

KUKA Robot Group

KUKA System Technology (KST)

KUKA.XRob RCS

Robot Calibration System

For KUKA System Software (KSS) 5.5

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Other functions not described in this documentation may be operable in the controller. The user has no claims to these functions, however, in the case of a replacement or service work.

We have checked the content of this documentation for conformity with the hardware and software described. Nevertheless, discrepancies cannot be precluded, for which reason we are not able to guarantee total conformity. The information in this documentation is checked on a regular basis, however, and necessary corrections will be incorporated in the subsequent edition.

Subject to technical alterations without an effect on the function.

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1 Introduction

1.1 Target group

This documentation is aimed at users with the following knowledge and skills:

- Advanced KRL programming skills
- Advanced knowledge of the robot controller system
- Advanced knowledge of measuring technology
- Advanced knowledge of sensor systems
- Advanced knowledge of image processing



For optimal use of our products, we recommend that our customers take part in a course of training at KUKA College. Information about the training program can be found at www.kuka.com or can be obtained directly from our subsidiaries.

1.2 Robot system documentation

The robot system documentation consists of the following parts:

- Operating instructions for the robot
- Operating instructions for the robot controller
- Operating and programming instructions for the KUKA System Software
- Documentation relating to options and accessories

Each of these sets of instructions is a separate document.

1.3 Representation of warnings and notes

Safety

Warnings marked with this pictogram are relevant to safety and **must** be observed.



Danger!

This warning means that death, severe physical injury or substantial material damage **will** occur, if no precautions are taken.



Warning!

This warning means that death, severe physical injury or substantial material damage **may** occur, if no precautions are taken.



Caution!

This warning means that minor physical injuries or minor material damage **may** occur, if no precautions are taken.

Notes

Notes marked with this pictogram contain tips to make your work easier or references to further information.



Tips to make your work easier or references to further information.



1.4 Terms used

Term	Description
Hole pattern	Position of the drilled holes
DB	Database
HD = hard disk	Hard drive
Camera frame	A result file when calibrating with the Krypton system
Krypton computer	PC with Krypton software installed
Krypton strober	Distributor for connecting multiple LEDs to a single output
PID data	Parameter identification file of the robot
RDC	Resolver Digital Converter
RCS	Robot calibration system
Tool LEDs	LEDs that are calibrated by the Krypton camera during every cali- bration operation.
Tool locating holes	Tool locating holes are required for measuring the tool with the Krypton camera.
X-Rob	XRob stands for a product family.

1.5 Trademarks

Microsoft is a trademark of Microsoft Corporation. Windows is a trademark of Microsoft Corporation.



2 Product description

2.1 Overview KUKA.XRob RCS

KUKA.XRob RCS is an add-on technology package with the following functions:

Functions

- XRob RCS configuration database for configuration of robot types.
- XRob RCS Wizard for execution of zero mastering and absolute calibration.

2.2 Functional principle

Description

The high-accuracy robot positions the programmed TCP anywhere in the Cartesian workspace with a predefined tolerance. The model parameters of the high-accuracy robot are determined at a calibration station (RCS). They are permanently saved on the robot (RDC).



Fig. 2-1: Positional accuracy

- 1 Setpoint position
- 2 Repeatability
- 3 Positioning of the absolutely accurate robot

Robot calibration (calibration process)	
Zero mastering	During zero mastering, the robot is moved to different poses with a calibration panel mounted. The Krypton camera measures the positions in space of the LEDs on the calibration panel. The axis offsets that are saved on the RDC when the new zero mastering is carried out are optimized.
Absolute calibration	For absolute calibration, the maximum payload is mounted on the robot. Up to 100 axis-specific poses, distributed throughout the workspace of the robot, are measured. These 6D measurements are used to calculate the optimizable parameters of the robot model which are written to the RDC. The quality is



checked in suitable Cartesian poses by means of a verification measurement with the Krypton camera.



- 1 Krypton camera
- 2 Calibration panel
- 3 Robot



- 1 Calibration panel
- 2 Krypton camera





3 Safety

- All persons working with the robot system must have read and understood the robot system documentation, including the safety chapter.
- The positionally accurate robot model is only valid for the robot as delivered.

Following conversion or retrofitting of the robot, e.g. with an arm extension or a new wrist, the robot must be recalibrated.

The robot system with KUKA.XRob RCS must be operated in accordance with the applicable national laws, regulations and standards.





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4 Installation

4.1 Installation overview

Step	Description
1	Check system requirements of the robot controller.
	(>>> 4.2 "System requirements" page 11)
2	Install Microsoft SQL Server Desk- top Engine MSDE.
	(>>> 4.3 "Installing Microsoft SQL Server Desktop Engine" page 11)
3	Install XRob database.
	(>>> 4.5 "Installing XRob.RCS database" page 12)
4	Install KUKA.XRob RCS database configurator.
	(>>> 4.6 "Installing XRob.RCS database configurator" page 12)
5	Install KUKA.XRob RCS Wizard.
	(>>> 4.8 "Installing XRob.RCS Wizard" page 13)

4.2 System requirements

Hardware

- KR C2ed05
- At least 512 MB RAM

Software

- Windows XP operating system
- KUKA System Software (KSS) 5.5
- KUKA.UserTech 2.2
- Microsoft .NET Framework 2.0

4.3 Installing Microsoft SQL Server Desktop Engine

Precondition

- Windows interface
- Local administrator rights
- All Windows applications are closed

Procedure

- 1. Start the program **Setup.exe** from the CD-ROM.
- 2. Reboot the computer. The installation is resumed and completed.

LOG file LOG files are created in the directory C:\PROGRAM FILES\MICROSOFT SQL SERVER\MSSQL\LOG.

4.4 Uninstalling XRob database



It is advisable to archive all relevant data before updating or uninstalling a software package.

Microsoft SQL Server Desktop Engine is installed.

Procedure

- In the Windows Start menu, select Settings > Control Panel > Software and uninstall the Microsoft SQL Server Desktop Engine.
- 2. Delete the folder **MICROSOFT SQL SERVER** in the directory C:\PRO-GRAM FILES.

4.5 Installing XRob.RCS database

Precondition

- Windows interface
- Local administrator rights
- All Windows applications are closed
- Microsoft SQL Server Desktop Engine is installed.

Procedure 1. Start the program Setup.exe from the CD-ROM. The Select Option window is opened.

- 2. Select Configuration database (Config DB).
- 3. Confirm with **Next**.

4.6 Installing XRob.RCS database configurator

Precondition

- Windows XP operating system
- Microsoft .NET Framework 2.0 is installed.
- Windows interface
- Local administrator rights
- All Windows applications are closed

Procedure

- 1. Start the program **Setup.exe** from the CD-ROM. The **Select Option** window is opened.
- 2. Select Database configurator.
- 3. Confirm with Next.
 - The program is installed under C:\KUKA\XROB_RCS\CONFIGGUI.

4.7 Uninstalling XRob.RCS database configurator



It is advisable to archive all relevant data before updating or uninstalling a software package.

Precondition

- Windows interface
- KUKA.HMI is switched off.
- KUKA.XRob RCS database configurator is installed.
- Procedure
- 1. Select the folder **Database configurator** in the directory **C:\KU-KA\XROB_RCS**.

