



perturbation

gait stability and fall prevention training



mercury® med with standard handrails

reliable treadmills made in germany

German Engineering since 1988



mercury® med with standard handrails



mercury® med with standard handrails and safety arch fall prevention [cos10079-01va01]

Benefit from our experience since 1988 in building and servicing standard and customized treadmill solutions around the globe.

h/p/cosmos standard

h/p/cosmos has been developing and building treadmills since 1988 in Germany for various fields including fitness, competitive sports, sports medicine, orthopedic and neurological rehabilitation, sport science, biomechanics, uniformed services, performance diagnostics, cardiopulmonary diagnostics and rehabilitation. This experience, maximum standards in quality and advanced technology are the foundation of our business and reflected in all treadmills.

The outstanding level of h/p/cosmos products and service as well as attractive prices form the h/p/cosmos standard.

Stable and low-maintenance

With their stable frame, the treadmills are almost indestructible, very low-maintenance and offer both runner or patient a pleasant running feeling thanks to their state-of-the-art design. They also stand out due to their smooth running, their versatile functions, their powerful drive system and their timeless and user friendly design.

Medical device (class IIb) and sports treadmills

Our treadmills are available as risk class IIb medical treadmills as well as sports treadmills. As a medical device, they are particularly suitable for the use in the fields of cardiology, neurology, cardiological rehabilitation and physiotherapy. The interface via coscom® v4 of the h/p/cosmos treadmill and ergometer series enables the connection to ECG, ergospirometry systems, blood pressure monitors and software programs.

Customer-specific configuration for individual solutions

Treadmills off the peg can be many, at h/p/cosmos you can also get your individually assembled treadmill solution with a large selection of options and accessories. Too little budget for the desired configuration? Changed demands on the treadmill system due to new business areas or new areas of application? No problem, most options and accessories can also be retrofitted at a later date. With h/p/cosmos you are always on the right track, because you cannot make the wrong decision due to the flexible and modular design.

improving gait stability



The ability to prevent or resist falls

Falls can be considered as a general life risk. Not only elderly or previously ill people are affected, but also young, healthy individuals are at risk of falls without recognizable cause. Hence, millions of people fall every year, leading to injuries of the musculoskeletal system and associated gait insecurity.

As every fall has the potential to cause serious health consequences, the ability to prevent or resist falls can be seen as a major threat to the individual's health. Due to the increasing aging of the population the problem and severe consequences of falls have already become a very significant topic and will further gain importance in the future.



Falls become a major threat to health during walking and everyday life

Walking is the most common activity that precedes fall-related events. Added to this is the unpredictability of fall events, which occur in a variety of scenarios in everyday life. The special h/p/cosmos perturbation module takes these aspects into account. The module offers a perturbation-based balance training by providing unexpected destabilizing balance perturbations - but in a controlled and safe environment. In other words, the module simulates common fall scenarios to improve the reactive stability and therefore the ability to compensate these destabilizing events and to resist falls.

Slips and trips

Falls are very often associated with walking and especially with slipping and tripping while walking (Kurz et al., 2016; McCrum et al., 2017; Pigman et al., 2019). This refers to a sudden and unexpected anterior or posterior change of speed.

In the real world examples are that the foot gets caught on the edge of a carpet (trip) or the foot slides forward (slips) when touching down, e.g. wet tiles or ice.



The h/p/cosmos perturbation module allows the transfer of activities of daily living (ADL) to the safe yet adaptable setting of a (medical) treadmill with safety arch fall prevention.



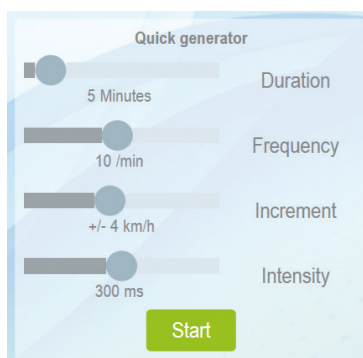
individual perturbation applications



Fast perturbation events



Perturbation profiles - switching between selfmade and premade profiles



Quick Generator for a quick and reliable adjustment of perturbation parameters

Research

Because of the majority of fall causes, research has focused on sudden accelerations, decelerations or stops of the treadmill (Kurz et al., 2016; Liu, Bhatt & Pai, 2016; McCrum et al., 2017; Pigman et al., 2019). While slips and trips are the main cause in real life, interferences in other planes can also happen. Science and industry have created various technical equipment, nevertheless they are cost-intensive and realism and relevance are often questionable.

