step-by-step instructions
- Ideal for precision part assembly applications including drive train components, seats, electronics, battery assembly and nondestructive testing

# MotoLogix (176052)



MotoLogix is a revolutionary software interface for controlling YASKAWA robots by PLC. Being available for several major PLC brands and fieldbuses it is designed with two primary objectives:

- Enable OEM's to deeply integrate YASKAWA robot systems in their PLC controlled machinery.
- Easy programming/commissioning/teaching/operating of robots in a machine, without need of specialized knowledge.

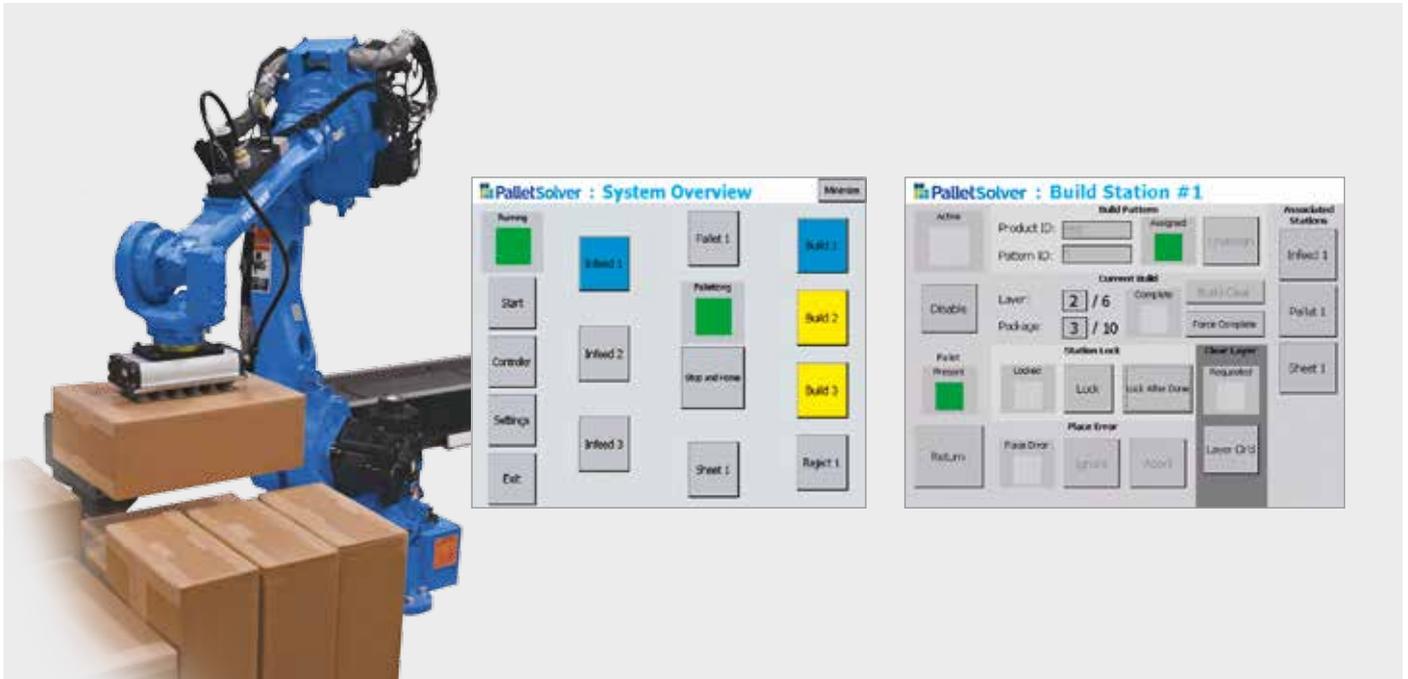
## KEY BENEFITS

- Robot programming carried out in PLC language – unified for the whole system
- Easy to use library of function blocks and sample programs
- Connect all peripheral devices (sensor, camera, conveyor) through PLC
- Robot completely integrated in your PLC and HMI environment
- Test the complete PLC/HMI robot application using virtualization
- Assurance of a YASKAWA path quality and a smooth motion
- All YASKAWA DX200 robots can be controlled
- No Teach pendant nor YASKAWA robotics knowledge is required
- Data stored in the PLC, not in the robot controller
- Control up to 4 robots over one MotoLogix interface

## MotoLogix has two components

1. MotoLogix Runtime – This enables the MotoLogix interface on the YASKAWA DX200 robot controller, using the fieldbus of your choice for communication with the PLC.
2. MotoLogix PLC Library – Comprehensive set of function blocks for writing your robot application logic in the PLC.

# PalletSolver (175399)



PalletSolver is a revolutionary robotics palletizing software suite for MOTOMAN robots. This feature-rich software is designed for homogeneous palletizing with two primary objectives:

- Enable fast development and integration of robotic palletizing system through user-friendly configuration, setup and customization.
- Facilitate system uptime without compromising production throughput through intuitive operator-friendly interface.

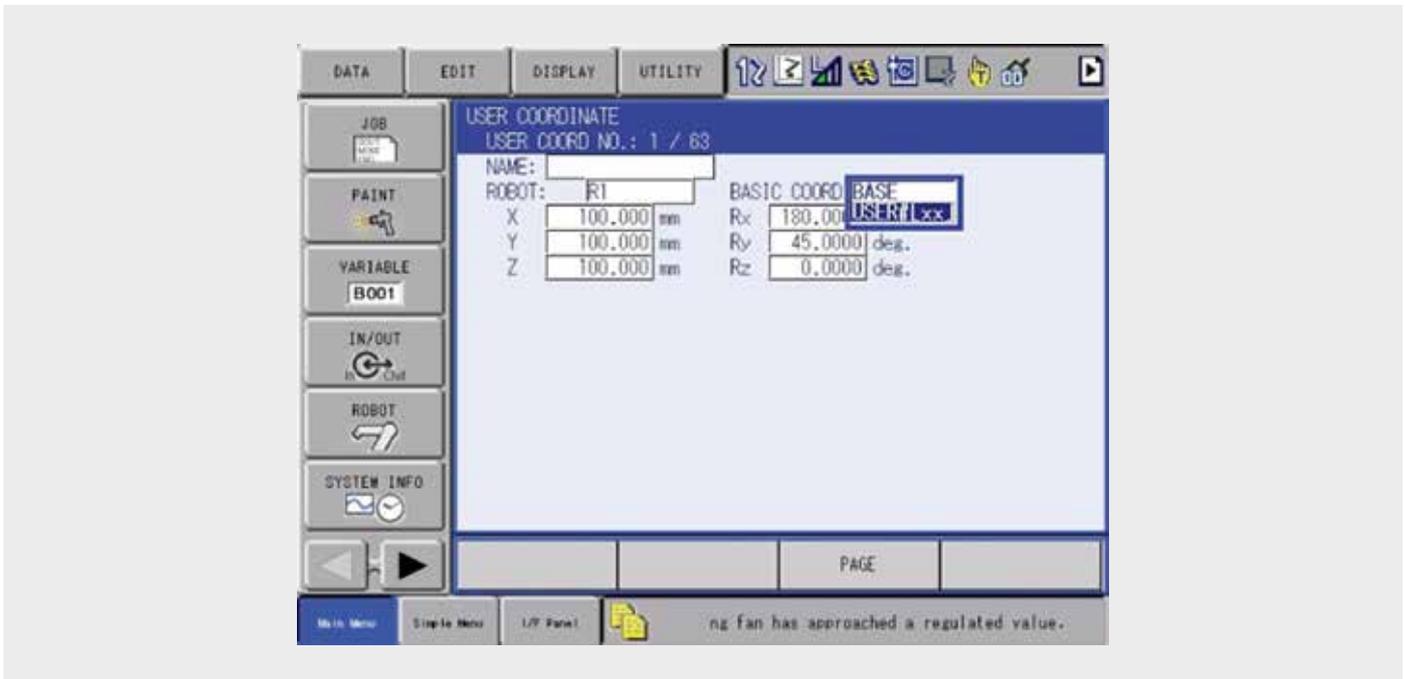
## PalletSolver software suite has two components

1. PalletSolver-PC – an offline pattern generation tool that resides on Windows®-powered PC.
2. PalletSolver-Engine – includes robot control programs, motion planning and I/O maps that reside on the robot controller DX200.

## KEY BENEFITS

- Intuitive user interface with guided pattern file generation steps
- Virtually unlimited products
- Support for all common gripper types
- Dynamic gripper zone configuration changeable for each cycle
- Support for multiple cells
- Interference constraints per station to ensure quick changeover without halting production
- Import pallet patterns generated by TOPS or CAPE software
- Export/import cell and gripper database that can be shared between projects
- 2D layer and 3D build pictures generated to help with drop box recovery
- Pattern Generation Tools: such as Label Positioning, Snap, Placement Spread, Auto Gaps, Pallet Overhang/Underhang, Centering, Calculated Weight and Height of Build

# Paint Basic Settings (177897)



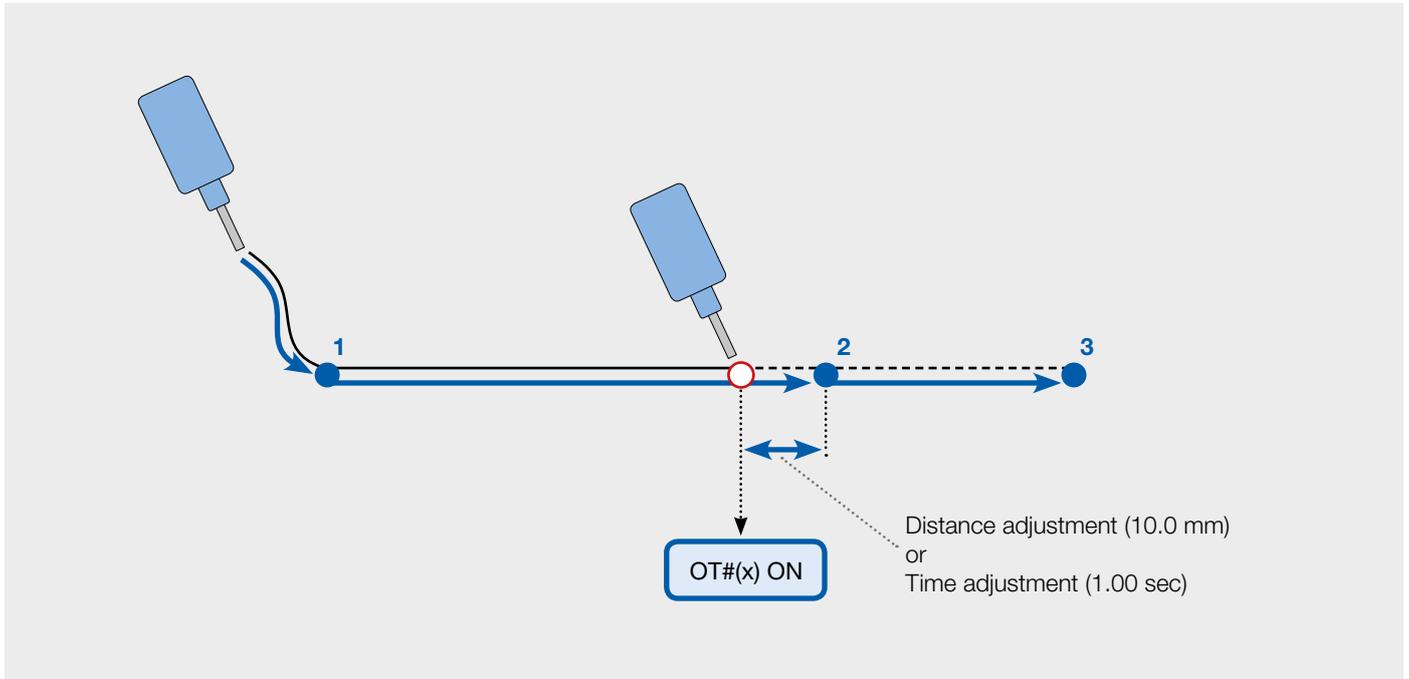
Standard settings for Paint application:  
e.g. manually set of user frame without teaching if frame is outside of robot working range

These settings can be adjusted by the customer in the controller itself.

## KEY BENEFITS

- Adjusted settings manually

# IO Output Timing Control (163953)



The IO output timing control function allows the user to switch an output depending on the distance or time relative to a point.

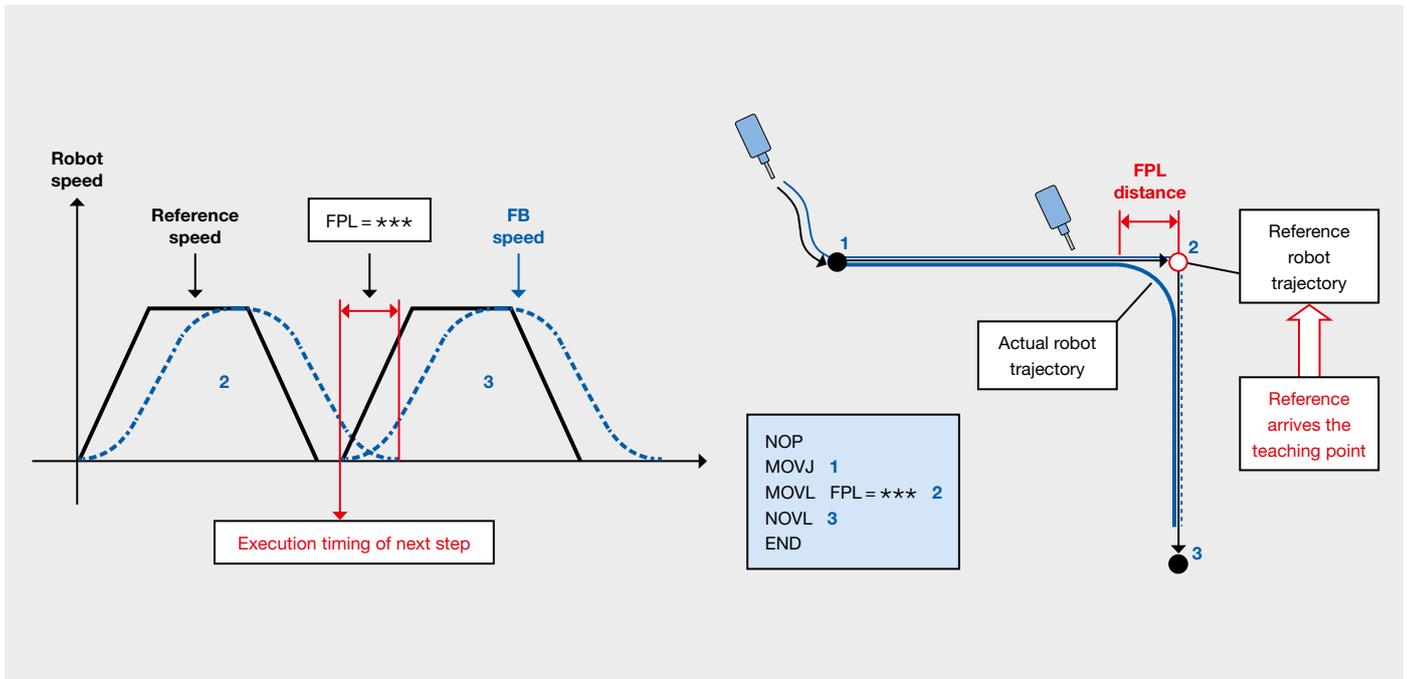
The instruction is added directly behind the related motion tag.

The instruction is speed independent.

## KEY BENEFITS

- Precise IO timing depending on robot position
- Speed independent

# Feedback Position Based PL (164720)



The positioning on a point of the trajectory can be set in mm based on the feedback position of the robot.

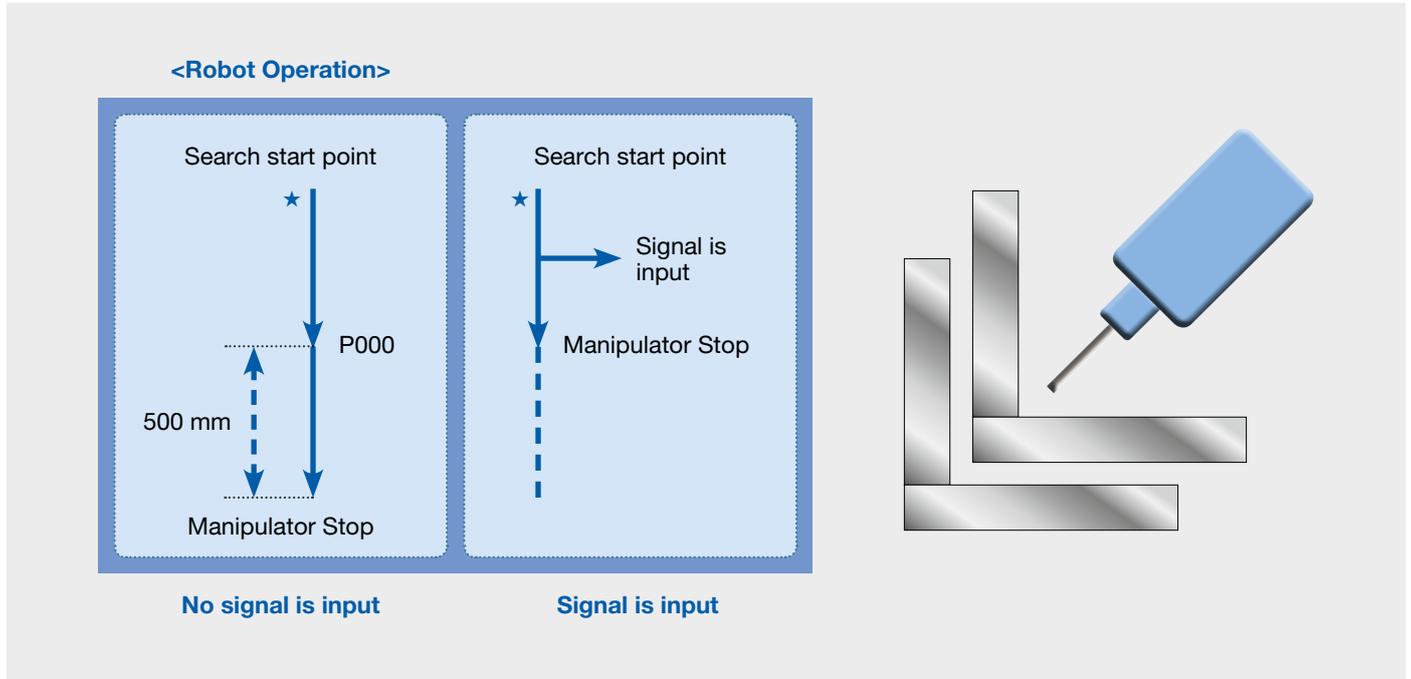
The FPL function is an upgrade from the PL function. The positioning distance can be set, based on mm before the next Step.

The next step is executed, when the actual robot position arrives FPL position.

## KEY BENEFITS

- Accuracy can be increased
- Fine positioning can be set in smaller steps

# Search Function (163905)



Search function uses various general detection sensors to stop the robot by the detection signal of the sensor and to allow the robot to operate the next work. That is to say, this function searches the target to be worked.

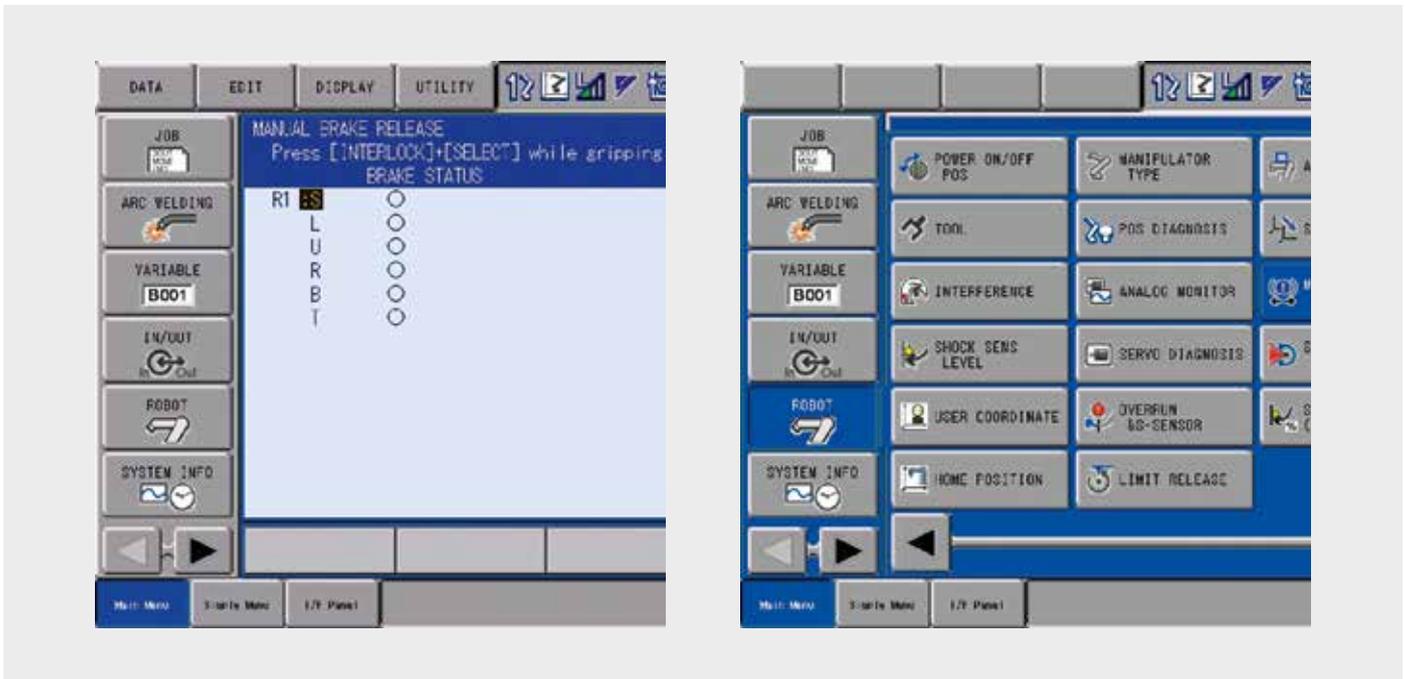
From the start position (★ mark) to the position defined by the variable P000, the robot operates by linear interpolation at a speed of 10.0 mm/sec. At the same time, after the robot operation starts, the function starts monitoring whether a signal is input to DIRECT IN No.1.

After the operation starts, as soon as there is a signal input, the robot stops. If there is no signal input, the robot stops at a distance of 500 mm ahead of the position defined by P000. In that case, whether the robot stops with or without a signal input can be determined by the value of the system byte status \$B02.

## KEY BENEFITS

- Although normal programs require a teaching procedure for each work piece, this function allows the robot to move in search of work pieces, which simplifies the program. (Refer to the program on the left side of this page.)

# Manual Brake Release (163943)

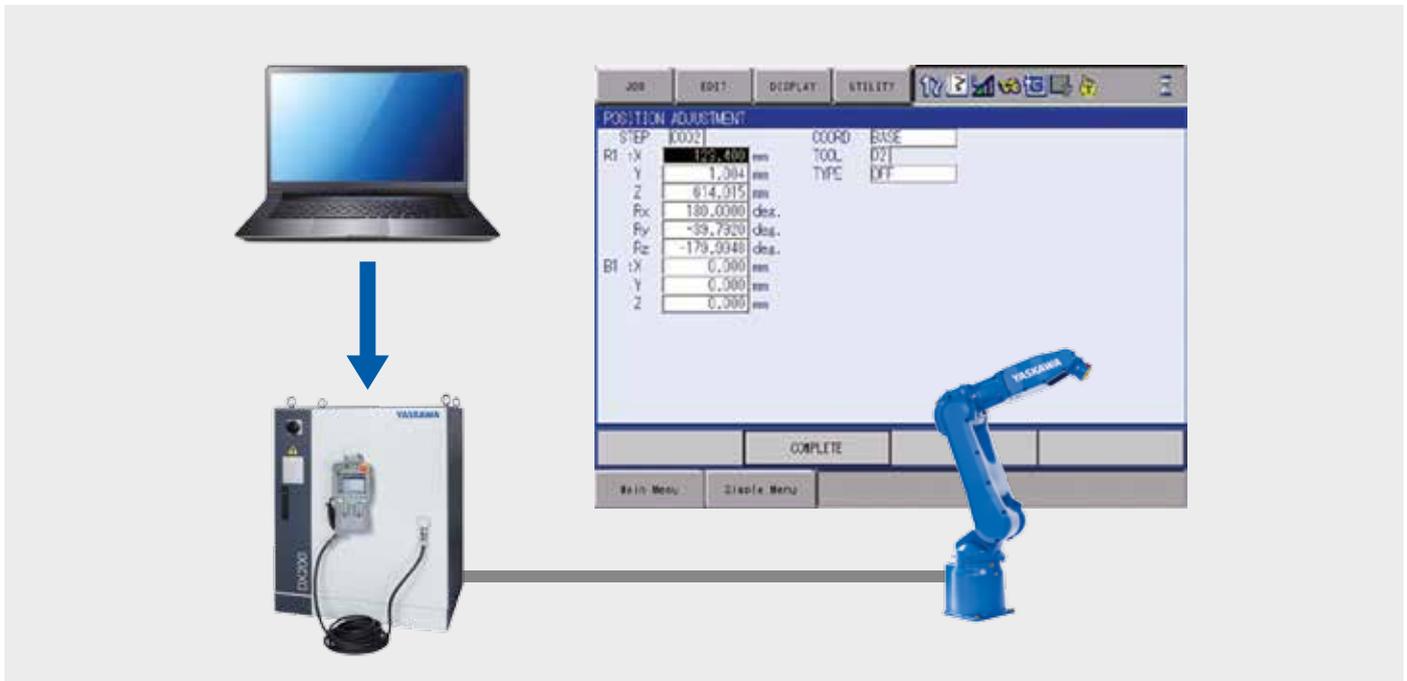


The manual brake release function allows forcible release of each motor brakes of the manipulator and external axes by programming pendant operation.

## KEY BENEFITS

- The Robot and external axis can be moved without Power connection

# Teaching Point Adjustment (163916)



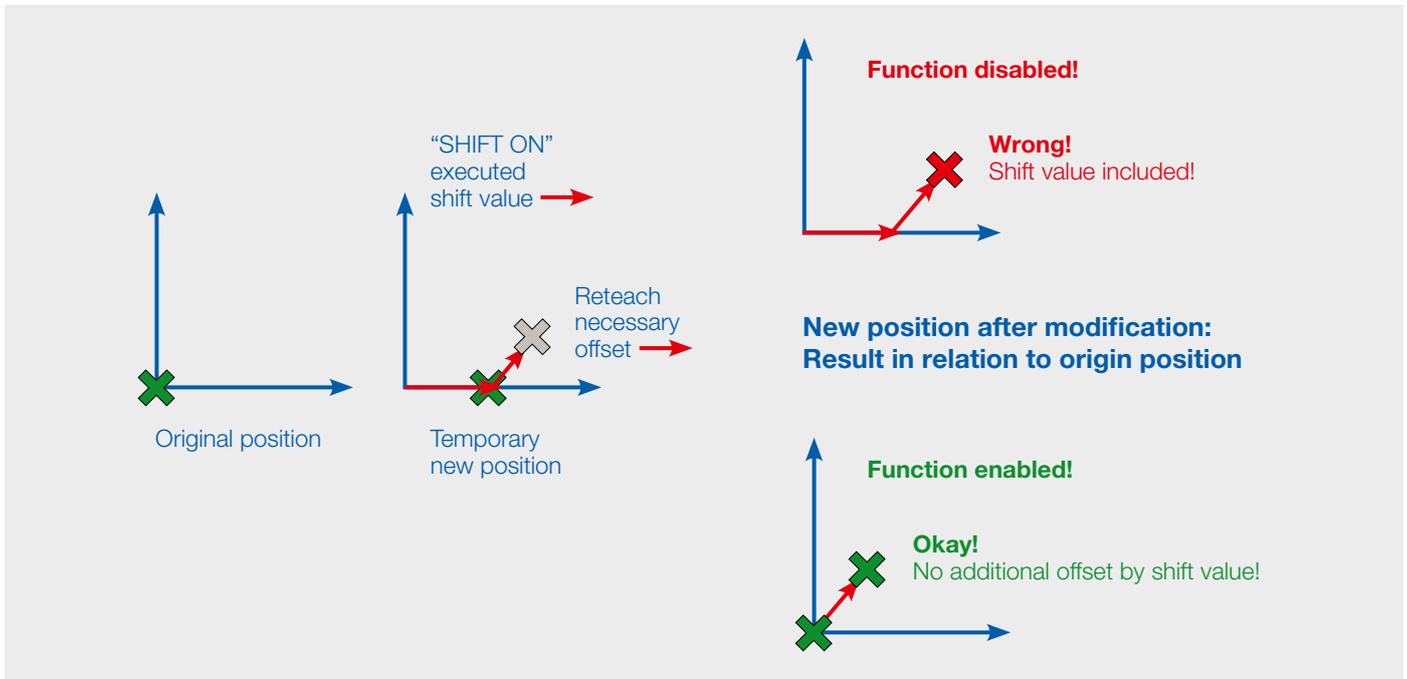
The “teaching point adjustment function” modifies the taught position data by entering the numeric number on the programming pendant without operating the manipulator.

This function allows simplified offline teaching with CAD data or others, and allows fine adjustment of position data in any coordinate system without operating the manipulator.

## KEY BENEFITS

- Teaching modification time is significantly reduced
- Position can be easily corrected in the window on the programming pendant

# Shift Condition Cancel (163925)



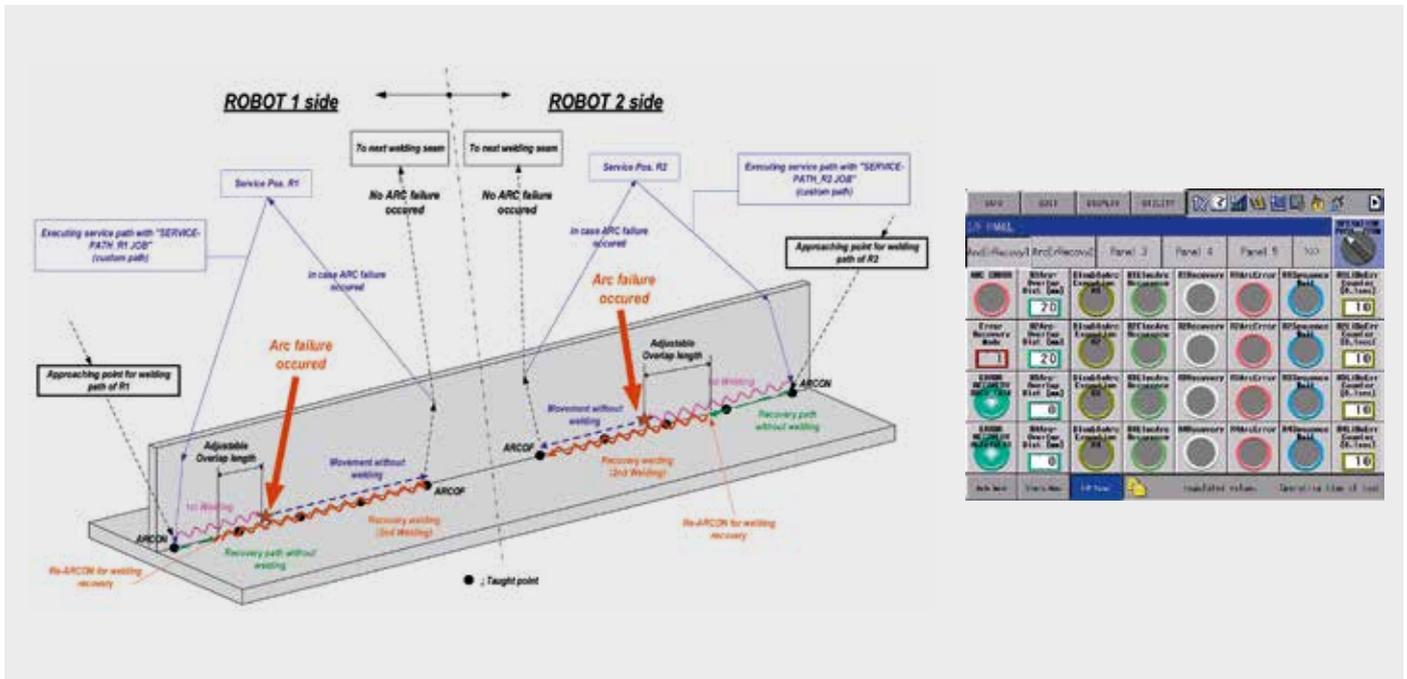
This function should be always enabled, when "shift on" instruction is used for programming!

