Manual for
928 E

EN

MONARK
SPORTS & MEDICAL

Contents

Important

Read the manual carefully before using the cycle and save it for future use.

2016 MONARK EXERCISE AB, Vansbro, Sweden

Monark Exercise AB

Monark has 100 years' experience of bicycle production. The Monark tradition has yielded know-how, experience, and a real feel for the product and quality. Since the early 1900s, Monark bikes have been living proof of precision, reliability, strength and service. Those are the reasons why we now are the world leader in ergometer bikes and the market leader in Scandinavia in transport bikes.

We manufacture, develop and market ergometers and exercise bikes, transport bikes and specialized bikes. Our largest customer groups are within health care, sports medicine, public authorities, industry and postal services.

For more information: http://www.monarkexercise.se

Product Information

Thank you for choosing a test cycle from Monark!

The Monark 928 E is designed to in a simple way be used for Max and SubMax cardiovascular tests, calculate VO_2 capacity and more. The bike can also be used for normal exercise.

Ergometer 928 E is equipped with a meter that has six different programs - *Training, METS, Åstrand, YMCA, Increment* and *PWC*. The cycle can also be connected to a computer with software for testing (software is available for free download from our website: www.monarkexercise.se).

928 E also have a new and more powerful engine for faster power control.

For more detailed description of the meter's functions, see the section "Display Description".

Each 928 E is calibrated at the factory. This means that you can begin to use the ergometer directly after assembly. However, if the user wishes to verify the scale calibration please read the instruction for " Calibration" in this manual.

NOTE!
Use of the product may involve considerable physical stress. It is therefore recommended that people who are not accustomed to cardiovascular exercise or who do not feel completely healthy, should consult a physician for advice.

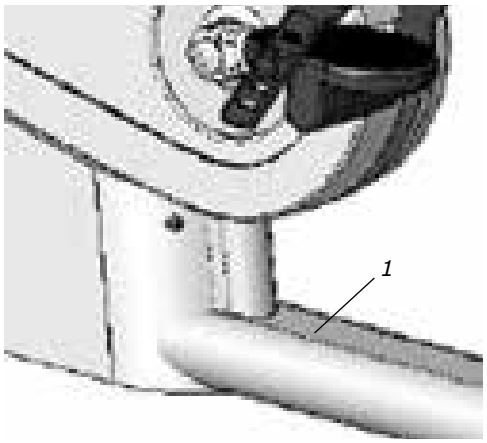


Fig: Serial number (1)

Facts

- Large, well-balanced flywheel 20 kg
- Can be calibrated
- Adjustable saddle with quick release lever
- Adjustable handlebar
- Stable frame, solid steel tube
- Powder painted
- Wheels for easy transport
- Electronic display with multiple functions

Width
500 mm at handlebar
640 mm at support tubes

Length
1240 mm

Height
1260 mm at handlebar
780-1170 mm at seat

Weight
58 kg
Max user weight 250 kg

Included
Chest belt
Calibration weight 4 kg
Power adaptor

Technical data power adaptor
Input voltage: 100-240 V AC, 47-63 Hz
Output voltage: 12 V DC
Current: 2.5 A
Polarity: n/a
(Art. No: adaptor 9328-183, plug (EUR) 9328-192)

Serial number

The serial number is placed according to *Fig: Serial number.*

PC program

If you need a pc software to do exercise tests on the bike, our software is available for free download from our website: www.monarkexercise.se.

Operating instruction

Workload adjustment

A change of the workload is done either by changing the pedal speed or by pressing (+/-) button on the display to increase or decrease the brake belt tension on the flywheel. See *Fig: Workload adjustment and connections*.

Power measurement

The cycle is designed to measure the power on the flywheel, because tests/protocols are made for it (for example Åstand's and YMCA).

Power Connection

The bike is designed to be used with the AC adaptor which is included with the bike. Connects (3) to the bike as shown in *Fig: Adjustments*.

Connection to an external unit

When the USB connector is inserted or when the meter detects a connected computer, you will hear a quick double beep. An icon for the USB lights in the display. Otherwise, the meter will turn off except rpm and HR. When the meter is connected to a computer, it turns to passive mode. No buttons are active except HEART button (to pairing the display and chest belt).

The socket for the USB connector (1) is shown in *Fig*: *Workload adjustment and connections*.

Fig: Workload adjustment and connections
1) USB
2) Workload adjustment (+/-)

Bike adjustments

When adjusting the seat height:

Turn the knob (1) on the seat post and pull it out. Adjust the height and lock the knob again.

Handlebar settings:

To adjust the handlebar angle loosen the quick release lever (2). See *Fig: Adjustments*.

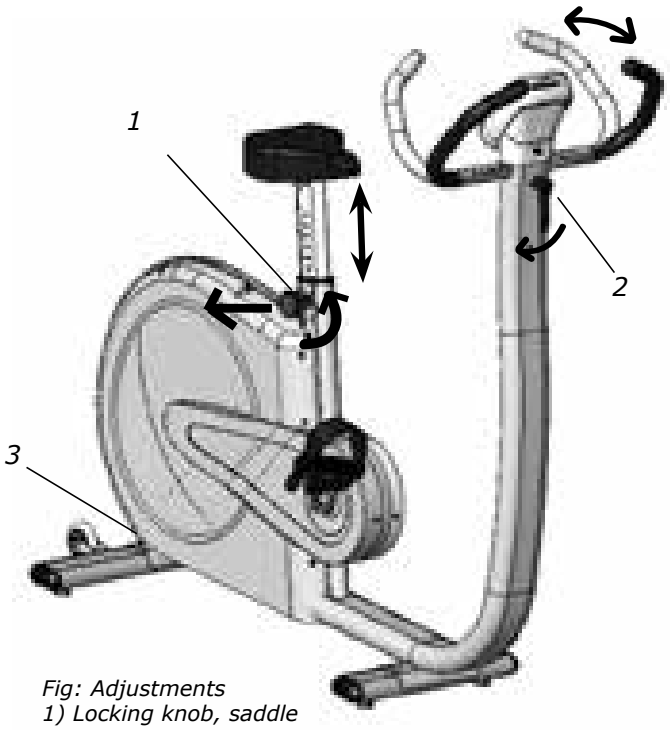


Fig: Adjustments
1) Locking knob, saddle
2) Locking handle, handlebar
3) Connection unit

Calories

There have been different theories on how to calculate this, since it depends on several factors and this means that it can only be seen as an estimate.

As a standard calculation, when we display calories on our calibrated bikes, we use: 1 minute with 100W gives 7 kcal. It is easy to convert watts to calories if it was on the flywheel, the formula is $1W=0{,}2388x10^{-3}$ kcal/s with four decimals. But when you normally show calories you want to show the total amount of calories your body has used during your training, not only the calories "burnt" on the flywheel.

We have chosen the formula given above that we think complies with the results given for a standard cycle position.

Pulse function

The user's heart rate can be measured with a chest belt that senses the electronic output of the heart. Chest belt ANT+ is supplied as standard.

Heart rate monitoring requires that the chest belt is correctly placed. Make sure that your skin is clean where the chest belt should be placed. When it is correctly fitted the logo on the belt will be central and readable, outward and upright, by another person. The chest belt should be secured at a comfortable tension around the mid section, just below the breast muscle, see *Fig: Placement chest belt*. Moisten the electrodes before use, see *Fig: Moistening the electrodes*.

NOTE!

Electromagnetic waves can interfere with the telemetry system. Cellular phones are not allowed to be used near the bike during test.

Pulse standard (chest belts)

The following pulse standard / chest belts can be used:

- Standard, uncoded 5K chest belts (5-5.6 kHz)
- Chest belts with ANT+

Short range ANT+: 0.6-0.8 m
Long range ANT+: 4-5 m
Range 5K: 0.8 m

Pairing display and chest belt

Normally the display connects to the first ANT+ chest belt in "short range" and shows the heart rate until the chest belt is outside the "long range". If there is no ANT+ chest belt but a 5K chest belt in "short range", the heart rate from the 5K chest belt is displayed until the signal is lost.

ANT+ is prioritized and the first choice of the display. 5K is discriminated, but after 30 seconds with only 5K the display is locked to this chest belt as long as you do not lose the signal.

Monark Exercise AB recommend that you use an ANT+ chest belt for best function.

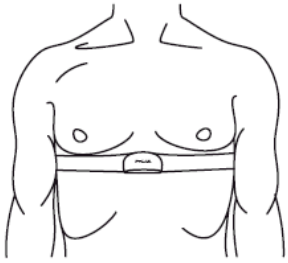


Fig: Placement of the chest belt

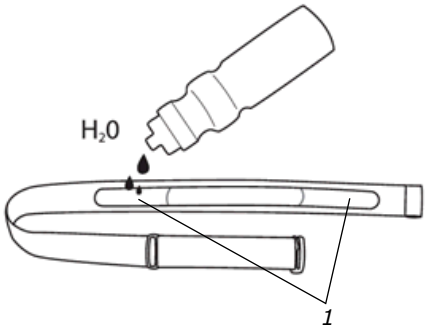


Fig: Moistening the electrodes (1)

The images above are used with permission of Polar Sweden.

Display Description

Display	
RPM	**pedal revolutions / min**
Heart rate (HR)	**bpm**
TIME	**min:sec**
Workload (WATT alt. kpm/min)	**Watt**
Speed	**km/h**
Distance	**km**
Calories (KCAL)	**kcal**
% Max HR	**%**

We recommend to use only the AC adaptor when using the bike. Without the AC adaptor, there will be no workload control and display alarm is activated.

Calibration and basic settings are saved even when the power fails.

(The display can be powered by batteries, 4x1.5V, R14, but only when you make the basic settings.)

The meter has the following functions:

- Settings for different units of measurement
- It is possible to calibrate the meter to get the correct workload
- Personal data like age, max pulse, weight and gender can be set
- USB port for continuous output of data to an external computer
- Several different programs, see table "Available Programs"
- The display also shows current pulse as percentage of max HR
- The workload is rpm independent

If the values for rpm and watt start flashing during use, the set workload requires higher brake power than 7 kp. To solve this, increase the rpm or decrease the set workload.

