

MME Standard Operating Procedure (SOP)

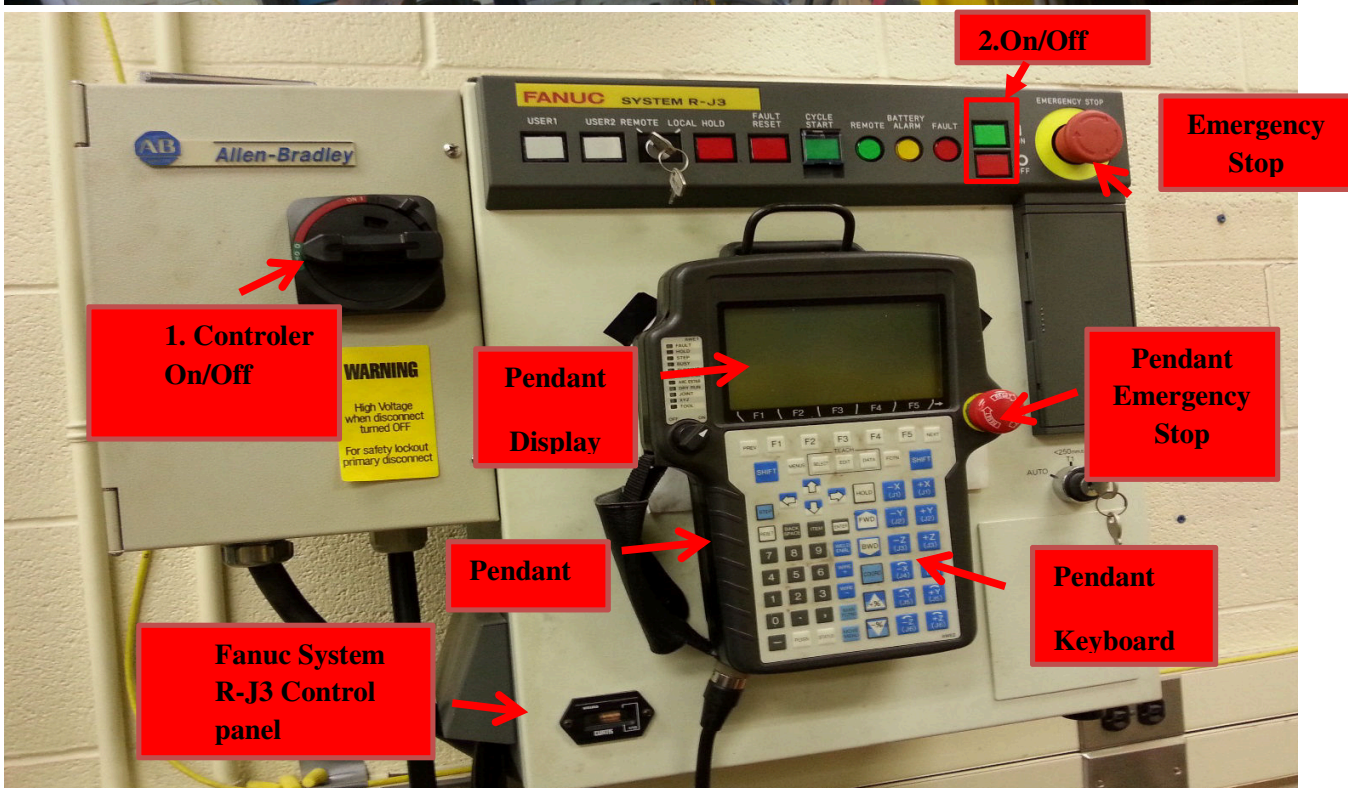
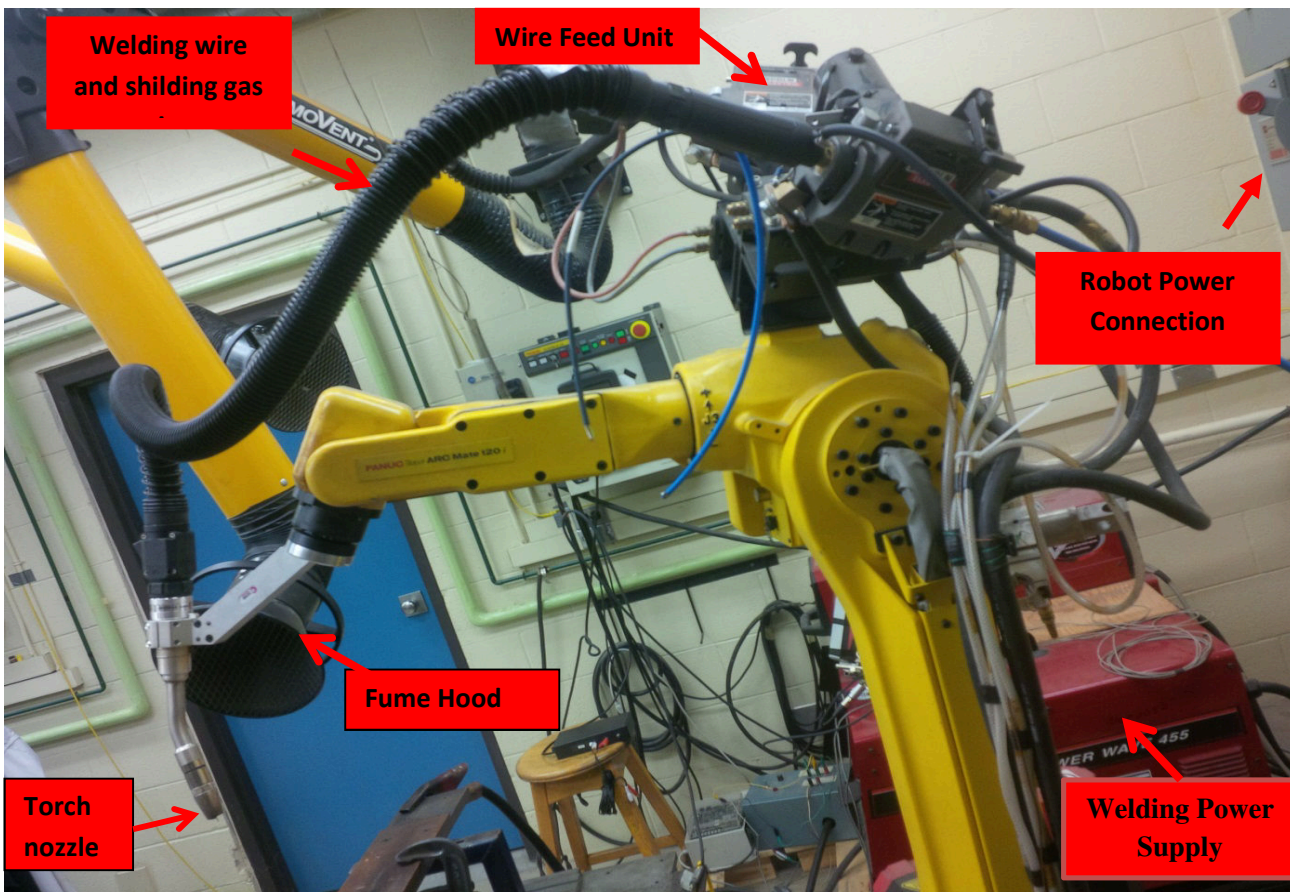
Name	FANUC Robot Arc Mate 120i
Description	Gas Metal Arc Welding robot
Manufacturer and Model	FANUC- Arc Mate 120i Welding Robot
Location	E3 2118K
SOP Creation Date	2015-03-17
SOP Created By	Nazmul Huda
SOP Revision Date	2015-03-20
SOP Revised By	Adrian Gerlich
SOP Location	inv.mme.uwaterloo.ca
Manual Location	E3 2118K & inv.mme.uwaterloo.ca
Equipment Owner	Adrian Gerlich
Support Technicians	

