SCHILLER’s medilog® Holter system

ECG analysis that meets highest demands
medilog®DARWIN

... the unique diagnostic tool!

With medilog®DARWIN, you can now process a routine Holter ECG quicker and more accurately. In addition to the detection of all cardiopathological events, medilog®DARWIN provides a comprehensive analysis of the human being as a unit. Functional atrial diagnostics, apnoea diagnostics and the determination of the quality of life are just some of the exceptionally useful features that medilog®DARWIN uses to filter information from a Holter recording without any additional sensors.

99.9 % accuracy
Every tenth of a percent of accuracy means approx. 100 beats more that are automatically detected correctly – which for you means 100 interactions less to post-process a 24-hour recording. For the medilog®ADAPT algorithm, we were able to increase the accuracy to 99.9 % (1). Moreover, all recorded channels are analysed and episodes that are too noisy are automatically excluded. This results in an improved analysis of a «true» Holter recording and saves you a large amount of time.

Just three mouse clicks away from a printout
Thanks to medilog®DARWIN’s accuracy, it just takes a few seconds to obtain a comprehensive Holter report. You can load, analyse and assess a recording and create a report with only a few clicks, supported by the user interface that is optimised for rapid processing. The automatic analysis of a 24-hour Holter recording takes less than 90 seconds.

Adapting to your needs
Each medical practice has its own work routine. We believe that the user should not adapt to the software, but that the software should adapt to the user; we have therefore developed medilog®DARWIN in a way so that it can be customised to your habits and routines. Freely configurable reports, adjustable screens and workflows are just some of the features which you can benefit from. We take the comments of hundreds of medilog®DARWIN users from all over the world very seriously and are continuously developing the system.
Obtained in comparison with the American Heart Association database (AHA; QRS Se: 99.9 %, QRS +P: 99.9 %, VES Se: 98.0 %, VES +P: 97.5 %) and the MIT-BIH arrhythmia database (MIT; QRS Se: 99.9 %, QRS +P: 99.9 %, VES Se: 96.4 %, VES +P: 93.7 %) according to the ANSI/AAMI standards EC38:1998 and EC57:1998.

ECHOView® saves precious time during arrhythmia analysis.

Spectral presentation and histogram.

Workflows... adjustable screen presentations.
Revolutionary atrial diagnostics
Thanks to the extremely high sampling frequency used in our medilog®AR recorders, the P waves are detected in real time. medilog®DARWIN processes these information and presents the atrial activity in unique graphs such as ECHOView® and the P-R trend. These tools help detecting cardiac diseases like A-V block, atrial flutter and atrial fibrillation very quickly and accurately.

Suitable for any application...
In combination with our ECG recorders, medilog®DARWIN delivers constant high-quality results for a wide variety of applications, ranging from laboratories with a high throughput (medilog®DARWIN Scanlab) to complex research problems.

Fully flexible...
medilog®DARWIN can be operated with one or two monitors to match your work routine. It can easily be integrated in networks and is compatible with a multitude of the latest high-speed printers. Patient data is safely stored on CD or DVD.
medilog®DARWIN allows you to work at different reading and analysis stations within the network. The applications range from interconnection of several PCs in a practice, to larger groups in hospitals and to the integration of remote reading and analysis stations via Internet. medilog®DARWIN blocks patient data that is edited by another user and provides information on who is editing which data. In addition, our proven data management system SEMA-200 is fully compatible with medilog®DARWIN.

Recommended minimal system requirements (standard)

- Intel® Core™2 CPU with 2 GHz or similar
- 20 GB hard disk
- 1 GB RAM
- Minimal monitor resolution 1024 x 768
- TCP/IP-compatible network hardware
- Available USB interface for the software key
- Compact Flash Card reader for medilog®AR4 and medilog®AR12
- DVD/RW drive
- MS Windows™ 2000, XP or Vista

Fully compatible with hospital information systems based on HL7
True apnoea screening

- Apnoea pre-screening
- Therapy assessment
- Assessment/review of sleep quality and quality of life
- Synchronised presentation of ECG waveforms and respiration curves

The unique tool to quickly detect apnoea and assess sleep quality. Thanks to the high sampling frequency and resolution (4096 Hz and 16 bit), the recorder is able to register the respiration curve in addition to the ECG. This is done by means of the recognised EDR method (ECG-Derived Respiration). The apnoea index calculated from this data provides you with information on if and to what extent the patient has had nightly apnoea phases.

