

OPERATING INSTRUCTIONS

nanoScan3 Tool - URCap

Safety System



Described product

nanoScan3 Tool - URCap

Manufacturer

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Original document

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1 About this document

1.1 Scope

These operating instructions contain information on the nanoScan3 Tool - URCap configuration software.

The following documents contain additional information:

Table 1: Available documents

| Document type | Title | Part number |
|------------------------|---------------------------------------|-------------|
| Operating instructions | nanoScan3 I/O | 8024594 |
| Operating instructions | sBot Stop – URCap, sBot Speed – URCap | 8025715 |

This document is included with the following SICK part numbers (this document in all available language versions):

8025718

1.2 Symbols and document conventions

The following symbols and conventions are used in this document:

Safety notes and other notes



DANGER

Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.



WARNING

Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.



CAUTION

Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.



NOTICE

Indicates a situation presenting possible danger, which may lead to property damage if not prevented.



NOTE

Indicates useful tips and recommendations.

Instructions to action

- The arrow denotes instructions to action.
- 1. The sequence of instructions for action is numbered.
- 2. Follow the order in which the numbered instructions are given.
- ✓ The check mark denotes the result of an instruction.

1.3 Further information

www.sick.com

The following information is available via the Internet:

- This document in other languages
- Operating instructions and mounting instructions of SICK components suitable for the safety system
- Guide for Safe Machinery (“Six steps to a safe machine”)

2 Safety information

2.1 General safety note

The information and tools will not fulfill the safety requirements for your application without further adjustments being made. The project planning provided by way of example is intended to serve as the basis to allow you to perform your own project planning and programming in line with your specific requirements. What this means is that the information and tools merely provide an example to demonstrate how a safety function can be taken care of.

When it comes to your own project planning and programming, you will need to rely on qualified staff given that it is your responsibility to ensure that the following requirements are complied with at the very least:

- ▶ Carrying out a risk assessment
- ▶ Taking into account applicable standards
- ▶ Verifying and validating the safety functions.

2.2 Intended use

The nanoScan3 Tool software is used to configure nanoScan3 type safety laser scanners from SICK that are connected to a robot from Universal Robots. The software is installed on the robot controller.

Incorrect use, improper modification or manipulation of the safety system will invalidate any warranty from SICK; in addition, any responsibility and liability of SICK for damage and secondary damage caused by this is excluded.

2.3 Requirements for the qualification of personnel

Only qualified safety personnel may use the configuration software nanoScan3 Tool - URCap to design, configure, commission, and diagnose safety-related devices, device groups or system configurations.

Project planning

For project planning, a person is considered competent when he/she has expertise and experience in the selection and use of protective devices on machines and is familiar with the relevant technical rules and national work safety regulations.

Configuration

For configuration, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its work safety aspects.

Commissioning

For commissioning, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its operational safety status.

Operation and maintenance

For operation and maintenance, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine and has been instructed by the machine operator in its operation.

3 Product description

3.1 Design

Design

The following elements work together:

- Safety laser scanner (from SICK)
- nanoScan3 Tool - URCap for configuring the safety system (from SICK)
- Robot (from Universal Robots)

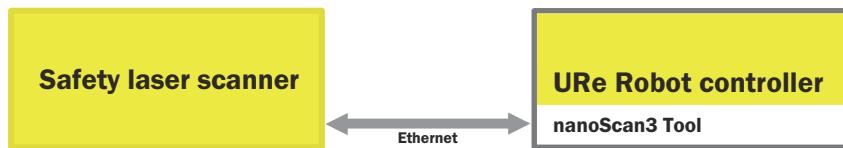


Figure 1: Design

3.2 Functionality

Overview

The nanoScan3 configuration software is installed on the robot control and operated on the teach panel. The configuration software can be used to configure specific safety laser scanners from SICK that are connected to the robot controller. The configuration can also be verified in the configuration software.

Further topics

- ["Ordering information", page 32](#)

3.3 Requirements on the application

To use the product, the application must meet the following requirements:

- The robot must be one of the following types from Universal Robots:
 - UR3e
 - UR5e
 - UR10e
 - UR16e
- Robots and humans perform their work in the same workspace, but at different times (cooperation, see ["Human-robot interaction"](#)).
- The robot works at a fixed position. If the robot is mounted on a moving table, the safety laser scanner must be mounted on the same table.
- The application requires a protective field ≤ 3 m.
- Access to the hazardous area must be designed so that the protective fields of the safety laser scanner cover the entire point of access to the hazardous area. A person cannot enter or reach into the hazardous area without interrupting the protective fields.
- Bypassing the protective field (e.g. by reaching around or stepping over it) is not possible and this is ensured by additional measures as necessary.
- It is ensured that persons do not bring any aids into the monitored area with which persons can use to get above the scan plane without interrupting the protective field (e.g. ladder or chair).
- The area to be monitored is free from all airborne particles or process residues in its operational status.

4 Project planning

4.1 Design

4.1.1 Position of the safety laser scanner

Requirements for the position of the safety laser scanner

Position the safety laser scanner so that it meets all of the following criteria:

- If the robot is mounted on a moving table, the safety laser scanner must be mounted on the same table.
- The scan plane runs horizontally.
- The scan plane runs 300 mm above the floor.
- The safety laser scanner must be mounted with the optics cover facing upwards.
- The safety laser scanner can monitor the entire point of access to the hazardous area. There are no areas that are not monitored where a person can be present.

4.1.2 Protective field design

4.1.2.1 Calculating value for Stop Field radius

Overview

The **Stop Field radius** value determines the maximum extension of protective field PF1. The value is calculated from the radius of the robot hazardous area and the minimum distance to the hazardous area. Detection in protective field PF1 activates the “Trigger protective stop” function. You must calculate **Stop Field radius** so that the robot comes to a standstill in the event of a protective field interruption before the person reaches the hazardous area.

All other settings for the protective field (e.g. surrounding walls) are made during commissioning.

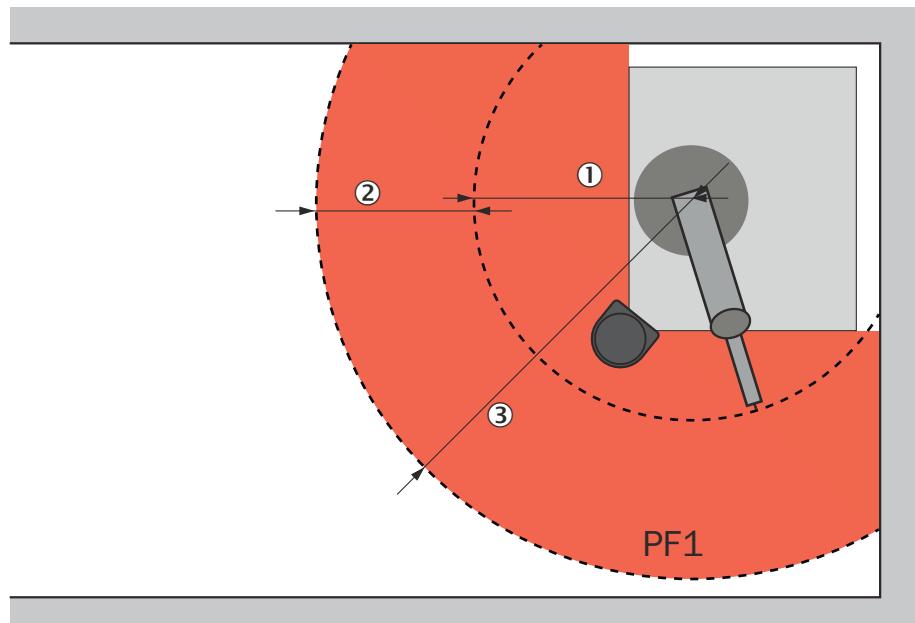


Figure 2: Stop Field radius

- ① Radius of the robot hazardous area (S_R)
- ② Minimum distance to the hazardous area for protective field PF1 (S_{PF1})
- ③ Stop Field radius

Approach

The value for **Stop Field radius S_{PF1}** is composed of the minimum distance to the hazardous area S_{R} and the radius of the robot hazardous area S_R .

