Test Project

Robot Systems Integration

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WSC2026_TP63_en

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Please note that each section of this Test Project (TP) is labelled "F/B/En/SFFn".

Release of each part of the Test Project to the Competitors and Interpreters are as follows.

F – During Familiarization

B – For Basic Task – normally on C1

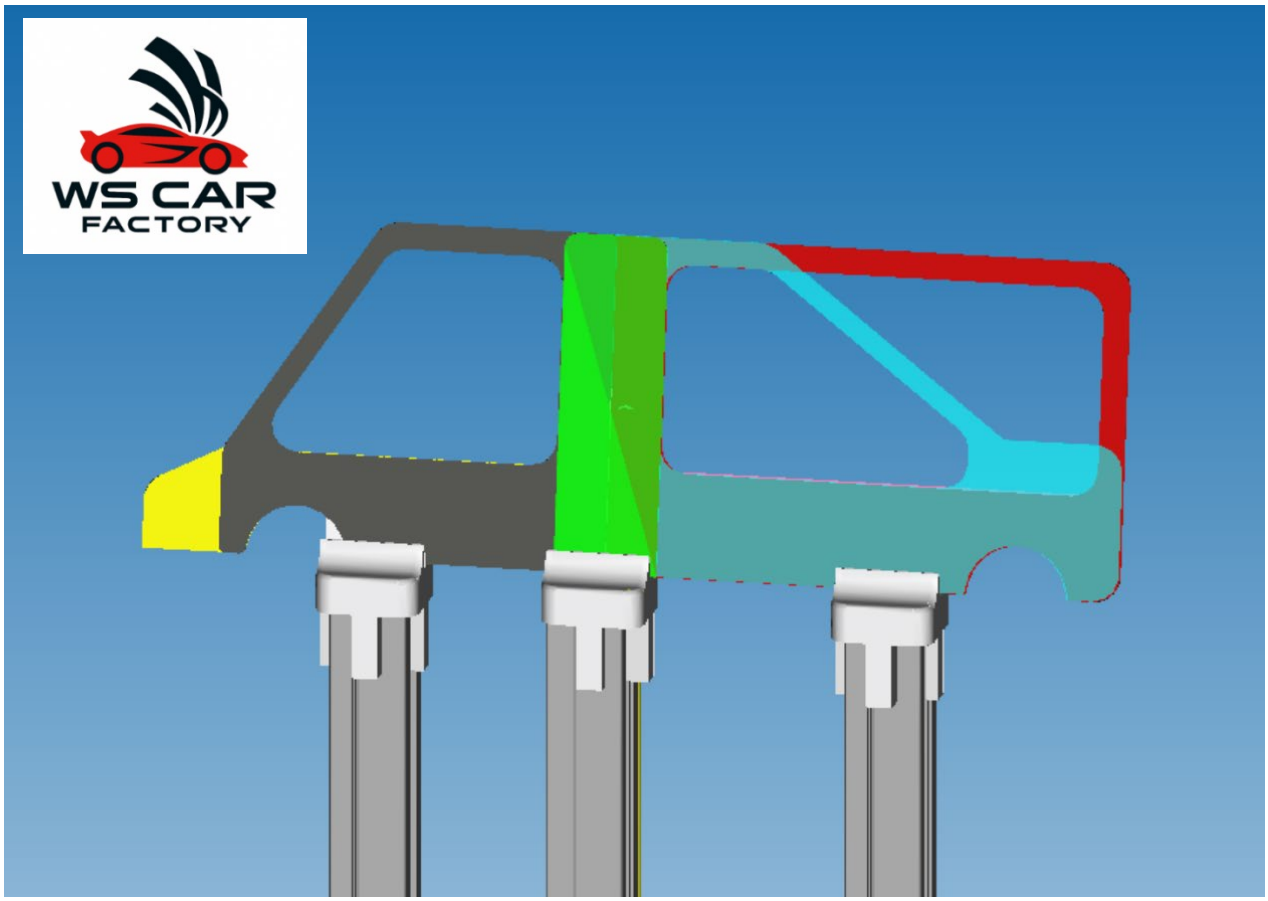
E1/2 etc – For Extension Tasks – normally on C3 and C4

SFF 1/2/3 – For Speed/Fault Finding Modules – immediately before each module.

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Introduction to Test Project

Introduction – Description (F)



A new brand car company, called WS Car Factory has a new plan project.

The project is to set up a system to automatically place and assemble differents parts of the car body in Bodyshop of their car factory.

The project is divided into stages, setting up the robot and the cell, completing the basic task and then attempting extension tasks if the Competitors have time.

There are also Speed/Fault Finding modules during the Competition.

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Introduction – Education Cell (F)



This competition is based upon the standard **FANUC** Shanghai Education Cell.

The Education Cell is delivered "ready to run" – there is no need for the Competitors to physically install the robot or connect input power.

But the Competitors should decide on the layout of the system, install, connections, and configure all cell Equipment's provided.

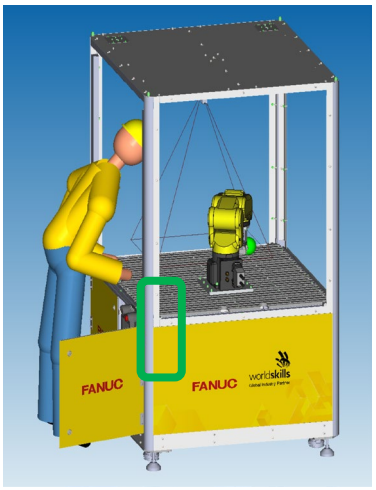
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Introduction – Safety (F)

Each Expert is responsible for the safety of their team.

The Competitor's bodies should not enter the cell while operating the robot or manipulating the teach pendant.

Examples:

OK	OK	Not OK
Body is outside of the cell while moving the robot.	Body is partially inside the cell, but TP is on hook.	Body is partially inside the cell while moving the robot.
		

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The Competitors must always be able to take a step back when working in the cell or moving the robot in case something unexpected happens.

Examples:

OK



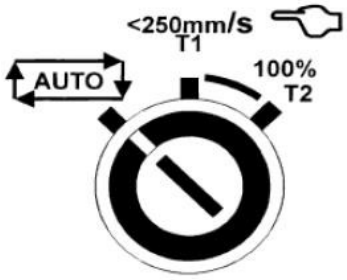
Not OK



Not OK



AUTO/T1/T2 Switch



Competitors should do all setup/programming etc in T1 mode (<250 mm/s). For testing, the Competitors can choose either to use Auto, T2 or T1 Mode.

The Cell Door can be Open or Closed while T1 or T2 Mode are used.

Please note that Competitors are responsible for the Auto/T1/T2 key and freely change the mode. However, Safety is the most important.

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Personal Protective Equipment

This is referred to the Technical Description and the WorldSkills 2026 Shanghai safety regulations.

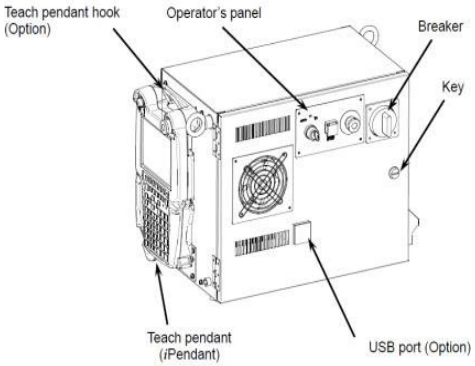
Controller Access/Open Controller Door

The controller door should remain closed. However, if there is a reason for the Competitors to open, this will be explicitly stated in the Test Project Description.

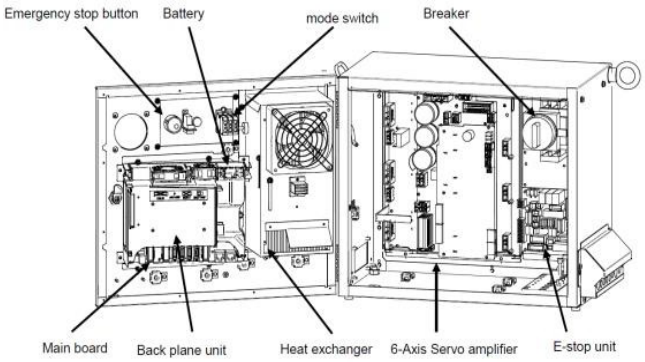
But if Competitors request for instance to check a proper ethernet connection, the door is allowed to be opened by **FANUC Technical Support Team or two (2) non-compatriot Experts only.**

Turn off Main Breaker before opening controller!

