

Manual 939 E



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's cycles have been living proof of precision, reliability, strength and service. Those are the reasons why we are now the world leader in cycle ergometers and the market leader in Scandinavia in transport cycles.

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



Contents

Monark Exercise AB	2
Product Information	5
<i>Serial number.....</i>	<i>5</i>
<i>Facts</i>	<i>5</i>
<i>PC software</i>	<i>5</i>
Operating Instruction	6
<i>Power on crank or flywheel.....</i>	<i>6</i>
<i>Operation of the ergometer.....</i>	<i>6</i>
<i>RPM meter.....</i>	<i>6</i>
<i>Measured quantities.....</i>	<i>6</i>
<i>Connection to an external unit</i>	<i>7</i>
<i>Initial operation.....</i>	<i>7</i>
<i>Cycle adjustments.....</i>	<i>7</i>
<i>Setting command type (PC or ECG device)</i>	<i>8</i>
<i>What command type is set</i>	<i>8</i>
<i>Connection to PC.....</i>	<i>9</i>
<i>Connection to an external unit e.g. ECG device</i>	<i>10</i>
<i>Setting of terminal</i>	<i>11</i>
Calibration.....	12
<i>Validation</i>	<i>12</i>
<i>Validation of force</i>	<i>12</i>
<i>Mechanical calibration</i>	<i>13</i>
<i>Electronic calibration.....</i>	<i>13</i>
<i>Scale - zero adjustment</i>	<i>14</i>
Testing with Ergomedic 939 E.....	15
<i>Heart Rate (telemetry)</i>	<i>16</i>
<i>Test person enforcement</i>	<i>16</i>
<i>Reviewing results.....</i>	<i>17</i>
Trouble shooting guide.....	18
Where to obtain additional information	19
Service.....	20
<i>Warning.....</i>	<i>20</i>
<i>Warranty</i>	<i>20</i>
<i>Service check and Maintenance</i>	<i>20</i>
<i>Batteries.....</i>	<i>21</i>
<i>Crank bearing</i>	<i>21</i>
<i>Flywheel bearing.....</i>	<i>21</i>
<i>Transportation</i>	<i>21</i>
<i>Replacement of brake belt.....</i>	<i>21</i>
<i>Brake belt contact surface</i>	<i>21</i>
<i>Chain 1/2" x 1/8"</i>	<i>22</i>
<i>Freewheel sprocket.....</i>	<i>23</i>
Spare parts list	24

Important

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

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's cycles have been living proof of precision, reliability, strength and service. Those are the reasons why we are now the world leader in cycle ergometers and the market leader in Scandinavia in transport cycles.

We manufacture, develop and market ergometers and exercise bikes, transport bikes and specialized bicycles. 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

Congratulations on your new Ergometer!

The Monark 939 E is designed to perform stress tests when connected to an ECG device. When connected to a PC or terminal, the bike can be used to perform Max and SubMax cardiovascular tests, calculate VO_2 capacity and more. The bike can also be used for normal exercise.

Each 939 E is calibrated at the factory. This means that you can begin to use the ergometer directly after assembly. But as usual when the bike has been moved, an electronic calibration must be done, see 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.

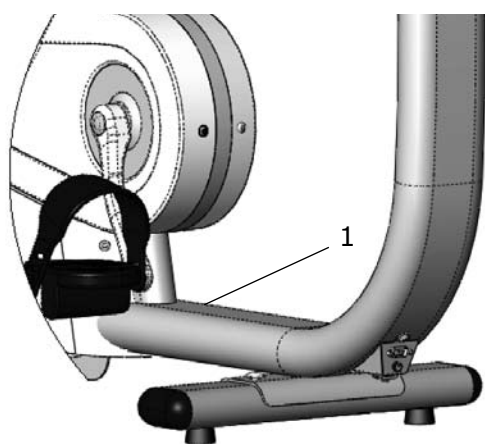


Fig: Serial number (1)

Serial number

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

Facts

- Controlled digital by ECG or PC with RS232 cable
- Connection of RS 232 cable in floor level
- Large, well-balanced flywheel, 20 kg (44 lbs)
- Pendulum scale, easy to calibrate
- Constant power mode
- Workload 0-1400 W (depending on rpm)
- Adjustable saddle with quick release lever
- Adjustable handlebar with quick release lever
- Stable frame, solid steel tube
- Rust protection and powder paint
- Wheels for easy transport
- Display that shows RPM

Width

550 mm (20") at handlebar

620 mm (25") at support tubes

Length

1240 mm (49")

Height

1260 mm (20") at handlebar

790-1160 mm (31"-46") at seat

Weight

58 kg (127,8 lbs)

Max user weight 250 kg (551 lbs)

Included

- Calibration weight 4 kg
- Chestbelt for pulse detection (only PC-model)
- USB - serial adaptor (only PC-model)
- Power adaptor
- Tool kit

Technical data power adaptor

Input voltage: 220-240V AC, 50/60Hz.

Current: 650mA.

Output voltage: 24V DC switching adaptor alt. 18V AC.

(Sweden, 18V, Art. No: 9339-67, other countries incl. USA, 24V, Art. No: 9339-66)

NOTE! The power adaptor must be approved by your national electrical authorities. In Europe, it must be CE marked.

PC software

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

Here are instructions for connection and options for connection to external devices. The need for advanced technical documentation / protocols for systems building, contact Monark Exercise AB, Sweden.

Power on crank or flywheel

When the Ergomedic 939 E is adapted to fitness tests it is set to measure the power on the flywheel.

When the Ergomedic 939 Medical is adapted to ECG work tests it is set to measure the power on the crank.

A sticker, placed on the display, see *Fig: RPM meter and ECG-sticker*, informs that the ergometer is set to measure the power on the crank.

Operation of the ergometer

The Ergomedic 939 E is built on a stabile frame, a large well balanced flywheel, a break belt and a pendulum weight which measures the force. Pedals and a chain drive are provided to spin the flywheel as a tension device tightens the belt to regulate the braking force applied to the wheel. The pendulum indicates the applied force directly on the scale located on the right side of the flywheel.

The computer system consists of one main unit and one control unit (terminal, PC or ECG). The main unit reads in the pedal speed, the applied force and determines the subjects heart rate by a chest transmitter. Additionally, the base controll activates the motor to adjust the tension of the belt, thereby regulating the applied braking force. The force may be automatically varied in response to changes in pedal speed to maintain a constant power workload.

