

Manual 839 E



Important

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

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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. That 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 Ergomedic 839 E is one of the world's most precise and user-friendly computerized pendulum ergometers.

The Ergometer is controlled by either a control unit, an external PC or other external units. The bike can perform max and submax fitness tests and calculate the VO_2 max. The ergometer can be connected to ECG to do work tests.

It is possible to build personal programs that are custom made for the user. The bike can also be used for normal exercise.

NOTE!

Use of the product may involve considerable physical stress. It is therefore recommended people who are not accustomed to cardio or not feel completely healthy to first consult a physician for advice.

Serial number

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



Fig: Serial number (1)

Facts

- Large, well-balanced flywheel 20 kg (48 lbs)
- Brake power 0-1400W at 200 rpm
- Pendulum scale, easy to calibrate
- Adjustable saddle and handlebar
- Stable frame, solid steel tube.
- Powder painted
- Wheels for easy transport

Computer

- Computer system 8 MHz
- Multi-colour rpm pacing bar graph display
- Visual metronome or heart rate
- Serial communication port: 300 - 38400 baud

Width

517 mm (20") at handlebar

640 mm (25") at support tubes

Length

1150 mm (45")

Height

945-1295 mm (37-51") at handlebar

790-1110 mm (31-44") at seat

Weight

56 kg (128 lbs)

Max user weight 250 kg (550 lbs)

Included

- Calibration weight, 4 kg
- Chestbelt
- PC-program
- Power adaptor/switching adaptor
- Tool kit

Technical data power adaptor

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

Current: 650mA

Output voltage: 24V DC switching adapter 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.

Operating Instruction

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

Power on crank or flywheel

When the Ergomedic 839 Medical is adapted to ECG work tests it is set to measure the power on the crank.

When the Ergomedic 839 E is adapted to fitness tests it is set to measure the power on the flywheel.

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



Fig: ECG-sticket

Operation of the ergometer

The Ergomedic 839 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 839 E can be controlled externally from a terminal, a PC or an ECG device. Direct printer connection port.

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 main unit.

It is also possible to use an analogue control from any external source to set the workload. This is done by the contacts b32 och z32 on the main connector on the bike.

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.

Measured quantities

Spacer	meter, miles
Energy	kcal
Heart rate	bpm
Force	Newton (N), kp
Power	Watts (W), kpm/min or VO ₂ ml/min/kg
Time	min:sec
Weight	kilogram (kg), pounds (lb)

Rpm Meter and visual Metronome / Puls

The metronome (the two green LED bars in the middle) flashes once per pedal stroke at a preset rate. The two green LED bars in the middle can also be set to show pulse. Pedal frequency compared to metronome rate is always shown.

Underspeed:

Pedal speed is lower than desired metronome rate 2, 4, 8, 16 or more depending which LED bar that indicates.

Overspeed:

Pedal speed is greater than desired metronome rate 2, 4, 8, 16 or more depending which LED bar that indicates.

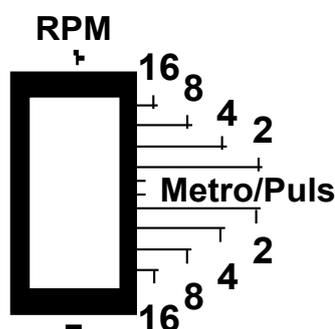


Fig: RPM display

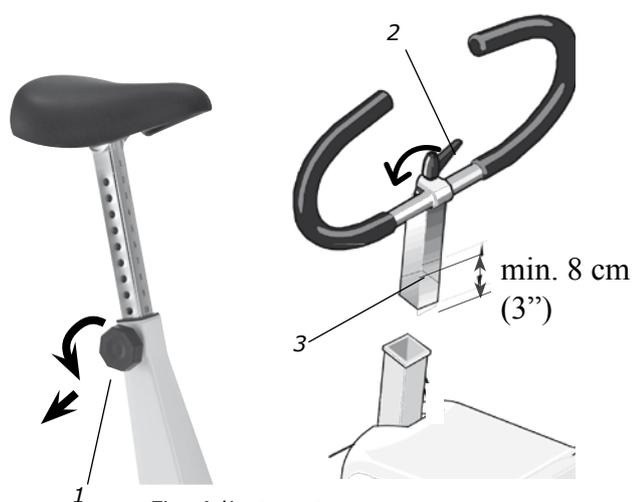


Fig: Adjustments

- 1) Quick release bolt
- 2) Quick release lever
- 3) Inserted min. 3"

Initial operation

The ergometer 839 E is to 100 % calibrated at the factory. The user may wish to verify this by performing the mechanical calibration of the pendulum weight. See "Electronic calibration".

Apply power to the ergometer by first connecting the cable from the power adaptor to the ergometer at the front connector labelled "24VDC / 18VAC". Then plug the power adaptor into the wall outlet. Turn the power switch to on position. A green LED indicates power to the 839 E.

Perform the electrical calibration as specified in section "Calibration Electronics". Test ride the ergometer. The 839 E Ergometer is now fully functional and ready to use.

Cycle adjustments

Do not forget to remove the transport protections (the transportation bracket on the weight lever, the protection tape on the flywheel and the transport blocks above and below the flywheel).

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 loosen the lever(1) on the seat tube. 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.

NOTE! The handlebar stem should be inserted into the frame tube at least 3 inches (about 8 cm). This measure is marked with "MAX" on the stem(3).

Connection to controller

Setting of command type (PC or ECG device)

From software version R15

First check the brake belt tension. If the belt is too tight loosen it a little by moving the pendulum 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 pendulum positions are correct, do a calibration. See "Electronic calibration".

