Area scanning distance sensor rotoScan RS 3

Configuration software for MS DOS

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1 General Information

1.1 About the RS3 Configuration Software

The software described here is intended for the configuration of the rotoScan RS3, using a PC under MS DOS version 3.0 or newer.

This software allows you to trace the RS3's scan on a plot, which permits immediate identification of possible violations of safety fields. The program permits the definition of safety fields and their modification to suit the respective environment.

A simple parameterisation permits the RS3 to be configured for a wide variety of applications.

1.2 Explanation of symbols

The symbols used in this manual are explained below.

Attention!
This symbol appears in front of text which must be carefully observed. Failure to heed this information can lead to injuries to personnel or damage to the equipment.

Notice!
This symbol indicates text which contains important information.

1.3 Contact address

Leuze electronic GmbH + Co.

In der Braike 1, Postfach 1111

D- 73277 Owen/Teck

Telephone: +49 (0) 7021/573 0

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1.4 The program structure

To ensure fast and flexible access to rotoScan, the program structure is flat. The user is guided through the program and the presentation is clear.

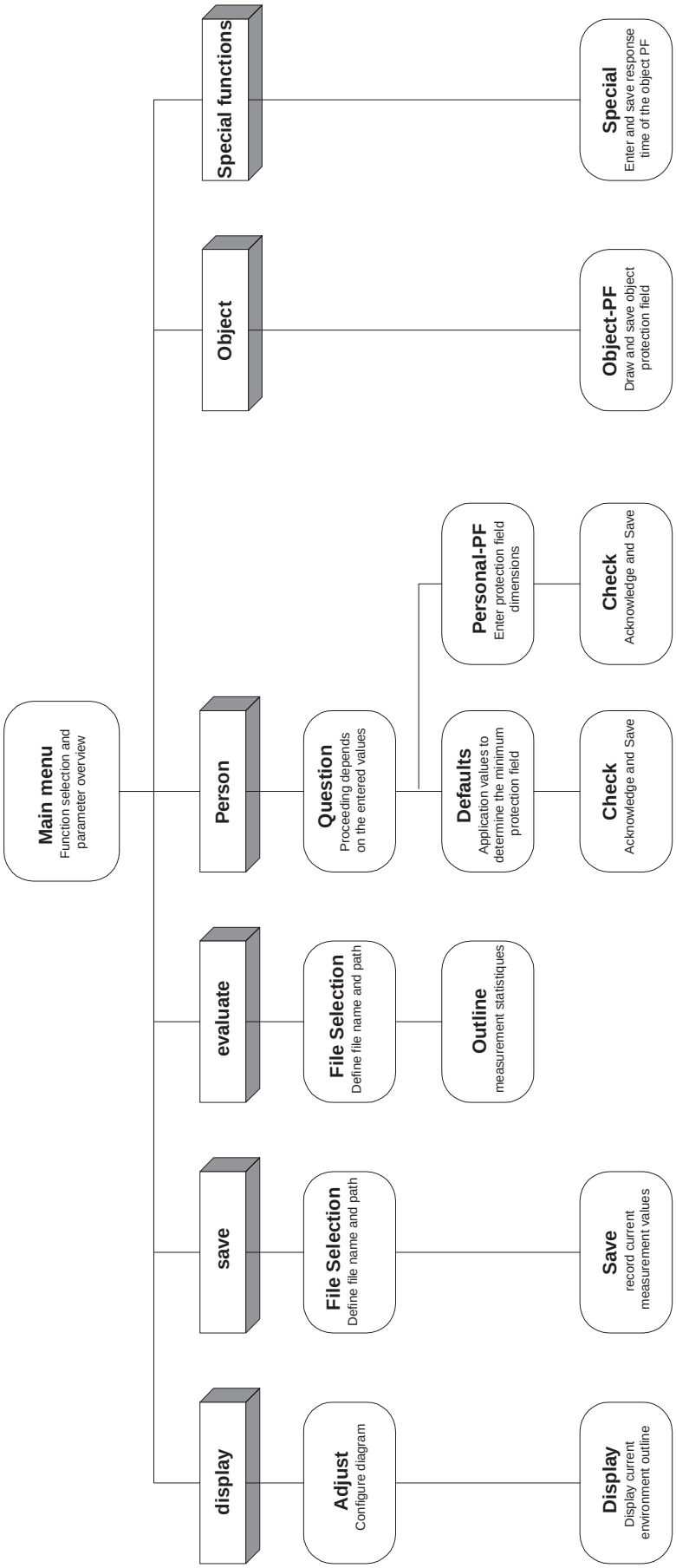
The functions of the three main groups:

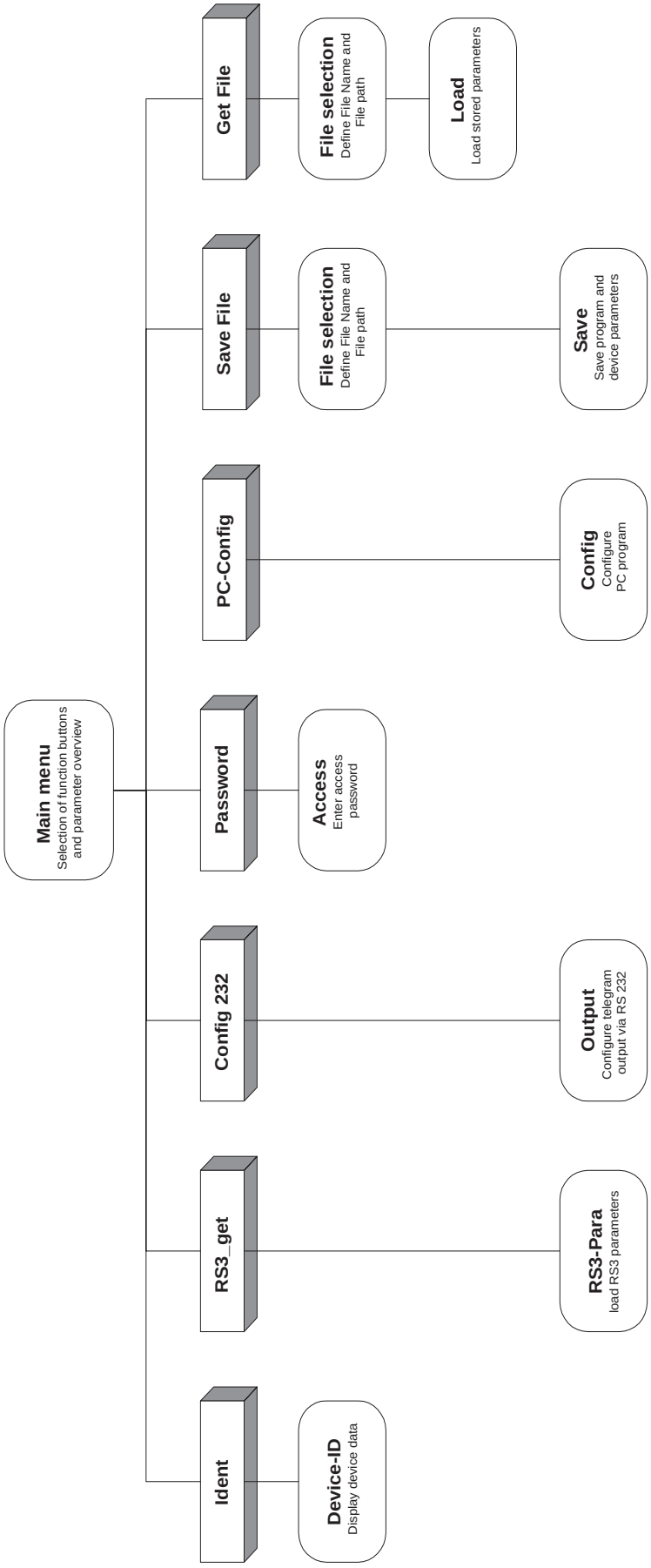
- Measurement values
- Parameters
- PC

are summarised in the main menu.

Every action is accessed in the main menu and is carried out following completion of any adjustments which are being made.

The parameters are displayed in a summary after returning to the main menu.