For information about how respective control units works, see respective sections.

The Monark Ergometer 939 E can be controlled externally from a terminal, a computer or an ECG device.

The control is performed over a serial line using ANSI/ISO/ASCII format commands. The interface is a 9-pin male D-sub connector, compatible with the RS232 standard, located on the front of the bike above the front support tube.

The ergometer need not to be turned off prior to connection of the external components, although removing the power from all devices may prevent erroneous data transfer between equipment during interconnection. Caution must be exercised in the connection of various types of equipment from different manufactures to avoid electrical hazards and physical damage. The user must be certain that the instrument connector and the cable are designed for the intended purpose. Serious injury to the user and / or equipment may result if inappropriate connections are attempted.

RPM meter

The LCD displays the number of pedal revolutions per minute with big numbers. The viewing starts automatically when the crank is in motion. The display turns off automatically after about three minutes if pedalling stops. See *Fig: RPM meter and ECG-sticker*.

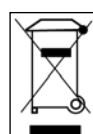


Fig: RPM meter and ECG-sticker



Batteries: 2 x 1.5 V, R14
Storing temperature: -10° C - +60° C
Operating temperature: 0° C - +50° C

Measured quantities

Distance	meter, miles
Energy	kcal
Heart rate	bpm
Force	Newton (N), kp
Power	Watts (W), kpm/min or VO₂ ml/min/kg
Time	min:sec
Weight	kilogram (kg), pounds (lb)

Connection to an external unit

To use the bike it has to be connected to an external device such as an ECG device or a PC. The external unit is connected to the serial data connection port (2) on the lower front of the bike. See *Fig: Connections*. The supplied 0-modem cable shall be used, alt. USB adaptor that comes with the PC model.

The bike is factory configured to connect to a PC alt. a handheld controller (accessories, Art. No: 9339-51). PC software is available for free download from our website: www.monarkexercise.se.

If the bike is going to be connected to an ECG device, you must change the settings on its internal computer. This setting can be changed directly on the bike with the scale indicator on the left side of the bike or with an external handheld controller.

Setting using the pendulum weight is done on the bike's left side. See section "Setting command type (PC or ECG device)".



Fig: Connection
1) Power input
2) Serial port connection, external unit
3) Switch (on/off)

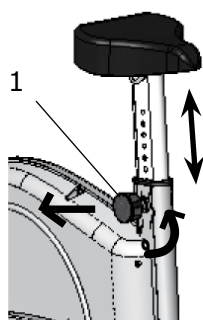


Fig: Adjustments
1) Quick release bolt
2) Quick release lever

Initial operation

The ergometer 939 E is to 100 % calibrated at the factory. But as usual when the bike has been moved, an electronic calibration must be done, see instruction for "Electronic calibration" in this manual.

Apply power to the ergometer by first connecting the cable from the power adaptor to the ergometer at the front connector, see *Fig: Connections*. Then plug the power adaptor into the wall outlet. Turn the power switch to on position. A green LED indicates power to the 939 E, see *Fig: LED*.

Perform the electrical calibration as specified in section "Calibration Electronics". Test ride the ergometer. The 939 E Ergometer is now fully functional and ready to use.

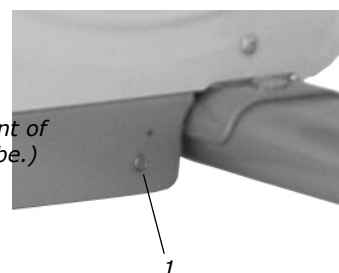


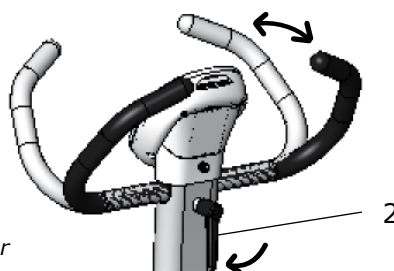
Fig: LED (1)
(Left side in front of rear support tube.)

Cycle adjustments

Seat height should be adjusted to a comfortable position. The appropriate height is to have the knee slightly bent when the sole of the foot is centred over the pedal axle with the pedal to the bottom position. To adjust the seat height turn the quick release bolt (1) on the saddle post approximately one revolution and pull it out. See *Fig: Adjustments*.

The handlebar setting should be in a comfortable position when cycling. During longer exercise sessions it is recommended to occasionally change handlebar position. To adjust the handlebar, loosen the quick release lever (2). See *Fig: Adjustments*.

When using the Polar chest belt, an identification between belt and sensor has to be done at first use. Make sure to get the pulse signal by standing close to the sensor (max. 60 cm / 23 ½").



Setting command type (PC or ECG device)

From program version R15

First check the brake belt tension. If the belt is too tight loosen it a little by moving the force indicator to about 4 kp and hold it there for a few seconds. Then the force-adjusting servo will loosen the belt tension. To be sure that indicator positions are correct, do a calibration. See "Electronic calibration".

1. Turn off the power by pressing the power switch (2) which is placed on the frame, see *Fig: Connections*. Disconnect the cable from any connected external device.
2. Adjust the scale mechanically so that 0-index on the scale and indicator are in line.
3. Move the indicator to 6 kp and hold it there.
4. Turn on the power again. (The green LED on the lower left side of the bike is lit up when there is power to the bike, see *Fig: LED*.)
5. Hold the indicator at 6 kp until two beeps are heard.
6. Move the pendulum pointer to
 - 0 = mode for use with PC or handheld controller.
 - 1 = mode for Siemens Megacart ECG
 - 2 = mode for other ECG devices, alt 1.
 - 3 = mode for other ECG devices, alt 2.
7. Keep at the selected position until two signals can be heard. Then release the pointer to 0. The system will now restart in the selected mode.

Alt. 1: ECG, Ergoline compatible command set, requested load value.

Alt. 2: ECG, Ergoline compatible command set, current load value.

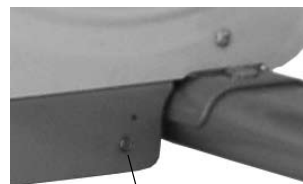
What command type is set

Connect power to the bike and set the power switch to "on" without moving pendulum. 1 beep = mode for PC or handheld controller, 2 beeps = mode for ECG Siemens Mega Cart, 3 beeps = location of other electrocardiographs, alt. 1 and alt. 2.



