

KUKA



Application Module
ready2_sensitive_assembly_KR AGILUS
Assembly and Operating Instructions



Issued: 10.10.2018
MA ready2_sensitive_assembly V2
KUKA Deutschland GmbH

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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.

KIM-PS5-DOC

Original documentation

Publication: Pub MA ready2_sensitive_assembly (PDF) en
PB11471

Book structure: MA ready2_sensitive_assembly V1.1
BS10478

Version: MA ready2_sensitive_assembly V2

Contents

1	Introduction.....	7
1.1	Documentation for ready2_sensitive_assembly_KR AGILUS.....	7
1.2	Representation of warnings and notes.....	7
1.3	Terms used.....	8
2	Purpose.....	9
2.1	Target group.....	9
2.2	Intended use.....	9
3	Product description.....	11
3.1	Overview of ready2_sensitive_assembly_KR AGILUS	11
3.1.1	F/T sensor.....	12
3.1.2	Contact-making.....	12
3.1.3	Search.....	13
3.1.3.1	Sine search.....	13
3.1.3.2	Lissajous search.....	14
3.1.3.3	Spiral search.....	14
3.2	Application software.....	15
4	Technical data.....	17
4.1	Basic data.....	17
4.2	Plates and labels.....	17
4.3	REACH duty to communicate information acc. to Art. 33 of Regulation (EC) 1907/2006.....	18
5	Safety.....	19
5.1	General.....	19
5.1.1	Disclaimer.....	19
5.1.2	Intended use.....	19
5.1.3	EC Declaration of Conformity and Declaration of Incorporation.....	20
5.2	Personnel.....	21
5.3	Safety devices.....	22
5.3.1	External EMERGENCY STOP device.....	22
5.3.2	Operator safety (optional).....	22
5.3.3	Safety measures.....	22
5.4	Applied standards and regulations.....	23
6	Planning.....	25
6.1	Working space.....	25
6.2	Safety equipment.....	25
6.3	Dimensions of F/T sensor.....	25
7	Transportation.....	27
7.1	Transportation of the application module.....	27
7.2	Transporting the robot.....	27
7.3	Transporting the assembly components.....	27
8	Start-up and recommissioning.....	29

8.1	Overview.....	29
8.2	Installing the F/T sensor.....	29
8.3	Connecting the connecting cables.....	30
8.3.1	Connecting the cables.....	31
8.3.2	Installing the sensor cable.....	32
8.4	Installing the software.....	33
8.5	Uninstalling the software.....	35
9	Operation.....	37
9.1	KUKA smartPAD teach pendant.....	37
9.1.1	Front view.....	37
9.1.2	Rear view.....	39
10	Configuration.....	41
10.1	HMI.....	41
10.2	Sensor configuration.....	41
10.2.1	Mounting screen.....	41
10.2.2	Load range screen.....	42
10.3	Assembly application.....	43
10.3.1	Application lists screen.....	43
10.3.2	Sensor load data screen.....	44
10.3.3	Reference coordinate system (RCS) screen.....	45
10.3.4	Adjuster screen.....	46
10.3.5	Approach screen.....	47
10.3.6	Distance screen.....	48
10.3.7	Break condition screen.....	49
10.3.8	Limit screen.....	50
10.3.9	Sine screen.....	51
10.3.10	Lissajous screen.....	52
10.3.11	Spiral screen.....	53
10.3.12	Monitor screen.....	54
11	Programming.....	57
11.1	Inline forms.....	57
11.1.1	ready2_sensitive_assembly Init.....	57
11.1.2	ready2_sensitive_assembly On.....	57
11.2	Global variables.....	58
12	Maintenance.....	59
12.1	Maintenance symbols.....	59
12.2	Maintenance table.....	60
12.3	Cleaning work.....	60
13	Repair.....	61
13.1	Changing the sensor cable.....	61
13.2	Changing the data cable.....	62
14	Messages.....	65
15	Decommissioning, storage and disposal.....	67
15.1	Decommissioning	67

15.2	Storage	67
15.3	Disposal.....	67
16	Appendix.....	69
16.1	Tightening torques.....	69
17	KUKA Service.....	71
17.1	Requesting support.....	71
17.2	KUKA Customer Support.....	71
	Index	79

1 Introduction

1.1 Documentation for ready2_sensitive_assembly_KR AGILUS

The documentation for ready2_sensitive_assembly_KR AGILUS has the following parts:

- Assembly and operating instructions for ready2_sensitive_assembly_KR AGILUS (this document)
- Operating instructions for the manipulator
- Operating instructions for the robot controller
- Operating and programming instructions for the KUKA System Software(KSS)
- Operating instructions for the F/T sensor

Each of these instructions is a separate document.

1.2 Representation of warnings and notes

Safety

These warnings are relevant to safety and **must** be observed.



DANGER

These warnings mean that it is certain or highly probable that death or severe injuries **will** occur, if no precautions are taken.



WARNING

These warnings mean that death or severe injuries **may** occur, if no precautions are taken.



CAUTION

These warnings mean that minor injuries **may** occur, if no precautions are taken.

NOTICE

These warnings mean that damage to property **may** occur, if no precautions are taken.



These warnings contain references to safety-relevant information or general safety measures.

These warnings do not refer to individual hazards or individual precautionary measures.

This warning draws attention to procedures which serve to prevent or remedy emergencies or malfunctions:

SAFETY INSTRUCTION

The following procedure must be followed exactly!

Procedures marked with this warning **must** be followed exactly.

Notices

These notices serve to make your work easier or contain references to further information.



Tip to make your work easier or reference to further information.

1.3 Terms used

Term	Description
FTC	Force Torque Control
HMI	KUKA smart Human-Machine Interface The smartHMI is the user interface of the robot controller.
KLI	KUKA Line Interface
KRL	KUKA Robot Language KUKA programming language
KSS	KUKA System Software
Manipulator	The robot arm
PLC	Programmable Logic Controller
PTP	Point-To-Point The point-to-point movement of the manipulator
RCS	Reference Coordinate System
RSI	Robot Sensor Interface
TCP	Tool Center Point TCP is the working point of a tool. A tool can have more than one TCP.

2 Purpose

2.1 Target group

This document is for the following target groups:

- Users
- Start-up personnel with the following qualifications:
 - Advanced knowledge of robot programming
 - Advanced knowledge of electrical engineering
 - Knowledge of the robot controller system
 - Knowledge of field bus interfaces
 - Knowledge of Windows operating system
- Operating personnel with basic knowledge of robot operation

All personnel must read and understand the following manufacturer documents before they work with ready2_sensitive_assembly_KR AGILUS:

- Manipulator
- Robot controller
- ready2_sensitive_assembly_KR AGILUS



For the optimal use of KUKA products, we recommend you to attend the training courses at KUKA College. Information about the training courses can be obtained from KUKA subsidiaries or by visiting www.kuka.com.

2.2 Intended use

Use

ready2_sensitive_assembly_KR AGILUS is designed to assemble and test electronic components in electronics industry.

Use of the machine according to its intended use also includes:

- Obeying the assembly and operating instructions of each component.
- Obeying the safety information of each component.
- Obeying the inspection schedule and the maintenance schedule of each component.

Misuse

Any use or operation that is different from the intended use is misuse and is not permitted. This includes, for example:

- Using operating parameters outside of the permitted ranges.
- Using the machine in potentially explosive environments.
- Outdoor operation

The manufacturers and suppliers are not responsible for any personal injuries or property damage due to such misuse. The risk lies entirely with the users.

3 Product description

3.1 Overview of ready2_sensitive_assembly_KR AGILUS

Description

ready2_sensitive_assembly_KR AGILUS is an application module for robots.

Components

ready2_sensitive_assembly_KR AGILUS mainly has the following components:



Fig. 3-1: Overview of ready2_sensitive_assembly

Item	Designation
1	KR3/KR6/KR10 AGILUS manipulator
2	smartPAD
3	KR C4 compact robot controller
4	F/T sensor

Function

ready2_sensitive_assembly_KR AGILUS is designed to assemble and test electronic components. It has the following functions:

- Contact-making
- Search

Application

ready2_sensitive_assembly_KR AGILUS is mainly used in electronics industry. Its application range includes, for example:

- RAM assembly
- Main board assembly
- Electrical component assembly

3.1.1 F/T sensor

Description

The F/T sensor measures the force and torque (F_x , F_y , F_z , T_x , T_y , T_z) of components. The F/T sensor streams data to devices that use EtherCAT fieldbus.



Fig. 3-2: F/T sensor

Item	Designation	Description
1	Connector	For power and EtherCAT
2	The mounting side	Connection to robot via an adapter plate
3	The tool side	Connection to tool
4	LED	<ul style="list-style-type: none">• L/A Link/Activity EtherCAT LED• RUN RUN LED• STATUS Sensor status LED



More information about the component can be found in its manufacturer documentation.

3.1.2 Contact-making

Description

The F/T sensor detects the force and position when the robot makes contact with the workpiece. The robot stops when the actual force and position reach their pre-defined values.

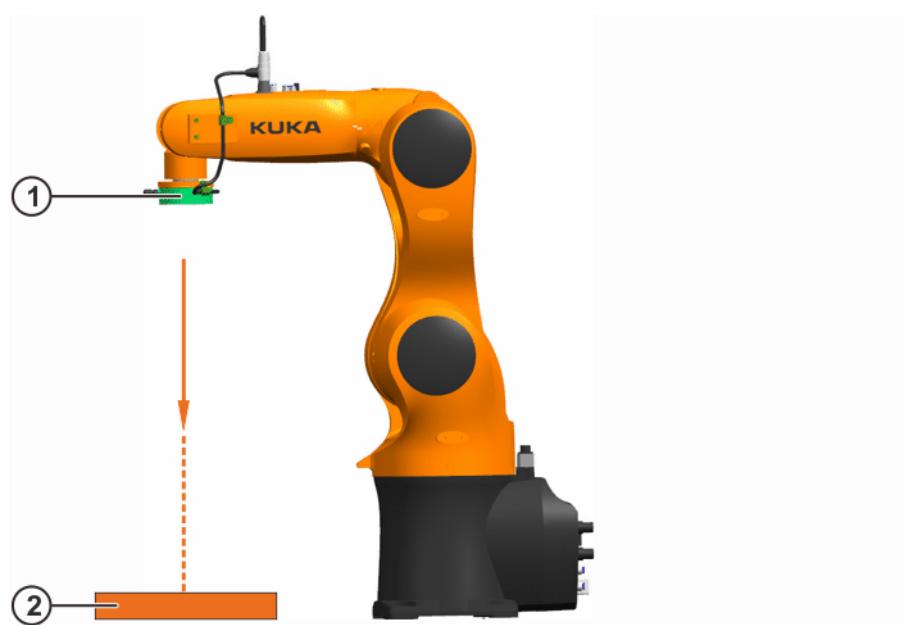


Fig. 3-3: Contact-making

Item	Designation
1	F/T sensor
2	Workpiece

3.1.3 Search

Description

There are three types of search methods:

- Sine search
- Lissajous search
- Spiral search

3.1.3.1 Sine search

Description

The robot TCP searches the target position along a Sine curve path.

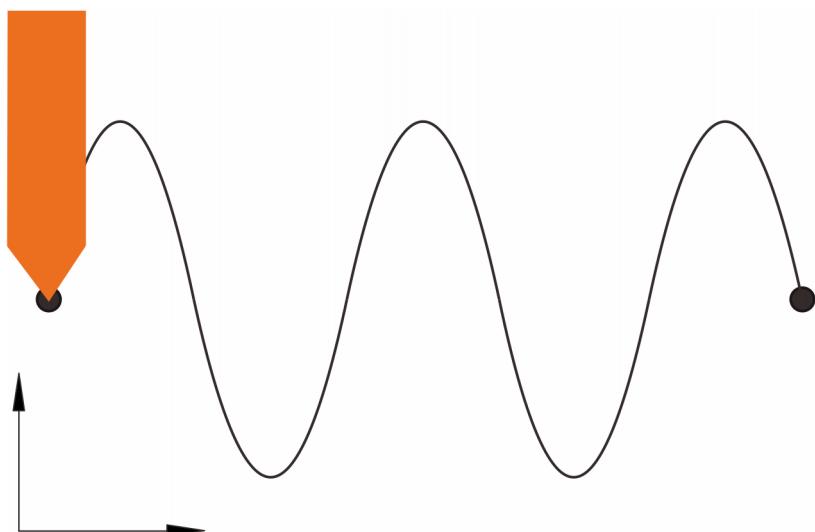


Fig. 3-4: Sine curve motion

3.1.3.2 Lissajous search

Description

The robot TCP searches the target position along a Lissajous curve path.

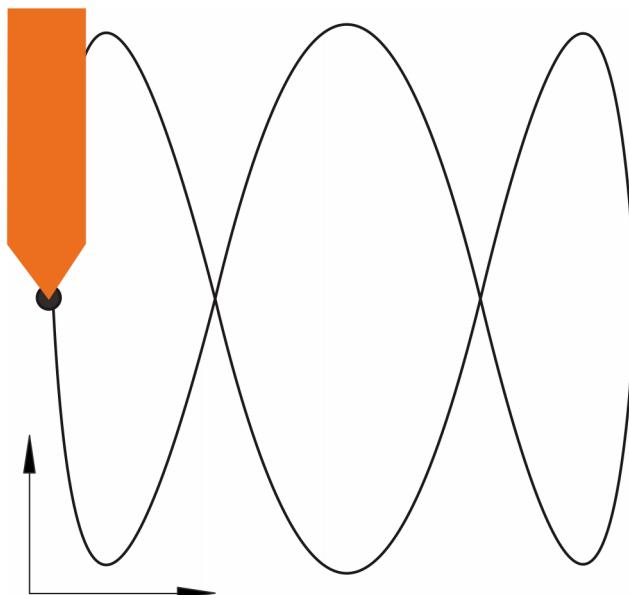


Fig. 3-5: Lissajous curve motion

3.1.3.3 Spiral search

Description

The robot TCP searches the target position along a Spiral curve path.