1. Press the switch to turn off the power, see *fig: Connections*. Disconnect the cable from any connected device.
2. Adjust the scale mechanically so that 0-index on the scale and the mark on the pendulum are in line.
3. Move the pendulum to 6 kp and hold it there.
4. Turn on the power again. The green LED (3) lights when power is connected to the bike.
5. Hold the pendulum at 6 kp until two beeps are heard.
6. Move the pendulum 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. Hold the selected position until two beeps are heard. Then release the pendulum 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?

When the power is turned on a beep is heard and depending on the beeps number you can decide which command type is set.

- Commando type 0: One long beep.
- Commando type 1: A long beep followed by a short beep.
- Commando type 2: A long beep followed by two short beeps.
- Commando type 3: A long beep followed by three short beeps.

Setting of terminal

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

1. Connect the terminal to the bike using the enclosed cable.
2. Connect power to the bike.
3. When the main menu is displayed on the LCD-screen press '99' and the hidden service menu appears.
4. Press '6', "Settings".
5. 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 other ECG device with an Ergoline protocol for communication, alt. 1.
- c) Press '3' and 'ENTER' if the bike is connected to other ECG device with an Ergoline protocol for communication, alt. 2.
- d) Press '0' if the bike is connected to a terminal or PC.

6. After that press '0' twice to go back to main menu.

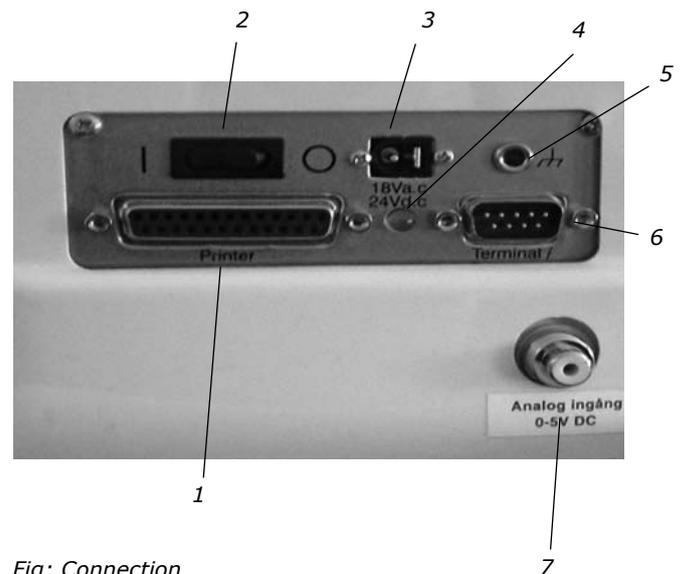


Fig: Connection
1) Printer connection
2) Power switch
3) Power connection
4) LED
5) Chassis ground
6) Terminal/PC (serial)
7) Analogue connection

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 PC use a USB serial adaptor to connect to an USB port.

Follow these steps to install the USB adaptor drivers:

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 Adapter to the Serial Cable and proceed with testing.

To control the ergometer use the PC software supplied with the ergometer and which is common to the models 831 E och 939 E, or other PC software made for the Ergomedic 839 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.

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

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[enter] and follow the instructions on the screen.
- Setting to control ergometer from other external ECG devices: Siemens Megacart ECG device: Type: env cmdtype=1[enter]
- Setting to control ergometer from external ECG devices: Various ECG devices: (most common setting) type: env cmdtype=2[enter]

To go back to control the ergometer with the terminal type: env cmdtype=[enter]

A lot of other settings can be made. For more information about this please see Technical Reference Manual MEC3V11Rn.

Connection to an external ECG device, digitally controlled

(if terminal is used)

1. Connect the terminal via the supplied 0-modem cable (9-pol. D-sub female connector on each end) to the corresponding connector (5) in the front end of the cycle, see *Fig: Connections*.
2. Connect the net adaptor to a suitable wall outlet and to the connection (3) on the bike and then turn power on.
3. After a short while the main menu is shown on the terminal's display.
4. Press '99' and the service menu comes up on the display.
5. Press '6', for Service set-up.
6. Press 'ENTER' on the following settings until "Command type" is shown.
7. This says:

- 0 Terminal/PC
- 1-3 see manual
- (0) _
8. Return to main menu by pressing '0' and then press '0' again to finish. The computer will then save the settings in the memory before it turns off. Computer will start up again automatically after a few seconds.
9. Turn off the power and remove the terminal incl. the cable.
10. Use a suitable cable between an ECG device and the bike (ECG Siemens Megacart requires a special cable).
11. The bike can now be controlled only from an external ECG device.

Reset the Ergometer to use with terminal/PC.

Follow steps 1-7. At step 7 press '0' and then 'ENTER'. The ergometer can now be controlled again from the terminal or an external PC.

If a zero (0) is displayed at the 3rd line, the ergometer is in normal mode which means that the bike can not be controlled by an external ECG device. Press '1' if a Siemens Megacart with Ergomed 940 will be used. For use of other devices press '2' or '3' and then 'ENTER' (see section "Setting of command type"). If the desired settings already in parenthesis press 'ENTER'.

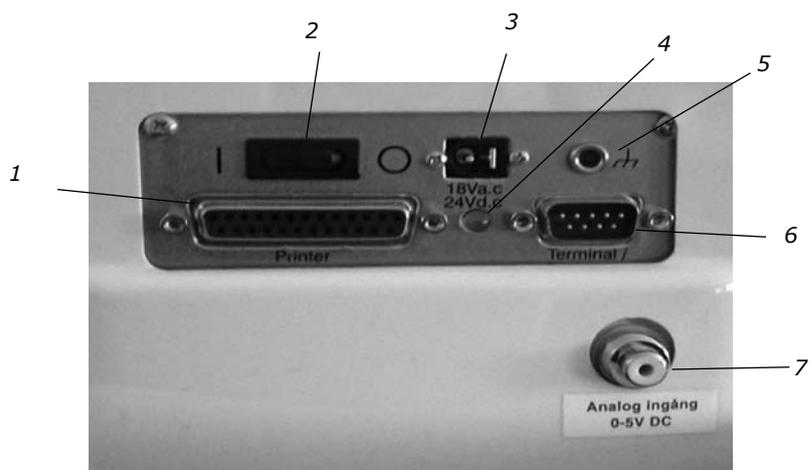


Fig: Connection

- 1) Printer connection
- 2) Power switch
- 3) Power connection
- 4) LED
- 5) Chassis ground
- 6) Terminal/PC (serial)
- 7) Analogue connection

Analogue control

The workload of the Ergometer can be controlled by external devices such as an analog ECG device (must be between 2 and 4 volts to operate properly). For settings, see the manual for the terminal and the manual for the software.