Available programs:

- Astrand
- YMCA
- PWC
- Increment
- METS
- Training

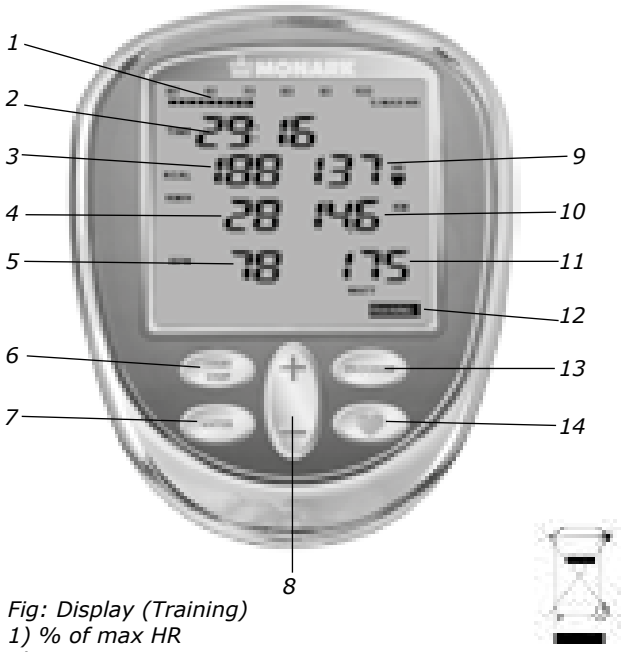


Fig: Display (Training)
1) % of max HR
2) Time
3) Kcal (estimated value)
4) Speed (km/h)
5) Pedal revolutions (rpm)
6) START STOP
7) ENTER
8) (+/-) button
9) Heart rate (HR)
10) Distance (km)
11) Workload (Watt)
12) Program
13) PROGRAM
14) HEART button

Sleep mode

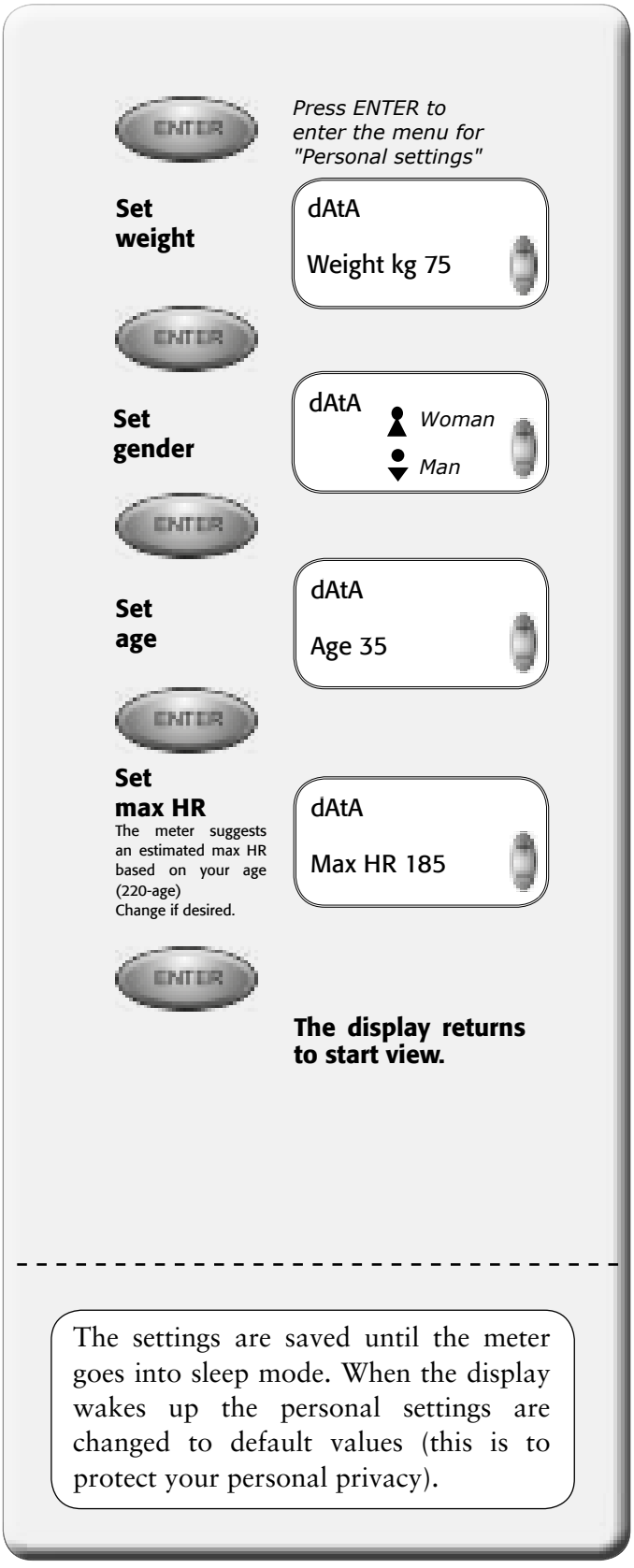
Sleep mode is activated after 10 minutes if you don't press any button or if no rpm is recorded.

All settings are saved, but the personal settings are erased (to protect your personal privacy).

The meter wakes up when you press any button or if rpm is recorded. The meter goes directly to 'Quick start' (see separate section).

Personal settings

Usually you are asked to set the personal data needed when you start a program or a test. This data can also be set before, during e.g. "Warm up" in Training program with this function.



The settings are saved until the meter goes into sleep mode. When the display wakes up the personal settings are changed to default values (this is to protect your personal privacy).

Alternative power / force display

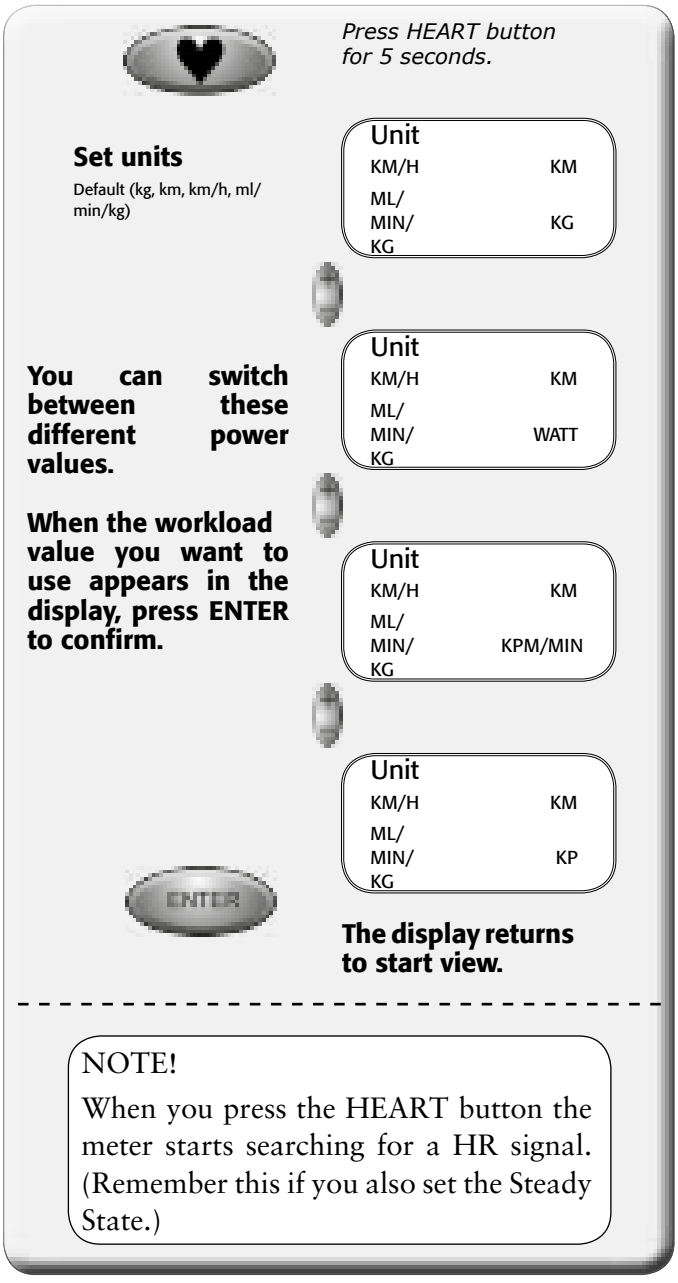
The meter displays power in watts (default). If you want to display the power in kpm / min instead, press the HEART button for 5 seconds. Then you can switch between WATT, KPM / MIN and current kp-value using the (+/-) button. Press ENTER or wait 10 seconds to confirm and exit the setting.

NOTE!

Even if you select kp as unit, it is the power in watts which is set in the background when you press (+/-) button.

The displayed kpm / min is a simplified calculation (1 kp = 10 N) according to Astrand's tables.

(Although the displayed Kp value is correct and not rounded as above. For all calculations in the display the exact value is used, 1 kp = 9.80665 N)

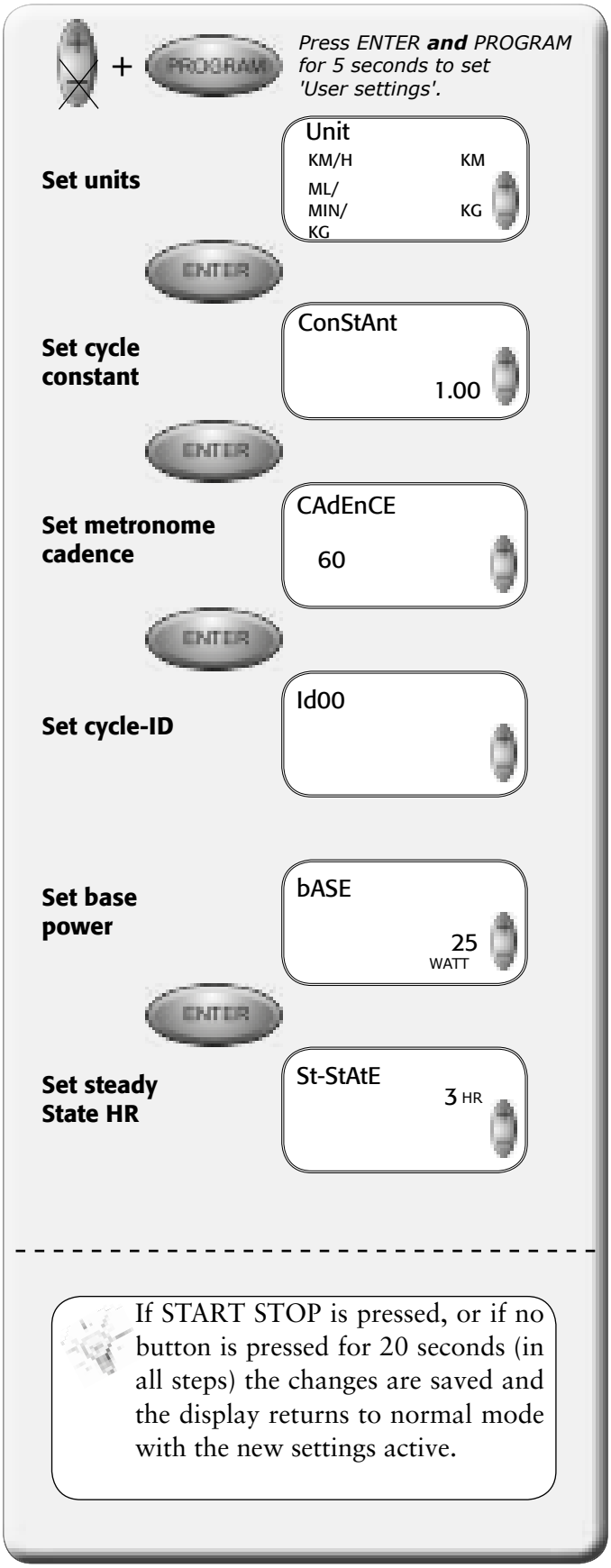


NOTE!