Calculate minimum distance to the hazardous area for protective field PF1 (S_{PF1}).

- ▶ Calculate the minimum distance to the hazardous area for protective field PF1. The following calculation example according to ISO13855 can be used for this.
- $$S_{PF1} = K \times (t_{Safetysystem} + t_{Robot}) + TZ + ZR + C$$

| Parameter | Description |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| K | Approach speed of a person. The approach speed is 1,600 mm/s according to EN ISO 10218-2. |
| $t_{Safetysystem}$ | Response time of the safety system corresponds to the response time of the safety laser scanner 70 ms |
| t_{Robot} | Robot stopping time |
| TZ (TT) | Tolerance range of the safety laser scanner 65 mm ¹⁾ |
| ZR | Supplement for reflection-related measurement errors ²⁾ 350 mm ¹⁾ |
| C | Supplement to protect against reaching over in millimeters (mm) $C = 1,200 \text{ mm} - (0.4 \times \text{protective field height (mm)})$ At a protective field height of 300 mm: 1,080 mm |

¹⁾ Value in delivery state Check the actual value with operating instructions 8024594.

²⁾ Is not required in all applications

Calculating radius of the hazardous area of the robot S_R

- ▶ Calculate the radius of the hazardous area of the robot S_R . The radius is composed of the scanning range of the robot arm, the size of the end effector and the workpiece.

The radius is the maximum horizontal distance between the center of the robot base and the outermost point of the transported workpiece. Every point that can be reached by the robot arm is part of the hazardous area.

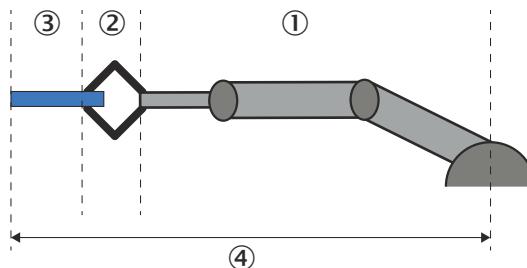


Figure 3: Composition of the radius of the hazardous area of the robot S_R

- ① Robot arm
- ② End effector
- ③ Workpiece
- ④ Radius of the hazardous area of the robot S_R

Calculating value for **Stop Field radius**

- ▶ $\text{Stop Field radius} = S_{PF1} + S_R$

Further topics

- "Calculating value for Reduced Field radius", page 11

4.1.2.2 Calculating value for Reduced Field radius

Overview

The **Reduced Field radius** value determines the maximum extension of protective field PF2. A detection in protective field PF2 triggers the safety-rated monitored speed (Reduced Mode). Protective field PF2 must be larger than protective field PF1.

All other settings for the protective field (e.g. surrounding walls) are made during commissioning.

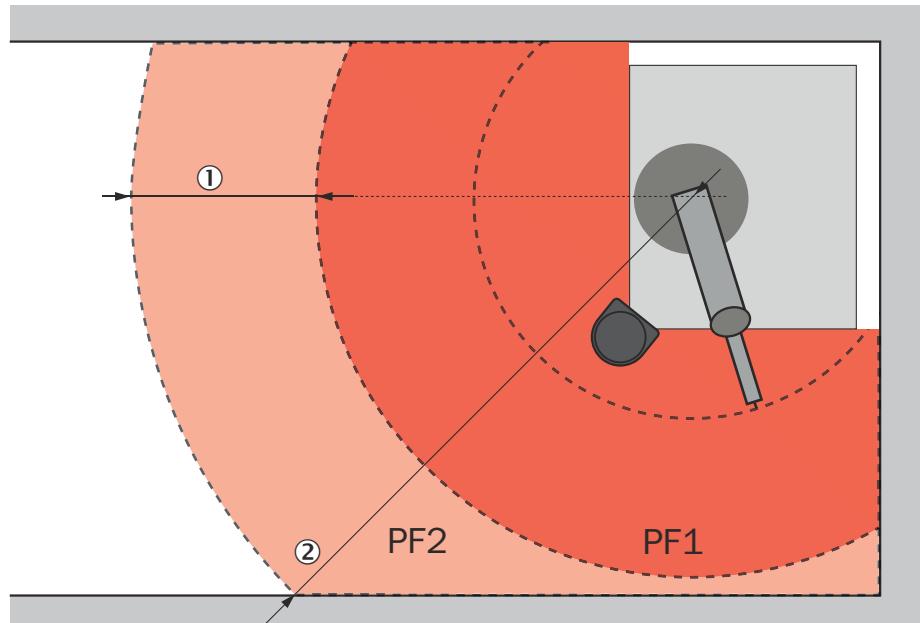


Figure 4: Difference between the minimum distances to the hazardous area

- ① Difference between safety distances S_{Diff}
- ② Reduced Field radius

Prerequisites

- Safety system uses 2 protective fields

Influence of S_{Diff} on the minimum distance to hazardous area S_{PF1}

The difference between safety distances S_{Diff} must be > 0 mm. In principle, you can freely design S_{Diff} . However, S_{Diff} has a retroactive effect on the minimum distance to hazardous area S_{PF1} .

- $S_{Diff} \leq 912$ mm: To calculate the minimum distance to hazardous area S_{PF1} , use the robot stopping time at maximum speed (Normal Mode).
- $S_{Diff} > 912$ mm: To calculate the minimum distance to hazardous area S_{PF1} , use the robot stopping time at safety-related monitored speed (Reduced Mode).

The value of 912 mm results from the following fact.

Object detection in protective field PF2 triggers the safety-rated monitored speed (Reduced Mode). If the robot monitors the reduced speed before an approaching person is detected in protective field PF1, the values for the reduced speed can be used to calculate the minimum distance to hazardous area S_{PF1} . This leads to a smaller minimum distance to hazardous area S_{PF1} .

It takes 500 ms for the robot to monitor the reduced speed (see robot documentation). The response time of the safety laser scanner is 70 ms. At an approach speed of 1600 mm/s, a difference in the minimum distances 912 mm results.

Approach

- Reduced Field radius = Stop Field radius + S_{Diff}

Complementary information

In the safety configuration of the robot controller, you can configure the stopping time for the maximum speed (Normal Mode) and the safety-rated monitored speed (Reduced Mode).