Fig: Connection

- 1) Power input
- 2) Serial port connection, external unit
- 3) Switch (on/off)



*Fig: LED (1)
(Left side in front of
rear support tube.)*

Connection to PC

To connect a PC to the ergometer, use a 0-modem cable (RS232) with a 9-pin D-sub female at each end. If no RS232 Serial port is available on the computer use a USB serial RS232 converter.

Before installing the Monark Software for your ergometer, you must take the following steps.

1. Locate the USB adaptor.
2. Inside the USB adaptor packaging, there is a mini-CD.
3. Insert the mini-CD into the CD-ROM drive and install the driver software. If there is no CD drive on your computer, driver software is available for download from the website (<http://www.vscom.de/USB-CD>).
4. Finalize the driver software installation by inserting the USB adaptor.
5. Install the Monark Software disk.
6. Connect the USB Adaptor to the Serial Cable and proceed with testing.

To control the ergometer use the PC software which is available for free download from our website: www.monarkexercise.se, or other PC software made for the Ergomedic 939 E.

From software version MEC3V11R14 and later settings can be made from a PC in terminal mode if the terminal is not available. Set PC in terminal mode. A terminal emulator is normally available in i.e. Windows under Accessories/Communication.

In terminal mode do the following settings:

- 9600 baud
- 8 data bit
- 1 stop bit
- no parity
- no flow control
- set terminal emulation to VT100
- set the COM port number. A USB serial converter is automatically assigned to a COM port number by Windows. This number is indicated under Startmenu / Settings / Control Panel / System Hardware / Device Manager. The USB serial adaptor should be listed in the Ports (COM & LPT) section.

Connect Ergometer and PC with the 0-modem cable (normally used for the handheld controller).

Turn on power to the ergometer. The ergometer is now checking what type of device is connected. When finished a message appears on the PC screen.

Common commands:

- Calibration: Type: cali, press ENTER and follow the instructions on the display.
- Setting to control ergometer from external ECG devices: Siemens Megacart: type: env cmdtype=1, press ENTER.
- Setting to control ergometer from external ECG devices: Various ECG devices: (most common setting) Siemens Megacart: type: env cmdtype=2, press ENTER.

To returning to control via the bike's handheld controller, type: env = cmdtype, press ENTER or env cmdtype = 0, press ENTER.

Connection to an external unit e.g. ECG device

First check the brake belt tension. If the belt is too tight loosen it a little by moving the force indicator to about 4 kp and hold it there for a few seconds. Then the force-adjusting servo will loosen the belt tension. To be sure that indicator positions are correct, do a calibration. See "Electronic calibration".

1. Press the switch (2) to turn off the power, see *Fig: Connections*. Disconnect the cable from any connected external device.
2. Adjust the scale mechanically so that 0-index on the scale and indicator are in line.
3. Move the indicator to 6 kp and hold it there.
4. Turn on the power again. (The green LED on the lower left side of the bike is lit up when there is power to the bike, see *Fig: LED*.)
5. Hold the indicator at 6 kp until two beeps are heard.
6. Move the pendulum pointer to
 - 0 = mode for use with PC or hand unit.
 - 1 = mode for Siemens Megacart ECG
 - 2 = mode for other ECG devices, alt 1.
 - 3 = mode for other ECG devices, alt 2.
7. Keep at the selected position until two signals can be heard. Then release the pointer to 0. The system will now restart in the selected mode.
8. Reconnect the proper cable between the external device (ECG Siemens Megacart requires a special cable) and the bike.
9. The bike is now controlled digitally from the external device.

These settings can also be done using the PC or the terminal. Follow the instructions described in the respective manuals.

Reset the Ergometer to use with terminal/PC.

Follow the points 1 – 7. At point 7 press 0 and then ENTER. The Ergometer can now be controlled again from the terminal or an external PC.

Alt. 1: ECG, Ergoline compatible
command set, requested load value.

Alt. 2: ECG, Ergoline compatible
command set, current load value.

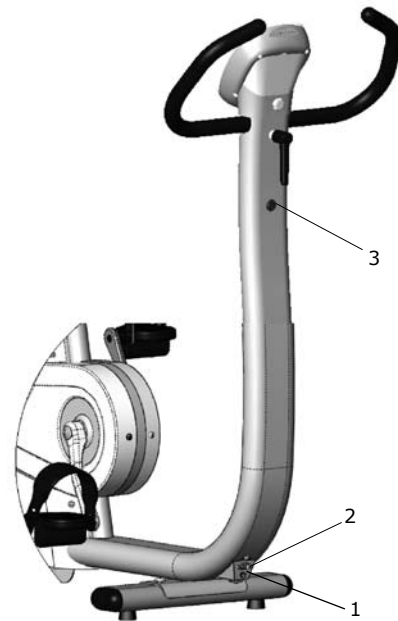
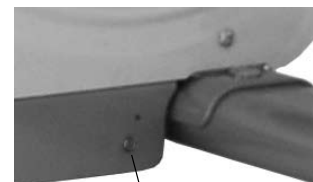


Fig: Connections

- 1) Power input
- 2) Serial port connection, external unit
- 3) Switch (on/off)

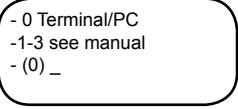


*Fig: LED (1)
(Left side in front of
rear support tube.)*

Setting of terminal

When using a handheld controller (Art. No: 9339-51) do as follows:

1. First, perform "Setting the command type (PC or ECG)" and select 0.
2. Connect the terminal to the bike using the enclosed cable.
3. Connect power to the bike.
4. When the main menu is displayed on the LCD-screen press 99 and the hidden service menu appears.
5. Press 6, "Settings".
6. Press ENTER (normally 13 times) until the display "Command type" appears.



- 0 Terminal/PC
-1-3 see manual
- (0) _

- a) Press 1 and ENTER if the bike is connected to a Siemens Megacart ECG device.
 - b) Press 2 and ENTER if the bike is connected to a Siemens Megacart ECG device, alt. 1.
 - c) Press 3 and ENTER if the bike is connected to a Siemens Megacart ECG device, alt. 2.
 - d) Press 0 if the bike is connected to a PC or a handheld controller.
7. After that press 0 twice to go back to main menu.

