ROBOT

(V)KR 150, 180, 210

Technical Data

Issued: 04 Jul 2003 Version: 06

PD Interleaf

Contents

Valid for

(V)KR 150
(V)KR 150 L130
(V)KR 150 L110
(V)KR 180
(V)KR 180 L150
(V)KR 180 L130
(V)KR 210
(V)KR 210 L180
(V)KR 210 L150

1 General

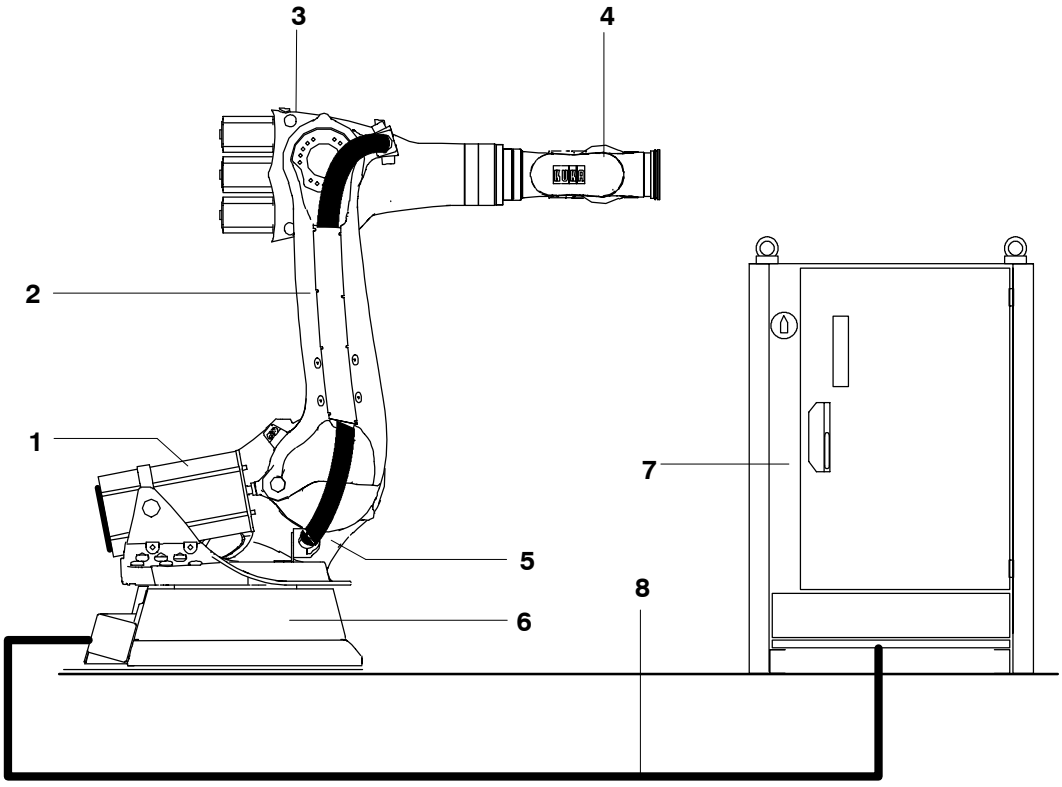
The robot is a six–axis industrial robot for installation on the floor or on the ceiling. It is suitable for all point–to–point and continuous–path controlled tasks. The main areas of application are

- spot welding
- handling
- assembly
- application of adhesives, sealants and preservatives
- machining
- MIG/MAG welding
- YAG laser beam welding.

Using the robot for purposes other than those mentioned above is considered contrary to its designated use (see Doc. Module “Safety, General”).

Figure 1 shows the robot system, comprising the manipulator (= robot), control cabinet and connecting cables.

The following data apply, unless otherwise indicated, to both floor–mounted and ceiling–mounted robots.



1 Counterbalancing system
2 Link arm
3 Arm
4 In−line wrist
5 Rotating column
6 Base frame
7 Control cabinet (see separate documentation)
8 Connecting cables

Fig. 1 Principal robot components

2 Principal data

Types	KR 150	KR 150 L130	KR 150 L110
	KR 180	KR 180 L150	KR 180 L130
	KR 210	KR 210 L180	KR 210 L150

Number of axes 6 (Fig. 3)

Load limits See the following table and Fig. 2

Robot type	**KR 150**	**KR 150 L130**	**KR 150 L110**
Wrist (IW)[1]	150/180 kg		
Rated payload [kg]	150	130	110
Suppl. load, arm [kg]	50	50	50
Suppl. load, link arm [kg]	100	100	100
Max. suppl. load, arm and link arm [kg]	100		
Suppl. load, rotating column [kg]	300	300	300
Max. total distrib. load [kg]	550	530	510
Arm length [mm]	1100	1300	1500

Robot type	**KR 180**	**KR 180 L150**	**KR 180 L130**
Wrist (IW)[1]	150/180 kg		
Rated payload [kg]	180	150	130
Suppl. load, arm [kg]	50	50	80
Suppl. load, link arm [kg]	100	100	100
Max. suppl. load, arm and link arm [kg]	100		
Suppl. load, rotating column [kg]	300	300	300
Max. total distrib. load [kg]	580	550	530
Arm length [mm]	1100	1300	1500

Robot type	**KR 210**	**KR 210 L180**	**KR 210 L150**
Wrist (IW)[1]	210 kg		
Rated payload [kg]	210	180	150
Suppl. load, arm [kg]	50	50	50
Suppl. load, link arm [kg]	100	100	100
Max. suppl. load, arm and link arm [kg]	100		
Suppl. load, rotating column [kg]	300	300	300
Max. total distrib. load [kg]	610	580	550
Arm length [mm]	1100	1300	1500

1 IW = in–line wrist

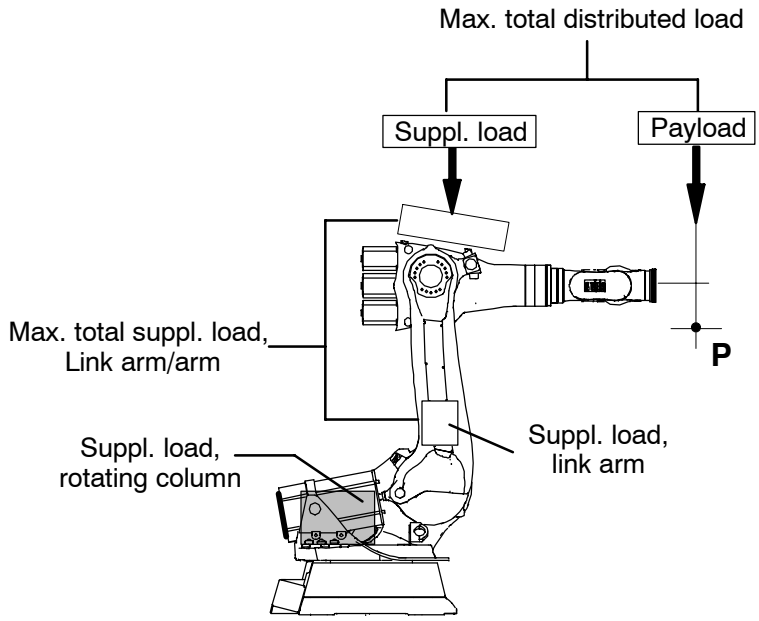


Fig. 2 Load distribution

Axis data

All specifications in the “Range of motion” column are referred to the **mechanical** zero of the robot axis concerned.

KR 150
KR 150 L130
KR 150 L110

- **In–line wrist, rated payload 150/130/110 kg**

Axis	Range of motion software limited	Speed with rated payload		
		150 kg	130 kg	110 kg
1	±185°	110 °/s	105 °/s	105 °/s
2	+90° to –61°	110 °/s	110 °/s	110 °/s
3	+65° to –209°	100 °/s	95 °/s	93 °/s
4	±350°		170 °/s	
5	±125°		170 °/s	
6	±350°		238 °/s	

KR 180
KR 180 L150
KR 180 L130

- **In–line wrist, rated payload 180/150/130 kg**

Axis	Range of motion software limited	Speed with rated payload		
		180 kg	150 kg	130 kg
1	±185°		95 °/s	
2	+90° to –61°		95 °/s	
3	+65° to –209°	90 °/s	87 °/s	83 °/s
4	±350°	162 °/s	168 °/s	171 °/s
5	±125°	164 °/s	168 °/s	170 °/s
6	±350°	229 °/s	235 °/s	238 °/s

KR 210
KR 210 L180
KR 210 L150

- **In–line wrist, rated payload 210/180/150 kg**

Axis	Range of motion software limited	Speed with rated payload		
		210 kg	180 kg	150 kg
1	±185°		86 °/s	
2	+90° to –61°		84 °/s	
3	+65° to –209°	84 °/s	84 °/s	81 °/s
4	±350°		100 °/s	
5	±125°		110 °/s	
6	±350°		184 °/s	

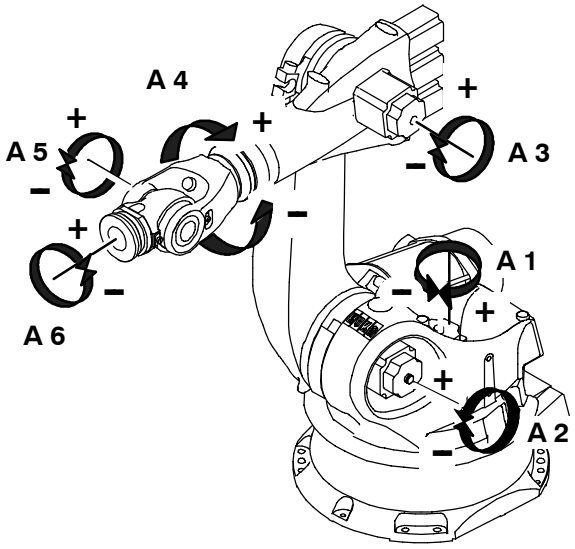


Fig. 3 Robot axes and their possible motions

Repeatability	± 0.15 mm for	KR 150 KR 150 L130 KR 150 L110 KR 180 KR 180 L150 KR 180 L130
	± 0.2 mm for	KR 210 KR 210 L180 KR 210 L150
Mounting position	All types: floor or ceiling (permissible angle of inclination ≤ 5°).	
Principal dimensions	see Fig. 13	
Working envelope	see Fig. 13.	
Volume of working envelope	KR 150 KR 150 L130 KR 150 L110 KR 180 KR 180 L150 KR 180 L130 KR 210 KR 210 L180 KR 210 L150	approx. 55.0 m^3 approx. 72.9 m^3 approx. 93.0 m^3 approx. 55.0 m^3 approx. 72.9 m^3 approx. 93.0 m^3 approx. 55.0 m^3 approx. 72.9 m^3 approx. 93.0 m^3
	The reference point is the intersection of axes 4 and 5.	
Load center of gravity P	see Fig. 4 to Fig. 12. For all rated payloads, the horizontal distance of the load center of gravity P from the face of the mounting flange is 240 mm; the vertical distance from rotational axis 6 is 270 mm (nominal distance in each case).	

