

EC-12R/S Resting and Stress ECG System

Technical specification



TECHNICAL SPECIFICATIONS OF EC-12R/S RECORDER

| | |
|--|--|
| Leads | I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6, NEHB |
| BP measurement method | - |
| BP interval of measurement | - |
| BP measurement's accuracy | - |
| PC connection | Bluetooth (wireless type) |
| Patient protection | EN 60601 (IEC-601-1), CF type |
| Power supply / Can be exchanged during recording! / | 2 x 1,2 V rechargeable batteries (or 2 x 1.5 V AA alkaline battery) |
| Dynamic interval | ±20 mV |
| DC offset range | ±1000 mV |
| Frequency response | 0.05 Hz ... 150Hz |
| Sampling rate | 1000 Hz |
| A/D resolution | 16 bit |
| Input impedance | ≥100 MΩ |
| Size | 125 x 70 x 33 mm |
| Weight | ~ 110 g (wireless type) |

STRESS SOFTWARE FUNCTIONS

| | | |
|---|---|---|
| <ul style="list-style-type: none"> Lead-off warning | <ul style="list-style-type: none"> Precise QRS classification | <ul style="list-style-type: none"> colour-coded ST level, slope and ST loop graphs |
| <ul style="list-style-type: none"> Store the Indication and medication of the patient | <ul style="list-style-type: none"> SAECG | <ul style="list-style-type: none"> Smoothing, baseline, mains filters |
| <ul style="list-style-type: none"> MET and VO2 computation | <ul style="list-style-type: none"> HR, BP, LOAD, MET graphs | <ul style="list-style-type: none"> Customizable alarm and stop criteria |
| <ul style="list-style-type: none"> Ergometer and treadmill database | <ul style="list-style-type: none"> Show T-wave deviation: QT, QTc trends | <ul style="list-style-type: none"> Vectorcardiography in stress-continuous test |
| <ul style="list-style-type: none"> Arrhythmia analysis | <ul style="list-style-type: none"> Weber and Morris function classification | <ul style="list-style-type: none"> Bayes theorem in the analysis |
| <ul style="list-style-type: none"> Duke-nomogram | <ul style="list-style-type: none"> Borg rank | <ul style="list-style-type: none"> QRS frontal axis |
| <ul style="list-style-type: none"> Exercise and condition plan | <ul style="list-style-type: none"> Pacemaker detection | <ul style="list-style-type: none"> Paper speed: 5-12,5-25-50-100-200 mm/s |
| <ul style="list-style-type: none"> Amplitude: 2,5, 5-10-20-40 mm/mV | <ul style="list-style-type: none"> Gender and age-specific ECG analysis software | <ul style="list-style-type: none"> Full Disclosure ECG recording |
| <ul style="list-style-type: none"> Modifiable protocols under Load | <ul style="list-style-type: none"> standard stress protocols, custom protocols | <ul style="list-style-type: none"> manual blood pressure measure |
| <ul style="list-style-type: none"> Speed measure km/h and mph | <ul style="list-style-type: none"> BMI and BMI prime | <ul style="list-style-type: none"> Adjustable infoboxes |
| <ul style="list-style-type: none"> Rhythm curves | <ul style="list-style-type: none"> Templates analysis | <ul style="list-style-type: none"> Event screen |
| <ul style="list-style-type: none"> QT, QTc, QT% | <ul style="list-style-type: none"> QRS Axis | <ul style="list-style-type: none"> Ectopic rate |
| <ul style="list-style-type: none"> Average view | <ul style="list-style-type: none"> ECG contrast | <ul style="list-style-type: none"> Milimeter paper settings |
| <ul style="list-style-type: none"> Display channels: 3, 6, 12, additionally: Cabrera, Custom | <ul style="list-style-type: none"> | <ul style="list-style-type: none"> |

| REST SOFTWARE FUNCTIONS | | |
|--|---|--------------------------------------|
| • 5, 10, 20 sec and long ECG record | • Rhythm curves | • Lead-off warning |
| • Precise QRS classification | • Store the Indication and medication of the patient | • Smoothing, baseline, mains filters |
| • Arrhythmia analysis | • QRS frontal axis | • Full Disclosure ECG recording |
| • Paper speed: 5-12,5-25-50-100-200 mm/s | • Amplitude: 2,5, 5-10-20-40 mm/mV | • BMI and BMI prime |
| • Automatic diagnosis | • Average vire | • ECG contrast |
| • Milimeter paper settings | • Display channels: 3, 6, 12, additionally: Cabrera, Custom | |

| BASIC FUNCTIONS OF SOFTWARE | | |
|---|-----------------------------------|--|
| DATABASE FUNCTIONS | | |
| • Common database for all Labtech system | • Record recycle bin function | • Search records |
| • Acquire Patient ID from barcode reader | • System log | • Local database, Network database: Microsoft SQL Server database, SQLite database |
| • Acquire Patient ID using magnetic card reader | • Filter records | • Different date format |
| • Medical record for patients | • Import – export records | • Password protected software starting |
| • Access control | • Import – export records by date | |
| BASIC FUNCTIONS | | |
| • Automatic update | • Normal and MSI install | • Full screen mode |
| • HIS integrations: GDT, DICOM MODALITY WORKLIST, Cardiospy SDK | • Two display mode | • Cubios HRV export |
| • FTP integration | • Email function | • AHA / IEC electrode placement |
| PRINT AND EXPORT FUNCTIONS | | |
| • Report printing and exporting | • Automatic print | • Selectable reports |
| • Color and Black and white reports | • Contrast settings | • Resizable resolution |
| • Customizable company logo | • Automatic diagnosis | • Custom report |
| • Adjustable paper speed and amplitude | • Import /Export settings | • Export ECG data to CSV, SCP, Dat format |
| • Export QRS data | • Export N-N intervals | • Export R-R intervals |

SOFTWARE MINIMUM CONFIGURATION

| | |
|-------------------------|---|
| Processor | minimum: Intel® Core™ i3 recommended: Intel® Core™ i5 or better (Sandy Bridge or newer architecture) |
| RAM | minimum: 4 GB; recommended: 8 GB |
| Graphics card | DirectX 10 compatible, min. 128 MB video memory |
| Display | minimum: min. 1280x800 resolution recommended: 22" monitor 1920 x 1080 resolution (Full HD) |
| HDD | 500 GB (SATA II or newer recommended) |
| Interface | 1 USB port for the EC-2H/3H/12H/ABP recorder 1 USB port for the USB-02 key 1 USB port for the printer |
| Printer | Laser (printing speed: 15-20 page/min, color printer recommended) |
| Operating system | Windows 7, Windows 8, Windows 8.1, Windows 10 (32-bit or 64-bit versions) |

*Windows XP is no longer supported by Microsoft. Labtech provides only limited support for previously installed systems.

ergoselect 4 – Technical Data

Dimensions



ergoselect 4 – Technical Data

| Ergometer | | ergoselect 4 | | |
|--|--|---------------|------------------|--|
| Brake system | microprocessor controlled eddy current brake | | | |
| Drive | two-stage brake system with special drive belts (no slippage, low wear) | | | |
| Load | 6 – 999 Watt, speed independent | | | |
| Accuracy | according to DIN VDE 0750-238 | | | |
| Speed range | 30 – 130 rpm | | | |
| Handlebar adjustment | inclination 360° ● / handlebar height with motor ○ | | | |
| Saddle height adjustment | continuously mechanical ● / with gas spring ○ / with motor (incl. patient) ○ | | | |
| Patient height | approx. 120 cm – 210 cm | | | |
| Patient weight (max.) | 160 kg ● / 200 kg ○ | | | |
| Control panel | M (Remote control) | P (Ergometry) | T (Color-Touch) | |
| Display, numerical | Load, rpm, time, blood pressure, heart rate (LCD) | | 7" color display | |
| Display, graphical (e.g. load, heart rate) | – | – | ● | |
| Patient display | Speed (rpm), saddle height (with optional saddle motor) | | | |
| Keyboard | – | Foil keyboard | Touch keyboard | |
| Exercise protocols | | | | |
| User programmable | – | 10 | 10 | |
| Manual load control | – | ● | ● | |
| Training protocols | | | | |
| User programmable | – | – | 10 | |
| Predefined test protocols | – | – | 3 | |
| Options | | | | |
| Automatic blood pressure measurement | ○ | ○ | ○ | |
| Oxygen saturation measurement | – | ○ | ○ | |
| Cardio set (heart rate receiver/ chest belt) | – | ○ | ○ | |
| Interfaces | | | | |
| digital (RS-232, USB)/ Bluetooth/WiFi | ● / ○ / ○ | | | |
| Dimensions and Weight | | | | |
| Ergometer | Ergometer with packaging | | | |
| Length: 105 cm | Length: 116 cm | | | |
| Width: 49 cm (Width handlebar approx. 53 cm) | Width: 60 cm | | | |
| High: 127 cm (114 – 140 cm with electrically adjustable handlebar) | High: 148 cm | | | |
| Weight: approx. 66 kg | Weight: approx. 80 kg | | | |
| Miscellaneous | | | | |
| Power | 100 – 240 V / 50 – 60 Hz / 50 VA max. | | | |

● Standard ○ Option

ergoselect 4 / 5

Ergometer

Operator's Manual

201000433000 • Version 2018-04-05 / Rev 02 • English



ergoselect 4 / 5

Ergometer

Operator's Manual

201000433000 • Version 2018-04-05 / Rev 02 • English

This manual was written with the utmost care. Should you still find details that do not correspond with the system, please let us know and we will correct the issue as soon as possible.

We reserve the right to modify the design and technical features of the device and are not bound by the information and illustrations provided in this manual.

All trademarks appearing in this document are trademarks of their respective owners. Their protection is acknowledged.

No part of this manual may be reprinted, translated or reproduced without the manufacturer's written permission.

This manual will not be automatically updated. Please contact the manufacturer for the latest document revision.

This manual also describes optional components that are not included in the standard scope of delivery of this product.

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1 General Information

- The product ergoselect bears the CE marking CE-0123 (Notified Body: TÜV), indicating its compliance with the provisions of the Council Directive 93/42/EEC about medical devices and fulfills the essential requirements of Annex I of this directive.
The CE marking covers only the accessories listed in the Order Information chapter.
The device is an MDD class IIa product.
- The device fulfills the requirements of the standard EN 60601-1 "Medical electrical equipment, Part 1: General Requirements for Safety" as well as the interference protection requirements of standard EN 60601-1-2 "Electromagnetic Compatibility – Medical Electrical Devices".
The radio-interference emitted by this device is within the limits specified in EN 55011, class B.
- The symbol  means: protection class II.
- This manual is an integral part of the device. It should be available to the device operator at all times. Close observance of the information given in the manual is a prerequisite for proper device performance and correct operation and ensures patient and operator safety. Please note that information pertinent to several chapters is given only once. Therefore, read the manual once carefully in its entirety.
- The symbols   mean:
Follow the instructions in the documentation.
They indicate points that are of particular importance in the operation of the device.
- Observance of the safety information protects from injuries and prevents inappropriate use of the device. All device users and persons responsible for assembly, maintenance, inspection and repair of the device must read and understand the content of this manual, before using the device or working with it. Paragraphs with special symbols are of particular importance.
- If unauthorized individuals open the control terminal, damaging the calibration sticker, any warranty claim shall become void.
- This manual reflects the device specifications and applicable safety standards valid at the time of printing. All rights are reserved for devices, circuits, techniques, software programs, and names appearing in this manual.
- On request ergoline will provide a Field Service Manual.
- The ergoline quality management system complies with the standard EN ISO 13485: 2012.
- The safety information given in this manual is classified as follows:

Danger

indicates an imminent hazard. If not avoided, the hazard will result in death or serious injury.

Warning

indicates a hazard. If not avoided, the hazard may result in minor injury and/or product/property damage.

Caution

indicates a potential hazard. If not avoided, the hazard may result in minor injury and/or product/property damage.
- To ensure patient safety, the specified measuring accuracy, and interference-free operation, we recommend using only original ergoline accessories. The user is responsible if accessories from other manufacturers are used.
- ergoline is responsible for the safety, reliability, and performance of the device, only if
 - modifications and repair are carried out by ergoline GmbH or by an organization expressly authorized by ergoline GmbH
 - the device is used in accordance with the instructions given in this operator manual.

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2 Safety Information

Danger

- Explosion Hazard •

The device is not designed for use in areas where an explosion hazard may occur.

Explosion hazards may result from the use of flammable anesthetics, skin cleansing agents, or disinfectants.

Warning

- Patient Hazard, Equipment Damage •

Do not expose the ergoselect to direct sunlight to prevent system components from reaching inadmissible high temperatures.

Do NOT use the ergoselect outdoors (medical device). Furthermore the device has no additional protection against the ingress of humidity. Humidity inside the device may cause equipment malfunctions and increases the risk of an electric shock.

Additionally, the device should not be operated in the vicinity of power systems, because they may impair equipment functions.

The ergoselect may only be used in combination with accessories approved by ergoline GmbH.

- Risk to Persons •

Before using the ergometer, the operator must ascertain that it is in correct working order and operating condition. The cables and connectors, in particular, must be checked for signs of damage. Damaged parts must be replaced immediately.

- Equipment Malfunction •

Only the special shielded cables supplied by ergoline may be used to connect the device to other pieces of equipment.

- Equipment Malfunction •

Cellular telephones may not be used in the immediate vicinity of the ergometer, because they might interfere with the proper functioning of the ergometer.

Electromagnetic interference most probably exists when the watt reading is unstable. If the displayed value changes frequently even though the speed is above 30 RPM, this may be due to electromagnetic interference.

Warning

- Shock Hazard •

When the device is connected to other equipment or if a medical system is created, it must be ensured that the added leakage currents do not present a hazard. In case of questions, please contact your ergoline dealer or the ergoline GmbH Service Department.

For use, the ergometer must always be connected to electric installations that fulfill the local requirements.

- Patient Hazard •

The German Medical Device Operator Ordinance (MPBetreibV, § 5) demands that users

- *must be trained in the use of the ergometer*
- *must be familiar with the routines for handling and assembly of the device*
- *must be familiar with and observe the safety rules and regulations for operation of this type of equipment*
- *must be informed about any other pertinent rules and regulations (e.g., safety instructions)*
- *must be informed about the potential hazards arising from the use of this type of equipment*
- *make sure that no unauthorized changes are carried out.*

Note

Only the removal of the power cord will result in an all-pole disconnection of the device from the power line.

Caution

Additional equipment connected to medical electrical equipment must comply with the respective IEC or ISO standards (e.g., IEC 60950 for data processing equipment). Furthermore, all configurations must meet the requirements of the applicable medical systems standards (see 3rd edition of IEC 60601-1).

Anybody connecting additional equipment to medical electrical equipment configures a medical system and is therefore responsible for the system's compliance with the requirements for medical electrical systems. Attention is drawn to the fact that local laws take priority over the above mentioned requirements.

If in doubt, please consult your local dealer or ergoline GmbH.

Safety Information for Non-Invasive Blood Pressure Measurement

Warning

• Patient Hazard •

Do not take blood pressure measurements with a cuff on patients suffering from sickle cell anemia or if skin lesions are likely to occur.

The cuff may cause hematomas in patients with severe blood coagulation disease. In these instances, the user must take a decision for or against automatic blood pressure measurements.

Caution

• Compromised Measuring Accuracy •

Arrhythmias occurring frequently during a measurement may compromise the accuracy of the measurement.

Valid measurements may not be possible under certain circumstances.

Electromagnetic fields are also capable of impairing the measuring accuracy.

Note

- *If the cuff pressure exceeds the maximum value of 300 mmHg during inflation, the inflation procedure will be aborted and the cuff deflated. As a redundant safety precaution, the cuff is immediately deflated when the cuff pressure exceeds 320 mmHg. You can check the proper functioning of this safety precaution by abruptly bending your arm while the cuff is being inflated, causing a brief overpressure in the cuff. The cuff must deflate immediately.*
- *Measurements that do not yield a valid measurement will not be repeated during the exercise test.*
- *If the inflation phase takes longer than 40 seconds or if an adequate pressure does not build up in the cuff within a reasonable period of time, the measurement will be aborted and the cuff deflated.*
- *If a valid measurement cannot be completed within 120 seconds, the measurement will be aborted and the cuff deflated.*
- *If the cuff pressure remains constant for some time, the measurement will also be aborted and the cuff deflated.*

Intended Use

The ergoselect is a computer-controlled medical ergometer, which operates at pedal speeds between 30 and 130 RPM and loads between 6 and 999 W.

The speed-independent range is shown in section 11.5 on page 54.

The ergoselect ergometer may only be used in exercise testing and for rehabilitation of cardiac and cardiovascular patients according to the instructions given in this manual. If the ergometer is used for other purposes, the manufacturer cannot be held liable for personal injuries or property damage resulting from the unintended use of the equipment.

Note – Applied Parts

- *Applied parts are components that are directly in contact with the human body (e.g., blood pressure measuring devices).*

Note – Stability

- *Ensure the stability of the ergometer. If the maximum permitted patient weight is exceeded, the stability of the ergometer can no longer be guaranteed. It may become unstable as a result.*

Biocompatibility

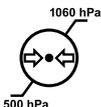
The parts of the product described in this manual, including all accessories that come in contact with the patient during the intended use, fulfill the biocompatibility requirements of the applicable standards if applied as intended.

If you have questions in this matter, please contact ergoline or an ergoline representative.

Applicable Laws, Regulations and Directives

If you have questions regarding laws, regulations or directives related to the product, please contact ergoline GmbH.