Calibration

The 939 E is a mechanically weighted and braked ergometer, making performance validation a simple procedure. The work performed on the ergometer is the product of the weight lifted times the numbers of revolutions (factored). Validation includes both mechanical and electronic procedures. If the ergometer fails to pass any section of the validation, proceed to the calibration and/or service menu (99 in the main menu).

Inspection of all mechanical components is suggested after any repair, or component service. The following validation should be performed annually:

1. Remove the cover from the flywheel.
2. Loosen the brake belt at the balancing spring.
3. Wait until the flywheel is no longer moving.
4. The pendulum weight index should be aligned with "0" on the scale.
5. Attach the calibration weight to the point at which the spring was attached.
6. The known weight should match the value on the scale. If not see section "Calibration of Pendulum Weight".
7. Reattach the tension belt.
8. Reassemble the cover.

Proceed to the validation to complete.

Validation

The following procedure will assure the user that the ergometer is performing properly on a daily basis. The test exercises the mechanical braking, pedalling and speed detecting systems as well as the computer regulation and sensing capability of the mechanical system. Additionally, if a calibrated ECG simulator is available, it may be used to verify the heart rate measuring system. Whether the simulator is used or not, the heart rate system may be validated by simply taking a pulse point rate measurement at the neck for example. While a patient is at rest and has been prepared for chest belt electrodes or an ear sensor, the pulse indicator flashes once per pulse beat. The flashing heart rate must be consistent with the manually recorded pulse. If it does not correspond, check the chest belt contact area and moisten if necessary the electrode surfaces with water. If this fails, call customer service.

Validation of force

To do this you need to have the bike connected to a computer with Monark software (manual mode) or that the handheld controller is used.

From main menu go to any start display with Newtons (N).

1. With the pendulum pointer at 0, the display should read "0 N".
2. Move the pendulum weight to the 4 kp position and the display should read "39" Newtons.

NOTE!

After this verification, the brake belt will be loose, which means that it takes about 15 seconds before the regulating device has tense the brake belt to normal again (5 N).

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.

Loosen possible tension in the brake. See "Scale - zero adjustment". Check that scale 0-index is in line with the pointer(1). See *Fig: Calibration*. If adjustment is needed adjust according to "Scale -zero adjustment".

A checked and approved weight(4), 4 kg (Art. No: 9000-211), is attached at(5). See *Fig: Calibration*.

At the correct calibration, the indicator should point to 4 kp on the scale.

If there is a deviation adjust the pointer to the correct position by adjusting the weight inside the pendulum(2). To do this the left cover has to be removed.

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

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

Check the scale calibration once a year or if required due to service.

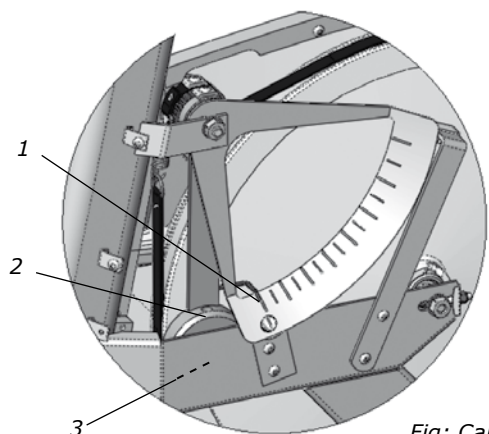


Fig: Calibration
1) The pointer's 0-position
2) Adjusting weight of sinker
3) Locking screw
4) Calibration weight
5) Hook for calibration weight
6) Pointer at 4 kp

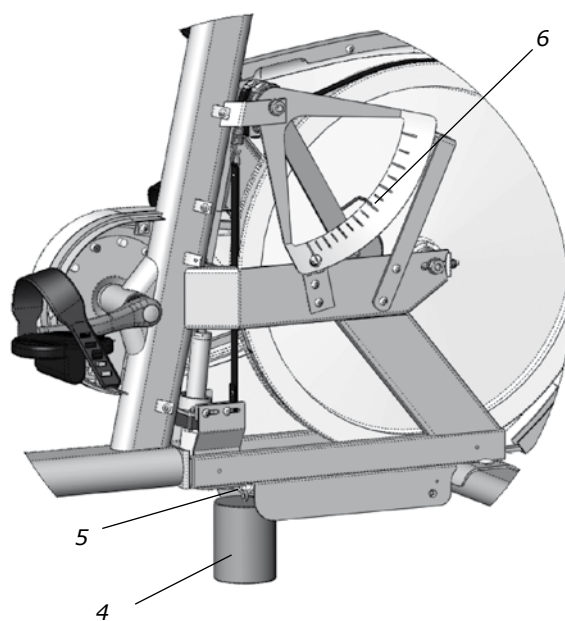
Electronic calibration

When calibrating the electronics do the following:

1. Turn off the power by pressing the power switch (2) which is placed on the frame, see *Fig: Connections*. in section "Connection to an external unit".
2. Adjust the scale mechanically so that 0-index on the scale and indicator are in line.
3. Move the indicator to 4 kp and hold it there.
4. Turn on the power again. (The green LED on the lower left side of the bike is lit up when there is power to the bike.)
5. Hold the indicator at 4 kp until one beep is heard.
6. Move the indicator to 0 kp and wait for one beep.
7. Move the indicator to 2 kp and wait for one beep.
8. Move the indicator to 4 kp and wait for one beep.
9. Move the indicator to 6 kp and wait for two beeps.
10. Move the indicator to 0 again.

Calibration is done.

The indicator can now be used to set the bike in different modes.



Scale - zero adjustment

Connect power to the bike. Loosen possible tension in the brake belt by moving the pendulum to 4 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 indicator/moving pointer. Tighten the locknut after the adjustment. See *Fig: Scale adjustments*.