Mounting flange

DIN/ISO[1] mounting flange (Fig. 16).
The flange is depicted with axes 4 and 6 in the zero position. The symbol ⧫ indicates the position of the locating element (bushing).
M10 screws of grade 10.9 are to be used for attaching payloads.
The grip length of the screws in the flange must be at least 1.5 x nominal diameter.

Depth of engagement:	min. 12 mm
	max. 14 mm

[1] DIN/ISO 9409–1–A160

Weight

KR 150	1245 kg
KR 150 L130	1255 kg
KR 150 L110	1263 kg
KR 180	1267 kg
KR 180 L150	1277 kg
KR 180 L130	1285 kg
KR 210	1267 kg
KR 210 L180	1277 kg
KR 210 L150	1285 kg

Principal dynamic loads

see Fig. 17

Drive system

Electromechanical, with transistor–controlled AC servomotors

Installed motor capacity

KR 150	21.60 kW
KR 180	22.80 kW
KR 210	23.40 kW

Robot protection classification

IP 65
ready for operation, with connecting cables plugged in (according to EN 60529).

Protection classification of the in–line wrist

IP 65 (according to EN 60529).

Protection classification of the in–line wrist “F”

IP 67 (according to EN 60529)

Stress limits, in–line wrist “F”

Thermal loading	10 s/min at 180 °C
Surface temperature	100 °C
Resistant to:	– high ambient dust content
	– lubricants and coolants
	– steam

Special maintenance intervals apply for in–line wrists of type “F”.

Ambient temperature

During operation:
283 K to 328 K (+10 °C to +55 °C),
During storage and transportation:
233 K to 333 K (–40 °C to +60 °C).
Other temperature limits available on request.

Special features for the “F” variant

Pressurized arm	
Overpressure in arm:	0.1 bar
Compressed air:	free of oil and water
Air consumption:	approx. 0.1 m^3/h
Threaded union:	M5
Pressure reducer:	0.1 – 0.7 bar
Pressure gauge:	0 – 1 bar
Filter:	25 – 30 μm

Sound level

< 75 dB (A) outside the working envelope

Zero adjustment

For zero adjustment with the electronic probe (accessory) when the tool is mounted, the latter must be designed to allow sufficient space for installation and removal of the probe (Fig. 18).

Colors

Robot
Base (stationary): black (RAL 9005).
Moving parts: orange (RAL 2003).
With “F” variant, additional special paint finish for the entire robot.

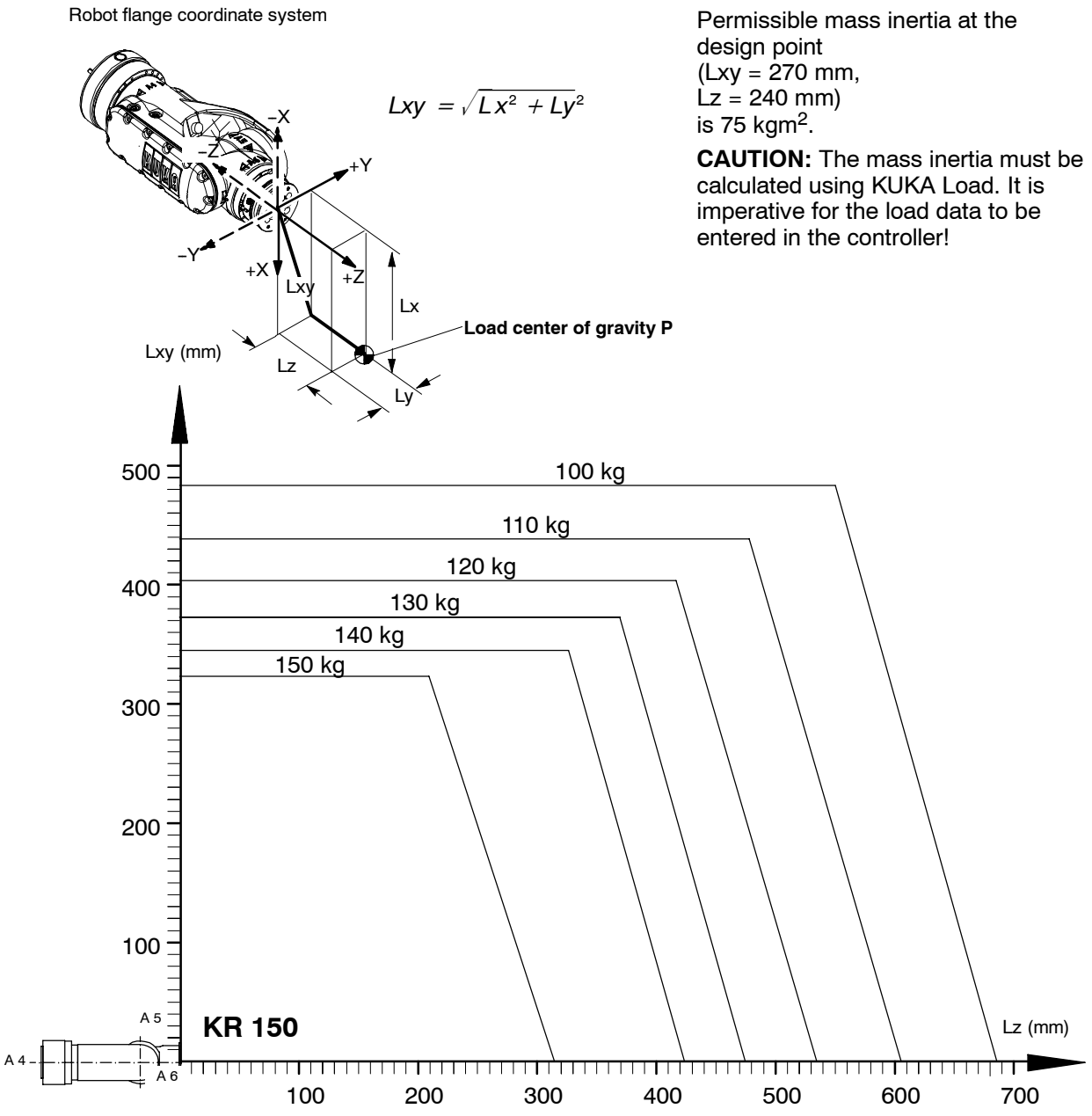
In–line wrist “F”:
Heat–resistant and heat–reflecting special paint finish in silver.

Plates

see Fig. 19 to Fig. 30.

Concerning Fig. 4 to Fig. 11:
These loading curves correspond to the maximum load capacity. Both values (payload and principal moment of inertia) must be checked in all cases. Exceeding this capacity will reduce the service life of the robot and generally overload the motors and the gears; in any such case KUKA 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 KUKA software documentation.



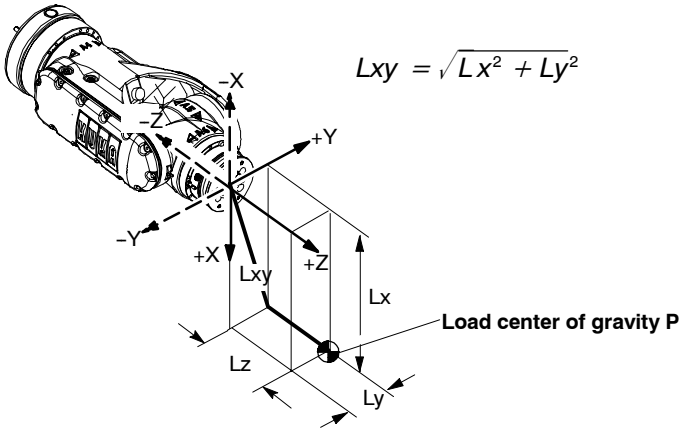
Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 75 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

Fig. 4 Load center of gravity P and loading curves for KR 150

The values determined here are necessary for planning the robot application.
For commissioning the robot, additional input data are required in accordance with the KUKA software documentation.

Robot flange coordinate system



Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 65 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

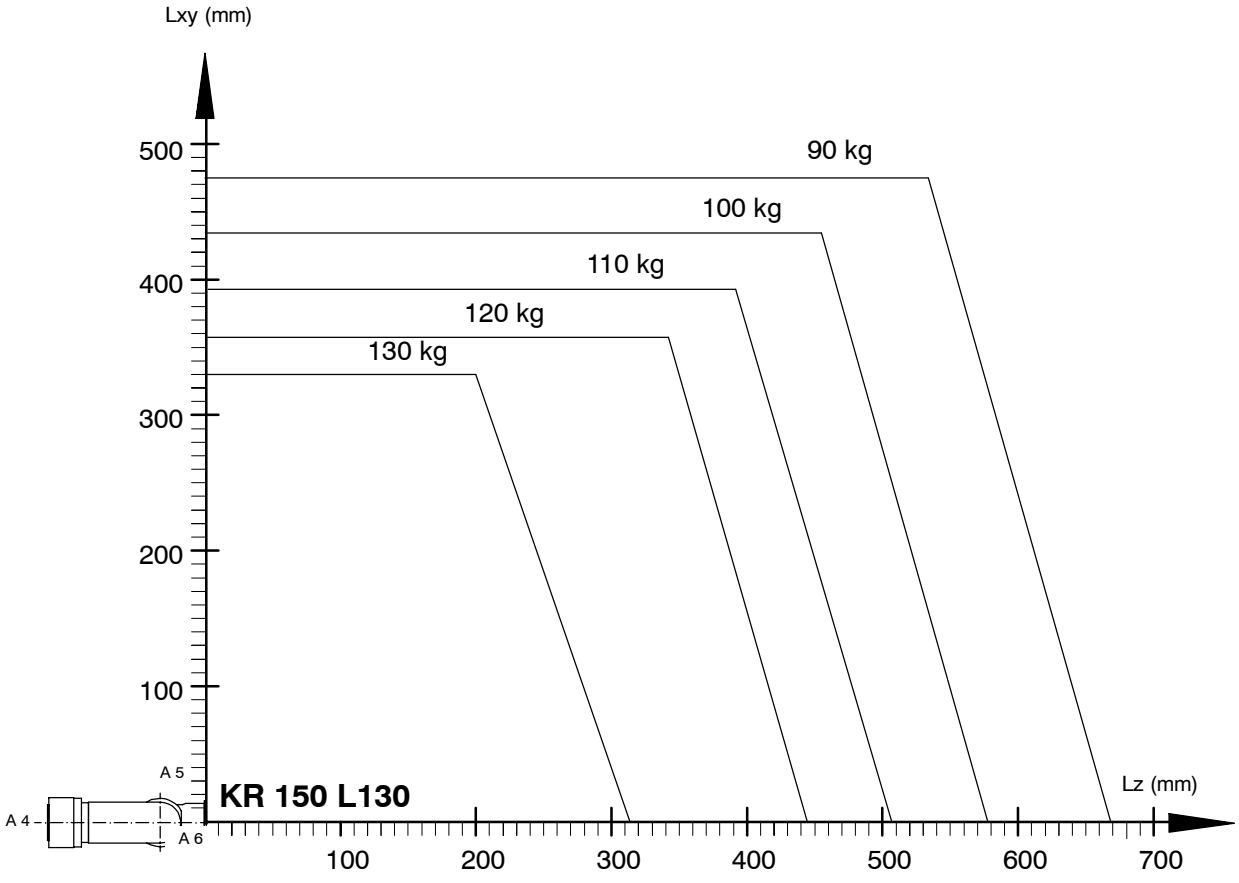
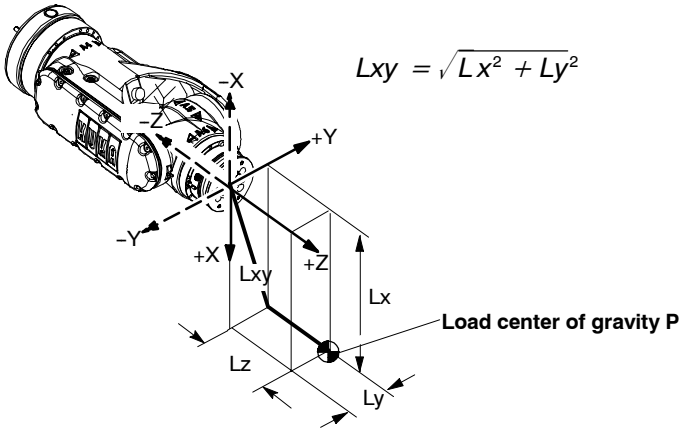