When you press the HEART button the meter starts searching for a HR signal. (Remember this if you also set the Steady State.)

User settings

Here you can make individual adjustments to optimize the bike for your needs on first use and when needed.



Units

Kg, km, km / h, ml / min / kg are default. You can switch between the different unit combinations with (+/-) button.

- Kg, km, km / h, ml / min / kg (default)
- Kg, km, km / h, METS
- Lbs, miles, miles / h, ml / min / kg
- Lbs, miles, miles / h, METS

Cycle constant

The cycle constant is as default set to 1.00. Change using the (+/-) button.

When the cycle constant is set to 1.00 the power is measured at the flywheel. This is used in Åstrand test, YMCA etc.

When the cycle constant is set to 1.05 the power is measured at the crank. This is often used on electronically-braked bikes.

Metronome cadence

Metronome diodes show pedalling revolutions (rpm) relative to the set reference value. The metronome is located at the back of the meter. The default value is 60 and can be adjusted with (+/-) button. The green LED in the middle flashes twice for each pedal revolution which helps to keep the right pedal cadence, see *Fig: Display* and *Fig: Metronome*.

The meter can be rotated so that the rider does not see the values in the display, but only sees the flashing diodes (in order to keep the right pedal cadence).

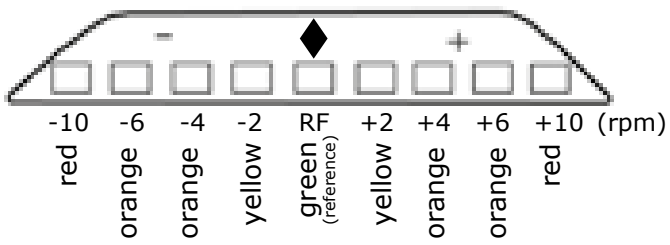


Fig: Metronome

BikeID

This ID is a parameter that the PC software can ask for. It is used to identify or number bikes when multiple bikes are controlled by same PC or similar.

Base Power

Default value which is used as "idle" power when no program or test is active. The default value is 25 but can be adjusted with (+/-) button.

Steady State HR

Default value is (±)3 but can be adjusted between 1 and 10 with (+/-) button.

Steady State (SS) HR is used only in Astrand program. SS is checked by comparing the mean value of HR during the period 4:45 to 05:00, and the mean time between 5:45 to 6:00. If the difference between these two values is the same or less HR is counted in SS.

Fig: Display
1) START STOP
2) ENTER
3) (+/-) button
4) HEART button (pairing display and chest belt)
5) PROGRAM
6) Metronome (on the back)

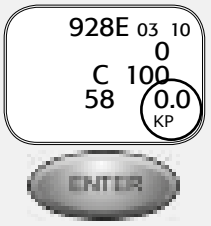
Calibration

NOTE!
Calibration can only be done from the display!

- Zero the scale, see "Scale - Zero adjustment"
- Release the brake belt tension by lifting the pendulum over 0.5 kp (the motor starts).
- (The brake belt tension can also be loosened by running the engine manually. This is done by pressing (-) in the calibration mode.)

Press START STOP **and** *PROGRAM for 2 seconds to enter calibration mode.*

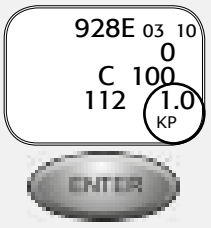
Check the potentiometer value at 0 kp.

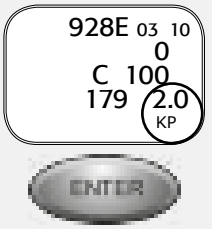


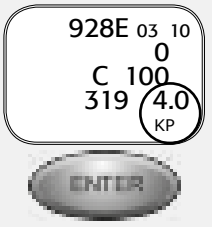
Move the pendulum to current value and hold it still until the potentiometer value stabilized.

Press ENTER for next step.

Repeat according to the pictures to the right.







Two short beeps are heard and the calibration is finished.

The bike is ready to use.

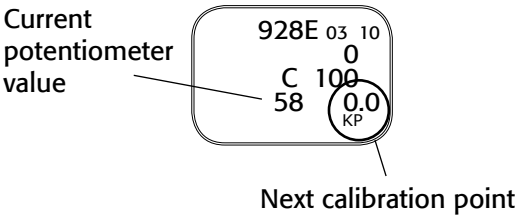
If you have started the calibration mode but change your mind, you can press the START STOP button to exit without saving.
(However, if you press ENTER the calibration process has begun and must also be completed.)

Manual motor control

By pressing the (+/-) button in the calibration mode, the motor can be run manually if rpm is less than 30. This is to ensure the functioning of the engine for service or support, and to release the brake belt tension.

= Tightens brake belt
= Slackens brake belt

Current potentiometer value



For best flexibility we recommend a potentiometer value between 40 and 60 at 0 kp.

Error message: CalErr - if the value is outside the window.

NOTE!

Potentiometer value shown in the photos are examples only, varies depending on the potentiometer value at 0 kp.

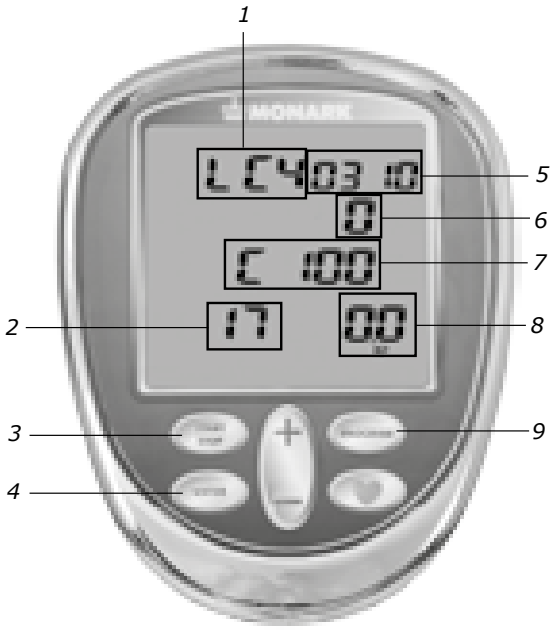


Fig: Display 'Calibration mode'
1) Bike model
2) Current potentiometer value
3) START STOP
4) ENTER
5) Software version
6) Hours in use
7) Cycle constant (1.00)
8) Calibration point
9) PROGRAM

Scale - zero adjustment

Connect power to the bike. Loosen possible tension in the brake belt by moving the indicator to 0.5 kp. Hold it there until the belt feels loose. Then move the indicator to 0 again. Now check if the indicator is aligned with the 0-index on the scale.

If adjustment is needed, loosen the locknut(1) and then change the position of the scale board, so that it will have its 0-index in line with the pointer. Tighten the lock nut after the adjustment. See *Fig: Scale adjustment*.

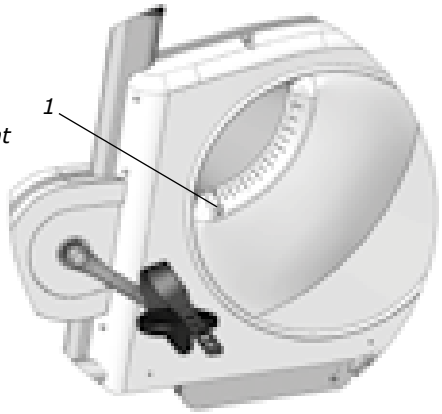
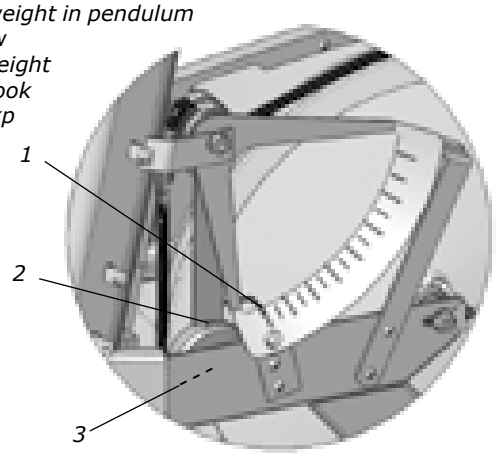
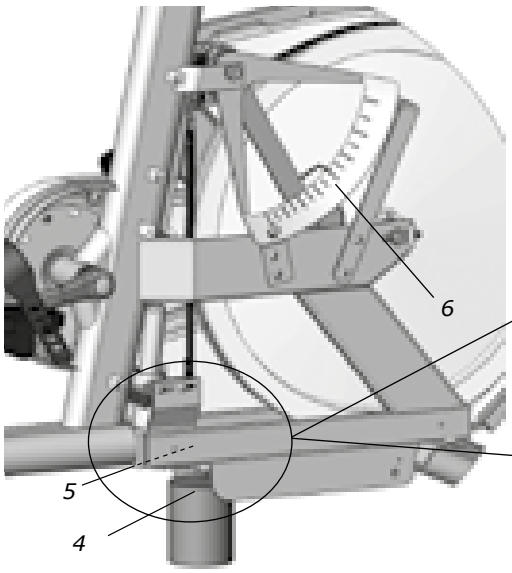


Fig: Scale adjustment
1) Locking screw

Fig: Calibration
1) The pointer's 0-position
2) Adjustment weight in pendulum
3) Locking screw
4) Calibration weight
5) Calibration hook
6) Pointer at 4 kp





Mechanical calibration

Although all Ergometers are calibrated at the factory the user may wish to verify this by performing a mechanical scale calibration. If so, please do the following:

- First, follow the steps in the "Scale -zero adjustment". Adjust the pendulum if necessary.
- Loosen the calibration hook from the hook holder, see *Fig: Calibration mode*.
- A checked and approved weight(4), 4 kg (Art. No: 9000-211), attached to the calibration hook (5), see *Fig: Calibration*.
- At the correct setting the weight has to be read by the pendulum scale at 4 kp-line (6). (Pendulum pointer should be centered over 4 kg mark.)
- Lift off the calibration weight and replace the calibration hook in the hook holder, see *Fig: Normal mode*. Note! The calibration hook should always be left in the hook control.