h/p/cosmos perturbation module

The h/p/cosmos perturbation module can provide extremely sudden changes of the speed. This can be as sudden and unexpected, that it is mandatory to use a fall prevention system, such as the h/p/cosmos safety arch with harness or the unweighting system h/p/cosmos airwalk® ap. Due to the powerful motor, the acceleration can be as fast as 17.36 m/sec^2 (for comparison: the sportscar Bugatti Veyron needs 2.6 sec from 0 ... 100 km/h, that equals 15.2 m/sec^2). But most of the perturbation events within a training session will be on a lower level and allow a customized training to a wide spectrum of patients. In due course of the training progress, the intensity can be adjusted with a few clicks.



Random factor

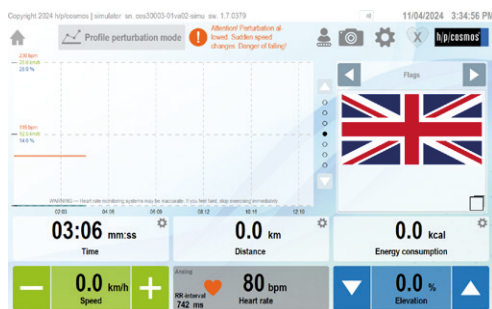
As in the real world the disturbances happen unexpectedly, the h/p/cosmos perturbation "quick generator" module includes a "random factor". Subjects will not predict the exact time or kind of the next event.

Individualization and progression matters

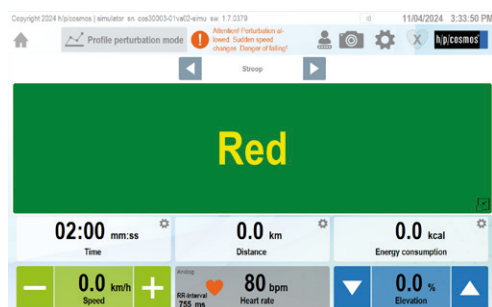
Single perturbation events or complex training sessions can be configured individually, within the profile editor. The fastest way to set up a gait stability training session, is to use the "quick generator". Sliding bars for the total training duration, the frequency and intensity (speed change and length in milliseconds) can be defined easily. If the subjects tolerate the training well, the overall intensity can be increased in a controlled manner.



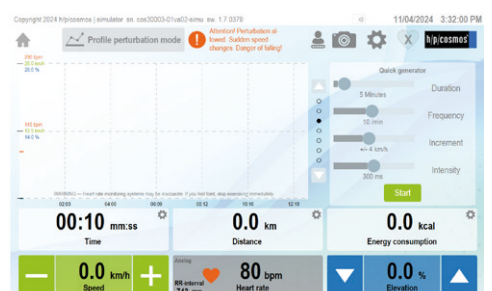
evidence-driven development



Dual Tasking - name the country flag



Dual Tasking - Stroop Test



Quick Generator for quick and reliable adjustment of perturbation parameters

Focus matters

As long as the subjects focus on their perturbed walking task, they will probably learn to handle it. Like in reality, a rather simple task can get difficult if subjects perform a second task (e.g. typing a message on the mobile phone when walking). To create a more difficult and realistic training, the h/p/cosmos perturbation module allows to add dual tasking exercises, to redirect the focus to another task, away from walking. Cognitive tests, such as the Stroop test, simple - medium - hard mathematics, name the country flag, guess the countries capital, logical number sequences and other brain teasers will distract the subject from walking while stimulating the play instinct.