OK



Not OK

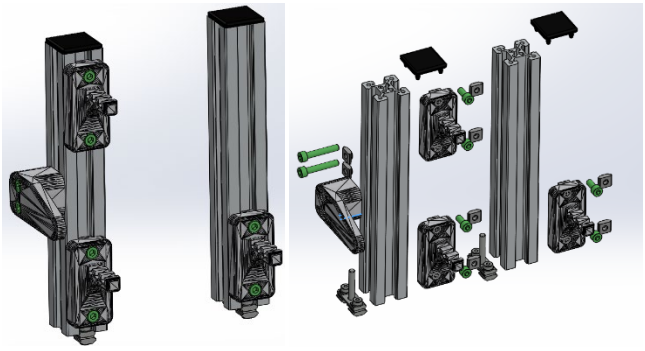


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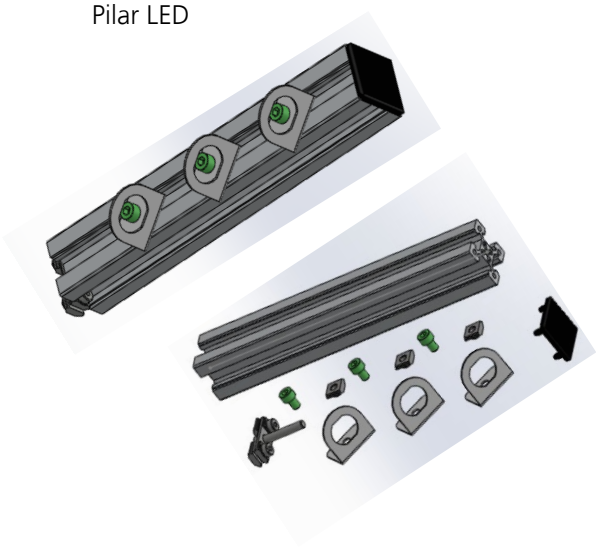
Description of Test Project Resources

Description – Basic Task Parts (F)

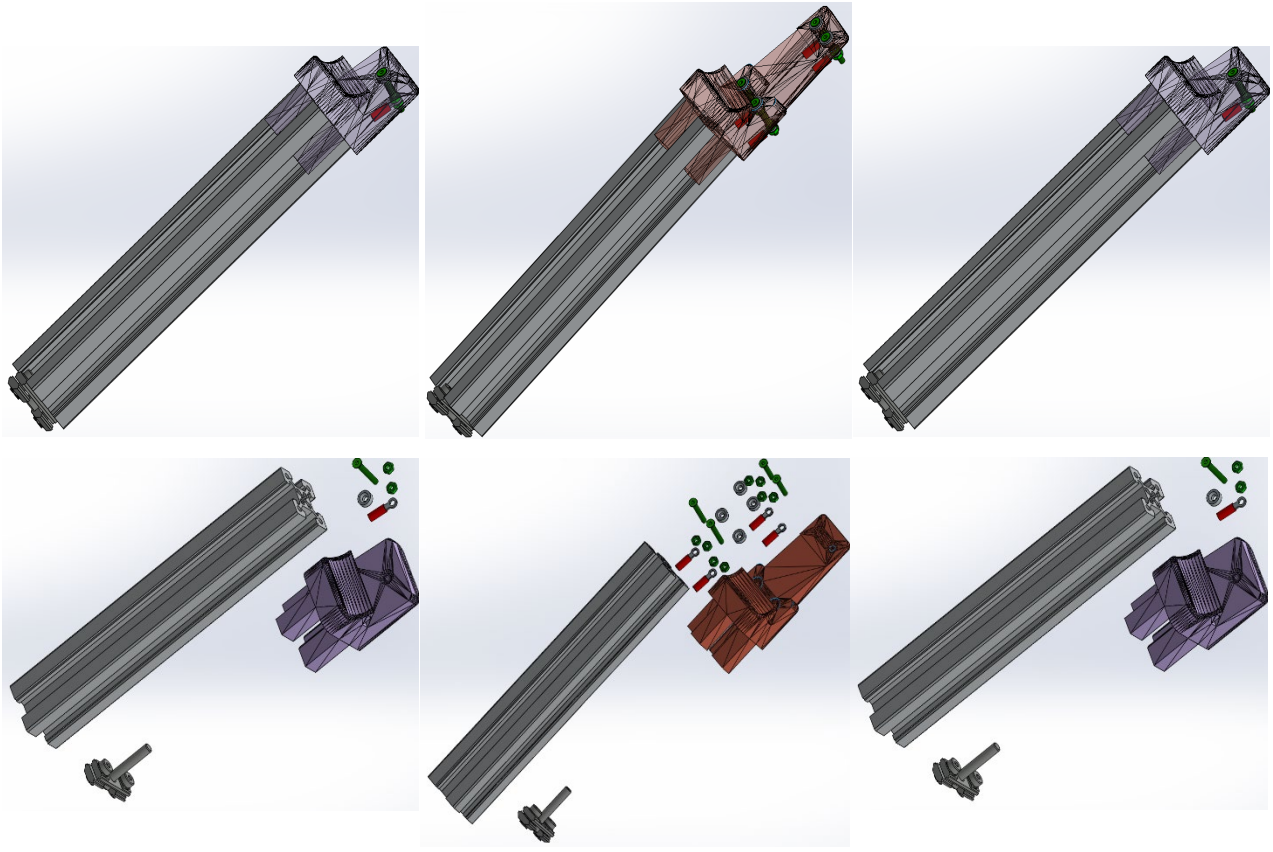
Rack Parts



Pilar LED

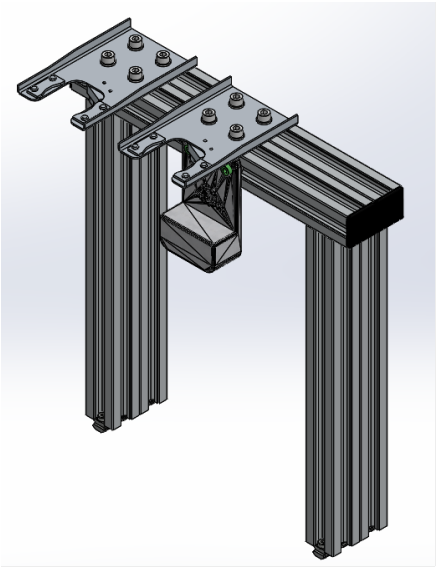


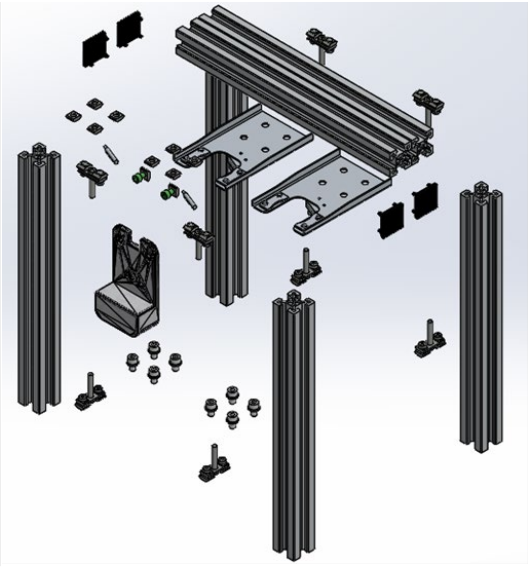
Welding Station Pillars (x2 Left Right x1 Middle)



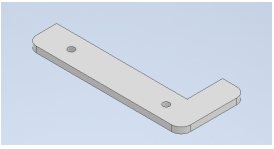
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Tool Magazine:

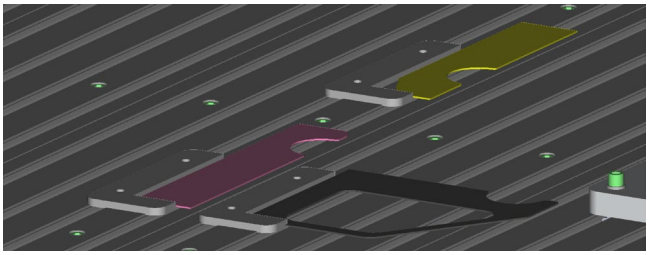




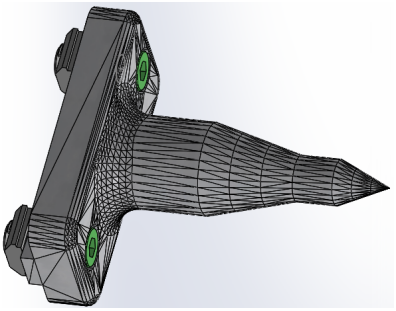
Square Ref Parts:

