



TORWEGGE

TORsten



MOVE IT FOR TOMORROW

EN

torsten.torwegge.de/en

// facts and figures

	autonomous		remote	
	190er	300er*	190er	300er*
Length	1,285 mm	approx. 2,500 mm	1,285 mm	approx. 2,500 mm
Width	835 mm	approx. 1,530 mm	835 mm	approx. 1,530 mm
Height	235 mm	approx.. 415 mm	235 mm	approx. 415 mm
Speed	0.6 m/s			
own weight	approx. 210 kg	approx. 350 kg	approx. 180 kg	approx. 320 kg
Maximum load	1,200 kg	7,000 kg	1,200 kg	7,000 kg
Maximum sliding load	3,000 kg	9,000 kg	3,000 kg	9,000 kg
Batteries	Lead crystal			
Charging concept I	Connector / Cable			
Charging concept II	Contact			
Charging concept III		inductive		inductive
Drive	SEW 350 W Engines	SEW 3000 W Engines	SEW 350 W Engines	SEW 3000 W Engines
Wheel	190 mm Mecanum	300 mm Mecanum	190 mm Mecanum	300 mm Mecanum
Lifting height	60 mm	80 mm	60 mm	80 mm

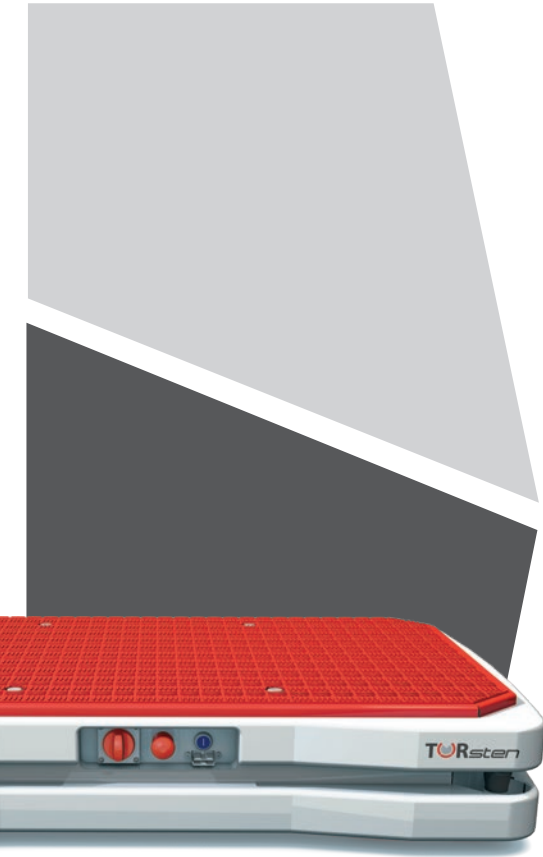
* expected to be available from mid-2018





IFOF AWARD

Automated Guided
Vehicle of the year 2017



strong
flexible helpful reliable
powerful

- Variety of platforms to drive under for easy customization
- Autonomous Navigation for reliable and future looking material flow
- Navigation via 2D layout, so no on-site changes in conversion or relocation of production necessary
- 9 axis robot cinematics (3 axis used for driving, 6 axis free to integrate e.g. 6-axis-Lightweight Robot to perform picking tasks)
- Depending on the design, TORsten moves loads of up to 9 tonnes and lifts loads of up to 7 tonnes
- Omnidirectional drive concept for movement in the smallest space and 360° assembly
- Existing transport routes can be used by TORsten and humans simultaneously (person safe)
- Reduction of driving speed when narrowing roads or approaching an obstacle
- robust construction
- Battery: Hardly self-discharging, resistant to high current, non-toxic, non-flammable, cycle resistant

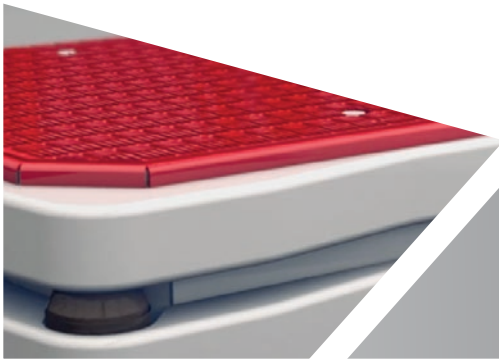
// Navigation

After transmission of the destination, the TORsten automatically finds the best route to that position by autonomous navigation. For this purpose, the following software components are integrated at the core of the control system in the navigation computer:

