

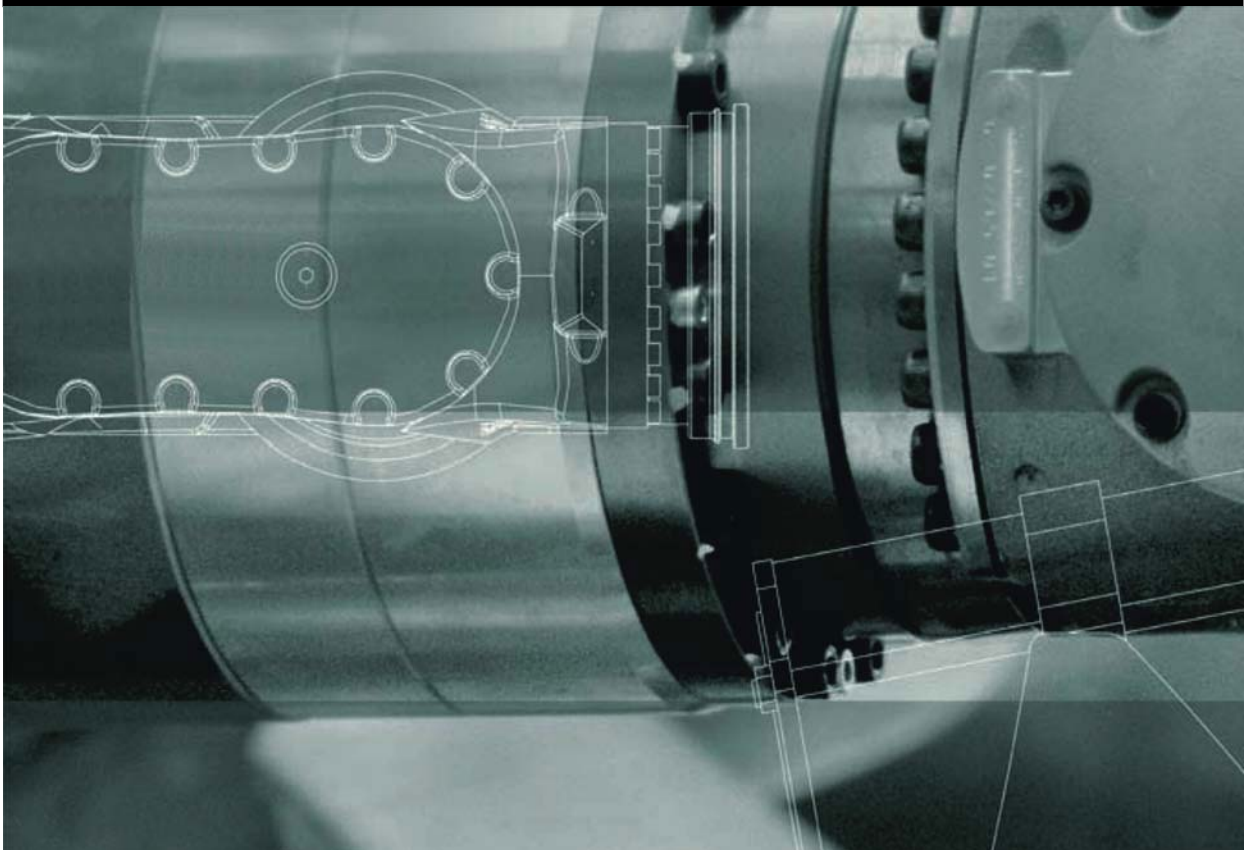
Robot Option

KUKA Roboter GmbH

Media Flange

For Product Family LBR iiwa

Assembly and Operating Instructions



Issued: 27.01.2015

Version: Option Media Flange V3

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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.

Translation of the original documentation

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1 Introduction

1.1 Documentation for the options

The documentation for this option consists of the following parts:


- Assembly and operating instructions for this option
- Assembly and operating instructions for the higher-level system


Each of these sets of 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 INSTRUCTIONS** Procedures marked with this warning **must** be followed exactly.

Hints

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
DTM	Device Type Manager
EtherCAT	EtherCAT is an Ethernet-based field bus.
MF	Media flange

1.4 Trademarks



is a trademark of Beckhoff Automation GmbH.

2 Purpose

2.1 Target group

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

- Advanced knowledge of mechanical engineering
- Advanced knowledge of electrical and electronic systems
- Knowledge of the robot controller system



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.

2.2 Intended use

Use The media flange is a universal interface that enables the user to connect electrical and pneumatic components to the robot flange, to configure them via the robot program and to access the internal energy supply system of the robot.

Misuse Any use or application deviating from the intended use is deemed to be impermissible misuse. This includes e.g.:

- Operation outside the permissible operating parameters
- Operation in potentially explosive environments
- Outdoor operation
- Underground operation

NOTICE

Changing the structure of the manipulator, e.g. by drilling holes, etc., can result in damage to the components. This is considered improper use and leads to loss of guarantee and liability entitlements.

3 Product description

3.1 Media flange overview

Description

The following media flanges are available:

- Basic flange
(>>> 3.1.1 "Basic flange" Page 9)
- Media flange electrical
(>>> 3.1.2 "Media flange electrical" Page 9)
- Media flange pneumatic
(>>> 3.1.3 "Media flange pneumatic" Page 10)
- Media flange IO pneumatic
(>>> 3.1.4 "Media flange IO pneumatic" Page 10)
- Media flange Touch pneumatic
(>>> 3.1.5 "Media flange Touch pneumatic" Page 11)

3.1.1 Basic flange

Overview

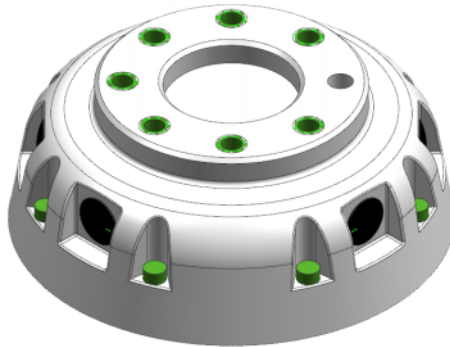


Fig. 3-1: Basic flange

Description

The basic flange has a hole pattern conforming to DIN ISO 9409-1-50-7-M6. The basic flange has no additional connection options.

3.1.2 Media flange electrical

Overview

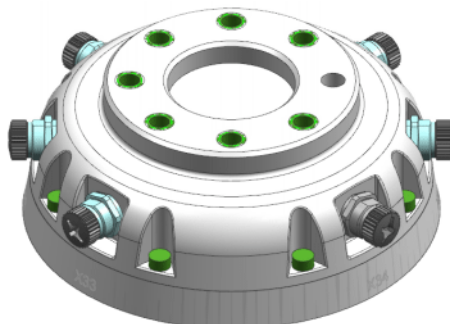


Fig. 3-2: Media flange electrical

Description

The media flange electrical is a universal interface that enables the user to connect electrical components to the robot flange.

The media flange electrical has a hole pattern conforming to DIN ISO 9409-1-50-7-M6.

The media flange electrical offers the following expansions:

- Connections for two supply voltages are available.
- Two interfaces for analog signals and CAT5 data transfer are available.



The electrical interface must be supplied by an external power or data source and not by the robot controller.

3.1.3 Media flange pneumatic

Overview

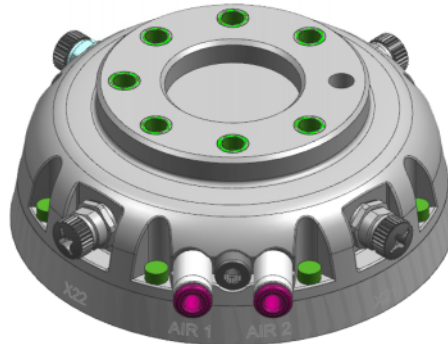


Fig. 3-3: Media flange pneumatic

Description

The media flange pneumatic is a universal interface that enables the user to connect pneumatic and electrical components to the robot flange.

The media flange pneumatic has a hole pattern conforming to DIN ISO 9409-1-50-7-M6.

The media flange pneumatic offers the following expansions:

- Pneumatic interface with two compressed air connections.
- Connection for a supply voltage.
- An interface for analog signals and CAT5 is available.



The electrical interface must be supplied by an external power or data source and not by the robot controller.

3.1.4 Media flange IO pneumatic

Overview

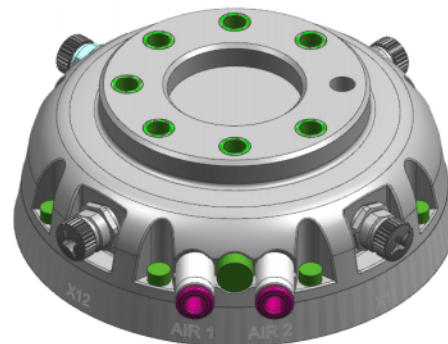


Fig. 3-4: Media flange IO pneumatic

Description

The media flange IO pneumatic is a universal interface that enables the user to connect electrical and pneumatic components to the robot flange.

The media flange IO pneumatic has a hole pattern conforming to DIN ISO 9409-1-50-7-M6.

The media flange IO pneumatic offers the following expansions:

- Configurable inputs and outputs for direct connection of sensors and other electrical components.
- Connection for a supply voltage.
- Connection of additional EtherCAT bus devices.
- Pneumatic interface with two compressed air connections.



The media flange IO pneumatic is supplied with power by the robot controller. No external power or data source is required. Data cable X650, X651 is required for operation.

3.1.5 Media flange Touch pneumatic

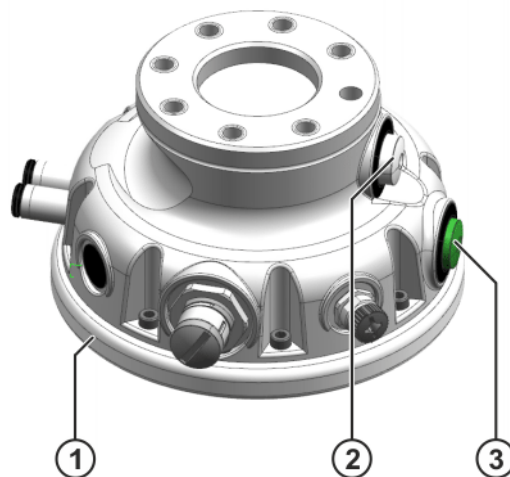
Overview

Fig. 3-5: Media flange Touch pneumatic

- 1 LED strip
- 2 Enabling switch
- 3 Application button

Description

The media flange Touch pneumatic is a universal interface that enables the user to connect electrical and pneumatic components to the robot flange.

The media flange Touch pneumatic has a hole pattern conforming to DIN ISO 9409-1-50-7-M6.

The media flange Touch pneumatic offers the following expansions:

- Configurable inputs and outputs for direct connection of sensors and other electrical components.
- Connection for a supply voltage.
- Additional EtherCAT devices can be connected.
- Pneumatic interface with two compressed air connections.
- Enabling switch
- Programmable application button
- Programmable visual indication
- Handle for manual guidance



The media flange Touch pneumatic is supplied with power by the robot controller. No external power or data source is required. Data cable X650, X651 is required.

Function

■ LED strip

- 2 light rings
 - Blue (freely configurable)
 - Red/green (reserved internally)
- Switching speed:
 - Application-specific, min. change of state every 25 ms

■ Enabling switch

The enabling switch has 3 positions:

- Not pressed
- Center position
- Fully pressed (panic position)

The enabling switch must be held in the center position in operating modes T1, T2 and CRR in order to be able to jog the manipulator.

By default, the enabling switch has no function in Automatic mode.

■ Application button

- The application button is freely programmable.
- Switching states:
 - OFF (0): Application button is not pressed
 - ON (1): Application button is pressed



Debouncing is not carried out for any inputs.

- Switching speeds:
 - Application-specific, scanning of the input values every 25 ms

4 Technical data

4.1 Technical data – overview

Overview

The technical data of the individual media flanges can be found in the following sections:

Media flange	Technical data
Basic flange	<ul style="list-style-type: none"> ■ Technical data (>>> 4.2.1 "Basic data, basic flange" Page 14) ■ Dimensions (>>> 4.2.2 "Dimensions, basic flange" Page 15) ■ Payloads (>>> 4.2.3 "Payloads, basic flange" Page 15) ■ Working envelope (>>> 4.2.4 "Working envelope, basic flange" Page 18)
Media flange electrical	<ul style="list-style-type: none"> ■ Technical data (>>> 4.3.1 "Basic data, media flange electrical" Page 18) ■ Dimensions (>>> 4.3.2 "Dimensions, media flange electrical" Page 19) ■ Payloads (>>> 4.3.3 "Payloads, media flange electrical" Page 19) ■ Working envelope (>>> 4.3.4 "Working envelope, media flange electrical" Page 22)
Media flange pneumatic	<ul style="list-style-type: none"> ■ Technical data (>>> 4.4.1 "Basic data, media flange pneumatic" Page 22) ■ Dimensions (>>> 4.4.2 "Dimensions, media flange pneumatic" Page 23) ■ Payloads (>>> 4.4.3 "Payloads, media flange pneumatic" Page 23) ■ Working envelope (>>> 4.4.4 "Working envelope, media flange pneumatic" Page 26)

Media flange	Technical data
Media flange IO pneumatic	<ul style="list-style-type: none"> ■ Technical data (>>> 4.5.1 "Basic data, media flange IO pneumatic" Page 26) ■ Dimensions (>>> 4.5.2 "Dimensions, media flange IO pneumatic" Page 27) ■ Payloads (>>> 4.5.3 "Payloads, media flange IO pneumatic" Page 27) ■ Working envelope (>>> 4.5.4 "Working envelope, media flange IO pneumatic" Page 30)
Media flange Touch pneumatic	<ul style="list-style-type: none"> ■ Technical data (>>> 4.6.1 "Basic data, media flange Touch pneumatic" Page 30) ■ Dimensions (>>> 4.6.2 "Dimensions, media flange Touch pneumatic" Page 31) ■ Payloads (>>> 4.6.3 "Payloads, media flange Touch pneumatic" Page 31) ■ Working envelope (>>> 4.6.4 "Working envelope, media flange Touch pneumatic" Page 34)

4.2 Technical data, basic flange

4.2.1 Basic data, basic flange

General

Media flange	Basic flange
Weight	230 g
EMC resistance	EN 61000-6-2 and EN 61000-6-4

Ambient temperature

Operation	+5 °C to +45 °C (278 K to 318 K)
Storage and transportation	-25 °C to +70 °C (248 K to 343 K)
Humidity class	Class 3K3 according to EN 60721-3-3; 1995
Protection rating of the media flange	IP 54 Ready for operation, with connecting cables plugged in (according to EN 60529)

4.2.2 Dimensions, basic flange

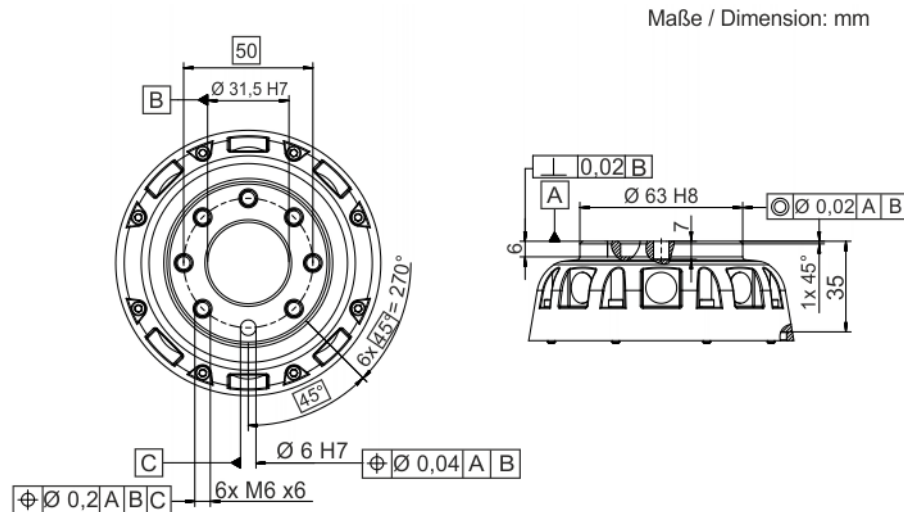


Fig. 4-1: Dimensions, basic flange

4.2.3 Payloads, basic flange

Payloads

- LBR iiwa 7 R800

Robot	LBR iiwa 7 R800
Wrist	IW
Rated payload	7 kg
Distance of the load center of gravity L_z	60 mm
Distance of the load center of gravity L_{xy}	35 mm
Permissible moment of inertia	0.3 kgm ²
Max. total load	7 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

