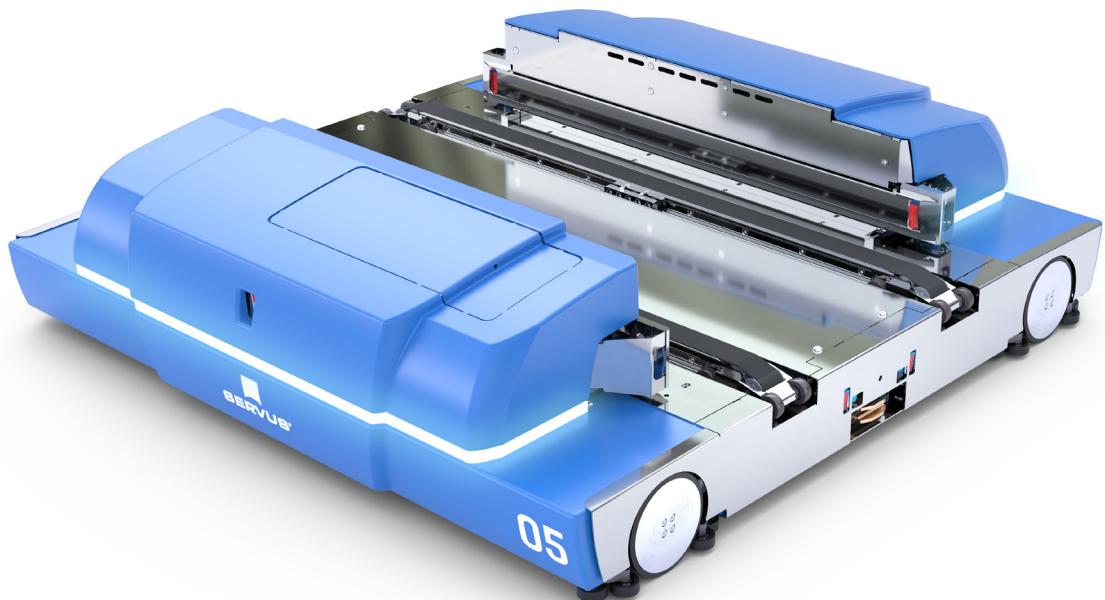




Operating Instructions

Transport Robot Generation 5



Legal notice

Manufacturer	<p>Servus Intralogistics GmbH Dr. Walter Zumtobel Str. 2 A-6850 Dornbirn T +43 5572 22 000 – 300 F +43 5572 22 000 – 9300 www.servus.info info@servus.info</p>
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Updates	<p>Due to the continuous technical development of our products, we reserve the right to design-related changes. Each of these changes will be incorporated in the operating instructions by replacing the respective pages or by revision of the electronic data carrier.</p>
Original document	<p>German-language documents are always the original documents. Foreign language versions are translations of the original document.</p>
Structure and design of the document	<p>Servus Intralogistics GmbH Dr. Walter Zumtobel Str. 2 A-6850 Dornbirn T +43 5572 22 000 – 300 F +43 5572 22 000 – 9300 www.servus.info info@servus.info</p>

NOTICE

This device complies with Part 15 of the FCC Rules and contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS standard(s).

Operation is subject to the following two conditions:

- this device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation.

AVIS

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

- l'appareil ne doit pas produire de brouillage, et
- l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

NOTICE

Changes or modifications made to this equipment not expressly approved by Servus Intralogistics GmbH may void the FCC authorization to operate this equipment.

NOTICE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Revisions of the document

Version	Changes	Date	Changed by	Comments
0.1	Document created	2023-07-13	ZUM	
0.2	Notice according to FCC 47 CFR § 15.105 added;	2024-01-15	ZUM	

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1 About this document

⚠️WARNING

Failure to observe the operating instructions for transport robot systems may result in death or serious injury!

This document is intended exclusively for users who are completely familiar with the contents of the operating instructions of the Servus system.

The following points must always be observed:

- Before starting work on the transport robot the operator must read and understand the operating instructions of the Servus system and all applicable documents in addition to this document.

1.1 General

This document contains the following information on the Transport Robot Generation 5:

- Safety
- Product description
- Technical data
- Transport and packaging
- Storage
- Assembly, installation, and initial commissioning
- Structure and function
- Transport robot website
- Troubleshooting
- Maintenance and servicing
- Shutdown
- Dismantling and Disposal

1.2 Target groups

This document is intended for:

- Transport personnel
- Operating personnel
- Technical staff
- Electrical engineering staff
- Dismantling personnel
- Disposal personnel

1.3 Documentation structure



The operating instructions for the Transport Robot Generation 5 are part of the operating instructions for the Servus system. The structure of the documentation is described in the Servus System operating instructions.

1.4 Storage

This document and all applicable documents together constitute the technical documentation of the product. The technical documentation is an integral component of the product. Keep the operating instructions complete and ready-to-hand in the vicinity of the product in a dry and clean location throughout the lifetime of the product.

If there is any loss or damage to the documents, a replacement copy can be requested from the manufacturer.

The system is delivered with the latest issue of the technical documentation. Any change to the product is subject to the internal, technical code of procedure of the manufacturer. After changes to the product, an updated document is provided. Discard old revisions and replace them with the latest revision.

In case the product is sold, the complete technical documentation must be included as a component of the product to the new owner.

1.5 Icons and labelling

The following symbols and markups are used in this document:

Generally

Continuous text

Entries from software visualisation, button designations, ...

Lists

- 1. Numbered list, level 1
 - a. Numbered list, level 2
- Bulleted list, level 1
 - Bulleted list, level 2

Instructions for action

- Prerequisite
- 1. Numbered action step
- Bulleted action step
 - Substep, level 1
 - Substep, level 2
- ✓ Result

Note



This symbol refers to detailed information on the subject in this or another document.



These instructions are used for communicating general, important information that is necessary for using the product and this document.

1.6 Abbreviations and descriptions used

Abbreviation/description	Description
AP	Access point
ARC	Autonomous robotic carrier; synonym for the Transport Robot Generation 5
System operator	Legal person using the machine and its associated electrical equipment
LHD	Load handling device
LHM	Load carrier
PPE	Personal protective equipment
RFID	Radio-frequency identification
TU	Transport unit
WMS	Warehouse management system

Table 1-1 Abbreviations and descriptions used

2 Safety

WARNING

Failure to observe the safety instructions may result in death or serious injury!

The following document contains information regarding ...

- ... Structure and design of the warning notices.
- ... Residual risks and hazards in case of proper use of the product.
- ... necessary procedures for avoiding residual risks.

The following points must always be observed:

- Before starting any work on the transport robot, make sure to read and understand the operating instructions and all other applicable documents.
- Only operate the transport robot if it is in perfect working order.
- The transport robot must only be operated by trained and authorised personnel.

2.1 Conformity

The transport robot is an incomplete machine in the sense of the Machinery Directive 2006/42/EC Annex II (g). Conformity with the EU harmonisation legislation and the underlying harmonised standards has been declared by the manufacturer. The corresponding declaration of incorporation has been issued and is attached to the technical documentation.

Before commissioning the transport robot, ensure that the following prerequisites are met:

- The transport robot must be integrated into a machine as defined in the Machinery Directive 2006/42/EC, Annex II (a). All specifications and requirements in these operating instructions and the applicable documents must be taken into account.
- On the basis of an appropriate conformity assessment procedure, conformity with the harmonisation legislation of the EU must be established for the machinery in its entirety that is constructed in this way.
- Conformity must be confirmed by issuing an EC declaration of conformity.
- Where applicable, harmonised standards and local regulations applicable at the respective installation site must be taken into account.

2.2 Limitation of liability

The manufacturer is not liable for defects that may be traced to the following causes:

- Failure to comply with this document
- Improper and negligent use of the system
- Insufficient maintenance
- Use of untrained or insufficiently trained/educated personnel and/or unauthorised personnel
- Use of non-approved spare parts
- Unauthorised modifications to the transport robot not agreed with the manufacturer
- Damage to seals or sealing wax (e.g. opening the battery case)

The guarantee explicitly does not include wear-and-tear parts that are subject to normal wear.

2.3 Warning notices

WARNING

Risks of death or serious injury due to moving parts!

Severe crushing injuries to body parts when reaching into moving components.

- Do not climb through into the neighbouring area!

2.3.1 Warning notices structure

Severe

Signal word	Consequences	Probability
 DANGER	Death, severe irreversible injury	immediately imminent, frequently possible
 WARNING	Death, severe irreversible injury	possible
 CAUTION	Moderate or minor, reversible injury	possible
ATTENTION	Material damage	possible

Table 2-1 Signal words, warnings

Type and source of the danger

From which source (assembly, substance ...) does what type of hazard (injury/property damage) emanate?

Consequences

What are the consequences of not heeding the warning (more detailed description of the nature and source of the hazard)?

Avoidance

How can the person acting escape or avoid the danger (instruction to the person)?

Example warning notice

WARNING

Risk of death or serious injury due to moving parts!

Severe crushing injuries to body parts when reaching into moving components.

- Do not climb through into the neighbouring area!

2.4 Pictograms

WARNING

Failure to observe the pictograms may result in death or serious injury!

Pictograms warn of residual risks emanating from the product. They are intended to influence action in a specific situation. They are part of warning notices in the operating instructions and other applicable documents and serve as warning notices directly on the transport robot.

- Before starting any work on the transport robot, familiarise yourself with the pictograms and make sure you understand their meaning.
- Always observe pictograms and any supplementary instructions.

Pictograms	Description
	Warning against general dangers

Table 2-2 Pictograms

2.5 Product safety

WARNING

Failure to observe the product safety requirements may result in death or serious injury!

The transport robot corresponds with the state-of-the-art and the technical safety regulations that are valid at the time of delivery. Nevertheless, hazardous situations may occur due to improper operation of the device.

- Only use the transport robot for its intended purpose.
- In no event should the transport robot be used contrary to its intended purpose.
- Only use transport robots in the Servus system intended for this purpose.

2.5.1 Intended use

The transport robot has been built and designed for the following use:

- The transport robot transports transport units between different positions along the track system within the Servus system.
- The transport robot only transports solid objects. Liquid materials must be transported in containers provided specially for this purpose.
- The technical data (operating conditions, etc.) in this document must always be taken into account. The transport robot may only be operated in accordance with these specifications.
- The transport robot is used in the internal operations of commercial and industrial businesses. The device may only be operated in compliance with intended use by:
 - Instructed persons, non-public
 - Person subject to employee protection

2.5.2 Improper use

Any use under conditions other than those specified above is deemed improper use and must be prevented.

The following use is regarded as particularly improper and dangerous:

- Any modifications to the transport robot without the approval of the manufacturer. This will invalidate the declaration of incorporation as well as the liability and warranty claims.
- Transporting transport units outside the specifications in the technical data (e.g. exceeding the maximum weight)
- Transporting caustic liquids and hazardous materials
- Transporting extremely hot materials (e.g. molten materials)
- Transporting personnel and animals.
- Transporting bulky parts, especially those which protrude over the edge of the transport robot and could cause injuries or could tip over
- Operation with manipulated safety equipment
- Use of the transport robot in explosive atmospheres

2.6 General safety instructions

WARNING

Failure to observe the general safety instructions may result in death or serious injury!

The following general safety instructions have been compiled in accordance with the manufacturer's findings and allow safe operation of the transport robot. Additional local or country-specific safety regulations, such as occupational safety regulations and accident prevention regulations, etc. may also apply. These must also be observed.

- Always observe the general safety instructions.
- Use the general safety instructions when conducting general safety training.
- Observe the general safety instructions in addition to the locally applicable safety regulations. The transport robot operator is responsible for this.

Despite safety precautions and a safe design, the transport robot can be a source of danger if action instructions and safety regulations are not observed. The following general safety instructions must be observed:

- Always observe the safety and warning instructions in the technical documentation and, if applicable, on the transport robot itself.
- Use the general safety instructions when conducting general safety training.
- Only start the transport robot or work on it if you are authorised and trained and have been instructed in how the transport robot functions. The person responsible for the transport robot may and must exclude unauthorised persons from manipulating the transport robot.
- Wear the prescribed personal protective equipment during all work on the transport robot.
- Always work in accordance with the regulations.
- Only use the original replacement and wear parts. Non-compatible parts could trigger hazardous situations.

2.6.1 Mechanical Systems

- Do not make any changes or adjustments to transport robot components (sensors, housing etc.) without consulting the manufacturer.

2.6.2 Electrical Systems

- Work on electrical systems may only be completed by technical personnel with electrical/electronics training.
- Do not bridge or bypass electrical switching elements. The resulting malfunctions are extremely dangerous.

2.6.3 Battery in the transport robot

- Do not open the battery casing.
- Do not short-circuit the battery.

2.7 Personal protection

2.7.1 Personnel qualification and training

WARNING

Death or serious injury due to inadequate personnel qualifications and training!

The transport robot operator is responsible for observing the following points:

- Enable and check compliance with all locally applicable health and safety regulations.
- Create operating instructions according to locally applicable work safety instructions.
- Ensure that personnel working on the transport robot are sufficiently qualified and trained.
- Make sure that personnel working on the transport robot have read and understood the operating instructions and all other applicable documents of the respective department.
- Make sure that personnel working on the transport robot have been instructed and that the training level has been checked.
- Make sure that personnel working on the transport robot have received product-specific training.
- Make sure that personnel working on the transport robot are re-trained at regular intervals.

Life phase	Operating mode	Minimum requirements for personnel
Transport	Power down	<ul style="list-style-type: none"> • Transport personnel
Installation	Power down	<ul style="list-style-type: none"> • Manufacturer's technical personnel
Installation	Manual	<ul style="list-style-type: none"> • Manufacturer's technical personnel
Initial commissioning	Manual, automatic, access point	<ul style="list-style-type: none"> • Manufacturer's technical personnel
Initial commissioning (network settings)	Access point	<ul style="list-style-type: none"> • Technical staff
Operation	Manual, automatic	<ul style="list-style-type: none"> • Operating personnel
Troubleshooting	Manual, automatic	<ul style="list-style-type: none"> • Operating personnel
Maintenance and servicing	Power down, manual, automatic	<ul style="list-style-type: none"> • Technical staff • Electrotechnical personnel • Manufacturer's technical personnel
Shutdown	Manual, automatic	<ul style="list-style-type: none"> • Technical staff • Electrotechnical personnel
Dismantling	Power down	<ul style="list-style-type: none"> • Dismantling personnel • Manufacturer's technical personnel
Disposal	Power down	<ul style="list-style-type: none"> • Disposal personnel • Manufacturer's technical personnel

Table 2-3 Personnel qualification per life phase

General requirements

Every person working on the transport robot meets all the following requirements:

- In full possession of mental and physical faculties
- No influence of medication, drugs or similar on the ability to react, concentration and judgement

Transport personnel

These staff meet all the following requirements:

- Familiar with the handling of packaging, transport aids and lifting equipment
- Familiar with the stable transport of articles
- Familiar with the handling of off-centre centres of gravity

Operating personnel

These staff meet all the following requirements:

- Trained in the use of the transport robot
- Familiar with the operation of the transport robot

Technical staff

These personnel meet all of the following requirements:

- Trained in the use of the transport robot
- Familiar with the operation of the transport robot
- Technical training

Electrical engineering staff

These personnel meet all of the following requirements:

- Trained in the use of the transport robot
- Familiar with the operation of the transport robot
- Electrotechnical training
- Familiar with the application of the five safety rules of electrical engineering
- Trained in handling batteries in general and the battery in the transport robot in particular

Dismantling personnel

These staff meet all of the following requirements:

- Trained in safe working practices during dismantling work

Disposal personnel

These staff meet all of the following requirements:

- Familiar with the locally applicable regulations on disposal, recycling and environmental protection

Qualified personnel of the manufacturer (or its representative)

These staff meet all of the following requirements:

- Trained in the use of the transport robot
- Familiar with the technical structure and configuration of the transport robot in detail
- Trained in complex repairs, adjustments, programming etc.
- Technical training, if applicable
- Electrotechnical training, if applicable

2.7.2 Personal protective equipment

WARNING

Failure to provide personal protective equipment may result in death or serious injury!

The transport robot operator is responsible for observing the following points:

- Ensuring that personnel working on the transport robot have the required personal protective equipment available.

The basic personal protective equipment for working on the transport robot consists of the following parts:

- Protective gloves to protect against mechanical risks (cuts etc.)
- Closed-toe safety shoes with protective toe cap to protect against injuries caused by falling objects

Depending on the type of work to be carried out, it may be necessary to use other personal protective equipment:

- Safety goggles to protect the eyes

2.8 Duty to report malfunction and damage

WARNING

Malfunctions of and damage to the transport robot may result in death or serious injury!

The operating company designates a person in the company who is responsible for the transport robot (e.g. shift leader or production manager). Observe the following points in the event of faults and damage to the transport robot:

- Always notify the person responsible for the transport robot immediately of any faults or damage.
- The person responsible for the product shall immediately take the transport robot out of operation and clearly mark it as "defective".
- The person responsible for the product shall immediately arrange for the faults or damage to be rectified.
- Do not put the transport robot back into operation until all damage has been repaired.

2.9 Changes to the transport robot

WARNING

Unauthorised modifications to the transport robot may result in death or serious injury!

Modifications to the transport robot can create new hazards. The conformity declaration and warranty are void, with immediate effect, if any modifications are made to the transport robot.

- Do not make any unauthorised changes to the transport robot.
- Make any desired changes to the transport robot only after consultation with the manufacturer.

2.10 Behaviour in case of emergency

WARNING

Death or serious injuries due to incorrect behaviour in an emergency!

Observe the following rules of conduct in emergency situations:

- Switch off the transport robot immediately.
- The transport robot may only be operated in manual mode by trained and authorised personnel.
- Observe the prescribed behaviour within the company for emergency situations.

2.10.1 Fire in the transport robot's battery

WARNING

Death or serious injuries due to incorrect behaviour in an emergency!

NMC (nickel-manganese-cobalt-oxide) batteries are used in the transport robot. This means that the batteries are neither explosive nor self-igniting during normal operation.

When operated outside the specified environmental conditions and especially in the event of mechanical damage or external influences (e.g. fire in the building), the battery may catch fire.

