FRANKA EMIKA CONNECTS.

Redefining Robotics

At Franka Emika – a deep-tech company from Munich, Germany – we redefined robotics with the world's most advanced robotic system Panda Powertool. In pursuit of high-performance and accessibility, we have combined human-centered design with trustworthy German engineering, giving rise to a masterpiece of technology. Highest mechatronic integration, exceptional soft-robot performance, as well as advanced and extendable functionalities unleashed unprecedented usability, best affordability and unlimited scalability.

Establishing a community

Having set the groundwork by redefining robotics, a broad spectrum of users gained access to an empowering technology. With decades of experience in world leading soft-robotics research, in 2017 we started shipping to experts worldwide to share our breakthrough. Besides elevating robotics and control research, our AI-enabled robot platform is being used by the most renowned Machine Learning and Artificial Intelligence research institutes as well as in health care and education. We then established an global partner network of software and hardware developers, distributors and solution providers to transfer our technology into elegant, robust and profitable robot-assisted automation solutions. Panda Powertool thus became the fastest selling industry-suited robotic system within the first year of delivery. Since then, users – from highly-skilled robotics professionals to factory workers of small medium businesses as well as global enterprises – are benefiting from this novel easy-to-use, flexible, cost-efficient and scalable approach.

Introducing Franka World

After redefining robotics and establishing a community, we launched a novel digital robotics platform to interconnect the digital with the physical world. Franka World enables community interaction between researchers, partners, customers, developers, suppliers and… robots to push the frontiers of Industrie 4.0. Besides communication, everyone is able to easily gain integrated access to products, services and management of entire robot fleets, independent of their physical location.

We are committed to create novel robotics platform technologies, improve performance and accessibility for everyone to overcome one of the biggest challenges of modern society, relieving an entire generation of tedious, potentially dangerous, vastly time-consuming and monotonous labor. We strive for a world where everyone can use a robot and we can reach that by connecting the world.

Franka Emika – designed, developed and made in Germany.

Keep creating and think beyond!

Simon
CEO & Co-Founder

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PANDA SOLUTION

Groundbreaking innovation for cost-efficient and scalable solutions

We redefined robotics with the world's most advanced robotic system Panda Powertool, the fastest selling industry-suited robotic system. Our customers – from SMBs to global enterprises – profit from this novel easy-to-use, flexible, cost-efficient and scalable solution.

VERSATILE TO FIT YOUR BUSINESS

Panda can serve mass production, as well as high-mix low-volume production runs. This requires flexibility, from the setup of new workstations to adjustments of existing tasks. Panda's soft-robot performance allows production processes that require precision, force application and sensitive handling. Thus, Panda perfectly fits the 3C industry across all types of applications, especially testing, inspection, handling, packaging and assembly.

INDUSTRY-READY AND IMMEDIATE TO INTEGRATE

Panda can be integrated quickly into an existing production infrastructure and supports modern and commonly employed industrial communication protocols. With its small footprint and 7 axes, Panda can reach far-off as well as very close to its own base, an ideal capability for constrained environments. The entire system comes in one box delivery, can be powered up by general-purpose power outlets and is ready to use within minutes. With the launch of Franka World, you can push the frontiers of Industrie 4.0 and its advantages, gaining integrated access to products, services and management of entire robot fleets, independent of their physical location.

ACCESSIBLE FOR EVERYONE

Panda offers the easiest and fastest workflow-based user experience. Robot apps represent modular building blocks of production processes such as grasping, plugging, insertion and screwing which can be arranged to create entire tasks in no time. These tasks can quickly be deployed on multiple robots to remarkably reduce setup costs. Additionally, a broad spectrum of users – from highly-skilled robotics professionals to factory workers – can be trained quickly without any prior know-how of Panda.

HIGHEST ROI IN THE MARKET

The outstanding soft-robot performance unleashed by Panda, Franka Emika's masterpiece of technology, is stunningly affordable due to proprietary technology, optimized design, and mass production. Besides that, versatility, industry-readiness, easy-integration and accessibility ensure the highest return on investment for your company.

