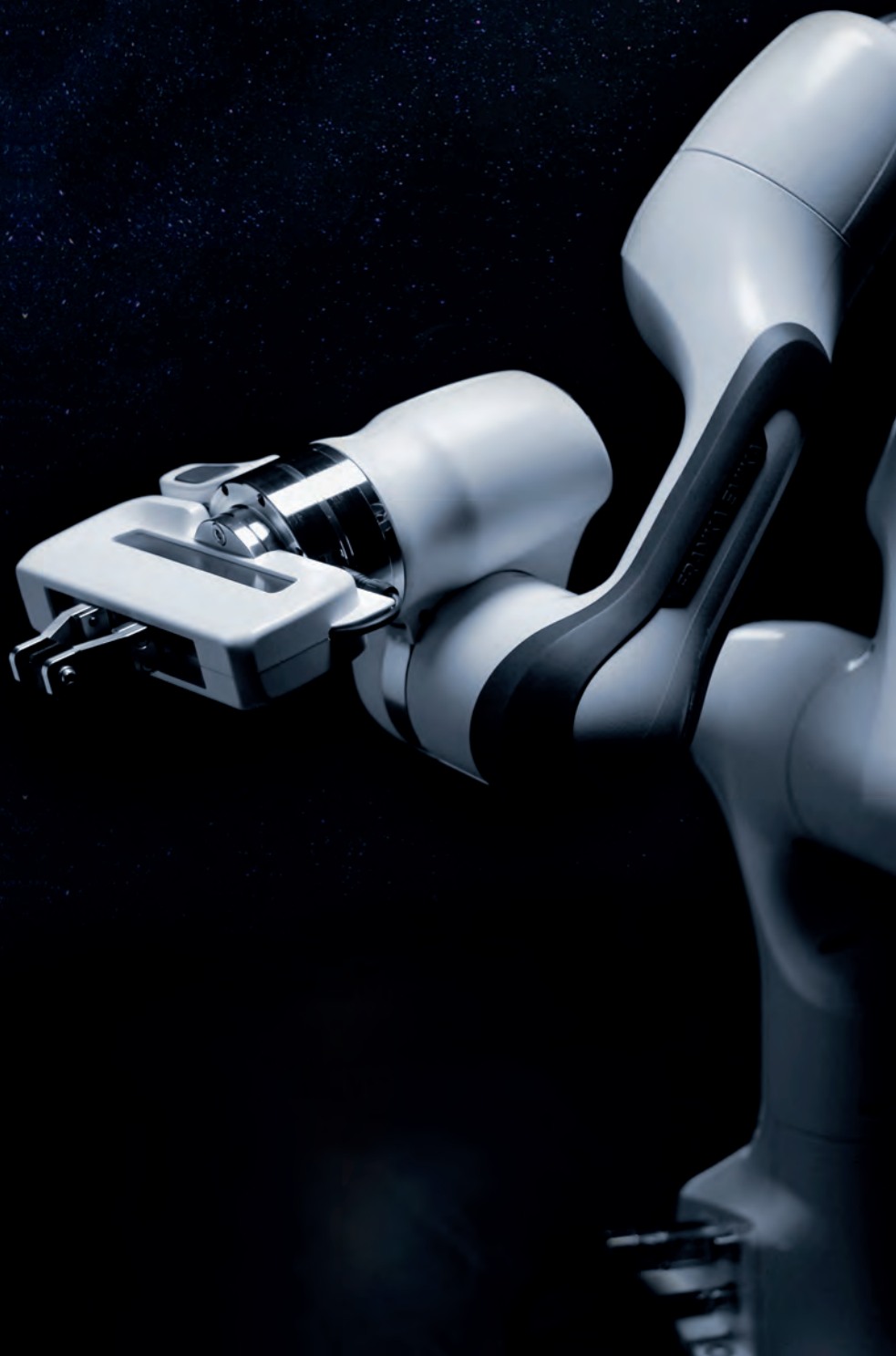
FRANKA EMIKA



FRANKA EMIKA

FRANKA EMIKA

Designed, developed and made in Germany.

Enabling automation for anyone, anywhere.