- **Localisation**
- **Global route planning**
- **Local collision avoidance**



The **localisation** software is based on the widely used, highly reliable Adaptive Monte Carlo Localisation. Through a fuse of sensors, the data from the laser scanners, the integrated inertia measuring device (rotary speed/acceleration) and the wheel encoders is brought together and to determine the actual global position of the platform. The data from the laser scanners (2D light section) is compared with the factory layout, so that operators can track the position of the platform.



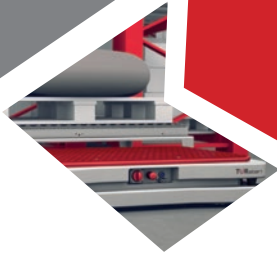


The **global route planning** system refers to a virtual route network that can be configured to reflect the actual physical environment. This approach does away with linear guide systems, inductive loops or magnetic track guide systems. The global route is calculated by means of an A* algorithm, based on the travelled track.



Local collision avoidance makes sure that moving obstacles are reliably identified by the lasers. For this purpose, the planners devise what is known as local cost maps. These maps are constantly updated to show all local obstacles so that the shortest obstacle-free route from the current location to the destination can be calculated. The vehicle is therefore permitted to leave the initially chosen global route should this be necessary to prevent a collision.





The motor and gear system are enclosed in a sturdy industrial drive box from SEW Eurodrive and can withstand heavy mechanical loads. The drive power booster, the motors and the gear system are maintenance-free IP 65 units suitable for operation in demanding industrial environments.

// drive and control concept

The modular power management and control technology of the TORsten meets the requirements of modern autonomous robot vehicles.

48 V DC power system; control voltage 24 V (industry standard)

- 48 V DC intermediate circuit with voltage and current monitor
- Energy supply through inductive power transmission or contacts
- Modern power storage system with environmentally friendly lead crystal batteries
- Operating time of minimum one shift without any need for recharging
- Integrated power management system from SEW Eurodrive

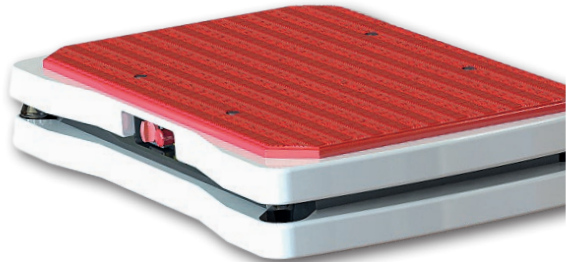
Modular control system for manual remote control or autonomous navigation with integrated route mapping processor

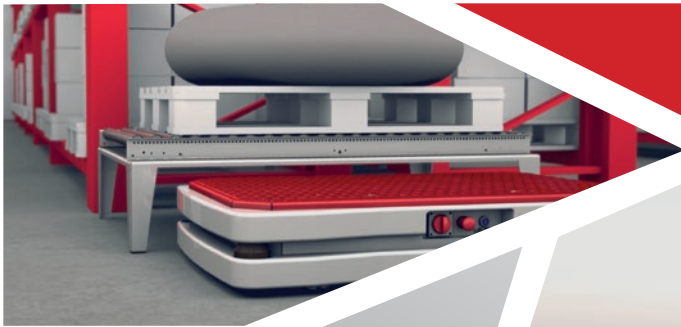
- User-friendly remote control with integrated safety technology for manual control
- Movement range in autonomous mode secured by safety scanners
- Automatic adjustment of vehicle speed to suit working area
- Speed-controlled scanned range switching for accurate movement in confined spaces
- Display of all vehicle parameters and states on stationary monitor



Distinct and consistent robot layer model for software and vehicle control (doing away with first navigation computer layer in the attached vehicle)

- Route planning system
- Robot kinematics (SEW Eurodrive/ MOVI-PLC)
- Multi motion (SEW Eurodrive/ MOVI-PLC)
- Drive power booster (SEW Eurodrive/ ELVCD)
- Drive units (SEW Eurodrive– CMP servomotors)





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