3 Symbols

| | | | |
|---|--|---|---|
|  | Symbol 'type B applied part'. Type B applied parts have no direct contact with patients and offer the lowest protection against electric shock. |  | Manufacturer's identification. |
|  | Symbol 'type BF applied part'. Type BF applied parts are connected to the body of the patient and provide a higher degree of protection against electric shock. The applied parts are isolated. |  | Date of manufacture. The number found under this symbol is the date of manufacture in the YYYY-MM-DD format. |
|  | Caution: Consult accompanying documents. |  | PVC-free. |
|  | Protection class II equipment. |  | Latex-free. |
|  | This symbol indicates that the waste of electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. Consult Operating Manual! |  | Suitable for indicated arm circumference. |
|  | Order number. |  | Small size. |
|  | Serial number. |  | Standard size. |
|  | Scheduled date of the next inspection (e.g., March 2017). |  | Large size. |
|  | Toggle switch ON (voltage). |  | Transport and storage label: top. |
|  | Toggle switch OFF (voltage). |  | Transport and storage label: keep dry. |
|  | CE mark per the Medical Device Directive 93/42/EEC of the European Union. Notified body: TÜV SÜD Product Service GmbH, Ridlerstr. 65, 80339 München, Germany. |  | Transport and storage label: fragile. |
|  | Nationally Recognized Testing Laboratory NRTL label for the USA and Canada. |  | Transport and storage label: approved temperature range. |
|  | Do not lean against the device: tipping hazard. |  | Transport and storage label: approved humidity, non-condensing. |
| | |  | Transport and storage label: approved pressure range. |
| | |  | Transport and storage label: do not stack. |

4 Setup and Mains Connection

4.1 Controls and Indicators

- ① Control terminal M
- ② Speed readout for patient
- ③ Connectors (e.g., for blood pressure cuff)
- ④ Adjustment of handlebar angle
- ⑤ Castors
- ⑥ Baseplate (small)
- ⑦ Leveling feet to adjust the ergometer to uneven floors
- ⑧ Sockets for power cord and connection cables (underside of ergometer)
- ⑨ Power switch (toggle switch [I/O])
- ⑩ Saddle adjustment with clamping lever



Figure 4-1: ergoselect 4M

- ① Control terminal T
- ② Speed readout for patient
- ③ Connectors (e.g., for blood pressure cuff, SpO2)
- ④ Adjustment of handlebar angle
- ⑤ Height adjustment for handlebar (by means of toggle switch, option)
- ⑥ Castors
- ⑦ Baseplate (large)
- ⑧ Leveling feet to adjust the ergometer to uneven floors
- ⑨ Sockets for power cord and connection cables (underside of ergometer)
- ⑩ Power switch (toggle switch [I/O])
- ⑪ Saddle adjustment (optionally with gas pressure spring or motor)



Figure 4-2: ergoselect 5T

4.2 Transport

For short distances, the ergometer can be lifted at the saddle and rolled away on its castors.

To cover greater distances, however, we recommend the following method:

- Disconnect the power cord and the connection cables.
- Rotate the handlebar towards the front and tighten the clamping lever.
- Stand in front of the ergometer, grasp the handlebar and tilt the ergometer towards you until it is standing on the castors only and is balanced.
- It is now possible to transport the ergometer.
- When you have reached the new location, lower the ergometer very carefully to protect it from considerable damage.

Caution

- Equipment Damage •

Avoid strong vibrations of the ergometer during transport.



Figure 4-3: Transporting the ergoselect

4.3 Setup

Place the ergometer on a horizontal level floor.

The ergometer must be set up in a secure and stable position; the two leveling feet at the back make for easy adjustment to uneven floors. An optional stabilizer plate is available to enhance the stability.

Extend the foot concerned until the ergometer no longer wobbles.

In case of delicate flooring, it is recommended to place a mat under the ergometer to protect the flooring from damage by the feet.

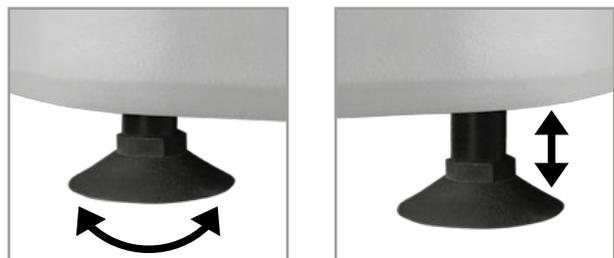


Figure 4-4: Leveling feet of the ergoselect ergometer

4.4 Mounting the Control Terminal

The control terminal can be installed with the display either facing the patient or the operator.

It is recommended to install the terminal with the display and control keys towards the operator and the speed read-out towards the patient.

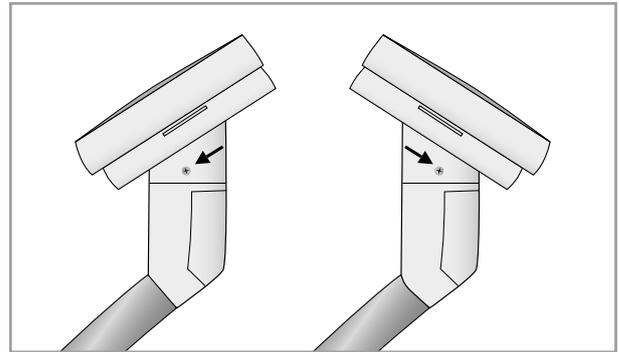


Figure 4-5: Different orientations of the control terminal

4.5 Connecting the Power Cord

Stand in front of the ergometer (looking at the control panel) and firmly grasp the handlebar with both hands.

Then tilt the ergometer carefully to one side (it is recommended to do this with the help of a second person) and place it on the floor so that it rests on the handlebar.



Figure 4-6: Assembly position

Caution

• Equipment Damage •

Before connecting the ergometer to the power line, check that the line voltage corresponds to the ratings on the type plate. The type plate is located on the back of the device, at the bottom.

4 Setup and Mains Connection

The connection panel is located on the underside of the ergometer.

- Connect the power cord to socket (a).
- Using the supplied strain relief, attach the cable to the metal frame (b).

Return the ergometer carefully to its upright position and make sure that it is not standing on the power cord.

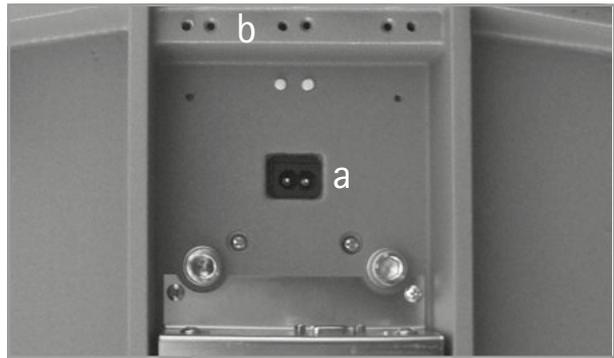


Figure 4-7: Underside of the Ergometer

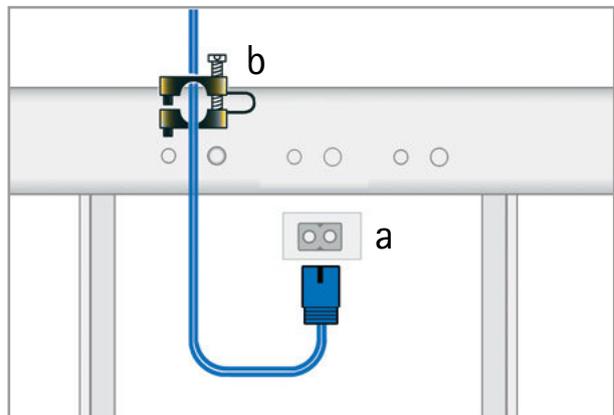


Figure 4-8: Connecting the power cord

a Power input

b Strain relief

Note

- **Disconnection from Power Supply** •

Pressing the power switch or removing the power cord disconnects the device from the power supply.

Removing the power cord results in a complete disconnection of the device from the power supply (all poles).

Ensure that the power plug is readily accessible at all times.

4.6 Connecting the ECG Cable

The ergometers can be connected to electrocardiographs and PC-based ECG systems of most manufacturers.

Different connection cables are available to support different communication modes (digital, analog, remote start, etc.).

All ergometers are equipped with a digital interface. (Special adapters are needed for analog control or the remote start capability. Please contact ergoline for these adapters.)

The connection cable is plugged into the 9-pole socket of the connection panel (Port 1) or the USB port and secured at the metal frame with an additional strain relief.

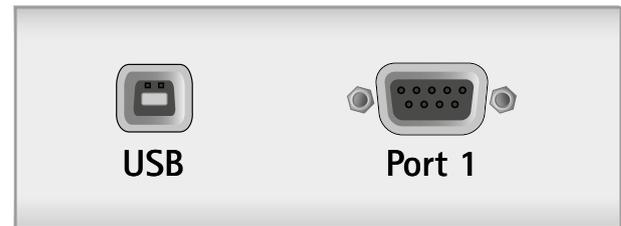


Figure 4–9: Connection to electrocardiograph / PC-based ECG system

USB PC connection via USB (virtual COM)

PORT 1 Digital connection (remote control from PC or ECG recorder), connection for cable adapter (analog interface + remote start)

Note

- Connection Cables •

Use only connection cables approved by ergoline.

A special PC driver software, which can be obtained from ergoline, is required for operation via the USB port.

4.7 Connecting ECG Leadwires

Plug the ECG leadwires (L, R, N) into the appropriate sockets (1) in the control terminal.

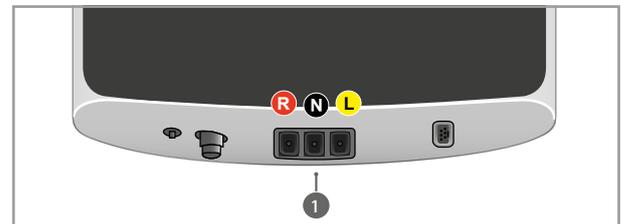


Figure 4–10: ECG leadwire connections

4.8 Connecting the Blood Pressure Cuff

- Connect the microphone cable for blood pressure measurement to the intended port (2) so that it clicks into place.
- Slip the cuff tubing onto the fitting (3) and engage. To disconnect, push back the connector's knurled sleeve.

Artifacts that may be caused by patient movements during the exercise test must be avoided, while the blood pressure is being taken.

Therefore, do not forget to attach the cuff tubing to the handlebar with the supplied Velcro tape:

- Open the large Velcro tape and wrap it around the handlebar.
- Secure the cuff tubing with the small Velcro tape, but do not exert pressure on the tubing.

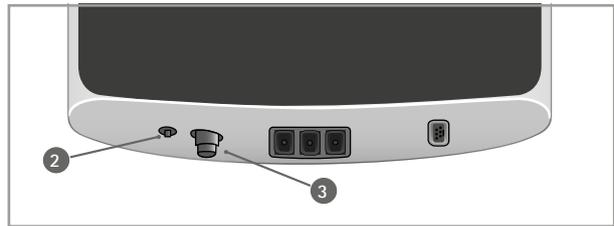


Figure 4-11: Blood pressure cuff connections
2 Microphone connection
3 Fitting for connection of cuff tubing

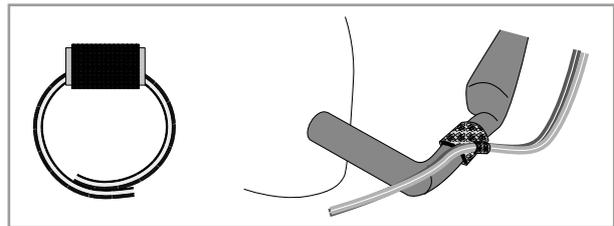


Figure 4-12: Velcro tape to secure the cuff tubing

4.9 Connecting the SpO2 Sensor

Connect the sensor cable to the corresponding socket (4) on the underside of the control terminal.



Figure 4-13: SpO2 sensor connection
4 SpO2 connection

The index finger is inserted into the SoftTip® sensor. The cable should run over the back of the hand.

Within a few seconds the current oxygen saturation in percent (%) will be indicated on the display.

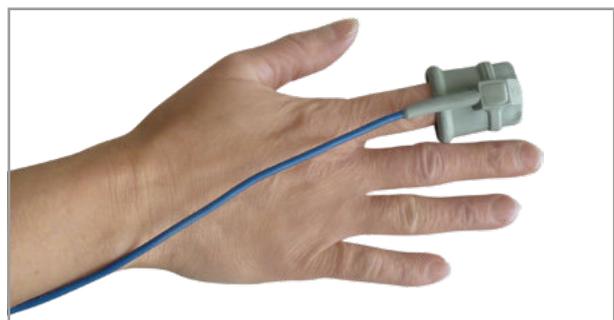


Figure 4-14: SpO2 SoftTip®

5 Preparing the Patient for Blood Pressure Measurements

5.1 Cuff Size

Always choose the cuff size suitable for the patient's arm.

The maximum arm circumference is indicated on the cuff.

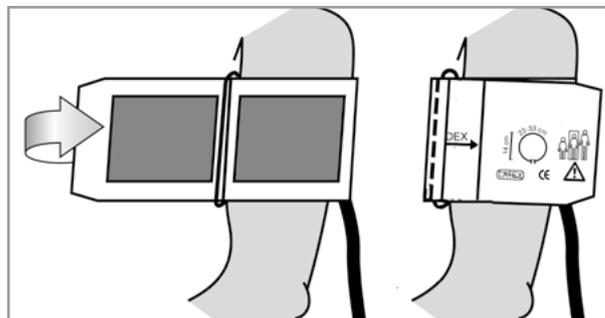


Figure 5-1: Correct cuff size

When you close the Velcro strap, check that the metal clasp (a) is inside the marked index range (b), and not outside.

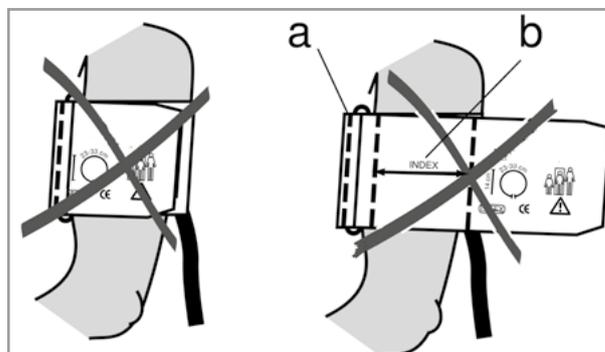


Figure 5-2: Wrong cuff size

5.2 Microphone Position

Before applying the cuff, check the position of the microphone inside the red pocket (on the inside of the cuff):

When the microphone is inside the pocket, its **metal side must face the arm**.

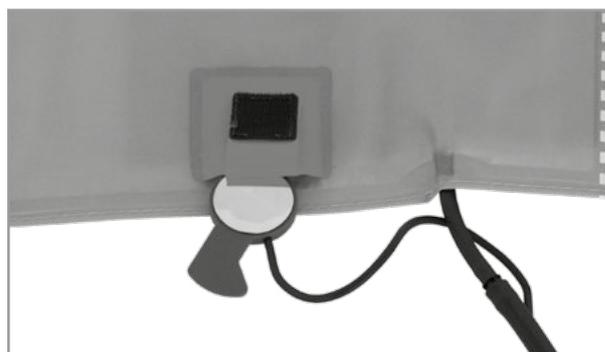


Figure 5-3: Correct microphone position

5.3 Applying the Cuff

The center of the microphone must be located exactly on the **brachial artery**. Locate the artery by palpation if required.

The **red tab** identifies the position of the microphone. The accurate placement of the microphone is the primary condition for reliable pressure measurement during exercise tests. The cuff must be applied directly on the skin, it may not be applied on top of clothing, paper, etc. Apply the cuff approx. **2 cm above the bend of the elbow**. The cuff should be **tight**, but it should not constrict blood vessels. Make sure that the cuff **cannot shift** when the patient moves during the exercise test.

The cuff tab must be located below the metal clasp (see illustration at right).

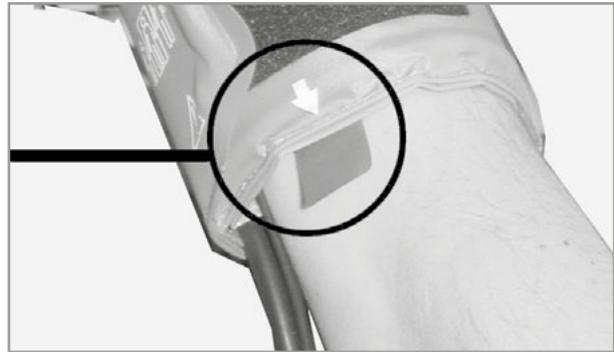


Figure 5-4: Microphone placement on the artery

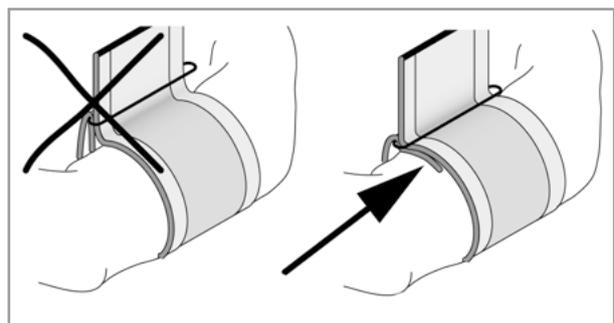


Figure 5-5: Correct cuff position (tab)

5.4 Checking the Cuff Tubing

Check that the cuff tubing does not knock against the patient's knee, when the patient is pedalling and the hand is on the handlebar.

Secure the cuff tubing with the Velcro tape attached to the handlebar.

Instruct your patient to move as little as possible during a blood pressure measurement and, in particular, to avoid excessive contractions of the muscles in the upper arm.



Figure 5-6: Distance between knee and tubing

Caution

• Patient Hazard •

Apply the cuff directly on the skin. Make sure that rolled up sleeves do not impede blood circulation in the upper arm. Loose cuffs will cause erroneous measurements; overtight cuffs may constrict blood vessels or cause skin lesions and hematomas.

• Incorrect Measurements •

A loose cuff would degrade the accuracy of the measurement. Therefore, the computer aborts the measurement if a minimum pressure is not attained within a few seconds.