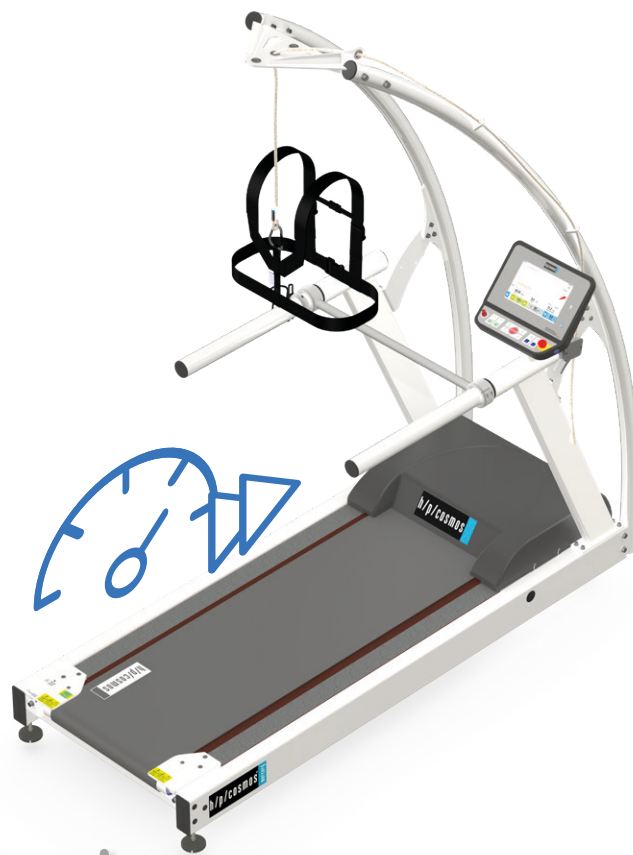
Literature:

Kurz, I., Gimmon, Y., Shapiro, A., Debi, R., Snir, Y., & Melzer, I. (2016) 'Unexpected perturbations training improves balance control and voluntary stepping times in older adults - a double blind randomized control trial', BMC Geriatrics, 16(1), p. 58. Available at: <https://doi.org/10.1186/s12877-016-0223-4>.

Liu, X., Bhatt, T., Pai, Y.-C. (Clive) (2016) 'Intensity and generalization of treadmill slip training: High or low, progressive increase or decrease?', Journal of Biomechanics, 49(2), pp. 135–140. Available at: <https://doi.org/10.1016/j.jbiomech.2015.06.004>.

McCrum, C., Gerards, M. H., Karamanidis, K., Zijlstra, W., & Meijer, K. (2017) 'A systematic review of gait perturbation paradigms for improving reactive stepping responses and falls risk among healthy older adults', European Review of Aging and Physical Activity, 14(1), p. 3. Available at: <https://doi.org/10.1186/s11556-017-0173-7>.

Pigman, J., Reisman, D. S., Pohlig, R. T., Wright, T. R., Crenshaw, J. R. (2019) 'The development and feasibility of treadmill-induced fall recovery training applied to individuals with chronic stroke', BMC Neurology, 19(1), p. 102. Available at: <https://doi.org/10.1186/s12883-019-1320-8>.



perturbation at a glance



The user friendly interface with touchscreen allows an intuitive operation



Mandatory fall prevention during perturbation with safety arch and chest belt



Perturbation and non-perturbed gait training on the same treadmill

Perturbation as an add-on feature

The perturbation module is an innovative add-on feature to h/p/cosmos treadmills of the latest generation with UserTerminal MCU6.

The treadmill can easily be retrofitted with the perturbation module, provided that the treadmill is equipped with either a safety arch or an airwalk® ap unweighting system with emergency stop and harness to prevent subjects from falling.

Overview

Programmable via convenient user interfaces, the perturbation module enables therapists and trainers to perform a wide range of trainings without time consuming configuration or preparation:

- reactive stability training
- realistic slips and trips pattern in sagittal plane
- short events in milliseconds
- fixed pattern, activated by click
- random pattern for unpredictable trainings
- dual tasking and cognitive tests to distract
- highest patient safety, due to fall-stop and harness

Of course, the treadmill's standard functionalities are retained when the perturbation mode is deactivated, so no additional devices are needed to perform standard therapeutic or performance trainings such as

- non-perturbed rehabilitation training
- endurance training walking or running
- gait analysis e.g. with optionally available pressure distribution
- cardio training
- performance diagnostics

perturbation in practice



Gait stability training with an elderly patient with Parkinson's disease



Stability training and gait training with a patient with weakness in foot dorsiflexion



