# CYCLUS 2


TESTS AND TRAINING

Outstanding features ... 3
Performance diagnostics on your own bike with the Cyclus2 ... 4
OBLA Test with lactate analysis ... 6
PWC Test ... 8
Sinus Test by Richter ... 10
Sinus Training by Richter ... 12
Wingate Anaerobic Test ... 14
Maximum Cadence Test ... 16
Isokinetic Maximum Strength Test ... 18
CPI Test ... 20
Torque Test: Analysis ... 22
Analysis with TrainingPeaks and WKO+, Web4Trainer and other software tools ... 23

# Outstanding features

**The Cyclus2 meets all demands of a versatile precision test- and training device. Some of the remarkable features are as follows:**

- Highly accurate test- and training results provided by the use of the athlete's own bike (racing bike, track racing bike, triathlon bike, handbike)
- Elastic suspension of the user's own bike enables sustained load performances (also side-to-side movement possible)
- Non-slip transmission of high brake-resistances up to 3000 Watts
- Life-like simulation of training- and competition courses
- Simulation of slip stream races (e.g.. 4000 m team pursuit, pacemaker race)
- Import option for recorded track profiles (e.g. Garmin Edge). Supported import formats are TCX (Garmin) and GPX (common standard).
- Electronic gear change enables realistic track simulations with inclinations of more than 15%.
- Newly designed SINUS-Training
- Easy setup of various exercise load patterns for individual tests and training practise.
- Large variety of load specifications: power (revolution speed independent), pedal force (revolution speed dependent), inclination (simulation of downhill force, rolling friction, air resistance) and isokinetic force
- Integrated tests (OBLA Test, Wingate Anaerobic Test, Isokinetic Maximum Strength Test, Maximum Cadence Test, PWC Test, CPI Test)
- Comfortable, automated analysis of a lactate performance curve supporting various threshold value schemes
- Direct import of lactate measurement values from lactate meters BIOSEN and Lactate SCOUT from EKF-diagnostic GmbH
- User-friendly control unit with graphical user interface
- Language support (German, English, French, Spanish, Polish, Russian, Italian)
- Two USB ports (e.g. USB stick, printer or extra keyboard)
- Direct analysis of training units and tests with impressive colour print-outs
- All print-outs of tests or training sessions can now be saved as PDF- or TIF-files on the USB memory stick.
- Incorporation of a personal logo on the print-out
- Saving of training- and test-data including analysis on the internal memory, USB stick or network drive, featuring reloading of all data for further analysis
- Easy-to-use export feature for training- and test-data (PWX for TrainingPeaks, CSV for Web4Trainer and user defined CSV e.g. for MS Excel).
- Direct ergometry data upload to the training platform TrainingPeaks via the internet for online data analysis
- Embedding of the Cyclus2 in existing spiro-ergometry- or ECG systems, respectively (external control)
- Controlling via TCP/IP or serial port (RS232) using a standard protocol
- Easy incorporation of the Cyclus2 in existing networks via state-of-the-art communications technologies (WLAN, Ethernet)
- Monitoring and remote controlling of the Cyclus2 via network computer including free VNC viewer
- Ideal for mobile performance diagnostics (compact suitcase, optional battery powered version available)

# Performance diagnostics on your own bike with the Cyclus2

## OBLA Test with lactate analysis

| | | |
|---|---|---|
| Load mode | | Incrementally increasing load with a freely selectable initial load and user defined step-size and -duration |
| Initial load (Watt) | A | |
| Step (Watt) | S | |
| Step duration (min) | D | The step duration can also be defined according to the work carried out |

**Endurance disciplines**

Road, Triathlon, Duathlon, MTB-CrossCountry, Track pursuit, Points race

| | |
|---|---|
| Juniors, Amateurs, Professionals | A = 100 / S = 20 / D = 3 |
| Women, Youths m/f | A = 60 / S = 20 / D = 3 |

**Sprint disciplines**

| | |
|---|---|
| Track sprint, 1.000 m | A = 100 / S = 20 / D = 1 |
| Cadence | 100 rpm |
| Lactate measurement | all steps |

## Threshold Test

| | |
|---|---|
| Load mode | 3 (4) x 9 min / S = 20 (explanation see above) |
| Cadence | 100 rpm |

## Torque Test (Traction Force Test)

| | |
|---|---|
| Load mode | Maximum strength during 20 seconds applying various cadences (isokinetic) |

| | Cadence | Pause |
|---|---|---|
| Endurance (Road, Triathlon, MTB) | 70 - 90 - 110 - 130 rpm | 4 min. |
| Endurance (Track - Men) | 90 - 110 - 130 - 150 rpm | 4 min. |
| Endurance (Track - Women) | 80 - 100 - 120 - 140 rpm | 4 min. |
| Sprint, 1.000 m (Men) | 80 - 100 - 120 - 140 - 160 rpm | 6 min. |
| Sprint (Women) | 70 - 90 - 110 - 130 - 150 rpm | 6 min. |

## Wingate Anaerobic Test

| | |
|---|---|
| Load mode | Maximum strength during a defined time span with a preset torque in relation to the test person's body weight. |
| Test duration | 30 seconds |

## Anaerobic Test (according to German Biker Association)

| | |
|---|---|
| Load mode | Maximum power during a defined time span with a preset cadence (isokinetic) |

| | Men | Women | Time |
|---|---|---|---|
| Endurance (Road, Triathlon, MTB) | 110 rpm | 100 rpm | 75 sec. |
| Endurance (Track) | 140 rpm | 130 rpm | 75 sec. |
| 1.000 m | 140 rpm | - | 60 sec. |
| Sprint | 160 rpm | 150 rpm | 45 sec. |

## Maximum Cadence Test (Motor Activity Test)

| | |
|---|---|
| Load mode | Maximum cadence with low initial load |
| Test duration | 6 seconds |

## Sinus Test by Richter (Strength Endurance Test)

| | | |
|---|---|---|
| Load mode | | Sinusoidal load periods with continuously increasing and decreasing load |
| Initial load (Watt) | A | |
| Sinus increase (Watt) | S | |
| Sinus duration (min) | D | |

**Endurance disciplines**
Road, Triathlon, Duathlon, MTB-CrossCountry, Track pursuit, Points race

| | |
|---|---|
| Juniors, Amateurs, Professionals | G = 100 / S = 50 / D = 5 |
| Women, Youths m/f | G = 50 / S = 25 / D = 5 |

**Sprint disciplines**

| | |
|---|---|
| Track sprint, 1.000 m | |
| All | G = 100 / S = 50 / D = 2 |

## Linear Test (Maximum Power Test)

| | |
|---|---|
| Load mode | Continuously increasing load in dependency of the work carried out up to the maximum power with freely selectable initial load. |
| Juniors, Amateurs, Professionals | A = 100 Watt – tendency 1 W / kj |
| Women, Youths m/f | A = 100 Watt – tendency 0,5 W / kj |

## Speed Force Level Test (Anaerobic Strength Test by Richter)

| | |
|---|---|
| Load mode | Test series with maximum strength over a defined distance (200m) applying a variable aerodynamic resistance area of the athlete. |
| | Resistance areas |
| **Endurance disciplines** | 0 - 0,05 - 0,1 - 0,2 - 0,4 - 0,6 - 0,8 - 1,0 - 2,0 m² |
| **Sprint disciplines** | 0 - 0,02 - 0,05 - 0,1 - 0,2 - 0,4 - 0,6 - 0,8 - 1 - 2,0 - 4,0 m²<br>Breaks: 5 -10 min. according to the respective distance |

## Conconi Test

| | |
|---|---|
| Load mode | Incrementally increasing load with a freely selectable initial load, Level and -duration in minutes or according to the work carried out |

## Acceleration Test

| | |
|---|---|
| Load mode | Pedal force controlled decreasing load in relation to the distance accomplished with increasing speed |

**NOTES:** The aforementioned tests and protocols were set up partially on the basis of approved and established test protocols by renowned sport medicine specialists and coaches and represent suggestions and examples to work from. The Cyclus2 offers all options for individual protocols of course.

# OBLA Test with lactate analysis

## What do we want to know?

Depending on the training-/ load intensity not only the heart rate but also the lactate value measurable in the blood increases. The latter provides information on the oxygen supply for the energy generation in the muscle cell and therefore allows an individual determination of the load intensity and the state of fitness. Each heart rate relates to a respective lactate value in the blood. High lactate concentrations are to be avoided. Hence we have to find out at which heart rate the training is most effective as the lactate concentration is “trainable”. The athlete’s consent should be asked prior to taking a blood sample.

## How do we do it?

First of all it is necessary to have a lactate measurement device available. With that the actual lactate value is measured using a drop of blood which is taken from the athlete’s finger or earlobe during physical activity. The lactate value is specified in mmol/l (Milli mol per litre). During the endurance training it should not exceed 2-4 mmol/l (in respective of the intensity). As the name indicates a level protocol is used for the test activity. It is common practise to take a blood sample at the end of each load step in order to determine the lactate value in relation to the respective heart rate

The step-duration and -size of the load can be set individually on the Cyclus2. For each step a minimum-, maximum-, and mean value of the heart rate is shown allowing a fairly differentiated analysis of the athlete’s performance capability. At the end of the OBLA Test the lactate values are directly entered in order to interpret and plot the lactate-performance curve. Various analysis models can be applied with the Cyclus2. The lactate curve is calculated optionally as exponential function or polynomial.

