

«Automasjonsprosjekter – spørre – evaluere – velge»

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Small Robots								Low Payloads						Medium Payloads				High Payloads			Heavy Payloads					Painting Robots						Press Linking	Linear Units								
..01	..02	..03	..04	..05	..06	..07	..08	..09	..10	..11	..12	..13	..14	..15	..16	..17	..18	..19	..20	..21	..22	..23	..24	..25	..26	..27	..28	..29	..30	..31	..32	..33	..34	..35	..36	..37					
10kg	15kg	15kg	2kg	8kg	8kg	8kg	2kg	10kg	8kg	8kg	25kg	20kg	8kg	20kg	20kg	20kg	20kg	20kg	20kg	100kg	100kg	270kg	100kg	100kg	100kg	100kg	100kg	100kg	100kg	10kg	10kg	10kg	10kg	10kg	10kg	10kg	10kg	100kg	100kg	100kg	100kg

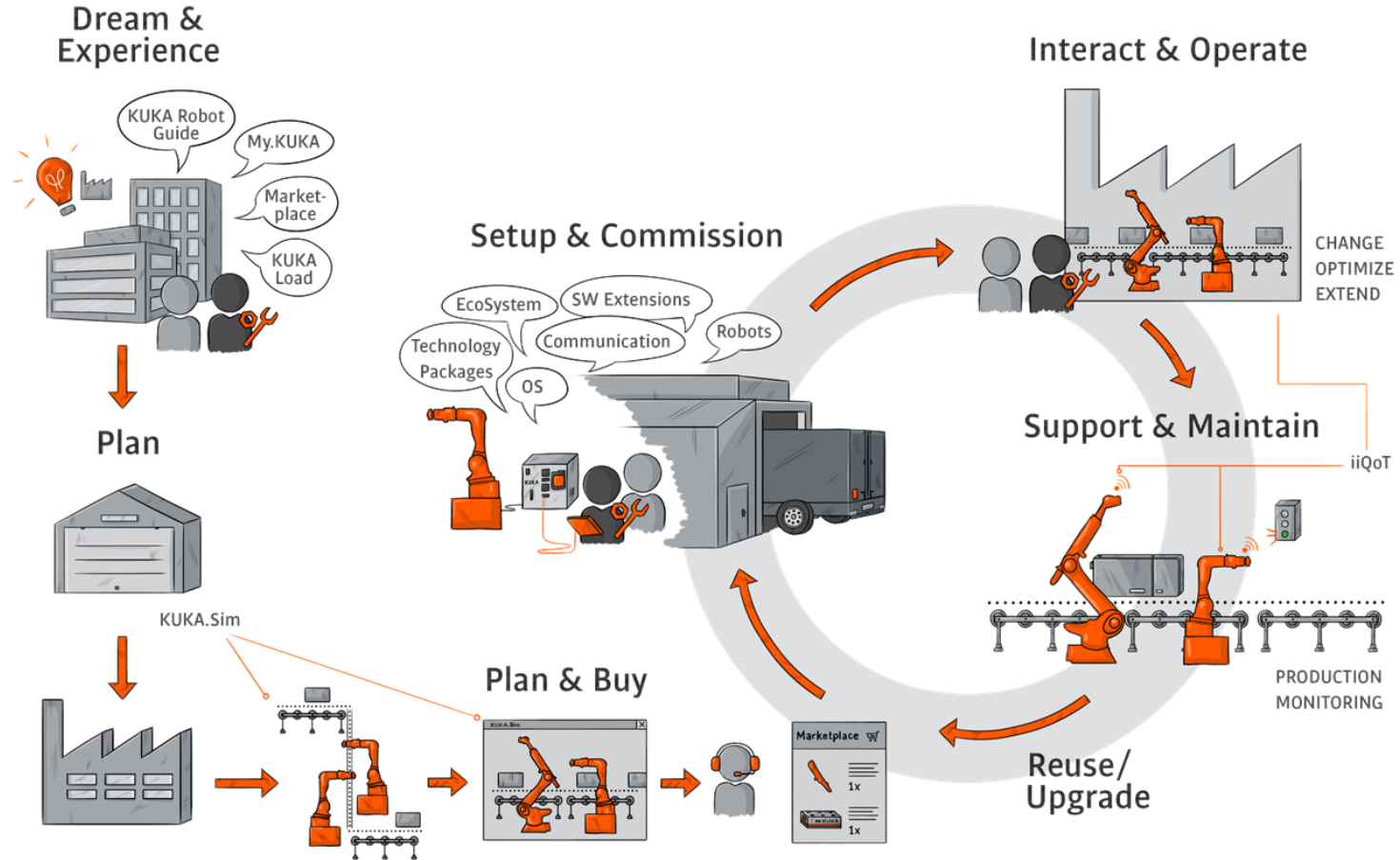
© see website for 02/2020

>100 Locations
> 60 countries

15.000
EMPLOYEES



Digitalization - Industrial Intelligence





Hva er hensikten med en forespørsel?



Skape en felles forståelse av behovet, internt og eksternt.

Beskrive egne produkter med kvalitet, toleranser og andre krav.

Sørge for at alle tilbydere får samme informasjon.

Legge grunnlaget for en god evaluering av innkomne tilbud.

Hva bør forespørselen inneholde?



Detaljer om inngående materialer.

Detaljer om produktet som skal produseres.

Krav til kapasitet, toleranser, kvalitet +++

Ønsker for brukergrensesnitt, operatørpaneler og lignende.

Dagens layout.

Husk at bilder forteller mer enn 1000 ord.



Evaluere tilbud?



Har tilbyderen akseptert dine behov og krav?

Skaper tilbudet en entydig og felles forståelse?

Benyttes det standardiserte produkter. Hardware og Software?

Finnes det et godt serviceapparat for komponenter i totalløsningen?

Garanti.

Opplæring

Husk at en simulering forteller mer enn 100 bilder.

Hva får du for pengene?



Collaborative eller Industri robot

Collaborative robot



Industrial robot





Noen påstander og fakta.!

Collaborative robot



Not true – always needed

Not true – always needed

Partly true

Low weight

Industrial robot



Needs safety equipment

Needs CE marking

Partly true

Heavy

Se alltid på applikasjonen med andre ord ditt behov



What is the TCO of a robotic cell?



The costs can be divided into:

- Investment
- Service
- Operating costs
- Repairs



What is the cost of a robotic system?

Difficult to answer, but compare that with:
“what does it cost to own a car?”


This depends on a number of factors:

 What size of car do you need?



 How often or far do you drive?



 How do you drive?



