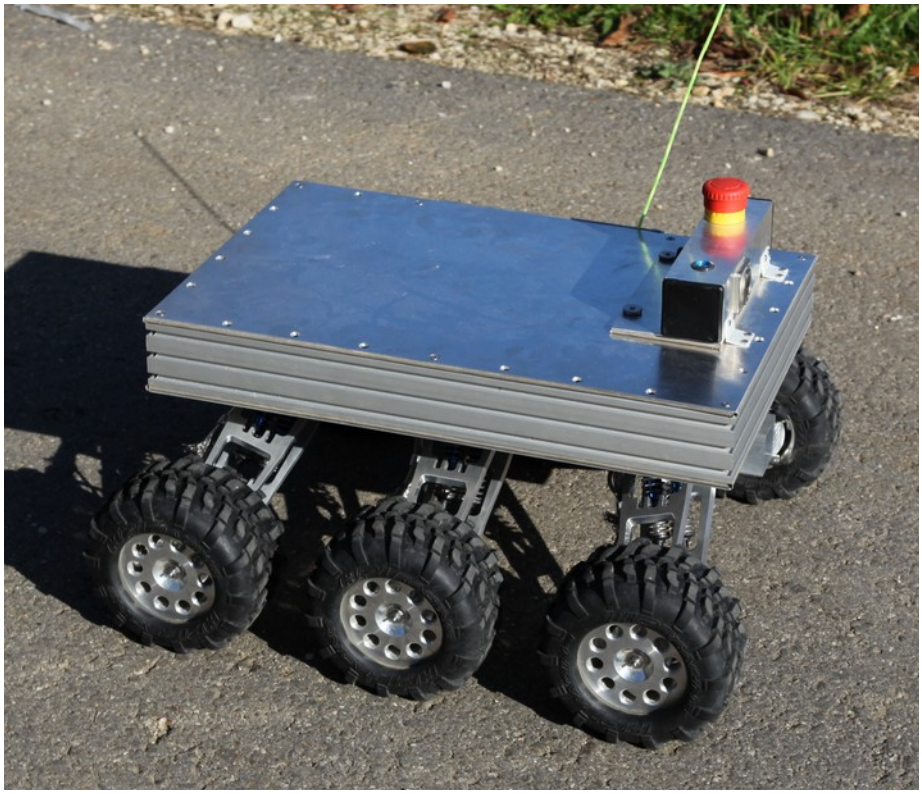
Innok TX

High-Speed Off-Road Robotic Platform



Fast – Off-road – Flexible

- **Up to 10 m/s**
- **Weatherproof IP54**
- **Fully suspended**
- **Silent**
- **Customizeable**
- **Extendable**

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EUROPÄISCHE UNION

The Innok TX is a six wheeled robotic platform well suited for outdoor use. Equipped with independent suspension and reaching maximum speeds up to 10 m/s it shows its strengths especially in the open terrain.

Innok Robotics configures your Innok TX according to your custom requirements. No matter if on-board PC, sensors or actors: You can simply choose from a number of additional equipment just as you like.

You may also integrate your own hardware by mounting it to the industry-standard aluminum profiles at the vehicle body. The incorporated power supply provides the voltages you need.

Afterwards you control the Innok TX by using the built-in CAN Bus which also makes a range of measured data accessible.

Innok TX

Innok TX – Next generation robotic platform

The Innok TX uses a novel concept for robotic platforms. It is equipped with an elaborate suspension and can reach speeds up to 10 m/s and more, owing to its drivetrain. Thus, it is interesting for research areas and applications where conventional robotic platforms were not fast enough up to now.

This is made possible by one gearless hub motor within each of the six wheels. Every motor is provided with its own independent and freely configurable controller. For use at high speeds this allows the implementation of a vehicle dynamics control which can manipulate every single wheel independently.

In order to get the most out of the motors the Innok TX uses a system which adapts the engines to the required load. In continuous operation the motor temperatures are kept at a safe level. However, temporarily the motor controllers can demand a many times higher amount of torque than in continous operation. This fuzzy logic control dynamically adapts output power without any hard switchover. As a result, for a limited time you can call an impressive power of up to 2 kW and a thrust of up to 150 N. Nevertheless, the Innok TX can move almost silently due to its gearless motors.

