

3. Safety

Description	Review the content here to understand the key safety guidelines, including important safety messages and your responsibilities when working with the robot. Note that system design and installation are not covered here.
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3.1. General

Description	Read the general safety information and the instructions and guidance pertaining to the risk assessment and intended use provided. Give particular attention to text accompanied by warning symbols. Subsequent sections describe and define safety-related functions particularly relevant for collaborative applications.
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Read and understand the specific engineering data relevant to mounting and installation, in order to understand the integration of UR robots before the robot is powered on for the first time.

It is essential to observe and follow all assembly instructions in the following sections of this manual.











NOTICE

Universal Robots disclaims any and all liability if the robot (arm Control Box with or without Teach Pendant) is damaged, changed or modified in any way. Universal Robots cannot be held responsible for any damages caused to the robot or any other equipment due to programming errors, unauthorized access to the UR robot and its contents, or malfunctioning of the robot.

3.2. Safety Message Types

Description

Safety messages are used to emphasize important information. Read all the messages to help ensure safety and to prevent injury to personnel and product damage. The safety message types are defined below.

	WARNING Indicates a hazardous situation that, if not avoided, can result in death or serious injury.
	WARNING: ELECTRICITY Indicates a hazardous electrical situation that, if not avoided, can result in death or serious injury.
	WARNING: HOT SURFACE Indicates a hazardous hot surface where injury can result from contact and non-contact proximity.
	CAUTION Indicates a hazardous situation that, if not avoided, can result in injury.
	GROUND Indicates grounding.
	PROTECTIVE GROUND Indicates protective grounding.
	NOTICE Indicates the risk of damage to equipment and/or information to be noted.
	READ MANUAL Indicates more detailed information that should be consulted in the manual.

3.3. General Warnings and Cautions

Description

The following warnings messages can be repeated, explained or detailed in subsequent sections.



WARNING

Failure to adhere to the general safety practices, listed below, can result in injury or death.

- Verify the robot arm and tool/end effector are properly and securely bolted in place.
- Verify the robot application has ample space to operate freely.
- Verify the personnel are protected during the lifetime of the robot application including transport, installation, commissioning, programming/ teaching, operation and use, dismantling and disposing.
- Verify robot safety configuration parameters are set to protect personnel, including those who can be within reach of the robot application.
- Avoid using the robot if it is damaged.
- Avoid wearing loose clothing or jewelry when working with the robot. Tie back long hair.
- Avoid placing any fingers behind the internal cover of the Control Box.
- Inform users of any hazardous situations and the protection that is provided, explain any limitations of the protection and the residual risks.
- Inform users of the location of the emergency stop button(s) and how to activate the emergency stop in case of an emergency or an abnormal situation.
- Warn people to keep outside the reach of the robot, including when the robot application is about to start-up.
- Be aware of robot orientation to understand the direction of movement when using the Teach Pendant.
- Adhere to the requirements and guidance in ISO 10218-2.



WARNING

Handling tools/end effectors with sharp edges and/or pinch points can result in injury.

- Make sure tools/end effectors have no sharp edges or pinch points.
- Protective gloves and/or protective eyeglasses could be required.



WARNING: HOT SURFACE

Prolonged contact with the heat generated by the robot arm and the Control Box, during operation, can lead to discomfort resulting in injury.

- Do not handle or touch the robot while in operation or immediately after operation.
- Check the temperature on the log screen before handling or touching the robot.
- Allow the robot to cool down by powering it off and waiting one hour.



CAUTION

Failure to perform a risk assessment prior to integration and operation can increase risk of injury.

- Perform a risk assessment and reduce risks prior to operation.
- If determined by the risk assessment, do not enter the range of the robot movement or touch the robot application during operation. Install safeguarding.
- Read the risk assessment information.



CAUTION

Using the robot with untested external machinery, or in an untested application, can increase the risk of injury to personnel.

- Test all functions and the robot program separately.
- Read the commissioning information.



NOTICE

Very strong magnetic fields can damage the robot.

- Do not expose the robot to permanent magnetic fields.



READ MANUAL

Verify all mechanical and electrical equipment is installed according to relevant specifications and warnings.

3.4. Integration and Responsibility

Description	<p>The information in this manual does not cover designing, installing, integrating and operating a robot application, nor does it cover all peripheral equipment that can influence the safety of the robot application. The robot application must be designed and installed in accordance with the safety requirements set forth in the relevant standards and regulations of the country where the robot is installed.</p> <p>The person/s integrating the UR robot are responsible for ensuring that the applicable regulations in the country concerned are observed and that any risks in the robot application are adequately reduced. This includes, but is not limited to:</p> <ul style="list-style-type: none">• Performing a risk assessment for the complete robot system• Interfacing other machines and additional safeguarding if required by the risk assessment• Setting the correct safety settings in the software• Ensuring safety measures are not modified• Validating the robot application is designed, and installed and integrated• Specifying instructions for use• Marking the robot installation with relevant signs and contact information of the integrator• Retaining all documentation; including the application risk assessment, this manual and additional relevant documentation.
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3.5. Stop Categories

Description	<p>Depending on the circumstances, the robot can initiate three types of stop categories defined according to IEC 60204-1. These categories are defined in the following table.</p> <table><tr><th>Stop Category</th><th>Description</th></tr><tr><td>0</td><td>Stop the robot by immediate removal of power.</td></tr><tr><td>1</td><td>Stop the robot in an orderly, controlled manner. Power is removed once the robot is stopped.</td></tr><tr><td>2</td><td>*Stop the robot with power available to the drives, while maintaining the trajectory. Drive power is maintained after the robot is stopped.</td></tr></table> <p>*Universal Robots robots' Category 2 stops are further described as SS1 or as SS2 type stops according to IEC 61800-5-2.</p>	Stop Category	Description	0	Stop the robot by immediate removal of power.	1	Stop the robot in an orderly, controlled manner. Power is removed once the robot is stopped.	2	*Stop the robot with power available to the drives, while maintaining the trajectory. Drive power is maintained after the robot is stopped.
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