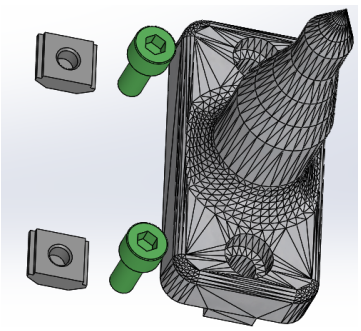


Example how to use them:



Fixed teach Pin (use to teach the TCP):

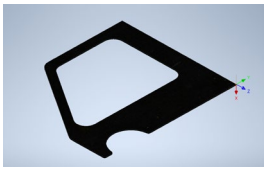
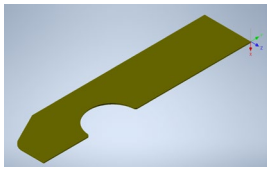
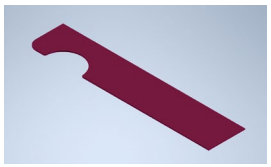
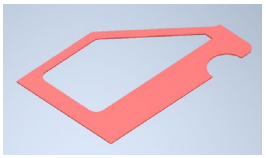
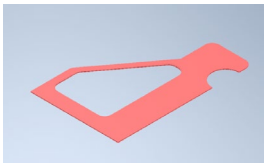
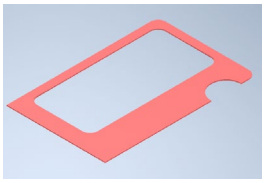
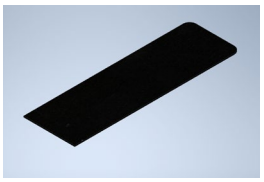




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Car Parts:

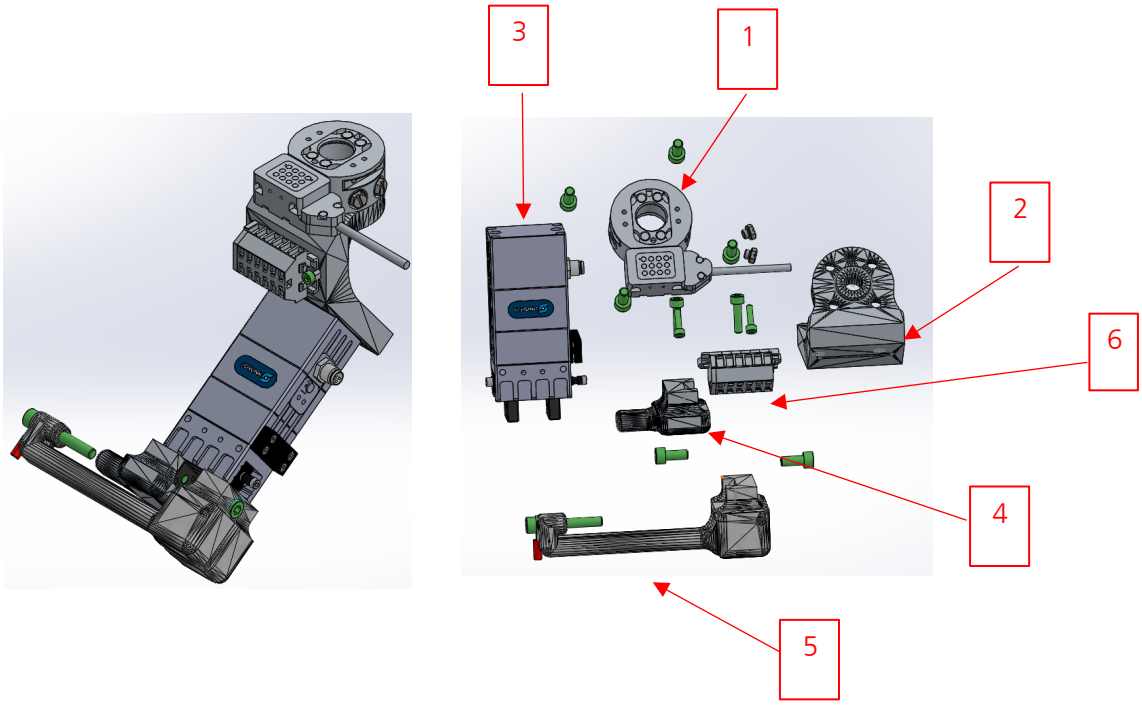
Parts in steel Metal 1 mm thickness.

FRONT OR BACK OR AMONT OF CAR	NAME	PICTURE	WEIGHT (IN GRAMS)
Front	UP Front Car Part		30
	Front Car Part		15
Back	Back Car Part		15
	Up Back Car Part Model 1 VAN		50
	Up Back Car Part Model 2 COUPE		50
	Up Back Car Part Model 3 SEDAN		70
Amont	Amont Car Part		10

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Description – Gripper and Teach Pin (F)

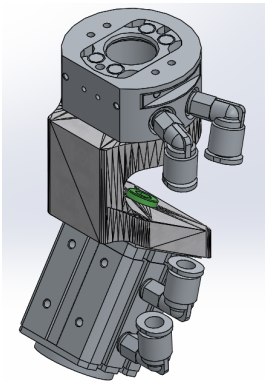
The Gun Spot_Tool

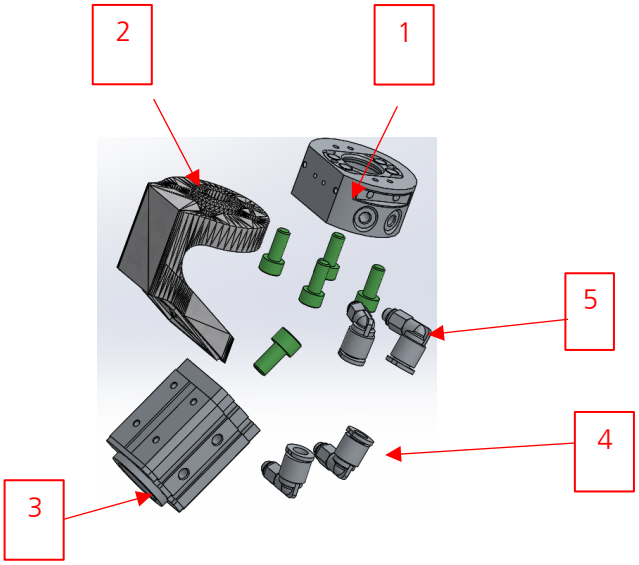


#	DESCRIPTION
1	SMC Quick Change with connection plug
2	Fixture EGP40_SMC_QC (3D Print)
3	Schunk EGP 40 – electric gripper
4	Gripper Finger Spot 1
5	Gripper Finger Spot 2
6	WAGO Plug connection

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The Pick Tool



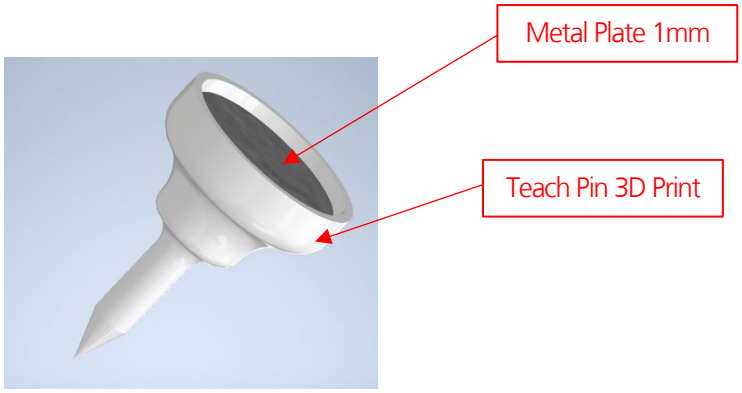


#	DESCRIPTION
1	SMC Quick Change with connection plug
2	Fixture SMCMH12_SMC_QC (3D Print)
3	SMC MH12D (Magnet Cylinder)
4	SCM Air Plug 6mm M5
5	SCM Air Plug 6mm M5

The Teach Pin MUST be used to teach accurate reference positions and frames.

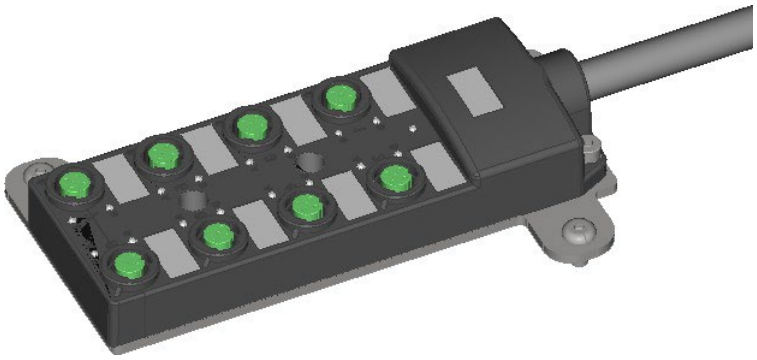
This also means creating a separate TCP for the Teach Pin.