It allows to overwrite (reteach) robot positions under consideration of current shift-values.

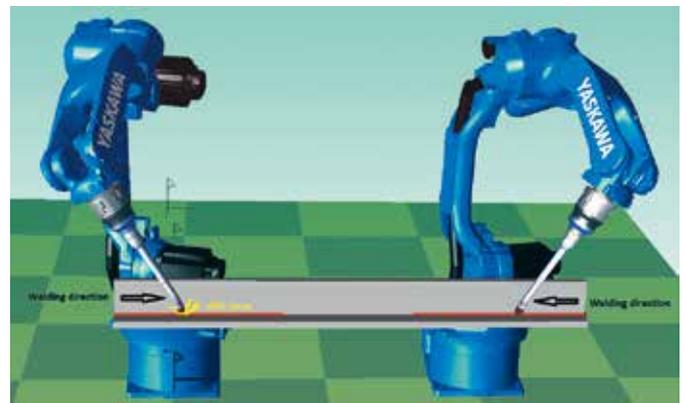
## KEY BENEFITS

- No "master workpiece" with original programming necessary!!!
- Reworks on existing "SHIFT-programmes" are easy and comfortable
- Temporarily shifted points can be overwritten (modified), independently from current shift values

# Error Recovery Arc Basic (181422)



The Error-Recovery function is a powerful arc-welding software solution for the intelligent handling of welding error scenarios in multi-robot plants. It enables the robot controller to supervise and record the welding process for an adequate recovery of the welding seam in case of a welding error. The robots will move to a user defined service position for maintenance in case of a welding error. During the recovery process the faulted robot/s will continue the welding path at the exact fault position with an adjustable overlap. Three different error recovery modes can be specified which are corresponding to the welding material and industrial handling of the parts.



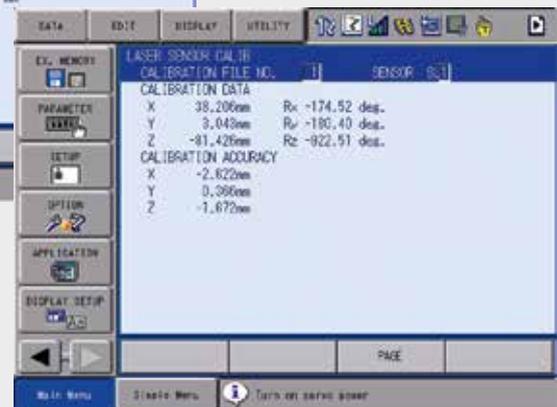
## KEY BENEFITS

- Macro Jobs provide an user interface for defining the error recovery mode, the starting and stopping of the welding path record and the definition of the overlap distance
- An interface panel facilitates the status control and supervision of the recovery process
- Overlapping distance can be adjusted directly by the interface panel
- Manages up to 4 arc welding robots plus external equipment like positioners or handling robots
- The welding distance is recorded during the welding process in order to locate the error position accurately
- Welding conditions like weaving etc. are always executed even in recovery
- Cell operators can always perform the required maintenance safely because the robots are automatically moving to their user defined service position when welding errors occur
- When all robots reached their service position an alarm occurs which gives information about the affected control group/s

# MotoEyeLT (178267)



Lasersensor monitor



Lasersensor calibration

The MOTOEyeLT software allows seam tracking and seam optimisation in real time.

For this purpose, the robot is equipped with a laser camera (preceding the tool) from different manufacturers.

Via the rapid Ethernet connection, the MOTOEyeLT software controls the communication between the components.

In order to achieve optimal welding results, the information from the camera is then processed by the software, allowing necessary adaptations of the robot path, robot velocity as well as process parameters.

Thanks to preconfigured macros programming is very simple. Moreover, the 40 files for the individual adjustment of the tracking parameters make system configuration easier.

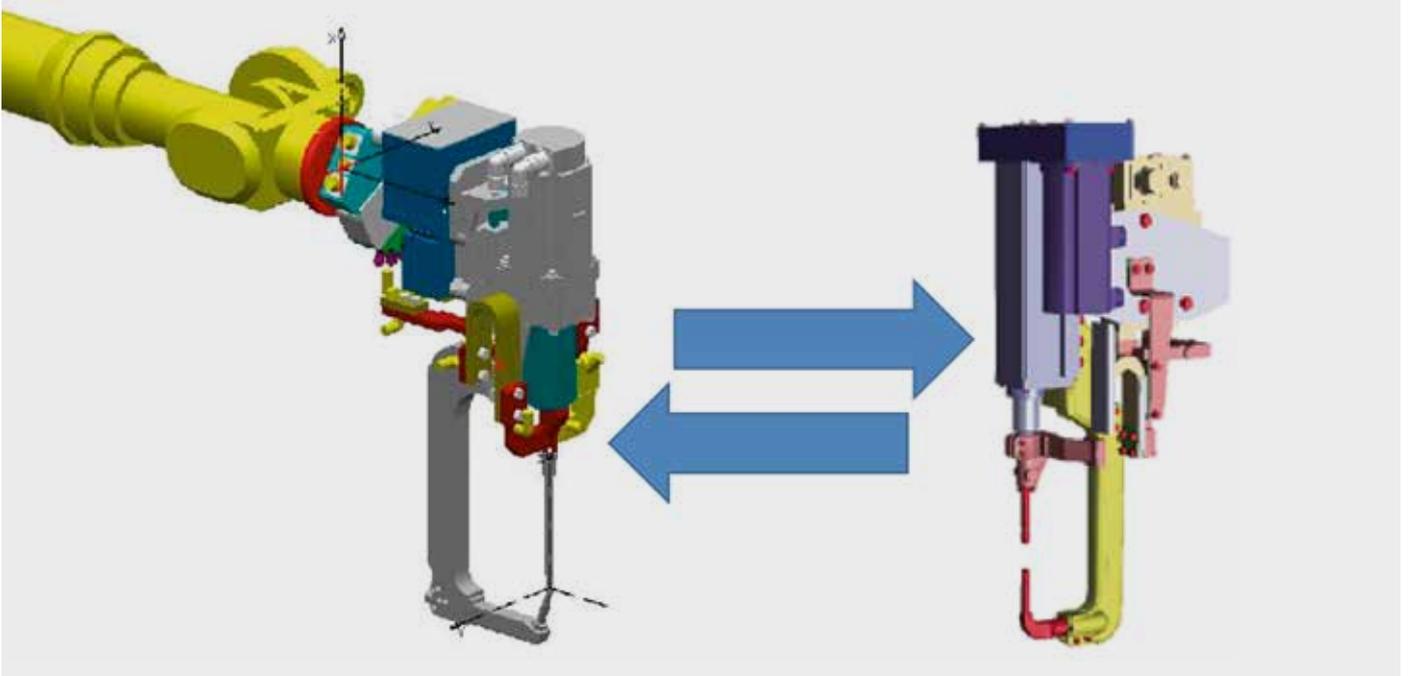
Additional advantages of MOTOEyeLT are the easy calibration with the sensor to the TCP as well as the use of Standard CIO programs (for digital and analogue power source control).

**Restriction:** If it is necessary/mandatory to adapt process parameters online, the analog output card (YEW) is required and it must be possible to control the power source using reference voltages.

## KEY BENEFITS

- Start and target point search
- Adaptive welding – adaptation of e. g. robot velocity and wire position
- Support of seam tracking sensors from different manufacturers
- Reduction of reworks
- Increased number of faultless work pieces
- Increased cost-effectiveness
- Simple programming with preconfigured macros
- Synchronous tracking with external and/or base axes
- 40 files with tracking parameter settings
- Simple calibration of the sensor with the TCP
- Use of Standard CIO programs (for digital and analogue power source control)

## Gun Change (175076)

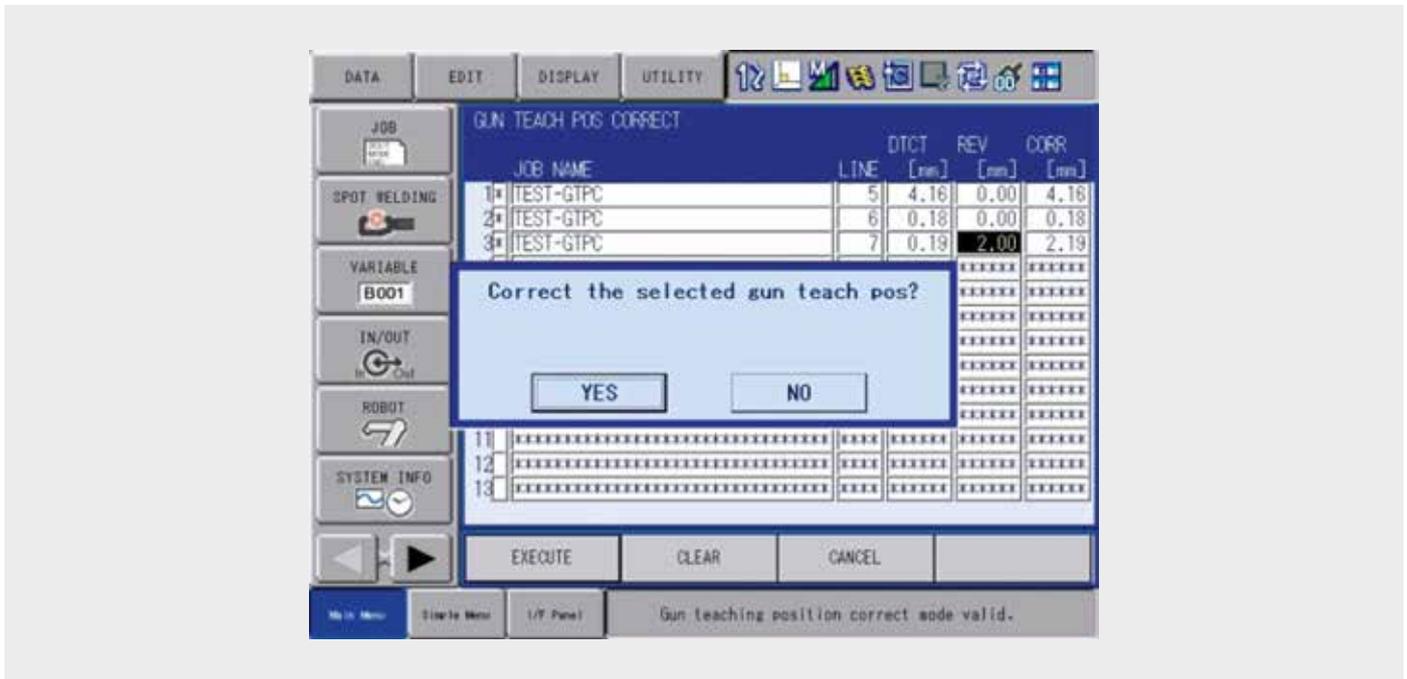


Using gun change function, only one servo amplifier and one dress pack at the robot side along with an ATC (automatic tool changer) is required to mount/ dismount multiple servo guns or other tools to one robot.

### KEY BENEFITS

- Enables using multiple servo guns or other tools on one robot
- Decreased footprint of robot cell
- Enhanced flexibility

# Gun Teaching Position Correction (175077)



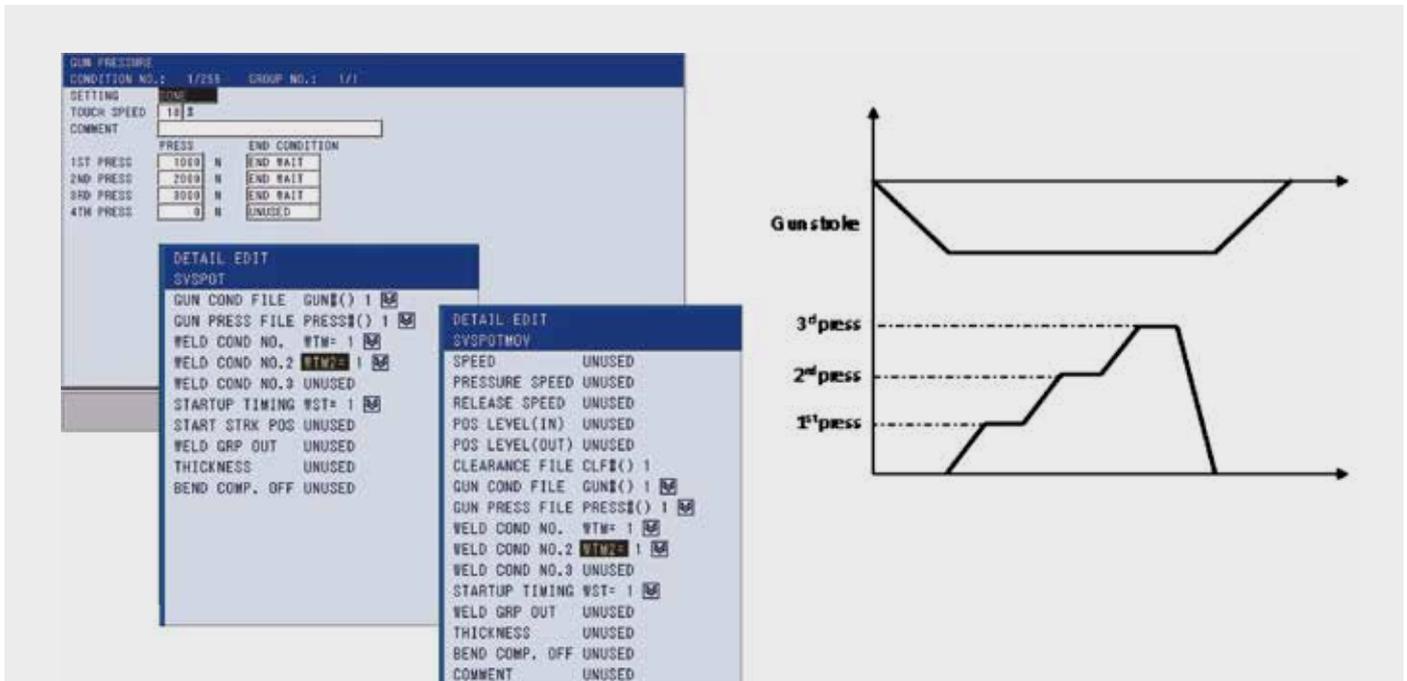
Correction of previously taught gun positions (SVSPOTMOV instruction) by “workpiece search motion” with moveable electrode.

The function can be used to automatic correction of work-piece misalignment in the tool coordinate Z axis direction.

## KEY BENEFITS

- Reduction of teaching time
- Improvement of weld quality

# Multi Step Pressure (175078)



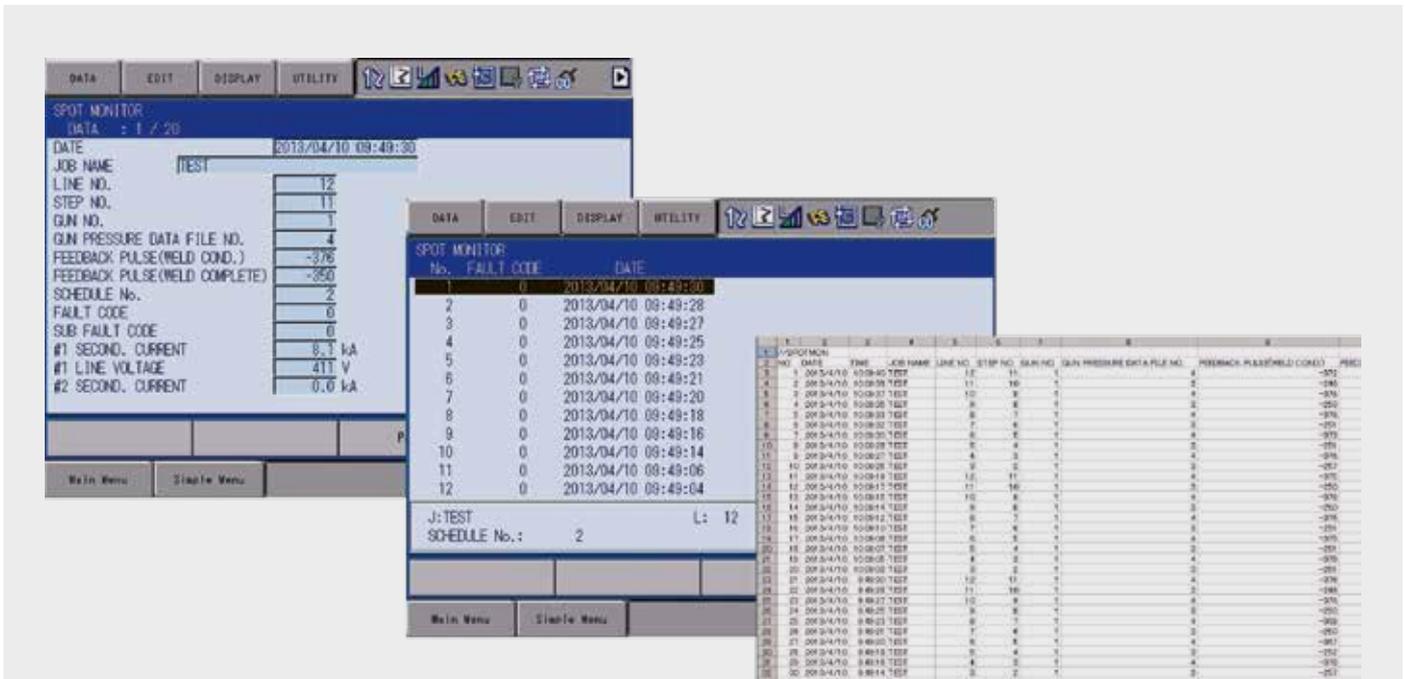
The multistep pressure function is an extension of the conventional welding commands SVSPOT / SVSPOTMOV.

After the gun is closed, the power source can be started up to four times with different pressure values and welding conditions, enabling high quality spot welding.

## KEY BENEFITS

- Multiple pressure values (and welding conditions) during one spot welding operation can be applied
- Enhanced welding process control

# Spot Monitor (175079)



The spot monitor function allows storing the history of approx. 200 welding results in the DX200 controller for motor gun and air gun application.

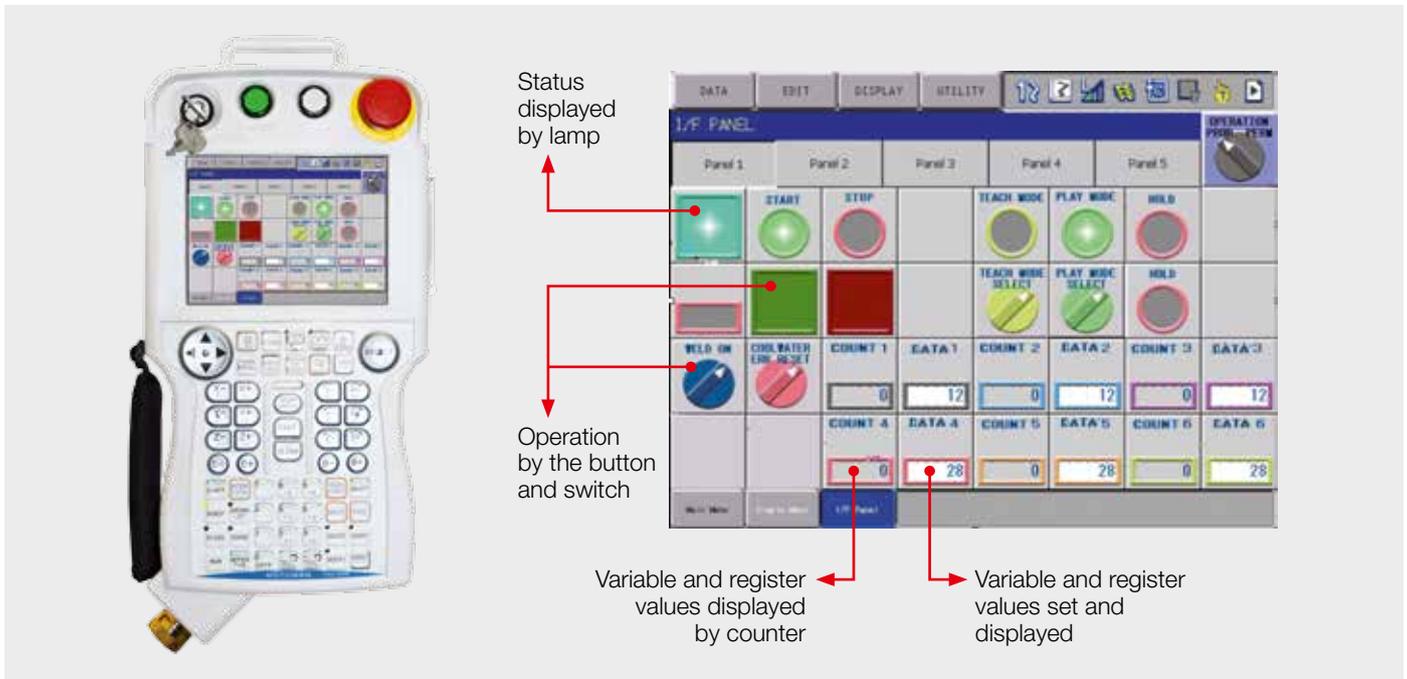
Also, the data stored in the robot can be sent to external memory devices or host PCs.

Requires dedicated power sources (e.g. Nadex) and interface board.

## KEY BENEFITS

- Enhanced quality control and reporting opportunities

# Interface Panel (IF panel) (163933)



A virtual operation panel can be constructed in the programming pendant.

Configuration with software provides flexible support for rapid system change.

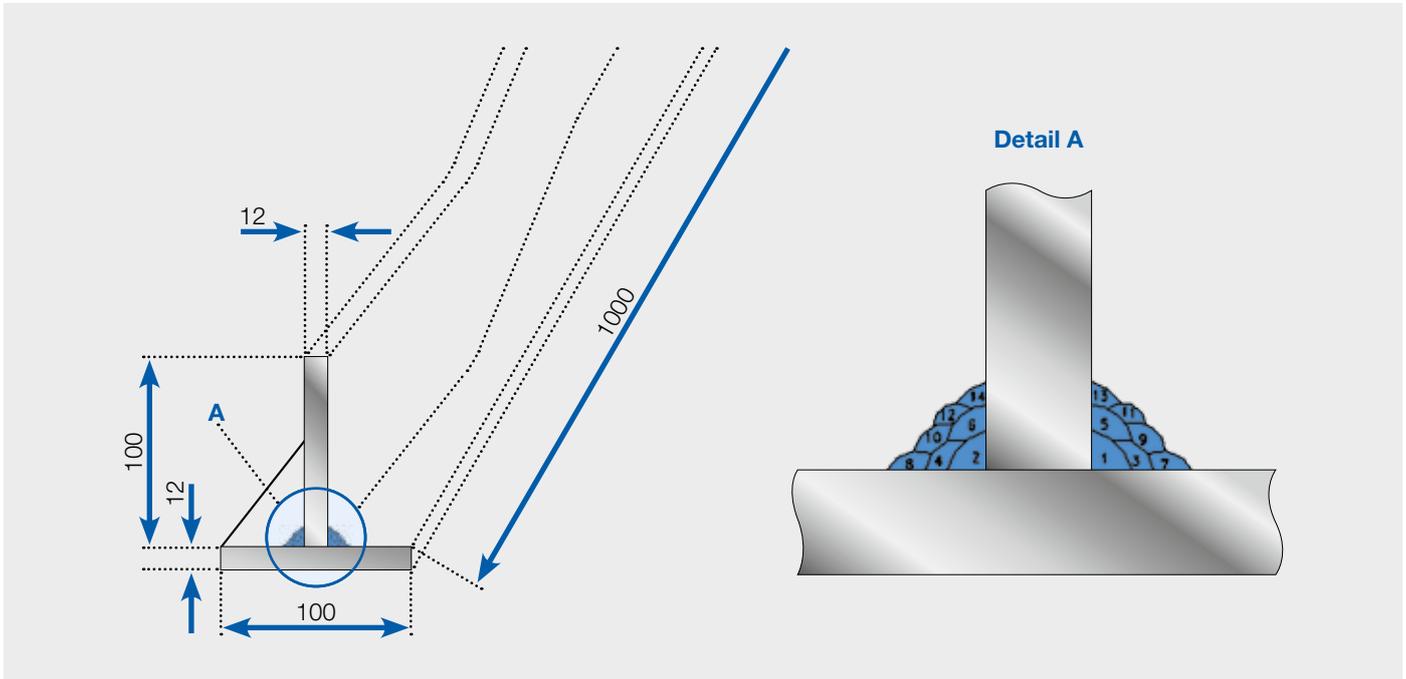
This function makes the system construction simple and enables the reduction of operation panel and Interlock panel.

Users can construct the arbitrary operation panel for PP by setting data in Interface panel setting screen.

## KEY BENEFITS

- No additional hardware is required
- Pendant operation allows for cost cutting on the system

# Point Variable (T-variable) (163919)



This function is fixed part of Multi-Layer function package. The special type of position variable has been created to simplify the programming of multi-layer welding structures (figures above). All welding passes basically have the same robot position. The only difference is the (variable) shift amount from root pass to current layer. Only the first layer must be taught by moving the robot. These positions will be registered as T-variable and in your JOB you can use same positions as often as necessary (number of layers) without moving the robot again.

The main difference to standard position variable (P-variable) is the “local” character: That means all information are stored in current JOB and each determined T-variable belongs only to the JOB where it has been set. Same T-variable (number) can be used in different JOBS and may have different position information! P-variable on the other hand has “global” character and if it is set once, it is commonly valid in all controller areas.

Using the T-variables is not mandatory but the more layers you have to teach, the more useful these T-variables will become.

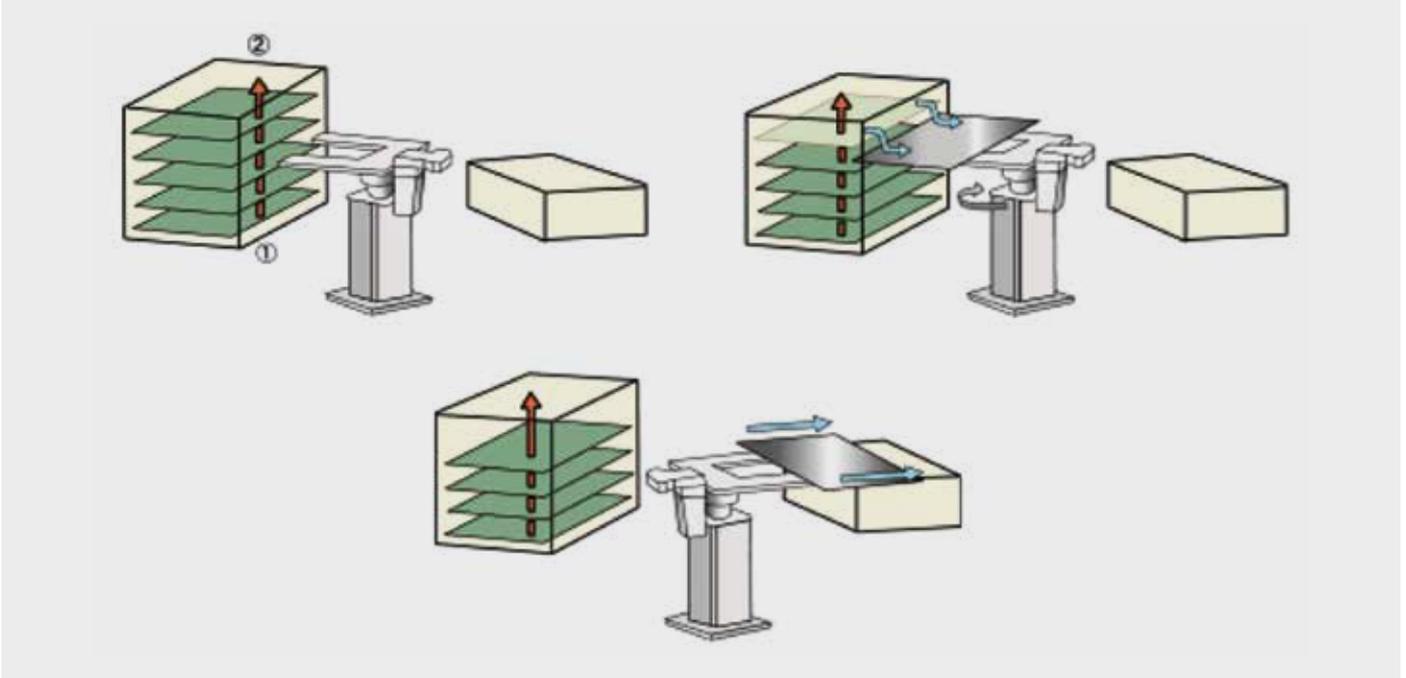
POSITION ADJUSTMENT			
STEP	0005	T0004	
R1 :X	820.000	mm	COORD ROBOT
Y	0.000	mm	TOOL 00
Z	614.000	mm	TYPE OFF
A	0.0000	deg.	
B	0.0000	deg.	
C	180.0000	deg.	
Re	0.0000	deg.	
B1 :X	0.000	mm	
Y	0.000	mm	
Z	0.000	mm	

POINT VARIABLE				
	●:UNUSED	○:RESERVED		
0000	0001	0002	0003	0004
0005	●0006	0020	0030	0040
0050	0060	●0100	○0110	

## KEY BENEFITS

- Simplifies programming on multi-layer seams
- Helps saving memory space
- Substitutes limited P-variables
- Up to 9999 T-variables for each JOB
- Offline editing possible

# Search Continuous Motion (163927)



The “SEARCH FUNCTION IN CONTINUOUS MOTION” holds the data of up to 50 positions where the DX200 detects digital signals from general sensors during job execution while moving over some parts in one line without stopping the motion.

