
KUKA

eLearning Upcoming Products 8.3
Hand-out for Module 1

- Werner Angerer
- Product Management

Upcoming Products

Mechanics

KR C4 Hard Ware

Upcoming Products

Mechanics

KR C4 Hard Ware

Mechanics

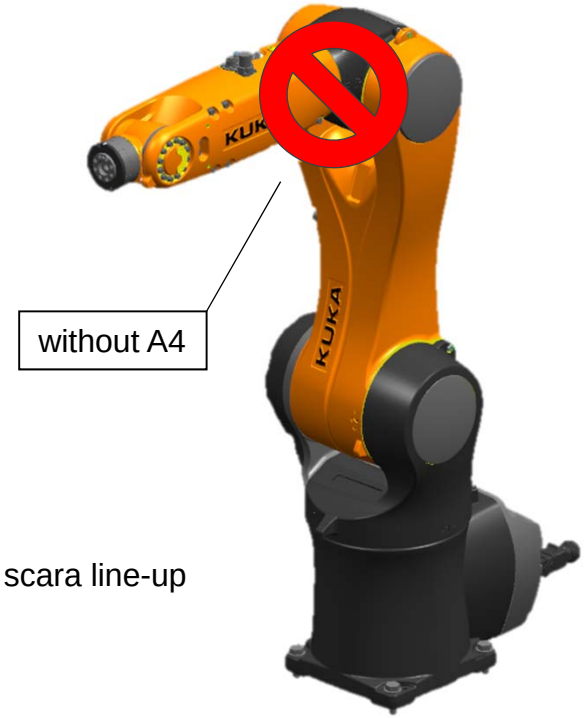
New Mechanics	KR6 R900 fivve	✔
	KR5 R1400 arc welding robot	✔
	KL 2000	✔
	Positioners	✔

Mechanics

New Mechanics	KR6 R900 fivve
	KR5 R1400 arc welding robot
	KL 2000
	Positioners

AGILUS KR6 R900 fivve

	KR 6 Rxxx fivve	KR 10 Rxxx fivve
R 700	x	
R 900	x	
R 1100		x
Mounting	Floor, Ceiling,Wall (with adapter)	
Variants	Standard, Food	



Reasons for development:

- Development of own 5A fast mover robots as successor of KUKA-Denso scara line-up
- Fast time to market (almost simultaneous to AGILUS sixx series)

Customer Benefits:

- Faster and more cost efficient than KR 6 R900 sixx
  (KR 6 R900 fivve: 155 cycles per minute, KR 6 R900 sixx: 150 cycles per minute 25-305-25mm cycle)
- Work envelope like small PA robot – better than Scara robot
- Integrated energy supply like AGILUS sixx
- Reduced number of spare parts because of same components as AGILUS sixx
- More flexibility because of detachable axis 5 parallel coupling (Programming only in axis positions)

Mechanics

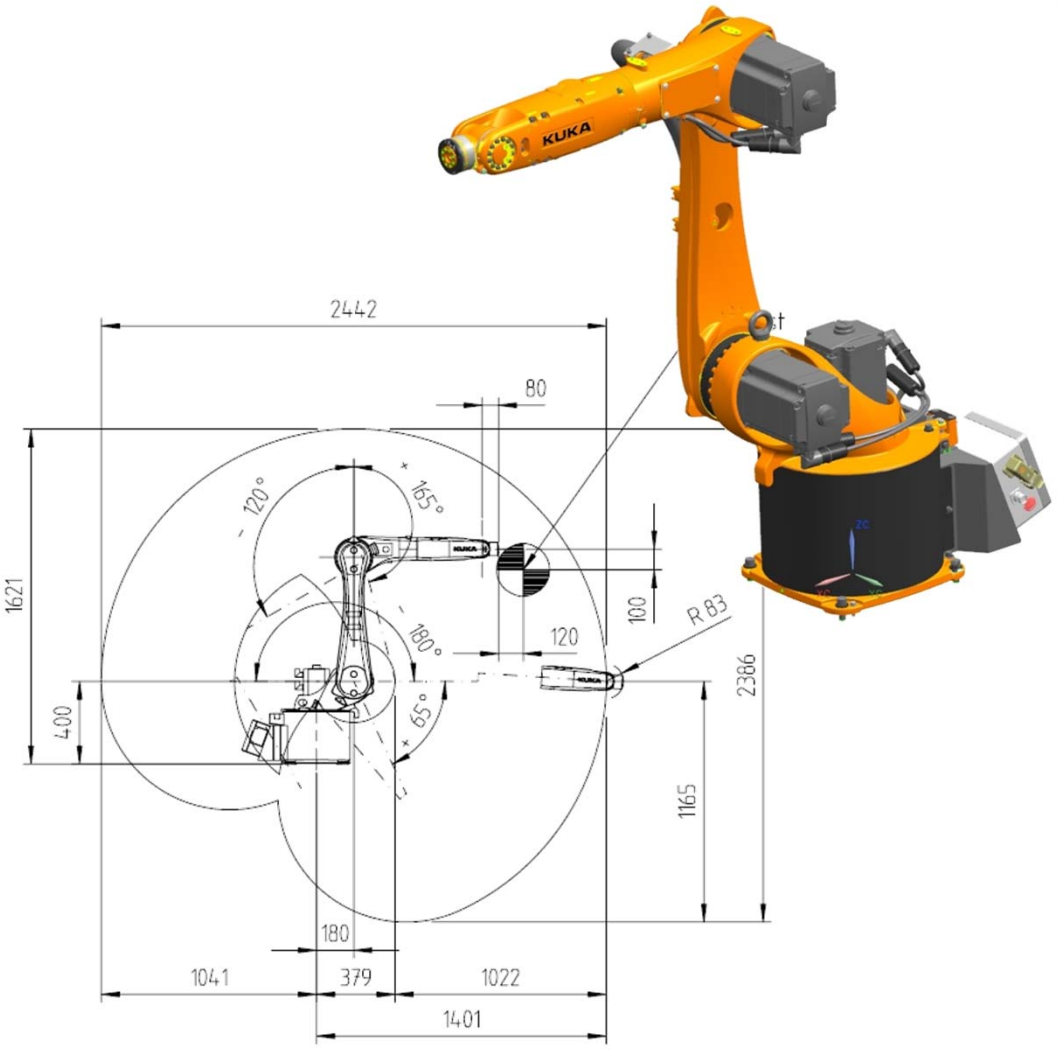
New Mechanics

- KR6 R900 fivve
- KR5 R1400 arc welding robot
- KL 2000
- Positioners

KR5 R1400

Basic Welding Robot

- In the first step only for Asian Market (only China, Malaysia, Taiwan, Korea)
- Specifications and mech. Design is adapted to Chinese engineering standards
- Functionality and pricing adapted to the Asian market needs
- Modification of the existing KR5 arc with optimized work space in front of A2 and axis range of A1
- Using exclusively the new KRC4 smallsize controller (no external axis possible!)
- Robot will be manufactured in China



KR5 R1400 – robot specs (preliminary)

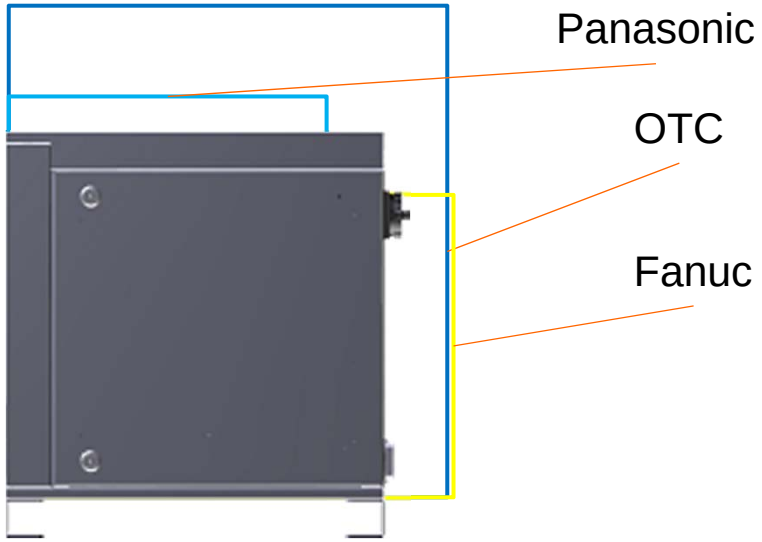
Axis	Working envelope	speed
1	± 170°	218 °/s
2	+ 65° to - 180°	218 °/s
3	+ 165° to - 120°	218 °/s
4	± 185°	381 °/s
5	± 120°	314 °/s
6	± 360°	492 °/s
Payload		5 kg
Supplem. load arm		10 kg
Supplem. load link arm		0 kg
Supplem. Load rotating column		20 kg
Weight		ca. 130 kg
Working range in front of A2		1022 mm
Working volume		9,97 m^3
Repeatability		± 0,04 mm