Fig. 5 Load center of gravity P and loading curves for KR 150 L130

The values determined here are necessary for planning the robot application.
For commissioning the robot, additional input data are required in accordance with the KUKA software documentation.

Robot flange coordinate system



Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 55 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

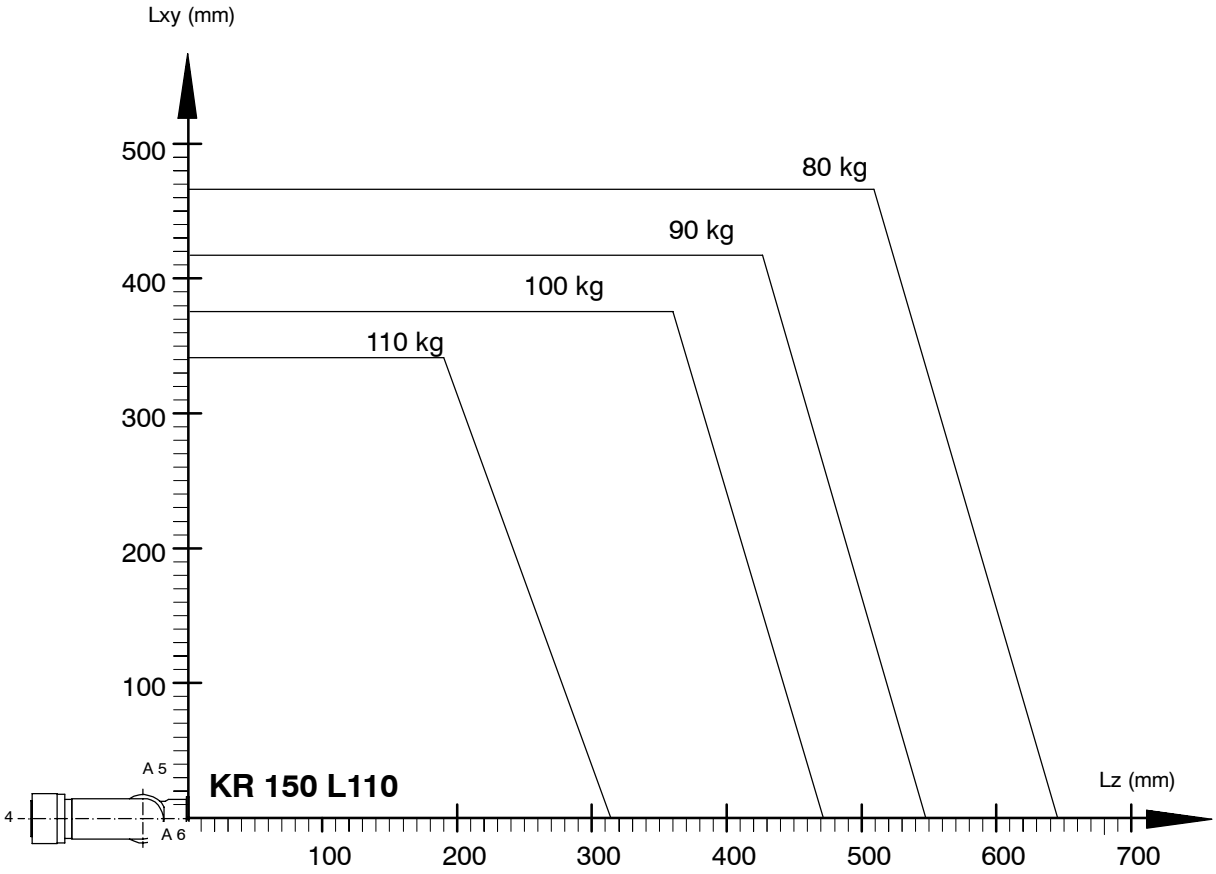
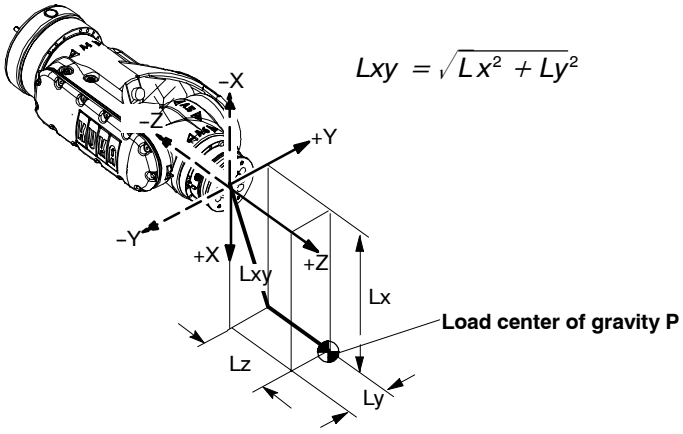


Fig. 6 Load center of gravity P and loading curves for KR 150 L110

The values determined here are necessary for planning the robot application.
For commissioning the robot, additional input data are required in accordance with the KUKA software documentation.

Robot flange coordinate system



Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 90 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

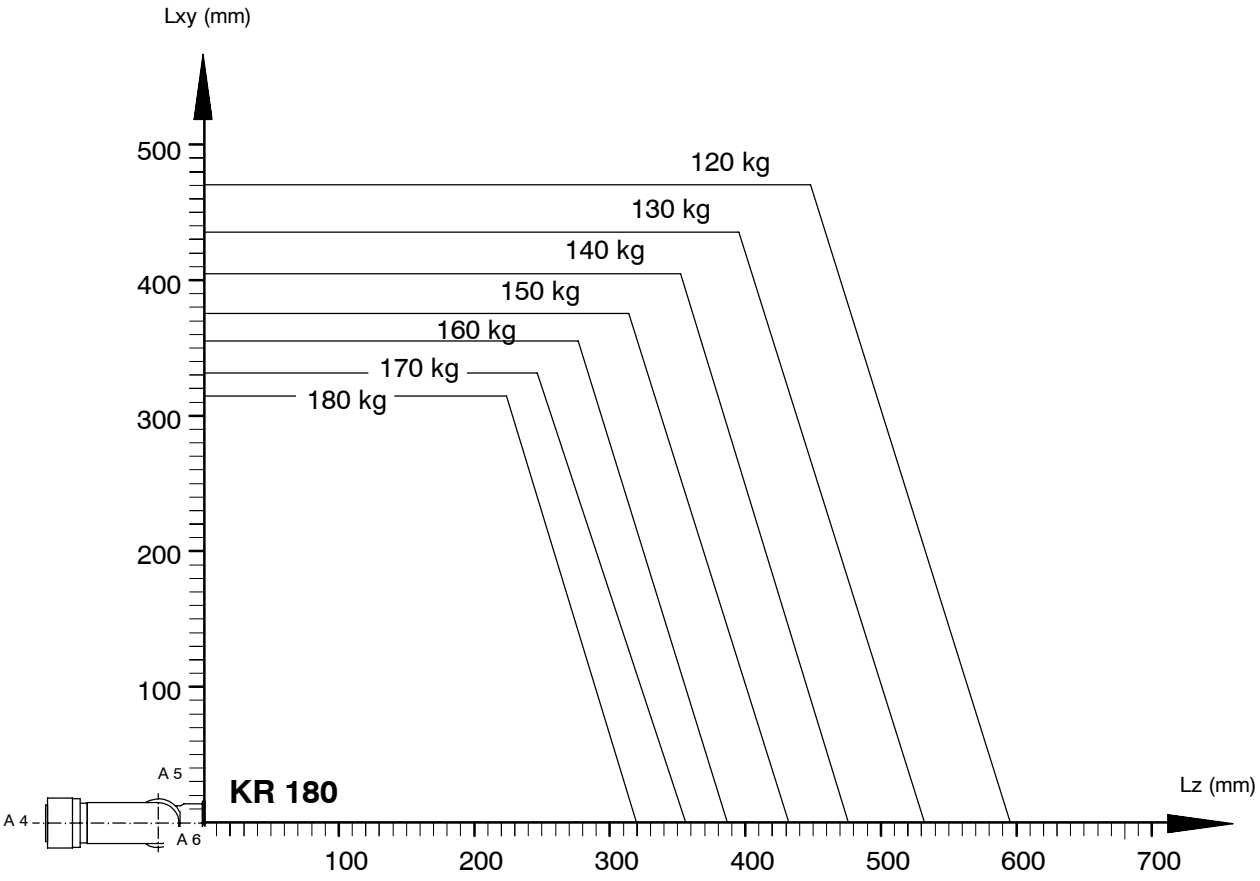
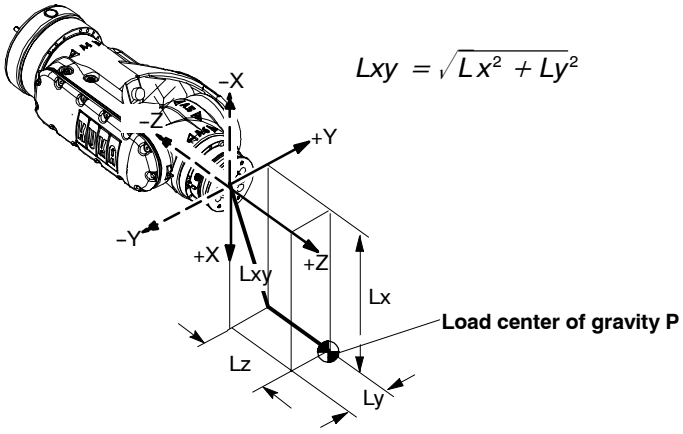


Fig. 7 Load center of gravity P and loading curves for KR 180

The values determined here are necessary for planning the robot application.
For commissioning the robot, additional input data are required in accordance with the KUKA software documentation.