Warning

• Patient Hazard •

If, by accident, an excessive pressure builds up inside the cuff, either remove the cuff immediately from the arm or disconnect the cuff tubing from the control terminal. The same measures are recommended if the cuff does not deflate correctly.

6 Operation

The ergometer is available with different control terminals which differ to some extent in terms of their functionality.

The following sections describe the control and configuration of the device.

6.1 Speed Readout

A speed readout as well as three LEDs on the control terminal inform the patient of the speed: too slow, too fast or correct (this readout is located at the top of the P and T versions of the control terminal and on the side of control terminal M).

The ranges for the respective speed ratings depend on the selected load (see chapter 11 "Technical Specifications" on page 50).



Figure 6-1: Speed readout

- 1 speed low (= patient should pedal faster)
- 2 correct speed
- 3 speed high (= patient should pedal slower)

Note

If, during an exercise test, the speed drops below 30 RPM, the load readout starts blinking on the display and the load is reduced to zero.

6.2 Handlebar Adjustment

Set the handlebar to a position where it is comfortable to reach while sitting upright.

Fold up the clamping lever to unlock the handlebar.

When the handlebar is in the correct position, fold down the clamping lever to lock the handlebar and check that the lever is tightened.

With the ergometer standing firmly, check that the handlebar is tight. Adjust the clamping force of the clamping lever if necessary.

Adjust the clamping force by opening the clamping lever and turning the setting screw clockwise about a quarter revolution with a flat-blade screwdriver. Then check the clamping force. Repeat these steps if necessary. When the clamping force is appropriate, lock the clamping lever by folding it down.

The handlebar is not designed to support the full body weight.



Figure 6-2: Handlebar adjustment

- 1 Clamping lever

Note

- Lock the clamping levers only as tight as necessary, NOT with maximum force.
- Lubricate the thread of the saddle clamping lever periodically with a suitable lubricant (e.g., OKS470).

Optionally, the height of the handlebar can be adjusted by means of a motor that is controlled via the toggle switch on the handlebar.

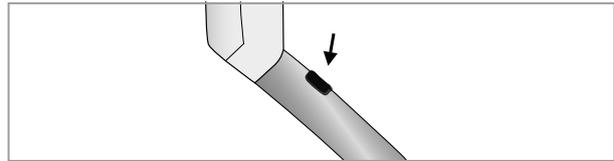


Figure 6-3: Toggle switch for adjusting the height of the handlebar

6.3 Saddle Adjustment

6.3.1 Motor-Assisted Saddle Adjustment

On the different ergometer models, the saddle height is adjusted in different ways:

- with a clamping lever (mechanical)
- with a gas pressure spring, or
- with a motor.

When adjusting the height at the display, press the [Saddle] key first. Then press the appropriate arrow key on the right to raise or lower the saddle. The display indicates the current saddle height.

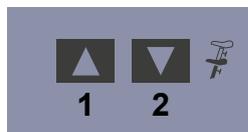


Figure 6-4:
Saddle adjustment at the control terminal

- 1 Saddle up
- 2 Saddle down

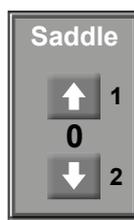


Figure 6-5:
Saddle adjustment at the display

- 1 Saddle up
- 2 Saddle down

Note

Press the [Saddle] or the  key to enable the adjustment of the saddle: the adjustment keys will be displayed (or via the  and  buttons on the control terminal).

6.3.2 Mechanical Saddle Adjustment

Open the clamping lever by turning it counter-clockwise. Then, you are able to adjust the saddle height. Adjust the appropriate saddle height. Fix the saddle height by turning the clamping lever clockwise until a resistance is felt.

Then tighten the clamping lever clockwise as follows:

- on **ergoselect 4**: 1/4 revolution, approx. 15 Nm,
- on **ergoselect 5**: 3/4 revolution, approx. 15 Nm



Figure 6-6: Tightening the clamping lever

6.3.3 Saddle Adjustment with Gas Pressure Spring

For adjustment of the saddle height, pull the lever of the gas pressure spring upward as shown in Figure 6 – 7. The saddle moves up automatically.

To lower the saddle, also pull the lever of the gas pressure spring upward. Push the saddle downward until it is at the correct height.

Note

The gas pressure spring must be relieved for adjustment of the saddle height. No patient is allowed on the saddle while the height is being adjusted.



Figure 6 – 7: Saddle adjustment with gas pressure spring

7 Control Terminal M

7.1 Turning the System On

You turn on the ergometer by pressing the power switch. The ergometer runs a self-test. Subsequently, the start screen displays.



Figure 7-1: Control terminal M

Note

- Instruct the patient not to pedal while the ergometer is being turned on and during the self-test.
- Apply the blood pressure cuff to the patient AFTER the ergometer has been turned on and the self-test completed.

Control terminals M are entirely operated by remote control (e.g., from an ECG recorder or a PC).

 With this key you initiate a blood pressure measurement. Pressing the key a second time during a measurement will stop the measurement.



Figure 7-2: Start screen

7.2 Operating Mode with Control Terminal M

Ergometers with the control terminal M support the following operating mode:

PC Mode

An external device (e.g. an ECG recorder, a PC-based ECG system) controls the ergometer – no intervention at all is required at the ergometer.

When the ergometer is switched on, the display shows the start screen – the ergometer is waiting for commands from the external ECG unit.



Figure 7-3: Start screen

As soon as the ergometer receives commands from the controlling ECG unit or PC, the exercise test will start and the corresponding values will be displayed.

The exercise test can only be terminated with the corresponding command from the controlling ECG unit.

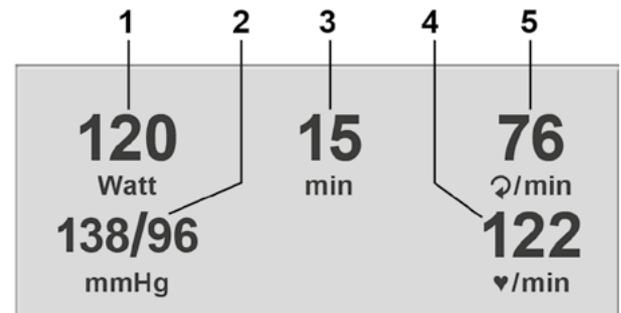


Figure 7-4: Exercise test screen

- 1 current load (Watt)
- 2 most recent BP value (systolic/diastolic) or cuff pressure during inflation and bar graph indicating microphone signal strength (see below)
- 3 duration of exercise test (min)
- 4 heart rate at the time of the BP measurement (BPM)
- 5 pedal speed (RPM)

Note

During an exercise test, the saddle height can be adjusted with  and .



Figure 7-5: Exercise test screen 2

8 Control Terminal P

8.1 Turning the System On

You turn on the ergometer by pressing the power switch (toggle switch [I/O]).
The ergometer runs a self-test. Subsequently, the main menu displays.

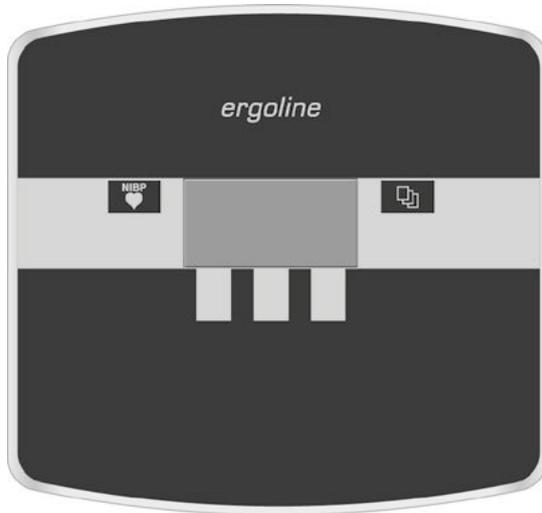


Figure 8-1: Control terminal P

Note

- Instruct the patient not to pedal while the ergometer is being turned on and during the self-test.
- Apply the blood pressure cuff to the patient AFTER the ergometer has been turned on and the self-test completed.
- The device can be configured to default to one of the operating modes.
If this option is selected, the start screen of the selected operating mode (e.g., Ergometry) will be displayed instead of the main menu.
With the  key, you can display the main menu.

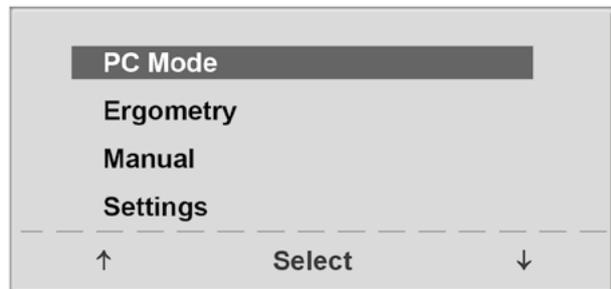


Figure 8-2: Main menu

The ergometer software is controlled with 5 keys:

 With this key you display the main menu or return to the previous menu level.

 With this key you initiate a blood pressure measurement. A measurement in progress can be aborted with the same key.

 The functions of these three softkeys change with the displayed menu – the key label describing the function is shown on the display.



Figure 8-3: Keypad P

8.2 Operating Modes with Control Terminal P

Ergometers with control terminal P support the following operating modes:

PC Mode

An external device (e.g. an ECG recorder, a PC-based ECG system) controls the ergometer – no intervention at all is required at the ergometer.

Ergometry

The ergometer runs an automatic exercise test – some of the corresponding test protocols are user-configurable and stored in the system.

(see chapter 8.2.4 "Settings with Control Terminal P" on page 27)

Manual

The ergometer is controlled manually, i.e., the user performs all load changes via the keypad.

Settings

Used to configure the ergometer.

8.2.1 PC Mode

Use the softkeys on the right and left (↑ ↓) to position the bar cursor on **PC Mode** and confirm the selection with **Select**.

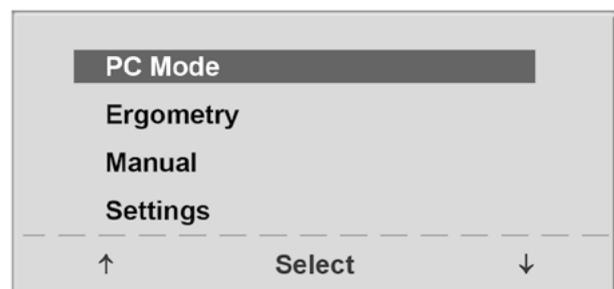


Figure 8-4: Main menu

The display shows the start screen – the ergometer is waiting for commands from the external ECG unit.

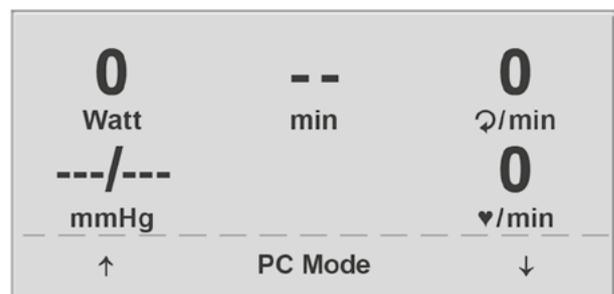


Figure 8-5: Start screen

The stored test protocols available for selection will be displayed. There are five fixed protocols (protocols 1 – 5, see chapter 11.3 "Exercise Test Protocols" on page 53), whereas protocols 6 – 15 are user-programmable.

The protocol menu provides an overview of the test phases.

Example: **50 W/2 min/25 W**

indicates: Basic load of 50 W
Stage time of 2 min
Load stage of 25 W

Use the softkeys on the right and left (↑ ↓) to position the bar cursor on one of the protocols and confirm the selection with **Select**.

The exercise test is started with the **Start** key, a blood pressure measurement at rest may precede the test (depending on the selected protocol).

When the basic load appears on the display (after approx. 15 seconds or upon termination of the blood pressure measurement) and the patient's RPM indicator blinks, the patient should start pedalling.

The internal protocol will now control the entire exercise test – the display always indicates the current values.

With the +5 W and –5 W keys, the current load can be changed any time (in increments of +/-1 W up to +/-25 W, as configured).

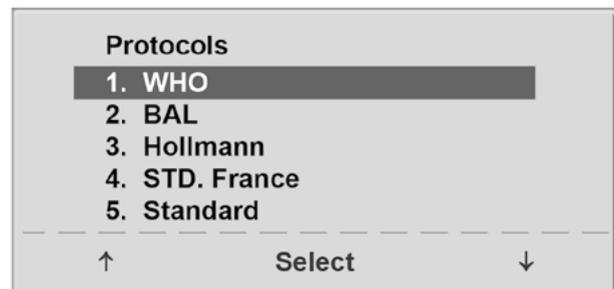


Figure 8-9: Selecting an exercise test protocol



Figure 8-10: Initial exercise test screen

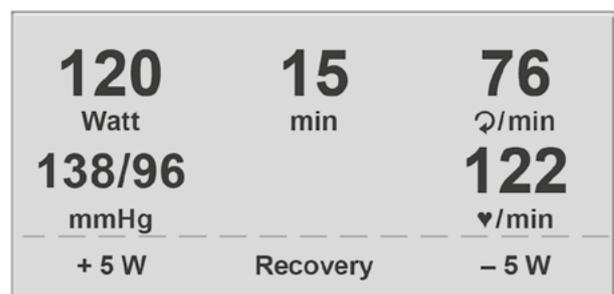


Figure 8-11: Display during the exercise test

Note

- The saddle height can be adjusted during an exercise test.
- To activate the saddle height adjustment, press : the row keys will be displayed then.
- Additional blood pressure measurements can be initiated with .

Terminating an Exercise Test

The exercise phase can be terminated manually at any time with the **Recovery** key.

The load will immediately be reduced to 25 watts, but a higher or lower value can be selected manually.

It is recommended that the patient continue to pedal in the recovery phase.

The **End** key in the middle will terminate the test.

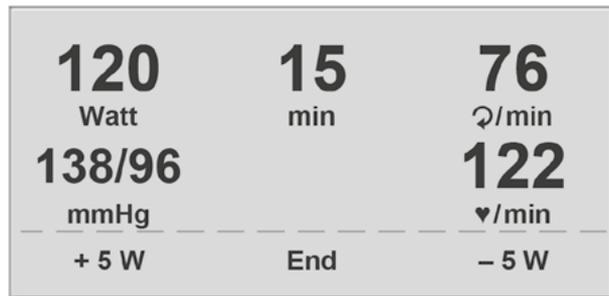


Figure 8-12: Recovery phase

8.2.3 Manual

Use the softkeys on the right and left (↑ ↓) to position the bar cursor on **Manual** and confirm the selection with **Select**.

In this operating mode the user controls the entire exercise test by selecting the loads, stage times and by initiating blood pressure measurements.

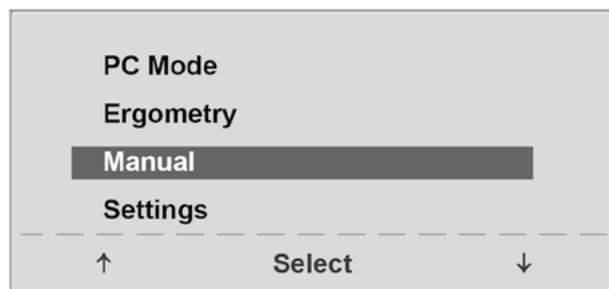


Figure 8-13: Main menu

The exercise test is started with the **Start** key, afterwards the load can be set and changed with the +5 W and -5 W keys (in increments of +/-1 W up to +/-25 W, as configured).

Blood pressure measurements can be initiated with .



Figure 8-14: Initial screen of a manual exercise test

Terminating an Exercise Test

The exercise test can be terminated manually at any time with the **End** key located in the middle.

The load will immediately drop to 0 watt.

There is no recovery phase in the manual mode.

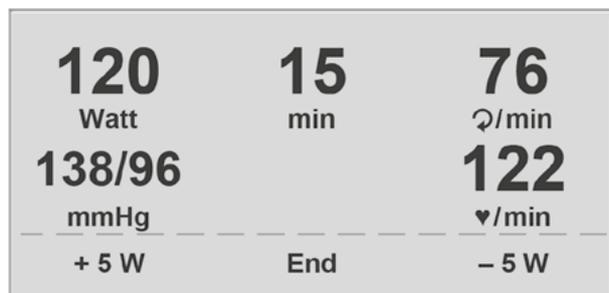


Figure 8-15: Display during the exercise test

8.2.4 Settings with Control Terminal P

Some of the device settings are configurable to meet specific requirements. The settings will be saved and remain stored even when the ergometer is switched off.

Use the softkeys on the right and left (↑ ↓) to position the bar cursor on **Settings** and confirm the selection with **Select**.

The configuration menu displays.

When all changes have been made, you can exit the configuration menu with the  key.

Use the softkeys on the right and left (↑ ↓) to position the bar cursor on the parameter to change and confirm the selection with **Select**.

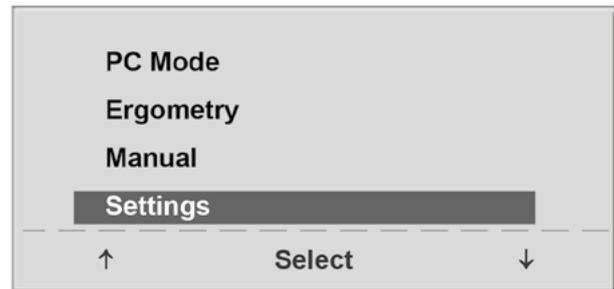


Figure 8-16: Main menu

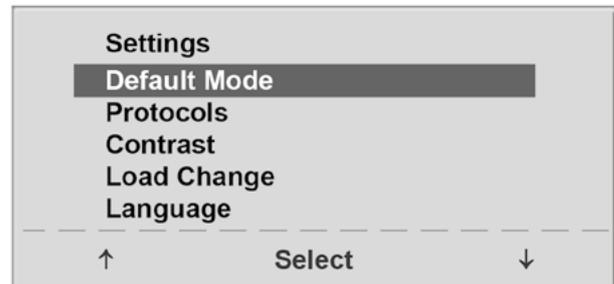


Figure 8-17: Settings menu

Default Mode

In this menu you choose the default mode activated when the ergometer is turned on. When first turned on after delivery, the ergometer will display this menu.