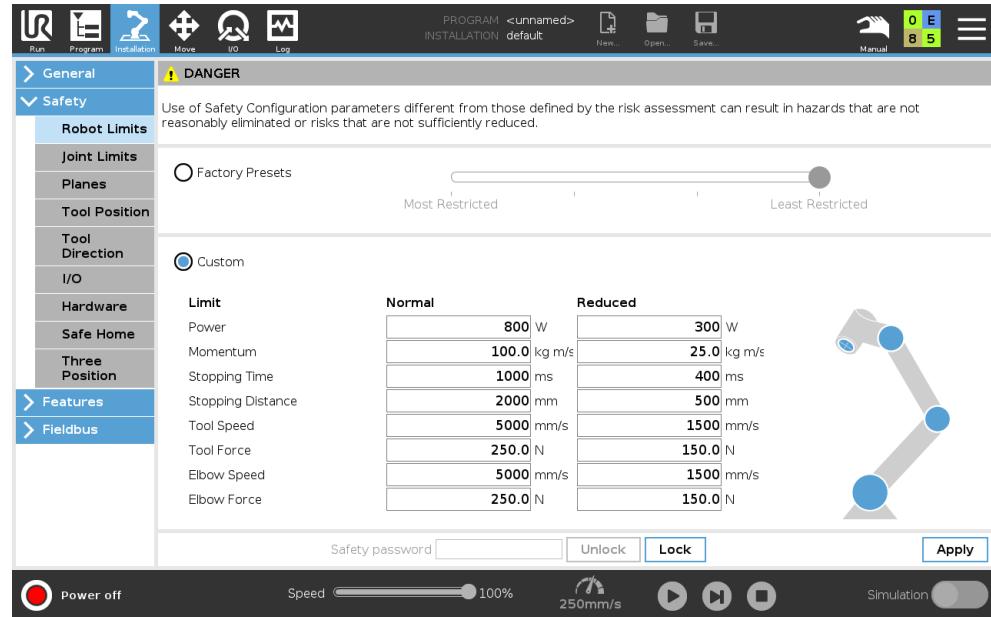


Figure 5: Configuration of the stopping time in the robot controller

Further topics

- ["Calculating value for Stop Field radius"](#), page 9

4.1.3 Position of the robot

The robot must be mounted at a fixed position. If the robot is mounted on a moving table, the safety laser scanner must be mounted on the same table. The robot and the safety laser scanner must always be positioned in the same relationship to each other.

If the position of the robot is changed, the protective fields must be reestablished because the environment of the system has changed.

4.1.4 Warning field

Depending on the variant, a warning field must be configured in the configuration software. This warning field is not used by the safety system. You can use the signal as you wish in your application.

Signal behavior

- LOW: Warning field free
- HIGH: Object in warning field

4.2 Testing plan

The manufacturer of the machine and the operating entity must define all required thorough checks. The definition must be based on the application conditions and the risk assessment.

The following tests must be planned:

- A thorough check must be carried out during commissioning and following modifications.
The check must detect if it is possible to enter the hazardous area without being detected.
- The regular thorough checks of the safety system must fulfill certain minimum requirements. The minimum requirements for the thorough check of the safety system comply at least with the sum of the minimum requirements for the thorough check of the components of the safety system (see operating instructions of the components).
The check must detect if it is possible to enter the hazardous area without being detected. Such possibilities may exist due to modifications, manipulations or external influences.
- In many cases, depending on the application conditions, the risk assessment can determine that further thorough checks are required.

The thorough checks must be carried out by qualified safety personnel or specially qualified and authorized personnel, and must be documented in a traceable manner.

The regular thorough checks serve to assess the effectiveness of the safety system and to identify defects as a result of changes or other influences (e.g., damage or manipulation).

5 Installation

5.1 Installing nanoScan3 Tool - URCap

Approach

1. Copy **nanoScan3_Tool_[...].urcap** file from SICK ZIP directory onto USB stick.
2. Connect USB stick to robot controller.
3. In the robot control:
Hamburger menu > SETTINGS > SYSTEM > URCAPS > PLUS icon
4. Search for and select **nanoScan3_Tool_[...].urcap** file.
5. Click on **OPEN**.
6. Reboot robot controller.

6 Configuration

6.1 Requirements for software and functional scope

Table 2: Functional scope of SICK components

| Component | Functional scope |
|--------------------|------------------|
| nanoScan3 Core I/O | 1.0.0 |
| nanoScan3 Pro I/O | 1.0.0 |

Table 3: Version for robots

| Software | Version |
|-----------|---------|
| Polyscope | 5.6 |

6.2 Configuration of the robot controller

6.2.1 Setting password for switching operating modes

Approach

1. Click on the Hamburger icon.
 2. Under **Password**, select the **Mode** menu item.
 3. In the **New password** and **Confirm new password** fields, enter the desired password.
 4. Click on **Apply**.
- ✓ You can switch between the operating modes using the icon at the top right. You must enter the password defined above to change to Manual operating mode.

6.2.2 Configuring inputs of the robot controller

Prerequisites

Robot is in manual operating mode.

Approach

1. Select **Installation** in the robot controller.
2. Under **Safety**, select the **I/O** menu item.
3. Assign the functions to the inputs.

| Input Signal | Function Assignment |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| config_in[0], config_in[1] | Automatic Mode Safeguard Stop |
| config_in[2], config_in[3] | Variant-dependent <ul style="list-style-type: none"> • 1 protective field : Unassigned • 2 protective fields : Reduced Mode |
| config_in[4], config_in[5] | 3-Position Switch |