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2. Delete the folder.

4.8 Installing XRob.RCS Wizard

Precondition

- Windows interface
- KSS 5.5
- KUKA UserTech 2.3 is installed
- Local administrator rights
- All Windows applications are closed.
- The network connection is established

Procedure

1. Start the program **Setup.exe** from the CD-ROM.

- The Select Option window is opened.
- 2. Select Install XRob RcsWizard.
- Confirm with Next.
 The program is installed under C:\KUKA\KRC\TP\XROB_RCS.

4.9 Uninstalling XRob.RCS Wizard

It is advisable to archive all relevant data before updating or uninstalling a software package.

Precondition

- Windows interface
- KUKA.HMI is switched off.
- KUKA.XRob RCS is installed.

Procedure

- Start the UnInstall.exe program in the directory C:\KRC_OPTION\XRO-BRCS\UNINST.
 - 2. Reboot the robot controller. Uninstallation is resumed and completed.

4.10 Re-installing XRob.RCS Wizard

Precondition

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- Windows interface
- Local administrator rights
- All Windows applications are closed
- KUKA.HMI is switched off
- KUKA.XRob RCS is uninstalled.

Procedure 1. Start the ReInstall.exe program in the directory C:\KRC_OPTION\XRO-BRCS\REINST.

2. Reboot the robot controller. Reinstallation is resumed and completed.

LOG file A LOG file is created under C:\KRC\ROBOTER\LOG.





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5 Configuration

5.1 Configuration overview

Step	Configuration steps
1	Open database configurator
	<pre>(>>> 5.2 "Opening the database configurator" page 15)</pre>
2	Enter tool data
	(>>> 5.3.1 "Entering tool data" page 16)
3	Enter load data
	(>>> 5.3.2 "Entering load data" page 17)
4	Enter base data
_	(>>> 5.3.3 "Entering base data" page 19)
5	Enter robot type data
	(>>> 5.3.4 "Entering robot type data" page 20)
6	Enter robot data
	(>>> 5.3.5 "Entering robot data" page 21)
1	Enter pose data
	(>>> 5.3.6 "Entering pose data" page 22)
8	Edit tool data
	(>>> 5.4.1 "Editing tool data" page 23)
9	Edit load data
10	(>>> 5.4.2 "Editing load data" page 23)
10	Edit base data
44	(>>> 5.4.3 "Editing base data" page 24)
11	Edit robot type data
10	(>>> 5.4.4 "Editing robot type data" page 24)
12	
10	(>>> 5.4.5 "Editing robot data" page 24)
15	
14	(>>> 5.4.6 "Editing pose data" page 24)
14	
15	(>>> 5.5.1 "Creating a new configuration" page 25)
15	
	(>>> 5.5.2.1 "Selecting a configuration" page 26)
16	(>>> 5.5.2.2 "Modifying a configuration" page 27)
10	Configure RCS Wizara
	(>>> 5.6 "Configuration file XROBCONFIG.XML" page 27)

5.2 Opening the database configurator

Procedure

- 1. Start DB Configurator.exe.
- 2. The XRob RCS database configurator opens.



- Select the menu sequence Database > Open.
 The data linking properties window is opened.
- 4. Enter server name, user name and password.
- 5. Select database on the server. Confirm with **OK**.

5.2.1 Saving settings

Procedure

Description Saving settings of the data linking properties window.

 Open the file DBKonfigurator.config in the directory C:\KU-KA\XRob Rcs\ConfigGUI.

2. In this file, carry out the settings for the server, user, password and database.

```
<!-- SQL Server or MSDE configuration -->
<add key="DBHost" value="PCRC..." />
<add key="DBUser" value="xrob..." />
<add key="DBPasswd" value="xrob..." />
<add key="DBName" value="Messplatz..." />
```

3. Select the menu sequence File > Save and close the file.

5.3 Entering data in the database configurator

5.3.1 Entering tool data

Description The tool data contain the following information: The measurement results of the mechanical calibration of the tool holes. The measurement results of the optical calibration of the LEDs with the Krypton system. The specification of the mass of the tool, flange adapter and panel, without a supplementary load, relative to the flange. The specification of the center of mass of the tool, flange adapter and panel, without a supplementary load, relative to the flange. Precondition The coordinates of the tool LEDs are known and are stored in a file with the extension .tl. The coordinates of the tool locating holes are known. The mass and center of mass of the tool are known. Procedure 1. Select the menu sequence **Data** > **New** > **Tool**. The input window is opened. 2. Enter an unambiguous designation for the tool in the **Designation** box. 3. Enter a comment in the **Comment** box (optional). 4. Load the coordinates of the tool LEDs by means of the File button. 5. Enter the coordinates of the tool locating holes manually. Click into the box under X, Y, Z. <edit> appears. Enter the values for X, Y, Z from the calibration log of the coordinate measuring machine. 6. Enter the mass of the tool in kg in the Mass box. 7. Enter the coordinates for X, Y, Z in mm in the boxes for the center of mass. 8. Confirm with OK. A message window is opened.

9. Confirm the message with Yes.

The data are updated in the database.

Rob RCS	S database configurat	tor			2
ate tool o	onfiguration				K
al un ambras	122122				
a rianoei	123123				
cription	Konfig Test				
ordinates of the	e tool LED:				
LED no		×[mm]	Y [mm]	Z [mm]	
1		-26,198	395,754	11,656	
2		395,743	396,155	11,861	
3		-25,884	-25,464	14,475	
4		395,876	-25,789	15,228	
5		185,471	184,814	132,207	
Fie					
File	e tool locating holes			77.1	
File	e tool locating holes	Y [mm]		Z [mm]	
File dinates of the X [mm] 250.000	e tool locating holes	Y [mm] 90,000		Z [mm] 300.000	
File dinates of the X [mm] 250,000	e tool locating holes	Y [mm] 80.000		Z [mm] 300.000	
File dinates of the X [mm] 250,000	e tool locating holes	Y [mm] 90,000		22 [mm] 300,000	
File dinates of the X [mm] 250,000	e tool locating holes	Y [mm] 90.000		Z (mm) 300.000	
Fie dinates of the X (mm) 250,000	e tool locating holes	Y [mn] 80.000		Z [mm] 300.000	
Fie dinates of the X [mm] 250.000	e tool locating holes	Y [mm] 80.000		2 [mm] 300,000	
Fie dinates of the X (mm) 250.000	e tool locating holes	Y [mm] 90.000		Z (mm) 300.000	
Fie dinates of the X [mm] 250,000	e tool locating holes	Y [mm] 80.000		Z (mm) 300.000	
File dinates of the X (mm) 250.000	e tool locating holes	Y [mm] 80,000		2 [mm] 300.000	
Fie Ginates of the X (mm) 250.000	e tool locating holes	Y [mm] 90,000		2 [mm] 300.000	
Fie	e tool locating holes	Y [mm] 80.000		Z [mm] 300.000	
Fie	e tool locating holes	Y [mm] 80.000		Z (mm) 200.000	

Fig. 5-1: Entering the tool data

5.3.2 Entering load data

Description

The load data are factored into the calculation of the paths and accelerations and help to optimize the cycle times.