## Who needs it?

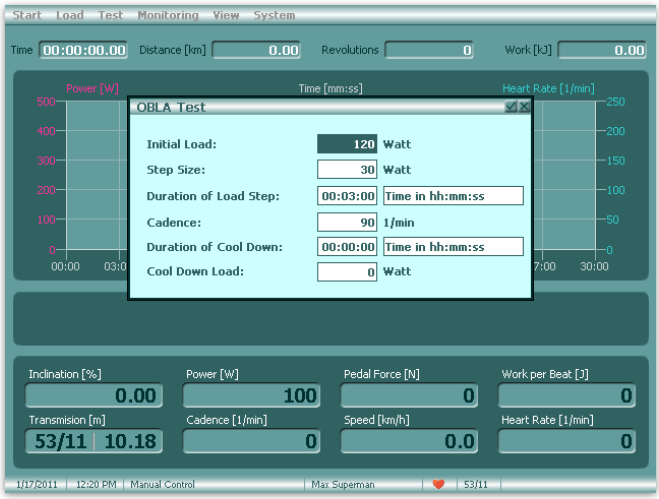
The answer is as simple as that: Everyone who wants to do efficient training.This also involves, apart from the competitive athletes and ambitioned hobby sportsmen, all fitness amateurs.



## When do I apply the test?

The OBLA Test with determination of the respective lactate values is no actual performance test but rather serves the optimal adaption of the athlete to the various training intensity levels. Strength, endurance and speed can be efficiently trained with the knowledge of the respective lactate concentration in the blood.

The new tests that can be carried out on the Cyclus2, presented on the following pages, provide you with a perfect “tune-up”.




Dialogue box for setting up the OBLA Test on the Cyclus2


Threshold analysis of an OBLA Test

CYCLUS 2

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[Here is Your logo]

Bike ergometry of Your own road bike

## OBLA Test

| | |
|---|---|
| Date: | 1/18/2008 5:09:14 PM |
| Saved as: | 080118_1709 MS Stufentest 120W, 18 |
| Initial Load: | 120 W |
| Load schema: | every 30 Minutes + 30 W |
| Cadence: | 90 1/min |

## Test Results

| | |
|---|---|
| Maximum Power: | 435 W |
| Relative Power: | 6.3 W/kg |
| Size/Nominal: | 231 % |

## Athlete

| | |
|---|---|
| Name: | Max Superman |
| Date of Birth: | 5/25/1974 |
| Body Weight: | 69.0 kg |
| Body Height: | 1.840 m |
| BMI: | 20.4 |

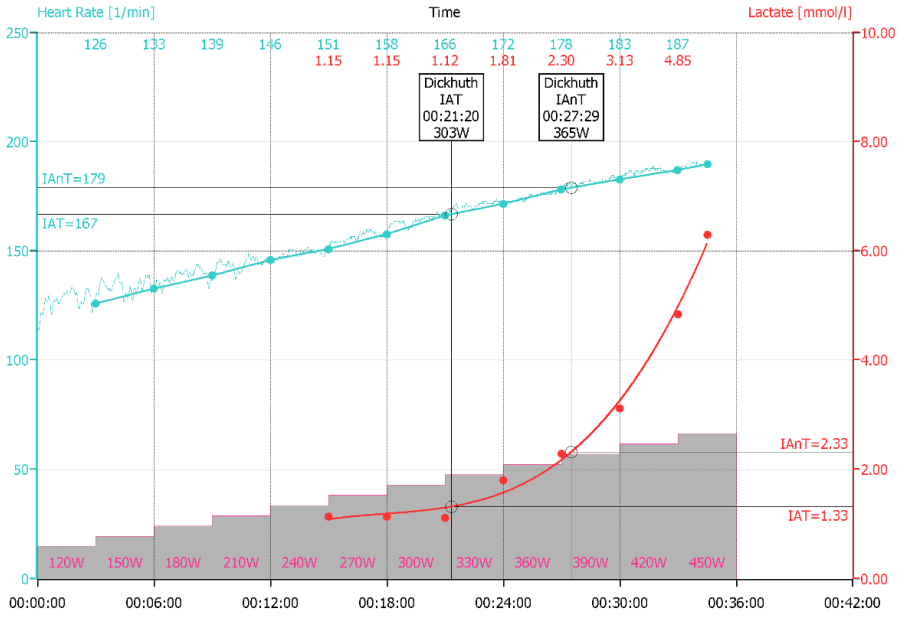
## Bike

| | |
|---|---|
| Crank Length: | 0.1725 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 53/11 |
| Weight: | 8.0 kg |

## Analysis of Thresholds

| | |
|---|---|
| Time: | 00:34:32.17 |
| Distance: | 31.10 km |
| Revolutions: | 3055 |
| Work: | 578.70 kJ |
| Smoothing Function: | Lac = $f(t)$ = -4.82704500 + 0.01598706 · t - 0.00001452 · $t^2$ + 0.00000000 · $t^3$ |
| Correlation: | 0.9969 |
| Threshold Model: | 'Model by Dickhuth' (Fixum=1.00 mmol/l) |

| Name | Max. | IAT | IAnT | PWC130 | PWC150 | PWC170 | Lac2 | Lac3 | Lac4 | Lac6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | 00:34:32 | 00:21:20 | 00:27:29 | 00:04:41 | 00:14:19 | 00:22:58 | 00:26:15 | 00:29:22 | 00:31:25 | 00:34:19 |
| Lactate [mmol/l] | 6.18 | 1.33 | 2.33 | - | - | 1.46 | 2.00 | 3.00 | 4.00 | 6.00 |
| Heart Rate [1/min] | 190 | 167 | 179 | 130 | 150 | 170 | 177 | 182 | 185 | 190 |
| Power [W] | 435 | 303 | 365 | 143 | 233 | 320 | 353 | 384 | 404 | 433 |
| Rel. Power [W/kg] | 6.3 | 4.4 | 5.3 | 2.1 | 3.4 | 4.6 | 5.1 | 5.6 | 5.9 | 6.3 |
| Size/Nominal [%] | 232 | 162 | 194 | 77 | 124 | 170 | 188 | 204 | 215 | 230 |







Print-out of the threshold analysis of an OBLA Test from the Cyclus2 (here model according to Dickhuth)

# PWC Test

## What do we want to know?

It has been established, that during cascade load schemes the heart rate increases linearly. The gradient of the increase thereby depends on the physical capacity of the proband. Note: The higher the endurance capacity of the proband the slower is the increase of the heart rate. The objective of the test is the determination of the performance at a defined heart rate. This approach was first introduced in 1948 by a Swedish man by the name of Wahlund. He used a heart rate threshold of 170 beats per minute for his examinations. Nowadays the test relates to the heart rates 130, 150, and 170 depending on the age and fitness state of the proband and is referred to as PWC130, PWC150 and PWC170, respectively. The test results are evaluated by comparing the values with published norm charts. Longitudinal section examinations, during which the results of former tests are consulted, allow statements about the performance trend. Research has shown that the test can be applied irrespective of the test person's age.

## How do we do it?

It is as simple as that: Put on the chest strap for the heart rate measurement, set the load scheme and heart rate to be examined, start the ergometry. The PWC Test as a standard test is part of the functional spectrum of the Cyclus2. The ergometry stops automatically as soon as the test result becomes available. The analysis is then immediately shown on the display of the Cyclus2 and can be put out via a colour printer connected to the Cylus2.

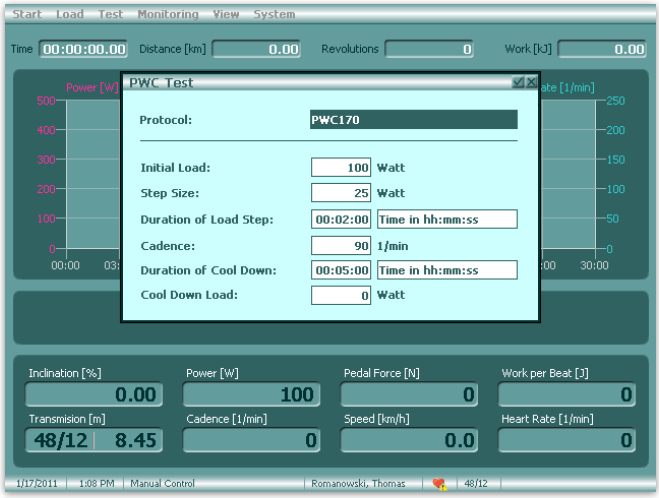
## Who needs it?

The PWC test is applied not only in competitive sports and high-performance sports but is also very suitable for the determination of the fitness state of an untrained person and of amateur sportsmen. Tests results can be gained even for the older generation. Accompanying tests during rehabilitation represent another interesting field of application. Important notice: The PWC Test is not recommended for persons with a limited cardiac performance.