The operator of the system is responsible for ensuring that the following points are observed in the event of a fire:

- All locally applicable guidelines and regulations are complied with.
- Protective gloves, protective clothing, gas mask against organic gases, eye protection and face protection are worn.
- Only fire extinguishers that are suitable for extinguishing metal and battery fires are used.
- During extinguishing, always position out of the area of escaping gases/vapours.
- If gases escape, ventilate immediately and leave the building if necessary.
- In case of inhalation of gases, consult a doctor immediately.
- If escaping substances make skin contact, wash skin with plenty of soap and water. In case of skin irritation, consult a doctor.
- In case of eye contact with escaping substances, rinse eyes with open eyelids with plenty of water and then consult an eye specialist immediately.

3 Product description

3.1 Scope of delivery

The transport robot is delivered with:

- 1 transport robot
- 1 transport robot packaging



Figure 3-1 Transport robot



Figure 3-2 Transport robot packaging (3 pieces stacked on pallet)

3.2 Accessories

The following accessories for the transport robot are supplied with the Servus system:

- Charger 3.0 (at least 1 per Servus system): The Charger 3.0 can be used to manually charge the transport robot.
- Access point button (at least 1 per Servus system): The access point button can be used to switch to the transport robot's access point mode.

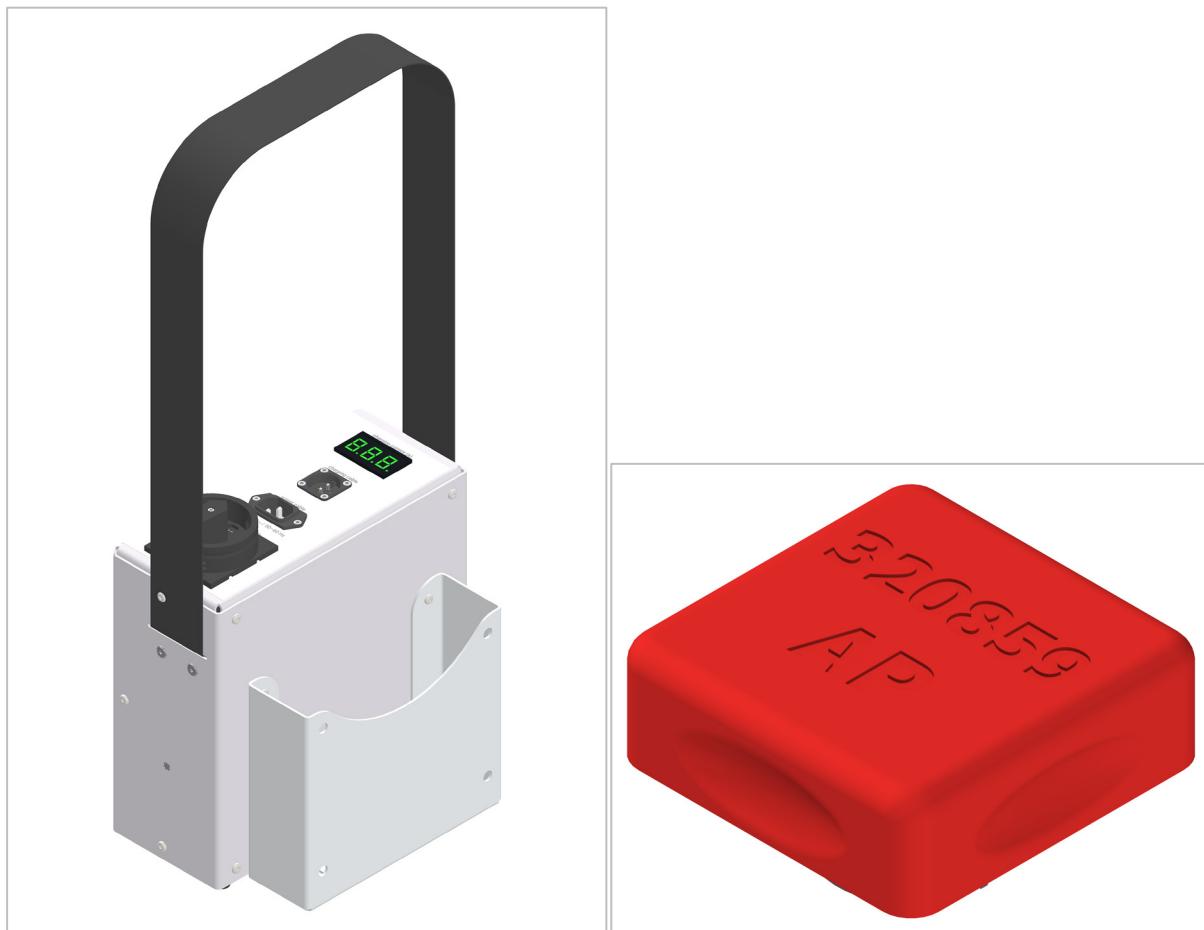


Figure 3-3 Charger 3.0 (left) and access point button (right)

3.3 Function

The Transport Robot Generation 5 transports transport units between different positions in the Servus system. A load handling device is used to pick up transport units at a storage position and drop them off at a retrieval position.

The transport robot moves independently along the Servus track system. The track system is mapped in the digital route network, which serves as a kind of road map for the transport robot. All the positions that the transport robot can reach are defined in this digital route network. With the help of RFID nodes along the track and a route measurement system in the transport robot, the transport robot moves itself on the route system.

The transport robot communicates with the Servus Manager via WLAN. The Servus Manager is the central control and monitoring software. It receives orders from a higher-level system (WMS) and converts them into corresponding travel orders for the transport robot.

The transport robot's energy supply is provided by a combination of rechargeable battery and super capacitor, which are charged at charging stations along the route.

3.4 Identification of the product

The following markings are affixed to the transport robot:

- Transport robot number
- Type plate

Transport robot number

The transport robot number enables easy identification of the transport robot. Each transport robot number is assigned exactly once within a Servus system. It serves as a reference in the Servus Manager, for example.



Figure 3-4 Example of a transport robot number

Type plate

The type plate contains all data for clear identification of the transport robot. It is located on the top of the transport robot.

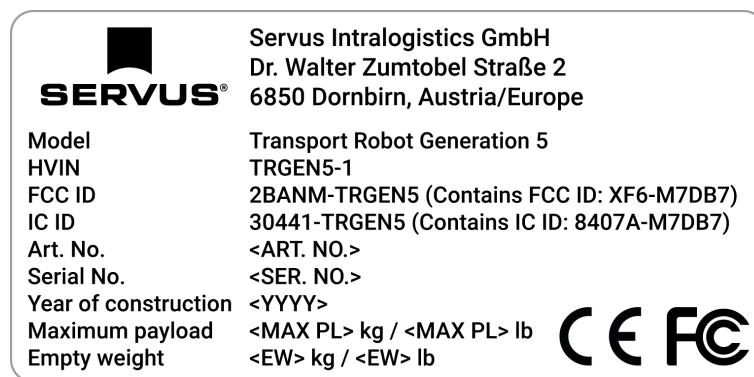


Figure 3-5 Example type plate

4 Technical data

Manufacturer

Manufacturer	Servus Intralogistics GmbH
Manufacturer's address	Dr. Walter Zumtobel Straße 2 6858 Dornbirn Austria

General product data

Designation	Transport Robot Generation 5 (TRGEN5)
Load handling device	Smartloader
Item number	363016
HVIN	TRGEN5
FCC ID	2BANM-TRGEN5 (contains FCC ID: XF6-M7DB7)
IC ID	30441-TRGEN5 (contains IC ID: 8407A-M7DB7)
Year of manufacture	2023
Serial number	194335
Suitable for	Servus System from Servus Intralogistics GmbH for Transport Robots Generation 5
Cleanroom class according to EN ISO 14644-1:2016	EN ISO 6
Protection class according to IEC 60529:2014	IP10
Calculated lifetime	10 years
Laser class of the laser sensors used according to EN 60825-1	1

Dimensions and weight

Track width	901 mm
Dimensions (L x W x H)	900 mm × 880 mm × 250 mm
Tine spacing (TS)	280 mm
Net weight	65 kg

Driving dynamics

Maximum speed	4 m/s
Maximum acceleration	1.2 m/s
Maximum delay	1.2 m/s
Driving direction	Forwards and backwards

Permitted transport units

maximum weight TE (loading equipment including load)	35 kg
maximum dimension TE (W × D × H)	425 mm × 625 mm × 420 mm
minimum dimension TU (W × D × H)	400 mm × 300 mm × 43 mm

Operating conditions

Field of use	Industry and commerce
Operating temperature	+5 °C to +40 °C
Humidity	5 to 85 % (non-condensing!)
maximum gradient Driving track	0° ± 0.5°
maximum descent Driving track	0° ± 0.5°
Max. sea level	2,000 m a.s.l.
maximum extraneous light tolerance	10.000 lx (no direct sunlight on sensors!)
maximum dust exposure (annual mean)	4 mg/m³

Energy management

Energy system	Combination of battery and super capacitor
Battery technology	Lithium ions (NMC - nickel-manganese-cobalt oxide)
Average power consumption in operation	about 150 W
Battery life in power saving mode	3.5 days
Battery life with transport robot switched off	12 months

Radio communication

Radio technology Communication	WLAN 5 GHz (IEEE 802.11a) WLAN 2.4 GHz (IEEE 802.11n)
Frequency bands WLAN 2.4 GHz	2.412 GHz to 2.472 GHz
Frequency bands WLAN 5 GHz	5.180 GHz to 5.320 GHz
maximum transmission power WLAN 2.4 GHz	63.096 mW (= +18.0 dBm)
maximum transmission power WLAN 5 GHz	22.387 mW (= +13.5 dBm)
Radio technology RFID node Route	RFID 13.56 MHz
Frequency bands RFID 13.56 MHz	13.56 MHz
maximum transmission power RFID 13.56 MHz	200 mW (= 23.0 dBm)
required minimum signal strength WLAN signal	-70 dB

Danger area

Danger area	Cubic content of the transport robot including the widest, longest and highest permissible transport unit(s)
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5 Transport and packaging

5.1 Transport lock *Smartloader*



Transport locks are fitted to the tines of the Smartloader to prevent the tines from moving during transport. Commercially available cable ties are used to secure the unit for transport.

5.1.1 Remove transport lock *Smartloader*

⚠ CAUTION

Injuries due to moving components!

Crushing injuries and cuts to fingers when reaching between the tines of the Smartloader and the frame of the transport robot.

- Wear protective gloves.
- Do not move the tines while working on the transport lock.

- Transport robot is switched off.
- Transport robot stands on Servus track system or on level surface.

ATTENTION

Material damage due to improper removal of the transport lock!

Damage to the belt of the Smartloader by applying the side cutter to the belt.

- Apply side cutters to the side of the tine on the cable tie.

1. Apply side cutters to the side of the tine on the cable tie.
2. Remove cable tie with side cutters.
3. Remove the severed cable tie.
4. Repeat steps 1 to 3 for the three other cable ties on the tines of the Smartloader.

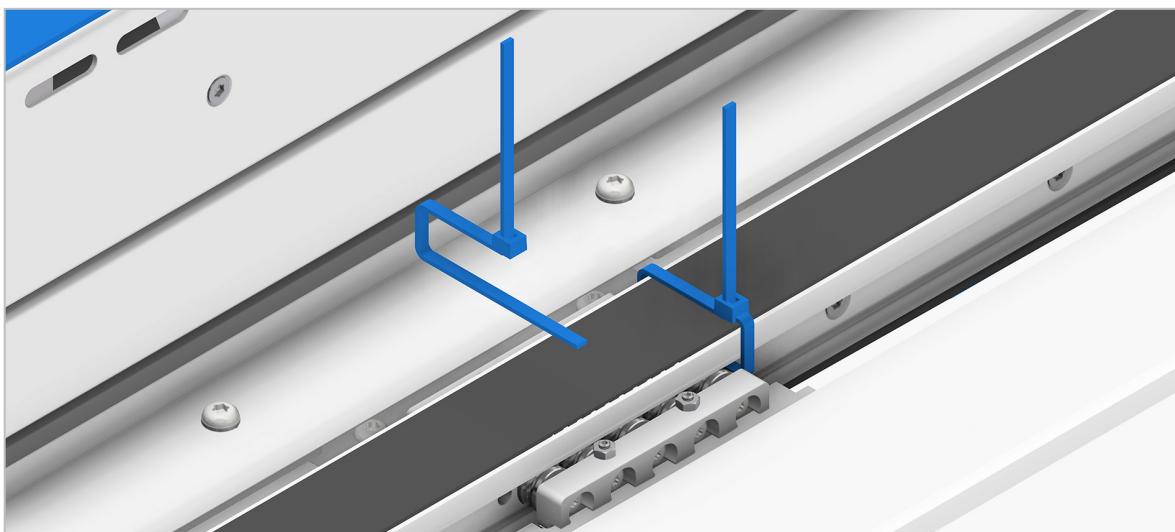


Figure 5-1 Removing the Smartloader transport lock

- ✓ Transport lock *Smartloader* successfully removed.

5.1.2 Fitting the transport lock *Smartloader*

⚠ CAUTION

Injuries due to moving components!

Crushing injuries and cuts to fingers when reaching between the tines of the Smartloader and the frame of the transport robot.

- Wear protective gloves.
- Do not move the tines while working on the transport lock.

- Four cable ties are available.
 - Length \geq 140 mm
 - Width 3.5 mm to 4.8 mm
- Transport robot is switched off.
- Transport robot stands on Servus track system or on level surface.
- Tines of the Smartloader are in the middle position and do not protrude beyond the frame.

1. Insert the cable tie through the opening for the transport lock.

ATTENTION

Material damage due to improper fitting of the transport lock!

Damage to the belt of the Smartloader by tightening the cable tie.

- Close the cable ties, but do not tighten.
- Do not squeeze the belt of the Smartloader.

2. Close the cable tie at the top of the tine, but do not tighten.
3. Repeat steps 1 to 2 on the three other openings for the transport lock.

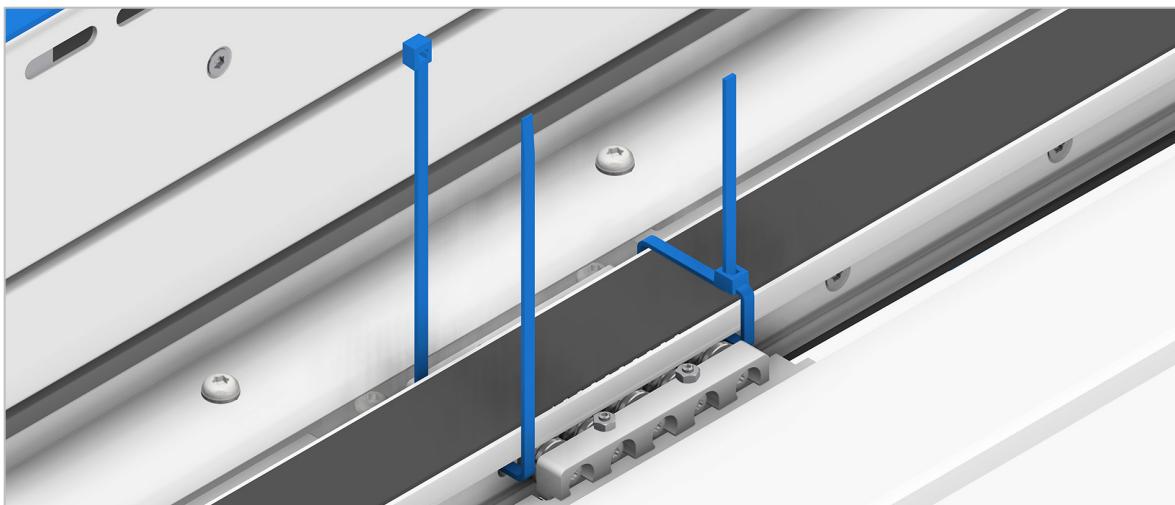


Figure 5-2 Fitting the Smartloader transport lock

- ✓ Transport lock *Smartloader* successfully fitted.

5.2 Transport position main switch



The main switch of the transport robot is locked for transport to ensure that the main switch is and remains switched off for transport. A standard cable tie is used for this purpose.

5.2.1 Release main switch

- Main switch is locked for transport.
- 1. Open the maintenance cover.
- 2. Remove cable tie with side cutters.
- 3. Remove the severed cable tie.

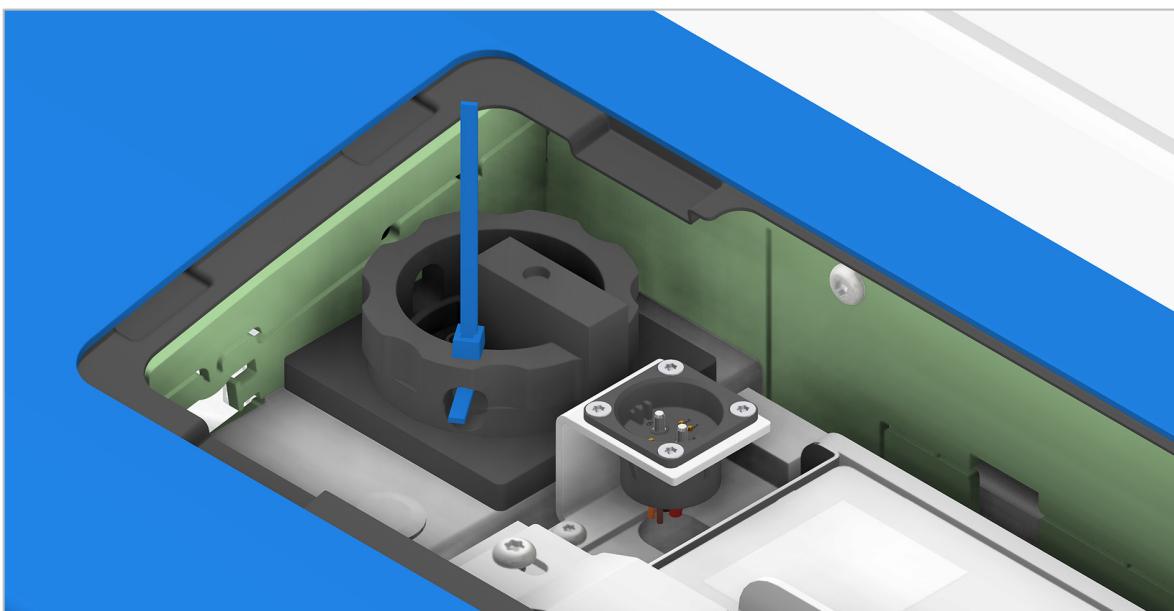


Figure 5-3 Release main switch

- 4. Close the maintenance cover.
- ✓ Main switch successfully released.