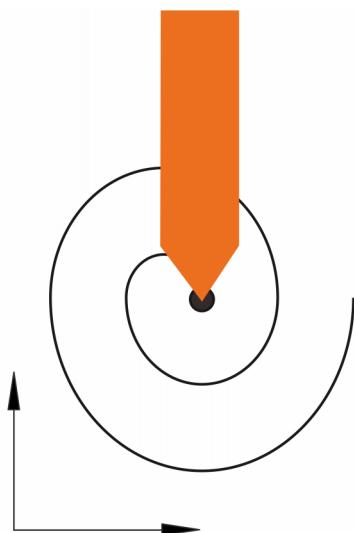


Fig. 3-6: Spiral curve motion

3.2 Application software

Description

The application software is KUKA.ready2_sensitive_assembly 1.0. It is integrated into the KUKA System Software (KSS). The application software environment is based on RSI, FTC, and KSS.

Software requirements

- KSS 8.5
- FTC 4.0
- RSI 4.0
- KUKA WorkVisual 5.0

Hardware requirements

- KR C4 robot controller
- F/T sensor

4 Technical data

4.1 Basic data

- i** Further technical data about the manipulator can be found in its operating instructions.
- i** Further technical data about the robot controller can be found in its operating instructions.
- i** Further technical data about other components of ready2_sensitive_assembly_KR AGILUS can be found in their manufacturer documentation.

The basic data of the application module:

Payload	1.5 kg
Communication	EtherCAT
Supply voltage	12 ... 30V DC
Ingress protection rating	IP20

The F/T sensor loading data:

Force/Torque	Rated range	Overload rating	Effective resolution
Fxy	500 N	2500 N	0.1 N
Fz	900 N	4500 N	0.1 N
Txy	20 Nm	100 Nm	0.005 Nm
Tz	20 Nm	100 Nm	0.005 Nm

4.2 Plates and labels

Description

The following plates and labels are attached to the components. They must not be removed or rendered illegible. Illegible plates and labels must be replaced.

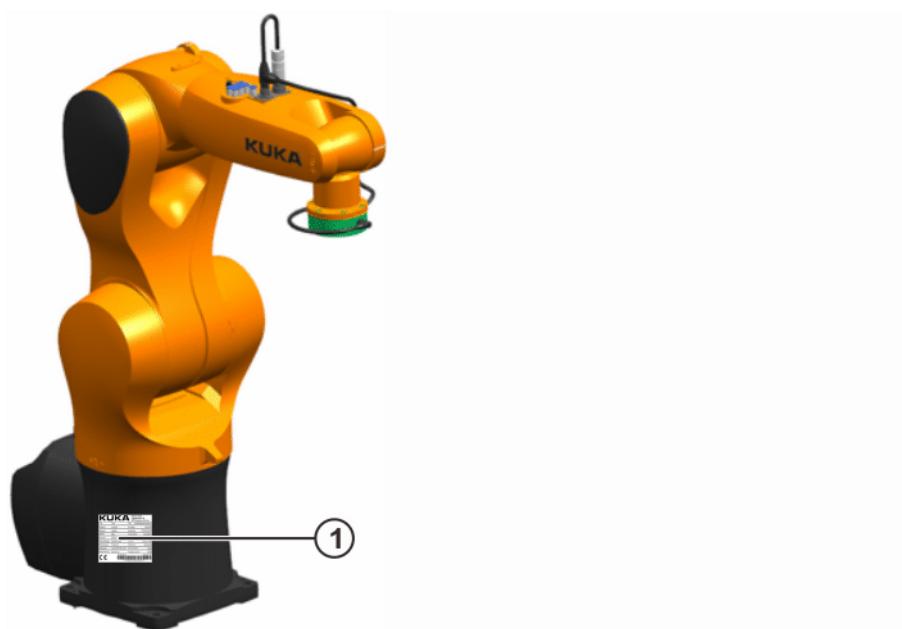


Fig. 4-1: Plates and labels

Item	Description																																				
1	<p>KUKA XXXXXXXX Zugspitzstraße 140 86165 Augsburg, Germany</p> <table border="1"><tr><td>Typ</td><td>Type</td><td>Type</td><td>XXXXXXXXXXXXXX</td></tr><tr><td>Artikel-Nr.</td><td>Article No.</td><td>No. d'article</td><td>XXXXXX</td></tr><tr><td>Serial-Nr.</td><td>Serial No.</td><td>No. de Série</td><td>XXXXXXXX</td></tr><tr><td>Baujahr</td><td>Date</td><td>Année de fabr.</td><td>XX/20XX</td></tr><tr><td>Gewicht</td><td>Weight</td><td>Poids</td><td>XXX kg</td></tr><tr><td>Anschlussp.:</td><td>Supply Voltage</td><td>Tension</td><td>XXXV XAC</td></tr><tr><td>Netzfrequenz</td><td>Frequency</td><td>Fréquence</td><td>50-60Hz</td></tr><tr><td>Vollaststrom</td><td>charge full load current</td><td>Courant pleine</td><td>XXA</td></tr><tr><td>Netzsicherung</td><td>Mains Fuse</td><td>Fusible de secteur</td><td>XXA</td></tr></table> <p>CE ANXXXXXX SNXXXXXX</p> <p>XX00000000XX000000000000XX</p> <p>Rev 3 12 34 56 78 9 10</p> <p>Identification plate on the manipulator (similar to illustration)</p>	Typ	Type	Type	XXXXXXXXXXXXXX	Artikel-Nr.	Article No.	No. d'article	XXXXXX	Serial-Nr.	Serial No.	No. de Série	XXXXXXXX	Baujahr	Date	Année de fabr.	XX/20XX	Gewicht	Weight	Poids	XXX kg	Anschlussp.:	Supply Voltage	Tension	XXXV XAC	Netzfrequenz	Frequency	Fréquence	50-60Hz	Vollaststrom	charge full load current	Courant pleine	XXA	Netzsicherung	Mains Fuse	Fusible de secteur	XXA
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Netzsicherung	Mains Fuse	Fusible de secteur	XXA																																		

4.3 REACH duty to communicate information acc. to Art. 33 of Regulation (EC) 1907/2006

On the basis of the information provided by our suppliers, this product and its components contain no substances included on the "Candidate List" of Substances of Very High Concern (SVHCs) in a concentration exceeding 0.1 percent by mass.

5 Safety

5.1 General

5.1.1 Disclaimer

The system described in this document is an application module.

The application module is built using state-of-the-art technology and in accordance with the recognized safety rules. Nevertheless, misuse may constitute a risk to life and limb or cause damage to the application module and to other material property.

The application module may only be used in perfect technical condition in accordance with its intended use and only by safety-conscious persons who are fully aware of the risks involved in its operation. Its use is subject to compliance with this document. Any functional disorders, especially those affecting safety, must be rectified immediately.

Safety information

Information about safety may not be construed against KUKA Deutschland GmbH. Even if all safety instructions are followed, this is not a guarantee that the application module will not cause personal injuries or material damage.

No modifications may be carried out on the application module without the authorization of KUKA Deutschland GmbH. Additional components (bits, holders, software, etc.), not supplied by KUKA Deutschland GmbH, may be integrated into the application module. The user is liable for any damage these components may cause to the application module or to other material property.

In addition to the Safety chapter, all other relevant documents contain further safety instructions. These must also be observed. The fundamental safety information for the application module can be found in the "Safety" chapter of the operating or assembly instructions of the robot controller and the KUKA System Software. Further information about safety is contained in the manufacturer documentation of the individual components.

The operator must have read and understood the application module documentation, including the Safety chapter.

This documentation contains safety instructions which refer specifically to the product described here. The fundamental safety information for the industrial robot can be found in the "Safety" chapter of the operating or assembly instructions for the robot controller.



WARNING

The "Safety" chapter in the operating instructions or assembly instructions of the robot controller must be observed. Death to persons, severe injuries or considerable damage to property may otherwise result.

5.1.2 Intended use

Use

ready2_sensitive_assembly_KR AGILUS is designed to assemble and test electronic components in electronics industry.

Use of the machine according to its intended use also includes:

- Obeying the assembly and operating instructions of each component.
- Obeying the safety information of each component.
- Obeying the inspection schedule and the maintenance schedule of each component.

Misuse

Any use or operation that is different from the intended use is misuse and is not permitted. This includes, for example:

- Using operating parameters outside of the permitted ranges.
- Using the machine in potentially explosive environments.
- Outdoor operation

The manufacturers and suppliers are not responsible for any personal injuries or property damage due to such misuse. The risk lies entirely with the users.

5.1.3 EC Declaration of Conformity and Declaration of Incorporation

ready2_sensitive_assembly_KR AGILUS constitutes partly completed machinery as defined by the EC Machinery Directive. ready2_sensitive_assembly_KR AGILUS may only be put into operation if the following pre-conditions are met:

- ready2_sensitive_assembly_KR AGILUS is integrated into a complete system.
or: ready2_sensitive_assembly_KR AGILUS, together with other machinery, constitutes a complete system.
or: All safety functions and safeguards required for operation in the complete machine as defined by the EC Machinery Directive have been added to ready2_sensitive_assembly_KR AGILUS.
- The complete system complies with the EC Machinery Directive. This has been confirmed by means of a conformity assessment procedure.

EC declaration of conformity

The system integrator must issue an EC declaration of conformity for the complete system in accordance with the Machinery Directive. The EC declaration of conformity forms the basis for the CE mark for the system. The industrial robot must always be operated in accordance with the applicable national laws, regulations and standards.

The robot controller has a CE mark in accordance with the EMC Directive and the Low Voltage Directive.

The application controller has a CE mark in accordance with the EMC Directive and the Low Voltage Directive.

Declaration of incorporation

The partly completed machinery is supplied with a declaration of incorporation in accordance with Annex II B of the EC Machinery Directive 2006/42/EC. The assembly instructions and a list of essential requirements complied with in accordance with Annex I are integral parts of this declaration of incorporation.

The declaration of incorporation declares that the start-up of the partly completed machinery is not allowed until the partly completed machinery has been incorporated into machinery, or has been assembled with other parts to form machinery, and this machinery complies with the terms of

the EC Machinery Directive, and the EC declaration of conformity is present in accordance with Annex II A.

5.2 Personnel

The following persons or groups of persons are defined for the industrial robot:

- User
- Personnel



All persons working with the industrial robot must have read and understood the industrial robot documentation, including the safety chapter.

User

The user must observe the labor laws and regulations. This includes e.g.:

- The user must comply with his monitoring obligations.
- The user must carry out briefing at defined intervals.

Personnel

Personnel must be instructed, before any work is commenced, in the type of work involved and what exactly it entails as well as any hazards which may exist. Instruction must be carried out regularly. Instruction is also required after particular incidents or technical modifications.

Personnel includes:

- System integrator
- Operators, subdivided into:
 - Start-up, maintenance and service personnel
 - Operating personnel
 - Cleaning personnel



Installation, exchange, adjustment, operation, maintenance and repair must be performed only as specified in the operating or assembly instructions for the relevant component of the industrial robot and only by personnel specially trained for this purpose.

System integrator

The industrial robot is safely integrated into a complete system by the system integrator.

The system integrator is responsible for the following tasks:

- Installing the industrial robot
- Connecting the industrial robot
- Performing risk assessment
- Implementing the required safety functions and safeguards
- Issuing the EC declaration of conformity
- Attaching the CE mark
- Creating the operating instructions for the system

Operators

The operator must meet the following preconditions:

- The operator must be trained for the work to be carried out.

- Work on the system must only be carried out by qualified personnel. These are people who, due to their specialist training, knowledge and experience, and their familiarization with the relevant standards, are able to assess the work to be carried out and detect any potential hazards.



Work on the electrical and mechanical equipment of the industrial robot may only be carried out by specially trained personnel.

5.3 Safety devices

5.3.1 External EMERGENCY STOP device

If an operator station which has one of the following functions must be equipped with an EMERGENCY STOP device:

- Starting a robot motion
- Starting an operation which may cause any potential hazards

The system integrators are responsible for the setup of the external EMERGENCY STOP device.

The external EMERGENCY STOP devices can be connected to the robot controller via interface X11 or a safety PLC. The external EMERGENCY STOP devices are not included in the supply scope of the industrial robot.

5.3.2 Operator safety (optional)

Interlocks, such as the safety gate switches, can be connected to the robot controller via interface X11 or a safety PLC. The system integrators are responsible for the setup of the optional operator safety circuit.



More information about the safety interface can be found in the Assembly and Operating Instructions of the robot controller.

5.3.3 Safety measures



The personnel must wear the correct and qualifying personal protective equipment according to the specific working situations.

NOTICE

Failure to read the ESD guidelines may cause property damage.

- The ESD guidelines must be read and understood before you work.

