

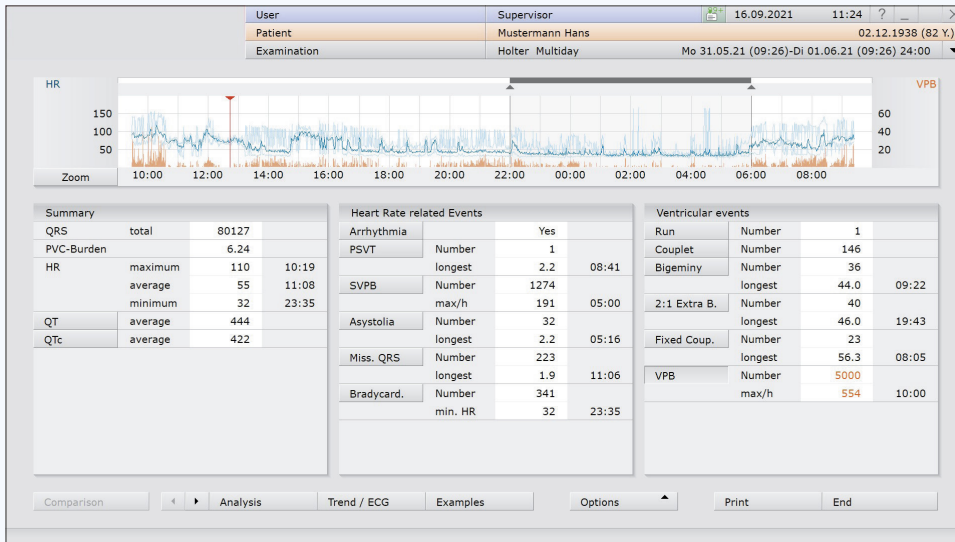


custo diagnostic – quick and easy!

Achieve your goal quickly and easily:  
The Holter ECG in custo diagnostic



# 1 Overview of events found in the Holter ECG



**Overview single day** (Example view with PVC distribution)

The left part, the **summary**, contains the total number of QRS complexes & information about minimum, average and maximum HR per minute.

The information can consider different periods of time: a 24-hour evaluation with day / night phase as well as a multiday evaluation (multiday view).

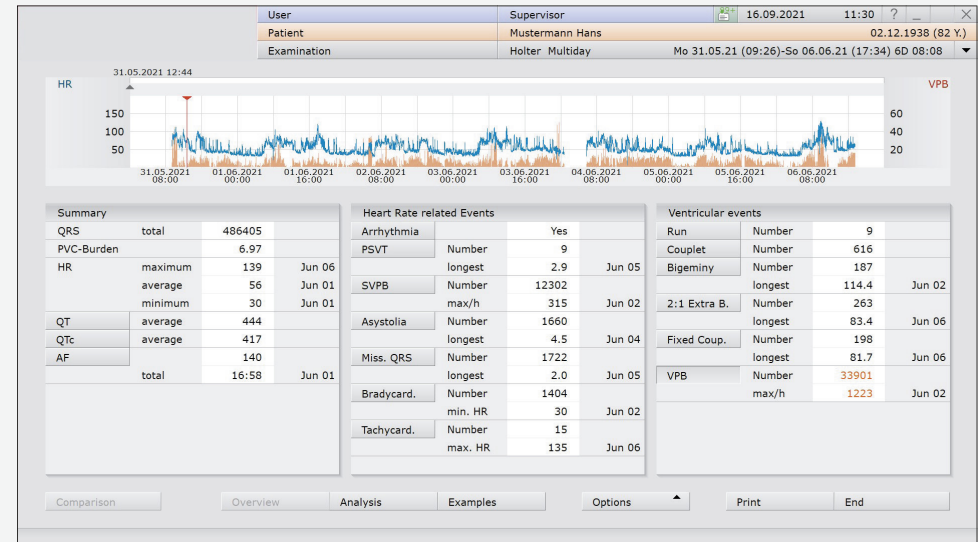
In addition, information as to PVC burden, AF, blood pressure trend (in combined examinations) as well as to QT and ST analysis is provided.