Main menu
Function selection and parameter overview
Special functions
Special
Enter and save response time of the object PF
Object
Object-PF
Draw and save object protection field
Person
Question
Proceeding depends on the entered values
Personal-PF
Enter protection field dimensions
Check
Acknowledge and Save
Defaults
Application values to determine the minimum protection field
Check
Acknowledge and Save
evaluate
File Selection
Define file name and path
Outline
measurement statistiques
save
File Selection
Define file name and path
Save
record current measurement values
display
Adjust
Configure diagram
Display
Display current environment outline


Main menu
Selection of function buttons and parameter overview
Get File
File selection
Define File Name and File path
Load
Load stored parameters
Save File
File selection
Define File Name and File path
Save
Save program and device parameters
PC-Config
Config
Configure PC program
Password
Access
Enter access password
Config 232
Output
Configure telegram output via RS 232
RS3_get
RS3-Para
load RS3 parameters
Ident
Device-ID
Display device data

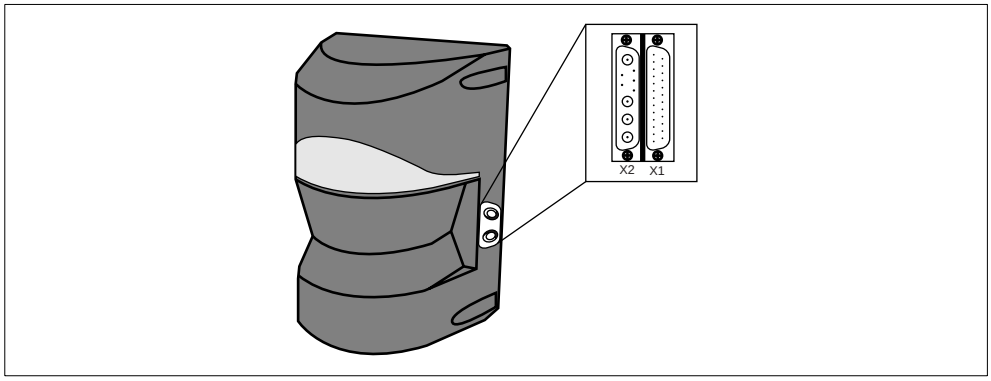
2 Installation of Hardware and Software

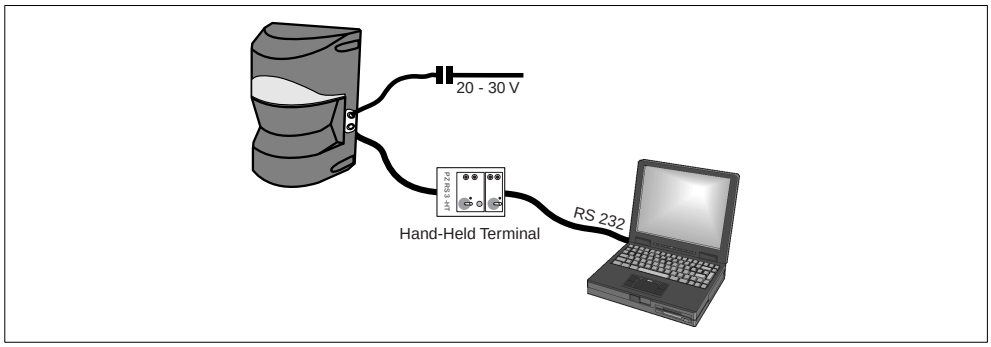
2.1 Hardware

2.1.1 Prerequisites

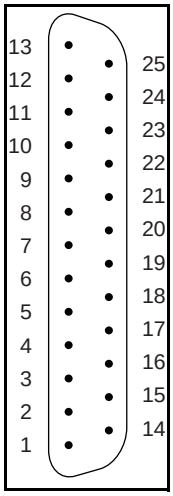
To be able to configure the rotoScan via a PC, you need the base unit (RS3) and a cable wired to suit the interfaces X1 at the RS3 and RS 232 at the PC.

The connection of the RS3 will only be described briefly here. Detailed information may be found in the Technical Description of the rotoScan RS3.





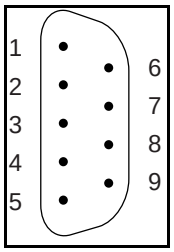
2.1.2 Pin assignments of the X1 interface connector



Only the pins listed in the table are required to configure the RS3 from a PC.

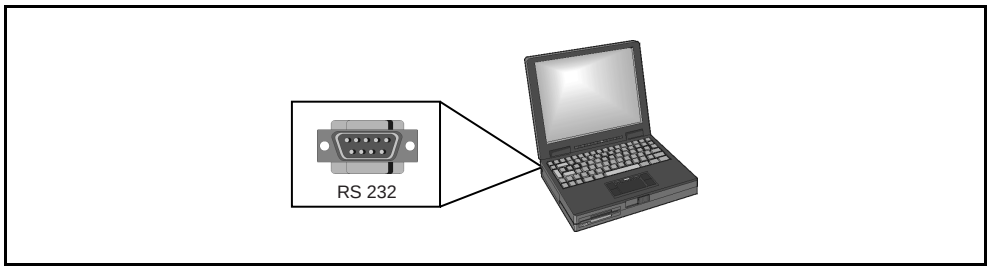
PIN	Signal	Description
1	GND	Ground (voltage supply)
2	U_B	20 - 30 V DC
3	Opto_GND	Ground (optical coupler)
6	COM_GND	Ground (interface)
7	RXD	RS 232 receive data
14	active	Transmitter ON (input)
19	TXD	RS 232 transmit data

2.1.3 Pin assignments on the RS 232 interface connector



Only the pins listed in the table are required to configure the RS3 from a PC.

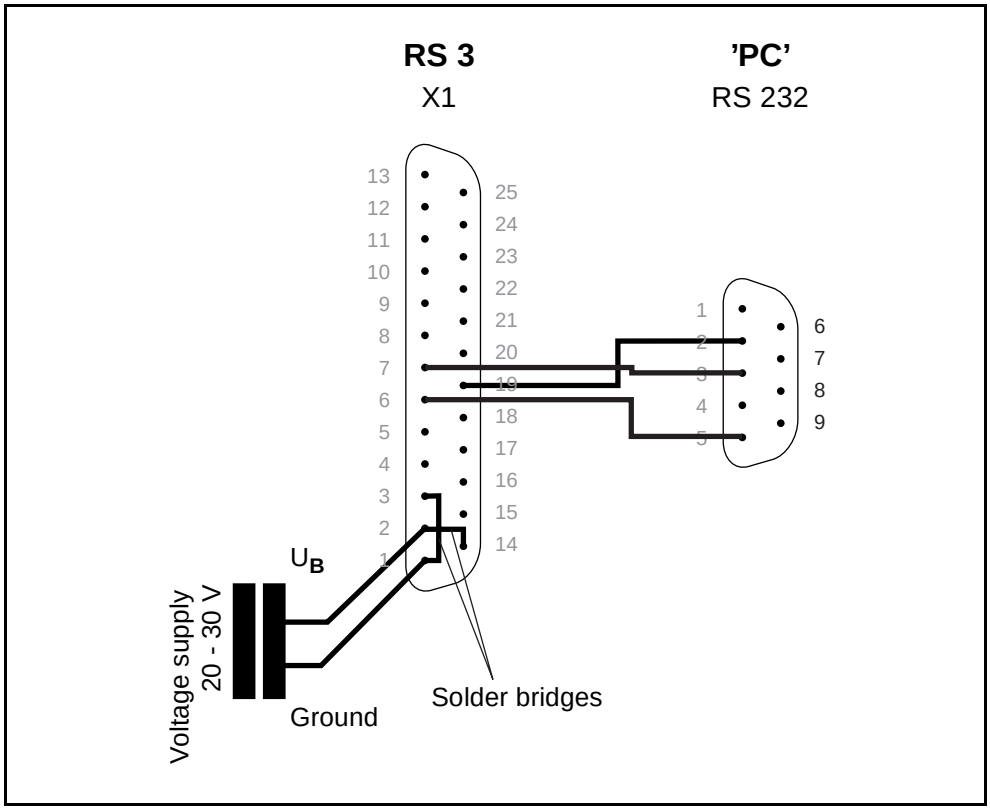
PIN	Signal	Description
2	TXD	RS 232 transmit data
3	R x D	RS 232 receive data
5	COM_GND	Ground (interface)



2.1.4 Wiring the two connectors

Wire the two connectors as shown in the following diagram.

The interface cable available as an accessory is shipped in the same configuration.



2.2 Software

2.2.5 System requirements

- An 80386 Intel® processor or faster (or compatible models, e.g. AMD® or Cyrix®)
- At least 512 kB main memory (RAM)
- A 3½" floppy drive
- A hard disk with at least 300 kB of free space.
  If you intend to save protection field or configuration parameters, you may require additional disk space.
- An unused RS 232 interface (serial)
- A VGA screen
- A mouse (is not required)
- Microsoft® DOS version 3.3 or newer

2.2.6 Installation

To install the RS3 configuration software, you need the supplied DOS program disk.

The disk contains the following files:

- KMxx.EXE

  contains the RS3 configuration program

- KMxx.HLP

  contains the Help texts

- KMxx.RS3

  Contains the current program parameters which are saved automatically when ending the program (if the file does not exist, default parameters are loaded)

To install, first copy the entire contents of the disk to a previously created directory (e.g. copy a:*.* C:\RS3Konfig\) on the hard disk.

Measurement files with the extension ".RS3" for saving distance measurements or protection fields should be stored in their own subdirectories.

↳ *The program can be called up with the file KMxx (xx = current version, e.g. 18).*

Parameters can be defined and saved on the hard disk without either device or password, for example to analyse previously saved data.

3 Operating the Program

3.1 Key assignments and mouse function

The program can be controlled using:

- Keyboard keys
- Screen buttons
- Mouse

Reserved keys

The most important functions can be controlled using the following keys:

- **RETURN** = Acknowledgement
  ends the input of texts and activates the function at which the mouse is pointing.
- **ESC** = Cancel
  interrupts the input,
  closes the window and returns to the main menu.
- **Arrow keys**
  Movement for positioning the mouse
- The **10-key numerical keypad** has no function.