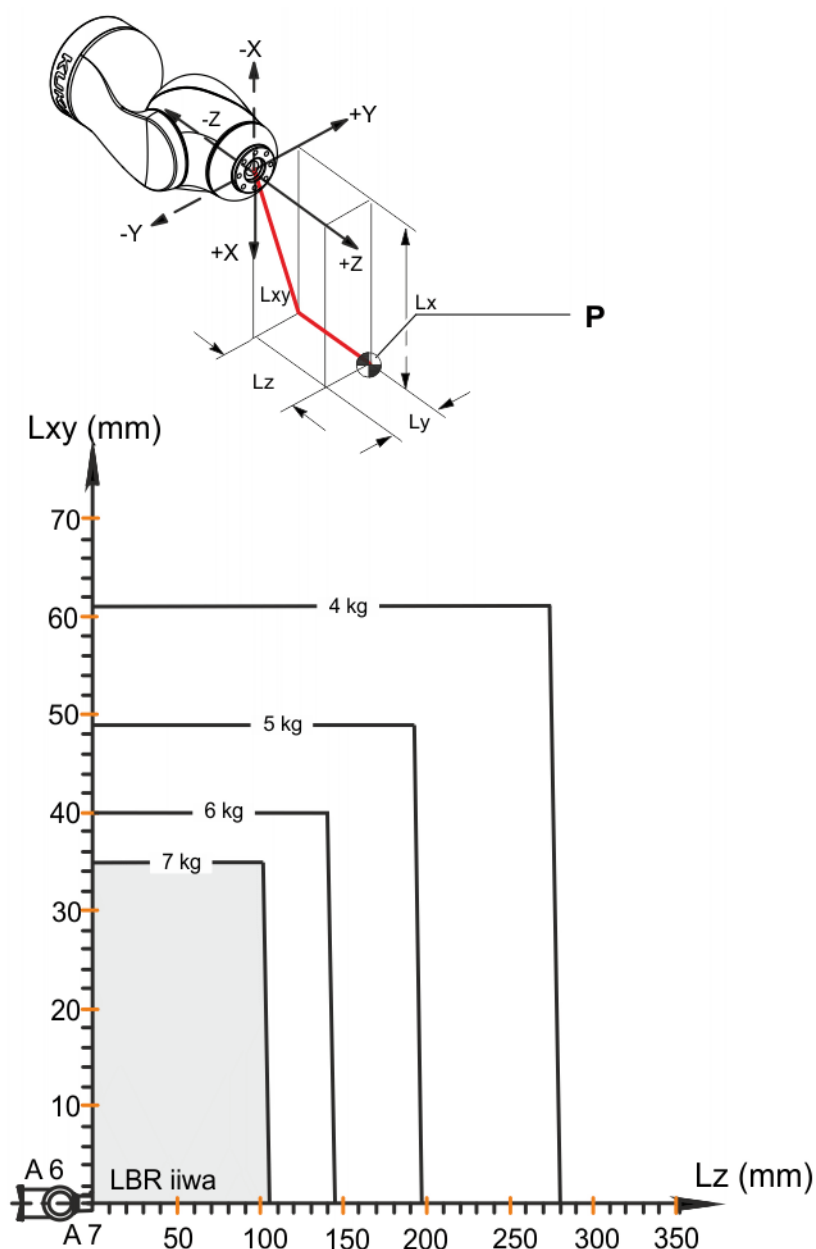


Fig. 4-2: Payload diagram, LBR iiwa 7 R800

■ LBR iiwa 14 R820

Robot	LBR iiwa 14 R820
Wrist	IW
Rated payload	14 kg
Distance of the load center of gravity L_z	44 mm
Distance of the load center of gravity L_{xy}	40 mm
Permissible moment of inertia	0.3 kgm^2
Max. total load	14 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

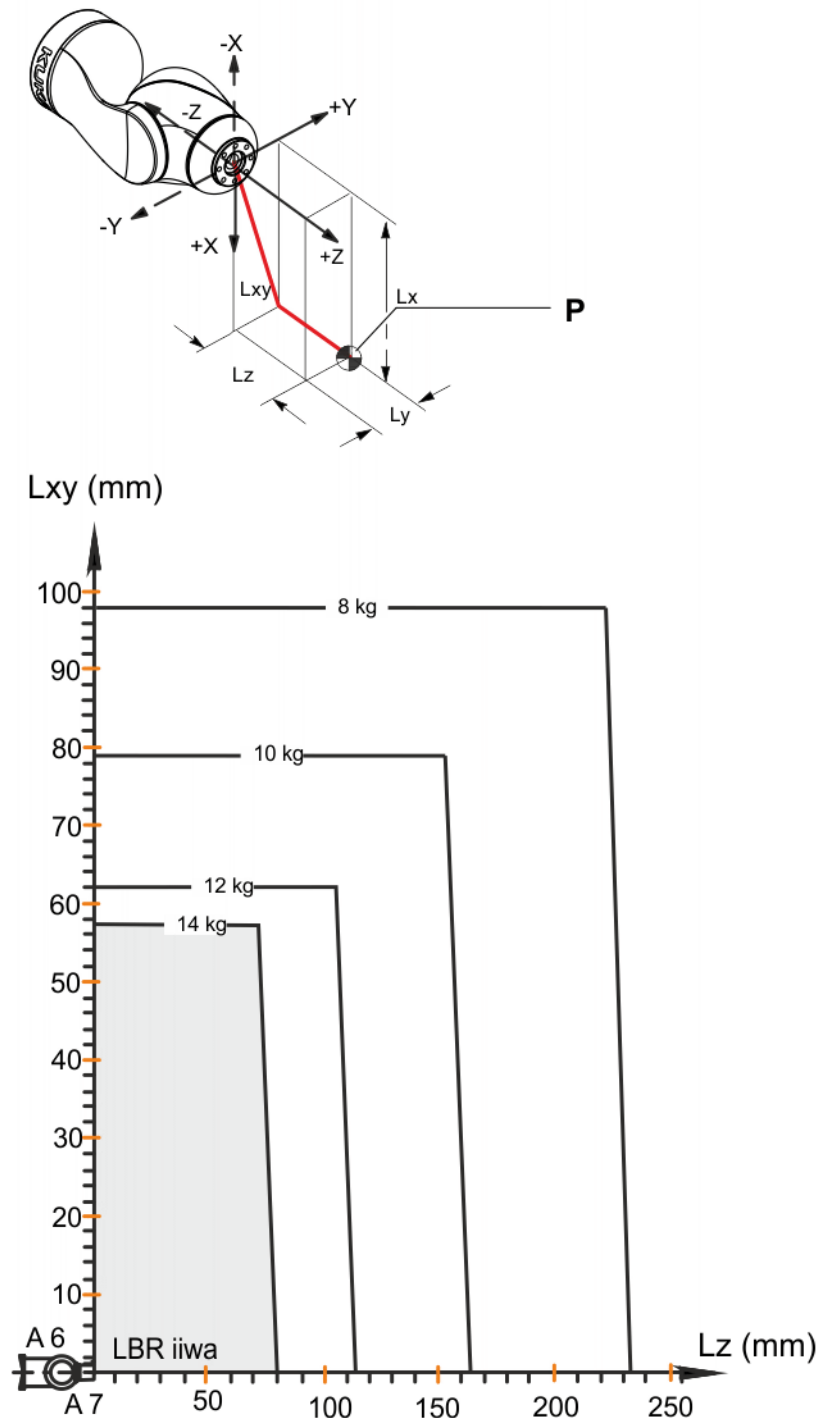


Fig. 4-3: Payload diagram, LBR iiwa 14 R820

NOTICE

This loading curve corresponds to the maximum load capacity. Both values (payload and mass moment of inertia) must be checked in all cases. Exceeding this capacity will reduce the service life of the robot and overload the motors and the gears; in any such case KUKA Customer Support must be consulted beforehand. The values determined here are necessary for planning the robot application. For commissioning the robot, additional input data are required in accordance with the operating and programming instructions of the control software.

Supplementary load

The robot cannot carry a supplementary load.

4.2.4 Working envelope, basic flange

The diagram shows the shape and size of the working envelope for the robot with the basic flange:

■ LBR iiwa 7 R800

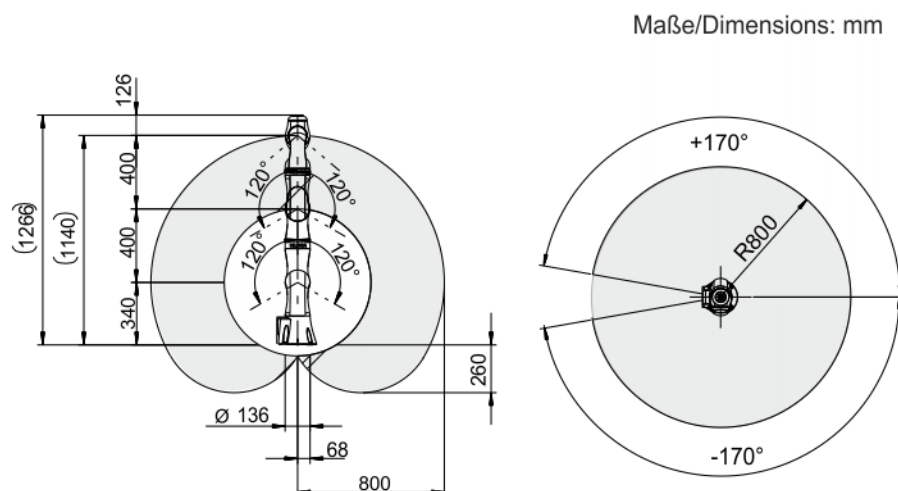


Fig. 4-4: Working envelope, LBR iiwa 7 R800 with media flange

■ LBR iiwa 14 R820

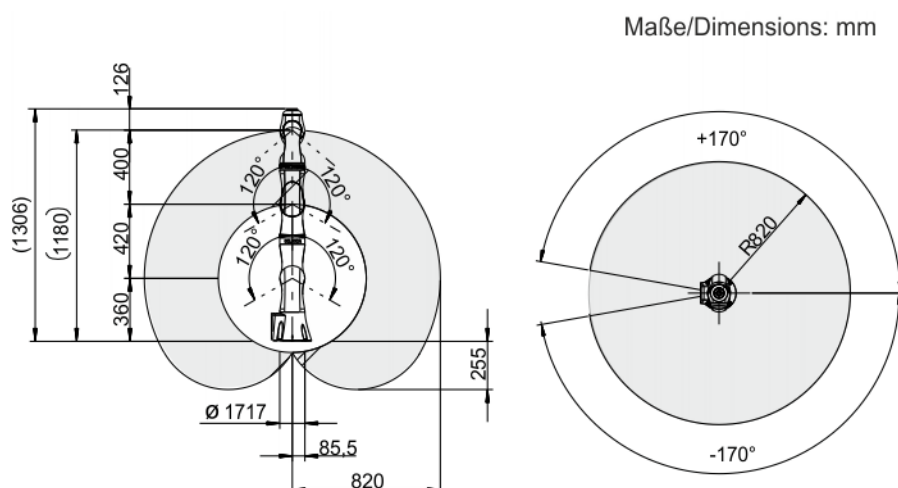


Fig. 4-5: Working envelope, LBR iiwa 14 R820 with media flange

4.3 Technical data, media flange electrical

4.3.1 Basic data, media flange electrical

General

Media flange	Media flange electrical
Weight	230 g
EMC resistance	EN 61000-6-2 and EN 61000-6-4

Ambient temperature

Operation	+5 °C to +45 °C (278 K to 318 K)
Storage and transportation	-25 °C to +70 °C (248 K to 343 K)

Humidity class	Class 3K3 according to EN 60721-3-3; 1995
Protection rating of the media flange	IP 54 Ready for operation, with connecting cables plugged in (according to EN 60529)

4.3.2 Dimensions, media flange electrical

Maße / Dimension: mm

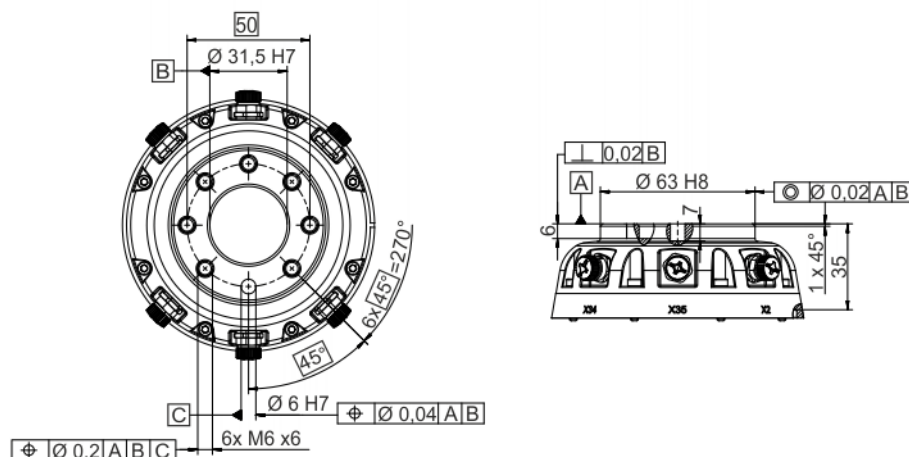


Fig. 4-6: Dimensions, media flange electrical

4.3.3 Payloads, media flange electrical

Payloads

- LBR iiwa 7 R800

Robot	LBR iiwa 7 R800
Wrist	IW
Rated payload	7 kg
Distance of the load center of gravity L_z	60 mm
Distance of the load center of gravity L_{xy}	35 mm
Permissible moment of inertia	0.3 kgm ²
Max. total load	7 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

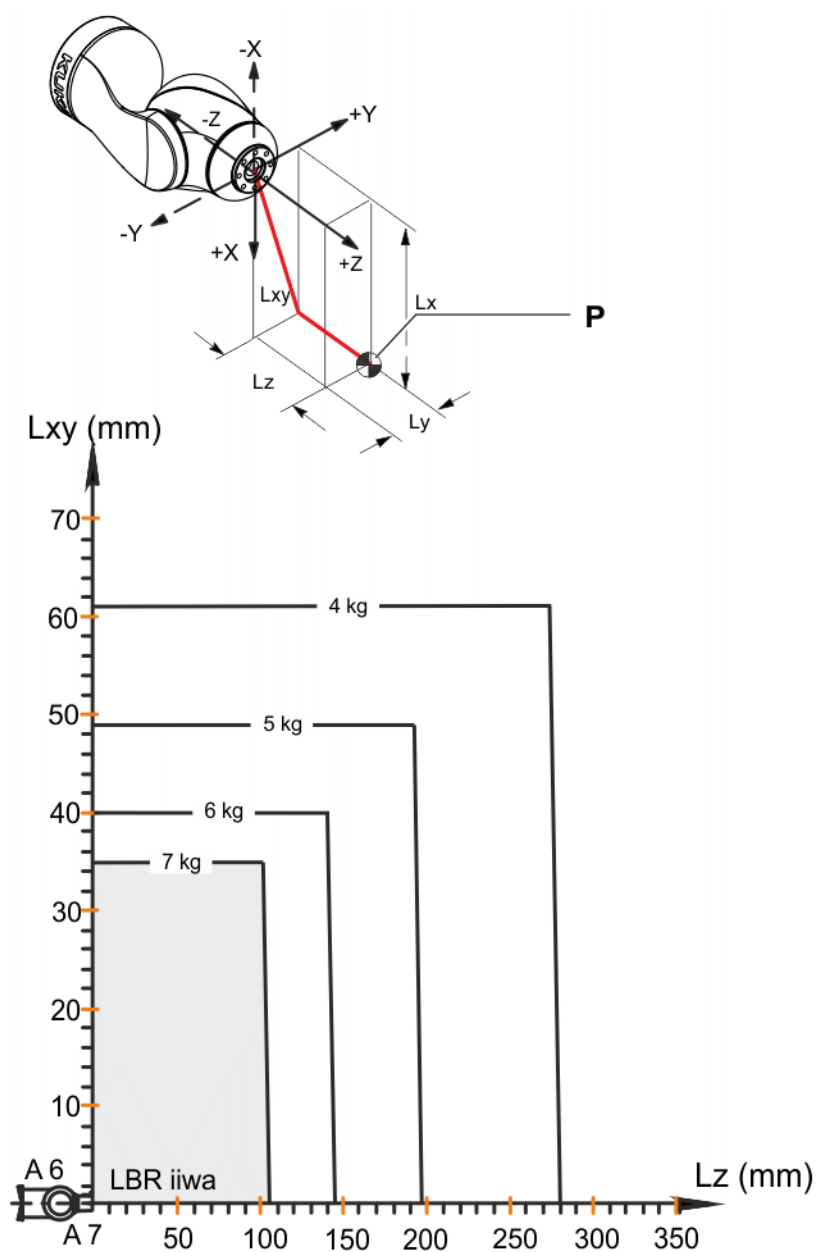


Fig. 4-7: Payload diagram, LBR iiwa 7 R800

■ LBR iiwa 14 R820

Robot	LBR iiwa 14 R820
Manual	IW
Rated payload	14 kg
Distance of the load center of gravity L_z	44 mm
Distance of the load center of gravity L_{xy}	40 mm
Permissible moment of inertia	0.3 kgm^2
Max. total load	14 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