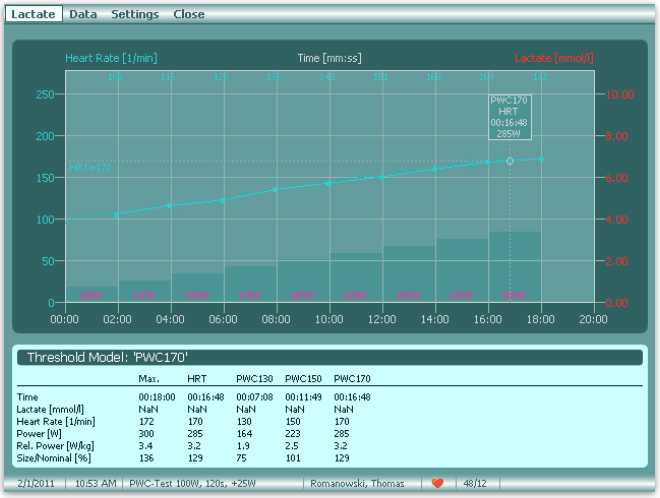


## When do I apply the test?

The PWC Test is ideal for testing the fitness state of generally trained amateur sportsmen in order to derive training recommendations from that. PWC Tests carried out in intervals during rehabilitation can give information on the progress of the treatment. In competitive sports and high-performance sports, apart from the thresholds, which result from the lactate curve, the heart rate thresholds are analysed after OBLA Tests.




Dialogue box for setting up the PWC Test on the Cyclus2




Analysis of a PWC Test on the Cyclus2

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Bike ergometry of Your own road bike

## PWC Test

| | |
|---|---|
| Date: | 9/11/2008 8:46:20 AM |
| Saved as: | 080911_0846 TR PWC-Test 100W, 120s, +25W |

## Athlete

| | |
|---|---|
| Name: | Thomas Romanowski |
| Date of Birth: | 6/30/1965 |
| Body Weight: | 88.0 kg |
| Body Height: | 1.780 m |
| BMI: | 27.8 |

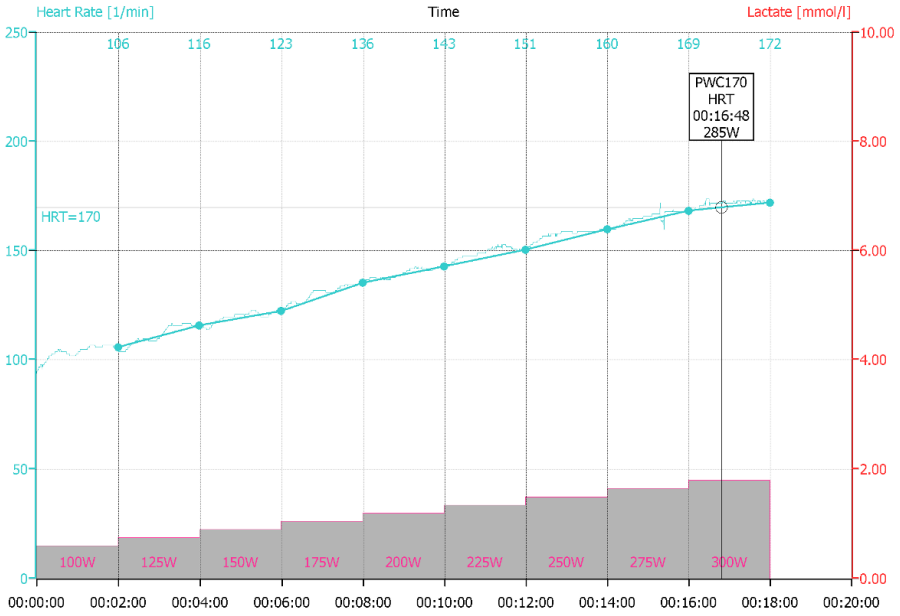
## Bike

| | |
|---|---|
| Crank Length: | 0.1725 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 48/12 |
| Weight: | 8.0 kg |

## Analysis of Thresholds

| | |
|---|---|
| Time: | 00:18:00.00 |
| Distance: | 13.95 km |
| Revolutions: | 1651 |
| Work: | 215.92 kJ |
| Threshold Model: | 'PWC170' |

| Name | Max. | HRT | PWC130 | PWC150 | PWC170 |
|---|---|---|---|---|---|
| Time | 00:18:00 | 00:16:48 | 00:07:08 | 00:11:49 | 00:16:48 |
| Lactate [mmol/l] | - | - | - | - | - |
| Heart Rate [1/min] | 172 | 170 | 130 | 150 | 170 |
| Power [W] | 300 | 285 | 164 | 223 | 285 |
| Rel. Power [W/kg] | 3.4 | 3.2 | 1.9 | 2.5 | 3.2 |
| Size/Nominal [%] | 139 | 132 | 76 | 103 | 132 |







Print-out of the analysis of the PWC Test from the Cyclus2

# Sinus Test by Richter

## What do we want to know?

The progress of the strength endurance is a significant factor for the performance of an athlete especially in cycling sports. In order to observe and analyse the strength endurance on the Cyclus2 the newly developed Sinus Test by Richter can be used. The permanent alternation between activity- and relaxation-phases is particularly motivating for the athlete resulting in a higher commitment during test and training. Sinusoidal functions have played an important role for the optimisation of biological systems ever since.

## How do we do it?

The Sinus Test by Richter consists of a series of sinusoidal activity- and relaxation phases, which contain, starting off with an initial load, increasing load maxima. The special feature of this programme are the sinusoidal floating transitions (small steps) of the load alternations during the load increase as well as during the load reduction, which are only possible on the Cyclus2 in this form. The load is defined in Watt and therefore does not depend on the rotational speed. This in turn allows the athlete to apply his individual cadence.

The precise monitoring of the pulse performance, lactate values or cadence during variable loads or relaxation periods gives detailed information on the strength-endurance-capability of the athlete. Professional athletes reach performance peaks of more than 700 Watt at this. The largest significance has the evaluation of the CPI value, the work per heart beat. This value is the ideal basis for the analysis of the test- and training-results. The peak CPI values here lie above 200 J/heartbeat. The pulse performance can be precisely monitored during activity as well as during relaxation phases by linking the peak values and lowest values respectively with a straight line.

## Who needs it?

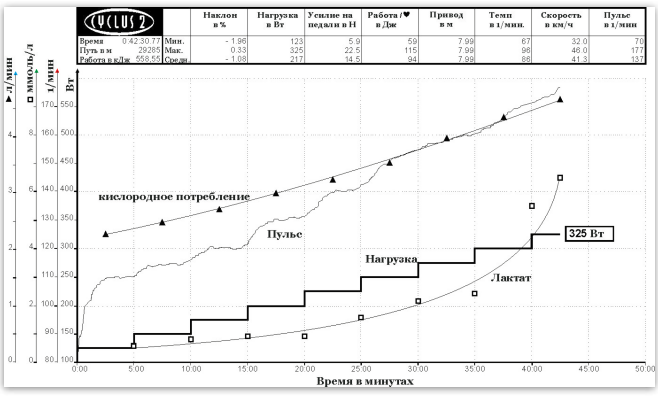
There is a wide range of applications and it is suitable for everyone who works or takes part in competitions in the strength-endurance field. Ice speed skaters and ice hockey players belong to this group apart from cyclists, triathletes or mountainbikers.



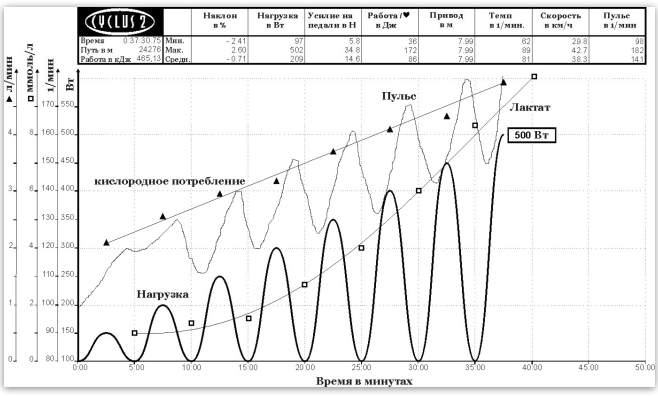
## When do I apply the test?

The Sinus Programme is suited for performance monitoring as Sinus Test as well as for the daily training routine (see Hill-Rhythm-Programme). Particularly the alternation of activity and relaxation increases the athlete's motivation.