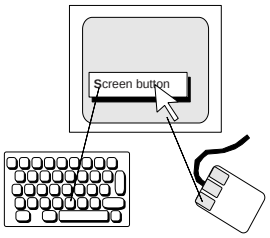
Screen buttons

The functions available in the current window can be accessed via screen buttons.

Screen buttons are marked by a coloured, shadowed field.
A distinction is made between three different types:

- Keys, which immediately initiate an action
- Changeover switches ("**On**" is marked by a coloured field, "**Off**" is marked by an uncoloured field).
- The "Edit" field, which facilitates the input of texts or numbers.
- The input is ended by "**RETURN**" or by "**ESC**".
- The standard control keys can be used while editing.
- The light-grey keys are disabled, e.g. because authorisation level is too low or RS3 communication is missing.

A screen button can be activated by clicking the left mouse button or by pressing the highlighted letter on the keyboard.



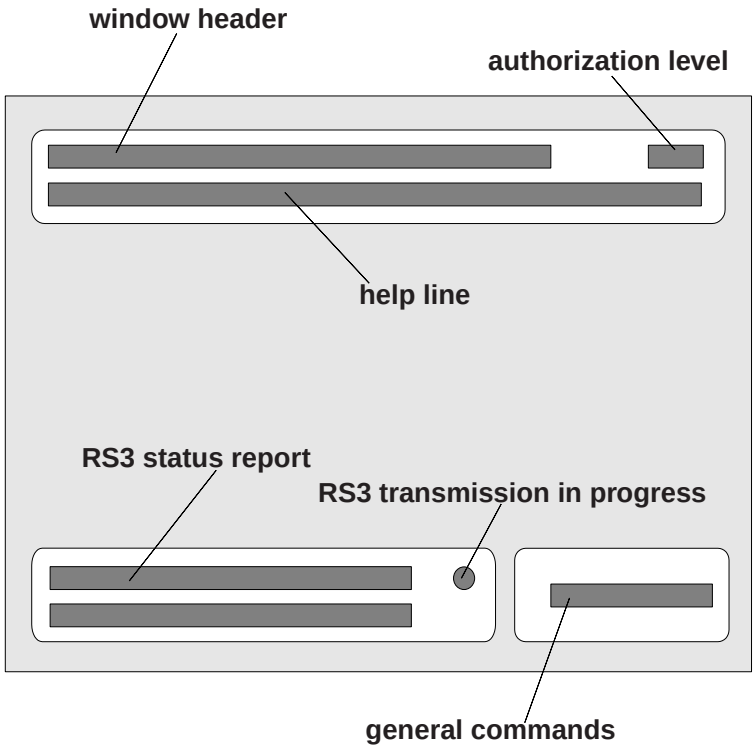
Mouse

With the exception of text entry, all functions can be controlled with the mouse.

By positioning the mouse on a field, a function can be selected; click with the left mouse button to activate the function.

	Keyboard	Screen	Mouse
Acknowledge-ment	RETURN		Left mouse button
Cancel	ESC, A	"Cancel"	Right mouse button
Help	F1,?	"?"	Middle mouse button
Move	Arrow keys		Move mouse

3.2 Screen layout



3.3 Meaning of the colours

The different colours symbolise special function groups:

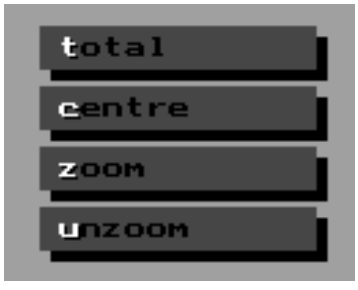
turquoise	general functions which are not relevant to safety
violet	functions which are relevant to safety (e.g. personal protection field)
blue	PC-functions (e.g. data saved on the hard disk)
red	warning and error messages, guide lines (e.g. minimum protection field)
yellow	geometrical data, current measurement values (e.g. current environment contour)
green	help file

3.4 General commands

The following three standard commands are displayed in each window at the bottom right-hand corner of the screen:

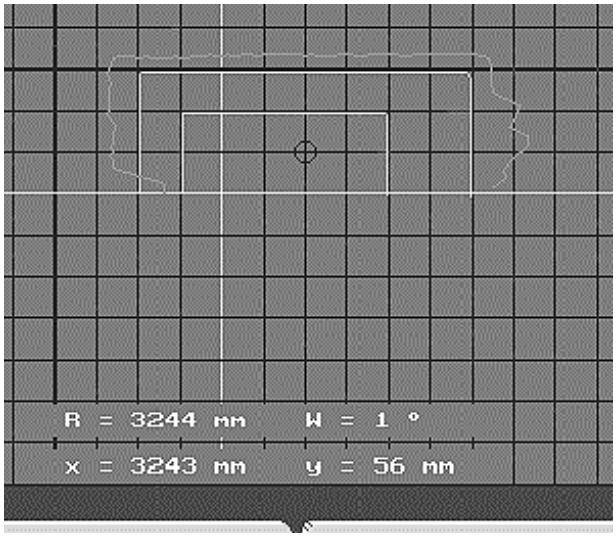
Yes	The changed parameters are now valid and, depending on the window, are transmitted and programmed into the rotoScan. The current window is closed and the system changes to the next window.
Cancel	The previous parameters are restored and the system returns to the main menu.
?	Calls up menu-specific, full-page help texts. If the mouse arrow is positioned over a button, a help text relevant to the button is displayed.

Windows with a graphical display of distance measurements or protection fields offer the following four commands for scaling the diagram:



- The distance resolution is automatically calculated and the origin of the coordinates shifted so that the current contour fits completely into the diagram.
- The contour is shifted so as to position the area at which the mouse cursor is pointing at the centre of the diagram.
- The screen area surrounding the mouse cursor is then enlarged.
- The screen area is enlarged.

For contour measurement, the distances from the sensor to the contour point, which is marked by a small yellow circle, are calculated and output.

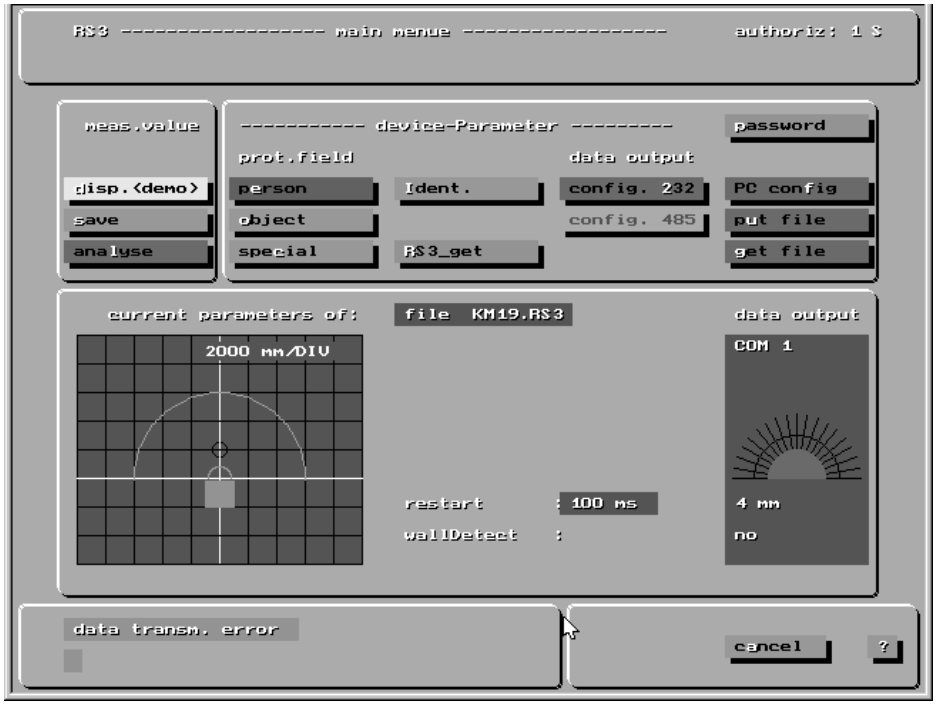


Where:

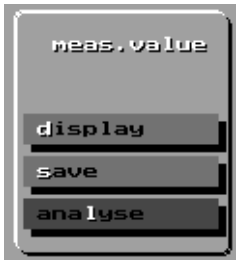
R = radius
W = angle between x-axis and sensor contour-point connection line
x = vertical distance to y-axis
y = vertical distance to x-axis

The indication circle can be shifted with the aid of the mouse and jumps corresponding to the 2°-sectors.

3.5 Window "Main menue"



Measurement value



Opens the window "**Settings**" for configuring the contour display. Continuing with the window "**Display**", the current distance measurement data are displayed as a 2D-contour and the status of the protection field is indicated.

From the window "**File selection**", the window "**Save**" is accessed. Here, the measured values in the RS3 continue to be read in and stored in the preselected file until the process is ended with the "**Cancel**" command.

The measurement values are loaded from the file selected in the "**File selection**" window, statistically analysed and displayed as a contour.