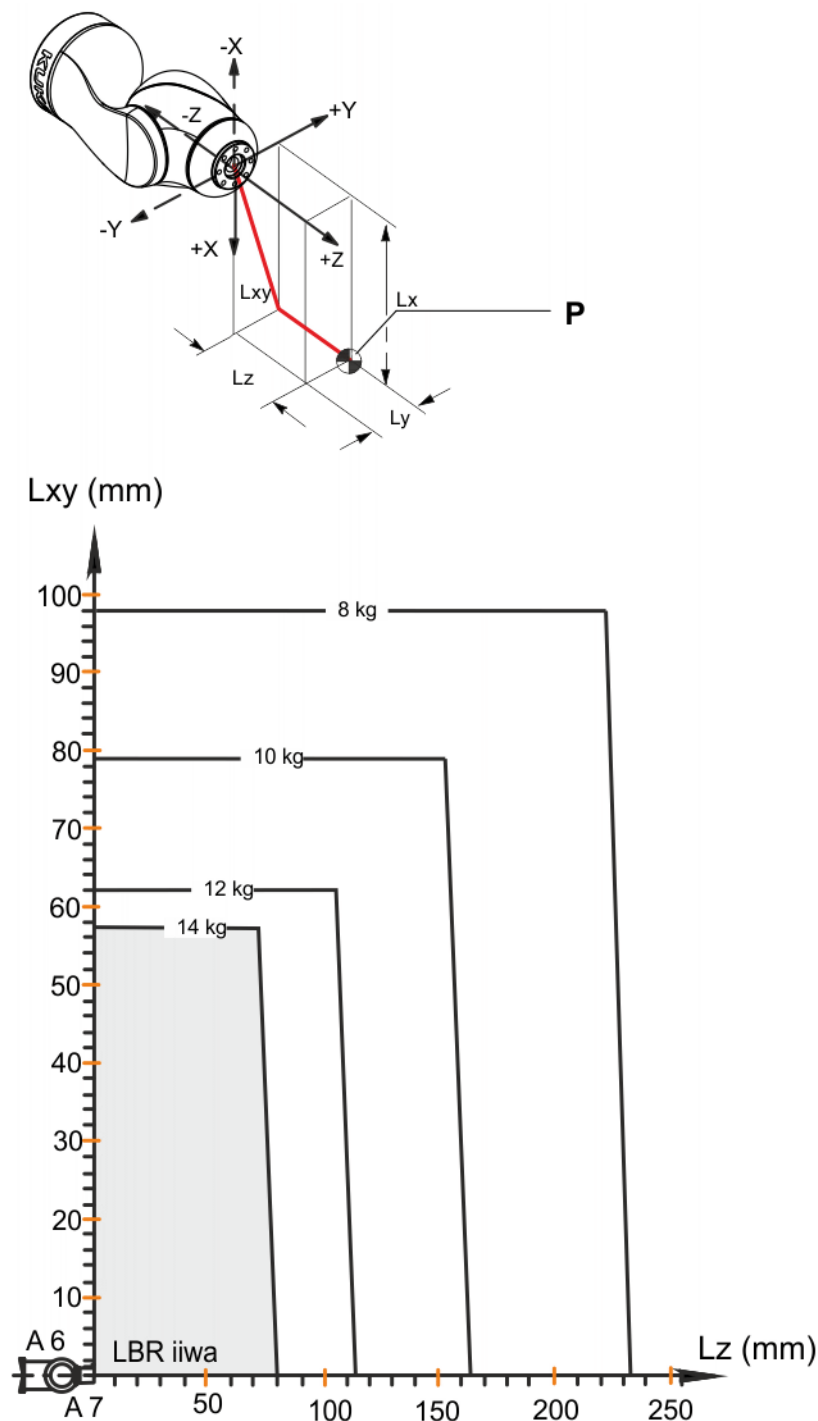


Fig. 4-8: Payload diagram, LBR iiwa 14 R820

NOTICE

This loading curve corresponds to the maximum load capacity. Both values (payload and mass moment of inertia) must be checked in all cases. Exceeding this capacity will reduce the service life of the robot and overload the motors and the gears; in any such case KUKA Customer Support must be consulted beforehand. The values determined here are necessary for planning the robot application. For commissioning the robot, additional input data are required in accordance with the operating and programming instructions of the control software.

Supplementary load

The robot cannot carry a supplementary load.

4.3.4 Working envelope, media flange electrical

The diagram shows the shape and size of the working envelope for the robot with the media flange electrical:

■ LBR iiwa 7 R800

Maße/Dimensions: mm

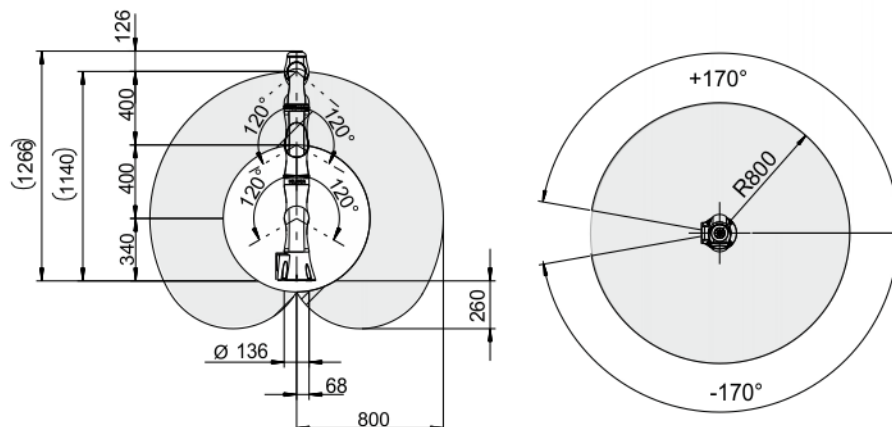


Fig. 4-9: Working envelope, LBR iiwa 7 R800 with media flange

■ LBR iiwa 14 R820

Maße/Dimensions: mm

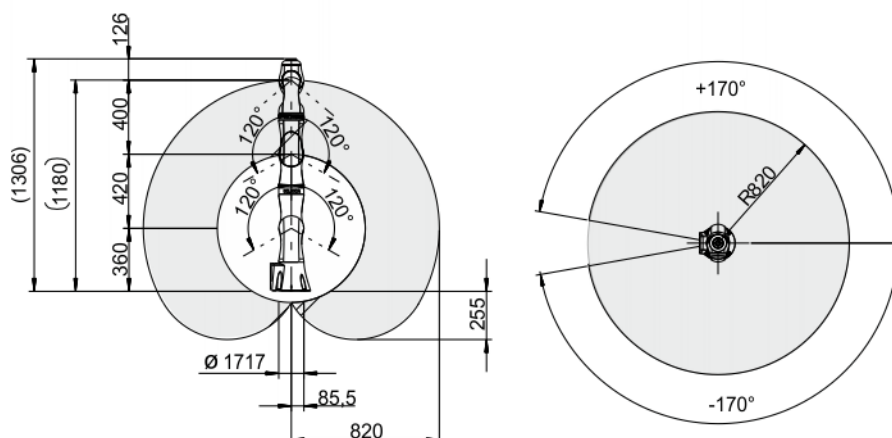


Fig. 4-10: Working envelope, LBR iiwa 14 R820 with media flange

4.4 Technical data, media flange pneumatic

4.4.1 Basic data, media flange pneumatic

General

Media flange	Media flange pneumatic
Weight	230 g
EMC resistance	EN 61000-6-2 and EN 61000-6-4

Ambient temperature

Operation	+5 °C to +45 °C (278 K to 318 K)
Storage and transportation	-25 °C to +70 °C (248 K to 343 K)

Humidity class	Class 3K3 according to EN 60721-3-3; 1995
Protection rating of the media flange	IP 54 Ready for operation, with connecting cables plugged in (according to EN 60529)

4.4.2 Dimensions, media flange pneumatic

Maße / Dimension: mm

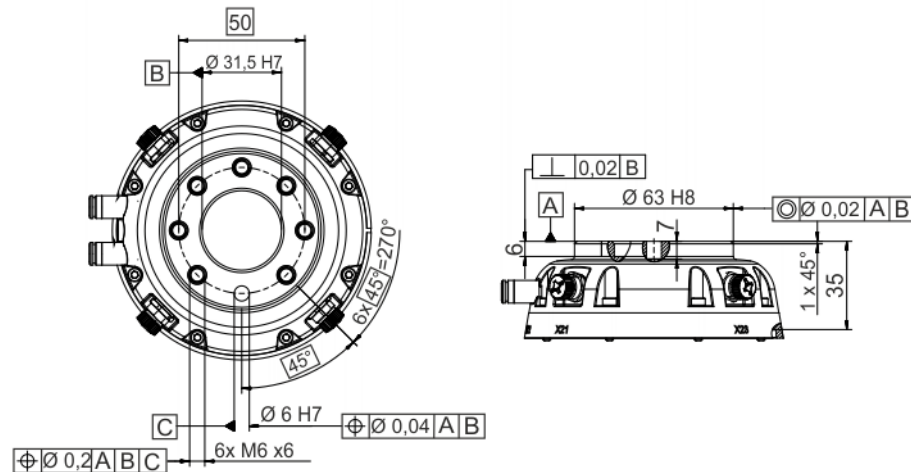


Fig. 4-11: Dimensions, media flange pneumatic

4.4.3 Payloads, media flange pneumatic

Payloads

■ LBR iiwa 7 R800

Robot	LBR iiwa 7 R800
Wrist	IW
Rated payload	7 kg
Distance of the load center of gravity L_z	60 mm
Distance of the load center of gravity L_{xy}	35 mm
Permissible moment of inertia	0.3 kgm^2
Max. total load	7 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

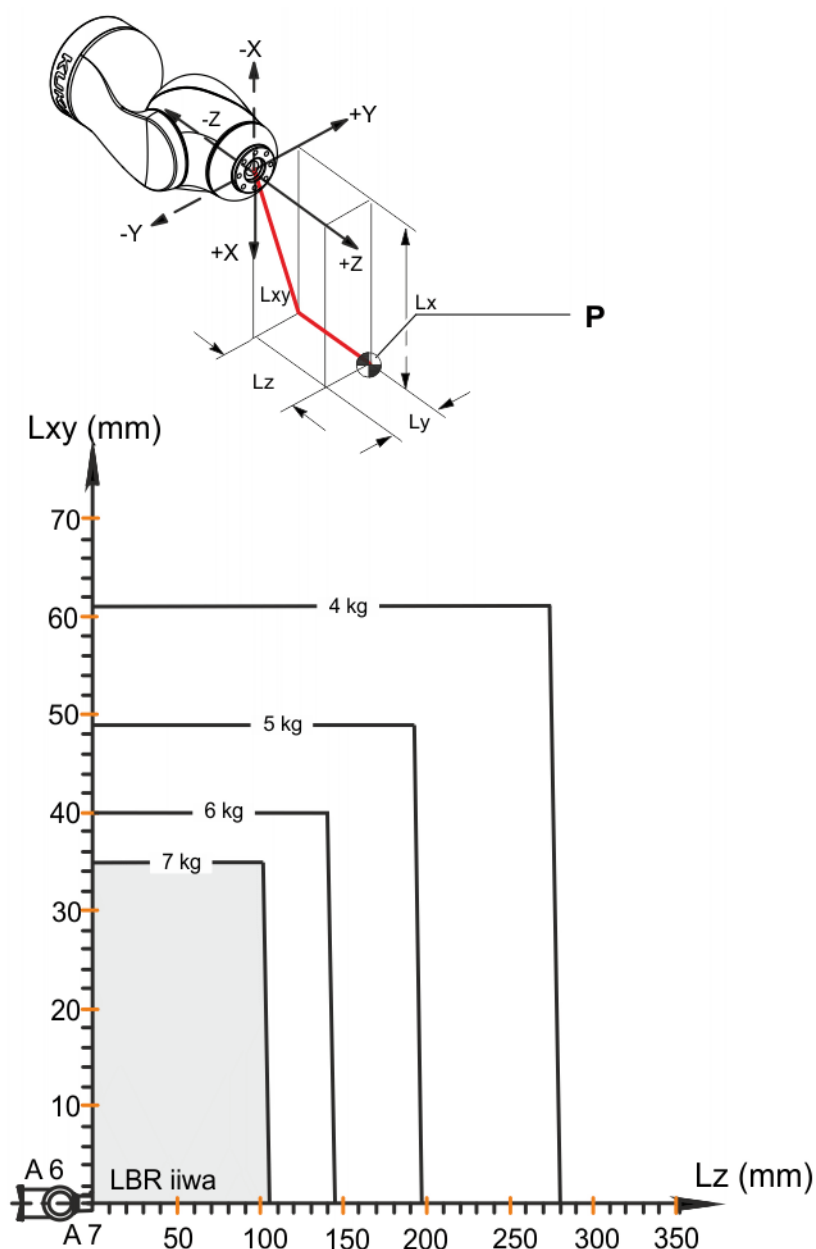


Fig. 4-12: Payload diagram, LBR iiwa 7 R800

■ LBR iiwa 14 R820

Robot	LBR iiwa 14 R820
Wrist	IW
Rated payload	14 kg
Distance of the load center of gravity L_z	44 mm
Distance of the load center of gravity L_{xy}	40 mm
Permissible moment of inertia	0.3 kgm^2
Max. total load	14 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

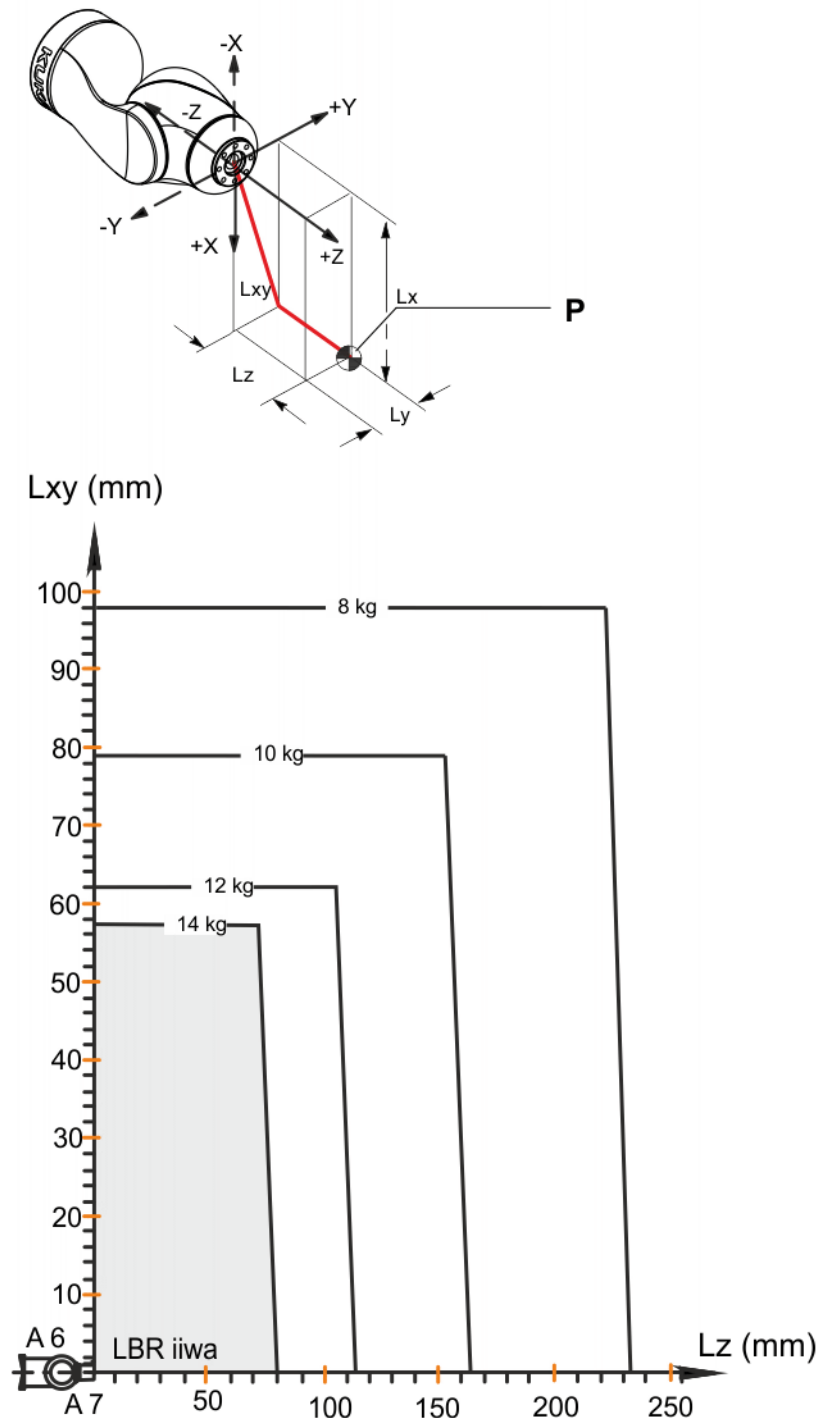


Fig. 4-13: Payload diagram, LBR iiwa 14 R820

NOTICE

This loading curve corresponds to the maximum load capacity. Both values (payload and mass moment of inertia) must be checked in all cases. Exceeding this capacity will reduce the service life of the robot and overload the motors and the gears; in any such case KUKA Customer Support must be consulted beforehand. The values determined here are necessary for planning the robot application. For commissioning the robot, additional input data are required in accordance with the operating and programming instructions of the control software.