Printer

A parallel interfaced printer may be attached to provide written reports.

Start by connecting the printer to the parallel output (1) located on the front of the bike. The terminal or the computer attaches both via a serial cable to the 9-pin interface connector (5) located on the front of the ergometer, see *Fig: Connections*.

If the external device is a desktop printer it must be capable of emulating Epson alt. IBM Proprinter mode to operate. Verify that the System set-up have been set to enable automatic printout. If it has been disabled, no output will reach the device until it has been enabled. Also, the baud rate, 4800 baud, selected by the interface cable must match that of the device.

Paper must be in the printer and the choice of units must be made before the printer is in use (see user manual for the printer).

The automatic printout length is a pre-set to eleven inch pages for standard fanfold or zee-fold paper. At the top of the each page, a header designating the columns is printed. The time period between the printing of each line may be set as desire, from 0 (continuous output) to 255 seconds in one second increments. The standard setting is 15 seconds between printouts. This provides reasonable documentation while not wasting large quantities of paper.

Calibration

The 839 E is a mechanically weighted and braked ergometer, making performance validation a simple procedure. Calibration is necessary to match the mechanics of the ergometer to the electronics of the computer. 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. For more information, see Manual terminal (art. No: 7950-302) or the manual of the software. 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 where the balancing spring was placed, see fig: Calibration weight
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 "Daily check" to complete, which is also included in the yearly check.

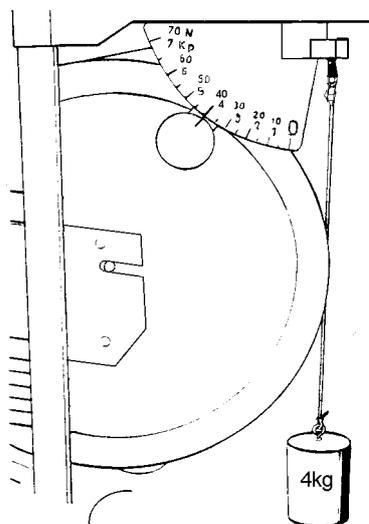


Fig: Calibration weight

Daily check

The following procedure will assure the user that the ergometer is performing properly on a daily basis.

- Check of pulse function, see section.
- Check of work load, see section.
- Move the pedals round and make sure that it obtained a reasonable rpm - check against a clock. Check so the pedals are smooth and nice. Listen for unusual sounds. Fix.
- Check / adjust the handlebar and saddle and check that they are tighten.
- Check that the support tubes are properly attached by wobble the bike. Tighten if necessary.

If you found something strange at the daily validation that you cannot fix by your own, please contact the service at Monark Exercise.

Checking of the pulse function

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 displayed heart rate, should agree with the manually detected pulse rate. If not, check the patient electrode connection and skin preparation prior to requesting service. If not, check the patient electrode connection and skin preparation prior to requesting service.

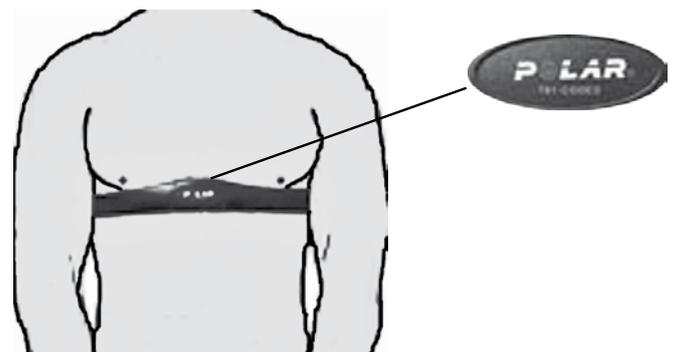


Fig: Placement of the chest belt

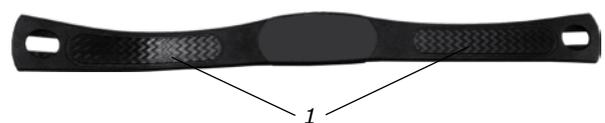


Fig: Electrodes on the back of the chest belt (1)

Validation of force

From main menu go to any start display with Newtons (N). See *Fig: Force*.

1. With the pendulum at zero, the display should read "00N".
2. Move the pendulum weight to the 4 kp position and the display should read "39N".

If the workload is not displayed properly, a calibration must be done. See "Electronic calibration".

NB:

The brake belt will become loose and because of this it will take a few seconds before normal workload is obtained the first time the ergometer is used.