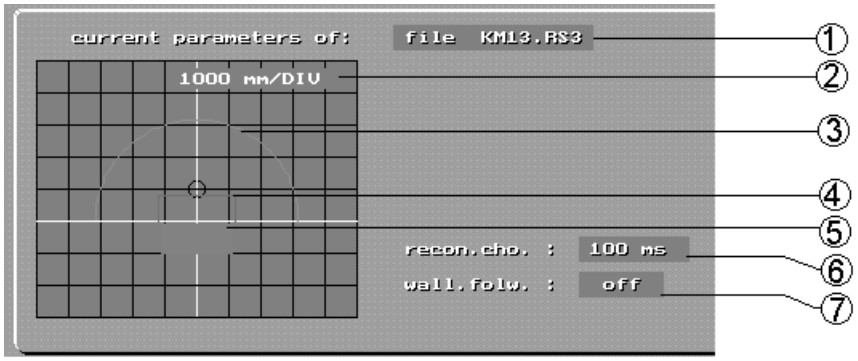
In addition, sector-specific data can be calculated.

Device parameters

The following buttons can be used for changing device parameters and configuring the PC:

Person:	The safety-relevant personal protection field is drawn as a contour and saved in rotoScan. A minimum protection field must first be calculated by entering the application data and then programmed in the rotoScan.
Object:	The object protection field for general use is defined and saved.
Special:	Special parameters for, among other options, setting the response time for the object protection field and for parameterising the teaching process.
Ident.	Device features, such as serial number and program version, are displayed.
RS3_get:	The parameters saved in rotoScan are loaded.
Config. 232:	Configuration of data output via the RS 232 serial interface.
Config. 485:	Configuration of data output via the RS 485 serial interface.
Password:	To obtain authorization for programming device parameters, a password must be entered.
PC config	Configuration of the PC-interface and program settings.
Put file:	Save contents of main memory to a file.
Get file:	Load parameters saved on file.

The current protection field parameters are displayed in the main menu as shown below:



1 Shows the origin of the indicated parameters:

- RS3 No. xxxxxx — from the connected unit
- File xxxxxxxx.RS3 — from the specified file
- User changed — after editing and confirming with the command "**Yes**"

2 Resolution of the protection field diagram

3 Object protection field (**turquoise**)

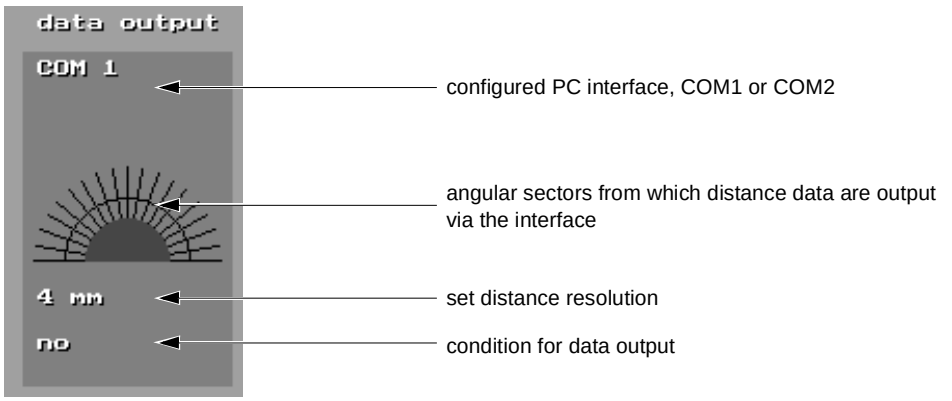
4 Personal protection field (**violet**)

5 Width of vehicle (**red**)

6 Restart time which has been set in the window "**Default settings**"

7 Analysis: off = standard procedure
on = with wall detection

The configuration of the distance data output via RS232 (to PC) or via RS485 for client-control is displayed in the right part of the overview.



All important remarks and error messages are displayed in the main menu status field:

Notice!
Messages displayed on a red background are either warning or error messages.

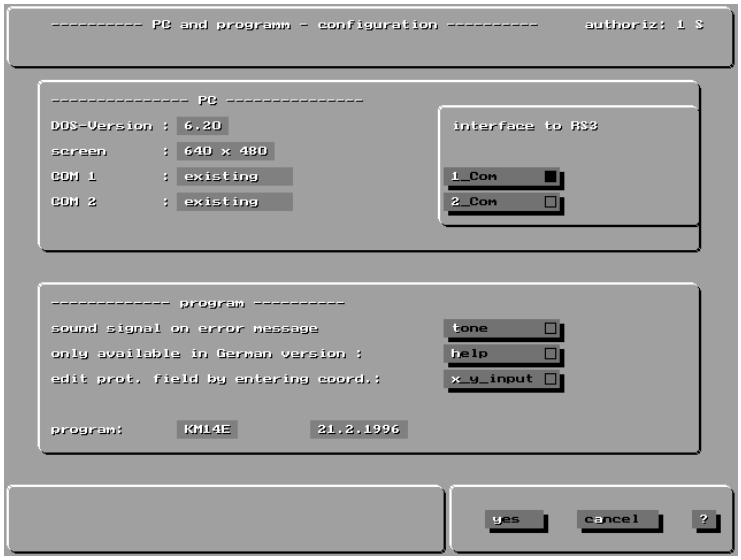
With error messages, the first line indicates the type of message and, in the case of device errors, the error number. The error is described in more detail in the second line.

4 Configuration

With regard to help texts and warning messages, the program can be configured to meet individual requirements.

It is, in any case, possible to work with the rotoScan only after the PC interface has been set.

4.1 Window "PC_config."



Notice!
The performance data of your PC are shown in the left corner of the screen to allow a comparison to be made to the hardware and software requirements of the program (see Chapter 2.1 and 2.2).

Basic configuration After the stating the program for the first time, the following basic configuration is set:

- COM 2
- Warning tone on
- Helpline on

Serial interface When selecting the PC interface, ensure that the interface is not already occupied by the mouse or other functions.

Warning tone When the warning tone is switched on, every error message is accompanied by a peep signal.

Helpline When the helpline is on, a short description of the selected screen key is given below the window title.

4.2 File selection

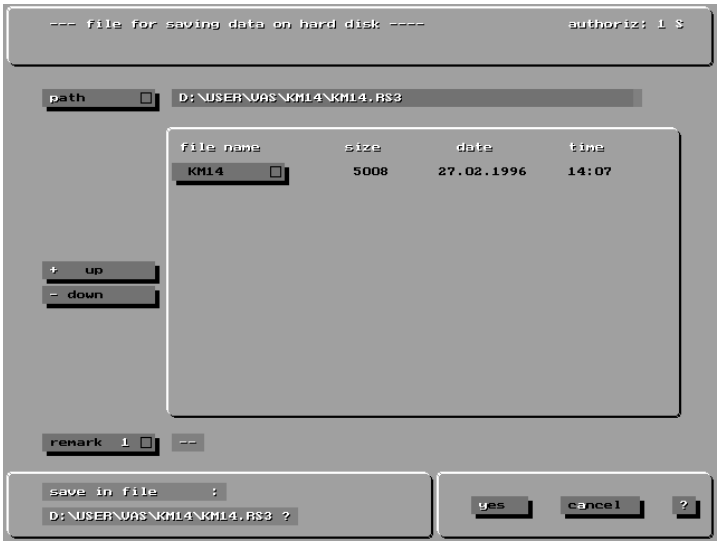
Several functions require the definition of a file name. If the desired file is not yet shown in the file list, press the "**Path**" key to enter the disk drive, path, and, if desired, the file name (without extension). Path statements must end with a "****".

The desired file can be selected either with the "**+**" and "**-**" buttons or with the mouse.

A brief additional text can be saved with the "**Remark 1**" button.

The "**Yes**" button initiates storage.

Note!
If you use a file name which already exists, the existing file will be overwritten.



Window "Save file" The parameters located in main memory are saved in the selected file.

Window "Get file" The parameters of a file saved on the PC are loaded and overwrite the parameters located in main memory.

5 Device Parameters

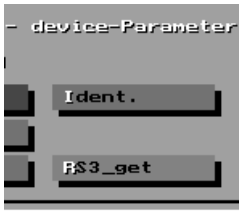
5.1 Default parameters

The rotoScan RS3 is a versatile protection device and may thus be configured for a wide variety of applications (see the "Technical Description" of the RS3 for examples).