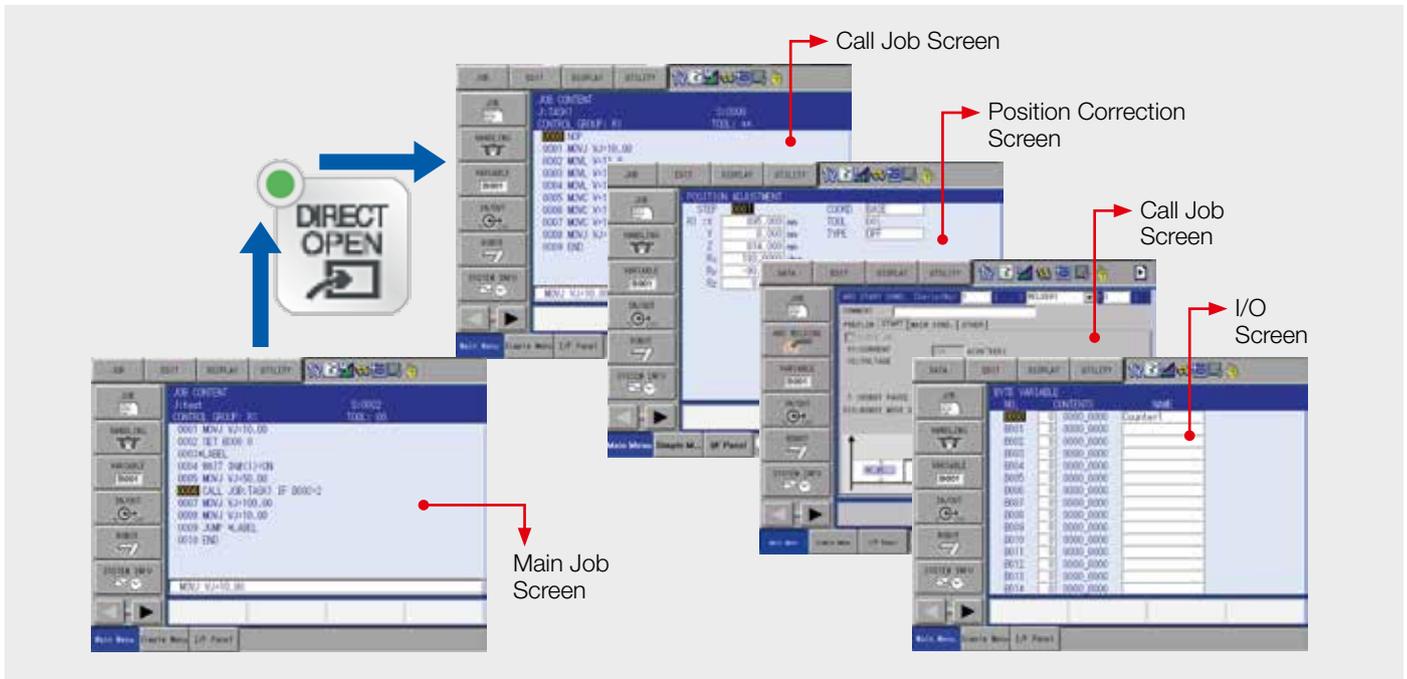
Detects also the up to 50 positions of circular placed parts with an circular movement.

Programs can be simplified, because normal programs require a searching procedure for each work piece, this function allows the robot to search all the work pieces in one line with only one movement and one NSRCHON command which simplifies the program.

## KEY BENEFITS

- Fast possibility to find each position of more parts in one line with only one movement
- Saving cycle time
- Simplified robot job's, saving programming time

# Numerical Input Screen Display with Direct Open (164052)



The numerical input screen function by pushing the direct open key immediately shows the job content screen or condition file contents of a job being called with the call instruction. The registered position data correction screen is also displayed.

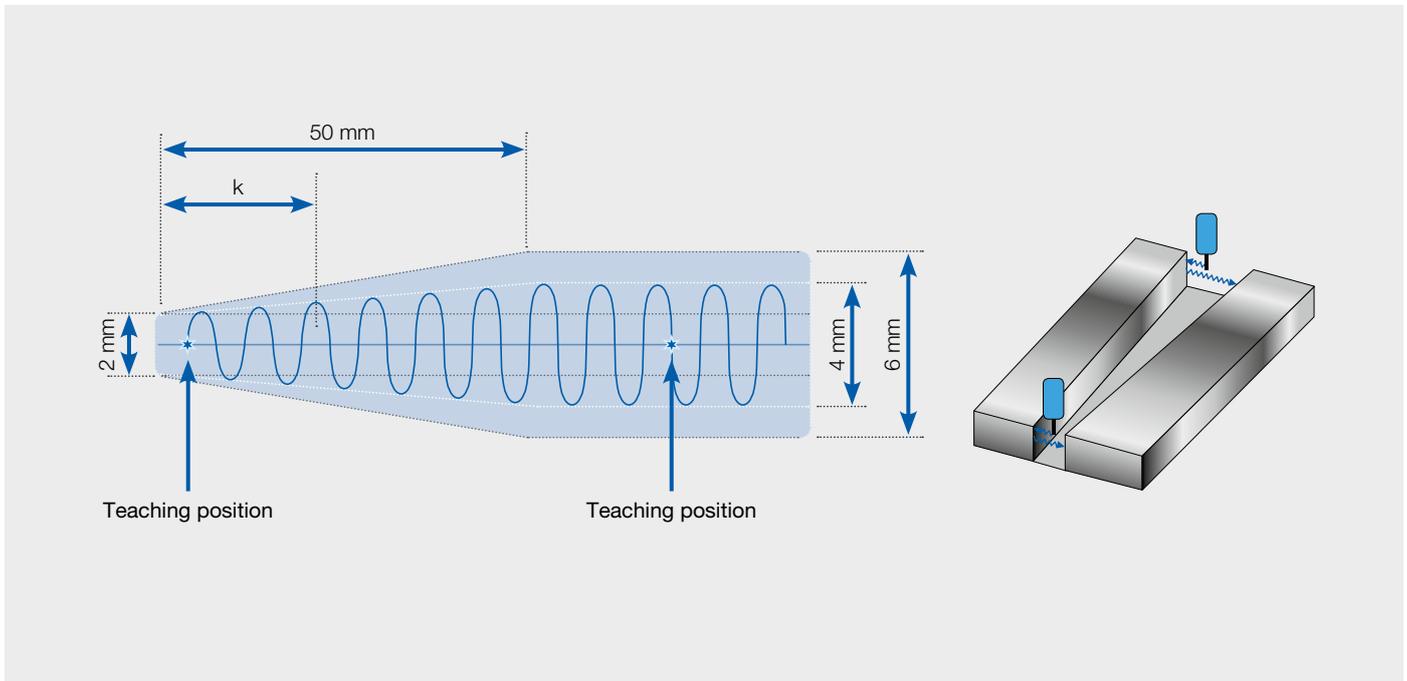
## FUNCTION OVERVIEW

- Job content screen of a job name directly specified by call instruction
- Condition file screen for a file name directly specified by work instruction
- Position correction screen for move instruction with position data
- I/O screen with I/O instruction (when I/O numbers are specified)

## KEY BENEFITS

- Easier and faster online teaching

# Weaving Adjustment (164053)

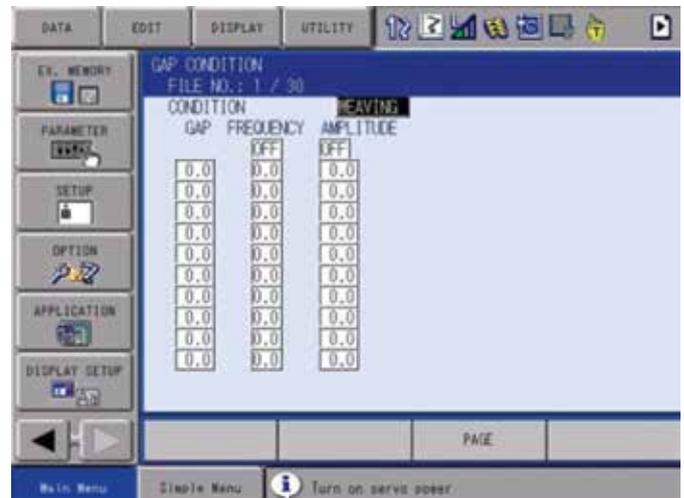


This function can be used to compensate variable conditions in a welding groove by continuous adapting of weaving parameter and speed.

## FUNCTION OVERVIEW

- Weaving amplitude will be continuously increased
- Robot speed and weaving frequency can also be adapted if needed

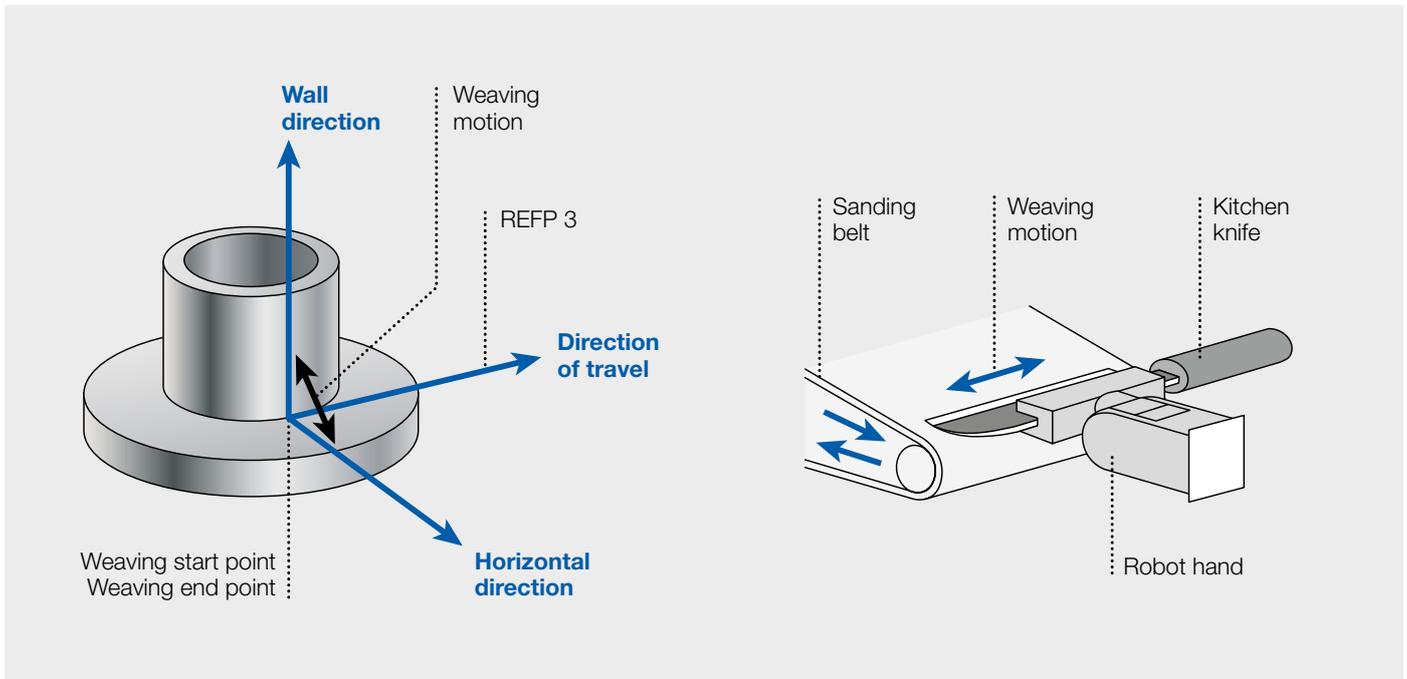
The information about groove conditions can be set manually as constant values, or can be set automatically by measuring device like touch sensor or any other start point detection unit: Please check feasibility in detail with technical department.



## KEY BENEFITS

- Extension of standard weaving function
- Available for application "general" and "arc welding"
- Function is also optional part of adaptive welding routine in MotoEyeLT software (see picture above: gap condition file), if laser seam tracking is used

# Hover Weaving (163918)



The “hover weaving function” is special weaving mode for applications in which robot positions for start-/end-points are the same: During process robot does not move on a trace!

So there's no travel direction for the robot and therefore weaving direction cannot be determined. For these sequences “hover weaving” enables usage of weaving function.

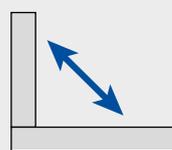
## Left figure: Example for application welding

Workpiece is operated by turn axis, start-/end-position of robot is the same, no synchronized motion.

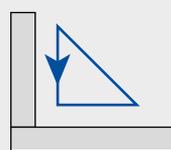
## Right figure: Example for application grinding/polishing

The work piece which is held by the robot arm provides just one position in relation to the grinding belt. Therefore there is no moving direction. Weaving is the only movement.

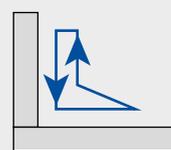
## Various weaving shapes are available:



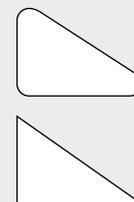
Single



Triangle



L-type



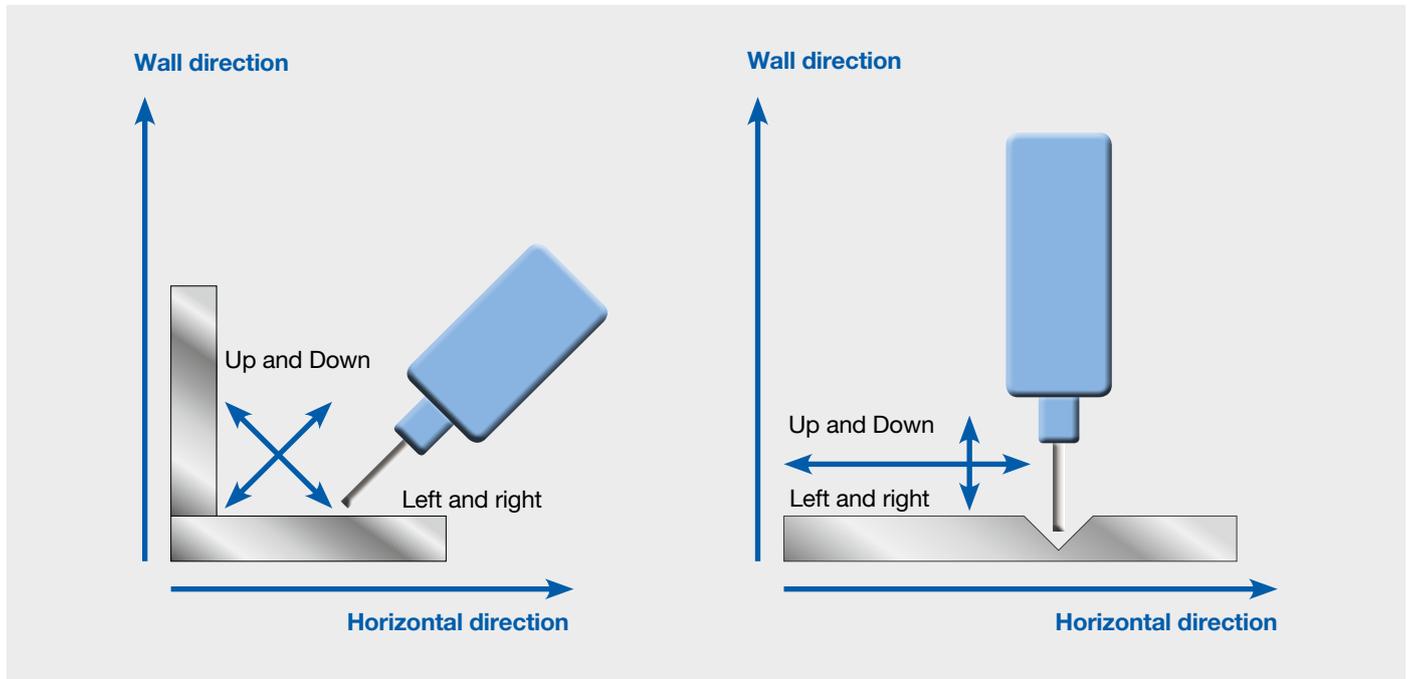
0 : With smoothing

1 : Without smoothing

## KEY BENEFITS

- Expansion of weaving function enables weaving for processes where the robot itself is not doing any movement
- Available for application arc welding and general
- Works also in combination with arc sensor “Comarc”

# COMARC (Multi 163983, Multilayer 163982)



COMARC (arc sensor) is the function with which the robot performs welding while automatically modifying deviation from welding lines based on the variation information of welding current in welding.

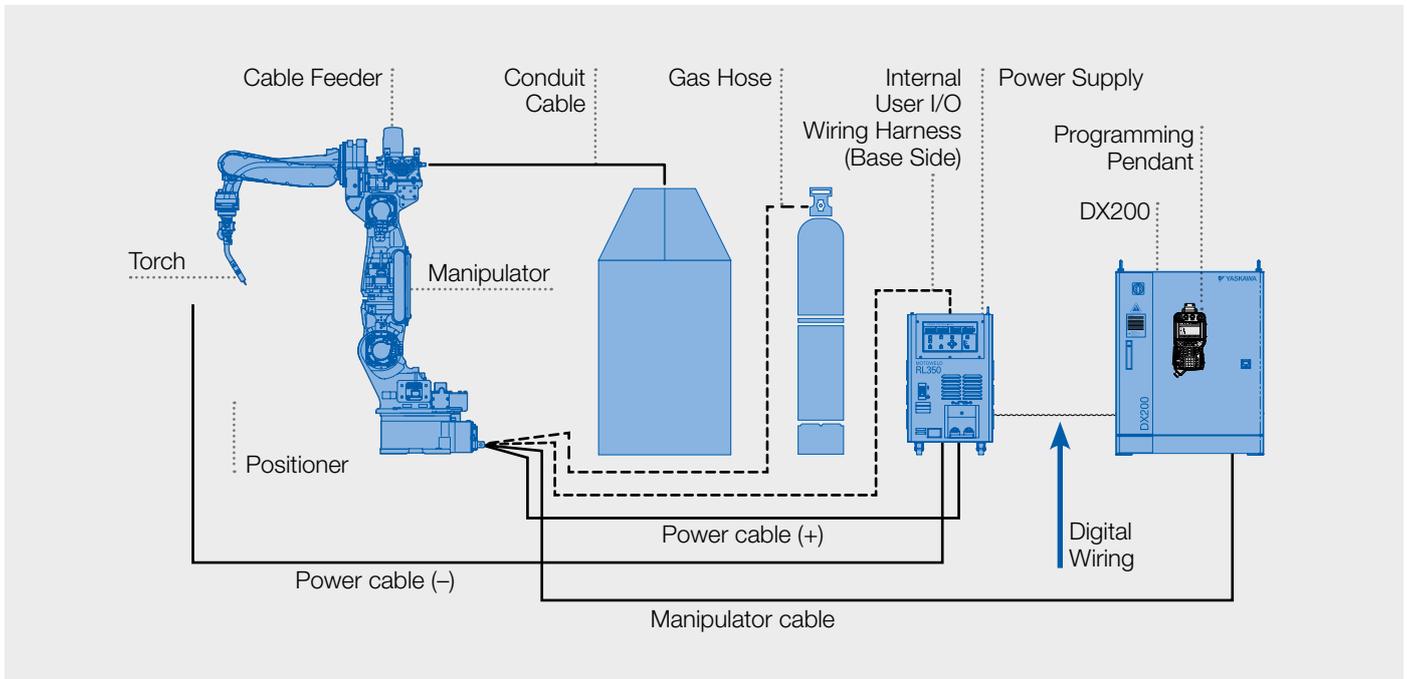
The welding machine with constant voltage characteristic has the property that welding current changes as the distance between the chip and base metal changes. The arc sensor utilizes this property. This information is acquired in the robot side while performing weaving for the welding torch, modification is performed in the horizontal directions of welding lines for the direction of robot movement so that

a current difference between the both sides of weaving is decreased, and simultaneous modification is performed in the vertical directions of welding lines for the vertical directions so that the preset current value is reached.

## KEY BENEFITS

- Modification position in horizontal and vertical direction
- Pass-over Function
- Comarc works only with simple weaving
- No CMT or Aluminum welding!

# ARC-Digital Basic (163982)



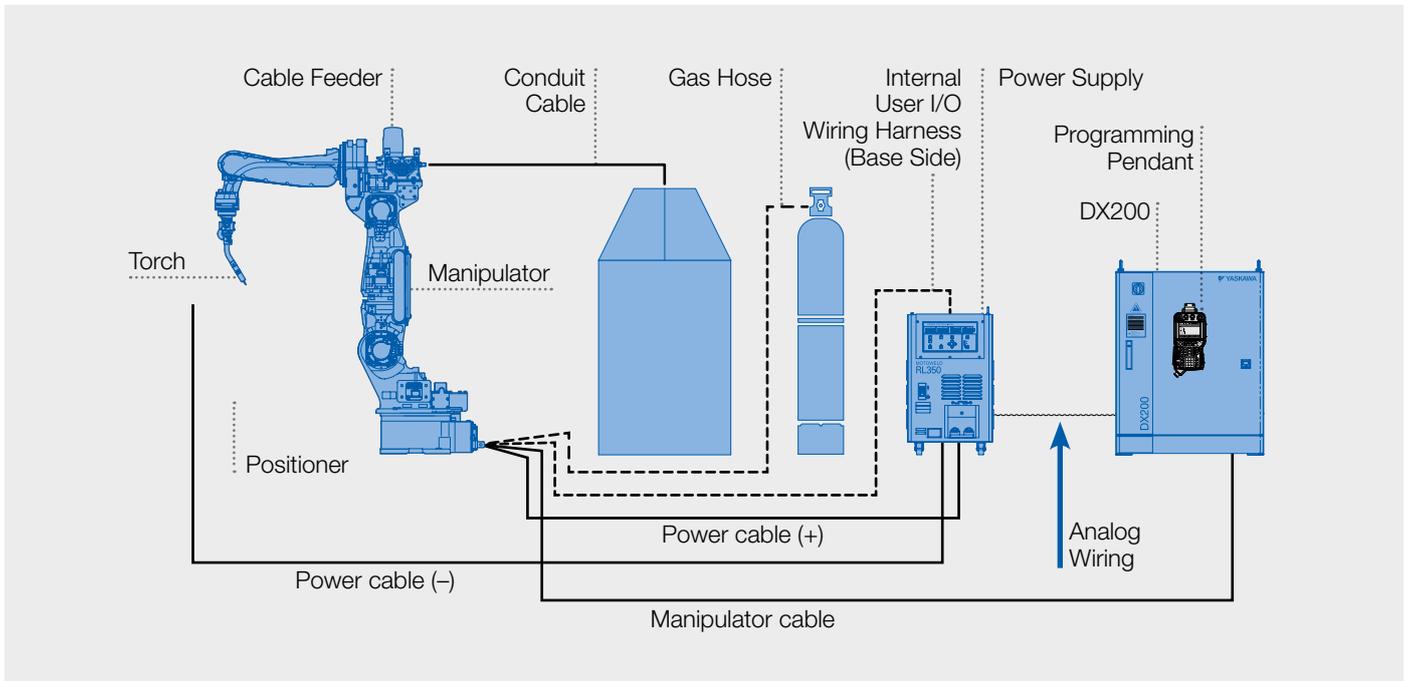
Settings for communication between Controller and Welding- Power-Source with Digital interface.

Input and output assignment can be found in the corresponding CIO-Ladder Manual.

## KEY BENEFITS

- The welding power source of the documentation data can be used
- The welding-specific data is managed by the welding power sources

# ARC-Analog Basic (163958)

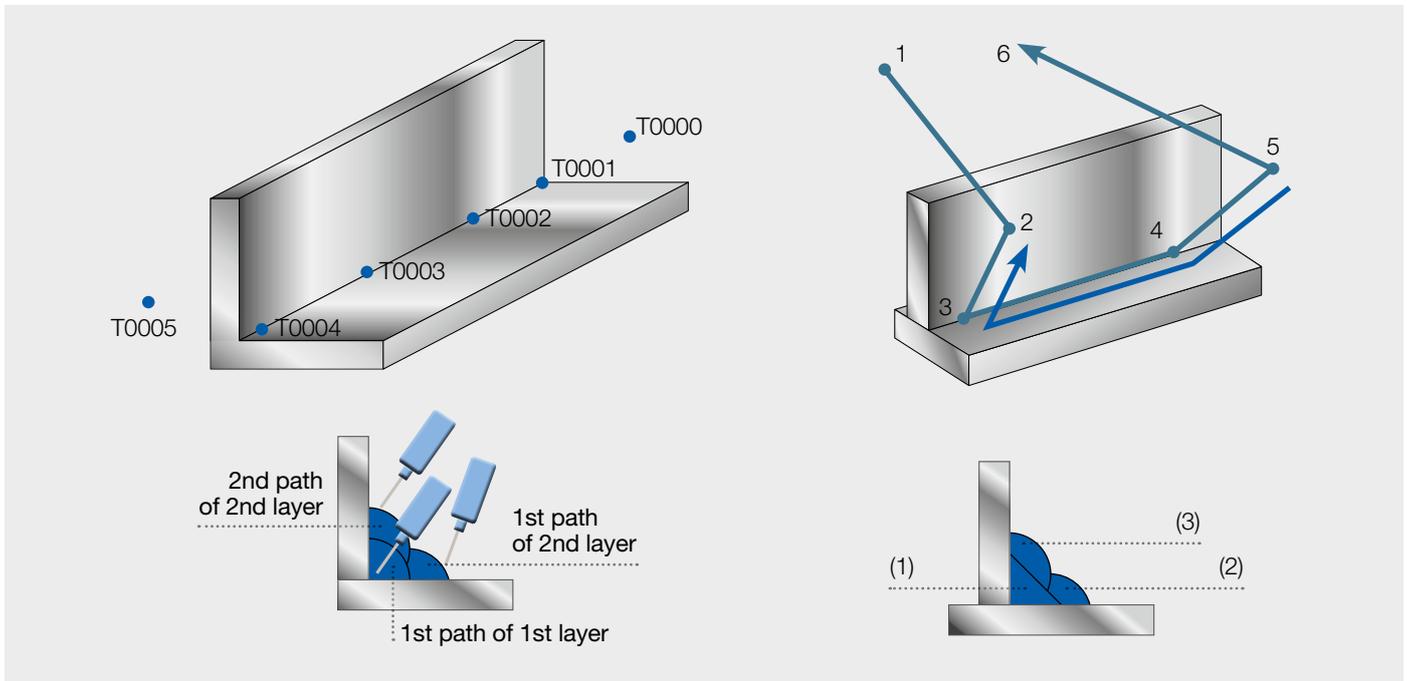


Settings for communication between Controller and Welding-Power-Source with analog interface.

## KEY BENEFITS

- The documentation data can be used by functionality of the controller
- The welding-specific data is managed by the robot controller
- Individual welding parameter can be defined
- ARC-Retry, -Restart, -AntiStick

# Memo Play (163920)



This function is fixed part of Multi-Layer welding package.

It allows to record any robot path.

The path will be stored in files and can be reproduced as often as you want.

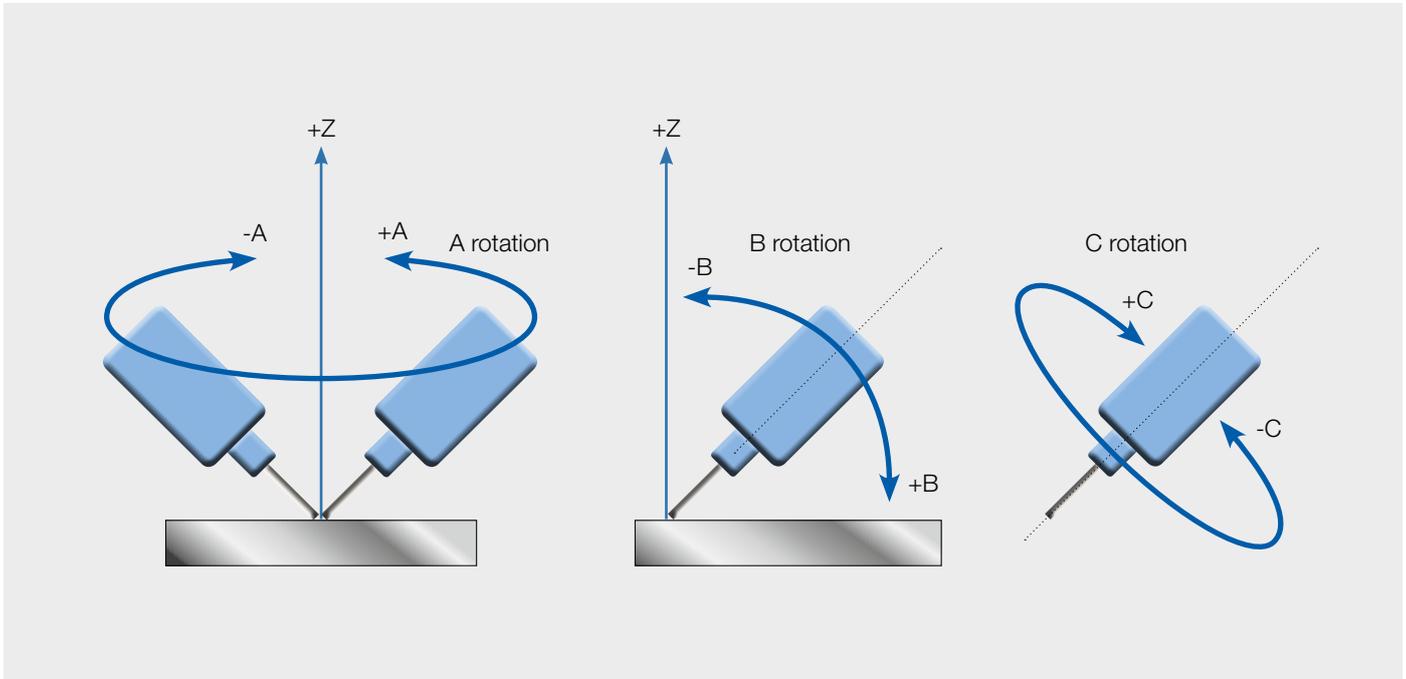
## Example:

- Work piece tolerances or displacements are requesting the use of arc sensor Comarc.
- In the first layer arc sensing will compensate the offsets between taught and current positions. This "new" path will be stored and can be reproduced in all following layers.

## KEY BENEFITS

- Useful function in multi layer welding package
- Instead of Comarc you can also use Laser Tracking sensor with MotoEyeLT for first layer!
- Memory extension mandatory

# Euler Angle (163921)



Euler angle function is fixed part of multi layer welding package. It is special tool coordinate system which follows popular nomenclature of torch angles used within manual welding:

- A-angle:** same as forehand/backhand welding.
- B-angle:** torch orientation in relation to opening angle of welding groove (tendency towards the wall or towards ground plate).
- C-angle:** no meaning for manual welding but robot can additionally use rotation around gas nozzle to get into more suitable position.

Please beware two important points for basic understanding of torch angles according to "Euler": This coordinate system was basically created for fillet seams in horizontal position.