Use the softkeys on the right and left (↑ ↓) to position the bar cursor on your preferred default mode and save the selection with **Select**.

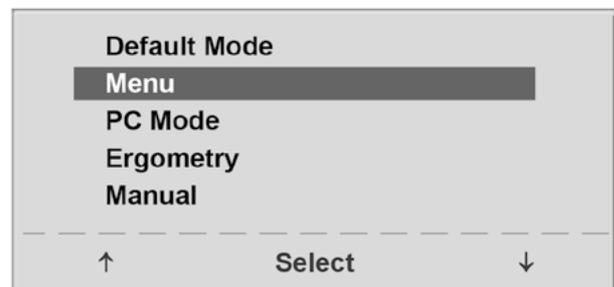


Figure 8-18: Selecting the default mode

Protocols

Protocols 6 to 15 are user-programmable (protocols 1 to 5 are fixed, see chapter 11.3 "Exercise Test Protocols" on page 53 for protocol parameter details). Default values can be entered for the following parameters:

- protocol type (Step/Ramp)
- basic load
- stage time
- load stage (load increase with each stage)

Use the softkeys on the right and left (↑ ↓) to position the bar cursor on the protocol to change (No. 6 to 15) and confirm the selection with **Select**.

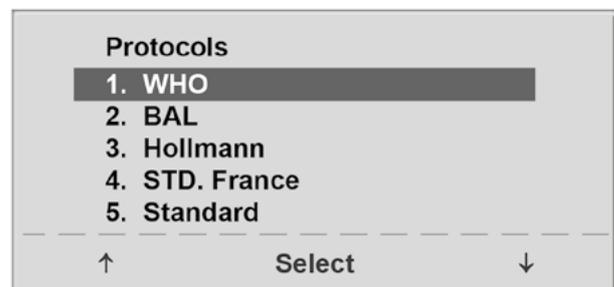


Figure 8-19: Selecting the exercise test protocol to configure

8 Control Terminal P

Use the right and left softkeys (↑ ↓) to select the parameter to edit.

At **Select**, for example, you can choose the protocol type:

- Step (load increase in steps) or
- Ramp (continuous load increase).

When done, press **Select** to save the selected protocol type.

To cancel the selection, press the  key.

All other parameters are edited in the same way.

Using the arrow keys (↑ ↓), highlight a parameter and confirm the selection with **Select**: the corresponding value appears in reverse video and can be changed with the arrow keys (↑ ↓).

Pressing **Select** will save the new value.

You exit the configuration with .

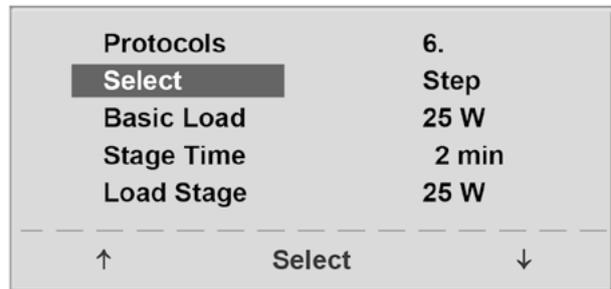


Figure 8-20: Selecting the parameter to edit

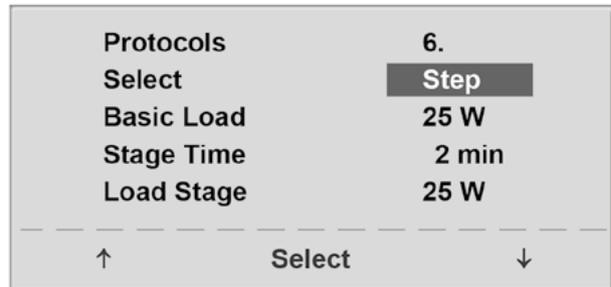


Figure 8-21: Editing the parameter value

Contrast

The display contrast is adjustable in the range from 0 to 100%.

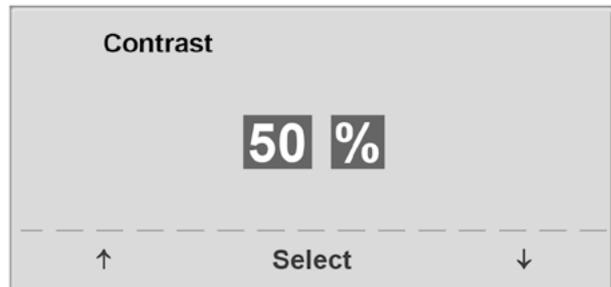


Figure 8-22: Adjusting the display contrast

Load Change

Here you determine the increments for each load change. Depending on your choice, each key press will change the load by +/- 1, 5, 10 or 25 watts.

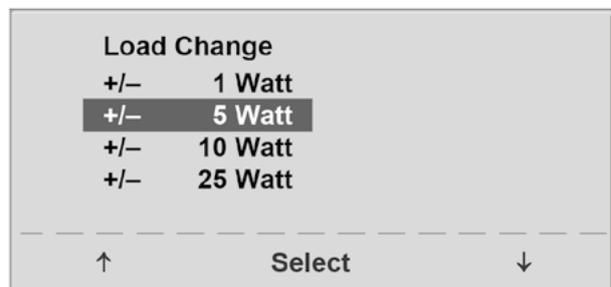


Figure 8-23: Selecting the increment for manual load changes

Language

The texts can be displayed in different languages.

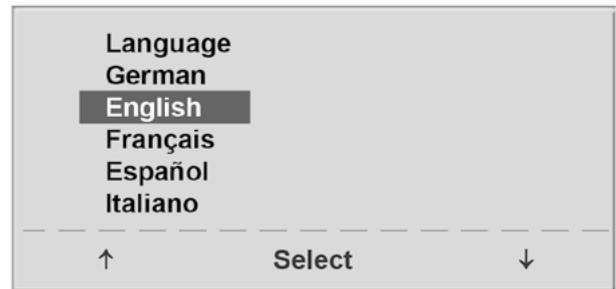


Figure 8–24: Language menu

Beep

The audio signal emitted during blood pressure measurements can be turned on and off.

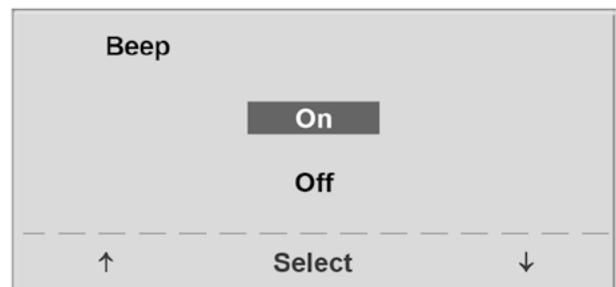


Figure 8–25: Beep during BP measurements

Software Version

Select this option to view the installed software version.

Date/Time

To begin with, you select **Date** and confirm the selection. Then the value displayed in reverse video can be edited with the $\uparrow \downarrow$ keys and saved with **Select**.

The time is adjusted in the same way. You exit the configuration with .

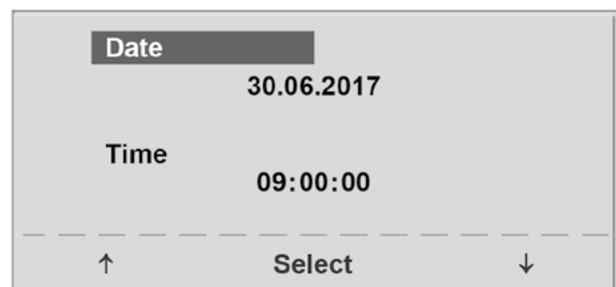


Figure 8–26: Setting the date

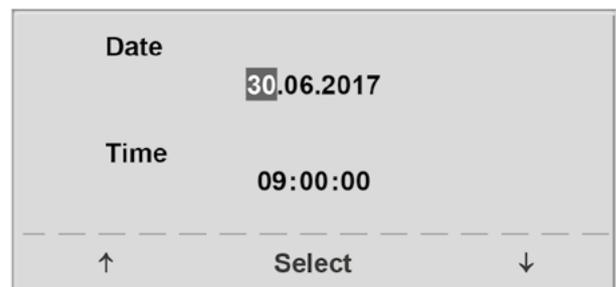


Figure 8–27: Setting the day

EKG Type

The selected EKG Type determines the communication method with the ECG recorder, PC-based ECG system, etc.

To prevent an accidental change of this setting, the menu is protected with a password. Using the arrow keys, enter 003 and confirm the entry with **Select**.

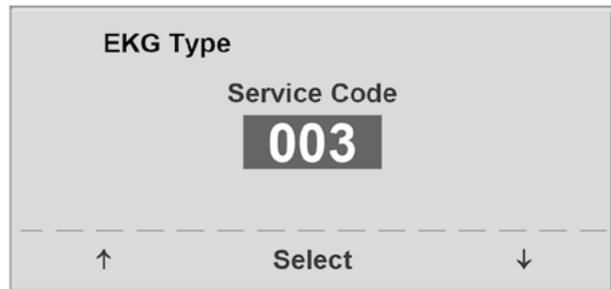


Figure 8–28: Entering the EKG Type password

All ergometers support the following communication modes:

- **Analog with pulse**
Remote start mode; before advancing to the next load level, the ergometer generates a control pulse and sends the corresponding data via the interface.
- **Analog/Digital**
An analog voltage controls the load – blood pressure measurements can be initiated with digital commands.
- **Digital (default)**
The communication with the ergometer is entirely controlled with digital commands.
- **Analog IN-OUT**
The entire communication (load control and BP measurements) is controlled with analog signals. No digital data will be sent.

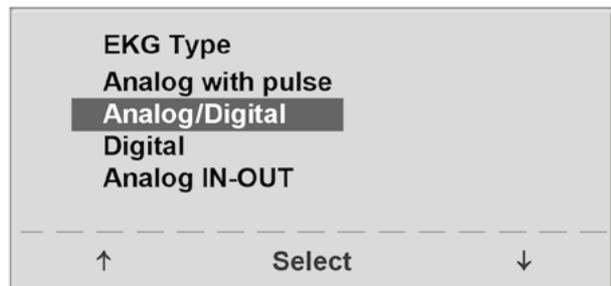


Figure 8–29: Selecting the ergometer communication mode

Select the communication mode and confirm with **Select**.

Note

- The EKG Type needs to be selected only when the ergometer is connected to an ECG unit. The selection is part of the installation procedure.
- The "Analog/Digital" and "Digital" communication is only possible when PC Mode is selected from the main menu or when this is the default mode.

RPM

Here you determine the RPM limits. When these limits are exceeded, the LEDs for high or low speed (RPM) will illuminate.

Select the value to change (Min. or Max.) and confirm with **Select**.

Using the arrow keys, change the value and save the new value with **Select**.

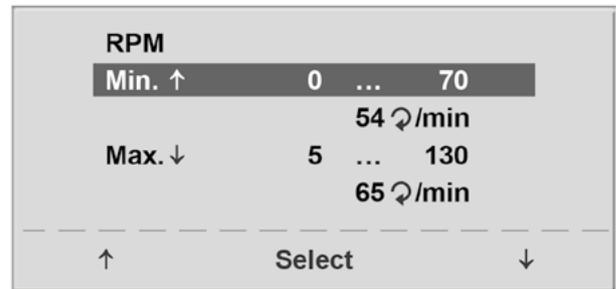


Figure 8–30: Setting the RPM limit values

Note

The limits selected in this menu only apply to the load range between 6 and 150 watts. At higher loads the RPM limits automatically adapt to the respective loads:

| Load (watts) | Green RPM range (1/min) |
|--------------|-------------------------|
| 6 – 150 | 54 – 64 (adjustable) |
| 151 – 250 | 58 – 65 |
| 251 – 350 | 68 – 75 |
| 351 – 450 | 78 – 85 |
| 451 – 550 | 88 – 95 |
| 551 – 650 | 98 – 105 |
| 651 – 750 | 108 – 115 |
| 751 – 850 | 118 – 125 |
| 851 – 950 | > 125 |
| 951 – 999 | > 130 |

Pulse Display

The pulse readout on the display can be turned off.

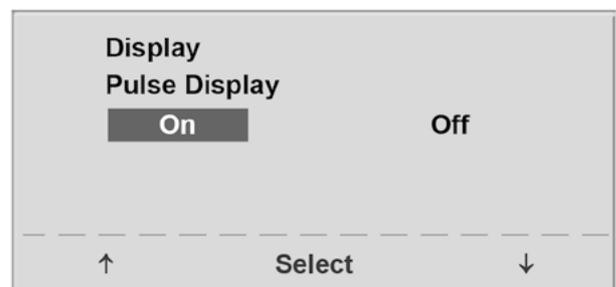


Figure 8–31: Setting the pulse readout

9 Control Terminal T

9.1 Turning the System On

You turn on the ergometer by pressing the power switch (toggle switch[I/O]).

Note

- *Instruct the patient not to pedal while the ergometer is being turned on and during the self-test.*
- *Apply the blood pressure cuff to the patient AFTER the ergometer has been turned on and the self-test completed.*
- *The device can be configured to default to one of the operating modes. If this option is selected, the start screen of the selected operating mode (e.g., Ergometry) will be displayed instead of the main menu.*

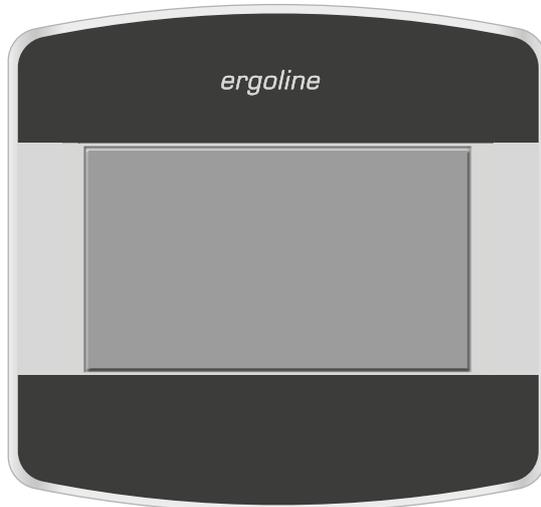


Figure 9-1: Control terminal T

The ergometer runs a self-test. Subsequently, the main menu displays.



Figure 9-2: Self-test screen

The ergometer software is controlled from the touch panel.

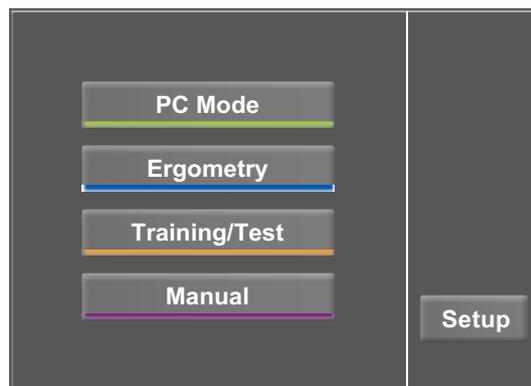


Figure 9-3: Main menu

9.2 Operating Modes with Control Terminal T

Ergometers with control terminal T support the following operating modes:

PC Mode

An external device (e.g. an ECG recorder, a PC-based ECG system) controls the ergometer – no intervention at all is required at the ergometer.

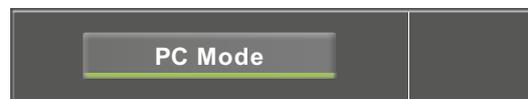


Figure 9-4: PC mode

Ergometry

The ergometer runs an automatic exercise test – the available protocols (5 preconfigured, editable protocols and 5 user-configurable protocols) are saved in the ergometer (see chapter "Settings" on page 36).



Figure 9-5: Ergometry mode

Training/Test

Ten user-configurable training/test protocols are available (see chapter 9.2.3 "Training/Test" on page 38).

A POLAR receiver is integrated in the ergometer and provides the relevant data for heart-rate controlled training sessions. The test subject's performance can be assessed on the basis of these protocols.



Figure 9-6: Training/Test mode

Manual

The ergometer is controlled manually, i.e., the user performs all load changes via the display.



Figure 9-7: Manual mode

Setup

Used to configure the ergometer.



Figure 9-8: Setup mode

9.2.1 PC Mode

When the [PC Mode] key has been pressed, the screen appears as shown at right. The ergometer is waiting for commands from the external ECG unit.

As soon as the ergometer receives commands from the controlling ECG unit or PC, the exercise test will start and the corresponding values will be displayed.

The display shows heart rate (1/min), blood pressure (mmHg), oxygen saturation in percent (%), duration of the exercise test (min:ss), pedal speed (1/min) and current load (W).

The exercise test can only be terminated with the corresponding command from the controlling ECG unit.

A blood pressure measurement can be initiated with the [RR] key. Pressing the [RR] key a second time during a measurement will stop the measurement.

When you press the [ECG] key, the display will change. The acquired, electrical signals will be displayed. The amplitude (gain) can be adjusted with the arrow keys [▲] and [▼].

The pump for the electrode suction system can be switched on and off with the [I/O] key.

You can change the vacuum intensity between low, medium and high by touching the [I/O] key.

To switch off the pump, press the appropriate key [low], [middle], [high] for about 3 seconds.

Confirm all inputs with the [✓] key.

If equipped with the appropriate option, the ergometer will show the [-♥-] button on the display. The number next to the icon is the number of the assigned heart rate belt. You can press this button to view additional information (see Figure 9 – 12).