At Franka Emika – a deep-tech company from Munich, Germany - we are committed to create novel robotics platform technologies, with improved 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. In pursuit of high-performance and accessibility, we have combined human-centered design with trustworthy German engineering, giving rise to a masterpiece of technology. We have redefined robotics with the sensitive, smart and lightweight robotic system Panda Powertool, that makes robotics intuitive and scalable for every production area.

ROBOT CAPABILITIES

- Agile thanks to its 7 axes, with pose repeatablity of +/- 0.1mm and negligible path deviation even at high velocities.
- Ultra sensitive thanks to link-side torque sensors in all 7 axes.
- Fast reaction to contacts and fine tuning of forces thanks to 1kHz control.
- Multiple operating levels thanks to intuitive work-flow-based programming and powerful expert control paradigms.
- Highly interconnected thanks to access to Franka World and support of all major industry-standard functions.

YOUR BENEFITS

- Precise, robust and fast execution of production processes, even in constrained environments.
- Detection of objects with the sense of touch, and force/torque feedback for tasks like insertion and screw driving.
- Constant modulation of forces: a prerequisite for tasks like contour tracking and polishing.
- Accessible by a broad spectrum of users, from highly-skilled robotics professionals to factory workers.
- Immediate to install and fast ROI, ideal for both mass production and high-mix low-volume production runs.

gimelli ENGINEERING

"With Panda, I have the perfect tool to digitalize tricky assembly tasks quickly and cost-effectively."
Michel Perret, CEO - Gimelli Engineering AG

flex

"My Industry 4.0 Team has enjoyed the collaboration and teamwork with Franka Emika in developing a factory-of-the-future showcase featuring their Panda robot, and is particularly excited about the potential of this technology they are rolling out."
Mike Doiron, CTO - Global Operations, FLEX

TQ

"Thanks to our experience in manufacturing Panda and our close cooperation with Franka Emika, at TQ we are able to develop perfectly coordinated and complete solutions for ourselves and Panda's users, too."
Sören Brüchmann, Division Manager of the TQ Franka Solution Center

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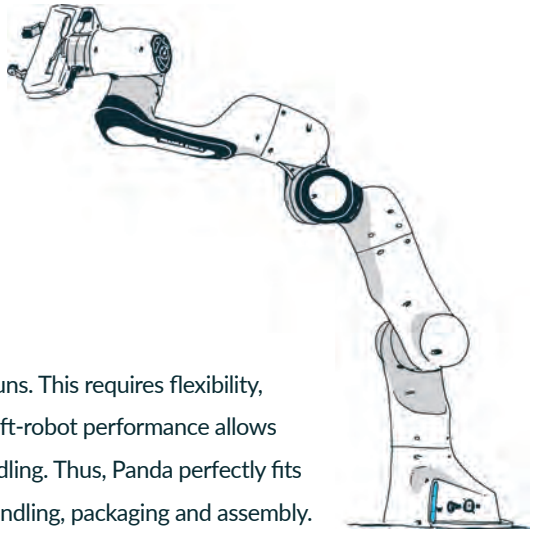
PANDA SOLUTION

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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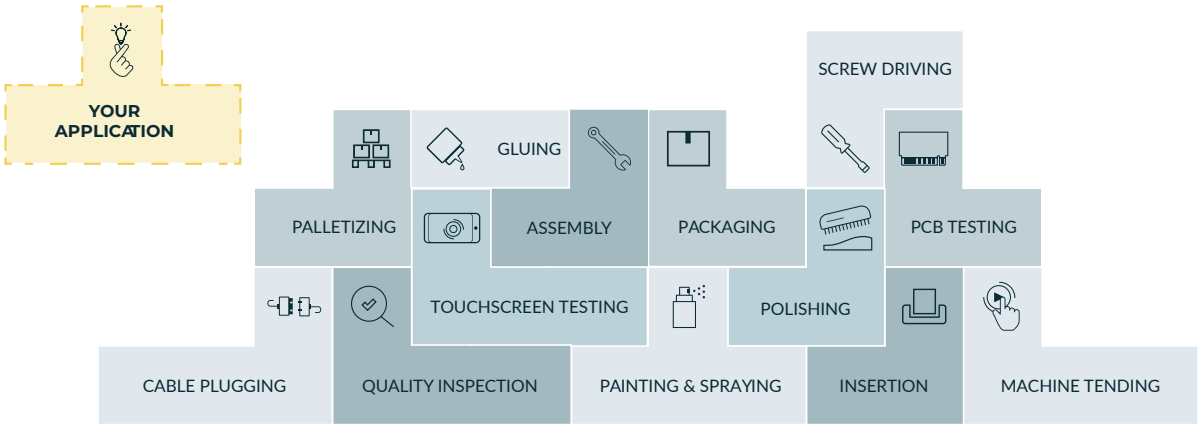
VERSATILE ACROSS SPECIFIC USE CASES