5.2.2 Lock main switch for transport

- One piece of cable tie is available.
 - Length \geq 100 mm
 - Width 2.5 mm to 9.0 mm
- Transport robot is switched off.
 1. Open the maintenance cover.
 2. Pass the cable tie through the locking hole of the main switch.
 3. Close and tighten the cable ties.

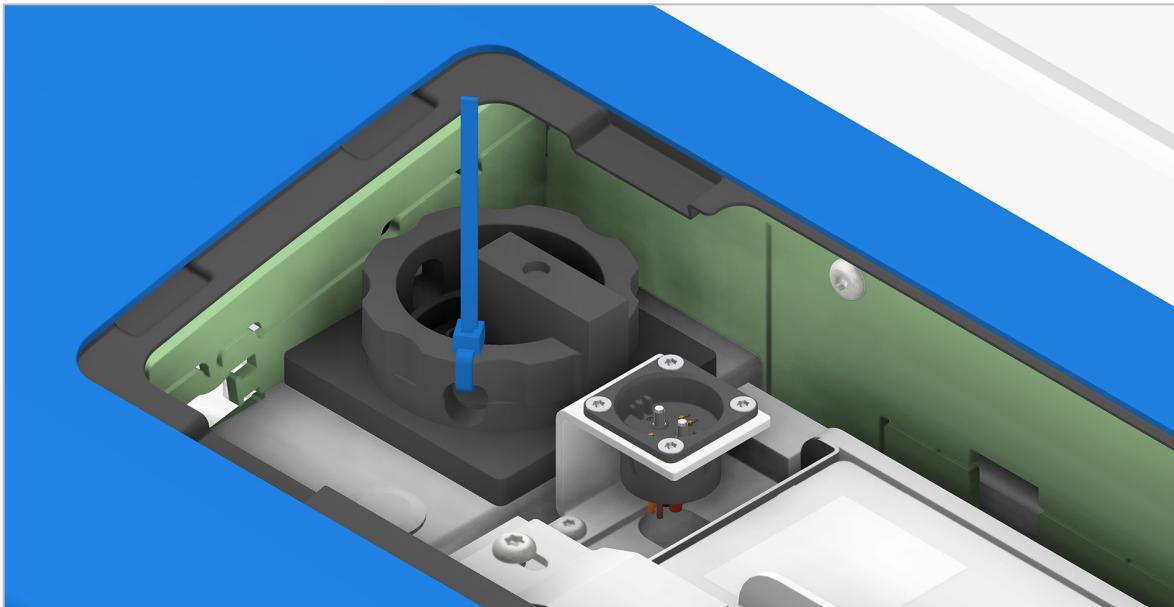


Figure 5-4 Locking the main switch for transport

4. Close the maintenance cover.
- ✓ Main switch successfully locked for transport.

6 Storage

ATTENTION

Material damage due to incorrect storage of the transport robot!

- Always comply with the specified storage conditions.

Storage conditions

The following storage conditions must always be observed when storing the transport robot:

- Store the transport robot in its original packaging.
- Store the transport robot in a dry and dust-free place.
- Air temperature:
+5 °C to +40 °C
- Humidity
5 to 85 % (non-condensing!)

7 Assembly, installation, and initial commissioning



Assembly, installation and initial commissioning of the transport robot are carried out entirely by the manufacturer.

In order for the transport robot to connect to the Servus System network, the transport robot settings must be configured for the local network:

- If the current network settings of the Servus system have been communicated to the manufacturer in advance, the transport robot is supplied and ready for operation. It can be inserted into the Servus system without any further actions.
- Otherwise, the network settings can be configured manually on site (see section 9.11).



How to insert and remove the transport robot from the Servus system is described in the Servus system operating instructions.

8 Structure and function

8.1 Transport robot

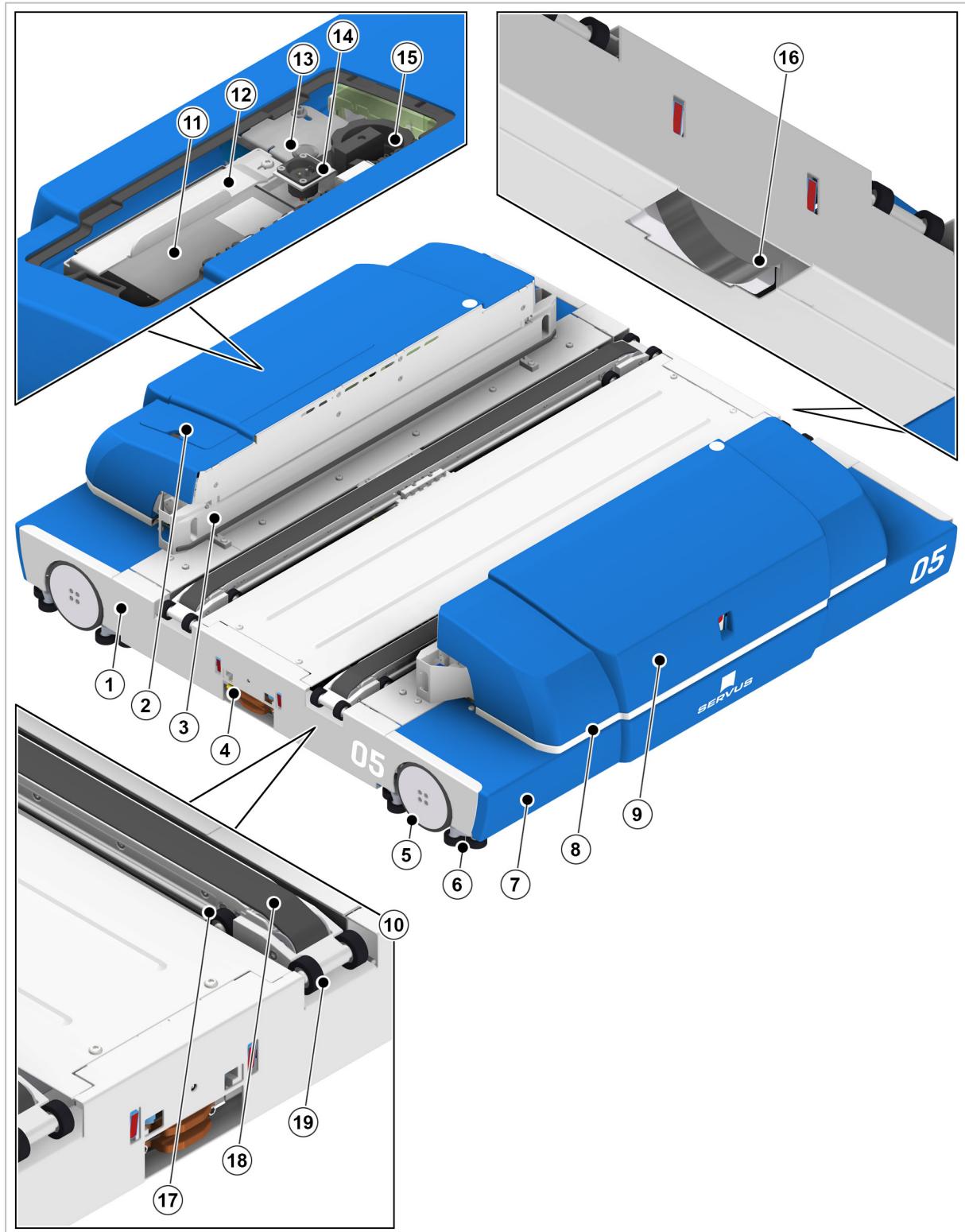


Figure 8-1 Structure of transport robot

#	Name	Description
1	Frame	Forms the basic load-bearing structure of the transport robot
2	Maintenance cover	Part of the bonnet; allows easy access to important components under the bonnet
3	TU side guide	Guides the transport unit when picking up/delivering
4	Charging contact	Part of the charging unit; connects to the charging stations along the track to charge the transport robot's energy storage (battery and super capacitor)
5	Drive wheel	Drives the transport robot during horizontal movement
6	Guide roller	For guiding the transport robot when driving on the track system
7	Lower bonnet section	Lower part of the bonnet of the transport robot
8	Status LED bar	Displays the current status of the transport robot
9	Upper hood section	Upper part of the bonnet of the transport robot
10	Smartloader	Load handling device of the transport robot; picks up transport units and delivers transport units
11	Battery	Supplies the transport robot with voltage during longer periods of inactivity; during ongoing operation, the super capacitor supplies the transport robot with voltage
12	Battery holder	Fixes the battery in the transport robot
13	Button	Not used
14	Charging port	Serves as connection for the Charger 3.0 and the access point button
15	Main switch	Switches the power supply of the transport robot on/off
16	Distance measuring wheel	Measures the distance covered by the transport robot
17	Stabilisation roller	Stabilises the tines of the Smartloader during extension/retraction
18	Belt	Loads and drops off transport units
19	Support roller	Is located on the respective handover location when retrieving and depositing transport units and thus acts as a support for the tines

Table 8-1 Structure of transport robot

8.2 Operating modes

The transport robot has the following operating modes:

- Manual mode
- Automatic mode
- Energy-saving mode
- Access point mode
- Power down

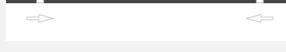
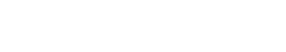
Manual mode

- The transport robot is switched on but not referenced.
- The transport robot can be operated manually.
- The transport robot cannot accept and execute any driving jobs from the higher-level system.

Main switch position	Light pattern status LED bar (front/rear)
I / ON	

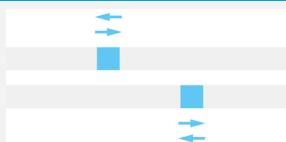
Automatic mode

- The transport robot is switched on and referenced.
- The transport robot can accept and execute travel orders from the higher-level system.
- The transport robot cannot be operated manually.

Main switch position	Light pattern status LED bar (front/rear)
I / ON	
	
	
	
	
	
	
	
	
	
	
	
	
	
	
	

Access point mode

- The WLAN settings of the transport robot can be configured manually.
- No other operation of the transport robot is possible.

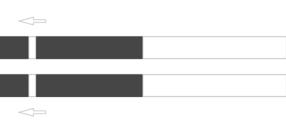
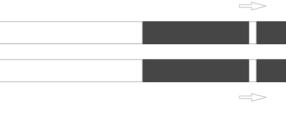
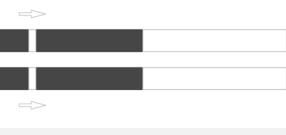
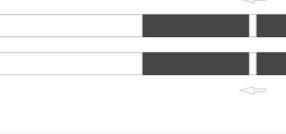
Main switch position	Light pattern status LED bar (front/rear)
I / ON	

Power down

- The power supply of the system is switched off.

Main switch position	Light pattern status LED bar (front/rear)
0 / OFF	

8.3 Light pattern status LED bar

Light pattern front/rear	Description	Status
	<ul style="list-style-type: none"> Front and rear: Power down 	Transport robot is switched off or in energy-saving mode
	<ul style="list-style-type: none"> Front and rear: Lights white 	Transport robot is moving
	<ul style="list-style-type: none"> Front and rear: White running light runs on the left side from the centre to the outside left; right side lights up white 	Transport robot drops off transport unit to the left side
	<ul style="list-style-type: none"> Front and rear: White running light runs on the right side from the centre to the outside right; left side lights up white 	Transport robot drops off transport unit to the right side
	<ul style="list-style-type: none"> Front and rear: White running light runs on the left side from the outside left to the centre; right side lights up white 	Transport robot picks up transport unit from the left side
	<ul style="list-style-type: none"> Front and rear: White running light runs on the right side from the outside right to the centre; left side lights up white 	Transport robot picks up transport unit from the right side
	<ul style="list-style-type: none"> Front and rear: Lights up dimmed white 	Transport robot is in automatic mode; transport robot is switched on and referenced, but has no order
	<ul style="list-style-type: none"> Front and rear: Green running light runs from the centre to the outside left and outside right; when the battery charge level is < 100 %: Running light does not run all the way to the outside; the lower the charge level, the shorter the running light 	Transport robot is charged at the charging station or manually
	<ul style="list-style-type: none"> Front and rear: Lights green 	Transport robot is in manual mode; transport robot is switched on but not referenced
	<ul style="list-style-type: none"> Front and rear: Pulses green 	

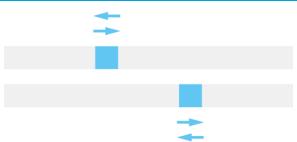
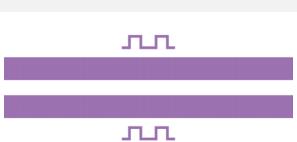
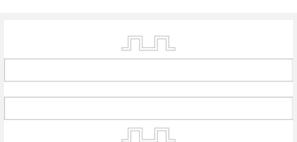
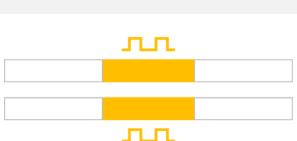
Light pattern front/rear	Description	Status
	<ul style="list-style-type: none"> Front and rear: Lights up dimmed white; blue running light runs between outside left and outside right 	Transport robot is in access point mode
	<ul style="list-style-type: none"> Front and rear: Pulses blue 	Transport robot is raised
	<ul style="list-style-type: none"> Front and rear: Pulses orange 	Transport robot is referenced
	<ul style="list-style-type: none"> Front and rear: Blue running light runs in each corner from the inside to the outside; centre lights up white 	Firmware of the transport robot is updated
	<ul style="list-style-type: none"> Front and rear: Flashes purple 	Transport robot stopped by emergency stop
	<ul style="list-style-type: none"> Front and rear: Flashes white 	Charge status of battery low
	<ul style="list-style-type: none"> Front and rear: Corners light up white; centre flashes orange 	order-related error active; transport robot continues operation; error handling by Servus Manager
	<ul style="list-style-type: none"> Front and rear: Flashes red 	Error on transport robot active; manual error correction required

Table 8-2 Light pattern status LED bar

9 Operation

9.1 Inserting transport robots into the Servus system



The procedure for inserting a transport robot into the Servus system is described in the Servus system operating instructions.

9.2 Removing transport robots from the Servus system



How to remove the transport robot from the Servus system is described in the Servus system operating instructions.

9.3 Change operating mode

	From manual mode	From automatic mode	From energy saving mode	From access point mode	From off
To manual mode	—	<ol style="list-style-type: none"> 1. Restart the transport robot. (See section 9.7.1) 2. Switch off the transport robot. (See section 9.5) 3. Switch on the transport robot. (See section 9.4) 	<ol style="list-style-type: none"> 1. Operate transport robots manually. (See section 9.7) <p>Alternatively:</p> <ol style="list-style-type: none"> 1. Restart the transport robot. (See section 9.7.1) 	<ol style="list-style-type: none"> 1. Disable access point mode. (See section 9.10) 2. Switch on the transport robot. (See section 9.4) 	<ol style="list-style-type: none"> 1. Switch on the transport robot. (See section 9.4)
To automatic mode	<ol style="list-style-type: none"> 1. Manually reference transport robot. (See section 9.7.4) 	—	<ol style="list-style-type: none"> 1. In the higher-level system, send the transport order to the transport robot. <p>Alternatively:</p> <ol style="list-style-type: none"> 1. Restart the transport robot. (See section 9.7.1) 2. Manually reference transport robot. (See section 9.7.4) 	<ol style="list-style-type: none"> 1. Disable access point mode. (See section 9.10) 2. Switch on the transport robot (see chapter 9.4) 3. Manually reference transport robot. (See section 9.7.4) 	<ol style="list-style-type: none"> 1. Switch on the transport robot. (See section 9.4) 2. Manually reference transport robot. (See section 9.7.4)
To energy saving mode	The transport robot automatically switches to energy-saving mode during longer periods of inactivity. It is not possible to switch to energy-saving mode manually.	The transport robot automatically switches to energy-saving mode during longer periods of inactivity. It is not possible to switch to energy-saving mode manually.	—	The energy-saving mode is not available in access point mode.	The energy-saving mode is not available in switched-off mode.
To access point mode	<ol style="list-style-type: none"> 1. Switch off the transport robot. (See section 9.5) 2. Enable access point mode. (See section 9.9) 	<ol style="list-style-type: none"> 1. Restart the transport robot. (See section 9.7.1) 2. Switch off the transport robot. (See section 9.5) 3. Enable access point mode. (See section 9.9) 	<ol style="list-style-type: none"> 1. Restart the transport robot. (See section 9.7.1) 2. Switch off the transport robot. (See section 9.5) 3. Enable access point mode. (See section 9.9) 	—	<ol style="list-style-type: none"> 1. Enable access point mode. (See section 9.9)
To Switched off	<ol style="list-style-type: none"> 1. Switch off the transport robot. (See section 9.5) 	<ol style="list-style-type: none"> 1. Restart the transport robot. (See section 9.7.1) 2. Switch off the transport robot. (See section 9.5) 	<ol style="list-style-type: none"> 1. Restart the transport robot. (See section 9.7.1) 2. Switch off the transport robot. (See section 9.5) 	<ol style="list-style-type: none"> 1. Disable access point mode. (See section 9.10) 	—

9.4 Switch on transport robot

- Transport robot is inserted into the Servus system.
- Transport robot is in switched off mode.
 1. Open the maintenance cover.
 2. Turn the main switch of the transport robot clockwise to the position *I / ON* .
 - ✓ The power supply of the transport robot is switched on.
 - ✓ Status LED bar pulses blue at the front and rear.
 - ✓ Transport robot is raised.
 - ✓ Status LED bar lights up green at the front and pulses green at the rear.
 - ✓ Transport robot is in manual mode.
 3. Close the maintenance cover.
 - ✓ Transport robot successfully switched on.