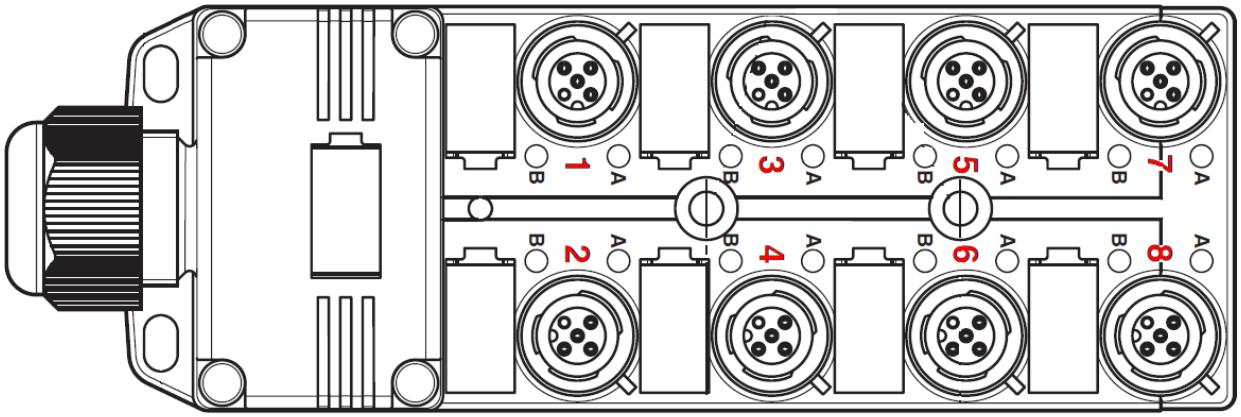


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Description – I/O Block (F) And I/O



An I/O Connection Block is supplied to connect peripheral equipment. The I/O Block has sockets numbered 1 to 8 as shown below:



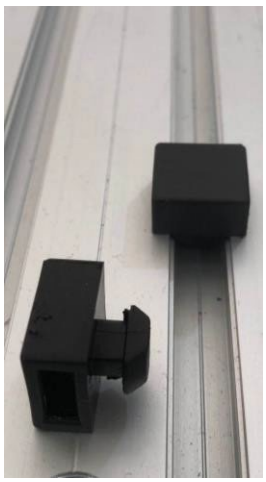
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The robot I/O is pre-connected to the sockets as shown in the table below:

SOCKET	A (PIN 4)	B (PIN 2)
1	DI [101]	DI [102]
2	DI [103]	DI [104]
3	DI [105]	DI [106]
4	DI [107]	DI [108]
5	DO [101]	DO [102]
6	DO [103]	DO [104]
7	DO [105]	DO [106]
8	DO [107]	DO [108]

The input and output cables can be connected directly to the socket or via a Y-connector as shown below, to make the most efficient use of the available I/O. Plastic clips are supplied to clip cables to the table if needed – see examples below:





There is a SMC solenoid valve connect on the **Digital Output [DO-109]**, this valve is used to general ON/OFF the air Supply. Please note that it is your responsibility to ensure that this solenoid valve is operated correctly to activate or deactivate the air supply to the cell, depending on the robot's operating phases or the cell's status.

PLEASE NOTE THAT NO ELECTRICAL MODIFICATION OF CABLES OR CONNECTORS OR ANY OTHER COMPONENTS IS REQUIRED OR ALLOWED!

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Description – UOP (F)

There is no physical Box for UOP, however Competitors may use FLAG and IHM interface.

The unused DO [n] is available for the Competitors to use for any purpose. If they are used, they should be labelled appropriately.

For details, please refer to the Robot Controller Manual B-83284EN/09, Section 3.3. SETTING UP THE ROBOT SYSTEM

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Description – PC and Software (F)

One (1) laptop is supplied, equipped with:

- Mouse
- Microsoft Windows.
- Microsoft Office: Word, Excel, PowerPoint, acrobat reader etc – for Documentation
- Microsoft Office SharePoint Designer for Web Page construction
- Microsoft Internet Explorer for connection to Robot Controller
- **FANUC** ROBOGUIDE for Simulation (and template RG Cell)
- Payload checker
- One USB key for file transfer etc.
- Ethernet cable for connection to robot controller for file transfer, iRVision etc.
- All necessary **FANUC** Manuals are also supplied in PDF form on the PC
- HTML Editor
- Manuals
- Payload Checker

Description – Ethernet (F)

An Ethernet cable is supplied to connect from Laptop to Robot for setup, entering comments, iRVision, etc. There is pre-installed Ethernet cable from robot controllers and there is no specific need for Competitors to open the controller.

IP addresses and Subnet Masks for PC and Robot should be set as shown below.

PLEASE DO NOT USE OTHER VALUES!

IP ADDRESS TABLE		
IP ADDRESS ROBOT 192.16.1.10	IP ADDRESS PC 192.168.1.1	SUBNET MASK 255.255.255.0

If Competitors have trouble setting up the Ethernet connection, then they can ask for assistance, however no point will be award.

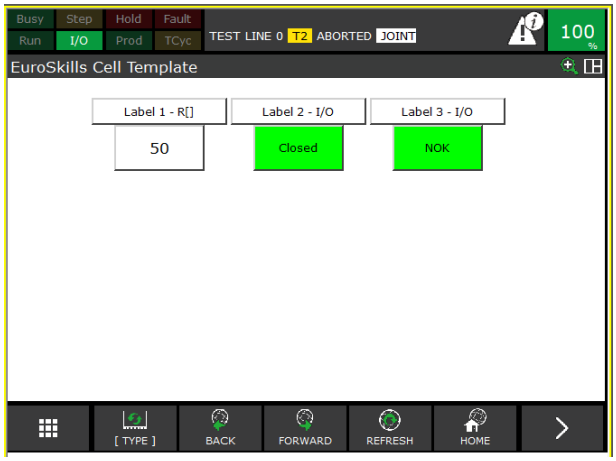
Description – Basic HMI (F)

A Basic HMI (User Interface) template file is provided – This file should be loaded and set up so that it can be displayed on the Teach Pendant.

The HMI need to be able to display manually by the operator and appear automatically when the main program is started in Automatic mode.

The minimum functions of the HMI should have:

- Display a Counter showing the number of the part being processed.
- Display Open/Closed status of the Gripper
- Displaying Error/Fault status of the Robot (equivalent to the Fault LED on the TP)



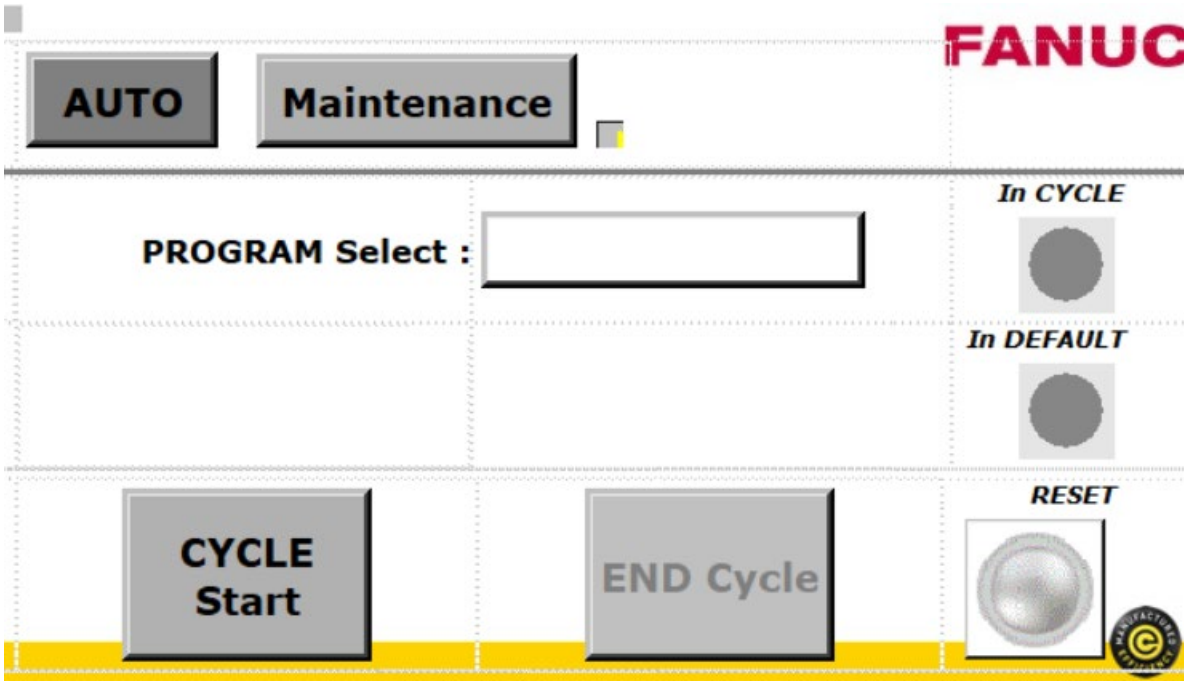
It is not enough to just load this file – it must be set up correctly with correct labels, I/O, Register values and Colours.