Immediate to install and get started in any industrial environments. Exceptionally versatile across applications thanks to its technological capabilities and flexible programming approach. This makes Panda a perfect powertool to automate your tasks effectively and a best fit for a great number of use cases from lot size 1 to mass production.



Panda at work

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A SUCCESS STORY

Sensitive and robust Screw Fastening Solution by TQ

TQ Systems developed a screw fastening solution in collaboration with Atlas Copco. As Franka Emika's Solution Partner, TQ offers their screw fastening solution to Panda's users, who can benefit from a ready-to-use, robust and efficient system. The solution – among many other automated tasks – is also part of the assembly line to produce Panda itself at TQ in Bavaria, Germany!

A snapshot from TQ's elegantly automated screw fastening solution.

Representative apps and workflow employed to intuitively set up the screw fastening solution.

"The TQ Screw Fastening Solution is a perfect example of how we enable our customers to use Panda. Once the hardware is set up, a worker is able to automate a screw fastening operation within 10 min. This makes Panda by far the most flexible screw fastening robot on the market."

Sören Brüchmann, Division Manager of the TQ Franka Solution Center

A worker shows Panda the position of the screws.

The end effector uses Panda's sensitivity to pick and fasten the screws successfully.

Screws are fastened robustly, with any error detected.

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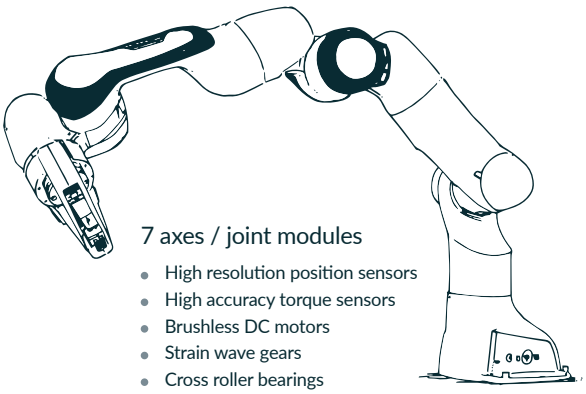
PANDAPOWERTOOL

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.

DATA SHEET [1]
ROBOT ARM & CONTROL

Release Version: April 2020

HARDWARE

Arm

Degrees of freedom	7
Payload	3 kg
Workspace	see backside
Maximum reach	855 mm
Force/ Torque 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
Power consumption	• max. ~ 350 W • typical application ~ 60 W
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 effector

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	~ 80 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	A1, A2, A3, A4: 150°/s A5, A6, A7: 180°/s
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	0.15 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)	0.005 Nm

1 kHz Control [3]