Figure 9 – 9: PC mode screen

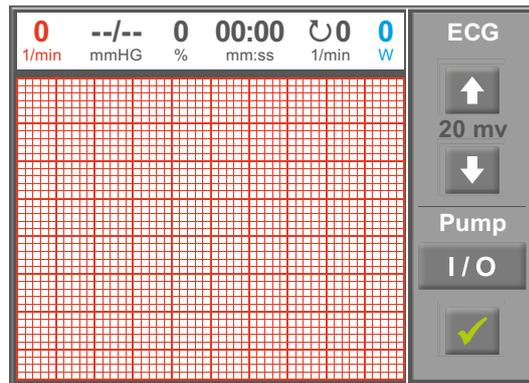


Figure 9 – 10: ECG screen

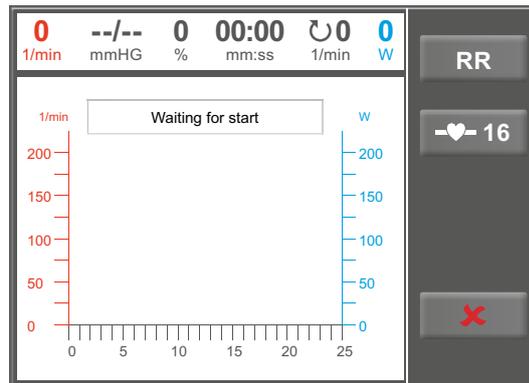


Figure 9 – 11: Screen display in PC mode with assigned heart rate belt

After pressing the button showing the number [16], a belt with another number can be assigned.

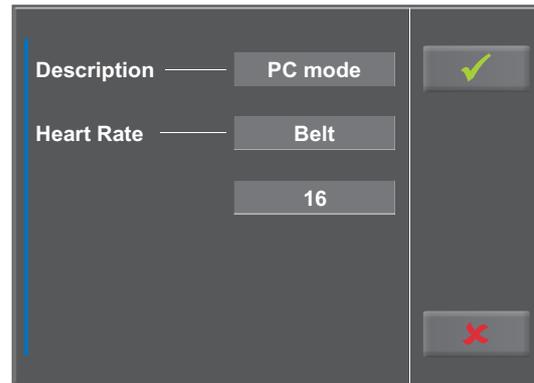


Figure 9–12: Information referring to the assigned HR belt

Press the button with the appropriate number to assign the belt with the corresponding ID. For further information on assigning heart rate belts, refer to chapter 9.2.5 "Setup", section "HR Belt Number" on page 43.

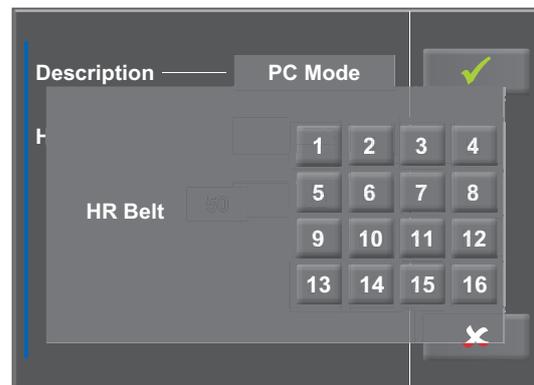


Figure 9–13: Selecting the heart rate belt

9.2.2 Ergometry

Pressing the [Ergometry] key in the main menu activates the ergometry mode.

The different exercise test protocols will be displayed (5 pre-configured, editable and 5 user-configurable protocols).

All exercise test protocols (including the 5 preconfigured protocols) are editable.

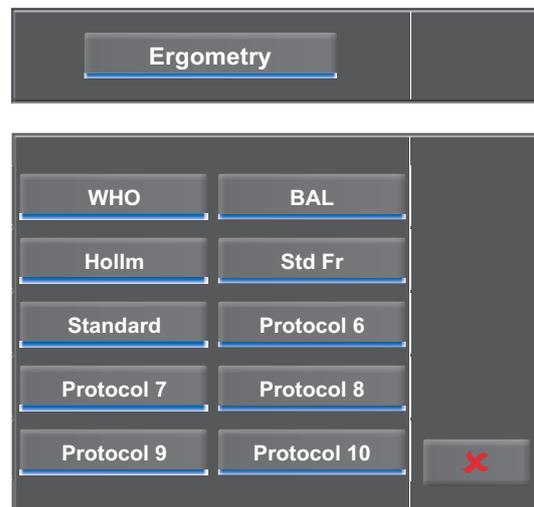


Figure 9–14: Ergometry menu

Settings

When you touch a protocol, the available parameters will be displayed.

With the [Edit] key, you can modify each protocol parameter. The new inputs overwrite the existing values.

All protocols can be edited during operation (except for the PC mode).

User-programmed protocols must be saved with the [Setup] key in the main menu (see chapter 9.2.5 "Setup", section "Protocols" on page 40).

In the configuration menu, the following parameters can be edited:

- the basic load (from 6 to 100 W),
- the stage time (form 1 to 30 min),
- the stage rate (increment, from 1 to 400 W).

With the [↓2.] key, you proceed to the next menu level where you can edit these parameters:

- the recovery load (from 6 to 100 W) and
- the recovery time (from 1 to 30 min).

With the [↑1.] key, you return to the previous screen.

Touch a light gray field, e.g., at Basic Load: a submenu with input field and numeric keypad opens. You can enter values directly via the numeric keypad.

Confirm your inputs with the [✓] key. To cancel the input, press the [✕] key.

The other parameters can be edited in the same way, they will overwrite the current values.



Figure 9–15: Exercise test protocol, screen 1

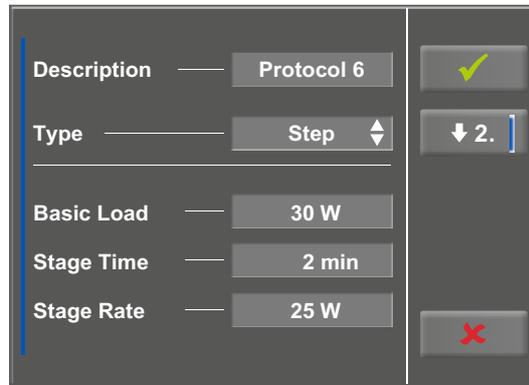


Figure 9–16: Exercise test protocol, screen 2

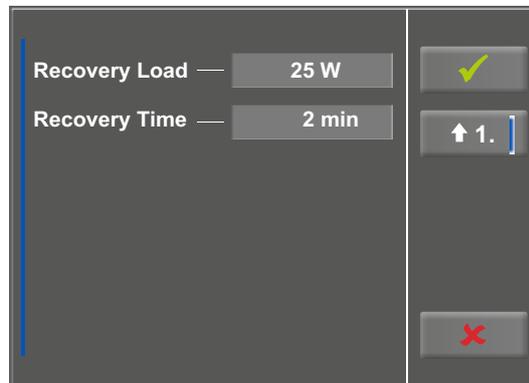


Figure 9–17: Exercise test protocol, basic load – screen 1

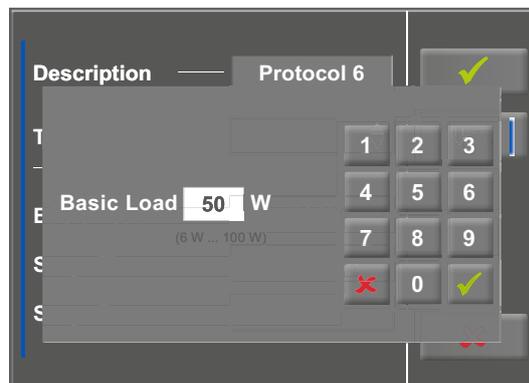


Figure 9–18: Exercise test protocol, basic load – screen 2

When you touch the [✓] key again after confirming, the display will change. Touching the [Start] key on the display will initiate the training session. The session is entirely controlled by the protocol. The display indicates the current values.

When you press the [const.] key, the current load will be maintained for the rest of the session.

You change the load with the [+5 W] and [-5 W] keys. The actual load change can be set in the configuration menu between +/- 1 W and +/- 25 W (see chapter 9.2.5 "Setup", section "Load Change" on page 42).

Terminating the Program

Once the full protocol has been completed, it terminates automatically.

The program can be terminated manually before the end of the protocol with [Stop]. First, you enter the recovery phase.

When you touch [Stop] again, the training will be terminated.

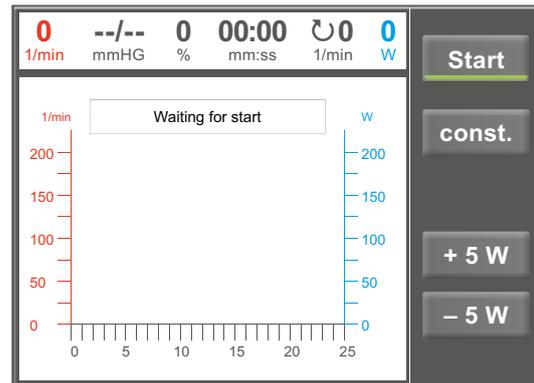


Figure 9–19: Starting an exercise test

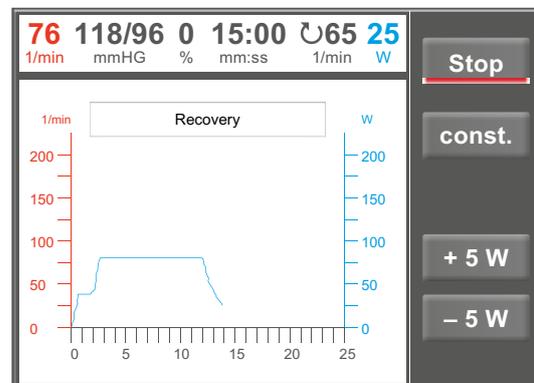


Figure 9–20: Terminating an exercise, screen 1

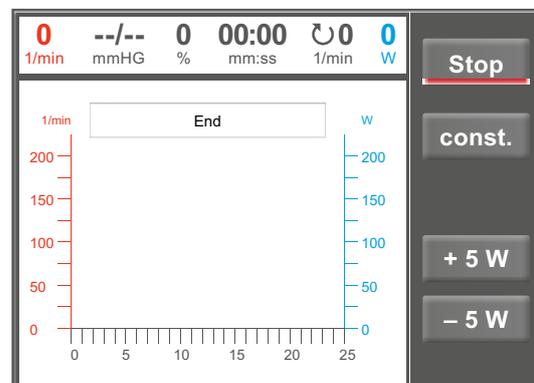


Figure 9–21: Terminating an exercise, screen 2

9.2.3 Training/Test

Ten different protocols are available in the Training/Test menu.

To edit the protocol parameters, first touch the Training/Test protocol you want to edit.

Then press the [Edit] key.

The individual parameters (light gray fields) can now be edited by touching the display or by repeatedly tapping [↕]. If you need to input characters (numbers or letters), an (alpha-) numeric keypad or a keyboard will be displayed.

The options for Type are [Pulse ↕], [Constant ↕], [Interval ↕], [Ramp Test ↕], [PWC Test 1 ↕], [PWC Test 2 ↕], [PWC Test 3 ↕] and [Inactive ↕]. You scroll through the Type options by tapping the [↕] key. Configure the parameters as required by the selected type.

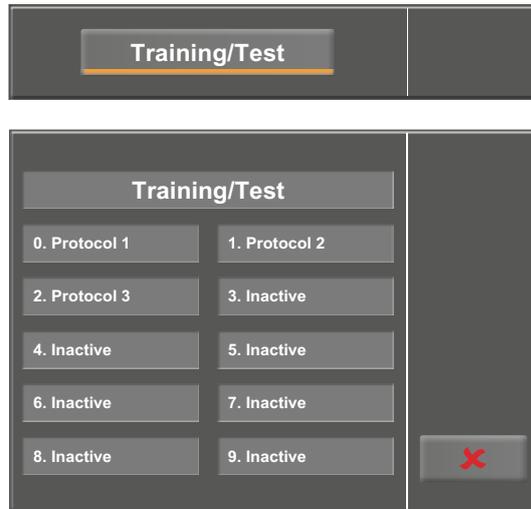


Figure 9–22: Training/Test mode selected



Figure 9–23: Editing the Training/Test protocol

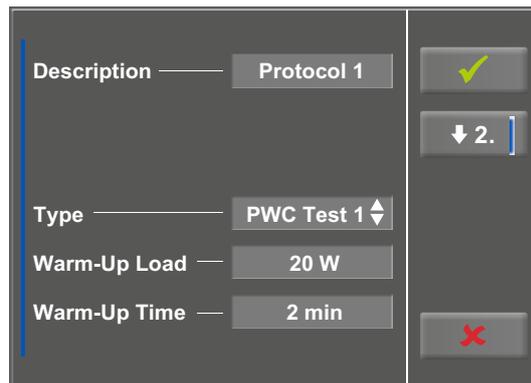


Figure 9–24: Editing parameters, screen 1

With the [▼] key (arrow down, [▼2.] or [▼3.]), you access the next menu level where more parameters can be configured. With the [▲] key (arrow up, [▲1.] or [▲2.]), you return to the previous screen.

Inputs are confirmed with the [✓] key.

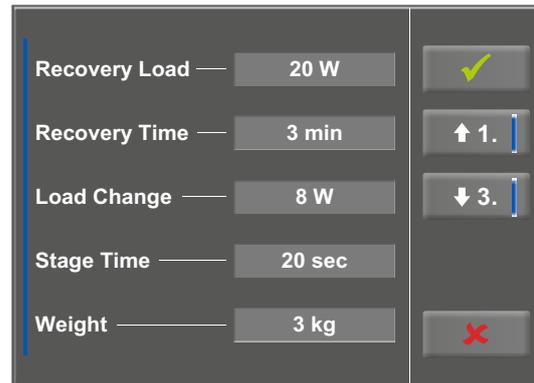


Figure 9–25: Editing parameters, screen 2

9.2.4 Manual

In this operating mode the user has complete control over the ergometer and initiates blood pressure measurements.

Pressing the [Start] key initiates the exercise test, the [+5 W] and [-5 W] keys are used to control the load. The actual load change can be set in the configuration menu between +/- 1 W and +/- 25 W (see chapter 9.2.5 "Setup", section "Load Change" on page 42).

A blood pressure measurement is initiated with the [RR] key.

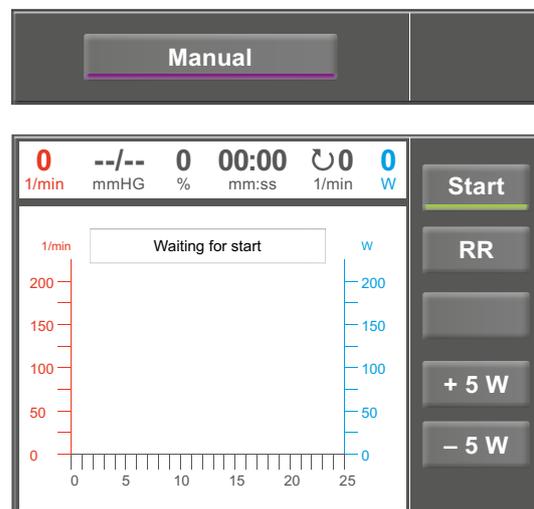


Figure 9–26: Starting a manual test

Terminating an Exercise Test

The exercise test can be terminated manually at any time with the [Stop] key.

The load will immediately drop to 0 watt.

There is no recovery phase in the manual mode.

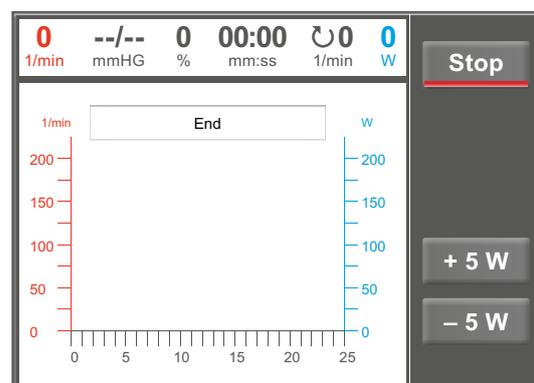


Figure 9–27: Terminating a manual test

9.2.5 Setup

The [Setup] key opens the configuration menu where various program functions can be defined.

To edit a setting, touch the corresponding menu item on the display.

Confirm inputs with the [✓] key and exit menus with the [✕] key.

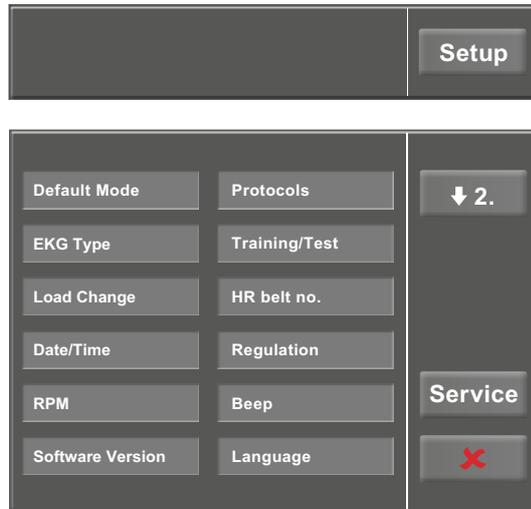


Figure 9–28: Setup menu

Default Mode

Select the operating mode to be activated when the ergometer is turned on:

- PC Mode
- Ergometry
- Training/Test
- Manual

and confirm the selection with the [✓] key.

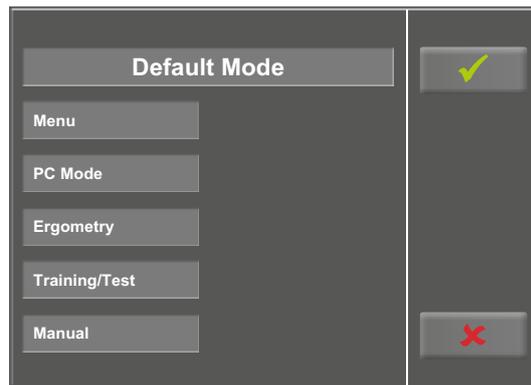


Figure 9–29: Setup – default mode

Protocols

The first 5 exercise test protocols (WHO, BAL, Hollm, Std Fr and Standard) are preconfigured, but all protocols in the list are editable.