## KEY BENEFITS

- Part of multi-layer package
- Tool coordinates like commonly used for manual welding
- Beware restrictions caused by non-rectangular and 2D character
- Same multi-layer design repeatable at any workpiece position

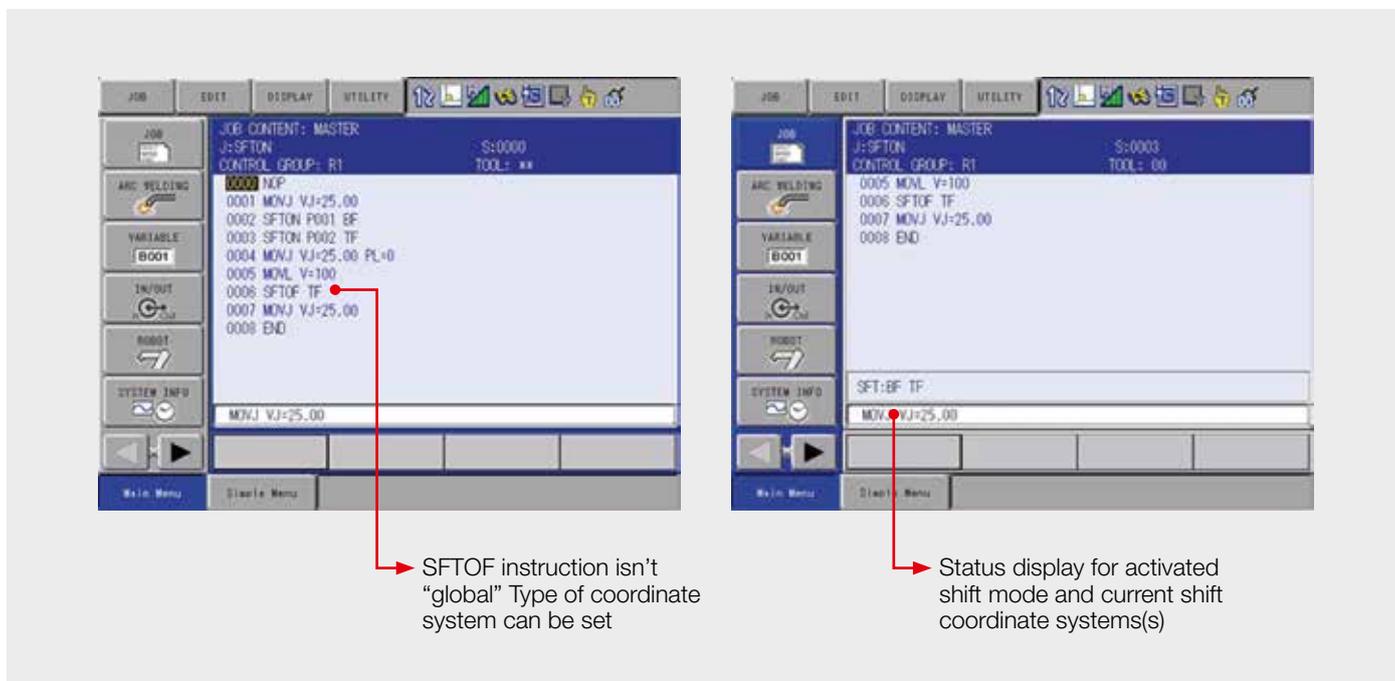
**Caution:** Only under these conditions the function can work properly!!! All other positions will miss a correct calculation for Z-direction which is related to world's Z-coordinate (please refer pictures).

Jog operations sometimes become complicated because Euler doesn't work like rectangular coordinate system. The picture below shows that xyz-direction is only 2-dimensional plane! Programmer has to get used to this situation.

The behaviour is the same all over the robot's "world" and is used to perform same multi layer designs at different work-piece positions in the cell (including rotation around z-axis).

This means that a multi-layer design which was set once, can be repeated at any position in your cell as often as wished (restrictions above must be considered).

# Special Shift (163922)



This function will only effect, if SHIFT-instruction is used!

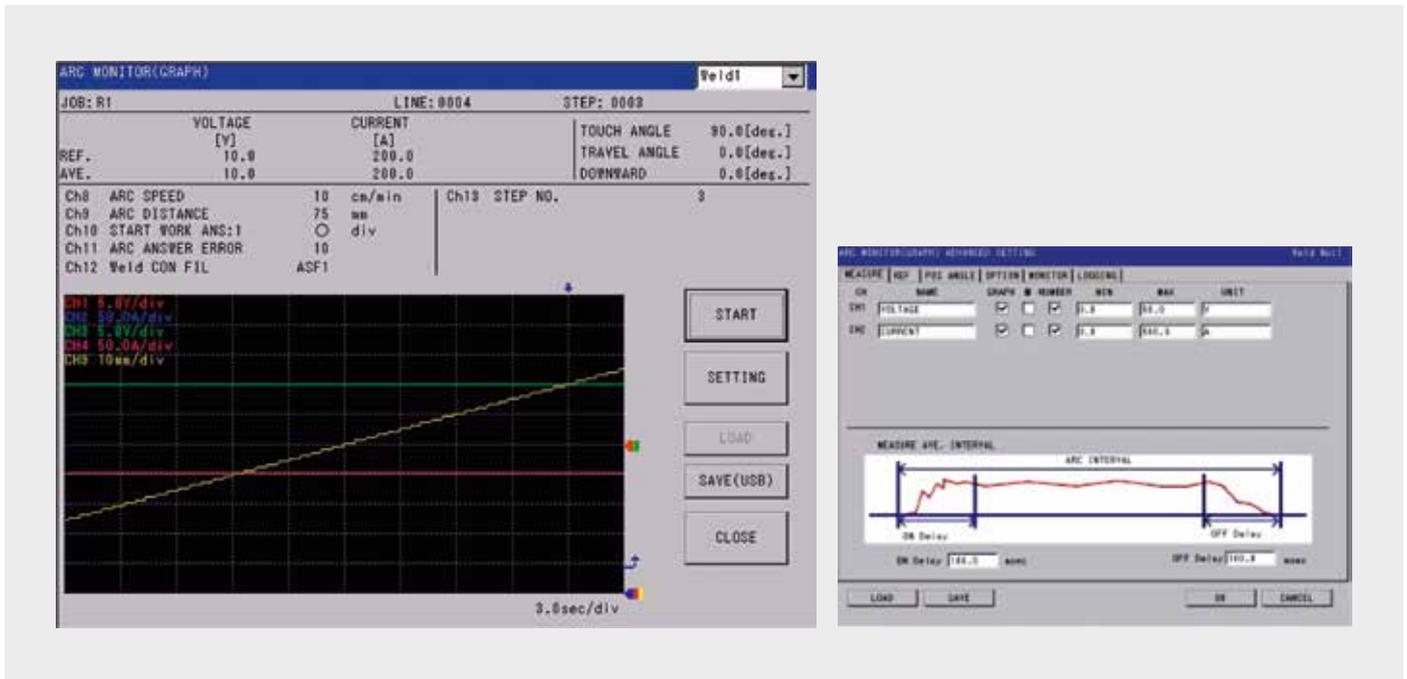
It eases and expands the SHIFT instruction performance. If shift instruction is used with different coordinate systems at the same time this function should be compulsory (for example MultiLayer-function)!

The additional features are shown in pictures above.

## KEY BENEFITS

- Useful expansion for any SHIFT-programming structure
- Easier and more comfortable use of SHIFT-function
- Use it wherever overlay of shift values in different coordinate systems becomes necessary

# Graphical Arc Monitoring (163946)



The graphical arc monitoring function consists of the following functions:

- Monitoring function
- Logging function

The Graphical Arc monitoring function samples the arc-welding related data and shows it on the programming pendant as a graph and numeric values. This function can also set the sampling data as a trigger and start displaying the data, and save the memory data of the definite period of time continuously in the external memory unit in the order of time scales.

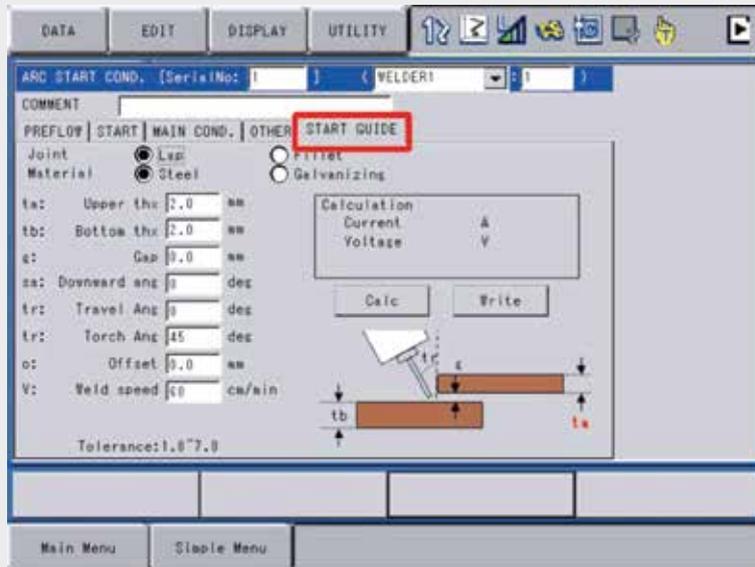
And also this function can save the sampling data of the welding condition and others in the external memory unit automatically apart from the arc monitor graph window.

Only for Analog Power sources and YASKAWA Weldcom interfaces.

## KEY BENEFITS

- Better visualization – Show information by numeric values and graph
- Storable by external memory

# Welding Condition Guide (168316)



“Welding condition guide” is a function that calculates the current value and the voltage by using the welding conditions, such as the welding position and the joint, and sets the values into the displaying arc start condition file.

The calculated current value and voltage by the welding condition guide are estimated value.

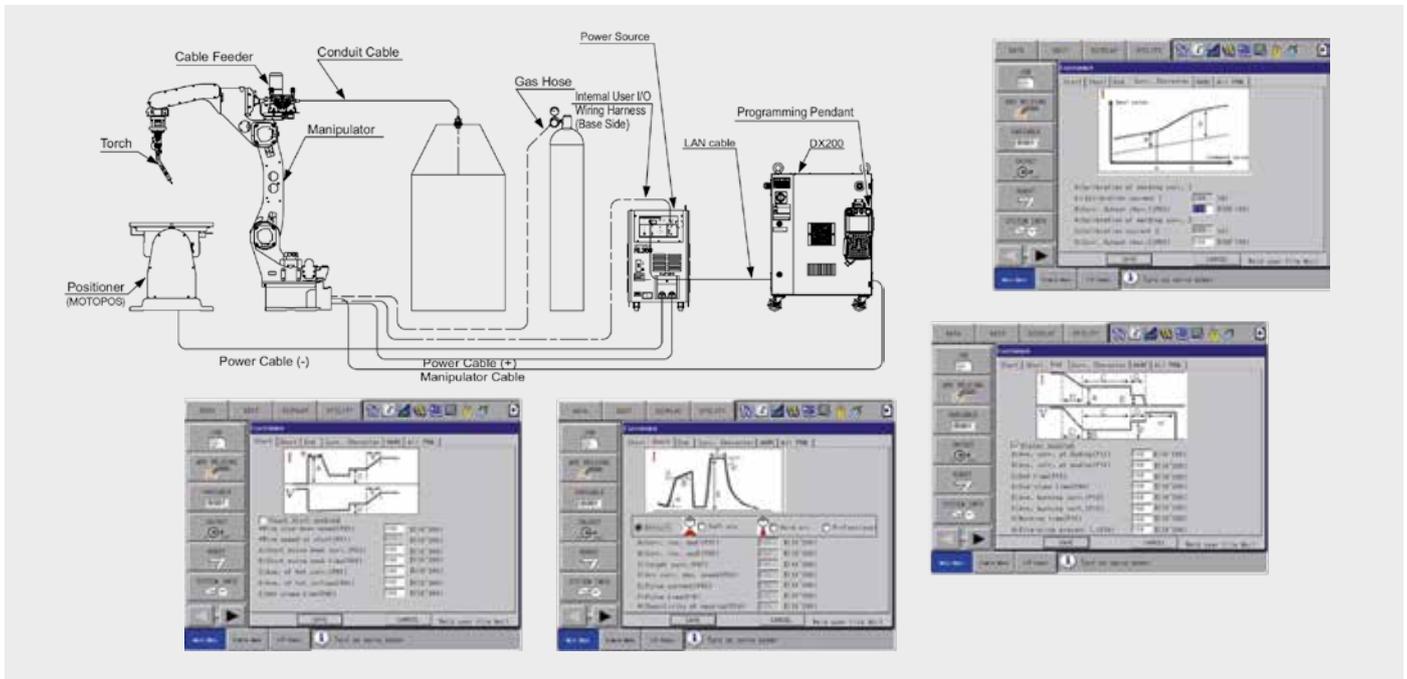
The welding condition guide may not to reach the optimal condition because of the differences, such as a real material, wire stickout, gas or welding waveform. Therefore, adjust the conditions while confirming the weld bead by performing the actual welding.

Support for analogue controlled welding power sources.

## KEY BENEFITS

- Easily find and adjust welding parameters
- Helpful to adjust the welding positions

# ARC-Weldcom MotoWeld (169454)



Settings for communication between Controller and Welding-Power-Source with Ethernet interface.

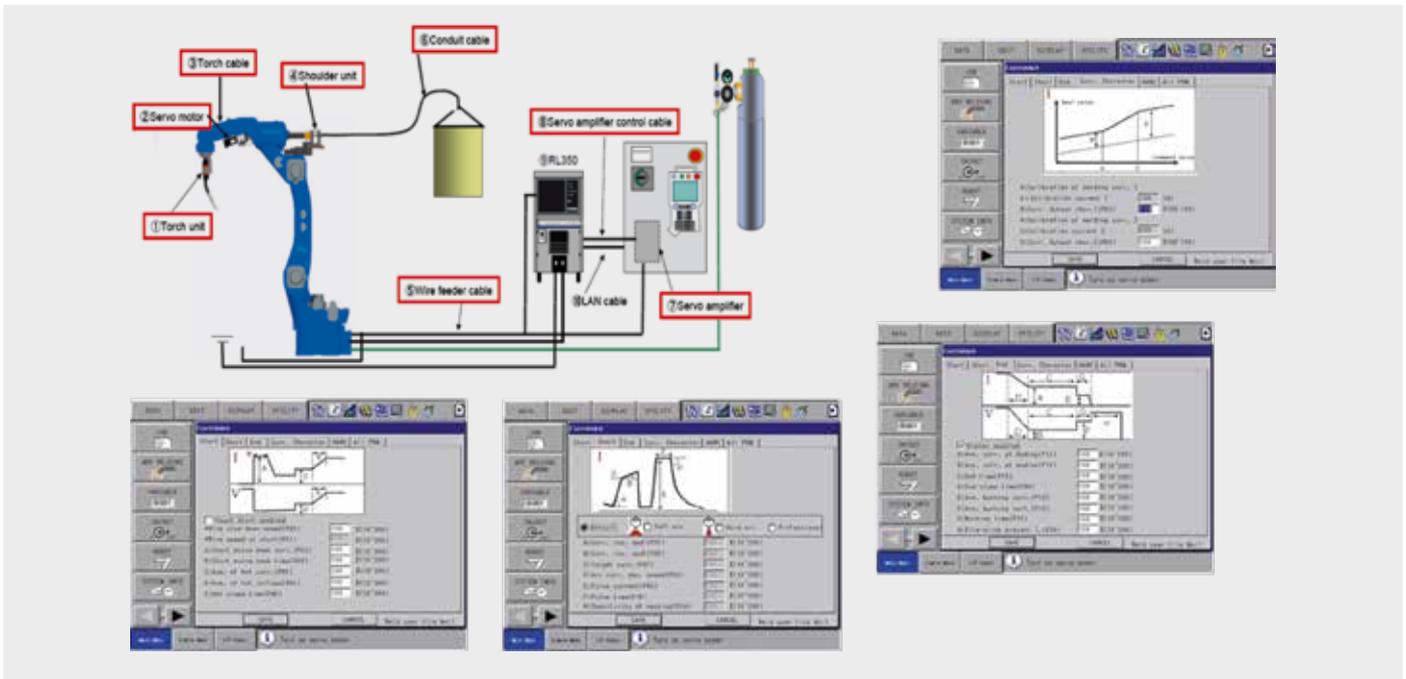
The WELDCOM function can use Motoweld welding power sources (e.g. RL350) for connection.

The WELDCOM function serves as a digital interface that communicates via Ethernet with an arc welding power source. The function provides high data rate transmission between DX200 and the welding power source, enables the welding power source parameter to be set from the programming pendant, and monitors graphically welding current and voltage during welding.

## KEY BENEFITS

- Welding power source parameter controlled by programming pendant

# ARC-Weldcom MotoWeld Plus (170307)



MotoWeld Plus is designed for MOTOPAC WL200+ welding equipment package (Servo Torch).

MotoWeld RL350 welding power source along with a servo wire feeder provide advanced welding process with low spatter (EAGL process).

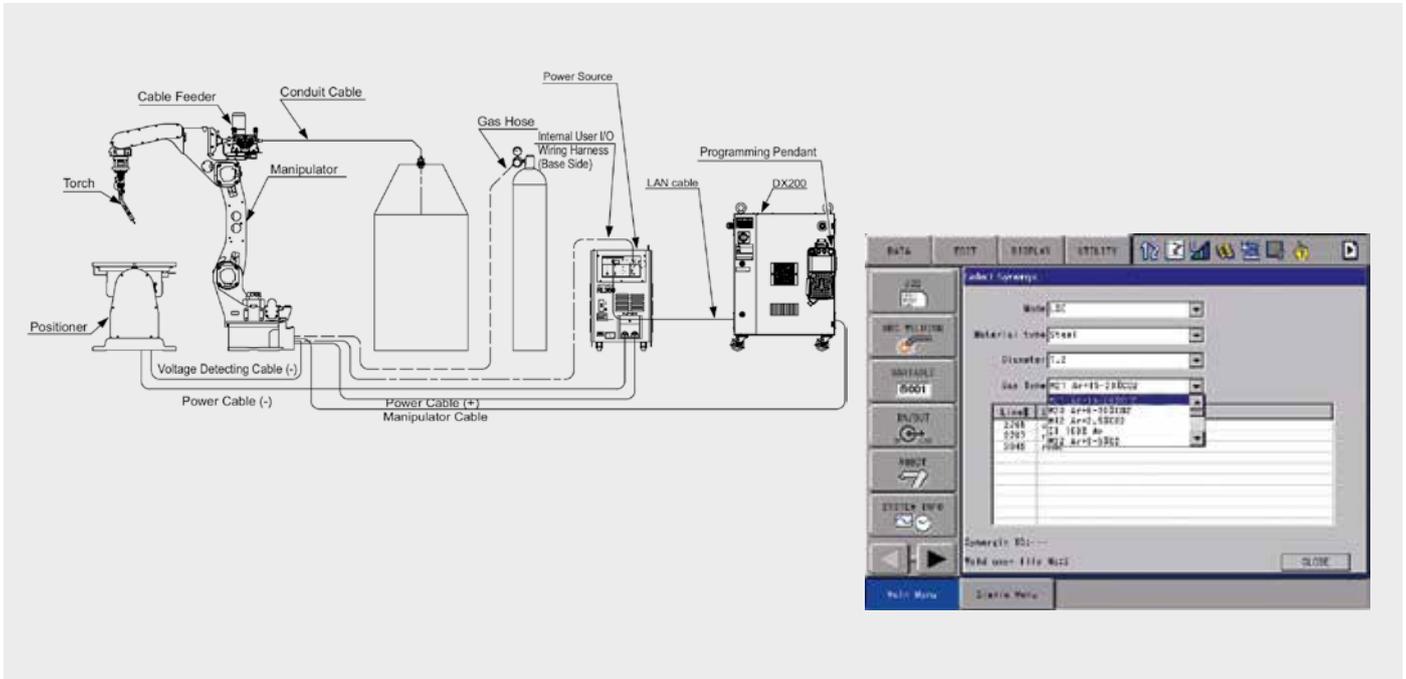
Settings for communication between Controller and Welding-Power-Source with Ethernet interface.

The WELDCOM function serves as a digital interface that communicates via Ethernet with an arc welding power source. The function provides high data rate transmission between DX200 and the welding power source, enables the welding power source parameter to be set from the programming pendant, and monitors graphically welding current and voltage during welding.

## KEY BENEFITS

- Welding power source parameter controlled by programming pendant
- MotoWeld RL350 power source and servo wire feeder enable low spatter welding process (EAGL process)

# ARC-Weldcom 2 – Fronius (181774)



The WELDCOM 2 function serves as a digital interface that communicates via Ethernet with an arc welding power source. The function provides high data rate transmission between DX200 controller and the welding power source, enables the welding power source parameter to be set from the programming pendant and monitors graphically welding current and voltage during welding.

The WELDCOM 2 function can use the **Fronius TPSi welders only** for connection.

## KEY BENEFITS

- Welding power source parameter controlled by DX programming pendant
- Selection of power source characteristics
- Welding in MIG/MAG synergic mode as well as in Fronius job mode possible

# TCP Control Adjust – Basic for ARC (Q-Set Basic) (164056)



## Visual torch inspection and TCP adjustment function

The YASKAWA “TCP Control Adjust – Basic for ARC” (Q-Set Basic) is a visual torch inspection and TCP adjustment function for MOTOMAN welding robots. An inspection program is executed at regular intervals to check the wire position on the torch. In this way the contact tip can be checked for accurate positioning and wear and the wire quality (twist).

The robot enters the testing device with a torch in such a way that it interrupts two laser light beams with the wire, while keeping the torch intact.

If the tool is deformed, then at least one of the laser light barrier isn't interrupted. In that case either an alarm can be displayed and the cause of the error can be fixed by the operator, or the automatic measurement of the torch can be started.

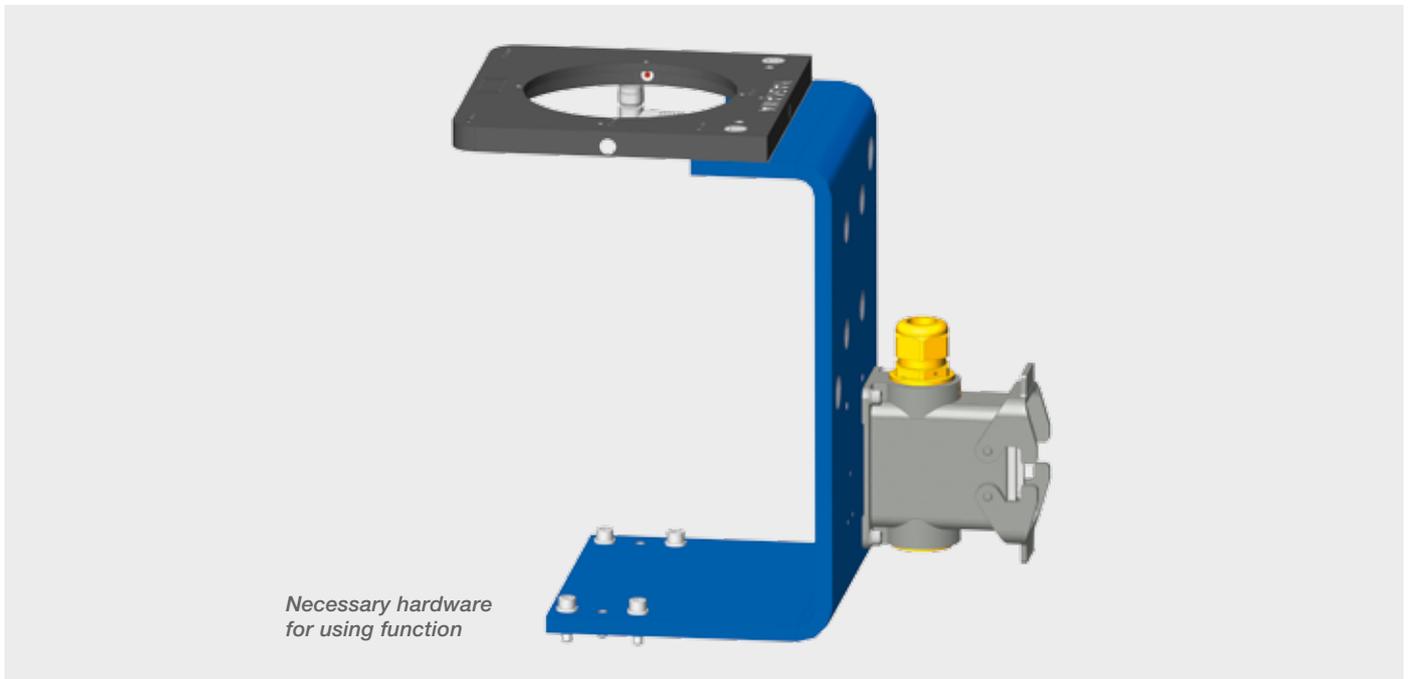
## KEY BENEFITS

- Quality assurance
- Higher availability through early detection of wear on the torch
- Torch check in regular intervals
- Automatic program correction after collision
- Automatic TCP adjustment after torch change
- Automatic tool-angle correction (optional)
- Automatic correction of the Tool-data
- Error message if the maximum deviation of the TCP is exceeded

In case of the automatic measurement and correction of the programs, the torch (wire) is measured with the light beams in X, Y and also in Z direction by means of a special robot program.

The new tool data is now used to convert and to correct all programs as a Relative Jobs. If the maximum permissible torch deviations are exceeded, an error message is displayed.

# TCP Control Adjust – Basic for General (Q-Set General Basic) (186453)



## Visual tool inspection and TCP adjustment function

The YASKAWA “TCP Control Adjust – Basic for General” (Q-Set General Basic) is a visual tool inspection and TCP adjustment function for MOTOMAN robots. An inspection program is executed at regular intervals to check the tool position. In this way the tool can be checked for accurate positioning.

The robot enters the testing device with the tool in such a way that it interrupts two laser light beams, while keeping the tool intact.

If the tool is broken or deformed, then at least one of the laser light barrier isn't interrupted. In that case either an

alarm can be displayed and the cause of the error can be fixed by the operator, or the automatic measurement of the tool can be started.

In case of the automatic measurement and correction of the programs, the tool is measured with the light beams in X, Y and also in Z direction by means of a special robot program.

The new tool data is now used to convert and to correct all programs as a Relative Jobs. If the maximum permissible tool deviations are exceeded, an error message is displayed.

## KEY BENEFITS

- Quality assurance
- Higher availability through early detection of wear on the tool
- Tool check in regular intervals
- Automatic program correction after collision
- Automatic TCP adjustment after tool change
- Automatic correction of the Tool-data
- Error message if the maximum deviation of the TCP is exceeded

# TCP Control Check – Basic for ARC (Q-Set Basic Check) (170951 für FSU)



## Visual torch inspection function

The YASKAWA “TCP Control Check – Basic for ARC” (Q-Set Basic Check) is a visual torch inspection function for MOTOMAN welding robots. An inspection program is executed at regular intervals to check the wire position on the torch. In this way the contact tip can be checked for accurate positioning wear and the wire quality (twist).

The robot enters the testing device with a torch in such a way that it interrupts two laser light beams with the wire, while keeping the torch intact.

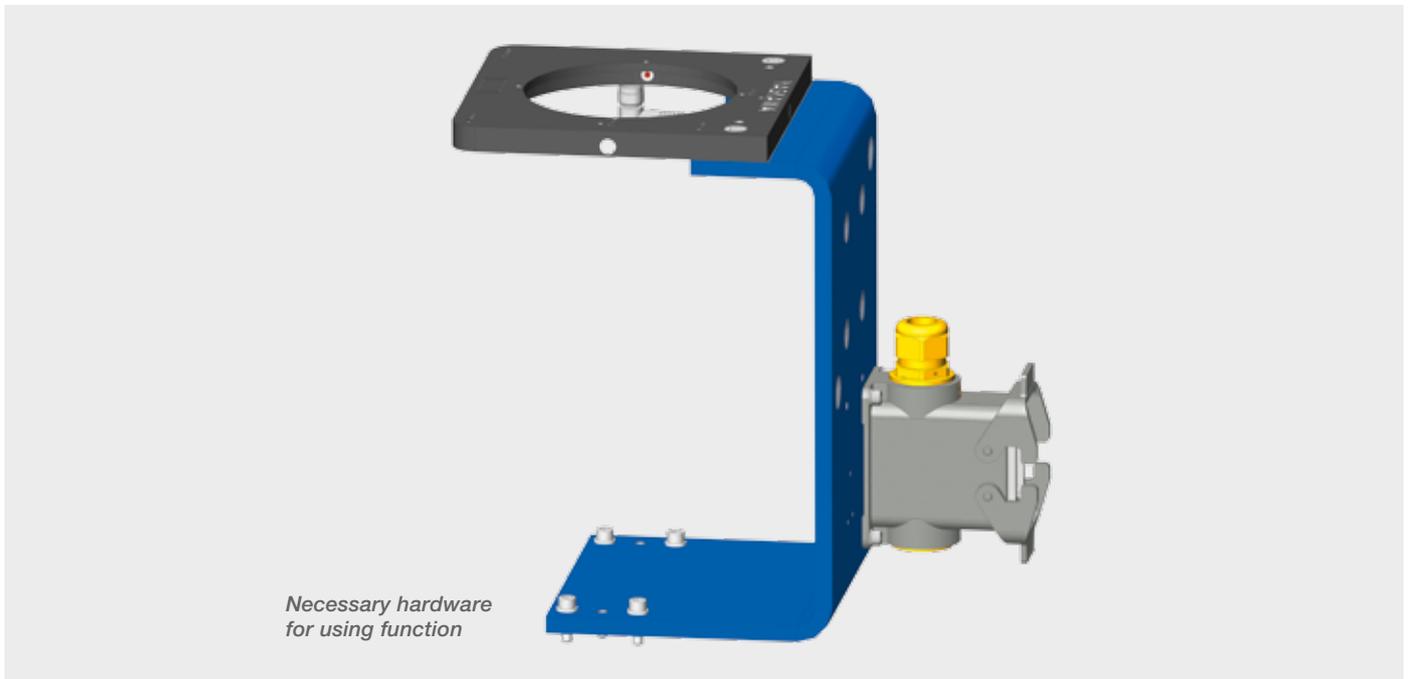
In case of the automatic measurement of the programs, the torch (wire) is measured with the light beams in X, Y and also in Z direction by means of a special robot program.

If the torch is deformed, then at least one of the laser light barrier isn't interrupted. In that case either an alarm can be displayed and the cause of the error can be fixed by the operator.

## KEY BENEFITS

- Quality assurance
- Higher availability through early detection of wear on the torch
- Torch check in regular intervals
- Error message if the maximum deviation of the TCP is exceeded

# TCP Control Check – Basic for General (Q-Set General Check) (172835)



## Visual torch inspection function

The YASKAWA “TCP Control Check – Basic for General” (Q-Set General Check) is a visual tool inspection function for MOTOMAN robots. An inspection program is executed at regular intervals to check the tool position. In this way the tool can be checked for accurate positioning and detection of tool breakage and the wear on the tool.

The robot enters the testing device with the tool in such a way that it interrupts two laser light beams, while keeping the tool intact.