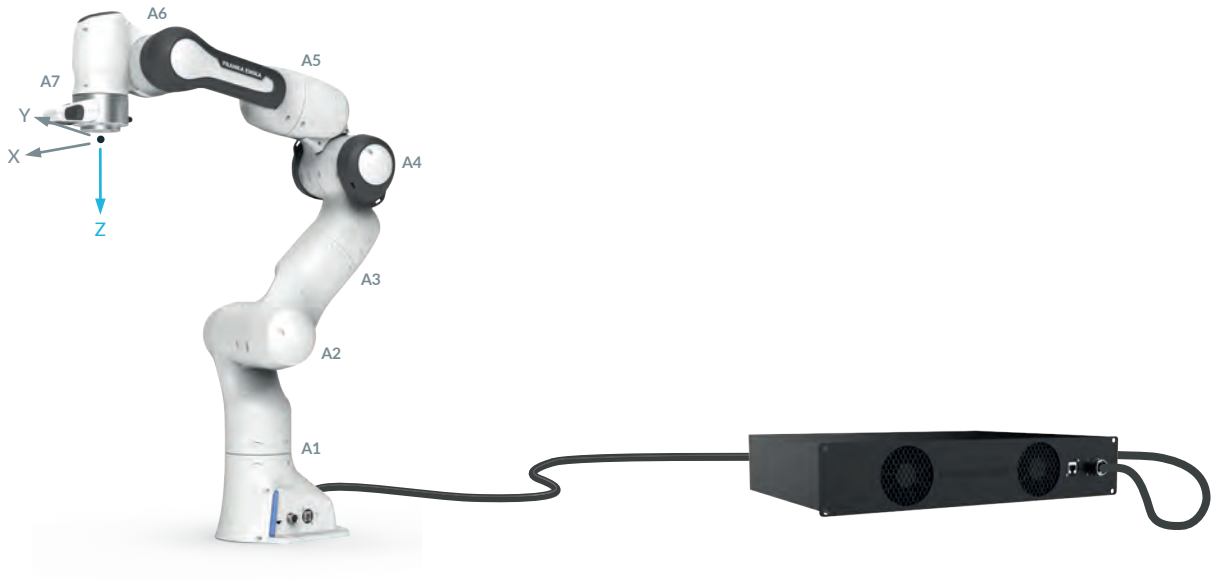
Minimum controllable force (Fz)		0.05 N
Force controller bandwidth (-3 dB)		10 Hz
Force range [N]	Nominal case	Local best case
Fx	-125 – 95	-150 – 115
Fy	-100 – 100	-275 – 275
Fz	-50 – 150	-115 – 155
Torque range [Nm]	Nominal case	Local best case
Mx	-10 – 10	-70 – 70
My	-10 – 10	-16 – 12
Mz	-10 – 10	-12 – 12

Interaction

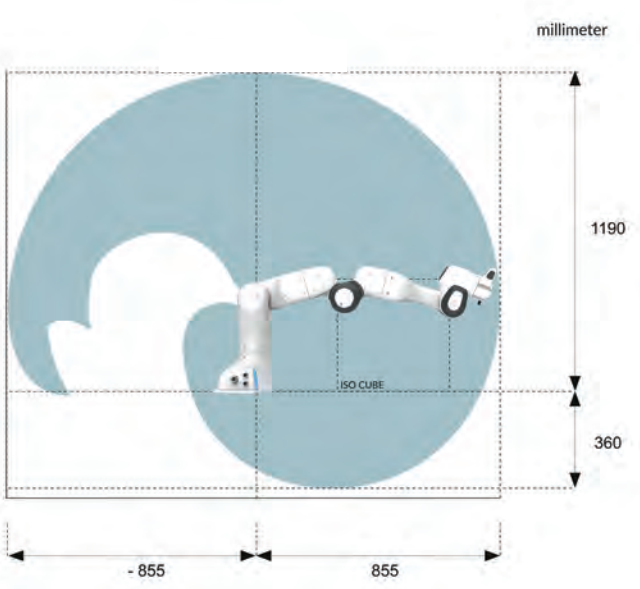
Guiding force	~ 2 N
Collision detection time	<2 ms
Nominal collision reaction time [3,4]	<50 ms
Worst case collision reaction time [3]	<100 ms
Adjustable translational stiffness	0 – 3000 N/m
Adjustable rotational stiffness	0 – 300 Nm/rad
Monitored signals	joint position, velocity, torque cartesian position, velocity, force

ADD-ONS

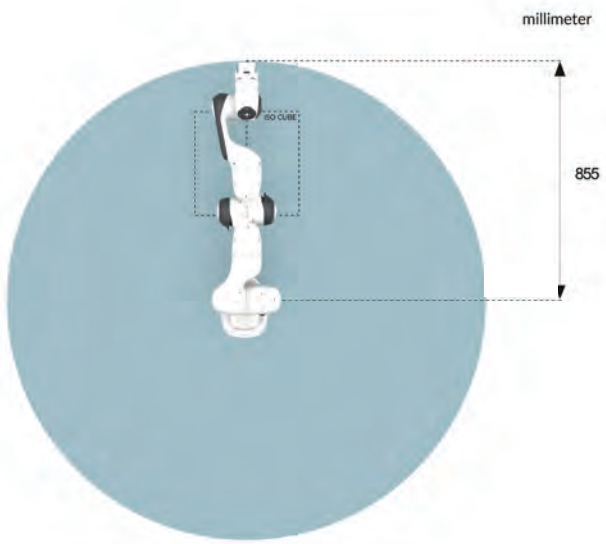
Safety retrofit option with safety-rated PLC	PLd Cat. 3 • Safe torque off (STO) • Safe OSSD inputs
Fully integrated end effectors	• 2-finger gripper • Vacuum gripper
Fast mounting	Clamping Adapter
Demonstration	Pop-up Box
Research interface	1kHz Franka Control Interface (FCI)
Fieldbuses	Modbus/TCP, OPC UA



