KUKA

ROBOT

(V)KR 30, 60-3; (V)KR 30 L16-2

Technical Data

Manipulator

Issued: 03 Jan 2011 **Version: 11**

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Valid for **(V)KR 30-3**
(V)KR 30 L16-2
(V)KR 60-3
(V)KR 60 L45-3
(V)KR 60 L30-3

This description applies analogously to all of the robots listed above, regardless of the robot variant or model shown in the illustrations.

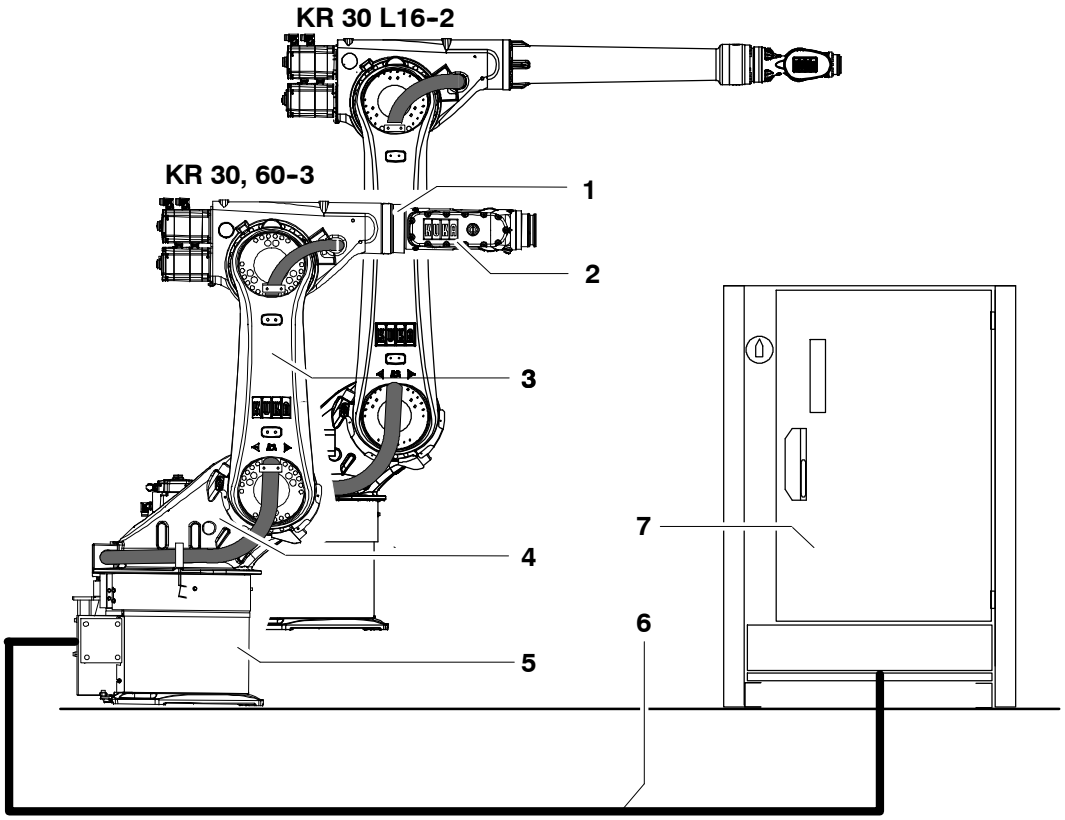
1 General

The robots are six-axis industrial robots for installation on the floor, the wall or the ceiling; the KR 30 L16-2 is for installation only on the floor and ceiling. They are suitable for all continuous-path controlled tasks. The main areas of application are

- 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.

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



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

Fig. 1 Principal robot components

2 Principal data

Type

KR 30-3
KR 30 L16-2
KR 60-3
KR 60 L45-3
KR 60 L30-3

Number of axes

6 (Fig. 3)

Load limits

see following table and Fig. 2

Robot type	KR 30-3	KR 30 L16-2	KR 60-3	KR 60 L45-3	KR 60 L30-3
Wrist (IW)[1]	IW 30/45/60[1]	IW 16	IW 30/45/60[1]	IW 30/45/60[1]	IW 30/45/60[1]
Rated payload [kg]	30	16	60	45	30
Max. supplementary load with rated payload [kg]	35	35	35	35	35
Max. total load [kg]	65	51	95	80	65

[1] IW = In-line wrist III

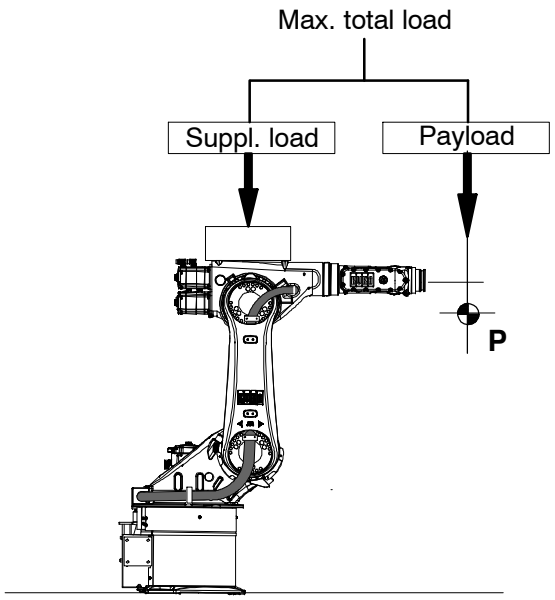


Fig. 2 Load distribution

Axis data

see the following tables.

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

KR 30-3

- **In-line wrist, rated payload 30 kg**

Axis	Range of motion software limited	Speed
1	±185°	140°/s
2	+35° to −135°	126°/s
3	+158° to −120°	140°/s
4	±350°	260°/s
5	±119°	245°/s
6	±350°	322°/s

KR 30 L16-2

- **In-line wrist, rated payload 16 kg**

Axis	Range of motion software limited	Speed
1	±185°	100°/s
2	+35° to −135°	80°/s
3	+158° to −120°	80°/s
4	±350°	230°/s
5	±130°	165°/s
6	±350°	249°/s

KR 60-3

- **In-line wrist, rated payload 60 kg**

Axis	Range of motion software limited	Speed
1	±185°	128°/s
2	+35° to −135°	102°/s
3	+158° to −120°	128°/s
4	±350°	260°/s
5	±119°	245°/s
6	±350°	322°/s

KR 60 L45-3

- **In-line wrist, rated payload 45 kg**

Axis	Range of motion software limited	Speed
1	±185°	128°/s
2	+35° to -135°	102°/s
3	+158° to -120°	128°/s
4	±350°	260°/s
5	±119°	245°/s
6	±350°	322°/s

KR 60 L30-3

- **In-line wrist, rated payload 30 kg**

Axis	Range of motion software limited	Speed
1	±185°	128°/s
2	+35° to -135°	102°/s
3	+158° to -120°	128°/s
4	±350°	260°/s
5	±119°	245°/s
6	±350°	322°/s

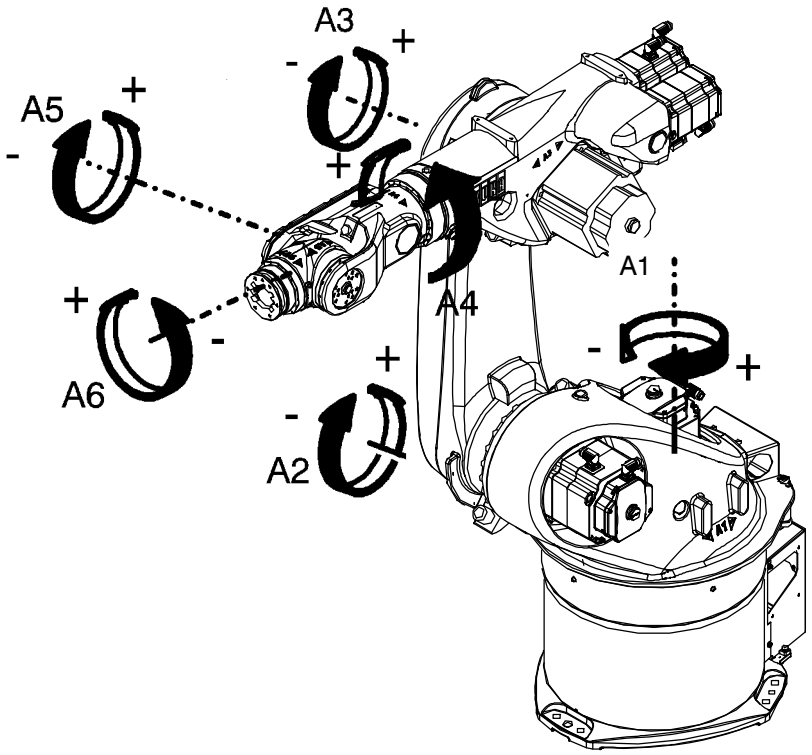


Fig. 3 Rotational axes and their directions of rotation

Repeatability (ISO 9283)	KR 30-3		± 0.06 mm
	KR 30 16-2		± 0.07 mm
	KR 60-3		± 0.06 mm
	KR 60 L45-3		± 0.06 mm
	KR 60 L30-3		± 0.06 mm
Mounting position	KR 30, 60-3	Floor, wall or ceiling (Restrictions on the range of motion of axis 1, see Fig. 16 and Fig. 17)	
	KR 30 L16-2	Floor and ceiling	
Principal dimensions	see Fig. 10 to Fig. 12.		
Working envelope	The shape and dimensions of the working envelope may be noted from Fig. 10 to Fig. 12.		