 Load of the car





- TCO - Total Cost of Ownership of Robot Systems
- Investment



The right robot for each task keeps the investment down



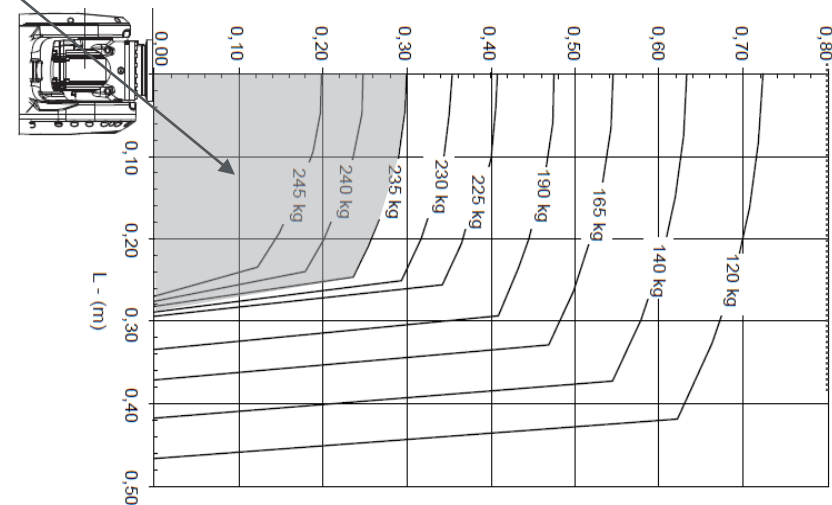
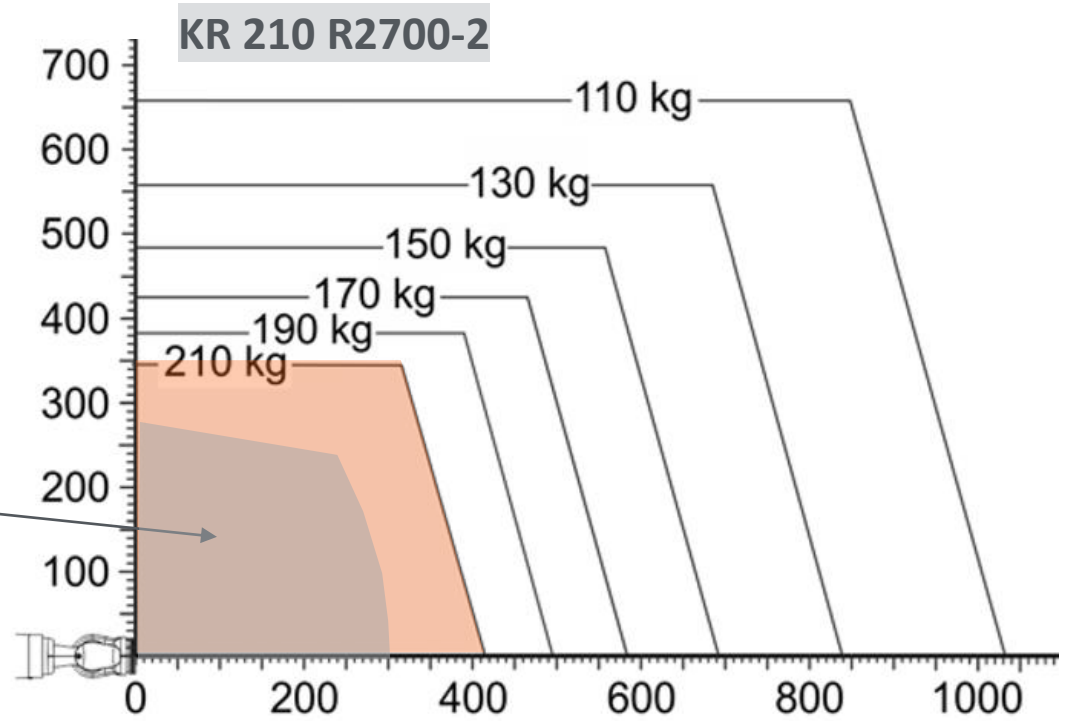
- Investment – be careful!
 - 100kg is not 100kg when compared!

The “comfort zone”

is the **zone** in the payload diagram where a robot can at least still carry his **nominal payload**

Let’s compare the comfort zones

Please note: The type of robot is not important at this point as we want to make a general comparison.





The fact is that every robot supplier defines their payload differently!

Technical Data for KR 150 R3100-2

Basic Data		Motion Range	
Maximum payload	220 kg	A1	±185°
Rated payload	150 kg	A2	-140° / -5°
Maximum reach	3100 mm	A3	-120° / 168°
Mounting position	Floor	A4	±350°
Pose repeatability (ISO 9283)	0.05 mm	A5	±125°
Number of axes	6	A6	±350°
Ambient temperature during operation	0 °C to 55 °C (273 K to 328 K)	Speed with rated payload	
Ambient temperature during storage/transportation	-40 °C to 60 °C (233 K to 333 K)	A1	105°/s
Protection rating (IEC 60529)	IP65	A2	107°/s
Protection rating, in-line wrist (IEC 60529)	IP65 / IP67	A3	114°/s
		A4	190°/s
		A5	180°/s
		A6	260°/s

Field of application: Particularly suitable for Machining, Handling, Assembly, Cutting/Separation, Applying/Painting/Glueing, Palletizing/packaging, Laser Welding, Measuring/Inspection.