If the pendulum pointer does not stand in the middle of the 4 kp mark the pendulum weigh must be adjusted by means of the adjusting weight (2). To be able to do this the left cover must be removed.

To adjust the position of the adjustment weight, the locking screw, in the center of the pendulum (3), must be loosened.

If the pointer shows too low, the adjustment weight must be moved upwards. If the pointer shows too high, the adjustment weight must be moved down and then locked in its new position. This process is repeated until pointer is in the correct position.

Check the calibration of the pendulum once a year or when needed.

Fig: Normal mode
1) Hook holder
2) Calibration hook

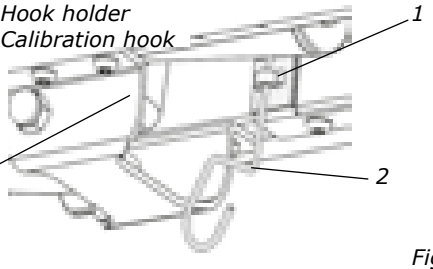
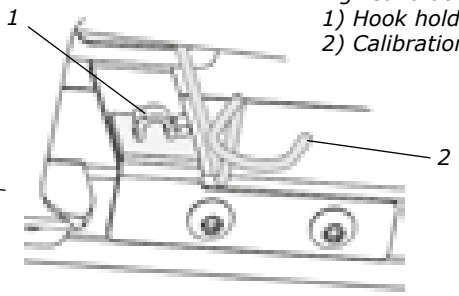


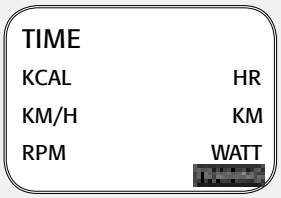
Fig: Calibration mode
1) Hook holder
2) Calibration hook



Training

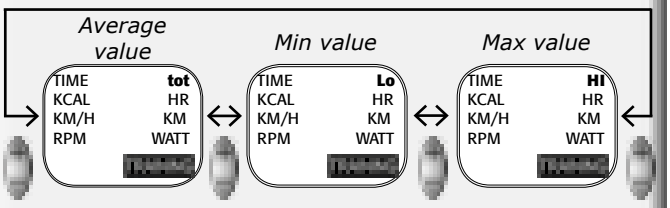
Personal data can be set for estimated HR (default HR is 185). See "Personal settings".

Start Training program



Stop Training program

To end the Training program, press START STOP and the results are displayed on three pages.



Interval training
Start with eg. 300 W - press START STOP and the cycle goes down to the base power - press ENTER and the power returns to the previous power (300 W).

Press ENTER (for 5 seconds during the test) and a new test is started with the same settings.

Press START STOP (for 5 seconds during the test) and the test is reset.

QUICK START

'Quick start' can be used as a separate program. (If START STOP is pressed, the TRAINING program is activated.)

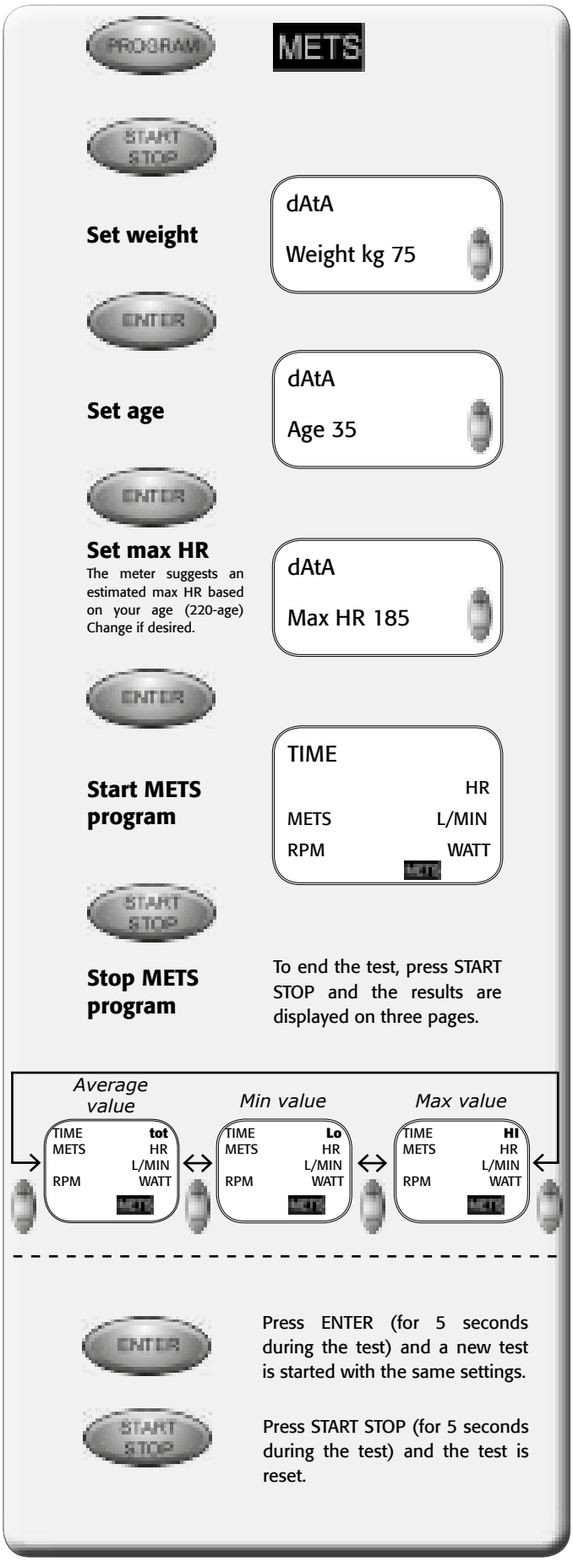
The program is active and starts with base power, adjust with the (+/-) button. No time is counted so the test person can warm up, use it as a 'quick start' or train without logging any values.

TRAINING

Press START STOP in 'Quick Start' and the display begins to show, count and log values. Press START STOP again and the test is completed and the results are displayed on three pages in the display and you can switch between the pages by pressing (+/-) button.

Workload adjustment

The power is adjusted with (+/-) button, press and hold for quick adjustment. The power can be set between 15 and 700 W in 5 W steps.



During the test METS and l/min. are continuously counted and displayed.

Calculation

METS values are displayed and calculated from the current workload. The two VO_2 values displayed during the test continuously calculate the average value for 5 seconds.

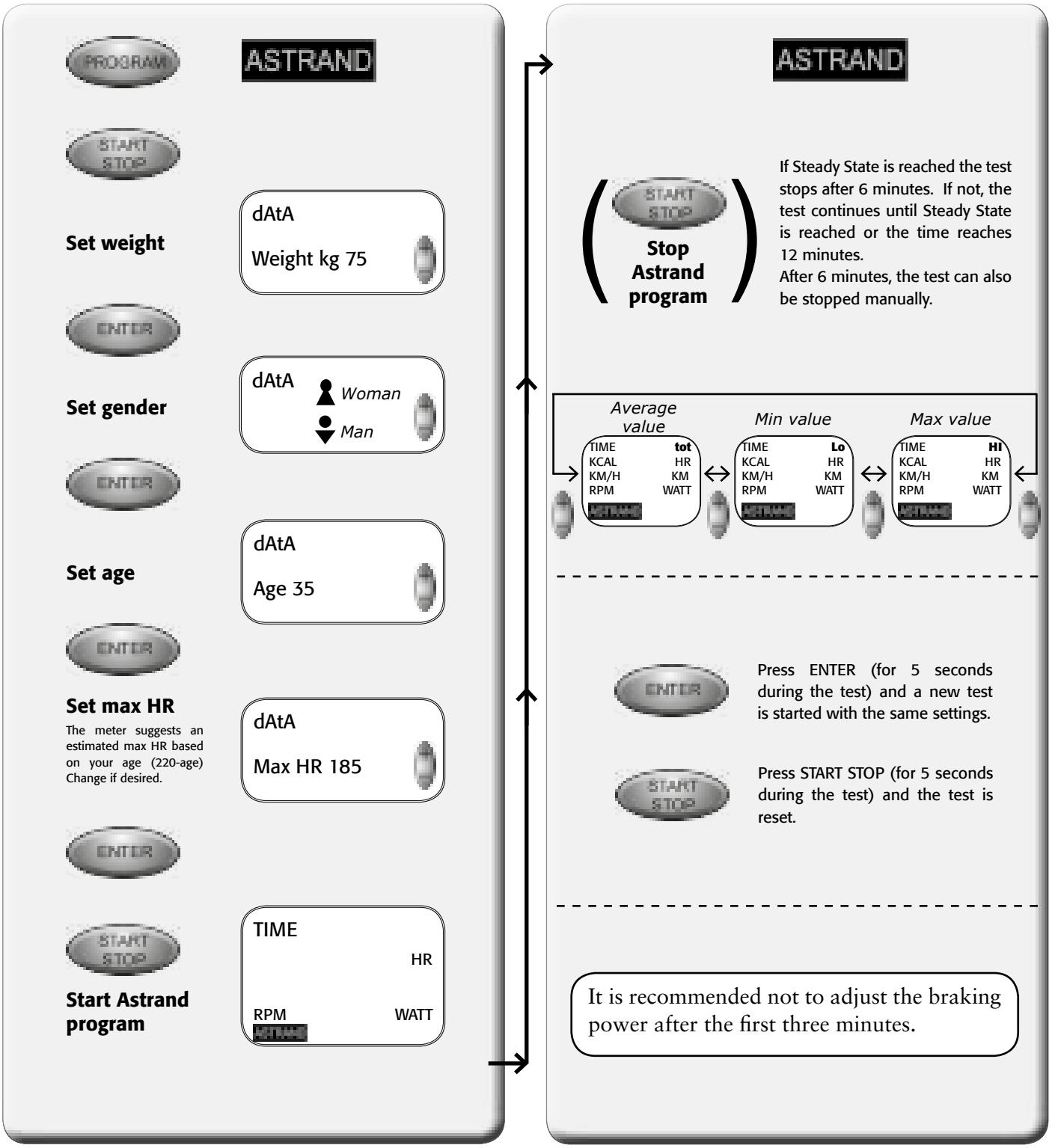
The formula used (values from ASTRAND original table) to calculate VO_2 at different workloads is: 0.2333 ... l / kpm = 0.01428 L / W (2.8 l / min at 1200 kpm)

This is according to Astrand's table between 150 W and 300 W, and a good approximation for 15-700 W and a cadence of about 50-65 rpm.