Robot flange coordinate system



Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 75 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

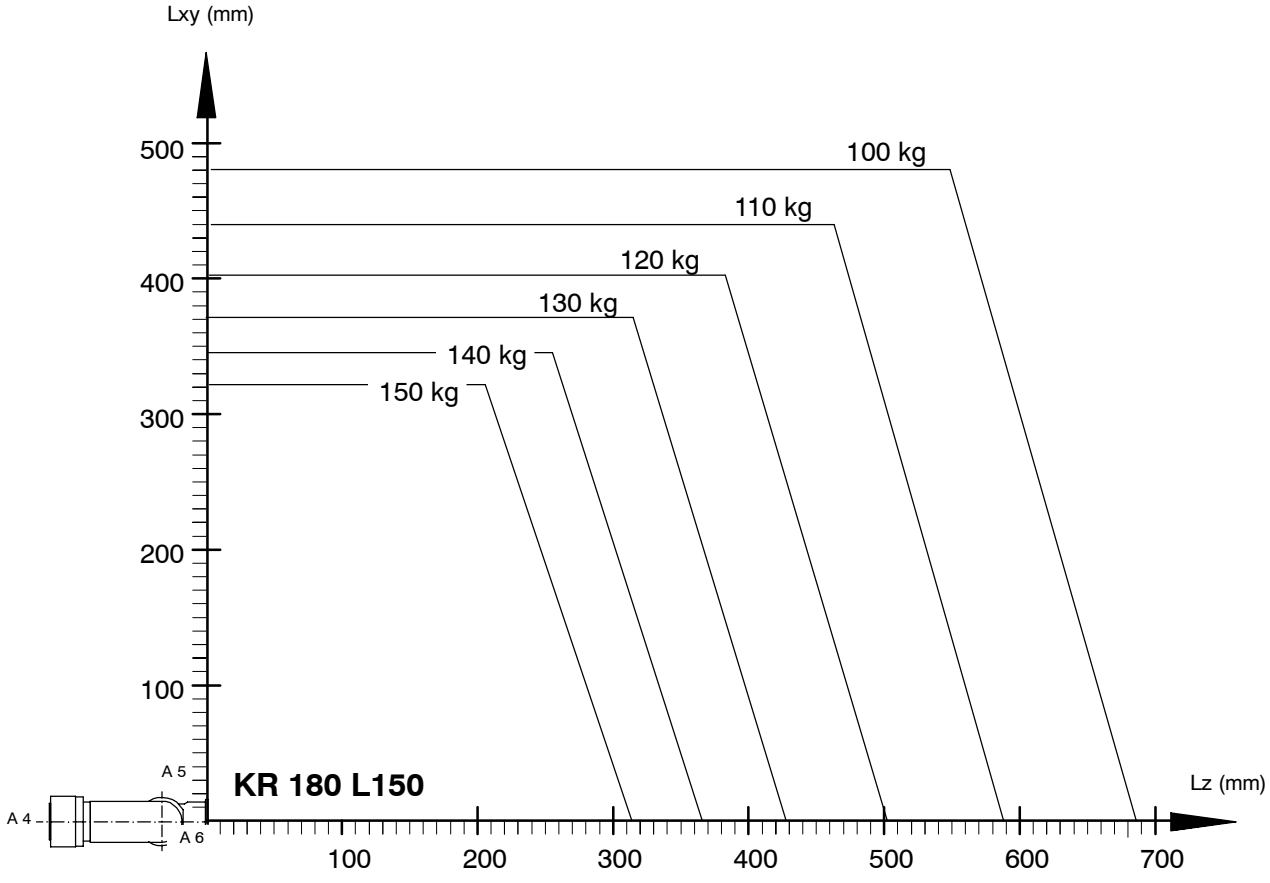
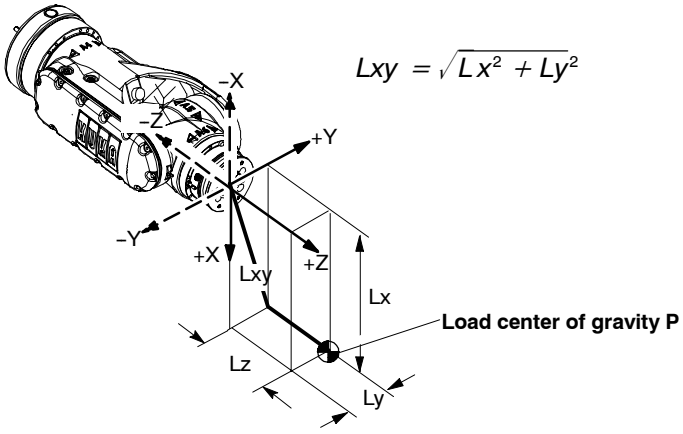


Fig. 8 Load center of gravity P and loading curves for KR 180 L150

The values determined here are necessary for planning the robot application.
For commissioning the robot, additional input data are required in accordance with the KUKA software documentation.

Robot flange coordinate system



Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 65 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

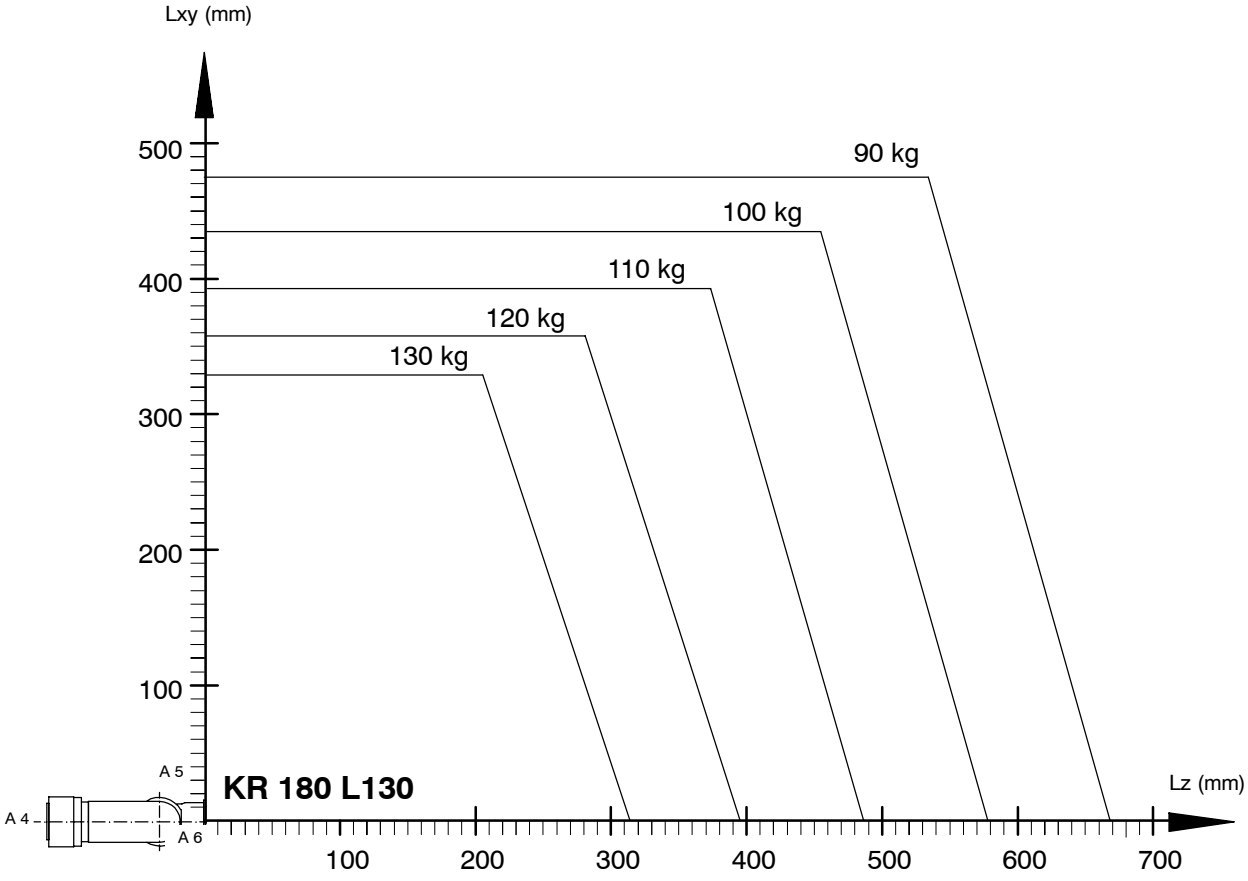
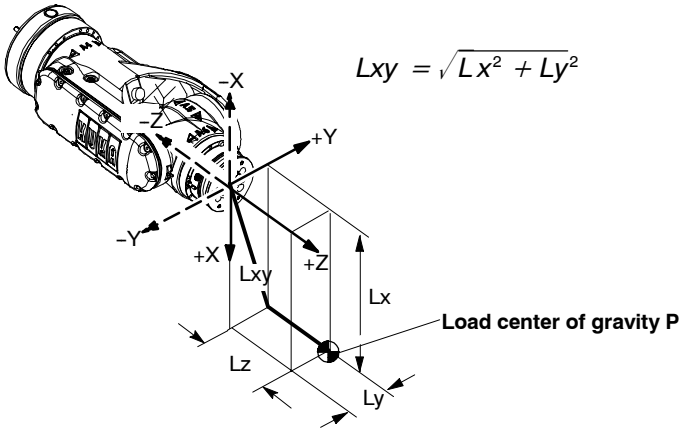


Fig. 9 Load center of gravity P and loading curves for KR 180 L130

The values determined here are necessary for planning the robot application.
For commissioning the robot, additional input data are required in accordance with the KUKA software documentation.