Competitors may use Microsoft SharePoint Designer or a Text Editor, or any other function installed on the PC to modify it.

Competitors may improve/extend this basic HMI as much as they wish.

For further information on the HMI/User Interface Setup, please refer to the information on the standard Education Cell: FEC_Ed_Cell_Technical_V5_4.pdf

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Description – Advanced HMI (F)

An example of Advanced HMI (User Interface) template file is provided. This shows how to make a more sophisticated User Interface.

Competitors may include advanced features into the HMI for additional points. Multiple pages and integrate UOP to control the START/STOP/PAUSE/ABORT of the Cell are allowed.

Description – Reserved Programs and Register (F)

There are some reserved programs:

Z_SHIP.tp, Z_ZERO.tp, Z_HOME.tp, Start_timer.pc

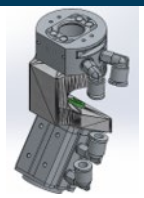
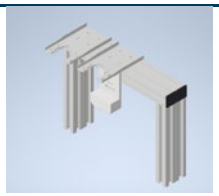
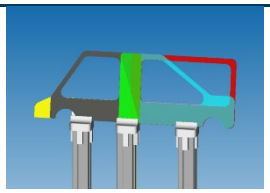
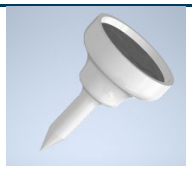
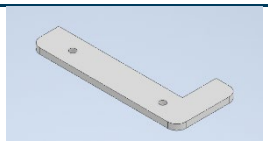
These are for Workshop Manager, Workshop Manager Assistants and Skill Management Team to use – please do not use/modify/delete these programs.

Competitors should not use Register R [200] is reserved for the marking team.

Instructions to the Competitor

Instructions – Basic Task - Parts (B)

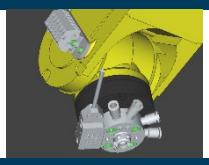
The necessary equipment for the application is supplied:

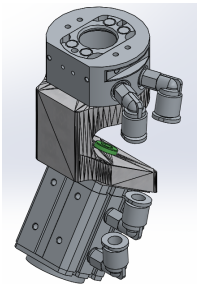
EQUIPMENT	PICTURE
Tool 1: Pick_Tool	
Tool 2: Gun Spot_Tool	
Tool Magazine	
Rack Parts	
Welding Station	
Car Parts	
Touch Pin	
Square Ref for parts on table	

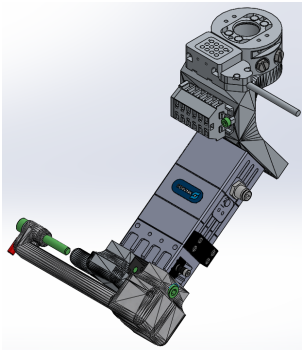
Instructions – Robot Setup – Gripper (B)

Installation of mechanical, electrical and connection of Tools. Set up the robot system to use it. Additional marks will be awarded for the most complete setup.

Set up the Robot payload(s) according to the data given:

	ITEM		DESCRIPTION	MASS (GRAMS)
Fix SMC QUICK Changer on	1		Wago on J4	5
	2		Mass of SMC Parts with Screw and	75

	ITEM		DESCRIPTION	MASS (GRAMS)
Tool N° 1 PICK_Tool	1		Total Mass of mounting plates, screws, SMC plug	60
	2		Mass of SMC Magnetic	75
	3		Mass of the 3D Print	15
	4		Mass of the Quick Changer parts	50

	ITEM		DESCRIPTION	MASS (GRAMS)
Tool N° 2 Gun Spot	1		Total Mass of mounting plates, screws, SMC plug, WAGO plug	60
	2		Mass of Schunck EGP40	170
	3		Mass of the 3D Print	15
	4		Mass of the Quick Changer parts	50
	5		Finger with weld touch	15
	6		Finger simple	10

Cable assembles need to be done in accordance with best practice (using the correct cable lugs for the wire sizes) and in line with the wiring specifications by the Competitors. See annex document attached.

How the welding contact simulation works:

White LED on the pilar of the welding station needs to goes ON when the contact touches the part.

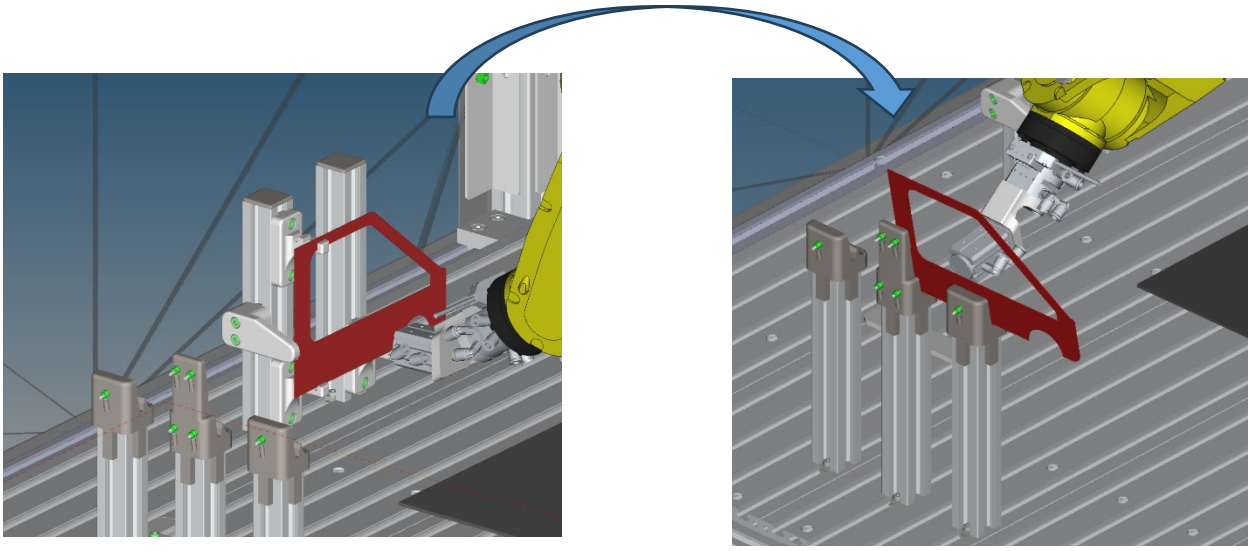
Appropriate Tool Centre Point (TCP) – for each tool and Teach Pin need to be set as minimum.

© WorldSkills International

Instructions – Tool Test Run (B)

The first task is divided into two (2) steps in the Test Project

First Step is Pick_Tool test:

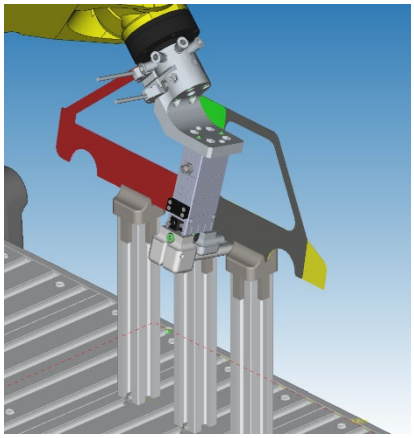


The first step is a simple test that the Tool 1 is correctly set up and working, with the tool N°1 Pick_Tool install on the robot. Program this sequence:

STEP	ACTION
1	Start at HOME Pos (use the robot program Z_HOME.TP)
2	Move to Position 1 to in the Rack Parts (with approach and retrack positions)
3	Move above the Welding Station
4	Place the Part 1 in the Welding Station (with approach and retrack positions)
5	Return to Home Pos (use the robot program Z_HOME.TP)

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Second Step Spot_Tool test:



Welding Sequence:

When activate RO closing, the EGP40 close and the screw touch the parts for 0.5s and RDI[1] goes ON

The second step is a simple test that the Tool 2 is correctly set up and working, with no Tool attach on the robot. Program this sequence

STEP	ACTION
1	Start at HOME Pos (use the robot program Z_HOME.TP)
2	Pick the good Tool in the Tool Magazine
2	Move above the Welding Station
3	Move anywhere in position of simulation point of spotwelding on the parts
4	Activate the sequence of welding with the I/O to manage the closing of the Gripper EGP40 to simulate le welding, when the touch screw is in contact of the parts in welding station the LED of the Welding Station goes ON.
5	After Welding Simulation move away from the part
	Drop the Tool in the Tool Magazine
6	Return to Home Pos (use the robot program Z_HOME.TP)

Competitors need to show tool change processes in rule of best practice.