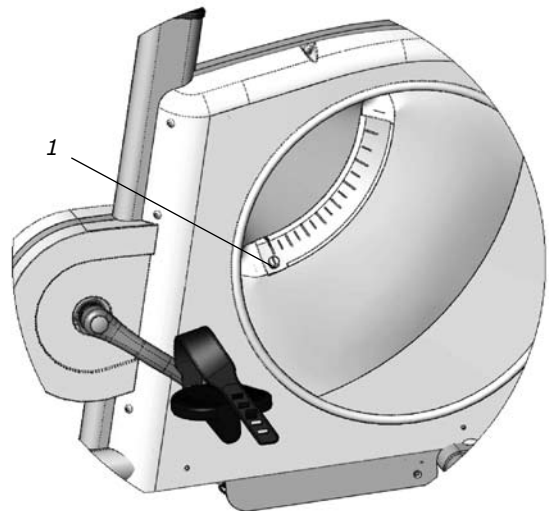


Fig: Scale adjustment
1) Locking screw

Testing with Ergomedic 939 E

The versatility of the 939 E / 939 Medical Ergometer enable it to be utilized in a variety of testing environments. The precision and reproducibility of the test values obtained with the bike, along with the uncomplicated way to set up the tests, means the bike can be used in clinical work tests, in occupational health services for the fitness tests as well as fitness centers, schools, sports clubs and the like. The backgrounds of both the individuals being tested and those administering the test may be vastly different in these widely varying testing situations.

In general, whether in a clinical laboratory or a health club, the subject may be exercised quite strenuously, depending on workloads which have been selected. As a precaution, it may be advisable, prior to beginning an exercise protocol, that each subject consults with a physician.

Before testing, the operator should review the entire protocol operation with the test subject, explaining the work which will be required and the duration of the procedure. A system of communicating fatigue, chest pain or other abnormal physical response to the exercise should be discussed.

The test subject should not engage in heavy physical activity for several hours prior to testing to establish maximum oxygen consumption. In addition, all testing and exercise protocols should be performed a reasonable time after meals. The test person should also refrain from smoking within an hour of the testing period.

The test person shall also have the appropriate clothing for a work test. Training suit or loose-fitting clothing is best. The test subject may need some general education concerning the pedalling of the ergometer. The saddle and the handlebars should be adjusted for comfort and proper mechanical distance. The appropriate height of the saddle is when the knee is slightly bent when the sole of the foot is centred over the pedal axle with the pedal to the bottom position.

The operation of the speed metronome and over/under display should be reviewed.

The maintenance of the proper speed should be practiced at a low workload.

Finally, put the chest belt on. Check for a minute that a proper heart rate is displayed. The baseline heart rate may also be of assistance in determining the nervousness of the test subject. The test subject should exhibit a relatively stable resting heart rate prior to starting the protocol.

Power calculation

1 rpm = 6 m on the flywheel brake surface.

50 rpm = 300 m

2 kp force makes $2 \times 300 = 600$ kpm/min

100 rpm = 600 m

1 kp force makes $1 \times 600 = 600$ kpm/min

(watt = rpm x kp)

Heart Rate (telemetry)

The test subject's heart rate can be monitored by chestbelt telemetry system. The chest belt is standard equipment.

Fuss-free HR measurement requires that the belt is correctly placed. When it is correctly fitted the logo on the belt will be central and readable, outward and upright, by another person. Before putting on the belt, clean the skin where the belt is to be placed. The chest belt should be secured at a comfortable tension around the mid section, just below the breast muscle, see *Fig: Placement of the chest belt*. Moisten the electrodes before use, see *Fig: Electrodes on the back of the chest belt*. To make contact with the HR receiver on the bike, the distance should not be more than 100 cm. It is especially important when first used to identify the chest belt with the sensor, by standing close to get the HR (maximum 60 cm). This relates especially to the Polar heart rate belt.

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

In case of problems, turn off WiFi, Bluetooth and similar on computers nearby.

Test person enforcement

The bike performs automated tests virtually by itself, requiring minimal intervention by the test operator. This allows the operator to pay careful attention to the test subject without distraction. The response to the exercise protocol can be accurately estimated and appropriate action taken to assist the test person, if necessary. Some programmes have sections where the test person may develop significant physical activity. The effect on the test person should not be underestimated.

During the test it is important to observe the subject person's appearance and heart rate. The testing should be stopped immediately if the test person reports chest pain, difficulty breathing, etc. A system of prompt medical attention should be set up prior to testing, in case of emergency.

The test person may also have difficulty keeping a steady pedalling speed. This is of minor importance (except in cases where the program assumes a constant braking force, since the effect is automatically adjusted to the correct value as long as the pedal speed is at least 35 revolutions / min (rpm)). However, it is important to consider what each test documentation says about the pedal speed.

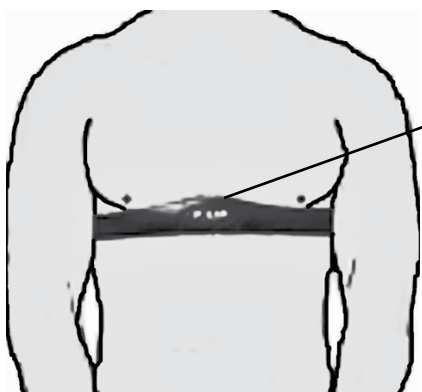


Fig: Placement of the chest belt

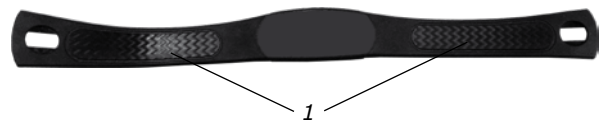


Fig: Electrodes on the back of the chest belt (1)

Reviewing results

The maximum oxygen uptake is the standard measurement of cardiopulmonary fitness. Dependent on the linear relationship between work and oxygen uptake and between work and heart rate, the heart rate response to work may be used to estimate the oxygen consumption. If the maximum heart rate is considered, the maximum oxygen consumption may be determined.

The YMCA and Åstrand protocols estimate the maximum oxygen consumption, based on a submaximal workload while all others report the oxygen consumption required by the final workload. The Bruce and Naughton protocols require that the test subject exercise at a workload level for a minimum of one minute to establish the oxygen consumption. If less than one minute is observed, the previous workload value is used.

The estimated maximum oxygen consumption derived from some of the ergometer tests is subject to the error of the “age related predicted maximum heart rate“. Although there is a definite and linear relationship between work and oxygen uptake, there are some differences in actual oxygen uptake based on individual work efficiency. Test subjects who are less familiar with bicycle exercise and those individuals who are less fit, are more likely be less efficient than those who ride bicycles frequently.

It should be noted that these results are estimates or predictions of maximal response and have a greater chance of being in error than if the individual were tested to their actual maximum value. Interpretation should therefore be made more carefully with an understanding of the possibility of errors in the methodology.