Robot flange coordinate system



Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 105 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

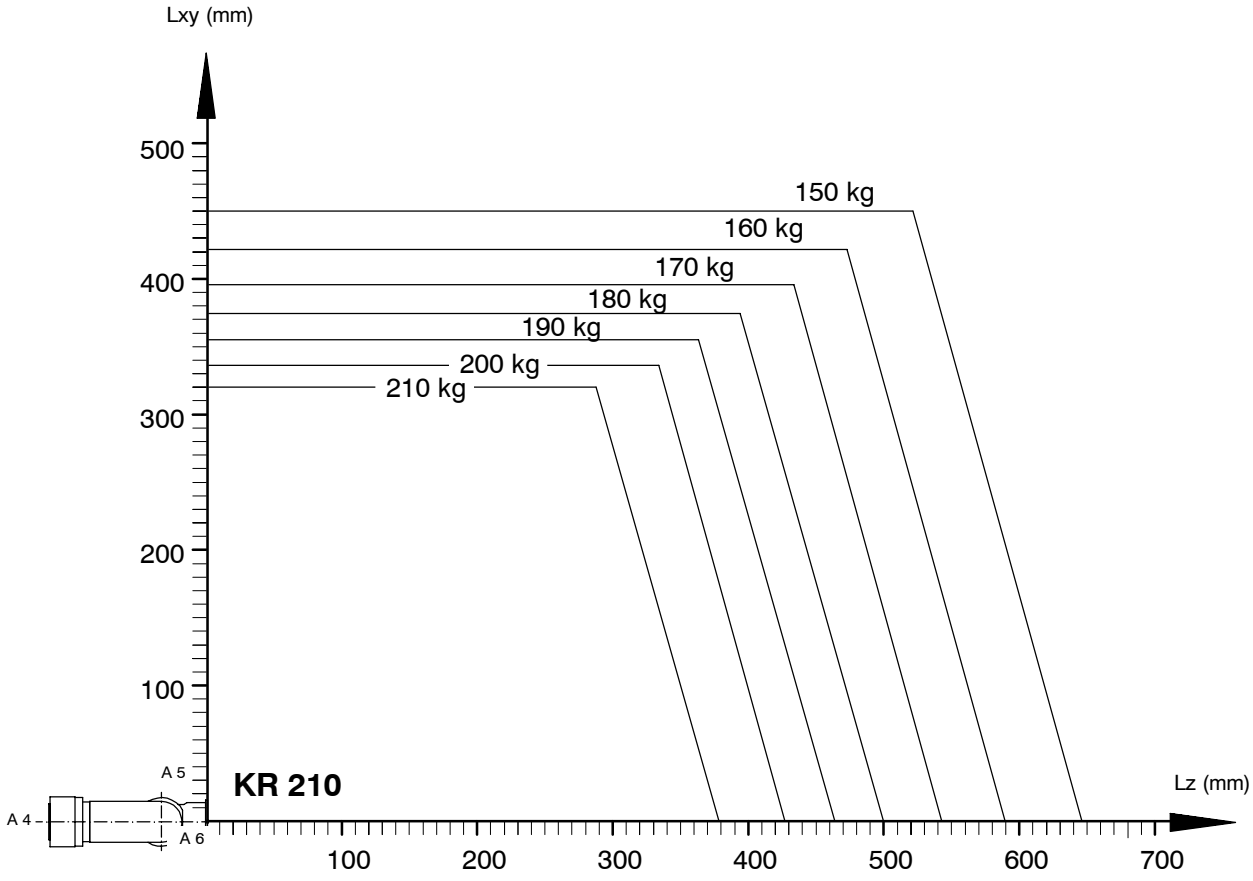
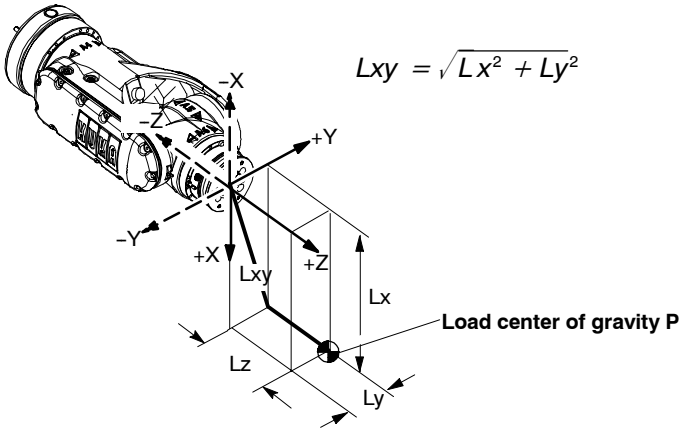


Fig. 10 Load center of gravity P and loading curves for KR 210

The values determined here are necessary for planning the robot application.
For commissioning the robot, additional input data are required in accordance with the KUKA software documentation.

Robot flange coordinate system



Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 90 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

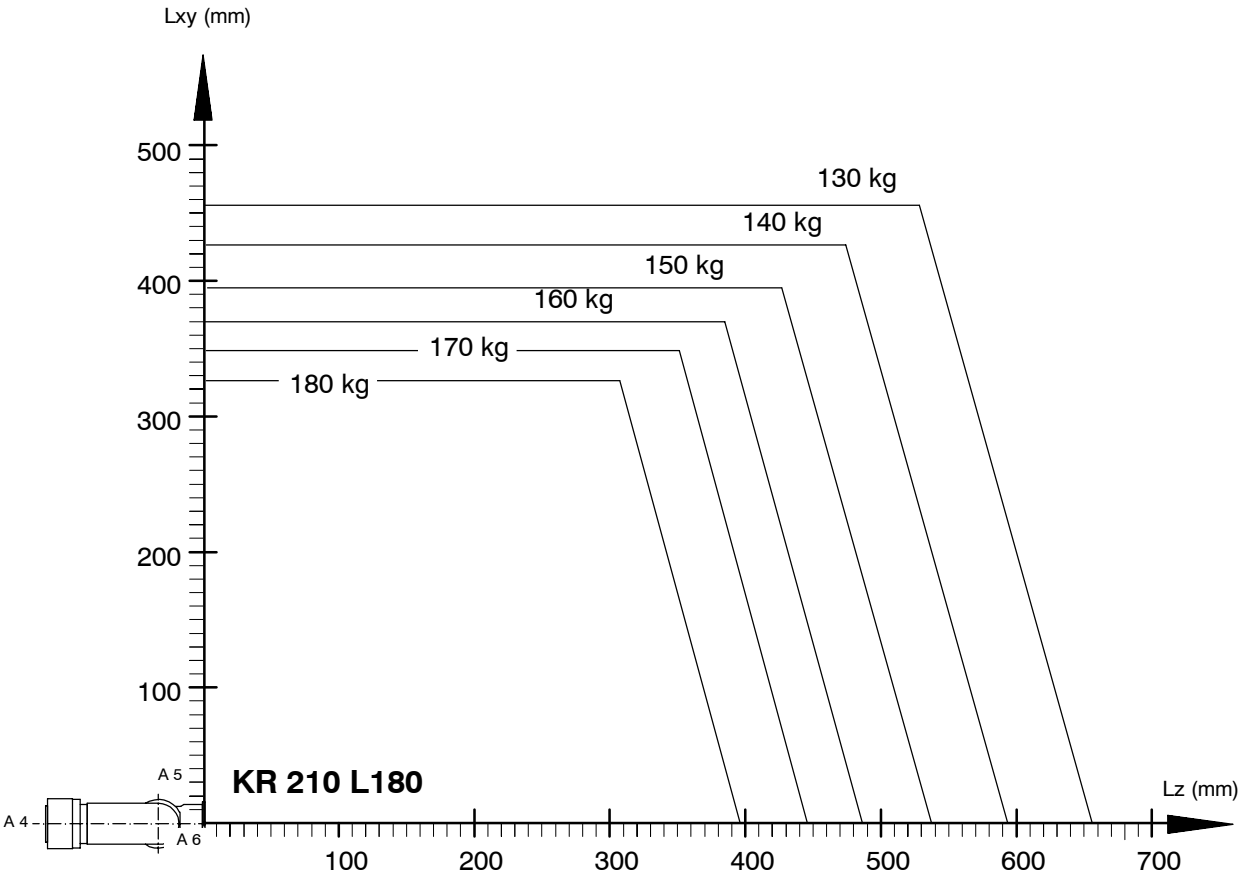
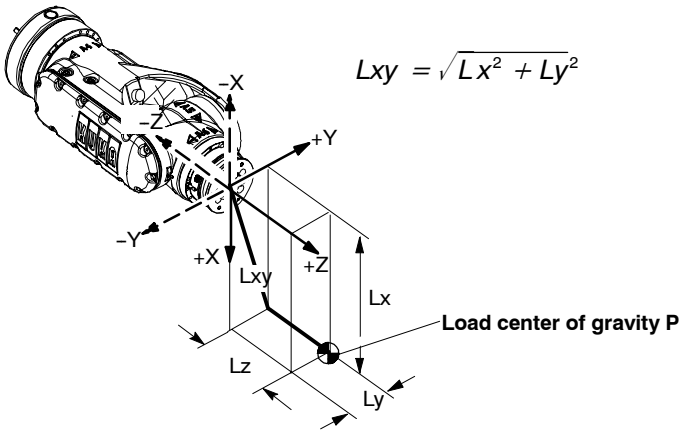


Fig. 11 Load center of gravity P and loading curves for KR 210 L180

The values determined here are necessary for planning the robot application.
For commissioning the robot, additional input data are required in accordance with the KUKA software documentation.

Robot flange coordinate system



Permissible mass inertia at the design point
(Lxy = 270 mm,
Lz = 240 mm)
is 75 kgm^2.

CAUTION: The mass inertia must be calculated using KUKA Load. It is imperative for the load data to be entered in the controller!