Supplementary load

The robot cannot carry a supplementary load.

4.4.4 Working envelope, media flange pneumatic

The diagram shows the shape and size of the working envelope for the robot with the media flange pneumatic:

■ LBR iiwa 7 R800

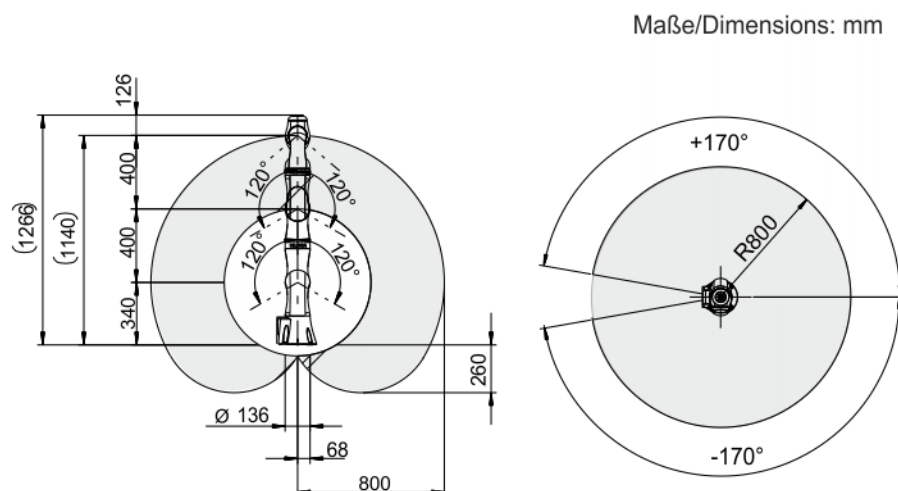


Fig. 4-14: Working envelope, LBR iiwa 7 R800 with media flange

■ LBR iiwa 14 R820

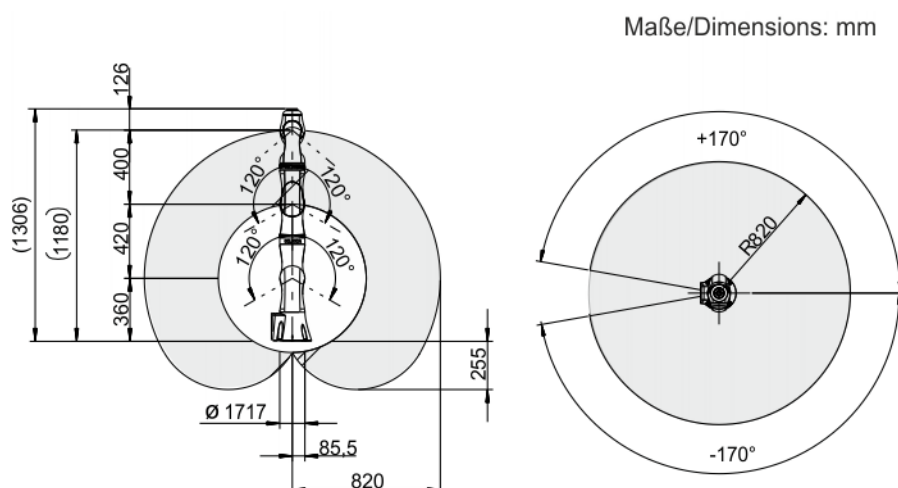


Fig. 4-15: Working envelope, LBR iiwa 14 R820 with media flange

4.5 Technical data, media flange IO pneumatic

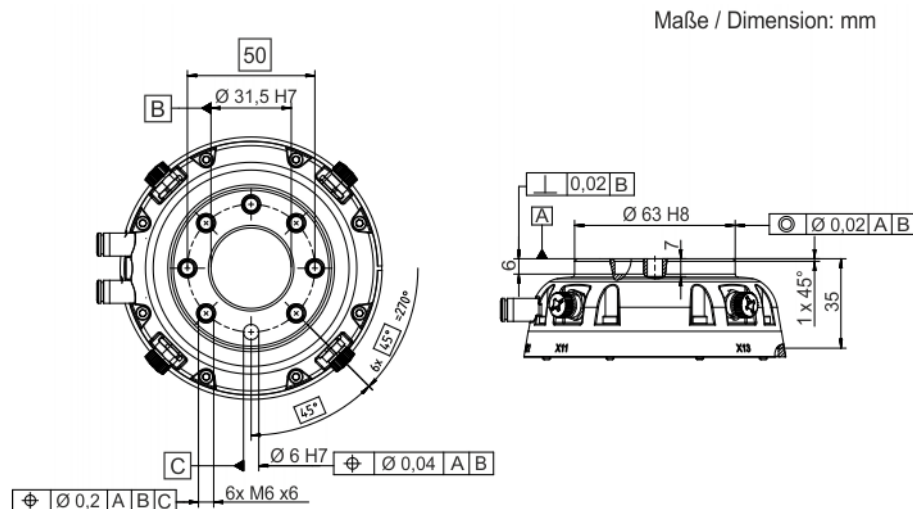
4.5.1 Basic data, media flange IO pneumatic

General

Media flange	Media flange IO pneumatic
Weight	230 g
Power supply	18 V ... 30 V
Power requirement	<ul style="list-style-type: none"> ■ 2 A for 4 outputs ■ 150 mA for EtherCAT ■ 3 A supply voltage
EMC resistance	EN 61000-6-2 and EN 61000-6-4

Ambient temperature

Operation	+5 °C to +45 °C (278 K to 318 K)
Storage and transportation	-25 °C to +70 °C (248 K to 343 K)
Humidity class	Class 3K3 according to EN 60721-3-3; 1995
Protection rating of the media flange	IP 54 Ready for operation, with connecting cables plugged in (according to EN 60529)

4.5.2 Dimensions, media flange IO pneumatic**Fig. 4-16: Dimensions, media flange IO pneumatic****4.5.3 Payloads, media flange IO pneumatic****Payloads**

■ LBR iiwa 7 R800

Robot	LBR iiwa 7 R800
Wrist	IW
Rated payload	7 kg
Distance of the load center of gravity L_z	60 mm
Distance of the load center of gravity L_{xy}	35 mm
Permissible moment of inertia	0.3 kgm ²
Max. total load	7 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

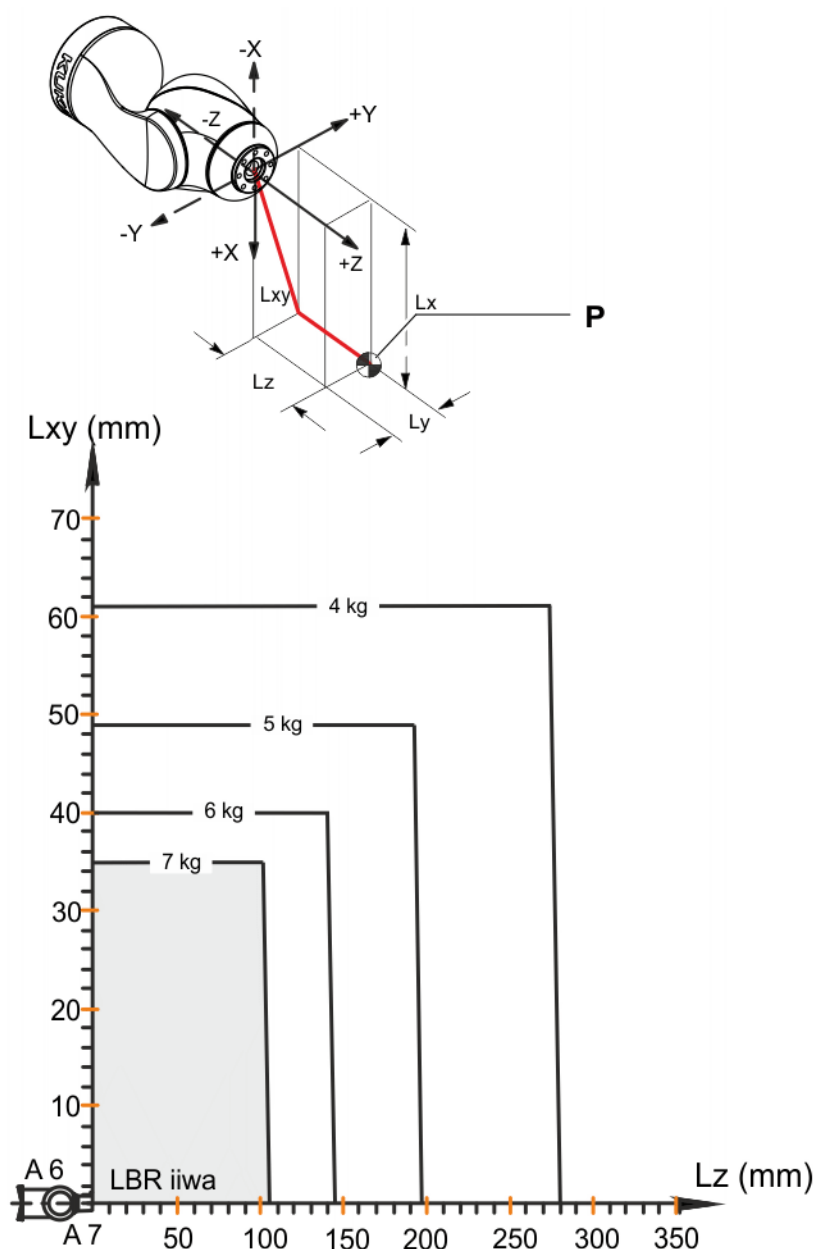


Fig. 4-17: Payload diagram, LBR iiwa 7 R800

■ LBR iiwa 14 R820

Robot	LBR iiwa 14 R820
Wrist	IW
Rated payload	14 kg
Distance of the load center of gravity L_z	44 mm
Distance of the load center of gravity L_{xy}	40 mm
Permissible moment of inertia	0.3 kgm^2
Max. total load	14 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

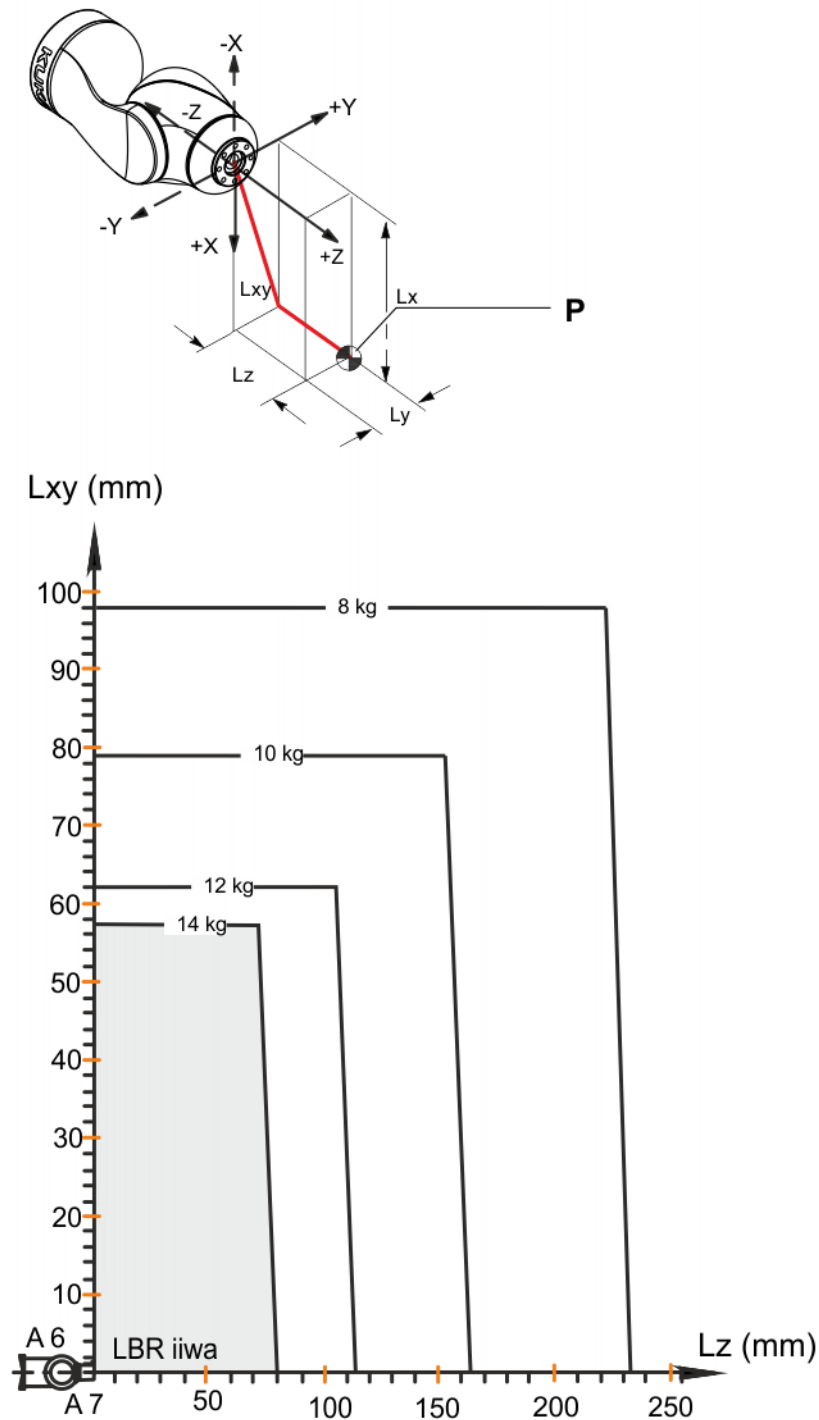


Fig. 4-18: Payload diagram, LBR iiwa 14 R820

NOTICE

This loading curve corresponds to the maximum load capacity. Both values (payload and mass moment of inertia) must be checked in all cases. Exceeding this capacity will reduce the service life of the robot and overload the motors and the gears; in any such case KUKA Customer Support must be consulted beforehand. The values determined here are necessary for planning the robot application. For commissioning the robot, additional input data are required in accordance with the operating and programming instructions of the control software.

Supplementary load

The robot cannot carry a supplementary load.