Example

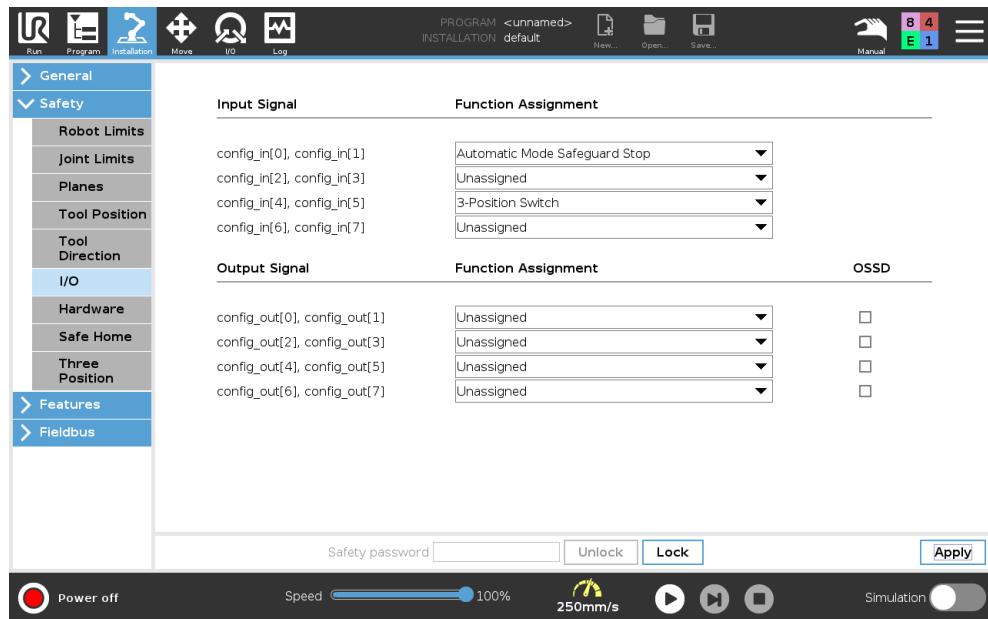


Figure 6: Example configuration with 1 protective field

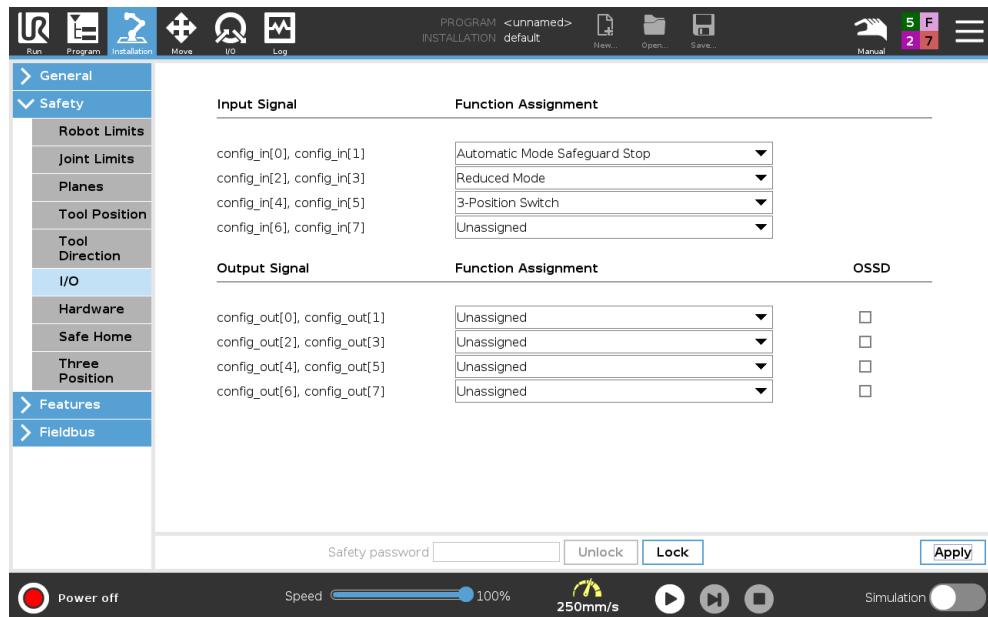


Figure 7: Example configuration with 2 protective fields

6.2.3 Configuring network

Approach

1. Click on the Hamburger icon.
2. Under System, click on Network.
3. Activate Static Address.
4. Configure network settings as desired. The subnet address specified here must match the subnet address configured in the nanoScan3 Tool - URCap configuration software.

6.3 Configuring the safety laser scanner

6.3.1 Starting nanoScan3 Tool configuration software

1. Click on **Installation** in the robot controller.
2. Under **URCaps**, click on **nanoScan3 Tool**.
- ✓ The start screen is displayed.

6.3.2 Configuration in 2 steps

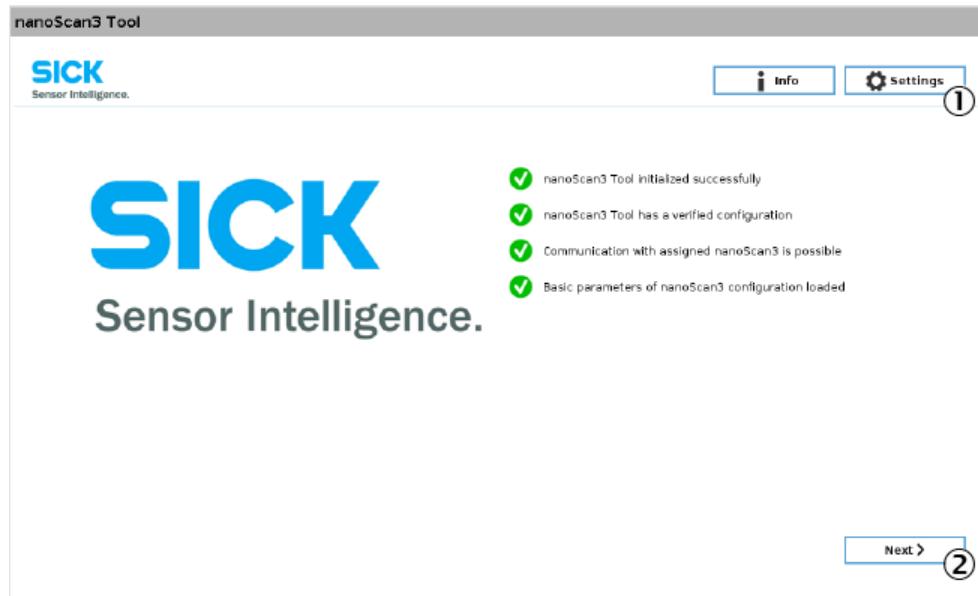


Figure 8: Start screen

| Number | Menu | Function |
|--------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Settings | General configuration Here, for example, the dimensions of the table or safety-relevant distances are configured. The general configuration usually only needs to be carried out during initial commissioning. |
| 2 | Next | Configuration of fields The fields are configured in the layout screen. You can then check and transfer the configuration. The fields must be reconfigured as soon as the position or the environment of the robot is changed. |

6.3.3 General configuration

6.3.3.1 Logging in

6.3.3.1.1 Logging in as service technician

Approach

1. In the start screen, click on **Settings**.
- ✓ The **Settings** dialog is displayed.
2. During the first login, the password must be changed. Use the following standard password:
SICKSAFE
Enter new desired password 2 × and click on **Approve**.
3. Enter selected password for service technician.

4. Click on **Login**.
- ✓ You are registered as a service technician. The configuration menu opens.

6.3.3.1.2 Resetting the password for service technician

Approach

1. In the start screen, click on **Settings**.
- ✓ The **Login** dialog is displayed.
2. Click on **Forgot PW**.
- ✓ A reset code is displayed on the screen.
3. Follow the instructions on the screen to contact SICK technical support. Technical support can provide a reset key using the reset code. Do not leave the dialog until the reset key is available.
4. Enter reset key in the **Service technician Password** field and click on **Login**.
5. Assign desired password 2 × and click on **Approve**.
- ✓ The password is assigned. You can log in with the new password.

6.3.3.2 Configuring table

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the **Desk** tab. Alternatively, click on the table.
2. In the **Width** and **Length** fields, enter the table dimensions.
- ✓ The table display is adjusted.
3. Click on **Apply**.
- ✓ The **Success** dialog is displayed. Confirm dialog to continue.

6.3.3.3 Configuring position of the robot

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the **Robot** tab. Alternatively, click directly on the robot.
2. In the **X** and **Y** fields, configure the position of the robot.
3. Click on **Apply**.
- ✓ The **Success** dialog is displayed. Confirm dialog to continue.