Various loads can be mounted on the robot:

- Payload on the flange
- Supplementary load on axis 3
- Supplementary load on axis 2
- Supplementary load on axis 1

All loads added together give the overall load.



There is a payload diagram for every robot. It can be used to check quickly whether the payload could be suitable for the robot. The diagram is not, however, a substitute for checking the payload with KUKA.Load.



Fig. 5-2: Loads on the robot

1 Payload

2

- Supplementary load on axis 3 4
- Supplementary load on axis 2
- 4 Supplementary load on axis 1

Parameters

The load data are defined using the following parameters:

Parar	Unit	
Mass	m	kg
Distance to the center of gravity	L _x , L _y , L _z	mm
Mass moments of iner- tia at the center of gravity	I _{xx} , I _{yy} , I _{zz}	kg m ²

3

Reference systems of the X, Y and Z values for each load:

Load	Reference system
Supplementary load	ROBROOT coordinate system
A1	A1 = 0°
Supplementary load	ROBROOT coordinate system
A2	A2 = -90°
Supplementary load	FLANGE coordinate system
A3	A4 = 0°, A5 = 0°, A6 = 0°
Payload	FLANGE coordinate system

Precondition

 The mass and center of mass of the tool are known from the supplementary load data.

Procedure

 Select the menu sequence Data > New > Load. The input window is opened.

- 2. Enter an unambiguous designation for the load in the **Designation** box.
- 3. Enter the total mass in kg in the **Mass** box.
- 4. Enter the coordinates in mm in the boxes for the center of mass.
- 5. Confirm with **OK**.

A message window is opened.

6. Confirm the message with **Yes**.

The data are updated in the database.

E KUKA XRob RCS database configurator	-	_ 🗆 🔀
XRob RCS database configurator Create load configuration		KUKA
Designation Konfig Text		
Mass kg		
Center of mass: X mm Y mm Z mm		
OK		Cancel

Fig. 5-3: Entering the load data

5.3.3 Entering base data

Description	The	e base data contain the following:
	•	The coordinates for the reference LEDs on the baseplate of the calibration station.
	1	The coordinate transformation between the Krypton camera and the robot base.
Precondition	•	The coordinates of the reference LEDs of the baseplate are known and are stored in a file with the extension .prb.
	•	The camera frame is known and is stored in a file with the extension .txt.
Procedure	1.	Select the menu sequence Data > New > Base .
		The input window is opened.
	2.	Select the suitable hole pattern for the robot.
	3.	Select the relevant mounting plate in the Mounting plate box. If there is no suitable mounting plate, create a new mounting plate. Press the New button. Specify a location for the mounting plate. Confirm with OK .
	4.	Select a calibration station in the Calibration station box. If there is no suitable calibration station, create a new calibration station. Press the New button. Specify a calibration station name. Confirm with OK .
	5.	Load the coordinates of the LEDs, e.g. LEDs.prb, by means of the File button.



Load the camera frame, e.g. Camera.txt, by means of the **File** button.

- 6. Confirm with **OK**.
- A message window is opened.
- 7. Confirm the message with Yes.

The data are updated in the database.

KUKA XRob RCS data	ibase configurator					e	
XRob RCS datal Create base configur	base configurato	or					KUK 2
Hole pattern name KR125	5					0K.	Cancel
••••							
Mounting plate Boder	r					Add	Cancel
Calibration station Messe	slatz 2				•	Add	Cancel
Coordinates of the LEDs							
LED no		× [mm]	Y [mr	1	Z [mm]		
▶ 1		-321,859	551,5	88	-38,118		
3		319,118	-555,0	54	-38,395		
Camera frame							
No.	×[mm]	Y [mm]	Z [mm]	A [deg]	B [deg]	C [deg]	
▶ 1	4,452	-966.058	-5128,956	174,705	-58,231	94,418	
Fie							
						ОК	Cancel

Fig. 5-4: Entering the base data

5.3.4 Entering robot type data

Description

The robot type data consist of the following data sets:

Robot type

- Payload group
- Hole pattern name

The hole pattern is available.

Precondition

Procedure

1. Select the menu sequence **Data** > **New** > **Robot type**.

The payload group and the hole pattern name are known.

- 2. Enter an unambiguous name in the **Robot type** box.
- 3. Select the relevant payload group in the **Payload group** box. If there is no suitable payload group, create a new payload group. Press the **New** button. Enter the new payload group name. Confirm with **OK**.
- 4. Select the relevant hole pattern. The corresponding hole pattern name is displayed in the **Hole pattern name** box.
- 5. Confirm with **OK**.
 - A message window is opened.
- 6. Confirm the message with **Yes**.

The data are updated in the database.





Fig. 5-5: Entering robot type data

5.3.4.1 Creating a new hole pattern

Description If there is no suitable hole pattern available, a new one must be created.

Procedure1. Create the hole pattern in a graphics program and save it as a bitmap
(bmp) with a resolution of 96 dpi and a size of 70x70 pixels.

- 2. Open the folder **Picture** in the directory C:\KUKA\XROB_RCS\CONFIG-GUI.
- 3. Copy the hole pattern to the folder.
- 4. Close the folder.

5.3.5 Entering robot data

Description

The robot data consist of the following data sets:

- Payload group
- Robot type

The robot type designates the basic machine type and payload, without taking an arm extension into consideration.

- Arm extension
- Installation type
- Machine data directory
- Transformation name

Precondition

The machine data are stored on the computer or network.

Procedure

- 1. Select the menu sequence **Data** > **New** > **Robot data**.
- 2. Select the relevant payload group in the **Payload group** box.
- 3. Select the created robot type in the **Robot type** box.



- 4. Select the arm extension in the **Arm extension** box. If there is no suitable arm extension, create a new arm extension. Press the **New** button. Specify a name for the arm extension. Confirm with **OK**.
- 5. Select the relevant installation type in the **Installation type** box. If there is no suitable installation type, create a new installation type. Press the **New** button. Confirm with **OK**.
- 6. Load the corresponding robcor.dat in the **Directory path: robcor.dat** box. Press the **File** button. Select the corresponding robcor.dat in the machine data and confirm with **Open**.

The transformation name is displayed.

7. Confirm with **OK**.

A message window is opened.

8. Confirm the message with Yes.

The data are updated in the database.

KUKA XRob RCS database	configurator		🛛
XRob RCS database Create robot configuration	to e configurator		KUKU 2
Payload group	Hohe Traglast (100 kg bis 240 kg)		
Robot type	KR 5 six R850		
Arm extension	av 0	Add	Cancel
Installation type	Boden	Add	Cancel
Directory path: robcor.dat		Fie	
Transformation name			
		OK	Cancel

Fig. 5-6: Entering robot data

5.3.6 Entering pose data

Description	A pose set defines all the poses that are used for a calibration type for one ro- bot type.								
Precondition	 The system test poses, calibration poses and test poses are known and stored in a KRL.DAT file. 								
	 The poses have been tested for collisions and visibility. 								
Procedure	 Select the menu sequence Data > New > Poses. 								
	2. Enter a name in the Pose set name box.								
	3. Load the system test poses, e.g. SPoses.dat, by means of the File button.								
	4. Load the calibration poses by means of the File button.								
	5. Load the test poses by means of the File button.								
	 Set the measurement tolerance. Select one of the system test poses. Set the value in the Tolerance sphere radius box. Press the Apply button. 								