In the centre, all detected **heart rate-related events** are stated, including all bradycardic and tachycardic heart rhythm disorders such as:

- Arrhythmias
- SVT
- SVPB
- Asystole
- Missing QRS complex
- Sinus bradycardia
- Sinus tachycardia

Important: Only those events are specified that have actually been detected.

On the right, all detected **ventricular events** are listed – from the isolated singular PVC to events that are based on more than one PVC, such as couplets, runs, ventricular tachycardias, as well as bigeminy, trigeminy, 2:1 extrasystoles, etc.



**multiday overview** (Example view with PVC distribution)

**The overview page fulfils two tasks:**

1. It gives the user an overview of the kind and frequency of events occurred.
2. It serves as basis for starting the individual editing steps. The information on the overview page is assigned to functions.

**Single mouse-click on an event**

- ▶ Distribution and frequency of the event are shown in the HR trend. For QT or if required QTc, the trend is indicated.

**Double click on:**

• a position in HR trend

- ▶ Opens the view Trend/ECG while skipping to the corresponding position

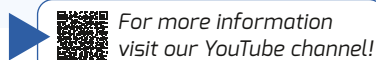
• an event

- ▶ Opens the example page of the event in question
- ▶ Opens the example page of the event in question, in chronologic sorting

• number of an event

- ▶ Opens the example page of the event in question, sorted according to the length

• length of an event



## 2 Check quality and rhythm



### Trend view

Get an overview of the recording quality by changing to the trend view: [Trend / ECG on the overview page](#)

### Different approaches are possible:

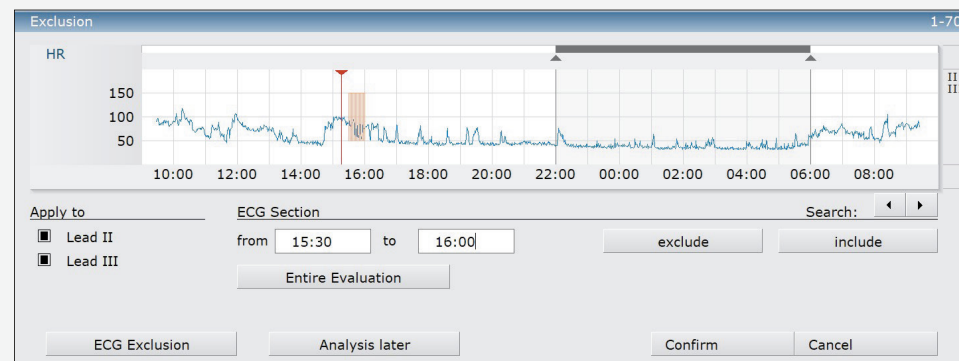
- Click in the HR trend and place the cursor at positions you want to view in the original ECG.
- Change to the total ECG view: [Options/Selection: Total ECG](#). There you can determine which leads and which period you want to look at. You can navigate through the ECG with the [cursor keys \(software or keyboard\)](#).
- Using the button [ECG overview](#), a smaller section is available, however you can use the mouse functions ([mark, measure, change, etc.](#)).

### Options:

You have various options to perform a re-analysis.

Re-analysis on alternative leads:

- Switch to the analysis page: [Analysis](#). Select the button [Options / Selection: Parameter](#) (▶ Tab: Beat identification). In the menu **“Channel selection of analysis / amplification”** you can select the adequate channels for re-analysis.
- After having selected the channel, click on the button [Analysis](#). If you have already edited the ECG, you can decide here if your manual changes are to be kept or not. Then confirm the dialogue box with [Confirm](#).