The program can be run in Auto or Manual mode, but additional points will be given for running from the UOP on IHM or by Cyle Start Button from controller.

The robot should be moved to the described start position before starting the test program so that Experts can check it is correct.

Test Run Conditions: One (1) cycle for each Step, Two (2) attempts.

No modification of program or data are allowed.

Correctness of task

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Instructions – Robot Setup – I/O Module and UOP (B)

Default I/O module was setup to use DI [101 – 108] and DO [101 – 108]. This is not particularly convenient as this means that there are many unused I/O points between DO/DI [1] to DO/DI [100].

Additional marks will be awarded for configuring the I/O Module to use DO/DI points in the range [1–8], and to delete any other unconnected I/O.

The configuration of the UOP should be set to be used with FLAG. (Rack 35)

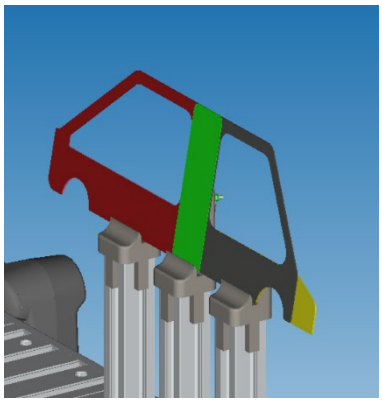
© WorldSkills International

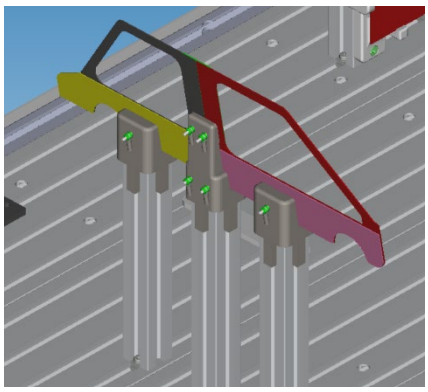
Instructions – Basic Task (B)



In a Bodyshop Factory many robots can be used for different purposes, as shown above – some robots are used to place some parts of the body car in place, and some robots are used to assembly by welding the parts.

The Basic Task is to simulate the Automation of the process to place and assembly a side of a body car, but instead of multiple robots, we will use only one robot.





Instructions – Basic Task Sequence (B)

STEP	ACTION
1	The Robot starts and ends the task at a Home position. It should not start the task unless it is at Home. There is no tool attach on the robot.
2	Pick the Tool 1
3	Pick the Front Car Part from ref Magazine and load it in the front of the welding station
4	Pick the Back Car Part from Magazine and load it to the back of the welding station
5	Pick the UP Front Car Part from ref Magazine and load it on top of the Front Car Part
6	Pick the UP back car part model 1 from the 1st place of the Rack part and place it on welding station
7	Pick the Amont car part from ref Magazine and place it
8	Drop tool 1 and pick tool 2
9	Weld the different points as described in the annex document
10	Drop tool 2
11	Return to home

Test Run Conditions: One (1) cycle for each Step, Two (2) attempts.

No modification of program or data are allowed.

Correctness of task

Time will be measured.

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Instructions – Extension Task 1 (E1)

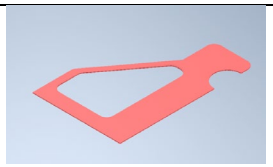
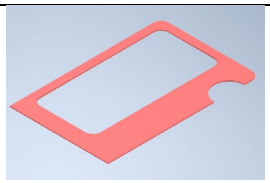
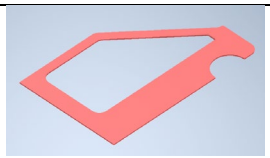
Different types of body Car

In addition to the Basic Task, Competitors need to set up a simulation of welding in relation with model of the UP Back Car. There are three (3) different Model of Back Car.

Each Model has a specific welding path and number of welding point.

See the appendix document to know the good recipe in function of the date.

The Rack can be loaded in random. iRVision to be used by scanning the QR code to determine pickup Model according to selected Recipe/Program.

MODEL PICTURE			
QR CODE	QR code Car : COUPE	QR code Car : SEDAN	QR code Car : VAN

A bonus point in this parts the four (4) parts in reference on the Table with the squares Parts ref can be replace by using black font to put the four (4) parts in random position to be pick.

Test Run Conditions: One (1) cycle for each Step, Two (2) attempts.

No modification of program or data are allowed.

Correctness of task

Correctness of task and Cycle Time will be measured.

The Experts will choose the order of the Rack Parts.

Vision Reading tested separately.

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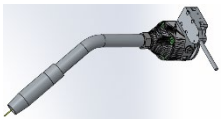
Instructions – Extension Task 2 (E2)

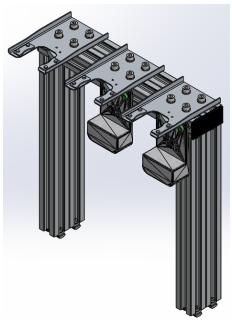
Third Tool: Arc Welding Tool

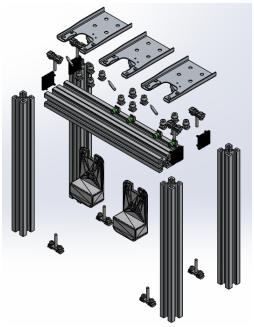
For the Basic Task, all the welding is made by GunSpot Welding Tool.

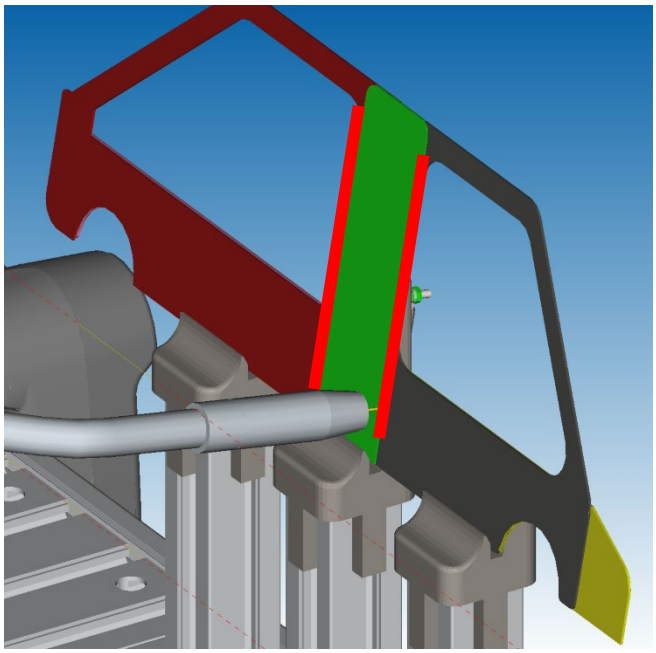
For this Extension Task, the Competitors will add new Arc Welding tool to simulate arc welding for Both side of the Amont at fix speed 50mm/s from around 1 cm of bottom to 1 cm the top.