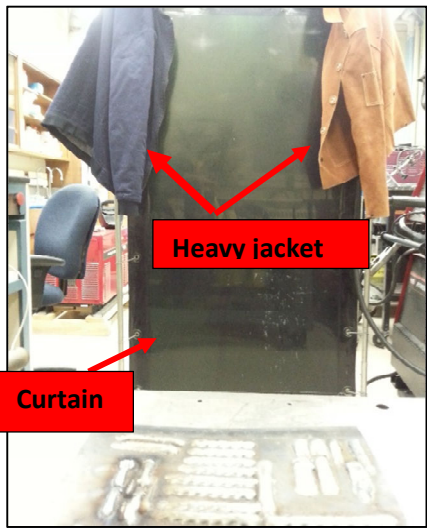


Significant Hazards	<ul style="list-style-type: none"> • High temperature arc can cause severe injury. • Flying metal during welding. • Fumes generated during welding is harmful. • Rays from arc is hazardous for eye. • Noise from welding can hamper hearing. • Unusual movement of robot can lead to damage and accident. • High voltage wire can lead to severe shock. • High pressure and heavy gas cylinders can cause explosion. • Holding hot metal in free hand can cause severe burning. • Explosive materials like burning gas near welding zone can cause explosion.
Administrative Controls	<ul style="list-style-type: none"> • Authorized personnel: Abdelbaset Midawi (mr.bastoo@gmail.com), Nazmul huda (n2huda@uwaterloo.ca), Yuji Kisaka (yujii5@icloud.com), Christopher Gobbi (gobbi_wan@hotmail.com). • The equipment can only operate during Monday to Friday 9.00 AM to 5.00 PM. • Only authorized personnel shall operate, maintain or service the robot. • Eye protection shall be required. • Spectators shall be prevented from the controlled area. • Service personnel shall comply with control procedures.
Engineering Controls	<ul style="list-style-type: none"> • Fanuc System R-J3 Control panel • Control system(Allen Bradley) • Programing board (Pendant). • Power source (Lincoln Electric). • Fume hood switch.

PPE Required	<ul style="list-style-type: none"> • Wear heavy and full hand apron or jacket to protect cloths and skin. • Eye protection- use the eye wear or eye shield (available near robot). • Gloves are available in lab to wear during welding operation, material handling and nozzle removal. • Remove all the explosive and flammable material away from welding zone during operation. • Always place the curtain (available in lab) 5 feet away from welding zone and stay behind it during welding operation. • Use ear protection if noise level is high. • Use proper shoe during doing experiment.
Relevant Standards and Codes	<ul style="list-style-type: none"> • Robots and robotic devices – Vocabulary- ISO 8373:201.2 • Robots and robotic devices -- Coordinate systems and motion nomenclatures-ISO 9787:2013. • Safety requirements for industrial robots -- Part 1: Robots-ISO 10218-1:2011. • Robots and robotic devices -- Safety requirements for industrial robots -- Part 2: Robot systems and integration-ISO 10218-2:2011. • Robots and robotic devices -- Safety requirements for personal care robots-ISO 13482:2014. • Robots and robotic devices -- Safety requirements for industrial robots-ISO/DTS 15066. • Check also robot manual for any error message with codes in pendants.
Relevant MSDS	<ul style="list-style-type: none"> • Argon gas. • Carbon Dioxide gas. • Helium gas. • Oxygen gas. • Ethyl Alcohol. • Burning gas. • All MSDS can be found at https://sharepoint.uwaterloo.ca/sites/MME/MSDS.
Accident Procedure	<p>Serious Injury/ Illness: Eye injuries, skin injuries</p> <ul style="list-style-type: none"> • Call 911 or proceed immediately to the UW Hospital Emergency Department. • Compressed air/argon/oxygen leakage from cylinder → Call UW Police 519-888-4911 or X. 22222. <p>For treatment of all other injuries, proceed to:</p> <ul style="list-style-type: none"> • Department/Residence → first aid kit / station location → E3 – 2108H . • Health Services → first aid services available → 519-888-4096, X. 84096. • UW Police → assists if the above services are not available → 519-888-4911, X. 22222.