Volume of working envelope	KR 30-3	approx. 27.24 m^3
	KR 30 L16-2	approx. 104.5 m^3
	KR 60-3	approx. 27.24 m^3
	KR 60 L45-3	approx. 36.89 m^3
	KR 60 L30-3	approx. 47.78 m^3
	The reference point is the intersection of axes 4 and 5.	
Load center of gravity P	see Fig. 4 to Fig. 7. For the rated payload, the (nominal) distance of the load center of gravity P from the face of the mounting flange (rotational axis 6) is as follows: KR 30, 60-3: 150 mm (horizontal), 180 mm (vertical) KR 30 L16-2: 150 mm (horizontal), 120 mm (vertical)	
Weight	KR 30-3	approx. 665 kg
	KR 30 L16-2	approx. 700 kg
	KR 60-3	approx. 665 kg
	KR 60 L45-3	approx. 671 kg
	KR 60 L30-3	approx. 679 kg
Principal dynamic loads	see Fig. 14	
Drive system	Electromechanical, with transistor-controlled AC servomotors.	
Installed motor capacity	approx. 14.9 kW	
Protection classification of the robot	IP 64 ready for operation, with connecting cables plugged in (according to EN 60529).	
Protection classification of the in-line wrist (Standard)	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 453 K (180 °C)
Surface temperature	373 K (100 °C)
Resistant to:	- high ambient dust content - lubricants and coolants* - steam

Special maintenance intervals apply for in-line wrists of type "F"

* after consultation with KUKA

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

Ambient temperature

during operation:
283 K to 328 K (+10 °C to +55 °C),
during operation with SafeRDC:
283 K to 323 K (+10 °C to +50 °C),
during storage/transportation:
233 K to 333 K (-40 °C to +60 °C).
Other temperature limits available on request.

Sound level

< 75 dB (A) outside the working envelope (Fig. 11 and Fig. 12)

Color

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. 18 to Fig. 27.

Stopping distances and times

see separate documentation

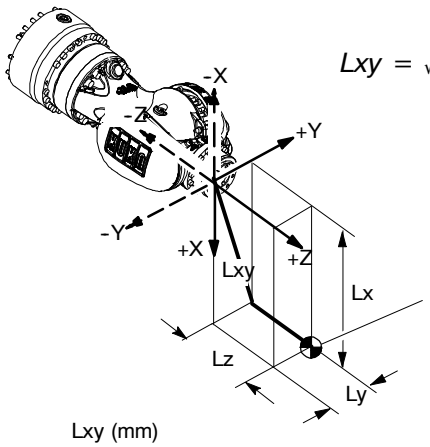
Special consumables

none

Fig. 4 to Fig. 7:
The loading curves and the values in the table 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.

Robot flange coordinate system



$$Lxy = \sqrt{Lx^2 + Ly^2}$$

Load center of gravity P

Permissible mass inertia at the design point
(Lxy = 120 mm,
Lz = 150 mm)
0.36 kgm^2.

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

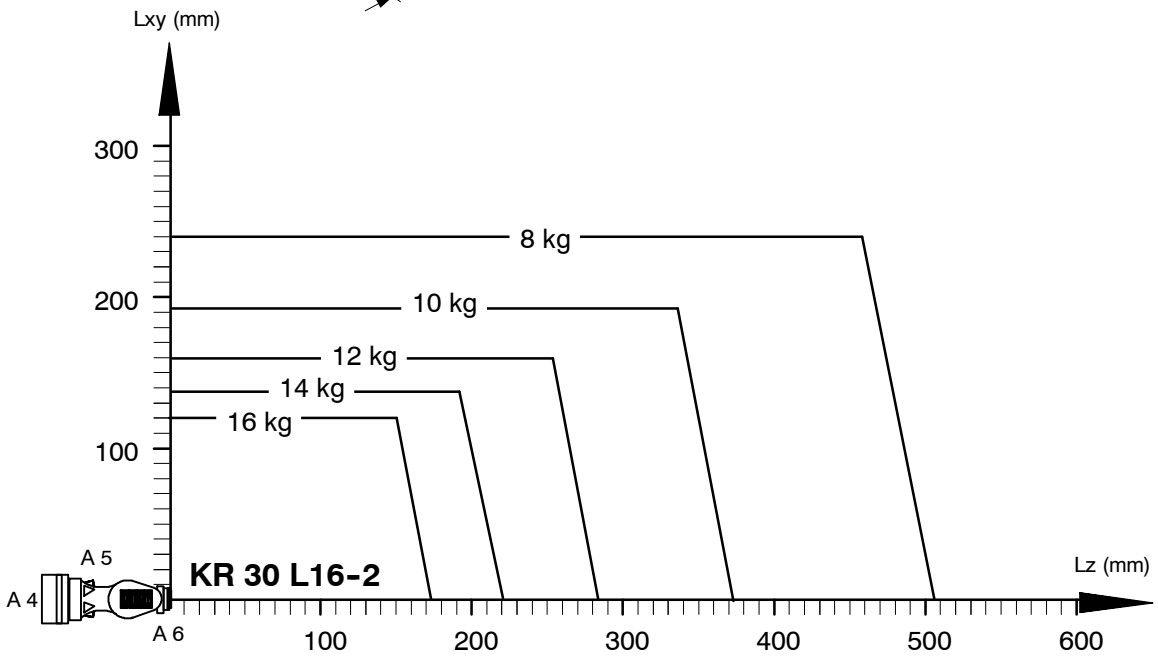
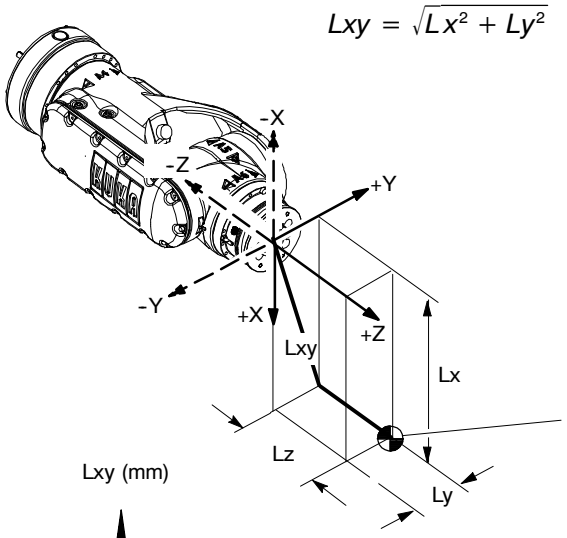


Fig. 4 Load center of gravity P and loading curves for KR 30 L16-2

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

$$Lxy = \sqrt{Lx^2 + Ly^2}$$



Permissible mass inertia at the design point
(Lxy = 180 mm,
Lz = 150 mm)
9 kgm^2.

