



WINNER  
**BI**  
BEST OF  
INDUSTRY  
AWARD

**TORWEGGE**

**TORsten**



**MOVE IT FOR TOMORROW**

**EN**

[torsten.torwegge.de/en](http://torsten.torwegge.de/en)

## // facts and figures

<b>Length</b>	1,285 mm
<b>Width</b>	835 mm
<b>Height</b>	235 mm
<b>Speed</b>	0.6 m/s
<b>own weight</b>	approx. 210 kg
<b>Maximum load</b>	1,200 kg
<b>Maximum sliding load</b>	3,000 kg
<b>Batteries</b>	Lead crystal
<b>Charging concept I</b>	Connector / Cable
<b>Charging concept II</b>	Contact
<b>Drive</b>	SEW 350 W Engines
<b>Wheel</b>	190 mm Mecanum
<b>Lifting height</b>	60 mm

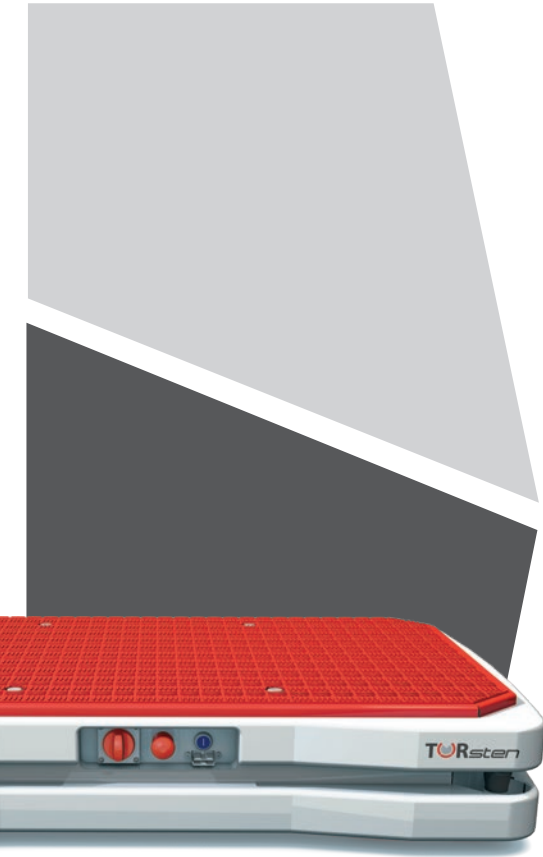
- TORsten is an autonomous guided vehicle, but is also available as remote navigating version without laser-scanners.
- A bigger variant for higher loads (>2,000 kg) is currently under development.
- TORsten has won multiple industry awards including the Industrie-preis, the IFOY Award, the German Design Award and the Best of Industry Award.





## IFOY 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, therefore no concret work on the floor in case of changes in production or removing of machines.
- 9 axis robot cinematics (3 axis used for driving, 6 axis free to integrate e.g. 6-axis-Lightweight Robot to perform picking tasks)
- TORsten moves loads of up to 3 tonnes and lifts loads of up to 1.2 tonnes
- Omnidirectional drive concept for movement in the smallest space and 360° mounting on the spot
- Routes can be used by Employees, Forklifts and TORsten simultaneously (person safe)
- Automatic reduction of speed in narrow pathes or obstacles come closer
- Robust construction
- Battery: Low self-discharging, high current, non-toxic, non-detectable, cycle-proofed

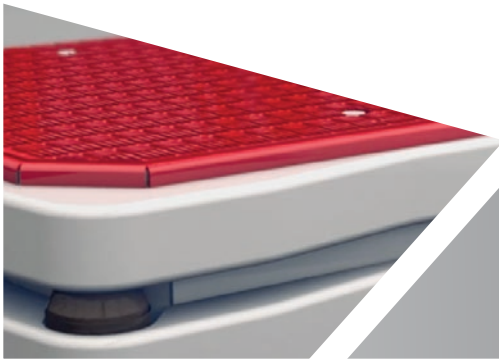
## // Navigation

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.



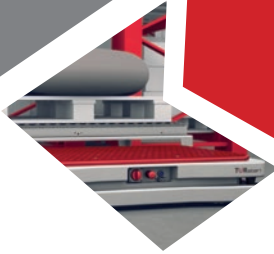


The **global route planning** system refers to a virtual route network that can be configured to reflect the actual physical environment. This approach does away with linear guide systems, inductive loops or magnetic track guide systems. The global route is calculated by means of an A\* algorithm, based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

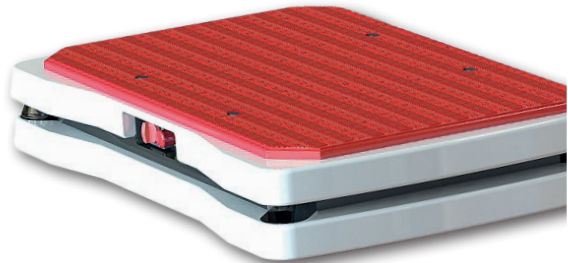
Modular control system for manual remote control or autonomous navigation with integrated route mapping processor

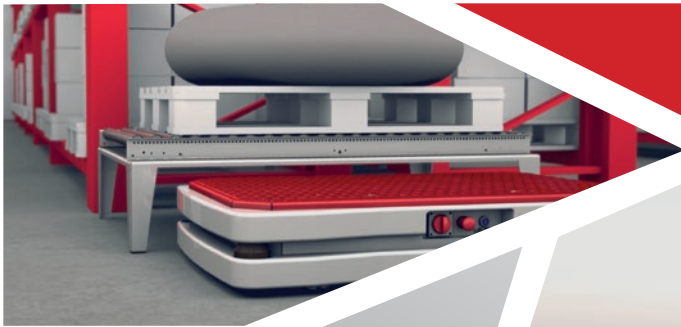
- User-friendly remote control with integrated safety technology for manual control
- Movement range in autonomous mode secured by safety scanners
- Automatic adjustment of vehicle speed to suit working area
- Speed-controlled scanned range switching for accurate movement in confined spaces
- Display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

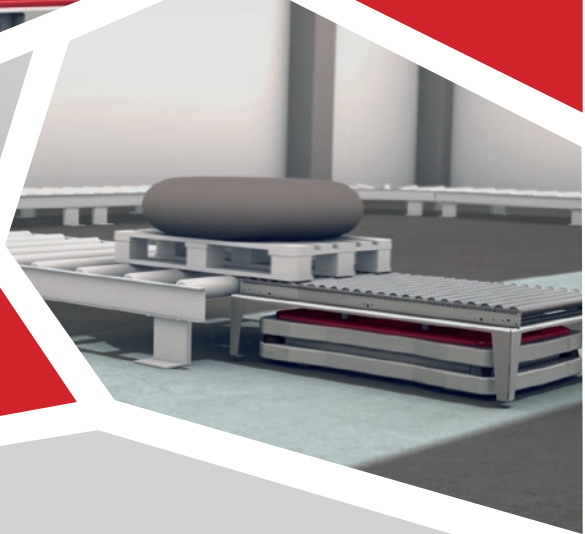




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