- 7. Repeat step 6 for the calibration poses and test poses.
- 8. Confirm with **OK**.
- A message window is opened.
- 9. Confirm the message with Yes.

The data are updated in the database.

	pose configuration	,							К	U
ose set name	Konfig Test						Tolerance	sphere radius	1,0 mm Ap	рł
ystem test po	ses									
No.	A1 [deg]	A2 [c	ieg]	A3 [deg]	A4 [deg]	A5 [deg]	A6 [ieg]	Tol. Sphere (mm)	
• 1	-27,754	-126,	656	141,447	0,000	0,000	0,000)	1,000	
2	-29,029	-81,0	00	140,000	1,167	-43,000	-80,0	00	1,000	
3	-32,233	-61,5	20	88,550	42,000	-3,000	-84,0	00	1,000	
4	-24,433	-82,9	00	116,259	6,020	-15,480	-83,8	20	1,000	
5	-95,687	-117,	360	119,000	68,569	85,140	-253,	940	1,000	
0	-30,311	-99,1		112,001	Tersret	30,004	-32,0		1,000	
• 1	-40,000	-00,0	w	30,000	0,000	-23,000	0,00	J	1,000	
•	40000	-50,0		30,000	0,000		0,00	U	1,000	
File	Pose generator			30000				U		
File	Pose generator	Yimal	2 [mo]	Aldeol	B (dec)	Cideol	Stiet1	J T first	Tel Schere Immi	
File est poses No.	Pose generator	Y [mm]	Z [mm] 849 994	A [deg]	B (deg)	C [deg]	S [int]	J T [int] 27	Tol Sphere [mm]	
File est poses No. 2	Pose generator X [mm] 1439.991 1499.992	Y [mm] 399,999 400.002	Z [mm] 849,994	A [deg] 0.000	B [deg] 90.000 90.000	C [deg] 0,000 0,000	5 (int) 6	T (int) 27 50	Tol. Sphere [mm] 1.000	
File est poses No. 2 3	Pose generator X [mn] 1459.391 1459.392 1459.391	Y [mm] 339,999 -400,002 339,936	Z [mm] 849.994 949.993	A [deg] 0,000 0,000 0,000	B [deg] 90,000 90,000 90,000	C [deg] 0,000 0,000 0,000	5 (int) 6 6	T (int) 27 50 27	Tol. Sphere [mm] 1,000 1,000	
File est poses No. 1 2 3 4	Point generator X [mm] 1459.591 1459.591 1459.591 1459.591 1459.591 1459.591 1459.591 1459.591	Y [mm] 339,999 400,002 339,996 400,003	Z [mm] 849,994 849,994 949,992	A [deg] 0.000 0.000 0.000 0.000	8 [deg] 90,000 90,000 90,000 90,000	C [deg] 0.000 0.000 0.000	5 (int) 6 6 6 6	T (int) 27 50 27 50	Tol Sphere [mm] 1,000 1,000 1,000	
File File No. 1 2 3 4 5	Pose generator X (mm) 1493.992 1493.992 1493.991 1493.992 1493.992 1493.992 1493.992 1493.992	Y [mm] 339,999 400,002 339,956 400,003 339,956	Z [mm] 849.994 949.993 949.993 949.992 849.990	A [deg] 0.000 0.000 0.000 0.000 0.000	8 [deg] 90,000 90,000 90,000 90,000 90,000	C [deg] 0.000 0.000 0.000 0.000	5 [int] 6 6 6 6 6	T [int] 27 50 27 50 27 50	Tol Sphere [mm] 1,000 1,000 1,000 1,000	
File File No. 1 2 3 4 5 6	Poice generator X (sm) 1493.991 1493.992 1493.992 1493.992 1493.992 1493.992 1493.992 1493.992 1493.993 1493.994	Y [mm] 339,999 400,002 339,998 400,003 339,998 400,003	Z [mm] 849.994 949.993 949.992 849.990 849.988	A [deg] 0.000 0.000 0.000 0.000 0.000 0.000 0.000	B [deg] 90,000 90,000 90,000 90,000 90,000 90,001	C [deg] 0.000 0.000 0.000 0.000 0.000 0.000	S (int) 6 6 6 6 6 6 6	T [int] 27 50 27 50 27 50 27 50	Tol Sphere [mm] 1.000 1.000 1.000 1.000 1.000 1.000 1.000	

Fig. 5-7: Entering poses

5.4 Editing data

5.4.1 Editing tool data

Precondition

Procedure

Procedure

- The tool data have been entered and updated in the database.
- Select the menu sequence Data > Open > Tool. The input window is opened.
- 2. Select the tool to be modified in the Serial number box.
- 3. Modify the desired tool data.
- 4. Confirm with **OK**.
- A message window is opened.
- 5. Confirm the message with **Yes**.

The data are updated in the database.

5.4.2 Editing load data

- **Precondition** The load data have been entered and updated in the database.
 - Select the menu sequence Data > Open > Load. The input window is opened.
 - 2. Select the load to be modified in the **Designation** box.
 - 3. Modify the desired load data.



- 4. Confirm with **OK**.
 - A message window is opened.
- Confirm the message with Yes.
 The data are updated in the database.

5.4.3 Editing base data

Precondition The base data have been entered and updated in the database.

Procedure1. Select the menu sequence Data > Open > Base.The input window is opened.

- 2. Modify the desired base data.
- 3. Confirm with **OK**.
 - A message window is opened.
- 4. Confirm the message with **Yes**. The data are updated in the database.

5.4.4 Editing robot type data

Precondition The robot type data have been entered and updated in the database.

Procedure

- Select the menu sequence Data > Open > Robot type. The input window is opened.
- 2. Select the robot type to be modified in the **Robot type** box.
- 3. Modify the desired robot type data.
- 4. Confirm with **OK**.
 - A message window is opened.
- Confirm the message with Yes.
 The data are updated in the database.

5.4.5 Editing robot data

Precondition The robot data have been entered and updated in the database.

Procedure

Procedure

- Select the menu sequence Data > Open > Robot data. The input window is opened.
- 2. Modify the desired robot data.
- 3. Confirm with **OK**.
 - A message window is opened.
- 4. Confirm the message with **Yes**.
 - The data are updated in the database.

5.4.6 Editing pose data

- **Precondition** The pose data have been entered and updated in the database.
 - Select the menu sequence Data > Open > Poses. The input window is opened.
 - 2. Select the pose set to be modified in the Pose set name box.
 - 3. Modify the desired pose data.

- 4. Confirm with **OK**.
 - A message window is opened.
- Confirm the message with Yes.
 The data are updated in the database.

5.5 Configuring robot types

5.5.1 Creating a new configuration

Precondition • All data have been entered and updated in the database.

Procedure

Select the menu sequence Configuration > New. The "Robot type and calibration station" tab is opened.

