

Test report No.: R - 04 - 226 - MP - PA 040 - N2

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Test institute: Berlin Cert
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Client: SANO Transportgeräte GmbH, Am Holzpoldgut 22, A-4040 Lichtenberg

Manufacturer: SANO Transportgeräte GmbH, Am Holzpoldgut 22, A-4040 Lichtenberg

Number of samples: 1

Type / model: PT ADAPT / Treppensteiger für manuelle Rollstühle bis 130 kg Zuladung

Identification No.: Treppensteiger: keine
Batteriepack: keine
Ladegerät: FW7305/24A

Test period: 2004-12-14 – 2004-12-22; 2005-03-16 – 2005-04-04

Test location: ☒ rooms of the test institute ☐ rooms of the client

Examiner: Dipl.-Ing. Thorsten Eilers, Dipl.-Ing. M. Kyslenko

Kind of the test: ☒ complete test ☐ partial test
☐ reexamination test ☐ specified by client

Test standards: ISO 7176-14:1997: Power and control systems for electric wheel
chairs – Requirements and test methods
EN 12184:1999: Electrically powered wheelchairs, scooters and
their chargers – Requirements and test methods
Clause 9: Electrical requirements

Annotation: The numbering corresponds to the applied standard ISO 7176-14:1997

Test result: The test result is: ☒ positive ☐ negative



Test sample: PT ADAPT

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Explanation to Compliance:

Pass: The tested unit was *found to comply* with the requirement.

No: The tested unit does *not comply* with the requirement.

N/A: The tested unit was *not applicable*.

Test standard: ISO 7176-14:1997: Power and control systems for electric wheelchairs

Test methods and -requirements:	Compliance:			Comments:
	Pass	No	N/A	
6 Electrical systems				
6.1 Battery connection and circuit protection diagram				
A diagram shall be clearly visible when the batteries are uncovered. It shall be attached to a surface as close as possible to the batteries.	X			
The diagram shall show the following:				
a) connections to the batteries with the identification of the wires and terminals	X			
b) the location and pictorial instructions for use all circuit breakers and fuses intended to be serviced by the user or an attendant	X			
c) the current rating and type of any fuses	X			
6.2 Colour and marking of wires connected to the batteries				
All wires connected to the positive terminal of the most positive battery pack shall be red and permanently marked with a '+' symbol.	X			Leitungsfarbe rot
All wires connected to the negative terminal of the most negative battery pack shall not be red and be permanently marked with a '-' symbol.	X			Leitungsfarbe schwarz
Other wires connected to the batteries shall not be red.	X			
6.3 Electrical isolation of wheelchairs				
The wheelchair frames, motor cases, gearbox cases, battery cases and the controller cases shall not be connected to the battery set or any other part of the electrical system by a circuit with a d.c. impedance of not less than 10 kΩ. When tested the ammeter in the test circuit shall not indicate a current of more than 5 mA.	X			Positive connection test: 0mA Negative connection test: 0mA
6.4 Fuses				
When changing fuses that do not need a tool for access, it shall not be possible to touch electrically live leads or terminals exposed during this procedure to any other part of any electrical circuit.			X	Sicherungswechsel ohne Werkzeug nicht möglich
6.5 Interchangeability of connectors				
Connectors provided for use by the wheelchair occupant or attendant shall be impossible to connect in a manner that will cause operation different from that specified by the manufacturer.	X			Batteriepack und Lenksäule. Unkorrektes anschließen nicht möglich