9.5 Switch off transport robot

- Transport robot is switched on.
- Transport robot is in manual mode.
 1. Open the maintenance cover.
 2. Turn the main switch of the transport robot anticlockwise to position *0 / OFF*.
 - ✓ Status LED bar lights up
 - ✓ Transport robot is in switched off mode.
 3. Close the maintenance cover.
 - ✓ Transport robot successfully switched off.

9.6 Stop transport robot with emergency stop



The transport robot is stopped by an emergency stop in the Servus system with emergency stop. Stopping the Servus system with emergency stop is described in the Servus system operating instructions.

9.7 Manually operate transport robots

9.7.1 Restart transport robot

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot. Transport robot can perform unexpected movements in the event of a fault.

- Ensure that there are no persons or objects in the possible working area of the transport robot during the entire movement.
- Only operate transport robots manually from outside the safety area.
- Maintain direct visual contact with the transport robot and its surroundings during the entire movement.
- Never move transport robots with damaged safety and monitoring equipment.
- In case of an emergency, press the emergency *stop* button in the Servus system.

- There is direct visual contact with the transport robot and its surroundings.
- Transport robot is switched on.
- Transport robot does not perform any movements.
- Transport robot is not charging manually.

1. Open the transport robot website.
2. Select main tab *Remote*.
- ✓ Warning message is displayed.
3. Read and understand the warning completely:
 - When you have understood the warning, select the *OK button* and proceed to the next step.
 - If you have not understood the warning, stop operation and contact the person responsible for the transport robot.
4. In the detail tab *Restart* select the button *Reset* .
- ✓ Status LED bar flashes white.
- ✓ Status LED bar lights up
- ✓ Transport robot is switched off briefly (a few seconds).
- ✓ Status LED bar pulses blue at the front and rear.
- ✓ Transport robot is raised.
- ✓ Status LED bar lights up green at the front and pulses green at the rear.
- ✓ Transport robot is in manual mode.
- ✓ Transport robot web page is reloaded.
- ✓ Transport robot successfully restarted.

9.7.2 Enable reduced speed



When this function is enabled, all movements of the transport robot are carried out at a significantly reduced speed. The function is not intended for regular operation, but only for diagnostic purposes.

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot. Transport robot can perform unexpected movements in the event of a fault.

- Ensure that there are no persons or objects in the possible working area of the transport robot during the entire movement.
- Only operate transport robots manually from outside the safety area.
- Maintain direct visual contact with the transport robot and its surroundings during the entire movement.
- Never move transport robots with damaged safety and monitoring equipment.
- In case of an emergency, press the emergency stop button in the Servus system.

- There is direct visual contact with the transport robot and its surroundings.
- Transport robot is switched on.
- Reduced speed is deactivated.
 1. Open the transport robot website.
 2. Select main tab *Remote*.
- ✓ Warning message is displayed.
- 3. Read and understand the warning completely:
 - When you have understood the warning, select the *OK* button and proceed to the next step.
 - If you have not understood the warning, stop operation and contact the person responsible for the transport robot.
- 4. In the detail tab *Reduced speed* select the button *Enable reduced speed*.
- ✓ Reduced speed is enabled.
- ✓ Label *<status>* in the detail tab *Reduced speed* displays *ON*.
- ✓ Reduced speed successfully enabled.

9.7.3 Disable reduced speed

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot. Transport robot can perform unexpected movements in the event of a fault.

- Ensure that there are no persons or objects in the possible working area of the transport robot during the entire movement.
- Only operate transport robots manually from outside the safety area.
- Maintain direct visual contact with the transport robot and its surroundings during the entire movement.
- Never move transport robots with damaged safety and monitoring equipment.
- In case of an emergency, press the emergency stop button in the Servus system.

- There is direct visual contact with the transport robot and its surroundings.
- Transport robot is switched on.
- Reduced speed is enabled.
 1. Open the transport robot website.
 2. Select main tab *Remote*.
- ✓ Warning message is displayed.
- 3. Read and understand the warning completely:
 - When you have understood the warning, select the button *OK* and proceed to the next step.
 - If you have not understood the warning, stop operation and contact the person responsible for the transport robot.
- 4. In the detail tab *Reduced speed* select the button *Disable reduced speed*.
- ✓ Reduced speed is disabled.
- ✓ Label *<status>* in the detail tab *Reduced speed* displays *OFF*.
- ✓ Reduced speed successfully enabled.

9.7.4 Manually referencing transport robots

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot. Transport robot can perform unexpected movements in the event of a fault.

- Ensure that there are no persons or objects in the possible working area of the transport robot during the entire movement.
- Only operate transport robots manually from outside the safety area.
- Maintain direct visual contact with the transport robot and its surroundings during the entire movement.
- Never move transport robots with damaged safety and monitoring equipment.
- In case of an emergency, press the emergency stop button in the Servus system.

- There is direct visual contact with the transport robot and its surroundings.
- Transport robot is switched on.
- Transport robot does not perform any movements.
- Transport robot is in manual mode.
- The transport unit is located centrally on the load handling attachment or completely on the storage position or retrieval position.

1. Check the position of the transport unit on the transport robot:
 - If there is no TU on the transport robot, continue with step 3.
 - If the TU is in the centre of the transport robot or completely in the storage or retrieval position, continue with step 3 .
 - If the TU is between the transport robot and the storage or retrieval position, continue with step 2.
2. Manually push the transport unit completely to the storage or retrieval position.
3. Open the transport robot website.
4. Select main tab *Remote*.

✓ Warning message is displayed.

5. Read and understand the warning completely:

- When you have understood the warning, select the button *OK* and proceed to the next step.
- If you have not understood the warning, stop operation and contact the person responsible for the transport robot.



The transport robot can be referenced in the forwards direction of travel and in the backwards direction of travel. The direction is clearly visible on the transport robot:

- **Front:** Status LED bar lights up green
- **Rear:** Status LED bar pulses green

6. Reference transport robot:

- In the detail tab *Reference* select the button *Reference forward* to reference the transport robot in the forward direction of travel.
- In the detail tab *Reference* select the button *Reference backward* to reference the transport robot backwards in the direction of travel.

✓ Status LED bar pulses orange at the front and rear.
✓ Charging unit is automatically referenced by moving the charging unit.
✓ Load handling device is automatically referenced by moving the load handling device.
✓ Transport robot travels at reduced speed in the desired direction to the next RFID node on the track.
✓ Status LED bar lights up dimmed white at the front and rear.
✓ Transport robot is in automatic mode.
✓ Transport robot successfully referenced manually.

9.7.5 Move transport robot manually horizontally

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot. Transport robot can perform unexpected movements in the event of a fault.

- Ensure that there are no persons or objects in the possible working area of the transport robot during the entire movement.
- Only operate transport robots manually from outside the safety area.
- Maintain direct visual contact with the transport robot and its surroundings during the entire movement.
- Never move transport robots with damaged safety and monitoring equipment.
- In case of an emergency, press the emergency stop button in the Servus system.

- There is direct visual contact with the transport robot and its surroundings.
- Transport robot is switched on.
- Transport robot does not perform any movements.
- Load unit is fully retracted and does not protrude beyond the frame.
- Transport robot is not charging manually.
- Transport robot is in manual mode.
- Tines of the Smartloader are in the middle position and do not protrude beyond the frame.

1. Open the transport robot website.
2. Select main tab *Remote*.
- ✓ Warning message is displayed.
3. Read and understand the warning completely:
 - When you have understood the warning, select the button *OK* and proceed to the next step.
 - If you have not understood the warning, stop operation and contact the person responsible for the transport robot.
4. Select sub-tab *Manual Mode*.

5. In the detail tab *Horizontal* select text field *Horizontal distance*.
6. Enter the desired distance in mm by which the transport robot is to be moved horizontally.



The transport robot can be moved forwards and backwards. The direction is clearly visible on the transport robot and on the transport robot website:

- **Front:** Status LED bar lights up green
- **Rear:** Status LED bar pulses green

7. Move the transport robot horizontally by the desired distance in the desired direction:
 - In the detail tab *Horizontal* select button  to move the transport robot forward.
 - In the detail tab *Horizontal* select button  to move the transport robot backwards.

✓ Transport robot moves horizontally at reduced speed the desired distance in the desired direction.

✓ Transport robot successfully moved horizontally manually.

9.7.6 Move Smartloader manually

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot. Transport robot can perform unexpected movements in the event of a fault.

- Ensure that there are no persons or objects in the possible working area of the transport robot during the entire movement.
- Only operate transport robots manually from outside the safety area.
- Maintain direct visual contact with the transport robot and its surroundings during the entire movement.
- Never move transport robots with damaged safety and monitoring equipment.
- In case of an emergency, press the emergency stop button in the Servus system.

- There is direct visual contact with the transport robot and its surroundings.
- Transport robot is switched on.
- Transport robot does not perform any movements.
- Charging unit is fully retracted and does not protrude beyond the frame.
- Transport robot is not charging manually.
- Transport robot is in manual mode.
 1. Open the transport robot website.
 2. Select main tab *Remote*.
- ✓ Warning message is displayed.
- 3. Read and understand the warning completely:
 - When you have understood the warning, select the button *OK* and proceed to the next step.
 - If you have not understood the warning, stop operation and contact the person responsible for the transport robot.
- 4. Select sub-tab *Manual Mode*.
- 5. Select the desired components of the Smartloader to be moved:
 - In the detail tab *Smartloader* select button *Belts* to move only the belts of the Smartloader.
 - In the detail tab *Smartloader* select button *Tines* to move only the tines of the Smartloader.
 - In the detail tab *Smartloader* select button *Both* to move tines and belts of the Smartloader.

6. In detail tab *Smartloader* text field select *Smartloader distance*.
7. Enter the desired distance in mm by which the desired component is to be moved.



The components of the Smartloader can be moved to the left and to the right. The direction is clearly visible on the transport robot and on the transport robot website:

- **Front:** Status LED bar lights up green
- **Rear:** Status LED bar pulses green

8. Move the desired component the desired distance in the desired direction:
 - In the detail tab *Smartloader* select button to move the desired component to the left.
 - In the detail tab *Smartloader* select button to move the desired component to the right.

✓ Desired component of the Smartloader moves at reduced speed the desired distance in the desired direction.

✓ Smartloader successfully moved manually.

9.7.7 Manually extend the loading unit

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot. Transport robot can perform unexpected movements in the event of a fault.

- Ensure that there are no persons or objects in the possible working area of the transport robot during the entire movement.
- Only operate transport robots manually from outside the safety area.
- Maintain direct visual contact with the transport robot and its surroundings during the entire movement.
- Never move transport robots with damaged safety and monitoring equipment.
- In case of an emergency, press the emergency stop button in the Servus system.

- There is direct visual contact with the transport robot and its surroundings.
- Transport robot is switched on.
- Transport robot does not perform any movements.
- Loading unit is fully retracted and does not protrude beyond the frame.
- Transport robot is not charging manually.
- Transport robot is in manual mode.
 1. Open the transport robot website.
 2. Select main tab *Remote*.
- ✓ Warning message is displayed.
- 3. Read and understand the warning completely:
 - When you have understood the warning, select the button *OK* and proceed to the next step.
 - If you have not understood the warning, stop operation and contact the person responsible for the transport robot.
- 4. Select sub-tab *Manual Mode*.
- 5. In the detail tab *Charging contact* Select radio button *Connect*.
- 6. In the detail tab *Charging contact* select the button *Send* to drive out the loading unit.

✓ Loading unit is extended.

✓ Loading unit successfully extended manually.

9.7.8 Retract loading unit manually

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot. Transport robot can perform unexpected movements in the event of a fault.

- Ensure that there are no persons or objects in the possible working area of the transport robot during the entire movement.
- Only operate transport robots manually from outside the safety area.
- Maintain direct visual contact with the transport robot and its surroundings during the entire movement.
- Never move transport robots with damaged safety and monitoring equipment.
- In case of an emergency, press the emergency stop button in the Servus system.

- There is direct visual contact with the transport robot and its surroundings.
- Transport robot is switched on.
- Transport robot does not perform any movements.
- Loading unit is extended and protrudes beyond the frame.
- Transport robot is not charging manually.
- Transport robot is in manual mode.
 1. Open the transport robot website.
 2. Select main tab *Remote*.
- ✓ Warning message is displayed.
- 3. Read and understand the warning completely:
 - When you have understood the warning, select the button *OK* and proceed to the next step.
 - If you have not understood the warning, stop operation and contact the person responsible for the transport robot.
- 4. Select sub-tab *Manual Mode*.
- 5. In the detail tab *Charging contact*, select the radio button *Disconnect*.
- 6. In the detail tab *Charging contact* select the button *Send* to retract the loading unit.

✓ The loading unit is retracted.

✓ Loading unit successfully retracted manually.

9.8 Charging transport robots manually



Manual charging of the transport robot battery is described in the Charger 3.0 operating instructions.

9.9 Enable access point mode

- Access point button is available.
- Transport robot is in switched off mode.
- Transport robot is not charging manually.

1. Open the maintenance cover.
2. Connect the access point button to the charging port.
3. Turn the main switch of the transport robot clockwise to the position */ ON*.

- ✓ The power supply of the transport robot is switched on.
- ✓ Status LED bar pulses blue at the front and rear.
- ✓ Transport robot is raised.
- ✓ Status LED bar glows dimmed white at the front and rear and a blue running light runs between the outer left and outer right.
- ✓ Transport robot is in access point mode.
- ✓ Transport robot provides a WLAN hotspot (SSID: arc-<transport robot number>).
- ✓ Access point mode successfully enabled.

9.10 Disable access point mode

- Transport robot is in access point mode.

1. Turn the main switch of the transport robot anticlockwise to position *0 / OFF*.
- ✓ Status LED bar lights up
- ✓ Transport robot is in switched off mode.

2. Remove the access point button from the charging port.
3. Close the maintenance cover.

- ✓ Access point mode successfully disabled.

9.11 Configure network settings manually



In order for the transport robot to be able to connect to the Servus System network, the transport robot settings must be configured for the local WLAN and the local IT infrastructure of the Servus System.

To configure the network settings manually, the transport robot is temporarily set up as an access point. This way, the transport robot can be accessed directly with a WLAN-enabled device.

- WLAN-enabled device with web browser is available (smartphone, tablet, laptop).
- Transport robot is in access point mode.



To connect to the transport robot's WLAN hotspot, no network security key or similar is necessary.

1. Connecting a WLAN-enabled device to the WLAN hotspot of the transport robot.
- ✓ Direct connection between the transport robot and the WLAN-enabled device is established.
2. Open the web browser on a WLAN-enabled device.
3. Enter the IP address **192.168.1.1** in the address line of the web browser and call it up to open the transport robot web page.



The necessary settings depend on the configuration of the local WLAN and the local IT infrastructure for the Servus system. Contact your IT administration for the current settings.

4. Select main tab **Settings**.
5. Select sub-tab **Wi-Fi**.
6. Adjust the WLAN settings according to the configuration of the local WLAN for the Servus system:
 - Check the settings in the detail tabs *Frequency*, *Region* and *Network* and adjust them if necessary.
 - In the respective detail tab, select the button **Save** to save the settings.
7. Select the sub-tab **IP Settings**.
8. Adjust IP settings according to the configuration of the local IT infrastructure for the Servus system:
 - Check the settings in the detail tabs *IP settings* and *Domain* and adjust them if necessary.
 - In the respective detail tab, select the button **Save** to save the settings.

9. Select sub-tab *Log Server*.



The log data of the transport robot is automatically sent to a server for logging. As a rule, the SEAS database server is used as the log server (SEAS DB).

10. Adjust log server settings according to the configuration of the local IT infrastructure for the Servus system:

- Check the settings in the detail tab *Log Server* and adjust them if necessary.
- In the respective detail tab, select the button *Save* to save the settings.

11. Select sub-tab *Websocket*.



The Websocket communication protocol enables bidirectional real-time data exchange between the transport robot and SEAS. The SEAS server provides the websocket server and the transport robot connects to this websocket server as a websocket client.

12. Add Websocket client for communication between transport robot and SEAS server.

13. Disable access point mode.

- ✓ The transport robot can automatically connect to the local WLAN of the Servus system the next time it is switched on.
- ✓ WLAN settings successfully configured manually.

9.12 Update firmware

ATTENTION

Material damage due to incorrect or outdated software!

Material damage possible due to lack of function support.

- Update firmware only in consultation with the manufacturer.
- Only use software packages agreed with the manufacturer.



The firmware is the control software for the transport robot's hardware. In the course of product improvements, it may be necessary to update the firmware. This is usually done by the manufacturer's customer service. In consultation with customer service, the update can be carried out directly by the operator if necessary.

Updating the firmware of the transport robot takes a few minutes and is based on the concept *Seamless Updates*. The firmware package can thus be installed without interruption during operation and is automatically activated after the next restart of the transport robot.

If the firmware update fails, the previous firmware is automatically installed and activated. The transport robot remains fully operational even in this case.

- Transport robot is switched on.
- Suitable firmware package is available (*.tar file).

1. Open the transport robot website.
2. Select main tab *Settings*.
3. Select sub-tab *Firmware*.
4. In the detail tab *Firmware* select the button *Select new firmware* to select the desired firmware package.

✓ The local file manager of the unit opens.

5. Select and open the desired firmware package in the local file manager.



Alternatively, the desired firmware package can be selected and opened via drag-and-drop:
➤ Drag and drop the firmware package from the local file manager to the detail tab *Firmware*.

✓ The label *New image* in the detail tab *Firmware* shows the file name of the desired firmware package.

6. Confirm that the firmware of the transport robot is to be updated:

- If the firmware is to be updated, select the button *Upload* in the detail tab *Firmware* to upload the desired firmware package to the transport robot.
- If you want to continue using the existing firmware, select the button *Cancel* in the detail tab *Firmware* to cancel the upload of the firmware package.



Uploading the firmware package to the transport robot can take several minutes.

- ✓ The firmware package is uploaded to the transport robot.
- ✓ The label *<Progress>* in the detail tab *Reduced speed* shows the progress in percent.
- ✓ Firmware package has been completely uploaded to the transport robot.

7. Restart the transport robot.

- ✓ New firmware is installed.
 - If the installation of the new firmware was successful, it is enabled.
 - If there was an error in the installation of the new firmware, the previous firmware is automatically installed and enabled again.
- ✓ Firmware successfully updated.