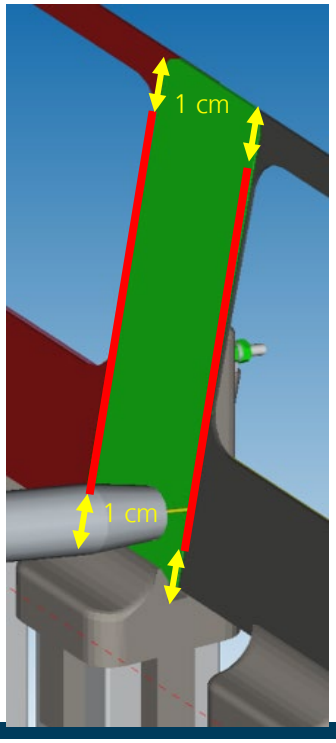
For this ExtensionTask you need to use the new Tool, so you need to declare it and manage it in the Tool_Mangazine

		DESCRIPTION	MASS (GRAMS)
Tool N° 3 Arc_Torch		Total Mass of the Tool	130





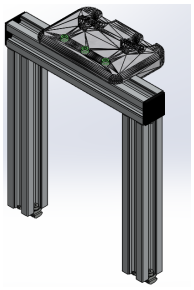


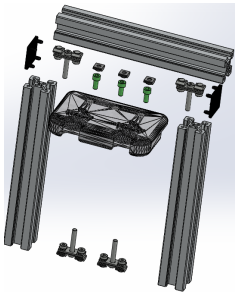


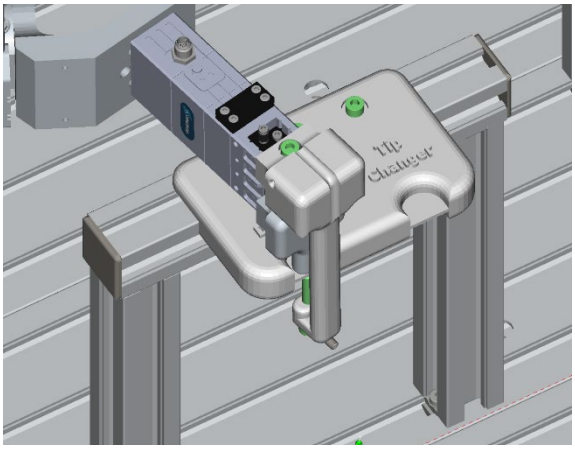
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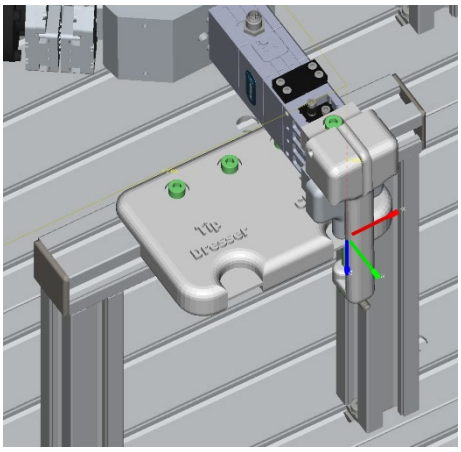
In a real welding production, the Gun SpotTool needs to be checked and the Tips need to change after certain welding Points. Competitors need to add in their layout the Tip Changer and Tip Dresser tool. The frequence how to use them depends of the Process so this need to be place in parameter.

When the robot is in position in the Tip Dresser and in the Tip Changer the operation time is 2s.









Test Run Conditions: One (1) cycle for each Step, Two (2) attempts.

The frequence time of the use of tip dresser and tip changer will be give by Expert before assessment and the value will be put in the parameter.

No modification of program or data are allowed.

Correctness of task

The Experts will choose the order of the Rack Parts.

Instructions – Speed/Fault-Finding Module 1 (SFF 1)

This is a QCM about general/Maintenance/

See file S-FF Module_1_1Quizz.

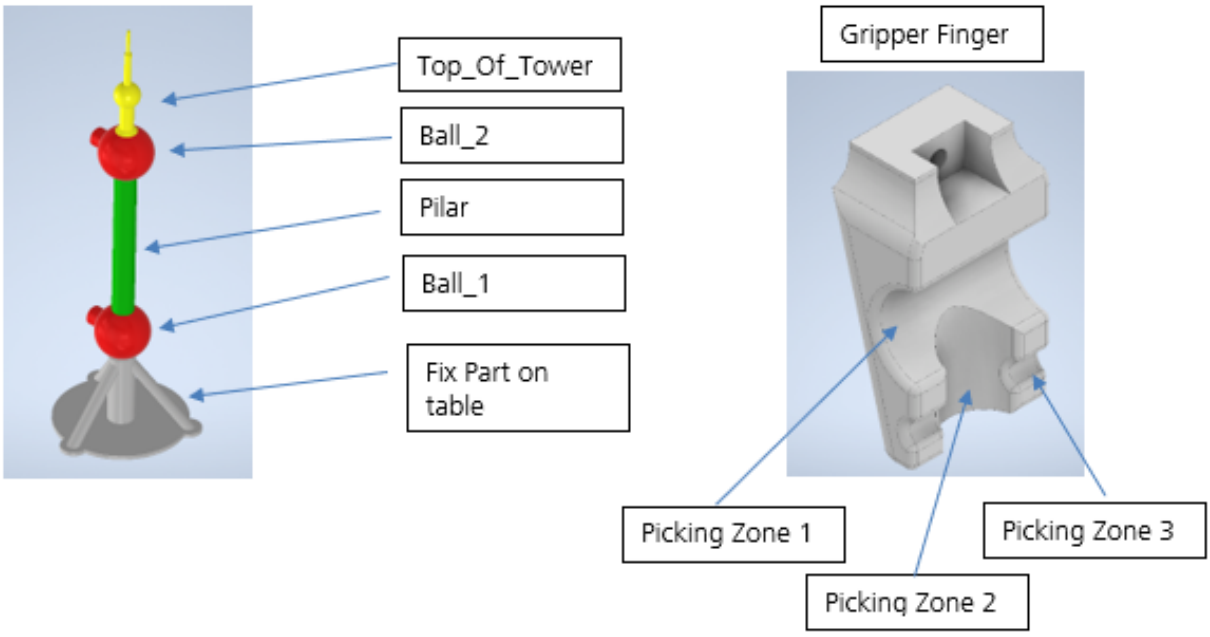
Total time available is 30 minutes.

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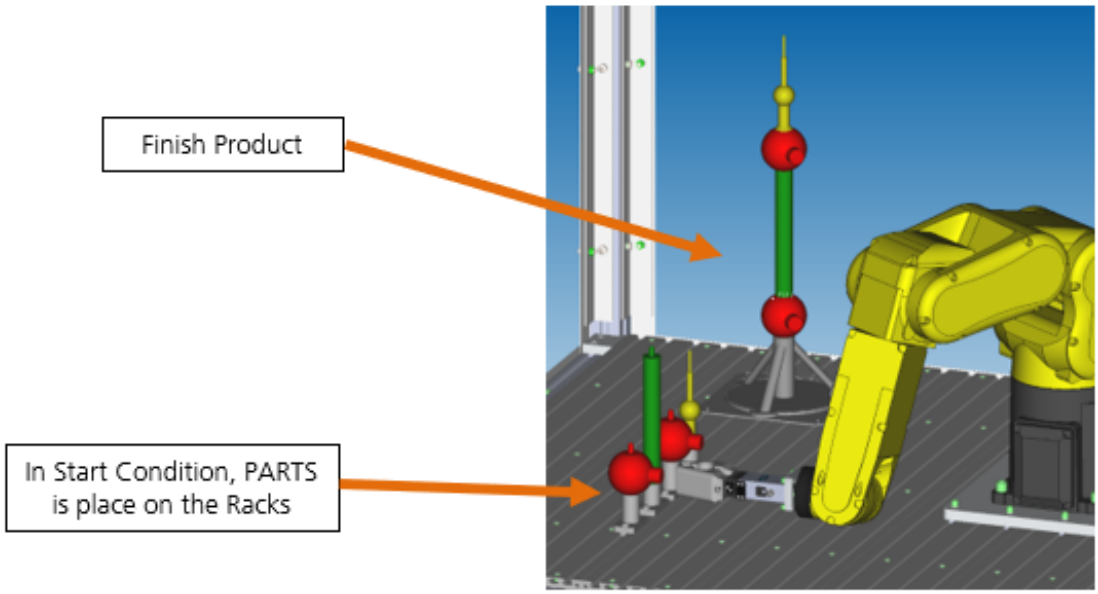
Instructions – Speed/Fault-Finding Module 2 (SFF 2)

Build the Famous symbol of Shanghai "Oriental Pearl Tower"





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This Module is about creating a Robot Program to build the Oriental Pearl Tower.

Competitor needs to create Pick & Place program to assemble the tower.

Each PARTS needs to be pick & place one by one, and the Tower needs to be completely assembled at the end of execution.

#	CONDITION
1	Start and Finish at Home Position (use Z_Home.tp)
2	Use some approach and retract points before each pick and place points
3	The program must run without any error messages
4	No damage is allowed
5	Use appropriate zone on the finger to pick and place parts

Total time allocated is fifteen (15) minutes.

If one (1) of the Gripper Finger or PARTS is broken, the SFF Module will be finished.