A relative fitness index can be obtained from the following table:

<i>Fitness Rating Index - Males</i> <i>Maximum Oxygen Consumption ml/kg/min</i>				<i>Fitness Rating Index - Females</i> <i>Maximum Oxygen Consumption ml/kg/min</i>			
<i>Rating</i>				<i>Rating</i>			
	<i>-36 yrs</i>	<i>36-45 yrs</i>	<i>45- yrs</i>		<i>-36 yrs</i>	<i>36-45 yrs</i>	<i>45- yrs</i>
<i>Excellent</i>	54	53	43	<i>Excellent</i>	55	49	46
<i>Good</i>	49	45	38	<i>Good</i>	45	43	38
<i>Above Average</i>	46	39	34	<i>Above Average</i>	39	37	32
<i>Average</i>	36	33	30	<i>Average</i>	34	33	27
<i>Below Average</i>	32	29	27	<i>Below Average</i>	30	29	24
<i>Fair</i>	28	25	24	<i>Fair</i>	26	26	20
<i>Poor</i>	24	23	20	<i>Poor</i>	20	22	18

See also table 7 in “ Work tests with the Bicycle Ergometer“ by P O Astrand.

Trouble shooting guide

Symptoms	Probable Cause / Corrective Action
LED does not light up	- No current in the outlet. Check the fuses. - Right transformer? Check so that the trafo information in section "Facts" is in accordance with the trafo used. - Looseness in the cord (directly on the box). Contact service centre for action / replacement. - Power switch (on / off).
No connection to PC	- Check cables. - Right COM port? - Drivers missing when using the USB-serial adaptor. CD with drivers is included. - Is the right type cmd set? "Start beep" = cmd type, see section "What commandotype is set".
No workload	- Pendulum stuck. Contact service centre for action / replacement. - Looseness in the motor connector. Contact service centre for action / replacement. - Check that the pedal speed is higher than 30 rpm. No workload is put on if the actual pedal speed is lower than 30 rpm. See "Service menu" pedal reference. The default setting is 30 rpm but can be adjusted to the desired value. - Check calibration.
No heart rate is displayed	- Check the chestbelt (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 correct on test person and tight enough. Check that the electrodes are wet, in hard 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 chestbelt on another known person who has a good pulse rendering. - Check for loose cables or jack if you have a plug-in receiver. Use another HR receiver (HR watch or test bike monitor) to check the chestbelt. - Check that it is the correct receiver and that it is in the correct place. If it has a round Polar-sticker it should be placed straight.
No rpm reading	Check cable.
Unable to calibrate force	- Potentiometer belt may be slipping or broken. Replace if damaged. - The potentiometer is misadjusted. Reboot memory from service menu (99). Set default (3). Then calibrate the electronics again.
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 is probably disturbance in the room. Magnetic fields from high voltage cables, elevators, fluorescent tube etc. can cause the disturbance. Other electronic equipment could be placed too close. 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 with every pedal revolution (increases with the weight)	- The pedals are not tight. Tighten them or change pedals. - The crank is loose. Check, tighten. - The base bearing is loose. Contact your dealer for service.
Scratching sound is heard when pedalling	Check that the carriage block is taken off and that none of the covers is scratching.
There is a click noise and a squeak noise when pedalling	Loosen the chain.
Any problems with the computer software	Send an email to the software developer HUR labs support: software@hur.fi

Operation interferences

It is normally considered that about 70 % of all shutdowns on small computers are caused by mains interferences, i.e. at short over voltage. These interferences can often be caused by different machinery, which is started or stopped. The processor in the computer is then reacting incorrectly or is not working at all. The problems can be solved by means of a mains interference protector, which is connected between the mains and the transformer.

Where to obtain additional information

The user may require more information concerning several areas of the ergometer usage. This manual was intended to instruct the reader primarily in the operation of the ergometer. References are made to related topics in the discussions concerning the testing procedures and the protocol operation sections. The following literature may provide some greater insight to ergometer-based testing without confusing the reader with technical medical terms.

- Åstrand P-O, "Ergometri - konditionsprov", Monark, Sverige.
- Golding L. A, Myers C. R, Sinning W. E, "Y's way to physical fitness", YMCA of the USA, Rosemont, IL, 1982

For more technical details, see the section entitled "Reference".

References

1. Astrand I, "Aerobic work capacity in men and women with special reference to age", Acta Physiol Scand. 49 (suppl. 169), 1960
2. Åstrand P-O, "Experimental studies of physical working capacity in relation to sex and age", Munksgaard, Köpenhamn, 1952.
3. Åstrand P-O, Rodahl K, "Textbook of Work Physiology", McGraw-Hill, New York, 1970.
4. Bruce RA, Kusumi F, Hosmer D, "Maximal oxygen intake and nomographic assessment of functional aerobic impairment in cardiovascular disease", Am Heart J 85:546-562, 1973.
5. Naughton J, "Exercise Testing and Exercise Training in Coronary Heart Disease", Academic Press, New York, 1973.
6. Golding LA, Myers CR, Sinning WE, "Y's way to physical fitness" YMCA of the USA, Rosemont, IL, 1982
7. Wilson P. K, Bell C. W, Norton A. C, "Rehabilitation of the heart and lungs", Beckman instruments, 1980.
8. Åstrand P-O, "Ergometri - konditionsprov", Monark, Sverige.

Service

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

Warning

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 (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 (2 times per year).
- Be sure that all moving parts, crank and flywheel are working normally and that no abnormal play or sound exists. I.e. 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 meter 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.

Crank bearing

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

Flywheel bearing

The bearings in the flywheel are lifetime greased and require normally no maintenance. 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.

Replacement of brake belt

To replace the brake belt remove covers if necessary. Make sure that the 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 of the knot in the other end of the cord and then remove the hole cord from the bike. When assembling a new brake cord, first enter one end into the hole in the tension center, and 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".

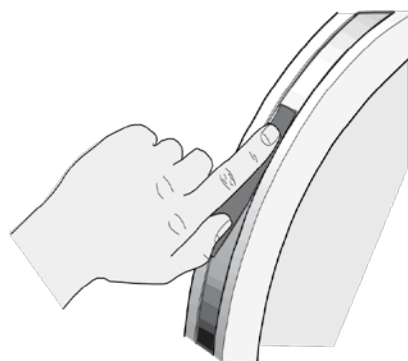


Fig: Brake belt contact surface

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 little 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 spring of the chain lock should be assembled with the closed end in the movement direction(5) of the chain. Use a pair of tongs for dismantling and assembling the spring (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 makes a lot of noise and wears out rapidly.