The personal protective equipment includes:

- Bump cap or helmet
- Ear protector
- Safety gloves
- Safety googles
- Safety clothes which meet the requirements of ESD guidelines
- Safety shoes which meet the requirements of ESD guidelines

5.4 Applied standards and regulations

Name/Edition	Definition
2014/30/EU:2014	EMC Directive: Directive 2014/30/EC of the European Parliament and of the Council dated 26 February 2014 on the approximation of the laws of the Member States concerning electromagnetic compatibility
2006/42/EU:2006	Machinery Directive: Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast)
EN 614-1:2006+A1:2009	Safety of machinery: Ergonomic design principles - Part 1: Terms and general principles
EN ISO 10218-2:2011	Industrial robots – Safety requirements: Part 2: Robot systems and integration
EN ISO 12100:2010	Safety of machinery: General principles of design, risk assessment and risk reduction
EN ISO 13849-1:2015	Safety of machinery: Safety-related parts of control systems - Part 1: General principles of design
EN ISO 13849-2:2012	Safety of machinery: Safety-related parts of control systems - Part 2: Validation
EN ISO 13850:2015	Safety of machinery: Emergency stop - Principles for design
EN 60204-1:2006/A1:2009	Safety of machinery: Electrical equipment of machines - Part 1: General requirements
EN 61000-6-2:2005	Electromagnetic compatibility (EMC): Part 6-2: Generic standards; Immunity for industrial environments
EN 61000-6-4:2007 + A1:2011	Electromagnetic compatibility (EMC): Part 6-4: Generic standards; Emission standard for industrial environments
EN ISO 10218-1:2011	Industrial robots – Safety requirements: Part 1: Robots Note: Content equivalent to ANSI/RIA R.15.06-2012, Part 1
EN 60204-1:2006/A1:2009	Safety of machinery: Electrical equipment of machines - Part 1: General requirements
EN ISO 12100:2010	Safety of machinery: General principles of design, risk assessment and risk reduction

6 Planning

6.1 Working space

Ambient conditions

ready2_sensitive_assembly_KR AGILUS is designed for the testing and assembly operations of electronical components in a dust-free industrial environment. So there are no air filters in the robot controller. If the ambient conditions are not suitable for the testing and assembly operations, the control components must be integrated into an electrical enclosure with air filters.

Cooling system

If the control components are integrated into an electrical enclosure, the electrical enclosure must be equipped with sufficient cooling system.



Information about the thermal power dissipation of each control component can be found in the "Technical data" Chapter of their manufacturer documentation.

6.2 Safety equipment

Description

ready2_sensitive_assembly_KR AGILUS is partly completed machinery and must be integrated into a robot cell by the system integrators for safe operation.

The system integrators define the additional required safety equipment according to their risk analysis.

Safety interface

The following interface can be used for integration of safety functions:

- Safety interface X11 of the robot controller

Safety function via safety interface X11

The following safety equipment can be integrated into the system via safety interface X11 of the robot controller:

- External EMERGENCY STOP devices
- Safeguards



More information can be found in the Assembly and Operating Instructions of the robot controller.

6.3 Dimensions of F/T sensor

Description

The F/T sensor is installed to the robot via an adapter flange.

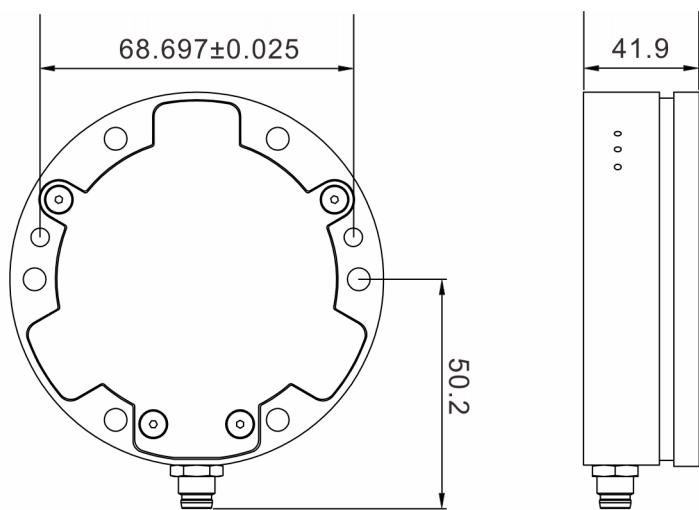
Dimensions

Fig. 6-1: Dimensions of F/T sensor

7 Transportation

7.1 Transportation of the application module



DANGER

Danger of the falling objects

The falling objects will cause death, severe injuries, or property damage.

- The lifting attachment must be fastened correctly.
- Only use the lifting ropes which have the sufficient load-bearing capacity.
- Do not stand under or near the hanging objects.



WARNING

Danger of the hanging objects

The hanging objects may cause death, severe injuries, or property damage.

- Slowly move the hanging objects.
- Do not stand under or near the hanging objects.

Description

The application module can only be transported in disassembled state via a fork lift truck or a pallet truck.

ready2_sensitive_assembly_KR AGILUS is packed in two cardboard boxes.

Robot box:

- Manipulator
- Robot controller
- smartPAD
- The connecting cables

Assembly component box:

- F/T sensor
- Adapter flange
- The connecting cables
- Other parts

7.2 Transporting the robot



Information about transporting the manipulator and the robot controller is in their Assembly and Operating Instructions.

7.3 Transporting the assembly components

Precondition

- The assembly component box is closed.

Procedure

- Transport the assembly component box to its assembly site with a trolley.

8 Start-up and recommissioning

8.1 Overview



This is an overview of the most important steps during the start-up. The precise sequence depends on the application module and other system-specific circumstances.

This overview only contains the start-up information of ready2_sensitive_assembly_KR AGILUS. The start-up procedures of ready2_sensitive_assembly_KR AGILUS can be divided into the following sections:

Manipulator



The start-up information of manipulator is in the "Start-up and recommissioning" Chapter of Assembly Instructions and Operating Instructions.

Robot controller



The start-up information of robot controller is in the "Start-up and recommissioning" Chapter of Assembly Instructions and Operating Instructions.

ready2_sensitive_assembly_KR AGILUS

Step	Description	Information
1	Unpack and visually check each component.	All components must be undamaged.
2	Install the F/T sensor.	(>>> 8.2 "Installing the F/T sensor" Page 29)
3	Connect the connecting cables.	(>>> 8.3.1 "Connecting the cables" Page 31)
4	Install the software.	(>>> 8.4 "Installing the software" Page 33)

8.2 Installing the F/T sensor

Description

The F/T sensor is installed to the robot via an adapter flange.



WARNING

Unintentional robot motions can cause injuries and damage to property. If work is carried out on an operational robot, the robot must be secured by activating the EMERGENCY STOP device. Warn all persons concerned before starting to put it back into operation.

Procedure

1. Insert the dowel pin into the robot flange.
 - Dowel pin: 5 × 12
2. Attach the adapter flange to the robot flange.
3. Diagonally fasten the screws to install the adapter flange to the robot flange.

- Screw size: M5 × 10
- 4. Insert the two dowel pins into the adapter flange.
 - Dowel pin: 4 × 12
- 5. Attach the F/T sensor to the adapter flange.
- 6. Diagonally fasten the screws to install the F/T sensor to the adapter flange.
 - Screw size: M5 × 10

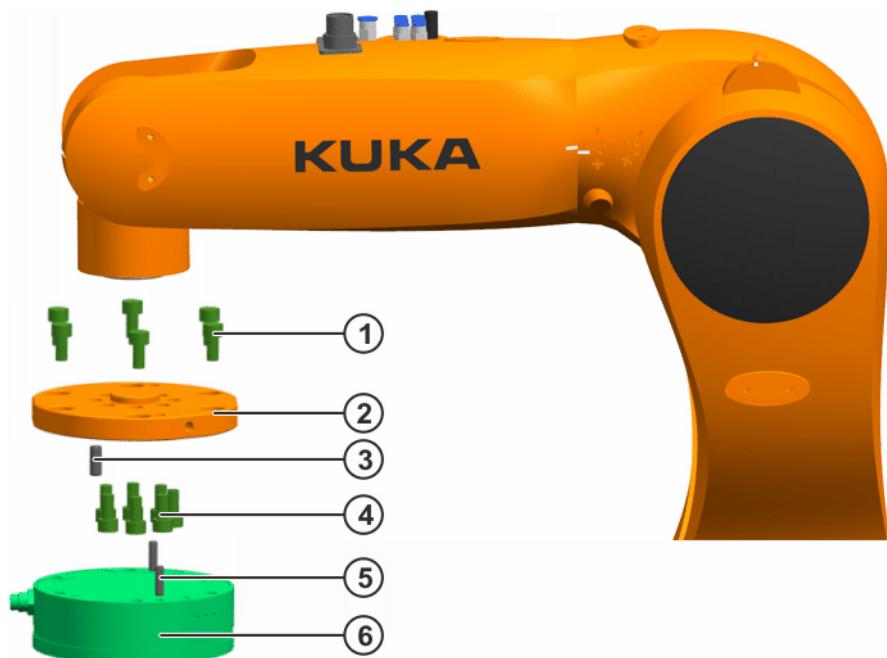


Fig. 8-1: Installing the F/T sensor

- | | | | |
|---|----------------|---|------------|
| 1 | Screws | 4 | Screws |
| 2 | Adapter flange | 5 | Dowel pins |
| 3 | Dowel pin | 6 | F/T sensor |

8.3 Connecting the connecting cables



CAUTION

- Risk of tripping
Incorrect installation of the connecting cable set may cause minor injuries.
- The connecting cable set must be installed in a way that risk of tripping must be prevented.

NOTICE

- Risk of cable damage
Incorrect installation of the connecting cable set may cause cable damage.
- The connecting cable set must be installed in a way that the connecting cables cannot be tensioned when the manipulator moves.
 - The connecting cable set must not be installed over sharp edges.
 - Avoid any circle which radius is less than 100 mm.

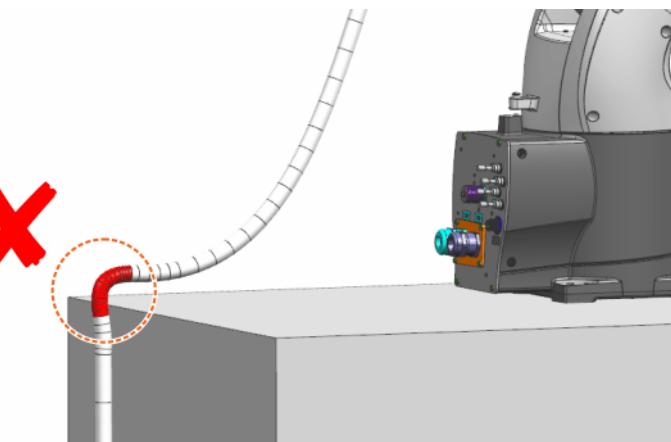


Fig. 8-2: Unfavorable routing of the connecting cable set

8.3.1 Connecting the cables



The wiring information of the manipulator and the robot controller can be found in their Assembly or Operating Instructions.

Description

Besides the standard cables of manipulator and robot controller, the following two cables must also be connected:

- Sensor cable
- Data cable

Precondition

- All components are installed.



WARNING

Unintentional robot motions can cause injuries and damage to property. If work is carried out on an operational robot, the robot must be secured by activating the EMERGENCY STOP device. Warn all persons concerned before starting to put it back into operation.

Procedure

1. Connect the standard cables of manipulator and robot controller.
2. Connect the sensor cable between the manipulator and the F/T sensor.
3. Connect the data cable between the robot controller and the manipulator.
 - X65 – XPN1

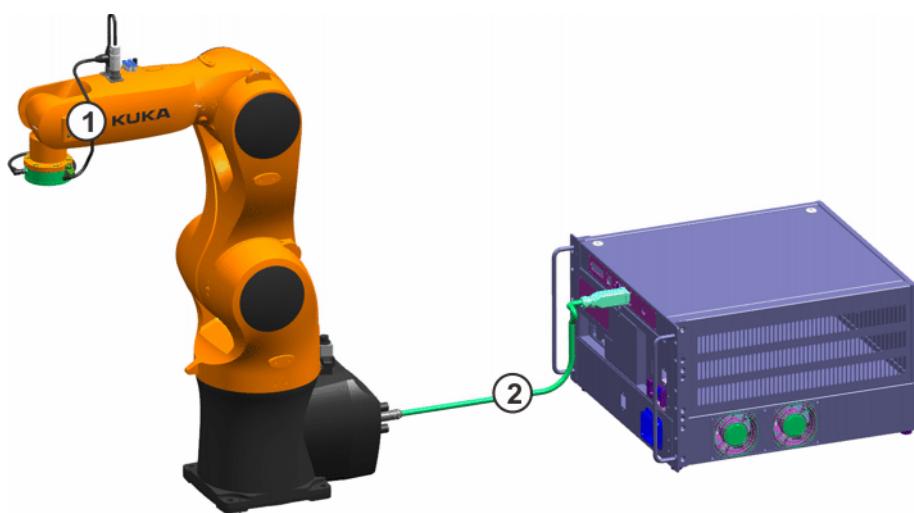


Fig. 8-3: Connecting the cables

1 Sensor cable

2 Data cable

8.3.2 Installing the sensor cable

Description

The sensor cable is attached to the manipulator.

Precondition

- All components are installed.



WARNING

Unintentional robot motions can cause injuries and damage to property.
If work is carried out on an operational robot, the robot must be secured by activating the EMERGENCY STOP device.
Warn all persons concerned before starting to put it back into operation.

Procedure

1. Fasten the two screws to install the fixing plate.
 - Screw size: M4 × 8
2. Use clamp to attach the sensor cable to the fixing plate.
3. Use clamp to attach the sensor cable to the adapter flange.

NOTICE

Further information about how to route the sensor cable can be found in the manufacturer documentation of F/T sensor.