Specifications

Model	
Type	
Controlled axes	
Reach	
Installation	
Motion range (Maximum speed) (Note 1)	J1 axis rotation J2 axis rotation J3 axis rotation J4 axis wrist rotation
Max. load capacity at wrist	
Max. load capacity at J2 base	
Max. load capacity at J3 arm (Note 2)	
Allowable load inertia at wrist	
Drive method	Electric
Repeatability (Note 3)	
Mass	
Installation environment	Ambient temperature : 0 to Ambient humidity : Non Sho Vibration acceleration : 4.9

Note 1) During short distance motions, the axis speed may not reach the m
Note 2) Max. payload capacity at wrist are changed by wrist load.
Note 3) Compliant with ISO 9283.
Note 4) Controller mass (120kg) is not included.

Performance (according to ISO 9283)

	Position repeatability	Path repeatability
IRB 660-180/3.15	0.1 mm	0.3 mm
IRB 660-250/3.15	0.1 mm	0.3 mm

Technical Information

Electrical Connections	
Supply voltage	200-600 V, 50/60 Hz
Power consumption	ISO cube 2.7 kw, Normal movements 3.2 kw

Physical	
Robot base	1136 x 850 mm
Robot weight	1650 kg

Environment

Ambient temperature for mechanical unit	
During operation	+0°C (32°F) to +50°C (122°F)
During transportation and storage	-25° C (-13° F) to +55° C (131° F)
During short periods (max. 24 h)	+70°C (158°F)

Relative humidity	Max. 95%
Noise level	Max. 73 dB (A)
Safety	Double circuits with supervisions, emergency stops and safety functions. 3-position enable device

Emission

EMC/EMI shielded

Data and dimensions may be changed without notice.

Working range

Moving to a higher payload class will generate:

- A higher purchase price
- A more powerful robot probably requires a sturdier floor/foundation
- A larger robot has typically more expensive spare parts
- A more powerful robot will also consume more energy

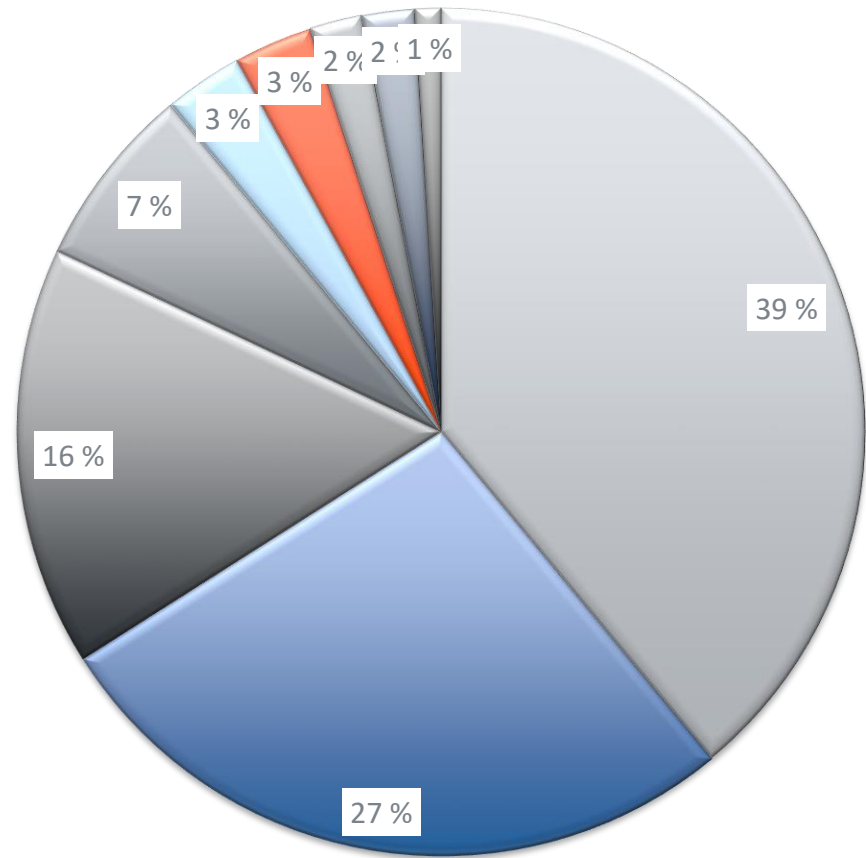


TCO Structure Robot System 14 Years Operating Life

The cost distribution defines/prioritizes the development activities that will lead to a significant reduction of TCO