How to work with the Innok TX

The vehicle-internal communication is based on a CAN Bus (CAN 2.0A), which is used to manage the motor controllers. Additionally, it delivers all vehicle information like cartesian odometric data, speeds and motor currents. The bus can be accessed by an externally mounted USB port.

If you choose the optional on-board PC (order no. IR-INTTX0B01), you get a ready to use system with pre-installed Robot Operating System (ROS). You can connect to the robot wired or wireless via (W-)LAN and run your algorithms directly on the Innok TX.

Integrate your own hardware in no time

Simply mount your own hardware to the standard aluminum profile rails with a groove dimension of 5 mm which is compatible with common profile rail systems like those from Bosch or Item. With the optional mounting kit (order no. IR-MOKTXC000) you receive a set of profile rails of different lengths and numerous connectors which you can mount in any way you want to attach your hardware to the Innok TX even quicker. The integrated power distribution system offers you regulated voltages of 3.3 V, 5 V and 12 V as well as the battery voltage.

Technical Data

Interfaces	
Data Interfaces	• CAN 2.0A • USB
Data Output	• odometry (cartesian) • speed • yaw rate • raw motor encoder data • motor currents • motor temperatures
Electric Interfaces	• 3.3 V max. 5 A (regulated) • 5 V max. 4 A (regulated) • 12 V max. 3 A (regulated) • 2 x battery voltage max. 20 A • charging connector
Software	• ROS integration • sample programs • demos
Power Supply	
Standard Battery	• LiPo • 22.2 V • 111 Wh
Battery Autonomy (without aux. systems)	• low load: ca. 7.5 km (ca. 90 min) • high load: ca. 2.5 km (ca. 30 min)
Charging-Time	• 30 min (fast charge)
Battery-Flexibility	• battery tray takes different sizes of batteries • max. 270x140x60 mm • voltage range 10 to 30 V
Chassis	
Suspension	• separate • independent • adjustable • kinematic body roll support
System	• springs • oil pressure shocks
Chassis Clearance	• max. 133 mm
Range of Spring	• max. 80 mm
Steering	• differential

Drive	
Traction	• 6-WD / AWD
Motors	• 6 motors • brushless • gearless • measurement of absolute angle
Motor Controller	• 6 controllers • 120 MHz ARM Cortex-M3 microcontroller
Motor Control System	• field oriented • fuzzy-logic torque management system
Motor Power	• max. 2 kW (combined)
max. Speed	• 10 m/s (e.g. on mowed meadow) • limit adjustable
Gradeability	• 50% (unloaded)
Construction	
Dimensions LxWxH	• max. 560x560x370 mm (without sensors)
Materials	• chassis: aluminum • body: aluminum
Weight	• ca. 16 kg (including standard battery)
Load Capacity	• max. 10 kg (recommended) • more load possible, reduced mobility
Ambient Temperature	• min. -20°C • max. +40°C
Type of Protection	• IP54

System integration by Innok Robotics

On request, Innok Robotics performs the complete integration of sensor technology onto the Innok TX. Simply chose from various components like laserscanners, ultrasonic sensors or IP cameras. For a list of components offered for integration by Innok Robotics please refer to page 4.

A powerful suspension ensures optimal performance

In oder to acquire sharper and more stable sensor data and to protect your components from shocks even at high speeds the Innok TX has a fully spring-borne independent suspension. The supplemental oil pressure shock absorbers ensure the wheels' contact to the ground at any time. The suspension offers a special kinematic system which acts contrary to lateral body roll to keep the vehicle upright even in hard turns at high speeds.

The lightweight and robust aluminum chassis of the Innok TX is especially designed for the potential of the drivetrain and the resulting speeds and forces. You can exactly adapt the Innok TX to your needs by its independently adjustable suspension with a range of spring of up to 80 mm. Thus, you stay completely free referring to maximum weight, weight distribution, traversed ground and preferred speed. For special requirements Innok Robotics offers dimensioning of the springs for a defined case of application (order no. IR-INTTX0F01).

Since driving fast is most fun outdoors...

As a fast robotic platform for outdoor use the Innok TX is protected against intrusion of water and dust by type of protection IP54. From asphalt to sand, forest and field soils right up to mud and snow the Innok TX can drive on various grounds. With its chassis clearence of 133 mm it can even pass higher obstacles without getting stuck.