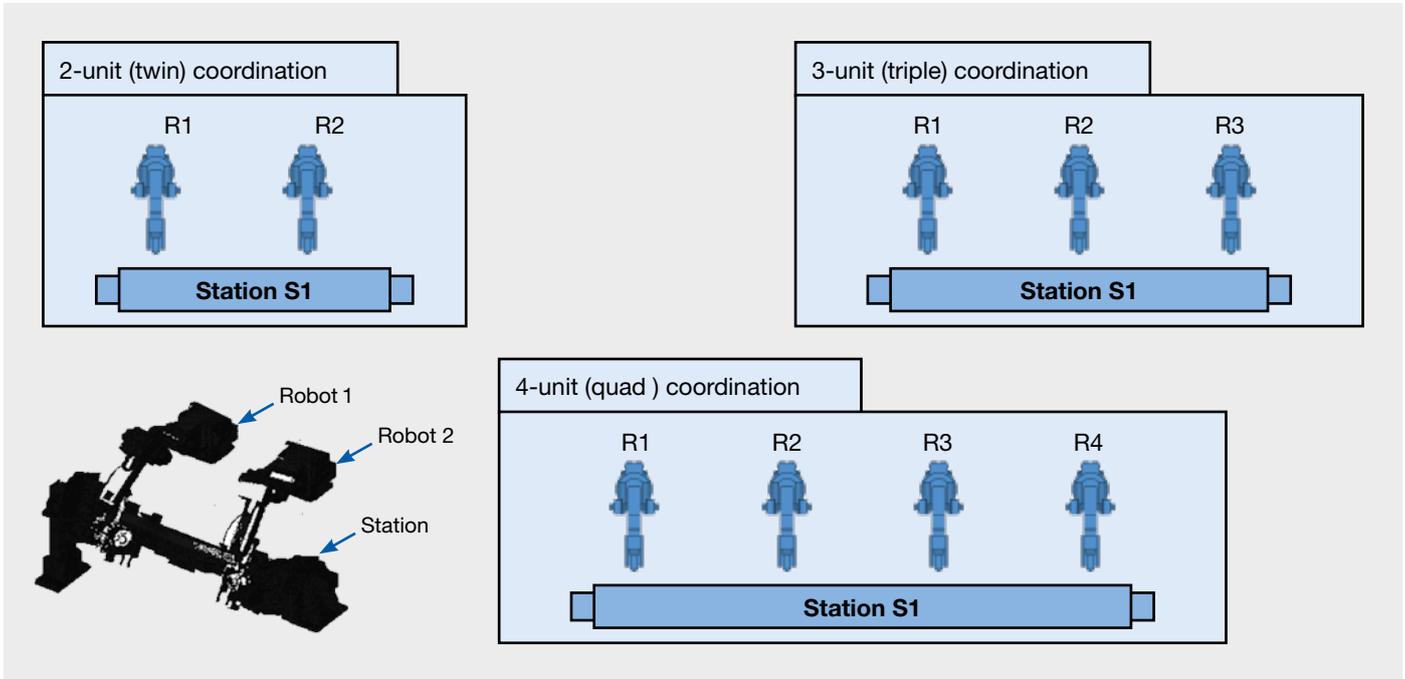
In case of the automatic measurement, the tool is measured with the light beams in X, Y and also in Z direction by means of a special robot program.

If the tool is broken or deformed, then at least one of the laser light barrier isn't interrupted. In that case an alarm can be displayed and the cause of the error can be fixed by the operator.

## KEY BENEFITS

- Quality assurance
- Higher availability through early detection of wear on the tool and tool breakage
- Tool check in regular intervals
- Error message if the maximum deviation of the TCP is exceeded

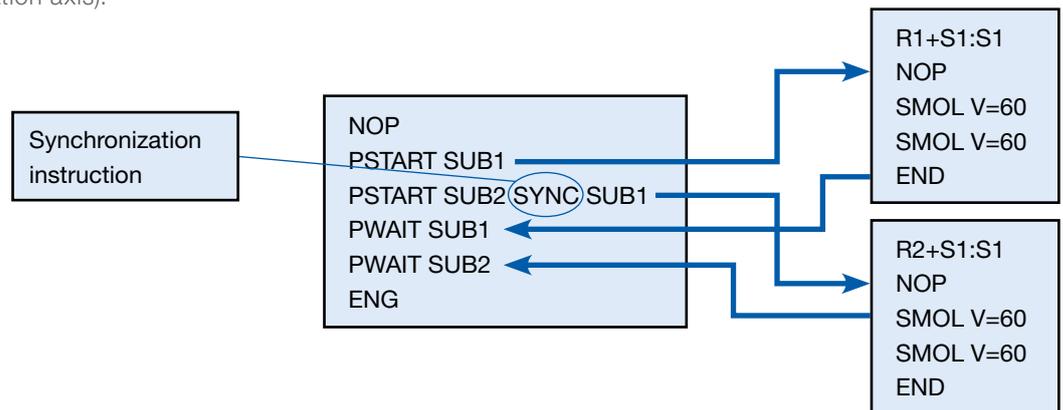
# Station Twin/Triple/Quad (164057)



System by which 2-unit (twin), 3-unit (triple), or 4-unit (quad) manipulators perform operation in coordination with one station.

This function is suitable for applications such as welding the right and left ends of a lengthy work piece.

This function enables two or more robots to simultaneously control the interpolation operation and relative speed that are relative to one station (rotation axis).

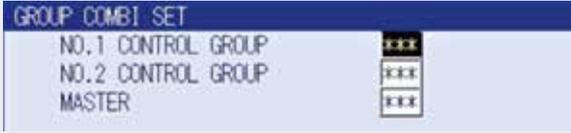


## KEY BENEFITS

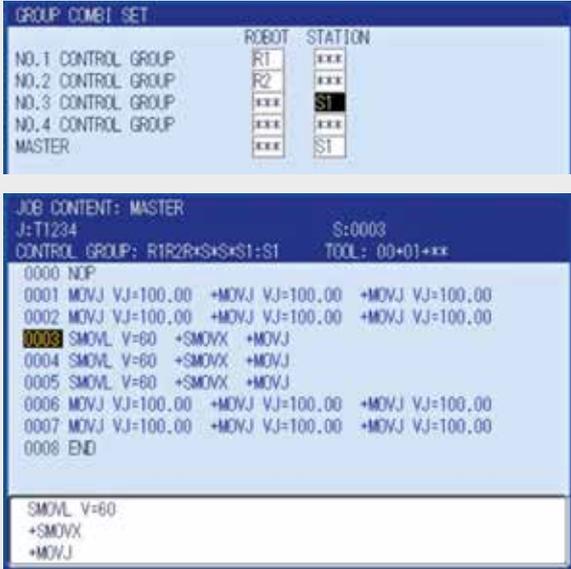
- Improved welding quality + reduced tact time when changing jig posture (for welding)
- Reduced teaching time
- Reduced work for wiring and I/O check
- Easy security for teaching when using two or more robots
- Capable of smartly constructing program using coordinated/independent functions

# Advanced Control Group (163929)

Standard Setting



Advanced control group active



In Standard Setting two group axes can be combined into one job. With this function up to 4 group axes can be combined into one job.

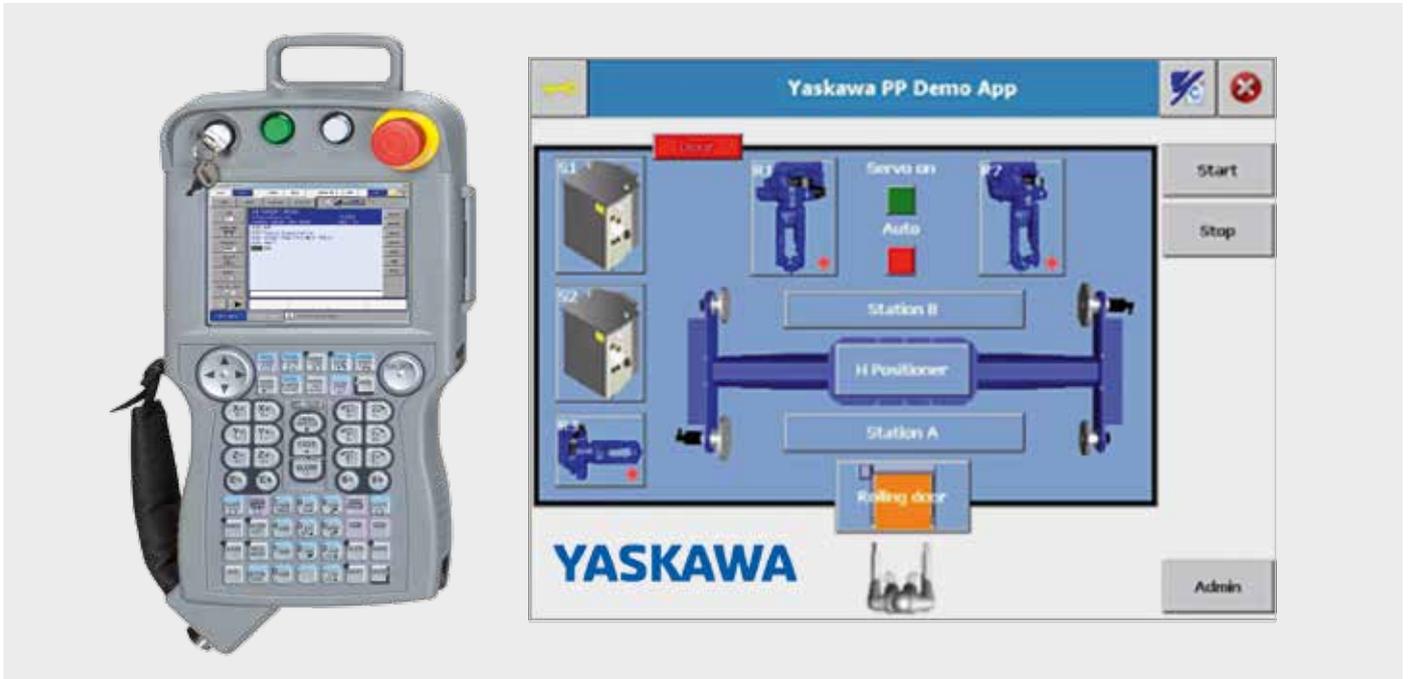
This function can be used to reduce parallel tasks (PSTART).

Axis group change in JOB HEADER is then not possible.

## KEY BENEFITS

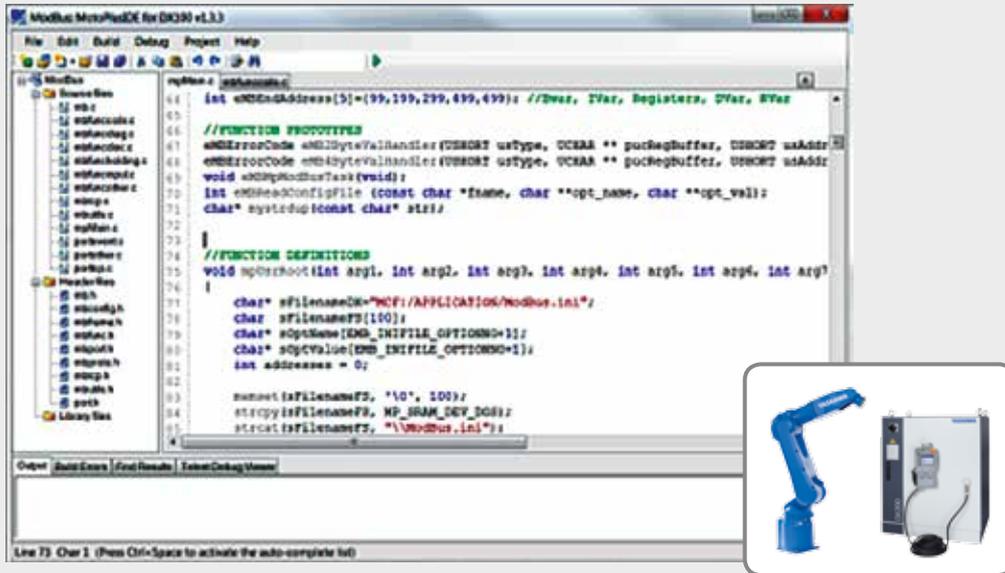
- Reduce parallel task (PSTART)
- Simple job structures
- The job maintenance is simplified

# PP Customization Runtime (164064)



This is a parameter. For further information please take a look at page 111 Advanced PP Customized Runtime.

# MotoPlus Runtime (164065)



The MotoPlus runtime is required for running applications built with the MotoPlus SDK. The SDK provides a complete programming environment for creating applications based on the C language that are executed onto the controller. The SDK provides access to the following APIs:

- Task Control API
- Network API
- Serial Communication API
- System Monitor/Control API
- Motion Monitor/Control API
- Sensor API
- File API

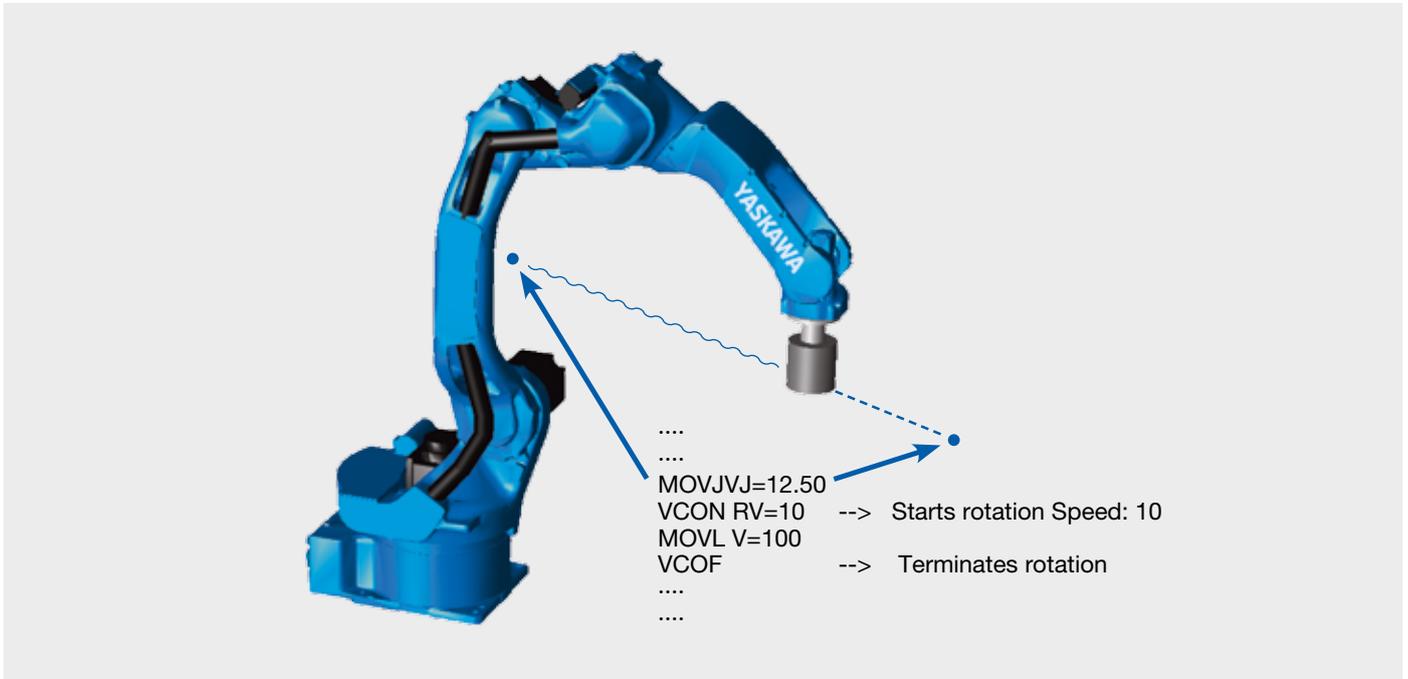
## KEY BENEFITS

- Required to run applications built with the MotoPlus SDK
- Run multiple MotoPlus applications per controller
- Runtime license required for each controller
- MotoPlus SDK for developing applications

## OPTIONAL SOFTWARE

- MotoPlus SDK – Development environment for creating MotoPlus applications
- 164071\_F-Paket DX200 MotoGSI – MotoGSI is a development package for creating communication interfaces on job basis

# T-axis Speed Control (163899)



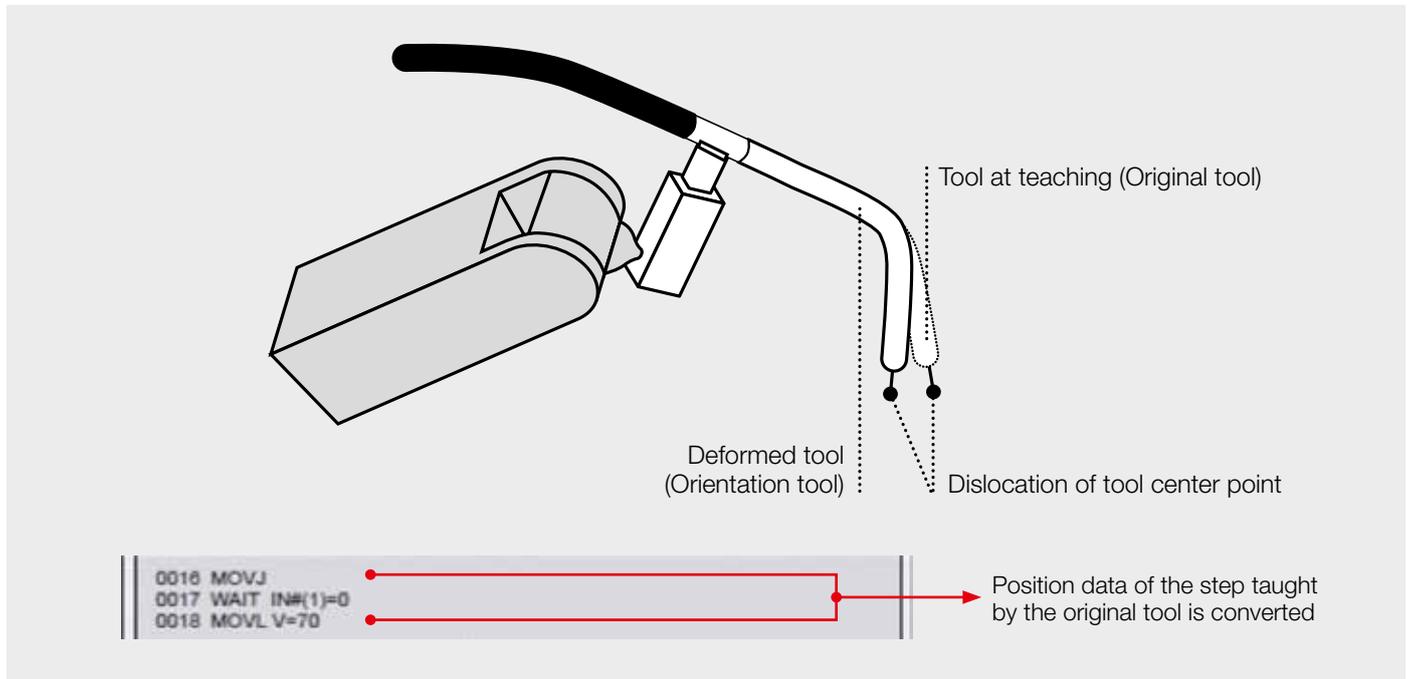
This function continuously rotates T-axis, the tip axis of the manipulator, according to the specified rotational speed.

Continuous rotation is not possible in the normal position control method because the operating range of the T-axis is limited. However, this function allows for continuous rotation regard less of the limited operating range.

## KEY BENEFITS

- Teaching time can be reduced.
- Working efficiency can be improved.
- The T-axis can be continuously rotated with the robot interpolated by the move instruction

# PMT (163906)



“PMT function” easily and accurately modifies positional data if the tool is deformed. (PMT: Position Modification for Tool deformation: position data modification function for tool deformation).

If the tool accidentally collides with a surrounding jig or wall and is deformed, the control points are shifted. As a result, teaching positions in the job that has been taught are also shifted.

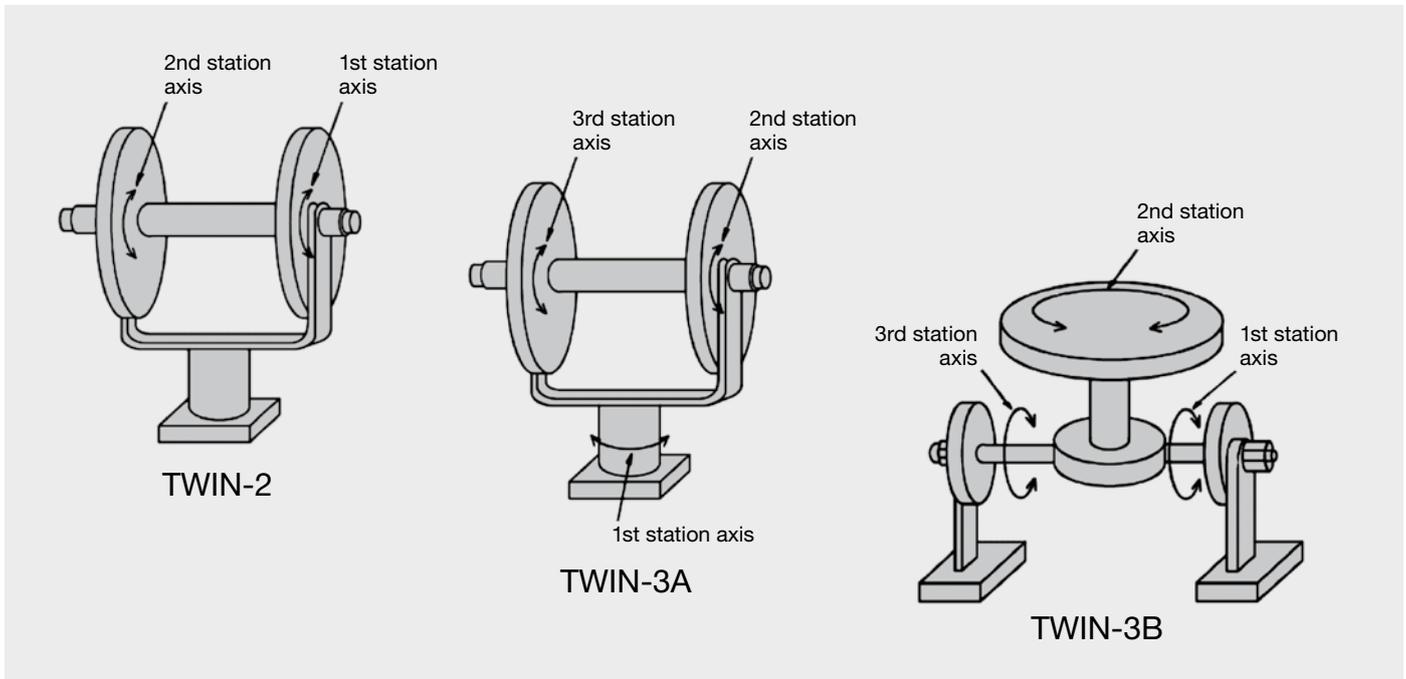
PMT function allows time and works for modifying the shift to be reduced. When a job is specified, the position data of the tool dimensions before the deformation (during teaching) is automatically converted to the position data of the tool dimensions after the deformation.

The tool before modification is called the old tool, and the tool after the deformation is called the new tool in PMT function.

## KEY BENEFITS

- Time and work for teaching modification can be reduced. Teaching modification work can be efficiently performed because position data can be automatically converted from the old tool to the new one.
- Storing tool data record can easily restore original tool data. The original tool data can be easily restored because the change record of the tool constant can be checked in the “Tool Backup” window.

# Twin Drive (163914)



If an axis with a large load is controlled by one motor in configuring station axes for welding applications or others, a large-capacity motor must be selected because of lack of motor capacity and torque. In that case, the station axis becomes large, which may cause a problem in installation space.

Where by, the axis with a large load may be controlled by two motors to compensate for lack of motor capacity and torque.

In such a system, however, two motors must be simultaneously operated.

The "Twin drive function" enables the station sub-axis motor to operate simultaneously with the station main-axis motor during teaching in such a case where the station is operated by two motors.

The following use requirements must be satisfied:

1. The same motor is used for the twin drive configuration axis.
2. The mechanism specification and motor specification on station axes are set in the same condition.

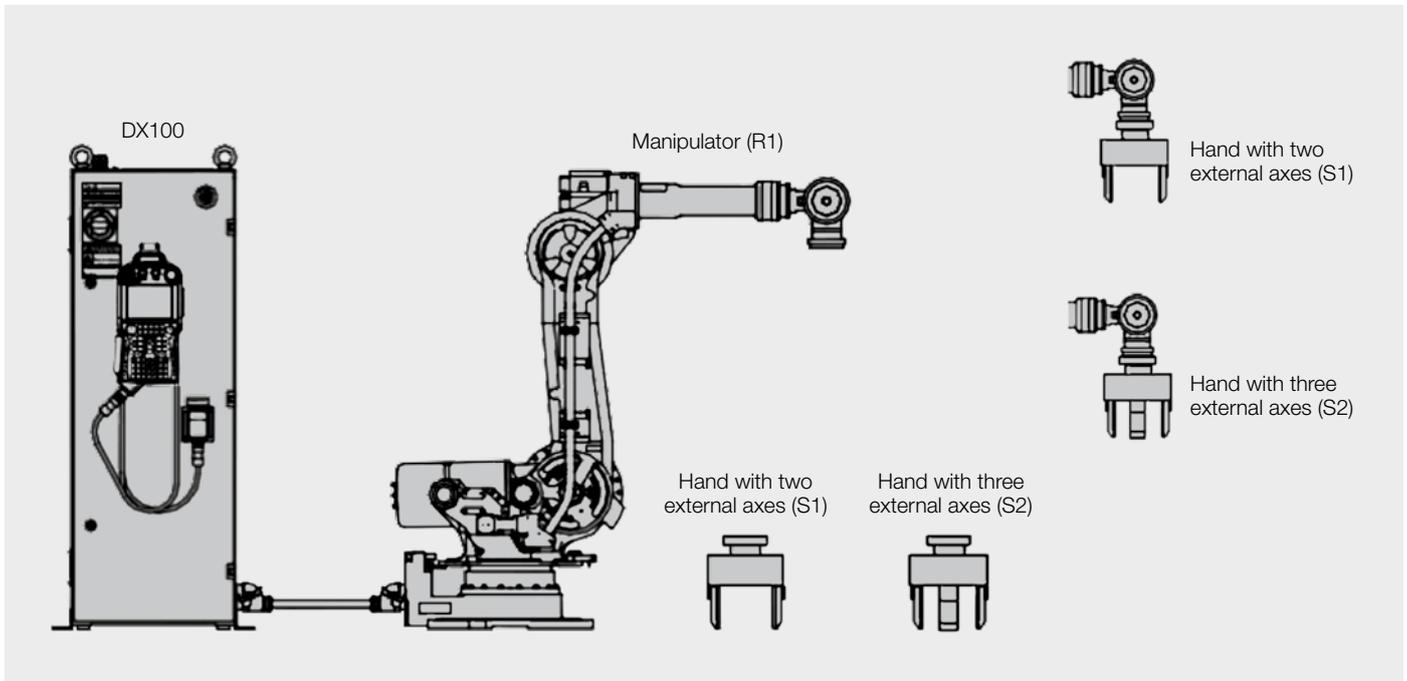
There are two operation modes of the station axis during teaching as follows:

1. Simultaneous operation mode
2. Single operation mode

## KEY BENEFITS

- Useful for heavy load positioners
- Long distance between head- and tailstock
- System space-saving installation. Because a large station axis can be controlled by two motors with relatively low capacity, system installation takes up less space.
- When selecting simultaneous operation mode during teaching, just pressing the control key for the main axis will simultaneously move the sub axis, which can reduce teaching time to half.

# Group Change Function (163931)

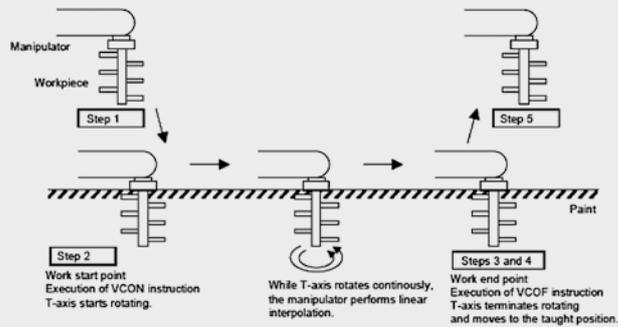


The group change function attaches/detaches a tool with multiple external axes. This function changes with the special instructions (CHUCK/UNCHUCK) more than one tool (such as gripper) with external axes. Using one robot with more than one tool changed allows works to be performed for various types of work pieces. The group change function improved work efficiency. In combination with ATC (Auto Tool Changer), the tool can be quickly changed by one instruction ("GRPCHG" instruction) to improve working efficiency.

## KEY BENEFITS

- Diversified robot work
- Improved work efficiency
- Quick Change for tools with external axes

# Speed Control (174457)



Line	Step	INFORM Instruction	Explanation
0000		NOP	
0001	0001	MOVJ VJ=12.50	Moves to the waiting point.
0002	0002	MOVJ VJ=12.50	Moves to the work start point.
0003		VCON ROBOT=1 JOINT=6 RPM=1000	Starts rotation of the T-axis of the manipulator 1. Rotation speed: 10.00 [rotation/min]
0004		TIMER T=0.50	Waits for rotation to start.
0005	0003	MOVL V=100	Moves to work end point by linear interpolation at 100.0 [mm/sec].
0006		VCOF ROBOT=1 JOINT=6	Terminates rotation.
0007	0004	MOVJ VJ=12.50	Moves T-axis to the taught position.
0008	0005	MOVJ VJ=12.50	Moves to the waiting point.
0009		END	

With the speed control function, the T-axis, the end tip axis of the manipulator, or the external axis (hereinafter referred to as the speed control axis), can be continuously rotated according to the specified rotation speed.

During the continuous rotation, the rotation speed of the speed control axis is independently controlled. When operating the manipulator with the speed control function, the speed control axis rotates at the specified speed disregarding teaching while other axes operate as taught.

## KEY BENEFITS

- Teaching time can be reduced.
- Working efficiency can be improved.
- The speed control axis rotates at the specified speed disregarding teaching

# IO Speed Control (177899)

The screenshot shows two instances of the 'IO SPEED CONTROL SETUP' screen. The top instance has 'DIRECT' selected under 'SPECIFIED ROTATION'. The bottom instance has 'LEVEL' selected, showing a list of rotation speeds from 100 rpm to 800 rpm. Two callout boxes provide additional information:

- Top Callout:** Set the universal input signal number to perform the rotation instruction.
- Bottom Callout:** For specifying the rotation speed, select from the following methods:
  - DIRECT: Specify the rotation speed between – 32,768 to 32,767 rpm with using 2 groups of universal input signal.
  - LEVEL: Select from 8-level rotation speeds by the signal conditions. Each rotation speed of 8 levels can be specified by the setting file respectively.

This is a function which performs the speed control operation of the external axis with using user input signals.