References / Literature:

- Astrand P-O, "Ergometri - konditionsprov", Monark, Sverige
- Åstrand I, "Aerobic work capacity in men and women with special reference to age", Acta Physiol Scand. 49 (suppl. 169), 1960
- Astrand P-O, "Experimental studies of physical working capacity in relation to sex and age", Munksgaard, Köpenhamn, 1952.
- Astrand P-O, Rodahl K, "Textbook of Work Physiology", McGraw-Hill, New York, 1970.

Astrand


PROGRAM
ASTRAND
START STOP
Set weight
dAtA
Weight kg 75
ENTER
Set gender
dAtA
Woman
Man
ENTER
Set age
dAtA
Age 35
ENTER
Set max HR
The meter suggests an estimated max HR based on your age (220-age) Change if desired.
dAtA
Max HR 185
ENTER
START STOP
Start Astrand program
TIME
HR
RPM
WATT
ASTRAND
START STOP
Stop Astrand program
If Steady State is reached the test stops after 6 minutes. If not, the test continues until Steady State is reached or the time reaches 12 minutes.
After 6 minutes, the test can also be stopped manually.
Average value
Min value
Max value
TIME
KCAL
KM/H
RPM
tot
Lo
HI
HR
KM
WATT
ENTER
Press ENTER (for 5 seconds during the test) and a new test is started with the same settings.
START STOP
Press START STOP (for 5 seconds during the test) and the test is reset.
It is recommended not to adjust the braking power after the first three minutes.

The test is automatically stopped after six minutes if Steady State (SS) is active. If not, the test continues until SS is reached or the time reaches 12 minutes.

Steady State (SS) is checked by comparing the average HR during the period 4:45 to 5:00 with the average HR during the period 5:45 to 6:00. If the difference between these two average values is the same or less considered SS.

When the test is completed the results are calculated and shown directly in the display.

You can stop the test manually after six minutes by pressing START STOP even if SS is not active (an error message is shown). The result is calculated and displayed.

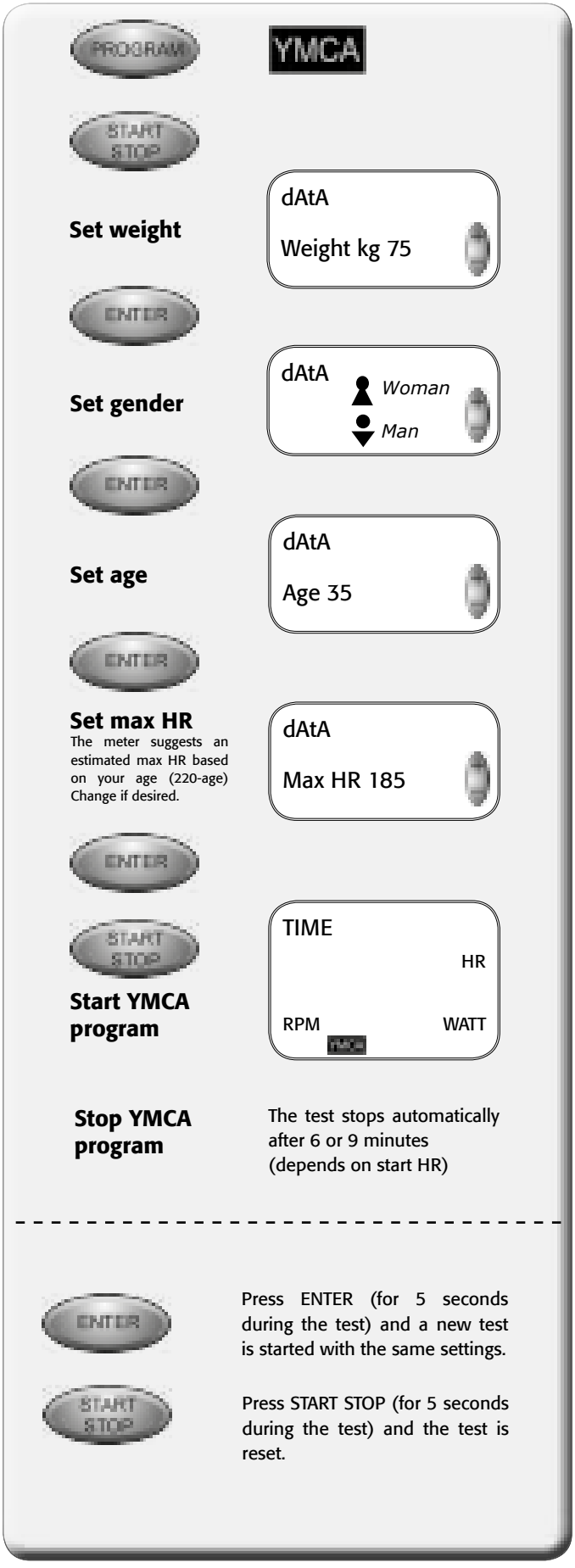
Explanations to error messages:

LO Hr	The end pulse is too low and outside the Astrand tables so no results can be calculated.
HI Hr	The end pulse is too high and outside the Astrand tables so no results can be calculated.
Err	Another reason why no results can be obtained.
No SS	The test is cancelled manually without SS after 6 minutes or no SS at time 12 minutes.

References / Literature:

- Astrand P-O, ”Ergometri - konditionsprov”, Monark, Sverige
- Åstrand I, ”Aerobic work capacity in men and women with special reference to age”, Acta Physiol Scand. 49 (suppl. 169), 1960
- Astrand P-O, ”Experimental studies of physical working capacity in relation to sex and age”, Munksgaard, Köpenhamn, 1952.
- Astrand P-O, Rodahl K, ”Textbook of Work Physiology”, McGraw-Hill, New York, 1970.

YMCA



The test is automatic after it has been started. Two or three levels (6 or 9 minutes) run automatically according to the table on the next page.

After six or nine minutes the test stops automatically and the YMCA will stop flashing. The results are shown in the display.

You can stop the test manually after two levels (6 minutes) by pressing START STOP and the results are calculated if the values are within the tables.

If the test values are outside tables so that no results can be given, you will hear a long beep and an error message appears.

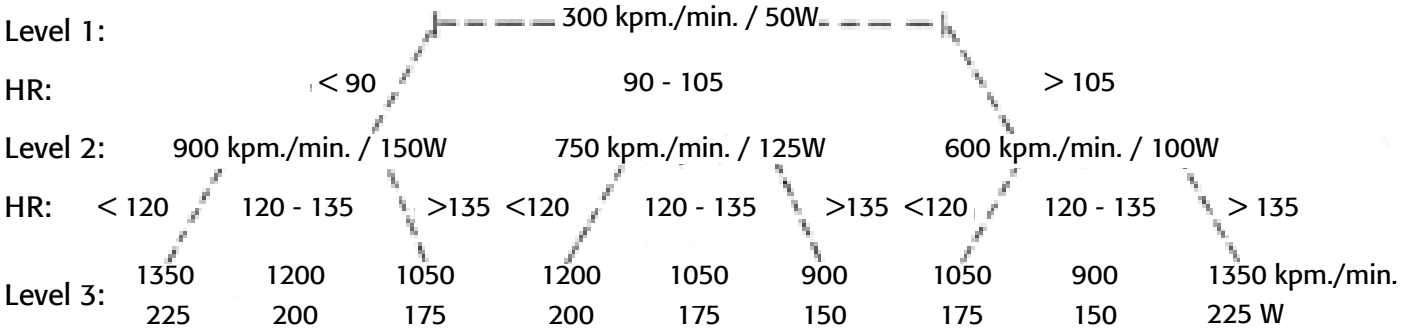
Explanations to error messages:

LO Hr	The end pulse is too low and outside the Astrand tables so no results can be calculated.
HI Hr	The end pulse is too high and outside the Astrand tables so no results can be calculated.
Err	If the test is stopped manually too early, or other reasons that no results can be given.

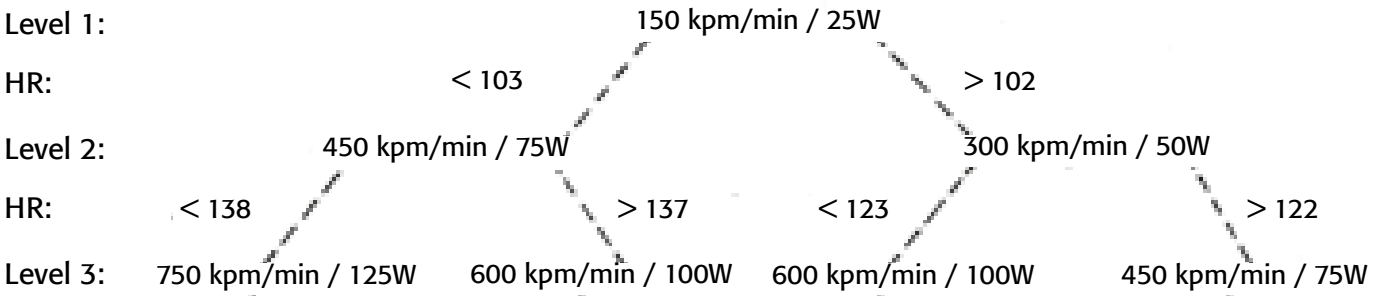
References / Literature:

- Golding L. A, Myers C. R, Sinning W. E, Y´s way to physical fitness“, YMCA of the USA, Rosemont, IL, 1982

Men:



Women:



NOTE! The given HR values are at the end of each level

Increment

PROGRAM

Increment

START STOP

Set age

dAtA
Age 35

ENTER

Set max HR

The meter suggests an estimated max HR based on your age (220-age) Change if desired.

dAtA
Max HR 185

ENTER

Set time for each step

dAtA
TIME 3:00

ENTER

Set start power

dAtA
Init WATT 25

ENTER

Set power increase per step

dAtA
Step WATT 25

ENTER

START STOP

Start Increment program

TIME NEXT
HR
RPM WATT
Increment

START STOP

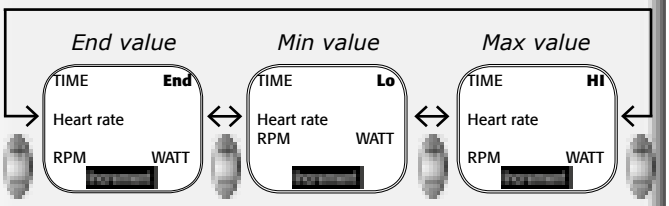
Stop Increment program

The test is stopped when:

- The cadence is <30 for more than 5 seconds
- When you press START STOP
- 700 W workload is achieved

Increment

The results are displayed on three pages that you switch between with the (+/-) button:



NOTE!