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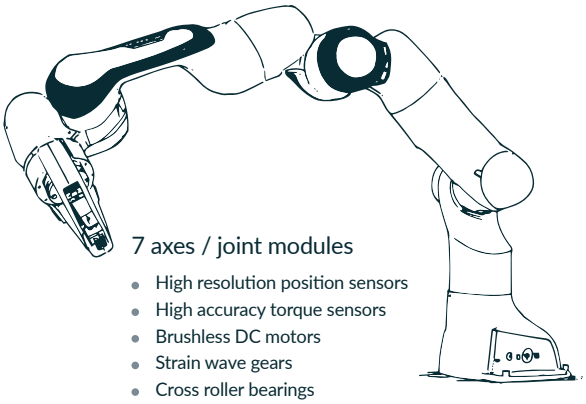
PANDA POWERTOOL

Human-centered design combined with trustworthy German engineering

Panda has been designed to be lightweight and manufactured in large quantities. It incorporates the highest mechatronic integration and is equipped with more than a hundred sensors. Our payload to moving mass ratio of 1 to 4 was achieved by diligent mechanical design and development all the way from system to component level. As a global product with local roots, Bavaria is home to Panda's manufacturing site and our supply chain is nearly 90% European.



7 axes / joint modules

- High resolution position sensors
- High accuracy torque sensors
- Brushless DC motors
- Strain wave gears
- Cross roller bearings

Soft-robot performance

MOTION

Panda incorporates the features of a classical stiff industrial robot with a pose repeatability of +/- 0.1 mm and a negligible path deviation even at high velocities of up to 2 m/s. This allows precise, robust and fast execution of manufacturing processes.

FORCE

Sensing

Inspired by the human sense of touch, Panda is equipped with link-side torque sensors in all 7 axes. Outstanding resolution, accuracy and repeatability allow the robot to dynamically sense the surrounding environment, even exceeding the performance of most purpose-made force sensors.

1 kHz Control

Panda can be used to apply forces with a minimum of 0.05N in order to conduct delicate tasks, for instance pressing, insertion, and screwing. Continuous and accurate fine-tuning of forces is also a prerequisite for applications such as contour tracking, polishing and grinding.

INTERACTION

Panda features adjustable guiding modes that compensate gravity and friction to reduce the perceived weight up to a factor of 60, ensuring smooth and elegant physical interaction between human and machine. Our sophisticated sensors, control algorithms and internal model allow prompt detection and reaction upon unwanted collisions within milliseconds. Besides that, Panda's flexible torque-controlled joints can act compliant or stiff in the same way humans contract or relax their muscles to adapt to a task or the environment.

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PANDA - DATASHEET [1]

April 2019

HARDWARE

Arm

Degrees of freedom	7
Payload	3 kg
Workspace	see backside
Maximum reach	855 mm
F/T Sensing	link-side torque sensors in all 7 axes
Expected nominal lifetime [3,4]	20,000 h
Joint position limits [°]	A1, A3, A5, A7: -166/166 A2: -101/101 A4: -176/-4 A6: -1/215
Mounting flange	DIN ISO 9409-1-A50
Installation position	upright
Weight	~ 17.8 kg
Moving mass	~ 12.8 kg
Protection rating	IP30
Ambient temperature [2]	15 – 25 °C (typical) 5 – 45 °C (extended)
Air humidity	20 – 80 % non-condensing
Interfaces	• ethernet (TCP/IP) for visual intuitive programming with Desk • input for external enabling device • input for external activation device or safeguard • Control connector • Connector for end-of-arm tooling

Control

Controller size (19")	355 x 483 x 89 mm (D x W X H)
Supply voltage	100 – 240 V_{AC}
Mains frequency	47 – 63 Hz
Power consumption	• max. 600 W • average ~ 300 W
Active power factor correction (PFC)	yes
Weight	~ 7 kg
Protection rating	IP20
Ambient temperature	15 – 25 °C (typical) 5 – 45 °C (extended)
Air humidity	20 – 80 % non-condensing
Interfaces	• ethernet (TCP/IP) for internet and/or shop-floor connection • power connector IEC 60320-C14 (V-Lock) • Arm connector

SOFT-ROBOT PERFORMANCE

Motion

Joint velocity limits [°/s]	A1, A2, A3, A4: 150 A5, A6, A7: 180
Cartesian velocity limits	up to 2 m/s end effector speed
Pose repeatabillity	<+/- 0.1 mm (ISO 9283)
Path deviation [3]	<+/- 1.25 mm

Force

Sensing [3]

Force resolution	<0.05 N
Relative force accuracy	0.8 N
Force repeatability	<0.05 N
Force noise (RMS)	<0.035 N
Torque resolution	<0.02 Nm
Relative torque accuracy	0.15 Nm
Torque repeatability	<0.05 Nm
Torque noise (RMS)	<0.055 Nm

1 kHz Control [3]

