



PARAVAN[®]
MOBILITY FOR LIFE



Travel Safely

PARAVAN Space Drive[®] II



Uncompromising mobility for people with disabilities

Greater safety, greater performance: Experience a new dimension in disability mobility with the new and improved Space Drive II system. Drive by Wire technology guarantees superior driving control thanks to highly comfortable and intuitive operation. It represents a revolutionary control system with a sophisticated safety concept, all made possible thanks to perfectly coordinated hardware and software. Thanks to its modular design, the Space Drive II can be tailored to your needs. Your one-stop shop for an individual mobility solution of the highest quality—as you would expect from PARAVAN.

Award-winning PARAVAN solutions

We are grateful for, and also a little proud of, the many top awards we have received over the last few years. These are great achievements that wouldn't have been possible without our customers. These include:

- ✓ German Innovation Award for Service 2014
- ✓ German Entrepreneurs' Award 2013
- ✓ German Industry Award 2012
- ✓ European Business Award 2013
- ✓ Grand SME Prize 2011
- ✓ Innovation Award of German Industry 2011

Space Drive® II– *a technical masterpiece*

Experience freedom: Realize your dreams with PARAVAN technology. Our Space Drive system has started a small revolution in road traffic. With the new generation we have now developed a completely intuitive vehicle control system. What is so incredible about this technology? People with disabilities, low residual strength, a large girth, low mobility, and even those without limbs can drive a car from a wheelchair. Our customers said it has helped them start a new life.

This is how it works

In Space Drive II, braking, accelerating, steering, and all other driving functions are operated by microprocessor-controlled driving aids ("Drive by Wire"). The various input devices digitally transfer the signals to a total of four servomotors in milliseconds. Powerful processors and newly developed motors ensure superb precision and ease of use. To be approved for use on roads, the system has to be absolutely fail-safe. This is guaranteed by multiple active redundancies. The driver's control signals are processed in parallel by three identical processors, which monitor each other. Space Drive II has a modular design. It can be configured individually and specifically adapted to your physical disability. The system can also be retrofitted.



At a glance–

Space Drive[®] II cockpit

1

■ **Add-on wing mirror:**

Provides a wider field of vision

2

■ **Start Control:**

Operates the ignition and two other functions

3

■ **2-way joystick:**

Input device for vehicle steering

4

■ **Gear Control:**

For simple gear selection

5

■ **Steering wheel:**

Can be activated if needed

6

■ **8-button touchpad:**

Operates up to eight freely selectable secondary functions

7

■ **Joystick:**

Simple operation of accelerator and brakes

8

■ **Beeper:**

An extra small aid for freely selectable secondary functions



Two variants, endless possibilities— *the basic system*

We install Space Drive II either as a "Single" or "Dual" system in your vehicle.

PARAVAN Space Drive® II Single System

Do you have difficulty steering your car, but can easily operate the accelerator and brake pedals? Then Space Drive II "Single" with Steer by Wire technology is the right option for you. Here you can use a freely selectable control element to issue steering commands, which are then implemented by a servomotor. Alternatively, we would be happy to install the Single System with an accelerating/braking function for customers without the use of their legs.

PARAVAN Space Drive® II Dual System

On the other hand, our Dual system is the ideal solution for customers with progressive illnesses or minimal mobility. Two servomotors are responsible for the accelerator, brakes, and steering of your car using Drive by Wire technology. A variety of different control elements is available for this purpose. Space Drive II can be adjusted to any changes that occur over the course of your illness and can be equipped accordingly.



Intelligent interaction– *Space Drive[®] II components*

More than the sum of its parts: With its fully developed technology, Space Drive II offers precise function, the highest comfort, ease of use, and maximum safety.



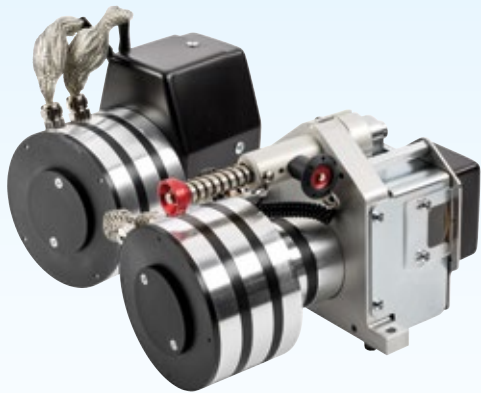
Head modules

The Space Drive II brain: The head module ensures that all systems work perfectly together when driving with a disability. Three parallel digital computing units (CPUs) control and monitor the connection between the Space Drive II system technology and regular vehicle technology via the available interfaces. Input commands are converted into digital signals to control the servomotors for steering, accelerating, and braking in real time. A multi-redundant system that is completely safe!