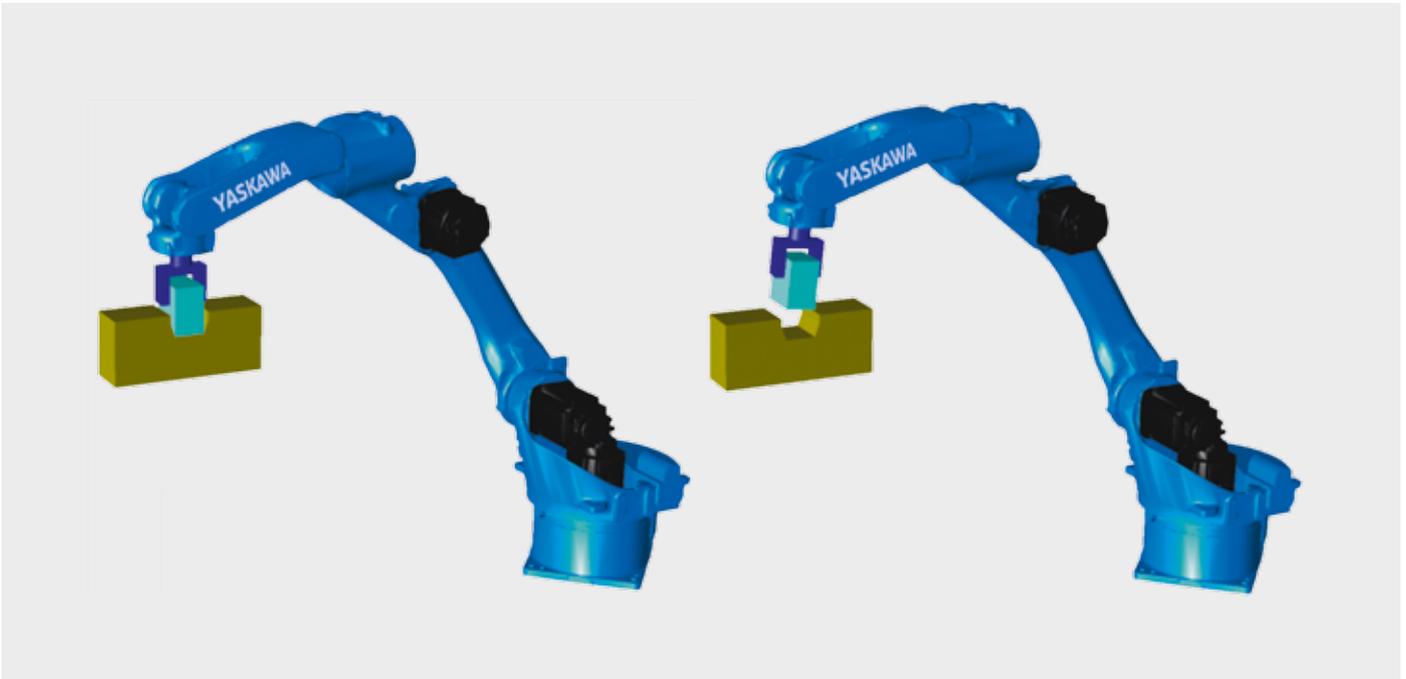
The external axis can be continuously rotated according to the specified settings.

Without executing the speed control command by a job, the speed control operation of the external axis can be operated by inputting an external signal. It can be used for controlling the pump axis mainly used for painting.

## KEY BENEFITS

- Teaching time can be reduced
- Tact time can be reduced
- Working efficiency can be improved
- The speed control axis rotates at the specified speed by IO signals

# Link Servo Float (163911)



The servo float function controls not only the position of the robot but both the position and force of the robot. Normally, even if an outer force is applied to the robot, the robot tries to maintain the current position and does not move because only the robot position is controlled. In that case, the servo float function provides flexible control on the position and posture of the robot, in response to the force applied from outside. It allows to overwrite (reteach) robot positions under consideration of current shift-values.

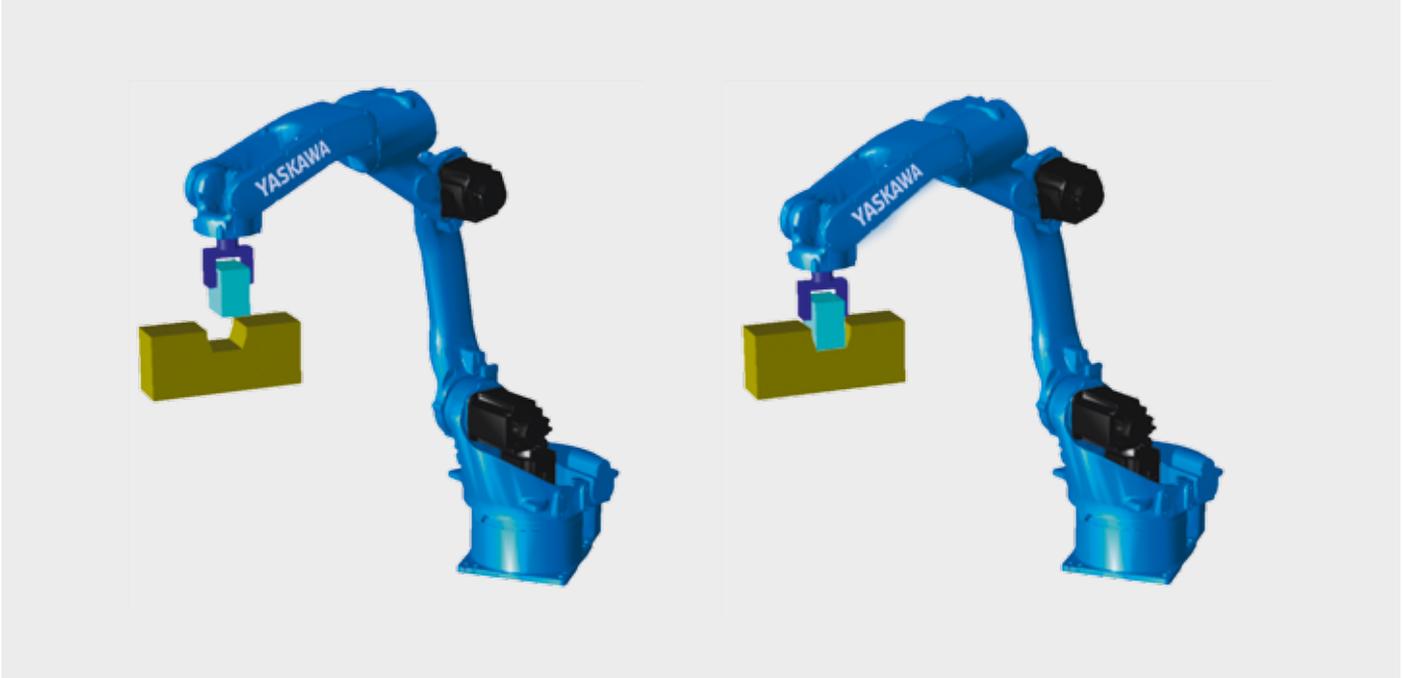
## Link Servo Float function

This function performs the servo float for each axis of the robot, for every robot separately. This function is used when a force is applied only to a specific axis or when the servo float is applied to all axes of the robot because the direction in which the force is applied cannot be identified.

## KEY BENEFITS

- No additional hardware is required
- **Link Servo Float Function**  
Can be activated by programmer for each axis or all together

# Link and Linear Servo Float (163912)



The servo float function controls not only the position of the robot but both the position and force of the robot. Normally, even if an outer force is applied to the robot, the robot tries to maintain the current position and does not move because only the robot position is controlled. In that case, the servo float function provides flexible control on the position and posture of the robot, in response to the force applied from outside. It allows to overwrite (reteach) robot positions under consideration of current shift-values.

## Link Servo Float function

This function performs the servo float for each axis of the robot. This function is used when a force is applied only to a specific axis or when the servo float is applied to all axes of the robot because the direction in which the force is applied cannot be identified.

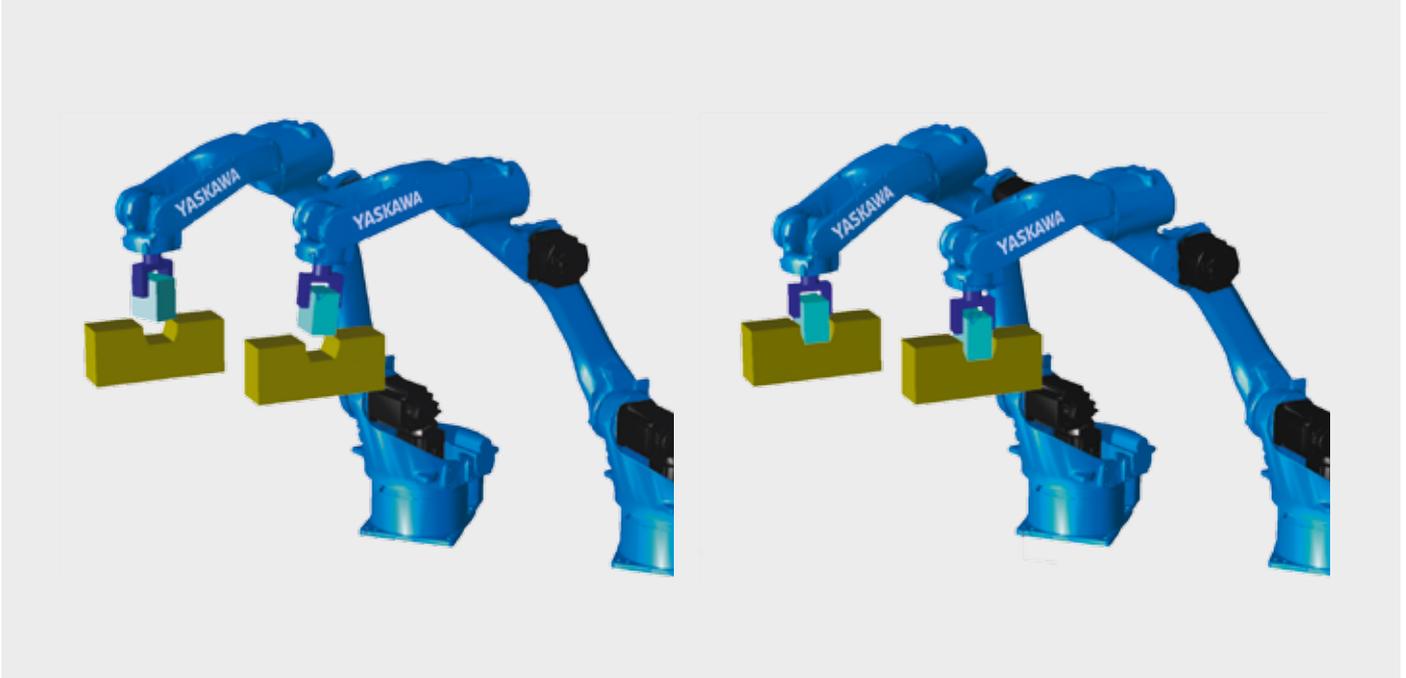
## Linear Servo Float function

This function performs the servo float for each coordinate axis of coordinate systems such as the robot coordinate, base coordinate, base coordinate, user coordinate, and tool coordinate. This function is used when the force is applied only to the specific direction of each coordinate system.

## KEY BENEFITS

- No additional hardware is required
- **Link Servo Float function**  
Can be activated by programmer for each axis or all together
- **Linear Servo Float function**  
Can be activated by programmer for each coordinate system in each direction

# Link Servo Float Multi Robot (167527)



The servo float function controls not only the position of the robot but both the position and force of the robot. Normally, even if an outer force is applied to the robot, the robot tries to maintain the current position and does not move because only the robot position is controlled. In that case, the servo float function provides flexible control on the position and posture of the robot, in response to the force applied from outside. It allows to overwrite (reteach) robot positions under consideration of current shift-values.

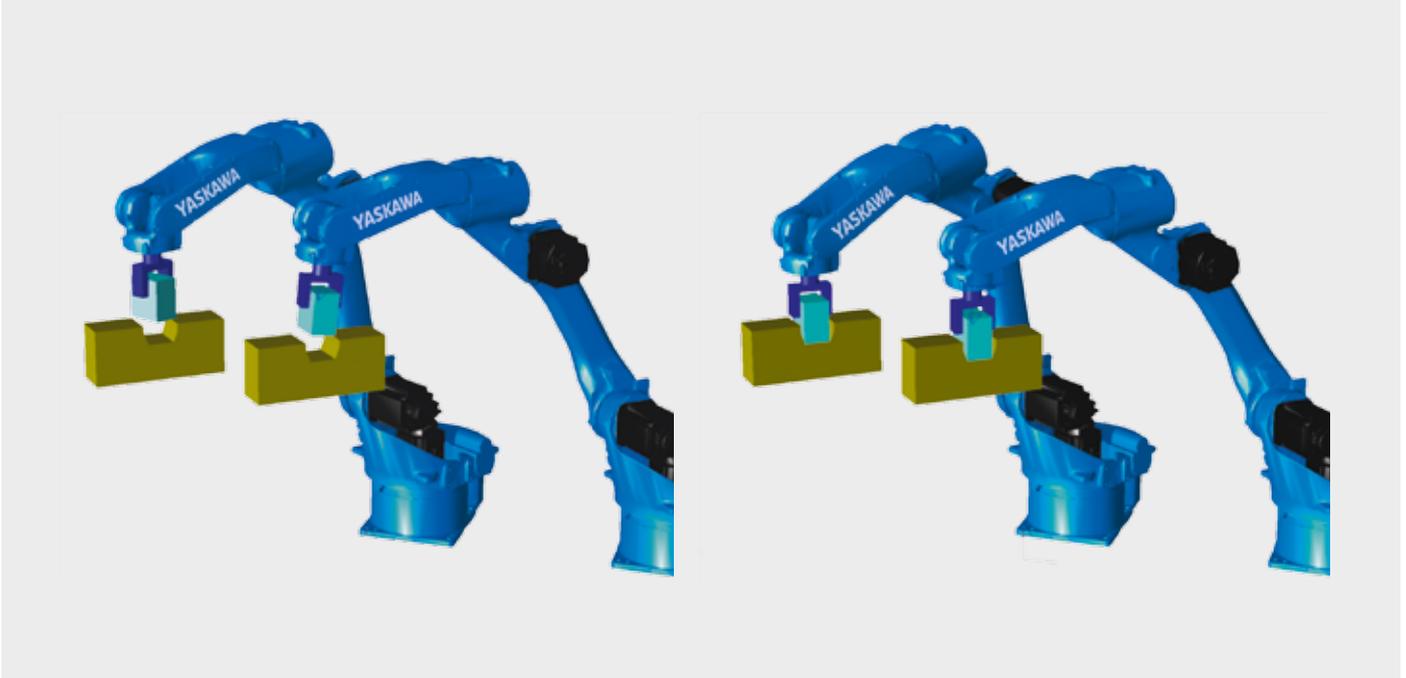
## Link Servo Float function Multi Robot

This function performs the servo float for each axis of the robot, for every robot separately. This function is used when a force is applied only to a specific axis or when the servo float is applied to all axes of the robot because the direction in which the force is applied cannot be identified.

## KEY BENEFITS

- No additional hardware is required
- **Link Servo Float function Multi Robot**  
For every robot link servo float can be activated for end axis or all together

# Link and Linear Servo Float Multi Robot (163913)



The servo float function controls not only the position of the robot but both the position and force of the robot. Normally, even if an outer force is applied to the robot, the robot tries to maintain the current position and does not move because only the robot position is controlled. In that case, the servo float function provides flexible control on the position and posture of the robot, in response to the force applied from outside. It allows to overwrite (reteach) robot positions under consideration of current shift-values.

## Link Servo Float function Multi Robot

This function performs the servo float for each axis of the robot, for every robot separately. This function is used when a force is applied only to a specific axis or when the servo float is applied to all axes of the robot because the direction in which the force is applied cannot be identified.

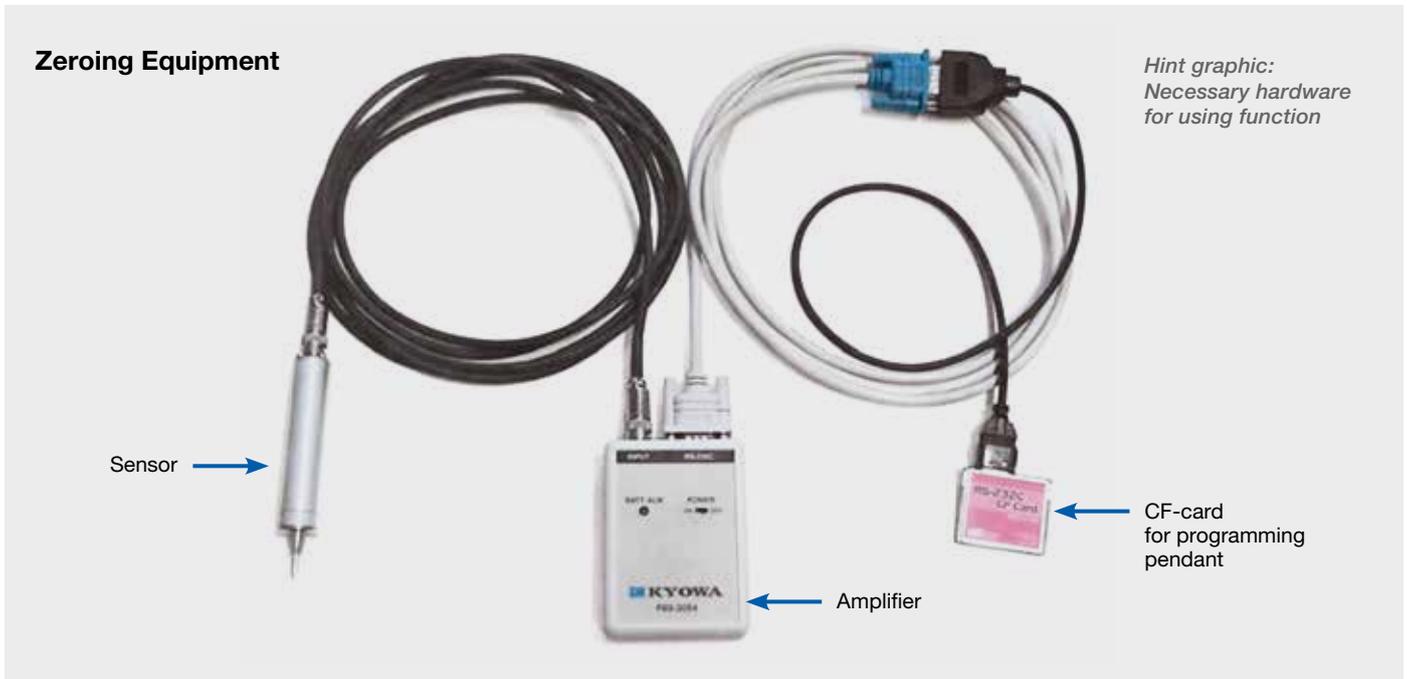
## Linear Servo Float function Multi Robot

This function performs the servo float for each coordinate axis of coordinate systems such as the robot coordinate, base coordinate, base coordinate, user coordinate, and tool coordinate. This function is used when the force is applied only to the specific direction of each coordinate system, for every robot separately.

## KEY BENEFITS

- No additional hardware is required
- **Link Servo Float function Multi Robot**  
For every robot link servo float can be activated for end axis or all together
- **Linear Servo Float function Multi Robot**  
For every Robot Linear Servo Float can be activated in a separate coordinate system

# Zeroing Robot (167546)



With the zeroing sensor you can fast restore the home position (absolute data) from your robot.

Zeroing sensor is easy to use.

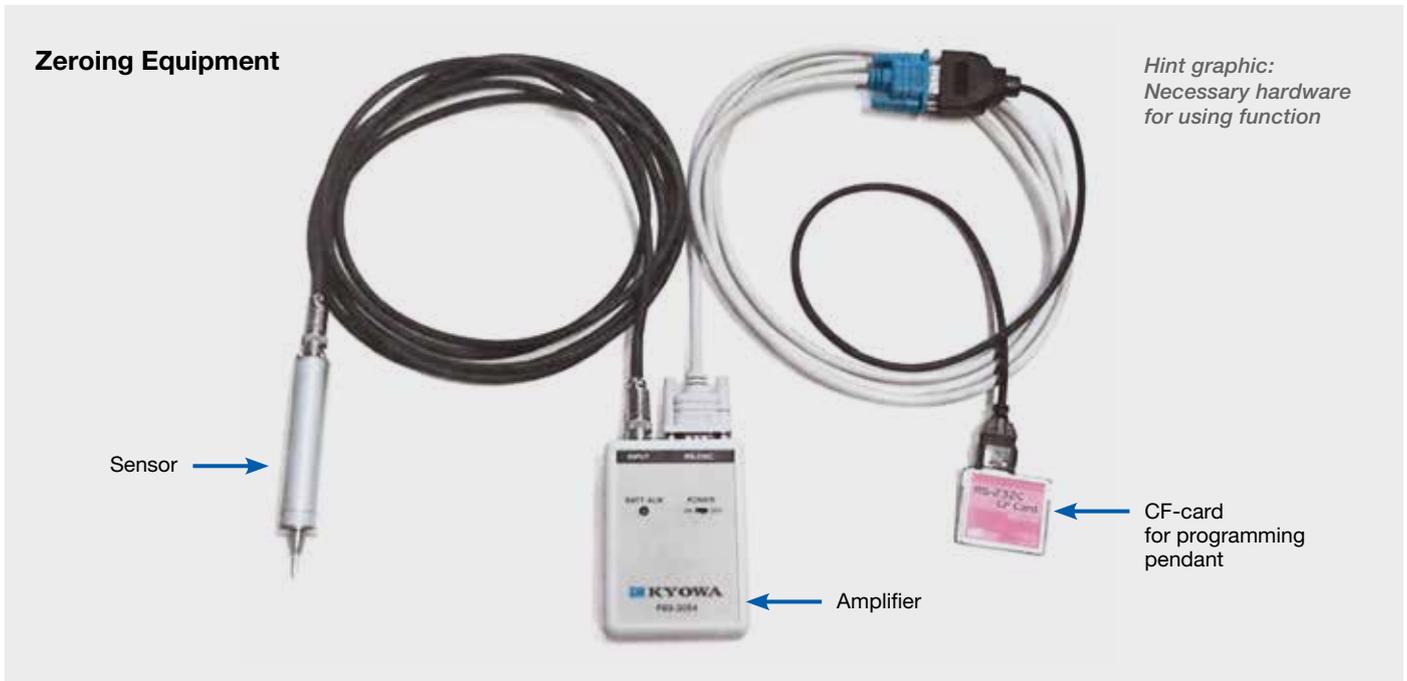
## Example:

- Replace the encoder (home position is lost).
- Operate the manipulator to change its posture so that zeroing can be performed.
- Install the zeroing unit to the manipulator.
- Press the “zeroing button”:
  - Manipulator automatically operates
  - Detection and registry of home position are automatically performed
  - Remove the zeroing unit from the manipulator

## KEY BENEFITS

- Accurate home position can be restored in a short period of time when replacing motor or encoder
- Reduced time to restore the absolute data when they are lost
- You cannot use the zeroing sensor with every robot type. For each available robot must order the hardware for the robot separate.
- Zeroing Equipment must be order separate

# Zeroing External Axis (167547)



With the zeroing sensor you can fast restore the home position (absolute data) from your external Axis.

Zeroing sensor is easy to use.

### Example:

- Replace the encoder (home position is lost).
- Operate the manipulator to change its posture so that zeroing can be performed.
- Install the zeroing unit to the external axis.
- Press the “zeroing button”:
  - External axis automatically operates
  - Detection and registry of home position are automatically performed
  - Remove the zeroing unit from the external axis

### KEY BENEFITS

- Accurate home position can be restored in a short period of time when replacing motor or encoder.
- Reduced time to restore the absolute data when they are lost
- External Axis /Positioners must prepare for the zeroing sensor
- Zeroing Equipment must be order separate

# MotoSight2D Interface (169635)



MotoSight2D is a fully integrated hardware/software 2D vision solution. It enables the robot controller to communicate with Cognex In-Sight sensor devices. Included with MotoSight2D is a pendant application that is used to assign supported vision tool results directly to robot variables for use in robot programs. Image captures as well as vision tool graphics appear directly on the programming pendant display screen. Using the pendant application, vision tool settings can also be modified directly from the programming pendant.

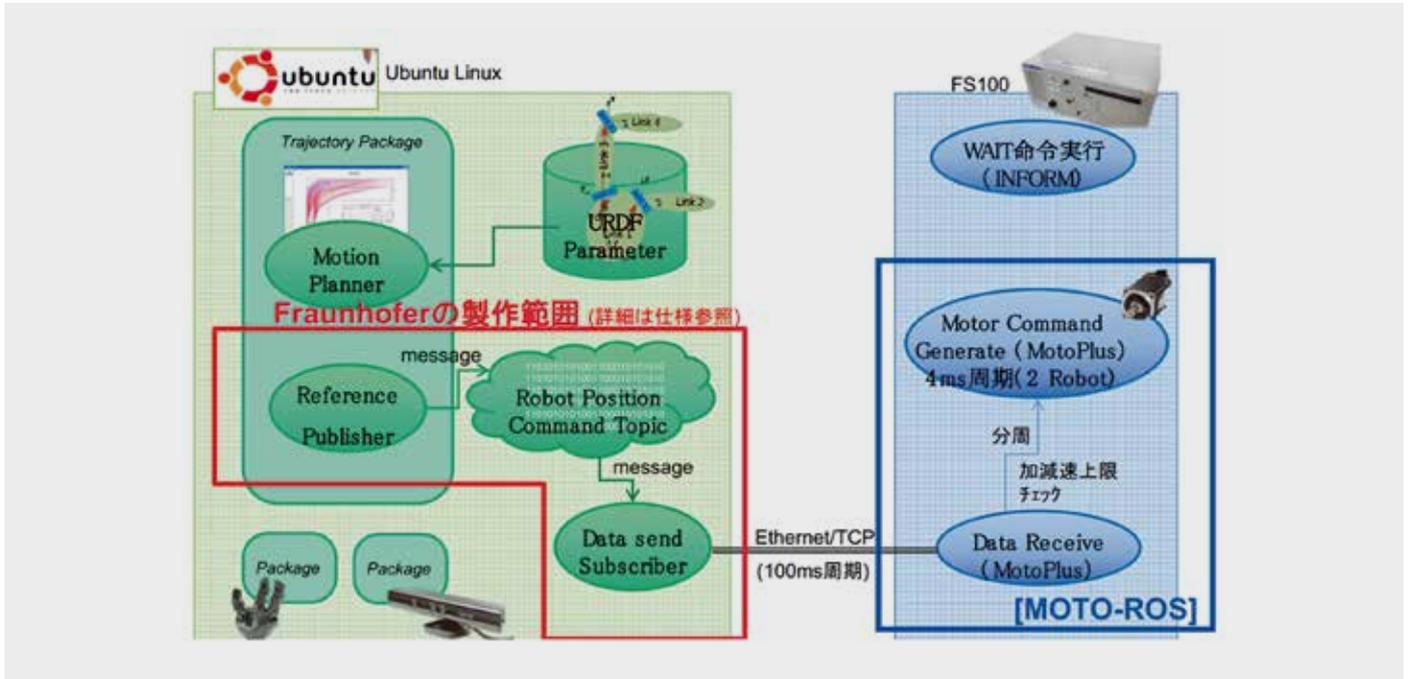
## KEY BENEFITS

- MotoSight2D features an easy to use graphic interface
- Display current camera image and vision result on the programming pendant
- Easy assignment of vision results to robot variables
- Modify vision tool settings directly from the programming pendant
- Manage up to 4 cameras
- Set of macros to embed the vision task in robot programs

## REQUIRED FUNCTIONS

- 164065\_Funktion DX200 MotoPlus Runtime – The MotoPlus runtime is required for running applications built with the MotoPlus SDK

# ROS-I and MOTOMAN (171403)

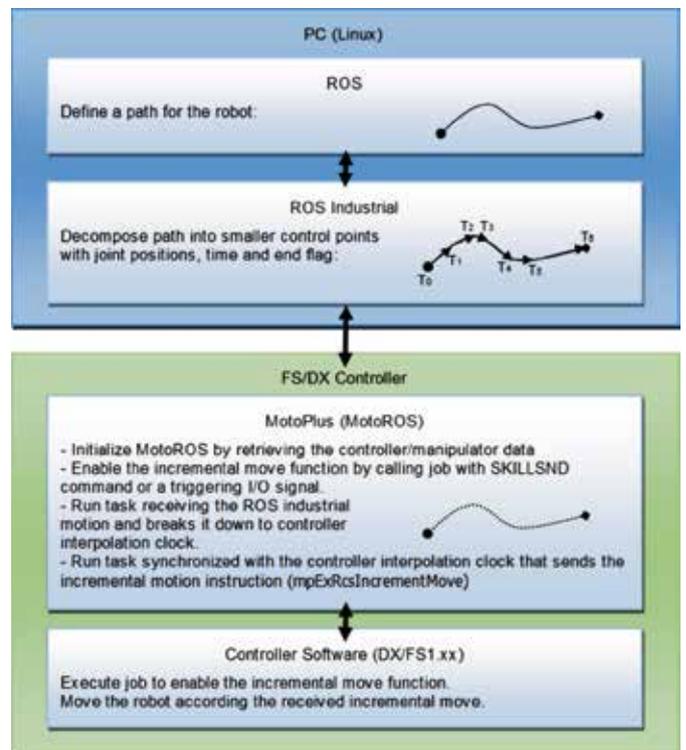


The ROS-Industrial program, initiated by Southwest Research Institute (SwRI), enables new applications and reduces project costs for industrial robotics. ROS-Industrial leverages the advanced capabilities of the Robot Operating System (ROS) software for powerful new industrial applications. This platform is usually used to calculate possible robot IK solutions by creating a virtual world identical to that of the real robot and using the obstacle/work space information to plan an optimal path to perform a task.

The Motoman driver communicates with ROS through the simple\_message interface, with a few additional MOTOMAN-specific message types. Trajectories are streamed to the controller using a message format that captures all the ROS JointTrajectoryPoint data: joint positions, velocities, accelerations, and path timing. The controller buffers these points and interpolates between them to send commands to the controller at the required timing.