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

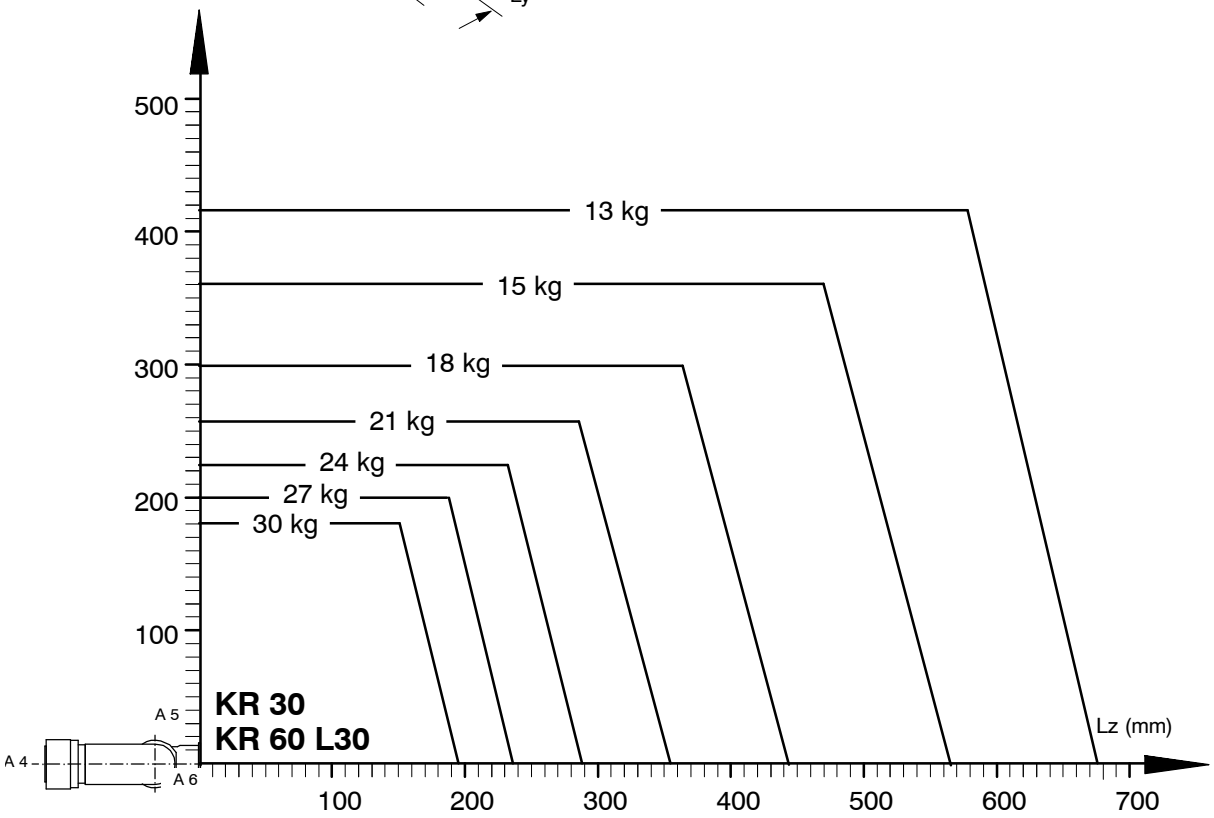
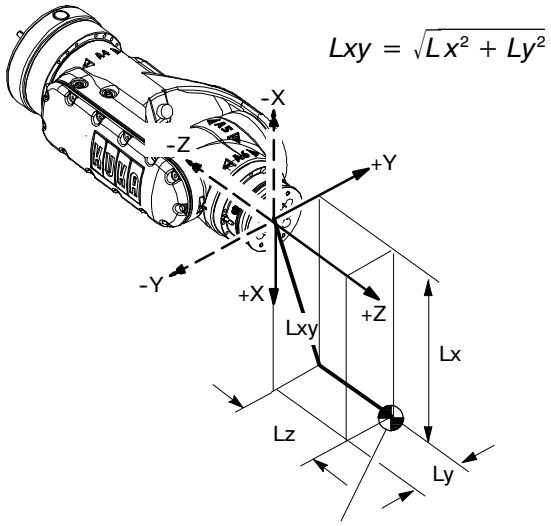


Fig. 5 Load center of gravity P and loading curves for KR 30; KR 60 L30

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



Load center of gravity P

Permissible mass inertia at the design point
(Lxy = 180 mm,
Lz = 150 mm)
18 kgm^2.

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

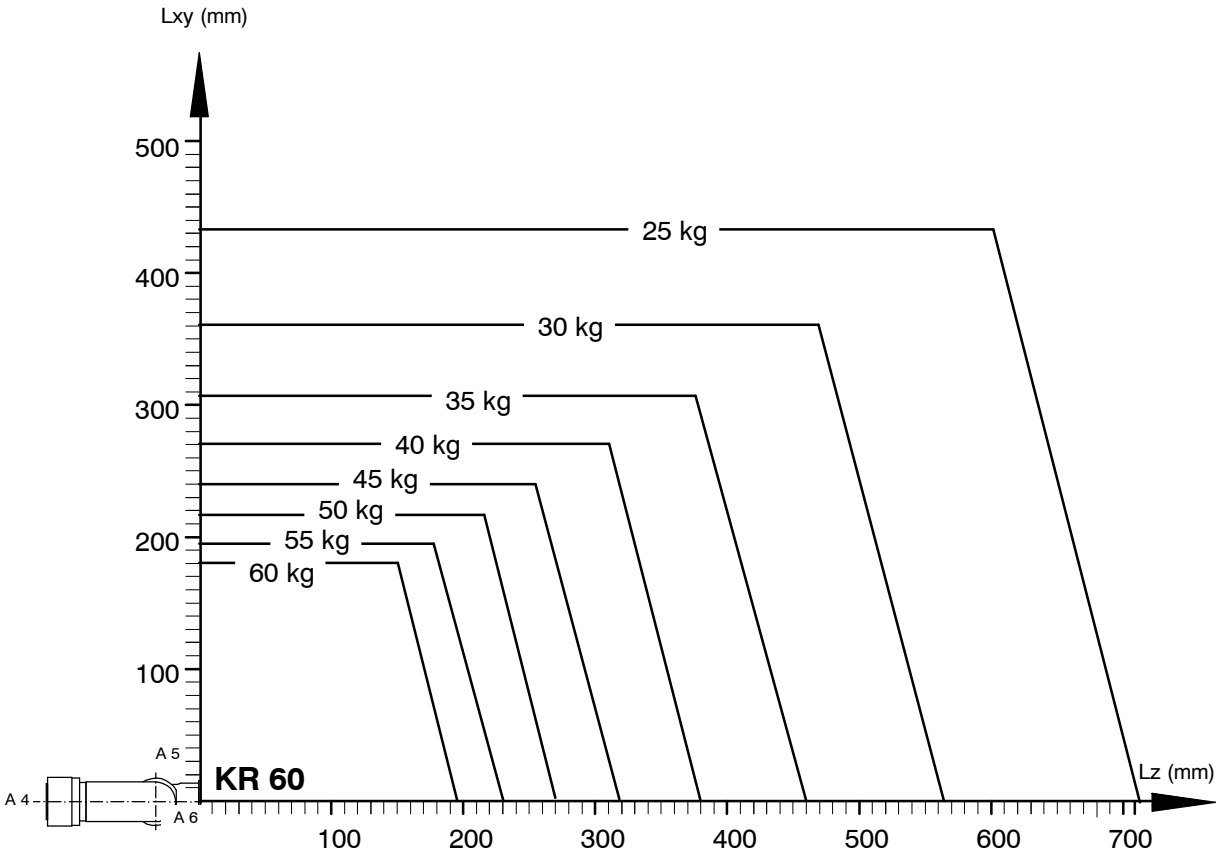
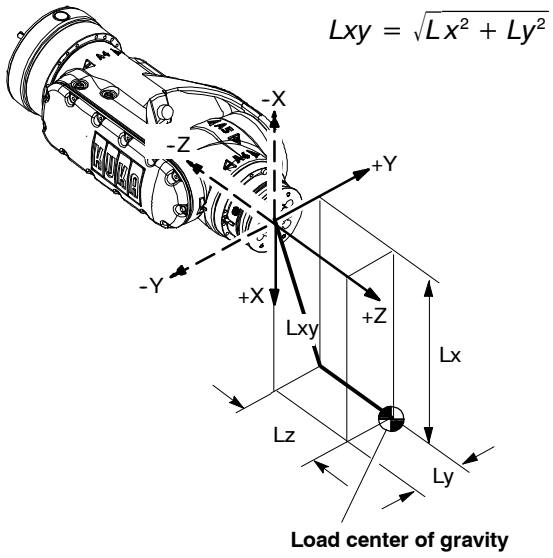


Fig. 6 Load center of gravity P and loading curves for KR 60

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



Load center of gravity

Permissible mass inertia at the design point
(Lxy = 180 mm,
Lz = 150 mm)
13.5 kgm^2