Example based on automotive installation measured 2019

- **Evaluation** of cost segments over 14 years “Operating Life”
 - Energy Costs based on a defined “Load Profile”
 - Integration Costs include “Second Life”

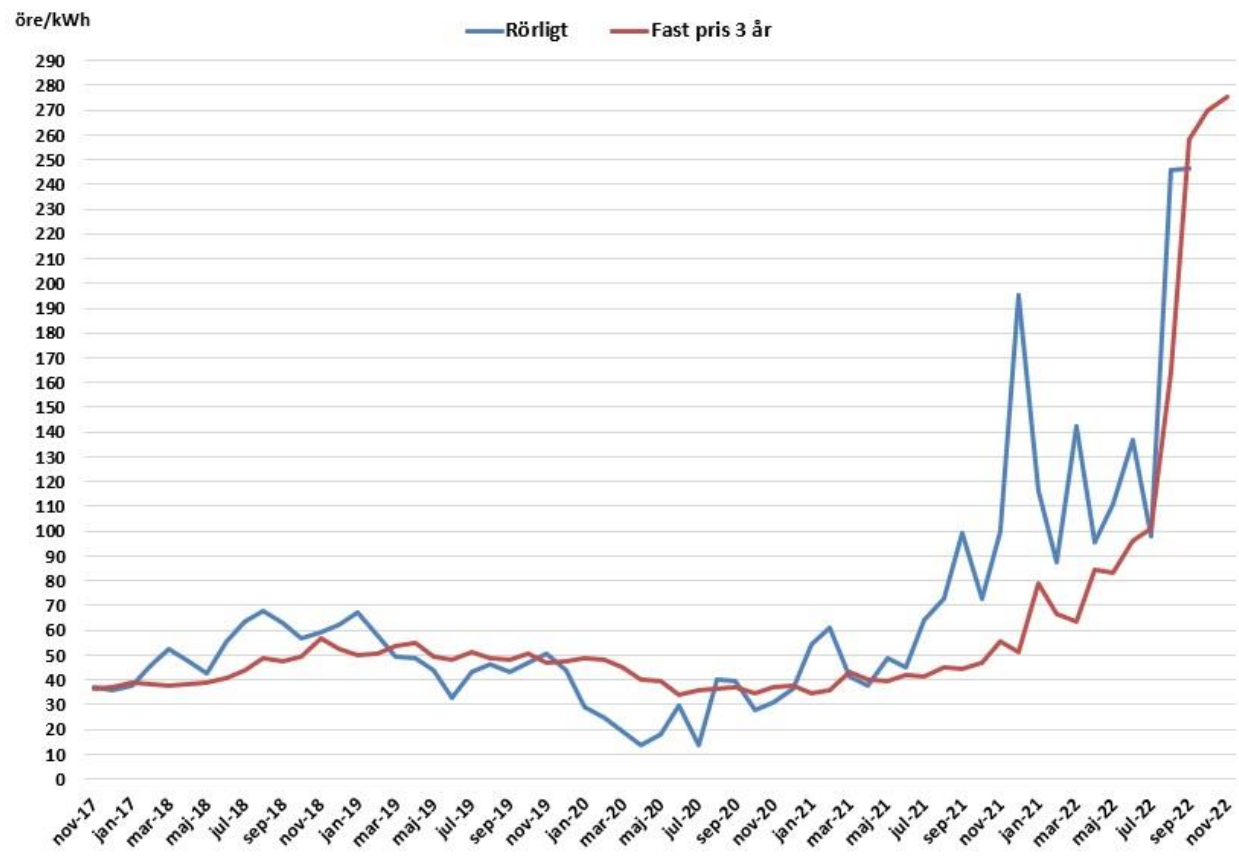


Main Cost Drivers	
• Initial Invest	39%
• Energy	27%
• Integration	16%
• Spare Parts Controller*	7%
• SW-Licenses & SW-Upgrades	3%
• Spare Parts Robot Arm*	3%
• Maintenance Consumables	2%
• Refurbishment Analysis	2%
• Training	1%