## KEY BENEFITS

- Robot speeds up to 100% of robot capability for DX100, DX200, and FS100 controllers
- Low-level control of joint position, velocity and path timing
- Improved fault detection and recovery
- Improved motion and controller status feedback



# T-axis Endless (163900)

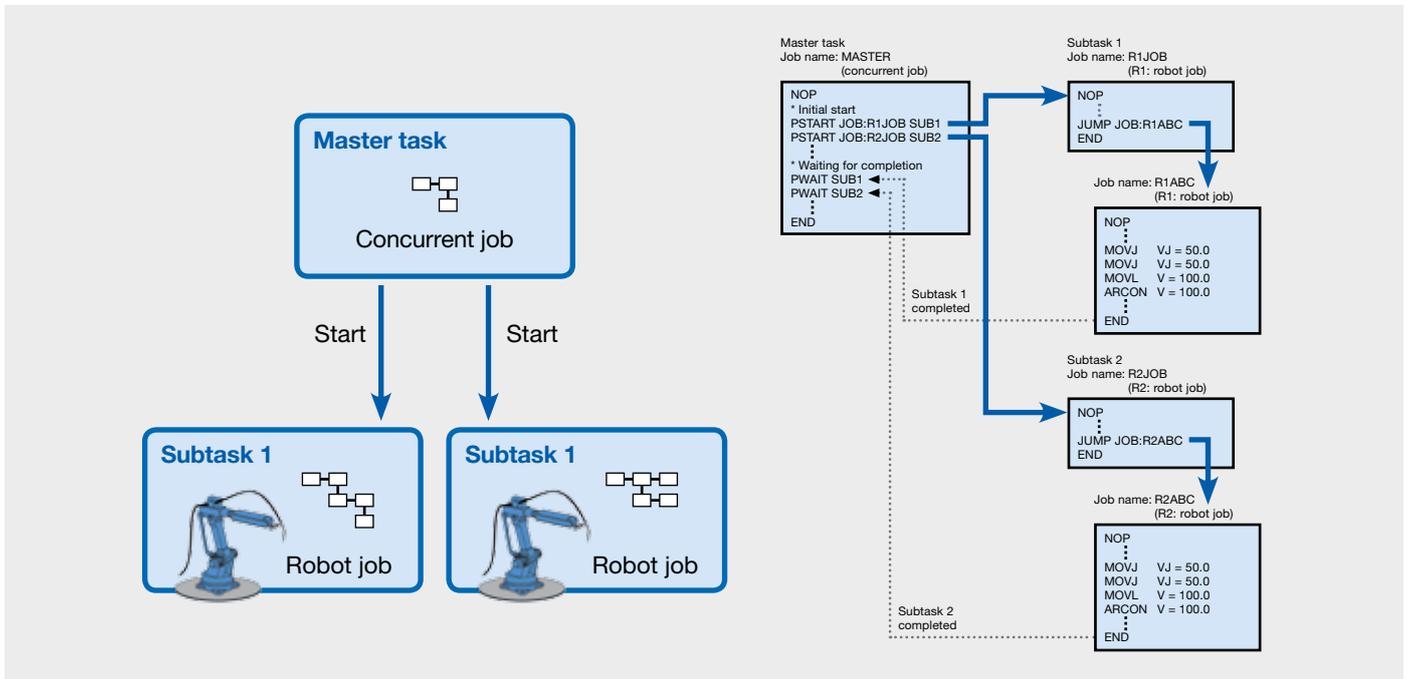


This function continuously rotates the T-axis a plural number of turns. Although the rotation angle of the T-axis is generally limited within  $\pm 360$  degrees, this function allows it to rotate endlessly. When executing the move instruction MOVJ with the “number of rotations of the external axis” specified, the T-axis rotates the “specified rotating amount + teaching position pulses” during the movement to the target position. One move command can specify up to  $\pm 100$  turns.

## KEY BENEFITS

- No turn back of the T-axis is necessary
- Teaching time can be reduced
- Tact time can be reduced

# Independent Control (163903)



The controller can control a maximum of 8 robots and plural stations (jig) through one controller. The “independent control function” allows two robots or the robot and jig to operate independently with different programs.

The controller has a function for decoding and executing a maximum of 8 jobs (extendable up to 16 jobs (optional) individually. The multitask control performed in this function is called independent control.

For instance, a two-robot system can be constructed that consists of one welding robot welding the work piece and the other robot transferring unwelded work pieces and welded work pieces.

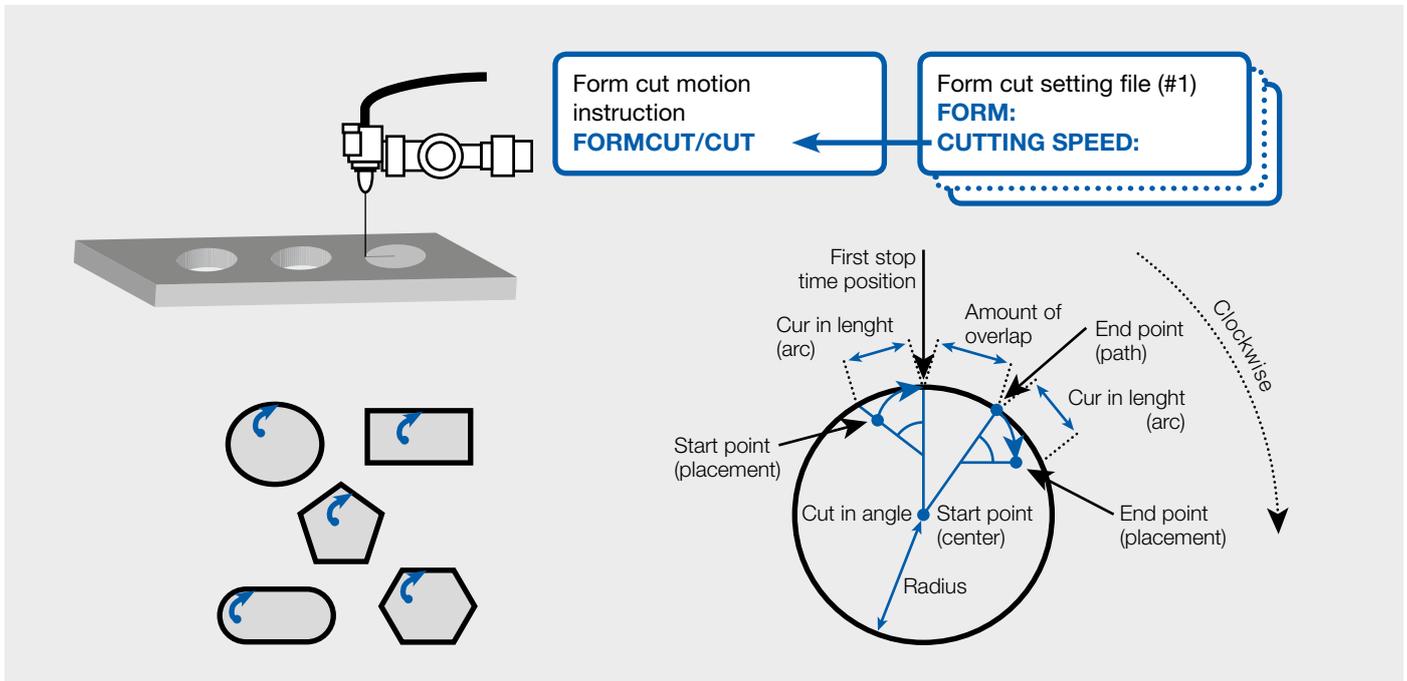
The system can be freely combined with applications for arc and non arc application. The teachbox key sheets are available on the basis of the master application.

Also, independent operation of the robot and station (external jig) can be performed. As an external axis motor, however, the motor for YASKAWA robot must be used.

## KEY BENEFITS

- Multitask of 8 jobs (extendable up to 16 jobs) individually
- Maximum of 8 robots and plural station through one controller
- Freely combined with applications

# Form Cutting (163917)

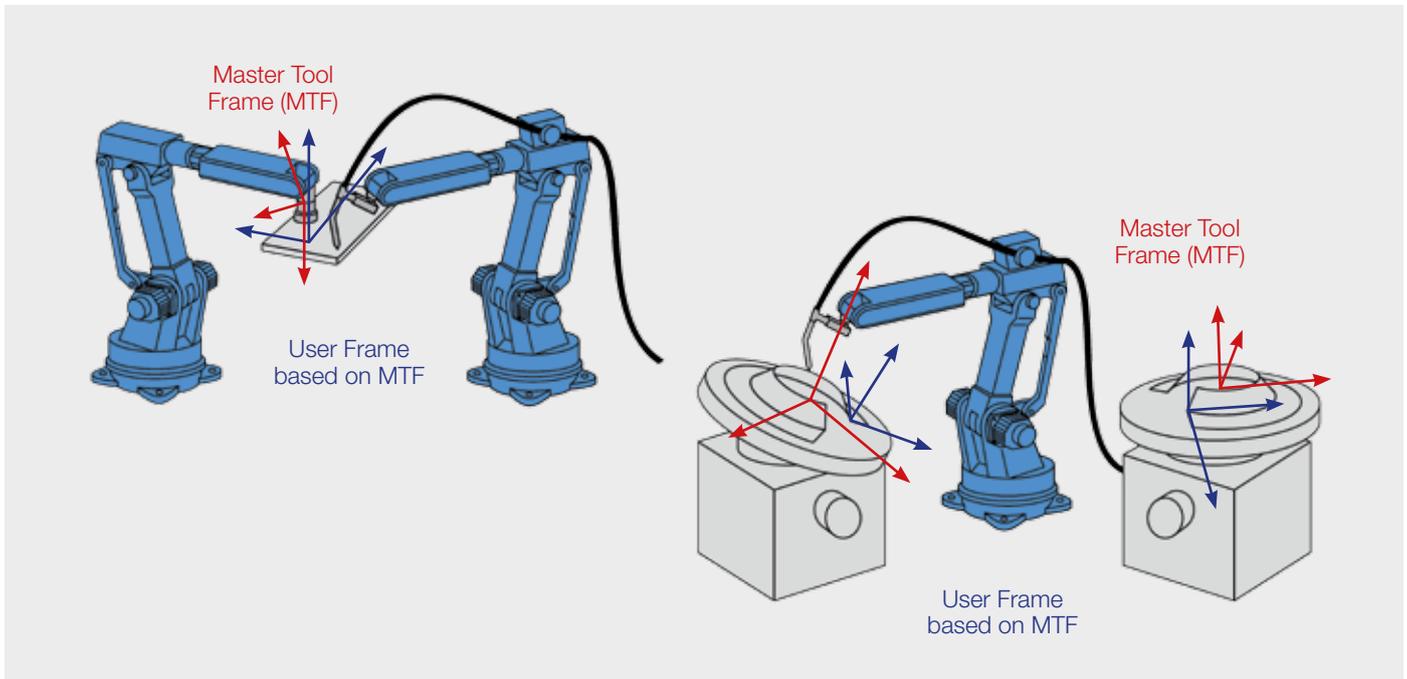


The form cutting function operates the robot in the specified form by executing one dedicated instruction ("FORMCUT"/"CUT" instruction) according to the condition set in the form cut setting file. This function can be used in the work for cutting the work piece to a form using the laser cutter or others gripped by the manipulator.

## KEY BENEFITS

- Teaching time can be reduced
- Path accuracy is improved

# Master Tool User Frame (163932)



The “Master Tool User Frame” is a special function for jigless systems and coordinated motion systems.

Master Tools are tool coordinated points at jigless systems or calibrations between robots and stations.

During motion of robots and stations Master Tools move in space. Shift values or relative coordinates can hardly be calculated.

By default, user coordinate systems are fixed in space. This feature allows the definition of user coordinate systems based on Master Tools.

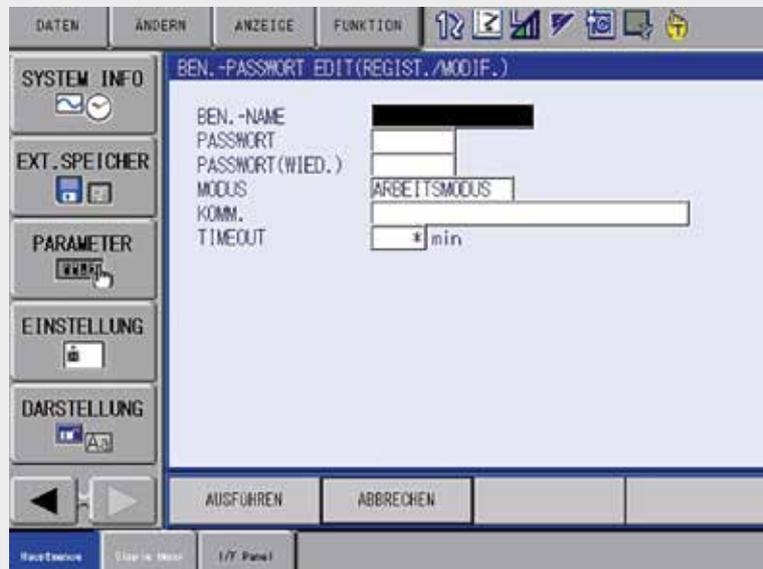
Simple calculation of coordinates and shift values based on Master Tool User Frames.

The devices of two stations do not have to be identical. Relative jobs based on Master Tool User Frames can be easily transferred.

## KEY BENEFITS

- Easy shift of points or jobs
- Easy handling with relative jobs based on user frames
- Simple job transfer between different stations or robot systems
- Available for jigless systems and coordinated systems with stations

# Password Protection (163941)



The password protection function helps assure system safety by requiring each user to have a personal authorization registered to access the controller so as to control what operations may be performed by the users.

The system administrator authorizes each user by assigning a login name and password, a security level and a timeout setting, thereby allowing a specific level of controller access.

The administrator can register up to 100 user accounts. The user account information can be stored in a file (USRINFO.DAT).

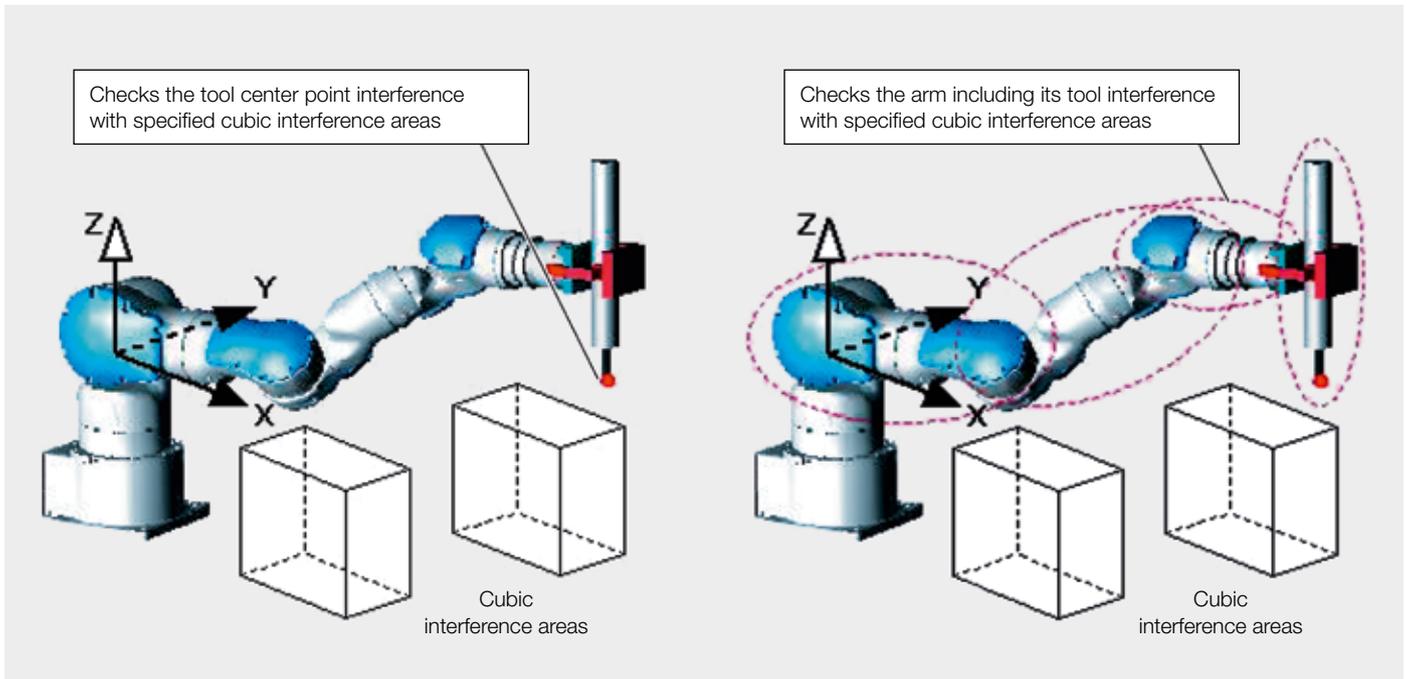
Only the system administrator can change registered user account information.

The password protection function also enables to find out, by tracing the alarm history, which user has been logged in at the time of a particular alarm.

## KEY BENEFITS

- 100 user accounts
- Alarms with username
- Logbook function with username

# Arm Interference with specified Cubic Area Check (163945)



This function turns ON the corresponding system output signals "CUBE INTERFERENCE Signal" when the tool center point interfered with specified cubic areas.

On the other hand, this function turns ON the corresponding system output signals "CUBE INTERFERENCE Signal" when the manipulator's arm including its tool center point interfered with specified cubic areas.

Up to 8 areas can be registered as interference areas to the arm.

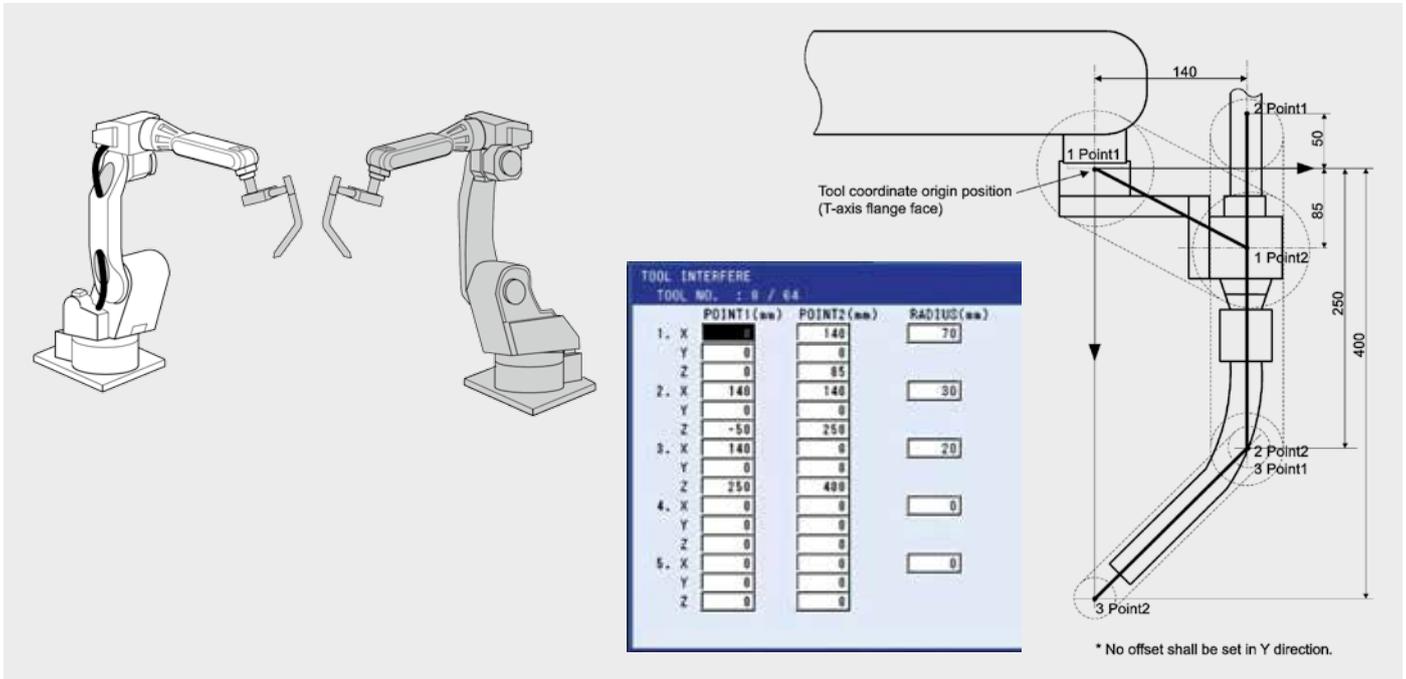
Alarm occurs and the manipulator stops immediately when the robot arm including the tool center point interferes with the already specified cubic interference areas.

The manipulator's tool part shape must be registered by the customer because its tool shape varies depending on the work that the manipulator performs. The shape can be registered with TOOL INTERFERE file. Function "Arm interference check" must be activated.

## KEY BENEFITS

- This function can prevent collisions between robots/tools and cubics

# Arm Interference Check (163951)



This function checks the interference among manipulator arms and tools in the system consisting of one controller and multiple manipulators.

Interference between each of the following is checked:

1. An arm and an arm
2. An arm and a tool
3. A tool and a tool

The checking method is to approximate each axis arm and tool in cylinder and then the interference is checked between the approximated cylinders.

Spheres are set at both ends of the cylinder, and the interferences are checked between spheres and between sphere and cylinder.

If this cylinder or sphere is intersected, the manipulators stop.

## KEY BENEFITS

- This function can prevent collisions between robots and tools

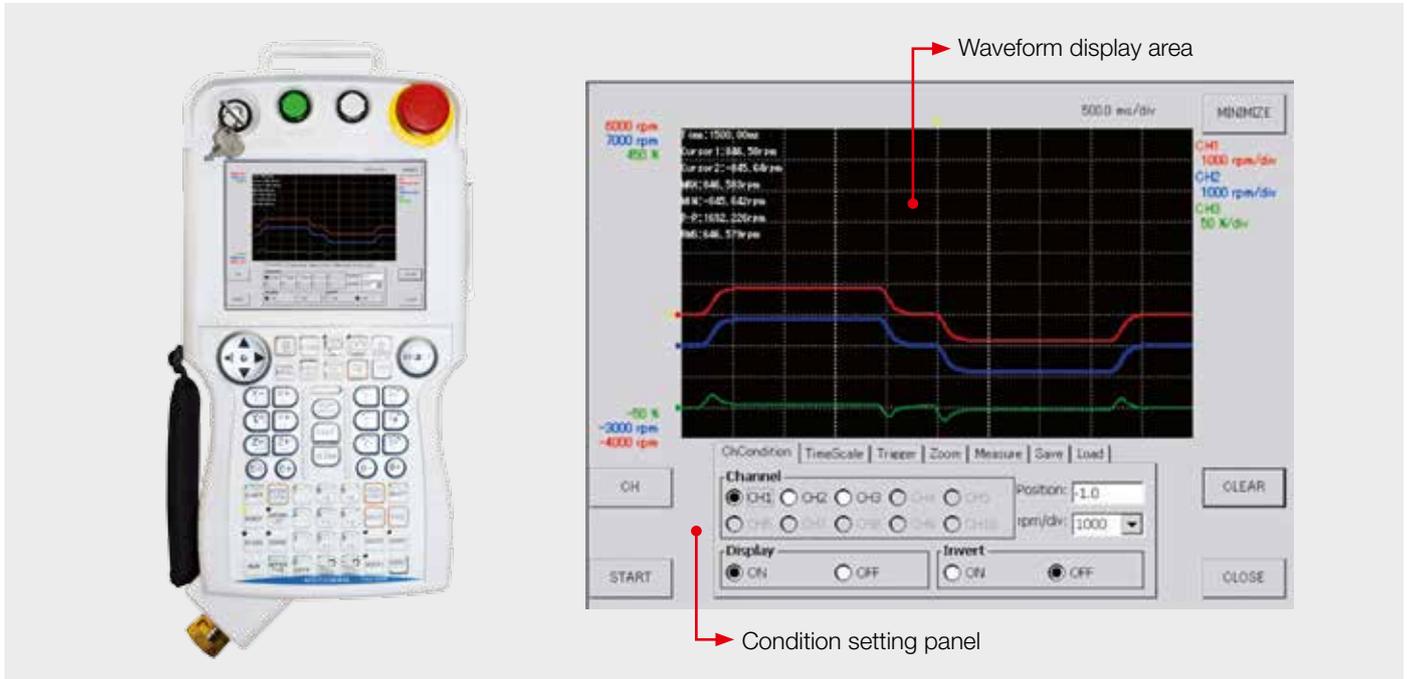
The tool part must be set by the customer because the tool shape depends on the work that the robot performs. These settings are set in the tool interfere file. A maximum of 5 cylinders and spheres can be set.

The arm interfere check function requires setting of cylinder and sphere for the robot arm. These setting values need not be set by the customer because they are factory-set.

The arm interfere check function may not be used depending on the robot type. All robots which are supported by FSU-Function are possible.

No check between tool and robot himself.

# Pendant Oscilloscope (163952)



The Pendant Oscilloscope Function is a monitoring function for visualizing the speed and torque of each robot axis and the status of concurrent I/O signals on the Programming Pendant. The Pendant Oscilloscope is configured by a user interface, which requires no additional hardware components. Equipped with an integral display screen containing the waveform display window and the condition setting panel, the PP oscilloscope application enables to perform several processes from condition setting to measurement operations at the same time.

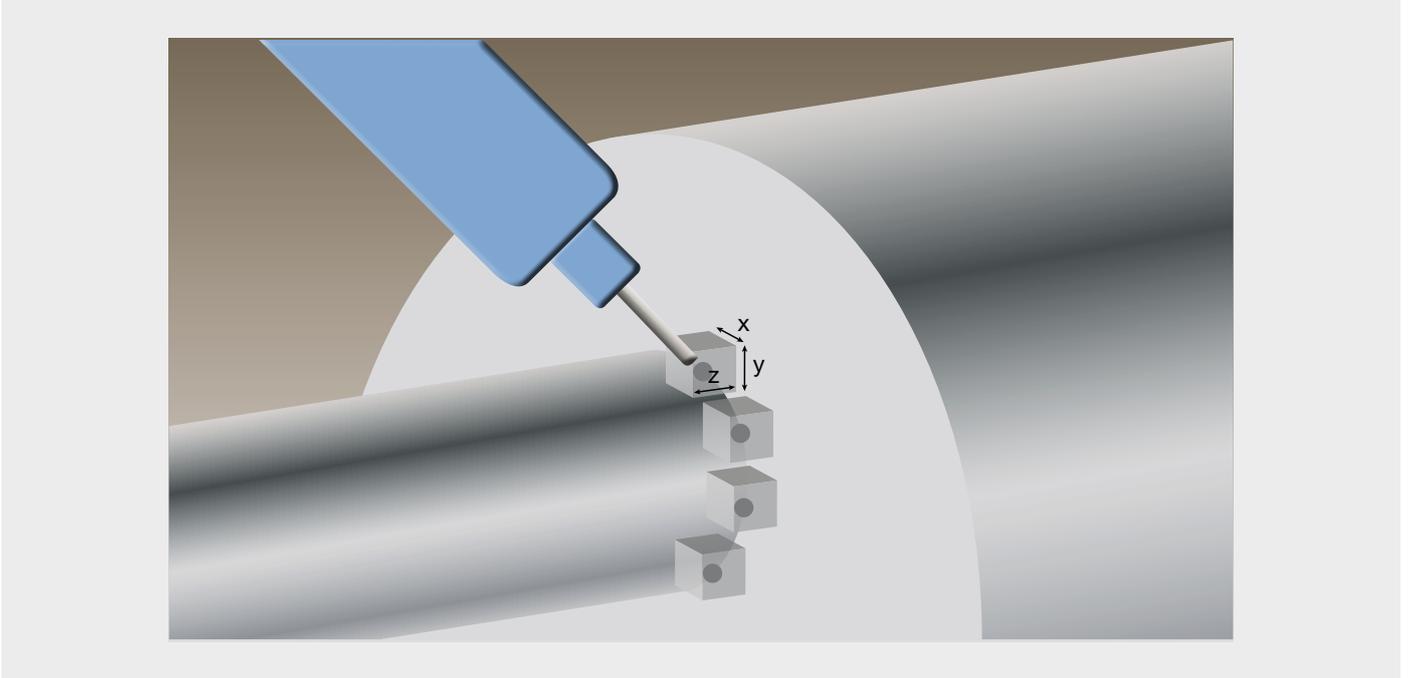
## The following features are included

- Channel selective triggering and trigger level adjustment
- Cursor measurement function, for measuring certain distances in waveforms or between peaks after the data acquisition
- Zoom function for displaying the data in a magnified view
- Manual and auto saving mode for storing the data in CSV format
- Time scale adjustment

## KEY BENEFITS

- No external Oscilloscope is needed
- The servo conditions can easily be monitored and recorded
- Simple configuration of all relevant measuring parameters
- Data can be logged in a CSV file for easy analysis on PC

# Safety Re-teach (163955)



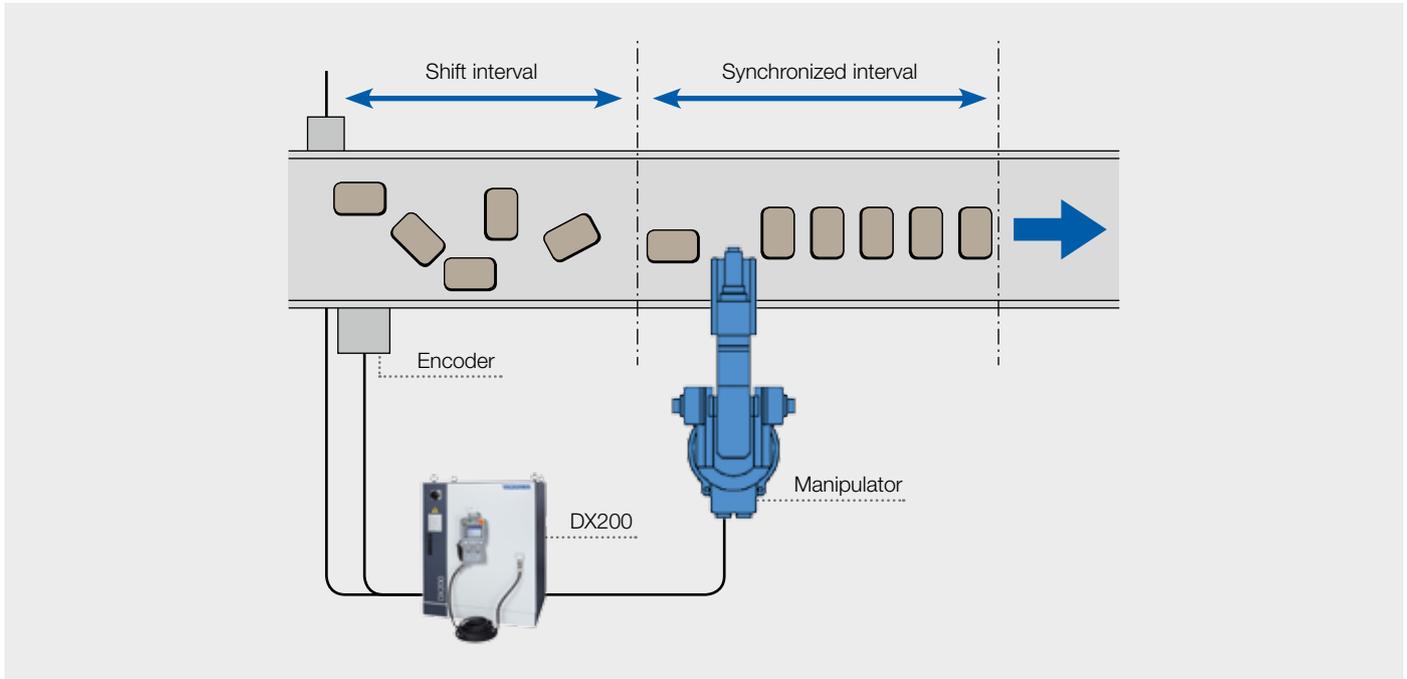
Thus, so the programmer can control the plant, the area in which the system operator can make some adjustment of the program.