Minimum controllable force (Fz)	0.05 N
Force controller bandwith (-3 dB)	10 Hz

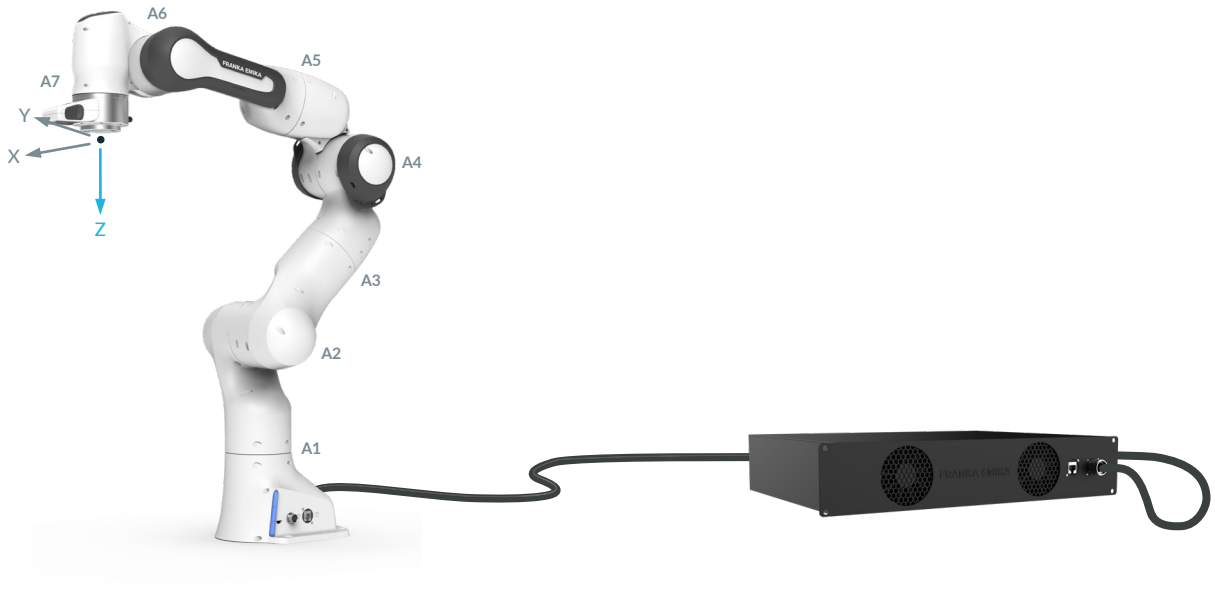
Force range [N]	Nominal case	Best case
Fx	-125 – 95	-150 – 115
Fy	-98 – 98	-270 – 270
Fz	-50 – 150	-115 – 155
Torque range [Nm]	**Nominal case**	**Best case**
Mx	-10 – 10	-70 – 65
My	-10 – 10	-11 – 11
Mz	-10 – 10	-11 – 11

Interaction

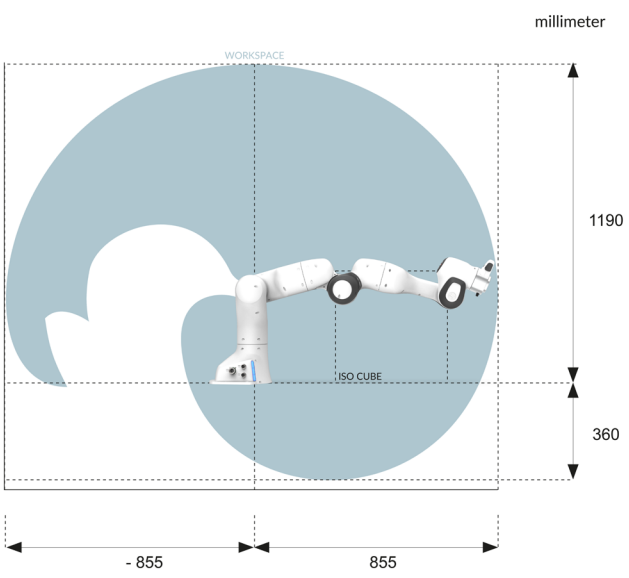
Guiding force	~ 2 N
Collision detection time	<2 ms
Nominal collision reaction time [3,4]	<50 ms
Worst case collision reaction time [3]	<100 ms
Translational compliance / stiffness	0 – 3000 N/m
Rotational compliance / stiffness	0 – 300 Nm/rad
Monitored signals	Joint position, velocity, torque Cartesian position, velocity, force