KR5 R1400 – controller size comparison (preliminary)

KR C4 standard (IP54)

KR C4 smallsize	
Width	500 mm
Height	485 mm
depth	450 mm
Weight	approx. 45 kg
Rated supply voltage	AC 1x 208 - 230 V

preliminary



KR C4 smallsize (IP54)

KR5 R1400

Customer Benefits:

- High cost performance ratio
- Dedicated arc welding robot
- One of the smallest IP54 control cabinet for arc welding robots in the marked
- Compact, slim and robust mechanics with a small footprint, but with a maximum possible working envelop

Mechanics

New Mechanics

- KR6 R900 fivve
- KR5 R1400 arc welding robot
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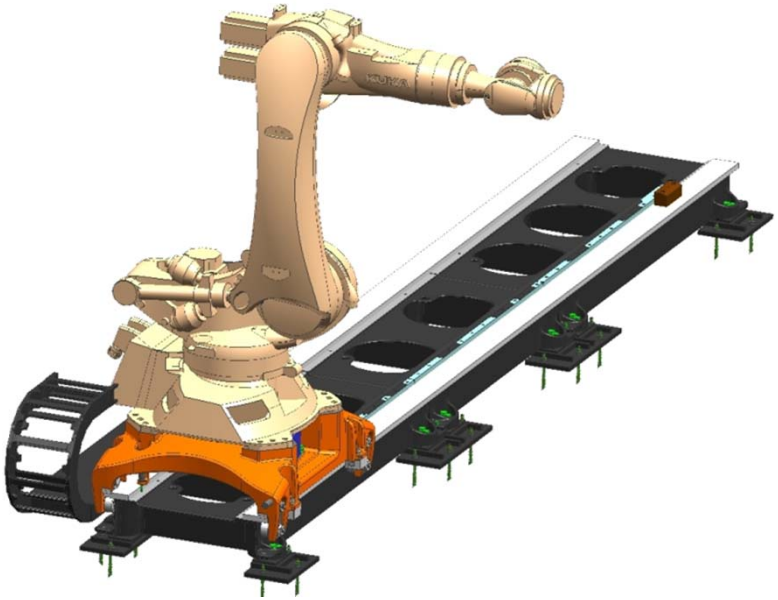
KL 2000



Background:

- need of a more cost-effective linear track
  to get a better competitive (performance and price) position
- The KL1500-3 is oversized for the Quantec-Series

Product:

- Linear track for Quantec-Series only (not for heavy payload class)
- The KL 2000 is a side product of the KL1500-3
- The manufacturing costs of the KL 2000 are 25% lower