## KEY BENEFITS

- Quality improvement through rapid adaptation
- A re-teaching is possible already by the operator

# Conveyor Synchronized with Shift

(Single 163988, Multi 163990)

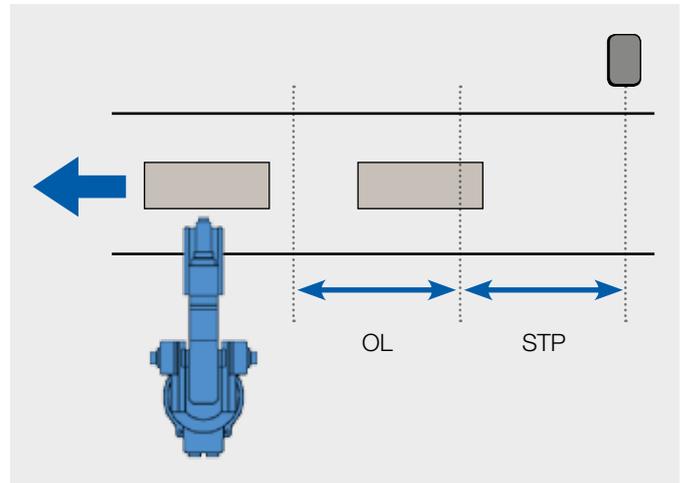


The conveyor synchronized function with shift temporarily stores information on multiple work pieces to enable the tracking process depending on each work piece.

This function is used when a large number of work pieces simultaneously flow between the limit switch and the manipulator.

## Example:

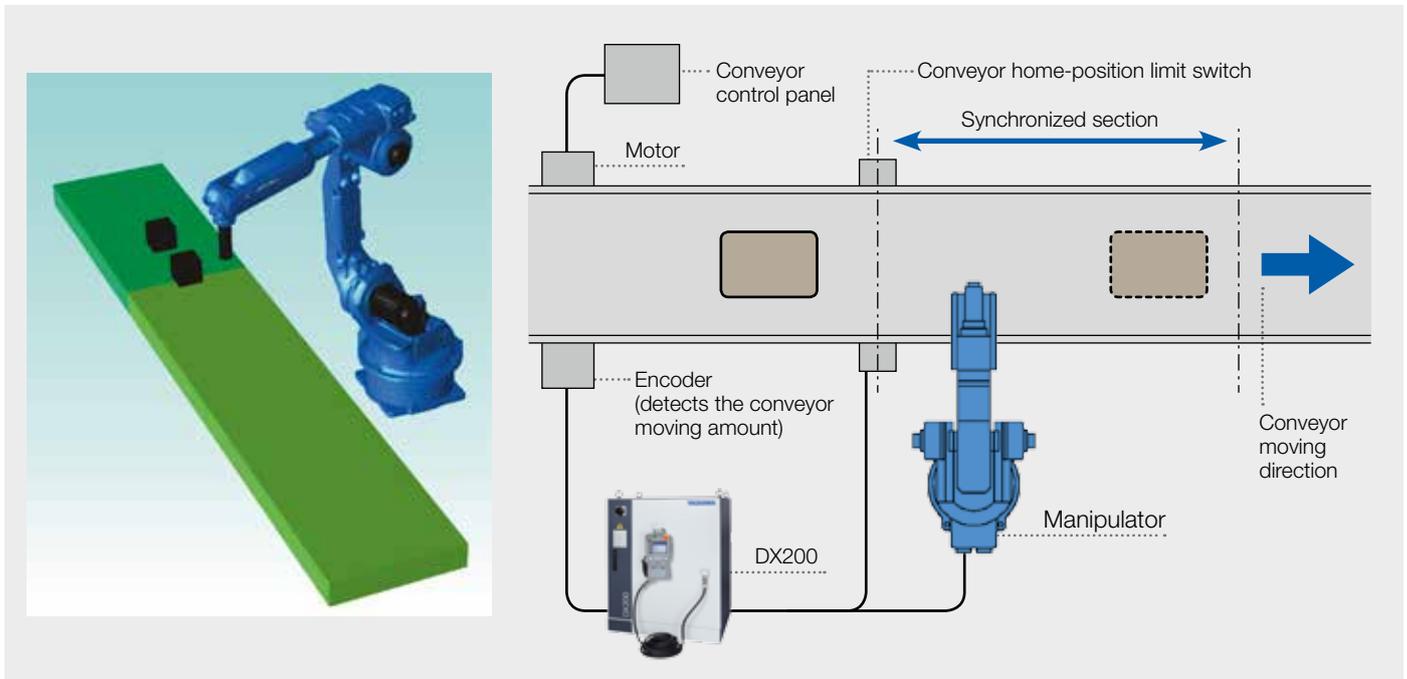
When a part reaches the STP (start position) the robot starts the synchronization. If another part reaches the STP, the robot will first finish the running Job at the current part. Then the robot returns to the home position and starts the synchronization at the second part while it is located within the OL (over limit) range.



## KEY BENEFITS

- Robot operations are synchronized with the conveyor
- The function can be applied to linear conveyor, circular conveyor, and revolving table
- The function can also be applied to the case where plural work pieces flow within the shift interval (a maximum of 99 pieces)

# Conveyor Synchronized (178880)



Conveyor synchronized function means that the manipulator operations are synchronized with the conveyor.

The manipulator works at the piece while the conveyor is moving.

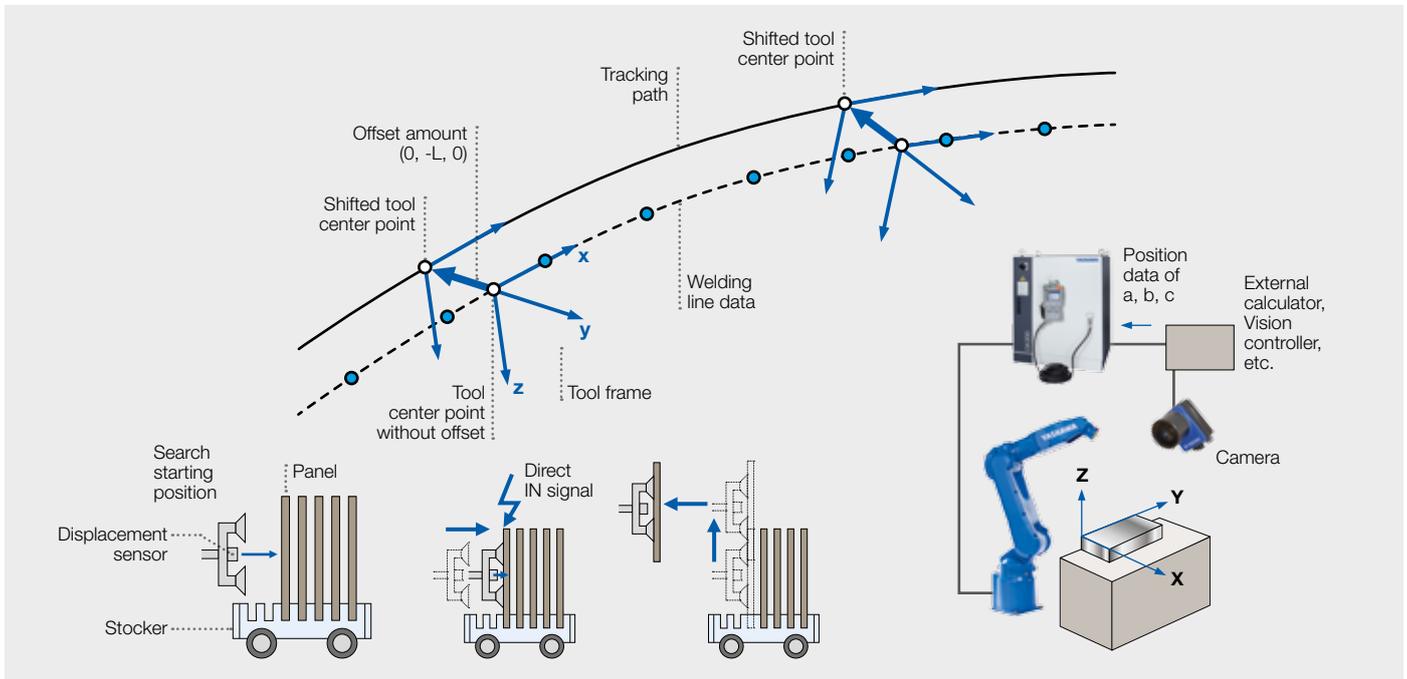
There are three types of the conveyor tracking motion: robot-axis tracking, base-axis tracking, and circular tracking.

Conveyor tracking function uses the travel distance of the conveyor. That means that the relative speed of the manipulator to the work piece is always constant.

## KEY BENEFITS

- Robot operations are synchronized with the conveyor
- The relative speed of the robot to the work piece is always constant
- The conveyor tracking function can process only one work piece from the input of the limit switch signal to the robot tracking operation

# Sensor Function (163991, 163992)



The sensor function corrects, up to three directions, the robot path and the speed, measures the distance, and detects the position by using an analogue displacement sensor, analogue torque sensor, and other analogue sensors.

## Real time path correction according to the sensor signal in playback operation:

With this function, a sensor can detect the deformation and position deviation of the work piece and the robot can correct the path in real time. Also, this function monitors whether the sensor signal exceeds the upper or lower limit of the threshold value to prevent the robot from dramatically deviating from the path.

## KEY BENEFITS

- Full automatic compensation of work piece tolerances in playback operation
- Speed correction according to an analogue signal
- Shift value creation according to an analogue signal
- Search function according to an analogue signal

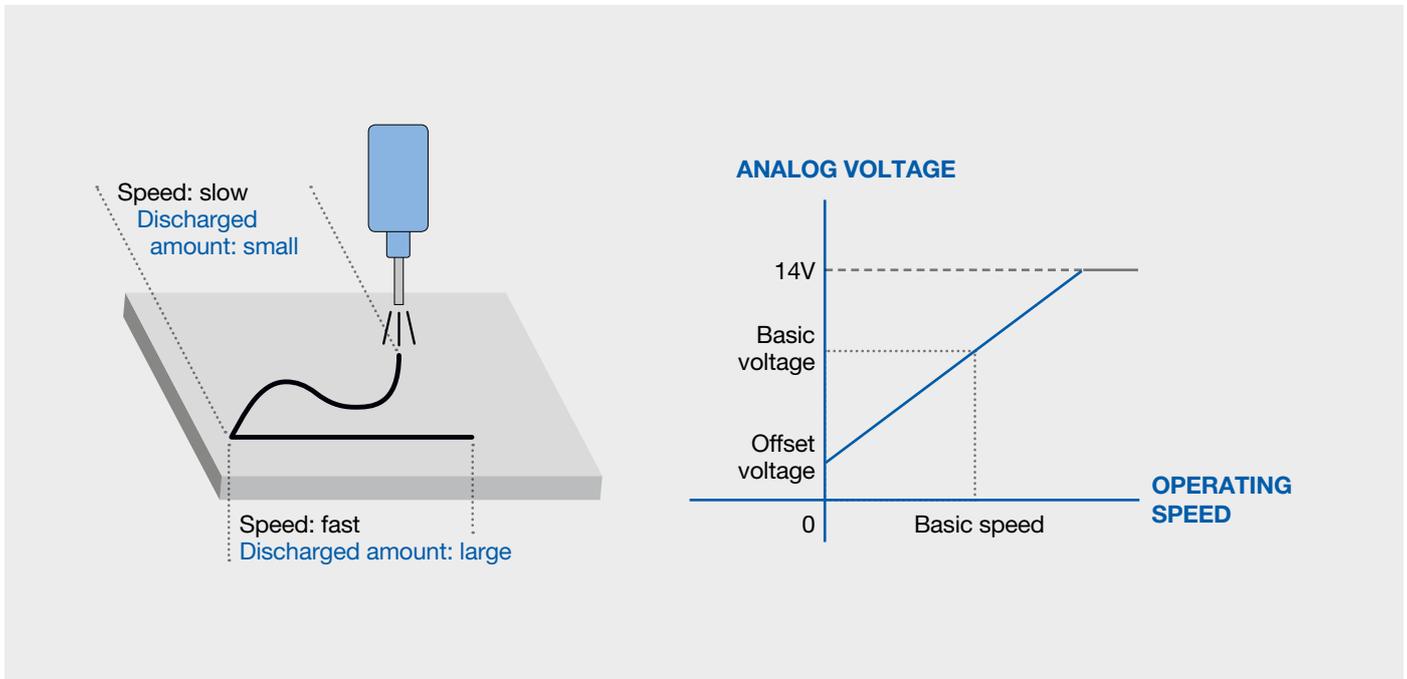
## Real time speed correction according to the sensor signal:

Usually, the robot moves at the set speed in the job, if the operating time varies depending on individual difference of work pieces, using this function allows the detection of operation proceeding and allows the robot to operate at an appropriate speed.

## Shift value creation function according to the sensor signal:

The distance to the target work piece can be calculated by using the input signal from the displacement sensor and the robot job can then

# Analog Output Function corresponding to Speed (164054)



The “analog output function corresponding to speed” automatically changes the analog output value depending on the variation of the manipulator operating speed. This function eliminates the need for setting the analog output value again depending on the variation of the operating speed, which reduces the teaching work for the job.

This function is useful when the thickness of sealing or painting should be constant, the manipulator operating speed can control the discharged amount of seals or paints.

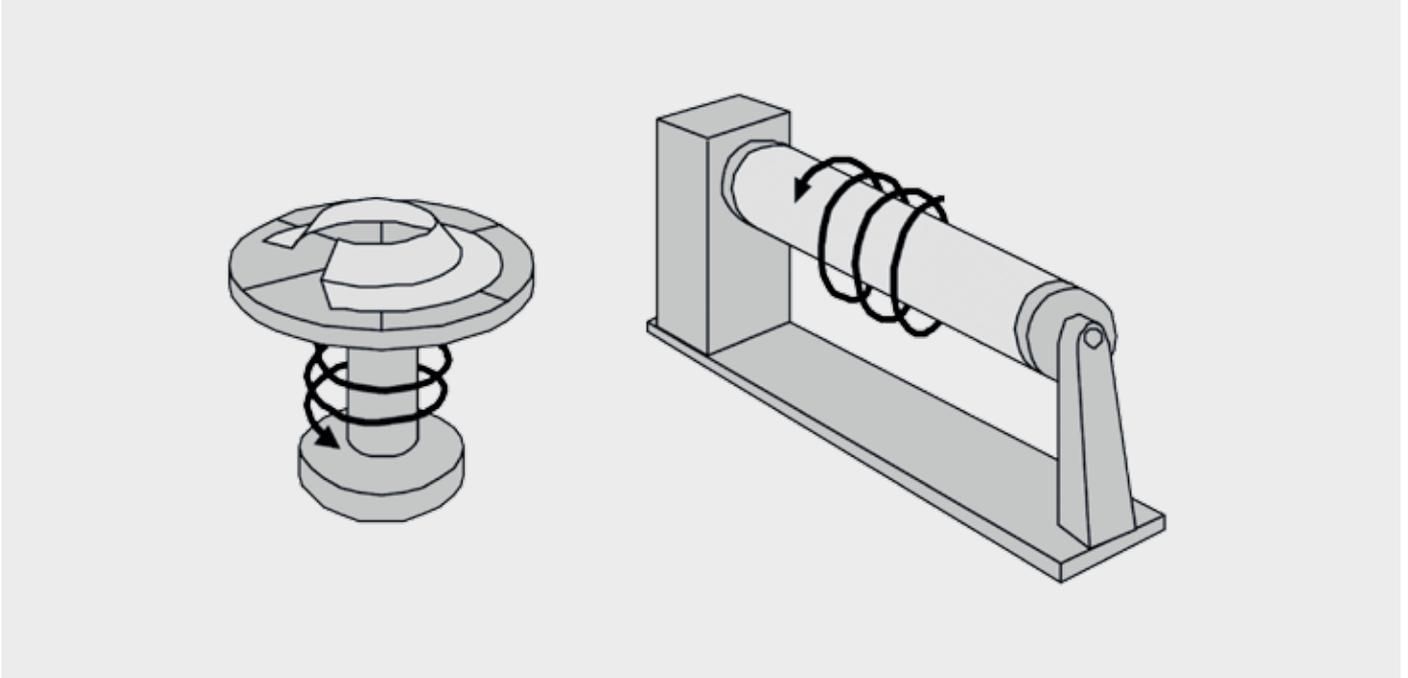
According to the set value of the ARATION instruction, the output characteristics for the relation between the operating speed and the analog voltage are calculated. The analog output function corresponding to speed is executed depending on these output characteristics.

When the ARATIOF instruction is executed, the analog output corresponding to speed is completed, and the set offset voltage becomes the fixed output.

## KEY BENEFITS

- Teaching effort is reduced
- Output possibilities: Analog (additional analog output extension board required) and/or digital 16-bit signal
- By using a filter process, the output signal can be close to the manipulator’s actual speed

# External Axis Endless (163899)

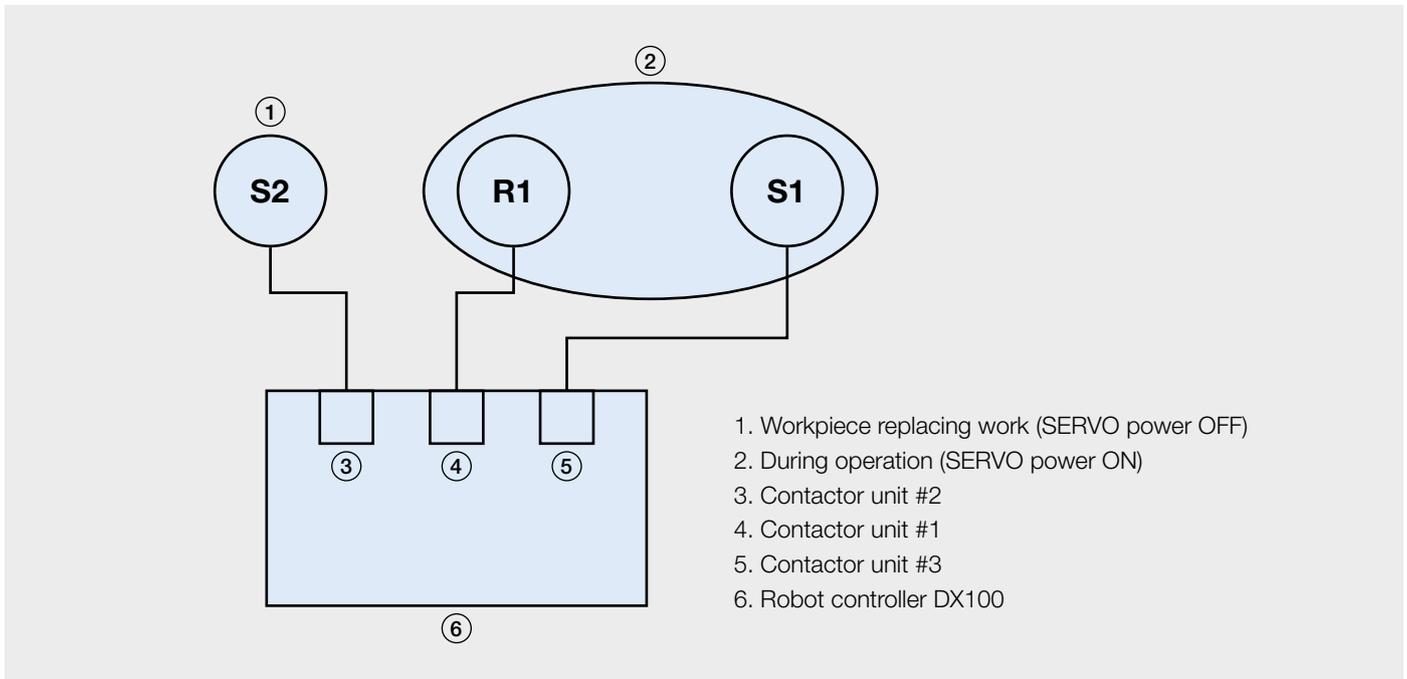


This function continuously rotates the external axis a plural number of turns. Although the rotation angle of the external axis is generally limited within  $\pm 360$  degrees, this function allows it to rotate endlessly. When executing the move instruction MOVJ with the “number of rotations of the external axis” specified, the external axis rotates the “specified rotating amount + teaching position pulses” during the movement to the target position. One move command can specify up to  $\pm 100$  turns.

## KEY BENEFITS

- Teaching time can be reduced
- Tact time can be reduced

# I/O JOG Operation in Play-mode (163923)



The I/O JOG operation function performs the axis operation for external axis by using universal input signals instead of the programming pendant.

The axis operation (JOG operation) of the station control group that is not registered in the job under playback operation can be executed by the allocated universal input signals.

Universal inputs are also used to select the motion speed. Five levels are possible.

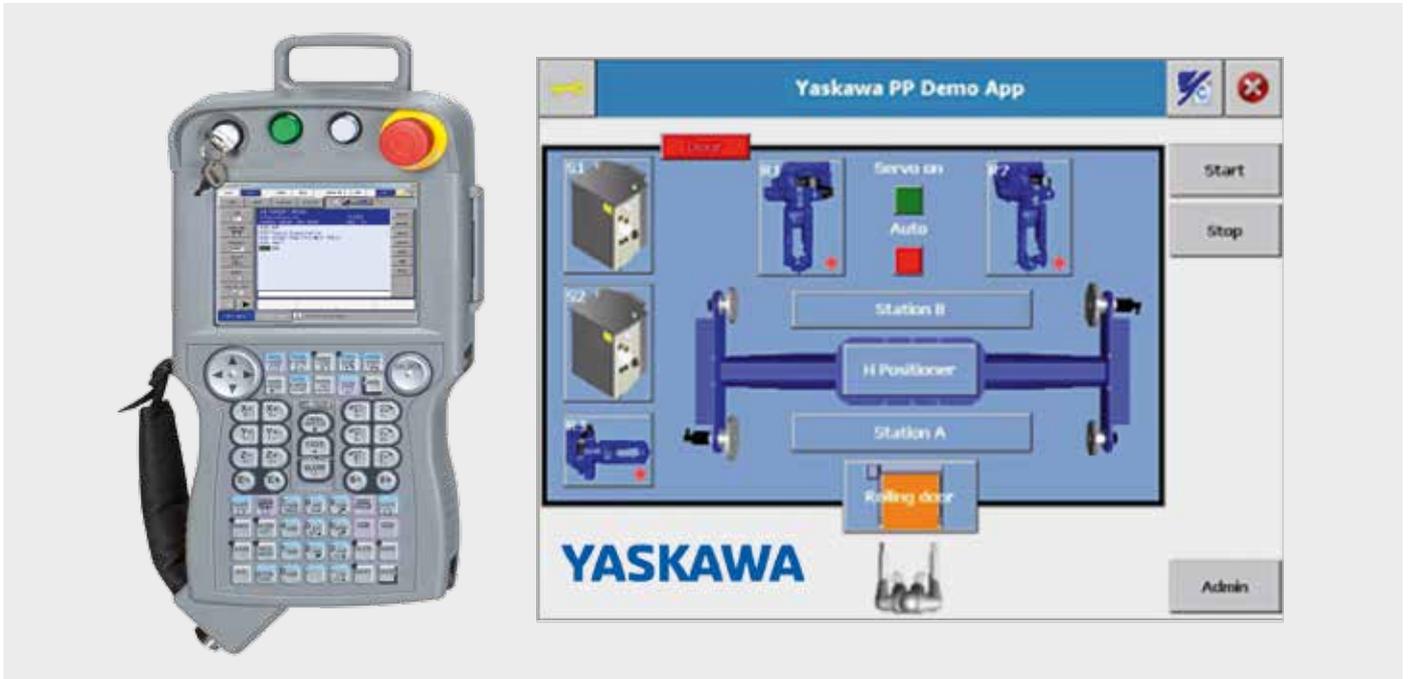
If a job, that includes the station under an active I/O JOG operation, is called or jumped, an alarm occurs to stop the operation of the robot and station.

It is recommended to connect each Robot or Station to a power on unit. It is recommended to turn off the servo for the control group that is not operating.

## KEY BENEFITS

- External axis can be moved without stopping the production line
- This function allows the operation of currently unused external axis, to check the quality of a work piece or perform some additional preparations on it
- I/O JOG operation in play mode software is necessary
- This function is not useable for Twin-Drive-Stations

# Advanced PP Customization Runtime (164066)



The Advanced PP Customization Runtime is required to run applications developed with Advanced PP Customization SDK. The SDK is a collection of modules for creating customized user interfaces for the programming pendant. The customized UI overlies the standard UI so it's possible to make important controls and informations easier to reach and create a unique interface concept across multiple devices. The SDK comes with different function modules which can be easily adapted in customized applications. These modules provide functionalities like event based variable access, logging, multi language support, custom UI elements and further more.

## KEY BENEFITS

- Custom UI elements
- Multi language support
- Event based variable handling. Get notification when a variable is changing
- Visualize the state of variables by connecting to custom UI elements
- Support for different user levels
- Logging
- Template for creating new applications
- Application is based on .NET 3.5 compact framework
- Visual Studio 2008 required for development
- Sample application which implements all available features

## REQUIRED SOFTWARE SDK

- Advanced PP Customization runtime – The runtime is required for each controller that is running a customized UI. 1 runtime license is already included in the "Advanced PP Customization SDK".

# Vision Function (164068)



This function is an inform instruction to communicate with different Vision System. It maps the communication protocols of a variety of selected vision systems and works, dependent on these, on the basis of Ethernet or RS232. This robot instruction allows easy control of image processing devices.

## MAIN FUNCTIONS

- In practice, this instruction is used to trigger a camera and including to receive any results data (e.g. position of a recognized part) without additional hardware

## KEY BENEFITS

- Based on inform language (“VSTART” and “VWAIT”) by communication
- No additional hardware required. Communication is done using the standard Ethernet or RS232 port of the controller
- Vision function support the following manufacturer with below described model:
  - OMRON model:** F160, F210, F250, via RS232-C FZ2, FZ3, FZ3 series Ethernet or RS232-C, Cam. No. 1 to 4
  - COGNEX model:** In-sight and In-Sight Micro series via Ethernet, Cam. No. 1
  - KEYENCE model:** CV-3000/5000 and XG-7000 series, Ethernet, Cam. No. 1, Interface: Ethernet, Cam. No. 1
- Camera Jobs must be create with additional software on camera side ( e.g. for Cognex “In-Sight Explorer” on Pc).

## REQUIRED FUNCTIONS

- DX200 Ethernet Function

# MotoGSI Basic (164069)



MotoGSI is a development package for creating communication interfaces on job basis. It comes with a set of jobs which allow communication with nearly every external device that supports Ethernet/TCP, Ethernet/UDP or RS232-connections. It also provides a set of helper functions to process and convert the in- and outgoing datastreams which are based on byte arrays. Also included in the package is a set of sample jobs to demonstrate the way of programming.

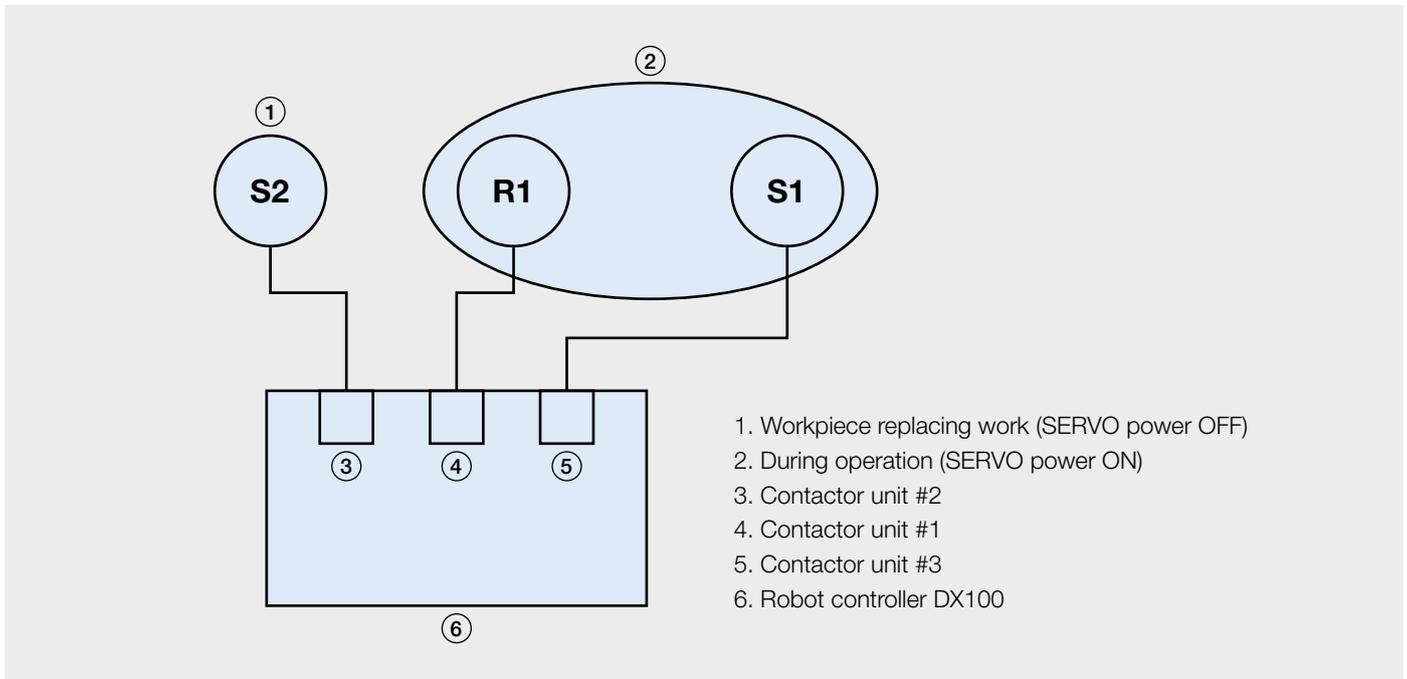
## KEY BENEFITS

- Extends inform language by socket communication functions based on Ethernet/TCP, Ethernet/UDP or RS232
- No additional hardware required. Communication is done using the standard Ethernet or RS232 port of the controller
- Communication with nearly every external devices that supports Ethernet/TCP, Ethernet/UDP or RS232-connections
- Implementation of specific protocols by using MotoGSI
- Set of helper functions to process and convert the datastreams which are based on byte arrays
- Pattern based search in the input datastream
- Easy to integrate in own robot programs
- MotoGSI is based on MotoPlus

## REQUIRED FUNCTIONS

- 164065\_Funktion DX200 MotoPlus Runtime – The MotoPlus runtime is required for running applications built with the MotoPlus SDK

# STO (Servo Torque Off) (171987)



The servo power supply individual control function is to turn ON/OFF the servo power supply in units of specified control group freely in the robot system with multiple control group configuration. Using this function, without stopping whole the system operation, the servo power supply only for the control group selected by an operator can be turned OFF. Therefore, the safe operation for removing a work piece with the system running and maintenance for robot tool, is secured, moreover, the operating efficiency is increased.

The STO function based on the Station and Robot declaration. It will be switch off complete Stations and/or robots (including Base).

This Function has Performance Level d (PLd).

## KEY BENEFITS

- Safe switch off of Robot and/or Stations
- Safe Signals (redundant signals)
- Performance Level d







The background of the image features a white, inverted triangle pointing downwards, centered on a blue background. The blue background is composed of several overlapping, semi-transparent triangular shapes that create a geometric, layered effect.

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Single Functions and Packages DX200, C-02-2018, A-No. 168427

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