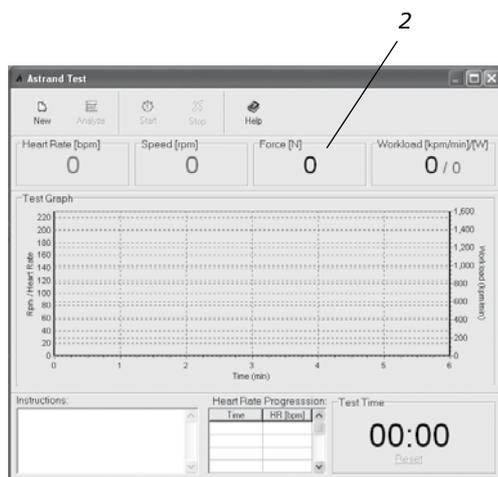
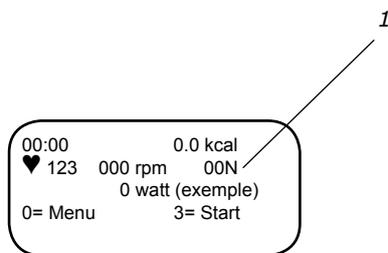


Fig: Force

- 1 Force in the display of the terminal
- 2 Force in the software

Electronic calibration

A daily check of the pendulum force sensor should be preformed. If the procedure reveals an error, recalibration may be necessary. The values are saved even if you turn off the power and if you physically move the bike. Usually it is not necessary to recalibrate the bike, but it should be done after each service, change of electrical parts, moving or after you have programmed into "Recovery" by default. (Terminal alt. '99', in the main menu and then alt. '3' in the service menu).

The following steps show how the electronics are calibrated against the pendulum scale.

The calibration coefficient which has been calculated by the computer is stored in the continuous memory. Whenever power is applied to the ergometer, the latest calibration value is restored to maintain memory. A new calibration replaces previous values.

A check of the electronic calibration can be done in the computer program. Choose a test. In the dialogue box that shows, you can read "Force [N]". If terminal is used, chose a test. You can see the work load at the "N" in the display. See *Fig: Force*.

NB:

The brake belt will become loose and because of this it will take a few seconds before normal workload is obtained the first time the ergometer is used.

Electronic calibration - terminal

1. Check at the bottom of the flywheel that the brake belt is loose, see *Fig: Brake belt is loose*. If not, move the pendulum to 4 kp and hold it there for some seconds. Move the pendulum down to 0-position again, and check that the brake belt is loose.
2. Adjust the meter panel, see section "Zero adjustment of meter panel", so that the index line of the pendulum is opposite the 0-index of the scale, see *Fig: 0-position*.
3. Push alt. '5' in the main menu (calibration) and follow the instructions on the display. Hold the pendulum in 0-position and wait for a beep, see *Fig: 0 kp*. NOTE! The pendulum must remain stationary.
4. Move the pendulum to 2 kp and wait for a beep, move the pendulum to 4 kp and wait for a beep. Finally move the pendulum to 6 kp and wait for two beeps shortly after each other. See *Fig: 2 kp*, *Fig: 4 kp*, *Fig: 6 kp* and *Fig: 0 kp*.
5. Lower the pendulum back to standby mode (0-index).

The calibration is done.

NOTE! The pendulum must remain stationary at the different positions.

Electronic calibration - PC

1. Check at the bottom of the flywheel that the brake belt is loose, see *Fig: Brake belt is loose*. If not, move the pendulum to 4 kp and hold it there for some seconds. Move the pendulum down to 0-position again, and check that the brake belt is loose.
2. Adjust the meter panel, see section "Zero adjustment of meter panel", so that the index line of the pendulum is opposite the 0-index of the scale, see *Fig: 0-position*.
3. Start the program "Monark 839E Analysis Software" in the computer.
4. In the menu "Monark 839E", choose "Check calibraton...".
5. Follow the instructions shown on the screen. See also *Fig: 2 kp*, *Fig: 4 kp*, *Fig: 6 kp* and *Fig: 0 kp*.

The calibration is done.

NOTE! The pendulum must remain stationary at the different positions.

Electronic calibration - with the pendulum

From software version R15

1. Check at the bottom of the flywheel that the brake belt is loose, see *Fig: Check loose brake belt*. If not, move the pendulum to 4 kp and hold it there for some seconds. Move the pendulum down to 0-position again, and check that the brake belt is loose.
2. Adjust the meter panel, see section "Zero adjustment of meter panel", so that the index line of the pendulum is opposite the 0-index of the scale, see *Fig: 0-position*.
3. Turn off the power (on the switch) and move the pendulum till 4 kp, see *Fig: 4 kp*.
4. Hold the pendulum at 4 kp and turn the power on the bike again and wait for beep. Lower the pendulum to 0, see *Fig: 0 kp*. Wait for a beep.
5. Move the pendulum to 2 kp, see *Fig: 2 kp*. Wait for a beep.
6. Move the pendulum to 4 kp, see *Fig: 4 kp*. Wait for a beep.
7. Move the pendulum to 6 kp, see *Fig: 6 kp*. Wait for two beeps. Lower the pendulum to 0 again.

The calibration is done.

NOTE! The pendulum must remain stationary at the different positions.



Fig: Check loose brake belt.