If the meter does not get any rpm indication at start, the test stops. To restart, press ENTER.

ENTER

Press ENTER (for 5 seconds during the test) and a new test is started with the same settings.

START STOP

Press START STOP (for 5 seconds during the test) and the test is reset.

About Increment test

Increment is a testing protocol, where the power is increased according to a predetermined schedule. An increment is used to see the HR increase in relation to the rising power. It is used in both submaximal to maximal tests to track the maximum capacity.

The test continues until the test manager or test person cancels the test.

Time for each step

Set the time (minutes:seconds) for each single step. Pre-set time setting the first time is 3 minutes.

Start power

Set the first power level.

Power increase per step (step)

Set the power increase between each step of 5 to 200 W. Last value is presented as default.

Test procedure

The display begins with the start power (which is specified in "Start Power") and begins the countdown to the next step. The display will increase the power at the specified power increase each time the set time has passed and a new countdown begins. At the same time you hear a beep.

The test is automatic after it has been started.

If the test is stopped because of the low rpm it starts automatically even if the rpm increases again.

PWC

PROGRAM

PWC

START STOP

Set weight

dAtA
Weight kg 75

ENTER

Set age

dAtA
Age 35

ENTER

Set test level

P 150

The meter suggests a level based on your age and estimated max HR.

ENTER

Set power increment per step

02:00
25 Watt

Power increase (two set)
25 W step 2 min / 50 W step 3 min

ENTER

Set start power

Init
25 Watt

START STOP

The test continues until the selected HR level is reached

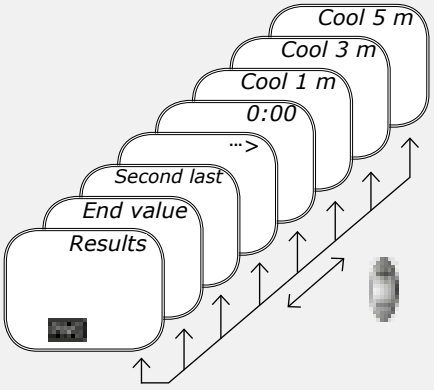
TIME NEXT
HR
RPM WATT

The program is automatic until the test HR level is exceeded.

Stop PWC program

The test is stopped when:
- HR level is reached (cool down starts)
- You press START STOP (if you press START STOP after the HR level reached the results are displayed)

PWC



To see the results that appear on each page, see the table on the next page.

START STOP

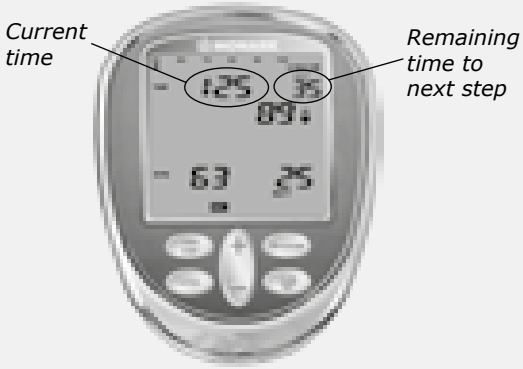
The test can always be stopped manually by pressing START STOP. Then the display shows the analysis pages but "Err" is displayed instead of watts value and watts / kg results, if the test is stopped before the countdown started and only the complete step the data is displayed.

ENTER

Press ENTER (for 5 seconds during the test) and a new test is started with the same settings.

START STOP

Press START STOP (for 5 seconds during the test) and the test is reset.



PWC test level

The meter suggests a level based on your age. Can be adjusted with (+/-) button.

Age (year)	Program
<30	P170
30-50	P150
>50	P130

Power step

The display shows time 2:00 and power 25 W. Switch with (+/-) button to time 3:00 and power 50 W. Press ENTER to save.

Start power

The display shows "Init". Set the initial power of the first step between 25 and 400 W with 25 W steps. Default value is 25 W. Press ENTER to save.

How it works

At the end of each step calculated average HR during the last 15 seconds, a beep sounds, 25 W or 50 W is applied workload, and a new countdown starts. In the first five seconds of the next steps the display shows test time, workload and estimated average HR during the previous step. During these five seconds the values flash.

This continues until the 15-second average HR is higher than the target HR (130 / 150 / 170). Then the test is stopped, a beep sounds, the workload reverts to start power, the final 15 seconds of average HR is displayed. The text "COOL" is displayed and the six-minute countdown starts. A 15-second average HR is displayed after 1, 3 and 5 minutes of the countdown.

You can skip the "cool down" by pressing the START STOP and the results appear instantly.

Results

After "cool down" two quick beeps are heard and the meter calculates and displays the results. The results are displayed on several pages that you switch between with the (+/-) button:

Page	Results that are displayed
Results	Total test time (end time), chosen test, total kcal, target HR, calculated result W_{PT}/kg and calculated result W_{PT}
End value	Total test time (end time), chosen test, target HR (end value) and calculated value per step
Second last	Second last test time, chosen test, step HR and calculated value per step
...>	Chosen test, step HR and calculated value per step
0:00	Test time, chosen test, start HR and calculated value per step
Cool 1 m	Time C1:00, chosen test and step HR
Cool 3 m	Time C3:00, chosen test and step HR
Cool 5 m	Time C5:00, chosen test and step HR

NOTE!
The displayed value for calories is the total estimated calorie consumption incl. "Cool down".

PWC target HR watt calculation:

The estimated watt value at target HR (WPT) is calculated from the following data:

W1 = Watts value set in penultimate step

W2 = Watts value set in the last step

P1 = 15-second average HR at the end of the penultimate step

P2 = 15-second average HR at the end of the last step

PT = Target HR: 130, 150 or 170 beats / min

Formula for the WPT:

WPT = W1 + (W2-W1)x(PT-P1)/(P2-P1) [W]

Relative WPT:

WPT / kg = WPT / Weight [W / kg]

For further information please refer to the reference literature.

References / Literature:

- Dr. Theodor Stemper, Diplom-Sportlehrer
- ROST, R, H. HECK, W. HOLLMANN, Die Fahrradergeometrie in der Praxis. Broschüre der BAYER AG
- STEMPER, Th.: Gesundheit - Fitness - Freizeitsport. Bund-Verlag, Köln 1988 (zu beziehen über SSV-Verlag, Hamburg)

Troubleshooting guide

Symptoms	Probable Cause / Corrective Action
The display is not working	• Check that there is power in the socket and that no fuse has blown. • If there is power in the socket but the display still does not work, contact the • service centre.
No heart rate displayed	• Check the chest belt (battery). Wet the thumbs and place them on the electrodes. A low clicking sound will appear near battery lid while you click on the electrodes with one thumb. Use another external HR monitor to check the belt. • Check that the chest belt is positioned correctly on test person and tight enough. Check that the electrodes are wet, in difficult cases it is necessary to use a contact gel or a mixture of water with a few drops of washing-up liquid. The level for HR signal can vary from person to person. Put chest belt on another known person who has a good pulse reading.
Uneven Heart rate	• Use an external unit, for example a HR watch, to check if it also indicates irregular pulse. If this is the case there are probably a disturbance in the room. The disturbance may be electronic fields from power cables, elevators, lamps etc. or other electronic devices which are too close (eg. cell phones). Move the bike to a different location in the room or change rooms. If an irregular HR remains it should be checked manually. If the HR remains irregular at work the person's health should be examined.
There is a click noise when pedalling (increases with the weight)	• The pedals are not tight. Tighten them or change pedals. • The crank arms is loose. Check, tighten. • The base bearing is loose. Contact your dealer for service.
There's a click noise and a squeak noise when pedalling	• Loosen the chain.
CalErr shows in the display	• Incorrect calibration or not calibrated at all. Calibrate the Ergometer.
Pendulum pointer scrapes in the scale	• Try to bend the scale slightly inwards
Scale plate scrapes in the pendulum	• Try to bend the scale plate slightly outwards
Problems with the computer software	• Describe the problem in an e-mail (in English) and send it to the software developer HUR labs support: support@hurlabs.com

More information

References / Literature:

If you want to learn more about the different tests, information is available in the following literature.

- Astrand P-O, ”Ergometri - konditionsprov”, Monark, Sverige
- Åstrand I, ”Aerobic work capacity in men and women with special reference to age”, Acta Physiol Scand. 49 (suppl. 169), 1960
- Astrand P-O, ”Experimental studies of physical working capacity in relation to sex and age”, Munksgaard, Köpenhamn, 1952.
- Astrand P-O, Rodahl K, ”Textbook of Work Physiology”, McGraw-Hill, New York, 1970.
- Golding L. A, Myers C. R, Sinning W. E, Y´s way to physical fitness“, YMCA of the USA, Rosemont, IL, 1982
- Dr. Theodor Stemper, Diplom-Sportlehrer
- Rost, R, H. Heck, W. Hollmann, Die Fahrradergeometrie in der Praxis. Broschüre der BAYER AG
- Stemper, Th.: Gesundheit - Fitness - Freizeitsport. Bund-Verlag, Köln 1988 (zu beziehen über SSV-Verlag, Hamburg)

Service

Note that the text about service and maintenance is universal and that all parts may not be relevant to your bike.

NOTE!
Make sure the voltage indicated on the appliance corresponds to the local mains voltage before making connections.