Complementary information

Safety-relevant values are marked with the following symbol:



6.3.3.4 Configuring mode and distances for field generation

Overview

Under the **Fields** tab, you can select the mode in which the fields can be configured. When the **Robot Centric** mode is selected, the calculated safety-relevant distances can be entered.

Prerequisites

- You are registered as a service technician.
- The value for Stop Field radius was calculated during project planning.
- The value for Reduced Field radius was calculated during project planning.

Approach

1. Click on **Fields**.
2. Select mode.
 - **Free Fields**
No distances are configured in this mode. Responsibility for safe design of the protective fields thus lies with the person who carries out commissioning.
 - **Robot Centric**
Distances are configured in this mode. These distances are circular with the robot base at the center of the circle. The distances are displayed during commissioning and are taken into account in the automatic generation of fields.
3. Enter values for safety-relevant distances.

Table 4: Parameters in the Fields tab

| Distance | Description |
|----------------------|----------------------------------------------------------------------------------|
| Warning Field radius | Distance of the warning field to the robot. |
| Reduced Field radius | The calculated minimum distance for triggering the safety-rated monitored speed. |
| Stop Field radius | The calculated minimum distance for triggering the protective stop. |

4. Click on **Apply**.
- ✓ The **Success** dialog is displayed. Confirm dialog to continue.

Complementary information

Safety-relevant values are marked with the following symbol:



Further topics

- "[Calculating value for Stop Field radius](#)", page 9
- "[Calculating value for Reduced Field radius](#)", page 11

6.3.3.5 Configuring information for application

Important information



NOTE

These settings are optional and not required for operation of the safety system.

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the **App** tab.
 2. In the **Application name** and **Project name** fields, enter the desired information.
 3. Click on **Apply**.
- ✓ The **Success** dialog is displayed. Confirm dialog to continue.

6.3.3.6 Assigning passwords for the service technician or operator

Overview

You can assign passwords for the different user groups here. If desired, you can specify that all actions are performed by a single user group.

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the **Pass** tab.
 2. If desired, activate the **Use one user for all actions** checkbox. If the option is activated, the Operator user role loses all rights. All actions that require authentication can only be performed by the Service technician user role.
 3. To change the password for the service technician, activate the **Change service technician password** checkbox, enter the desired password in the **New password** field and repeat in the **Confirm new password** field.
 4. To change the password for the operator, activate the **Change operator password** checkbox, enter the desired password in the **New password** field and repeat in the **Confirm new password** field.
 5. If desired, activate the **User signature required to activate safety** checkbox. If the option is activated, the user must save a signature to complete commissioning. For example, the report can be used to track which user performed commissioning.
 6. Click on **Apply**.
- ✓ The **Success** dialog is displayed. Confirm dialog to continue.

6.3.3.7 Configuring the safety laser scanner

6.3.3.7.1 Assigning safety laser scanners

Prerequisites

- You are registered as a service technician.

Approach

1. In the graphic overview, click on the free placeholder (e.g. A). Free placeholders are gray.
- ✓ A list of available and not yet assigned safety laser scanners is displayed.
2. If several safety laser scanners are used, click on **Identify** if needed.
- ✓ The display of the selected safety laser scanner flashes.
3. If the desired safety laser scanner is not displayed, if applicable click on **Rescan** to update the list.
4. Click on **Assign** to assign the desired safety laser scanner to a position.
- ✓ The desired safety laser scanner is assigned to the position. The view changes to the **Password** tab.

Complementary information

The safety laser scanner must be assigned a password to enable operation.

If the safety laser scanner is in its delivery state, the IP address must be adjusted after password assignment.

Further topics

- "[Configuring the connection data](#)", page 22
- "[Assigning password for the safety laser scanner](#)", page 23

6.3.3.7.1.1

Removing safety laser scanners

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the desired safety laser scanner. Placeholders with assigned safety laser scanner are orange.
- ✓ A garbage can icon appears next to the safety laser scanner.
2. Click on the garbage can icon.
3. Click on **Apply**.

6.3.3.7.2

Configuring position of the safety laser scanner

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the desired safety laser scanner. Placeholders with assigned safety laser scanner are orange.
2. Click on the **Position** tab.
3. In the X or Y fields, enter the offset between the zero point of the coordinate system (lower left table corner) and the center point of the safety laser scanner. The center point of the safety laser scanner is marked on the top side.
4. In the **Rotation** field, enter the alignment of the safety laser scanner in degrees.
- ✓ The entered alignment of the safety laser scanner is displayed with a mark in the preview. This mark must correspond to the 90° mark on the top of the safety laser scanner.
5. Click on **Apply**.
- ✓ The **Success** dialog is displayed. Confirm dialog to continue.

Example

In this example, the safety laser scanner is mounted on the lower right corner (B). The table is 1,200 mm × 600 mm.

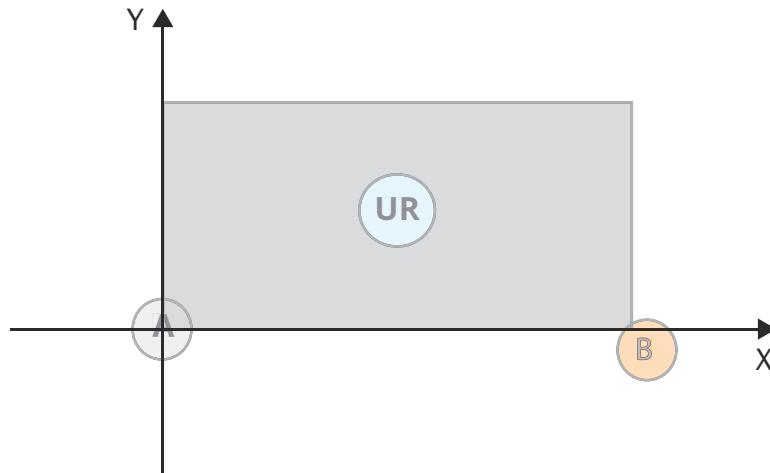


Figure 9: Example positioning of a safety laser scanner at position B

The X and Y values for the safety laser scanner can be determined by measuring the offset between the center point of the safety laser scanner and the table corner. If you calculate the offset of the safety laser scanner to the table corner with the coordinates of the table corner, you get the values for X and Y.

| | X | Y |
|----------------------------------------------------------------------|-----------------|---------------|
| Offset between safety laser scanner and the lower right table corner | 80 mm | - 80 mm |
| Coordinates of the lower right table corner | 1,200 mm | 0 mm |
| Position values for safety laser scanners | 1,280 mm | -80 mm |

Complementary information

Safety-relevant values are marked with the following symbol:



6.3.3.7.3 Configuring name of the safety laser scanner

Important information



NOTE

These settings are optional and not required for operation of the safety system.

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the desired safety laser scanner. Placeholders with assigned safety laser scanner are orange.
2. Click on **Name**.
3. In the **Name** field, enter the desired name.
4. Click on **Apply**.
✓ The **Success** dialog is displayed. Confirm dialog to continue.