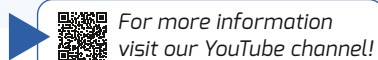


### Dialogue box for defining the ECG exclusion

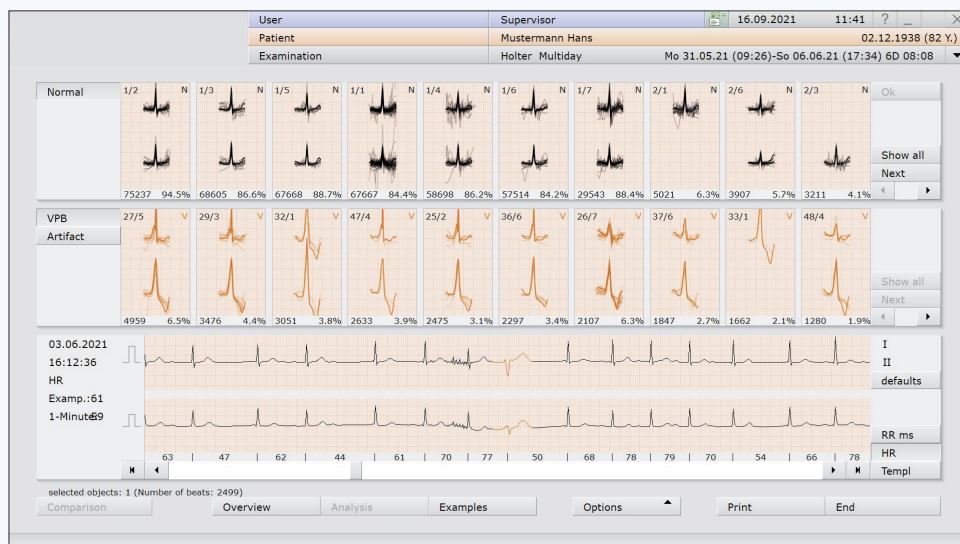
#### Manual exclusion of ECG:

- In the trend view [Trend / ECG](#) click on the button [Options / Selection: Exclusion](#).
- In HR trend, place the cursor at the beginning of the area to be excluded. Click the left mouse button, hold it down and mark the area to be excluded.

In the menu item **“ECG area”**, you can enter the start and end point of the area to be excluded also as time of day.



### 3 Checking the ventricular events



#### Template view

##### Check and if necessary, adapt templates

For editing the ventricular events, different options are available which you can use, depending on the number of VPBs.

From the overview page, you can click on the button **Analysis**, to get the template view.

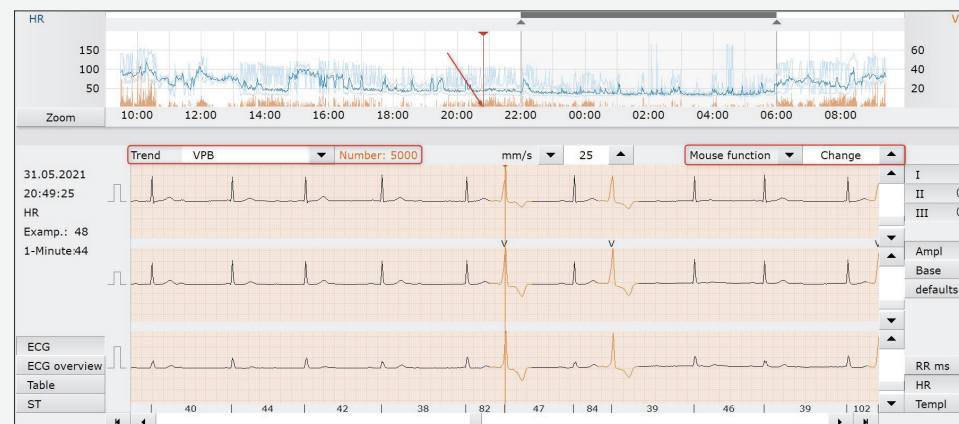
There, the classes **“Normal”**, **“VPB”** and **“Artefact”** are available.

(In pacemaker ECG, the pacemaker-induced actions are in the template **“Pacemaker”**.)