KL 2000 – Key features

Improved price performance ratio

shorter delivery times

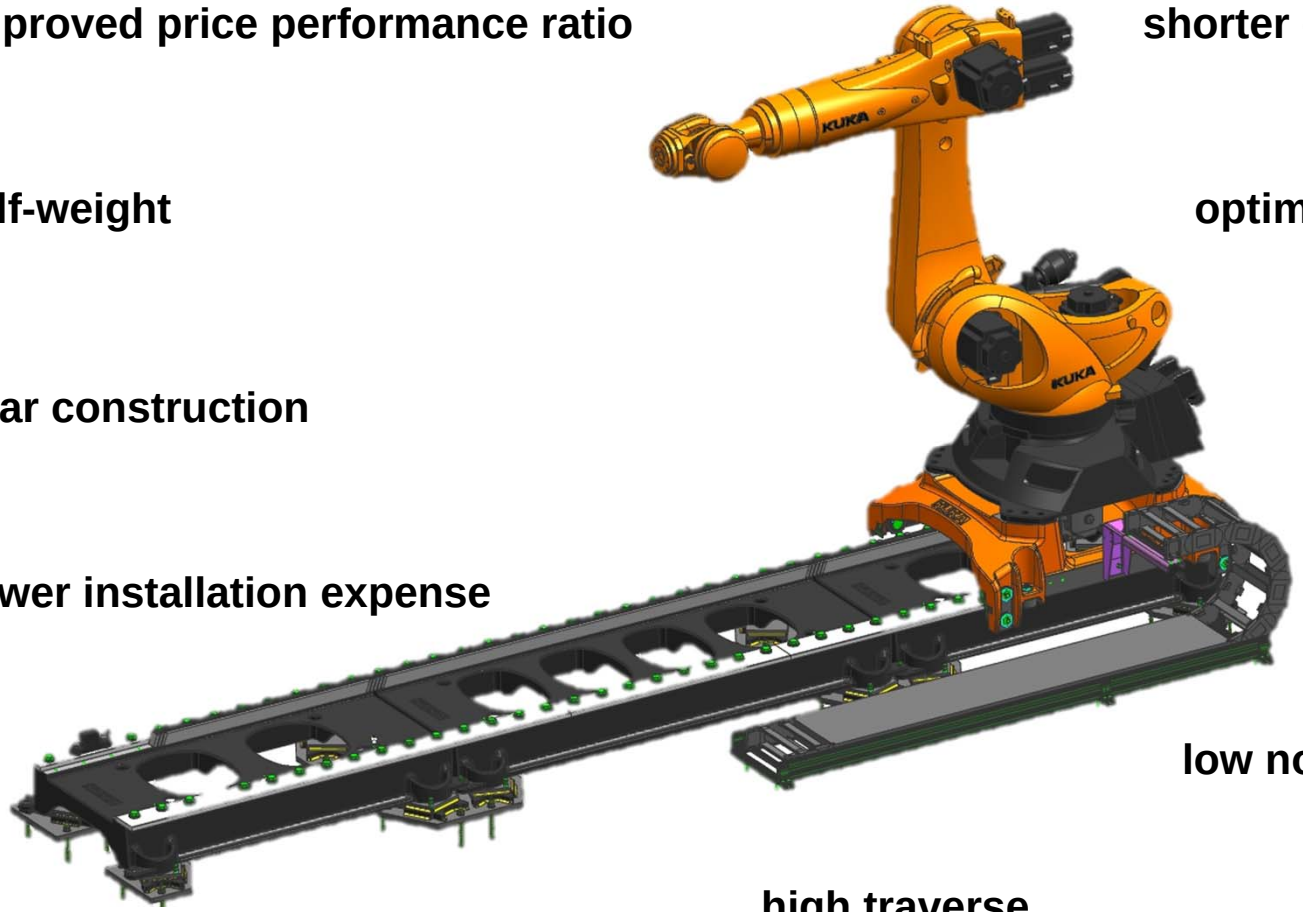
low self-weight

optimized for Quantec

modular construction

new carriage

lower installation expense



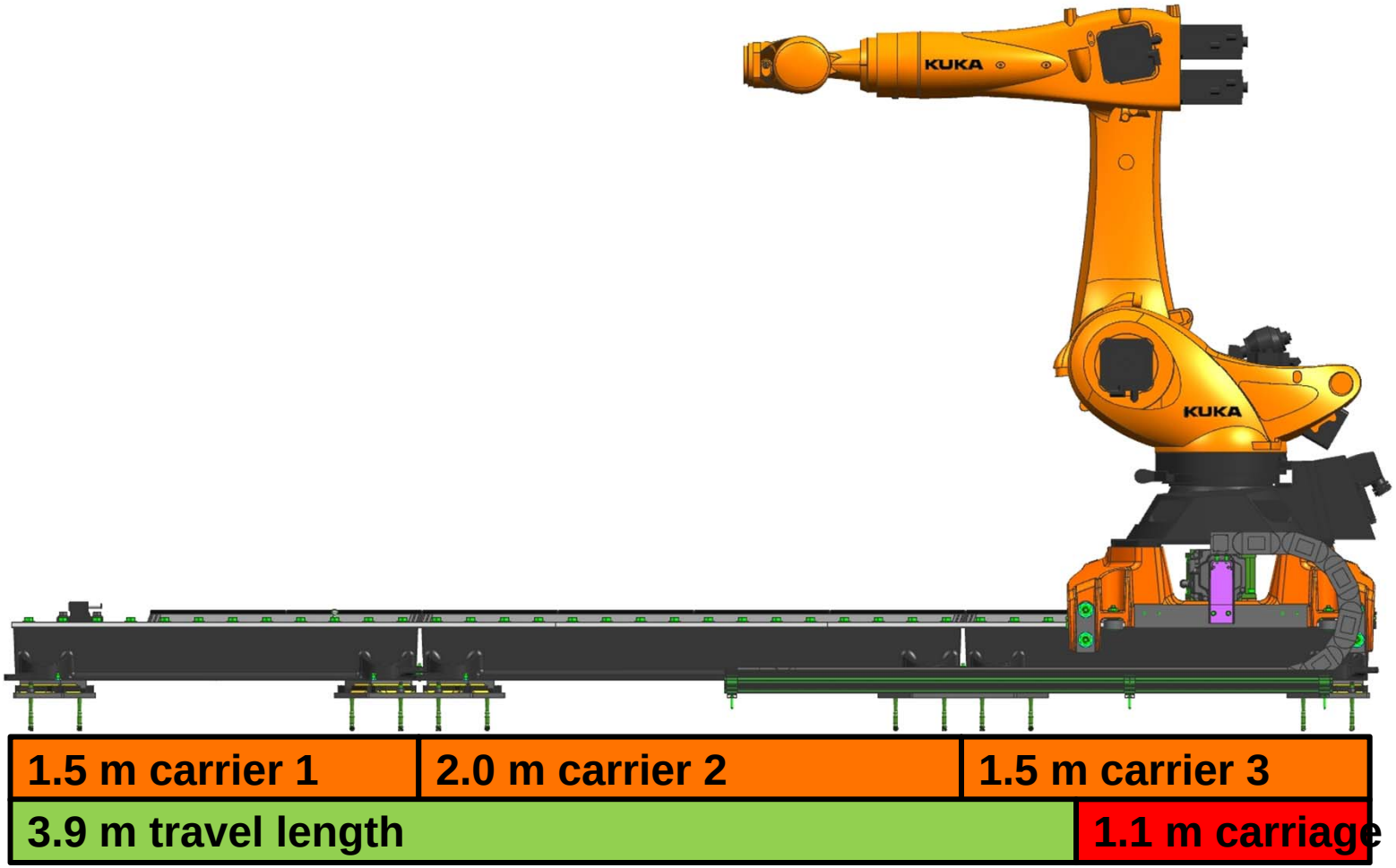
low noise emission

high traverse

Technical data

KL 2000	
Suitable robots	KR Quantec (except Quantec K and press)
Mounting position	Floor
Payload per carriage	2000 kg
Mass of carriage	350 kg
Max. number of carriages	4
Min. rated travel	0.4 m
Max. rated travel	29.9 m
Gradation of rated travel	0.5 m
Max. velocity	2.0 m/s (Ratio1:12)
Repeatability	± 0.02 mm
Transmission of force	Toothed rack
Motor type	Siemens G1

Example: Installation of a KL with 3.9 m travel length



KL 2000 – Customer benefits compared to KL1500

Customer Benefits:

- Higher performance by about 25% due to less weight of carriage and Quantec robot
- Lower price because of new design
- Much lower installation effort through
  - 45% fewer base plates
  - 40% fewer dowels
  - 15% shorter welding seams
- More effective nominal stroke thanks to the motor integrated carriage

Mechanics

New Mechanics

- KR6 R900 fivve
- KR5 R1400 arc welding robot
- KL 2000
- Positioners

KUKA Positioner – product improvments

- New motor- & gearbox unit combination
  - Established robot gears and motors
  - Higher stiffness and accuracy
  - Fastest index-times

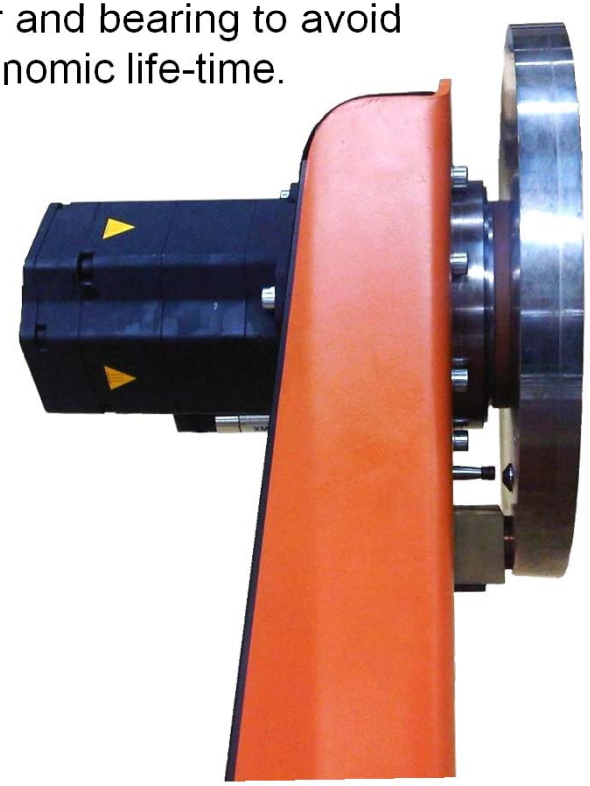
- Improved mechanical design
  - Slim design
  - Stiff layout
  - Compact construction
  - Internal motor cabling
  - New counter bearing

- Maintaining flexibility of old positioners
  - Biggest variety with payload, tool radius and face plate distance

KUKA Positioner – drive unit

- The new KP - drive unit is off the shelf equipped with:
  - EMD Mastering Set
    (all KUKA axes are adjusted by the EMD Mastering Set)
  - Isolated face plate
    This prevents leakage current flow through the gear and bearing to avoid damaging of these components and reduce the economic life-time.

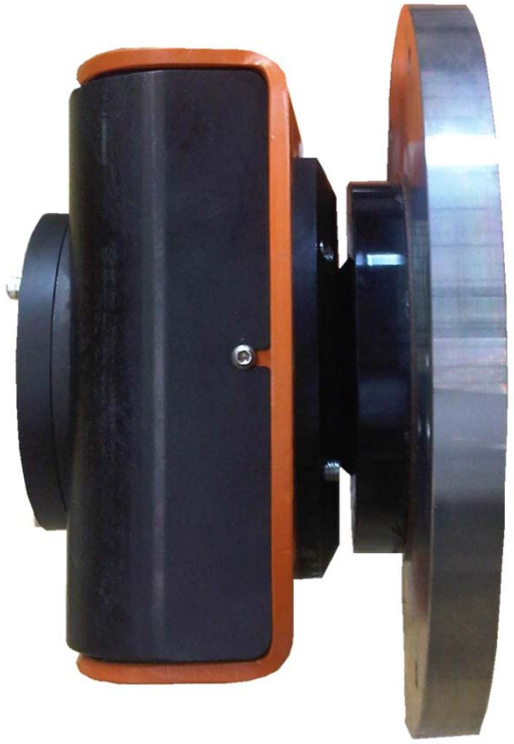
- Following options are available for the drive units
  - Endless rotating welding-current feedback
  - Guide rails for simple and repeatable fixation of the work piece carrier



KUKA Positioner – Counterbearing

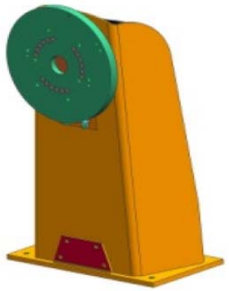
- The new counter bearing is off the shelf equipped with:
  - 10 mm length compensation
  - Swivel bearings
  - Isolated face plate