Emergency Shutdown Procedure	Personnel Injury <ul style="list-style-type: none">• Turn off the total system by "Emergency Button (preferred)" or power switch.• Call 911 and inform the dispatcher to advise medical personnel that the accident involved physical damage.• Contact Health Services – first aid services available → 519-888-4096 or Ext. 84096.• UW Police – assists if the above services are not available → 519-888-4911 or Ext. 22222. Fire <ul style="list-style-type: none">• Turn off the total system by "Emergency Button (preferred)" or power switch.• Evacuate as stated in the E3 building emergency plan.• Active wall mounted fire alarm pull station located at exits.• Call 911 for medical assistance (Ambulance). If using a cell/mobile call UW Police at 519-888-4911.
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Shielding curtain



Shielding Helmet



Eye goggle



Pre-start Checklist

- Check the SOP.
- Check the emergency fire exits.
- Check the fire extinguisher.
- Check around for any notification about any lockout sign of the robot.
- Remove any flammable element like gas cylinder, wood away from welding area.
- Check for high voltage connection wire around the welding area and arrange properly.
- Start the fume hood and wait few minutes for removal of any gas inside the room. (Located by fume hood and double doors).
- Check the cylinder for availability of required gas to perform the experiment and leakage in gas pipe.
- Check the availability of other required elements to perform experiment like apron, gloves, eye glass or shield, shield curtain.
- Check the filler wire setup; wire should be connected in way so that it is taut and not twisted. Also check the twisting into winding of filler coil.
- Clean the torch nozzle and contact tip (if needed).
- Set the work piece and hold it in place using clamps to prevent movement during operation.

Start-up Procedure

Step By Step

- Turn on gas supply. Check for shielding gas leakage.
- Turn on welding power supply (Lincoln Electric).
- Turn on (1. On/off) the control panel power supply (Allen Bradley) and wait for 1 min.
- Then turn on (2. On/off) the power supply of the Fanuc System R-J3 Control panel.

- Check the welding wire movement smoothness.
- Position the material.
- If everything fine prepare for operation.

Operating Procedure

- Create the desired welding program (Voltage, wire feed speed, welding speed, arc starting, arc ending point) using the pendant/programming board.
- Perform a pre-run to check the position of the work piece relative to the torch to ensure the created program and work piece positioning are accurate.
- Check the movement of the robot with the movement on the programming board, ensure you are standing outside of the reach of welding robot, marked by yellow line (5ft).
- Wear safety glasses, welding helmet, insulating clothing.
- Ensure safe distance from the welding zone, welding glass/ welding curtain, apron before operation.
- Ensure that snorkel fume extractor is within 12" of the weld area to capture fumes produced by the. welding operation, and that the extraction system is turned on.
- Re-check for any flammable elements around the welding zone.
- Turn on the DAQ system if required.
- Run the experiment.
- Wear gloves to remove the material from the position.

Shutdown Procedure

- Turn off power supply of the Fanuc System R-J3 Control board. (2. On/off).
- Turn off Allen Bradley (1. On/off).
- Switch off the welding power supply (Lincoln Electric).
- Close the gas cylinder flow.
- Turn off fume hood.

Clean-up

- Safely remove finished work piece(s); make sure to have gloves on since work-piece is really hot.
- Arrange all used accessories and clean the welding area.
- Dispose of any scrap material in the lab waste box.

Lockout

- Notify all affected workers and supervisor.
- Cut down the robot power connection by lifting the locker.
- Remove of all the shield gas connection.
- Place tag in the ever on/off position mentioning lock out situation.
- After completion of repair, rebuild the connection and notify everyone.

Maintenance and Repair

Inform administration group or Supervisor(Adrian Gerlich)

Owner Contact :

Adrian Gerlich, Ph.D. P.Eng.

Associate Professor

SOP Accept

Acceptance

X

owner

This SOP must be accepted by the equipment owner. The best way to protect this information is to use a digital signature. See your IT staff if you do not have one.

digital signature

Delete the manual signature block if able to use the digital signature.

name

Authorized

X

trainer

Trainers and Operators

The best way to identify trainers and operators is to have them use a digital signature. See your IT staff if they do not have one.

X

trainer

Add or delete digital signatures as needed. If more signature blocks are added, all signatures need to be redone.

X

trainer

Delete the manual signature block if able to use digital signatures.

Update the online SOP when trainers or operators are added.

digital signature (preferable) or pen on paper...

trainer	authorized by	date
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name name

signature signature

name name

signature signature

name name

signature signature

Authorized Operators

X **X**
operator trainer

X **X**
operator trainer

X **X**
operator trainer

X

operator

X

trainer

digital signature (preferable) or pen on paper...

operator	trainer	date
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name

name

signature

signature

name

name

signature

signature

name

name

signature

signature