##### Option 1: PVC editing via the template page

This option makes sense if there are many VPBs ( $n > 100$ )

- If you click on a template, the first beat of this template will be shown in the trend ECG.
- You can navigate between the single beats of the templates with the **cursor keys (software/keyboard)**.
- Double-clicking on a template opens the template level below.
- If a template is not correct, it can be selected by clicking and be changed to artefact, ventricular or normal beat by pressing the letters **A**, **V** or **N** on the keyboard. For renaming to a pacemaker class, **P** is used (Pre-condition: the ECG has been analysed with pacemaker).
- Any number of templates can be selected simultaneously, and further functions for template editing are available via the context menu (right click on a template).



#### Trend view, selected trend: VPB

##### Option 2: VPB editing via the trend view **Trend/ECG**

This option makes sense if there is a medium number of PVC (up to 100)

- Switch to the trend view and select the trend **VPB** (make sure that the cursor is on the first event of the selected event type – see red arrow).
- **Choose the mouse function: Change**
- You can move from one event to the other with the cursor keys on your keyboard or in the software. If the cursor is on a correct VPB, press the arrow key to the right **▶** and thus move to the next VPB.
- If the cursor is on a false negative event (e. g. T wave), press **DEL ▶**. The false negative event is deleted and the next VPB is automatically accessed.
- If the cursor is on a normal beat, press **N** on the keyboard **▶** the next VPB is automatically accessed.
- If you want to change a single beat into VPB, press **V**, for changing it into artefact, press **A**.

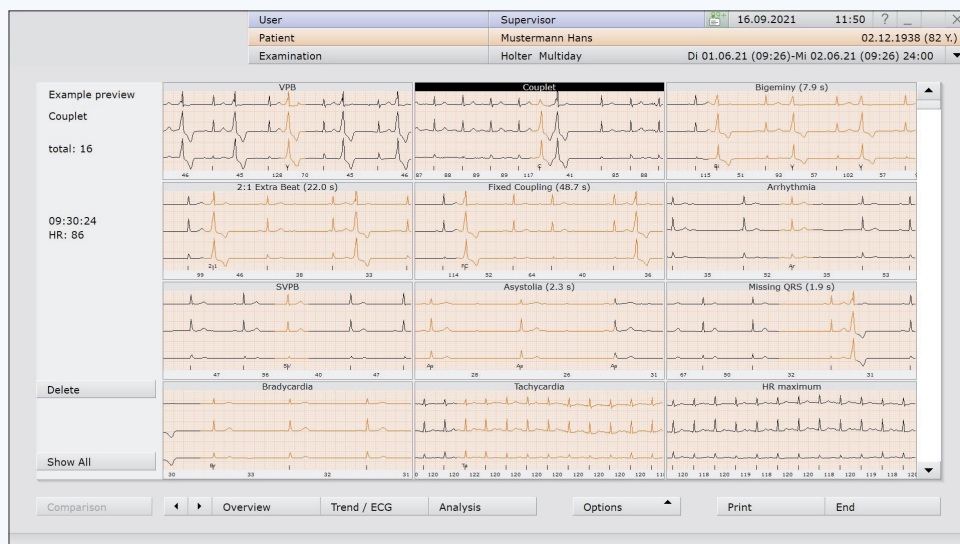
##### Option 3: VPB editing via the example page

- See explanations under 4 “Checking the heart rate-related events”



For more information  
visit our YouTube channel!

## 4 Checking the heart rate-related events



### Example preview

You can access the example preview from the overview page by clicking the button **Examples**. In the example preview, all ventricular and heart rate-related events found are shown. The first example of the respective event type is displayed as an example. From the selected example, the total number of events is then indicated.

### VPB editing via the example page (also refer to fig. “Example preview”)

- Select the VPB example in the example preview. Any number of examples can be selected.
- Now you can decide if you want to view the VPB templates **all templates** or all single VPBs **all PVCs**.

### Deleting a false positive VPB:

- Select the event in question
- Press the button: **delete select.** or the **DEL** key on your keyboard

### Marking a VPB

By marking an event, you highlight it. Marked events can be considered separately when being printed.