- The following listed options are available for counter bearing:
  - Endless rotating welding-current feedback
  - Guide rails for simple and repeatable fixation of the work piece carrier
  - Energy supply through hollow wrist

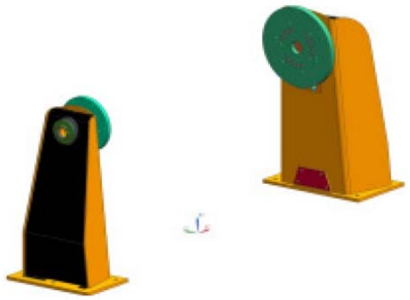


KUKA Positioner – horizontal turning KP1-H / KP1-HC

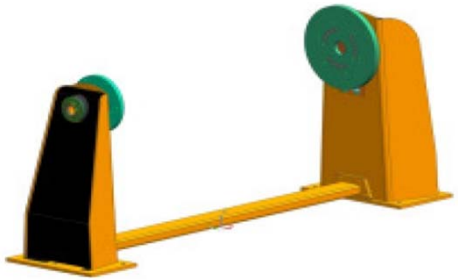
Type	Payload	Face plate distance	Loading height
KP1-H250 **KP1-HC250(T)**	250 kg	HC: Variable HC*xxx*T: 1500 – 3000 mm in 100 mm steps	980 mm 1080 mm 1180 mm 1280 mm
KP1-H500 **KP1-HC500(T)**	500 kg		
KP1-H750 **KP1-HC750(T)**	750 kg		
KP1-H1000 **KP1-HC1000(T)**	1000 kg		
KP1-HC2000	2000 kg	HC: Variable	
KP1-HC4000	4000 kg		



KP1-H



KP1-HC



KP1-HC*xxx*T

- EMT mastering

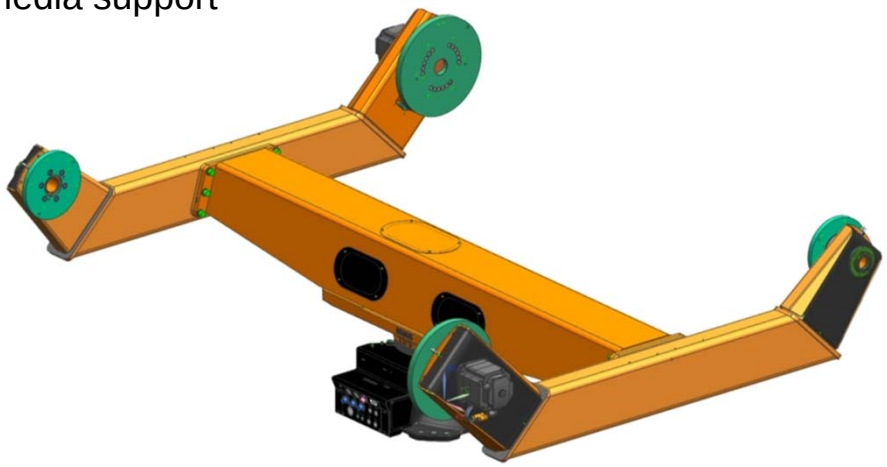
Available options:

- Endless rotating welding-current feedback
- Guide rails for simple and repeatable fixation of the work piece carrier
- Empty or filled energy supply

KUKA Positioner – horizontal turning KP3-V2H

Type	Payload (per side)	Face plate distance	Turing radius	Loading height	Index-time
KP3-V2H250	250 kg	1600 - 3000 mm (in 200 mm steps)	500 - 1000 mm (in 100 mm steps)	952 mm	ca. 4,0 s
KP3-V2H500	500 kg				ca. 3,8 s
KP3-V2H750	750 kg				ca. 4,0 s
KP3-V2H1000	1000 kg				ca. 3,9 s

- EMT mastering of all axis
- RDC included
- Plug in field supplied at the base, for all axis and media support
- Service holes for motor and media supply
- Forklift pockets for easy transportation



Available options:

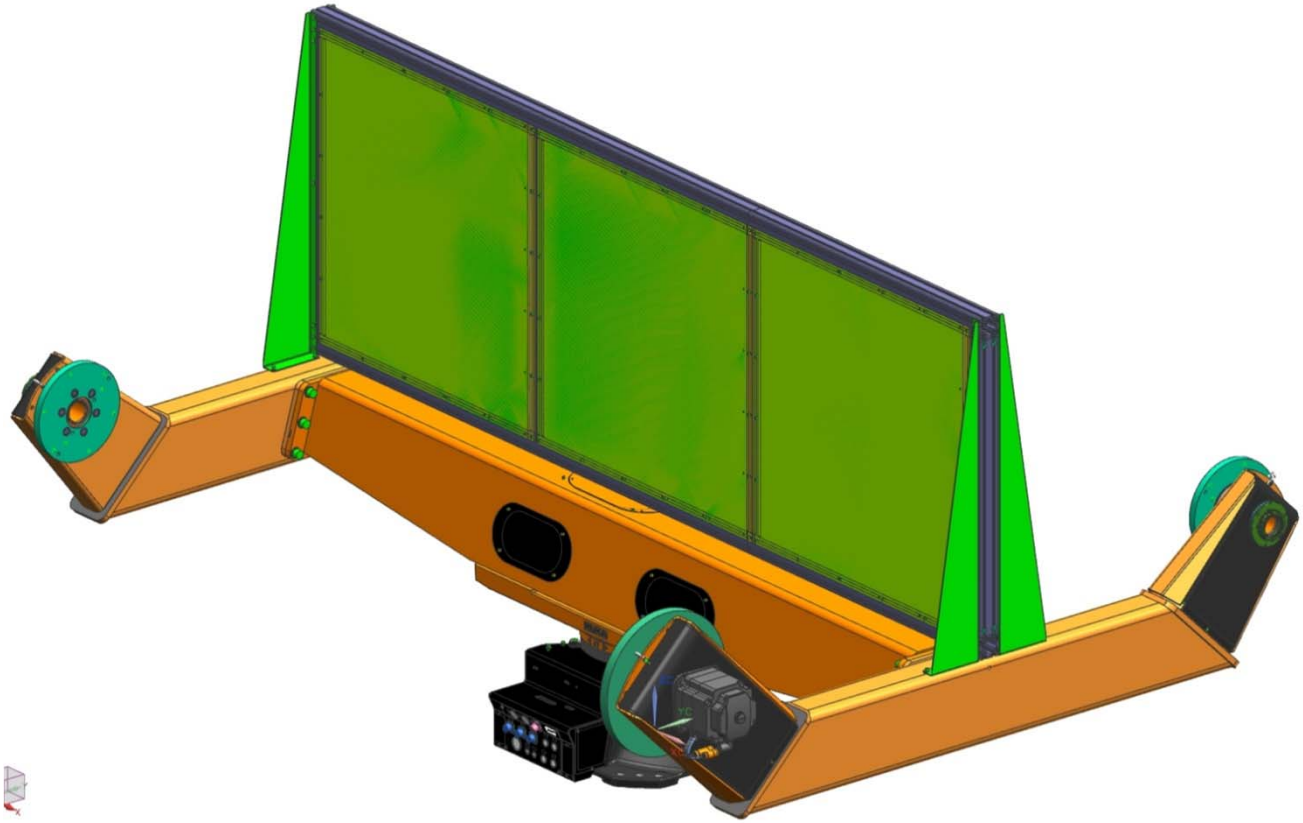
- Endless rotating welding-current feedback
- Guide rails for simple and repeatable fixation of the work piece carrier
- Anti-glare shield
- Empty or filled energy supply

KUKA Positioner – KP3-V2H base axis

- Connector panel supplied at the base, for all axis and media support
- All cables are mounted inside and lead through the hollow axis in to the cross beam
- Quick rotary times (0-180° ca. 3,7 - 3,9 sec) for short cycle times by the use of KR Quantec components
- Hardware mechanical hard stops available
- Service holes for motor and media supply
- Forklift pockets for easy transportation

KUKA Positioner – KP3-V2H anti-glare shield

- For each KP3-V2H is an optional glare shield available.