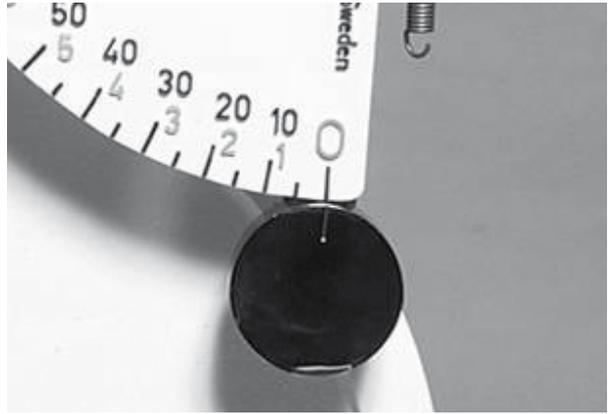


Fig: 0-position

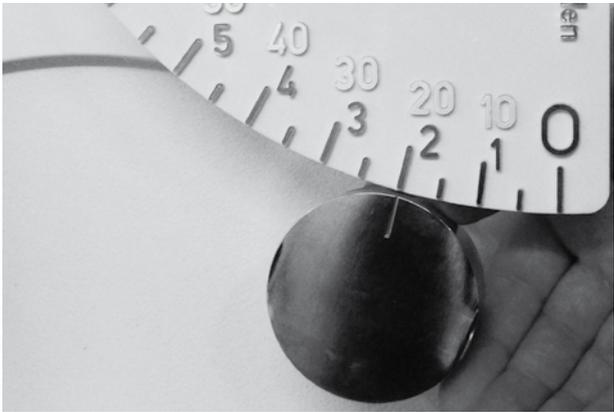


Fig: 2 kp

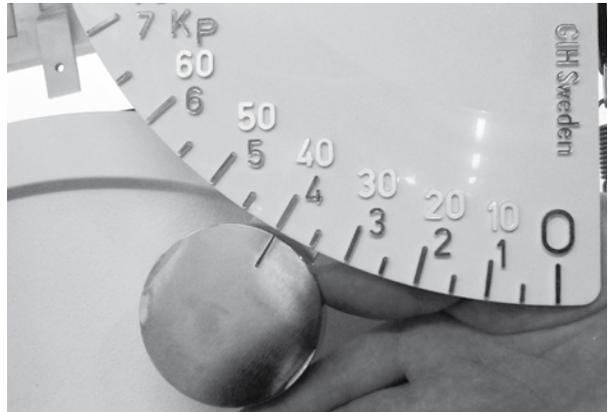


Fig: 4 kp



Fig: 6 kp



Fig: 0 kp

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.

Remove the cover from the flywheel. Loosen the balancing spring from the brake belt. Check that the 0-index of the scale is in line with the index of the pendulum weight. If adjustment is necessary, loosen first the lock nut. Then change the scale so that the index of the pendulum is in line with the 0-index of the scale. Tighten the locknut after the adjustment.

Attach a known weight, e.g. 4 kg (Art. No: 9000-211) where the balancing spring was placed.

NOTE!

The flywheel must be completely stopped before the weight is hung on!

When correctly set, the weight (4 kg) should be possible to read from the corresponding place on the meter panel. Should there be a deviation, adjust the pendulum to the correct weight on the scale by means of the adjusting weight inside the pendulum. To change the position of the adjusting weight, loosen the lock screw of the weight. Should the index of pendulum weight be too low, move the adjusting weight upwards into the weight. Should the index be too high, the adjusting weight is moved downwards and locked in the new position. This procedure is repeated until the correct reading is achieved.

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

Assemble the front cover again.

Zero adjustment of meter panel

Check that the index on the pendulum weight is aligned with the index at the 0-position on the scale board. If adjustment is necessary, first loosen the locknut(3) and then change the position of the board. Tighten the locknut after the adjustment. See *Fig: Calibration*.

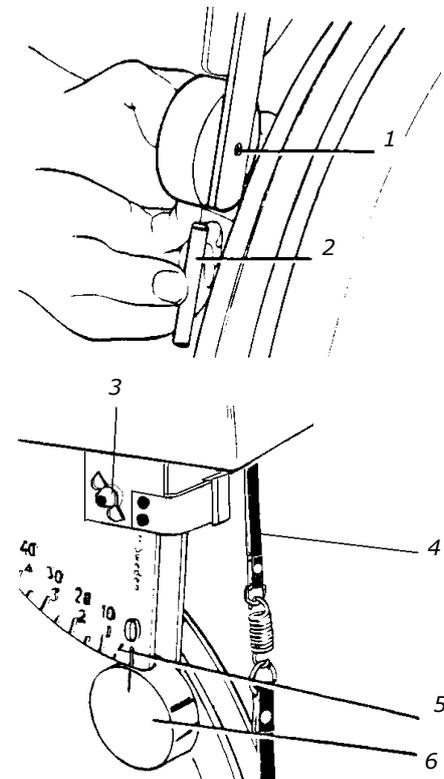
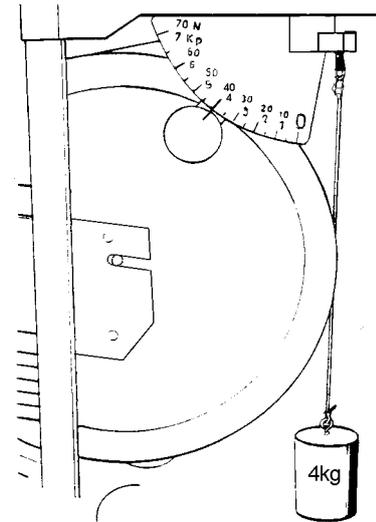


Fig: Calibration
1) Locking screw
2) Adjusting weight
3) Locking nut
4) Brake belt
5) Meter panel
6) Pendulum weight

Testing with Ergomedic 839 E

The versatility of the 839 E/939 Medical Ergometer enable it to be utilized in a variety of testing environments. The precision and reproducibility of measurements made with the ergometer in conjunction with the ease of testing, allow it to be employed in clinical exercise stress facilities, corporate fitness programs and health clubs. 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 of 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 consult 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 subject should also refrain from smoking within an hour of the testing period.

The test subject should be prepared for riding the ergometer, including the selection of proper clothing which neither interferes with the physical activity nor endangers the health of the test subject. Training suit or other 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, the chestbelt should be applied. Check for a minute that a correct pulse 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 system)

A person's heart rate can be measured with a chest belt that senses the electronic output of the heart. 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.

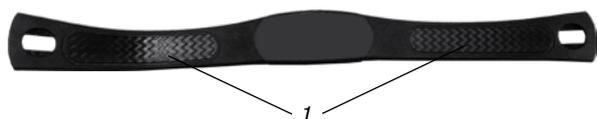


Fig: Electrodes on the back of the chest belt (1)

Subject supervision

The ergometer performs automated tests virtually by itself, requiring minimal intervention by the 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 to assist the test subject, if necessary, may be given. The user is subjected to considerable exercise in certain advanced protocol stages. The effect on the test subject should not be underestimated.