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Test methods and -requirements:	Compliance:			Comments:
Connectors shall not simply be colour coded to identify correct assembly.	X			Bauartbedingt
It shall not be possible to connect any connector intended for operation at or below the battery set nominal voltage to any socket intended for domestic or industrial electrical power distribution.	X			
6.6 Attachment and positioning of wiring				
All wires shall be routed and secured in such a manner that they cannot be snagged on furniture or any other protrusion or be damaged by, or interfere with, any moving part of the wheelchair.			X	Keine Leitungen ausserhalb des Gerätes vorhanden
When examined and tested it shall be demonstrable that no wires could:				
a) be snagged on furniture or any other protrusion			X	
b) be damaged by parts that move; or			X	
c) be trapped in any pinch points.			X	
6.7 Protection from non-insulated electrical parts				
When tested it shall not be possible for a test finger to touch non-insulated electrical parts except those protected by a circuit with a d.c. impedance of not less than 10 kΩ (see 6.3).	X			
6.8 Short-circuit protection				
Short-circuit protection shall be provided as close as possible to each battery pack. When tested, a circuit protection device shall disconnect all wheelchair circuits from each battery pack under short circuit conditions.	X			30 A Sicherung zwischen den Batterien Ohne Werkzeug kein Wechsel möglich
Circuit protection devices shall not be of the automatic resetting type.	X			
6.9 Safety when charging batteries				
When tested, it shall not be possible to drive the wheelchair.	X			Beim Laden wird Ausgangsspannung vom Akkupack auf 0V reduziert
6.10 Reversed polarity at the battery				
When tested:				
a) when the battery set connections reversed, there shall be no damage to the controller or any part of the drive system other than blown fuses and if the wheelchair operates, it shall be in accordance with the manufacturer's specification with no uncontrolled or unwanted movements;	X			Kein einschalten, kein fahren möglich
b) after reconnection of the battery set to the original configuration the wheelchair shall operate in accordance with the manufacturer's specification.	X			Normale Funktion
6.11 Controller overvoltage protection				

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Test methods and -requirements:	Compliance:			Comments:
When tested:				
a) the controller shall not fail or operate in a manner that results in uncontrolled movement of the wheelchair; and	X			Tested with 31,0V; normale Funktion
b) there shall be no abnormal movements of the wheels, other than to stop, or any damage to the controller, other than blown fuses.	X			
6.12 Controller command signal processing failures				
Provision shall be made to ensure that an open-circuit or short-circuit command signal failure does not:				
a) result in loss of control of the wheelchair other than to stop;	X			Siehe test report No. 04-226-MP-PA050-N1, Berlin Cert GmbH, dated 2005-03-17
b) prevent the wheelchair from stopping when the control device is put in its stop position.	X			
When tested, the wheelchair shall not tip over, and shall stop within a distance not exceeding $D = 1,3 L_H$.	X			
6.13 Controller output device failure				
Provision shall be made to ensure that the failure of any output device will not result in loss of control of the wheelchair other than to stop.	X			Siehe test report No. 04-226-MP-PA050-N1, Berlin Cert GmbH, dated 2005-03-17
When tested, the wheelchair shall:				
a) not tip over;	X			
b) stop within a distance of $1,3 L_i$ either:	X			
b1) when the switch is operated (either opened or closed, depending on whether short-circuit or open-circuit test is being conducted) at the marker, or	X			
b2) where it fails to stop under the conditions in item 1), when the switch is operated and the control device is put to its stop position at the marker.	X			
6.14 Stalled condition protection				
Circuit protection device that immobilize the wheelchair shall not operate in less than 15 s after the wheelchair is stalled with a maximum speed command signal applied.			X	Nicht anwendbar, das Gerät ist zum Überwinden von Hindernissen gedacht (Stufen)
After being stalled for a period of 3 min with a maximum speed command signal applied, the wheelchair shall not in accordance with the manufacturer's specification.			X	
When tested:				
a) current shall flow in the motor windings for at least 15 s before the initial break in current;			X	