- 2. Enter an unambiguous name in the **Designation** box.
- 3. Enter a comment in the **Comment** box (optional).
- 4. Select the calibration type in the **Calibration type** box.
- 5. Activate **Configuration active**. Active configurations are now available for selection in the RCS Wizard.
- 6. Select the desired payload group in the Payload group box.
- 7. Select the corresponding robot in the **Robot type** box.
- 8. Select the desired arm extension in the Arm extension box.
- Select the relevant installation type in the Installation type box.
 The corresponding directory path and transformation name are displayed.
- 10. Select the desired calibration station in the **Calibration station** box.
- 11. Select the corresponding mounting plate in the **Base** tab.

The hole pattern name, hole pattern, coordinates of the LEDs and the camera frame are displayed.

- 12. Select the corresponding load in the **Designation** box on the **Load** tab.
- 13. Select the corresponding pose in the **Pose set name** box on the **Poses** tab.
- 14. Select the corresponding tool in the Serial number box on the Tool tab.
- 15. Select the relevant model in the **Configuration name** box on the **Model** tab.
- 16. Confirm with **OK**.

A message window is opened.

17. Confirm the message with Yes.

The data are updated in the database.



base Data Configuration	Info	
Rob RCS databa reating a new configu	se configurator ration	
signation Konfig Test	Comment	
bration type Absolutiverme	ssung 🔽 🔽 Configuration active	
sbot type and calibration stat	on Base Load Poses Tool Model	
ayload group	Hohe Traglast (100 kg bis 240 kg)	
Robot type	KR200 comp	
km extension	AV 400	
stallation tune	Rodan	
Vice the state of the DA File		
rectory pain or MADA file	[MADAIKRC2/KR200_CPPICT400FL00R	
ransformation name	#KR200L140_CPT S C2 FLR ZH04	
Calibration station	Messplatz 2	

Fig. 5-8: Creating a new configuration

5.5.2 Editing a configuration

5.5.2.1 Selecting a configuration

Procedure

1. Select the menu sequence **Configuration > Open**.

2. Only active configuration activated. Only active configurations can be selected.

Only active configuration not activated. All configurations can be selected.

- 3. Select the desired calibration station in the Calibration station box.
- 4. Select the desired calibration type in the **Calibration type** box.
- 5. Select the desired robot type in the **Robot type** box.
- 6. Select the configuration to be modified in the **Configuration** box.
- 7. Confirm with Apply.

The "Robot type and calibration station" tab is opened.



	detekses souffermeter	7
ROD RCS	catabase contiguration for editing	
root campran	on station configuration for during	K
only active conf	fourations	
ilibration station	Messplatz 8	
libration type	Absolutvermessung	
bot type	KR200-2 some	
infiguration	KR200L170-2comp Abs	

5.5.2.2 Modifying a configuration

Precondition

- New data have been entered.
- A configuration for a robot type and calibration station has been selected.

Procedure

- 1. Modify the load in the **Designation** box on the **Load** tab.
- 2. Modify the mounting plate in the **Mounting plate** box on the **Base** tab.
- 3. Modify the poses in the **Pose set name** box on the **Poses** tab.
- 4. Modify the tool in the **Serial number** box on the **Tool** tab.
- 5. Modify the model in the **Configuration name** box on the **Model** tab.
- 6. Confirm with **OK**.

A message window is opened.

7. Confirm the message with **Yes**.

The data are updated in the database.

5.6 Configuration file XROBCONFIG.XML

 Description
 In order to be able to exchange data between the computers, links must be entered in the XRobConfig file.

 The configuration file XROBCONFIG.XML is situated, after installation of KU-KA.XRob RCS, in the directory ...\KRC\TP\XROB_RCS\UTIL.

 To edit XROBCONFIG.XML, the file must be opened in edit mode.

 Precondition
 RCS Wizard is installed.

 Windows interface

 Procedure
 1. Open the file XRobConfig in the directory C:\KRC\TP\XROB_RCS\UTIL using the editor.

 2. Modify the following entries in the file:

Issued: 05.03.2008 Version: LastRecentFinal en

```
<General>
 <StationId>Messplatz 8</StationId>
</General>
<RcsAssistent>
<!-- location of main MADA directory -->
<MaDaRootDir>\\pcrc40382 3\RCS\MachineData</MaDaRootDir>
<!-- location of used KRL programs-->
<KRLProgramDir>KRC:\R1\Program</KRLProgramDir>
<!-- location for XPId file output -->
<XPIdOutputDir>C:\KRC\Roboter\IR Spec</XPIdOutputDir>
</RcsAssistent>
<LanguageDatabaseLocation>C:\krc\tp\XRob_Rcs\Data\XRobLang.mdb</Lan-
guageDatabaseLocation>
<!-- current set language for xrob -->
<CurrentLanguage>de-DE</CurrentLanguage>
<ConfigDB>
<!--network name or ip adress where database server is hosted, "lo-
calhost"
is for local system -->
<DbHost>pc40367</DbHost>
<!-- name of the database -->
<DbName>MessplatzDB</DbName>
<!-- default user name for database acces -->
<User>xrob user</User>
<!-- default password for default database user -->
<Password>xrob user</Password>
<ResultDB>
<!-- network name or ip adress where database server is hosted, "lo-
calhost" is for local system-->
<DbHost>pc40367</DbHost>
<!-- name of the database -->
<DbName>resultdb</DbName>
<!-- default user name for database acces -->
<User>Name</User>
<!-- default password for default database user -->
<Password>testpas</Password>
</ResultDB>
. . .
<KryptonWorkingDir>\\pc40367\Austausch\rocal\bin</KryptonWorkingDir>
<KryptonRemoteHost>pc40367</KryptonRemoteHost>
<ShellLocation>C:\Windows\system32\cdm.exe</ShellLocation>
<IstFileName>C:\KRC\ROBOTER\IR SPEC\Messdaten.ist</IstFileName>
```

Entry	Description
<stationid></stationid>	Calibration station created in the base data.
<madarootdir>Dir></madarootdir>	Machine data path.
<xpidoutputdir>putDir></xpidoutputdir>	Path of the file ErgebnisXRob.pid. The evaluation results are saved here.
<languagedatabaseloca- tion>cation></languagedatabaseloca- 	Path for the language database. This modification is optional.
<currentlanguage>Language></currentlanguage>	Language setting in the language database. This modification is optional.
<dbhost></dbhost>	Server name.

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Entry	Description
<dbname></dbname>	Database name
<user></user>	Predefined user name. This modi- fication is optional.
<password></password>	Predefined password. This modi- fication is optional.
<kryptonworkingdir>tonWorkingDir></kryptonworkingdir>	Path specification for the working directory of the Krypton software.
<kryptonremotehost>tonRemoteHost></kryptonremotehost>	Name of the Krypton computer.
<shelllocation>tion></shelllocation>	Path specification of CMD.exe on the Krypton computer. This modi- fication is optional.
<istfilename></istfilename>	Path for the results database

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6 Operation

6.1 Zero mastering with the RCS Wizard

Precondition

- Krypton RemoteControl.exe is started on the Krypton computer.
- The data have been entered and updated in the database.
- A configuration has been created and updated in the database.
- The network connection is established.
- Operating mode T1 or T2.