10 Transport robot website



The transport robot web page is opened by selecting the relevant transport robot in the Servus portal. Opening the transport robot website is described in the Servus Portal operating instructions.

10.1 Main tab *Status*

Detail tab *Status*

Control element	Name/Symbol	Description
Label	ARC number	Transport robot number
Label	Version	Version number of the installed software
Label	Status	Current transport robot action
Label	Wi-Fi	Current signal strength of the WLAN signal in dB
Label	Path network	Version of the path network available on the transport robot
Label	<temperature under bonnet>	Current temperature under the bonnet of the transport robot in °C
Label	<Humidity under bonnet>	Current humidity under the bonnet of the transport robot in %
Label	Battery	Current state of charge of the battery in %

Table 10-1 Detail tab *Status*

Detail tab *Horizontal*

Control element	Name/Symbol	Description
Label	<Speed>	Current travel speed of the transport robot in m/s
Label	Position	Current position of the transport robot in [mm]
Label	Target	Target position of the transport robot in mm

Table 10-2 Detail tab *Horizontal*

Detail tab *Belts*

Control element	Name/Symbol	Description
Label	<Speed>	Current speed of the Smartloader belts in m/s
Label	Position	Current position of the Smartloader belts in mm
Label	Target	Target position of the Smartloader belts in mm

Table 10-3 Detail tab *Belts*

Detail tab *Tines*

Control element	Name/Symbol	Description
Label	<Speed>	Current speed of the Smartloader's tines in m/s
Label	Position	Current position of the Smartloader's tines in mm
Label	Target	Target position of the Smartloader's tines in mm

Table 10-4 Detail tab *Tines*

Detail tab *ARC Position*

Control element	Name/Symbol	Description
Label	Rear	Unique number of the next RFID node in the backwards direction of travel
Label	Front	Unique number of the next RFID node in the forwards direction of travel
Label	Distance from rear	Distance of the transport robot to the next RFID node in backwards travel direction
Label	Index mark	Counting status of the counted index marks on the page where positioning is to take place

Table 10-5 Detail tab *ARC position*

Detail tab *Current Order*

Control element	Name/Symbol	Description
Label	Order ID	<p>Contains three pieces of information separated by colons:</p> <ul style="list-style-type: none"> • External driving order ID: Unique identification of the transport order • Order position: Number of the order position within a transport order • Order revision: Revision number of the transport order; if data of the transport order are subsequently changed (e.g. destination address is changed), the revision number is increased.
Label	Status	Current status of the order position
Label	Action	Action executed by the transport robot to the destination address

Table 10-6 Detail tab *Current Order*

Detail tab *Transport Units*

Control element	Name/Symbol	Description
Label	Status	Indicates whether the transport robot is loaded
Label	Total depth	Depth of the transported transport unit in mm
Label	ID	Transport unit ID (unique identifier of the transport unit)

Table 10-7 Detail tab *Transport Units*

Detail tab *Warnings*

Control element	Name/Symbol	Description
Label	Code	Number of the transport robot's active message
Label	Name	Designation of the transport robot's active message
Label	Source	Origin of the transport robot's active message
Label	Description	Description of the transport robot's active message

Table 10-8 Detail tab *Warnings*

10.2 Main tab Order

Detail tab *Previous order*

Control element	Name/Symbol	Description
Symbol		Symbol for previous job
Label	Order ID	<p>Contains three pieces of information separated by colons:</p> <ul style="list-style-type: none"> • External driving order ID: Unique identification of the transport order • Order position: Number of the order position within a transport order • Order revision: Revision number of the transport order; if data of the transport order are subsequently changed (e.g. destination address is changed), the revision number is increased.
Label	Status	Last status of the order position
Label	Action	Action the transport robot has executed to the destination address
Label	Vertex	If the transport robot is positioned on an RFID node: unique number of the RFID node
Label	Front Vertex	If the transport robot is positioned between two RFID nodes: unique number of the next RFID node in forward direction of travel
Label	Rear Vertex	If the transport robot is positioned between two RFID nodes: unique number of the next RFID node in the backwards direction of travel
Label	Index	Number of the target index mark
Label	Count side	Side of the transport robot on which the index marks were counted
Label	Vertical offset	Not used

Table 10-9 Detail tab *Previous order*

Current order

Control element	Name/Symbol	Description
Symbol		Symbol for current job
Label	Order ID	<p>Contains three pieces of information separated by colons:</p> <ul style="list-style-type: none"> • External driving order ID: Unique identification of the transport order • Order position: Number of the order position within a transport order • Order revision: Revision number of the transport order; if data of the transport order are subsequently changed (e.g. destination address is changed), the revision number is increased.
Label	Status	Current status of the order position
Label	Action	Action executed by the transport robot to the destination address
Label	Vertex	If the transport robot is positioned on an RFID node: unique number of the RFID node
Label	Front Vertex	If the transport robot is positioned between two RFID nodes: unique number of the next RFID node in forward direction of travel
Label	Rear Vertex	If the transport robot is positioned between two RFID nodes: unique number of the next RFID node in the backwards direction of travel
Label	Index	Number of the target index mark; 0 = no index mark at the target
Label	Count side	Side of the transport robot on which the index marks are counted
Label	Vertical offset	Not used

Table 10-10 Detail tab Previous order

Detail tab *Next order*

Control element	Name/Symbol	Description
Symbol		Symbol for next order
Label	Order ID	<p>Contains three pieces of information separated by colons:</p> <ul style="list-style-type: none"> • External driving order ID: Unique identification of the transport order • Order position: Number of the order position within a transport order • Order revision: Revision number of the transport order; if data of the transport order are subsequently changed (e.g. destination address is changed), the revision number is increased.
Label	Status	Current status of the order position.
Label	Action	Action executed by the transport robot to the destination address
Label	Vertex	If the transport robot is positioned on an RFID node: unique number of the RFID node
Label	Front Vertex	If the transport robot is positioned between two RFID nodes: unique number of the next RFID node in forward direction of travel
Label	Rear Vertex	If the transport robot is positioned between two RFID nodes: unique number of the next RFID node in the backwards direction of travel
Label	Index	Number of the target index mark; 0 = no index mark at the target
Label	Count side	Side of the transport robot on which the index marks are counted
Label	Vertical offset	Not used

Table 10-11 Detail tab *Previous order*

Detail tab *Transport units*

Control element	Name/Symbol	Description
Symbol		Symbol for transport unit
Label	Transport unit #	Sequence number of the transport units transported on the transport robot (e.g. 0 and 1 for two transported transport units)
Label	ID	Transport unit ID (unique identifier of the transport unit)
Label	Type	Type of identification (e.g. barcode)
Label	Depth	Depth of the transported transport unit in mm
Label	Width	Width of the transported transport unit in mm

Table 10-12 Detail tab Transport units

10.3 Main tab MDA

Button bar

Control element	Name/Symbol	Description
Button	Export as CSV	Export current MDA data as CSV

Table 10-13 Button bar

Detail tab *Time*

Control element	Name/Symbol	Description
Symbol		Symbol for time data
Label	<Status>	Time that the transport robot has been in the respective status

Table 10-14 Detail tab *Time*

Detail tab *Order*

Control element	Name/Symbol	Description
Symbol		Symbol for transport order data
Label	<Action/status>	Number of actions that the respective transport robot has performed or number of statuses in which the respective transport robot has been

Table 10-15 Detail tab *Order*

Detail tab *Travelled distance*

Control element	Name/Symbol	Description
Symbol		Symbol for distance data
Label	<Distance>	Distance covered by the transport robot or the respective component

Table 10-16 Detail tab *Travelled distance*

Detail tab *Movements*

Control element	Name/Symbol	Description
Symbol		Symbol for movement data
Label	<Movement>	Number of movements that the transport robot or the respective component has carried out

Table 10-17 Detail tab *Movements*

Detail tab *More*

Control element	Name/Symbol	Description
Symbol	...	Symbol for various data
Label	Restart	Number of restarts carried out
Label	Curves	Number of curves negotiated

Table 10-18 Detail tab *More*

10.4 Main tab *Remote*

WARNING

A moving transport robot may result in death or serious injury!

Severe or fatal crushing injuries to body parts due to collision with the moving transport robot or moving components of the transport robot.

- Only operate the transport robot manually according to the instructions in section 9.7.

10.4.1 Sub-tab *Remote Control*

Detail tab *Restart*

Control element	Name/Symbol	Description
Symbol		Restart transport robot symbol
Button	Reset	Restart transport robot

Table 10-19 Detail tab *Restart*

Detail tab *Reduced speed*

Control element	Name/Symbol	Description
Symbol		Symbol for reduced speed
Label	<Status>	Indicates whether the reduced speed is activated
Button	Enable reduced speed	Enable reduced speed
Button	Disable reduced speed	Disable reduced speed

Table 10-20 Detail tab *Reduced speed*

Detail tab *Reference*

Control element	Name/Symbol	Description
Symbol		Manually reference symbol for transport robot
Button	Reference forward	Manually referencing the transport robot in the forward direction of travel
Button	Reference backward	Manually referencing the transport robot in the backwards direction of travel

Table 10-21 Detail tab *Reference*

10.4.2 Sub-tab *Manual Mode*

Detail tab *Horizontal*

Control element	Name/Symbol	Description
Symbol		Symbol for manual horizontal movement of the transport robot
Text field	Horizontal distance	Distance in mm by which the transport robot is to be moved horizontally
Sketch		Marking of the front and back of the transport robot: <ul style="list-style-type: none">Front: Status LED bar lights up greenRear: Status LED bar pulses green
Button		Move the transport robot horizontally forwards by the set distance
Button		Move transport robot horizontally backwards by the set distance

Table 10-22 Detail tab horizontal

Detail tab *Smartloader*

Control element	Name/Symbol	Description
Symbol		Symbol for manual movement of the Smartloader
Text field	Smartloader distance	Distance in mm by which Smartloader components are to be moved
Sketch		Marking of the front and back of the transport robot: <ul style="list-style-type: none">• Front: Status LED bar lights up green• Rear: Status LED bar pulses green
Button		Move the Smartloader components to the left by the set distance
Button		Move the Smartloader components to the right by the set distance
Button	Belts	Select belts as components of the Smartloader to be moved
Button	Both	Select belts and tines as components of the Smartloader to be moved
Button	Tines	Select tines as components of the Smartloader to be moved

Table 10-23 Smartloader detail tab

Detail tab *Charging Contact*

Control element	Name/Symbol	Description
Symbol		Symbol for manual movement of the loading unit
Radio button	Connect	Select "Extend loading unit" movement
Radio button	Disconnect	Select "Retract loading unit" movement
Radio button	Position	only for qualified personnel of the manufacturer
Text field	Charging contact steps	Only for qualified personnel of the manufacturer
Button	Send	Perform selected movement

Table 10-24 Detail tab *Charging Contact*

10.5 Main tab *Diagnostics*



The main tab *Diagnostics* contains detailed real-time data on internal power supplies, sensors, digital inputs/outputs and the like.

The data is arranged in a tree structure and can be used to support troubleshooting when contacting the manufacturer's customer service.

10.6 Main tab *Settings*



Changed and saved settings are only enabled after restarting the transport robot.

10.6.1 Sub-tab *General*

Detail tab *Product info*

Control element	Name/Symbol	Description
Symbol		Symbol for product information
Label	ARC number	Transport robot number
Label	Transport robot item number	Transport robot item number
Label	Software configuration item number	Item number of the software configuration
Label	Serial number	Serial number of the transport robot
Label	Production date	Transport robot's production date

Table 10-25 Detail tab *Product Info*

Detail tab *Software info*

Control element	Name/Symbol	Description
Symbol		Symbol for software information
Label	Version	Version number of the firmware
Label	Image	File name of the currently installed firmware package
Label	Build date	Creation date of the firmware

Table 10-26 Detail tab *software info*

Detail tab *Path network info*

Control element	Name/Symbol	Description
Symbol		Symbol for path network information
Label	Version	Version of the path network available on the transport robot
Label	Network ID	Unique identification number for the Servus system

Table 10-27 Detail tab *Path network info*

10.6.2 Sub-tab *Wifi*

Detail tab *Info*

Control element	Name/Symbol	Description
Symbol		Icon for general WLAN information
Label	RSSI	Current signal strength of the WLAN signal in dB
Label	Channel	WLAN channel currently in use
Label	BSSID	MAC address of the access point
Label	MAC address	MAC address of the transport robot

Table 10-28 Detail tab *Info*

Detail tab *Frequency*

Control element	Name/Symbol	Description
Symbol		Icon for WLAN frequency settings
Radio button	<WLAN Frequency>	Select the WLAN frequency to be used
Button	Save	Save WLAN frequency settings

Table 10-29 Detail tab *Frequency*

Detail tab *Region*

Control element	Name/Symbol	Description
Symbol		Icon for WLAN region settings
Radio button	<Region>	Select the region in which the transport robot is operated
Button	Save	Save region settings

Table 10-30 Detail tab *region*

Detail tab Network

Control element	Name/Symbol	Description
Symbol		Icon for WLAN security settings
Text field	SSID	SSID/Name of the WLAN to be used
Radio button	<Authentication protocol>	Authentication protocol to be used
Text field	WiFi password	Password of the WLAN
Button		Display the entered WLAN password
Button		Hide the entered WLAN password
Drop-down list	TLS version	TLS version to be used
Drop-down list	Inner method	Inner EAP method to be used
Text field	User	User name to be used
Drop-down list	Client certificate	Client certificate to be used; Certificates are added in the sub-tab <i>Certificates</i>
Drop-down list	CA certificate	CA certificate to be used; Certificates are added in the sub-tab <i>Certificates</i>
Button	Save	Save Wi-Fi security settings

Table 10-31 Network detail tab

10.6.3 Sub-tab *IP settings*

Detail tab *IP settings*

Control element	Name/Symbol	Description
Symbol		Icon for IP settings
Switch	Enable DHCP	Enable/Disable use of a DHCP Server
Text field	IP address	IP address of the transport robot to be used
Text field	Net mask	Network mask of the network to be used
Text field	Gateway	Gateway of the network to be used
Text field	DNS Server	IP address of the DNS server to be used
Button	Save	Save IP settings

Table 10-32 Detail tab *IP settings*

Detail tab *Domain*

Control element	Name/Symbol	Description
Symbol		Symbol for domain settings
Text field	Host name	Name of the transport robot used on the DNS server is defined
Button	Save	Save host name setting
Switch	Host name at DNS	Enable/disable use of host names
Text field	Start of authority	Domain of the DNS zone to be used
Button	Save	Save domain settings

Table 10-33 Detail tab *domain*

10.6.4 Sub-tab *SERAN*



The SERAN sub-tab is not in use.

10.6.5 Sub-tab *Log Server*



The log data of the transport robot is automatically sent to a server for logging. As a rule, the SEAS database server is used as the log server (SEAS DB).

Detail tab *Log server*

Control element	Name/Symbol	Description
Symbol		Icon for log server settings
Label	Log server	IP address of the server to be used as log server
Button	Save	Save log server settings

Table 10-34 Detail tab *Log server*

10.6.6 Sub-tab *Websocket*



The Websocket communication protocol enables bidirectional real-time data exchange between the transport robot and SEAS. The SEAS server provides the websocket server and the transport robot connects to this websocket server as a websocket client.

Buttons *Websocket*

Control element	Name/Symbol	Description
Button	Add client	Create a new websocket client
Button	Edit	Edit websocket Client
Button	Delete	Delete websocket Client

Table 10-35 *Websocket buttons*

Tab *Websocket*

Control element	Name/Symbol	Description
Symbol		Websocket client icon
Label	<Hostname>	Name or IP address of the websocket server

Table 10-36 *Websocket tab*

Detail tab *Details*

Control element	Name/Symbol	Description
Label	Protocol	Websocket protocol used
Label	Host name	Name or IP address of the websocket server
Label	Port	Port number via which the websocket connection is to be made
Label	End point	Endpoint on the websocket server of the transport robot to which the connection is to be made

Table 10-37 *Detail tab Details*

10.6.7 Sub-tab Advanced

Detail tab *Horizontal*

Control element	Name/Symbol	Description
Symbol		Symbol for advanced settings for horizontal movement of the transport robot
Text field	Speed	Maximum travel speed of the transport robot in m/s
Text field	Minimum distance to obstacle	Distance that the transport robot always maintains to an obstacle that is in front of it in mm; WARNING: Increasing this value can lead to process malfunctions in the Servus system. Increase value only in consultation with the manufacturer.
Text field	Forward acceleration	Acceleration of the transport robot in forward direction in m/s ²
Text field	Backward acceleration	Acceleration of the transport robot in the backwards direction of travel in m/s ²
Text field	Forward deceleration	Braking acceleration of the transport robot in forward direction in m/s ²
Text field	Backward deceleration	Braking acceleration of the transport robot in forward direction in m/s ²
Button	Save	Save settings for the horizontal movement of the transport robot
Button	Set defaults	Reset settings for horizontal movement of the transport robot to default values

Table 10-38 Detail tab *Horizontal*

Detail tab *Smartloader*

Control element	Name/Symbol	Description
Symbol		Icon for advanced settings for moving the Smartloader
Switch	Enable place sensors	Enable/disable sensors for <i>TU position</i>
Switch	Additional tines depth	<ul style="list-style-type: none"> Enabled: Tines of the Smartloader under-run the transport unit beyond the rear edge of the transport unit, but are limited by the maximum mechanical distance that the tines of the Smartloader can extend Disabled: The tines of the Smartloader move under the transport unit only as far as the rear edge of the transport unit <p>WARNING: Changing this setting can lead to process malfunctions in the Servus system. Change setting only in consultation with the manufacturer.</p>
Text field	Speed	Maximum speed of the Smartloader belt when picking up transport units from static storage locations or when dropping off transport units to static retrieval locations (tines extend and retract) in m/s
Text field	Acceleration	Maximum acceleration and braking acceleration of the Smartloader belt when picking up/dropping off transport units in m/s ²
Text field	IO channel speed	<p>Maximum speed of the Smartloader belt when picking up transport units from active storage positions or when dropping off transport units to active outfeed positions (tines <u>do not</u> extend) in m/s;</p> <p>Active positions are positions with IO channels (e.g. roller conveyors)</p>
Button	Save	Save settings for moving the Smartloader
Button	Set defaults	Reset settings for moving the Smartloader to default values