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Test methods and -requirements:	Compliance:			Comments:
b) no fuses shall blow that immobilizes the wheelchair; and			X	
c) any resettable circuit protection devices shall be capable of being operated not less than five times consecutively without damage.			X	
On completion of the test:				
d) the wheelchair shall operate in accordance with the manufacturer's specifications; and			X	
e) no part of the drive system shall be damaged.			X	
6.15 Ability to stop when power is switched off or lost				
With the wheelchair travelling at its maximum speed down a slope, when the power supply is interrupted it shall either:			X	
a) stop in a distance not exceeding $1,3 L_{\text{Imax}}$; or			X	
b) stop in a distance not exceeding $1,3 L_{\text{Imax}}$ as soon as any control device is changed from the straight ahead position; or			X	
c) be capable of being steered normally until the control device is put to the stop position, after which it shall stop in a distance not exceeding $1,3 L_{\text{Imax}}$.			X	
When tested the average braking distance of the wheelchair shall not exceed $1,3 L_{\text{Imax}}$ and the steering response throughout the test shall be in accordance with the manufacturer's specifications.			X	Testprozedur nicht anwendbar, aber Gerät stopt direkt
6.16 Controller microprocessor watchdog				
If the controller of the wheelchair uses a microprocessor, provision shall be made to ensure that failure of the microprocessor or its associated components does not result in uncontrolled movement of the wheelchair and its actuators that could injure the driver or damage the wheelchair. The breaks shall automatically be applied if the microprocessor fails.	X			Siehe test report No. 04-226-MP-PA050-N1, Berlin Cert GmbH, dated 2005-03-17
a) When tested, the wheelchair shall stop within a distance of $1,3 L$ (see 6.12)			X	
b) When tested, the motor(s) shall stop within 1,5 s.	X			
6.17 Safety with discharged battery				
The wheelchair shall not deviate from its intended path, when fitted with batteries recommended by the manufacturer, until the chair stops due to lack of battery capacity.	X			In Bereitschaft: Ab 23,9V langsames rot-grün blinken; ab 23V schnelles rot-grün blinken < 23 V Abschaltung
When tested:				
a) the wheelchair shall not deviate from the intended path more than 1 m in any direction;			X	
b) no motor, other than drive motor, shall exhibit any unintended movement.	X			

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Test methods and -requirements:		Compliance:			Comments:
7	Non-powered mobility test				
	The force required to move the wheelchair in a straight line on the horizontal without electrical power shall not exceed 100 N.			X	
	Where there provision for the drive or automatic braking system to be disengaged, for disengagement it shall not:				
	a) require any component to be detached;			X	
	b) affect any adjustment of the transmission;			X	
	c) require the use of tools;			X	
	d) require the use of force exceeding 60 N.			X	
	It shall not be possible for the drive or automatic braking system to be partially engaged.			X	
	If the automatic braking system is disengaged, and electrical power is restored, it shall not be possible to drive the wheelchair unless a visual and/or auditory alarm is activated.			X	
8	Safety guard test				
	When tested, it shall not be possible to touch the following:				
	a) any power driven parts of the propulsion system, except the wheels and up to 50 mm of their axles;	X			
	b) any gears, drive belts, pulleys, chains or other drive mechanisms which create a pinch point or could injure a user or trap loose clothing;	X			
	c) any shaft which rotates more than two revolutions during its total cycle of operation.	X			
9	Battery chargers				
	9.2.1 General				
	Battery chargers that are not mounted on the wheelchair and that are intended for wheelchair batteries shall meet the requirements of Class 2 of IEC 335-2-29 and shall be moisture resistant to IEC 529-IPX1 (drip proof).	X			Class II, Gehäuse drip proof geprüft, siehe Schreiben von FRIWO
	In addition, battery chargers shall conform to the requirements given in 9.2.2 to 9.2.7	X			
	9.2.2 Battery chargers having more than one rated output voltage (manual selection only)				
	It shall not be possible to change the voltage setting of the battery charger without the aid of tool, key entry combination or similar means of restricting access.			X	
	If the means of restricting access is other than a tool, it shall not consist of operation which ere performed in normal use of the charger.			X	
	9.2.3 Battery charger which are suitable for more than one type of battery (manual selection device only)				