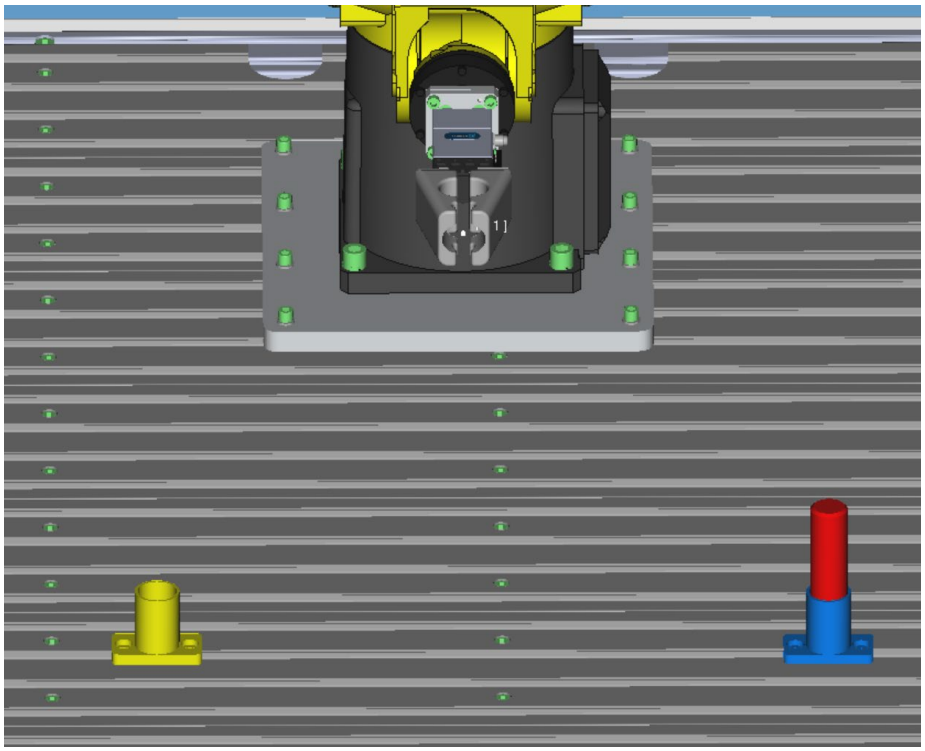
The result is no attempt.

Correct number of Parts Pick and Place also are considered.

Time to complete the task will be measured.

Instructions – Speed/Fault-Finding Module 3 (SFF 3)

FANUC Tablet TP introduction



This Module is about creating a Robot Program with Tablet TP interface.

Competitors need to create Pick & Place program to move PART as sequence in below Table.

At this stage, Fanuc Tablet TP will be used to operate and create program.

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#	CONDITION
1	Start at home Pos (using Z_Home.TP)
2	Move to Pick Position above the Blue Rack with 140mm approach – Pick the PART – Retrack 140mm with linear motion.
3	Move to Place Yellow Rack with 140mm approach – Drop the PART – Retrack 140mm with linear motion and wait for 1 second.
4	Pick the PART in Yellow Rack and retrack 140mm.
5	Move to the Blue Rack with 140mm approach – Drop the PART – Retrack 140mm with linear motion and wait for 1 second.
6	Repeat the operation 5 times.
7	Return to Home.

The total time allocated is fifteen (15) minutes.

If one (1) of the Gripper Finger or PARTS is broken, the SFF Module will be finished.

The result is no attempt.

Complete correct cycle.

Cycle time to be measured based on full cycle.

Bonus point if the Icon Bloc function is used.

The time taken to complete the task will be measured.

Instructions – Working Style and Safety (F)

Throughout the Competition, Competitors will be expected to work as they are in real Industrial setting – installing and setting up a Robot System at a Customer site.

Always work professionally and take all normal precautions against everything that may occur in a real industrial situation.

Instructions - ROBOGUIDE/Digital Twin (F)

Simulation plays an important role in this skill.

- Planning the layout of the cell and checking reachability of cell components.
- Creating the basic task program structure while the equipment is being installed according to the layout
- Creating the extension task program structure while the basic task structure is being installed and tested

It is also important that any changes that are found during installation and testing are implemented in the Simulation as well as on the real cell – so that there is a Digital Twin of the actual cell – the layout, the programs – all equipment of the cell.

First, Competitors will be asked to create a ROBOGUIDE program to check reachability of the equipment installed in the cell. Later it will be checked if the ROBOGUIDE simulation is really a Digital Twin of the real cell.

Remember also to make the Teach Pendant display as realistic as possible – for example with the 4D Graphics function, and to work professionally with the laptop as well as with the Robot.

Instructions – Documentation (F)

When Competitors finish the task, they should hand over a documentation package to the end customer. This documentation should contain all necessary information to run, maintain and troubleshoot the system after it is delivered.

Competitors are provided with a template document in English for the documentation submission.

The documentation contents not necessary to be in English, but it will be helpful to the Marking Teams if at least the titles of the different sections of the documentation could be in English and own language.

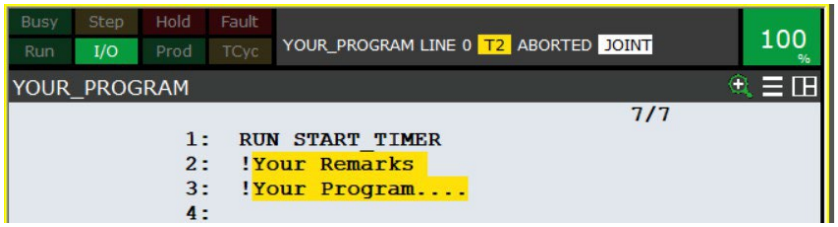
Instructions – Robot and PC Power (F)

At the end of every Competition day, the Competitors should turn OFF both robot and PC power. The Experts will tell the Competitors when to turn ON power again before marking.

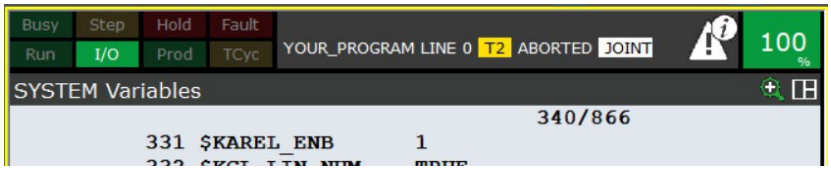
Instructions – Test Running and Test Run Timer (F)

Test Run will be done according to the Technical Description – Two (2) attempts in a specified time and first successful attempt ends test run. No modifications will be authorized during assessment time.

To measure the Cycle Time, the Competitors should insert the RUN START_TIMER command as shown below into each main program.



Hint: [INST] > Multiple control > RUN > COLLECT > KAREL Progs > START_TIMER It may be necessary to enable KAREL to make the program START_TIMER visible:



The timer value will be shown in R [200] – Thus, this register is reserved for this purpose:



The Marking Team will check that this has been correctly done before starting the test run

IF COMPETITORS HAVE ANY QUESTIONS OR CONCERNS ABOUT THE USE OF THE START_TIMER PROGRAM THEN THEY SHOULD ASK DURING COMPETITION TIME, NOT DURING MARKING TIME.

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Equipment, machinery, installations, and materials required

It is expected that all Test Projects can be done by Competitors based on the equipment and materials specified in the Infrastructure List, except as detailed below.

Materials, Equipment, and tools supplied by Competitors (F)

The Competitor PCs are equipped with US International standard Keyboards and basic mouse.

Competitors may bring their own keyboard and mouse to connect to the PC if they prefer. Hard-wired USB connections are recommended. The installation and functioning of these devices are the responsibility of the Competitors. It is permitted to install additional drivers, if necessary, after approval by SMT.

Neither WorldSkills nor the Global Partner or PC supplier can guarantee the compatibility or functioning of the Competitor supplied devices.

The Competitors may also bring a paper or electronic dictionary. The dictionary may not have been modified in any way – handwriting, additional papers etc. It will be checked on C-2

There should be no other tools or equipment required to complete the Test Project – these are all provided in the Test Project Kit and Tool Trolley, and Competitors are prohibited from bringing other tools and equipment.

Materials, equipment, and tools prohibited in the skill Area (F)

PERSONAL LAPTOPS – USB – MEMORY STICKS – MOBILE PHONES

Competitors are only allowed to use memory sticks provided by the Competition Organizer.

Memory sticks or any other portable memory devices cannot be taken outside the workshop.

Memory sticks or other portable memory devices are to be submitted to the Chief Expert or to the Deputy Chief Expert at the end of each day for safe keeping.

Experts are allowed to use personal laptops, tablets, and mobile phones in the Expert room only.

Competitors are not allowed to bring personal laptops, tablets, or mobile phones into the workshop.

PERSONAL PHOTO CAMERAS – VIDEO TAKING DEVICES

Competitors and Experts are allowed to use personal photo and video taking devices in the workshop after the total Competition is completed.