Especially due to its high speeds the Innok TX opens up plenty of new potential applications which were not imaginable with other robotic platforms up to now. By a number of upgrade options with different hardware components you can customize your Innok TX or you simply integrate your own hardware.

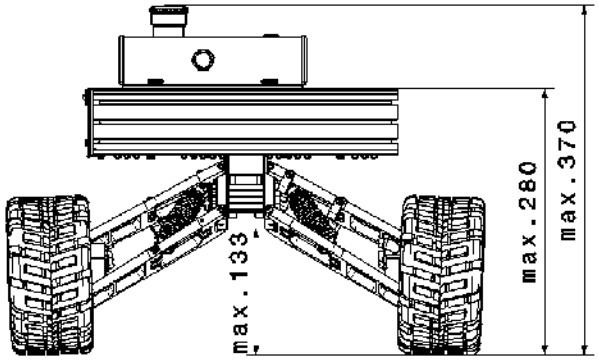
How to contact us

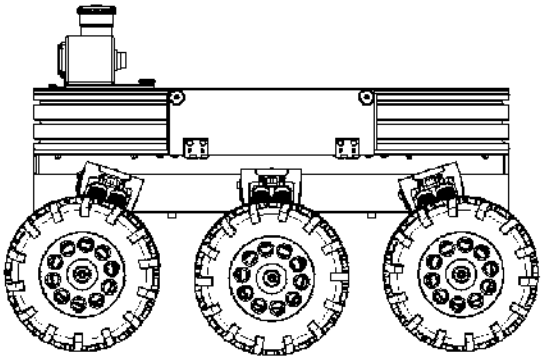
If you, as well, want to use the potential of this innovative product or if you have questions or want to find out more:

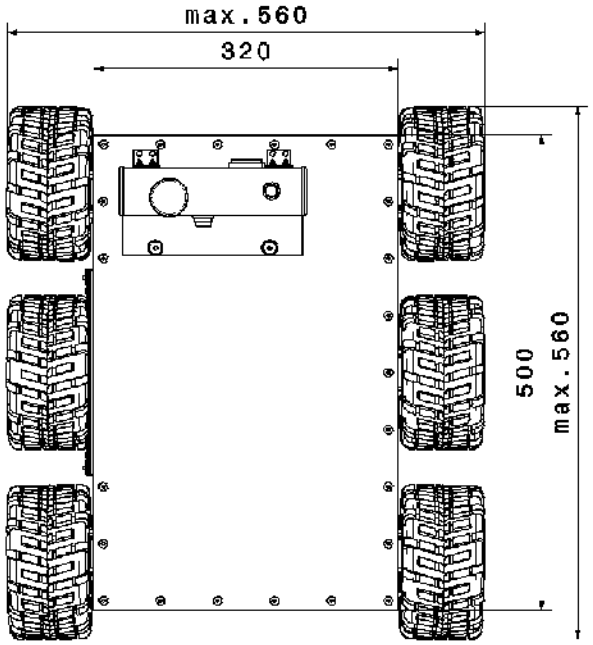
Call us! We will be glad to advise you!

Innok Robotics GmbH: +49 9402 / 47391-0
Your personal point of contact: Alexander Boos

Drawing







Ordering Information

Order No.	Description
IR-TXCTXC000	**Innok TX Robotic Platform** including chassis, drivetrain, power electronics and battery
IR-MOKTXC000	**Mounting Kit** consists of 8 profile rails and 16 connectors
Components including integration	
IR-INTTX0B01	**On-Board PC** 1,1 GHz, 2 GB RAM, pre-installed Ubuntu-Linux with ROS
IR-INTTX0F01	**Spring Dimensioning** Exact tuning of the suspension for your application according to your specifications.
IR-INTTX0L01	**Laser Scanner SICK LMS100** An economical laser scanner with a range of 20 m for indoor use.
IR-INTTX0L02	**Laser Scanner SICK LMS111** The LMS111 has a range of 20 m and is suitable for outdoor use.
IR-INTTX0L04	**Laser Scanner SICK LMS151** With the outdoor laserscanner LMS151 and its 50 m of range you are on the safe side even at high speeds.
IR-INTTX0L03	**Laser Scanner HOKUYO UTM-30LX-EW** With its range of 30 m this laser scanner excellently matches the performance of the Innok TX.
Integration of other components upon request.	