KUKA Positioner – KP3-V2H energy supply

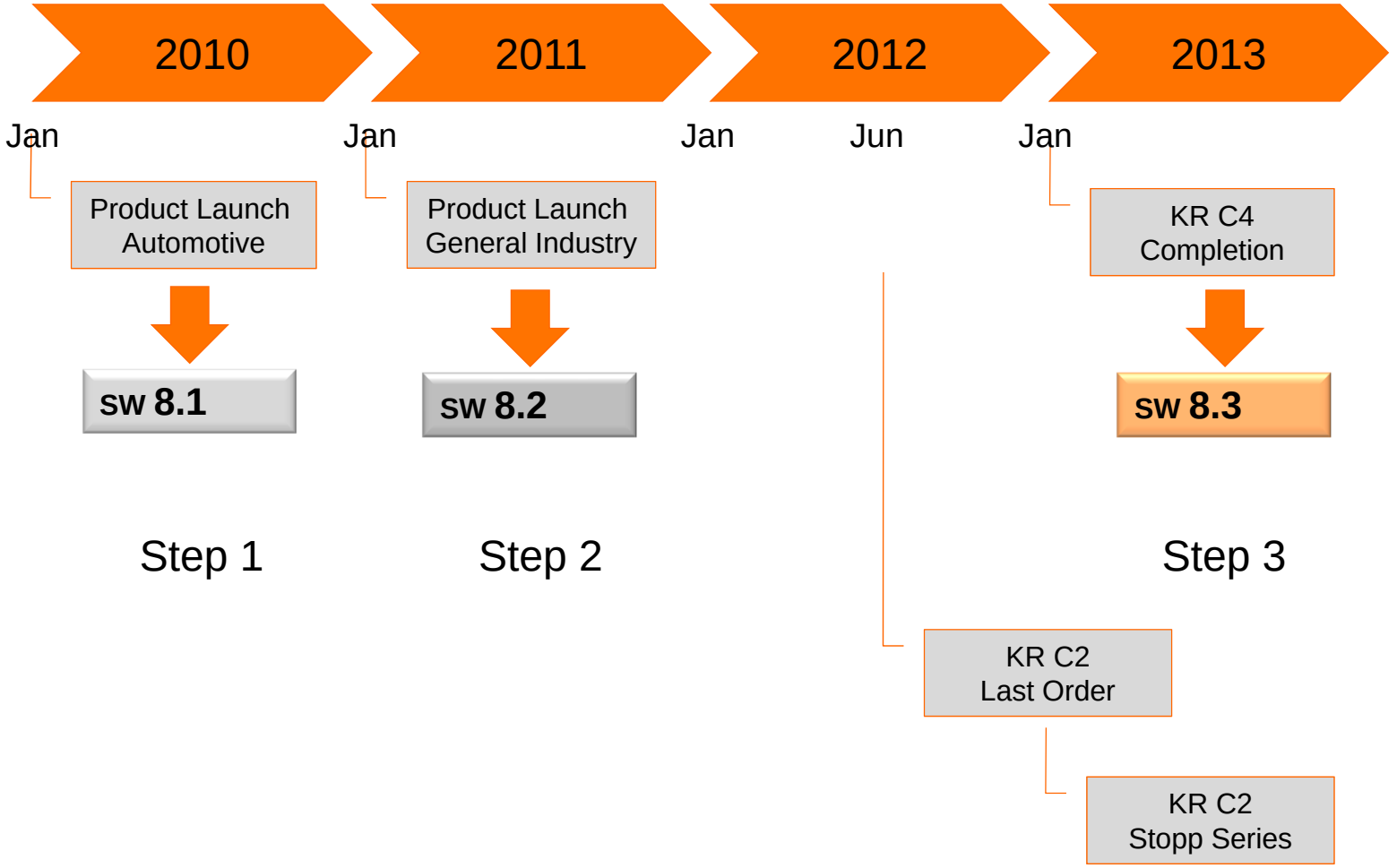
- Energy supplies:
  - Empty Energy supply
  - Filled Energy supply (water, air, field bus, signal cable)
- Protected in the cross beam and plastic pipes
- Media feeding to work piece carrier is provided through the hollow axis of the counter bearing

Upcoming Products

Mechanics

KR C4 Hard Ware

Product launch KR C4 (Introduction)



KR C4 Hardware

Controller related topics

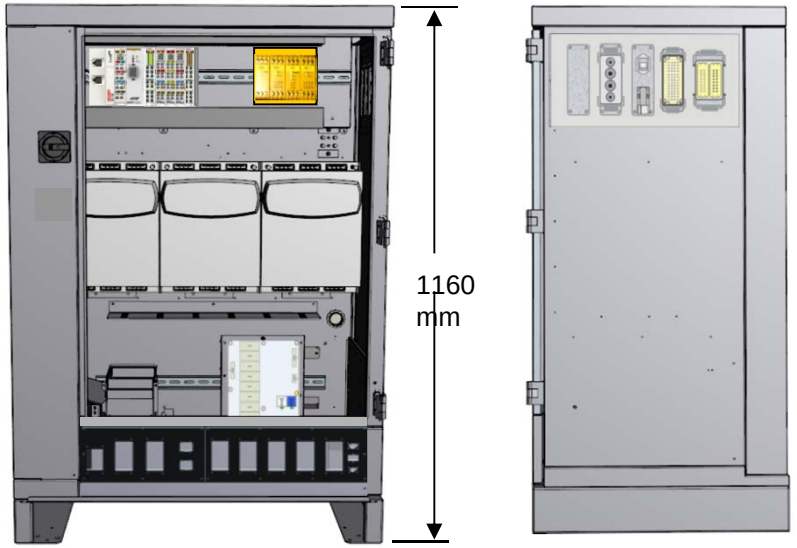
- Midsize Cabinet
- Extended Cabinet
- New KUKA PC
- New KUKA switches
- Transformerless operation

KR C4 Hardware

Controller related topics

Midsize Cabinet	available ✔
KRC4 Extended Cabinet	
New KUKA PC	
New KUKA switches	
Transformerless operation	

- Based on standard cabinet
- Additional 200mm space for e.g. E67 interface
- Additional interface (right side)
- Used for large interfaces

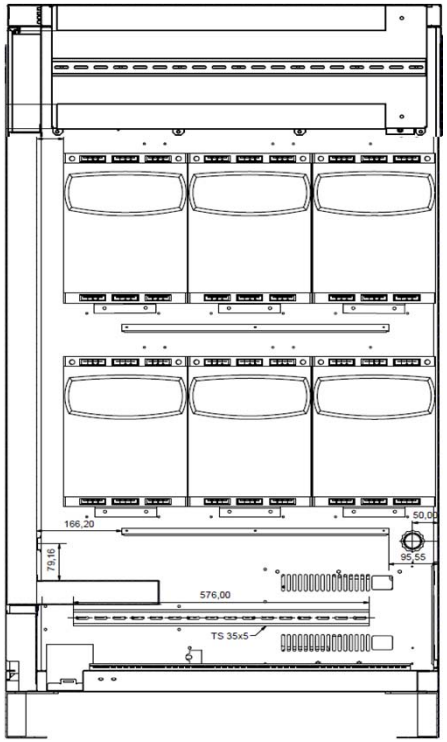


KR C4 Hardware

KRC4 General motion products (KRC4 CK for Customer build cinematics)

KSS 8.3 / WoV 3.0

- W x H x D appr. 842 x 1600 x 562 mm (not stackable)
- 2 rows of servo-modules for up to 16 axes
  (in the first delivery stage max. 2x KPP)
- Up to 4 RDC by 2 in daisy chain
- additional customer installation space on top of the servo drives with upper interface (right side)
- side connector panel
- Basic-, Peripheral interface and Options like KR C4 standard
- Several motor interfaces (multiple axes and single axis)



