

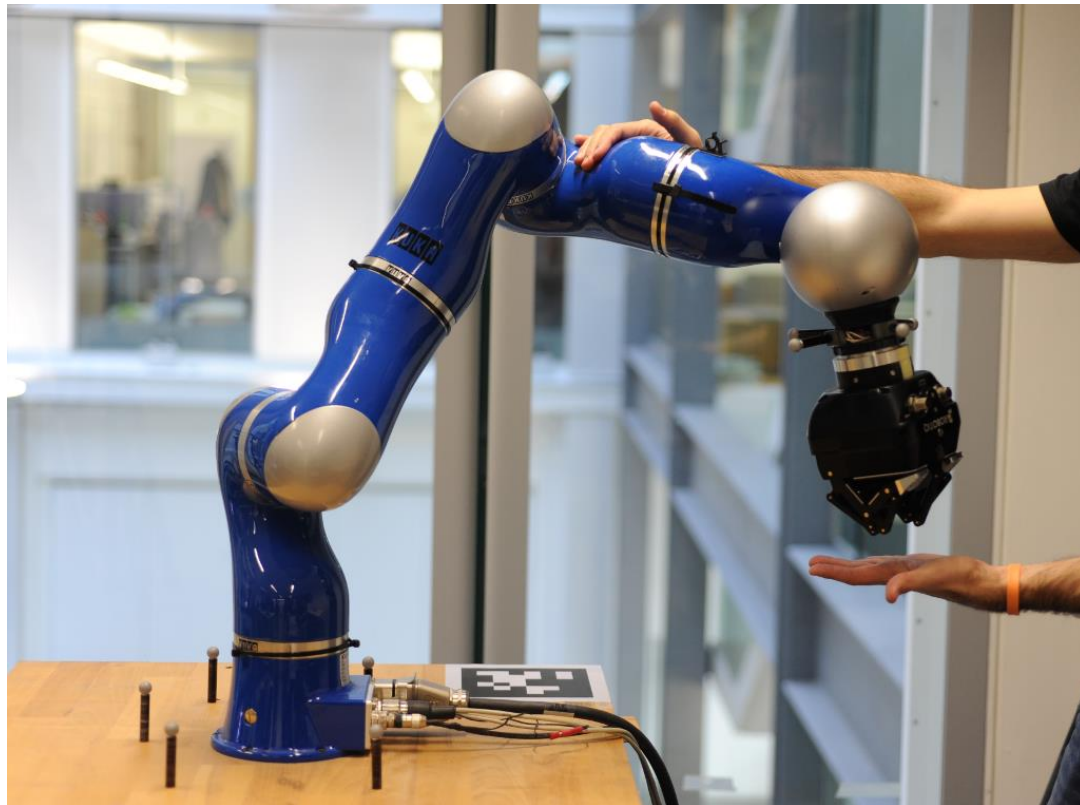


KUKA LWR Risk Assessment Form

School Assessment No:	INFRA 04
Title of Activity:	Operating the Kuka LWR robotic arm.
Location(s) of Work:	Manipulation Lab; Informatics Forum 1.30

Brief Description of Work:

Experimental work with the robotic arm.



Hazard Identification:

Hazard(s)	Present Risk Evaluation L/M/H	Control Measures (i.e., alternative work methods / mechanical aids / engineering controls, etc.)	Risk Evaluation after control L/M/H
Impact between robotic arm and people or objects in its path (e.g. being struck by the robotic arm)	L	<p>The KUKA LWR robot is designed to allow human-robot close proximity, however only authorised and trained operators may work within the working envelope.</p> <p>The emergency STOP button must be always within easy reach of the operator.</p> <p>The operators should be familiar with safe code of working practice for working with the robot.</p> <p>No unauthorised person should enter the robot's working envelope when robot operation is underway, unless an authorised and trained operator is present attending control of the robot.</p> <p>No unauthorised person should operate the robot.</p>	L
Crushing and trapping (e.g. part of the body being trapped between the robotic arm and the fixed object)	L	<p>Those working in close proximity to the robot should be aware of areas of possible injury, such as the small gaps in rotational joints.</p> <p>The emergency STOP button must be always within easy reach of the operator.</p>	L
Ejection of the workpiece from the grippers due to mechanical failure, malfunction or overloading.	L	<p>The emergency STOP button must be always within easy reach of the operator.</p>	L