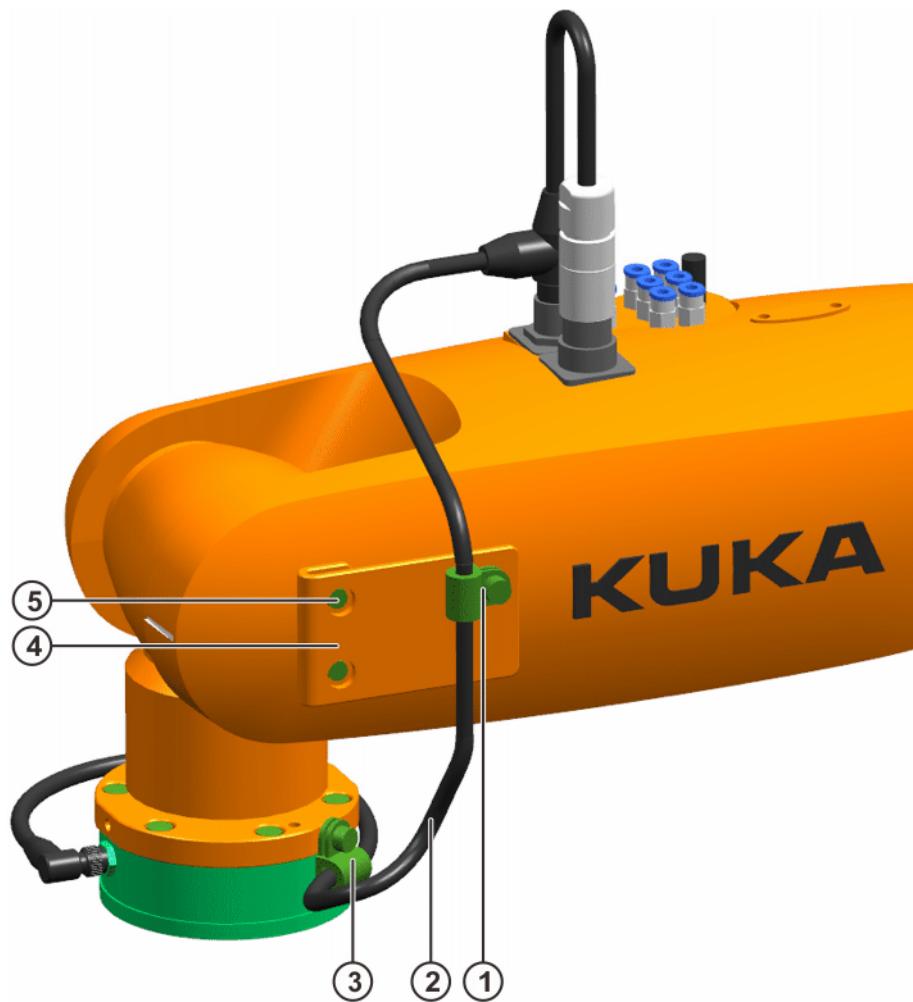


Fig. 8-4: Installing the sensor cable

- | | |
|----------------|--------------------|
| 1 Clamp | 4 The fixing plate |
| 2 Sensor cable | 5 Screw |
| 3 Clamp | |

8.4 **Installing the software**

Description

The software is installed via KOP file.

Precondition

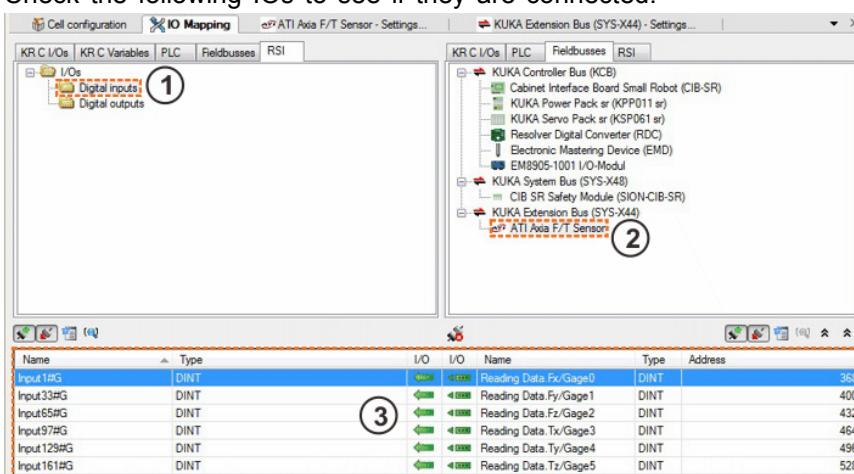
- Expert rights
- KUKA WorkVisual is installed.
- The following software packages are installed in the KUKA WorkVisual:
 - RobotSensorInterface
 - ForceTorqueControl
 - ready2_sensitive_assembly

Procedure

1. Open KUKA WorkVisual.
2. Select **File > Browse for project**.

The **WorkVisual Project Explorer** window opens.

3. Select the target project.
4. Click **Open**.
5. Drag and drop the **ready2_assembly_ATI_Axia80** file from the **ready2_sensitive_assembly** fold of the **Options** tab in the **Catalogs** to the **Controller** folder in the **Hardware** tab of **Project Structure**.
The WorkVisual window opens.
6. Click **OK**.
The three KOP files show in the **Options** folder.
7. Right-click the robot controller in the **Project Structure** tab.
8. Select **Set as active controller**.
The **KUKA Extension Bus (SYS-X44)** shows in the **Bus structure**.
The **ATI Axia F/T Sensor** shows in the **KUKA Extension Bus (SYS-X44)**.
9. Select **IO Mapping tab**.
10. Check the following IOs to see if they are connected:



- 1 **Digital inputs of I/Os** in the **RSI** tab
- 2 **ATI Axia F/T Sensor** of the **KUKA Extension Bus (SYS-X44)** in the **Fieldbuses** tab
- 3 The connection status of the IOs

11. Select **Extras > Generate Code**.

If there are no errors in the **Message** window, then you can move to the next step.

12. Set user group to be Expert in SmartHMI and log in.

Default password: kuka

13. Select **Extras > Deploy...**

The **WorkVisual Project Deployment** window opens.

14. Click **Next**.

15. Click **Next**.

16. Click **Next**.

The **Project management** window opens in SmartHMI.

17. Press **Yes** in SmartHMI.

The other **Project management window** opens in SmartHMI.

18. Press **Yes** in SmartHMI.

19. Click **Finish** in KUKA WorkVisual.

Result

- The application software is installed into the robot controller.
- The robot controller will automatically reboot.

8.5 Uninstalling the software

Description

The software is uninstalled via KUKA WorkVisual.

Precondition

- Expert rights
- The application software is installed in the KUKA WorkVisual and the robot controller.

Procedure

1. Open KUKA WorkVisual.
2. Right-click to delete the **ready2_assembly_ATI_Axia80** file from the **Controller** folder in the **Project Structure**.
3. Right-click to delete the **ready2_sensitive_assembly** file from the **Options** folder in the **Project Structure**.
4. Click **OK**.
5. Right-click to delete the **ATI Axia F/T Sensor of EtherCAT** in the **KUKA Extension Bus (SYS-X44)**.
6. Select **Extras > Generate Code**.
If there are no errors in the **Message** window, then you can move to the next step.
7. Set user group to be Expert in SmartHMI and log in.
Default password: kuka
8. Select **Extras > Deploy...**
The **WorkVisual Project Deployment** window opens.
9. Click **Next**.
10. Click **Next**.
11. Click **Next**.
The **Project management** window opens in SmartHMI.
12. Press **Yes** in SmartHMI.
The other **Project management window** opens in SmartHMI.
13. Press **Yes** in SmartHMI.
14. Click **Finish** in KUKA WorkVisual.

Result

- The application software is uninstalled from the robot controller.

9 Operation

9.1 KUKA smartPAD teach pendant

9.1.1 Front view

Function

The smartPAD is the teach pendant for the industrial robot. The smartPAD has all the operator control and display functions required for operating and programming the industrial robot.

The smartPAD has a touch screen: the smartHMI can be operated with a finger or stylus. An external mouse or external keyboard is not necessary.

Overview

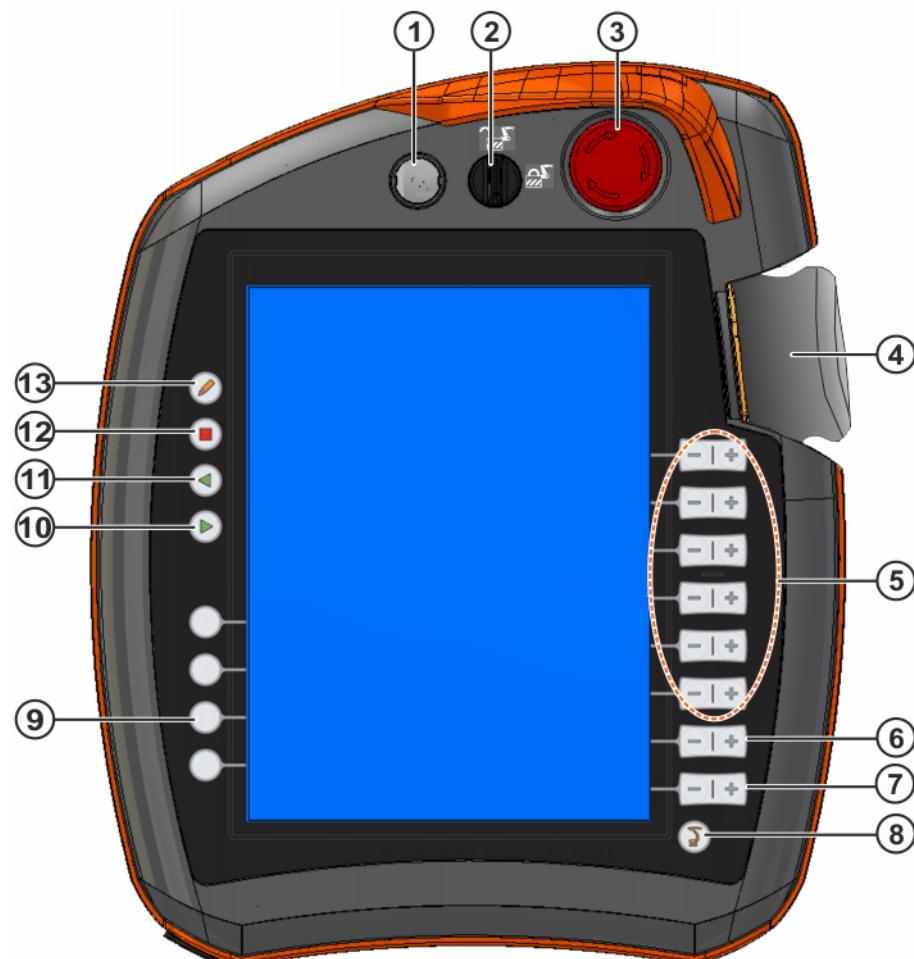


Fig. 9-1: KUKA smartPAD, front view

Item	Description
1	Button for disconnecting the smartPAD
2	Mode selector switch. The switch may be one of the following variants: <ul style="list-style-type: none">• With key• Without key The mode selector switch is used to call the connection manager. The operating mode can be changed by using the connection manager.
3	EMERGENCY STOP device Stops the robot in hazardous situations. The EMERGENCY STOP button locks itself in place when it is pressed.
4	Space Mouse: For moving the robot manually
5	Jog keys: For moving the robot manually
6	Key for setting the program override
7	Key for setting the jog override
8	Main menu key: Shows the menu items on the smartHMI
9	Status keys. The status keys are used primarily for setting parameters in technology packages. Their exact function depends on the technology packages installed.
10	Start key: The Start key is used to start a program.
11	Start backwards key: The Start backwards key is used to start a program backwards. The program is executed step by step.
12	STOP key: The STOP key is used to stop a program that is running.
13	Keyboard key Displays the keyboard. It is generally not necessary to press this key to display the keyboard, as the smartHMI detects when keyboard input is required and displays the keyboard automatically.

9.1.2 Rear view

Overview



Fig. 9-2: KUKA smartPAD, rear view

- | | | | |
|---|-------------------|---|----------------------|
| 1 | Enabling switch | 4 | USB connection |
| 2 | Start key (green) | 5 | Enabling switch |
| 3 | Enabling switch | 6 | Identification plate |

Description

Element	Description
Rating plate	Rating plate
Start key	The Start key is used to start a program.
Enabling switch	<p>The enabling switch has 3 positions:</p> <ul style="list-style-type: none"> Not pressed Center position Fully pressed (panic position) <p>The enabling switch must be held in the center position in operating modes T1 and T2 in order to be able to jog the manipulator.</p> <p>In the operating modes Automatic and Automatic External, the enabling switch has no function.</p>

Element	Description
USB connection	The USB connection is used, for example, for archiving and restoring data. Only for FAT32-formatted USB sticks.

10 Configuration

10.1 HMI

The HMI of ready2_sensitive_assembly has two parts:

- Sensor configuration
- Assembly application

10.2 Sensor configuration

Description

ready2_sensitive_assembly sensor configuration has two screens:

- Mounting
- Load range

Precondition

- Log in as Administrator.

Path

- Main menu > Configuration > Sensitive assembly > Sensor configuration

10.2.1 Mounting screen

Description

The Mounting screen shows the relationship between the flange coordinate system and the sensor coordinate system.