6.3.3.7.4 Configuring the connection data

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the desired safety laser scanner. Placeholders with assigned safety laser scanner are orange.
2. Click on the **Address** tab.
3. In the **IP Address**, **Subnet** and **Router** fields, enter connection data.
4. Click on **Apply**.
✓ The **Success** dialog is displayed. Confirm dialog to continue.

6.3.3.7.5 Assigning password for the safety laser scanner

Overview

You must assign a password for the safety laser scanner before the settings can be transmitted to the device.

Prerequisites

- You are registered as a service technician.

Approach

1. Click on the desired safety laser scanner. Placeholders with assigned safety laser scanner are orange.
 2. Click on the **Password** tab.
 3. In the **Current nanoScan3 password** field, enter the password of the safety laser scanner (in delivery condition: "SICKSAFE")
 4. In the **New nanoScan3 password** and **Confirm new nanoScan3 password** fields, enter the desired password.
 5. Click on **Apply**.
- ✓ The **Success** dialog is displayed. Confirm dialog to continue.

Complementary information

The password for the safety laser scanner can only be reset with the Safety Designer configuration software.

6.3.3.8 Verifying settings

Prerequisites

- You are registered as a service technician.

Approach

1. Click on **Verify**.
- ✓ The **Plausibility Checks** window is displayed. The software automatically checks whether the configuration is plausible. A failed test is labeled with the following symbol:



In some cases, you can navigate directly to the corresponding setting by clicking on the following icon:



2. Click on **Proceed**.
- ✓ The configuration report is displayed.
3. Check configuration report.
 4. Click on **Verify**.
 5. Click on **Logout** to return to the start screen.
- ✓ The **Success** dialog is displayed. Confirm dialog to continue.

6.3.4 Configuration of fields

6.3.4.1 Checking requirements for configuration of fields

Approach

1. Start nanoScan3 Tool - URCap configuration software.
- ✓ The start screen is displayed. The readiness for configuration of the fields is signaled via several parameters.

2. Make sure that all parameters are displayed in green.
3. Click on **Next**.

Further topics

- "Error messages on the start screen", page 30

6.3.4.2 Teaching in area

Overview

Before configuring the fields, the environment must be taught into the configuration software. The safety laser scanner scans the environment for this reason. The taught-in contour is taken into account when creating the fields so that walls are not considered, for example.

Approach

1. Click on **Teach**.
 2. Use the slider on the right side to set the delay time for teach-in. During this time, persons can leave the scan area.
 3. Click on **Teach area**.
 4. Leave the area.
- ✓ The safety laser scanner scans the environment.
 - ✓ In **Robot Centric** mode, the configured safety-relevant distances are combined with the results of the scan to automatically generate the fields..

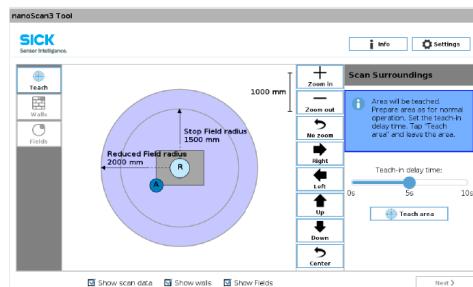


Figure 10: Before teach-in

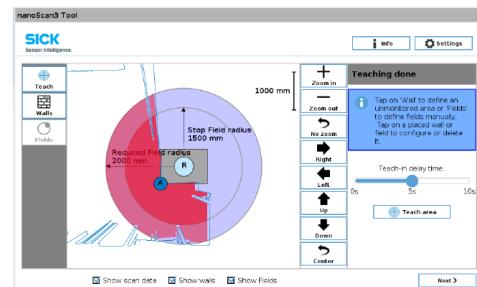


Figure 11: After teach-in

6.3.4.3 Defining walls

Overview

With the **Walls** functions, areas can be excluded from monitoring. This allows you to take into account physical guards that could not be detected by the safety laser scanner when teaching in the area, e.g. fences or covers made of acrylic glass. It can also be used to define areas in which persons cannot be present.

Important information



WARNING

Unmonitored areas

Persons or parts of the body to be protected may not be recognized or not recognized in time in case of non-observance.

- ▶ Only use this function for physical guards where it is not possible to climb over, reach over, crawl under, etc.

Prerequisites

- The area has been taught in.

Approach

1. Click on Walls.
2. Draw a line in the layout.
- ✓ The wall is drawn. The protective fields are adjusted so that areas behind the wall are no longer monitored.

Complementary information

The lines must be drawn so that they do not end in the middle of a field. This would mean that a person from an unmonitored area could step directly into the protective field. The required minimum distances would possibly not be observed.

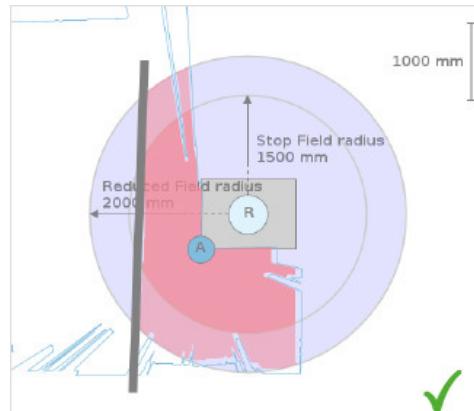


Figure 12: Valid line

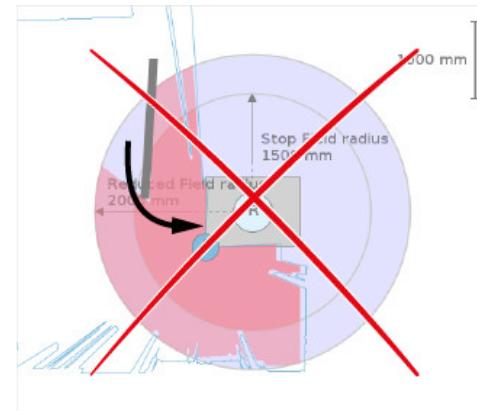


Figure 13: Invalid line

6.3.4.4 Drawing fields manually

Overview

With the Fields function, the fields can be drawn manually.

Prerequisites

- The area has been scanned.
- Free Fields mode is active (**Settings**).

Approach

1. Click on Fields.
2. In the preview, click on the position where the circle is to be placed.
- ✓ 2 circles with different radii are displayed.
The inner circle is for the protective field for the “Trigger protective stop” function.
3. Use the displayed tools to configure the circles as desired and confirm by ticking the check mark (see figure 14).
- ✓ The drawn circles are combined with the results of the scan. The protective fields are generated.
4. If necessary, draw other circles to protect all relevant areas with protective fields.
- ✓ Several circles are merged into a single field.

