

Mode
switch
INPUT

Description	PFH _D	Affects
When the external connections are Low, Operation Mode (running/ automatic operation in automatic mode) is in effect. When High, mode is programming/ teach. Recommendation: Use with an enabling device, for example a UR e-Series Teach Pendant with an integrated 3-position enabling device. When in teach/program, initially both TCP speed and elbow speed will be limited to 250mm/s. The speed can manually be increased by using the pendant user interface “speed-slider”, but upon activation of the enabling device, the speed limitation will reset to 250mm/s.	Less than 1.8E-07 Input to SF2	Robot

Freedrive
INPUT

Description	PFH _D	Affects
Recommendation: Use with 3PE TP and/or 3 Position Enabling Device INPUT. When Freedrive INPUT is High, the robot will only enter Freedrive if the following conditions are satisfied: <ul style="list-style-type: none">• 3PE TP button is not pressed• 3 Position Enabling Device INPUT either not configured or not pressed (INPUT Low)	Less than 1.8E-07 Input to SF2	Robot

19.2. Table 2

Description

UR e-Series robots comply with ISO 10218-1:2011 and the applicable portions of ISO/TS 15066. It is important to note that most of ISO/TS 15066 is directed towards the integrator and not the robot manufacturer. ISO 10218-1:2011, clause 5.10 collaborative operation details 4 collaborative operation techniques as explained below. It is very important to understand that collaborative operation is of the APPLICATION when in AUTOMATIC mode.

Collaborative
Operation 2011
edition, clause
5.10.2

Technique	Explanation	UR e-Series
Safety-rated monitored stop	Stop condition where position is held at a standstill and is monitored as a safety function. Category 2 stop is permitted to auto reset. In the case of resetting and restarting operation after a safety -rated monitored stop, see ISO 10218-2 and ISO/TS 15066 as resumption shall not cause hazardous conditions.	UR robots’ safeguard stop is a safety-rated monitored stop, See SF2 on page 1. It is likely, in the future, that “safety-rated monitored stop” will not be called a form of collaborative operation.

Technique	Explanation	UR e-Series
Hand-guiding	<p>This is essentially individual and direct personal control while the robot is in automatic mode. Hand guiding equipment shall be located close to the end-effector and shall have:</p> <ul style="list-style-type: none">• an Emergency Stop pushbutton• a 3-position enabling device• a safety-rated monitored stop function• a settable safety-rated monitored speed function	<p>UR robots do not provide hand-guiding for collaborative operation. Hand-guided teach (free drive) is provided with UR robots but this is for programming in manual mode and not for collaborative operation in automatic mode.</p>

Technique	Explanation	UR e-Series
Speed and separation monitoring (SSM) safety functions	<p>SSM is the robot maintaining a separation distance from any operator (human). This is done by monitoring of the distance between the robot system and intrusions to ensure that the MINIMUM PROTECTIVE DISTANCE is assured. Usually, this is accomplished using Sensitive Protective Equipment (SPE), where typically a safety laser scanner detects intrusion (s) towards the robot system.</p> <p>This SPE causes:</p> <ol style="list-style-type: none">dynamic changing of the parameters for the limiting safety functions; ora safety-rated monitored stop condition. <p>Upon detection of the intrusion exiting the protective device's detection zone, the robot is permitted to:</p> <ol style="list-style-type: none">resume the "higher" normal safety function limits in the case of 1) aboveresume operation in the case of 2) above <p>In the case of 2) 2), restarting operation after a safety -rated monitored stop, see ISO 10218-2 and ISO/TS 15066 for requirements.</p>	<p>To facilitate SSM, UR robots have the capability of switching between two sets of parameters for safety functions with configurable limits (normal and reduced). See Reduced Mode on page 4. Normal operation can be when no intrusion is detected. It can also be caused by safety planes/ safety boundaries. Multiple safety zones can be readily used with UR robots. For example, one safety zone can be used for "reduced settings" and another zone boundary is used as a safeguard stop input to the UR robot. Reduced limits can also include a reduced setting for the stop time and stop distance limits - to reduce the work area and floorspace.</p>

Technique	Explanation	UR e-Series
Power and force limiting (PFL) by inherent design or control	How to accomplish PFL is left to the robot manufacturer. The robot design and/or safety functions will limit the energy transfer from the robot to a person. If any parameter limit is exceeded, a robot stop happens. PFL applications require considering the ROBOT APPLICATION (including the end-effector and workpiece(s), so that any contact will not cause injury. The study performed evaluated pressures to the ONSET of pain, not injury. See Annex A. See ISO/TR 20218-1 End-effectors.	UR robots are power and force limiting robots specifically designed to enable collaborative applications where the robot could contact a person and cause no injury. UR robots have safety functions that can be used to limit motion, speed, momentum, force, power and more of the robot. These safety functions are used in the robot application to thereby lessen pressures and forces caused by the end-effector and workpiece (s).