Table 10-39 Smartloader detail tab

Detail tab *IO channel*

Control element	Name/Symbol	Description
Symbol		Icon for advanced settings for the IO channel
Text field	Transport unit timeout	Maximum time for the completion of an IO channel communication in seconds
Button	Save	Save settings for the IO channel
Button	Set defaults	Reset IO channel settings to default values

Table 10-40 Detail tab *IO channel*

Detail tab *Main*

Control element	Name/Symbol	Description
Symbol		Icon for advanced general settings of the transport robot
Text field	Automatic power down time	Time after which an inactive transport robot switches to energy-saving mode in seconds
Button	Save	Save general settings of the transport robot
Button	Set defaults	Reset general settings of the transport robot

Table 10-41 Detail tab *Main*

Detail tab Charging

Control element	Name/Symbol	Description
Symbol		Icon for advanced settings for loading the transport robot
Text field	Minimum battery level	Lower limit of the used battery capacity in % ("0 % virtual state of charge"); To protect against accelerated ageing of the battery, the entire capacity of the battery is not used. If this value is set to 30 %, for example, it means that the capacity range from 0 % to 30 % is not used. 30 % "real state of charge" is displayed as 0 % "virtual state of charge" in this example.
Text field	Maximum battery level	Upper limit of the used battery capacity in % ("100 % virtual state of charge"); To protect against accelerated ageing of the battery, the entire capacity of the battery is not used. For example, if this value is set to 90 %, it means that the capacity range from 90 % to 100 % is not used. 90 % "real state of charge" is displayed as 100 % "virtual state of charge" in this example.
Text field	Maximum time charging	Maximum charging time at the charging station in seconds
Text field	Maximum additional charging time	Maximum additional charging time at the charging station when the battery charge level is < 90 % in seconds
Button	Save	Save settings for loading the transport robot
Button	Set defaults	Reset settings for loading the transport robot to default values

Table 10-42 Detail tab Charging

10.6.8 Sub-tab *Firmware*

Detail tab *Firmware*

Control element	Name/Symbol	Description
Symbol		Icon for firmware update
Button	Select new firmware	Select new firmware package (*.tar)
Label	Current image	Name of the currently installed firmware package
Label	New image	Name of the firmware package to be installed and enabled
Button	Upload	Upload firmware package to transport robot
Button	Cancel	Cancel uploading the firmware package
Symbol/Label		Progress in uploading the firmware package to the transport robot in %

Table 10-43 Detail tab firmware

10.6.9 Sub-tab *Change Password*

Detail tab *Change password*

Control element	Name/Symbol	Description
Symbol		Symbol for password change
Text field	Actual password	Current valid password
Text field	New password	New password
Text field	Confirm Password	Repeat the new password
Button	Change password	Save new password

Table 10-44 Detail tab *Change password*

10.6.10 Sub-tab *Users*

Tab *User*

Control element	Name/Symbol	Description
Symbol		User icon
Label	<Name>	Name of user

Table 10-45 tab *User*

Detail tab *Details*

Control element	Name/Symbol	Description
Label	Name	Name of user
Label	Permissions	Rights assigned to the user
Button	Edit	Edit user
Button	Delete	Delete user

Table 10-46 Detail tab *Details*

10.6.11 Sub-tab *Certificates*

Tab *Certificates*

Control element	Name/Symbol	Description
Symbol		Certificate symbol
Label	<Name>	Name of the certificate

Table 10-47 tab *Certificates*

Detail tab *Certificates*

Control element	Name/Symbol	Description
Label	Type	Type of certificate
Label	Valid from	Time from which the certificate is valid
Label	Valid to	Time until which the certificate is valid
Label	In use	Indicates whether the certificate is in use
Button	Delete	Delete certificate

Table 10-48 Detail tab *Certificates*

10.7 Main tab *Documentation*

Detail tab *User manuals*

Control element	Name/Symbol	Description
Symbol		Symbol for documentations
Label	<Document>	Document name
Button	Download	Download document

Table 10-49 Detail tab *User manuals*

11 Troubleshooting

11.1 List of entries

Code	Short description	Description	Rectification
1000	Overtemperature	Overtemperature (motor controller error code: {0})	<ul style="list-style-type: none"> ➤ Check the weight of the transport unit, reduce if necessary. ➤ Check ambient temperature (<40 °C) reduce.
1001	Ovvoltage	Ovvoltage (motor controller error code: {0})	<ul style="list-style-type: none"> ➤ Check the power supply in the control cabinet. ➤ Check the setting of the "brake chopper" in the control cabinet.
1002	Overcurrent	Overcurrent (motor controller error code: {0})	<ul style="list-style-type: none"> ➤ Rectify blockage of the specified drive. ➤ Reduce the weight of the transport unit.
1003	Undervoltage	Undervoltage (motor controller error code: {0})	<ul style="list-style-type: none"> ➤ Check the power supply in the control cabinet. ➤ Check the setting of the "brake chopper" in the control cabinet. ➤ Reduce the weight of the transport unit.
1004	Contouring error	Contouring error (motor controller error code: {0})	<ul style="list-style-type: none"> ➤ Rectify blockage of the specified drive.
1005	Communication failed	Bus communication with address {0} failed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1006	Route calculation error	Could not calculate route from {0} to {1}	<ul style="list-style-type: none"> ➤ Correction of the path network. ➤ parameter1 => source node, parameter2 => destination node
1007	Centring TU failed	Could not centre transport unit	<ul style="list-style-type: none"> ➤ Check if the transport unit is jammed. ➤ Release the jam.
1008	TU too big	Both transport unit position sensors are occupied (transport unit too big?)	<ul style="list-style-type: none"> ➤ Use a smaller transport unit. ➤ Check TU position sensor
1009	Location empty	Could not load transport unit. Location is empty	<ul style="list-style-type: none"> ➤ Check whether there is a transport unit in the last location approached. If not: Correct order. ➤ Check space allocation sensor.

Code	Short description	Description	Rectification
1010	Location full	Could not drop off transport unit. Location is full	<ul style="list-style-type: none"> ➤ Check whether there is already a transport unit in the last location approached. ➤ If yes: Correct order. ➤ Check space allocation sensor.
1011	Reference position not found	Could not find reference position	<ul style="list-style-type: none"> ➤ Check load handling device for mechanical blockages.
1012	Loading failed	Could not load transport unit	<ul style="list-style-type: none"> ➤ Check if the transport unit is jammed. Release the jam.
1013	Dropping off failed	Could not drop off transport unit	<ul style="list-style-type: none"> ➤ Check if the transport unit is jammed. Release the jam. ➤ Check that the speed of the load handling device and the roller conveyor match.
1014	Sensor location occupancy error	At least one of the sensors location occupancy has an error	<ul style="list-style-type: none"> ➤ Check the wiring of the location occupancy sensors. ➤ Check location occupancy sensors.
1015	Index mark not found	Could not find index mark for positioning	<ul style="list-style-type: none"> ➤ Check vertical/horizontal position in the path network. ➤ Check vertical location counter sensors.
1016	Motor is blocked	Motor is blocked	<ul style="list-style-type: none"> ➤ Rectify blockage of the specified drive.
1017	Fatal motor controller error	Fatal error in motor controller (motor controller error code: {0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1018	Motor controller error	Error in motor controller (motor controller error code: {0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1019	Invalid location depth	Invalid location depth in order (order: {0} mm, maximum: {1} mm)	<ul style="list-style-type: none"> ➤ Correct the location depth in the mapping configuration.
1020	Wheels are spinning	Transport robot cannot move because the wheels are spinning	<ul style="list-style-type: none"> ➤ Rectify dirt on the track. ➤ Restart transport robot and send it to RFID nodes.
1021	Distance measurement error	Distance measurement for detecting obstacles has an error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1022	Drifting too long	Transport robot is drifting too long	<ul style="list-style-type: none"> ➤ Rectify dirt on the track. ➤ Restart transport robot and send it to RFID nodes.

Code	Short description	Description	Rectification
1023	Dropping off failed	Could not drop off the transport unit. It is still on the transport robot	<ul style="list-style-type: none"> ➤ Rectify jam or blockage.
1024	TU too deep	Depth of the loaded transport unit exceeds the allowed maximum	<ul style="list-style-type: none"> ➤ Remove TU that is too large. ➤ Check TU position sensor
1025	Loading although transport robot loaded	Transport robot should load a transport unit but is already loaded	<ul style="list-style-type: none"> ➤ Correct incorrect order/remove TU.
1026	Dropping off although transport robot not loaded	Transport robot should drop off a transport unit but is not loaded	<ul style="list-style-type: none"> ➤ Correct incorrect order.
1027	IO Channel not in automatic mode	Transport robot should drop off/load at an IO channel but the IO channel is not in automatic mode	<ul style="list-style-type: none"> ➤ Switch the PLC for the IO channel to automatic mode.
1028	IO Channel reset	Drop-off/load process was interrupted by a reset of the IO channel	<ul style="list-style-type: none"> ➤ Send "Error replacement order". ➤ Restart the transport robot. ➤ Contact support.
1029	Route calculation error	Could not add edge {0}-{1} to the route	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1030	Unhandled message type	Module received an unhandled message type ({0})	<ul style="list-style-type: none"> ➤ Contact support.
1031	Vertex not in path network	Vertex {0} does not exist in path network	<ul style="list-style-type: none"> ➤ Correct path network.
1032	RFID not in path network	RFID 0x{0}{1} does not exist in path network	<ul style="list-style-type: none"> ➤ Adjust the RFID configuration in the path network.
1033	Wrong RFID	Transport robot found RFID 0x{0}{1} but expected 0xxxxxxxx{2}	<ul style="list-style-type: none"> ➤ Correct path network.
1034	RFID not on route	RFID 0x{0}{1} is not on the route	<ul style="list-style-type: none"> ➤ Correct path network.
1035	Distance too long	Distance to RFID 0x{0}{1} is too long ({2} mm)	<ul style="list-style-type: none"> ➤ Correct path network.
1036	RFID not found	Could not find RFID 0x{0}{1}	<ul style="list-style-type: none"> ➤ Correct path network. ➤ Check RFID vertices on the track for damage.
1037	Wrong path network version	Wrong path network version loaded	<ul style="list-style-type: none"> ➤ Restart the path network update.

Code	Short description	Description	Rectification
1038	Loading path network failed	Could not load path network	➤ Restart the path network update.
1039	Could not reach target	Could not reach target	➤ Correct path network.
1040	Wrong assistant message	Received wrong message from assistant {0}	➤ Restart the transport robot. ➤ Contact support.
1041	Could not add vertex	Could not add vertex {0} to path network	➤ Correct path network.
1042	Vertex already exists	Could not add vertex {0} to path network. Vertex already exists	➤ Correct path network.
1043	Could not add edge	Could not add edge {0}-{1} to path network	➤ Correct path network.
1044	Vertex not found	Could not add edge {0}-{1} to path network. Could not find Vertex {2}	➤ Correct path network.
1045	Could not delete vertex	Could not delete vertex {0} from path network	➤ Correct path network.
1046	Routing not started	Route calculation task could not receive a message	➤ Restart the transport robot. ➤ Contact support.
1047	Assistant not finalised	Could not finalise assistant {0}	➤ Restart the transport robot. ➤ Contact support.
1048	Distance too short	Distance to RFID 0x{0}{1} is too short ({2} mm)	➤ Restart the transport robot. ➤ Contact support.
1049	Vertex skipped	Vertex {0} was skipped	➤ Correct path network. ➤ Contact support.
1050	Referencing error	Could not reference charging unit	➤ Restart the transport robot. ➤ Contact support.
1051	Distance RFID/magnet too big	Distance between RFID and magnet is too big (0x{0}{1})	➤ Clean the RFID tag.
1052	Interval too long	Task interval is too long	➤ It is only a warning.
1053	Vertical offset too big	Vertical offset exceeds the physical limits of the transport robot	➤ Correct the location depth in the mapping configuration.
1054	Vertical offset too big	Vertical offset exceeds the physical limits of the ASRS	➤ Correct the location depth in the mapping configuration.

Code	Short description	Description	Rectification
1055	Reference sensor not occupied	At least one vertical reference sensor is not occupied while the transport robot is driving horizontally	<ul style="list-style-type: none"> ➤ Check reference sensor. ➤ Check the transport robot for tilting.
1056	Sensor location counter active	At least one vertical sensor location counter is occupied while the transport robot is driving horizontally	<ul style="list-style-type: none"> ➤ Check the location counter sensor. ➤ Check the transport robot for tilting.
1057	Wrong state	Task is in a wrong state	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1058	Runtime error	Unexpected runtime error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1059	Lifting platform tilted	Lifting platform tilted	<ul style="list-style-type: none"> ➤ Check the tension of the conveyors.
1060	Error while moving	An error occurred while the transport robot was driving	<ul style="list-style-type: none"> ➤ Check the travel paths of the transport robot. ➤ Restart the transport robot. ➤ Contact support.
1061	PDO timeout	Could not read the next PDO within time limit	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1062	Setting speed failed	Could not set speed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1063	Setting maximum speed failed	Could not set maximum speed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1064	Editing speed failed	Could not edit speed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1065	Setting safety stop failed	Could not set safety stop	<ul style="list-style-type: none"> ➤ Contact support.
1066	Acknowledging safety stop failed	Could not acknowledge safety stop	<ul style="list-style-type: none"> ➤ Contact support.
1067	Setting target position failed	Could not set target position	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1068	Target Control Horizontal not ready	Target Control Horizontal not ready	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1069	Starting referencing failed	Could not start referencing	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1070	Forced stop	Stop was forced	<ul style="list-style-type: none"> ➤ No error. Acknowledge stop to continue.

Code	Short description	Description	Rectification
1071	Starting magnet search failed	Could not start magnet search	➤ Restart the transport robot. ➤ Contact support.
1072	Error in submodule	A submodule has an error	➤ Restart the transport robot. ➤ Contact support.
1073	Task stopped	Task was stopped	➤ Restart the transport robot. ➤ Contact support.
1074	Movement timeout	Could not find target position within time limit	➤ Remove jam. ➤ Check whether brakes open.
1075	Configuring digital CPU input failed	Could not configure digital CPU input	➤ Contact support.
1076	Response error	Module received a wrong response	➤ Restart the transport robot. ➤ Contact support.
1077	Setting LED configuration failed	Module could not set LED configuration	➤ Restart the transport robot. ➤ Contact support.
1078	Setting LED state failed	Module could not set LED state	➤ Restart the transport robot. ➤ Contact support.
1079	Getting digital input failed	Module could not read digital input	➤ Restart the transport robot. ➤ Contact support.
1080	Getting analogue input failed	Module could not read analogue input	➤ Restart the transport robot. ➤ Contact support.
1081	Setting digital output failed	Module could not set digital output	➤ Restart the transport robot. ➤ Contact support.
1082	Setting analogue output failed	Module could not set analogue output	➤ Restart the transport robot. ➤ Contact support.
1083	Getting module state failed	Could not read module state	➤ Restart the transport robot. ➤ Contact support
1084	Buffer too small	Used buffer is too small	➤ Restart the transport robot. ➤ Contact support.
1085	Wrong digital output configuration	Invalid pin number when configuring a digital output	➤ Contact support.
1086	Wrong digital input pin number	Invalid pin number when reading a digital input	➤ Contact support.
1087	Wrong analogue input pin number	Invalid pin number when reading an analogue input	➤ Contact support.
1088	Wrong digital output pin number	Invalid pin number when writing a digital output	➤ Contact support.