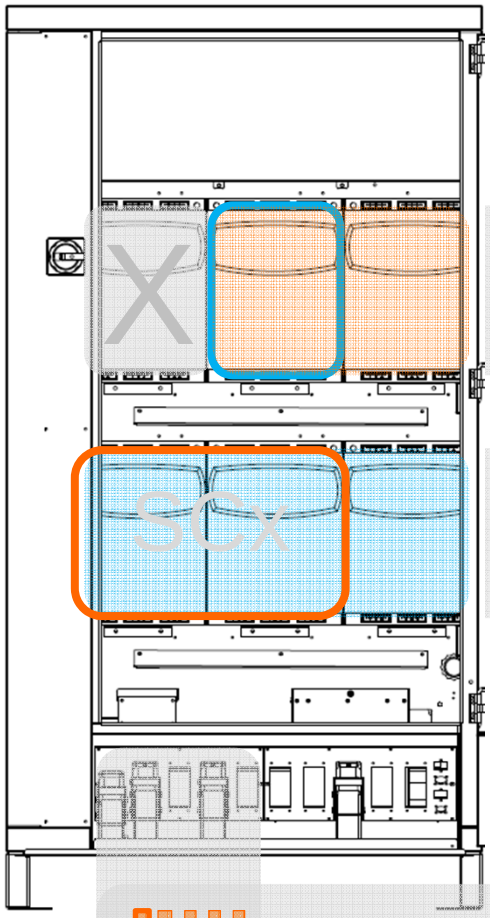
KR C4 extended − Key Features and Benefits

- SPACE-SAVING Compact control cabinet for up to 16 freely configurable axes
- SAFE All axes can be limited in their motion range using failsafe technology, monitored for operational stop or completely switched off.
- EASY The engineering tool WorkVisual allows simple configuration of the robots and all external axes, as well as the technology, safety and the entire periphery.
- ENERGY-EFFICIENT Highly efficient control of all axes thanks to the state-of-the-art servo and drive technology. Further more, the energy consumption can be reduced by up to 95% in different standby modes.
- All-ROUNDER Safety-, Robot-, Logic-, Motion-, und Process- Control

KR C4 extended − Technical data

Basic data	
Cabinet type	KR C4 extended
Number of axes	16
Weight	max. 240 kg
Protectional classification	IP 54
Sound level according to DIN 45635-1	52 – 68 db (A) (dependent on load)
Installation with other cabinets	Side-byside, clearence 50 mm, not stackable
Standards and regulations	2006/42/EG, 2004/108/EG, 97/23/EG, EN ISO 13850, EN ISO 13849-1, EN ISO 13849-2, EN ISO 12100-1, EN ISO 12100-2, EN ISO 10218-1, EN 614-1, EN 61000-6-2, EN 61000-6-4, EN 60204-1
Color: side walls / door	RAL 7016 (anthrac.) / KUKA orange (similar: RAL 2003)
Power supply connection	
Standard rated supply voltage acc. to DIN/IEC 38	AC 3 x 380/400 V (direct connection if system has grounded neutral); alternative main supply or voltages via transfomers
Permissible tolerance of rates voltage	-10% / 10%
Mains frequency	49 … 61 Hz
Full-load current	20A (1 KPP), see rating plate 40A (2 KPP), see rating plate
Mains-side fusing	min. 3 x 25 A slow-blowing (1 KPP), see rating plate min. 3 x 50 A slow-blowing (2 KPP), see rating plate
Evironmental conditions	
Ambient temperature during operation without cooling unit	+5 °C - +45 °C (278 K - 318 K without cooling unit)
Dimensions	
Height	1.600 mm
Width	842 mm
Depth	562 (602) mm

KR C4 extended – 6-axes Robot + 6 external axes



- KSP 600 3x20 UL up middle 00-211-365
- KSP 600 3x40 UL up middle 00-211-366
- KSP 600 3x64 UL up middle 00-211-367

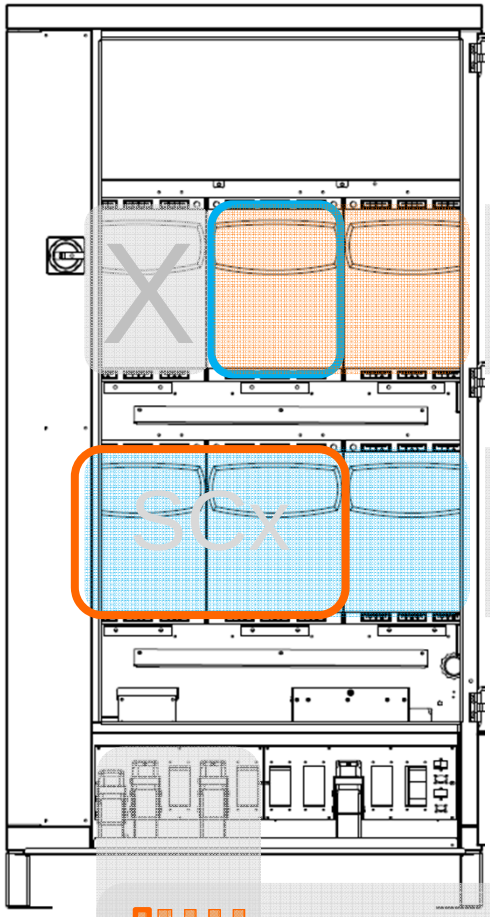
- KPP 600-20 2x40 UL up right 00-211-363

SCx

- KPP 600-20 1x40 UL down right 00-199-704
- KPP 600-20 1x64 UL down right 00-199-707

- Interface 6 external axis X7.1/.2/.3/.4/.5/.6 00-216-906
- Interface 6 external axis X81/X7.1/.2 00-216-904

KR C4 extended – axes Robot + 5 external axes



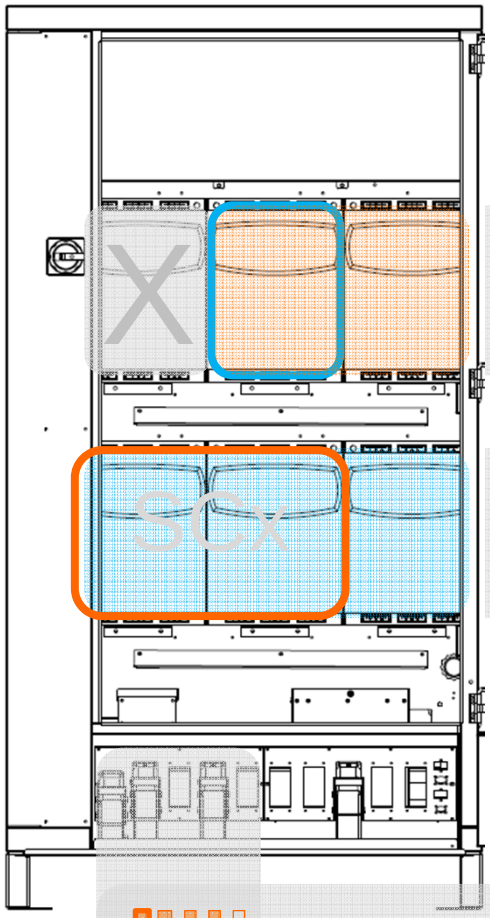
- KSP 600 3x20 UL up middle 00-211-365
- KSP 600 3x40 UL up middle 00-211-366
- KSP 600 3x64 UL up middle 00-211-367

- KPP 600-20 2x40 UL up right 00-211-363

SCx

- Interface 5 external axis X7.1/.2/.3/.4/.5 00-216-902
- Interface 5 external axis X81/X7.1/.2 00-216-900

KR C4 extended – 6-axes Robot + 4 external axes



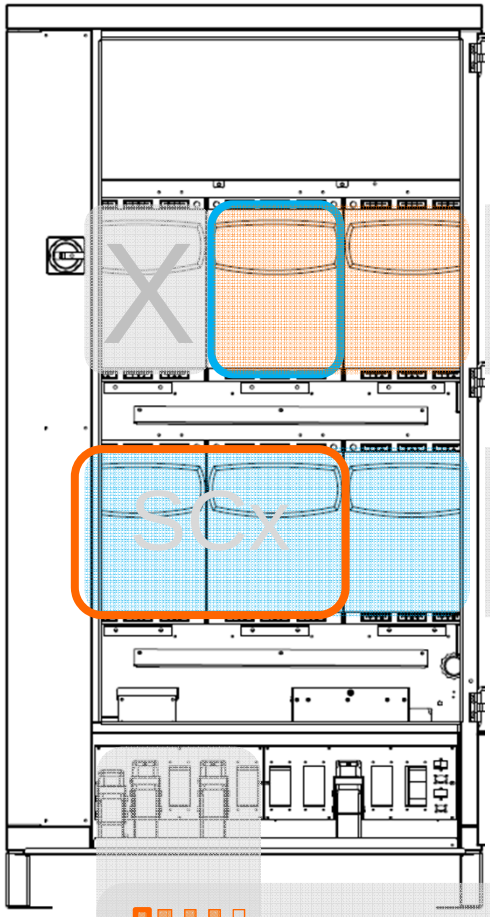
- KSP 600 3x20 UL up middle 00-211-365
- KSP 600 3x40 UL up middle 00-211-366
- KSP 600 3x64 UL up middle 00-211-367