Procedure 1. Start the KUKA System Software (KSS) 5.5.

- 2. Select the menu sequence Monitor > XRob RCS > Show.
- 3. Press the **Next** softkey.

A prompt window is displayed.

- 4. Select the calibration type. Press the **Zero mastering** softkey. The configuration window is displayed.
- 5. Select the data from the created configuration in the boxes **Payload** group, Robot type, Arm extension, Installation type and Mounting platform.

File	E	dit	Configure	Monitor	Setup	Com	mands	Technology) H	elp	
	Payload gr	roup		Hohe Traglast (1	00 kg bis 240	kg)					
*	Robot typ	e	I	KR200 comp							
~	Arm exten	ision	I	AV 400			-				
	Installation	n type	I	Boden							
	Mounting ;	platform	I	Boden							
	C Time	no.	Source Me	sage						i I	
	10:08:	250	Inc	prrect servo parar	neter A4						
	10:08:	250	Inc	prrect servo paran	neter A5						
MODE	10:08:	250		orrect servo parar	neter A6				_		
	Sum Can	S I B		ob version not rele	ascu:,	T1 POV	/ 100%	BName	1-34 PM	Select	
MEAS	Tab +					< Back	Next:	>>	Close	1/1	

Fig. 6-1: Selecting a configuration

- 6. Press the Next softkey.
- 7. Enter the robot serial number in the prompt window.
- Press the Next softkey. The configuration name, the comment and the robot serial number are displayed.
- 9. Press the Next softkey.
- A message window is displayed.
- 10. Press the **Next** softkey to confirm the message.

The "Tool mounting" prompt window is displayed.

- 11. Follow the prompt.
- 12. Press the Next softkey.

The "Unmaster robot" prompt window is displayed.

13. Unmaster the axes.



Further information is contained in the operating and programming instructions for the KUKA System Software (KSS).

14. Press the Next softkey.

The "Master robot in home position" prompt window is displayed.

15. Master the robot.



Further information is contained in the operating and programming instructions for the KUKA System Software (KSS).

16. Press the Next softkey.

The "Test measurement for robot type check" prompt window is displayed.

17. Press the Next softkey.

The program for checking the robot type is displayed.

18. Set mode selector switch to Automatic mode. Start the program. Once program execution has been completed, the result is displayed.



On completion of the control measurement, a message window is displayed. **System ready for measurement** must be highlighted in green. If this is not the case, an error has occurred. (>>> 8.1 "Causes of errors during the test measurement" page 43)

19. Press the Next softkey.

The "Carry out mastering" prompt window is displayed.

 Start the program. Once program execution has been completed, the results are displayed.

F	ile	Program	Configure	Mor	nitor S	etup	Comr	nands	Techno	ology H	elp
	RCS			Result of	f mastering (calibratio	on				100% ())
×		A	xis 1:	-0,0064	• ,	Axis 4:	-	0,0088	۰		
		A	dis 2:	0,0239	° /	Axis 5:		0,0048	۰		
		A	ds 3:	-0,0294	° ,	Axis 6:		0,0722	٥		
	C Time 10:08:.	no. 250	Source Mes	ssage prrect servi	o parameter A4					<u> </u>	
	10:08:.	250 250	Inco	prrect servi prrect servi	o parameter A5 o parameter A6						\square
MODE	(i) 1:31:5. Num Ca	12	XRob XRo B	ob version	not released!,	Aut	POV	100%	RNam	• 1:42 PM	Select
MEAS						Rep	beat	Nex	t >>	Close	1/1

Fig. 6-2: Mastering results

- 21. Press the Next softkey.
 - A prompt window is displayed.
- 22. Follow the prompt. Press the Next softkey.
 - The "Carry out control measurement" prompt window is displayed.

- 23. Press the **Next** softkey to confirm the prompt.
 - The program for the control measurement is displayed.
- 24. Start the program. Once program execution has been completed, the results are displayed.

File	Program	Configure	Monitor	Setup	Com	mands	Technolo	ogy H	elp
RCS		Result	of mastering	control mea	suremer	nt			100% 60
×	Ax	is 1: - I	0,0064 °	Axis 4:	-	0,0088	٥		
	Ax	is 2:	0,0239 °	Axis 5:		0,0049	•		
	Ax	is 3: -	0,0294 °	Axis 6:		0,0722	۰		
	ime no.	Source Mes	sage	actor A4					
	0:08: 250 0:08: 250 0:08: 250	Inco Inco	rrect servo paran rrect servo paran rrect servo paran	neter A5 neter A6					
	Cap S I F		b version not rele	ased!,	It POV	/ 100%	RName	▼ 1:48 PM	Select
MEAS				R	epeat	Next	>>	Close	1/1

Fig. 6-3: Control measurement result

25. Press the Next softkey.

A prompt window is displayed.

- 26. Follow the prompt.
- 27. Press the Next softkey.

A prompt window is displayed. Answer the prompt with the **Yes** or **No** softkey.



If the prompt is answered with Yes, the absolute calibration is started. If the prompt is answered with No, the Wizard can be closed. Press the **Close** softkey.

6.2 Zero mastering for KR spot and KR 5 with the RCS Wizard

Precondition

- Krypton RemoteControl.exe is started on the Krypton computer.
- The data have been entered and updated in the database.
- A configuration has been created and updated in the database.
- The network connection is established.
- Operating mode T1 or T2.

Procedure

- 1. Start the KUKA System Software (KSS) 5.5.
- 2. Select the menu sequence **Monitor > XRob RCS > Show**.
- Press the Next softkey.
 A prompt window is displayed.
- 4. Select the calibration type. Press the **Zero mastering** softkey. The configuration window is displayed.



- 5. Select the data from the created configuration in the boxes **Payload** group, Robot type, Arm extension, Installation type and Mounting platform.
- 6. Press the Next softkey.
- 7. Enter the robot serial number in the prompt window.
- 8. Press the **Next** softkey.

The configuration name, the comment and the robot serial number are displayed.

9. Press the **Next** softkey.

A message window is displayed.

- 10. Press the **Next** softkey to confirm the message.
 - A prompt window is displayed.
- 11. Follow the prompt.
- 12. Press the Next softkey.

The "Unmaster robot" prompt window is displayed.

13. Unmaster the axes.

Further information is contained in the operating and programming instructions for the KUKA System Software (KSS).

14. Press the Next softkey.

The "Master robot in home position" prompt window is displayed.

15. Master the robot.



Further information is contained in the operating and programming instructions for the KUKA System Software (KSS).

16. Press the **Next** softkey.

The "Test measurement for robot type check" prompt window is displayed.

17. Press the Next softkey.

The program for checking the robot type is displayed.

- 18. Set mode selector switch to Automatic mode. Start the program. Once program execution has been completed, the result is displayed.
- 19. Press the **Next** softkey.

The "Carry out mastering" prompt window is displayed.

- Start the program. Once program execution has been completed, the results are displayed.
- 21. Press the Next softkey.

A prompt window is displayed.

- 22. Follow the prompt.
- 23. Press the Next softkey.