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

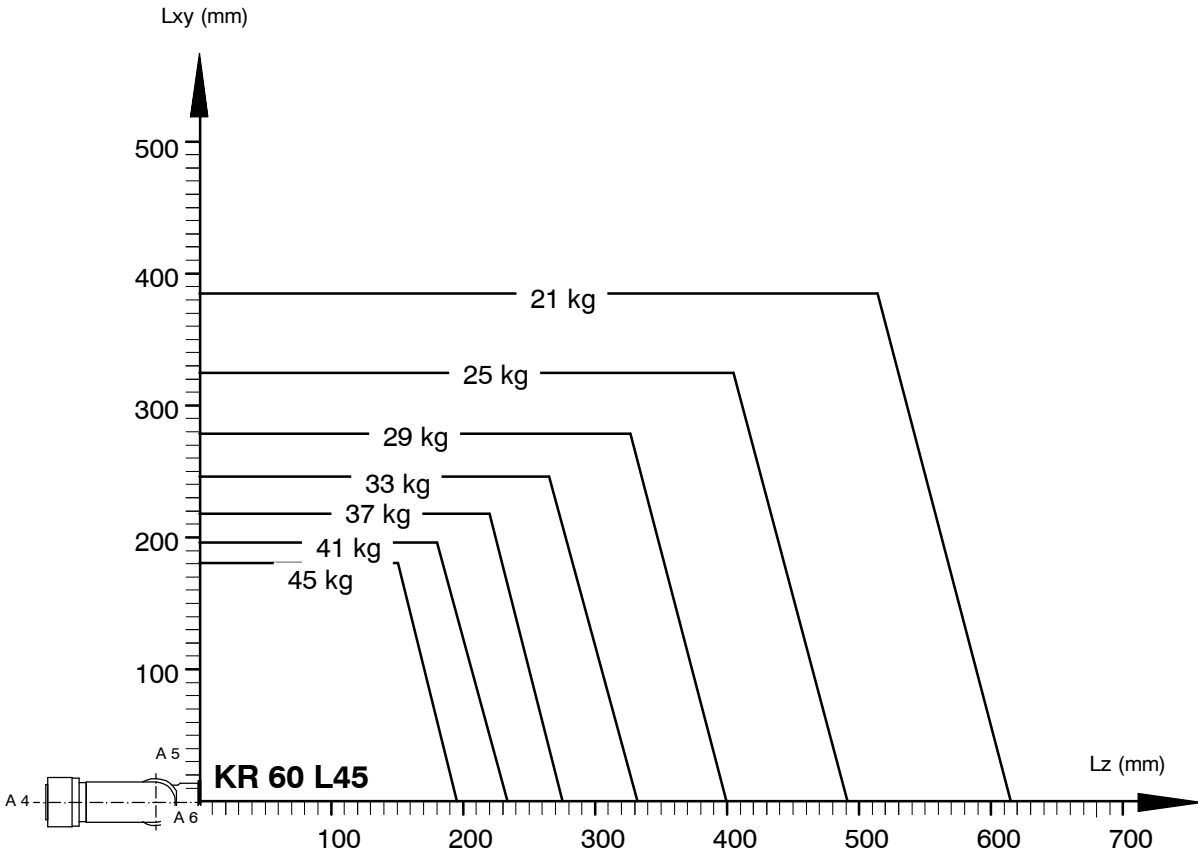


Fig. 7 Load center of gravity P and loading curves for KR 60 L45

Mounting flange

DIN/ISO[1)] mounting flange (Fig. 9). The mounting flange is depicted with axes 4 and 6 in the zero position. The symbol ⧫ indicates the position of the locating element (bushing). 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:	IW 16	min. 6 mm max. 9 mm
Depth of engagement:	IW 30/45/60	min. 12 mm max. 14 mm

1) DIN/ISO 9409-1-A50 for IW 16
DIN/ISO 9409-1-A100 for IW 30/45/60

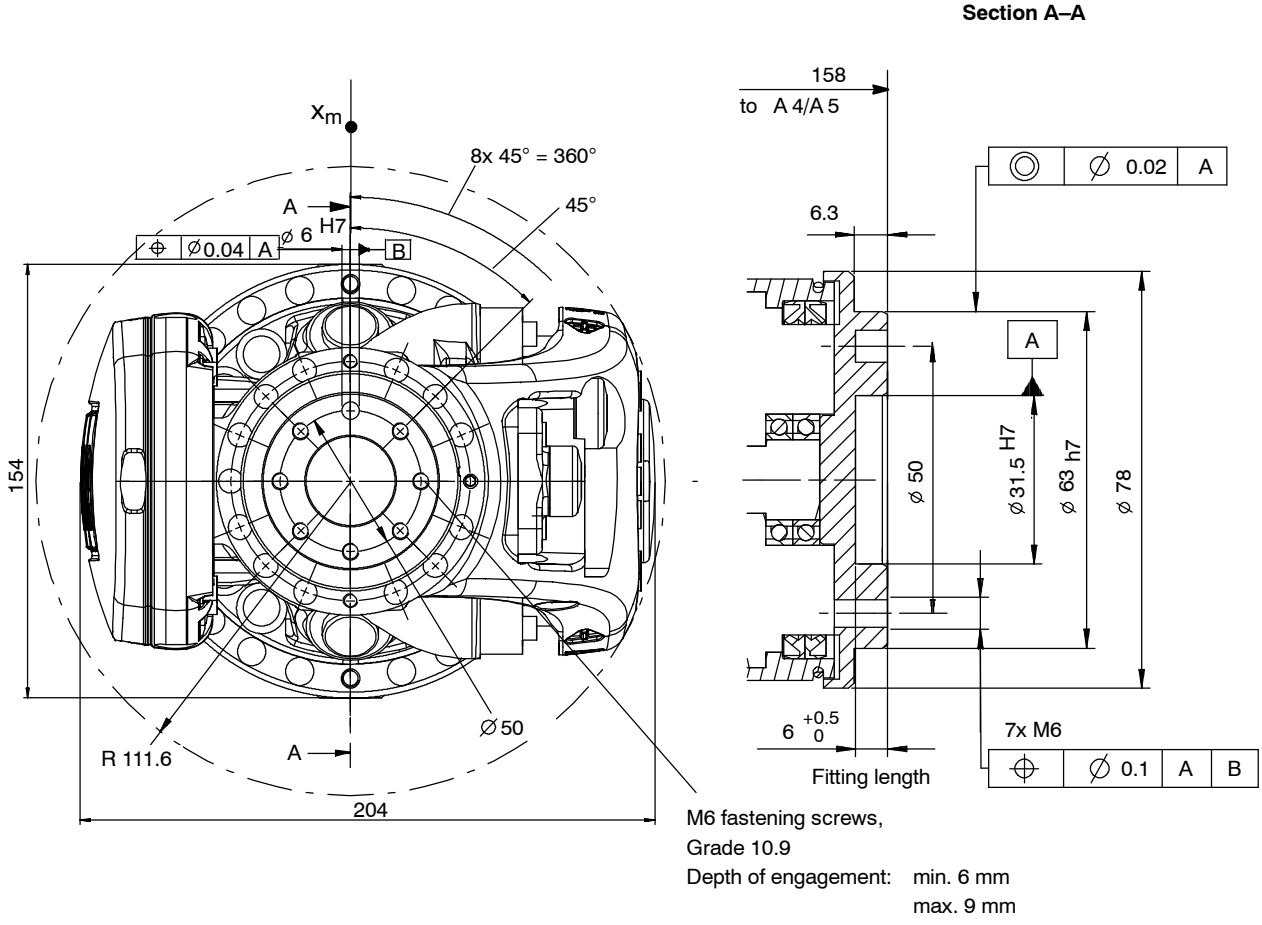
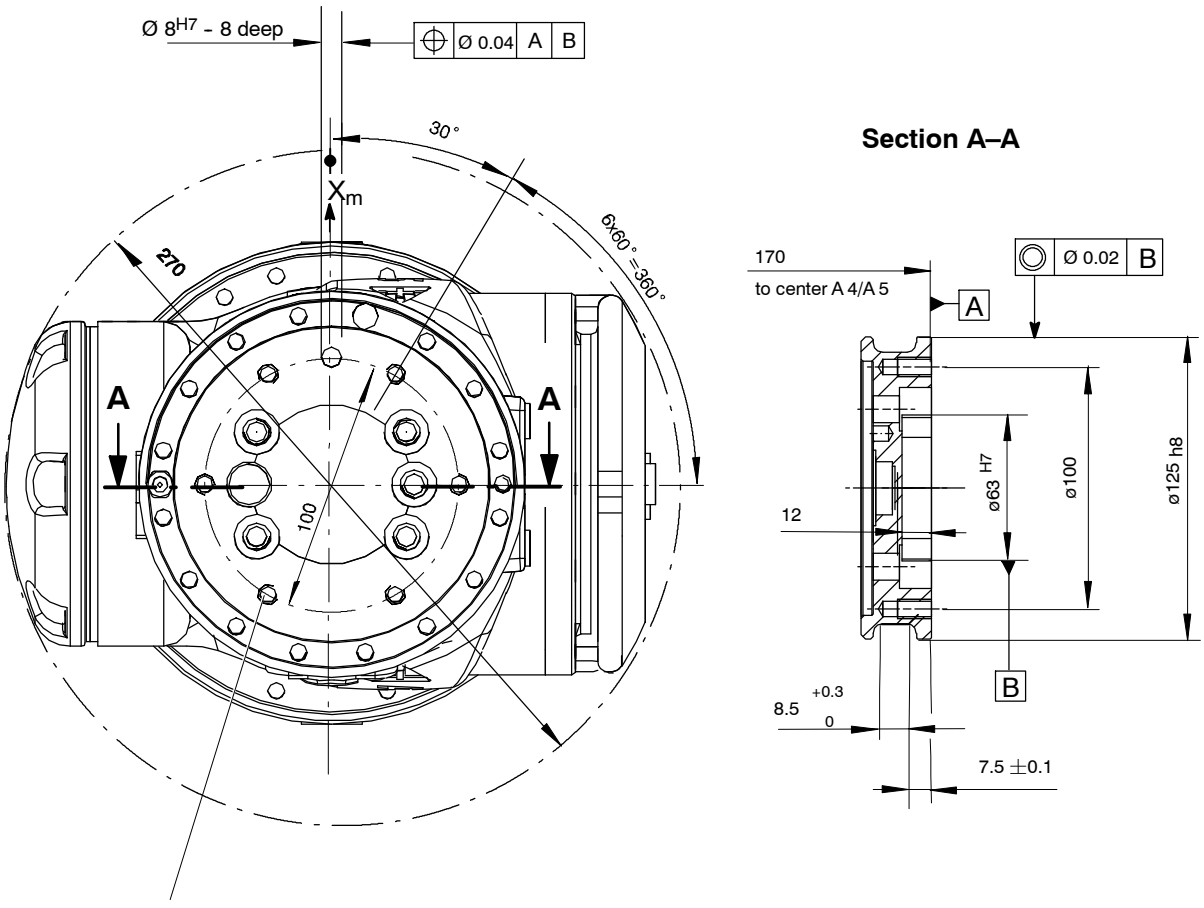
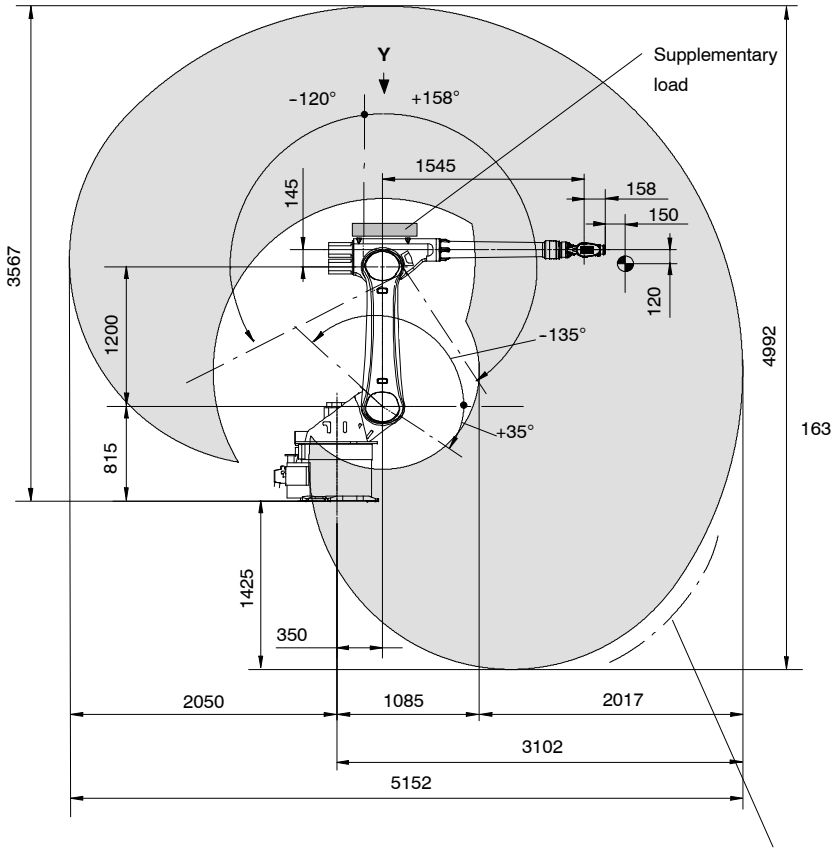