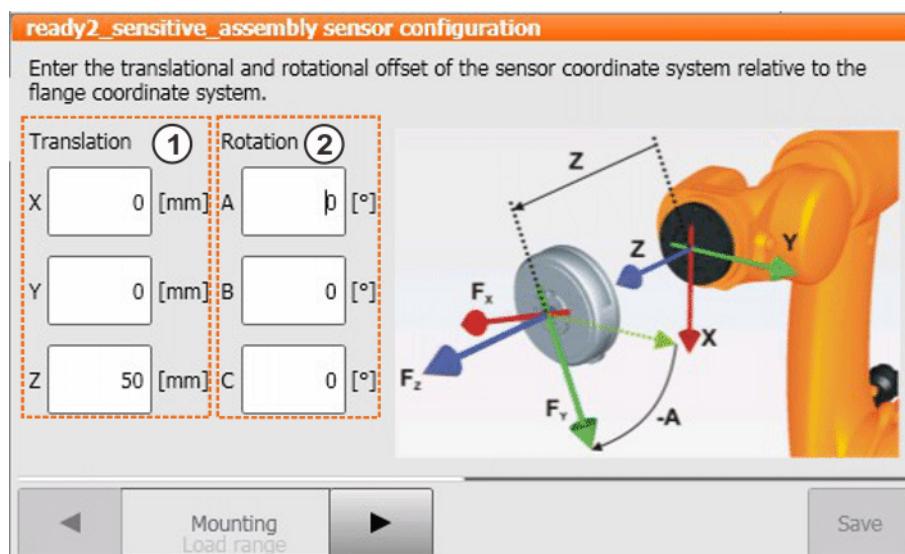


Fig. 10-1: Mounting screen

Item	Description
1	<p>Translation</p> <p>The translational offset of the sensor coordinate system relative to the flange coordinate system.</p> <p>Range</p> <ul style="list-style-type: none"> • X: -25000 ... +25000 mm <ul style="list-style-type: none"> – Default: 0 • Y: -25000 ... +25000 mm <ul style="list-style-type: none"> – Default: 0 • Z: -25000 ... +25000 mm <ul style="list-style-type: none"> – Default: 50
2	<p>Rotation</p> <p>The rotational offset of the sensor coordinate system relative to the flange coordinate system.</p> <p>Range</p> <ul style="list-style-type: none"> • A: -180° ... +180° <ul style="list-style-type: none"> – Default: 0 • B: -180° ... +180° <ul style="list-style-type: none"> – Default: 0 • C: -180° ... +180° <ul style="list-style-type: none"> – Default: 0

10.2.2 Load range screen

Description

The Load range screen shows the maximum permissible load on the sensor.

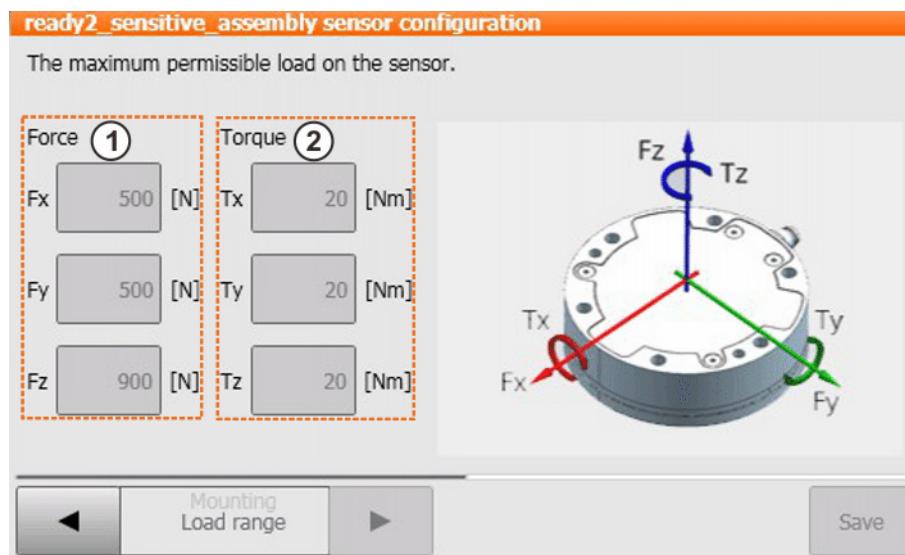


Fig. 10-2: Load range screen

Item	Description
1	Force <ul style="list-style-type: none"> • Fx • Fy • Fz
2	Torque <ul style="list-style-type: none"> • Tx • Ty • Tz

10.3 Assembly application

Description

ready2_sensitive_assembly assembly application has 12 screens:

- Application lists
- Sensor load data
- RCS
- Adjuster
- Approach
- Distance
- Break condition
- Limit
- Sine
- Lissajous
- Spiral
- Monitor

Precondition

- Log in as Expert

Path

- Main menu > Configuration > Sensitive assembly > Assembly application

10.3.1 Application lists screen

Description

The screen shows how to create, open, delete, and save an assembly application.

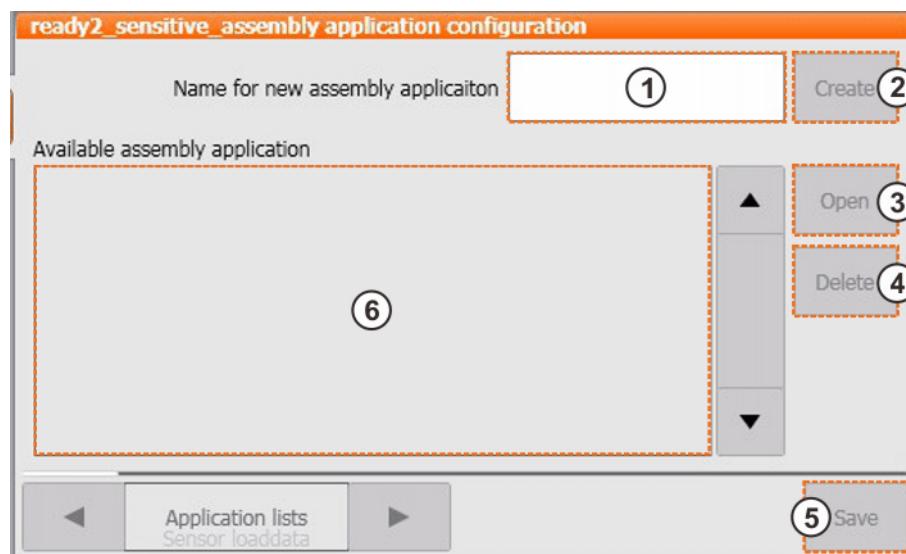


Fig. 10-3: Application lists screen

Item	Description
1	Name Input the name for the new assembly application.
2	Create There are four assembly search types which can be created: <ul style="list-style-type: none"> • Basic assembly • Sine curve search assembly • Lissajous curve search assembly • Spiral curve search assembly
3	Open Open the application which is selected in the application list. <ul style="list-style-type: none"> • The name of an opened application can be changed and the application can be saved under the new name.
4	Delete Delete the application which is selected in the application list.
5	Save Save the changes.
6	Available assembly application The available assembly application list

10.3.2 Sensor load data screen

Description

You can set the sensor load and its center of gravity in the sensor coordinate system.

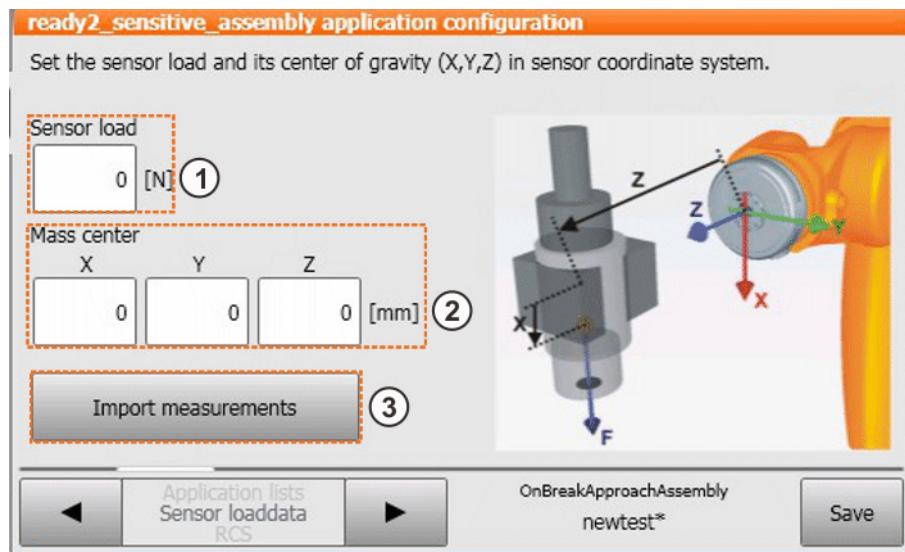


Fig. 10-4: Sensor load data screen

Item	Description
1	Sensor load <ul style="list-style-type: none"> Range: 0 ... +900 N Default: 0
2	Mass center Input the position of the center-of-gravity of the sensor load which is relative to the origin of the sensor coordinate system. <ul style="list-style-type: none"> Default: 0 Unit: mm
3	Import measurements After program StAssy_LDD.SRC runs, if you click the Import measurements button, the software will automatically read the data of sensor load and mass center. StAssy_LDD.SRC path <ul style="list-style-type: none"> R1 > Program > StAssy

10.3.3 Reference coordinate system (RCS) screen

Description

The application configuration is based on a reference coordinate system. You must select a Cartesian coordinate system which the force control can refer to.

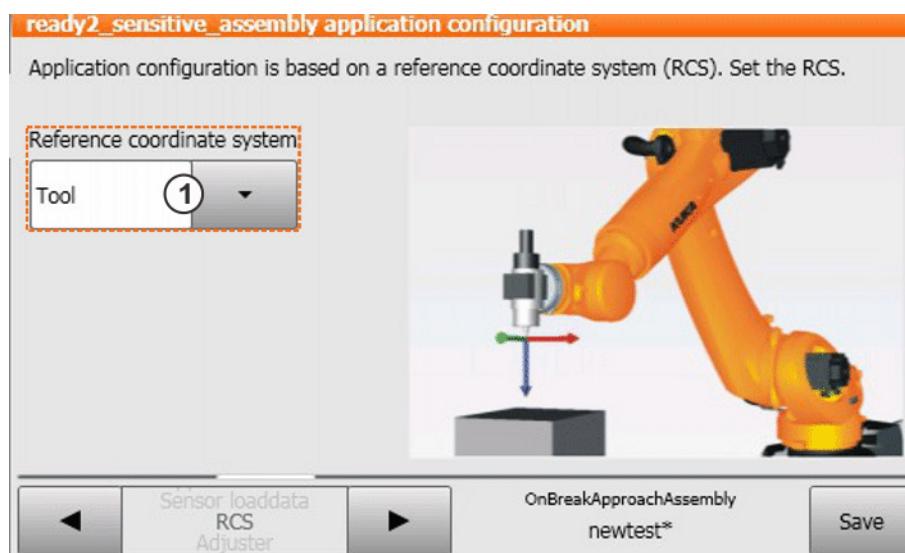


Fig. 10-5: RCS screen

Item	Description
1	Reference coordinate system <ul style="list-style-type: none"> • World • Base • RobRoot • Tool (default)

10.3.4 Adjuster screen

Description

The adjuster is defined by setting a main direction and a corresponding target force. When the contact is made and the target force is reached, the robot will stop.

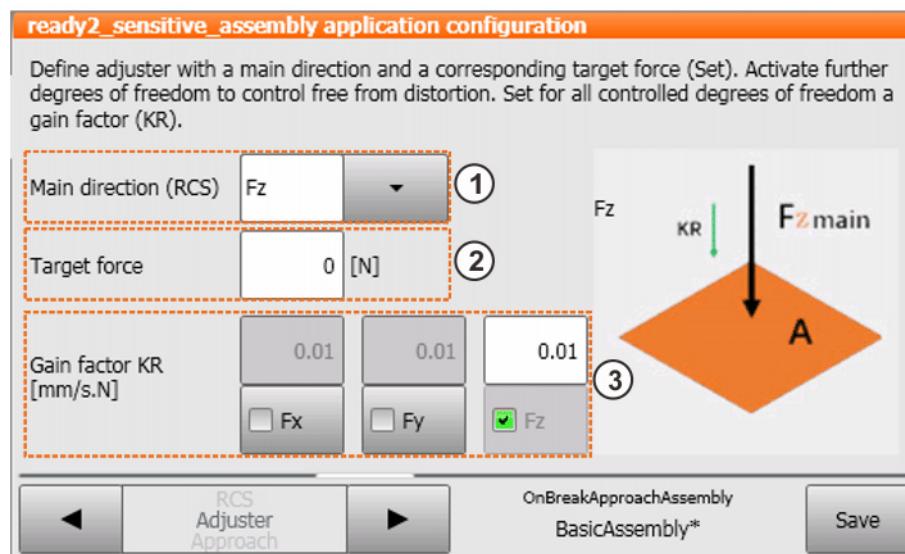


Fig. 10-6: Adjuster screen

Item	Description
1	<p>Main direction (RCS)</p> <p>Select a direction in which the motion is performed in the reference coordinate system until the contact is made.</p> <p>Motion in X, Y, or Z direction of the RCS:</p> <ul style="list-style-type: none"> • Fx • Fy • Fz
2	<p>Target force</p> <p>Set the target force if a force adjuster is activated for the main direction.</p> <ul style="list-style-type: none"> • Range: -900 ... +900 N • Default: 0
3	<p>Gain factor KR</p> <p>Set the gain factor for the activated direction of the force adjuster.</p> <ul style="list-style-type: none"> • Range: 0 ... +256 mm/s.N • Default: 0.01

10.3.5 Approach screen

Description

You can set the approach velocity, and the trigger force of contact control in this screen.