During the testing, the general appearance and heart rate may be the most crucial factors to monitor. The testing should be stopped immediately if the test subject 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 subject may also show difficulty in regulating the speed of the ergometer. The power will be properly regulated regardless of the speed, assuming that the protocol work type is not force and that the speed is maintained above the rpm low setting (default is 30 rpm).

In addition, some test subjects may become sensitive to the display on the handheld remote controller. If this is suspected, the controller may be removed from its cradle and located out of view. Similarly, the pulse LED may disturb the test subject and may be disabled.

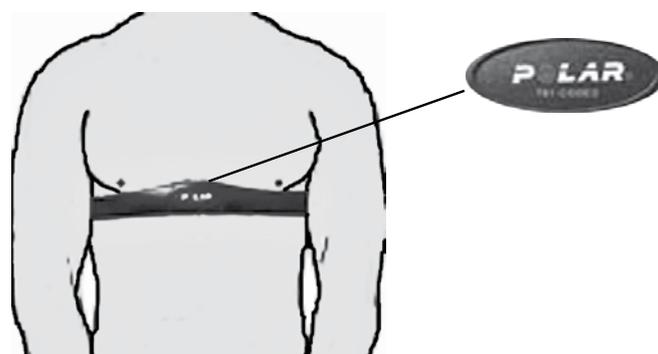


Fig: Placement of the chest belt

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 tables:

<i>Fitness Rating Index - Males</i>				<i>Fitness Rating Index - Females</i>			
<i>Maximum Oxygen Consumption ml/kg/min</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.

Troubleshooting guide

Symptom	Probable Cause/Corrective Action
LED does not light up.	No current in the outlet. Check the fuses. Right trafo? Check that the trafo information in section "Facts" is consistent with the trafo used.
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?
Does not load work.	The pendulum stuck Contact the service for fix / replacement. Check that the pedal rpm is higher than 30 rpm. No work load is put on if the actual rpm 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 shown.	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 chest belt 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 pulse receiver (pulse 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. Potentiometer 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 pulse 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 irregular pulse remains we recommend measuring HR manually. If HR still remains irregular at workload test person's health need to 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 noise 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.

Error messages

Message	Reason
"Test Aborted"	An automatic protocol operation has been stopped too early. No results are available.

Operation interferences

It is normally considered that about 70 % of all shutdowns on small computers are caused by mains interferences, i.e. at shot 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, Sweden.
- Myers CR, Sinning WE, "Y's way to physical fitness" YMCA of the USA, Rosemont, IL, 1982.

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

References

1. Åstrand I, "Aerobic work capacity in men and women with special reference to age", Acta Physiol Scand. 49 (suppl. 169), 1960. 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 for 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 as above for labour or shipping.

Service check and maintenance

To keep your Ergometer in good shape you should make a regular service.

Service action:

- If you wish to disinfect the surface of the bike we recommend isopropyl alcohol. Use a damp but not wet cloth to clean the surface you wish to disinfect.
- Keep your Ergometer clean and properly 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 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 (2 times per year).
- Check that the chain is snug and there is no play in the pedal crank (2 times per year).
- Check that pedals, chain and freewheel sprocket are lubricated (2 times per year).
- Be sure that the brake belt does not show significant signs of wear (2 times per year).
- Check that the handlebars and seat adjustment screws are lubricated (2 times per year).
- Be sure that all moving parts as crank and flywheel are working normal 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 require normally no supplementary lubrication. If problem arises, please contact your Monark dealer.

Flywheel bearing

The bearings in the flywheel are lifetime greased and require normally no maintenance. If problem arises, please contact your Monark dealer.

Transport

At transport the brake cord should be somewhat 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 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 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 belt on other bikes, turn off all workload. 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 brake belt contact of the flywheel surface should then be ground off with fine sand paper 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".

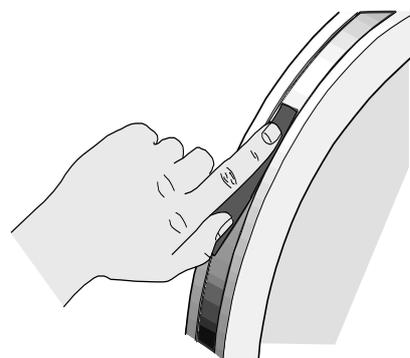


Fig: Brake belt contact surface

Chain 1/2" x 1/8"

Check the lubrication and tension of the chain in 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.

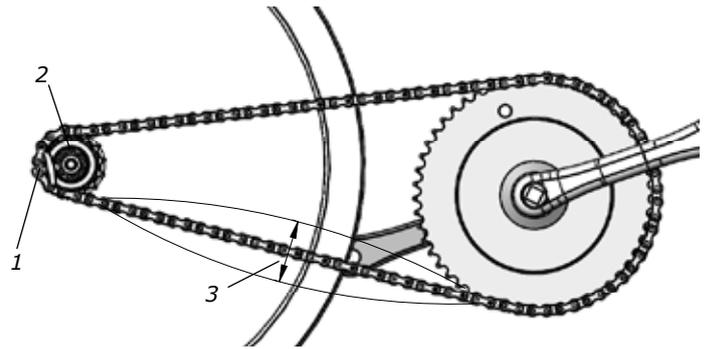


Fig: Chain adjustments
1) Chain adjuster
2) Axle nut
3) Chain play

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 replace the brake belt, remove covers as required.

To adjust the chain the hub nuts(2) should be loosened. Loosening or tightening the nuts on the chain adjusters will then move the hub and axle forward or backward (1). Tighten hub nuts firmly. 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*.

