**USER REQUIREMENT SPECIFICATION**

**Palletising Robot Equipment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Identification** | **Title** | Palletising equipment – | | | |
| **Author** |  | | | |
| **Date** |  | | | |
| **Version** | 1.0 | | | |
| **Status** | X | Draft |  | Released |

Table of Contents

[1. Purpose & Scope 2](#_Toc66874854)

[2. Project Contact Details 3](#_Toc66874855)

[3. Description of Product and Packaging 4](#_Toc66874856)

[4. Process Information 5](#_Toc66874857)

[5. Installation Environment 6](#_Toc66874858)

[6. Project Specifications 8](#_Toc66874859)

[7. Equipment Specifications 9](#_Toc66874860)

[8. Safety, Health and Environment 10](#_Toc66874861)

[9. General Design Requirements 13](#_Toc66874862)

[10. Quality and Performance 14](#_Toc66874863)

[11. Equipment Electrical and Automation Specifications 16](#_Toc66874864)

[12. Documentation 17](#_Toc66874865)

[13. Training 19](#_Toc66874866)

[14. Pallet Specification 20](#_Toc66874867)

# Purpose & Scope

|  |  |
| --- | --- |
| General | This document describes and defines the specific requirements for Palletising equipment application to be delivered in accordance with the standards as detailed below.  Robot Palletising equipment is machinery which provides automatic means for stacking products (cases, packs or bags) on to a pallet via use of a Robot.    Product will be discharged from the packing line or container and then transported to the infeed unit of the Robot Palletising equipment by conveyor. The Robot Palletising equipment should be able to:   * Take the product from the infeed conveyor. * Place products on the pallet following a defined pattern. Repeat the process until a defined number of layers is achieved. * Take a slip sheet/interlayer and place it on the pallet/layer following a defined pattern.   Scope of palletiser |
| Validation | Scope validation will include a representative demonstration run on a demo rig at the supplier’s premises. Product will be provided to run through the system in order to test and validate the technology being deployed. |

# Project Contact Details

|  |  |
| --- | --- |
| URS Support and Questions | Name:  Email:  Phone/Mobile: |
| Project Lead/Manager | Name:  Email:  Phone/Mobile: |
| Technical Engineer | Name:  Email:  Phone/Mobile: |
| Site Manager | Name:  Email:  Phone/Mobile: |
| Zone/ Department Manager | Name:  Email:  Phone/Mobile: |
| Finance | Name:  Email:  Phone/Mobile: |
| Other stakeholder | Name:  Email:  Phone/Mobile: |

# Description of Product and Packaging

|  |  |
| --- | --- |
| Product Group | The products to be palletised are XXXX in corrugated box outers. There are multiple formats of outers as specified below |

|  |  |
| --- | --- |
| Additional information | The products will be at ambient temperature when presented to the palletiser and the cases will be of sufficient strength to render it suitable for vacuum lifting.The base tape seal on the box will be intact in each case. |

|  |  |
| --- | --- |
| Product specification | Multiple Box Sizes:  L  W  H  Maximum product dimensions are 650mm x 500mm x 500mm  Minimum product dimensions are 250mm x 250mm x 250mm  Maximum product weight is 30kg.  There are approximately XXX variations of case size within the scope of this project.  Case sizes should be verified by the palletising system prior to handling in order  to check that the case presented to the system corresponds with the configured case  size in the machine setup. |

# Process Information

|  |  |
| --- | --- |
| Process | Type of product picking and laying: Multiple product  Maximum finished stack height: 1600mm |

|  |  |
| --- | --- |
| Product reference line | Reference line in case of product change-over: Center  **Centre**  **Top view**  Conveyor  Product A  Product B  Prod. C  **Left**  **Top view**  Conveyor  Product  A  Product B  Prod. C  **Center**  **Top view**  Conveyor  Product A  Product B  Prod. C  **Right**  When products arrive to the equipment, what is the maximum deviation from reference line (mm) 50mm |
|  | Cases should be automatically aligned and positioned by the palletising system.  Product infeed conveyor height (mm) 895 |