Code	Short description	Description	Rectification
1089	Configuring sensor output pin failed	Could not configure sensor output pin	➤ Contact support.
1090	Setting digital mode failed	Could not set input conversion mode from analogue to digital	➤ Contact support.
1091	TU depth invalid	Transport unit depth measured ({0} mm) does not match depth from order	➤ Ensure that the TU size from the order matches the actual TU size.
1092	Sending ReadyForTakeover failed	Could not send ReadyForTakeover or acknowledge was not received ({0})	➤ Restart the transport robot. ➤ Contact support.
1093	ReadyToHandover not received	ReadyToHandover from IO channel {0} was not received	➤ Restart the transport robot. ➤ Contact support.
1094	Sending TakeoverActive failed	Could not send TakeoverActive or acknowledge was not received ({0})	➤ Restart the transport robot. ➤ Contact support.
1095	Sending TakeoverComplete failed	Could not send TakeoverComplete or acknowledge was not received ({0})	➤ Restart the transport robot. ➤ Contact support.
1096	HandoverComplete not received	HandoverComplete from IO channel {0} was not received	➤ Restart the transport robot. ➤ Contact support.
1097	Sending ReadyToHandover failed	Could not send ReadyToHandover or acknowledge was not received ({0})	➤ Restart the transport robot. ➤ Contact support.
1098	TakeoverActive not received	TakeoverActive from IO channel {0} was not received	➤ Restart the transport robot. ➤ Contact support.
1099	Sending HandoverActive failed	Could not send HandoverActive or acknowledge was not received ({0})	➤ Restart the transport robot. ➤ Contact support.
1100	Sending HandoverComplete failed	Could not send HandoverComplete or acknowledge was not received ({0})	➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1101	TakeoverComplete not received	TakeoverComplete from IO channel {0} was not received	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1102	Sending reset failed	Could not send reset or acknowledge was not received ({0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1103	ResetSignalUp not received	ResetSignalUp from IO channel {0} was not received	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1104	Sending ResetHandshake failed	Could not send ResetHandshake or acknowledge was not received ({0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1105	ResetSignalDown not received	ResetSignalDown from IO channel {0} was not received	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1106	Stop signal not received	Stop signal from IO channel {0} was not received	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1107	IO channel timeout	Timeout during IO channel communication	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1108	Active from LHD not received	Active from LHD not received ({0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1109	Finished from LHD not received	Finished from LHD not received ({0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1110	Encoder error	Motor controller encoder check failed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1111	Communication failed	Subtask could not send state update	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1112	Communication failed	Could not get position from path measuring wheel	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1113	Communication failed	Could not get speed from path measuring wheel	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1114	Communication failed	Could not get motor state from motor controller {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1115	Communication failed	Could not get error register from motor controller {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1116	Communication failed	Could not get digital inputs from motor controller {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1117	Communication failed	Motor controller {0} could not get analogue input {1}	➤ Restart the transport robot. ➤ Contact support.
1118	Communication failed	Could not write digital output in motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1119	Communication failed	Could not write digital output in motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1120	Communication failed	Could not get actual position from motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1121	Communication failed	Could not get the following error from motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1122	Communication failed	Could not get speed from motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1123	Communication failed	Could not get speed from motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1124	Communication failed	Could not get measured revolutions per minute from motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1125	Communication failed	Could not get actual current from motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1126	Communication failed	Could not get temperature from motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1127	Communication failed	Could not set maximum current in motor controller {0}	➤ Restart the transport robot. ➤ Contact support.
1128	Communication failed	Could not read from SPI	➤ Restart the transport robot. ➤ Contact support.
1129	Communication failed	Could not write to SPI	➤ Restart the transport robot. ➤ Contact support.
1130	Communication failed	Could not read from I2C	➤ Restart the transport robot. ➤ Contact support.
1131	Communication failed	Could not write to I2C	➤ Restart the transport robot. ➤ Contact support.
1132	Magnet tag without (expected) RFID tag found	Magnet tag without (expected) RFID tag found during reference movement	➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1133	RFID tag without magnet tag found	RFID tag 0x{0}{1} without magnet tag found during reference movement	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1134	Executing command failed	Could not execute manual command	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1135	Vertical obstacle	Vertical movement blocked for more than {0} seconds	<ul style="list-style-type: none"> ➤ Ensure that vertical travel of the lifting platform is free of obstructions. ➤ Restart transport robot and send it to RFID nodes. ➤ Contact support.
1136	RFID vertex not found	Target reached but RFID vertex 0x{0}{1} was not found	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1137	Getting power section voltage failed	Could not get power section voltage in motor controller {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1138	Getting control electronics voltage failed	Could not get control electronics voltage in motor controller {0}	<ul style="list-style-type: none"> ➤ Check the power supply to the transport robot.
1139	Vertical index mark not found	Could not find vertical index mark for positioning (side: {0}, front: {1}, rear: {2})	<ul style="list-style-type: none"> ➤ Check the rack for damage. ➤ Check vertical location counter sensors. ➤ Clean dirty location counter sensors.
1140	Horizontal index mark not found	Could not find horizontal index mark for positioning (side: {0})	<ul style="list-style-type: none"> ➤ Check the rack for damage. ➤ Check horizontal location counter sensors. ➤ Clean dirty location counter sensors.
1141	Smartloader obstacle	Smartloader movement blocked for more than 2 seconds	<ul style="list-style-type: none"> ➤ Check Smartloader for obstacles.
1142	Unidentified obstacle on the track	Transport robot was blocked by an obstacle on the track	<ul style="list-style-type: none"> ➤ Check the track for obstacles. ➤ Remove obstacles.
1143	Getting number of poles failed	Could not get number of poles from motor controller {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1144	Target Control error	Target Control error	<ul style="list-style-type: none"> ➤ Restart the transport robot.
1145	IO channel connection error	IO channel connection error	<ul style="list-style-type: none"> ➤ Check that the I/O channel PLC is running.
1146	Unhandled IO channel error code	Unhandled IO channel error code {0}	<ul style="list-style-type: none"> ➤ Contact support.

Code	Short description	Description	Rectification
1147	Initialising RFID module failed	Could not initialise RFID module	➤ Restart the transport robot.
1148	Getting Hall error failed	Could not get Hall error from motor controller {0}	➤ Restart the transport robot.
1149	Motor Hall error	Hall Error (motor: {0}, wrong pulses: {1})	➤ Restart the transport robot.
1150	Watchdog error	Watchdog error: {0} ms (maximum: {1} ms)	➤ Restart the transport robot.
1151	Motor lifting platform enabled and brake activated	Motor lifting platform enabled and brake activated (missing power supply brake)	➤ Check PLC. ➤ Restart the transport robot.
1152	Adding order failed	Could not add order {0}:{1}:{2}	➤ If the order was sent manually, check order for validity, resend. ➤ If the order was sent automatically by the system, contact support if the error is not solved by the system.
1153	Replacing order failed	Could not replace order in error state ({0}:{1}:{2})	➤ If the order was sent manually, check order for validity, resend. ➤ If the order was sent automatically by the system, contact support if the error is not solved by the system.
1154	Deleting order failed	Could not delete order ({0}:{1}:{2})	➤ Check the delete command and send it again.
1155	Unexpected order state change	Unexpected order state change	➤ If the transport robot continues to run, nothing needs to be done. ➤ If in doubt, contact support.
1156	Memory allocation failed	Memory allocation failed	➤ Restart the transport robot.
1157	Memory allocation failed	Memory allocation failed	➤ Restart the transport robot.
1158	Wrong sensor TU position occupied	Wrong sensor transport unit position occupied	➤ Restart the transport robot.
1159	Wrong state for ready signal	Transport robot tried to send ready signal to IO channel while it was in wrong state	➤ If the transport robot does not move on, restart the transport robot.
1160	Wrong state to abort communication	Transport robot tried to abort IO channel communication while it was in wrong state	➤ If the transport robot does not move on, restart the transport robot.

Code	Short description	Description	Rectification
1161	Wrong state to abort communication	IO channel tried to abort communication while it was in wrong state	➤ If the transport robot does not move on, restart the transport robot.
1162	Wrong state to finish communication	Transport robot tried to finish IO channel communication while it was in wrong state	➤ If the transport robot does not move on, restart the transport robot.
1163	Transport robot sent unhandled command	Transport robot tried to send an unhandled command to IO channel	➤ If the transport robot does not move on, restart the transport robot.
1164	IO channel connection is already open	Transport robot tried to open a connection to an IO channel while there is already a connection opened	➤ If the transport robot does not move on, restart the transport robot.
1165	IO channel connection not open	Transport robot could not open WebSocket connection to IO channel	➤ Restart the transport robot.
1166	Received invalid message	Transport robot received an invalid message from IO channel via the WebSocket interface	➤ If the transport robot does not move on, restart the transport robot.
1167	Connection closed unexpectedly	WebSocket connection to IO channel was closed unexpectedly	➤ If the transport robot does not move on, restart the transport robot.
1168	No IO channel interface specified	Transport robot tried to send ready signal to IO channel with no interface specified	➤ Contact support.
1169	No IO channel interface specified	Transport robot tried to send active signal to IO channel with no interface specified	➤ Contact support.
1170	No IO channel interface specified	Transport robot tried to send reset signal to IO channel with no interface specified	➤ Contact support.
1171	No IO channel interface specified	Transport robot tried to send finish signal to IO channel with no interface specified	➤ Contact support.
1172	No IO channel interface specified	Transport robot tried to disconnect from IO channel with no interface specified	➤ Contact support.

Code	Short description	Description	Rectification
1173	Sent unknown command	Transport robot sent unknown command to IO channel	➤ If the transport robot does not move on, restart the transport robot.
1174	Received unknown command	Transport robot received unknown command from IO channel	➤ If the transport robot does not move on, restart the transport robot.
1175	TU depth greater than location depth	Depth of transport unit ({0} mm) greater than location depth ({1} mm)	➤ Request replacement.
1176	Invalid broker UID	Invalid broker UID	➤ Restart the transport robot. ➤ Contact support.
1177	Referencing LHD failed	Could not reference load handling device	➤ Restart the transport robot. ➤ Contact support.
1178	LHD not enabled	LHD not enabled	➤ Restart the transport robot. ➤ Contact support.
1179	Encoder error at path measuring wheel	Encoder error at path measuring wheel	➤ Restart the transport robot. ➤ Contact support.
1180	Getting accelerometer values failed	Could not get accelerometer values	➤ Restart the transport robot. ➤ Contact support.
1181	Enabling motor failed	Could not enable motor {0}	➤ Restart the transport robot. ➤ Contact support.
1182	Communication failed	Could not set operating mode of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1183	Communication failed	Could not configure position controller of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1184	Communication failed	Could not configure speed controller of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1185	Communication failed	Could not set acceleration of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1186	Communication failed	Could not set deceleration of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1187	Communication failed	Could not set quick stop deceleration of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1188	Communication failed	Could not set current of motor {0}	➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1189	Communication failed	Could not set actual position of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1190	Communication failed	Could not set position window of target reached (motor: {0})	➤ Restart the transport robot. ➤ Contact support.
1191	Communication failed	Could not set position window time of target reached (motor: {0})	➤ Restart the transport robot. ➤ Contact support.
1192	Communication failed	Could not set position window of following error (motor: {0})	➤ Restart the transport robot. ➤ Contact support.
1193	Communication failed	Could not set position window time of following error (motor: {0})	➤ Restart the transport robot. ➤ Contact support.
1194	Setting quick stop command failed	Could not set quick stop command for motor {0}	➤ Restart the transport robot. ➤ Contact support.
1195	Setting halt command failed	Could not set halt command for motor {0}	➤ Restart the transport robot. ➤ Contact support.
1196	Setting continue command failed	Could not set continue command for motor {0}	➤ Restart the transport robot. ➤ Contact support.
1197	Clearing error failed	Could not clear error of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1198	Setting encoder resolution failed	Could not set encoder resolution of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1199	Setting absolute target position failed	Could not set absolute target position of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1200	Setting relative target position failed	Could not set relative target position of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1201	Sensor TU position occupied	Sensor transport unit position {0} after centring transport unit still occupied	➤ Check if something is blocking the TU position sensor. ➤ Check if the sensor is working ➤ Restart the transport robot. ➤ Contact support.
1202	Getting target reached state failed	Could not get target reached state	➤ Restart the transport robot. ➤ Contact support.
1203	Getting actual current failed	Could not get actual current	➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1204	Getting overcurrent state failed	Could not get overcurrent state	➤ Restart the transport robot. ➤ Contact support.
1205	Getting Hall error state failed	Could not get Hall error state	➤ Restart the transport robot. ➤ Contact support.
1206	Getting motor error state failed	Could not get motor error state	➤ Restart the transport robot. ➤ Contact support.
1207	Getting actual speed failed	Could not get actual speed	➤ Restart the transport robot. ➤ Contact support.
1208	Getting actual position	Could not get actual position	➤ Restart the transport robot. ➤ Contact support.
1209	Getting reference sensor state failed	Could not get reference sensor state	➤ Restart the transport robot. ➤ Contact support.
1210	Getting movement parameters failed	Could not get movement parameters	➤ Restart the transport robot. ➤ Contact support.
1211	Getting sensor TU position state failed	Could not get sensor transport unit position (left: {0}, right: {1})	➤ Restart the transport robot. ➤ Contact support.
1212	Sensor TU position occupied after dropping TU off	Transport unit detected on load handling device while retracting tines after dropping transport unit off	➤ Restart the transport robot. ➤ Contact support.
1213	Sensor location occupancy not occupied after dropping TU off	No transport unit detected on location after dropping off	➤ Restart the transport robot. ➤ Contact support.
1214	Stopping movement failed	Could not stop movement	➤ Restart the transport robot. ➤ Contact support.
1215	Sending queue message failed	Could not send queue message	➤ Restart the transport robot. ➤ Contact support.
1216	Setting LHD safety stop failed	Could not set load handling device safety stop	➤ Restart the transport robot. ➤ Contact support.
1217	Acknowledging LHD safety stop failed	Could not acknowledge load handling device safety stop	➤ Restart the transport robot. ➤ Contact support.
1218	Setting position window time of the target reached failed	Could not set position window time of target reached	➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1219	Setting position window of the target reached failed	Could not set position window of target reached	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1220	Resetting position failed	Could not reset position	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1221	Setting position window time of following error failed	Could not set position window time of following error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1222	Setting position window of following error failed	Could not set position window of following error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1223	Setting safety stop deceleration failed	Could not set safety stop deceleration	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1224	Sensor TU position was not occupied while loading TU	No transport unit detected on load handling device while retracting tines for loading transport unit	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1225	Sensor TU position occupied before loading TU	Transport unit detected on load handling device while extending tines for loading transport unit	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1226	Sensor TU position occupied after dropping TU off	Transport unit detected on load handling device after extending tines for dropping transport unit off	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1227	Sensor TU position was not occupied while dropping TU off	No transport unit detected on load handling device while extending tines for dropping transport unit off	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1228	Sensor TU position occupied after dropping TU at IO channel off	Transport unit detected on load handling device after dropping transport unit at IO channel off	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1229	Configuring position controller failed	Could not configure position controller	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1230	Configuring speed controller failed	Could not configure speed controller	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1231	Enabling sensors location occupancy failed	Could not enable sensors location occupancy	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1232	Enabling sensors TU position failed	Could not enable sensors TU position	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1233	Enabling motors failed	Could not enable motors	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1234	Setting maximum speed before enabling reduced speed failed	Could not set maximum speed before enabling reduced speed failed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1235	Setting absolute target position failed	Could not set absolute target position	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1236	End of TU not detected after dropping TU off	End of transport unit not detected after dropping off	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1237	Setting temperature sensor type failed	Could not set temperature sensor type of motor {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1238	Getting temperature failed	Could not get temperature of motor {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1239	Disabling brake lifting platform failed	Could not disable brake lifting platform {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1240	Battery level low	Battery level low	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Check voltage of charging station. ➤ Manually load the transport robot. ➤ Contact support.
1241	Ovvoltage at charging unit	Ovvoltage at input of charging unit	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1242	Battery communication failed	Battery communication failed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1243	Overttemperature power charger	Overttemperature power charger	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1244	Critical temperature power charger	Critical temperature power charger	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1245	Critical temperature buck converter power charger	Critical temperature buck converter power charger	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1246	Overttemperature super capacitor	Overttemperature super capacitor	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1247	Setting charging current failed	Could not set charging current	➤ Restart the transport robot. ➤ Contact support.
1248	Getting power charger state failed	Could not get power charger state	➤ Restart the transport robot. ➤ Contact support.
1249	Getting super capacitor state failed	Could not get super capacitor state	➤ Restart the transport robot. ➤ Contact support.
1250	Getting battery state failed	Could not get battery state	➤ Restart the transport robot. ➤ Contact support.
1251	Getting power charger errors failed	Could not get power charger errors	➤ Restart the transport robot. ➤ Contact support.
1252	Getting power charger warnings failed	Could not get power charger warnings	➤ Restart the transport robot. ➤ Contact support.
1253	Setting power charger output failed	Could not set power charger output	➤ Restart the transport robot. ➤ Contact support.
1254	Resetting power charger output failed	Could not reset power charger output	➤ Restart the transport robot. ➤ Contact support.
1255	Setting/Resetting power charger output failed	Could not set/reset power charger output	➤ Restart the transport robot. ➤ Contact support.
1256	Getting power charger logs failed	Could not get power charger logs	➤ Restart the transport robot. ➤ Contact support.
1257	Enabling battery charging failed	Could not enable battery charging ({0})	➤ Restart the transport robot. ➤ Contact support.
1258	Enabling super capacitor charging failed	Could not enable super capacitor charging ({0})	➤ Restart the transport robot. ➤ Contact support.
1259	Clearing power charger errors failed	Could not clear power charger errors	➤ Restart the transport robot. ➤ Contact support.
1260	Ping power charger missing	Ping power charger missing	➤ Restart the transport robot. ➤ Contact support.
1261	Overtemperature buck converter power charger	Temperature of buck converter power charger too high	➤ Restart the transport robot. ➤ Contact support.
1262	Found too many index marks on edge	Found too many index marks on edge (index mark: {0})	➤ Check the track of the transport robot. ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1263	Setting path network file failed	Could not set path network file	➤ Restart the transport robot. ➤ Contact support.
1264	RFID reader hardware error	RFID reader hardware error	➤ Restart the transport robot. ➤ Contact support.
1265	Temperature super capacitor invalid	Temperature super capacitor invalid	➤ Restart the transport robot. ➤ Contact support.
1266	Wrong temperature sensor type	Wrong temperature sensor type (motor: {0})	➤ Restart the transport robot. ➤ Contact support.
1267	NTC temperature sensor short-circuited	NTC temperature sensor short-circuited (motor: {0})	➤ Restart the transport robot. ➤ Contact support.
1268	NTC temperature sensor not connected	NTC temperature sensor not connected (motor: {0})	➤ Restart the transport robot. ➤ Contact support.
1269	No voltage at charging contacts	No voltage at charging contacts at vertex {0}	➤ Restart the transport robot. ➤ Contact support.
1270	Charging failed	Could not charge at charging station at vertex {0}	➤ Restart the transport robot. ➤ Contact support.
1271	Battery level RTC battery low	Battery level RTC battery low ({0} mV)	➤ Restart the transport robot. ➤ Contact support.
1272	RTC battery missing	RTC battery is missing ({0} mV)	➤ Restart the transport robot. ➤ Contact support.
1273	Activating standby mode failed	Activating standby mode failed	➤ Restart the transport robot. ➤ Contact support.
1274	Deactivating standby mode failed	Deactivating standby mode failed	➤ Restart the transport robot. ➤ Contact support.
1275	Invalid retraction distance	Target retraction distance is invalid ({0} mm)	➤ Restart the transport robot. ➤ Contact support.
1276	Emptying TU although not loaded	Transport robot should empty a transport unit but it is not loaded	➤ Restart the transport robot. ➤ Contact support.
1277	Setting modulo method failed	Could not set modulo method of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1278	Setting modulo value failed	Could not set modulo value of motor {0}	➤ Restart the transport robot. ➤ Contact support.
1279	Setting positioning mode failed	Could not set positioning mode of motor {0}	➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1280	IO-Link not ready	IO-Link not ready (state: {0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1281	Resetting IO-Link failed	Could not reset IO-Link (channel: {0}, data {1})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1282	5 V supply voltage not OK	5 V supply voltage is not OK ({0} mV)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1283	Vertical movement not supported	Vertical movement not supported	<ul style="list-style-type: none"> ➤ Correction of the order. Vertical movements can only be performed by lifters.
1284	Motor short-circuited	Motor cable short-circuited (Motor-Motor, Motor-GND, Motor-Power)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1285	TU depth from order invalid	Transport unit depth from order ({0} mm) exceeds the allowed maximum	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1286	Encoder deviation	Impermissible encoder deviation detected (FPGA: {0}, motor controller: {1}, speed: {2} incr/s)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1287	TU unexpected detected	Transport unit unexpectedly detected while referencing	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1288	TU could not reach target	Transport unit could not reach target	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1289	Leanloader could not change level	Leanloader could not change from lower level to grab level	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1290	Leanloader could not change level	Leanloader could not change from grab level to upper level	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1291	Leanloader could not change level	Leanloader could not change from upper level to grab level	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1292	Leanloader could not change level	Leanloader could not change from grab level to lower level	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1293	No voltage at charging contacts	No voltage at charging contacts at vertex {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1294	Overload digital outputs	Overtemperature in high-side-switch of digital outputs	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1295	Communication failed (ping)	Communication with power charger failed (ping)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1296	Communication stepper motor controller failed	Initial communication with stepper motor controller failed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1297	Unexpected reset stepper motor controller	Unexpected reset of stepper motor driver IC	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1298	Stepper motor controller error	Error of stepper motor driver IC	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1299	Checking horizontal index mark failed	Could not check horizontal index mark for positioning (side: {0})	<ul style="list-style-type: none"> ➤ Check the rack for damage. ➤ Check horizontal location counter sensors. ➤ Clean dirty location counter sensors.
1300	Voltage below minimum value	Internal power supply below minimum value ({0} mV)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1301	Voltage above maximum value	Internal power supply above maximum value ({0} mV)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1302	Communication failed	Could not get reference position of encoder	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1303	Checking reference position encoder failed	Could not check index position of the encoder (actual: {0}, base: {1}, modulo: {2})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1304	Timeout while waiting for instance	Timeout while waiting for instance at startup	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1305	Creating instance failed	Could not create an instance at startup	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1306	Wrong instance type	Instance has a wrong type at startup	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1307	Getting power pack state failed	Could not get power pack state	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1308	Communication failed (ping)	Communication with power pack failed (ping)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1309	Firmware update failed	Could not update power pack firmware	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1310	Getting power pack logs failed	Could not get power pack logs	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1311	Getting power pack errors failed	Could not get power pack errors	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1312	Getting power pack warnings failed	Could not get power pack warnings	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1313	Clearing power pack errors failed	Could not clear power pack errors	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1314	Setting manufacturing data failed	Could not set power pack manufacturing data	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1315	Getting manufacturing data failed	Could not get power pack manufacturing data	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1316	Undervoltage power pack cell	Undervoltage power pack cell	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1317	Ovvoltage power pack cell	Ovvoltage power pack cell	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1318	Overcurrent charging current power pack (T1)	Overcurrent charging current power pack (T1)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1319	Overcurrent charging current power pack (T2)	Overcurrent charging current power pack (T2)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1320	Overcurrent discharging current power pack (T1)	Overcurrent discharging current power pack (T1)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1321	Overcurrent discharging current power pack (T2)	Overcurrent discharging current power pack (T2)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1322	Overcurrent discharging current power pack (SCD)	Overcurrent discharging current power pack (SCD)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1323	Overttemperature power pack cell	Overttemperature power pack cell	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1324	Overttemperature power pack FET	Overttemperature power pack FET	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1325	Internal overtemperature power pack	Internal overtemperature power pack	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1326	Internal undertemperature power pack	Internal undertemperature power pack	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1327	Hardware protection	Hardware protection	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1328	Critical temperature power pack cell	Critical temperature power pack cell	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1329	Undervoltage	Undervoltage	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1330	Critical temperature power pack FET	Critical temperature power pack FET	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1331	Overttemperature power pack cell	Overttemperature power pack cell	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1332	Overttemperature power pack cell	Overttemperature power pack cell	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1333	Undertemperature power pack	Undertemperature power pack	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1334	Undertemperature power pack	Undertemperature power pack	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1335	SOC correction power pack	Power pack needs a SOC correction	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1336	Transport robot read RFID vertex earlier than expected	Distance measured between vertex {0} and RFID vertex {1} is {2} mm shorter than configured	<ul style="list-style-type: none"> ➤ Correct path network
1337	Transport robot read RFID vertex later than expected	Distance measured between vertex {0} and RFID vertex {1} is {2} mm longer than configured	<ul style="list-style-type: none"> ➤ Correct path network
1338	Invalid TU width from order	Invalid transport unit width from order ({0} mm)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1339	Invalid inner clearance for adjustable TU side guide width (width: {0} mm, minimum: {1} mm, maximum: {2} mm)	Invalid inner clearance for adjustable TU side guide width (width: {0} mm, minimum: {1} mm, maximum: {2} mm)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1340	Communication failed	IO-Link communication failed (reg {0}, data {1})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1341	IO-Link device delay	IO-Link device delay (reg {0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1342	Getting Hall sensors failed	Module could not get Hall sensors	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1343	Timeout while reading SDO	Could not read SDO within the time limit (CAN ID: {0}, address: 0x{1}.0x{2})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1344	Timeout while writing SDO	Could not write SDO within the time limit (CAN ID: {0}, address: 0x{1}.0x{2})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1345	Reading SDO failed	SDO could not be read (CAN ID: {0}, address: 0x{1}.0x{2})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1346	Writing SDO failed	SDO could not be written (CAN ID: {0}, address: 0x{1}.0x{2})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1347	CAN-Bus stuff error	CAN-Bus stuff error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1348	CAN-Bus format error	CAN-Bus format error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1349	CAN-Bus acknowledge error	CAN-Bus acknowledge error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1350	CAN-Bus bit 0 error	CAN-Bus bit 0 error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1351	CAN-Bus bit 1 error	CAN-Bus bit 1 error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1352	CAN-Bus CRC error	CAN-Bus CRC error	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1353	CAN-Bus transmit FIFO buffer full	CAN-Bus transmit FIFO buffer full	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1354	CAN-Bus transmit FIFO buffer full	CAN-Bus transmit FIFO buffer full	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1355	Battery empty	Battery empty	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1356	Initialisation of LTC3889 failed	Initialisation of LTC3889 failed	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1357	Adjusting speed controller failed	Could not adjust the speed controller of motor controller {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1358	TU too high	Height of the loaded transport unit exceeds the allowed maximum: {0} mm (maximum: {1} mm)	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1359	Overcurrent Smartloader belts	Overcurrent Smartloader belts	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1360	Overcurrent Smartloader tines	Overcurrent Smartloader tines	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1361	Overcurrent Leanloader belt front	Overcurrent Leanloader belt front	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1362	Overcurrent Leanloader belt rear	Overcurrent Leanloader belt rear	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1363	Reference sensor not occupied	Reference sensor of hopper is not occupied	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1364	Overcurrent hopper	Overcurrent hopper	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1365	Invalid LHD command type	Invalid LHD command type ({0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1366	Setting period for measuring velocity failed	Could not set period for measuring velocity in motor controller {0}	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1367	Magnet vertex not found	Target reached but magnet vertex {0} was not found	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1368	Magnet not found	Could not find magnet at {0}	<ul style="list-style-type: none"> ➤ Correct path network. ➤ Check RFID nodes on the track for damage.
1369	Transport robot read magnet vertex earlier than expected	Distance measured between vertex {0} and magnet vertex {1} is {2} mm shorter than configured	<ul style="list-style-type: none"> ➤ Correct path network
1370	Transport robot read magnet vertex later than expected	Distance measured between vertex {0} and magnet vertex {1} is {2} mm longer than configured	<ul style="list-style-type: none"> ➤ Correct path network