Fig. 8 DIN/ISO mounting flange for in-line wrist 16 kg

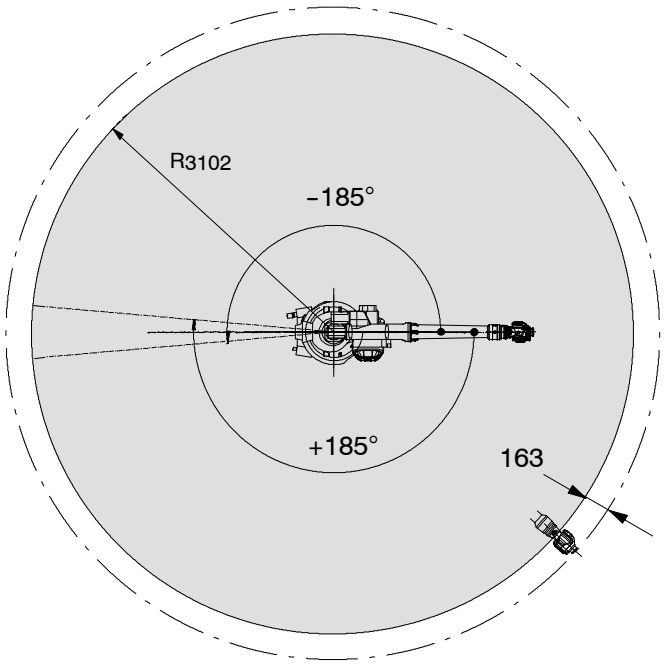


M8 fastening screws
Grade 10.9
Depth of engagement: min. 12 mm
max. 14 mm

Fig. 9 DIN/ISO mounting flange for in-line wrist 30/45/60 kg



Dimensions: mm



CAUTION: The interference radius (safe area) lies approx. 163 mm beyond the reference point for the working envelope.

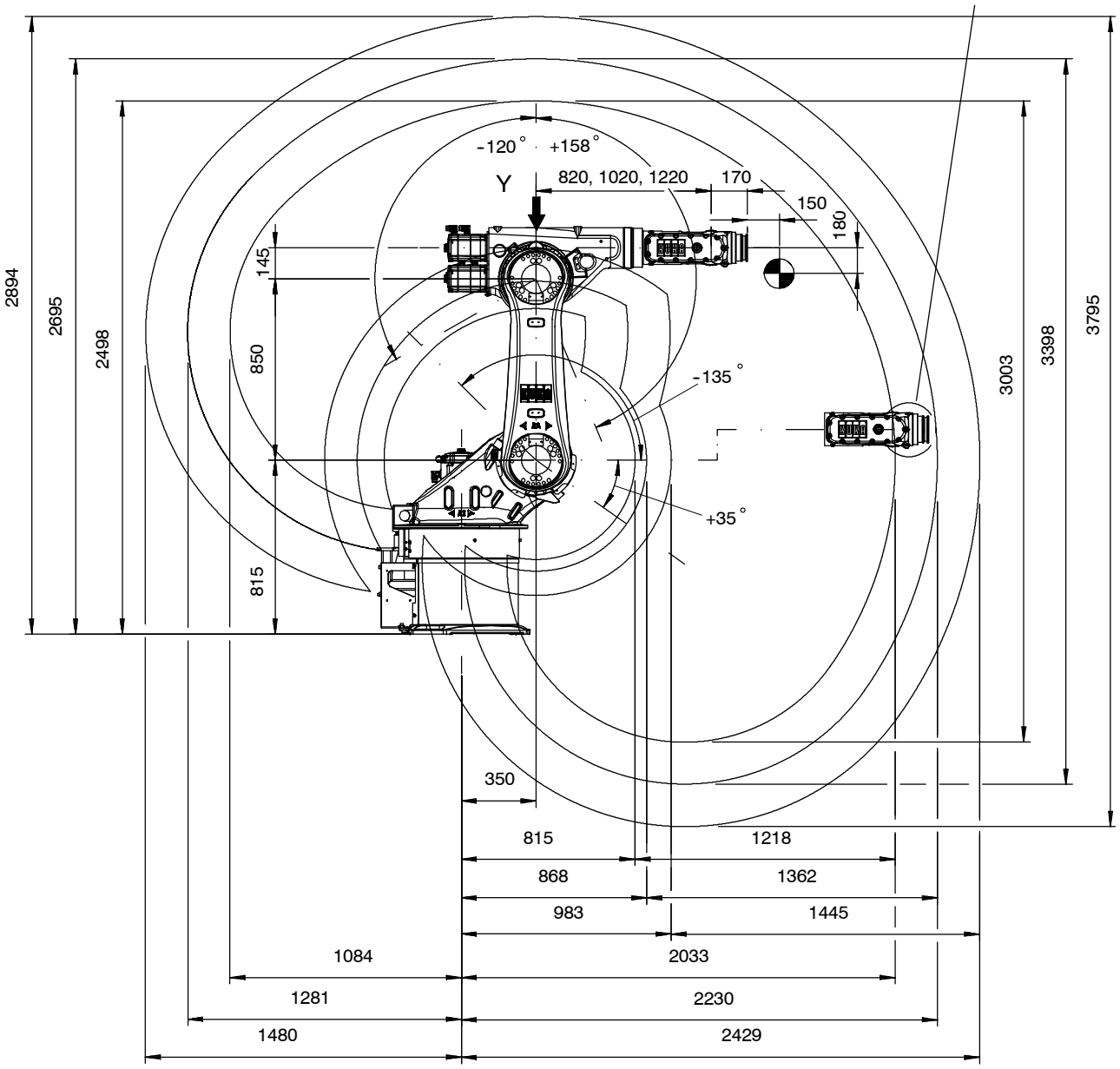
NOTE: The supplementary load center of gravity must be located as close as possible to rotational axis 3 and to line a in Fig. 13.