- KPP 600-20 1x40 UL up right 00-211-362
- KPP 600-20 1x64 UL up right 00-211-364

SCx

- Interface 4 external axis X7.1/.2/.3/.4 00-216-897
- Interface 4 external axis X81/X7.1 00-216-899

KR C4 extended – 6-axes Robot + 3 external axes



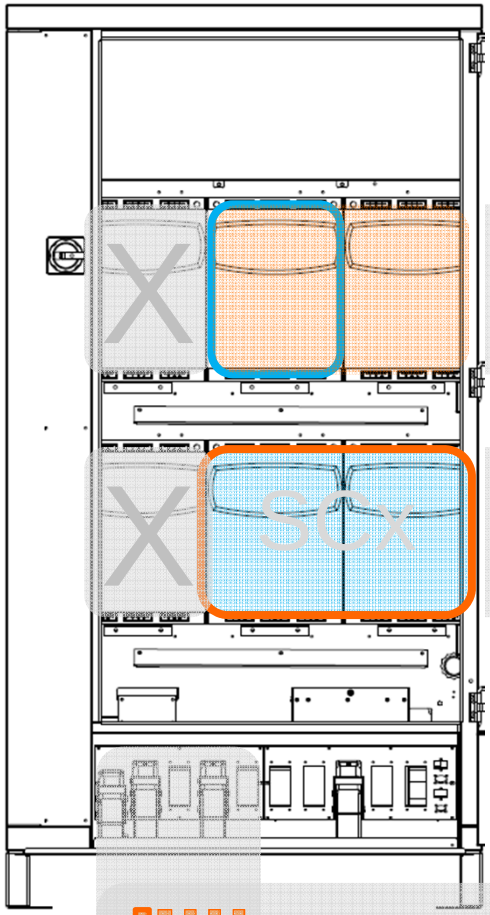
- KSP 600 3x20 UL up middle 00-211-365
- KSP 600 3x40 UL up middle 00-211-366
- KSP 600 3x64 UL up middle 00-211-367

- KPP 600-20 UL up right 00-211-360

SCx

- Interface 3 external axis X7.1/.2/.3 00-216-894
- Interface 3 external axis X81 00-216-896

KR C4 extended – Palletizing Robot + 5 external axes



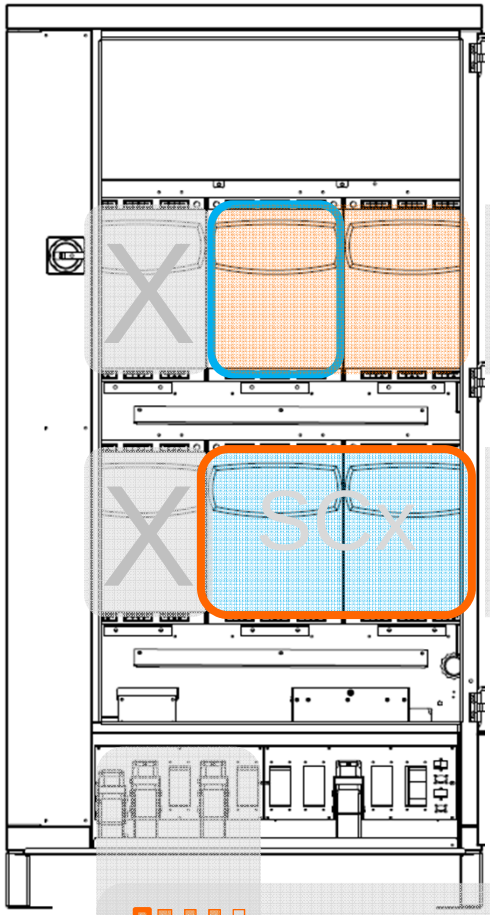
- KSP 600 3x20 UL up middle 00-211-365
- KSP 600 3x40 UL up middle 00-211-366
- KSP 600 3x64 UL up middle 00-211-367

- KPP 600-20 2x40 UL up right 00-211-363

SCx

- Interface 5 external axis X7.1/.2/.3/.4/.5 00-216-902
- Interface 5 external axis X81/X7.1/.2 00-216-900

KR C4 extended – Palletizing Robot + 4 external axes



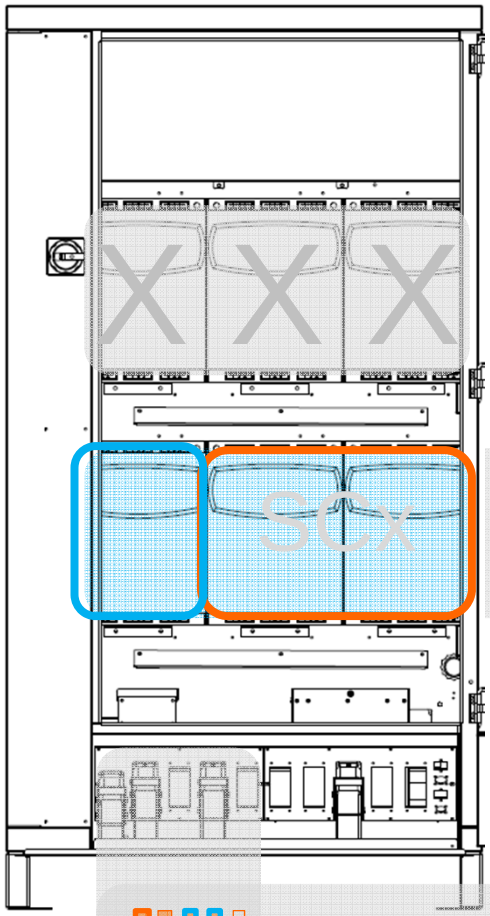
- KSP 600 3x20 UL up middle 00-211-365
- KSP 600 3x40 UL up middle 00-211-366
- KSP 600 3x64 UL up middle 00-211-367

- KPP 600-20 1x40 UL up right 00-211-362
- KPP 600-20 1x64 UL up right 00-211-364

SCx

- Interface 4 external axis X7.1/.2/.3/.4 00-216-897
- Interface 4 external axis X81/X7.1 00-216-899

KR C4 extended – Palletizing Robot + 3 external axes



- KSP 600 3x20 UL down left 00-199-735
- KSP 600 3x40 UL down left 00-199-736

- Interface 3 PA external axis X7.1/.2/.3 00-216-895

KRC4 cabinets overview – number of drives

KR C4 compact

up to 6 drives & up to 6 add. drives

KR C4 smallsize

up to 6 drives & up to 6 add. drives

KR C4 standard

up to 8 drives

KR C4 midsize

up to 8 drives & additional installation space

KR C4 extended

up to 16 drives & additional installation space

KR C4 Hardware

Controller related topics

Midsize Cabinet	available
New KUKA PC MCC20	available ✔
New KUKA switches	
Transformerless operation	

- Replaces MCC 10 (compatible)
- Onboard graphic with DVI interface
- Prepared for Win7 (2GB RAM)