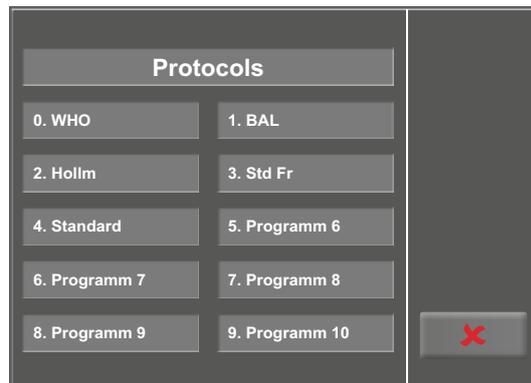


Figure 9–30: Setup – protocols, screen 1

To reach the level for editing of the individual protocol parameters, first touch the protocol that you want to modify (e.g., [5. Program 6]), and then touch the [Edit] key.

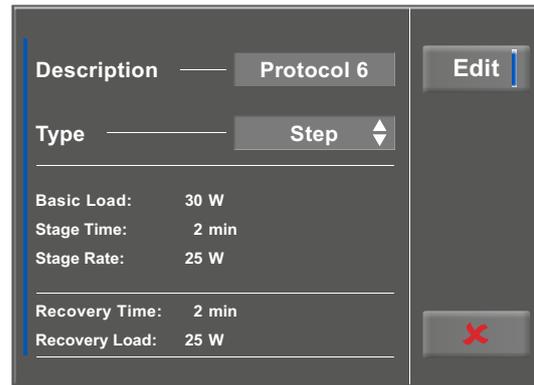


Figure 9-31: Setup – protocols, screen 2

To change the name of a protocol, touch the protocol name and enter the new name from the keypad. Confirm your inputs with the [✓] key.

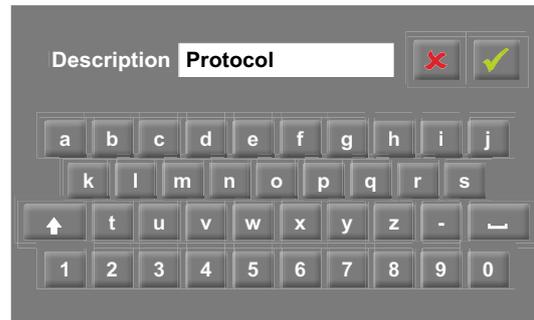


Figure 9-32: Setup – protocols, screen 3

At Type, you can choose [Step ↕], [Ramp ↕] or [Inactive ↕]. You scroll through the Type options with the [↕] key.

When choosing the Step type (load increase in steps), define the basic load (from 6 to 100 W), the stage time (from 1 to 30 min) and the stage rate (increment, from 1 to 400 W). When choosing the Ramp type (continuous load increase), define the basic load (from 6 to 100 W) and the load increase (from 1 to 50 W).

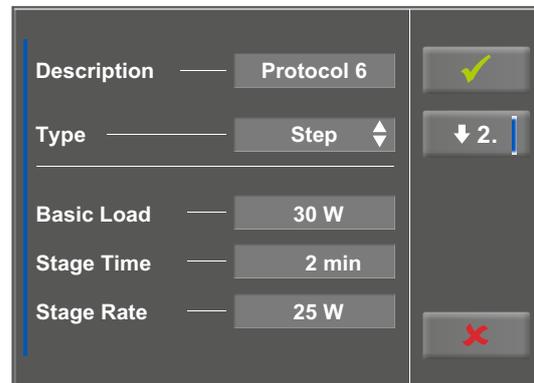


Figure 9-33: Setup – protocols, screen 4

To configure the protocol parameters (light gray fields), touch one of the parameters.

Edit the parameter as appropriate and confirm the modification with the [✓] key.

Touch the Cancel key [✕] to conclude the parameter change.

With the [↓2.] and [↑1.] keys, you toggle between the different screens.

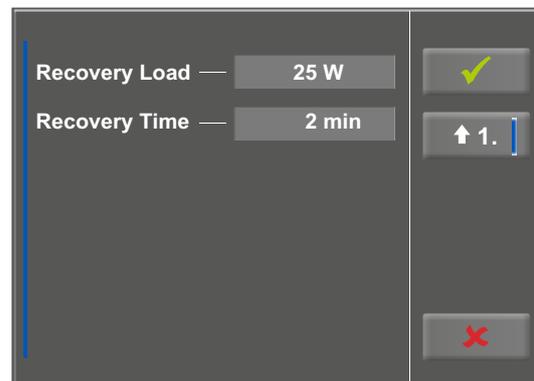


Figure 9-34: Setup – protocols, screen 5

EKG Type

The selected EKG Type determines the communication method with the ECG recorder, PC-based ECG system, etc.

To prevent an accidental change, this setting is protected with a password.

A submenu opens when you touch EKG Type on the display. Enter the code number "3" via the numeric keypad and confirm with the [✓] key.



Figure 9–35: Setup menu

The following communication modes are supported:

- **Analog with pulse**
Remote start mode; before advancing to the next load level, the ergometer generates a control pulse and sends the corresponding data via the interface.
- **Analog/Digital**
An analog voltage controls the load – blood pressure measurements can be initiated with digital commands.
- **Digital** (default)
The communication with the ergometer is entirely controlled with digital commands.
- **Analog IN-OUT**
The entire communication (load control and BP measurements) is controlled with analog signals. No digital data will be sent.

Choose the appropriate communication mode and confirm with the [✓] key.

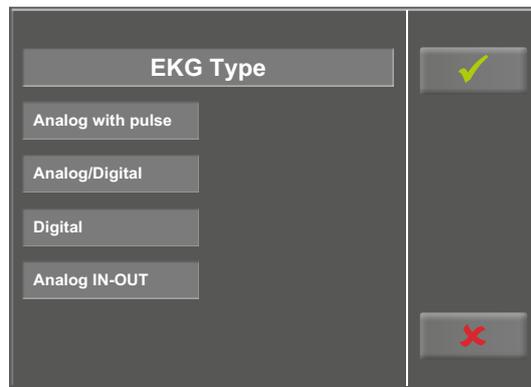


Figure 9–36: Setup – EKG type

Load Change

With this function, you select the increments for load changes.

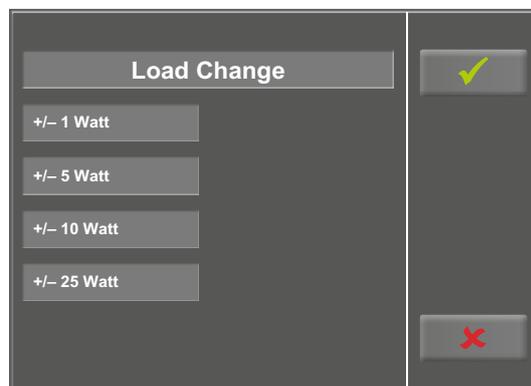


Figure 9–37: Setup – load change

HR Belt Number

If the test subject wears a chest belt to measure the heart rate during the training, the corresponding chest belt number must be entered here. You will find the number on the back of the housing. It is the unique identifier for this particular belt.

With the [↓2.] and [↑1.] keys, you toggle between the screen displays.

Figure 9–38: Setup – HR belt number, screen 1

Figure 9–39: Setup – HR belt number, screen 2

Date/Time

Touch the respective fields to adjust date and time.

Enter day, month, year as well as hours, minutes and seconds via the numeric keypad.

Inputs are confirmed with the [✓] key.

Figure 9–40: Setup – date and time, screen 1

Figure 9–41: Setup – date and time, screen 2

Regulation

At Regulation, you can specify the load details:

- load control (flat, normal, steep)
- duration: load + (0 min to 15 min) and
- duration load - (0 min to 15 min)

You scroll through the load control options (flat, normal, steep) by tapping the light gray text field.



Figure 9-42: Setup – regulation method, screen 1

When you touch the light gray fields to the right of 'Duration: load +' or 'Duration: load -', the time can be entered via the numeric keypad.

Inputs are confirmed with the [✓] key.

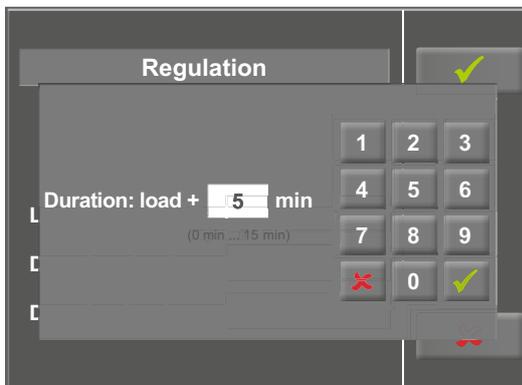


Figure 9-43: Setup of the regulation method, screen 2

RPM

In this menu, you determine the limits for the RPM indication.

The 3 LEDs on the control panel show the patient whether the pedal speed is high, low or correct.



Figure 9-44: Setup – RPM, screen 1

Touch the light gray field to the right of Min. or Max. and enter the value via the numeric keypad.

Confirm the input with the [✓] key or cancel the input with the [✗] key.

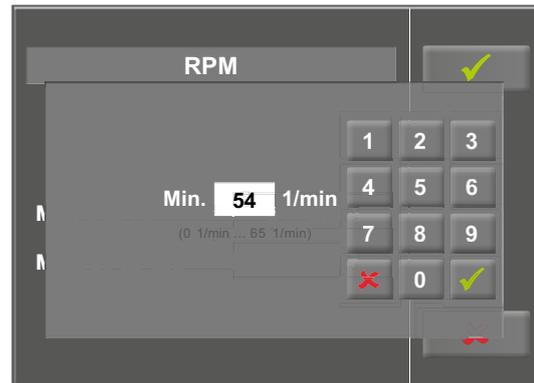


Figure 9–45: Setup – RPM, screen 2

Beep

A short beep confirms each key press. The audible feedback can be enabled and disabled.

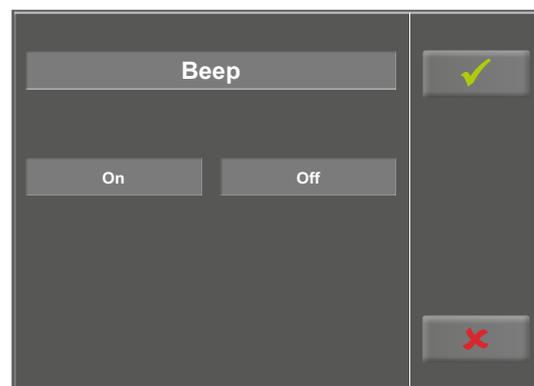


Figure 9–46: Setup – beep

Software Version

This menu shows the software version and the date of the technical inspection of the measuring system (MTK).



Figure 9–47: Setup – software version

Language

Here you choose the language for the user interface.



Figure 9-48: Setup – language

Display

Press the [▼2.] key to display the next screen and touch Display.

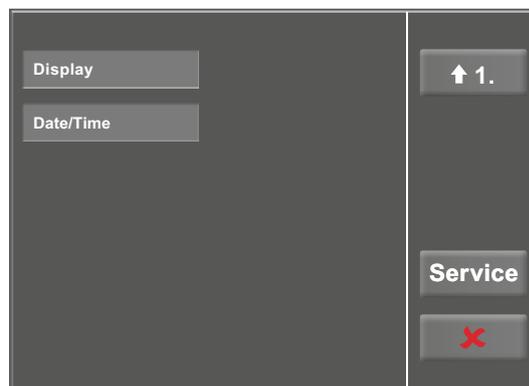


Figure 9-49: Setup – screen display 1

Switch the pulse readout on or off.

Select the blood pressure unit: mmHg (millimeter of mercury) or kPa (kilopascal).



Figure 9-50: Setup – screen display 2

10 Cleaning, Maintenance, Disposal

10.1 General Cleaning

Wipe the device surface down with a cloth moistened with soap water or a disinfectant.

The cloth should not be dripping wet; do not allow liquids to enter the device.

10.1.1 Cleaning the Saddle

Clean the saddle with a soft and dry or moist cloth. **Disinfectants used should not contain alcohol.**

10.1.2 Disinfection

The following disinfectants are approved for disinfection:

Schülke & Mayr GmbH:

- Antifect® AF, FF, FD 10
- Terralin® (0,5 ‰)
- Quartamon Med®

B. Braun Melsungen AG:

- Hexaquart plus® (0.5 ‰ / 5.0 ‰)
- Hexaquart S® (1.5 ‰ / 5.0 ‰)
- Meliseptol®
- Melsept SF® (0.5 ‰ / 5.0 ‰)

ECOLAB:

- Incidin Foam®

Warning

- **Shock Hazard** •
- *Disconnect the device from the power line before cleaning.*
- **Equipment Damage** •
- *Do not allow liquids to enter the device. Devices into which liquids have entered must be immediately cleaned and checked by a service technician, before they can be reused.*
- *Do not use acids, alkaline solutions (household cleaners) or caustic disinfectants.*

Note

Do not use cleaning agents or disinfectants that contain alcohol.

Note

Strictly observe the manufacturer's instructions for use.

10.2 Cleaning the Blood Pressure Cuff

10.2.1 Removing the Microphone

Pull the end of the cuff through the metal clasp and fold out the cuff.

Pull on the short Velcro tab to open the microphone pocket and carefully remove the microphone.

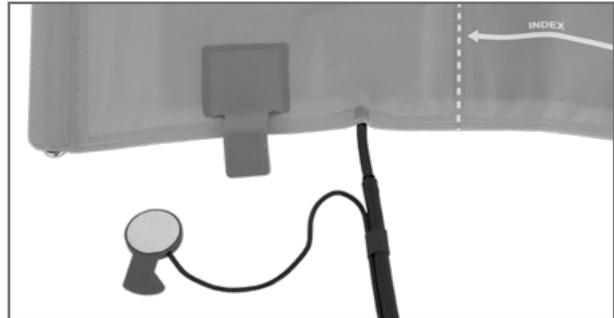


Figure 10–1: Removing the microphone

10.2.2 Cleaning

Clean the cuff and tubing with a moist cloth. You can use a dishwashing liquid or mild soap water (do NOT use cleaning agents containing alcohol).

Clean the microphone with a cloth moistened with alcohol or soap water.

Allow the microphone to dry before reinserting it in its pocket.

10.2.3 Disinfection

For disinfection, spray a disinfectant sparingly on the cuff, the tubing and the microphone. After the contact time indicated by the manufacturer, wipe all components dry.

The following disinfectants are approved for disinfection:

Schülke & Mayr GmbH:

- Antifect® AF, FF, FD 10
- Terralin® (0,5 ‰)
- Quartamon Med®

B. Braun Melsungen AG:

- Hexaquart plus® (0.5 ‰/5.0 ‰)
- Hexaquart S® (1.5 ‰/5.0 ‰)
- Meliseptol®
- Melsept SF® (0.5 ‰/5.0 ‰)

ECOLAB:

- Incidin Foam®

Warning

• Equipment Damage •

- Cuff, microphone and tubing may not under any circumstances:
 - be immersed in liquid
 - be cleaned in a water bath or in running water

Note

Strictly observe the manufacturer's instructions for use.

10.2.4 Inserting the Microphone

Slip the microphone into the pocket, the metal side facing the arm.

Guide the microphone cable out of the pocket and to the right of the Velcro tab. Then close the tab.

Fold the end of the cuff over and introduce it into the metal clasp.

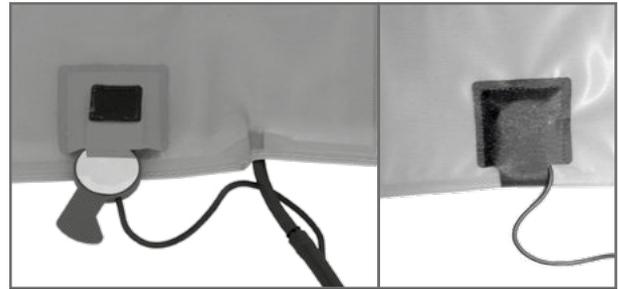


Figure 10-2: Inserting the microphone

10.3 Maintenance

10.3.1 Checks Before Each Use

Before each use, visually inspect the device for signs of damage. If you detect damage or impaired functions which may result in a hazard to the patient or the operator, the device must be repaired before it can be used again.

10.3.2 Technical Safety Inspections and Inspections of the Measuring System

The technical safety inspections and the inspections of the measuring system must be completed every two years according to the rules of the art by a Service Engineer authorized by ergoline.

Similarly, the automatic sphygmomanometer in the control terminal must be checked and, if necessary, calibrated by an authorized specialist every two years to fulfill legal requirements.

The date of the next inspection is indicated on the inspection sticker attached next to the type plate on the ergometer.

10.4 Disposal

The product described in this operator manual must not be disposed as unsorted municipal waste; it must be collected separately.

Please contact your authorized manufacturer ergoline GmbH for information concerning the disposal of your equipment. There is no waste approval. Proper disposal is documented by ergoline GmbH.
Consult Operator's Manual!