The default factory settings are listed in the following table:

parameter	default
method	1
left edge	2800 mm
right edge	2800 mm
speed	1995 mm/s
response time	400 ms
braking distance	1000 mm
error margin	700 mm
frequency channel	1
average from (number of scans)	1
restart	100 ms
system response time	100 ms
RS3 password	RS3LEU
personal safety field	semi-circle with r = 4.5 m
object safety field	semi-circle with r = 0.8 m response time = 400 ms
RS 232	continuous data transmission (unconditional) 90° distance measurement values (2° sectors, 180° area)

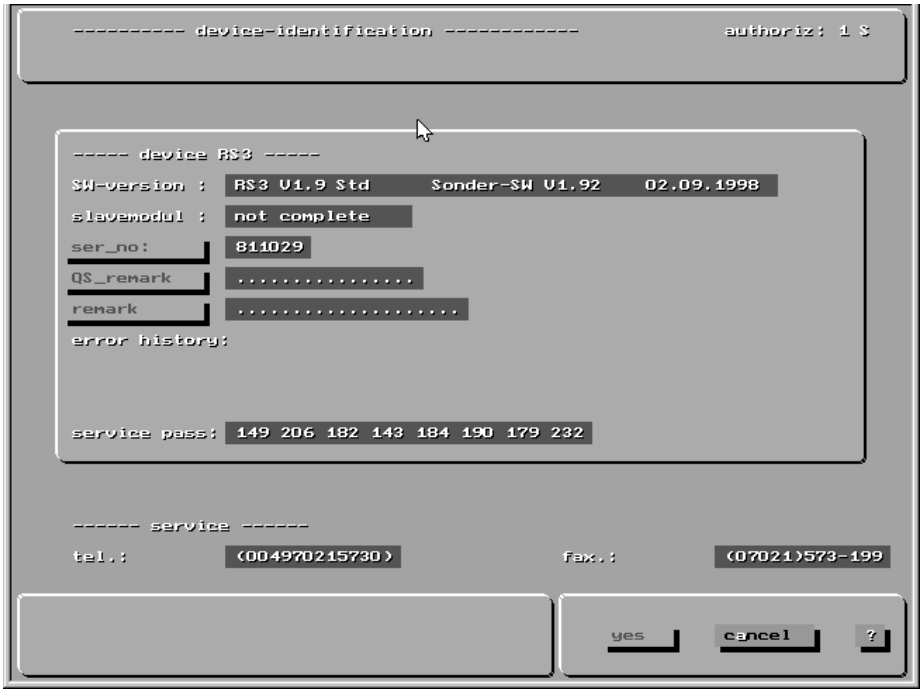
5.2 Command "RS3_get"



If rotoScan is connected, the device parameters are loaded automatically. The device parameters are also reloaded after temporarily disconnecting the serial interface, e.g. when exchanging the device.

The device parameters can be loaded as necessary with the "**RS3_get**" button (e.g. after the user changes the parameters). An overview of the most important parameters is then displayed in the bottom half of the screen.

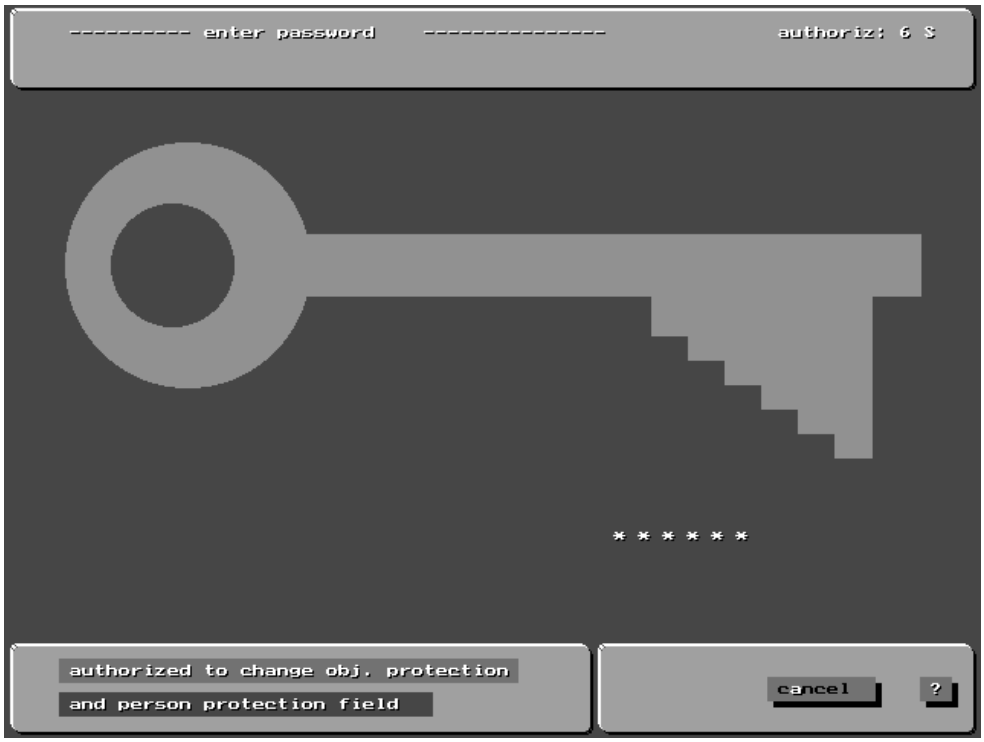
5.3 Window "Ident."



The following device-specific data are displayed in the window "**Ident.**":

- the device software version, which should match the version of the communication software.
- module-assignment status
- the serial number, which should be stated in the event of any inquiries.
- manufacturer comments
- error history: the code numbers of the most recent errors are listed here (up to 12). This list can be deleted only by resetting all device parameters (see the technical description on page 24).
- if the personal password is no longer available, use the coded user password ("Service Pass") when making inquiries to the manufacturer.
- on the line 'last error', the most recent error is displayed.

5.4 Window "Password"



On delivery, full access is possible with the default password "**RS3LEU**".

Notice!
If the safety officer has entered his personal password (see Chapter 5.5), only this password is valid.

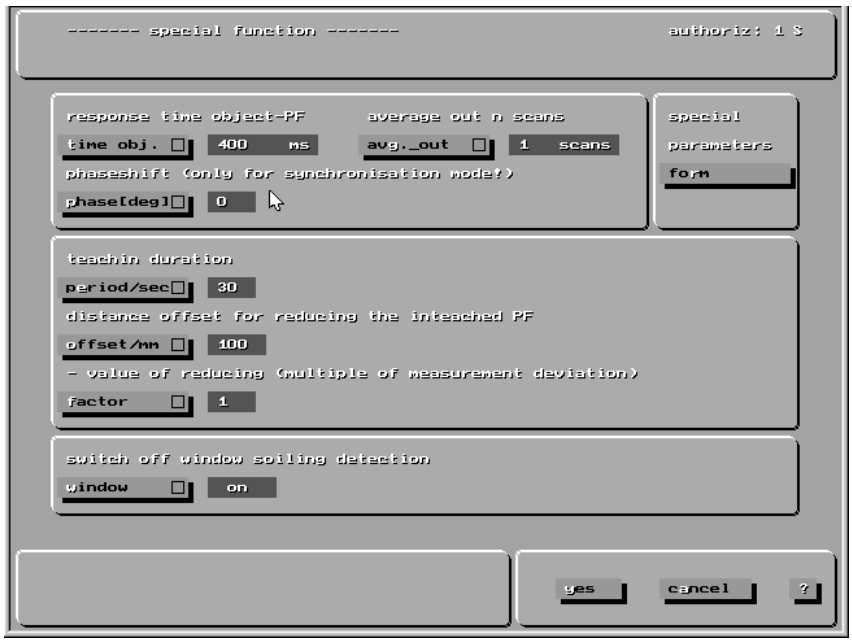
- *2 valid digits authorise the user to change parameters which are not critical to safety*
- *6 valid digits authorise the user to change the personal protection field*

The respective authorisation is displayed in the upper-right corner of each window.

If the password can no longer be found, the sequence of numbers **Service Pass** which appears in the window "**Ident.**" can be used by customer service to determine the device password.

5.5 Special functions

Several special parameters can be carried out in the window "**Special function**". Due to the fact that parameters which affect the personal protection field can be edited in this window, the password must be entered before this window can be opened.



Time_obj.: reaction time of the RS3 in milliseconds for the object protection field.

Phase: this parameter displays the horizontal phase shift of the laser beam with respect to that of the parallel-operated RS3 which is operated in synchronised mode to avoid mutual interference.

Duration: the duration of the teaching process (10 - 500 sec.) is valid for teaching with the PC and for teaching with the hand-held terminal.
In general, a longer teaching process reduces the likelihood of false detections.

Offset: the environment contour which has been taught must be reduced in order to generate a corresponding protection field. This means that it must be reduced radially until no false detections are caused as a result of environmental conditions (static!). Test: the RS3 should register no false detections for a period of approx. 30 min.

Factor: the value determined by the RS3 for the measurement uncertainty (during measurements of the surroundings) is used here as a reduction value. The value of the factor can be entered here (test the protection field! See above: "**Offset**" button).

Window: this button can be used to switch off window soiling detection (Warning: when used for the protection of persons, dark-coloured fabrics are not detected when window is soiled!).

Average: the average of the measurements over multiple scans is coupled to the response time. That means, if a response time of 200 ms and an average of "**1**" are set, the response time is 200 ms. If an average over 3 scans is selected, the response time is 600 ms.

Formula: Used for setting special parameters (see figure above)

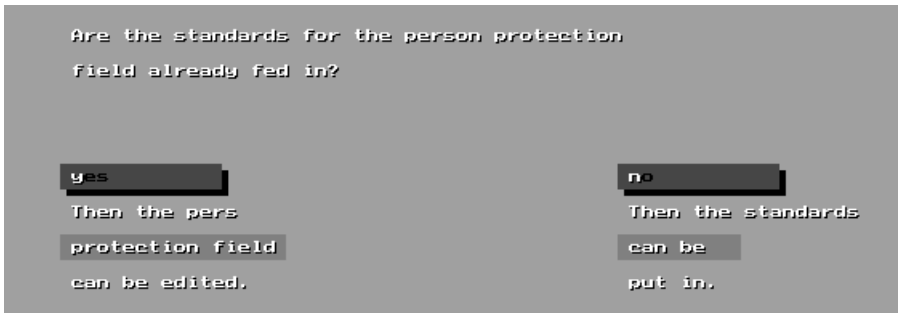
Special parameters

The number of sectors (0.25 degrees) which must be occupied in order for the objects to be detected can be set under "sc-parameters" "**parameter 1**".

