




Nextage robot Risk Assessment Form

School Assessment No:	INFRA 56
Title of Activity:	Working with Nextage robots
Location(s) of Work:	Robotics Teaching Lab; Bayes Centre G.20 Field Robotics Lab; Bayes Centre G.7
Brief Description of Work: Working with the Nextage robot.	
	

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
Damage caused by inexperienced user	H	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.	L
Impact between robotic arm and people or objects in its path (e.g., being struck by the robotic arm)	L	<p>The Nextage robot is designed to allow human-robot close proximity, however only authorised and trained operators may work within the working envelope.</p> <p>Robot arm movements, such as thrusting-out, sweeping, swinging-down or pulling-back, may cause the robot arm to make an impact on the operator or the peripheral equipment, resulting in personal injury or damage to the robot main unit or peripheral equipment. Be careful not to cause these dangerous situations during robot operation and implement necessary measures.</p> <p>In addition, eliminate hazards existing in the factory environment, and the tools and workpieces to be used. These hazards include, for example, an unexpected movement of a robot cell, end effector, external axis or peripheral equipment; a transfer, rotation or movement of a sharp end effector; a fault with an end effector; an</p>	L

		<p>unintended movement or release of a jig, gripper or peripheral equipment; and a fall or discharge of the product or components.</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>	
Crushing and trapping (e.g., part of the body being trapped between the robotic arm joints)	H	<p>Those working in close proximity to the robot should be aware of areas of possible injury. The hazardous areas in the robot main unit are as follows: joints, linkage sections, gaps at covers, space between the right and left arms, clearance between the arm and surrounding fixed parts. If any part of the body is entangled, caught in, crushed between two objects in these hazardous areas, personal injury or damage to the robot main unit or peripheral equipment may result. Be careful not to cause these dangerous situations during robot transportation, installation, operation, maintenance, and implement necessary measures.</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

Slipping/tripping	L	<p>Working areas should be kept clear of obstructions.</p> <p>Any spillages should be cleaned up immediately.</p>	L
Electrical equipment (electrocution)	M	<p>The following actions may result in electric shock:</p> <ul style="list-style-type: none"> • Turning on the control power switch with the robot main unit cover or the connector removed. • Inserting fingers into any gap between the robot main unit and the cover. • Performing repair, maintenance or inspection work without removing the power cable from the control box. <p>Be sure to connect the earth electrode of the power plug to the Class D ground. Failure to do so has a danger of electric shock at breakdown or electric leakage.</p> <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>	L

Fire and burn injury	M	<p>Lab users must be acquainted with the Fire Routine Procedure for the area.</p> <p>During operation or immediately after operation of NEXTAGE, touching the motor or circuit board of the robot main unit may result in burn injury. Do not attempt to touch any hot section by inserting your fingers into any gap between parts of the robot main unit. Also, when you open the cover of the robot main unit for repair, maintenance, and inspection work, please confirm that the motor and circuit board are not hot.</p>	L
Compressed Air (eye injury)	M	Nextage users should read and sign the compressed air risk assessment INFRA_35, to show awareness of this issue.	L
Lifting of unit (back injuries)	H	<p>Follow procedures for heavy and bulky loads that present a risk of injury.</p> <p>Fully disconnect all external connections and power cables before lifting and moving the unit.</p> <p>Unusual postures during installation or transfer of the robot main unit may cause the workers to suffer back pain.</p>	L
Fatigue	L	Do not stare into the hand LED lighting or the indication lamp of the robot main unit for an extended period of time. Doing this may cause the operator to feel stress or fatigue.	L

Engineering Controls:

Guarding		Extraction (LEV)		Interlocks		Enclosure	
Other relevant information (incl. testing frequency if appropriate):							

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 robot.
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Assessment carried out by:

Name:	Vladimir Ivan	Date:	25/08/2021
Signature:		Review Date:	25/08/2022



Safe system of work – Form SSW

Working with the Nextage robot – INFRA 56

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

INFRA 35 must be read, understood, and signed off along with this SSW, before use of the robot with the vacuum.

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'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 Nextage is designed to allow close human-robot interaction, however it should only be used in this manner by authorised experienced users.

Inexperienced and unauthorised users should only enter the working envelope under the direction of an experienced authorised user who is present at the time.

The Nextage is not satisfied from the viewpoint of intrinsic safety and functional safety design regarding the safety risks applied for the following applications. For this reason, do not use the product for the following applications:

- Applications associated with maintenance or management of human life or body (medical practices)
- Applications associated with transfer or transportation of people (transportation equipment, railway facilities, and air navigation facilities)
- Applications as a critical safety component of mechanical equipment (safeguards, safety equipment, etc.)

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.

The robot arms must not be overloaded.

The operating environment of NEXTAGE OPEN is in the range of ambient temperature 5 to 40°C and humidity 20 to 80%RH (No condensation).

If NEXTAGE is used in an environment of which pollution degree is 3 or higher rating according to IEC 60664-1, a malfunction may occur in the robot. NEXTAGE must be used within the pollution degree 1 or 2 rating environment.

The indication lamp or buzzer of the robot main unit presents the state of NEXTAGE. If you misunderstand the meaning of the colours of the indication lamp or the buzzer sounds, personal injury or damage to the robot main unit or peripheral equipment may result.

In addition, be sure to minimize the hazards created as a result of, for example, the following: Misinterpretation by workers of collaborating robots or simultaneous motion; bringing the robot main unit to a stop by a stop command in an operation cycle; change in robot speed to adapt to the task to be performed; an unexpected movement of the robot main unit, end effector, additional axis, or peripheral equipment; and a fault with peripheral equipment having expected functions; improper assembly or installation of a component or part; a fault with a gripping device; an overload occurring in the robot main unit or peripheral equipment due to buckling or breakage of a component; mishandling during a trial operation or decommissioning of the robot.

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. Shut down unit and any associated equipment. Ensure computer is logged out, to prevent unauthorised use.

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>