**Sinus Test and OBLA Test in comparison - in co-operation with the IAT Leipzig, Prof. Neumann**




Physiological data during an OBLA Test




Physiological data during a SINUS Test

CYCLUS 2

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Bike ergometry of Your own road bike

## Training Protocol

| | |
|---|---|
| Date: | 2/22/2008 12:20:51 PM |
| Saved as: | 080222_1220 TW sst s4 b130 a30 pl2 e5 |
| Description: | sst s4 b130 a30 pl2 e5 |

## Athlete

| | |
|---|---|
| Name: | Thomas Wiedemann |
| Date of Birth: | 6/6/1975 |
| Body Weight: | 70.0 kg |
| Body Height: | 1.865 m |
| BMI: | 20.1 |

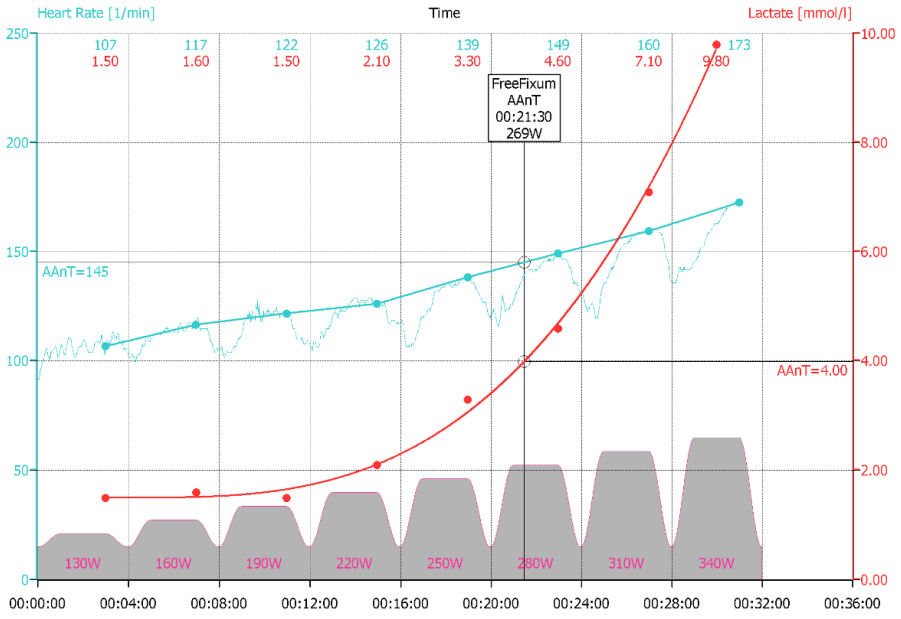
## Bike

| | |
|---|---|
| Crank Length: | 0.1750 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 50/12 |
| Weight: | 8.0 kg |

## Analysis of Thresholds

| | |
|---|---|
| Time: | 00:31:06.09 |
| Distance: | 26.35 km |
| Revolutions: | 2993 |
| Work: | 377.19 kJ |
| Smoothing Function: | $Lac = f(t) = 1.48048600 + 0.00036588 \cdot t - 0.00000159 \cdot t^2 + 0.00000000 \cdot t^3$ |
| Correlation: | 0.9992 |
| Threshold Model: | 'Free Fixum' (Fixum=4.00 mmol/l) |

| Name | AAnT | PWC130 | PWC150 | PWC170 | Lac2 | Lac3 | Lac4 | Lac6 |
|---|---|---|---|---|---|---|---|---|
| Time | 00:21:30 | 00:16:11 | 00:23:13 | 00:30:09 | 00:14:15 | 00:18:46 | 00:21:30 | 00:25:16 |
| Lactate [mmol/l] | 4.00 | 2.34 | 4.82 | - | 2.00 | 3.00 | 4.00 | 6.00 |
| Heart Rate [1/min] | 145 | 130 | 150 | 170 | 126 | 138 | 145 | 155 |
| Power [W] | 269 | 229 | 282 | 334 | 214 | 248 | 269 | 297 |
| Rel. Power [W/kg] | 3.8 | 3.3 | 4.0 | 4.8 | 3.1 | 3.5 | 3.8 | 4.2 |
| Size/Nominal [%] | 140 | 119 | 146 | 173 | 112 | 129 | 140 | 154 |







Print-out of a Sinus Test with plateau from the Cyclus2

# Sinus Training by Richter

## What do we want to know?

Sinus programmes for the training have been developed on the Cyclus2 in parallel and analogy to the Sinus Test in order to effectively implement the conclusions from the Sinus Test in future training practise and to specifically eliminate weaknesses. The athlete's motivation is the top priority in this.

## How do we do it?

The Sinus training programmes by Richter contain the sinusoidal activity and relaxation phases as known from the Sinus Test. An initial load is applied, too. Unlike the Sinus Test the pre-defined load maxima remain constant, i.e. the athlete constantly changes between a floatingly increasing load and floatingly decreasing load (relaxation) in Watt – i.e. rotational speed independent (extensive and intensive interval method).

The duration of the activity-/relaxation periods can be varied individually thereby. Periods of 5 minutes duration during which the athlete goes up to the pre-defined maximum load and back down to the initial load with the same rhythm have proved feasible.

The monitoring of the pulse performance or cadence during and between the individual phases allows an excellent monitoring of the athlete by the coach. Also the own individual training-self-monitoring of the athlete, e.g. via a preset cadence, which has to be kept to during all phases of increasing and decreasing load, is perceived as very motivating and diversified.

## Who needs it?

There is a wide range of applications and it is suitable for everyone who works or takes part in competitions in the strength-endurance field. Ice speed skaters and ice hockey players belong to this group apart from cyclists, triathletes or mountain bikers.

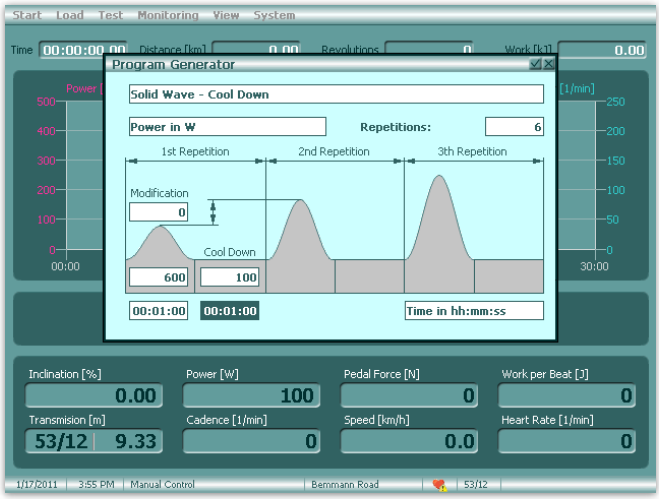


## When do I apply the test?

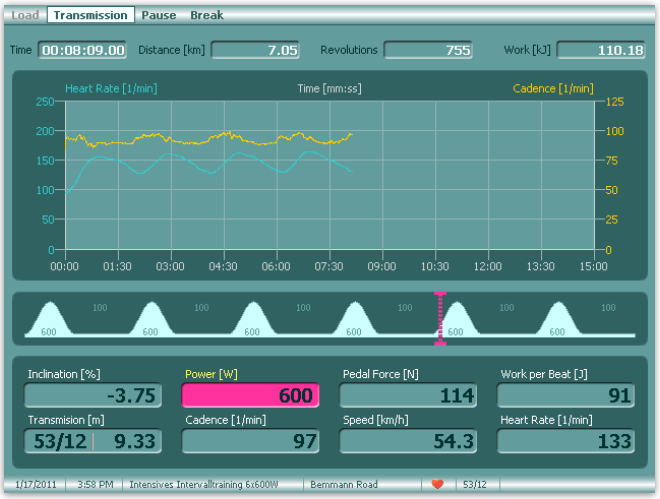
As motivation training in the strength-endurance-range. The variation of the cadence during the rotational-speed-independent performance helps in finding the optimal training- and competition cadence.

## What is the benefit?

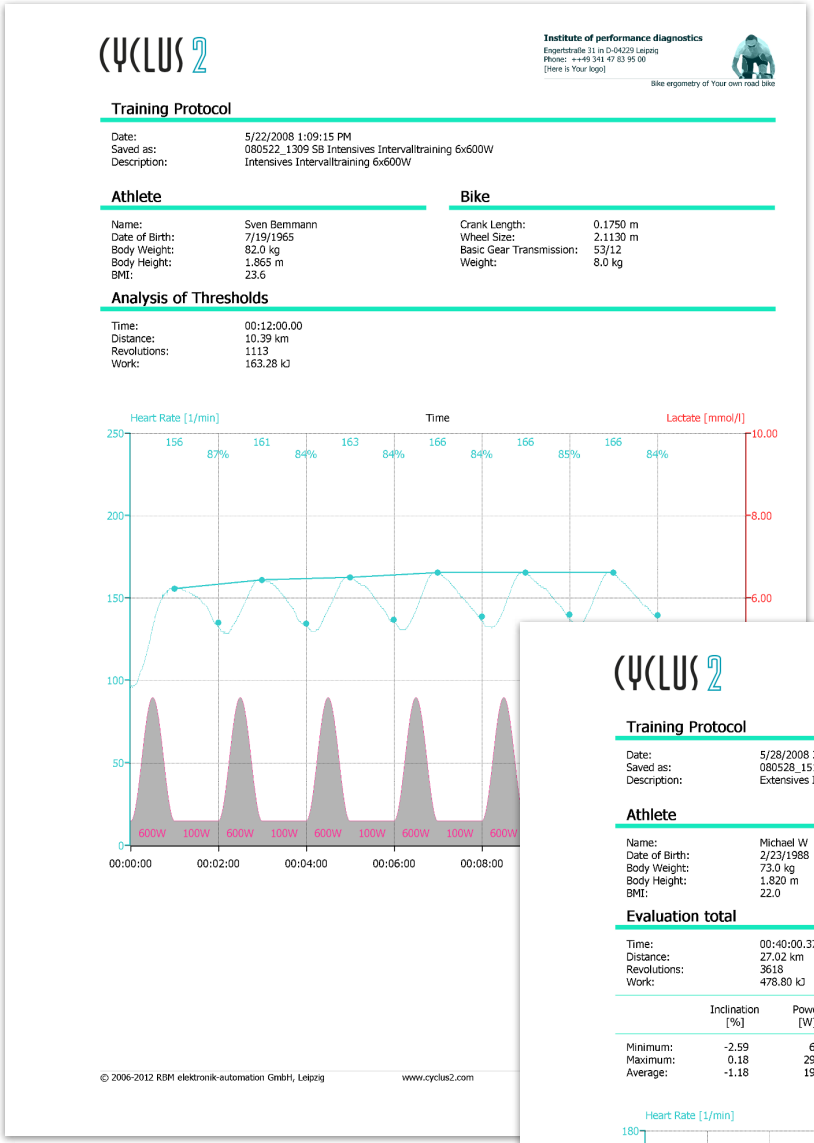
Primarily the monitoring of the pulse performance during and after the training by applying a straight line along the maximum- and minimum pulse values on the print-out renders precise conclusions about the performance or performance increase that has been made.




