



Product & Safety 16.06.2020

Objective of the Training

- \checkmark You recognize TORU und understand its functionality
- \checkmark You understand how to work together with TORU
- \checkmark You know what to take care of in the warehouse to ensure an optimal environment for TORU
- \checkmark You are aware of why TORU requires your support sometimes

We want to prepare you for the collaboration with TORU as well as possible!

Please make sure to refer to the TORU User Manual for complete instructions!



Safety Concept & Risks

Framework

Roles Concept

ARC Overview



TORU Workspace/Tasks



Basic TORU data figures



- Dimensions: 1.375 x 685 x 1.930 mm
- Extended Height: 2.912 mm
- Weight (emptied): 235 kg
- Speed: max. 1,5 m/s
- Battery Life: 8 Hours
- Operational Time: max. 18 Hours/Day
- Gripping Height: min. 80 mm / max. 2.500 mm
- Backpack
 - » 8 Layers
 - » 8 16 Objects
 - » max. 40 kg

Components



Gripper components



Gripper Components

Pushback Unit

Right centering unit



Emergency stop buttons

Press the emergency stop buttons before any manual handling or displacing of the robot!





Emergency stop buttons





Closing the tower



Midpoint of the tower



Light signals



Safety Concept & Risks

Safety concept





Safety Concept

Robot Vision





Safety Concept

Protective Fields



Safety Concept

Protecting the robot from obstacles using sheet metal strips



Additional marking or collision protection is required so that the laser scanner can reliably detect obstacles such as conveyor belts, tables or railings.

Safety Concept

Securing from obstacles with collision protection

Overhanging obstacle



Collision Protection

Additional marking or collision protection is also required in order to reliably identify hanging obstacles such as fire extinguishers and control cabinets.

Safety Concept

Protective field

- A violation of the protective field leads to the **reduction** of the driving speed to a **safer** driving speed of (1,08 km/h).
- TORU will try to navigate around the object in the safety field.
- A collision with an individual at this speed poses no danger on that individual.
- When the **bumper** gets pressed, the robot does an **emergency stop**.
- After the robot stops due to a pressed bumper, the robot is allowed to "**freely drive**" in the opposite direction.
- Safety functions are implemented via a safety controller.
- The navigation is accomplished on an Industrial-PC.
- The safety controller overrides the industrial PC and intervenes/influences the navigation orders given by the industrial PC in the case of an **emergency**.

Risks



Usage Framework

Usage Framework

Improper use cases

- Operating with **deactivated** or **dismantled** safety devices or housing parts
- Operating **outside** the planned picking and working area of the warehouse
- Operating on **galleries** and near **stairs** or **ramps**, which were not properly secured by **railings** to prevent the robot from crashing or falling
- Operating on floors that do not meet the adequate safety requirements for operation
- Operating in potentially **explosive** or **hazardous areas**
- Transporting individuals and animals
- **Operating**, maintaining and repairing of the robots by **unauthorized** personel
- Applying **changes** or adjustments of any kind to either **software** or **hardware** without having the required **written approval** from the manufacturer
- Manual work on the robot without an activated emergency stop button

The framework status at commissioning must be maintained during the entire operating time of the robot. MAGAZINO must be consulted in the case of signifcant changes.

Warehouse Organisation

How to properly store boxes?





ALIGNMENT



Warehouse Organisation

Use of pickcarts Check, if for this customer required? Check whether the correct pickcart is in the station Push until the end of the station

After completing an order wave, the pickcarts must be emptied promptly so that another order wave can be started.

ARC Overview

Dashboard

Overview





Quiz

- 1. How can TORU be taken out of service?
 - ightarrow By pressing the emergency stop button
- 2. How can TORU recognize obstacles and humans?
 - \rightarrow TORU recognizes with different sensors all objects on the ground
- 3. How do the employees need to behave in front of TORU?
 → No special behavior required
- 4. What needs to be considered to stick to the required warehouse hygiene?
 - → Min/Max size of box; Gap in between boxes and to the next layer; Barcode straight to the front

Quiz – Warehouse Organization

Can TORU work with these stacks?



• Gaps between the boxes too small.



- Big boxes placed on top of smaller ones.
- Overlapping stacks.

Quiz – Warehouse Organization

Can TORU work with these stacks?



- Rotated boxes.
- Boxes sticking out of the shelf.

• Box/barcode unrecognizable.

49.*

Quiz – Warehouse Organization

Can TORU work with these stacks?



Operating Manual

Attachment

Operating Manual

MAGAZINO

TORU 5.4 Original Betriebsanleitung



Datum 05.201

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FEEDBACK