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

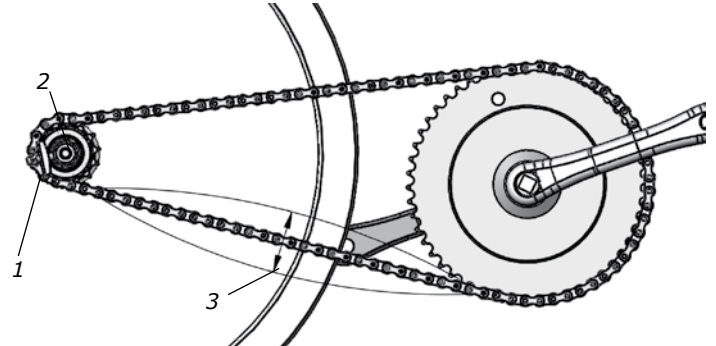


Fig: Chain adjustments

- 1) Chain adjuster
- 2) Axle nut
- 3) Chain play

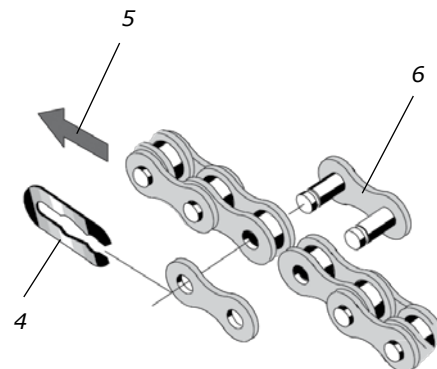


Fig: Chain replacement

- 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-adapter and assemble the new parts in reverse order according to the above.

NOTE! Do not tighten the axle nut completely. It must be possible to loosen the adapter-sprocket half a turn.

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*.

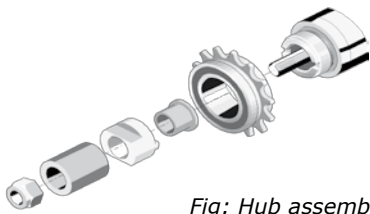
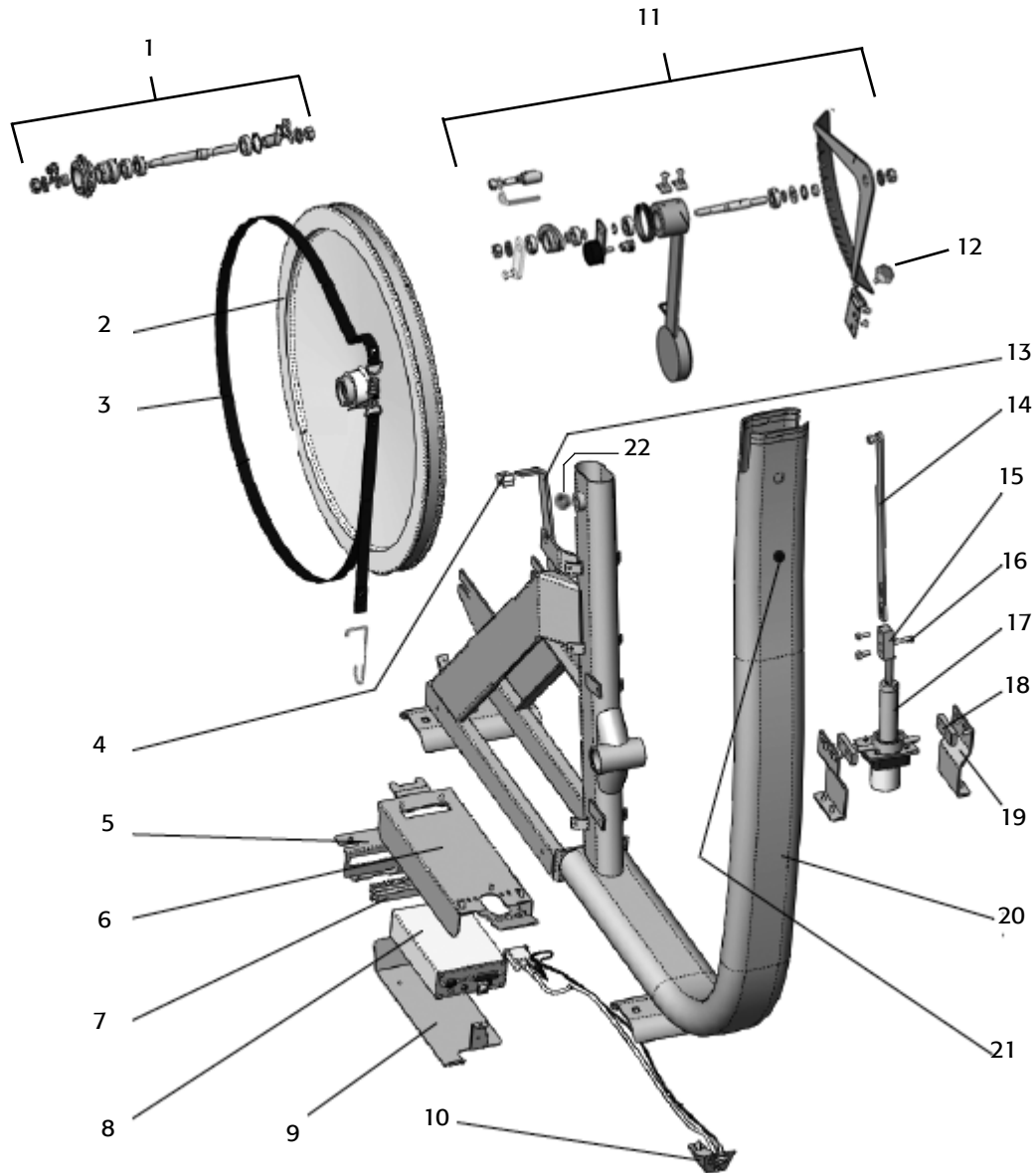