# Installation Environment

|  |  |
| --- | --- |
| Factory Zoning Plan | The cleaning in this area is:  Dry cleaning  Wet cleaning Other: Click here to enter text. |

|  |  |
| --- | --- |
| Temp. and Humidity | The equipment will be installed in a room with following conditions:  Temperature: Minimum: 16°C Maximum: 30 °C  Humidity: Minimum: 50 %RH Maximum: 60 %RH  Risk of condensation on the equipment? No. |

|  |  |
| --- | --- |
| Other room condition | Aggressive environment: No.  Dusty atmosphere: No.  Other conditions: No.  Other conditions: No.  Other conditions: No. |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Room dimensions & constrains | The equipment will be installed in an existing facility: Yes  If YES, the approximate available dimensions are:   |  |  |  |  | | --- | --- | --- | --- | | **Area** | **Length (L)** | **Width (W)** | **Height (H)** | | **L x W x H** | **7000** | **5500** | **4000** |   For exact dimensions of available space please review CAD file:  Above dimensions are in: mm..  Access to the room (for machine installation): is through the fork truck access door. |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Utilities at the factory | |  |  | | --- | --- | | **Electrical Power Supply** | | | 3 Phase Supply | 415 VAC | | Min 390 VAC | | Max 439 VAC | | 1 Phase Supply | 230V ± 5% | | Frequency | 50 Hz | | Earthing system | TN-S |  |  |  | | --- | --- | | **Compressed Air** | | | Pressure | 8 bar | | Min 6 bar | | Max 9 bar | |

|  |  |
| --- | --- |
| Floor information | Floor level: Ground floor  Floor slope No Slope on Floor  Type of floor (concrete, tile, …): Concrete with Epoxy Screed.  Floor is at least C20/25 concrete construction and as least 250mm deep. |

|  |  |
| --- | --- |
| Additional information | No Additional information required |

# Project Specifications

|  |  |
| --- | --- |
| General | Number of lines/booms coming to the palletiser: 1 |

|  |  |
| --- | --- |
| Downstream equipment | Type of conveying system downstream equipment Counterbalance Forklift |

|  |  |
| --- | --- |
| Pallets | ISO 2 (1200 x 1000)  Other: Click here to enter text.  Pallet material Wood  Pallets will be supplied to the system dry and clean  The top off the pallet will have gaps between slats no larger than 25mm |

|  |  |
| --- | --- |
| Scope of supply | Change over time required with 1 operator (minutes) <5 minutes  Infeed conveyors/unloading boom required? Yes  Automatic pallet supply from magazine (required buffer time) No  Automatic distribution of slip-sheet No  Automatic distribution of interlayer No  Automatic distribution of pallet top cover No  Outfeed conveyor (indicate qty. of full pallet to be stored here)  Training program as required Yes  Other requirements: |

# Equipment Specifications

|  |  |
| --- | --- |
| HMI General Requirement | HMI panel with a touch screen interface must be able to provide necessary information to the operator to operate for minor stoppages, without the need for maintenance team.  The HMI must provide palletising pattern visualization (preferably 3D view).  Flexibility  Access of machine parameters (speeds, counters, timers....) must be accessed through HMI and not through PLC programing.  HMI must provide:   * Alarm identification with synoptic and clear indication of alarm zone provenience. * Re-startup assistance with confirmation of palletiser configuration. * Pallet pattern adjustment * New recipe set-up within 10 mins by a trained machine operator. * Change over to a previously set up stack pattern in less than 5 mins * There should be no practical limit to the number of programs that can be saved in the system.   Create new Pattern   * Easy & Intuitive pattern generation by using the HMI interface. * Drag & Drop programming, easy to configurate without supplier intervention. * Ability to group various products together to enable multi-picking and thereby increase the speed. |

|  |  |  |
| --- | --- | --- |
| HMI Location | HMI should be located in a convenient location and height for easy operation.  This location should maximize the visibility of the palletising equipment. A 960mm high console type panel with a sloping top is suggested for HMI and keyboard mounting.  Operator input should be via touchscreen controls or by keyboard/rollerball mouse combination. |  |

|  |  |
| --- | --- |
| Electrical protection | Uninterruptible Power Supply (UPS) should be present where deemed necessary for HMI operating system safe shutdown and/or sensitive electrical components that ensure correct machine restart in case of unforeseen lack of power. |