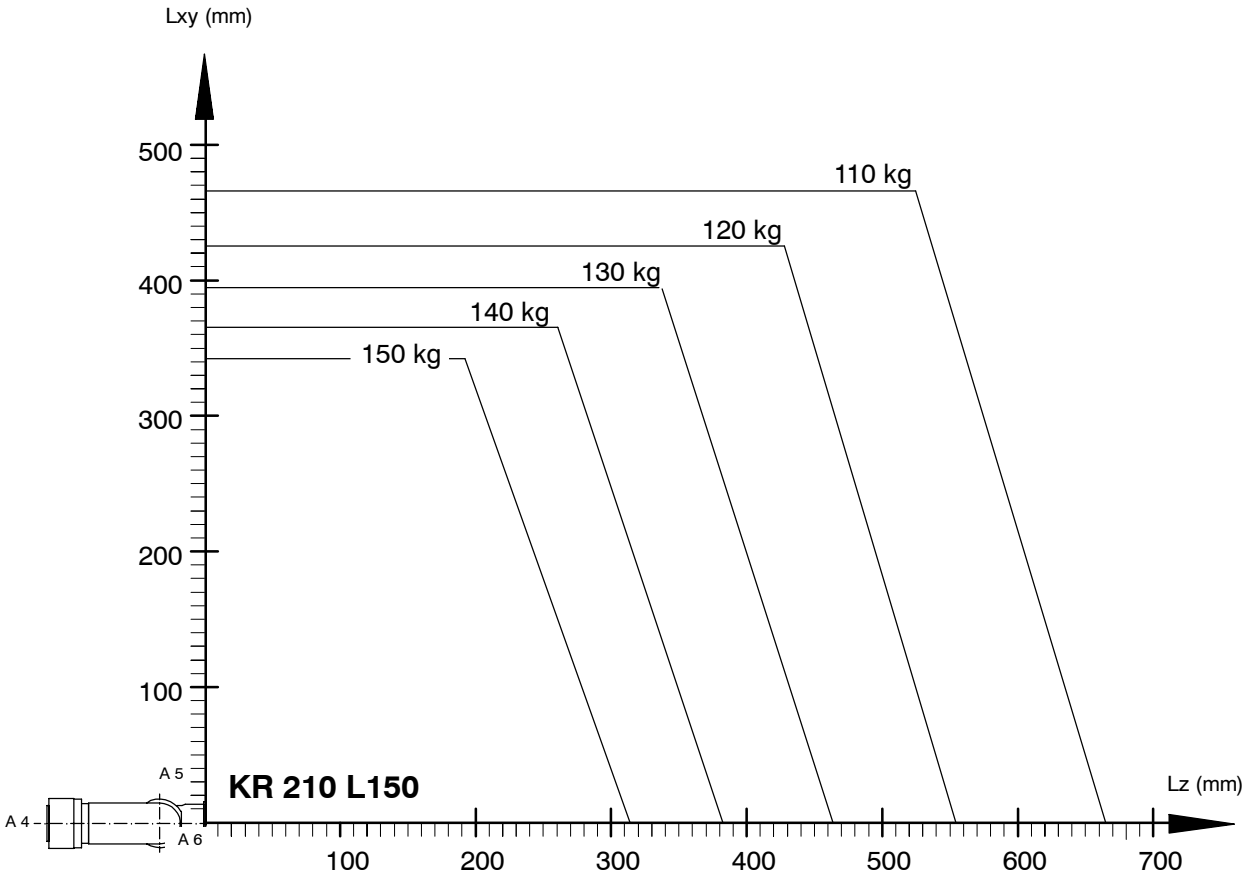
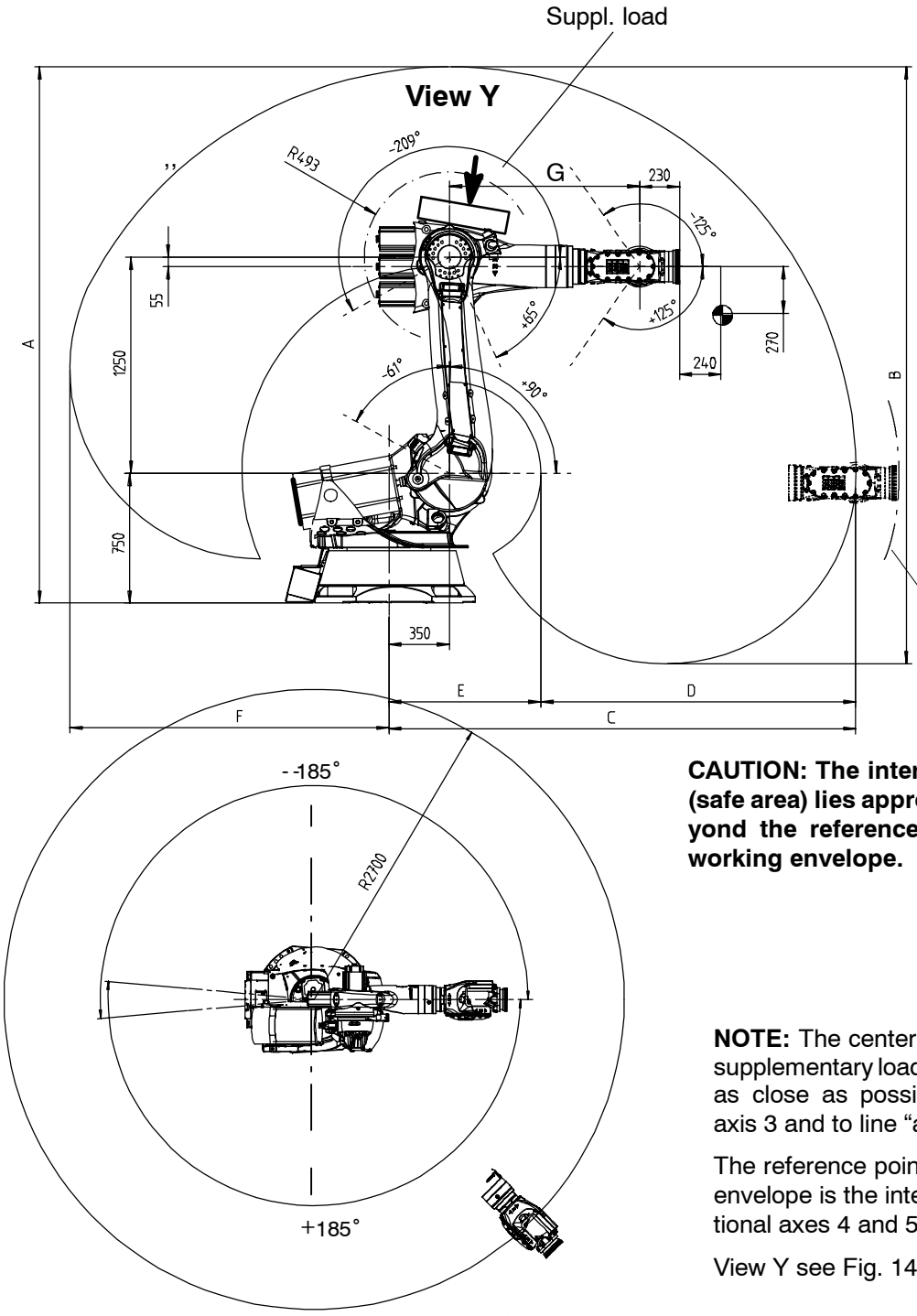


Fig. 12 Load center of gravity P and loading curves for KR 210 L150



CAUTION: The interference radius (safe area) lies approx. 250 mm beyond the reference point for the working envelope.

NOTE: The center of gravity of the supplementary load must be located as close as possible to rotational axis 3 and to line “a” in Fig. 14.

The reference point for the working envelope is the intersection of rotational axes 4 and 5.

View Y see Fig. 14.

	A	B	C	D	E	F	G
KR 150	3100	3450	2700	1875	825	1843	1100
KR 150 L130	3300	3850	2900	2050	850	2043	1300
KR 150 L110	3500	4250	3100	2150	950	2243	1500
KR 180	3100	3450	2700	1875	825	1843	1100
KR 180 L150	3300	3850	2900	2050	850	2043	1300
KR 180 L130	3500	4250	3100	2150	950	2243	1500
KR 210	3100	3450	2700	1875	825	1843	1100
KR 210 L180	3300	3850	2900	2050	850	2043	1300
KR 210 L150	3500	4250	3100	2150	950	2243	1500

Fig. 13 Principal dimensions and working envelope (software values)