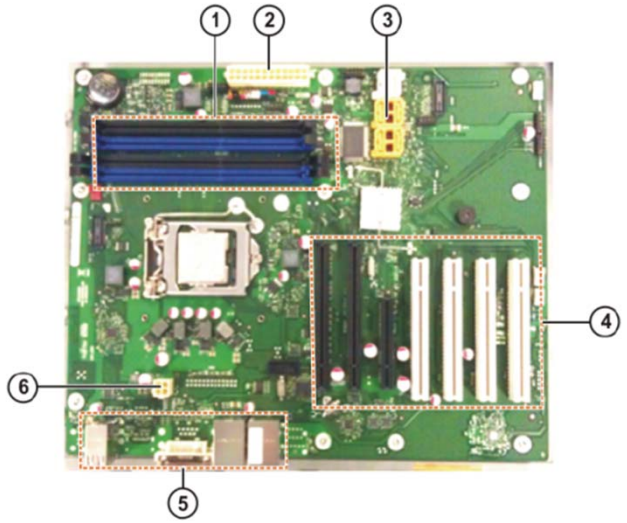


Abb. 11-6: Mainboard D3076-K Schnittstellen

KR C4 Hardware

Controller related topics

Midsize Cabinet	available
New KUKA PC MCC20	available
New KUKA switches	→ WoV 3.0
Transformerless operation	

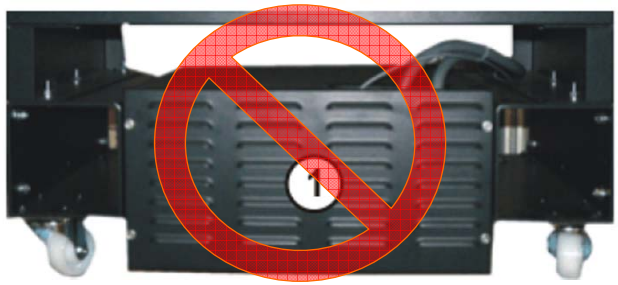
- New KUKA standard switches
- ProfiNet & Ethernet/IP
- Managed & unmanaged
- Requires WoV 3.0 for configuration

KR C4 Hardware

Controller related topics

Midsize Cabinet	available
New KUKA PC MCC20	available
New KUKA switches	WoV 3.0
Transformerless operation	available

- Hardware replaced by Software
- 380V/440V/480V (with neutral point)
- Available for various robot types
  -> see price list



KRC4 – Certification US / Canada

UL-Validation

- Validation done by TÜV Süd (officially recognized organization - NRTL)
- Certified Standard:
  - UL 1740, CSA Z434-3, ANSI-RIA 15/06
- Scope:
  - KUKA standard robot families,
  - KR C4 standard cabinet with smartPad,
  - KSS 8.2 and options like save range monitoring / save opperation
  - selected dress packages
- Timeline:
  - official release for ordering: February 2013

General information

KRC4 – Certification US / Canada

- Background:
  - In response to increasing demand for certification of our robot systems according to the internationally recognized UL/CSA standard, it was decided in conjunction with KUKA Management that core products available for global delivery should be subjected to such certification.
  - UL standards were originally rules and regulations developed by "*Underwriters Laboratories*", a (non-governmental) organization, in order to inspect and certify the safety of (electrical) products in the USA.
  - Since then, many of these regulations have been incorporated into national standards and statutory regulations. As a result, they are mandatory for importing into particular countries or required by companies for a delivery release.

  - Excerpt from Wikipedia *(translation of German-language entry)*: …The UL certification mark appears on products that have been evaluated by UL for particular properties to eliminate risk and to confirm operating capability under certain circumstances. UL maintains a directory of over 3 million products which is publicly available through online databases. …

General information (cont.)

KRC4 – Certification US / Canada

- Coverage:
  - The main regulation for robotics in the United States is UL 1740. It encompasses robot arms, attachments (energy supply systems, dress packages), connecting cables, the teach pendant (KUKA smartPAD) as well as control hardware and software (if relevant for "user safety").
  - The validation also covers conformity with ANSI RIA R15.06 (US standard) as well as with CSA Z434-03 (Canadian standard).

- Testing organization:
  - TÜV Süd carries out the testing according to the standards described above and issues the label as a visible sign of conformity (see label).
    The "C" and the "US" indicate validity for Canada and the US.
    Legal validity and market acceptance are synonymous with the UL inspectio

Type of certification

KRC4 – Certification US / Canada

- Certification:
  - With the certification (= listing), KUKA Roboter obtains permission for the Hungary and Augsburg plants to build, label and ship products that conform to UL/CSA 1740 (coverage of further plants is not currently planned).
  - "Retrocertification" of systems already delivered is not usually possible. In principle, a field validation of individual systems by NRTLs is possible. However, due to the inordinate effort and costs, this should only be considered under the most exceptional circumstances.
  - The certificates can be viewed online on the corresponding website by customers at any time.
  - Link: (Information will follow)

  - Note: When referring hereafter to "UL conformity" or "UL ...", this is a shortened form of speech. This, of course, refers to complete certification according to UL/CSA/ANSI 1740 by TÜV Süd North America.

Scope of certification – Robot arms & cables

KRC4 – Certification US / Canada

- The following families of robots have been certified:
  - Low payloads (5 to 16 kg)
  - Medium payloads (30 to 60 kg)
  - High payloads (all Quantec robots)
  - Heavy-duty (360 to 500 kg)
  - Palletizers (not the KR 2000 series!)
- Please note
  - Unlike with KR C2 UL, there are no special UL variants of robots with their own article number.
  - All listed robot types have a UL certificate as standard.
  - In principle, this includes all installation types and reaches along with the associated application-specific variants (e.g. foundry or similar).
  - In case of uncertainty, please refer to the relevant certificates (see link).
  - The corresponding cables between the controller and the robot are also certified.

niedrige Traglast
KR 5 arc
KR 5-2 arc HW
KR 16 arc HW
KR 6-2 I KR 16-2
KR 6-2 KS I KR 16-2 KS
mittlere Traglast
KR 30-3 I KR 60-3
KR 30 L16-2
KR 30-4 KS I KR 60-4 KS
hohe Traglast - Quantec
Quantec
Quantec K
Quantec press
Schwerlaster
KR 360-3 I KR 500-3
Pallettierer
KR 40 PA
KR Quantec PA
KR 300-2 PA I KR470-2 PA
KR 700 PA

Scope of certification – Energy supply systems

KRC4 – Certification US / Canada

- Energy supply systems
  - Selected energy supply systems are currently also certified.
    (Certification of the complete ES modular system is in preparation, but not included in the current project.)
  - Further information can be obtained from KUKA Roboter GmbH product management.

Scope of certification – Controller

KRC4 – Certification US / Canada

- Controller:
  - The standard NA version is the basis for KR C4 certification. In other words, only this basic cabinet may be used for the configuration of UL systems, not the EU variant, MidSize or ExtendedCabinet.
  - In principle, all modular system elements are permissible for the configuration (these are checked in the SAP configurator).
    Execptions:
    - HAN6 infeed (Due to the standards the infeed must be from above)
    - Cooling device (no UL certification by supplier)
  - If a grounded neutral is available and the corresponding machine data are present, UL-compliant systems without a transformer may also be configured (only 400V, 440V, 480V).
  - For UL-compliant cells and systems, a lamp to signal that the robot is ready for motion is essential. This can be fitted to the side or to the interior of the cell and need not be attached to the robot itself. For this purpose, KUKA provides the required components to assist the integrator in implementing an appropriate solution (see next slide). Unlike with KR C2, the lamp is not part of the robot variant.

Scope of certification – Controller (cont.)

KRC4 – Certification US / Canada

- Controller:
  - The following components must always be configured:
    - KR C4 "Drives ready" interface X53 (00-217-280)
    - One of the 6 variants with US1/US2 wiring (-> provides the wiring for the lamp interface)
  - The following components are to be ordered for the lamp:
    - "Drives ready" lamp cabling kit (00-217-352) - consisting of 2 connectors as well as 15 m cable - not assembled
    - "Drives ready" lamp (00-217-334) incl. holder

- smartPAD:
  - The smartPAD is included in the certification.

Scope of certification – Software

KRC4 – Certification US / Canada

- Software
  - Since the KUKA basic release provides safety-oriented functionality (E-STOP, operator safety, etc.), the software is part of the certification scope.
    The corresponding system software must therefore always be selected for the UL system.
    - System software KSS 8.2 UL (00-217-827)
  - The same applies to all SafeOperation derivatives.
    - SafeOperation 3.1UL (00-221-735) (optional)
    - SafeRangeMonitoring 3.1UL (00-221-734) (optional)
    -
  - All other software packages can be included in the configuration.

Thank you for your attention