# Safety, Health and Environment

|  |  |
| --- | --- |
|  | The Palletiser System must be in compliance with the following norms:  **ISO-10218-1** and **ISO-10218-2** Safety requirements for industrial robots ISO- 12100 Safety of machinery -- General principles for design -- Risk assessment and risk reduction. The machinery should be CE/UKCA marked for deployment in the UK and the supplier should take care of this. Full technical files will be necessary and a rigorous safety design and verification procedure should be undertaken. Any supplier should take responsibility for ensuring that the essential health and safety requirements of the relevant directives have been met. The directives in question are as follows:  • Machinery Directive 2006/42/EC  • The Electromagnetic Compatibility Directive 2014/30/EU  Conformity declarations and referenced standards will be required following installation. |

|  |  |
| --- | --- |
| Risk analysis | Any robot system design requires protective measures to ensure the operator’s safety at all times during robot operation. A risk assessment is necessary to identify the hazards and estimate the risks associated with a robot system application so that proper risk reduction measures can be selected.  A risk assessment shall be carried out on those hazards identified in the hazard identification. This risk assessment shall give particular consideration to:  a) the intended operations of the robot, including teaching, maintenance, setting, cleaning and normal running;  b) unexpected start-up;  c) access by personnel from all directions;  d) reasonably foreseeable misuse of the robot;  e) the effect of failure in the control system; and  f) where necessary, the hazards associated with the specific robot application.  Risks shall be eliminated or reduced first by design or by substitution, then by safeguarding and other complementary measures. Any residual risks shall then be reduced by other measures (e.g. warnings, signs, training). |

|  |  |
| --- | --- |
| E-stop (Emergency stop) | In case of E-stop, the equipment must ensure correct product stability and avoid any risk of product falling.  Every robot shall have a protective stop function and an independent emergency stop function.  This stop function shall cause a stop of all robot motion, remove or control power to the robot drive actuators, and allow for the control of any other hazard controlled by the robot. This stop may be initiated manually or by control logic.  The emergency stop device shall be in accordance with IEC 60204-1 and ISO 13849. |

|  |  |
| --- | --- |
| Safety Devices | In case additional safety devices are needed (light curtains, radars, etc) , the location must be design to ensure no accidental product falling will hit someone in the safety zone. |

|  |  |
| --- | --- |
| Robot controller in jog/teaching mode (if present) | Even when teaching the robot, it is recommended to test the movements from a safe area of the work envelop to ensure proper control before entering the robot work cell. |

|  |  |
| --- | --- |
| Working zone | Robot arms shall be always equipped with safety rated positioning systems to ensure safety stop as soon as the arm is going out of the defined working zone. |

|  |  |
| --- | --- |
| Jam removal and maintenance access | Supplier must ensure a safe access inside guarding for jam removals and maintenance purposes. |

|  |  |
| --- | --- |
| Additional requirement | 1. **Intervention:** The supplier must provide a document detailing the foreseeable interventions associated with the equipment. 2. **Noise level:** Noise levels at 1m distance, all around the equipment, must be less than 85 dB(A) while palletising product at design speed. 3. **Energy Isolation:** Motion disable is required to isolate the energy for quick intervention.   If required, enter here any other requirements:   1. Installation Method Statement prior to installation commencing. 2. Installation Risk Assessment prior to installation commencing. |

|  |  |
| --- | --- |
| Marking | Each robot shall be marked in a distinct, legible and durable manner with:  a) the manufacturer's and, where appropriate, the authorized supplier's business name and complete address;  b) the designation of type of machine (i.e. industrial robot) and model number or reference number (if any);  c) the month and year of manufacture;  d) the mass and/or weight of machine;  e) the maximum reach and load capacity;  f) supply data for electrical and, where applicable pneumatic systems (e.g. minimum and maximum pneumatic pressures);  g) lifting points for transportation and installation purposes, where applicable. |

|  |  |
| --- | --- |
| Collision | To be most effective in preventing harm to personnel, the robot should stop and create an awareness signal when a collision is sensed and not move to another position without operator intervention. |

# General Design Requirements

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Components | Supplier shall build the equipment with the components detailed in the preferred components list below. If any of the components are not a standard for the supplier, the supplier shall propose equivalent alternative components for approval by the Project Manager.   |  |  | | --- | --- | | **Component** | **Preferred** | | PLC | Beckhoff | | Drives | Kuka | | Sensors | Wenglor | | Panel Componentry/LV | Eaton | | Push buttons | Telemechanique | | Pneumatics | Festo/Norgren | |
|  |  |

|  |  |
| --- | --- |
| Infeed product conveying system | Conveyors designed shall ensure a smooth and reliable product transferring process.  In any conditions rollers conveyors are used not less than two rolls should be always simultaneously in contact with the product itself. |