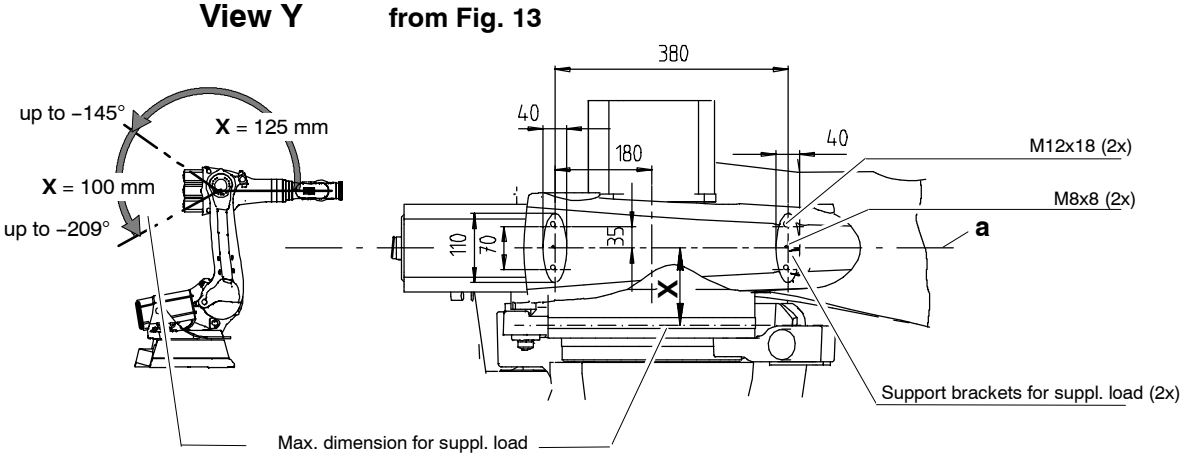


Fig. 14 Attachment holes for supplementary load on arm

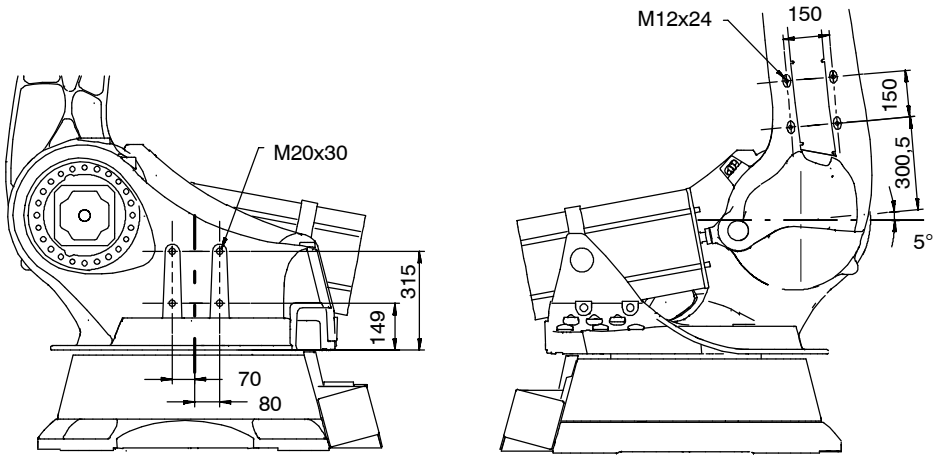
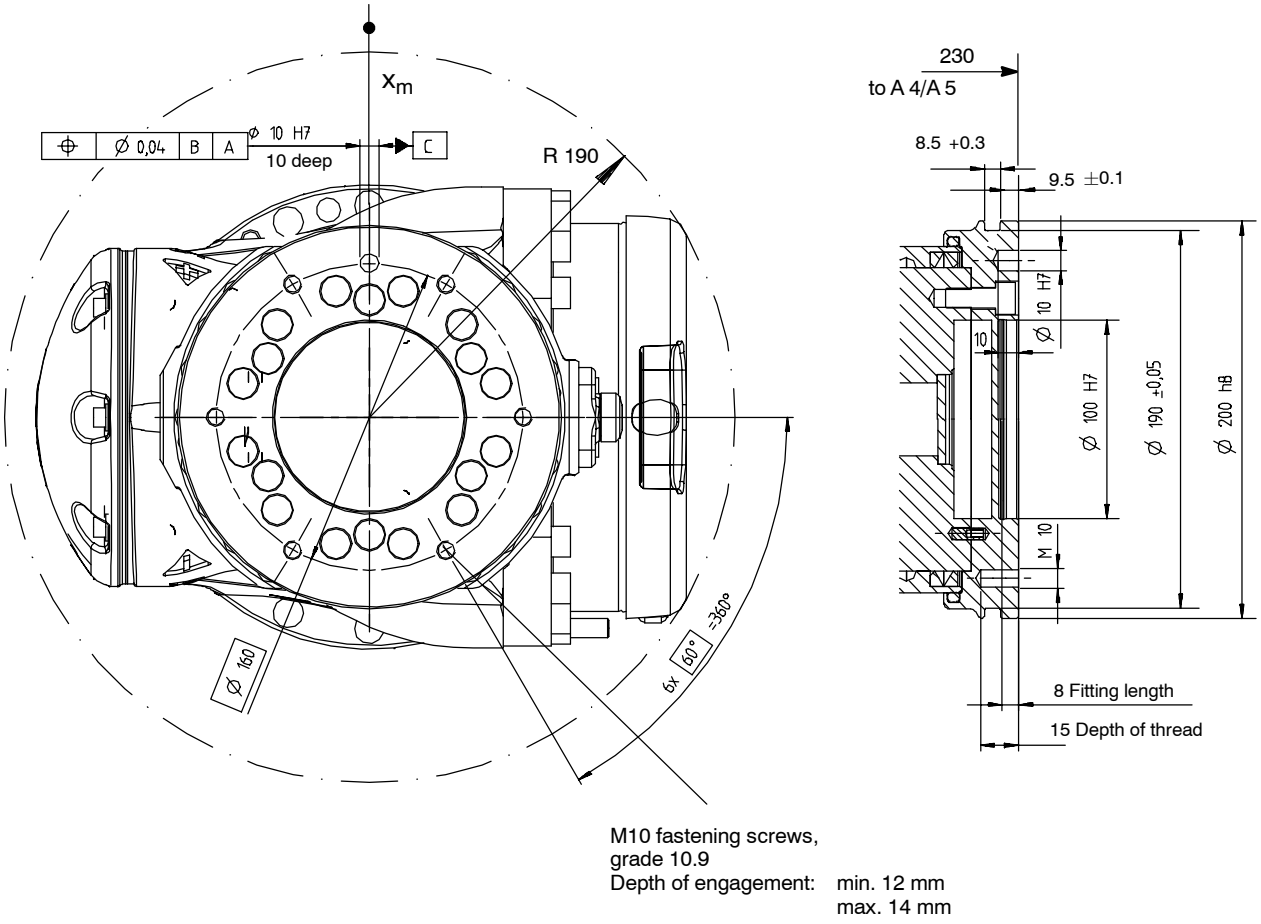


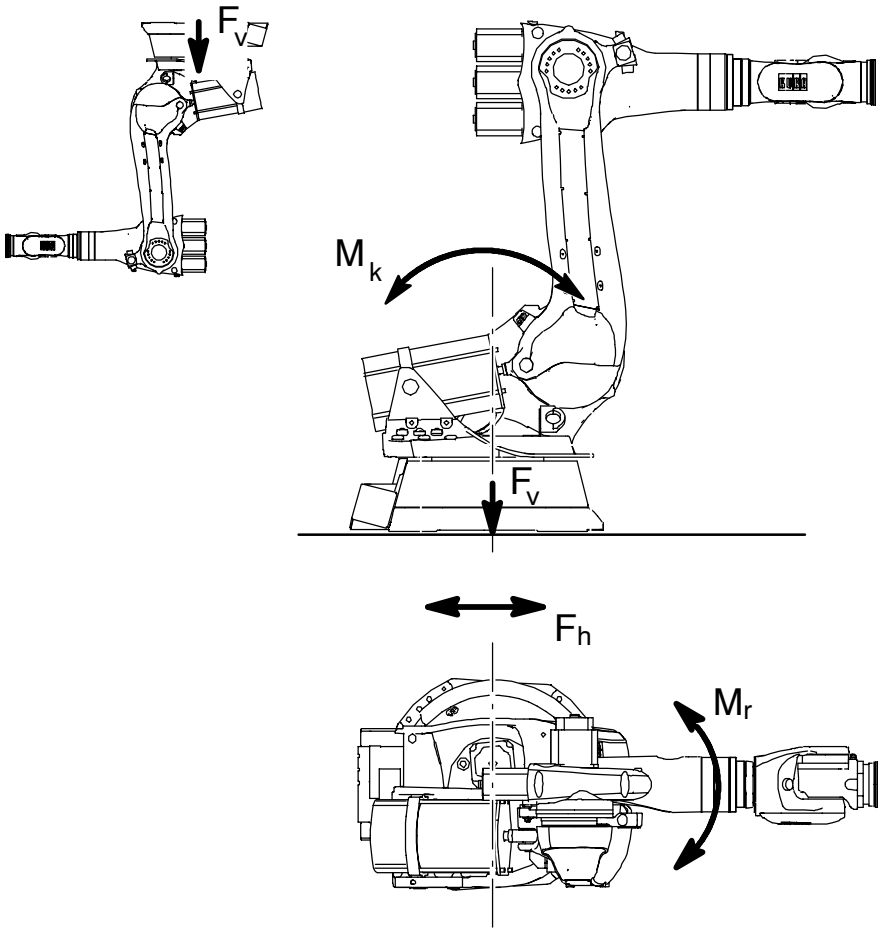
Fig. 15 Attachment holes for supplementary load on rotating column and link arm



M10 fastening screws,
grade 10.9
Depth of engagement: min. 12 mm
max. 14 mm

Fig. 16 DIN/ISO mounting flange for in–line wrist 150/180/210 kg

The specified forces and moments already include the payload and the inertia force (weight) of the robot.



F_v	=	vertical force	F_{vmax}	=	24 000 N
F_h	=	horizontal force	F_{hmax}	=	18 000 N
M_k	=	tilting moment	M_{kmax}	=	49 000 Nm
M_r	=	turning moment about axis 1	M_{rmax}	=	38 000 Nm

Total mass	=	Robot	+	total load	for type
		1245 kg	+	550 kg	KR 150
		1255 kg	+	530 kg	KR 150 L130
		1263 kg	+	510 kg	KR 150 L110
		1267 kg	+	580 kg	KR 180
		1277 kg	+	550 kg	KR 180 L150
		1285 kg	+	530 kg	KR 180 L130
		1267 kg	+	610 kg	KR 210
		1277 kg	+	580 kg	KR 210 L180
		1285 kg	+	550 kg	KR 210 L150