Random perturbation with a geriatric patient to improve his reactive stability

configuration pluto med: gait rehabilitation - perturbation

recommended configuration gait rehabilitation perturbation pluto® med (Certification pending. Product launch planned for Q3 2024)



recommended configuration gait rehabilitation perturbation pluto® med

pos.	qty.	order number	product description
1.	1	cos31022	h/p/cosmos treadmill pluto® med - running surface 150 x 50 cm, speed range 0 ... 22 km/h, elevation 0 ... 25 %, UserTerminal MCU6 with 10.1" TouchScreen and coscom® v4 protocol
2.	1	cos101000sw_pert-V1.0	Special software feature for sudden deceleration and acceleration of the treadmill belt speed
3.	1	cos10079-01va01	Safety arch 50 with harness & chest belt / stop function, fall protection for all applications (mandatory for high risk applications); running surface 50 cm wide
4.	1	cos14903-04-S	Chestbelt S for safety arch system - colour code: red, for chest measurement approx. 65-95 cm
5.	1	cos14903-04-L	Chestbelt L for safety arch system - colour code: yellow, for chest measurement approx. 105-135 cm
6.	1	cos102522va03	Packing treadmill 150/50 (SA), packed part assembled on pallet with cardboard hood, incl. safety arch (L: 274 cm / W: 122 cm / H: 94 cm)
7.	1	cos60098010021	transport / shipping charge (please specify if truck, sea or air freight; for overseas sea shipment is recommended)
8.	1	cos10194	installation, commissioning and instruction through authorized and trained personnel

E & OE. Subject to alterations without prior notice. The illustrations may show accessories and items of optional equipment which are not part of standard specification or the recommended configuration.
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mercury® med with UserTerminal MCU6, safety arch and perturbation module

configuration quasar med: gait rehabilitation - perturbation

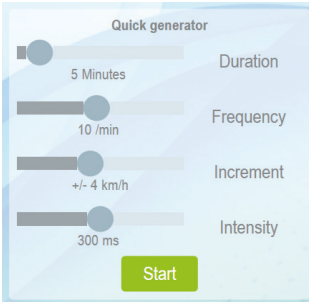
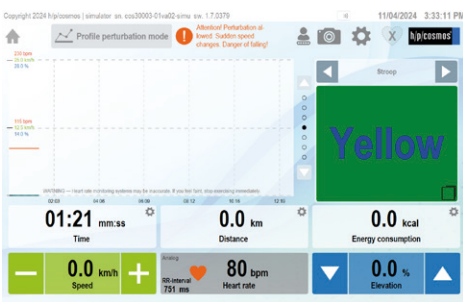
recommended configuration gait rehabilitation perturbation quasar® med



recommended configuration gait rehabilitation perturbation quasar® med

pos.	qty.	order number	product description
1.	1	cos30003-01va02	h/p/cosmos treadmill quasar® med - running surface 170 x 65 cm, speed range 0 ... 25 km/h, elevation 0 ... 28 %, UserTerminal MCU6 with 10.1" TouchScreen and coscom® v4 protocol
2.	1	cos101000sw_pert-V1.0	Special software feature for sudden deceleration and acceleration of the treadmill belt speed
3.	1	cos10079-01va02	Safety arch 65 with harness & chest belt / stop function, fall protection for all applications (mandatory for high risk applications); running surface 65 cm wide
4.	1	cos14903-04-S	Chestbelt S for safety arch system - colour code: red, for chest measurement approx. 65-95 cm
5.	1	cos14903-04-L	Chestbelt L for safety arch system - colour code: yellow, for chest measurement approx. 105-135 cm
6.	1	cos102522va03	Packing treadmill 150/50 (SA), packed part assembled on pallet with cardboard hood, incl. safety arch (L: 274 cm / W: 122 cm / H: 94 cm)
7.	1	cos60098010021	transport / shipping charge (please specify if truck, sea or air freight; for overseas sea shipment is recommended)
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UserTerminal MCU6 featuring a quick generator module for fast and easy perturbation setup and several tests (e.g. Stroop test)

specifications pluto® med (Certification pending. Product launch planned for Q3 2024.)