11 Technical Specifications

11.1 Ergometer

| | |
|--------------------------|--|
| Model | modular ergometer system ergoselect models ergoselect 4, M / P / T, ergoselect 5, M / P / T |
| Operating mode | continuous operation |
| Power | 100 – 240 V / 50 – 60 Hz max. 100 VA (max. 140 VA for ergometers with motor-assisted adjustment of the handlebar) |
| | <p>specifications of the US power cord: SPT 2x18AWG 125 V / 10 A "hospital" or "hospital grade"</p> <p>specifications of the internal backup battery: IEC: CR 2032 / 3 V 230 mAh</p> |
| Braking principle | computer-controlled eddy current brake with torque measurement; speed independent to DIN VDE 0750-0238 |
| Load range | 6 ... 999 Watt, speed independent (see diagrams on page 54) |
| Speed range | 30 ... 130 RPM |
| Load accuracy | to DIN VDE 0750-0238 |
| Load increments | user programmable |
| Internal protocols | <p>Control Terminal P:</p> <ul style="list-style-type: none"> • 5 fixed and 5 user-programmable exercise test protocols • manual load control <p>Control Terminal T:</p> <ul style="list-style-type: none"> • 10 exercise test protocols (5 preconfigured, editable and 5 user-configurable protocols) • 10 additional, user-programmable training/exercise test protocols • manual load control • 3 preprogrammed performance tests |
| Permitted patient weight | <p>version 1: manual adjustment of the saddle height (standard), up to 160 kg</p> <p>version 2: gas-spring assisted adjustment of the saddle height (option), up to 200 kg</p> <p>version 3: electrical adjustment of the saddle height with digital indication of the current height (option), up to 200 kg</p> |
| Handlebar adjustment | for patient heights from 120 cm to 210 cm, continuous handlebar adjustment over 350° |

| | |
|--|--|
| Handlebar height adjustment | version 1: rigid steering column (standard) version 2: electrically adjustable steering column (option) |
| Crank length | 170 mm (adjustable length cranks available as optional accessories) |
| Displays | version 1: control terminal M with 93 x 70 mm LCD, 128 x 64 pixels and 7-segment RPM display version 2: control terminal P with 93 x 70 mm LCD, 128 x 64 pixels and 7-segment RPM display version 3: control terminal T with TFT LCD touch screen, 165 x 104 mm, 800 x 480 pixels and 7-segment RPM display |
| Interfaces | PORT 1 (DSUB-9-pole): remote control from PC or ECG recorder remote start of an ECG recorder (option) USB: remote control from PC (driver required) option: Bluetooth / WLAN / COM module |
| Dimensions, weight | length: 1030 mm width: 490 mm (width of handlebar approx. 530 mm) height: 1140 – 1400 mm Weight: approx. 66 kg |
| Safety standards | DIN EN 60601-1, DIN EN 60601-1-2, DIN VDE 0750-238 |
| Protection class / degree of protection | II  / B (ergometer) BF (blood pressure module) |
| MDD classification | class IIa to 93/42 EEC |
| RF emission | class B to DIN EN 55011/5.0 DIN EN 60601-1-2 |
| Environment | operation: temperature: +10 to +40 °C rel. humidity 30 to 75%, no condensation atmospheric pressure: 800 to 1060 hPa transport and storage: temperature: -20 to +70 °C rel. humidity 10 to 95%, no condensation atmospheric pressure: 500 to 1060 hPa |

11.2 Blood Pressure Module

| | |
|-------------------------------------|--|
| Measuring method | auscultatory method (Korotokov), oscillometric; for resting BP, the results from both measurements are compared for plausibility |
| Measuring range | systolic pressure: 40 to 280 mmHg diastolic pressure: 40 to 280 mmHg pulse rate: 35 to 230 bpm |
| Measurement error, systematic | systolic pressure: ± 3 mmHg diastolic pressure: ± 3 mmHg (temperature: $+15$ to $+25$ °C) |
| Standard deviation (clinical trial) | systolic/diastolic pressure: 7 mmHg (max.) |
| Inflation pressure | 300 mmHg max.; during inflation the inflation pressure automatically adapts to patient's BP |
| Inflation rate | between approx. 6 seconds (to 140 mmHg) and approx. 18 seconds (to 300 mmHg) |
| Max. cuff pressure | 300 mmHg |
| Cuff deflation method | pulse-dependent deflation rate approx. 3 mmHg/beat or approx. 3 mmHg/s |
| Calibration | calibration with external pressure meter |
| Artifact rejection | automatic artifact rejection |

11.3 Exercise Test Protocols

| Protocol | Basic Load [W] | Stage Time [min] | Load Stage [W] | Recovery Load [W] | Recovery Time [min] |
|------------------------------|----------------|------------------|----------------|-------------------|---------------------|
| 1. WHO | 25 | 2 | 25 | 25 | 99 |
| 2. BAL | 50 | 3 | 50 | 25 | 99 |
| 3. Hollmann | 30 | 3 | 40 | 25 | 99 |
| 4. STD France | 30 | 3 | 30 | 25 | 99 |
| 5. Standard | 20 | 1 | 25 | 25 | 99 |
| 6. – 15. (user programmable) | 25 | 2 | 25 | 25 | 99 |
| Adjustment Range | 20 – 100 | 1 – 30 | 1 – 400 | 20 – 100 (*) | 1 – 99 |

(*) With Control Terminal P, the recovery load is fixed at 25 W.

11.4 Test Protocols (control terminal T only)

| Protocol | Basic Load [W] | Duration [sec] | Load Increment [W] | Stage Time [sec] | Recovery Load [W] | Recovery Time [min] |
|------------------|----------------|----------------|--------------------|------------------|-------------------|---------------------|
| ramping protocol | 0 | 120 | 25 | 10 | 25 | 99 |
| PWC-130 (*) | 25 | 0 | 25 | 120 | 25 | 99 |
| PWC-150 (*) | 50 | 0 | 25 | 120 | 25 | 99 |
| PWC-170 (*) | 50 | 0 | 50 | 120 | 25 | 99 |

(*) the protocol advances to the recovery phase as soon as the target heart rate (130/150/170) is reached

11.5 Family of characteristics of the braking torque control range

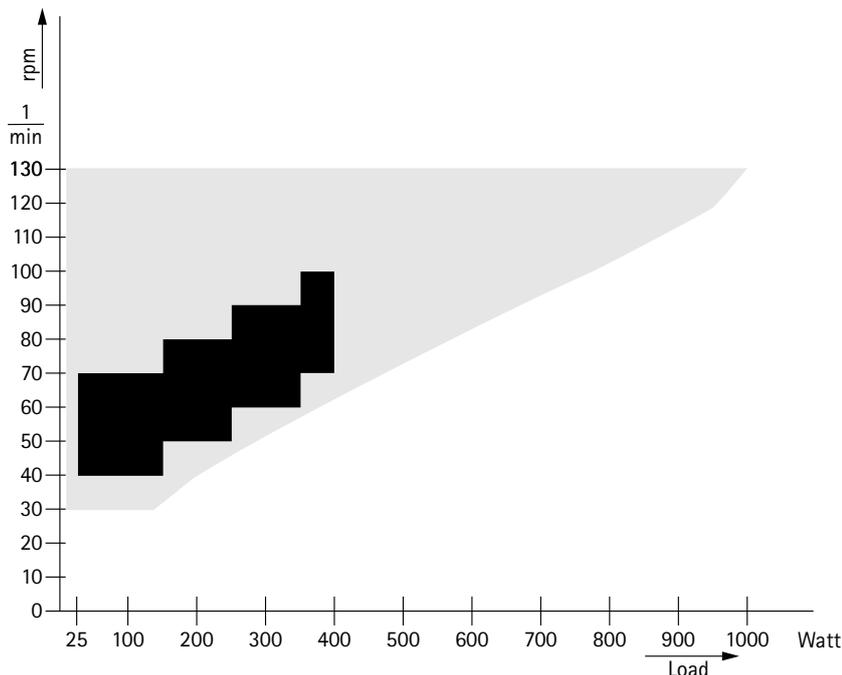


Figure 11 – 1: black: speed-independent range to DIN VDE 0750-0238
 black + gray: speed-independent range of the ergoselect ergometer

11.6 Family of characteristics of the load periods according to IEC 60601-1

| Watt | Time (min) | | | | | | | | | | | | | | |
|------|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 999 | 9 | 28 | 6 | 31 | 6 | 31 | 6 | 31 | 6 | 31 | 6 | 31 | 6 | 31 | |
| 800 | 12 | 23 | 8 | 27 | 8 | 27 | 8 | 27 | 8 | 27 | 8 | 27 | 8 | 27 | |
| 700 | 19 | 18 | 9 | 20 | 9 | 20 | 9 | 20 | 9 | 20 | 9 | 20 | 9 | 20 | |
| 600 | 33 | 13 | 10 | 15 | 10 | 15 | 10 | 15 | 10 | 15 | 10 | 15 | 10 | 15 | 10 |
| 500 | 68 | 10 | 17 | 10 | 17 | 10 | 17 | 10 | 17 | 10 | 17 | 10 | 17 | 10 | |
| 400 | 115 | 10 | 30 | 10 | 30 | 10 | 30 | | | | | | | | |
| 350 | ∞ | | | | | | | | | | | | | | |
| 300 | ∞ | | | | | | | | | | | | | | |

Figure 11 – 2: Under permanent load, the load periods and pauses (white) shall be observed.

12 Electromagnetic Compatibility EN 60601-1-2

Changes or modifications to this system not expressly approved by ergoline could cause EMC issues with this or other equipment.

This system is designed to comply with applicable regulations regarding EMC.

Its compliance with these requirements has been verified. It needs to be installed and put into service according to the EMC information stated as follows.

Warning

- RF Interference •

Use of portable phones or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation.

Caution

- Equipment Malfunction •

The equipment or system should not be used adjacent to, or stacked with, other equipment. If adjacent or stacked use is necessary, the equipment or system should be tested to verify normal operation in the configuration in which it is being used.

| Guidance and Manufacturer's Declaration – Electromagnetic Emissions | | |
|---|------------|--|
| The ergoselect ergometer is intended for use in the electromagnetic environment specified below. It is the responsibility of the customer or user to ensure that the ergoselect ergometer is used in such an environment. | | |
| Emissions Test | Compliance | Electromagnetic Environment – Guidance |
| RF emissions to EN 55011 | Group 1 | The ergoselect ergometer uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment. |
| RF emissions to EN 55011 | Class B | The ergoselect ergometer is suitable for use in all establishments, including domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. |
| Harmonic emissions to EN 61000-3-2 | Class A | |
| Voltage fluctuations/flicker emissions to EN 61000-3-3 | Complies | |

| Guidance and Manufacturer's Declaration – Electromagnetic Immunity | | | |
|---|---|--|--|
| The ergoselect ergometer is intended for use in the electromagnetic environment specified below. It is the responsibility of the customer or user to ensure that the ergoselect ergometer is used in such an environment. | | | |
| Immunity Test | IEC 60601 Test Level | Compliance Level | Electromagnetic Environment – Guidance |
| Electrostatic discharge (ESD) to EN 61000-4-2 | ± 6 kV contact ± 8 kV air | ± 6 kV ± 8 kV | Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %. |
| Electrical fast transient/burst to EN 61000-4-4 | ± 2 kV for power supply lines ± 1 kV for input and output lines | ± 2 kV passed | Mains power should be that of a typical commercial or hospital environment. |
| Surge to EN 61000-4-5 | ± 1 kV differential mode ± 2 kV common mode | ± 1 kV N/A | Mains power should be that of a typical commercial or hospital environment. |
| Voltage dips, short interruptions and voltage variations on power supply input lines to EN 61000-4-11 | < 5 % UT (>95 % dip in UT) for 0.5 cycles 40 % UT (60 % dip in UT) for 5 cycles 70 % UT (30 % dip in UT) for 25 cycles < 5 % UT (> 95 % dip in UT) for 5 seconds | < 5 % UT 40 % UT 70 % UT < 5 % UT | Mains power should be that of a typical commercial or hospital environment. If the user of the ergoselect ergometer requires continued operation during power mains interruptions, it is recommended that the ergoselect ergometer be powered from an uninterruptible power supply or a battery. |
| Power frequency (50/60 Hz) magnetic field to EN 61000-4-8 | 3 A/m | passed | Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment. The ergoselect ergometer has no components susceptible to magnetic fields. |
| Note: UT is the a.c. mains voltage prior to application of the test level. | | | |

| Guidance and Manufacturer's Declaration – Electromagnetic Immunity | | | |
|--|--|-------------------------|--|
| The ergoselect ergometer is intended for use in the electromagnetic environment specified below. It is the responsibility of the customer or user to ensure that the ergoselect ergometer is used in such an environment. | | | |
| Immunity Test | IEC 60601 Test Level | Compliance Level | Electromagnetic Environment – Guidance |
| <p>Conducted RF to EN 61000-4-6</p> <p>Radiated RF to EN 61000-4-3</p> | <p>3 Vrms 150 kHz to 80 MHz</p> <p>3 V/m 80 MHz to 2.5 GHz</p> | <p>3 V</p> <p>3 V/m</p> | <p>Portable and mobile RF communications equipment should be used no closer to any part of the ergoselect ergometer, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance: $d = 1.2 \sqrt{P}$ $d = 1.2 \sqrt{P}$ for 80 MHz to 800 MHz $d = 2.3 \sqrt{P}$ for 800 MHz to 2.5 GHz</p> <p>where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey (a), should be less than the compliance level in each frequency range (b).</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p>  |
| <p>Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.</p> <p>Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.</p> | | | |
| <p>(a) Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the ergoselect ergometer is used exceeds the applicable RF compliance level above, the ergoselect ergometer should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the ergoselect ergometer.</p> <p>(b) Over the frequency range from 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</p> | | | |

Recommended separation distances between portable and mobile RF communications equipment and the ergoselect ergometer

The ergoselect ergometer is intended for use in an electromagnetic environment, as specified below, in which radiated RF disturbances are controlled. The customer or the user of the ergoselect ergometer can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ergoselect ergometer as recommended below, according to the maximum output power of the communications equipment.

| Rated Maximum Output Power of Transmitter [W] | Separation Distance according to Frequency of Transmitter [m] | | |
|---|---|---|--|
| | 150 kHz to 80 MHz $d = 1.2 \sqrt{P}$ | 80 MHz to 800 MHz $d = 1.2 \sqrt{P}$ | 800 MHz to 2.5 GHz $d = 2.3 \sqrt{P}$ |
| 0.01 | 0.12 | 0.12 | 0.23 |
| 0.1 | 0.37 | 0.37 | 0.74 |
| 1 | 1.17 | 1.17 | 2.33 |
| 10 | 3.7 | 3.7 | 7.37 |
| 100 | 11.7 | 11.7 | 23.3 |

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

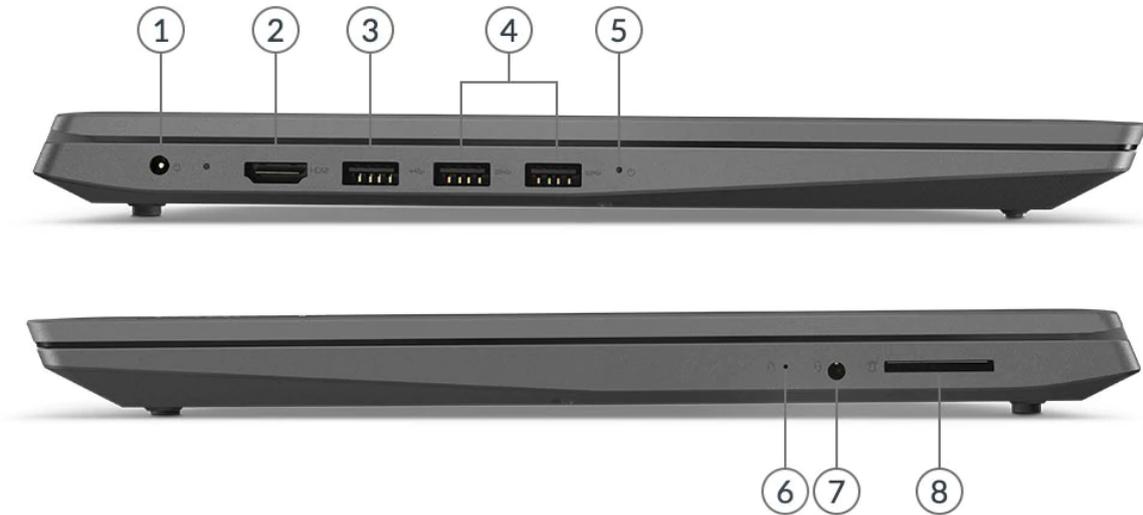
Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.



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http: www.ergoline.com

OVERVIEW



| | |
|---------------------|--|
| 1. Power connector | 5. Power indicator |
| 2. HDMI 1.4b | 6. NOVO button hole |
| 3. USB 2.0 | 7. Headphone / microphone combo jack (3.5mm) |
| 4. 2x USB 3.1 Gen 1 | 8. Card reader |

PERFORMANCE

Processor

Processor Family

AMD 3000, AMD Athlon™, or AMD Ryzen™ 3 / 5 Processor

Processor**

| Processor Name | Cores | Threads | Base Frequency | Max Frequency | Cache | Memory Support | Processor Graphics |
|-------------------------|-------|---------|----------------|---------------|-----------------|----------------|----------------------------|
| AMD 3020e | 2 | 2 | 1.2GHz | 2.6GHz | 1MB L2 / 4MB L3 | DDR4-2400 | AMD Radeon™ Graphics |
| AMD Athlon Silver 3050U | 2 | 2 | 2.3GHz | 3.2GHz | 1MB L2 / 4MB L3 | DDR4-2400 | AMD Radeon Graphics |
| AMD Athlon Gold 3150U | 2 | 4 | 2.4GHz | 3.3GHz | 1MB L2 / 4MB L3 | DDR4-2400 | AMD Radeon Graphics |
| AMD Ryzen 3 3250U | 2 | 4 | 2.6GHz | 3.5GHz | 1MB L2 / 4MB L3 | DDR4-2400 | AMD Radeon Graphics |
| AMD Ryzen 5 3500U | 4 | 8 | 2.1GHz | 3.7GHz | 2MB L2 / 4MB L3 | DDR4-2400 | AMD Radeon Vega 8 Graphics |

Operating System

Operating System**

- Windows® 10 Pro 64
- Windows 10 Home 64
- FreeDOS

Graphics

Graphics**

| Graphics | Type | Memory | Key Features |
|----------------------------|------------|--------|--------------|
| AMD Radeon Graphics | Integrated | Shared | DirectX® 12 |
| AMD Radeon Vega 8 Graphics | Integrated | Shared | DirectX 12 |

Monitor Support

Monitor Support

Supports up to 2 independent displays (native display and 1 external monitor via HDMI®)

- HDMI supports up to 3840x2160@30Hz

Chipset

Chipset

AMD SoC (System on Chip) platform

Memory

Max Memory^[1]

- Up to 8GB (8GB SO-DIMM) DDR4-2400
- Up to 12GB (4GB soldered + 8GB SO-DIMM) DDR4-2400

Memory Slots**^[2]

- One DDR4 SO-DIMM slot
- One memory soldered to systemboard, one DDR4 SO-DIMM slot

Memory Type

DDR4-2400

Notes:

1. The max memory is based on the test results with current Lenovo® memory offerings. The system may support more memory as the technology develops.
2. A4-3020E model: One DDR4 SO-DIMM slot

Storage

Storage Support^[1]

Up to two drives, 1x 2.5" HDD + 1x M.2 SSD

- 2.5" HDD up to 1TB
- M.2 2242 SSD up to 512GB
- M.2 2280 SSD up to 512GB

Storage Type^{***}

| Disk Type | Interface | RPM | Security |
|---------------|--------------------------|------|----------|
| 2.5" SATA HDD | SATA 6Gb/s | 5.4K | - |
| M.2 2242 SSD | PCIe® NVMe®, PCIe 3.0 x2 | - | - |
| M.2 2280 SSD | PCIe NVMe, PCIe 3.0 x4 | - | - |

Notes:

1. The storage capacity supported is based on the test results with current Lenovo storage offerings. The system may support larger storage as the technology develops.