- Select the event in question
- Click the button **mark select.** “mark selected ones”
- Marked events are highlighted in colour (see fig. top right)

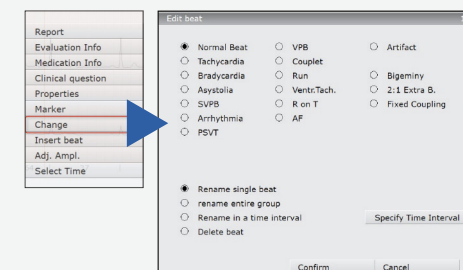


### Example preview – selected event type: VPB

### Changing a VPB (or another event)

- Select the event in question
- Call up the context menu via a right mouse click
- Select the menu item **“Change”**
- Determine the new event type

To get back to the example preview, click the button **Example preview**



### Editing of further, heart rate-related examples

Editing is made according to the above-mentioned procedure.

- Select the next event example to be edited.
- Double clicking on an event in the example preview opens the page with single events of the selected event type.
- Get an overview of whether the correctly detected or the false positive events are prevailing.
- Select the group (correct vs. false positive), where you have the smallest choice.

### Example 1: Ten correct events and one false positive one

- Select the incorrect event
- Press the **DEL** key or choose the button **delete select.**

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## 4 Checking the heart rate-related events

### Example 2: One correct event and ten false positive ones

- Select the correct event
- Choose the button reverse select.
- Press the **DEL** key or choose the button delete select.

### Example 3: All events are incorrect

- Check if all examples are actually incorrect
- Press the **DEL** key or choose the button delete all

### Editing of HR examples for maximum, average and minimum HR

In the example preview, the ECG examples for HR max., HR av. and HR min. are displayed (see fig. above)

- If an example does not appear correctly, select it (mouse click!) and choose the button delete or press the **DEL** key
- The current example is deleted and the next one appears automatically



Example preview: maximum, average and minimum heart rate

## 5 Writing a report

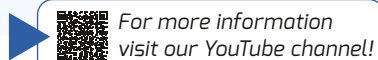
### Calling up the report

At the end of ECG editing there is report writing. To this end the report window is used, which can be called up from any screen in the Holter ECG via a right mouse click.

- Right clicking opens the context menu. Click on the first entry **“Report”** –
- the report dialogue box appears.
- In a multiday evaluation, a report can be created for each single day (selection of the respective day via date) and for all days of a multiday evaluation (selection button **Overview** 1) in their entirety. Precondition: the function **“Multiday report on”** must be activated under the button **Options** (see fig. above)
- For report creation, there is a total of 2)
  - 4 groups with 8 text modules each available,
  - 3) - 32 text modules in sum each of which may be of any length.
- If necessary, adapt the report text and confirm the report with **Confirm** 4)

### Hint:

The text modules can be configured freely and be adapted to the individual needs of the user. The large number of export elements enables maximum flexibility here.





## 6 Appendix: Keyboard shortcuts in the Holter ECG project

### General keys

Keyboard shortcut	Action
<b>Ctrl + Left (←)</b>	Calls up the previous screen.
<b>Ctrl + Right (→)</b>	Calls up the screen from which the user skipped back.

### View “Analysis”

Keyboard shortcut	Action
<b>Area “Template view”</b>	
<b>W</b>	The selection of a template moves on by one template. If no template is selected, the first one will be selected. If the end of a group is reached, the first template of the next available group will be selected. Combined with Shift, the selection moves in the other direction.
<b>N</b>	Sets the selected templates in a normal template.
<b>V</b>	Sets the selected templates in a PVC template.
<b>A</b>	Sets the selected templates in an artefact template.
<b>P</b>	Sets the selected templates in a pacemaker template.
<b>Space bar</b>	Sets the selected templates N - A - V - S - N template.