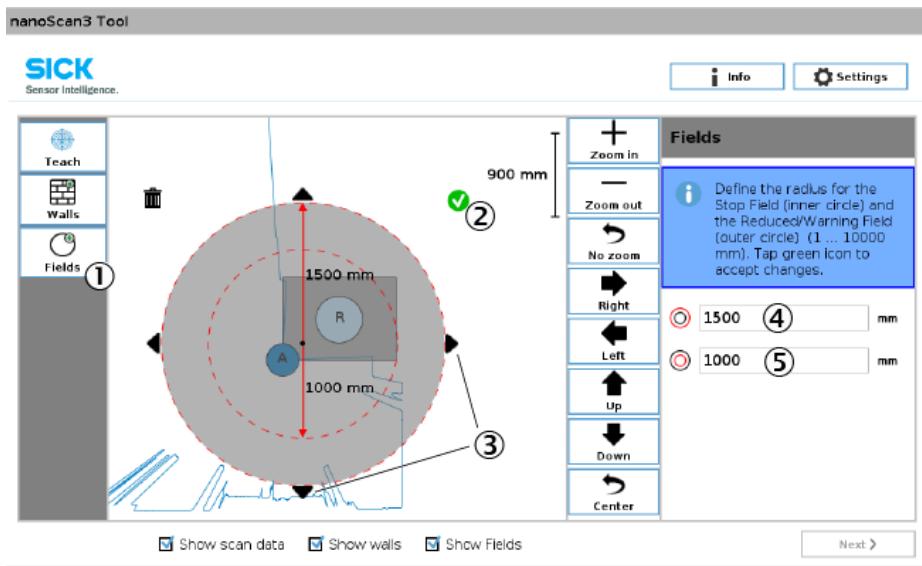


Figure 14: Drawing fields manually

- ① Fields function
- ② Save changes.
- ③ Move circle.
- ④ Adjust Warning Field or Reduced Field Radius.
- ⑤ Adjust Stop Field Radius.
- ⑥ Delete circle.

6.3.5 Transferring configuration to device

Prerequisites

- Protective fields can be configured.

Approach

1. Click on Next.
- ✓ The Confirmation dialog is displayed.
2. Enter the password of the user and confirm with Yes.
3. Confirm dialog for transferring the configuration with Yes.
- ✓ Configuration is being transferred to the device.

6.3.6 Checking configuration

Overview

You can check the configuration in the **Commissioning** screen. The view shows the real time data of the safety laser scanner.

Important information



DANGER

Unmonitored areas

The robot does not stop or does not stop on time.

- ▶ Perform test carefully.
- ▶ This requires appropriate expertise and experience. You must be able to assess if the system is operationally safe.

Prerequisites

- Configuration has been transferred to the device.

Approach

1. Check the following points:
 - The blue areas are not monitored. Persons cannot stay in blue areas or are protected from movement of the robot by other measures.
 - The display on the lower edge visualizes the switching behavior of the fields. Green = Field free; Red = detection in field. The Stop Field switches inputs C10 and C11. If available, the Reduced Field switches the inputs C12 and C13.
 - Access to the hazardous area is only possible through the Stop Field.
 - It is not possible to bypass the fields, e.g. by stepping over them. It is not possible to stay in the hazardous area without being detected in the Stop Field.
2. Click on Next.

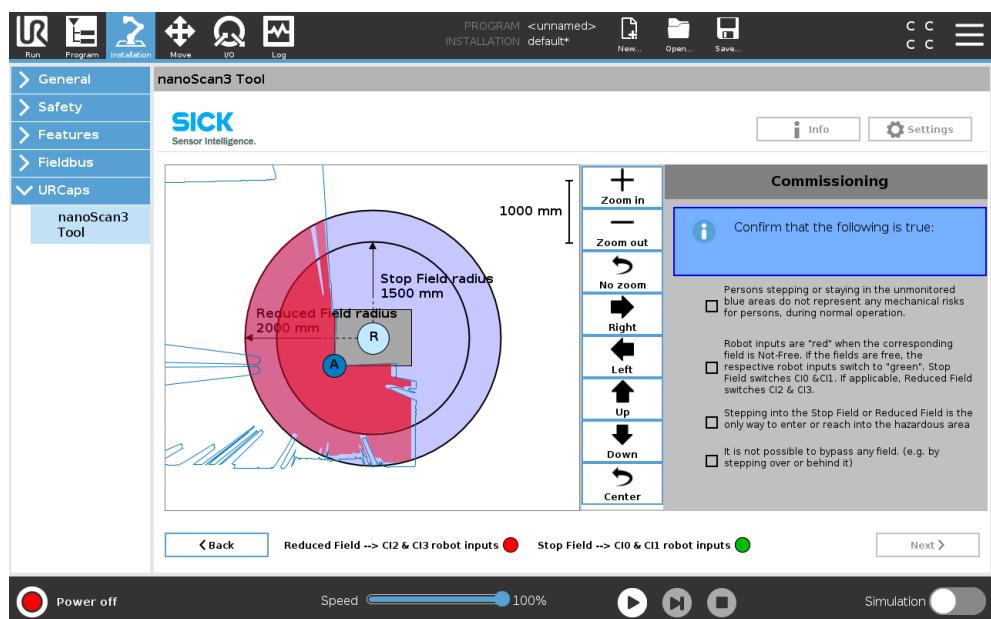


Figure 15: Check configuration

7 Commissioning

7.1 Safety



DANGER

Dangerous state of the machine

During commissioning, the machine or the protective device may not yet behave as you have planned.

- ▶ Make sure that there is no-one in the hazardous area during commissioning.
-

7.2 Performing commissioning at a new location

Overview

If the safety laser scanner is mounted on a table together with the robot, the location of the table can be changed without having to reconfigure the safety system from scratch. Only the fields need to be reconfigured and the configuration transferred to the safety laser scanner. The configuration of the fields is safety relevant. The responsibility for the safety of the application thus lies with the person who carries out commissioning at a new location. The fields can also be configured by users with the Operator role.

Important information



WARNING

Unmonitored or not completely monitored areas

The robot does not stop or not on time.

- ▶ Ensure that the fields are only configured by users who can evaluate a safe working condition.
-

Approach

Configuring fields (short description)

1. In the start screen, click on **Next**.
- ✓ The layout screen is displayed.
2. Scan the area.
3. If necessary, define areas not to be monitored with the **Walls** function.
4. When **Free Fields** mode is activated in the general settings, define the fields with the **Fields** function. Otherwise the fields are generated automatically.
5. Click on **Next**.

Transferring configuration (short description)

6. Follow instructions to transfer configuration to device.

Checking configuration (short description)

7. Check the configuration in the **Commissioning** screen.
8. Click on **Next**.

Completing commissioning

The **Report** screen shows an overview of the configuration. Commissioning is complete when the configuration is confirmed.

9. Otherwise the user signature is entered in the **User signature** field.
10. Click on **Activate Safety**.
- ✓ Robot is secured.

Further topics

- "Checking requirements for configuration of fields", page 23
- "Teaching in area", page 24
- "Defining walls", page 24
- "Drawing fields manually", page 25
- "Transferring configuration to device", page 26
- "Checking configuration", page 26

8 Troubleshooting

8.1 Error messages on the start screen

Several tests are performed when starting the software. Failed tests are labeled with a red icon.