The programme generator is for the setup of variable sinus programmes




Display during a sinus training



CYCLUS 2

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Bike ergometry of Your own road bike

Training Protocol

| | |
|---|---|
| Date: | 5/22/2008 1:09:15 PM |
| Saved as: | 080522_1309 SB Intensives Intervalltraining 6x600W |
| Description: | Intensives Intervalltraining 6x600W |

Athlete

| | |
|---|---|
| Name: | Sven Bemmann |
| Date of Birth: | 7/19/1965 |
| Body Weight: | 82.0 kg |
| Body Height: | 1.865 m |
| BMI: | 23.6 |

Bike

| | |
|---|---|
| Crank Length: | 0.1750 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 53/12 |
| Weight: | 8.0 kg |

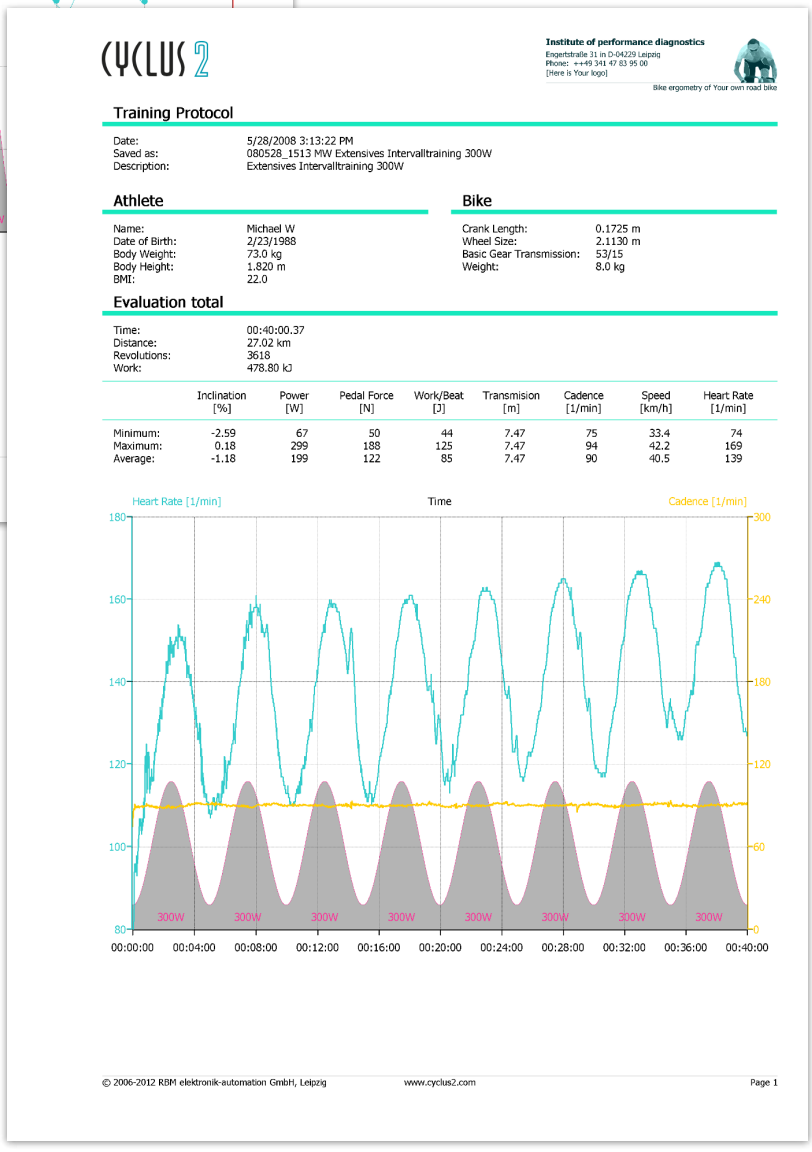
Analysis of Thresholds

| | |
|---|---|
| Time: | 00:12:00.00 |
| Distance: | 10.39 km |
| Revolutions: | 1113 |
| Work: | 163.28 kJ |



 www.cyclus2.com

**Analysis intensive interval method**
Print-out of a sinus training (intensive interval method) from the Cyclus2



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[Here is Your logo]
Bike ergometry of Your own road bike

Training Protocol

| | |
|---|---|
| Date: | 5/28/2008 3:13:22 PM |
| Saved as: | 080528_1513 MW Extensives Intervalltraining 300W |
| Description: | Extensives Intervalltraining 300W |

Athlete

| | |
|---|---|
| Name: | Michael W |
| Date of Birth: | 2/23/1988 |
| Body Weight: | 73.0 kg |
| Body Height: | 1.820 m |
| BMI: | 22.0 |

Bike

| | |
|---|---|
| Crank Length: | 0.1725 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 53/15 |
| Weight: | 8.0 kg |

Evaluation total

| | |
|---|---|
| Time: | 00:40:00.37 |
| Distance: | 27.02 km |
| Revolutions: | 3618 |
| Work: | 478.80 kJ |

| | Inclination [%] | Power [W] | Pedal Force [N] | Work/Beat [J] | Transmision [m] | Cadence [1/min] | Speed [km/h] | Heart Rate [1/min] |
|---|---|---|---|---|---|---|---|---|
| Minimum: | -2.59 | 67 | 50 | 44 | 7.47 | 75 | 33.4 | 74 |
| Maximum: | 0.18 | 299 | 188 | 125 | 7.47 | 94 | 42.2 | 169 |
| Average: | -1.18 | 199 | 122 | 85 | 7.47 | 90 | 40.5 | 139 |



 www.cyclus2.com Page 1

**Analysis extensive interval method**
Print-out of a sinus training (extensive interval method) from the Cyclus2

# Wingate Anaerobic Test

## What do we want to know?

The Wingate Anaerobic Test (WAnT), in common terms often just called Wingate Test, belongs to the anaerobe test procedures in performance diagnostics amongst which it ist the most common. The athlete has to perform under a rotational-speed-dependent load in relation to his body weight for a short time span, 30 seconds in most cases. The maximum power (Peak Power PP) therefore settles at the maximum cadence. After reaching the maximum power a steady power decrease towards the end of the test can be observed. The peak power ought to be identical with the maximal alactacide performance capability. Please note when running the test that the test results strongly depend on the duration of the test and on the preset load.

## How do we do it?

The athlete should run a sufficient warm-up sequence before performing the test. From the first to the last second of the test the athlete must constantly apply the maximal possible cadence for the desired test results to be valuable for analysis. The Cyclus2 offers the athlete the option of starting the test to his own discretion by exceeding a preset start-up cadence.

The test duration is usually 30 seconds but it can be set freely over a wide range. The load parameter is to be preset in relation to the body weight. This preset can be calculated using the body weight set on the Cyclus2 and a factor (relative torque) or optionally the value can be calculated externally according to an individual model and in the following entered as absolute value of the pedal force. Diagnosticians, who are experienced with the Wingate Anaerobic Test on the Monark ergometer, can set the test parameter as kg per kg body weight, as it is common procedure with the Monark ergometer.

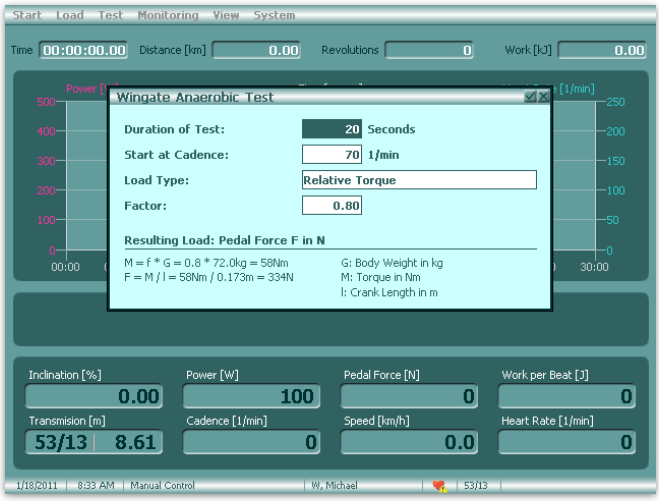
## Who needs it?