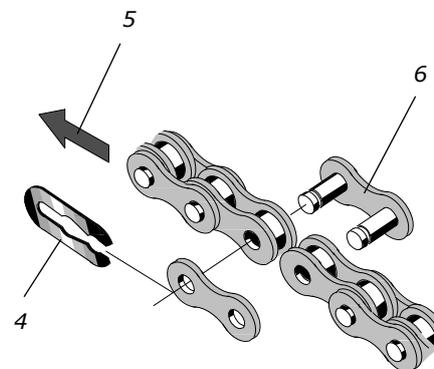


Fig: Chain replacement
4) Lock spring
5) Movement direction
6) Chain lock

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 details as above but in reverse order.

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. Special remover (Art. No: 9100-14) in the adapter and place the spacer and axle nut outside. See *Fig: Special remover*

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

Replace sprocket-adapter 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 somewhat to make it easier for the oil to reach the ball bearing. See *Fig: Lubrication*.



Fig: Lubrication



*Fig: Special remover
(Art. no: 9100-14)*

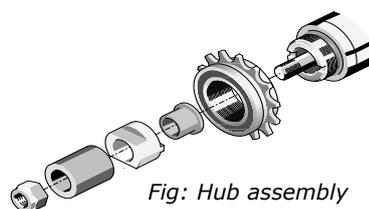
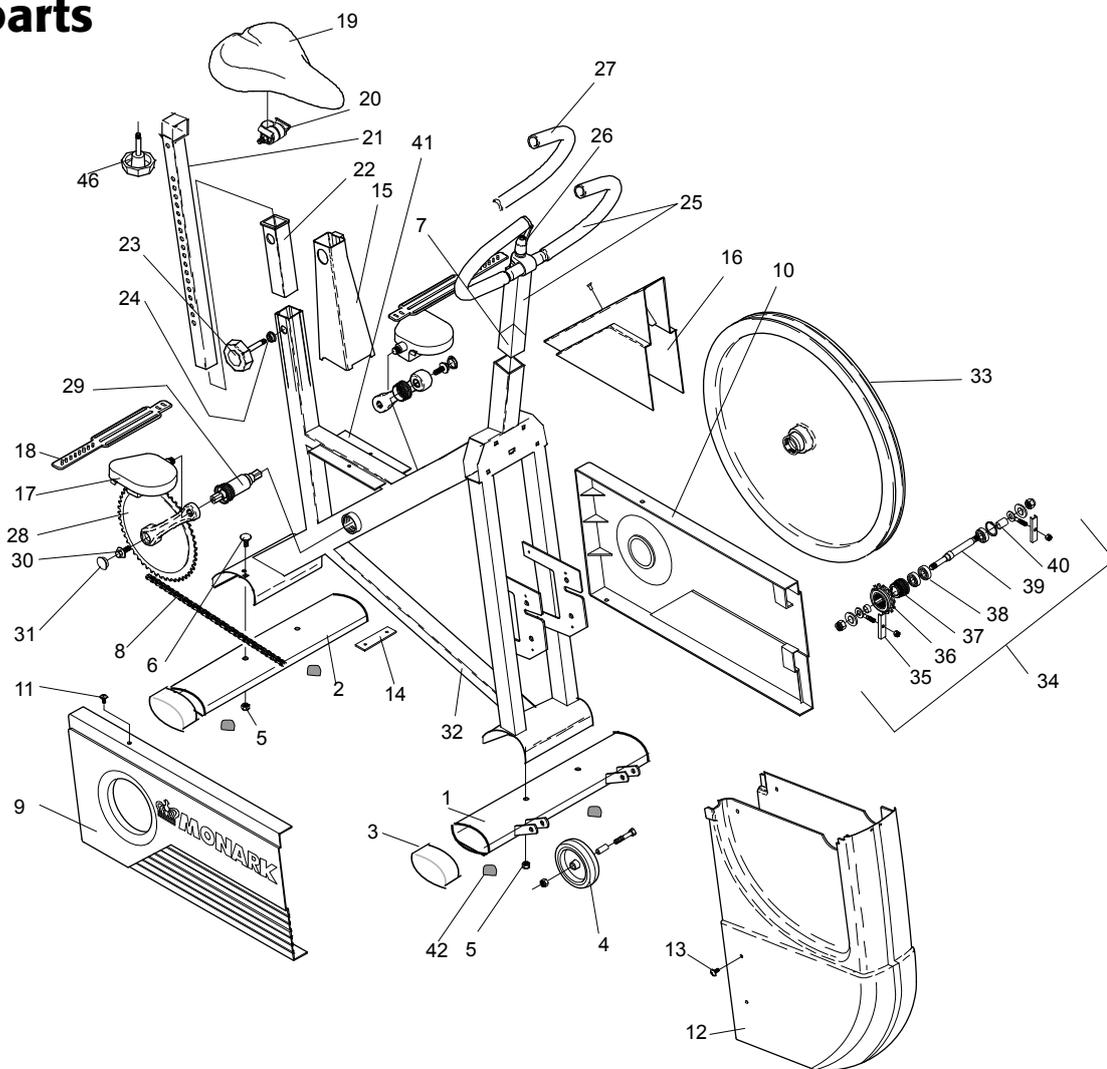
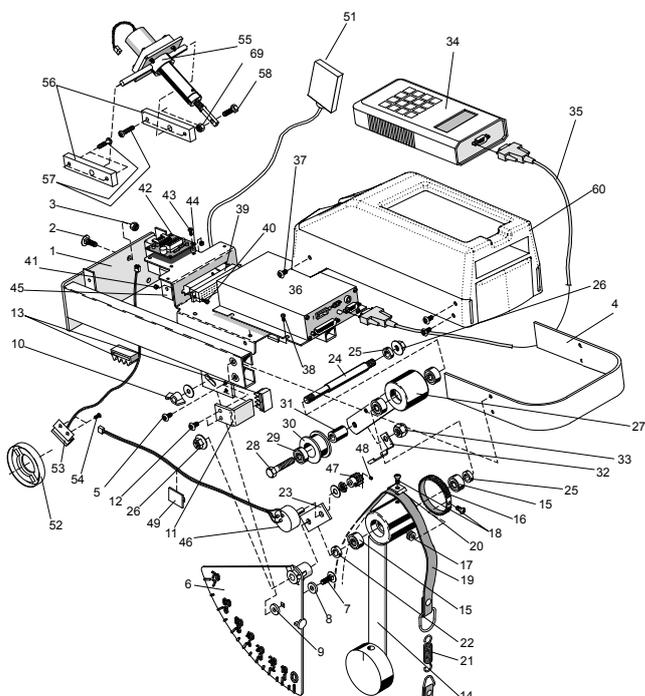
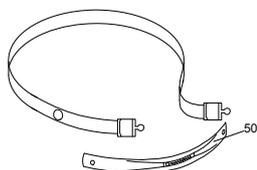