### View “Analysis”

Keyboard shortcut	Action
<b>Left (←)</b>	Searches the previously selected template.
<b>Right (→)</b>	Searches the next selected template.
<b>Enter (Return)</b>	Executes the action behind the button “OK” if this is active.
<b>ESC</b>	Sets back the selected templates, so that no template is selected anymore.
<b>Shift+A</b>	Normal templates skip back by 10.
<b>Shift+D</b>	Normal templates skip forward by 10.
<b>Shift+Y</b>	PVC templates skip back by 10.
<b>Shift+C</b>	PVC templates skip forward by 10.
<b>F2</b>	Calls up the dialogue box “Mark ECG” or deletes the marking.

### Area “View single complexes”

<b>Cursor keys</b>	Position of the selected template.
<b>Page-up/Down</b>	Next/Previous page.
<b>Home/End</b>	Beginning/End position.

### View “Trend / ECG”

Keyboard shortcut	Action
<b>Area “ECG” (horizontal scrolling)</b>	
<b>Left (←)</b>	Searches the previously selected event.
<b>Right (→)</b>	Searches the next selected event.
<b>F2</b>	Calls up the dialogue box “Mark ECG” or deletes the marking.
<b>N</b>	Renames to beat of the present cursor position to a normal beat without further notice. Precondition: Mouse function = Change
<b>V</b>	Renames to beat of the present cursor position to a PVC-isolated beat without further notice. Precondition: Mouse function = Change
<b>Area “ECG overview” (vertical scrolling, with trend)</b>	
<b>Up (↑)</b>	Moves the entire view up one line.
<b>Down (↓)</b>	Moves the entire view down one line.
<b>Ctrl + Up (↑)</b>	Moves the entire view up one page.
<b>Ctrl + Down (↓)</b>	Moves the entire view down one page.
<b>Page Up</b>	duces the scroll value by one value. If it becomes negative, the ECG will scroll backwards, afterwards speed will increase.
<b>Page Down</b>	Increases the scroll value by one value. If it becomes positive, the ECG will scroll forwards, afterwards speed will increase.



**View “Trend / ECG”**

Keyboard shortcut	Action
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**Area “ECG overview” (vertical scrolling, with trend)**

<b>Space bar</b>	Starts or stops scrolling.
<b>Ctrl + Shift + Home</b>	Skips to the beginning of the ECG. Precondition: Mouse function = exclusion
<b>Ctrl + Shift + End</b>	Skips to the end of the ECG. Precondition: Mouse function = exclusion
<b>F2</b>	Calls up the dialogue box “Mark ECG” or deletes the marking. Precondition: Mouse function <> Exclusion

**Area “Table”**

<b>Up (↑)</b>	Scrolls up within the table.
<b>Down (↓)</b>	Scrolls down within the table.

**Area “ST”**

<b>Space bar</b>	Start/Stop superimposition.
<b>Page-Up/Down</b>	Show previous/next ST example.
<b>F2</b>	Calls up the dialogue box “Mark ST example” or deletes the marking.
<b>Left (←)</b>	Searches the previously selected event. Precondition: it is an event trend.
<b>Right (→)</b>	Searches the next selected event. Precondition: it is an event trend.

**View “Example page”**

Keyboard shortcut	Action
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**Area “Example overview”**

<b>Arrow keys (↑↓←→)</b>	Move “cursor” within the examples.
<b>Home</b>	“Cursor” skips to the first example.
<b>End</b>	“Cursor” skips to the last example.
<b>Page Up</b>	“Cursor” skips one page up.
<b>Page Down</b>	“Cursor” skips one page down.
<b>Return</b>	Calls up the screen “Single example” with the example event currently selected.
<b>F2</b>	Marks or deletes the marking of the example without dialogue box.
<b>F3</b>	Deletes all examples of the event (with warning notice).
<b>Del</b>	Deletes the top event of the example. If there is no more event, the example will be deleted.