"Parameter 1" should not be set higher than "**3**" because then small objects (diameter 70 mm, 1.5 % - remission) up to a distance of max. 4.5 m in the "**personal protection field**" and "**object protection field**" cannot be reliably detected (the default setting is "**1**", sector-width at 4.5 m is approx. 20 mm).

Attention!
If the aforementioned parameter is entered incorrectly, a safety-risk may result (for example: a person is not detected by the rotoScan in time).

5.6 Window "Inquiry for personal protection field"



The window "**Inquiry for personal protection**" is used only to branch to the personal protection field or to enter the default settings.

In the window "**Default settings**", a minimum protection field is calculated from the application values (vehicle width, speed, etc.) in order to ensure that the personal protection field cannot be configured too small. In addition, it is also possible to define the restart type, evaluation process and the personal password in this window.

5.7 Window "Default settings"

Minimum protection field

To ensure adherence to minimum safety-critical values, application-specific data must be entered in the window "**Default settings**".
The program uses these application values to calculate the minimum protection field for the protection of persons.

The minimum protection field (PF depth) is determined from the dimensions of the hazardous machine parts and their speeds. It is calculated using the following formula:

$$PF\ depth = speed\ x\ (response\ time + ctrl.\ delay + braking\ distance)\ x\ 1.1 + error\ margin$$

Value	Significance
speed	maximum speed of vehicle (max. permissible speed: 2.5 m/s) or approach speed of 1.6 m/s in case of a safety field
response time	the response time of the rotoScan RS3 is calculated from the following formula: $response\ time = number\ of\ scans\ x\ 100\ ms\ x\ average\ from\ scans$. **Example:** The safety field should trigger when an average of two out of four successive scans records a detection. For this purpose, the "**number of scans**" must be set to 4 (x 100 ms scanning rate of the RS3) and the "**average from scans**" must be set to 2. The formula above yields a response time of 800 ms.
ctrl. delay	controller response time
braking distance	distance travelled between application of the brake and vehicle coming to a halt
error margin	margin added to the safety field
factor 1.1	margin added to account for possible wear of the brakes

The minimum depth for the area protection is calculated as follows:

$$PF\ depth = 1.6\ x\ (response\ time + ctrl.\ delay + braking\ distance)\ x\ 1.1 + error\ margin$$

The maximum depth of a rectangular safety field for a given lateral separation is limited by the maximum range and is calculated using the following formula:

$$\mathrm{maxdepth} = \sqrt{(\mathrm{maxRange}^2 - \mathrm{edgeDistance}^2)}$$

Value	Significance
maxDepth	maximum possible safety field depth
maxRange	maximum range of 4.5 m
edgeDistance	distance between sensor and edge of the danger area (e.g., vehicle edge in the case of a vehicle)

The calculated minimum protection field is shown as a red contour. The braking distance and the reaction distance are shown in yellow.

Average The average of the measurement values over multiple scans is coupled to the response time. That means, if a response time of 200 ms and an average of "**1**" are set, the total response time is 200 ms. If an average over 3 scans is selected, the total response time is 600 ms.

Methods It is possible here to program different methods to evaluate the measurements.

Method "1": This method is compares the measurements per sector with the programmed protection field contour. If the measurements are over the duration of the response time inside the protection field contour, the outputs are active (the protection field is occupied).

Method "2": Method "2" is used primarily for fixed-rail transfer-cars. (see technical description).

Method "5": The advantage of methods "**5**" and "**6**" is that shiny objects are also reliably detected. Both methods measure the reference-area (e.g. the floor) with adjustable tolerance values. If a different distance is measured in a sector, the protection field switches to "**occupied**".
With method "**5**", an area can be radially monitored. This means that it is possible to monitor not only planar areas, but a room as well.

Method "6": With this method, a reference-area (planar area) can be checked. With the command "**fade out**" it is possible to limit this area to the left and right sides. A detailed description of both methods is available from Leuze electronic.

Frequency channel If you are using several adjacent rotoScans, the measurement values may be corrupted through mutual interference between the units. To avoid this, you should operate neighbouring units on different frequency channels. You may choose from up to 5 channels.

Restart With the setting "**100 ms**", the output contacts are enabled as soon as the personal protection field is clear for a period of at least 100 ms.

Where various applications are used, the personal protection field can be re-enabled only by means of external acknowledgement. The "**Inhibit**" setting is used for this purpose.

Device password To avoid unauthorised overwriting of safety-relevant parameters, the safety officer must define a personal, six-digit password which is entered using the "**RS3_Passw.**" button.

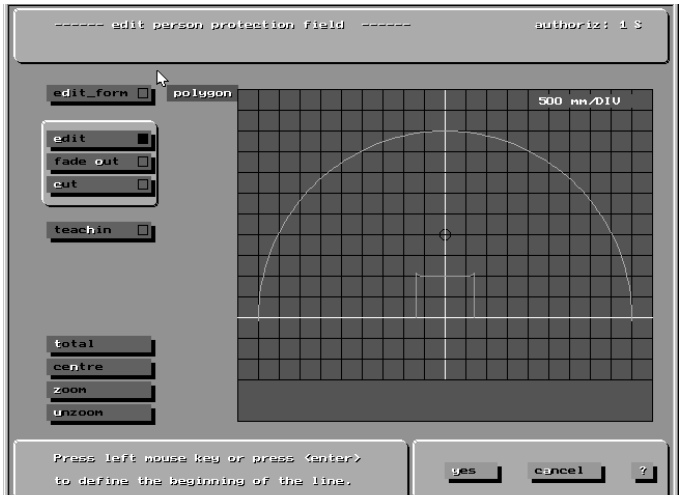
5.8 Definition of protection fields

The two protection fields can be measured, changed or redrawn in the "**Person**" or "**Object**" windows.

In the RS3, measurement values are measured and evaluated in angular increments of 0.25°. For this purpose, the resolution of the personal protection field in the RS3 is increased to 0.25° through interpolation of the 2° corner points. The 2°corner points of an existing protection field contour can be measured with reference to x, y and radial distance and angle to the sensor. (see Chapter 3.3).

The yellow indication circle can be moved with the mouse. The contour is moved in increments of 2° sectors.

The display can be refreshed by clicking the mouse.



To set the section of diagram which is displayed (Zoom), see Chapter 3.3.

5.8.1 Protection field form

Before editing a protection field, the "**edit_form**" button should be used in order to make a preliminary decision as to what form the protection field should take.

The "**polygon**" setting can be used to edit or create polygonal protection fields.

The "**rectangle**" setting resets the protection field contour to the shape of a rectangle and is described by the numerical values of: "**left _mm**", "**right _mm**" and "**front _mm**".

The following selection options provide various methods with which a protection field can be edited.

5.8.2 Editing a polygonal protection field

Using the mouse cursor, a contour point can be moved and, by acknowledging with either the return key or the left mouse button, can be set as the starting point of a line. The cursor is then moved to the end of the line and a thin yellow line is extended to indicate a possible new line. Acknowledge to accept this line as a new contour section.

Double click on the corner points to draw connected lines.

By activating the "**teach in**" button, a protection field (polygon-form) for the current surroundings can be 'trained' (see also technical description). The teaching process can be parameterised in the "**Special functions**" window (the parameters are also applicable for teaching with the hand-held terminal).

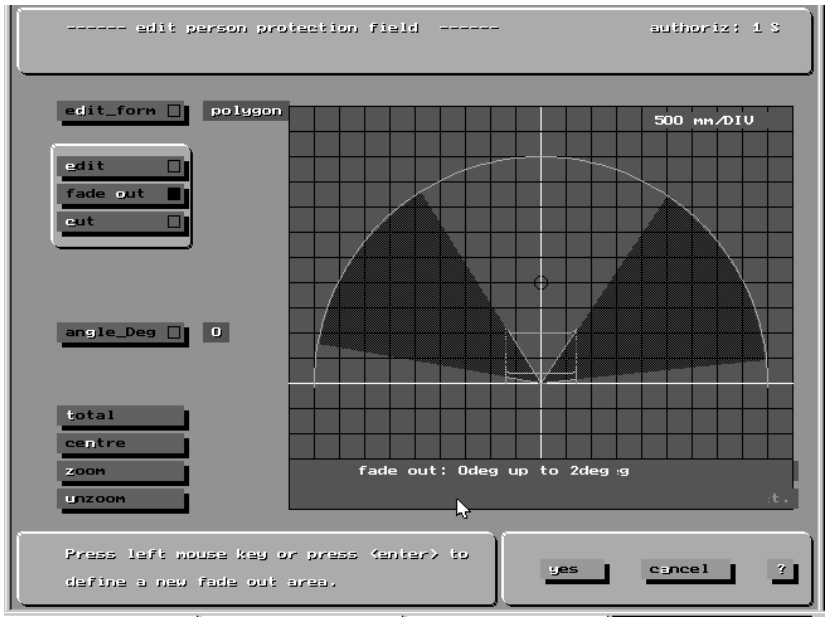
5.8.3 Editing a rectangular protection field

When editing a rectangular protection field (edit_form = rect.), the mouse cursor can be used to define the contour corners, namely the

- left front corner, when the cursor is located in the left half of the diagram
- right front corner, when the cursor is located in the right half of the diagram.