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

View Y see Fig. 13.

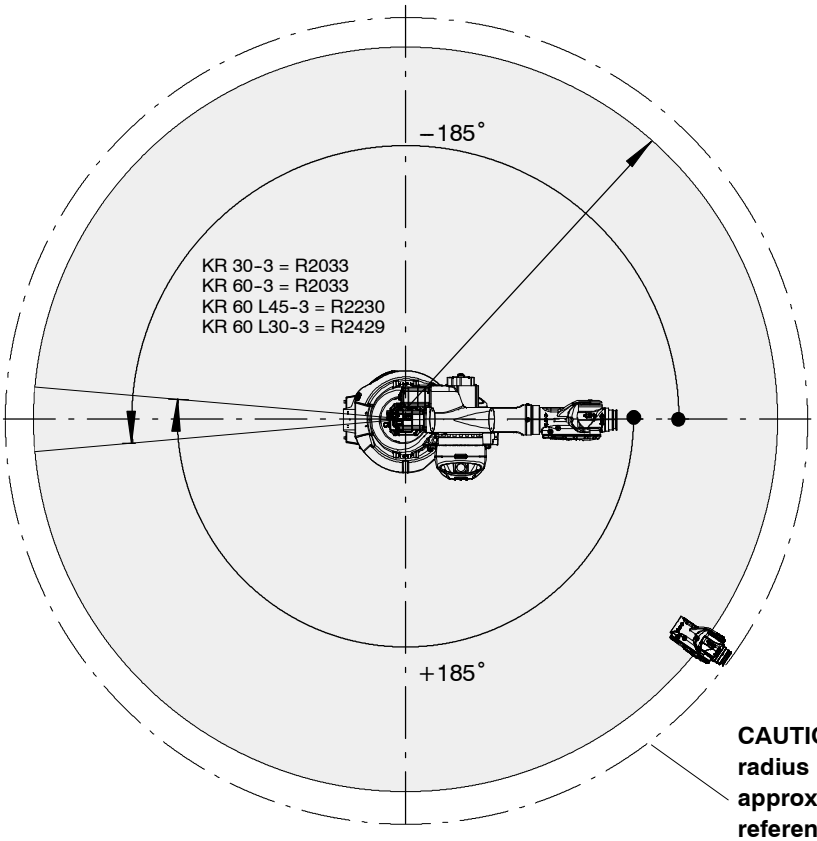
Fig. 10 Principal dimensions and working envelope for KR 30 L16-2 (software values)

CAUTION: The interference radius (safe area) lies approx. 181 mm beyond the reference point for the working envelope.



NOTE: The supplementary load center of gravity must be located as close as possible to rotational axis 3 and to line a in Fig. 13.
The reference point for the working envelope is the intersection of axes 4 and 5.
View Y see Fig. 13.

Fig. 11 Principal dimensions and working envelope (software values)



CAUTION: The interference radius (safe area) lies approx. 181 mm beyond the reference point for the working envelope.

Fig. 12 Turning range of A 1, KR 30-3, KR 60-3

View Y from Fig. 10 and Fig. 11

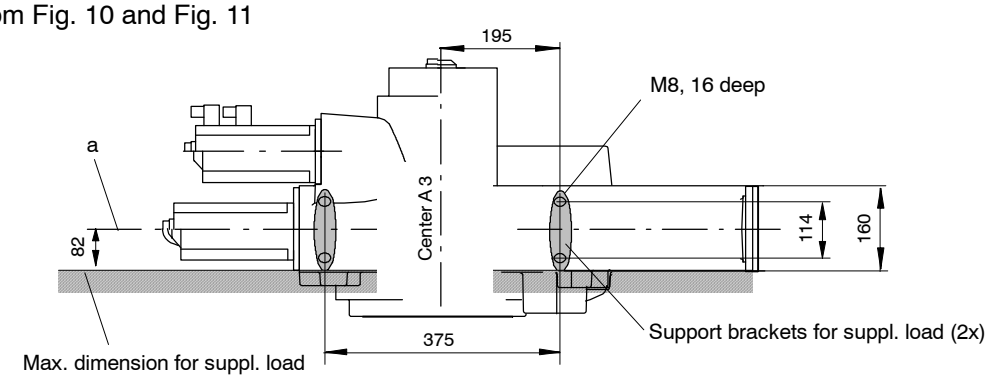
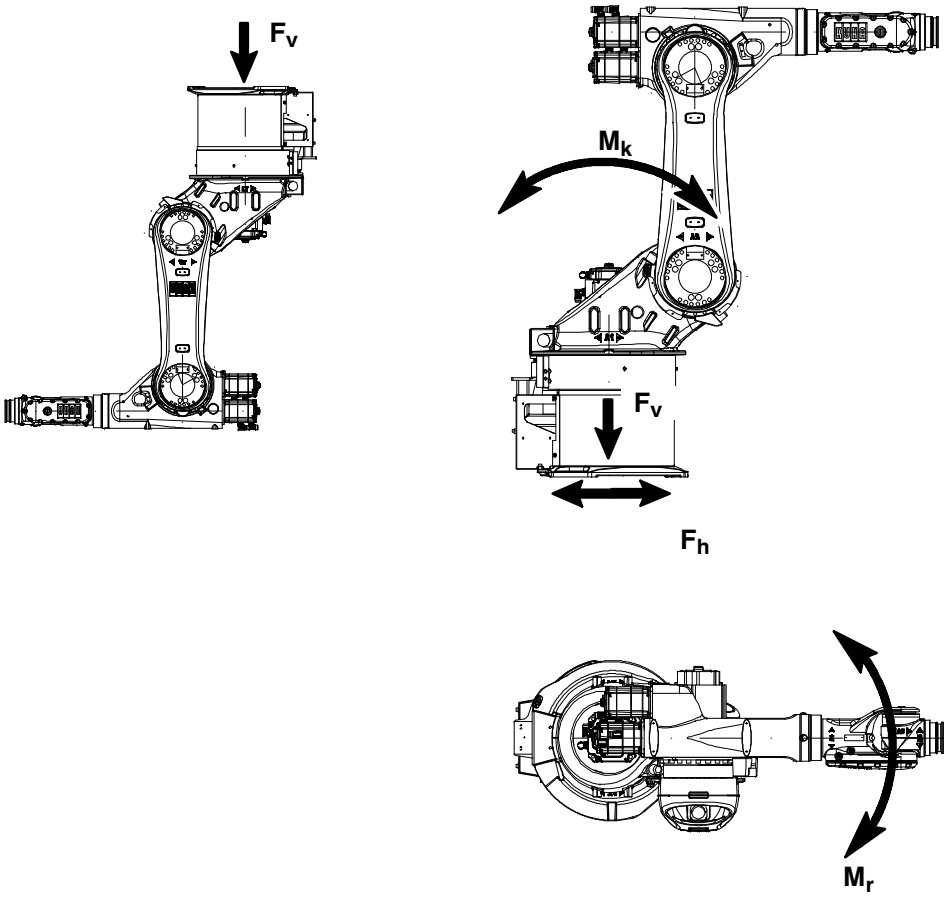