4.5.4 Working envelope, media flange IO pneumatic

The diagram shows the shape and size of the working envelope for the robot with the media flange IO pneumatic:

■ LBR iiwa 7 R800

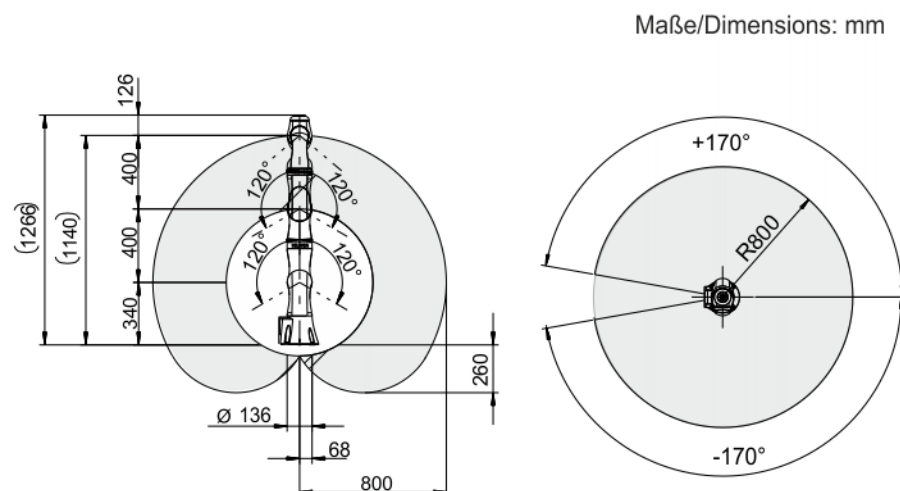


Fig. 4-19: Working envelope, LBR iiwa 7 R800 with media flange

■ LBR iiwa 14 R820

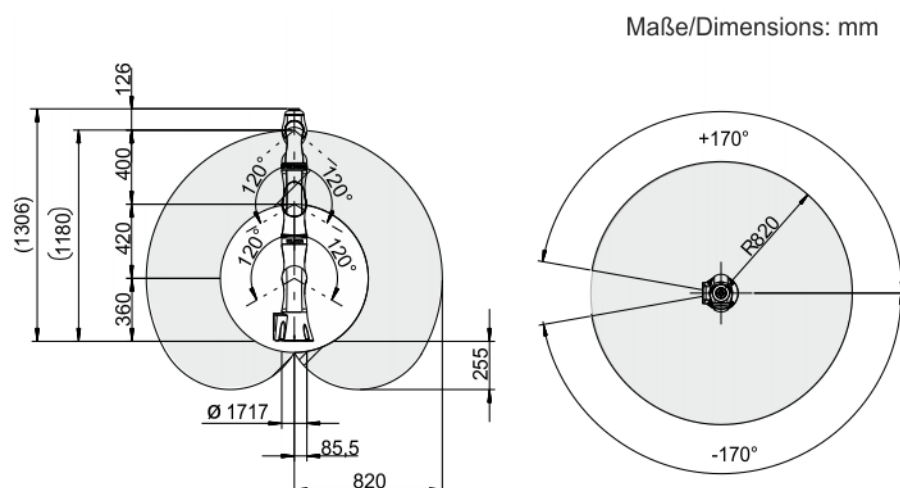


Fig. 4-20: Working envelope, LBR iiwa 14 R820 with media flange

4.6 Technical data, media flange Touch pneumatic

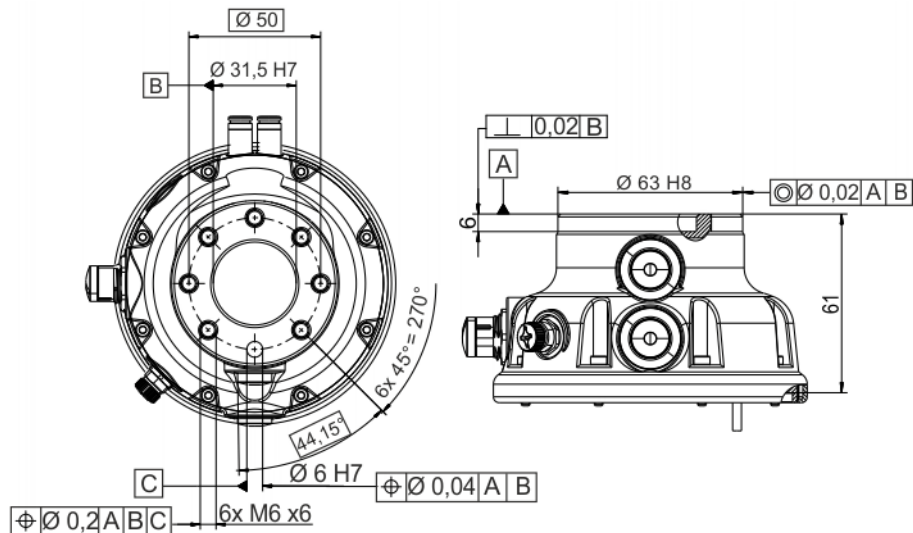
4.6.1 Basic data, media flange Touch pneumatic

General

Media flange	Media flange Touch pneumatic
Weight	458 g
Power supply	18 V ... 30 V
Power requirement	<ul style="list-style-type: none"> ■ 2 A for 4 outputs ■ 150 mA for EtherCAT ■ 3 A supply voltage
EMC resistance	EN 61000-6-2 and EN 61000-6-4

Ambient temperature

Operation	+5 °C to +45 °C (278 K to 318 K)
Storage and transportation	-25 °C to +70 °C (248 K to 343 K)
Humidity class	Class 3K3 according to EN 60721-3-3; 1995
Protection rating of the media flange	IP 54 Ready for operation, with connecting cables plugged in (according to EN 60529)

4.6.2 Dimensions, media flange Touch pneumatic**Fig. 4-21: Dimensions, media flange Touch pneumatic****4.6.3 Payloads, media flange Touch pneumatic****Payloads**

- LBR iiwa 7 R800

Robot	LBR iiwa 7 R800
Wrist	IW
Rated payload	7 kg
Distance of the load center of gravity L_z	35 mm
Distance of the load center of gravity L_{xy}	35 mm
Permissible moment of inertia	0.3 kgm ²
Max. total load	7 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

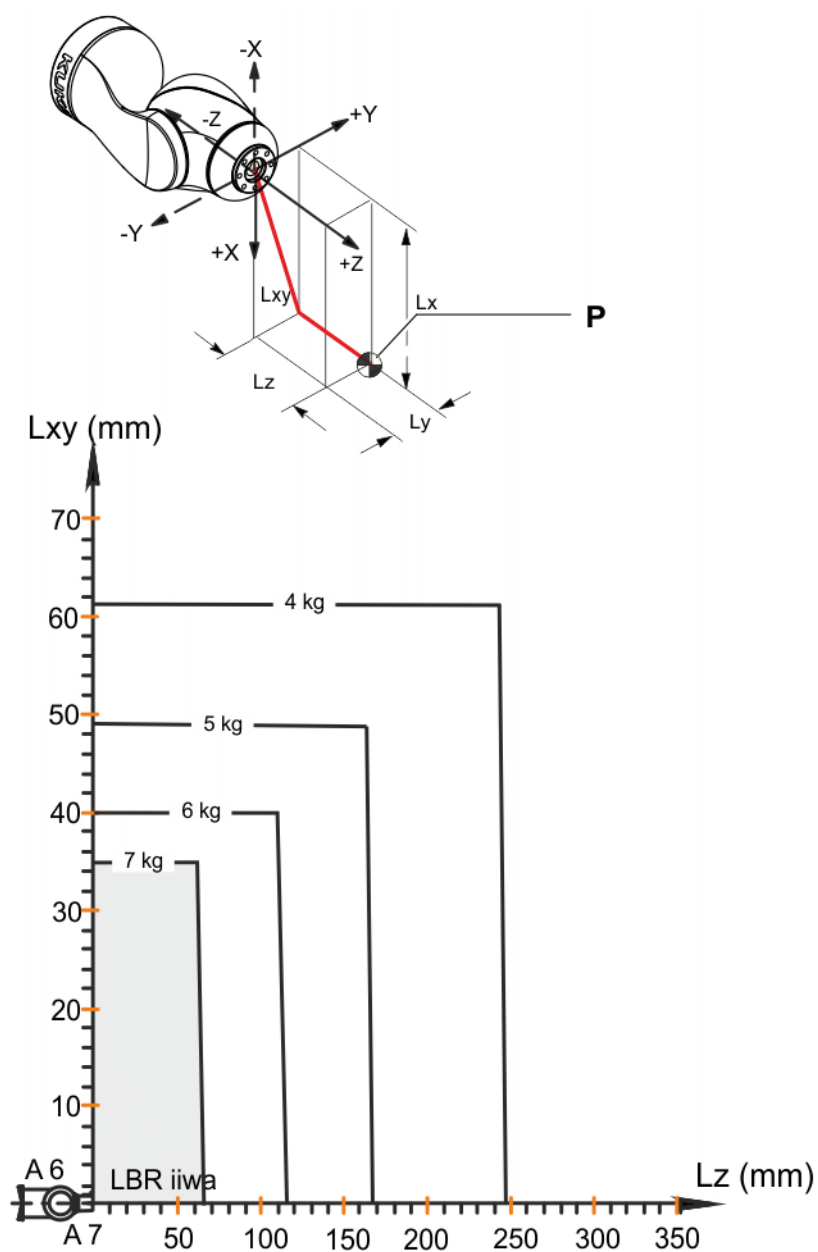


Fig. 4-22: Payload diagram, LBR iiwa 7 R800

■ LBR iiwa 14 R820

Robot	LBR iiwa 14 R820
Wrist	IW
Rated payload	14 kg
Distance of the load center of gravity L_z	30 mm
Distance of the load center of gravity L_{xy}	40 mm
Permissible moment of inertia	0.3 kgm^2
Max. total load	14 kg
Supplementary load	none

Load center of gravity P

For all payloads, the load center of gravity refers to the distance from the face of the mounting flange on axis A7.

Payload diagram

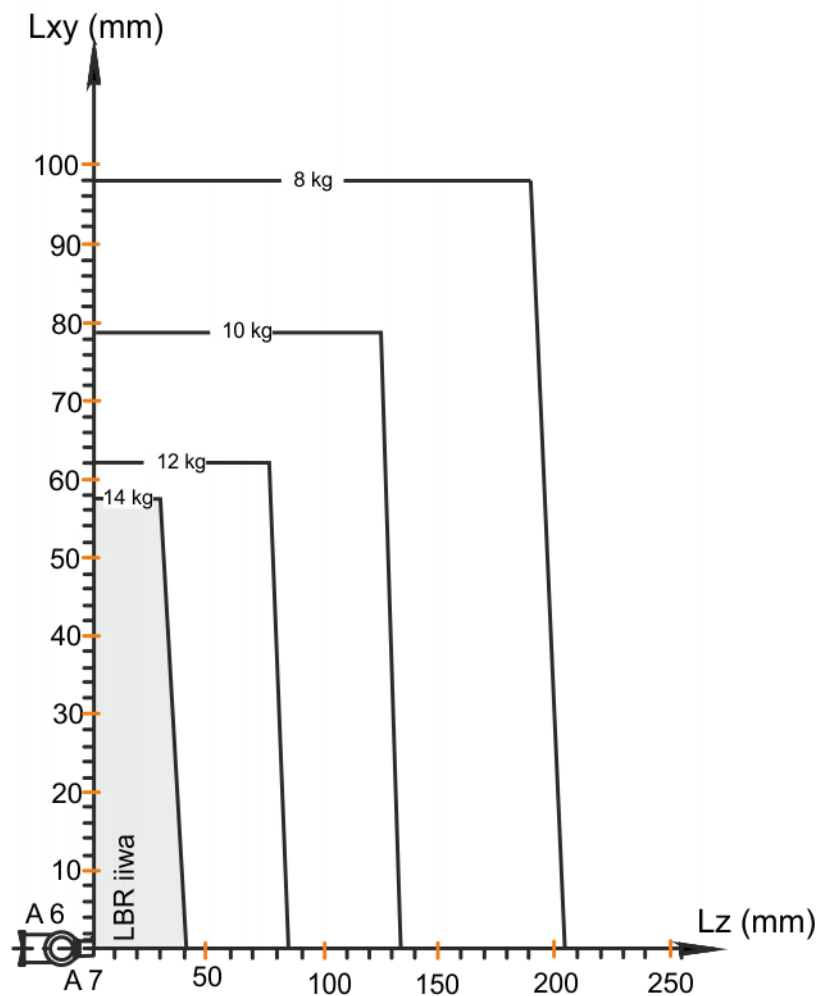
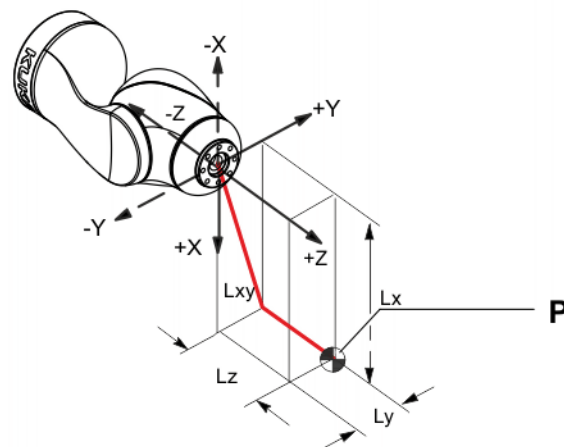


Fig. 4-23: Payload diagram, LBR iiwa 14 R820

NOTICE

This loading curve corresponds to the maximum load capacity. Both values (payload and mass moment of inertia) must be checked in all cases. Exceeding this capacity will reduce the service life of the robot and overload the motors and the gears; in any such case KUKA Customer Support must be consulted beforehand. The values determined here are necessary for planning the robot application. For commissioning the robot, additional input data are required in accordance with the operating and programming instructions of the control software.

Supplementary load

The robot cannot carry a supplementary load.

4.6.4 Working envelope, media flange Touch pneumatic

The diagram shows the shape and size of the working envelope for the robot with the media flange IO pneumatic:

■ LBR iiwa 7 R800

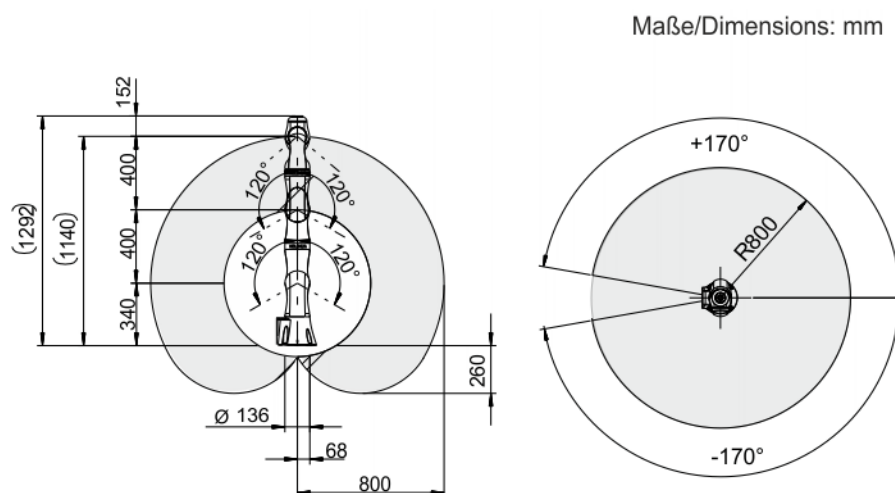


Fig. 4-24: Working envelope, LBR iiwa 7 R800 with media flange

■ LBR iiwa 14 R820

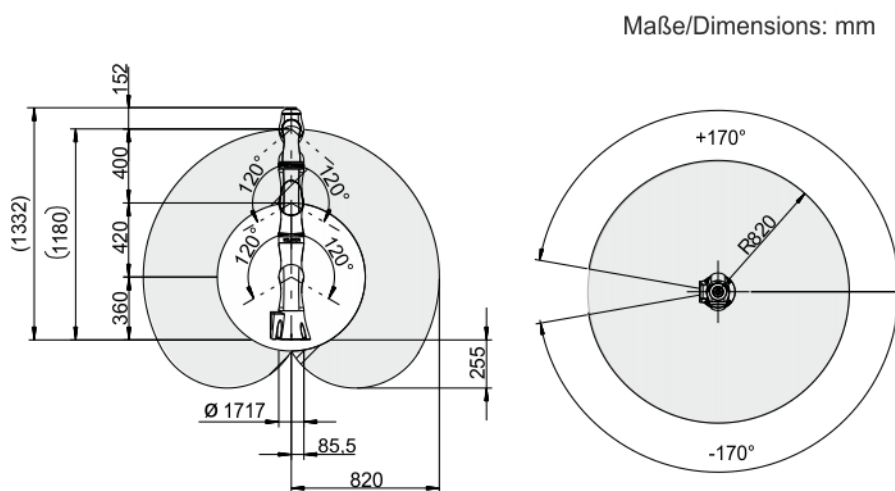


Fig. 4-25: Working envelope, LBR iiwa 14 R820 with media flange

5 Safety

5.1 Safety of the option

For this assembly or option, the safety instructions of the higher-level system with which it is operated apply. The general safety instructions also apply. All applicable safety measures required by national law, as well as all regulations and ordinances for the avoidance of personal injury and material damage, must likewise be observed at all times.

The relevant personal protective equipment must be worn during performance of all work on the system, system components or equipment.