If the corner point is too close to or outside of the yellow boundary contour, the area is marked as red and the error message "**Rectangle protection field is too big**" is displayed.

The "**left _mm**", "**right _mm**" and "**front _mm**" buttons can be used to enter the protection field dimensions from the keyboard.



5.8.4 Fading out sectors

The "**fade out**" button can be used to fade out individual or adjacent sectors.

To do this, move the mouse cursor to the desired sector. Upon acknowledgement, the color of the yellow guide line changes to **red**, marking the starting point of the area to be faded out.

The cursor can now be moved angularly and, as it is moved, spreads a black-shaded area which marks the sectors to be faded out. This sector area is set on acknowledgement. The protection field is then faded out in this area (r = 0).

If the cursor is located in the area to be faded out, the warning message "**fade out sector**" is displayed in the bottom right corner of the diagram.

Sectors which have been faded out can be faded back in by remarking:

- *Place cursor on sector and confirm*
- *Move the cursor (black surface is covered with a dark grey surface)*
- *Acknowledge*

The "**angle**_°" button can be used to set the area from the keyboard.

- *Enter the angle value*
- *Confirm the entry (Return)*
- *Confirm fade-out start (Return)*
- *Enter second angle value*
- *Confirm the entry (Return)*
- *Confirm fade out end (Return)*

5.8.5 Prune safety field

In the "**cut**" selection, the "**left _mm**", "**right _mm**" and "**front _mm**" buttons can be used to limit the protection field to a set value.

Simply enter a limit value in the appropriate button and acknowledge.

5.8.6 Programming the personal protection field

The six-digit password is required to program the personal protection field.

After acknowledging with "**Yes**", the protection field appears again in the control window.

- *If the control display (red background) matches the desired values, acknowledge with "**Yes**".*

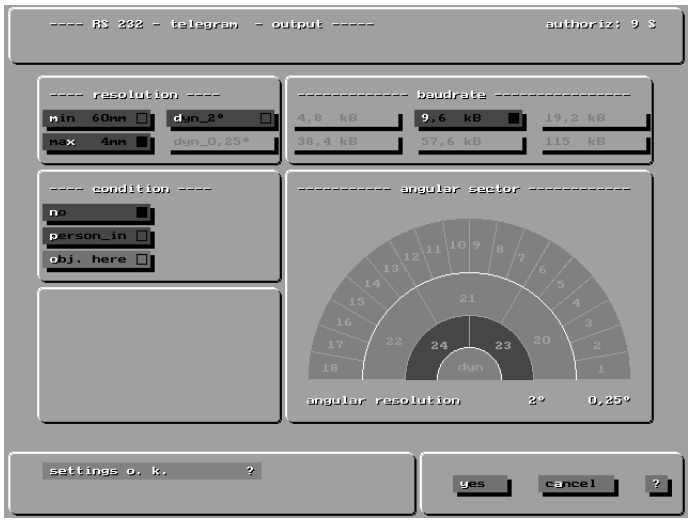
The set protection field contour is saved in the rotoScan as a reference protection field.

Programming the object protection field

For the detection of general objects, an object protection field can be defined with a radius of up to 15 m.

- *Use either an existing protection field or draw a new one; acknowledge with "**Yes**".*

5.9 Window "Config. 232"



The output of the distance data via a serial interface has no influence on the function of the protection field and is required only for additional external evaluation.

Resolution

Normally, the measurement values are transmitted in two bytes in order to achieve a maximum distance resolution of 4 mm.

To reduce transmission time, switch to "**Min 60 mm**", which uses single-byte transmission.

Angular sector

Select partial sectors with the left mouse button.

In this way any segments can be combined.
Segments 1 - 18 are used for transmitting 1/4°-measurement values, segments 20 - 24 are used for transmitting 2°-measurement values.

Condition for output

For monitoring purposes, it can make sense if data are output only if the relevant protection field is violated. For this purpose, the condition "**person_in**" or "**obj._here**" can be switched on.

6 Displaying the Contour of the Environment

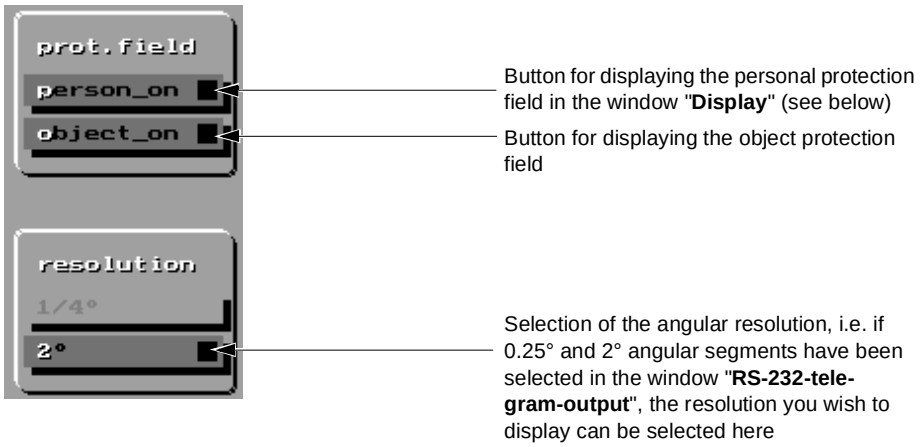
6.1 Window "Set"

Before the current distance measurements are displayed as a permanent contour, a sector can be defined in the window "**Set**". An instantaneous picture of a contour is shown.

The protection fields can optionally be superimposed.

When transmitting angular sectors with different resolutions, the resolution you wish to display must be selected.

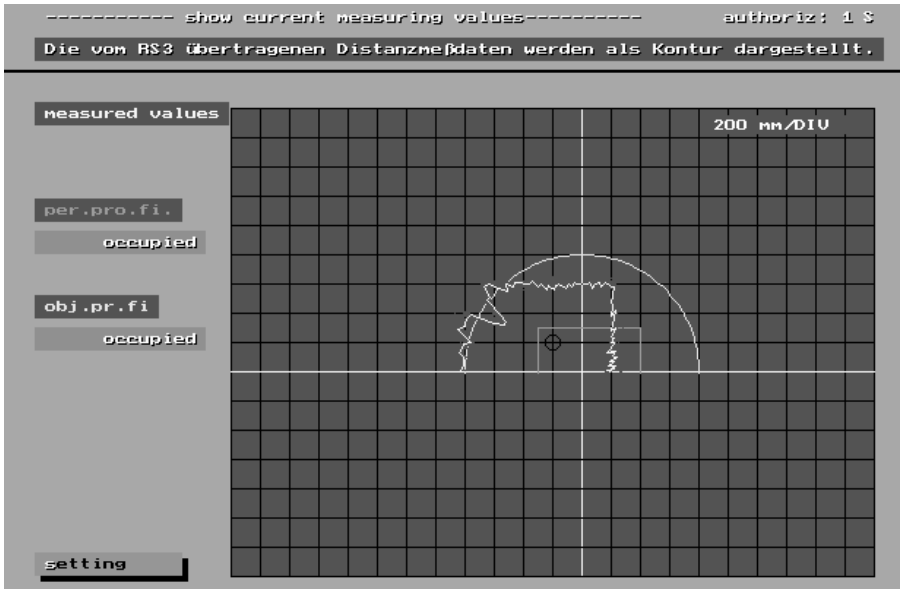
The settings required to view the measured data of the scanner in the window "**Display**" (see below) can be set in the left edge of this window.



By activating the "**Yes**" button, the program switches to the window "**Display**".

6.2 Window "Display"

In this window, the measurement values are shown cyclically with the view chosen in the window "**Set**" (see above).

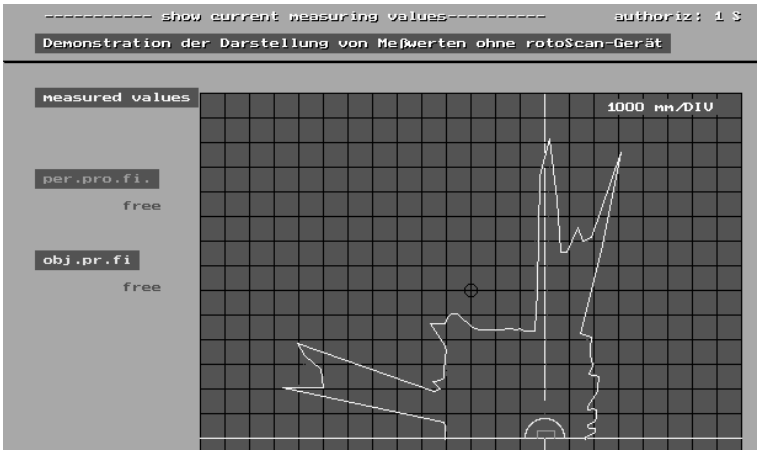


The status of the superimposed protection field is displayed in the top left-hand area of the window.