Arm & Control



Side-view: reachable space for the end effector flange



Top-view: reachable space for the end effector flange

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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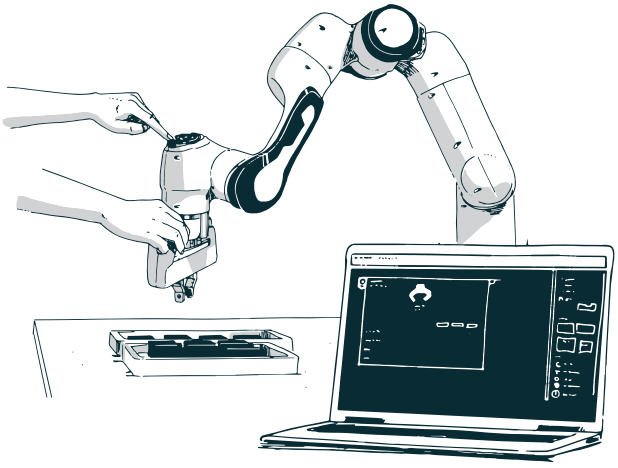
WORKING WITH PANDA

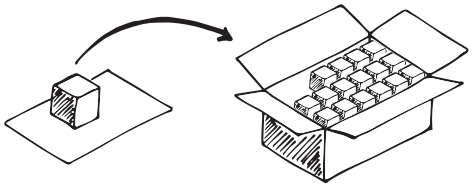
Workflow-based programming for every skill level

Panda offers the easiest and fastest workflow-based programming 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 as an expert

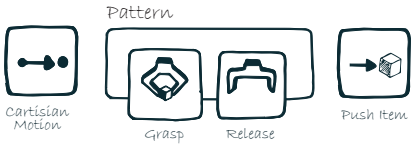
Our programming paradigm offers access through various programming levels like the possibility to develop new apps with customized interfaces. Besides, services can easily be created to seamlessly integrate software and hardware extensions. Apps and services can then be deployed through Franka World in order to reach a large community, accelerating the distribution of your solution and multipling your business case.