The test is most commonly applied in competitive sports for anaerobe trained athletes e.g. in cycling for track sprinters, ice track sprinters and ice hockey players. Furthermore it is used in rehabilitation for monitoring the muscle building process.



## When do I apply the test?

Subsequent to a Maximum-Cadence- and OBLA Test, whereas for the OBLA Test it is recommended to omit full intensity. Furthermore is the Wingate Test a suitable physical training activity within the intensive interval training (e.g. 6 repetitions with active break-time activity).




Dialogue box for setting up a Wingate Anaerobic Test on the Cyclus2


Analysis of the Wingate Anaerobic Test on the Cyclus2

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Bike ergometry of Your own road bike

## Wingate Anaerobic Test

| | |
|---|---|
| Date: | 11/12/2007 4:04:03 PM |
| Saved as: | 071112_1604 MW Wingate Anaerobic |
| Load: | M = f * G = 0.8 * 72.0kg = 58Nm |
| | F = M / l = 58Nm / 0.173m = 334N |
| Start at Cadence: | 70 1/min |

## Test Results

| | |
|---|---|
| Peak Power: | 999.0 W |
| Main Power: | 798.0 W |
| Anaerobic Power: | 13.9 W/kg |
| Anaerobic Capacity: | 11.1 W/kg |
| Fatigue Index: | 20.4 W/s |

## Athlete

| | |
|---|---|
| Name: | Michael W |
| Date of Birth: | 2/23/1988 |
| Body Weight: | 72.0 kg |
| Body Height: | 1.820 m |
| BMI: | 21.7 |

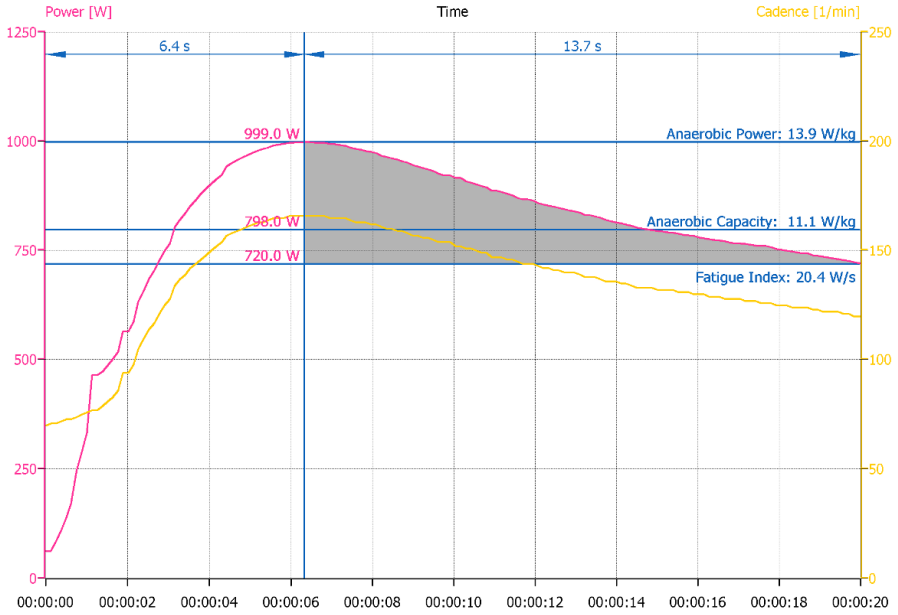
## Bike

| | |
|---|---|
| Crank Length: | 0.1725 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 53/13 |
| Weight: | 8.0 kg |

## Evaluation total

| | |
|---|---|
| Time: | 00:00:20.00 |
| Distance: | 0.39 km |
| Revolutions: | 45 |
| Work: | 16.15 kJ |

| | Inclination [%] | Power [W] | Pedal Force [N] | Work/Beat [J] | Transmision [m] | Cadence [1/min] | Speed [km/h] | Heart Rate [1/min] |
|---|---|---|---|---|---|---|---|---|
| Minimum: | -8.75 | 62 | 49 | 28 | 8.61 | 70 | 36.2 | 98 |
| Maximum: | 1.97 | 999 | 333 | 475 | 8.61 | 166 | 85.8 | 185 |
| Average: | -4.64 | 798 | 321 | 363 | 8.61 | 135 | 69.9 | 135 |







Print-out of a Wingate Anaerobic Test from the Cyclus2

# Maximum Cadence Test

## What do we want to know?

In professional cycling it is of great significance to know which maximal cadence an athlete is capable of performing. The maximal achieved cadence indicates the athlete's motoric-coordinative capabilities, which are genetically determined and have to be trained during adolescence. In cycling the test also indicates which cycling disciplines the athlete is more suited for and which less.

Continually increasing average cadences in the various cycling disciplines indicate the great significance of the cadence for the sportive success. High cadences enable a better supply of oxygen and nutrients to the musculature, the evacuation of metabolic end products works faster resulting in shorter recreation times.

## How do we do it?

The Maximum Cadence Test, also named Motoric Test, as a standard test in complex performance diagnostics belongs to the functional spectrum of the Cyclus2. Use the input mask specially designed for this test to set the test parameters and start the ergometry. The usual running time for the test is 6 seconds. The adjustable start-up cadence serves as parameter for the automated start of the ergometry.

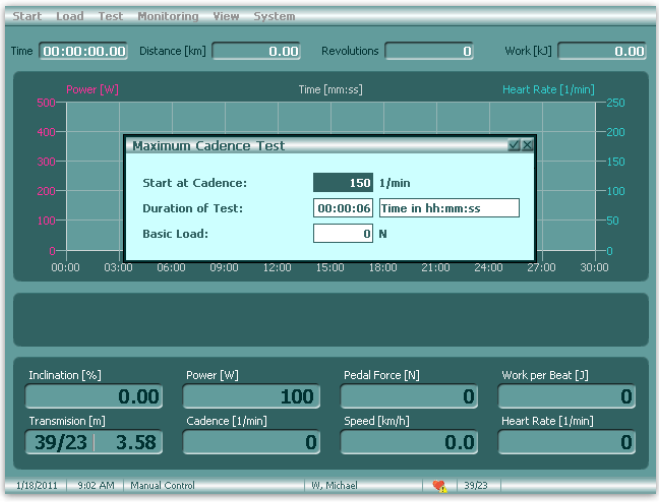
## Who needs it?

All performance-oriented cyclists should have their maximal cadence tested.

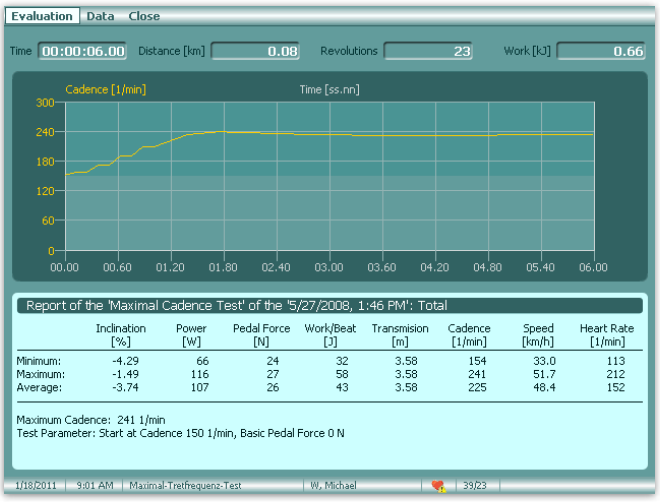
## When do I apply the test?

We recommend offering the Maximal Cadence Test in one package with the OBLA Test and another anaerobe test procedure. This way, as a result of the performance diagnostics, the athlete gets detailed information regarding his endurance capacity, his motoric capabilities and his anaerobe capacity, which are important factors for the assessment of the actual state of training.