To change the diagram sector or to measure an instantaneous picture, you can return to the previous window by selecting the "**Setting**" button.

6.3 Window "Display" in demonstration mode

To demonstrate the function of the communication software (without rotoScan), the software can be set to a demonstration mode, i.e. the measurement data which would, in the case of a connected device, usually be sent to the PC via the serial interface, come instead from the hard disk from the file "**DEMO.RS3**". If the RS3 is not connected and the file "**DEMO.RS3**" is present (in the work directory), the communication software switches automatically to the demonstration mode. The title of the button "**Display**" in the window "**Main menu**" then switches to "**Display<Demo>**". The function of this button is, for the most part, identical to that of the button "**Display**" (see above Chapter 6.2).



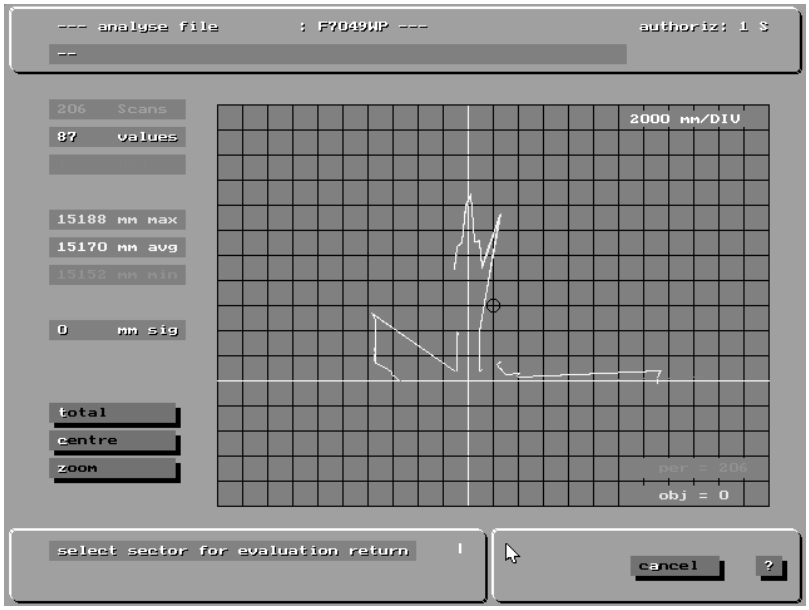
In the window "**Display**", it is also possible to move a virtual object (a boot) into the previously defined protection field (personal and object protection fields on the screen) to demonstrate the messages (see above) which appear as the result of changes in the measurement field. The settings for displaying the measurement values are described in Chapter 6.1. Programming of the protection fields is carried out as described (see Chapter 5.7 and 5.8). Due to the fact that an acknowledgment from the RS3 is missing, the warning messages which appear while saving the protection fields must be ignored. The protection field data are only stored internally in the communication software.

7 Saving and Evaluating Distance Measurement Data

7.1 Window "Save"

The window "File selection" (see Chapter 4.2) leads to the window "**Save**", into which the RS3 measurement values are read and stored in the preselected file until the process is ended with the command "**Cancel**".

7.2 Window "Analyse"



After the first pass, the minimum, maximum and average contours are displayed.

Sector analysis By clicking on a contour point, the statistical data of the selected sector are displayed on the left-hand side.

7.3 Format of the saved data

The data are saved as a text file.

After a brief plain-text comment, the program and device parameters are listed. The measurement data are filed as they were transmitted in the telegram from the rotoScan to the PC (see Chapter 11 in the Operating Manual).

Each scan is divided by the text "**===Scan===**" and the current scan No.

Example

```
Leuze electronic
-------------------------
Configuration data and RS3 parameters
**************************************
Parameters for            : RS3 No. 411002
with authorization        : 6
stored. with KM Version   : KM18plain-text information
Program path              : C:\KM\
Measurement data path     : C:\KM\TEST2.RS3
Serial interface          : COM2
-
-
*********************************   -------------------

--- Param_Part 10: ---
--

999                                 List of parameters
999

---End of Parameter List---          -------------------
===Scan===                          Begin measured data
1                                   with scan no. 1
☺                                   (STX)
é                                   (Data type + 128)
¡                                   (Length + 128)
ä                                   :
ë                                   :
ä                                   user data
è                                   :
ä                                   :
                                    :
                                    :
                                    :
É                                   (status byte)
ÿ                                   (segment no.)
—                                   (check byte)
♥                                   (ETX)
===Scan===                          -------------------
2                                   (scan no. 2)
```

8 Help

Help text is available for the German-language version and can be called up for specific menu items.

8.1 Using help

To view the help text for a given screen button, click the button with the middle mouse button, use "**F1**", or select the "**?**" on the screen.

If the mouse cursor is not located on a button, a general help text for the current window is displayed.

Additional search terms are listed below the displayed help text and can be selected with the mouse.

8.2 Troubleshooting and remedies

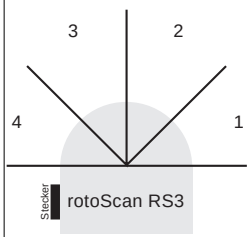
Description	Possible cause(s)	Remedy
General errors		
The mouse cursor moves erratically over the screen	RS3-data are transmitted to the mouse interface	Change PC interface for RS3-data
Transmission error "**no telegram received**"	Connection RS3-PC	Check interface
	Incorrect interface	
	RS3 switched off	Switch on RS3
	Condition set with data output	Check data output in window "**Config. 232**"
Standby-operation	RS3-input "**active**" has not been switched on	Connect Pin X1-14 with Pin 2 ($+U_B$)
Error with the function "Display"		
No contour displayed in window "**Set**"	No data output segment set.	Program a segment in the window "**Config. 232**"
No contour displayed in window "**Display**" and the message "**Data output only with protection field violation**" is displayed.	Condition set with data output	Check data output in window "**Config. 232**"
The window "**Display**" shows only a part of the contour.	Only a part of the area is transmitted.	Check data output in window "**Config. 232**"
		Check resolution in the window "**Set**"
Contour is drawn very slowly.	PC too slow.	Check PC-data in window "PC-config."
	Too many segments chosen for data output.	Window "**Config. 232**"
Error with the function "Select File"		
Message "**No data available**" appears.	Entered path does not exist.	Use different path or file names.
	Entered file does not exist.	
Error with the function "Analyse"		
Message "**Insufficient scans**" appears.	File contains only parameters.	Save the file again.
Only a part of the contour is shown.	Only partial sectors are transmitted.	Check file with "**Get_file**"
	The record was created with an older version of the program.	

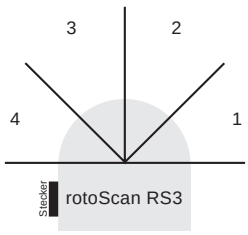
Description	Possible cause(s)	Remedy
Error with the function "Program protection field "		
The minimum protection field is too big.	Incorrect default settings entered	Check in the "**Default settings**" window
The edit window "**Person**" cannot be accessed.	Wall detection is switched on.	Turn off wall detection in the "**Default settings**" window
While programming, the warning message "**Missing password**" appears.	You do not have the required authorisation level.	Enter the password for the required authorisation level in the window "**Password**".

If other, undescribed, errors occur or if you are unable to correct the problems, please contact LEUZE customer service.

8.3 RS3 error codes

In the case of a device fault, the device status with the error code is displayed instead of the distance measurement data.

Error no.	Error description	Remedy
Internal errors		
401	motor revolutions too low	Check the RS3's operating voltage or disconnect the unit from the mains supply and turn it back on again afterwards.
402	motor revolutions too high	
421	did not achieve target number of revolutions	
Errors of the unit's initialization		
1528	operating voltage outside limits	Disconnect the RS3 from the mains supply and switch it back on afterwards.
1530 ... 1533	window sector 1 - 4 dirty	Clean laser window 
1535	RC reference value (value too large)	Contact LEUZE Customer Service
1536	RC reference value (value too small)	
Errors during measurement operation		
2518 ... 2525	operating voltage outside limits	Disconnect the RS3 from the mains supply and switch it back on afterwards.
2600 ... 2614	zero distance measured	Avoid exposure to strong light from other sources and mutual interference of several RS3s.

Error no.	Error description	Remedy
3310 ... 3313	window sector 1 - 4 dirty	Clean laser window 
3328 ... 3331	no detection in sectors 1 - 4	Check window sectors for manipulation by covering.
3333	equipment temperature outside limits	Check the ambient temperature.
Errors during interactive operation		
4007 / 4008	password incorrect	Enter a valid password
4009 ... 4099	transfer error	Check the wiring of the interfaces and the connection between the RS3 and the PC.
4505	object safety field too small	Check the object safety field parameters.
4506	object safety field too large	
4507	distance too large	You have exceeded the maximum scan radius (15 m). Change the configuration.
4508 ... 4599	object safety field	Check the object safety field parameters.
5002	safety fields too small	Check the safety field parameters.
5003	safety fields too large	
5004 ... 5099	parameter check	Check RS3 parameters.

If other error codes occur, or the problems cannot be corrected, you should contact LEUZE Customer Service.