Fig. 17 Principal loads acting on the mounting base due to robot and total load

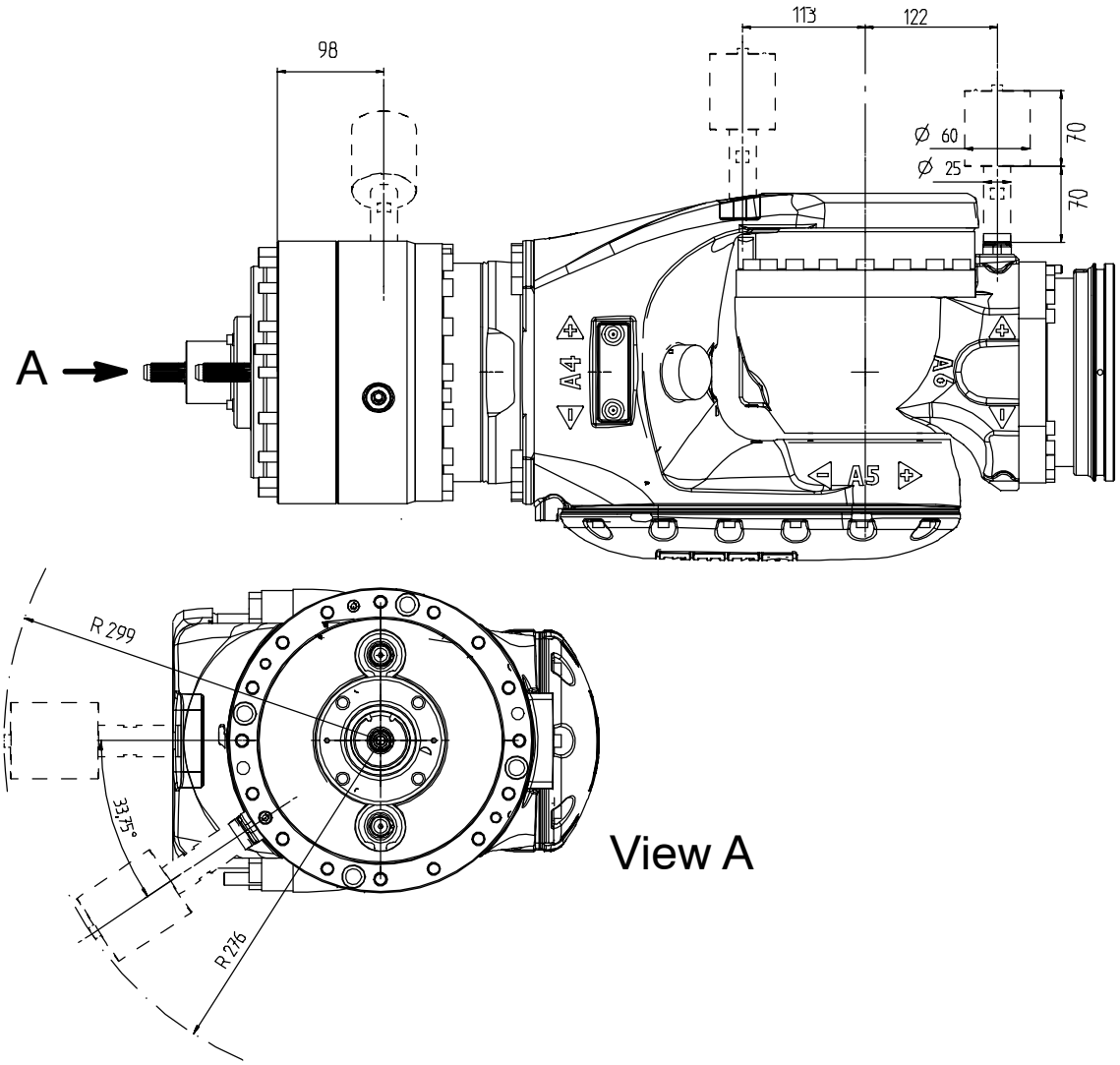


Fig. 18 Electronic probes (EMT), installation on A 4, A 5 and A 6

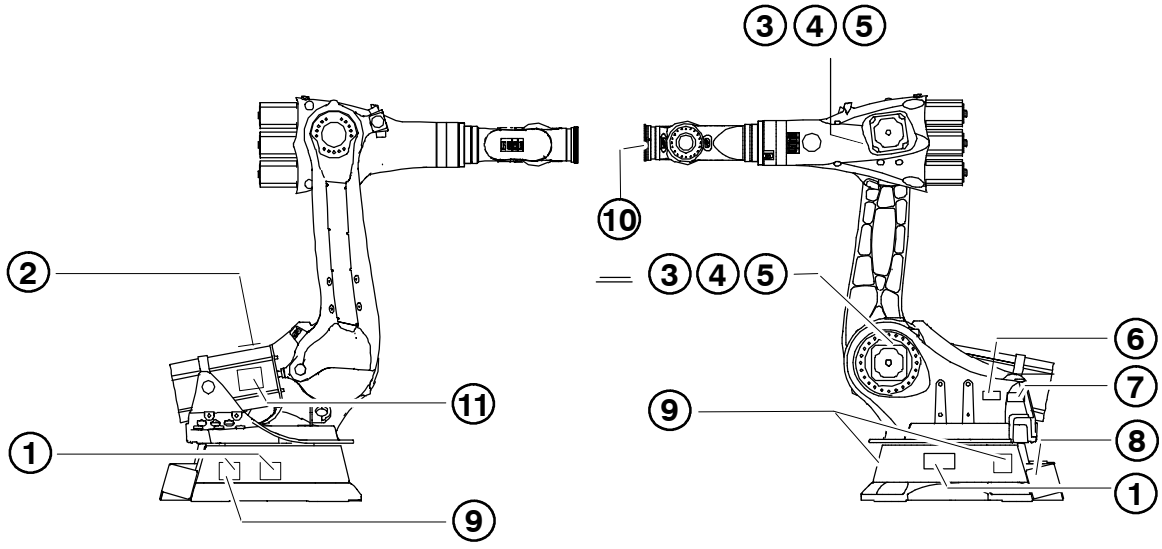


Fig. 19 Plates on robot (see also Fig. 20 to Fig. 30)

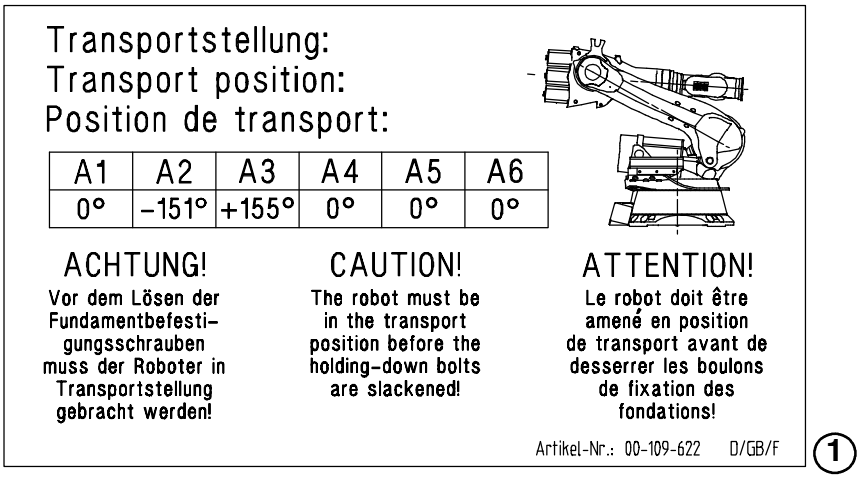


Fig. 20 Instructions regarding transport position for floor–mounted and ceiling–mounted robots

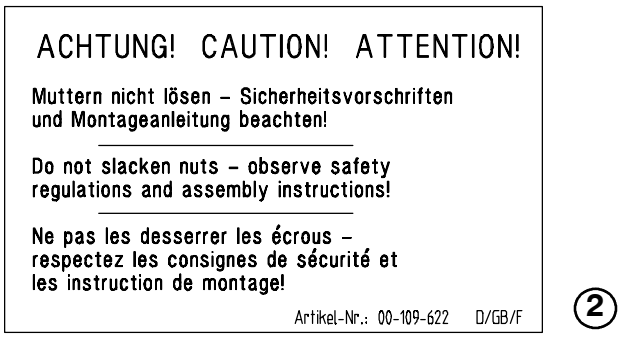


Fig. 21 Safety instructions regarding counterbalancing system

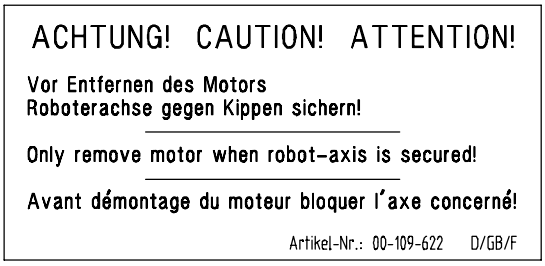


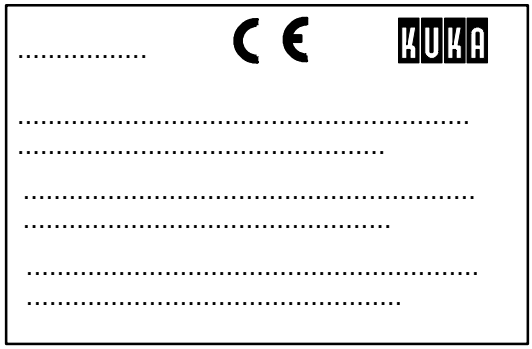
Fig. 22 Instructions for safeguarding against toppling of A 2, A 3

4x on each AC servomotor

④

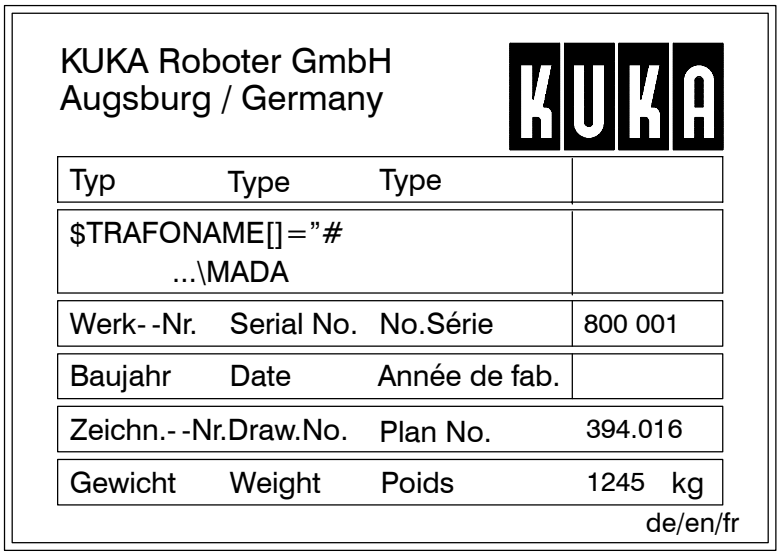
Fig. 23 Hot surface warning sign

On all motors



⑤

Fig. 24 Drive motor rating plate

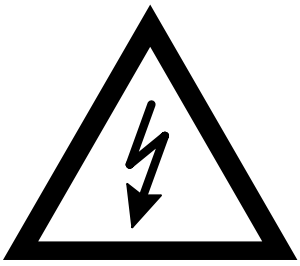


⑥

Fig. 25 Robot identification plate (example)

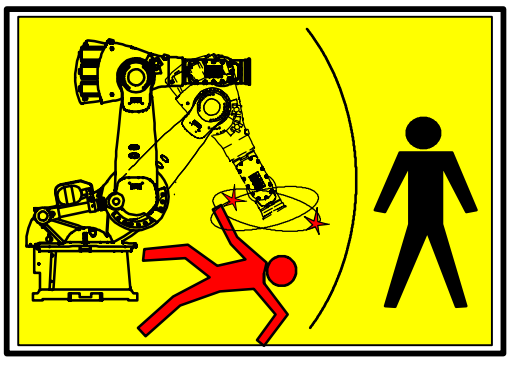
⑦

Fig. 26 Reference to operating instructions



⑧

Fig. 27 High voltage warning sign



⑨
3x

Fig. 28 Danger area

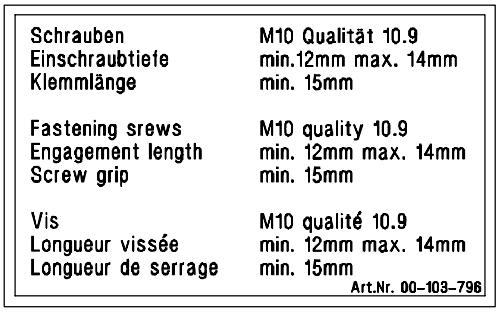


Fig. 29 Fastening instructions

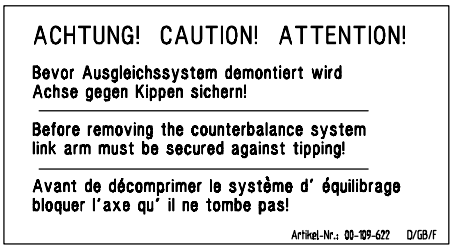


Fig. 30 Instructions for safeguarding against toppling of A 2