# Quality and Performance

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Quality Requirement | |  |  |  | | --- | --- | --- | |  | **FAT**  Factory Acceptance Test | **SAT**  Site Acceptance Test | | **Product alignment:** | Product place positions deviate less than +/-30 mm from theoretical pallet pattern  (alignment subject to box quality) | Product place positions deviate less than +/-30 mm from theoretical pallet pattern  (alignment subject to box quality) | | **Pallet alignment** | Pallet position deviate less than +/-20 mm from theoretical position | Pallet position deviate less than +/-20 mm from theoretical position | | **Interlayer – Slip sheet alignment** | Interlayer – slip sheet position deviate less than +/-50 mm from theoretical position | Interlayer – slip sheet position deviate less than +/-50 mm from theoretical position | |
|  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Material losses | |  |  |  |  | | --- | --- | --- | --- | |  |  | **FAT**  (Factory acceptance test at supplier) | **SAT**  (Site Acceptance test )  After commissioning  See appendix | | **Product Losses:**  Product losses due to palletiser issues | | ***NA*** | <0.1 %  ***Measurement:***  *Defects counted in during SAT run* | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Performance requirements | |  |  |  | | --- | --- | --- | | **Criteria** | **FAT**  Factory Acceptance Test | **SAT**  Site Acceptance Test | | Restart *time*  *(in case of a minor stoppage)* | 1 min | 1 min | | Changeover time | N/A | ≤ 5mins | | Time for programming a completely new stack pattern | <10min | <10min | | CIL (Cleaning, Inspection & Lubrication) time | N/A | ≤ 20mins/ day | | Time needed for start-up (from machine with no power to stable production) | NA | <5 Min | | Throughput Speed (including pallet changeover time) | Minimum acceptable 500 cases per hour. Desired speed 750-800 cases per hour | Minimum acceptable 500 cases per hour. Desired speed 750-800 cases per hour | |

# Equipment Electrical and Automation Specifications

|  |  |
| --- | --- |
| Connectivity | 1. Will the equipment be linked to the factory network?  Yes  No   If yes, a static IP address will be assigned to the system controller by the network administrator.   1. Equipment should be equipped with a Modem link for remote diagnostics.   The site has suitable 4g coverage to enable this.   1. Will the equipment be networked with other equipment?  Yes  No   If YES, list here after the name of the other equipment:  Click here to enter text.. |

# Documentation

|  |  |
| --- | --- |
| Document requirement | * **Layout**: A layout with the basic dimensions of the equipment already in the area where it shall be installed shall be delivered together with the commercial offer. * **Certificate of compliance** for all directives followed in the equipment, including CE mark * **Pneumatic Drawings** with reference numbers. * **Recommended spare parts:** A list of recommended parts for mechanical parts, electrical parts and pneumatic parts. |
|  | * **Operating Manual:** The Operation Manual shall contain all the details required for operating the equipment appropriately, covering at least the following items: * Safety Instructions * Detailed description of the equipment * Operating Procedure * Detailed description of the operating screens * Troubleshooting list for all possible mechanical and electrical faults and alarms and the detailed method to correct the fault or error. |
|  | * **Online Live Project Update Reports:** Required on a weekly basis for the project duration. |

Installation & commissioning

|  |  |
| --- | --- |
| Requirement | 1. Installation by:   Supplier  Outside Contractor(Appointed by Nestle)   1. Commissioning by:   Supplier  Agent   1. FAT   Supplier  Agent  Representative product will be provided for testing at FAT stage.   1. SAT   Supplier  Agent |

# Training

|  |  |
| --- | --- |
| Languages | Training to be provided by supplier in English:  Yes  No |

|  |  |
| --- | --- |
| Additional requirement | Training must include at least but not be limited to, all the details required for operating the equipment appropriately, covering at least the following items:   1. Safety Instructions 2. Detailed description of the equipment 3. Operating Procedure 4. Detailed description of the operating screens 5. Predictive and preventative maintenance   Training should include one operator training session of 4 hours with up to 10 operators and 1 project champion/key engineer training session for 2 people for detailed training. |

# Pallet Specification

|  |  |
| --- | --- |
| Pallet ISO2 | Pallet length 1200 mm (+5 -8 mm)  Pallet width 1000 mm (+5 -8 mm)  Pallet height 144 mm (+7 -5 mm)  Empty pallet weight 22 Kg    Pallets will have a full perimeter base.  Pallets will be dry and clean  The top off the pallet will have gaps between slats no larger than 25mm |

|  |  |
| --- | --- |
| Euro pallet | Pallet length 1200 mm (+5 -8 mm)  Pallet width 800 mm (+5 -8 mm)  Pallet height 144 mm (+7 -5 mm)  Empty pallet weight 15 Kg    Pallets will be dry and clean  The top off the pallet will have gaps between slats no larger than 25mm |