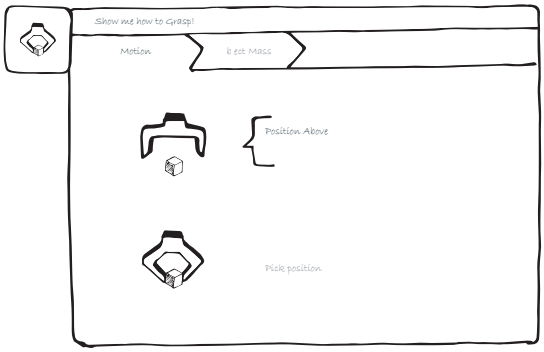


A. Set up the task that you would like to automate.

B. Pick necessary pre-programmed blocks – our apps – from https://world.franka.de/



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

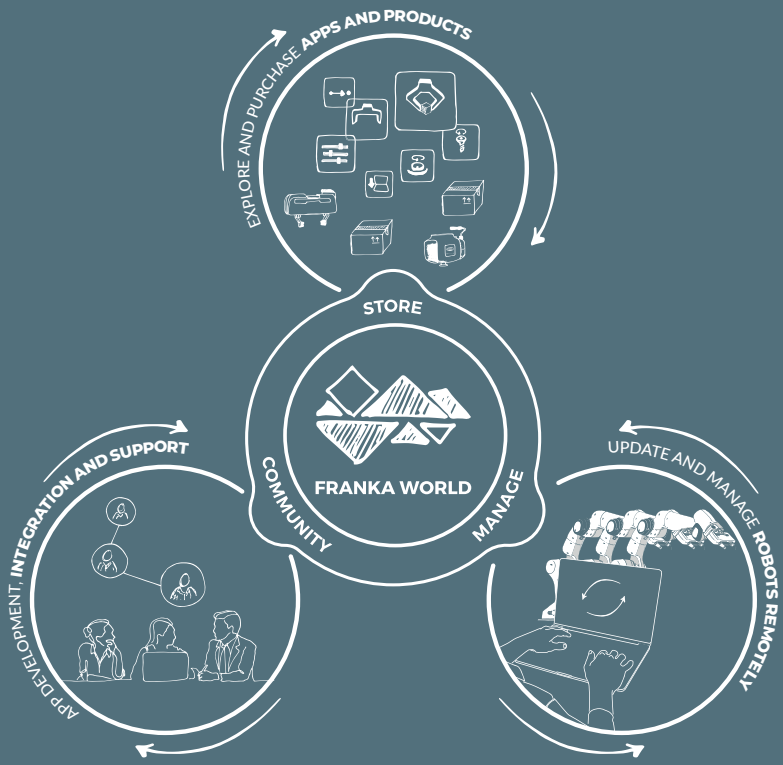


D. Teach Panda by manual guidance and parameterize each app via dialog-based interaction.

FRANKA WORLD

Franka World connects

Franka World is an online platform that interconnects Franka Emika's customers, partners, developers and robots!
By bringing Pandas into the cloud, all parties can mutually benefit from each other's interaction, and gain integrated access to the products and services provided by Franka Emika and our network of qualified partners.



The benefits of Franka World

Franka World provides customers with centralized and remote management of their fleets of Franka Emika robots, and the possibility to access the store, to browse a continuously growing portfolio of accredited software and hardware extensions. Franka World also draws together an active and passionate community of professionals who will contribute to your success with integration services and support.

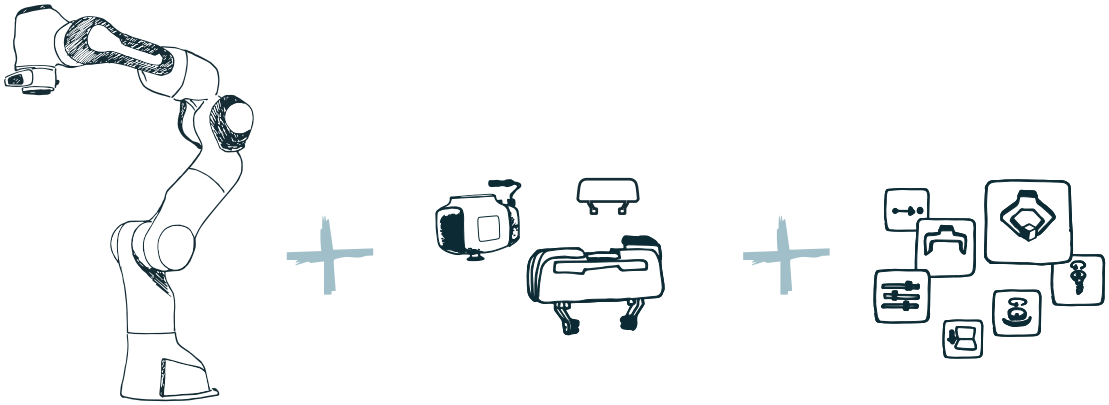
- Register robots
- Browse Store
- Try out apps and features
- Purchase robots, end-effectors, apps and features
- Install apps and features on robots
- Move apps and features between robots
- User role management
- Overview of registered robots
- Robot system updates
- Share tasks between robots
- Robot task status dashboard
- Robot live data dashboard
- Upload apps
- Access support and integration services

FRANKA EMIKA

MODULARPRICING

See how you could solve your automation challenges and save costs with us!

Our ready-to-go solutions are a perfect fit for common applications, as well as can be a great starting point to build upon a more complex automation case. Once you have identified an automation need, contact our sales team at sales@franka.de and they will guide you through the process that includes the following steps:



A. Purchase the Panda robot system. B. Choose your end effector. C. Choose your software.

Add value with consulting and integration services.

If your automation project is more complex and requires a personalized solution, the integration and development costs of our partners will be added. Please talk to our sales team and they will connect you to one of our partners, who will assist in designing the best solution for you and in determining if unique software and hardware extensions are required.