Dialogue box for setting up a Maximum Cadence Test on the Cyclus2




Display of the analysis of a Maximum Cadence Test on the Cyclus2

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Bike ergometry of Your own road bike

## Maximum Cadence Test

| | |
|---|---|
| Date: | 5/27/2008 1:46:47 PM |
| Saved as: | 080527_1346 MW Maximal-Tretfrequer |
| Start at Cadence: | 150 1/min |
| Initial Load: | 0 N |

## Test Results

| | |
|---|---|
| Maximum Cadence: | 241 1/min |

## Athlete

| | |
|---|---|
| Name: | Michael W |
| Date of Birth: | 2/23/1988 |
| Body Weight: | 73.0 kg |
| Body Height: | 1.820 m |
| BMI: | 22.0 |

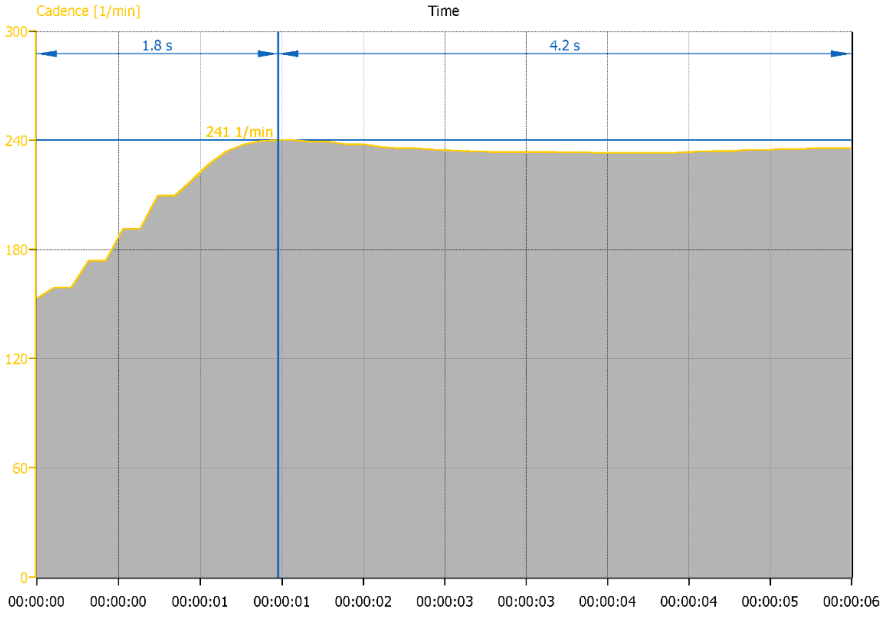
## Bike

| | |
|---|---|
| Crank Length: | 0.1725 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 39/23 |
| Weight: | 8.0 kg |

## Evaluation total

| | |
|---|---|
| Time: | 00:00:06.00 |
| Distance: | 0.08 km |
| Revolutions: | 23 |
| Work: | 0.66 kJ |

| | Inclination [%] | Power [W] | Pedal Force [N] | Work/Beat [J] | Transmision [m] | Cadence [1/min] | Speed [km/h] | Heart Rate [1/min] |
|---|---|---|---|---|---|---|---|---|
| Minimum: | -4.29 | 66 | 24 | 32 | 3.58 | 154 | 33.0 | 113 |
| Maximum: | -1.49 | 116 | 27 | 58 | 3.58 | 241 | 51.7 | 212 |
| Average: | -3.74 | 107 | 26 | 43 | 3.58 | 225 | 48.4 | 152 |







Print-out of a Maximum Cadence Test from the Cyclus2

# Isokinetic Maximum Strength Test

## What do we want to know?

The dynamic maximum strength in isokinetic load mode is measured in relation to the cadence. Some athletes perform their maximum strength at 80 rpm, others may need more momentum for that. In contrast to the static measurement is the dynamic measurement (in motion) much more practice-oriented. Note, that during training or competition an immense exertion of strength, in most of the cases, is carried out in motion, e.g. during sprint activities.

## How do we do it?

The desired test cadence is to be set. During the test the load is controlled i.e. increased in such a way, that the athlete cannot exceed the cadence even if trying very hard. In other words: as soon as the athlete tries to go faster the Cyclus2 prevents that by counterbalancing increasing the load. Or from another point of view: The strength is measured, which the athlete applies in order to break through the “invisible boundary”.

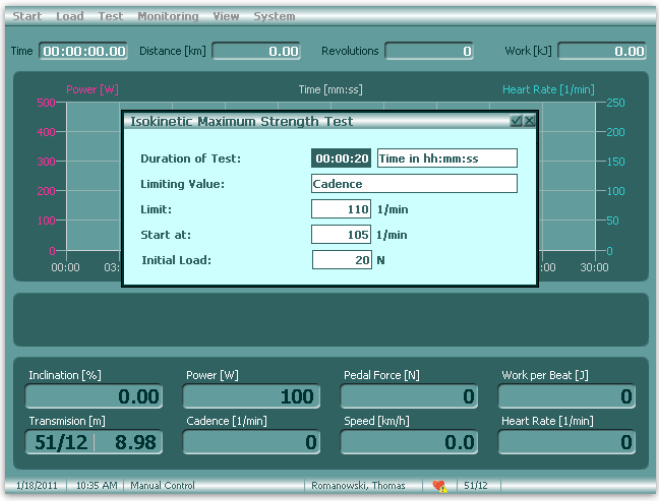
## Who needs it?

Cyclists, mountain bikers and triathletes who depend on the optimal application of strength. Questions like “Which gear transmission ratio do I use”, “Which cadence do I perform a sprint with?” or “How do I efficiently climb an up-hill stretch?” are answered by this.

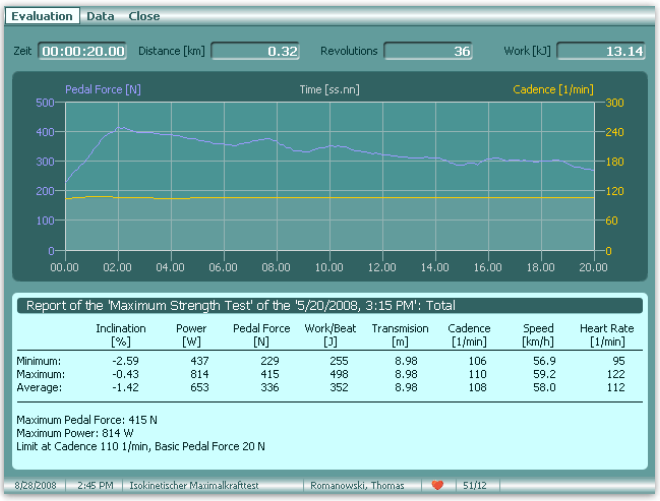
## When do I apply the test?

It applies in addition to the OBLA Test, because another important factor for the assessment of the performance of an athlete is gained in this context.






Dialogue box for setting up an Isokinetic Maximum Strength Test on the Cyclus2




Display of the analysis of an Isokinetic Maximum Strength Test on the Cyclus2

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Bike ergometry of Your own road bike

## Isokinetic Maximum Strength Test

| | |
|---|---|
| Date: | 5/20/2008 3:15:48 PM |
| Saved as: | 080520_1515 TR Isokinetischer Maxim |
| Limiting Value: | Cadence |
| Limit: | 110 1/min |
| Initial Load: | 20 N |

## Test Results

| | |
|---|---|
| Maximum Pedal Force: | 415 N at 110 1/min |
| Maximum Power: | 814 W |

## Athlete

| | |
|---|---|
| Name: | Thomas Romanowski |
| Date of Birth: | 6/30/1965 |
| Body Weight: | 88.0 kg |
| Body Height: | 1.780 m |
| BMI: | 27.8 |

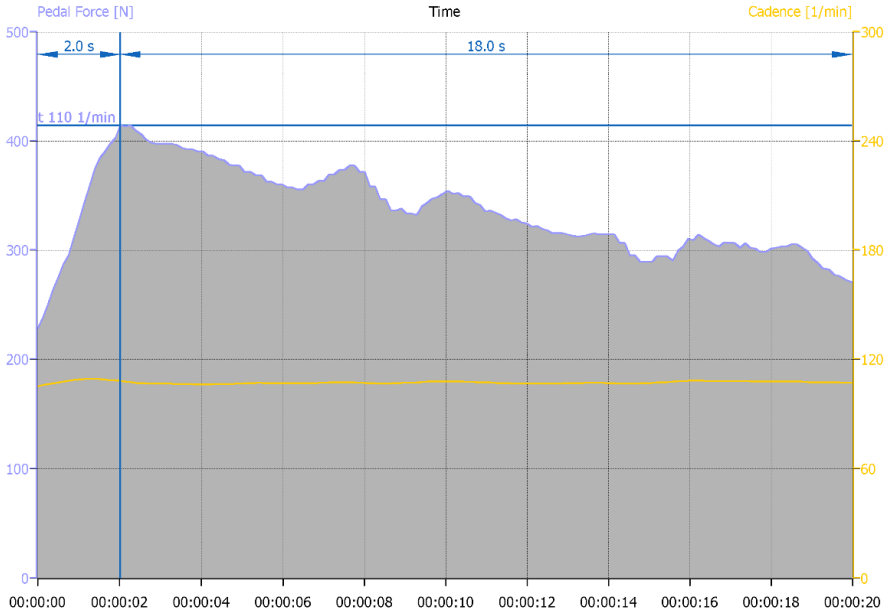
## Bike

| | |
|---|---|
| Crank Length: | 0.1725 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 51/12 |
| Weight: | 8.0 kg |

## Evaluation total

| | |
|---|---|
| Time: | 00:00:20.00 |
| Distance: | 0.32 km |
| Revolutions: | 36 |
| Work: | 13.14 kJ |

| | Inclination [%] | Power [W] | Pedal Force [N] | Work/Beat [J] | Transmision [m] | Cadence [1/min] | Speed [km/h] | Heart Rate [1/min] |
|---|---|---|---|---|---|---|---|---|
| Minimum: | -2.59 | 437 | 229 | 255 | 8.98 | 106 | 56.9 | 95 |
| Maximum: | -0.43 | 814 | 415 | 498 | 8.98 | 110 | 59.2 | 122 |
| Average: | -1.42 | 653 | 336 | 352 | 8.98 | 108 | 58.0 | 112 |







Print-out of an Isokinetic Maximum Strength Test from the Cyclus2

# CPI Test

## What do we want to know?

How much impact does a single heartbeat have? The measurement of the CPI value – Sorry: CARDIO PERFORMANCE INDICATOR or simply: work per heartbeat renders very differentiated and detailed information on the fitness state of the test person. The excellent reproducibility of the test allows a continuous efficiency control as even the slightest changes in the fitness state can be precisely reported. Cross-reference to other people is possible but for most people not of interest. The fact, that one can detect one's own performance increase, even if it's small, is far more important. The more differentiated a test can show a person's improvements the more motivation it rouses for further training.