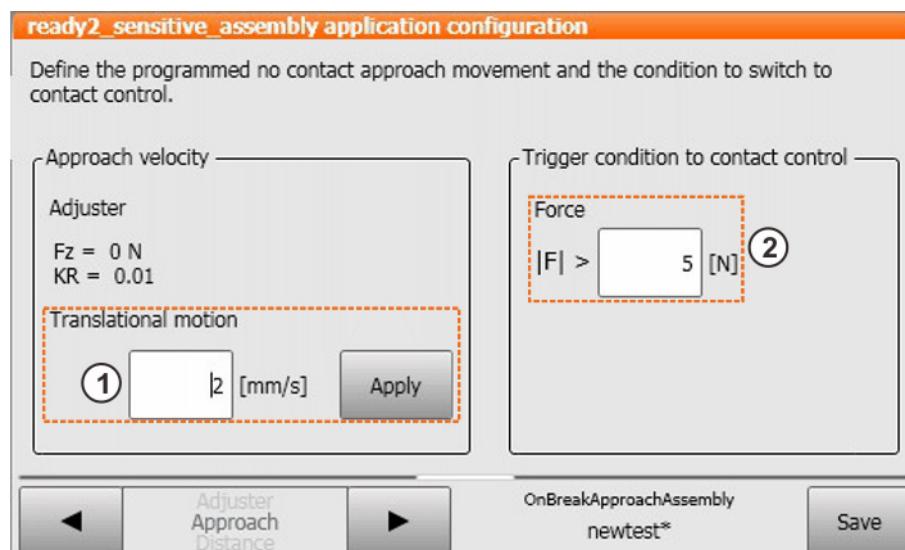


Fig. 10-7: Approach screen

Item	Description
1	<p>Translational motion velocity</p> <p>Set the velocity for translational motion in the X, Y, or Z main direction of RCS.</p> <p>You can input the maximum velocity or accept the suggested velocity by pressing the Apply button.</p> <ul style="list-style-type: none"> Range: 0 ... +200 mm/s Default: 0
2	<p>Force</p> <p>Trigger force of contact control</p> <p>When the actual force is greater than the trigger force, the contact adjuster starts to control and attempts to reach the target force which is defined in the Adjuster screen.</p> <ul style="list-style-type: none"> Range: 0 ... +900 N Default: 10 <p>If the robot is in one of the following three search types, when the search condition is met, the trigger force will also act as search force.</p> <ul style="list-style-type: none"> Sine Lissajous Sprial

10.3.6 Distance screen

Description

You can set the Contact distance, Insert distance, and Protect distance in this screen.

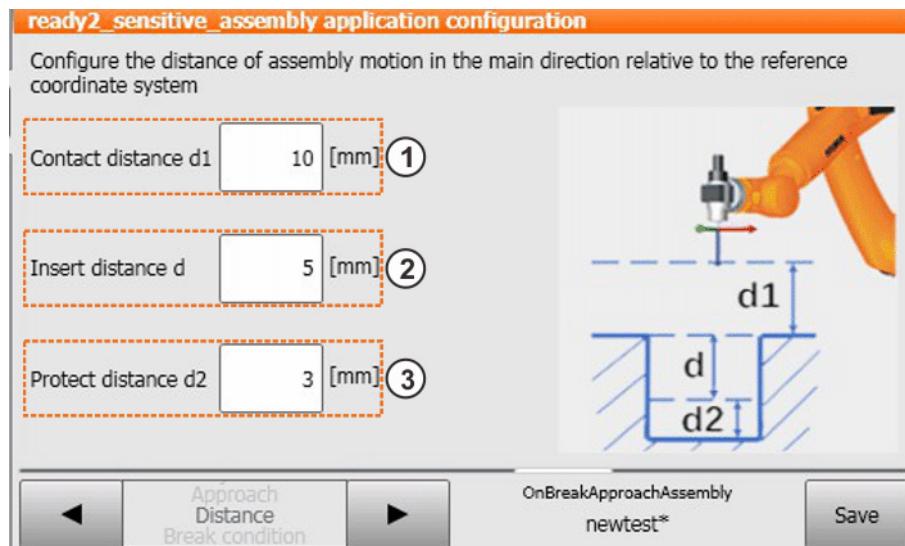


Fig. 10-8: Distance screen

Item	Description
1	Contact distance d1 The distance between the start point of robot and the working platform. <ul style="list-style-type: none"> Range: 0 ... +100 mm Default: 10
2	Insert distance d The hole depth <ul style="list-style-type: none"> Range: 0 ... +100 mm Default: 5
3	Protect distance d2 The protection distance <ul style="list-style-type: none"> Range: 0 ... +100 mm Default: 3

10.3.7 Break condition screen

Description

For each adjuster component which is activated in the Adjuster screen, a break condition must be defined. When the break condition is met, the assembly motion will stop.

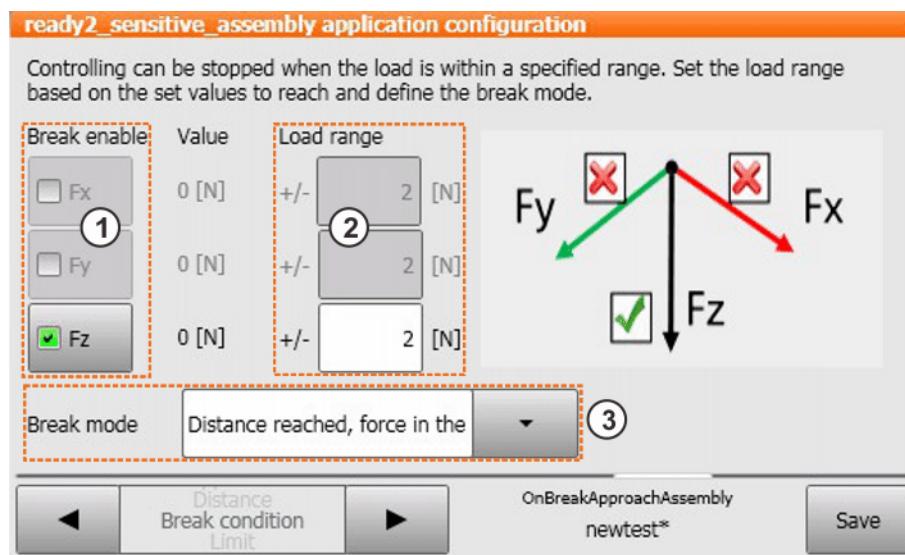


Fig. 10-9: Break condition screen

Item	Description
1	Break enable <ul style="list-style-type: none"> • Fx • Fy • Fz
2	Load range <ul style="list-style-type: none"> • Range: 0 ... +900 N • Default: 2
3	Break mode There are three break modes: <ul style="list-style-type: none"> • Distance reached, force in the target range • Distance reached, hold time once within target range of force • Distance reached, hold time entirely within target range of force

10.3.8 Limit screen

Description

You can set the maximum time and load for the whole control of RCS.

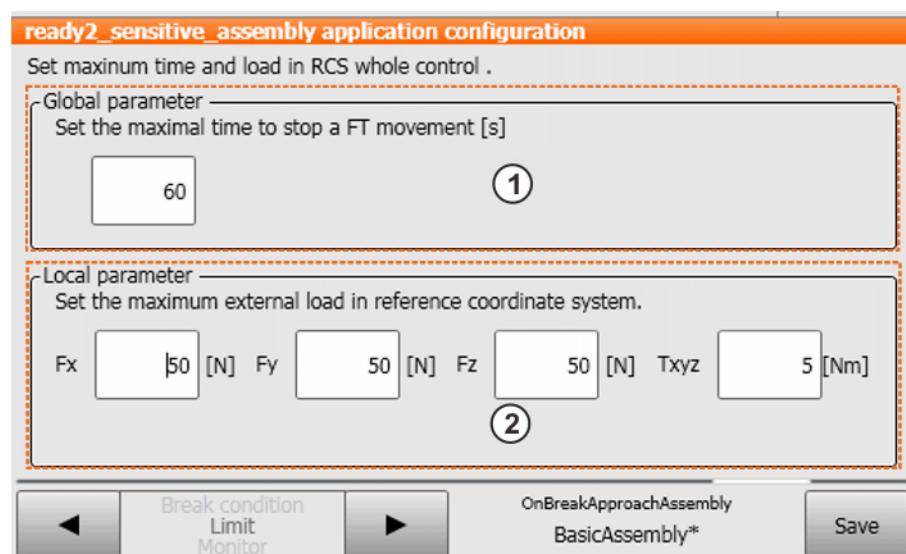


Fig. 10-10: Limit screen

Item	Description
1	<p>Global parameter</p> <p>Set the maximum time to stop an assembly motion.</p> <ul style="list-style-type: none"> If each one of the break conditions is not met in the maximum time, the assembly motion will be stopped when the maximum time is reached. Unit: s Default: 60
2	<p>Local parameter</p> <ul style="list-style-type: none"> Fx, Fy, Fz Set the maximum external load in the reference coordinate system. <ul style="list-style-type: none"> If the external load is greater than the setting, the assembly motion will be stopped. Unit: N Default: 50 Txyz Set the maximum external torque in the reference coordinate system. <ul style="list-style-type: none"> If the external torque is greater than the setting, the assembly motion will be stopped. Range: 0 ... +20 Nm Default: 5

10.3.9 Sine screen

Description

You can set the parameters of Sine curve search motion in this screen.

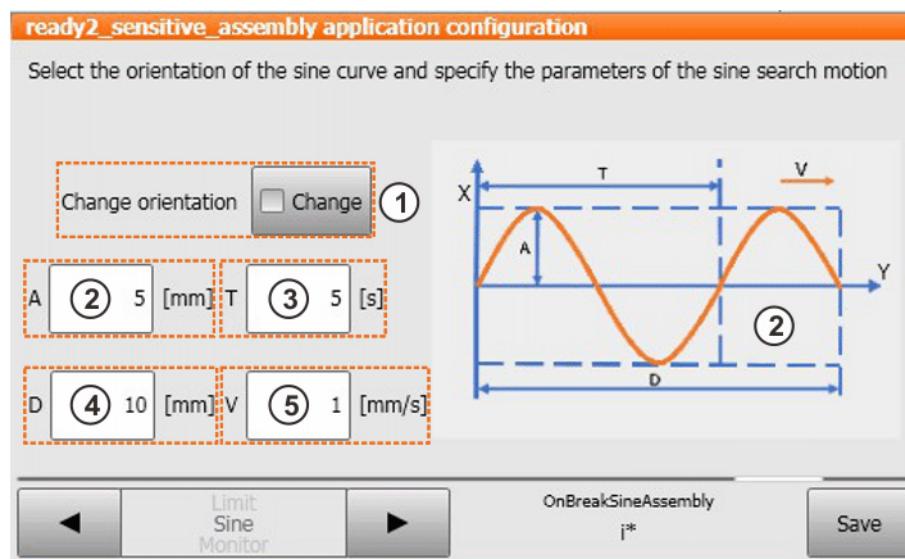


Fig. 10-11: Sine screen

Item	Description
1	Change orientation Change the orientation of the Sine curve search motion.
2	A The amplitude of the Sine curve <ul style="list-style-type: none"> Range: 0 ... +10 mm Default: 5
3	T The period of the Sine curve <ul style="list-style-type: none"> Range: 0 ... +20 s Default: 5
4	D The length of the Sine curve <ul style="list-style-type: none"> Range: 0 ... +50 mm Default: 10
5	V The velocity of the Sine curve search motion <ul style="list-style-type: none"> Range: 0 ... +50 mm/s Default: 1

10.3.10 Lissajous screen

Description

You can select the type of Lissajous curve and set the parameters of the Lissajous curve search motion.

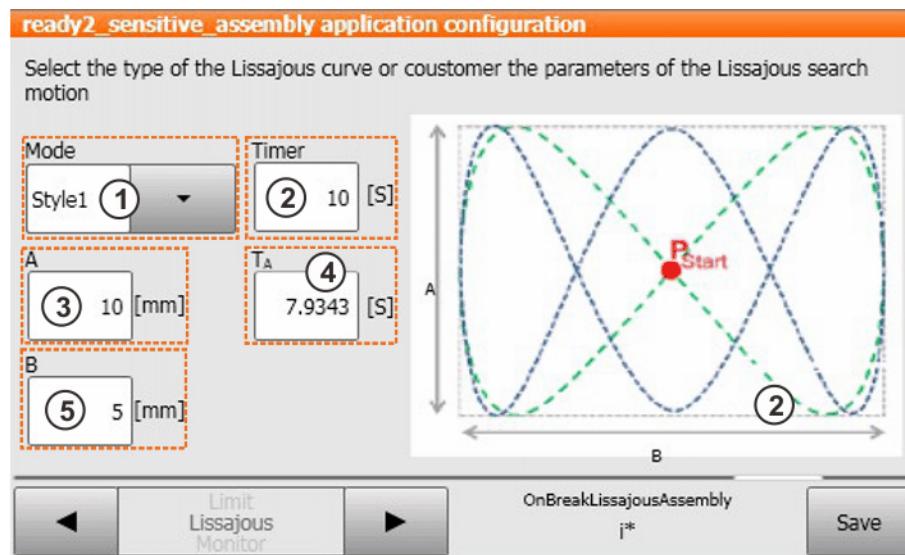


Fig. 10-12: Lissajous screen

Item	Description
1	Mode <ul style="list-style-type: none"> Style1: $T_B = T_A/1.2989$ Style2: $T_B = T_A/0.992$ UserMode: Define the values of T_A and T_B
2	Timer Set the maximum time of Lissajous curve search motion. <ul style="list-style-type: none"> Range: 0 ... +20 s Default: 10
3	A The width of the Lissajous curve. <ul style="list-style-type: none"> Range: 0 ... +20 mm Default: 10
4	T_A The period of the width of the Lissajous curve <ul style="list-style-type: none"> Unit: s
5	B The length of the Lissajous curve. <ul style="list-style-type: none"> Range: 0 ... +20 mm
-	T_B The period of the length of the Lissajous curve <ul style="list-style-type: none"> Unit: s

10.3.11 Spiral screen

Description

You can set the parameters of Spiral curve search motion in this screen.