The "Standard EMT mastering: check mastering" prompt window is displayed.

24. Check mastering.

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Further information is contained in the operating and programming instructions for the KUKA System Software (KSS).

25. Press the Next softkey.

The "Save MAMES data" prompt window is displayed.

26. Press the Save softkey.

The data are saved to the HD, RDC and DB.

27. Press the **Next** softkey.

A prompt window is displayed. Answer the prompt with the **Yes** or **No** softkey.



If the prompt is answered with Yes, the absolute calibration is started. If the prompt is answered with No, the Wizard can be closed. Press the **Close** softkey.

6.3 Absolute calibration with the RCS Wizard

Precondition

- Krypton RemoteControl.exe is started on the Krypton computer.
- The data have been entered and updated in the database.
- A configuration has been created and updated in the database.
- The network connection is established.
- Operating mode T1 or T2.

Procedure

- 1. Start the KUKA System Software (KSS) 5.5.
- 2. Select the menu sequence **Monitor** > **XRob RCS** > **Show**.
- 3. Press the **Next** softkey.
- A prompt window is displayed.
- 4. Select the calibration type. Press the **AbsoluteC** softkey. The prompt is confirmed.

The configuration window is displayed.

5. Select the data from the created configuration in the boxes **Payload** group, Robot type, Arm extension, Installation type and Mounting platform.

Fi	ile	E	dit	Config	jure Mo	nitor	Set	tup	Comn	nands	Techno	ology	He	lp
Æ	RCS	Payload g	roup		Hohe Tra	ıglast (100) kg bis :	240 kg)				100%		
×		Robot typ	e		KR200 cc	KR200 comp								
		Arm exten	nsion n type		AV 400 Boden	AV 400								
	Mounting platform				Boden	Boden								
	G	Time	no.	Source	Message									
	000	10:08: 10:08: 10:08:	250 250 250		Incorrect services Incorrect services Incorrect services and the service services and the s	vo parame vo parame vo parame	eter A4 eter A5 eter A6							
MODE	Nur	1:31:5 n Cap	-12 S I R	XRob	XRob versior	n not relea	sed!,	T1	POV	100%	RName	1:34	PM	Select
MEAS		Tab +						<< Ba	ack	Nex	t>>	Close		1/1

Fig. 6-4: Selecting a configuration

- 6. Press the **Next** softkey.
- 7. Enter the robot serial number in the prompt window.
- 8. Press the Next softkey.

The configuration name, the entered comment and the robot serial number are displayed.

- 9. Press the Next softkey.
 - The "Unmaster axes" prompt window is displayed.
- 10. Unmaster axes.



Further information is contained in the operating and programming instructions for the KUKA System Software (KSS).

- 11. Press the Next softkey.
 - The "Master axes" prompt window is displayed.
- 12. Master the axes.



Further information is contained in the operating and programming instructions for the KUKA System Software (KSS).

13. Press the Next softkey.

A message window is displayed.

- 14. Press the **Next** softkey to confirm the message.
 - A prompt window is displayed.
- 15. Follow the prompt.
- 16. Press the Next softkey.
 - A prompt window is displayed.
- 17. Press the **Next** softkey to confirm the prompt.
 - The program for the control measurement is displayed.
- 18. Set mode selector switch to Automatic mode. Start the program.



On completion of the control measurement, a message window is displayed. **System ready for measurement** must be highlighted in green. If this is not the case, an error has occurred. (>>> 8.1 "Causes of errors during the test measurement" page 43)

- 19. Set mode selector switch to T1 mode.
- 20. Press the Next softkey.

A prompt window is displayed.

- 21. Press the Next softkey to confirm the prompt.
 - The program for absolute calibration is displayed.
- 22. Start the program.

Once program execution has been completed, the results are displayed.

F	ile	Pro	gram	Conf	igure	Mo	nitor	Se	tup	Comn	nands	Techn	ology	He	elp
	RCS				F	Result	of abso	olute ca	libratio	n					100% Color
*	Mean error before calibration Mean error after calibration Number of poses measured								0.812 0.448 30	mm mm Poses					
				Nur	mber of v	valid pos	ses:		30	Poses					
MODE		Time 1:50:4 1:51:4 1:52:0 1:52:0	no. -12 1350 1356 1350	Source XRob /R1/ KCP /R1/I	Mess Versid Progr Start Progr	age one XRo ammed key requ ammed	ob non ai path read uired path read	utorizzata ched (BC ched (BC	al, CO)					<u>·</u>	Select
MEAS	Nu	n Cap	S	B					Aut Rep	POV	100% Nex	RNam	e 1:5 Clo:	7 PM se	1/1

Fig. 6-5: Absolute calibration results

23. Press the Next softkey.

The "Positioning accuracy control measurement run" prompt window is displayed.

24. Press the Next softkey.

The program for the positioning accuracy control measurement run is displayed.

- 25. Set mode selector switch to Automatic mode. Start the program. Once program execution has been completed, the results of the test run are displayed.
- 26. Press the Next softkey.

The "Save PID data" prompt window is displayed.

27. Press the **Save** softkey.

The PID data are saved to the HD and RDC.



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7 Messages

7.1 Viewing messages in the Event Viewer

Procedure

- 1. Open **eventvwr.exe** in the directory C:\WINDOWS\SYSTEM32.
- Select the menu sequence Action > Property to open the selected message.

Description All messages are saved in the Event Viewer. The **XRob RCS** Event Viewer displays all messages called by KUKA.XRob RCS.

📲 Event Viewer					- 🗆 ×
File Action View Help					
⇔ → 🖭 💽 💣 🗗 🖫 ੯	2				
🗊 Event Viewer (Local)	XRobRCS 1.834	ł event(s)			
Application	Туре	Date	Time	Source	Cal 🔺
Security	Information	18.02.2008	13:57:05	LanguageModule	Noi
System	Information	18.02.2008	13:56:34	LanguageModule	Noi
KrcLog	Information	18.02.2008	13:55:59	LanguageModule	Noi
isi KrcLogb	Information	18.02.2008	13:55:00	Calib	Noi
	Information	18.02.2008	13:52:06	SensKrypton	Nor
KrcLogS	\Lambda Warning	18.02.2008	13:52:06	RobotConnector	Noi
KrcLogU	Information	18.02.2008	13:52:03	SensKrypton	Nor
XRobRCS	Information	18.02.2008	13:51:47	SensKrypton	Nor
82	🔥 Warning	18.02.2008	13:51:46	RobotConnector	Nor
	Information	18.02.2008	13:51:44	SensKrypton	Nor
	Information	18.02.2008	13:51:06	RobotConnector	Nor
	Information	18.02.2008	13:51:01	RobotConnector	Nor
	🔥 Warning	18.02.2008	13:50:43	StartUpManager	Nor
	Information	18.02.2008	13:50:42	RcsKernel	Nor
	Information	18.02.2008	13:50:42	DBAccess-RCSConfig	Nor
	Information	18.02.2008	13:50:41	RobotConnector	Noi
	Information	18.02.2008	13:50:41	RobotConnector	Not
	1 Information	18.02.2008	13-40-28	LanguageModule	No

Fig. 7-1: Event Viewer

7.2 Error messages

Description Configuration or operator errors may result in error messages in an application.