*Cost calculated on MTBF figures



Cost of electricity over the last 5 years - Sweden region 3 average monthly cost



The price for electricity is driven by 2 major factors:

- War Russia vs Ukraine – embargos versus Russia
- Electrification of society – energy production not increasing in line with consumption

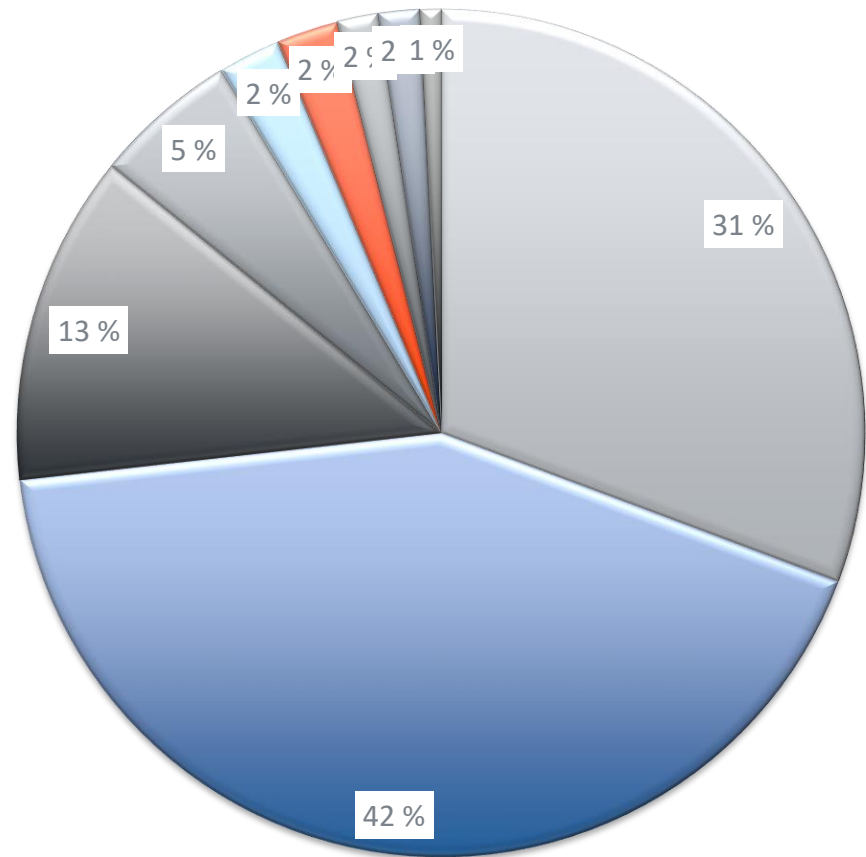
It is not likely that price for electricity will return to 2019 levels even if the war ends



TCO doubled price for each kWh (compared with 2019)

The cost distribution defines/prioritizes the development activities that will lead to a significant reduction of TCO

- **Evaluation** of cost segments over 14 years “Operating Life”
 - Energy Costs based on a defined “Load Profile”
 - Integration Costs include “Second Life”



Main Cost Drivers	
• Initial Invest	31%
• Energy	42%
• Integration	13%
• Spare Parts Controller	5%
• SW-Licenses & SW-Upgrades	2%
• Spare Parts Robot Arm	2%
• Maintenance Consumables	2%
• Refurbishment Analysis	2%
• Training	1%

*Cost calculated on MTBF figures

KUKA

The background features a complex, abstract geometric pattern. It consists of numerous interconnected, semi-transparent polygons in shades of grey and white, creating a mesh-like structure. In the center, there is a prominent circular motif composed of overlapping, faceted shapes in warm tones of orange, yellow, and white, resembling a stylized sun or a crystalline structure.

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