treadmill	pluto® med
manufacturer:	h/p/cosmos sports & medical gmbh / Germany
order number:	cos31022
applications:	endurance training walking and running, stress device for performance testing, gait analysis and gait training
control:	via UserTerminal MCU6 with keyboard, touch display and Windows® 10 operating system, integrated interface coscom® v4
keyboard:	9 keys for manual control, easily controllable with medical gloves and under sweaty conditions
running surface:	L: 150 cm (4ft 11.1") W: 50 cm (1ft 7.6") access height: 23 cm (9.1") - running belt with slip resistant surface - max. permissible load: 250 kg (551 lbs) - max. permissible load: 300 kg (660 lbs) at extra charge
speed range:	0.0 ... 22.0 km/h (0.0 ... 6.1 m/s) (0.0 ... 13.6 mph)
acceleration:	7 acceleration / deceleration levels between 131 s and 3 s from 0 to max. or from max. to 0; equals 0.053 ... 2.315 m/s² levels 1 to 4 enabled, levels 5 to 7 on request adjustable via treadmill or remote control
elevation:	0.0 ... 25.0 % (0.0...14.0°) motorized adjustment (up to -25 % when using reverse belt rotation)
running direction:	reverse belt rotation at extra charge. Max. permissible reverse speed 5 km/h (3.1 mph) if no safety-harness with fall-stop prevention system is used.
motor systems:	2.2 kW (3 PS) 3-phase AC motor, maintenance free and brushless. For high-performance applications we recommend models with a 3-phase 3x400 volt power supply and a running surface min. 190/65 cm.
power transmission:	frequency inverter, poly-V-belt, very quiet operation
safety systems:	CE 0123; medical device regulation MDR (EU) 2017/745; machinery regulation (EU) 2023/1230; IEC 60601-1; EN 60601-1-2 (EMC tested); ISO 20957-1; ISO 20957-6; EN 14971; emergency-stop mushroom push button (for drive system power-off), emergency-stop (with pull-cord and clip); potential equalization bolt; transformer for potential-isolation from the mains. Certification pending. Product launch planned for Q3 2024.
degree of protection:	appliance class I (⊕) / type B (⚡) / IP 20
classification:	medical device risk class IIb according to MDR, active therapeutic medical device and active diagnostic medical device
usage class:	S, I according to ISO 20957-1
accuracy class:	A (high accuracy) according to ISO 20957-6
earth leakage current:	< 0.2 mA
ambient condition:	10 ... +30 °C; (-30 ... +50 °C on request) 20 ... 85 % humidity (up to 100 % on request), 700 ... 1060 hPa air pressure; 3,000 m (~10,000 ft) max. altitude without pressurization
display (resolutions) paramter:	25.9 cm / 10.1" (1280x800), color touch display, speed, time, elevation, distance, heart rate, heart rate variability energy consumption, altitude, power, pace, METs, diagram view of heart rate and load parameter, parameter export as .pdf and .csv tables to USB
resolution:	1 decimal place
units:	metric / imperial
heart rate monitoring:	heart rate receiver included, 5kHz + Bluetooth® automatic control of speed and elevation according to programmed target heart rate ("cardio mode")
digital interface:	1x LAN / RJ45, 1x RS232 for external control, 4x USB 3.0, 1x USB 2.0, 1x USB 4.0 for data transmission, 1x connection for safety arch fall stop RFID / NFC Reader (optional at extra charge) Bluetooth® (optional at extra charge)
programs:	over 18 programs / profiles (predefined) over 8 exercise profiles (scalable) - many test profiles (UKK Walktest, Conconi, Graded test, Gardner, Naughton, Ellestad, Cooper, Balke, etc.) - min. 100 free definable programs - import / export of profiles from / to USB stick also for further processing

PC software (incl.):	h/p/cosmos para control® for display & remote control;
PC software: (extra charge)	h/p/cosmos para graphics®, para analysis® & para motion®. PC software for control, monitoring, recording & analysis
accessory (incl.):	instruction for use on USB stick, service kit, 5 m LAN cable, 5 m (16 ft 4.85") PE-cable
colour of frame:	pure white RAL 9010 (powder coated)
handrails:	steel tube handrails Ø 60 mm on both sides, over min. 1/3 of treadmill length, square crosstube between pillars Other lengths and designs at extra charge Front crossbar (Ø 30 mm) at extra charge
voltage supply:	200 ... 240 Volt AC 1~/N/PE 50/60 Hz 16A type C fuse; dedicated circuit, line and protection
size of frame:	L: 210 cm (6ft 11") W: 86 cm (2ft 9.9") H: 139 cm (4ft 1.37 ")
net. weight:	device approx. 240 kg (530 lbs)
gross weight:	device approx. 315 ... 505 kg (694 ... 1113 lbs)

Weight and dimensions may differ depending on accessories.