Check Control

The clever control panel: As the Check Control is installed within the driver's field of vision, he/she can always see the system-relevant status information for Space Drive II. The different display colors are also highly attractive!



Servomotors

The heart of the system: Servomotors perform all control commands when driving with Space Drive II. They translate braking and accelerating commands from the controls into active acceleration or braking; a steering servomotor converts the slightest steering movements on the control element (e.g. mini steering wheel, rotational steering device, or joystick) into active vehicle steering. The motors are fully redundant, patented, and deliver enough power for almost any vehicle type.



Input devices

Superb handling: With the correct input device, you literally have everything to hand. We have developed an acceleration/braking lever, joystick, bicycle-type steering, mini steering wheel, and much more for the primary functions of braking, accelerating, and steering. Thanks to this wide range, we can tailor the system precisely to your individual needs.



Cable harness

Perfect connection: The flexible, multiple-screened high-quality cables ensure perfect communication between the Space Drive II system and vehicle via a CAN interface. Protected contacts and coding comply with the most stringent automotive standards and prevent confusion. Installation in the many different vehicle types is quick and easy, and the reduction in maintenance work is a further advantage.

User-friendly–

Space Drive[®] II input devices

How does your car know what to do? With our sophisticated input devices, operation is very easy regardless of your disability.



Mini steering wheel

The handy alternative to the standard steering wheel is only 15 cm large and is adapted to your individual residual strength. Perfectly tailored and completely reliable. A 3.5-turn or 6-turn steering wheel can be chosen.

Even the best input device only reaches its full potential if it is very easy to operate. As a result, we have developed many different fittings. Of course, we will also adapt your vehicle according to your wishes. Don't hesitate to contact us!

Fittings for the mini steering wheel

- Three pins
- Fork
- Knobs (available in four sizes)



Acceleration/braking lever

This digital 'slider' for accelerating and braking provides a lightning-quick response and gives users the option to control the amount of force and travel.

Fittings for the acceleration/braking lever

- Three pins
- Fork
- L slider (optionally with Beeper)



2 or 4-way joystick

The functional, dynamic, and flexible 2 or 4-way control system. Variation options are set mechanically. The sensitivity of your device can be parameterized via your computer and is therefore perfectly adapted to your needs. Upon request, we can integrate the Gear Control system for simpler gear selection.

Fittings for the joystick

- Stick (optionally with Beeper)
- Bevels



Rotational steering device

The ergonomic wrist control system. It is possible to set the reset force easily and mechanically without replacing the spring. It also comes with an adjustable angle of rotation and precision guide rail.

Fitting for rotational steering device

- Stick (optionally with Beeper)



Bicycle handlebars

The extensive steering unit with a 40 degree steering lock angle. The resistance can be individually set; seven operating buttons and a horn are also available for the driver.

Upgradeable–

Space Drive[®] II additional modules

Would you like anything else? Experience mobile freedom in even greater comfort with our additional modules.



Back-up batteries

The independent emergency power generator maintains the power supply even if the car experiences a voltage loss. Automatic testing and charging using dedicated charging intelligence.



Gear Control

This input device with keypad replaces the standard gear lever. Up to three further driving levels can be operated using the "D" button (depending on vehicle type). Gear Control can be installed separately or together with a steering, accelerating, or braking control element.



Park Control

The convenient alternative to the hand brake lever. Pull the handbrake using the switch without force. Can be installed in many vehicle types. The accurate control electronics mean there is no need for mechanical readjustment.



Brake Control

Simple braking for hand devices or original pedals, which requires no hydraulics. The electronic module is redundant and incredibly compact and can be upgraded with the correct steering element upon request. Using your hand or feet, simply press a flexibly attached pedal that is adapted to your residual strength. No conversion of the standard brakes is necessary; the system can be easily deactivated.

Simply sophisticated— *solutions for secondary functions*

Braking, accelerating, and steering are under your control – but how do you activate the direction indicators, horn, and windscreen wipers? Our clever control elements cover all important secondary functions. Safe and convenient.



10-button touchpad

The control panel for ten different functions. For example, ten pre-defined elements can be operated using a CAN bus interface via the PARAVAN gateway.



Beeper

A further solution for vehicles with or without CAN bus: Can be attached anywhere in the vehicle and covers up to ten secondary functions.



8-button touchpad

The compact control element for eight freely selectable secondary functions.



PICO button

Control element for any secondary function.