## How do we do it?

By applying an entirely new test protocol, which is available in this form only on the Cyclus2: With a continuous increasing load and a relief phase not only the heart performance is examined but also the adaptability and capability for recovery.

It is as simple as that: For a certain amount of work a test person requires a corresponding number of heartbeats. The work carried out divided by the number of heartbeats (total pulse) renders the mean value for the work per heartbeat or in scientific terms: CPI-value

## Who needs it?

Everyone! Fitness aficionados, amateur sportsmen, athletes – everyone practises for the same reason: they want to reach a goal. To lose weight, to become faster, not to sweat easily, etc., etc., etc. That can practically be achieved only with the right motivation.



## When do I apply the test?

In order to increase motivation. Especially in fitness sports. The simple implementation in a short time span (10 min.) and the informative value set new standards for fitness tests. Fitness becomes exactly measurable.

The individual CPI value is the maximum value achieved of the work per heartbeat. Looking at the curve progressions on the print-out, the following can be verified: The later the work/heartbeat curve intersects the Watt curve the better the fitness state of the test person (see print-out).

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Bike ergometry of Your own road bike

## Training Protocol

| | |
|---|---|
| Date: | 5/28/2008 4:38:03 PM |
| Saved as: | 080528_1638 TR CPI Test 200W |
| Description: | CPI Test 200W |

## Athlete

| | |
|---|---|
| Name: | Thomas Romanowski |
| Date of Birth: | 6/30/1965 |
| Body Weight: | 88.0 kg |
| Body Height: | 1.780 m |
| BMI: | 27.8 |

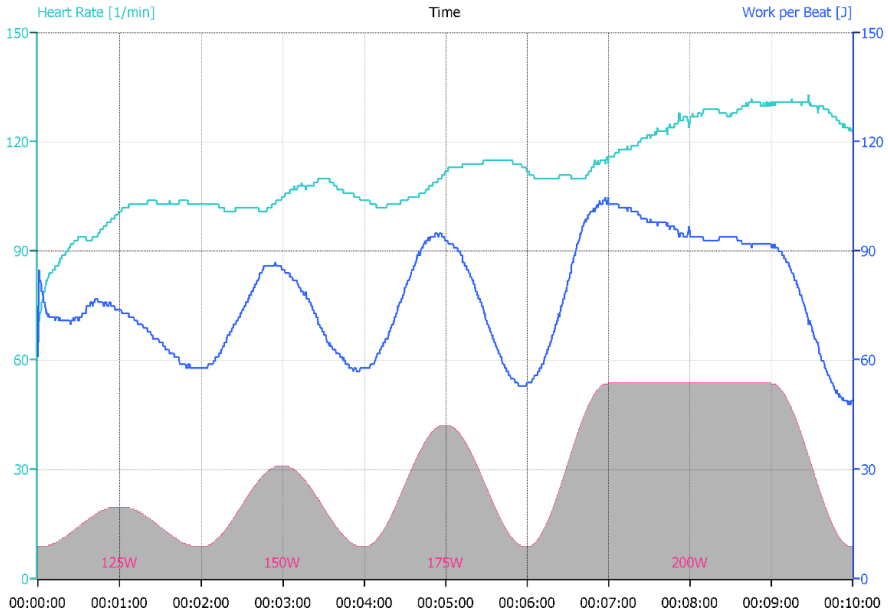
## Bike

| | |
|---|---|
| Crank Length: | 0.1725 m |
| Wheel Size: | 2.1130 m |
| Basic Gear Transmission: | 51/15 |
| Weight: | 8.0 kg |

## Evaluation total

| | |
|---|---|
| Time: | 00:10:00.00 |
| Distance: | 6.00 km |
| Revolutions: | 835 |
| Work: | 86.76 kJ |

| | Inclination [%] | Power [W] | Pedal Force [N] | Work/Beat [J] | Transmision [m] | Cadence [1/min] | Speed [km/h] | Heart Rate [1/min] |
|---|---|---|---|---|---|---|---|---|
| Minimum: | -1.73 | 70 | 48 | 48 | 7.18 | 80 | 34.5 | 69 |
| Maximum: | -0.13 | 200 | 137 | 105 | 7.18 | 89 | 38.3 | 133 |
| Average: | -0.92 | 145 | 96 | 77 | 7.18 | 84 | 36.0 | 111 |







Print-out of a CPI Test from the Cyclus2

# Torque Test: Analysis

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Bike ergometry of Your own road bike

## Torque Test

### Details of the athlete

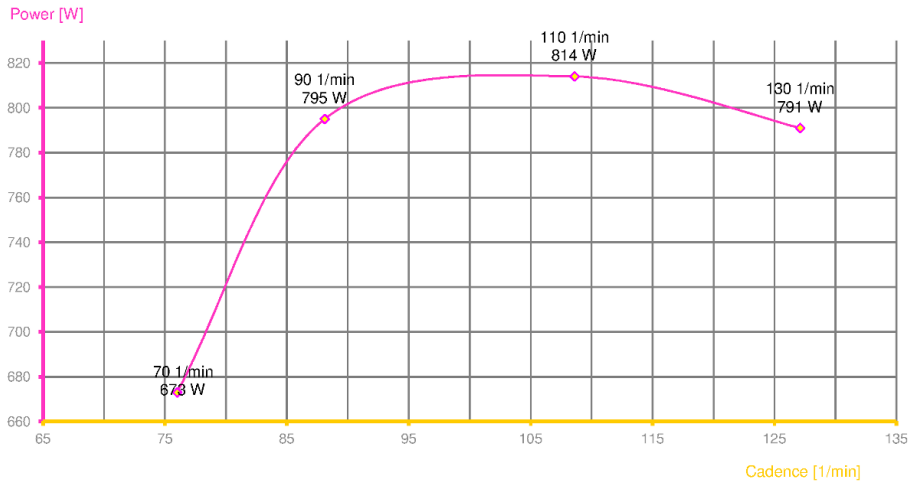
Name: Romanowski, Thomas
Birthdate: 6/30/1965

### Protocol data

Created by: Töpel, Daniel
Created on:

| Index | Etappe | Power [W] | Cadence [1/min] | Remark | Filename |
|---|---|---|---|---|---|
| 1 | 0 | 673 | 76 | 70 1/min | 080520_1506 TR Isokinetischer Maximalkra.csv |
| 2 | 0 | 795 | 88,1 | 90 1/min | 080520_1511 TR Isokinetischer Maximalkra.csv |
| 3 | 0 | 814 | 108,6 | 110 1/min | 080520_1515 TR Isokinetischer Maximalkra.csv |
| 4 | 0 | 791 | 127,1 | 130 1/min | 080520_1522 TR Isokinetischer Maximalkra.csv |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |

### Graphical analysis




### Comments

 www.cyclus2.com

Print-out of a Torque Test from MS Excel with imported Cyclus2 data

# Analysis with TrainingPeaks and WKO+, Web4Trainer and other software tools

## What do we want to know?

Whether bar- or curve-chart, reference analysis or specific calculation– with the various transmission methods for the range of test- and training data to an external PC or training portal on the internet there are no boundaries set to your analysis creativity.

## How do we do it?

Choose the desired export format and configure it, if necessary. The supported types of format are PWX for the further processing with TrainingPeaks, the CSV-CycleOps-format for the training platform Web4Trainer and a freely configurable text format. All data are saved to an USB memory stick and are easily transferable to your PC this way.

You may also choose the comfortable way of uploading your training data directly from the Cyclus2 to the training platform TrainingPeaks via the internet. All devices are fitted with a network socket (Ethernet). Your Cyclus2 can additionally be fitted with a Wifi-adapter accessory. You connect the ergometer with your network, provided that you have internet access you can use the upload function straight away.

## Who needs it?

Professional and ambitioned cyclists and triathletes are more and more commonly trained by their coaches with the aid of the internet. Training portals serve as interfaces for the coach to setup the training programmes which the athlete works off and accounts for with the results ready for analysis. The ergometer training on the Cyclus2 can be archived using the Drag&Drop function. Training scientists want to carry out specific examinations; they have access to all data and have therefore a wide range of possibilities.



CYCLUS 2

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