Optionally available at extra charge are special frame colours, other handrail designs, special voltage supply, other options and accessories. Weight and package specifications can deviate according to options, accessories packing and way of transport. E&OE. Subject to alterations without prior notice. Please consider the natural and physical performance limitations of the single phase 230 volt power supply. The single phase 230 volt power supply is sufficient up to normal fitness or therapy applications. For all special high performance applications (speed running, controlled jump-ons, sidesteps, heavy subjects at higher speed, extreme elevations, etc.), we recommend models with a 3-phase, 3x400 volt power supply (for example model h/p/cosmos quasar med 3p, pulsar 3p, venus or saturn).

Warning! Installation, commissioning, instruction, maintenance and repair work only to be conducted by h/p/cosmos trained and authorised personnel. For treadmills with oversized deck (width >65cm), for children, special applications, without sufficient safety space behind the treadmill, for subjects and / or patients with health or other limitations (e.g. visual impairment, etc.), for running at high speed and / or for all individuals, where a fall triggers a dangerous risk of injury or death (e.g. newly operated hip patients, invasive probes, etc.), a fall prevention system is obligatory (e.g. safety arch with chest belt and harness or a weight support system). For more information see the instructions for use. Safety space behind the treadmill: min. L: 2 m (6ft 6.74") x treadmill width. Children are only allowed to be on the treadmill, if under permanent supervision and secured by a fall prevention system.



specifications quasar® med

treadmill	quasar® med
manufacturer:	h/p/cosmos sports & medical gmbh / Germany
order number:	cos30003-01va02
applications:	endurance training walking and running, stress device for performance testing, gait analysis and gait training
control:	via UserTerminal MCU6 with keyboard, touch display and Windows® 10 operating system, integrated interface coscom® v4
keyboard:	9 keys for manual control, easily controllable with medical gloves and under sweaty conditions
running surface:	L: 170 cm (5ft 6.9") B: 65 cm (2ft 1.6") access height: 23 cm (9.06") - shock load reduction for the joints - running belt with slip resistant surface - reinforced running belt with profiled surface, 5 mm thick - max. permissible load: 300 kg (660 lbs)
speed range:	0 ... 25.0 km/h (0 ... 6.9 m/s) (0 ... 15.5 mph) special speed available at extra charge: 0 ... 10 km/h (0 ... 6.2 mph), 0 ... 30 km/h (0 ... 18.6 mph)
acceleration:	7 acceleration / deceleration levels between 131 s and 3 s from 0 to max. or from max. to 0; equals 0.064...2.78 m/s² (for max speed 25 km/h) programmable via para control® PC software
elevation:	0 % ... +28.0 % (0 ... 15.6°) motorized adjustment, (up to -28 % when using reverse belt rotation)
running direction:	reverse belt rotation at extra charge, max. permissible reverse speed 5 km/h (3.1 mph) if no safety-harness with fall-stop prevention system is used.
motor systems:	3.3 kW (4.5 HP) 3-phase AC motor, maintenance free and brushless; 20 years warranty on main drive motor. For high-performance applications, we recommend models with a 3-phase 3x400 volt power supply and a running surface min. 190/65cm.
power transmission:	frequency inverter, poly-V-belt, very quiet operation
safety systems:	CE 0123; medical device regulation MDR (EU) 2017/745; machinery directive 2006/42/EC; IEC 60601-1; EN 60601-1-2 (EMC tested); IEC 62304; EN 14971; ISO 20957-1; EN 957-6; emergency-stop mushroom push button (for drive system power-off), emergency-stop (with pull-cord and clip); potential equaliza- tion bolt; transformer for potential-isolation from the mains. Certification pending. Product launch planned for Q3 2024.
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accuracy class:	A (high accuracy) according to EN 957-6
earth leakage current:	≤ 0.2 mA
ambient condition:	temperature: +10 ... +40 °C (-30 ... +50 °C on request) humidity: 20 ... 85 % (up to 100 % on request) air pressure: 700 ... 1060 hPa; 3,000 m (~10,000 ft) max. altitude without pressurization
display (resolutions) paramter:	25.9 cm / 10.1" (1280x800), color touch display, speed, time, elevation, distance, heart rate, heart rate variability, energy consumption, altitude, power, pace, METs, diagram view of heart rate and load parameter, parameter export as .pdf and .csv tables to USB
resolution:	1 decimal place
units:	metric / imperial
heart rate monitoring:	heart rate receiver included, 5kHz + Bluetooth®, automatic control of speed and elevation according to programmed target heart rate ("cardio mode")
digital interface:	4x USB 2.0 (1x USB 3.0 internal), 1x LAN / RJ45, 1x HDMI, 1x RS232 1x connection for safety arch fall stop, RFID / NFC Reader (optional at extra charge), Bluetooth® (optional at extra charge), WiFi / WLAN (optional at extra charge)
programs:	over 18 programs / profiles (predefined) over 8 exercise profiles (scalable) - 10 test profiles (UKK 2 km Walktest, Conconi, Graded test, Naughton, Ellestad, Cooper, Balke, etc.) - min. 100 free definable programs - import / export of profiles from / to USB stick also for further processing