Warranty

EU countries - Private use

If you are a consumer living in the EU you will have a minimum level of protection against defects in accordance with EC Directive 1999/44/EC. In short, the directive states that your Monark dealer will be liable for any defects, which existed at the time of delivery. In case of defects, you will be entitled to have the defect remedied within a reasonable time, free of charge, by repair or replacement.

EU countries - Professional use

Monark Exercise products and parts are guaranteed against defects in materials and workmanship for a period of one year from the initial date of purchase of the unit. In the event of a defect in material or workmanship during that period, Monark Exercise will repair or replace the product. Monark Exercise will not, however, refund costs for labour or shipping.

Other countries

Monark Exercise products and parts are guaranteed against defects in materials and workmanship for a period of one year from the initial date of purchase of the unit. In the event of a defect in material or workmanship during that period above, Monark Exercise will repair or replace (at its option) the product. Monark Exercise will not, however, refund costs for labour or shipping.

Service check and Maintenance

It is important to carry out a regular service on your ergometer, to ensure it is kept in good condition.

Service action:

- We recommend isopropyl alcohol to disinfect the surface of the bike. Use a damp but not wet cloth to clean the surface you wish to disinfect.
- Always keep the bike clean and well lubricated (once a week).
- Periodically wipe the surface with a rust preventative, especially when it has been cleaned and the surface is dry. This is done to protect the chrome and zinc parts as well as the painted parts (4 times per year).
- Check now and then that both pedals are firmly tightened. If not the threading in the pedal arms will be damaged. Also check that pedal arms are firmly tightened on the crank axle, tighten if necessary. When the ergometer is new it is important to tighten the pedals after 5 hours of pedalling (check this 4 times per year).
- Check that the pedal crank is secure to the crank axle (4 times per year).
- Be sure that the pedals are moving smoothly, and that the pedal axle is clear of dirt and fibres (4 times per year).
- When cleaning and lubricating be sure to check that all screws and nuts are properly tightened (twice a year).
- Check that the chain is snug and there is no play in the pedal crank (twice a year).
- Check that pedals, chain and freewheel sprocket are lubricated (twice a year).
- Be sure that the brake belt does not show significant signs of wear (twice a year).
- Check that the handlebars and seat adjustment screws are lubricated (twice a year).
- Be sure that all moving parts, crank and flywheel are working normally and that no abnormal play or sound exists. Play in bearings causes fast wearing and with that follows a highly reduced lifetime.
- Check that the flywheel is placed in the center and with plane rotation.

Batteries

If the display is battery-operated, the batteries are in a separate package at delivery. If the storing time has been long the battery power can be too low to make the computer act correctly. Batteries must then be changed.

Flywheel bearing

The flywheel bearing is long-term greased and requires no supplementary lubrication. If a problem arises, please contact your Monark dealer.

Crank bearing

The crank bearing is greased and normally requires no supplementary lubrication. If a problem arises, please contact your Monark dealer.

Transportation

During transport the brake cord should be tightened to prevent it from falling off the flywheel.

Replace brake belt

To replace the brake belt remove covers if necessary. Make sure that the brake belt is loose.

Alt. 1: To loosen the brake belt on pendulum bikes with engine, connect power to the unit and raise the pendulum to 4 kp. Hold it there until brake belt is loose. Please note how the belt is assembled. Remove it from the bike. Attach the new brake belt and assemble the bike in reverse order.

Alt. 2: To loosen the brake cord on cycles with a weight basket set the basket to its upper position. Loosen the lock washer that is holding the cord and remove it from the tension center. Loosen or cut off the knot on the other end of the cord and then remove the whole cord from the bike. When assembling a new brake cord, first enter one end into the hole in the tension center, tie a knot and let the knot fall into the bigger part of the hole. Lock the end of the cord with the lock washer.

Alt. 3: To loosen the brake belt on the bike remove all tension. Please note how the belt is assembled. Remove it from the bike. Attach the new brake belt and assemble the bike in reverse order.

NOTE!
When replacing the brake belt it is recommended to clean the brake surface. See ”Brake belt contact surface”.

Brake belt contact surface

Deposits of dirt on the brake belt and on the contact surface may cause the unit to operate unevenly and will also wear down the brake belt. The contact surface of the flywheel should be smoothed with fine sandpaper and any dust removed with a clean dry cloth.

Remove any potential covers and all workload on the brake belt and then remove it. Grind with a fine sand paper. Grinding is easier to perform if a second individual cautiously and carefully pedals the cycle.

Irregularities on the brake belt contact surface are removed by means of a fine sand paper or an abrasive cloth. Otherwise unnecessary wear on the brake belt may occur and the unit can become noisy.

Always keep the brake belt contact surface clean and dry. No lubricant should be used. We recommend replacing the brake belt when cleaning the contact surface. In regard to assembly and adjustment of the brake belt, see ”Replacement of brake belt”.

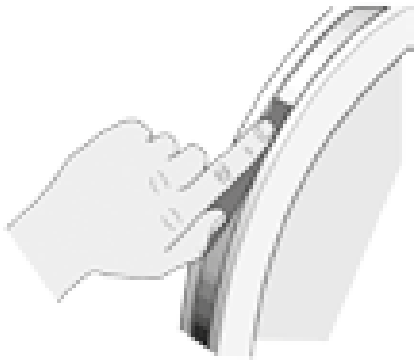


Fig: Brake belt

Chain 1/2“ x 1/8“

Check the lubrication and tension of the chain at regular intervals. In the middle of its free length the chain should have a minimum play (3) of 10 mm (1/4 inch). See *Fig: Chain adjustments*. When the play in the chain is about 20 mm (3/4 inch) the chain must be tightened. Otherwise it will cause abnormal wear of the chain and sprockets. Therefore it is always recommended to keep the chain play as small as possible. Loosen the hub nut (2) on both sides and tense the chain with the chain adjuster (1) when needed.

When the chain has become so long that it can no longer be tightened with the chain adjusters it is worn out and shall be replaced with a new one.

To adjust or replace the chain, remove covers if required.

To adjust the chain the hub nuts (2) should be loosened. Loosening or tightening the nuts on the chain adjusters (1) will then move the hub and axle forward or backward. Then tighten the nuts on the hub axle again. See *Fig: Chain adjustments*.

To replace the chain, loosen the chain adjusters as much as possible. Dismantle the chain lock (6) and remove the chain. Use a pair of tongs for dismantling spring. Put on a new chain and assemble the chain lock. The chain lock washer should be assembled with the closed end in the chain's movement direction (5). Use a pair of tongs for dismantling and assembling the chain lock washer (4). See *Fig: Chain replacement*.

NOTE!
At assembly the flywheel has to be parallel with the centerline of the frame. Otherwise the chain and sprockets make a lot of noise and wear out rapidly.

Then assemble the removed parts as above but in reverse order.

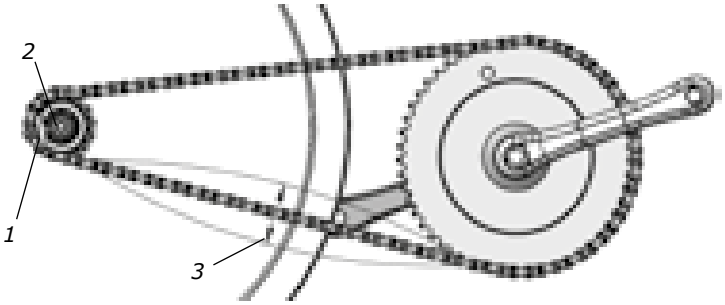


Fig: Chain adjustments
1) Chain adjuster
2) Axle nut
3) Chain play

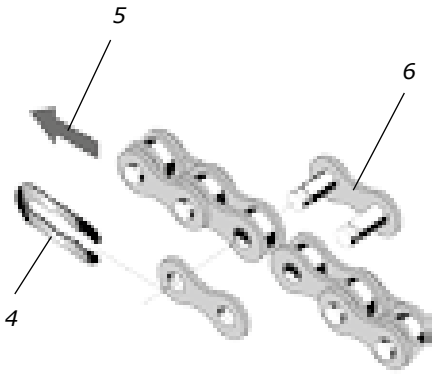


Fig: Chain replacement
4) Lock spring
5) Movement direction
6) Chain lock

Freewheel sprocket

When replacing the freewheel sprocket remove frame covers if necessary. Remove the chain according to section ”Chain 1/2” x 1/8””.

Loosen the axle nuts and lift off the flywheel. Remove the axle nut, washer, chain adjuster and spacer on the freewheel side. Replace sprocket-adaptor and assemble the new parts in reverse order according to the above.

The sprocket should be lubricated with a few drops of oil once a year. Tilt the cycle to make it easier for the oil to reach the bearing. See *Fig: Lubrication*.