5.2 Applied norms and regulations

Name	Definition	Edition
2006/42/EC	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)	2006
2004/108/EC	EMC Directive: Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC	2004
EN ISO 13850	Safety of machinery: Emergency stop - Principles for design	2008
EN ISO 13849-1	Safety of machinery: Safety-related parts of control systems - Part 1: General principles of design	2008
EN ISO 13849-2	Safety of machinery: Safety-related parts of control systems - Part 2: Validation	2012
EN ISO 12100	Safety of machinery: General principles of design, risk assessment and risk reduction	2010
EN ISO 10218-1	Industrial robots: Safety Note: Content equivalent to ANSI/RIA R.15.06-2012, Part 1	2011
EN 614-1	Safety of machinery: Ergonomic design principles - Part 1: Terms and general principles	2009

EN 61000-6-2	Electromagnetic compatibility (EMC): Part 6-2: Generic standards; Immunity for industrial environments	2005
EN 61000-6-4 + A1	Electromagnetic compatibility (EMC): Part 6-4: Generic standards; Emission standard for industrial environments	2011
EN 60204-1 + A1	Safety of machinery: Electrical equipment of machines - Part 1: General requirements	2009

6 Planning

6.1 Interfaces on A1

Description

Interface A1 is located at the rear of the base frame. There are separate interfaces on A1 for the media flange electrical and the media flange pneumatic. The following interfaces are available on A1:

- Interface A1, electrical, for the following media flanges:
 - Media flange electrical
- Interface A1, pneumatic, for the following media flanges:
 - Basic flange
 - Media flange pneumatic
 - Media flange IO pneumatic
 - Media flange Touch pneumatic

The connections for the media flange-specific interfaces on A1 are shown in the following illustrations.

Interface A1, electrical

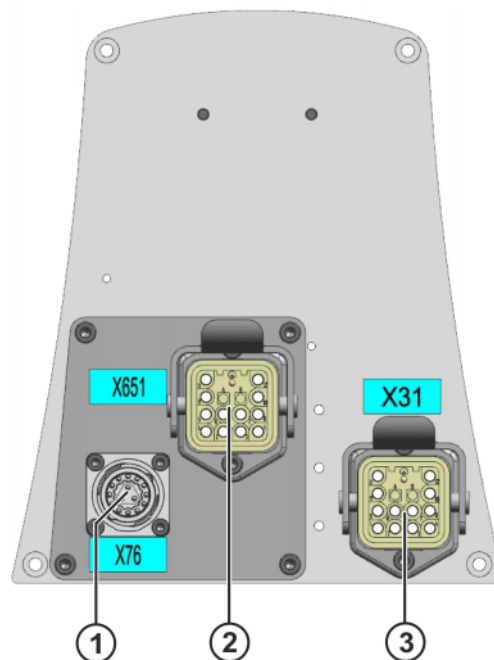


Fig. 6-1: Interface A1, electrical

- 1 Power supply for the media flange, X76
- 2 Data and power supply for the media flange, X651
- 3 Robot data cable connection, X31

Interface A1, pneumatic

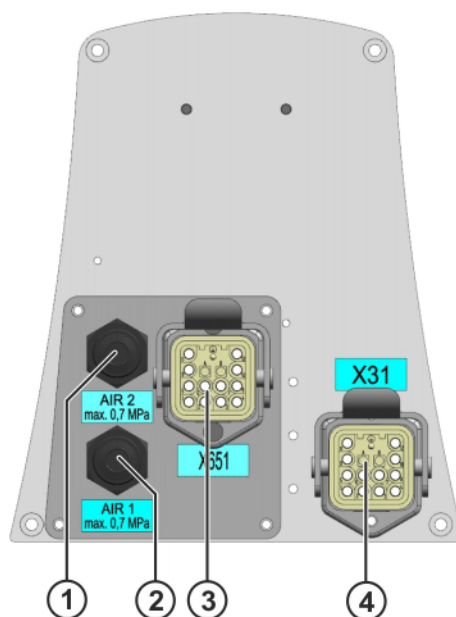


Fig. 6-2: Interface A1, pneumatic

- 1 Connection for air line AIR 2 (Ø 6.0)
- 2 Connection for air line AIR 1 (Ø 6.0)
- 3 Data and power supply for the media flange, X551
- 4 Robot data cable connection, X31

Customer-specific air connection with the following values:

Connection	Designation	Limit values	Vacuum
Air line AIR 1	Max. pressure	7 bar	0.95 bar
Air line AIR 2	Max. pressure	7 bar	0.95 bar

6.2 Media flange interfaces, overview

Overview

The interfaces of the individual media flanges can be found in the following sections:

Media flange	Technical data
Basic flange	No interfaces available
Media flange electrical	<ul style="list-style-type: none"> ■ Interfaces (>>> 6.2.1.1 "Interface, media flange electrical" Page 39) ■ Wiring diagram (>>> 6.2.1.2 "Wiring diagrams, media flange electrical" Page 40) ■ Connector bypacks X651 (>>> 6.2.5 "Connector bypack X651" Page 54) and X76 required

Media flange	Technical data
Media flange pneumatic	<ul style="list-style-type: none"> ■ Interfaces (>>> 6.2.2.1 "Interface, media flange pneumatic" Page 43) ■ Wiring diagram (>>> 6.2.2.2 "Wiring diagrams, media flange pneumatic" Page 44) ■ Connector bypack X651 required (>>> 6.2.5 "Connector bypack X651" Page 54)
Media flange IO pneumatic	<ul style="list-style-type: none"> ■ Interfaces (>>> 6.2.3.1 "Interface, media flange IO pneumatic" Page 45) ■ Wiring diagram (>>> 6.2.3.2 "Wiring diagrams, media flange IO pneumatic" Page 46) ■ Connecting cable set X650, X651 (>>> 6.2.6 "Data cable" Page 54)
Media flange Touch pneumatic	<ul style="list-style-type: none"> ■ Interfaces (>>> 6.2.4.1 "Interface, media flange Touch pneumatic" Page 50) ■ Wiring diagram (>>> 6.2.4.2 "Wiring diagrams, media flange Touch pneumatic" Page 51) ■ Connecting cable set X650, X651 (>>> 6.2.6 "Data cable" Page 54)

6.2.1 Media flange electrical

6.2.1.1 Interface, media flange electrical

Overview

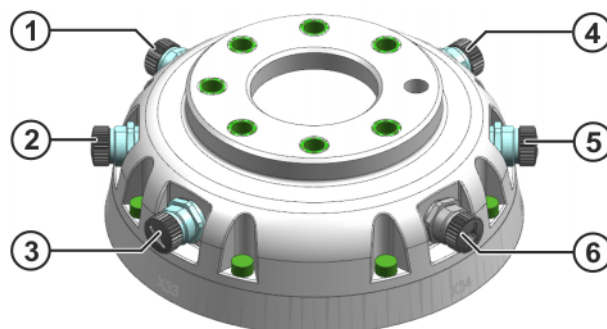
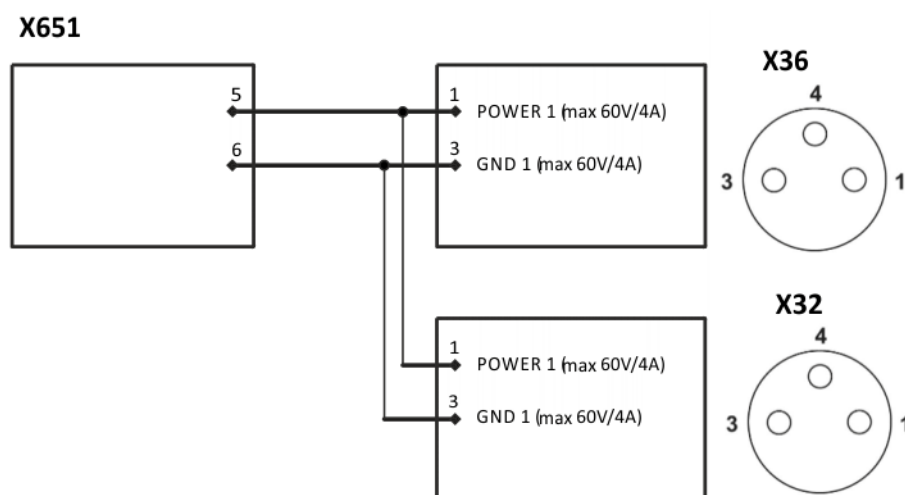


Fig. 6-3: Interface for media flange electrical

- 1 X36 power supply
- 2 X32 power supply
- 3 X33 power supply
- 4 X2 CAT5 interface
- 5 X35 power supply
- 6 X34 CAT5 interface

**Connection/
function**

Connection	Function
X2	CAT5 interface 4x AWG 26 shielded (CAT5), external via X651, M8 connection, 4-pole
X36	Power supply
X32	max. 60 V / 4 A per connection, max. total 8 A, external via X651, M8 connection, 3-pole
X33	Power supply
X35	max. 60 V / 4 A per connection, max. total 5 A, external via X76, M8 connection, 3-pole
X34	Interface for analog signals and CAT5 6x AWG 28 shielded, external via X76, M8 connection, 8-pole

6.2.1.2 Wiring diagrams, media flange electrical
**Connection X651,
X32, X36**

Fig. 6-4: Wiring diagram, MF electrical, X651, X32, X36

Connection X651, X2

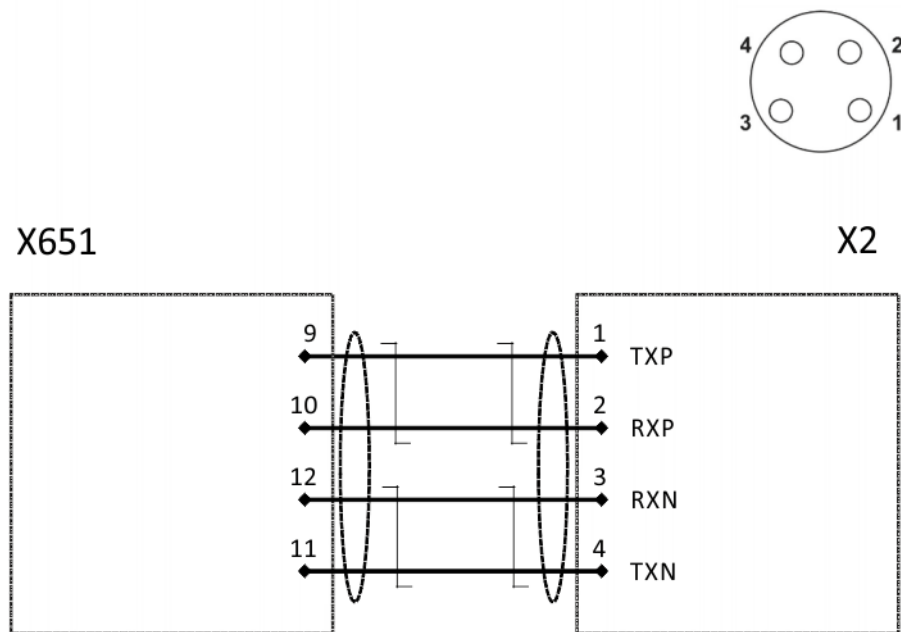


Fig. 6-5: Wiring diagram, MF electrical, X651, X2

Connection X76, X33, X35

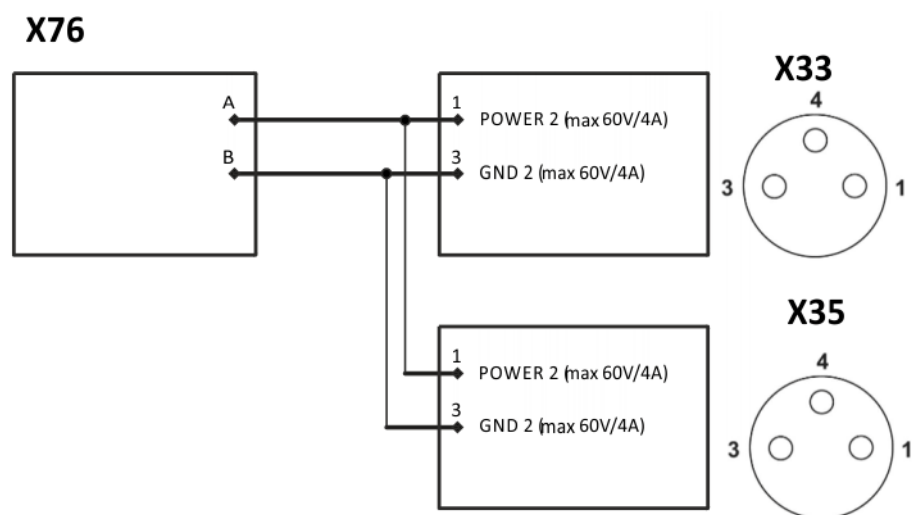
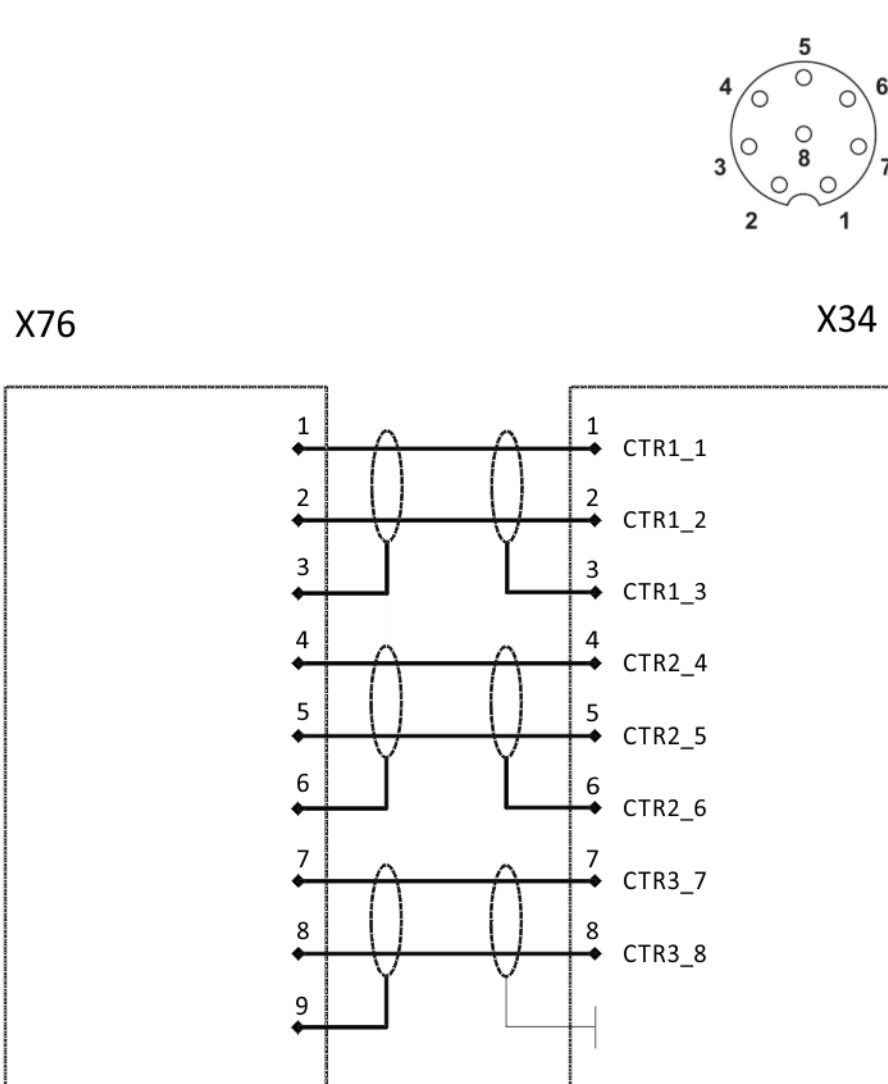


Fig. 6-6: Wiring diagram, MF electrical, X76, X33, X35

**Connection X76,
X34****Fig. 6-7: Wiring diagram, MF electrical, X76, X34**

6.2.2 Media flange pneumatic

6.2.2.1 Interface, media flange pneumatic

Overview

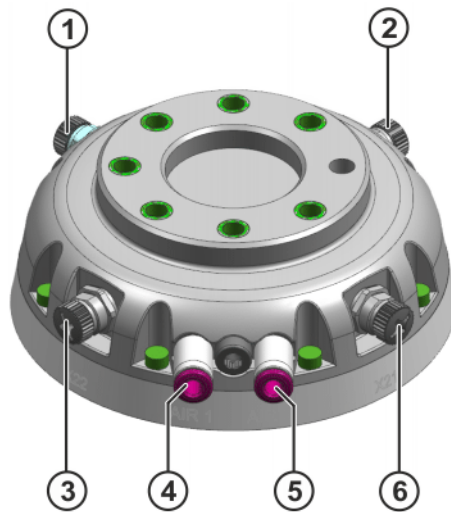


Fig. 6-8: Interface for media flange pneumatic

- 1 X2 CAT5 interface
- 2 X23 power supply
- 3 X22 power supply
- 4 Air 1 air connection
- 5 Air 2 air connection
- 6 X21 power supply