The following information help you rectify the cause for the failed test.

| Failed test | Possible measure |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| nanoScan3 Tool initialized successfully | Restart software. |
| nanoScan3 Tool has a verified configuration | Verify the configuration in the Settings menu. |
| Communication with assigned nanoScan3 is possible | Check cabling and type of the connected safety laser scanner. Check network configuration. |
| Basic parameters of nanoScan3 configuration successfully loaded | Check configuration of the safety laser scanner. Contact SICK if necessary. |

8.2 Carry out diagnosis

Approach

1. Click on **Info**.
 2. Click on **Diagnostic**.
- ✓ Diagnostic information is shown.

8.3 Displaying last verified report

Approach

1. Click on **Info**.
 2. Click on **Last verify report**.
- ✓ The last transferred configuration is displayed. If you want, you can save it on a USB data card.

9 Technical data

9.1 Data sheet

Table 5: Defined parameters of the safety laser scanner¹

| | |
|----------------------------------|--------------------------------|
| Protective field resolution | 70 mm |
| Multiple sampling | 2 |
| Scan cycle time | 30 mm |
| Application type | Stationary |
| External device monitoring (EDM) | Deactivated |
| Universal I/O 1 | Warning field |
| Universal I/O 2 | OSSD pair 2, OSSD A (OSSD 2.A) |
| Universal I/O 3 | OSSD pair 2, OSSD B (OSSD 2.B) |

¹ In principle, these parameters can be configured on the safety laser scanner. In this safety system, however, the parameters are permanently set to the specified values.

10 Ordering information

10.1 Scope of delivery

Table 6: Software scope of delivery

| | |
|------------------------|-------------------------|
| nanoScan3 Tool - URCap | Provided upon purchase. |
| Operating instructions | |

10.2 Ordering information

Suitable components for the configuration software

Table 7: Ordering information for safety laser scanner

| Product | Type code | Part number |
|-----------------------------------------|-----------------|-------------|
| nanoScan3 Core I/O safety laser scanner | NANS3-AAAZ30AN1 | 1100333 |
| nanoScan3 Pro I/O safety laser scanner | NANS3-CAAZ30AN1 | 1100334 |

Table 8: Ordering information for system plug

| Accessories for | | Connection type | Type code | Part number |
|--------------------|-------------|------------------------------------------------------|-----------------|-------------|
| Device | Part number | | | |
| nanoScan3 Core I/O | 1100333 | Cable with plug connector M12 Ethernet connection | NANSX-AAABAEZZ1 | 2104949 |
| nanoScan3 Pro I/O | 1100334 | Cable with plug connector M12 Ethernet connection | NANSX-AAACAEZZ1 | 2104860 |

Table 9: Brackets ordering information

| Part | Part number |
|----------------------------------------------------|-------------|
| Mounting kit 1b (with protection for optics cover) | 2111768 |

11 Accessories

11.1 Connectivity

Table 10: Ethernet cable, M12, 4-pin, D-coding on RJ45 ordering information

| Part | Type code | Part number |
|--------------------------------------------------------------|--------------------|-------------|
| Male connector, straight, 2 m cable, RJ45 male connector | YM2D24-020PN1MRJA4 | 2106182 |
| Male connector, straight, 5 m cable, RJ45 male connector | YM2D24-050PN1MRJA4 | 2106184 |
| Male connector, straight, 10 m cable, RJ45 male connector | YM2D24-100PN1MRJA4 | 2106185 |

12 Glossary

| | |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dangerous state | A dangerous state is a status of the machine or facility, where people may be injured. Protective devices prevent this risk if the machine is operated within its intended use. The figures in this document always show the dangerous state of the machine as movement of a machine part. In practice, there are different dangerous states, such as: <ul style="list-style-type: none">• Machine movements• Electrical parts• Visible and invisible beam• A combination of multiple hazards |
| EDM | External device monitoring |
| Enabling device | Additional manually operated device used in conjunction with a start control and which, when continuously actuated, allows a machine to function. (EN ISO 12100) |
| External device monitoring | The external device monitoring (EDM) monitors the status of downstream contactors. In order to use external device monitoring, positively guided contactors must be used to switch off the machine. If the auxiliary contacts of the positively guided contactors are connected to the external device monitoring, the external device monitoring checks whether the contactors switch correctly when the OSSDs are switched off. |
| Hazardous area | Hazardous area is any space within and/or around machinery in which a person can be exposed to a hazard. (ISO 12100) |
| OSSD | Output signal switching device: signal output for the protective device, which is used for stopping the dangerous movement. An OSSD is a safety switching output. The functionality of each OSSD is tested periodically. OSSDs are always connected in pairs and must undergo dual-channel analysis for safety reasons. An OSSD pair is formed from 2 OSSDs that are connected and analyzed together. |
| Protective field | The protective field protects the hazardous area of a machine or vehicle. As soon as the electro-sensitive protective device detects an object in the protective field, it switches the associated safety outputs to the OFF state. This signal can be passed to controllers resulting in the dangerous state coming to an end, e.g. to stop the machine or the vehicle. A horizontal or vertical protective field is required, depending on the application. The electro-sensitive protective device can therefore be mounted in horizontal or vertical alignment, depending on the requirements. |
| Protective stop | Type of interruption of operation that allows a cessation of motion for safeguarding purposes and which retains the program logic to facilitate a restart. (ISO 10218-1) |

| | |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reset | <p>When a protective device has sent a stop command, the stopped state must be maintained until a reset device is activated and the machine can be restarted in a second step.</p> <p>The reset brings the protective device back to the monitoring state after it has sent a stop command. The reset also quits the start-up or restart interlock of a protective device, so that the machine can be restarted in a second step.</p> <p>The reset must only be possible, when all safety functions and protective devices are functional.</p> <p>The reset of the protective device must not introduce any movement or dangerous situations itself. The machine is only permitted to start after the reset once a separate start command has been sent.</p> <ul style="list-style-type: none"> • Manual resets are performed using a separate, manually operated device, such as a reset pushbutton. • Automatic resets by the protective device are only permitted in special cases, if one of the following conditions is met: <ul style="list-style-type: none"> ◦ It must not be possible for people to be in the hazardous area without triggering the protective device. ◦ It must be ensured that no people are in the hazardous area during or after the reset. |
| Resolution | The resolution of an active opto-electronic protective device (also known as the sensor detection capability) is the minimum size of an object for it to be reliably detected. |
| Response time | The protective device's response time is the maximum time between the occurrence of the event leading to the sensor's response and supply of the switch-off signal to the protective device's interface (for example OFF state of the OSSD pair). |
| Safety function | Function of a machine whose failure can result in an immediate increase of the risk(s). (ISO 12100) |
| Scan cycle time | <p>The scan cycle time is the time the sensor needs for a complete scan of its detection area.</p> <p>Example: Time required by the mirror of a safety laser scanner for one rotation.</p> |
| Stop Category 2 | A controlled stop with power left available to the robot. The safetyrelated control system monitors that the robot stays at the stop position. |
| Universal I/O | Universal I/O can be configured as universal input or as universal output. |
| Warning field | <p>The warning field monitors larger areas than the protective field. Simple switching functions can be triggered with the warning field, e.g. a warning light or an acoustic signal can be triggered if a person approaches, even before the person enters the protective field.</p> <p>The warning field must not be used for safety applications.</p> |

| | | |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
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| Austria | India | Slovenia |
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