Fig: Lubrication

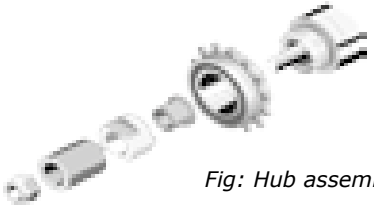
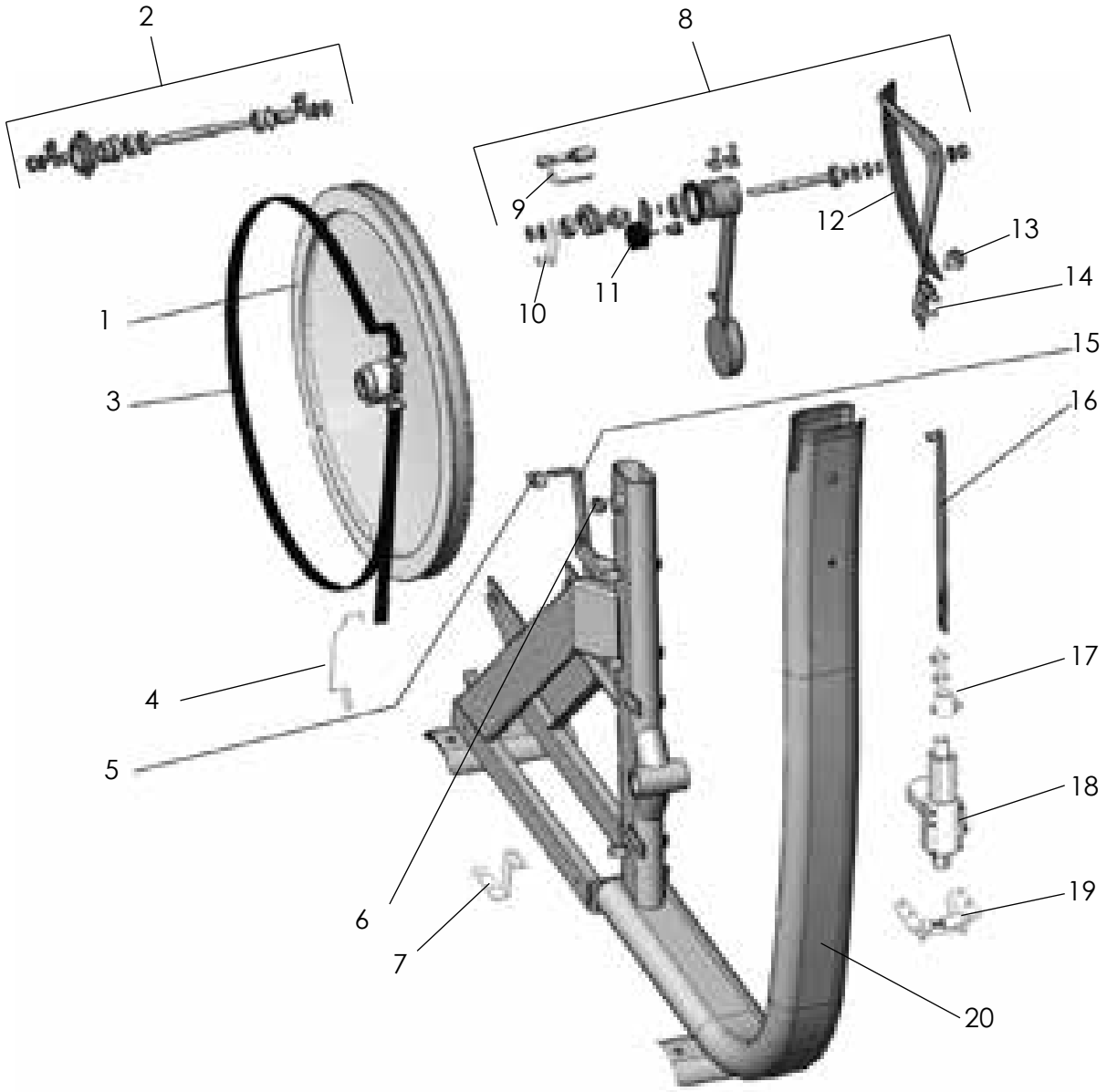


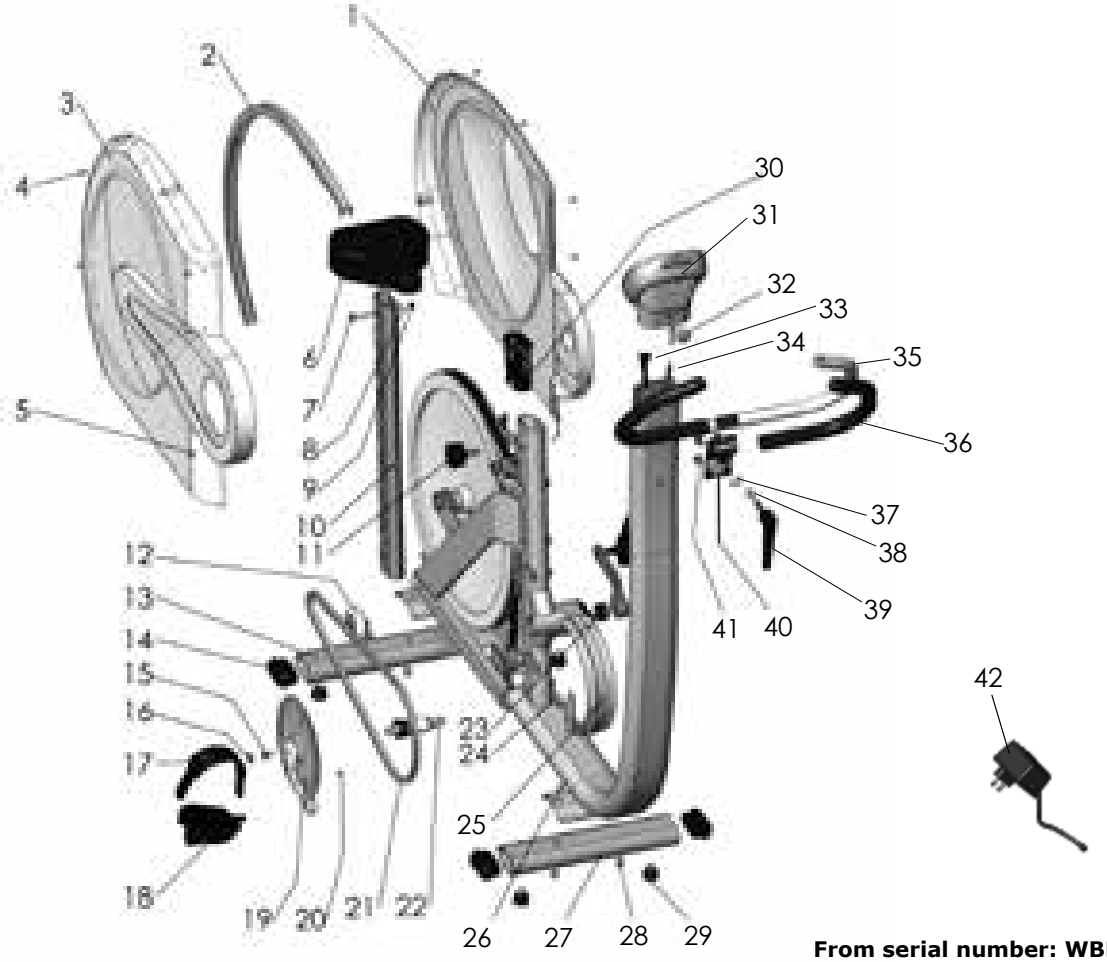
Fig: Hub assembly

Spare parts list



From serial number: WBK 295716 L

Pos.	Qty.	Art. No.	Description	Pos.	Qty.	Art. No.	Description
1	**1**	**9300-3**	**Flywheel, complete**	**14**	**1**	**9328-29**	**Scale lock, complete**
2		**9300-24**	-Flywheel suspension, complete	**15**	**1**	**9328-62**	**Stop**
3	**1**	**9328-85**	**Brake belt, complete**	**16**	**1**	**9338-19**	**Stay**
4	**1**	**9328-94**	- Hook for calibration weight	**17**	**1**	**9328-92**	**Adapter**
5	**2**	**9300-99**	**Pendulum stop, plastic**	**18**	**1**	**9310-55**	**Motor**
6	**1**	**9328-33**	**Adaptor M20/M16**	**19**	**1**	**9328-96**	**Bracket for servo**
7	**1**	**9328-91**	**Hook control**	**20**	**1**	**9328-1**	**Frame**
8	**1**	**9311-66**	**Pendulum, complete**		**1**	**9000-211**	**Calibration weight, 4 kg**
9	**1**	**9338-43**	- Brake belt release				
10	**1**	**9328-93**	-Holder pot. adjustment				
11	**1**	**9311-67**	-Potentiometer with cable				
12	**1**	**9328-803**	-Plate with kp-scale				
13	**1**	**9000-105**	-Screw M5x10				



From serial number: WBK 295716 L

Pos.	Qty.	Art. No.	Description	Pos.	Qty.	Art. No.	Description
1	**1**	**9328-39**	**Frame cover, left**	**25**	**1**	**9309-3**	**Joint list**
2	**1**	**9328-4**	**Aluminium profile**	**26**	**4**	**9300-12**	**Screw M8x16**
3	**1**	**9328-38**	**Frame cover, right**	**27**	**1**	**9328-5**	**Support tube, front**
4	**9**	**5675-9**	**Screw M5x6,5**	**28**	**4**	**5845**	**Locking nut M8**
5	**21**	**5673-9**	**Screw M5x12**	**29**	**4**	**9328-26**	**Rubber foot**
6	**1**	**4994-5**	**Saddle**	**30**	**1**	**9328-131**	**Bushing f. saddle post**
7	**1**	**5605-1**	**Screw M8x46**	**31**	**1**	**9311-162**	**Display**
8	**1**	**5864**	**Washer**	**32**	**1**	**9000-105**	**Screw M5x10**
9	**1**	**5775**	**Nut**	**33**	**1**	**9328-196**	**Multicable 1850 mm**
10	**1**	**9328-135**	**Saddle post**	**34**	**1**	**9328-188**	**Power cable 2200 mm**
11	**1**	**9328-132**	**Locking knob**		**1**	**9328-78**	**Handlebar, complete with handles, clamp and locking handle**
12	**1**	**9328-37**	**Transport wheel compl. (pair)**	**35**	**1**	**9328-9**	-Handlebar
13	**1**	**9328-6**	**Support tube, rear**	**36**	**1**	**9328-72**	-Handgrip, blue (pair)
14	**4**	**9328-51**	**Plastic cap**	**37**	**1**	**5864**	-Washer
15	**2**	**8523-115**	**Screw M8x1x20**	**38**	**1**	**9127-37**	-Spacer
16	**2**	**8523-2**	**Dust cover for crank**	**39**	**1**	**9100-280**	-Locking handle
17	**1**	**9300-207**	**Foot straps (pair)**	**40**	**1**	**9328-2**	-Handlebar clamp
18	**1**	**9300-220**	**Pedal (pair)**	**41**	**4**	**9337-38**	-Screw M8x16
19	**1**	**9300-430**	**Steel crank set, complete**	**42**	**1**	**9328-183**	**Power adaptor**
20	**1**	**9371-16**	-Magnet		**1**	**9328-192**	-Plug EUR
21	**1**	**9326-55**	**Chain, 98 L with chain lock**		**1**	**9338-36**	**USB cable 3 m**
22	**1**	**8966-175**	**BB cartridge bearing**		**1**	**9328-150**	**Screw set**
23	**1**	**8966-176**	**Support casing for BB-bracket**		**1**	**9311-75**	**Chest belt, Garmin ANT+**
24	**1**	**9311-161**	**Sensor with cable 150 mm**				

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KROONS VÄG 1, SE-780 50 VANSBRO, SWEDEN | WWW.MONARKEXERCISE.SE | TEL: +46(0)281 59 49 40 | FAX: +46(0)281 719 81