L-Button

A useful push button device for connecting to a single secondary function that offers a cushioned design and rests comfortably in your hand.



Remote Control

The remote, multi-functional control. With this device, you can operate 8 functions from a distance.

As unique as you are—

Space Drive[®] II installation examples

Created with our customers in mind—the new Space Drive II is as revolutionary as it is perfectly adapted to the user's wishes. Numerous satisfied drivers are already delighted:



Getting started with mobile freedom– *Space Drive® II driving school unit*

Being mobile feels strange to begin with, so users need to practice. Qualified driving instructors from our PARAVAN driving schools in Aichelau and Heidelberg accompany you on your journey to being mobile. Our driving school cars allow you to become familiar with Space Drive II technology, so you can feel at home in your own car. Enjoy a fascinating learning experience on the way to a new era of mobile freedom.

Fully networked– the PARAVAN diagnostics tool

The new diagnostic tester is simply amazing. With just a few clicks, all information in your Space Drive II system is transferred by e-mail to engineers and technicians in the PARAVAN mobility park. With this data we can service, upgrade, and update your system at any time. Simple, fast, and reliable.



Free travel on any road– *the safety concept*

Mobile but safe! We have developed our spectacular system according to this motto. It has turned out to be a real success story: Space Drive is the first Drive by Wire control system with road traffic certification.

The safety of Space Drive II is based on the globally unique triple active redundancy of all components. As soon as a part fails, another part takes over its function. The servomotors, in particular, are controlled and monitored by an ECU each, which contains several processors. Steering, braking, and accelerating signals are directly transferred into the PARAVAN ECU three times. Each data transfer is monitored and checked throughout.

Certifications

The safety and quality of our technology has been officially checked from A to Z. At a glance:

- Certified according to ECE-R13, ECE-R79, ECE-R10
- Functional safety according to ISO 26262 (ASIL D)*
- Hydro pulse test
- EMC test
- Temperature test
- Stability test
- TÜV certification DIN EN ISO 9001 : 2008

* The probabilistic target values according to ASIL D requirements of the ISO 26262-5 chapter 8, 9 (SPFM, LFM, PMHF) are achieved.

At a glance–

Technical information

- Active redundancy
- Fault memory in several components (recording of respective event)
- Can be parametrized via computer
- One-click support via the innovative diagnostics tool
- Integrated interface
- Optimum and flexible design, suitable for all vehicles
- Multi-language function
- Modular system
- Made in Germany = fast delivery of spare parts
- Complies with all relevant standards and directives in Europe

Operating temperature:	-40° C to +85° C
Storage temperature:	-40° C to +125° C
12V operating voltage:	+ 9V DC to +16V DC
24V operating voltage:	+18V DC to +32V DC
Typical power consumption:	7 A per module
Continuous load:	330 A per motor / 60 A peak load
Current limiter:	100 amp.
Cycle time:	10 ms
Start time until ready for use:	1 sec. - 10 sec. depending on use
Bus systems:	2x CAN, 2x FlexRay, 2x LIN
Safety:	Triple redundancy
Diagnosis / car interface:	DTC connection/OBD-II
Languages:	DE, EN, FR, IT, ES, and more
Digital I/O:	8 (2 I/O with timer function)
Dimensions:	W: 225 / H: 60 / D: 144
Weight:	2,200 grams
Environmental test:	ISO 16750 - Part 5
EMC:	CISPR 25, ECE R10, ISO 11542-4
ESD protection:	ISO 10605
NEMP protection:	E=50 KV/m, H=133 A/m
Cooling:	Passive cooling with cooling fins
Plugs and connections:	Coded and compliant with automotive standards
Reverse polarity protection:	All power inputs
Power supply:	2 separate power sources
Microcontroller:	3 independent CPUs (128 MHz)
ISO 1939 CAN protocol:	High-speed CAN, 500 kB, 11/29 Bit
Applicable standards:	AEC-Q100, Q101, Q200
Tests:	ECE-R13, ECE-R79



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Unlimited mobility—advantages of the Space Drive II

- Patented, TÜV-approved
- Uncompromising in quality and safety
- System can be fully deactivated
(Accompanying persons can operate the steering wheel and pedals as normal)
- Precise and simple operation
- All components are manufactured according to international automotive standards
- Suitable for all vehicles
- 20 million kilometers driven in continuous load test (hydro pulse) under extreme conditions
- Individual adaption even for advanced changes
- Multiple redundant safety thanks to three parallel safety circuits
- Exact configuration of parameters via computer
- Safe speed-controlled steering, even at high speed
- Ergonomically relaxed driving
- Superb value for money
- 24-hour service, including spare parts