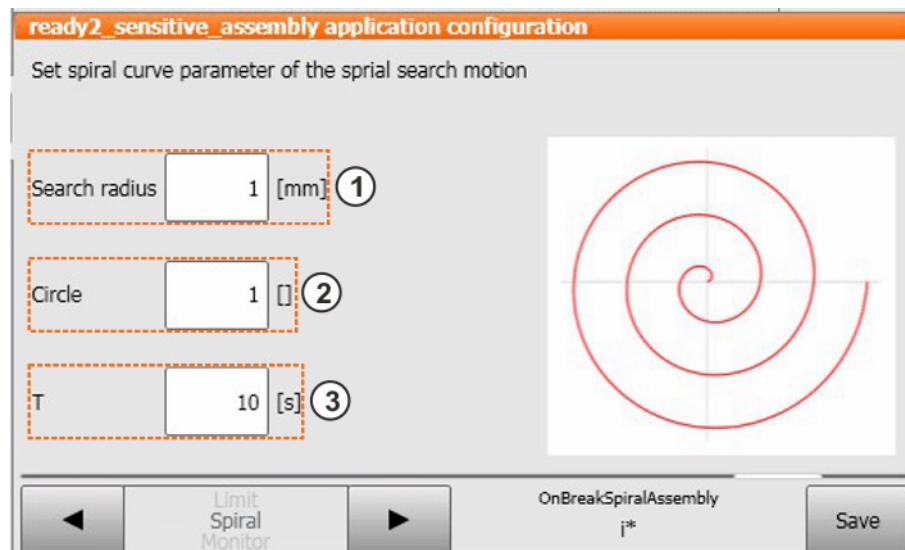


Fig. 10-13: Spiral screen

Item	Description
1	Search radius Set the radius of the single spiral curve. <ul style="list-style-type: none"> • Range: +1 ... +10 mm • Default: 1
2	Circle Set the number of turns of the spiral curve. <ul style="list-style-type: none"> • Range: +1 ... +10 • Default: 1
3	T Set the run time of single lap of the spiral curve. <ul style="list-style-type: none"> • Range: +1 ... +20 s • Default: 10

10.3.12 Monitor screen

Description

The screen shows the control signals.

To display the force/torque control signals, the default RSI channel 1 must be used.

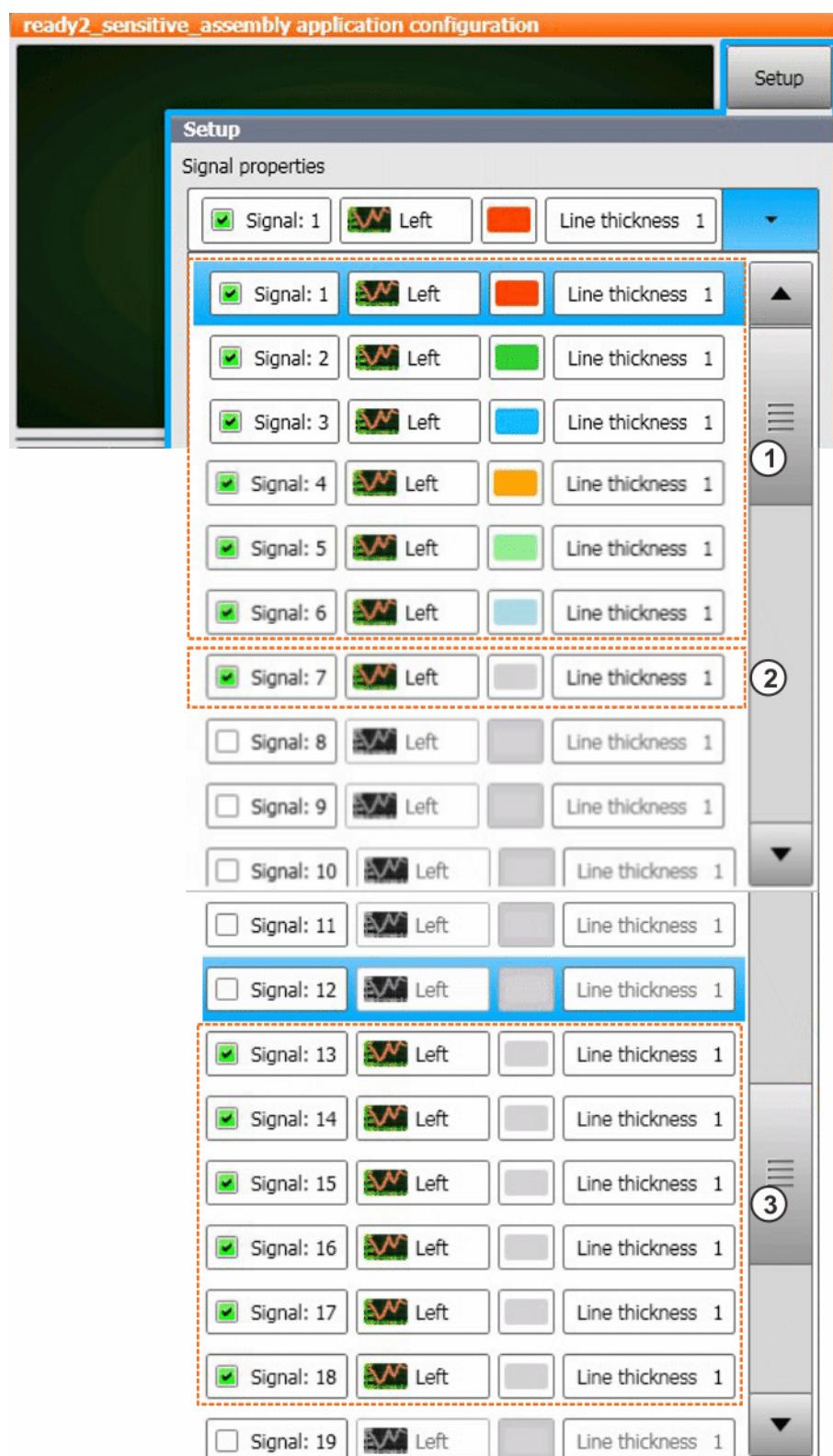


Fig. 10-14: Monitor screen

Item	Description
1	Signal 1 ... Signal 6 Process forces and torques in the RCS
2	Signal 7 The distance for the robot to move in the main direction

Item	Description
3	Signal 13 ... Signal 18 Process forces and torques in the sensor coordinate system

11 Programming

11.1 Inline forms

Description

The entire program of the assembly operation can be programmed via inline forms in KRL.

Precondition

- Program is opened.

Procedure

1. Select **Commands > ready2_sensitive_assembly**.
2. Select the target command.
3. Set the parameters in the inline form.
4. Press **Cmd OK** to save.

11.1.1 ready2_sensitive_assembly Init

Description

The inline form initializes the sensor-guided assembly motion with the application data.

Path

- **Commands > ready2_sensitive_assembly> Init**

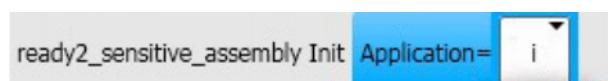


Fig. 11-1: Inline form Init

Item	Description
Application	Select the target application.

11.1.2 ready2_sensitive_assembly On

Description

The inline form initializes the sensor-guided assembly motion with the application data.

Path

- **Commands > ready2_sensitive_assembly > On**

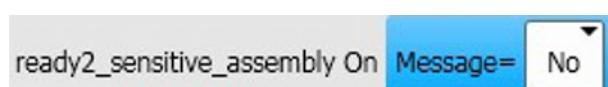


Fig. 11-2: Inline form On

Item	Description
Message	<ul style="list-style-type: none">• No: No message• Info: Notification message• Quit: Acknowledgement message

11.2 Global variables

Description

There are global variables to evaluate a terminated assembly application. These global variables are declared in the following file:

- R1\TP\StAssy\StAssy.DAT

SA_nIFBreak

The reason of the termination of an assembly motion is saved in the variable SA_nIFBreak.

12 Maintenance



The maintenance work must be done by the authorized specialist personnel.

Precondition

Before you start any maintenance work or repair work, the following pre-conditions must be obeyed:

- The Assembly and Operating instructions of each component must be read and understood.
- The locally applicable accident prevention regulations must be read and understood.
- The ESD guidelines must be read and understood.
- The qualifying personal protective equipment must be worn.
- The robot system, all the control components, and all the additional components must be switched off and secured. Precautions must be taken to prevent any unauthorized persons from switching them on again.
- The main power must be disconnected. Precautions must be taken to prevent any unintentional main power connection.
- The air pressure in the pneumatic components must be released. The main air supply pipe must be switched off. Precautions must be taken to prevent any unauthorized persons from connecting it again.

12.1 Maintenance symbols

Maintenance symbols



The overview may contain maintenance symbols that are not relevant for the maintenance work on this product. The maintenance illustrations provide an overview of the relevant maintenance work.



Oil change



Lubricate with grease gun



Lubricate with brush



Lubricate with spray grease



Tighten screw/nut



Check component, visual inspection



Clean component



Exchange battery



Exchange toothed belt



Check toothed belt tension

12.2 Maintenance table

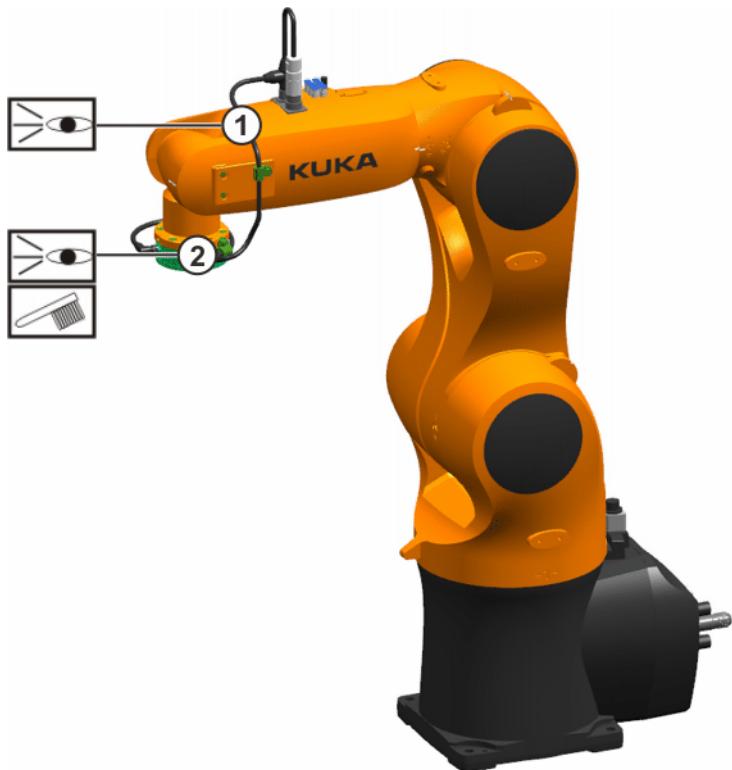


Fig. 12-1: Maintenance points

Interval	Item	Activity
Daily	1	Check the wear of the sensor cable.
Weekly	2	Check the conditions of F/T sensor. Clean the F/T sensor.



Maintenance for each component of ready2_sensitive_assembly_KR AGILUS is described in their manufacturer documentation. All these maintenance tasks must also be done.

12.3 Cleaning work



The cleaning work of F/T sensor is described in its manufacturer documentation.

13 Repair



The repair work must be done by the authorized specialist personnel.



Before you start any repair work, the **Precondition** in the "Maintenance" Chapter must be obeyed.

13.1 Changing the sensor cable

Description

The old sensor cable is replaced by a new one.



WARNING

Unintentional robot motions can cause injuries and damage to property.
If work is carried out on an operational robot, the robot must be secured by activating the EMERGENCY STOP device.
Warn all persons concerned before starting to put it back into operation.

Procedure

1. Disconnect the cable connectors from the manipulator.
2. Disconnect the cable connector from the F/T sensor.
3. Remove the clamp from the manipulator.
4. Remove the clamp from the F/T sensor.
5. Remove the old sensor cable.
6. Install and connect the new sensor cable.