PC software (incl.):	h/p/cosmos para control® for display & remote control
accessory (incl.):	instruction for use on USB stick, drinking bottle holder, service box, special oil, PE potential equalization cable POLAR® H10 heart rate chest belt (Bluetooth® + 5 kHz)
colour of frame:	pure white RAL 9010 (powder coated)
handrails:	steel tube handrails Ø 60 mm on both sides, over min. 1/3 of treadmill length with crossbar in front, other handrail designs at extra charge
voltage supply:	230 Volt AC 1~/N/PE 50/60 Hz 15 ... 16A fuse; dedicated circuit, line and protection;
size of frame:	L: 230 cm (7ft 6.6") W: 105 cm (3ft 5.3") H: 149 cm (4ft 10.7")
net. weight:	device approx. 335 kg (740 lbs)
gross weight:	device approx. 410 ... 600 kg (1124 ... 1322 lbs)

Weight and dimensions may differ depending on accessories.

Optionally available at extra charge are special frame colours, other handrail designs, special voltage supply and other options and accessories. Weight and package specifications can deviate according to options, accessories packing and way of transport. E&OE. Subject to alterations without prior notice. Please consider the natural and physical performance limitations of the single phase 230 volt power supply. The single phase 230 volt power supply is sufficient up to normal fitness or therapy applications. For all special high performance applications (speed running, controlled jump-ons, sidesteps, heavy subjects at higher speed, extreme elevations, etc.), we recommend models with a 3-phase, 3x400 volt power supply (for example model h/p/cosmos quasar med 3p, pulsar 3p, venus or saturn).

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sports / athletics



sports
quasar®



cycling & athletics
saturn® med 300/100r



performance diagnostics
pulsar® med 3p



inline skating
saturn® med 300/125r



functional training
pulsar® med 3p + robowalk®



**cross country skiing
skating / biathlon**
saturn® med 450/300rs



wheelchair
saturn® med 300/125r



speed training / speedlab®
quasar® 3p



fitness
pluto® / mercury® / quasar® / pulsar®



motion analysis
quasar® med



expander training
robomove®



bike ergometer
torqualizer®



**biomechanics
gait parameters**
optogait



German Engineering since 1988

rehabilitation



active gait correction
robowalk® expander / mercury® med



senior fitness
mercury®



orthopaedic rehabilitation
mercury® med / arm support / airwalk® ap



cardiac rehabilitation
mercury® med



**body weight supported
treadmill therapy**
airwalk® ap / mercury® med



angiology
mercury® med



gait analysis / biomechanics
gaitway® 3d with force and pressure measurement



**cardiovascular stress
testing / CPET**
mercury® med



locomotion therapy
locomotion® med 150/50



bike ergometer
torqualizer® 1200
medical certification pending

special applications



**environmental & climate
chambers**
quasar® med 3p with
external UserTerminal



biomechanics
gaitway® 3d



military / army
quasar® special version



speed training
sprint trainer comet®



**fire fighter ladder
training & fitness**
discovery®

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