Connection/ function

Connection	Function
X2	CAT5 interface 4x AWG 26 shielded (CAT5), external via X651, M8 connection, 4-pole
X21	Power supply max. 30 V / 3 A per connection, max. total 8 A, via X651, M8 connection, 8-pole
X22	
X23	

Designation	Limit values
Max. pressure	7 bar
Operating temperature	+5 °C to +45 °C (278 K to 318 K) condensation-free
Hose connection	4.0 mm Ø
Medium	Air, oil-free, dry, filtered in accordance with: ISO 8573.1-1, 1.2 to 16.2 Degree of filtration: max. 5 µm

6.2.2.2 Wiring diagrams, media flange pneumatic

Connection X651,
X21, X22, X23

X651

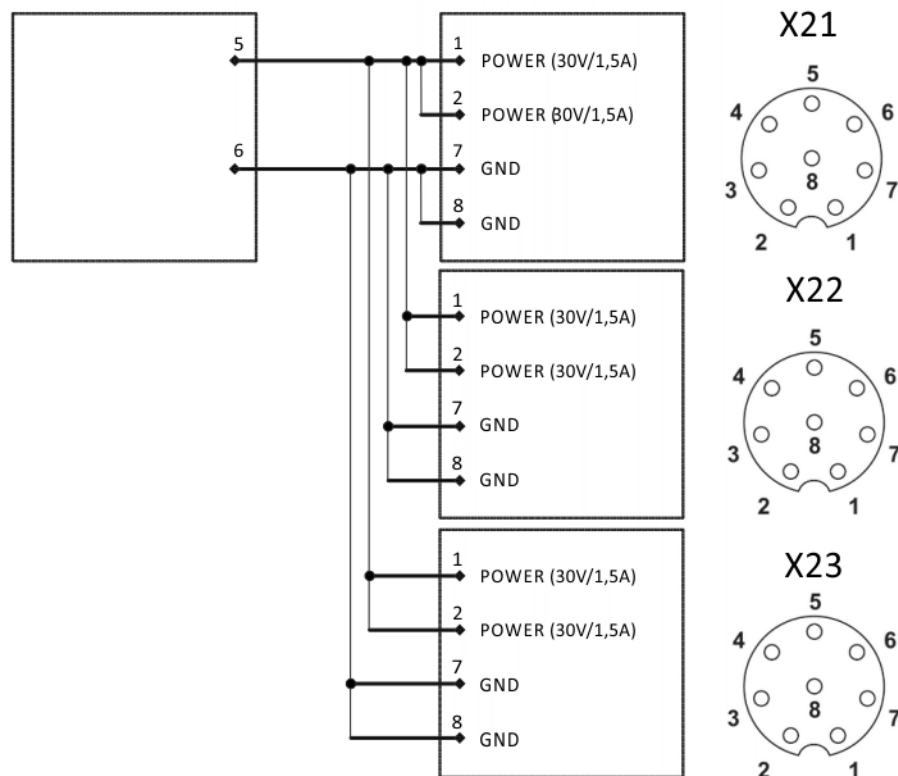
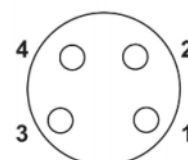


Fig. 6-9: Wiring diagram, MF pneumatic, X651, X21, X22, X23

Connection X651,
X2



X651

X2

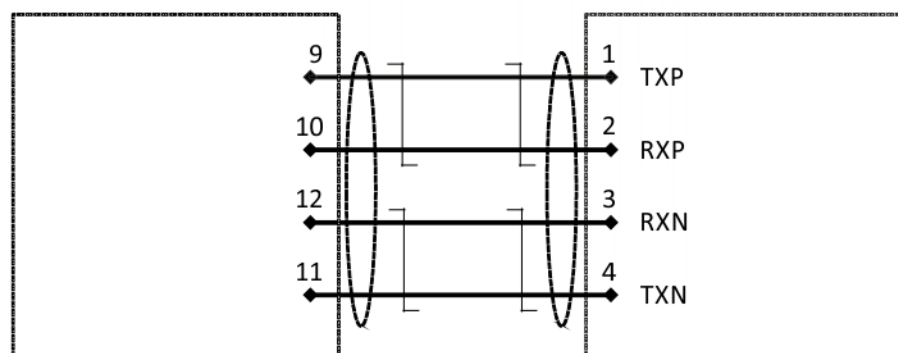


Fig. 6-10: Wiring diagram, MF pneumatic, X651, X2

6.2.3 Media flange IO pneumatic

6.2.3.1 Interface, media flange IO pneumatic

Overview

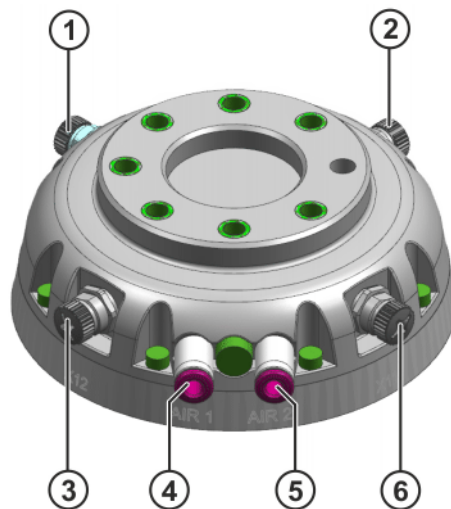


Fig. 6-11: Interface for media flange IO pneumatic

- 1 X2 EtherCat
- 2 X13 power supply, digital inputs/outputs
- 3 X12 power supply, digital inputs/outputs
- 4 Air 1 air connection
- 5 Air 2 air connection
- 6 X11 power supply, digital inputs/outputs

Connection/ function

Designation	Limit values
Max. pressure	7 bar
Operating temperature	+5 °C to +45 °C (278 K to 318 K) condensation-free
Hose connection	4.0 mm Ø
Medium	Air, oil-free, dry, filtered according to: ISO 8573.1-1, 1.2 to 16.2 Degree of filtration: max. 5 µm

6.2.3.2 Wiring diagrams, media flange IO pneumatic

Connection X11,
X12, X13

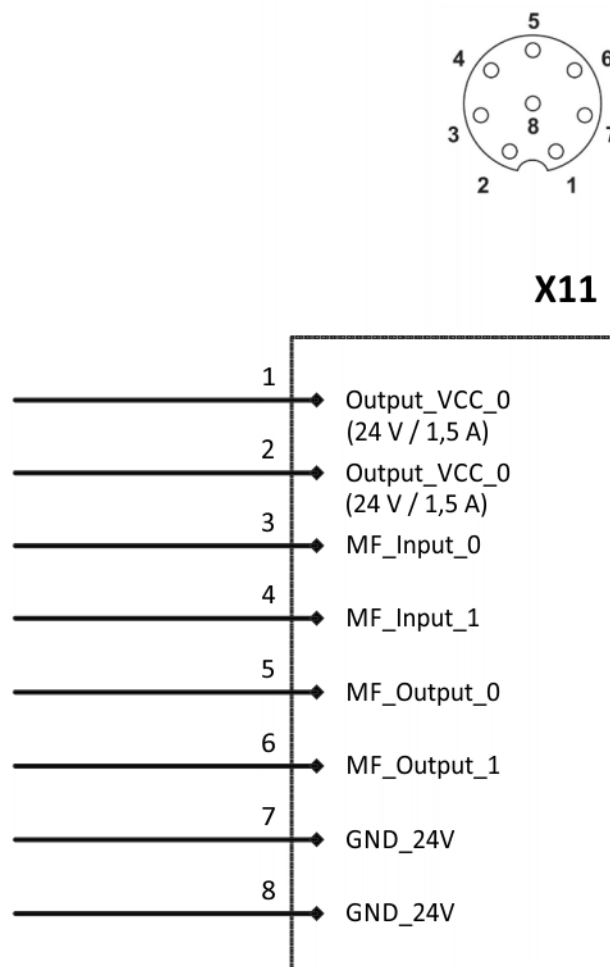


Fig. 6-12: Wiring diagram, MF IO pneumatic, X11

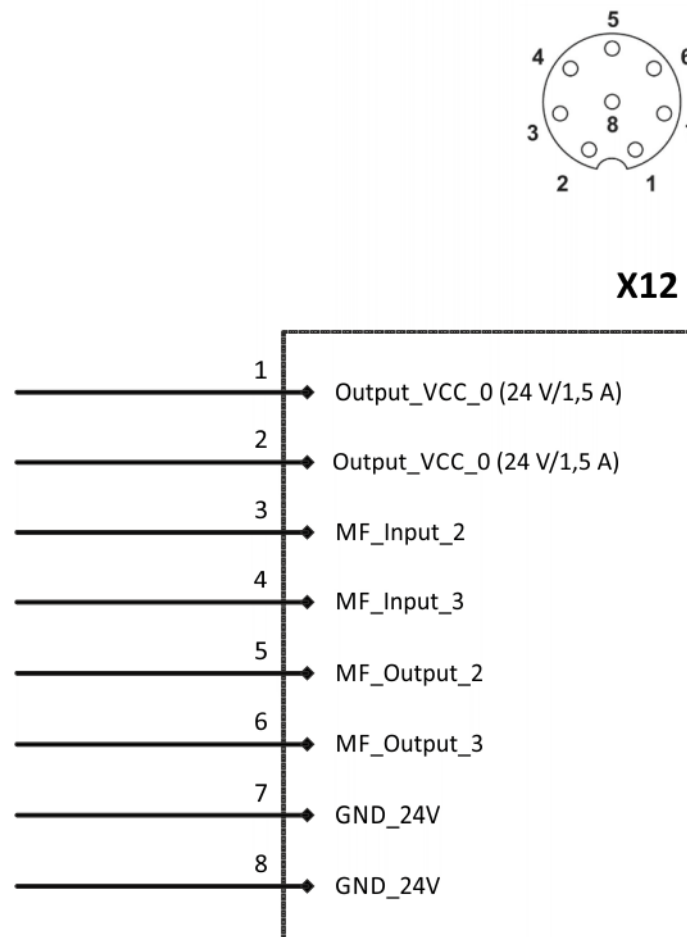


Fig. 6-13: Wiring diagram, MF IO pneumatic, X12

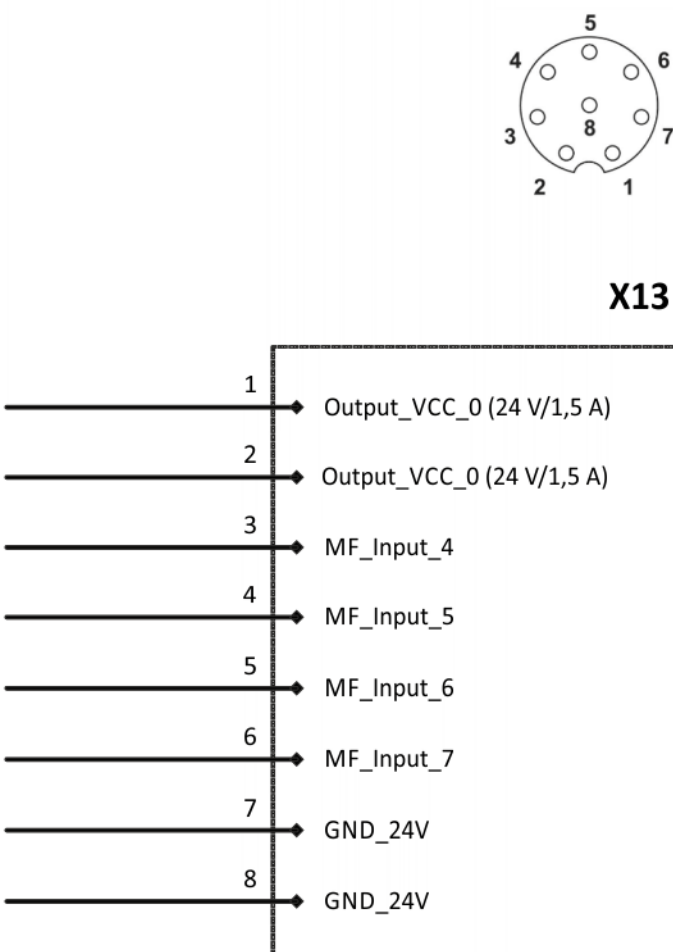


Fig. 6-14: Wiring diagram, MF IO pneumatic, X13

Digital outputs

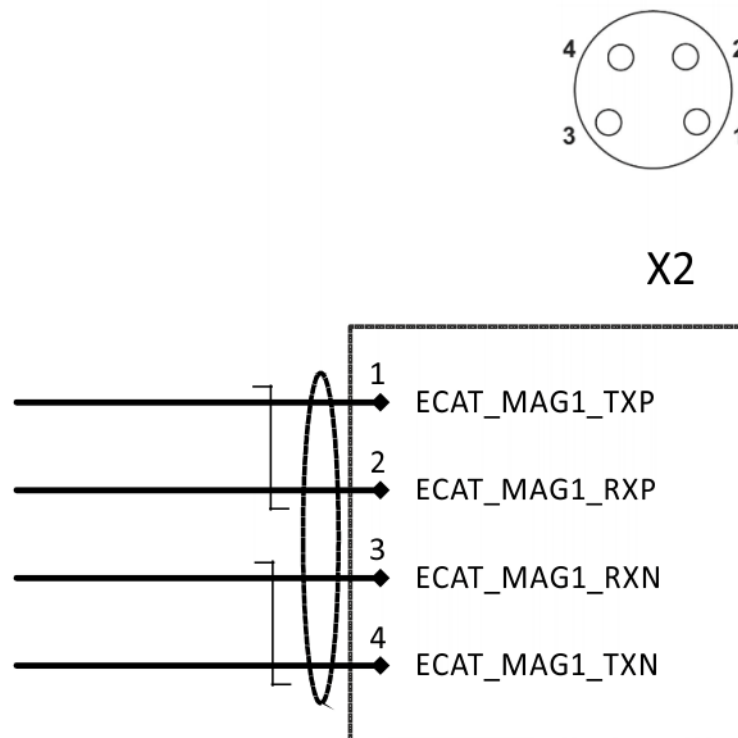
Designation	Values
Digital outputs	4 short-circuit proof
Rated voltage	24 V DC (-15%/+20%)
Output current	max. 0.5 A per output
Short-circuit current	max. 2 A
Load type	Ohmic, inductive Lamp load
Maximum cable length	1 m

Power supply

Designation	Values
Power supply	24 V DC (-15%/+20%) / 3 A nominal 27 V max. 1.5 A per pin max. 2 A per socket max. 3 A total
Maximum cable length	1 m

Digital inputs

Designation	Values
Digital inputs	8
Signal voltage "0"	-3 V ... +5 V EN 61131-2, type 3
Signal voltage "1"	15 V ... 30 V EN 61131-2, type 3
Input current	typically 3 mA EN 61131-2, type 3
Input filter	typically 0.3 ms
Maximum cable length	1 m

Connection X2**Fig. 6-15: Wiring diagram, MF IO pneumatic, X2**

6.2.4 Media flange Touch pneumatic

6.2.4.1 Interface, media flange Touch pneumatic

Overview

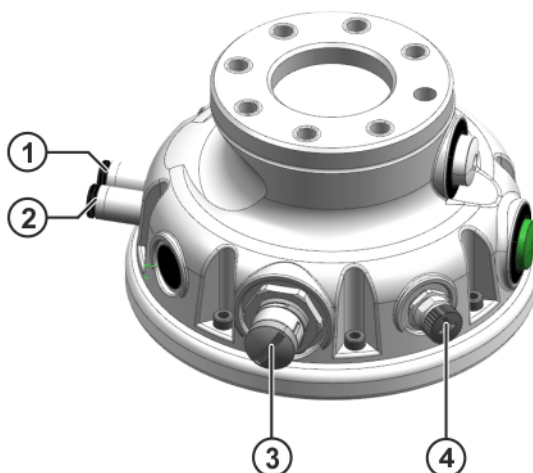


Fig. 6-16: Interface, media flange Touch pneumatic

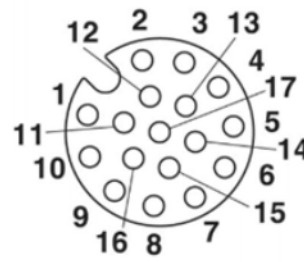
- 1 Air 1 air connection
- 2 Air 2 air connection
- 3 X3 power supply (digital inputs/outputs)
- 4 X2 EtherCat

Connection/ function

Designation	Limit values
Max. pressure	7 bar
Operating temperature	+5 °C to +45 °C (278 K to 318 K) condensation-free
Hose connection	4.0 mm Ø
Medium	Air, oil-free, dry, filtered according to: ISO 8573.1-1, 1.2 to 16.2 Degree of filtration: max. 5 µm