(>> *8.3.2 "Installing the sensor cable" Page 32*)

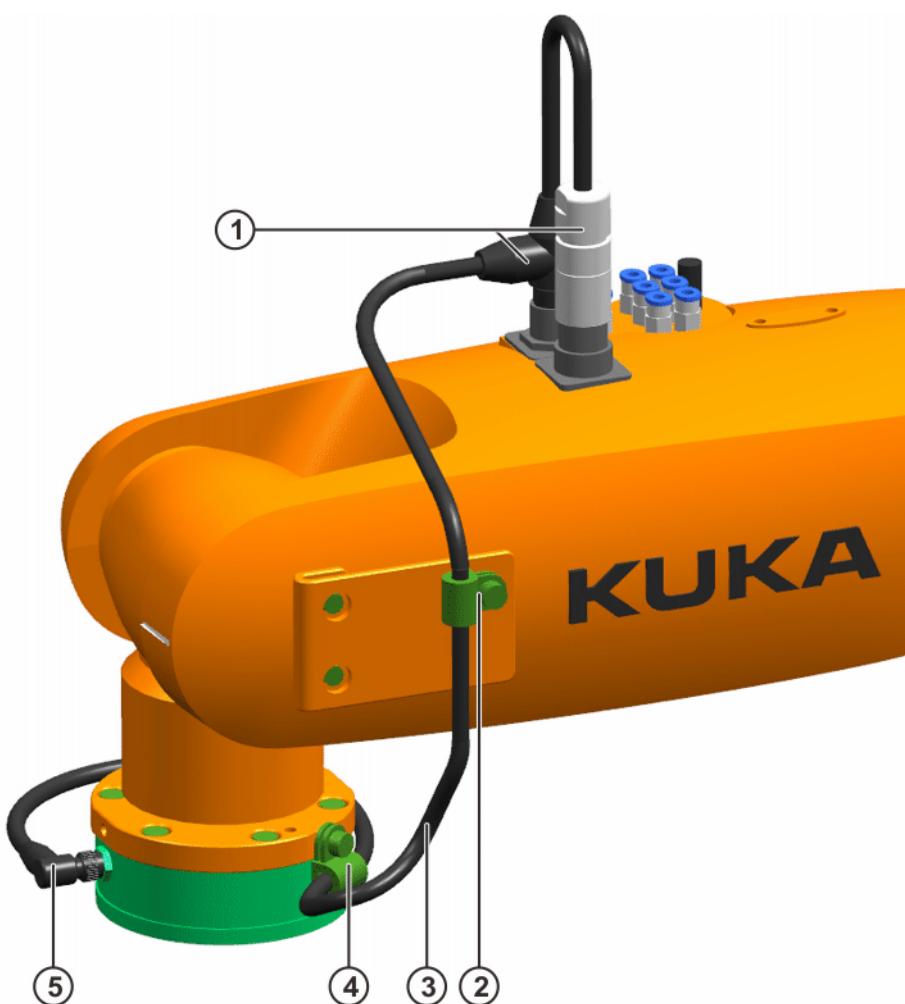


Fig. 13-1: Changing the sensor cable

- | | | | |
|---|------------------|---|-----------------|
| 1 | Cable connectors | 4 | Clamp |
| 2 | Clamp | 5 | Cable connector |
| 3 | Sensor cable | | |

13.2 **Changing the data cable**

Description

The old data cable is replaced by a new one.



WARNING

Unintentional robot motions can cause injuries and damage to property.
If work is carried out on an operational robot, the robot must be secured by activating the EMERGENCY STOP device.
Warn all persons concerned before starting to put it back into operation.

Procedure

1. Disconnect the data cable from the manipulator and the robot controller.
2. Connect the new data cable to the XPN1 of the manipulator and the X65 of the robot controller.

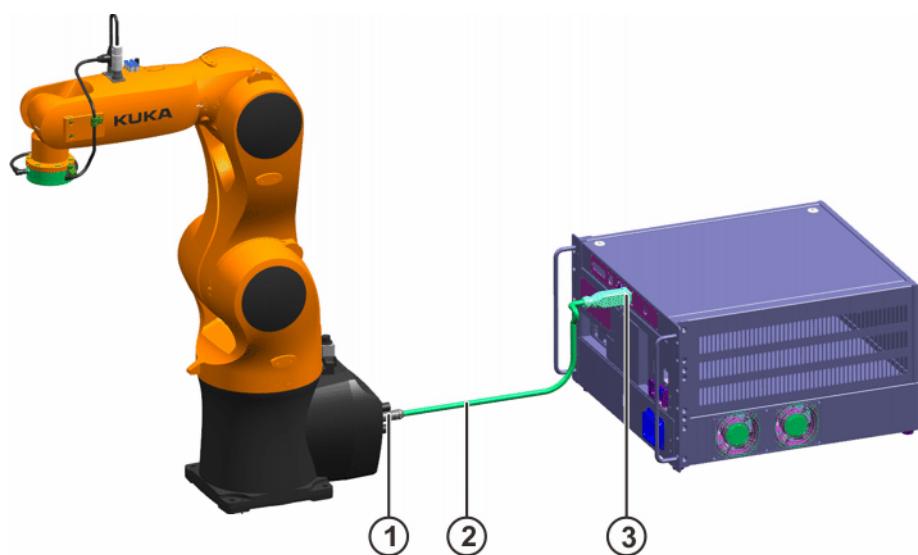


Fig. 13-2: Changing the data cable

- | | |
|--------------|-------|
| 1 XPN1 | 3 X65 |
| 2 Data cable | |

14 Messages

No.	Message	Cause / Remedy
34106	<i>ready2_sensitive_assembly sensor overload {0}</i>	<p>Cause: The F/T sensor is overloaded.</p> <p>Effect: Path-maintaining EMERGENCY STOP, Input of active commands (robot motions, program start) is blocked.</p> <p>Remedy: Modify the way of mounting or reduce load.</p>
34107	<i>ready2_sensitive_assembly sensor overload {0}</i>	<p>Cause: The F/T sensor is overloaded.</p> <p>Effect: Path-maintaining EMERGENCY STOP, Input of active commands (robot motions, program start) is blocked.</p> <p>Remedy: Modify the way of mounting or reduce load.</p>

15 Decommissioning, storage and disposal

15.1 Decommissioning



The decommissioning information of the manipulator and the robot controller is in their Assembly and Operating Instructions.
The decommissioning information of the other components is in their manufacturer documentation.

15.2 Storage



The storage information of the manipulator and the robot controller is in their Assembly and Operating Instructions.
The storage information of the other components is in their manufacturer documentation.

Description

Each component must be stored in a clean and dry environment. Each component must be prevented from contamination, corrosion, and unauthorized operation. In storage, each component must have no risk of injury to persons. The detail information of storage is as follows:

- The storage environment must be dry and dust-free.
- Visually check each component and eliminate any faults before storage.
- Clean each component before storage. Each component must be dry and have no cleaning residues.
- Seal off all electrical connections with suitable covers.
- Use qualifying coverings to separate each component from the external environment.
- Avoid temperature fluctuations in the storage environment.
- Avoid wind and air current in the storage environment.
- Avoid high air humidity in the storage environment.
- Avoid direct sunlight in the storage environment.

15.3 Disposal

When ready2_sensitive_assembly_KR AGILUS reaches the end of its useful life, it can be dismantled, and the materials must be disposed of properly by type.

The following table shows the materials which are used in this application module. Some of the plastic components are marked with a material designation and must be disposed of accordingly.



The disposal information of the manipulator and the robot controller is in their Assembly and Operating Instructions.
The disposal information of the other components is in their manufacturer documentation.

Material	Subassembly, component	Notice
Metal		
Steel	Strain relief holders, screws, washers, pins	-
Copper	Electrical cables, wires	-
Aluminum	Adapter flanges, screw spindle housing	-
Electrical components		
Electrical components	Bus modules, boards, sensors	Dispose of as electrical scrap without disassembling
Plastics		
PA	Inlet for connecting cable set, cable straps	-
PE	Plastic spiral KW12	-
PU	Hoses	-
PUR, PVC, rubber	Cable sheaths	-

16 Appendix

16.1 Tightening torques

Tightening torques

The following tightening torques (Nm) are valid for screws and nuts where no other specifications are given.

The specified values apply to lightly oiled black (e.g. phosphated) and coated (e.g. mech. galv., zinc flake plating) screws and nuts.

	Strength class		
Thread	8.8	10.9	12.9
M1.6	0.17 Nm	0.24 Nm	0.28 Nm
	0.35 Nm	0.48 Nm	0.56 Nm
M2.5	0.68 Nm	0.93 Nm	1.10 Nm
M3	1.2 Nm	1.6 Nm	2.0 Nm
M4	2.8 Nm	3.8 Nm	4.4 Nm
M5	5.6 Nm	7.5 Nm	9.0 Nm
M6	9.5 Nm	12.5 Nm	15.0 Nm
M8	23.0 Nm	31.0 Nm	36.0 Nm
M10	45.0 Nm	60.0 Nm	70.0 Nm
M12	78.0 Nm	104.0 Nm	125.0 Nm
M14	125.0 Nm	165.0 Nm	195.0 Nm
M16	195.0 Nm	250.0 Nm	305.0 Nm
M20	370.0 Nm	500.0 Nm	600.0 Nm
M24	640.0 Nm	860.0 Nm	1030.0 Nm
M30	1330.0 Nm	1700.0 Nm	2000.0 Nm

	Strength class	
Thread	8.8 ISO7991 Allen screw	10.9 ISO7380, ISO07381 Fillister head screw
M3	0.8 Nm	0.8 Nm
M4	1.9 Nm	1.9 Nm
M5	3.8 Nm	3.8 Nm

	Strength class	
Thread	10.9 DIN7984 pan head screws	
M4	2.8 Nm	

Tighten M5 domed cap nuts with a torque of 4.2 Nm.

17 KUKA Service

17.1 Requesting support

Introduction

This documentation provides information on operation and operator control, and provides assistance with troubleshooting. For further assistance, please contact your local KUKA subsidiary.

Information

The following information is required for processing a support request:

- Description of the problem, including information about the duration and frequency of the fault
- As comprehensive information as possible about the hardware and software components of the overall system

The following list gives an indication of the information which is relevant in many cases:

- Model and serial number of the kinematic system, e.g. the manipulator
 - Model and serial number of the controller
 - Model and serial number of the energy supply system
 - Designation and version of the system software
 - Designations and versions of other software components or modifications
 - Diagnostic package KRCDiag
- Additionally for KUKA Sunrise: Existing projects including applications
- For versions of KUKA System Software older than V8: Archive of the software (KRCDiag is not yet available here.)
- Application used
 - External axes used

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KUKA Customer Support is available in many countries. Please do not hesitate to contact us if you have any questions.

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Index

Configuration, Sensor.....	41
Data cable, changing.....	62
2006/42/EU:2006.....	23
2014/30/EU:2014.....	23
95/16/EC.....	23

A

ANSI/RIA R.15.06-2012.....	23
Appendix.....	69
Assembly application.....	43
Assembly components, transporting.....	27

C

Cables, connecting.....	31
CE mark.....	20
Cleaning work.....	60
Configuration.....	41
Connecting cables, connecting.....	30
Connection manager.....	38
Contact-making.....	12

D

Data, basic.....	17
Declaration of Conformity.....	20
Declaration of Incorporation.....	20
Decommissioning.....	67
Dimensions, F/T sensor.....	25
Disposal.....	67

E

EC Declaration of Conformity.....	20
Electromagnetic compatibility (EMC):.....	23
EMC Directive.....	20, 23
EMERGENCY STOP.....	38
EMERGENCY STOP device, external.....	22
EN 60204-1:2006/A1:2009.....	23
EN 61000-6-2:2005.....	23
EN 61000-6-4:2007 + A1:2011.....	23
EN 614-1:2006+A1:2009.....	23
EN ISO 10218-1:2011.....	23
EN ISO 10218-2:2011.....	23
EN ISO 12100:2010.....	23
EN ISO 13849-1:2015.....	23
EN ISO 13849-2:2012.....	23
EN ISO 13850:2015.....	23
Enabling switch.....	39

F

F/T sensor.....	12
F/T sensor, installing.....	29

G

Glossary.....	8
---------------	---

H

HMI.....	8, 41
----------	-------

I

Identification plate.....	39
Init, ready2_sensitive_assembly.....	57
Inline forms.....	57
Intended use.....	9, 19
Introduction.....	7

J

Jog keys.....	38
---------------	----

K

Keyboard.....	38
Keyboard key.....	38
KLI.....	8
KRL.....	8
KSS.....	8
KUKA Customer Support.....	71
KUKA Service.....	71
KUKA smartPAD.....	37

L

Lissajous search.....	14
Low Voltage Directive.....	20

M

Machinery Directive.....	20, 23
Maintenance.....	59
Maintenance symbols.....	59
Maintenance table.....	60
Manipulator.....	8
Messages.....	65
Mode selector switch.....	38

O

On, ready2_sensitive_assembly.....	57
Operation.....	37
Operators.....	21

P

Personnel.....	21
Planning.....	25
Plates and labels.....	17
PLC.....	8
Product description.....	11

Programming.....	57	Transportation.....	27
PTP.....	8	Transportation, Application module.....	27
Purpose.....	9		

R

RCS.....	8
Recommissioning.....	29
Repair.....	61
Robot, transporting.....	27
RSI.....	8

S

Safety.....	19
Safety devices.....	22
Safety equipment.....	25
Safety instructions.....	7
Safety measures.....	22
Safety of machinery.....	23
Safety, general.....	19
Screen, Adjuster.....	46
Screen, Application lists.....	43
Screen, Approach.....	47
Screen, Lissajous.....	52
Screen, Load range.....	42
Screen, Monitor.....	54
Screen, Mounting.....	41
Screen, RCS.....	45
Screen, Sensor load data.....	44
Screen, Sine.....	51
Screen, Spiral.....	53
Search.....	13
Sensor cable, changing.....	61
Sensor cable, installing.....	32
Sine search.....	13
smartPAD.....	37
Software, installing.....	33
Software, uninstalling.....	35
Space Mouse.....	38
Spiral search.....	14
Standards, applied.....	23
Start-up.....	29
Start backwards key.....	38
Start key.....	38, 39
Status keys.....	38
STOP key.....	38
Storage.....	67
Support request.....	71
System integrator.....	20, 21

T

Target group.....	9
TCP.....	8
Technical data.....	17
Terms used.....	8
Tightening torques.....	69
Touch screen.....	37
Training.....	9

U

USB connection.....	39
Use, contrary to intended use.....	19
Use, improper.....	19
User.....	21

V

Variables, Global.....	58
------------------------	----

W

Warnings.....	7
Working space.....	25