**Area “View single example”**

<b>Arrow keys (↑↓←→)</b>	Move “cursor” within the examples.
<b>Shift + Arrow keys (↑↓←→)</b>	Move “cursor” within the examples. Selection is automatically made.
<b>Home</b>	“Cursor” skips to the first example.
<b>End</b>	“Cursor” skips to the last example.

**View “Example page”**

Keyboard shortcut	Action
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<b>Shift + Home</b>	“Cursor” skips to the first example and selects all examples between the first example and the last position.
<b>Shift + End</b>	“Cursor” skips to the last example and selects all examples between the last position and the last example.
<b>Page Up</b>	“Cursor” skips one page up.
<b>Page Down</b>	“Cursor” skips one page down.
<b>Shift - Page Up</b>	“Cursor” skips one page up and selects the skipped examples.
<b>Shift - Page Down</b>	“Cursor” skips one page down and selects the skipped examples.
<b>ESC</b>	Cancel the selection of the examples.
<b>Space bar</b>	Set or takes the selection of the example.
<b>Return</b>	Calls up the screen “Example overview” and selects the example in question that is shown in this screen.
<b>F2</b>	Marks or deletes the marking of the example without dialogue box. If examples are selected, each selected example will be treated accordingly. This means that examples which are selected and marked are unmarked, and examples which are selected and not marked are marked.
<b>F3</b>	Deletes all examples of the event (with warning notice).
<b>Del</b>	Deletes the example. If examples are selected, all selected examples will be deleted.





View “Total ECG” (vertical scrolling)		View “Exclusion” (vertical scrolling with exclusion function)		View “Pacemaker”, “RR variability”, “HRT”	
Keyboard shortcut	Action	Keyboard shortcut	Action	Keyboard shortcut	Action
<b>Up (↑)</b>	Scrolls up as long as the key is pressed.	<b>Up (↑)</b>	Scrolls up as long as the key is pressed.	<b>Left (←)</b>	Searches the previous point in time of the specified PM trend.
<b>Down (↓)</b>	Scrolls down as long as the key is pressed.	<b>Down (↓)</b>	Scrolls down as long as the key is pressed.	<b>Right (→)</b>	Searches the next point in time of the specified PM trend.
<b>Ctrl + Up (↑)</b>	Moves the entire view a whole page up.	<b>Ctrl + Up (↑)</b>	Moves the entire view a whole page up.	<b>F2</b>	Calls up the dialogue box “Mark ECG” or deletes the marking.
<b>Ctrl + Down (↓)</b>	Moves the entire view a whole page down.	<b>Ctrl + Down (↓)</b>	Moves the entire view a whole page down.	<b>End</b>	“Cursor” skips to the last example.
<b>Shift + Up (↑)</b>	Moves the entire view one line up.	<b>Shift + Up (↑)</b>	Moves the entire view one line up.		
<b>Shift + Down (↓)</b>	Moves the entire view one line down.	<b>Shift + Down (↓)</b>	Moves the entire view one line down.		
<b>Page Up</b>	Reduces the scroll value by one value. If it becomes negative, the ECG will scroll backwards, afterwards speed will increase.	<b>Page Up</b>	Reduces the scroll value by one value. If it becomes negative, the ECG will scroll backwards, afterwards speed will increase.		
<b>Page Down</b>	Increases the scroll value by one value. If it becomes positive, the ECG will scroll forwards, afterwards speed will increase.	<b>Page Down</b>	Increases the scroll value by one value. If it becomes positive, the ECG will scroll forwards, afterwards speed will increase.		
<b>Space bar</b>	Starts or stops scrolling.	<b>Space bar</b>	Starts or stops scrolling.		
<b>F2</b>	Calls up the dialogue box “Mark ECG” or deletes the marking.	<b>Ctrl + Shift + Home</b>	Skips to the beginning of the ECG. Precondition: mouse function = exclusion		
		<b>Ctrl + Shift + End</b>	Skips to the end of the ECG. Precondition: mouse function = exclusion		

This screen is called up via the dialogue box “Exclusion”, button “ECG exclusion”.