**S3 Product/item Detected:**

* **ON3\_1:** The system shall identify the product on the conveyor line and notify the subsequent processes about its arrival.
* **ON3\_2:** The system shall be able to visually perceive and differentiate between a moving conveyor and an object on a moving conveyor.
* **ON3\_3:** The response time must be instantaneous or as minimal as possible.
* **ON3\_4:**

**S4 System Start:**

* **ON4\_1:** The system shall indicate the beginning of the operation.
* **ON4\_2:** The system shall transmit activation signals to all its subsystems.
* **ON4\_3:** The system status shall be logged into the database for diagnostics in case of any contingency.
* **ON4\_4:**

**S5 Pick Product/item:**

* **ON5\_1:** The system shall be able pick products of cylinder or box shape, with

a maximum dimension of 5 cm and a minimum dimension of 0.5 cm and a maximum weight of 100 g.

* **ON5\_2:** The system shall complete the pick task in less than 2 seconds if there

are no potential collisions while performing.

* **ON5\_3:** The system shall pick the item safely as per ISO 14539:2000.
* **ON5\_4:** The moving parts of the system shall not present any sharp edges,

and the robot arm and the gripper to handle the parts shall be lightweight.

**S6 Translate the product/item:**

* **ON6\_1:**The system shall change its position and orientation without dropping/damaging the product in the gripper.
* **ON6\_2:** The system shall translate to the required location with minimal deviation.
* **ON6\_3:** The system shall finish the repositioning in under 2 seconds.
* **ON6\_4:**

**S7 Place the Product/item:**

* **ON7\_1:** The system shall place the products in the desired location (whether it’s a conveyor or box)
* **ON7\_2:** The system shall place the product with not more than 0.05 mm of clearance between the product and the surface.
* **ON7\_3:** The system shall ensure that the release of the gripper and the product being placed on the surface are nearly simultaneous.
* **ON7\_4:** The system shall ensure that the entire operation takes not more than 1.5 seconds to complete and move on to the subsequent process.
* **ON7\_5:** The system shall place the item safely as per ISO 14539:2000.

**S8 Return to home position:**

* **ON8\_1:** The system shall return all actuators and the end effector back to a certain predetermined configuration(home configuration).
* **ON8\_2:** The system shall ensure that no product is currently being held by the gripper, unless the emergency STOP function has been engaged.
* **ON8\_3:**
* **ON8\_4:**

**S9 Stand by:**

* **ON9\_1:** The system shall hold the relative positioning and orientation of the actuators and the end effector in the predetermined ‘Home’ configuration unless indicated otherwise by any other process.
* **ON9\_2:** the system shall release the actuators and end effector from the home configuration when an appropriate trigger event occurs in the system (i.e a faulty product is identified on the main conveyor).
* **ON9\_3:** The transition of actuator states from ‘home’ configuration to the required configuration shall happen almost instantaneously and shall not take more than 2 seconds.
* **ON9\_4:**

**S10 Emergency Stop:**

* **ON10\_1:** The system shall terminate all currently ongoing operations.
* **ON10\_2:** The actuators and the end effector shall halt their current actuation processes and hold their current position and orientation so as to not cause further damage.
* **ON10\_3:** The state of the system shall be logged into the system as well as indicated to the operator.
* **ON10\_4:** There shall be minimal delay between the trigger input and the triggering of the appropriate response.this shall not take more than 1 second