6.2.4.2 Wiring diagrams, media flange Touch pneumatic

Connection X3



X3

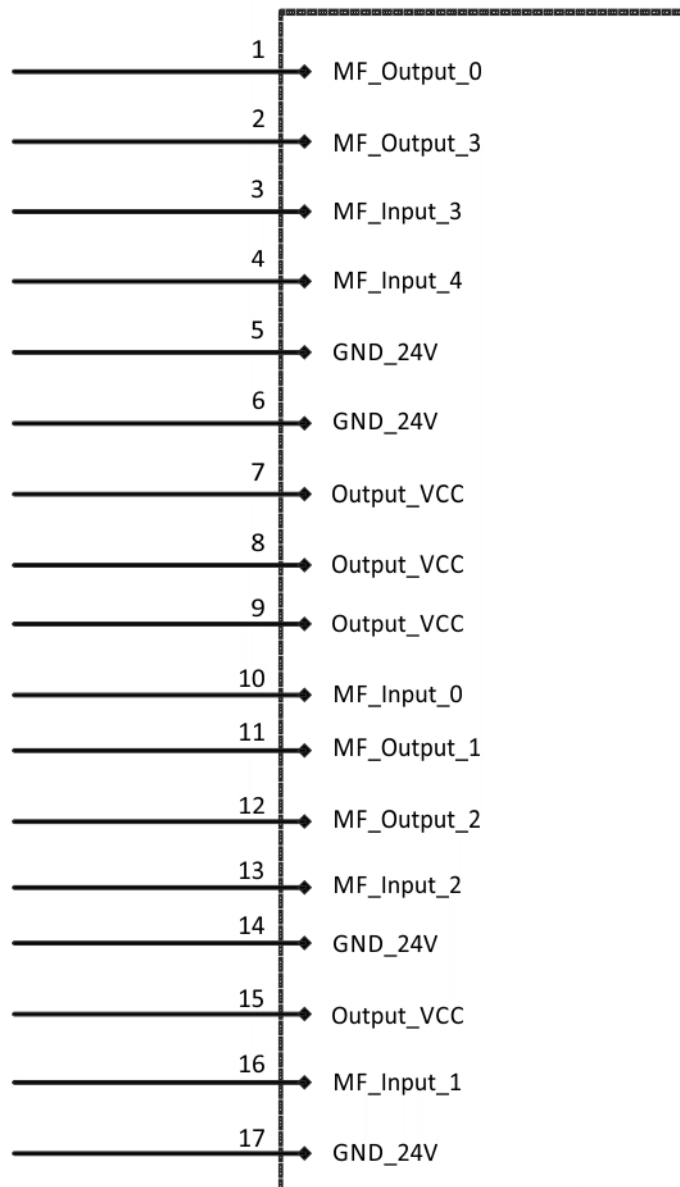


Fig. 6-17: Wiring diagram, MF Touch pneumatic, X3

Digital outputs

Designation	Values
Digital outputs	<ul style="list-style-type: none"> 4 digital outputs short-circuit proof Current monitoring for all 4 outputs together.
Switching states (rated voltage)	<ul style="list-style-type: none"> OFF (0): 0-1.5 V ON (1): 11 V-30 V
Output current	max. 0.5 A per output
Short-circuit current	max. 2 A
Load type	<ul style="list-style-type: none"> Resistive: min. 560 ohms Capacitive: max. 1 uF Inductive: max. 400 mH <p>Note: For higher loads, the current limitation may be triggered or the switching times may be extended.</p>
Maximum cable length	1 m

Digital inputs

Designation	Values
Digital inputs	<ul style="list-style-type: none"> 5 digital inputs <p>Note: Debouncing is not carried out for any inputs.</p> <p>Note: Inductive and capacitive loads are not permissible.</p>
Signal voltage "0"	0 V ... +5 V Note: If no signal is connected, the input takes the state "0".
Signal voltage "1"	11 V ... 30 V
Input current	min. 5 mA with 27 V
Switching speed	Application-specific, scanning of the input values every 25 ms
Maximum cable length	1 m

Power supply

Designation	Values
Power supply	<p>24 V ($\pm 25\%$) / 3 A, switchable</p> <p>nominal 27 V</p> <p>Output SwitchOffX3Voltage (>>> 8.2 "Configuration of media flange Touch pneumatic" Page 59)</p> <ul style="list-style-type: none"> ■ Logic 0: Power on ■ Logic 1: Power off <p>Default: 0</p> <p>Note: The 4 Output_VCC and GND_24V pin pairs must be connected.</p> <p>Note: Resupply of the media flange via the customer supply connections is not permissible.</p>
Load type	<ul style="list-style-type: none"> ■ Resistive: min. 9 ohms ■ Capacitive: max. 1 μF ■ Inductive: max. 400 mH <p>Note: For higher loads, the current limitation may be triggered or the switching times may be extended.</p>
Maximum cable length	1 m

EtherCAT

Values	Designation
Ethernet connection	100 Base-TX
Max. cable length EtherCAT	1 m

Connection X2

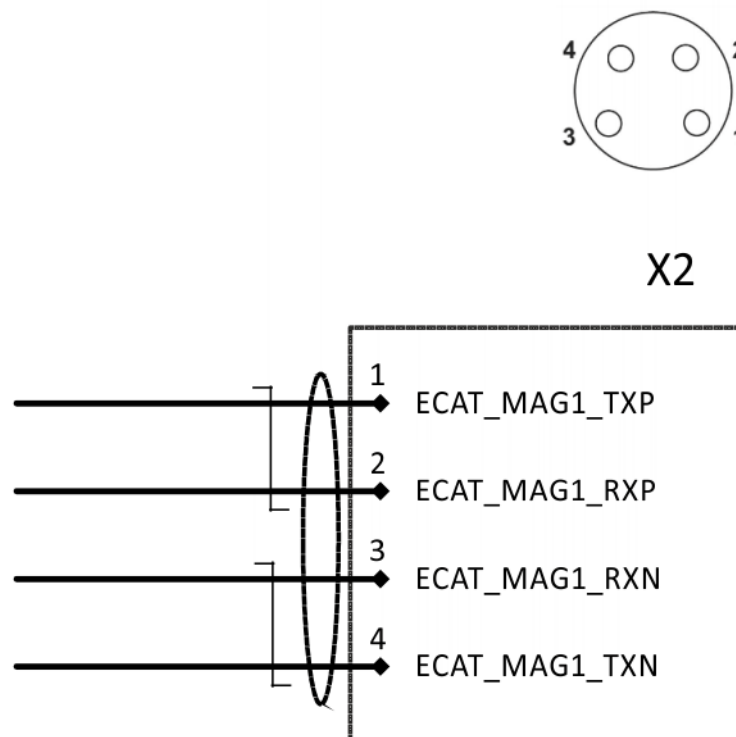


Fig. 6-18: Wiring diagram, MF Touch pneumatic, X2

6.2.5 Connector bypack X651

Description

Two coding pins are included in the connector bypack. These are to be inserted as illustrated below.

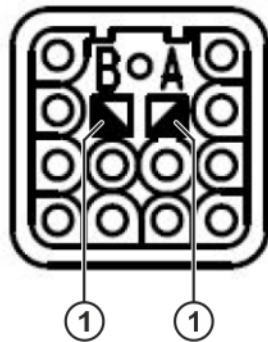


Fig. 6-19: Connector bypack X651

6.2.6 Data cable

Description

The following points must be observed when planning and routing the connecting cables:

- The bending radius for fixed routing must not be less than 35 mm for data cables with power supply for media flange and 45 mm for data cables.
- Protect cables against exposure to mechanical stress.
- Route the cables without mechanical stress – no tensile forces on the connectors
- Cables are only to be installed indoors.
- Observe the permissible temperature range (fixed installation) of -10 °C to +70 °C (263 K to 343 K).
- Route the motor cables and the control cables separately in metal ducts; if necessary, additional measures must be taken to ensure electromagnetic compatibility (EMC).

This data cable is required for operating the robot with the media flange IO pneumatic and media flange Touch pneumatic.

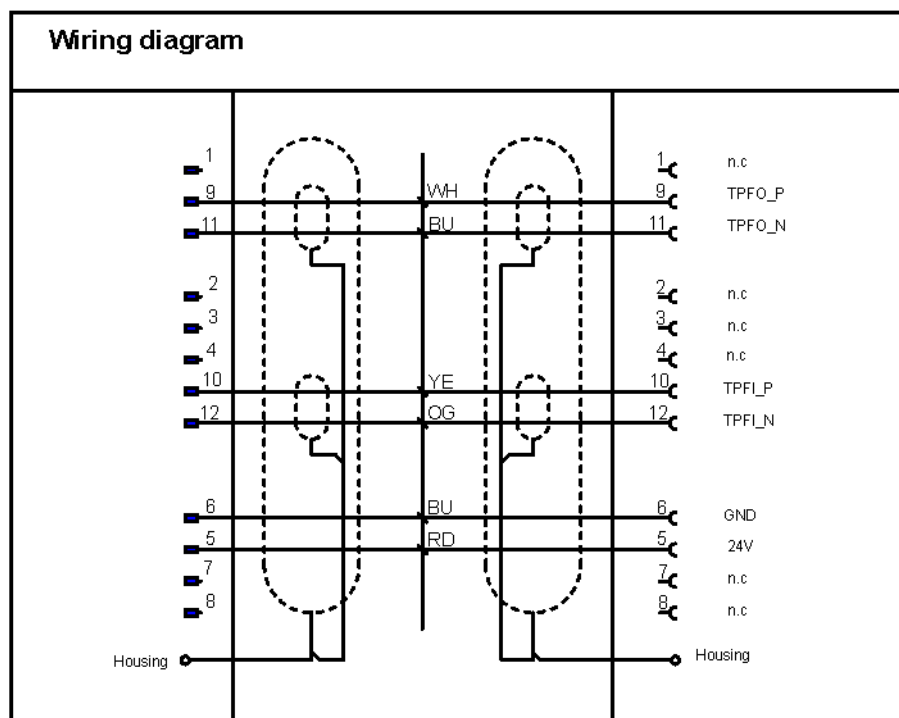
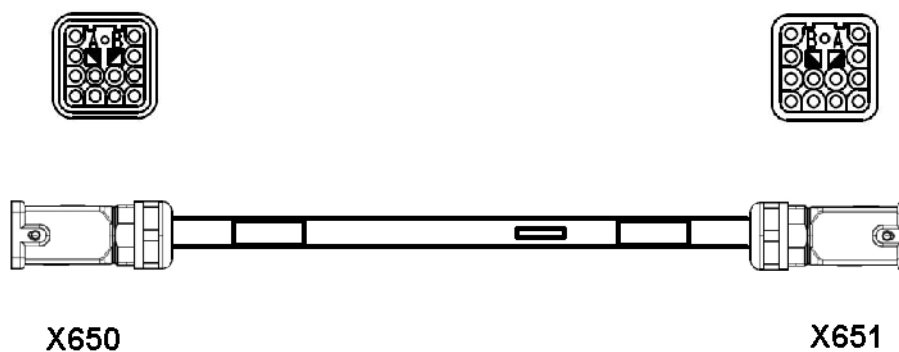


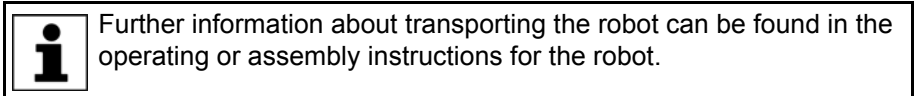
Fig. 6-20: Data cable X650, X651

NOTICE

Connecting the data cable to the robot with different media flange types can result in damage to the components.

7 Transportation

The media flange must not be transported without the robot.



8 Configuration

8.1 Configuration of media flange IO pneumatic

The media flange IO pneumatic with which the robot is equipped must be selected when creating the Sunrise project. The I/O configuration for the media flange is created automatically and contains the complete bus structure of the media flange, including the I/O mapping.

The I/O group in which the inputs/outputs are configured is called MediaFlange. It contains 8 inputs and 4 outputs.

- Inputs: Input0...Input7
- Outputs: Output0...Output3

The inputs/outputs can be addressed directly in the robot application. When the media flange is selected during creation of the Sunrise project, the class MediaFlangeIOGroup.java is generated at the same time. The class already contains the methods required for programming in order to access the inputs/outputs of the media flange.



Detailed information about project creation is contained in the system software documentation.



Detailed information on device mapping is contained in the **WorkVisual** documentation.

8.2 Configuration of media flange Touch pneumatic

The media flange Touch pneumatic with which the robot is equipped must be selected when creating the Sunrise project. The I/O configuration for the media flange is created automatically and contains the complete bus structure of the media flange, including the I/O mapping.

The I/O group in which the inputs/outputs are configured is called MediaFlange. It contains 5 inputs and 4 outputs.

- Inputs: InputX3Pin3, InputX3Pin4, InputX3Pin10, InputX3Pin13, InputX3Pin16, UserButton (= application button)
- Outputs: OutputX3Pin1, OutputX3Pin2, OutputX3Pin11, OutputX3Pin12, SwitchOffX3Voltage, LEDBlue (= light ring, blue)

The inputs/outputs can be addressed directly in the robot application. When the media flange is selected during creation of the Sunrise project, the class MediaFlangeIOGroup.java is generated at the same time. The class already contains the methods required for programming in order to access the inputs/outputs of the media flange.



Detailed information about project creation is contained in the system software documentation.



Detailed information on device mapping is contained in the **WorkVisual** documentation.

9 Maintenance

9.1 Maintenance

Description If used for its intended purpose, the media flange requires minimal maintenance, i.e. visual inspections are recommended. Regular visual inspections make sure that any changes are detected in good time. This enables early detection of damage, thereby preventing failure of components and assemblies. Damaged components or assemblies must be exchanged.



Maintenance, cleaning and inspection measures must only be carried out by appropriately qualified and authorized personnel. All other maintenance, cleaning and inspection work not described in this documentation must only be carried out by KUKA Roboter GmbH.

Interval	Activity
1 year	■ Test the enabling switch



Information about testing the enabling switch is contained in the Sunrise.OS documentation.

9.2 Cleaning

Precondition

- Power supply lead is disconnected.
- Observe the EMC guidelines.

Work regulations

- The manufacturer's instructions must be observed when using cleaning agents for cleaning work.
- It must be ensured that no cleaning agents enter electrical components.
- Do not use compressed air during cleaning work.
- Do not spray with water.

Procedure

1. Loosen and vacuum up any dust deposits.
2. Clean the media flange with a cloth soaked with a mild cleaning agent.
3. Replace damaged, illegible or missing identifications, labels and plates.



Further information on cleaning is contained in the robot documentation.

10 Repair

10.1 Repair

No repair work is planned for the media flanges. For further information, please contact your local KUKA Customer Support.

11 Troubleshooting

11.1 Troubleshooting, media flange IO pneumatic, media flange Touch pneumatic

Fault	Cause	Remedy
Short circuit	Impermissible loads have been used.	<ul style="list-style-type: none"> ■ The system automatically deactivates all outputs and automatically restarts after 5 s. or ■ The system automatically disconnects the voltage supply and automatically restarts after 5 s.

12 Decommissioning, storage and disposal

12.1 Decommissioning

Decommissioning of the media flanges is carried out by KUKA Service.

12.2 Storage

- Description** If the media flanges are to be put into long-term storage, the following points must be observed:
- The place of storage must be as dry and dust-free as possible.
 - Avoid temperature fluctuations.
 - Avoid wind and drafts.
 - Avoid condensation.
 - Use appropriate coverings that cannot detach themselves and which can withstand the expected environmental conditions.
 - Do not leave any loose parts on the media adapter module, especially ones that might knock against other parts.
 - Do not leave media flanges exposed to direct sunlight while in storage.
 - Observe and comply with the permissible temperature ranges for storage.
 - Select a storage location in which the packaging materials cannot be damaged.

12.3 Disposal

When the media flanges reach the end of their useful life, they can be removed from the system and dismantled, and the materials can be disposed of properly by type.

The following table provides an overview of the materials used in the media flanges. All plastic components are marked with a material designation and must be disposed of accordingly.

Material, designation	Subassembly, component	Note
Aluminum, steel	Media flange	
PUR	Cable sheaths	
Copper	Cables, wires	
PU	Compressed air hoses	
PA	Connector housing	
Electrical components	Bus modules, valve terminals, sensors, connecting cables	Dispose of as electrical scrap without disassembling

13 KUKA Service

13.1 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	<p>The following information is required for processing a support request:</p> <ul style="list-style-type: none"> ■ 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 <p>The following list gives an indication of the information which is relevant in many cases:</p> <ul style="list-style-type: none"> ■ 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

13.2 KUKA Customer Support

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