Removable Storage

Optical

None

Card Reader

4-in-1 card reader (SD, SDHC, SDXC, MMC)

Multi-Media

Audio Chip

High Definition (HD) Audio

Speakers

Stereo speakers, 1.5W x2, Dolby® Audio™

Microphone

Single microphone

Camera

0.3-megapixel, fixed focus

Battery

Battery^{**}

- Integrated Li-Polymer 30Wh battery
- Integrated Li-Polymer 35Wh battery

Max Battery Life^[1]

- MobileMark® 2014: 5 hr (30Wh)
- MobileMark 2014: 6 hr (35Wh)

Notes:

1. All battery life claims are approximate maximum and based on results using the MobileMark 2014, MobileMark 2018, JEITA 2.0, continuous 1080p video playback (with 150nits brightness and default volume level) or Google Power Load Test (PLT) battery-life benchmark tests. Actual battery life will vary and depends on many factors such as product configuration and usage, software use, wireless functionality, power management settings, and screen brightness. The maximum capacity of the battery will decrease with time and use.

Power Adapter

Power Adapter^[1]

65W round tip (2-pin, wall-mount) AC adapter, 100-240V, 50-60Hz

Notes:

1. AC adapter offerings depend on the country.

DESIGN

Display

Display**^[1]

| Size | Resolution | Touch | Type | Brightness | Surface | Aspect Ratio | Contrast Ratio | Color Gamut | Viewing Angle | Key Features |
|-------|-----------------|-------|------|------------|------------|--------------|----------------|-------------|---------------|--------------|
| 15.6" | HD (1366x768) | None | TN | 220 nits | Anti-glare | 16:9 | - | - | - | - |
| 15.6" | FHD (1920x1080) | None | TN | 220 nits | Anti-glare | 16:9 | - | - | - | - |
| 15.6" | FHD (1920x1080) | None | IPS | 250 nits | Anti-glare | 16:9 | - | - | - | - |

Touchscreen

Non-touch

Notes:

1. California Electronic Waste Recycling Fee

In California, per state law, Lenovo charges an electronic waste recycling fee on this covered device at the time of sale of the product. For more information, go to <https://www.calrecycle.ca.gov/Electronics/Consumer>

Input Device

Keyboard

6-row, spill-resistant, multimedia Fn keys, numeric keypad

Keyboard Backlight

Non-backlight

Touchpad

Buttonless Mylar® surface multi-touch touchpad

Mechanical^[1]

Dimensions (WxDxH)

362.2 x 251.5 x 19.9 mm (14.26 x 9.9 x 0.78 inches)

Weight

Starting at 1.85 kg (4.08 lbs)

Case Color

Iron grey

Surface Treatment**

- IMR (in-mold decoration by roller)
- Texture

Case Material

PC + ABS (top), PC + ABS (bottom)

Notes:

1. The system dimensions and weight vary depending on configurations.

CONNECTIVITY

Network

Onboard Ethernet

No Ethernet

WLAN + Bluetooth^[1]

802.11ac 2x2 Wi-Fi® + Bluetooth 5.0, M.2 card

Notes:

1. Bluetooth 5.2 is hardware ready but may run at a lower version due to OS limitation

Ports^[1]

Standard Ports

- 1x USB 2.0
- 2x USB 3.1 Gen 1
- 1x HDMI 1.4b
- 1x Card reader
- 1x Headphone / microphone combo jack (3.5mm)
- 1x Power connector

Notes:

1. The transfer speed of following ports will vary and, depending on many factors, such as the processing speed of the host device, file attributes and other factors related to system configuration and your operating environment, will be slower than theoretical speed.
USB 2.0: 480 Mbit/s;
USB 3.2 Gen 1 (SuperSpeed USB 5Gbps, formerly USB 3.0 / USB 3.1 Gen 1): 5 Gbit/s;
USB 3.2 Gen 2 (SuperSpeed USB 10Gbps, formerly USB 3.1 Gen 2): 10 Gbit/s;
USB 3.2 Gen 2x2 (SuperSpeed USB 20Gbps): 20 Gbit/s;
Thunderbolt™ 3/4: 40 Gbit/s

SECURITY & PRIVACY

Security

Security Chip

Firmware TPM 2.0 integrated in SoC

Fingerprint Reader

No fingerprint reader

BIOS Security

- Power-on password
- Supervisor password
- Hard disk password

SERVICE

Warranty

Base Warranty**^[1]

- 1-year depot service
- 2-year (1-yr battery) depot service

Notes:

1. More information of warranty policy, please access <https://pcsupport.lenovo.com/warranty>

ENVIRONMENTAL

Operating Environment

Temperature^[1]

- At altitudes up to 2438 m (8,000 ft)
 - Operating: 5°C to 35°C (41°F to 95°F)
 - Storage: 5°C to 43°C (41°F to 109°F)
- At altitudes above 2438 m (8,000 ft)
 - Maximum temperature when operating under the unpressurized condition: 31.3°C (88°F)

Humidity

- Operating: 8% to 95% at wet-bulb temperature 23°C (73°F)
- Storage: 5% to 95% at wet-bulb temperature 27°C (81°F)

Altitude

Maximum altitude (without pressurization): 3048 m (10,000 ft)

Notes:

1. When you charge the battery, its temperature must be no lower than 10°C (50°F).

CERTIFICATIONS

Green Certifications

Green Certifications

- ErP Lot 3
- RoHS compliant

- Feature with ** means that only one offering listed under the feature is configured on selected models.
- Feature with *** means that one or more offerings listed under the feature could be configured on selected models.
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HP LaserJet M110we Printer

Prints efficiently. Fits anywhere.



HP's smallest laser printer, designed for efficiency with fast printing and the time-saving HP Smart app.²³ Includes HP+, the smart printing system that keeps you connected and ready to print from virtually anywhere.²

This is an HP+ printer. It requires an HP account, connection to the internet, and exclusive use of Original HP Toner cartridges for the life of the printer. More at: <http://www.hp.com/plus-faq>

This printer is intended to work only with cartridges that have a new or reused HP chip, and it uses dynamic security measures to block cartridges using a non-HP chip. Periodic firmware updates will maintain the effectiveness of these measures and block cartridges that previously worked. A reused HP chip enables the use of reused, remanufactured, and refilled cartridges. More at: <http://www.hp.com/learn/ds>



Compact size



HP AIo Remote



Easy replace toner



Eco friendly

HP's smallest LaserJet

- Efficient performance from HP's smallest laser printer.
- Business doesn't need to wait for your printer. Maximize your uptime with print speeds up to 20 ppm (A4).⁴
- Get wireless with self-reset to help you stay connected.⁶
- Smartly and elegantly designed, so it's simple and intuitive to use.

Never run out¹³ and save up to 50%¹⁴ with Instant Ink for laser printing

- Never run out of toner for your laser printer.¹³ Convenient toner replacements and smart delivery included.
- Save up to 50% with Instant Ink.¹⁴ Enroll to get toner, delivery and recycling starting at \$3.99 a month.
- Peace of mind with plan flexibility to change or cancel anytime at no cost.¹⁵
- A pre-paid recycling satchel is included for your used cartridges to be recycled with zero waste to landfill.¹⁶

HP+ Smart printing has arrived

- This cloud-connected HP+ printer is smarter - it keeps itself up to date and ready to print.⁹
- Up to 6 months of Instant Ink included¹⁰; after 6 months, monthly fee charged automatically unless cancelled.
- Print and scan from the palm of your hand. Enjoy advanced productivity features for 2 years with HP+.²
- Putting the planet first with Forest First prints.¹²

Stay productive from anywhere

- Get high-quality scanning, and share to Dropbox, Google Drive, or email – from virtually anywhere.²
- Print documents and images directly from Dropbox and Google Drive with HP Smart app.²
- Save time by sending a secure fax from your smartphone, tablet, or PC with HP Smart app.²
- Eliminate steps in repetitive tasks with Shortcuts.² Scan to the cloud, email, and more in just a tap.²

Technical specifications

| | | | |
|---------------------------------|--|-----------------------------------|---|
| Functions | Print | Printer dimensions (W x D x H) | Minimum: 346 x 189 x 158 mm; Maximum: 346 x 360 x 280 mm; |
| Print technology | Laser | Package dimensions (W x D x H) | 378 x 198 x 222 mm |
| First page out | Black (A4, ready): As fast as 8.5 sec; | Printer weight | ~3.79 kg |
| Print resolution | Black (best): Up to 600 x 600 dpi; | Package weight | 4.8 kg |
| Monthly duty cycle | Up to 8,000 pages A4; Recommended monthly page volume: 100 to 1000 | Operating environment | Temperature: 15 to 32.5°C Humidity: 30 to 70% RH |
| Printer smart software features | HP Auto-On/Auto-Off ¹ , HP Smart App ² | Storage conditions | Temperature: -20 to 60°C |
| Standard print languages | PCLm/PCLmS; URF; PWG | Acoustics | Acoustic power emissions: 6.0 B(A) Acoustic pressure emissions: 48 dB(A) |
| Print area | Print margins: Top: 2 mm, Bottom: 2 mm, Left: 2 mm, Right: 2 mm; Maximum print area: 216 x 355.6mm | Power | Requirements: 110V - 127V nominal @ +/-10% (min 99V, max 140V), 50 - 60Hz nominal +/- 3Hz (min 47Hz, max 63Hz), 220V - 240V nominal @ +/-10% (min 198V, Max 264V), 50 - 60Hz nominal +/- 3Hz (min 47Hz, max 63Hz). Not dual voltage, power supply varies by part number with # Option code identifier.; Typical Electricity Consumption (TEC): 0.239 kWh/Week (Blue Angel); 0.256 kWh/Week (Energy Star 3.0); Power supply type: Power requirements are based on the country/region where the printer is sold. Do not convert operating voltages. This will damage the printer and void the product warranty.; |
| Number of supplies | 1 (black) | Certifications | CISPR32:2012 & CISPR32:2015 /EN55032:2012 & EN55032:2015+AC:2016 - Class B; EN 61000-3-2:2014; EN 61000-3-3:2013; EN 55035:2017; FCC Title 47 CFR, Part 15 Class B/ICES-003, Issue 6 |
| Duplex printing | No | Sustainable impact specifications | Recyclable through HP Planet Partners; Contains post-consumer recycled plastic; Net zero-deforestation prints with HP+ |
| Processor speed | 500 MHz | Country of origin | Made in Vietnam |
| Connectivity | Standard: 1 Hi-Speed USB (compatible with USB 2.0 specifications); 802.11 b/g/n (2.4 GHz) Wi-Fi radio + BLE; | Control panel | 3 LEDs (Attention, Ready, Wireless); 3 buttons (Cancel, Power, wireless) |
| Wireless | Yes | What's in the box | 7MD66E: HP LaserJet M110we Printer; Power cord; Toner Cartridge (~300 pages); Setup Poster; Reference Guide; Warranty Guide; Flyer |
| Mobile printing capability | HP Smart App; Apple AirPrint™; Mopria™ Certified; Wi-Fi® Direct printing | Supplies | W1410A HP 141A Black Original LaserJet Toner Cartridge |
| Memory | Standard: 32 MB; Maximum: 16 MB Flash ROM; 32 MB SDRAM; 32 KB NVRAM | Service and Support | U31VXE HP Plus 3 Year Care Pack Next Day Exchange LaserJet ULow SVC U31VZE HP Plus 3 Year Care Pack Onsite Exchange LaserJet ULow SVC U31W1E HP Plus 3 Year Care Pack Return to Depot LaserJet ULow SVC U6N05E HP Installation with Networking Service for Consumer Printer |
| Number of paper trays | Standard: 1 input tray; Maximum: 1 input tray | Warranty | Two-year limited warranty |
| Media types | Plain paper, envelope, postcard, label | | |
| Media size | Custom (metric): 105 x 148 to 216 to 355.6mm Supported (metric): A4; A5; A6; envelopes (C5, DL); custom | | |
| Input capacity | Standard: Up to 150 sheets Maximum: Up to 150 sheets | | |
| Output capacity | Standard: Up to 100 sheets Envelopes: Up to 10 envelopes Maximum: Up to 100 sheets | | |
| Compatible operating systems | Microsoft® Windows® 11, 10: 32-bit or 64-bit, 2 GB available hard disk space, Internet connection. Apple® macOS Catalina (v10.15) macOS Big Sur (v11.0) macOS Monterey (v12.0); 2 GB HD; Internet required. Linux (For more information, see https://developers.hp.com/hp-linux-imaging-and-printing) | | |
| Minimum system requirements | Windows: Microsoft® Windows® 11, 10: 32-bit or 64-bit, 2 GB available hard disk space, Internet connection. Mac: Apple® macOS Catalina (v10.15) macOS Big Sur (v11.0) macOS Monterey (v12.0); 2 GB HD; Internet required | | |
| Software included | No CD in box. Download software from hp.com or 123.hp.com | | |

Footnotes

² Requires the HP Smart app download. For details on local printing requirements see www.hp.com/go/mobileprinting. Certain features/software are available in English language only, and differ between desktop and mobile applications. Subscription may be required; subscription may not be available in all countries. See details at www.hpsmart.com. Internet access required and must be purchased separately. HP account required for full functionality. List of supported operating systems available in app stores. Fax capabilities are for sending a fax only. After 2 years, monthly fee applies to continue advanced features with HP Smart Advance. HP Smart Advance is not available in all countries. For more information, see www.hpsmart.com.

³ Based on internal HP testing. Average timing estimate based on: 1) downloaded HP Smart app on mobile or desktop device, 2) setting up Shortcut, 3) scanning jobs which have more than 2-3 tasks associated with them (scan to email, save and rename, store to cloud, etc.). Average timing savings comparison based on using printer and desktop scan software to complete similar scanning tasks. Requires the HP Smart app download and supported HP printer. For details on local printing requirements see www.hp.com/go/mobileprinting.

⁴ Measured using ISO/IEC 24734, excludes first set of test documents. For more information see <http://www.hp.com/go/printerclaims>. Exact speed varies depending on the system configuration, host OS, port-monitor, software application, driver, and document complexity.

⁵ Wireless operations are compatible with 2.4 GHz operations only. Learn more at www.hp.com/go/mobileprinting. Internet access required and must be purchased separately.

⁶ Utilizing technology in the HP+ system and compared to HP standard consumer printers without HP+. HP+ printers are ready when you are with improved connectivity utilizing Smart Driver and Print/Scan Doctor technology, more secure with Smart Security technology, more productive through HP Smart Advance features included for 2 years, and more sustainable by enabling Forest First printing and net-zero deforestation prints.

⁷ Instant Ink sign up required. Instant Ink not available in all countries. Subject to monthly page limit of plan selected. Must complete Instant Ink sign up within 7 days of setting up the printer with the HP-recommended setup process as indicated in the instructions that came with your printer. Unless service is cancelled within the promotional period online at www.hpinstantink.com, a monthly service fee, based on the plan chosen, plus tax and coverage fees will be charged to your credit/debit card. Customer will be charged for any overage fees and applicable taxes at the end of each month in the promotional period. Use of in-box ink or toner cartridge is included in period of offer. One offer redeemable per printer. Included months offer with Instant Ink subject to change after 4.30.2022. Offer cannot be redeemed for cash. Setup Offer may be combined with other offers; see terms and conditions of the other offer for more details. Requires a valid credit/debit card, an email address, and Internet connection to printer. See additional offer information available during online sign up process. For service details, see www.hpinstantink.com.

⁸ HP works collaboratively with our partners including WWF and Arbor Day Foundation to manage, restore, and protect forests in many countries around the world. With HP+, every print - regardless of paper brand - is addressed through HP's Forest Positive Framework to counteract risks of deforestation. HP brand paper is sourced only from certified responsibly managed forests or from recycled content. For other brands of paper, HP invests in forest restoration, protection or management projects in key regions sufficient to balance any paper used by HP+ customers that may not have been responsibly sourced. To learn more visit www.hp.com/forestfirst.

⁹ Based on plan usage, Internet connection to eligible HP printer, valid credit/debit card, email address, and delivery service in your geographic area.

¹⁰ Based on monthly subscription cost of HP Instant Ink 1,500-page plans without purchase of additional sets of pages compared to cost per page to print ISO/IEC 24711 pages on most in-class, monochrome A4 laser printers and MFPPs using original standard capacity cartridges priced for: Australia <599 AUD; New Zealand <599 NZD. Sale prices not considered for this study. Buyers Lab October 2020 study commissioned by HP, based on publicly available information as of September 30, 2020. Printers selected by market share in IDC Quarterly Hardcopy Peripherals Tracker - Final Historical 2020Q1. For details: www.keypointintelligence.com/HPPrinterServiceR0W



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