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Test methods and -requirements:	Compliance:			Comments:
The selected battery type shall be conspicuously marked on the outside of the case.			X	
It shall not be possible to change the charging characteristics without a tool, key entry combination or similar means of restricting access.			X	
If the means of restricting access is other than a tool, it shall not consist of operations which are performed in normal use of the charger.			X	
9.2.4 Indication of correct connection				
The charger shall clearly indicate when it is correctly connected to a battery set.	X			Anzeige über LED
9.2.5 Reverse polarity connection				
Reverse polarity connection of the charger to a battery set shall not damage the charger and excessive current shall not flow from the battery set under this condition.			X	Nicht möglich, codierter Anschluss
When tested:				
a) the current that flows to discharge the battery set shall be no greater than 100 mA;			X	
b) there shall be no damage to the battery set after reverse polarity connection and following resetting and/or replacement of any circuit protection devices the battery charger shall operates as specified by the manufacturer.			X	
9.2.6 Charging				
The charger shall charge the battery set to 80% of the rated capacity in a period not exceeding 8 h.	X			
The charger shall be labeled to indicate the rated capacity of the battery set that is capable of charging to 80% of the rated capacity in a period not exceeding 8 h;			X	
When tested, the measured charge of the battery set after charging for 8 h shall not be less than 80% of the rated capacity of the battery set.	X			
9.2.7 Charger for batteries that give off flammable gas				
For chargers for batteries that give off flammable gas, there shall be a delay of not less than 0,5 s before charging commences when connection to the battery set is made after the charger has been switched on.			X	
When tested, the delay between the connection of the battery set and the flow of current shall be at least 0,5 s.			X	
10 Forces needed to operate control devices				
The manufacturer shall disclose the forces necessary to operate all control devices on the wheelchair. If the pressure for operating pneumatic switches are adjustable, the maximum and minimum operating pressures shall be disclosed				

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Test methods and -requirements:	Compliance:			Comments:
Lever to control speed and/or direction	X			7,5 – 12,2 N
Push button, rocker, and keypad switches			X	
Toggle switches			X	
Pneumatic switches, positive pressure switches (puff)			X	
Pneumatic switches, reduced pressure switches (sip)			X	

Test standard: EN 12184:1999: Electrically powered wheelchairs, scooters and their chargers

Test methods and -requirements:	Compliance:			Comments:
	Pass	No	N/A	
9. Electrical requirements				
9.1 General requirements				
The wheelchair shall conform to the requirements of ISO 7176-14	X			
Wheelchairs which include battery chargers that cannot be removed without the use of tools and/or are permanently connected to the wheelchair battery shall conform to the electrical requirements of IEC 60601-1 and the requirements of ISO 7176-14			X	Externes Ladegerät
9.2 Requirement for controller switch				
Provision shall be made for the user to switch the controller on and off.	X			
9.3 Requirement for power indicator				
The wheelchair shall be fitted with a power-on indicator, so the user knows that the wheelchair is ready to drive.	X			Siehe auch Punkt 6.17
9.4 Requirements for circuit protection				
Circuits connections to batteries in the wheelchair shall be protected against excessive current	X			30 A Sicherung im AKKU Pack zwischen Batterien.
The following functions of the wheelchair shall not be affected by the operation of the means of protection of any other circuit:				
driving, braking and steering			X	
lightning, direction indicators and hazard warning flashers			X	
9.5 Requirement for disengagement of automatic brakes				
It shall not be possible to drive the wheelchair with its own motor drive system if the automatic brakes are disengaged.			X	

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Test methods and -requirements: NOTE: This requirement overrides part of ISO 7176-14:1997, clause 7.2, concerning requirements for non-powered mobility.		Compliance:			Comments:
9.6	Requirements for connections to batteries				
	Intermediate connections to batteries connected in series shall not be used to supply power.	X			
	Connections to battery terminals shall be insulated when batteries are enclosed in a battery container.	X			
9.7	Requirements for battery chargers				
	Battery chargers shall confirm to the requirements of clause 9 of ISO 7176-14	X			Siehe Seite 6 - 7
	battery chargers shall indicate when charging is in progress	X			LED Anzeige
	battery chargers shall indicate when charging is complete	X			LED Anzeige
	battery chargers shall have the capability of charging batteries discharged to 70% of their nominal voltage	X			
	trickle charging current shall not exceed 500 mA	X			
	battery chargers shall operate without the need for intervention or supervision apart from connecting and turning on at the start of charging and turning off and disconnecting at the end of charging	X			
9.8	Electromagnetic compatibility (EMC)			X	Siehe Report# EMVC 2004-06-09, emv consulting, Datum: 2004-06-15 Kein akkreditiertes Prüflabor