Electric Shock	L	<p>All portable electrical equipment must be safety tested at correct intervals and labelled with the date of test.</p> <p>Electrical cables, plugs should be regularly visually inspected by the user for damage.</p> <p>Any defective equipment should be reported immediately to the Admin Office / Local Safety Adviser or another member of senior staff, then suitably labelled and taken out of use until the repair has been effected.</p> <p>Any computer hardware faults should be reported to members of computing staff.</p> <p>Repairs and maintenance of the equipment can only be carried out by qualified engineers or technical staff.</p> <p>The robot must not be powered on without installing an end-effector or a mechanical cap to cover the exposed connectors.</p>	L
Slipping/tripping	L	<p>The working area should be free of trip hazards.</p> <p>Any spillages should be cleaned up immediately.</p>	L
Mounting and moving the unit (tripping/toppling)	M	<p>The robot must be mounted on a strong surface with enough weight and suitable mass distribution to prevent the robot and the desk from toppling.</p> <p>Before moving the robot arm from the pedestal, the robot arm must be parked in the candle position, powered down, and all cables must be disconnected according to the manufacturer's instructions.</p>	M

		<p>Moving of the robot arm and the controller box must be performed by at least two people.</p> <p>The robot arm must be transported inside the padded transport case provided by the manufacturer.</p>	
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Engineering Controls:

Guarding	X	Extraction (LEV)		Interlocks		Enclosure	
Other relevant information (incl. testing frequency if appropriate):							
Guarding by separation of people from the robot's working envelope.							

Personal Protective Equipment (PPE):

Eye / Face		Hand /Arm		Feet / Legs		Respiratory	
Body (clothing)		Hearing		Other (Specify)			
Specify the grade(s) of PPE to be worn:							
Specify when during the activity the item(s) of PPE must be worn:							

Non-disposable items of PPE must be inspected regularly, and records retained for inspection

Persons at Risk:

Academic staff	X	Technical staff	X	P'Grad students	X	U'Grad students	X
Maintenance staff	X	Office staff		Cleaning staff		Emergency personnel	
Contractors		Visitors	X	Others			

Additional Information:

Authorisation and training are required prior to the use of the robotic arm.
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Assessment carried out by:

Name:	Vladimir Ivan	Date:	25/08/2021
Signature:		Review Date:	25/08/2021



Safe system of work – Form SSW

Working with the KUKA LWR robot – INFRA 04

INFRA 12 must be read, understood and signed off along with this SSW, before use of the robot.

No user is allowed to operate the robot without having completed an induction session with an experienced and trained user, read and signed with countersignature this Risk Assessment form or following the safety procedures described herein.

Inexperienced ***or*** unauthorised use is not allowed. When performing experiments/demonstrations including inexperienced personnel, ensure they are aware of the robot arm's range of motion, weight and speed. Ensure there is a safety gap or barrier, enabling the operator to stop the robot in case of an emergency.

NEVER carry out any changes or adjustments to the robot when it is powered up.

The robotic arm must not be overloaded.

Before use, the area should be checked and cleared of unnecessary items. Cables should be neatly routed, and the emergency stop button available for use and the operator should keep the Emergency Stop within reach at all times.

If any injury occurs, the unit should be stopped, disabled and medical assistance sought.

Should any defects in the equipment be spotted, they must be reported to the Supervisor and the use of the machine suspended until corrective action has been taken.

Once finished: park the robot in the home position, stop the control software, and shutdown the control unit the main switch.

The emergency phone number is 2222

The nearest First Aid box is in the floor kitchen

Informatics First Aider list can be found on the web at;

<http://www.inf.ed.ac.uk/safety/first-aiders.html>