Assess the sleep quality by use of the unique HRV frequency spectrogram. This spectrogram shows the sympathetic and vagal activity.

Did the interruption cause apnoea or did the apnoea cause the interruption? The integrated ECG provides both information synchronously.

medilog®DARWIN Apnoea offers you a fast, reliable and inexpensive screening tool to exclude apnoea in your patients.

Apnoea pre-screening at home. Reducing costs through prevention.

Just some of the reasons for using medilog®DARWIN Apnoea... In around 30% of all patients that undergo a polysomnography, no apnoea is detected. However, it is very often these patients who suffer from cardiological diseases. And yet it is not uncommon for cardiological diseases to occur in combination with apnoea. Apnoeas are often chronic and, if left untreated, can lead to enormous financial burdens for the health care system due to high follow-up costs.
The ageing population

Just one reason why medilog® DARWIN Atrial is so important... Atrial fibrillation (AF) is the most common form of irregular cardiac rhythm and affects approx. 2% of all people. The risk of such disease increases with age and the number of people affected is going to double over the coming 20 years. Atrial fibrillation is believed to account for one third of all hospital admissions for cardiac rhythm problems and it is believed to cause around 15% of all strokes. Early diagnosis and treatment could reduce the enormous costs for the health care system for emergency treatment, and increase the patient's chance of survival.

medilog® DARWIN Atrial puts a reliable, affordable and non-invasive screening device in the hands of people that can make a difference.

True atrial screening

- Reducing costs through early detection of atrial fibrillation and atrial flutter
- Preliminary assessment of the need for further invasive diagnosis, therapy or surgery
- Even more effective patient monitoring following surgery or ablation

The unique diagnostic package that allows you to specifically search for atrial anomalies. Thanks to a sampling frequency of 4096 Hz, our medilog®AR recorders detect and mark P and T waves online and in real time. In combination with the unique medilog®DARWIN features such as ECHOView®, you are now able to distinguish between atrial fibrillation, atrial flutter and A-V block patterns at a glance. You no longer need time-consuming beat or arrhythmia analyses to detect all atrial events.

ECHOView® presents more than 15,000 beats in a compressed format and allows the quickly check large ECG segments for incorrectly located P and T waves.

In the atrial analysis window, A-V block patterns and other critical anomalies are presented simply and clearly to get a detailed overview at a glance.

When you click on an unusual ECG segment in the ECHOView® window, the ECG waveforms are displayed and you can check them for indications of atrial fibrillation or atrial flutter.
Heart rate variability – an underestimated indicator

A traditional Holter recording does not take into account the heart rate variability (HRV), or just some parameters that are delivered by an HRV analysis. Yet the HRV is essential for the assessment of the autonomic nervous system and complements a standard Holter diagnosis. This is confirmed by numerous publications in this field. Moreover, Chinese physicians knew already 3000 years ago that a too regular pulse poses a deadly risk to the patient. Many Holter systems offer an HRV analysis; however, only very few systems deliver the precision required for a reliable analysis. medilog®DARWIN provides you with the best beat-to-beat analysis that a non-invasive measuring method can offer. It is therefore the ideal screening tool to assess the autonomic nervous system and to complement a Holter diagnosis.

A unique tool to obtain a further-reaching HRV analysis and to assess the sleep quality and level of stress. For research purposes, all files can be exported as MatLab, ISHNE or in MS EXCEL.
**Fire of Life™ and Heart Rate Variability (HRV)**

**HRV**

Heart rate variability (HRV) is the variation between consecutive heartbeats and is affected by several factors such as age, stress, cardiac diseases and state of health. The HRV decreases with age and is lower among people who lead an inactive lifestyle and those who suffer from medical conditions such as coronary heart disease, hypertension or diabetic neuropathy. Since the heart is the centre of many regulating systems, the heart rate is influenced by various body functions. The heart rate is continuously adjusted by the autonomic nervous system, the controlling network of the human body, in response to internal and external triggers such as physical activation, stress, relaxation, recovery and sleep.

**New perspectives in HRV measurement**

The HRV is an important value to assess the autonomic nervous system. A low HRV can indicate an increased mortality risk. However, it is important to ensure that the HRV measurement is reliable and not influenced by inaccuracies caused by the equipment. SCHILLER medilog® DARWIN HRV provides the best beat-to-beat measurement available non-invasively and is an ideal screening tool to detect autonomic failure, syncopes and neuropathy and to conduct detailed research into HRV and associated conditions.