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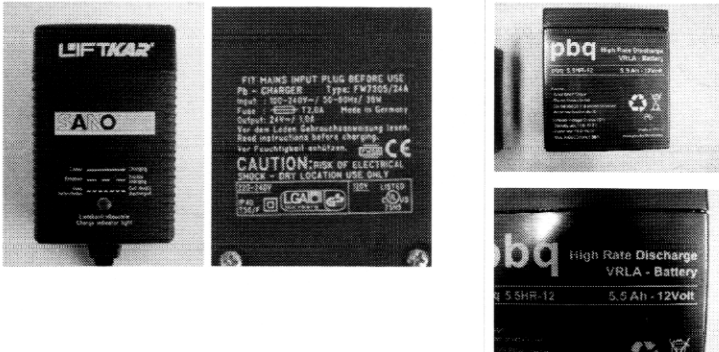
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Test standard: EN 60601-1:1996: Medical electrical equipment; Part 1: General requirements for safety

Test methods and -requirements:		Compliance:			Comments:
		Pass	No	N/A	
Leakage currents when wheelchair is connected to supply mains				X	Kein internes Ladegerät vorhanden
Current	measurement				allowable value
	Normal polarity		Reversed polarity		
Protective earth (measured on enclosure charger)	Ohm		--		0,2 Ohm
Earth leakage current N.C. (charger)	µA		µA		500 µA
Earth leakage current S.F.C. (charger)	µA		µA		1000 µA
Enclosure leakage current N.C. (wheelchair)	µA		µA		100 µA
Enclosure leakage current N.C. (charger)	µA		µA		100 µA
Enclosure leakage current S.F.C. protective earth (wheelchair)	µA		µA		500 µA
Enclosure leakage current S.F.C. protective earth (charger)	µA		µA		500 µA
Enclosure leakage current S.F.C. Single fault mains voltage (wheelchair)	µA		µA		500 µA
Enclosure leakage current S.F.C. Single fault mains voltage (charger)	µA		µA		500 µA
Patient leakage current N.C. (AC/DC)	µA		µA		100 µA / 10 µA
Patient leakage current S.F.C. protective earth (AC/DC)	µA		µA		500 µA / 50 µA
Patient leakage current S.F.C. Single fault mains voltage (AC/DC)	µA		µA		500 µA / 50 µA
Power input battery charger	VA		A		--

Technical datas, documentation, test equipment:

Components	Battery Charger	Batteries	
Manufacturer	Friwo	pbq	
Model / Type	FW7305 / 24A	5.5hr-12	
Identification No:	--	--	
Technical Data:	Input: 100-240V~, 36W, Output: 24V=, 1A	12 V / 5.5Ah (20h)	
Photo:			

Submitted documents:	
wheelchair	Prüfbericht EMV, Report# EMVC 2004-06-09, emv consulting, vom 2004-06-15, Prüfstandards: EN 60601-1-2:2001, EN 55022 Klasse B
Battery charger	CE Konformitätserklärung FRIWO GmbH, 2004-12-10 E-Mail von FRIWO, 2005-03-24 zu IPX1
Batteries	datasheet
Control unit	Schalt- und Bestückungspläne

Test equipment			
PM 0006	Test finger	PM 3016	DC power supply
PM 0043	Volt- and ampere meter	PM 0025	resistance
PM 1030	Shunt	PM 0027	resistance
PM 3005	Safety tester		

tested by: 2005-04-04	checked by: 2005-04-04
Dipl.-Ing. T. Eilers	Dipl.-Ing. Th. Friedrich