All messages are saved in the Event Viewer.

ID	Message	Cause	Remedy
-61000	Error when saving PID data in the database.	No connection to database.	Establish connection to database.
-25026	Error: saving of PID data on RDC failed	No connection to RDC.	Establish connection to RDC.
-61011	Error when saving MAM data to RDC.	 No connection to RDC. Incorrect MAM file format on the hard disk. 	 Establish connection to RDC. Repeat mastering.



ID	Message	Cause	Remedy
-25035	Error: saving of MAM data on hard drive failed.	MAM file could not be gen- erated in the directory C:\KRC\ROBOTER\IR_SP EC.	 Deactivate write protec- tion of directory C:\KRC\ROBOT- ER\IR_SPEC.
			 Check that you have access rights to write to the directory C:\KRC\ROBOT- ER\IR_SPEC.
-25030	Error: MAM file could not be found in IR_SPEC directory.	MAM file <serial_number>.mam could not be found in the directory C:\KRC\ROBOTER\IR_SP EC.</serial_number>	Compare the file name of the MAM file with the pro- grammed serial number of the robot (file name: <serial_number>.mam)</serial_number>
-25032	Error: MAM file cannot be loaded from hard drive.	MAM file on hard drive faulty.	Repeat mastering.
-25033	Error: MAM file checksum incorrect.	 Contents of the MAM file have been changed. Check sum check indi- cates faulty file integrity. 	 Copy the original MAM file to the directory C:\KRC\ROBOT- ER\IR_SPEC.
		 Robot serial number or \$Mames values have changed. 	 Check the programmed robot serial number and the \$Mames values in \$machine.dat.
-25037	Error: loading of a KRL vari- able failed.	KRL variable could not be read.	Check whether the KRL variable can be read manu- ally in the variable display of the GUI.
-61005	Error when saving the mas- tering in the database.	No connection to database.	Establish connection to database.
-61008	Error when saving meas- ured values to the hard drive.	Measurement values file <serial_number>.ist could not be generated in the specified directory (see XROBCONFIG.XML).</serial_number>	 Deactivate write protec- tion of specified directo- ry (see XROBCONFIG.XML file).
			 Check that you have access rights to write to the specified directory (see XROBCON- FIG.XML file).
-61010	Error when calculating the mastering difference.	An error has occurred in the GUI function "Check mas- tering".	Repeat the GUI function "Check mastering".
-61013	Error when reading \$RAT_MOT_AX.	The KRL variable \$RAT_MOT_AX[] could not be read.	Check whether the KRL variable can be read manu- ally in the variable display of the GUI.
-61014	Error when reading \$RAT_MOT_ENC.	The KRL variable \$RAT_MOT_ENC[] could not be read.	Check whether the KRL variable can be read manu- ally in the variable display of the GUI.
-61015	Error when reading \$AXIS_RESO.	The KRL variable \$AXIS_RESO[] could not be read.	Check whether the KRL variable can be read manu- ally in the variable display of the GUI.

ID	Message	Cause	Remedy
-61016	Error when reading the Mames values.	The KRL variable \$mames[] could not be read.	Check whether the KRL variable can be read manu- ally in the variable display of the GUI.
-61017	Directory not found.	The specified directory path for reading or writing files does not exist.	Check whether all directory paths specified in the file XROBCONFIG.XML exist on the hard drive.
-61019	Access to file denied.	File could not be opened.	Check that you have access rights to read and write to the file.
-61018	File not found	File could not be found in the specified directory.	Check whether the file is present in the specified directory.
-61021	Input/output error.	General error when access- ing the storage medium.	Check access to the stor- age medium.
-61035	Error when copying a file.	An error occurred while a file was being copied.	Check access rights and write protection of source and target directory.
-61029	Error when setting the robot serial number.	Unable to set serial number in robot system.	Check whether the robot serial number can be set manually via the GUI menu item Setup .
-24001	Serious system error. Details can be found in XRob log.	Unusual cause.	 Cold start of the robot controller. If the message is still present following a cold restart, inform KUKA Service.
-24004	Error in XRobConfig.xml file. (Section Command- Handler)	Entries in the Command- Handlers section of XROB- CONFIG.XML missing or incorrect.	Use the log to isolate the cause of the error and improve the file XROBCON-FIG.XML.
-24010	Feature measurement error (sensor activation failed)	Sensor with configured ID is not ready for measurement.	Make sure that the feature is correctly configured and that the sensor is functional.
-24011	Feature measurement error (sensor deactivation failed)	 Sensor is not ready for measurement. Communication prob- lems. 	Check that the measure- ment system is ready for operation.
-24012	Feature measurement error (trigger measurement)	Communication problems with the sensor.	Check that the measure- ment system is ready for operation.
-24013	Feature measurement error (calling measurement data)	Communication problems with the sensor	Check that the measure- ment system is ready for operation.
-24017	Initialization of calibration failed	An exceptional error has occurred.	 Analyze XRob log. Cold start of the robot controller. If the message is still
			present following a cold restart, inform KUKA Service.





KUKA

8 Troubleshooting

Error	Cause	Remedy	
	The battery of the tool LEDs is	 Exchange battery. 	
	depleted.	 Charge battery. 	
	The tool LEDs are defective.	Exchange tool LEDs.	
	The Krypton strober for the tool LEDs is defective.	Exchange the Krypton strober.	
	The Krypton remote control for the tool and reference LEDs is defective.	Exchange the remote control.	
	The measured robot type does not match the selected configuration.	 Select a different robot type in the configuration. 	
The message System ready is not highlighted in		 Remeasure the robot type. 	
	The mounted tool does not match the tool in the configuration.	 Select a different tool in the config- uration. 	
		 Exchange tool. 	
green.	The Krypton camera is defective.	Exchange the Krypton camera.	
	No network connection between Kryp-	 Check the network connections. 	
	ton camera and KUKA KRC.	 Connect the network connections. 	
		 Exchange the network connec- tions. 	
	The reference LEDs of the base plate	 Make reference LEDs visible. 	
	are invisible or defective.	 Check reference LEDs. 	
		 Exchange reference LEDs. 	
	The Krypton strober for the reference LEDs of the base plate is defective.	Exchange the Krypton strober.	

8.1 Causes of errors during the test measurement





KUKA

9 KUKA Service

9.1 Requesting support

Introduction

The KUKA Robot Group documentation offers information on operation and provides assistance with troubleshooting. For further assistance, please contact your local KUKA subsidiary.



Faults leading to production downtime are to be reported to the local KUKA subsidiary within one hour of their occurrence.

Information

- The following information is required for processing a support request:
- Model and serial number of the robot
- Model and serial number of the controller
- Model and serial number of the linear unit (if applicable)
- Version of the KUKA System Software
- Optional software or modifications
- Archive of the software
- Application used
- Any external axes used
- Description of the problem, duration and frequency of the fault

9.2 KUKA Customer Support

AvailabilityKUKA Customer Support is available in many countries. Please do not hesi-
tate to contact us if you have any questions.ArgentinaRuben Costantini S.A. (Agency)

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