Code	Short description	Description	Rectification
1371	Leanloader could not find the reference sensors	Leanloader could not find the reference sensors	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1372	Maintenance settings could not be read	Maintenance settings could not be read	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1373	TU position sensor not occupied after loading a TU	Transport unit position sensor not occupied after loading a transport unit (left: {0}, right: {1})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1374	TU position sensor occupied after dropping off a TU	Transport unit position sensor occupied after dropping off a TU (left: {0}, right: {1})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1375	Moving during safety stop	Moving during safety stop	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1376	Report index marks failed	Index marks could not be reported	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1377	Duplicated edge	Duplicated edge in path network file (front ID: {0}, rear ID: {1})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1378	IO-Link clock failed	External IO-Link clock is not operational (data: {0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1379	Overtemperature power pack cell is imminent	Overtemperature power pack cell is imminent	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1380	Undertemperature power pack is imminent	Undertemperature power pack is imminent	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1381	Undertemperature power pack	Undertemperature power pack	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1382	Critical temperature power pack	Critical temperature power pack	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1383	Undervoltage IO-Link	Undervoltage IO-Link	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1384	Overtemperature IO-Link	Overtemperature IO-Link	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1385	Overcurrent IO-Link L+ supply	Overcurrent IO-Link L+ supply (channel: {0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Code	Short description	Description	Rectification
1386	Undervoltage IO-Link L+ supply	Undervoltage IO-Link L+ supply (channel: {0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.
1387	IO-Link CQ driver fault	IO-Link CQ driver fault (channel: {0})	<ul style="list-style-type: none"> ➤ Restart the transport robot. ➤ Contact support.

Table 11-1 Message list

12 Maintenance and servicing

ATTENTION

Material damage due to moisture!

Cleaning agents or water can damage the electronics inside the transport robot.

- Do not directly spray the transport robot with cleaning agent or water.

12.1 Maintenance plan

	Personnel	1j
Check and clean external surfaces	Technical staff	x
Check and clean belts	Technical staff	x
Check and clean all guide rollers	Technical staff	x
Check and clean all stabilising rollers	Technical staff	x
Check and clean all support rollers	Technical staff	x

Table 12-1 Maintenance plan

12.2 Operating fluids

The following operating materials are required for maintenance work:

- Mild cleaning agent (e.g. *Interflon Fin Clean All* diluted by at least 1:10)
- Adhesive *Loctite 243 Screw Locking*

12.3 Tools

The following tools are required for the maintenance work:

- Hexagon socket spanner set metric TX 6 to TX 25
- Lint-free cleaning cloth

12.4 Check and clean external surfaces

- Transport robot is removed from the system.
- Transport robot is switched off.

1. Remove coarse dirt (chips, fibres etc.)
2. Check external surfaces of the bonnets and stainless steel sheets for damage (obvious scratches/abrasive marks, deformation etc.).
 - If the surfaces show damage, contact manufacturer to replace the affected parts.
 - If there is no damage to the surfaces, continue with step 3.
3. Apply mild cleaning agent sparingly to a cleaning cloth.
4. Clean external surfaces of the bonnets and stainless steel sheets.

✓ Outer shell successfully tested and cleaned.

12.5 Check and clean belts

- Transport robot is removed from the system.
- Transport robot is switched off.

1. Manually extend the tines completely.
2. Move the belt by hand, checking for damage along its entire length (cracks, frayed edge, irregularly worn surface etc.).
 - If the belt is damaged, contact the manufacturer to replace the belt.
 - If the belt is not damaged, continue with step 3.
3. Apply mild cleaning agent sparingly to a cleaning cloth.
4. Manually move the belts and clean along the entire length.
5. Manually retract the tines until the tine of the Smartloader is in the middle position and does not protrude beyond the frame.

✓ Belt successfully checked and cleaned.

12.6 Check and clean guide roller

- Transport robot is removed from the system.
- Transport robot is switched off.

1. Check for presence of guide roller.
 - If the guide roller is missing, fit a new guide roller (see section 12.7.2).
 - If the guide roller is present, continue with step 2.
2. Remove coarse dirt (chips, fibres etc.).
3. Check all guide rollers for damage (worn surface, deformation, roller is difficult to move, etc.).
 - If the guide roller is damaged, replace the guide roller (see section 12.7).
 - If there is no damage to the guide roller, continue with step 4.
4. Apply mild cleaning agent sparingly to a cleaning cloth.
5. Clean the guide roller.

✓ The guide roller is checked and cleaned.

12.7 Replace guide roller

12.7.1 Remove guide roller

- Transport robot is removed from the system.
- Transport robot is switched off.
- 1. Loosen and remove fastening screw.
- 2. Remove guide roller.
- Guide roller successfully removed.

12.7.2 Fit guide roller

- Transport robot is removed from the system.
- Transport robot is switched off.
- 1. Apply a thin layer of adhesive Loctite 243 to the last 4 threads of the fastening screw.
- 2. Insert and tighten fastening screws.
- Guide roller successfully mounted.

12.8 Check stabilising roller

- Transport robot is removed from the system.
- Transport robot is switched off.

1. Check for presence of stabilisation roller
 - If the stabilisation roller is missing, fit a new stabilisation roller (see section 12.9.2).
 - If the stabilisation roller is present, continue with step 2.
2. Manually extend the tines far enough until the support rollers can be easily reached.
3. Remove coarse dirt (chips, fibres etc.).
4. Check stabilisation roller for damage (worn surface, deformation, roller is difficult to move, etc.).
 - If the stabilisation roller is damaged, replace the stabilisation roller (see section 12.9).
 - If there is no damage to the stabilisation roller, proceed to step 2 .
5. Apply mild cleaning agent sparingly to a cleaning cloth.
6. Clean the stabilising roller.
7. Manually retract the tines until the tine of the Smartloader is in the middle position and does not protrude beyond the frame.

✓ Stabilisation roller successfully tested and cleaned.

12.9 Replace stabilisation roller

12.9.1 Remove stabilisation roller

- Transport robot is removed from the system.
- Transport robot is switched off.
- 1. Manually extend the tines far enough until the support roller can be easily reached.
- 2. Loosen and remove fastening screw.
- 3. Remove the stabilisation roller.
- 4. Manually retract the tines until the tine of the Smartloader is in the middle position and does not protrude beyond the frame.
- ✓ Stabilisation roller successfully removed.

12.9.2 Mount stabilisation roller

- Transport robot is removed from the system.
- Transport robot is switched off.
- 1. Manually extend the tines far enough until the support rollers can be easily reached.
- 2. Apply a thin layer of adhesive Loctite 243 to the last 4 threads of the fastening screw.
- 3. Insert and tighten fastening screw.
- 4. Manually retract the tines until the tine of the Smartloader is in the middle position and does not protrude beyond the frame.
- ✓ Stabilisation roller successfully mounted.

12.10 Check support rollers

- Transport robot is removed from the system.
- Transport robot is switched off.

1. Check for presence of support roller.
 - If the support roller is missing, fit a new support roller (see section 12.11.2).
 - If the support roller is present, continue with step 2.
2. Manually extend the tines far enough until the support rollers can be easily reached.
3. Remove coarse dirt (chips, fibres etc.).
4. Check all guide rollers for damage (worn surface, deformation, roller is difficult to move, etc.).
 - If the support roller is damaged, replace the support roller (see section 12.11).
 - If there is no damage to the support roller, continue with step 2.
5. Apply mild cleaning agent sparingly to a cleaning cloth.
6. Clean the support roller.
7. Manually retract the tines until the tine of the Smartloader is in the middle position and does not protrude beyond the frame.

✓ Support roller successfully checked and cleaned.

12.11 Replacing support roller

12.11.1 Remove support roller

- Transport robot is removed from the system.
- Transport robot is switched off.
- 1. Manually extend the tines far enough until the support rollers can be easily reached.
- 2. Loosen and remove fastening screw.
- 3. Remove the support roller.
- 4. Manually retract the tines until the tine of the Smartloader is in the middle position and does not protrude beyond the frame.
- ✓ Support roller successfully removed.

12.11.2 Mount support roller

- Transport robot is removed from the system.
- Transport robot is switched off.
- 1. Manually extend the tines far enough until the support roller can be easily reached.
- 2. Apply a thin layer of adhesive Loctite 243 to the last 4 threads of the fastening screw.
- 3. Insert and tighten fastening screw.
- 4. Manually retract the tines until the tine of the Smartloader is in the middle position and does not protrude beyond the frame.
- ✓ Support roller successfully mounted.

13 Shutdown

- The transport robot does not have orders
- 1. Open the transport robot website.
- 2. Select main tab *Status*.

WARNING

Material damage due to insufficient battery charge!

If the battery of a transport robot is completely discharged (0 %) and is not recharged within 3 months, the battery is irreparably damaged.

- Before taking out of service, check that the battery charge level is at least 90 %.
- Charge transport robots with a battery state below 90 % to at least 90 %.
- Switch off the transport robot.
- Completely recharge the transport robot every 12 months.

3. In the detail tab *Status* check the value of the label *Battery* to check the current charge status of the battery:
 - If the value is less than 90 %, continue with step 4.
 - If the value is greater than or equal to 90 %, continue with step 5.
4. Manually charge the transport robot until the battery charge level is at least 90 %.
5. Remove transport robot.
6. Switch off the transport robot.
7. Store the transport robot according to the instructions in section 6.
8. Fully charge the transport robot manually every 12 months.

✓ Transport robot successfully decommissioned.

14 Dismantling and disposal



Return the transport robots to the manufacturer for dismantling and disposal.

14.1 Waste disposal of the transport robot



For disposal, observe the locally applicable legal regulations and the supplier documentation as well as the specifications of your company's environmental management system (e.g. ISO 14001, EMAS).

Provide recyclable materials to a recycling depot if possible.

Component	Disposal
Screws, threaded nuts	Steel
Drive wheels	Aluminium, plastic
Path measuring wheel	Plastic
Roles	Plastic, steel
cover	Plastic
Cables	Copper
Drives	Waste electronic equipment
Sensors	Waste electronic equipment
Battery	Hazardous special waste; disposal via locally approved take-back system or licensed specialist disposal company
Super capacitor	Hazardous special waste; disposal via locally approved take-back system or licensed specialist disposal company
Circuit boards	Electronic equipment waste
Board holder	Glass-fibre reinforced plastic (GRP), aluminium
Sliding contact	Electronic equipment waste
Switches/buttons	Electronic equipment waste
Plug / Sockets	Electronic equipment waste
Belt	Plastic
Machine elements (linear rails, toothed racks, gears, rollers, toothed pulleys, shafts, spindles, linkages ...)	Steel, stainless steel, aluminium
Couplings	Aluminium, plastic
Shaft	Stainless steel
Energy chain	Plastic
Holders, suspensions, spacers ..	Aluminium, stainless steel
Cover plates	Stainless steel
Frame	Stainless steel

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