Partners' services include:

- reselling and distributing Panda robots locally or globally
- consulting customers about the best robot-application fit
- consulting about risk assessment prior to integration
- integrating Panda into existing production lines accordingly
- developing solutions which might include both custom hardware and software
- troubleshooting and assisting the customer with first line support
- providing training and education services

- Product Developers
- App Developers
- Solution Providers
- Resellers
- Education Providers

For more details on our partners and to choose the right one, visit our webpage https://franka.de/partners or send us an email to sales@franka.de, and our team will promptly redirect the lead to the most suitable partner.
Are you interested in becoming a partner company? Consult our CONTACTS page and connect to our partner managers.

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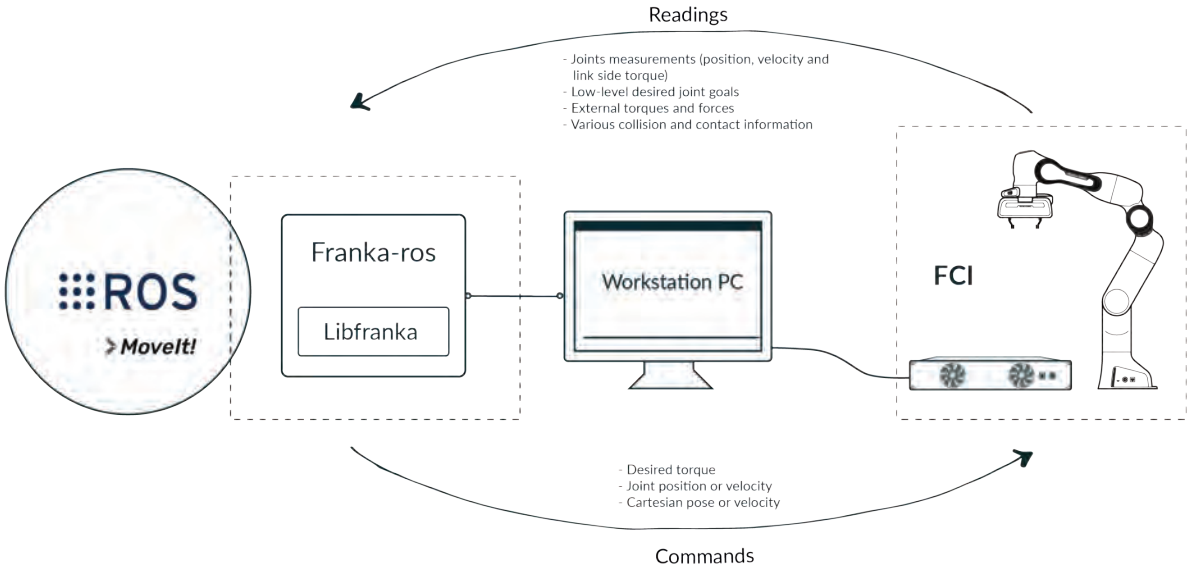
PANDA FOR RESEARCHERS

The ideal platform for research

Panda is the ideal platform to conduct research on and test e.g. control and motion algorithms, grasping strategies, interaction scenarios and machine learning, as it features the add-on Franka Control Interface (FCI). FCI allows a fast low-level bidirectional connection to the robot's Arm and Hand.

Franka Control Interface (FCI)

Activating the FCI* unlocks the possibility to connect your workstation PC to the Panda system, using a fast and direct low-level bidirectional communication. It provides the current status of the robot and enables its direct control (1 kHz).



Documentation about Franka Control Interface and how to use it can be found at https://support.franka.de, which also includes source code and documentation of the open source packages libfranka and franka_ros.

libfranka provides a C++ interface which can run on a workstation PC. It enables you to connect your own applications via standard Ethernet to a Panda with activated FCI.

franka_ros connects Panda with the entire ROS ecosystem. It integrates libfranka into ROS Control, and includes URDF models and detailed 3D meshes of our robots and end effectors, which allows visualization (e.g. RViz) and kinematic simulations. Additionally, MoveIt! integration makes it easy to move the robot and control the gripper.

** FCI cannot be used for commercial purposes. If your plan is to deploy robots for commercial purposes, then Panda in combination with suitable App Packages is your ideal power tool.*

Franka Emika GmbH

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