Fig: Hub assembly



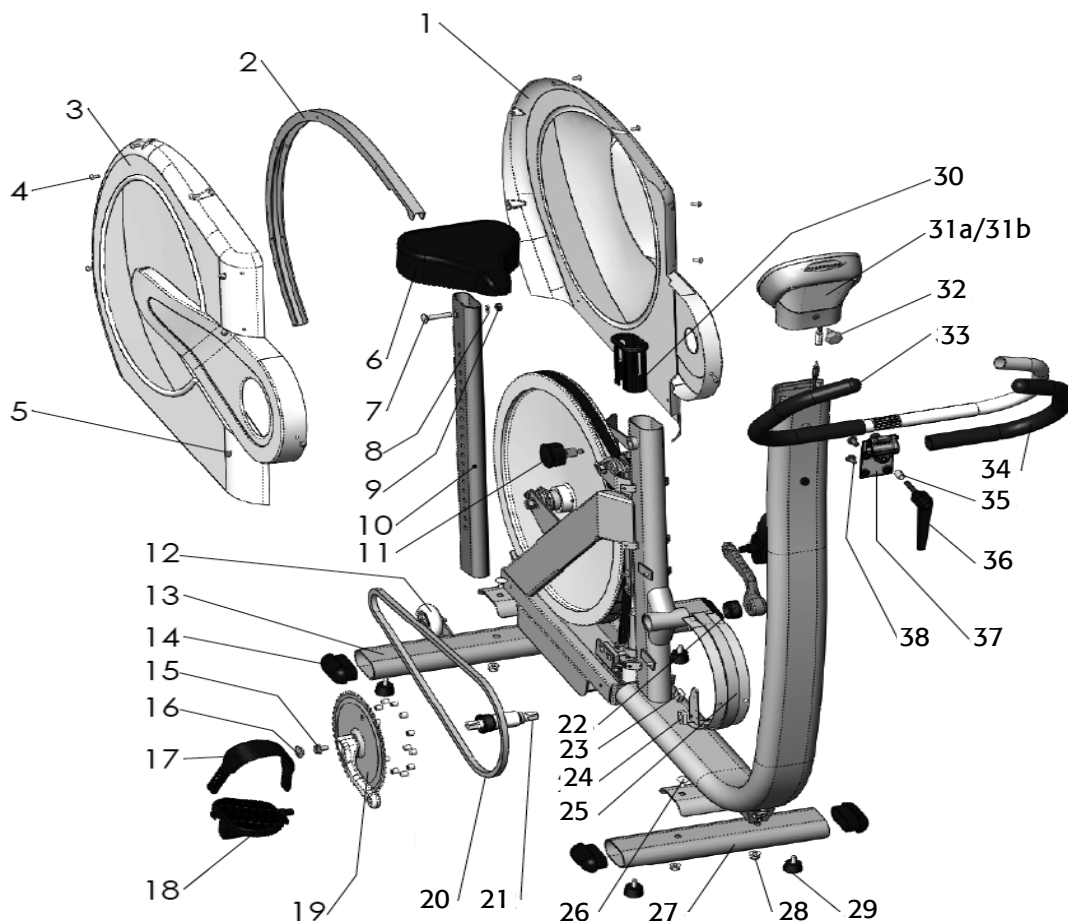
Fig: Lubrication

Spare parts list



From serial number WBK 285590H

Pos.	Qty.	Art. No.	Description	Pos.	Qty.	Art. No.	Description
1	1	9300-24	Wheel suspension complete set	13	1	9328-62	Stop
2	1	9300-3	Flywheel	14	1	9338-19	Stay
3	1	9328-64	Brake belt, complete	15	1	9338-17	Adapter servo
4	2	9300-99	Plastic stop	16	3	14323	Screw M6x16
5	1	9338-29	Contact plate	17	1	9338-57	Tension device, complete
6	1	9338-28	Bracket for box	18	2	9338-15	Bracket for servo
7	1	9338-31	Contact, complete	19	2	9338-16	Bracket for servo
8	1	9338-24	Electronic box	20	1	9338-1	Frame
9	1	9338-30	Cover plate	21	1	9338-58	Switch, "on"/"off", with cable
10	1	9338-142	Contact bracket, complete	22	1	9328-33	Adaptor M20/M16
11	1	9328-100	Pendulum, complete		1	9339-39	Communication cable, 3 m
12	1	9328-29	Scale lock, complete		1	9339-67	Power adaptor



From serial number WBK 285590H

Pos.	Qty.	Art. No.	Description	Pos.	Qty.	Art. No.	Description
1	1	9338-59	Frame cover, left	22	1	8966-176	Support casing for BB-bracket
2	1	9328-4	Aluminium profile	23	1	9328-162	Crank sensor w. 1750 mm cable
3	1	9338-60	Frame cover, right	24	1	9326-162	Sensor black, w. 100 mm cable
4	9	5675-9	Screw M5x6,5	25	1	9309-3	Joint list
5	21	5673-9	Screw M5x12	26	4	9300-12	Screw M8x16
6	1	4994-5	Saddle	27	1	9328-5	Support tube, front
7	1	5605-1	Screw M8x46	28	4	5845	Locking nut M8
8	1	5864	Washer	29	4	9328-26	Rubber foot
9	1	5775	Nut	30	1	9328-131	Bushing f. saddle post
10	1	9328-130	Saddle post	31a	1	9338-23-1	Display (without pulse)
11	1	9328-132	Locking knob	31b	1	9338-23-2	Display (with pulse) incl. Polar receiver
12	1	9328-37	Transport wheel compl. (pair)	32	1	9000-105	Screw M5x10
13	1	9328-6	Support tube, rear	33	1	9328-7	Handlebar, complete
14	4	9328-51	Plastic cap	34	1	9328-72	Handgrip, blue (pair)
15	2	8523-115	Screw M8x1x20	35	1	9326-89	Distance
16	2	8523-2	Dust cover for crank	36	1	9100-280	Lever, complete
17	1	9300-207	Foot straps (pair)	37	1	9328-8	Handlebar clamp
18	1	9300-220	Pedal (pair)	38	4	9337-38	Screw M8x16
19	1	9300-432	Steel crank set, complete with magnets		1	9000-211	Calibration weight, 4 kg
20	1	9326-55	Chain, 98 L with chain lock		1	9339-89	Chestbelt Polar Wear-link
21	1	8966-175	BB cartridge bearing		1	9328-78	Handlebar, wide splines, compl.

[illegible]

[illegible]