Fig: Hub assembly

Spare parts



Pos.	Qty.	Art. No.	Description	Pos.	Qty.	Art. No.	Description
1	1	9301-15	Support tube, front	23	1	9300-118	Locking knob
2	1	9301-16	Support tube, rear	24	1	9300-134	Pressure washer
3	4	9328-51	Plastic cap, blue	25	1	9300-280	Handlebar complete
4	2	9000-37	Transport wheel	26	1	9100-180	-Lever, complete
5	6	5845	Locking nut M8	27	1	9126-72	-Handgrip, blue (pair)
6	2	9300-12	Screw MVBF M8x16 mm	28	1	9300-430	Steel crank set, complete
7	1	9300-291	Expander wedge M10	29	1	9300-340	BB cartridge bearing
8	1	9300-55	Chain 1/2 x 1/8", 116 l	30	2	8523-115	Screw M6S 8.8 M8 x 20 FZB
9	1	9300-50	Chain guard	31	2	8523-2	Dust cover
10	1	9300-52	Side guard	32	1	9301-5	Frame
11	2	5675-9	Mounting screw LKT-TT 5x6.5mm	33	1	9300-3	Flywheel 20 kg, complete
12	1	9339-55	Wheel cover	34	1	9300-24	Wheel suspension complete set
13	2	9304-32	Screw M5x25 mm	35	1	9000-12	-Chain adjuster
14	1	9300-53	Holder for guard	36	1	9106-13	-Sprocket
15	1	9300-56	Cover for saddle	37	1	9106-14	-Connection
16	1	9300-57	Cover for frame	38	3	19001-6	-Bearing 6001-2z
17	1	9300-220	Pedal (pair)	39	1	9300-18	-Axle
18	1	9300-207	Pedal strap, (pair)	40	1	9300-17	-Bush, 23 mm
19	1	4994-5	Saddle	41	2	9300-58	Holder for chain guard
20	1	9300-114	Seat clamp	42	4	9328-26	Rubber foot
21	1	9300-138	Saddle post		1	9000-211	Calibration weight, 4 kg
22	1	9300-115	Bushing f. saddle post				



Pos.	Qty.	Art. No.	Description	Pos.	Qty.	Art. No.	Description
1	1	9339-38	Frame for equipment	34	1	9339-51	Terminal
2	4	9300-21	Screw MVBF 6x16 mm	35	1	9339-27	Cable
3	4	5843-9	Nut M6	36	1	9339-52	Base unit
4	1	9339-59	Handles	37	6	5673-9	Screw M5x12
5	4	5673-9	Screw M5	38	4	5675-9	Screw M5x6,5
6	1	9339-100	Scale board	39	1	9339-25	Connection device
7	1	9339-21	Screw M6	40	2	9305-42	Screw MCS M3x30 fzb
8	1	5880	Washer	41	2	5840	Nut M3
9	1	5862	Washer	42	1	9339-56	Card for metronome
10	1	9000-102	Wing nut	43	4	9339-49	Screw MCS M3x10 fzb
11	1	9300-94	Stop	44	4	9339-33	Spacer
12	2	5671-9	Screw M5	45	1	9339-24	Cover
13	2	9300-99	Plastic stop	46	1	9339-62	Potentiometer
14	1	9300-88	Weight lever with bearing	47	1	9303-52	Pulley
15	2	19001-6	Ball bearing 6001-2z	48	1	9305-44	Locking screw
16	1	9303-54	Belt 55T	49	1	9300-66	Holder for cable
17	2	5861	Washer	50	1	9339-98	Chestbelt, DT
18	1	5673-9	Screw M5	51	1	9339-76	Receiver, DT
19	1	9339-61	Brake belt	52	1	9300-671	Dust cover with magnet
20	1	9300-92	Bracket	53	1	9300-65	Crank sensor
21	1	9008-124	Spring	54	2	9326-59	Screw RXS B8x6.5 FZB
22	1	9339-87	Spacer	55	1	9339-57	Tension device, complete
23	1	9303-51	Holder for potentiometer	56	2	9339-40	Bracket for tension device
24	1	9339-86	Axle	57	4	5671-19	Screw M5
25	2	9000-17	Spacer	58	1	14324-9	Screw M6
26	2	5799	Nut	59	1	5843-9	Nut M6
27	1	9339-22	Tension lever	60	1	9339-80	Instrument cover
28	1	14359	Screw M8		1	9339-67	Power adaptor/switching adaptor
29	1	19088-6	Bearing		1	9339-850	Chestbelt, Polar T34
30	1	9100-21	Tension cylinder		1	9339-851	Strap for chestbelt, Polar
31	1	9339-32	Spacer		1	9338-21	Receiver, Polar
32	1	9339-23	Belt control		1	9338-20	USB serial adaptor
33	1	5844	Nut M8				



Version 1206
Art. No: 7950-234