ADD-ONS

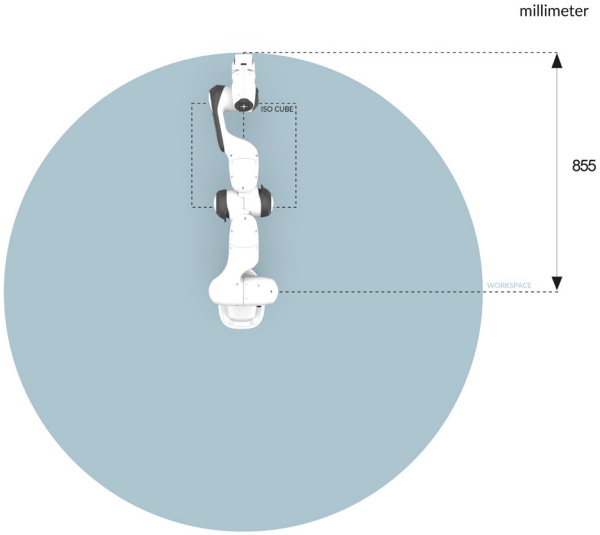
Safety retrofit option with safety-rated PLC	PLd Cat. 3 • Safe torque off (STO) • Safe OSSD inputs
Fully integrated end effectors	• 2-finger gripper • Vacuum gripper
Fast mounting	Panda Paw
Travelling case	Panda Case
Research interface	1kHz Franka Control Interface
Fieldbuses	Modbus/TCP, OPC UA, Profinet



Arm & Control



Workspace side-view



Workspace top-view

1. Technical data are subject to change.
2. Lifetime and performance can potentially be reduced when operating outside the typical temperature range.
3. Based on ISO 9283 (Annex A), specified values refer to a workspace of 0.4 x 0.4 x 0.4 m centered at [0.515, 0.0, 0.226] m, with the Z-Axis of the flange oriented parallel to earth-gravity and the elbow positioned upwards.
4. Nominal conditions (66% load).

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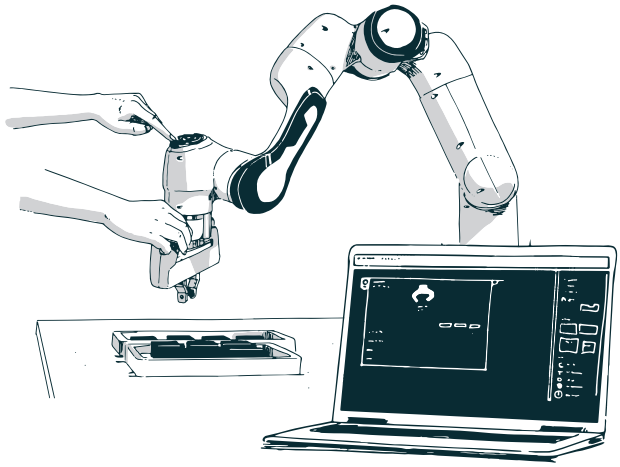
WORKING WITH PANDA

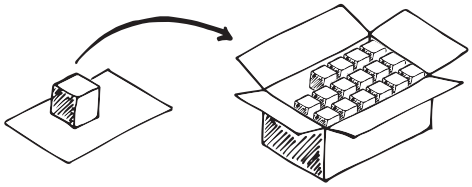
Workflow-based programming

Panda offers the easiest and fastest workflow-based user experience. Robot apps incorporate the entire complexity of the system and represent modular building blocks of a production process such as grasping, plugging, insertion and screwing. Using Desk – Franka Emika's browser based interface – apps can be arranged to create entire tasks in no time. These tasks can quickly be adapted, reused or deployed on multiple robots to remarkably reduce setup costs. Individual apps and tasks can be parameterized by means of showing Panda poses by demonstration, or adding context relevant parameters such as speed, duration, forces, and triggering actions.

Developing apps and services

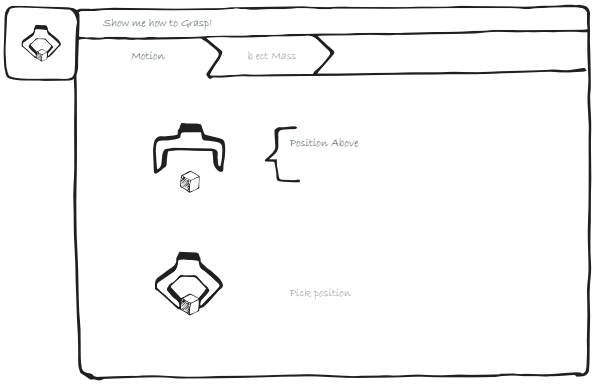
Our programming paradigm offers the possibility to develope new apps with customized interfaces, user dialogues, as well as specific and extended functionalities. Besides, services can easily be created to seamlessly integrate software and hardware extensions. Apps and services can then be deployed through Franka World in order to reach a large community, accelerating the distribution of your solution and multipling your business case.





A. Set up the task that you would like to automate.

B. Arrange your apps into a sequence to recreate the workflow.



C. Teach Panda and parameterize each app via dialog-based interaction.