Fig. 13 Attachment holes for supplementary load

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

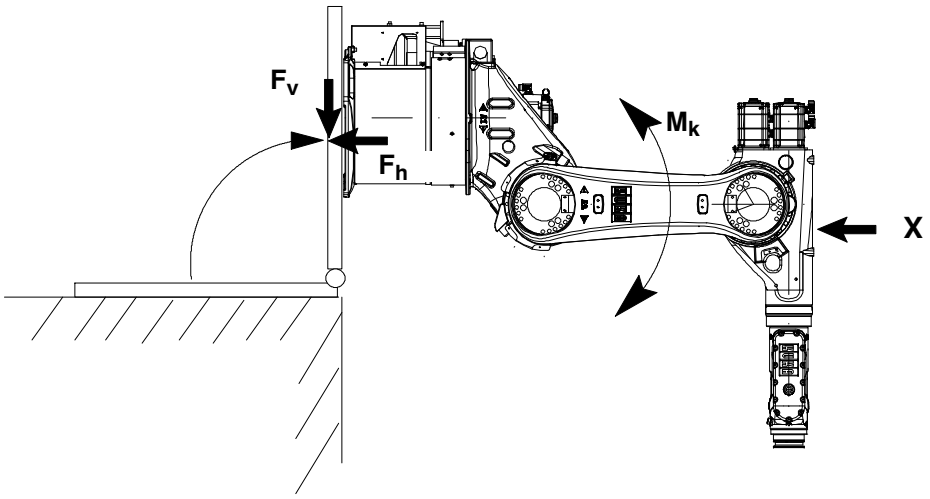


F_v	=	Vertical force	F_{vmax}	=	13 600 N
F_h	=	Horizontal force	F_{hmax}	=	12 300 N
M_k	=	Tilting moment	M_{kmax}	=	21 600 Nm
M_r	=	Turning moment about axis 1	M_{rmax}	=	18 400 Nm

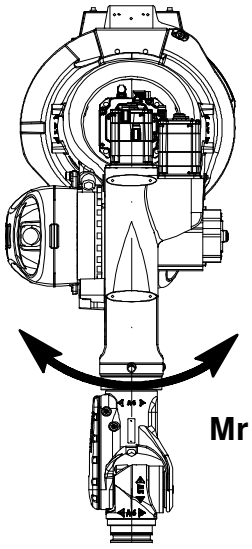
Total mass =	robot	+	total load	for type
	665 kg	+	65 kg	KR 30-3
	700 kg		51 kg	KR 30 L16-2
	665 kg	+	95 kg	KR 60-3
	671 kg	+	80 kg	KR 60 L45-3
	679 kg	+	65 kg	KR 60 L30-3

Fig. 14 Principal loads acting on floor or ceiling due to robot and total load

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



View X



F_v	=	Vertical force		F_{vmax}	=	12 700 N
F_h	=	Horizontal force		F_{hmax}	=	10 200 N
M_k	=	Tilting moment		M_{kmax}	=	18 900 Nm
M_r	=	Turning moment about axis 1		M_{rmax}	=	15 800 Nm

Total mass	=	robot	+	total load	for type
		665 kg	+	65 kg	KR 30-3
		665 kg	+	95 kg	KR 60-3
		671 kg	+	80 kg	KR 60 L45-3
		679 kg	+	65 kg	KR 60 L30-3

Fig. 15 Principal loads acting on wall due to robot and total load

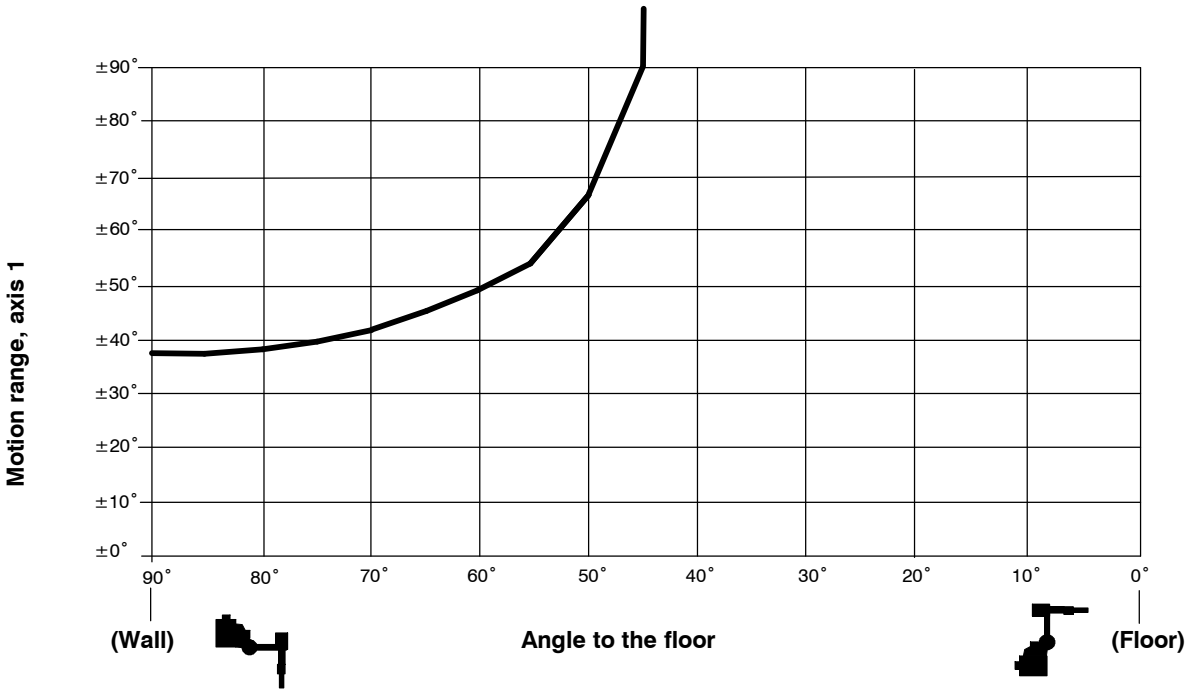


Fig. 16 Restriction of range of motion for axis 1 as a function of the installation angle of the KR 30-3

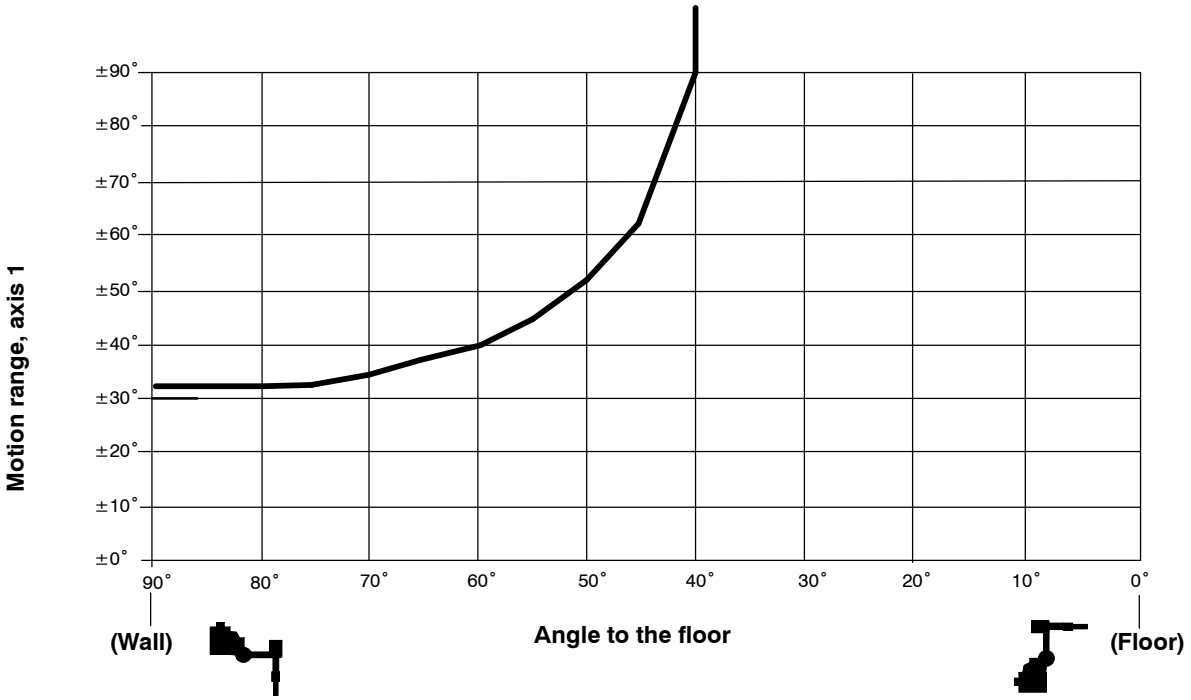


Fig. 17 Restriction of range of motion for axis 1 as a function of the installation angle of the KR 60-3, KR 60 L45-3 and KR 60 L30-3