SCHILLER medilog® DARWIN HRV is part of the range of medilog products which have been used for more than 30 years to record ECGs and to diagnose arrhythmias. The latest range of ECG and HRV recorders and software now puts a reliable, affordable and non-invasive screening device and research tool in your hands – so that you can make that difference in treatment and cost.
## Holter/software overview

### medilog® Holter Recorder Feature Matrix

<table>
<thead>
<tr>
<th>Feature</th>
<th>medilog®AR12 plus</th>
<th>medilog®AR4 plus</th>
<th>medilog®FD5 plus</th>
<th>MT-101 / MT-101 nano</th>
</tr>
</thead>
<tbody>
<tr>
<td>PureECG™</td>
<td>yes (1)</td>
<td>yes (1)</td>
<td>yes (1)</td>
<td>no</td>
</tr>
<tr>
<td>ST / QT / pacemaker analysis</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>HRV analysis</td>
<td>High resolution (1)</td>
<td>High resolution (1)</td>
<td>yes (3)</td>
<td>yes (2)</td>
</tr>
<tr>
<td>Fire of Life™ &amp; autonomic diff.</td>
<td>yes (1)</td>
<td>no</td>
<td>yes (3)</td>
<td>yes (2)</td>
</tr>
<tr>
<td>Apnoea detection</td>
<td>yes (1)</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>QRS detection</td>
<td>yes (1)</td>
<td>yes (1)</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>P wave detection &amp; atrial analysis</td>
<td>yes (1)</td>
<td>yes (1)</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Motion detection and analysis</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
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<tr>
<td>Wireless interface</td>
<td>BlueTooth™ (4)</td>
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<td>no</td>
<td>no</td>
</tr>
<tr>
<td>SpO₂ sensor</td>
<td>optional</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

(1) Items in bold letters emphasize the characteristic features of the specific device
(2) 1000 Hz sampling rate recommended to obtain comparable results
(3) Accuracy of results is limited due to lower storage rate
(4) medilog®AR12 plus will be equipped with BlueTooth™ interface from summer 2011

The limitations a mobile design entails on amplifier circuits in modern digital long-term ECG recorders challenge a compromise between quality of operation and power consumption. Until now! With the medilog® plus recorder series, SCHILLER is introducing the new PureECG™ technology which sets a new standard for both signal quality and power consumption!

During a 24-hour or even longer ECG recording, noisy episodes due to muscle artefacts and/or degrading electrodes are unavoidable.

A conventional Holter recorder tends to amplify noise much more than the actual signal we are interested in. To compensate, the signal often is heavily filtered, which further distorts the ECG traces.

With the new PureECG™ technology in our medilog® plus recorder series, we have broken up this vicious circle. Although we were able to reduce the power consumption dramatically, the recorded signal is remarkably clearer and matches the original signal.
### Microvit MT-101 recorder specifications
- **Dimensions (h x w x l) in mm**: 90 x 60 x 20
- **Weight incl. batteries**: 110 g
- **Electrodes**: 4 or 6
- **ECG channels**: 2 or 3
- **Sampling frequency**: 1000 Hz
- **Resolution**: 12 bit
- **Batteries**: 2 x 1.5v AA
- **Max. recording duration**: 72 hours

### Microvit MT-101 nano recorder specifications
- **Dimensions (h x w x l) in mm**: 62 x 58 x 18
- **Weight incl. accumulator**: 66 g
- **Electrodes**: 5
- **ECG channels**: 2 or 3
- **Sampling frequency**: 1000 Hz
- **Resolution**: 12 bit
- **Accumulator**: 1.37 V Li-Ion 800 mA
- **Max. recording duration**: 72 hours

### medilog®FD5 plus, medilog®AR4 plus, medilog®AR12 plus recorder specifications
- **Dimensions (h x w x l) in mm**: 76 x 60 x 25
- **Weight without battery**: 115 g
- **Electrodes**: 3, 5 or 7
- **ECG channels**: 1 or 3
- **Sampling frequency**: 3 x 8,000 Hz
- **Resolution**: 15.5 bit
- **Batteries**: 1 x 1.5 V (AAA)
- **Recording duration**: max. 80 hours
- **Waterproof**: IPX4
- **Automated cable test**: Impedance