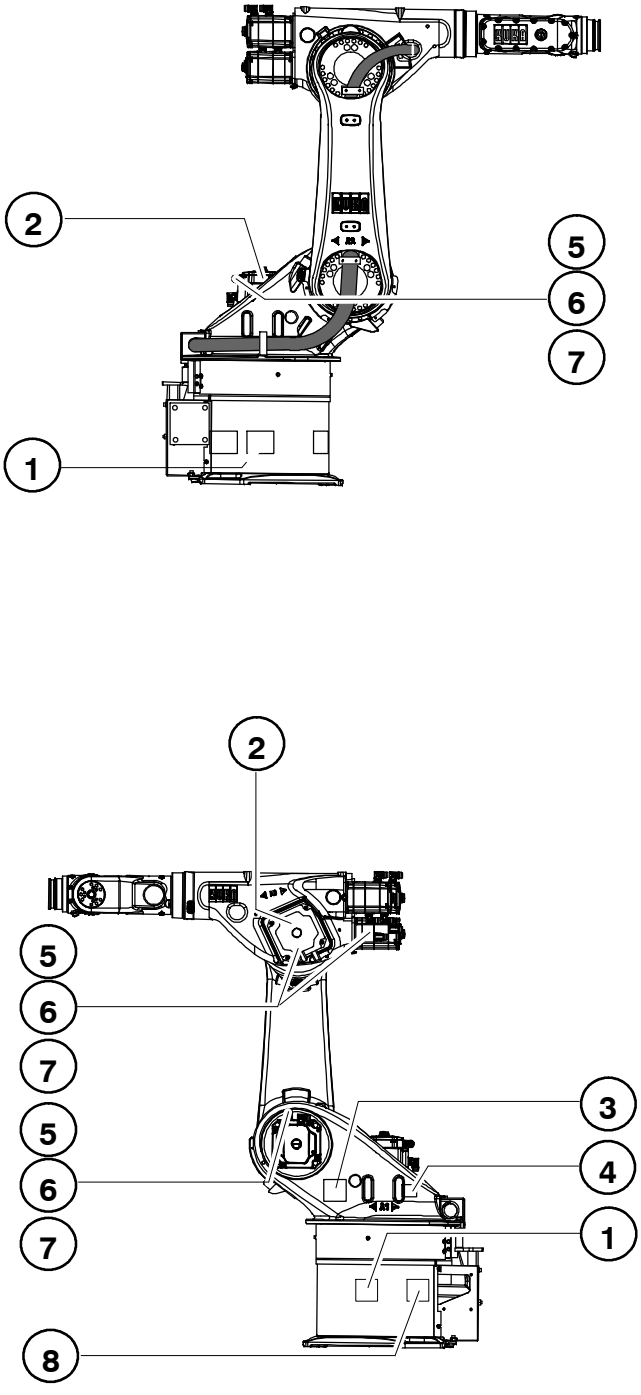
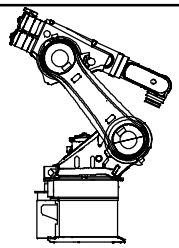


Fig. 18 Plates on robot (see also Fig. 19 to Fig. 27)

Transportstellung:
Transport position:
Position de transport:

A1	A2	A3	A4	A5	A6
0°	–135°	+155°	0°	+90°	



ACHTUNG!
Vor dem Lösen der Fundamentbefesti-gungsschrauben muss der Roboter in Transportstellung gebracht werden!

WARNING!
The robot must be in the transport position before the holding-down bolts are slackened!

ATTENTION!
Le robot doit être amené en position de transport avant de desserrer les boulons de fixation des fondations!

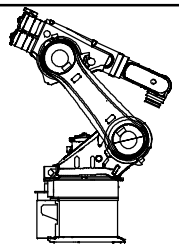
Artikel-Nr. 00-000-000 D/GB/F

① 2x

Fig. 19 Instructions regarding transport position KR 30, 60-3

Transportstellung:
Transport position:
Position de transport:

A1	A2	A3	A4	A5	A6
0°	–135°	+158°	0°	+90°	



ACHTUNG!
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Artikel-Nr. 00-000-000 D/GB/F

① 2x

Fig. 20 Instructions regarding transport position KR 30 L 16-2

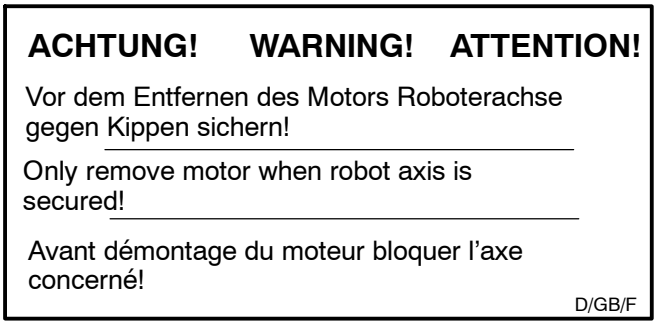


Fig. 21 Instructions for safeguarding against toppling of A 2, A 3

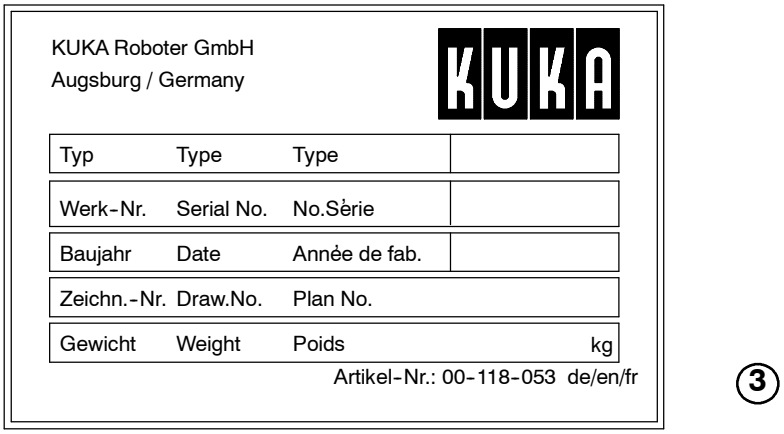
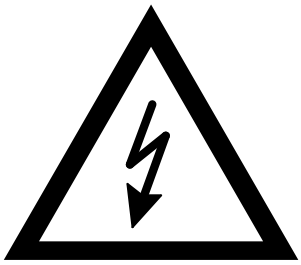


Fig. 22 Robot identification plate (example)

④

Fig. 23 Reference to operating instructions



⑤

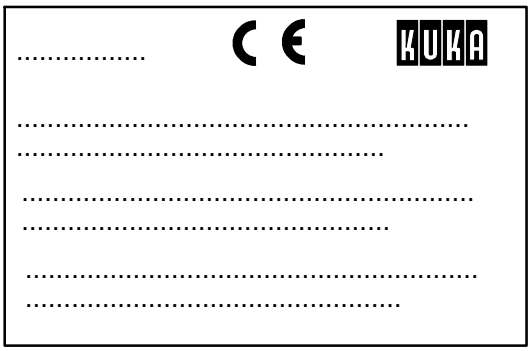
Fig. 24 High voltage warning sign

4x on each motor

⑥

Fig. 25 Hot surface warning sign

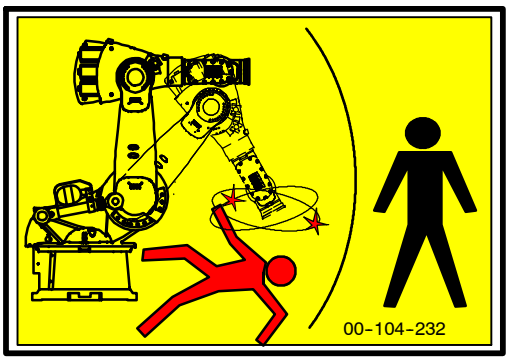
On all motors.



⑦

Fig. 26 Drive motor rating plate

3x on base frame



⑧

Fig. 27 Danger zone