HeartX Holter Service

Welcome to HeartX Holter Analysis Service, your all-inclusive solution for precise and insightful analysis of Holter (ECG) data. Our service empowers you to save valuable time in Holter analysis by delivering an automated pre-analyzed Holter report within one business day, ready for your efficient interpretation and diagnosis. The following document explains the provided analysis results of HeartX Holter in more detail.

Before we start:

It's important to note that while our service provides an automated analysis with a specific sensitivity and specificity, it doesn't guarantee 100% accuracy. Additionally, this is a pre-analysis, and we do not offer diagnoses. The final report always includes a full disclosure section, ensuring all ECG data is available for your review, allowing you to set the final interpretation.

The quality of the data is a crucial factor within your team's responsibility. Adequate ECG quality significantly impacts the accuracy of the pre-analysis and, consequently, the reliability of your interpretations. A poor ECG quality makes it challenging to generate precise results and hinders your ability to derive meaningful insights.

HeartX Holter Events

The automated analysis is conducted by our CardioDay Holter analysis software, a trusted name in the market for over 30 years. This analysis identifies a specific set of events, though it may not classify all existing cardiological phenomena. Instead, it distinguishes certain events, enabling you to pinpoint specific phenomena within our categorized events.

Definition of detected Events:

Event	Description
R-R pause	RR interval ⩾ 2000 milliseconds.
VE tachycardia	Series of at least four QRS complexes (V) with an average heart rate > 80 bpm.
VE run (⩾ 4 beats)	Series of at least four QRS complexes (V) with an average heart rate < 80 bpm.
VE Triplet	Three consecutive QRS complexes (V), regardless of prematurity or heart rate.
VE Couplet	Two consecutive QRS complexes (V), regardless of prematurity or heart rate.
VE Bigeminy	At least two alternations between normal beat (N) and ventricular beat (V).
VE isolated	Any isolated QRS complex (V), regardless of prematurity or heart rate.
Bradycardia	Heart rate of at least four beats below 50bpm.
N-N delay	Atypical and sudden extension of the RR interval—RR interval 140% delayed to an average value from previous RR intervals.
SVE tachycardia	Series of at least four QRS complexes (S) with an average heart rate > 120 bpm.

Event	Description
SVE run (≥ 4 beats)	Series of at least four QRS complexes (S) with an average heart rate < 120 bpm.
SVE triplet	Three consecutive QRS complexes (S).
SVE couplet	Two consecutive QRS complexes (S).
SVE bigeminy	At least two alternations between normal beat (N) and supraventricular beat (S).
SVE isolated	Any isolated QRS complex (S). In CardioDay, a value averaged over previous RR intervals is used to determine premature beats (Prematurity set at 80%).

For example, the following cardiological phenomena are not classified automatically:

- Different types of AV block
- Bundle branch block
- Junctional Beat
- Atrial flutter

However, the events displayed (e.g. Pause, NN delay, VE isolated) will allow you to confirm your diagnosis of these cardiological phenomena.

HeartX Holter Report

The HeartX Holter PDF report encompasses essential information to aid your understanding of the recorded data. Here's a breakdown of the report sections:

Cover page

The cover page shows a summary of detected events along with recording details such as date, start time, recording duration, and the percentage of the recording duration that could not be analyzed due to noise.

In the General Section, the report offers insights into:

- The total number of detected QRS complexes.
- Percentages of ventricular and supraventricular beats.
- For Pacemaker recordings, the number and percentage of paced beats.
- The count of beats within bradycardia.

The Heart Rate Section furnishes details on:

- The average heart rate calculated over the entire recording duration.
- Minimum and maximum heart rates averaged over one minute.
- Minimum and maximum heart rates over approximately 10 beats.

The Supraventricular and Ventricular Sections present

- events detailed in the preceding "HeartX Holter Events" chapter.

The Arrhythmia Section includes:
- The total number of detected pauses (R-R intervals > 2.00 s).
- Number of pauses > 3 and > 4 seconds.
- The longest pause with corresponding time.

In the Atrial Fibrillation Section, you'll find
- the number of minutes and the total percentage of atrial fibrillation present in the recording.

Below the event table, a written summary encapsulates the findings in a textual format. It's important to note that this summary reflects the automated analysis and does not provide any diagnosis or interpretation.

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HOLTER REPORT

Start of recording: 8:20 AM Date of recording: 11/14/2022
Duration: 23:40 hours
This report was created with CardioDay v2.7.0.136 (Beta)

General	Heart Rate Data
87892 QRS complexes	49 Minimum HR (10 beats) at 5:00 AM
139 Ventricular ectopic beats (0%)	66 Average
6759 Supraventricular ectopic beats (8%)	158 Maximum HR (10 beats) at 1:47 PM
0 % of total time classified as noise	50 Minimum HR (Avg for 60s) at 5:00 AM
343 Beats in bradycardia (< 50 bpm), 0% total	131 Maximum HR (Avg for 60s) at 1:31 PM
1216 Beats in tachycardia (> 100 bpm), 1% total	

Supraventricular Ectopy (8%)	Ventricular Ectopy (0%)
143 Isolated	24 Isolated
23 Couplets	19 Couplets
11 Triplets	10 Triplets
12 Bigeminal cycles	0 Bigeminal cycles

Supraventricular Runs	Ventricular Runs
9 Runs (≥ 4 beats) totaling 95 beats, 0%	0 Runs (≥ 4 beats) totaling 0 beats, 0%
30 Beats longest run 119 bpm at 9:37 AM	
4 Beats fastest run 120 bpm at 9:56 AM	
31 Tachycardia (≥ 4 beats at 120 bpm) totaling 6442 beats, 7%	9 Tachycardia (≥ 4 beats at 80 bpm) totaling 47 beats, 0%
1174 Beats longest tachycardia 124 bpm at 6:32 PM	10 Beats longest tachycardia 135 bpm at 9:55 AM
23 Beats fastest tachycardia 162 bpm at 1:47 PM	6 Beats fastest tachycardia 158 bpm at 12:53 PM

Bradyarrhythmia	Atrial Fibrillation
2 Pause (> 2.00 s) Longest 2.34 s at 9:44 AM	4 minutes of AFIB with a burden of (< 1%)
42 N-N Delay (Delay > 140 %)	

Summary

The recorder was hooked up at 8:20 AM on 11/14/2022.

The recording was 23:40 hours in duration and a total of 87892 QRS complexes were detected.
The average heart rate was 66 bpm, the minimum heart rate was 50 bpm at 5:00 AM, and the maximum heart rate was 131 bpm at 1:31 PM.

Atrial fibrillation was present for 4 minutes (< 1% of the recorded duration).

43 episodes of bradycardia were detected, the longest bradycardia episode was 19.4 seconds in duration at 5:07 AM with a rate of 50 bpm and the slowest bradycardia episode had a rate of 49 bpm and was at 5:14 AM. 2 pauses were detected, the longest pause was 2.34 seconds in duration at 9:44 AM.

A total of 6759 supraventricular ectopic beats were detected (8% of total beats). 143 supraventricular beats were isolated, there were 23 couplets, and 6570 beats in 51 total supraventricular runs. 4 episodes of supraventricular bigeminy were detected for a total of 12 cycles of supraventricular bigeminy. 31 of the runs were episodes of supraventricular tachycardia (>=4 beats in length, >120 bpm), the longest supraventricular run was 1174 beats in length with a rate of 124 bpm at 6:32 PM and the fastest supraventricular run had a rate of 162 bpm and was 23 beats in length at 1:47 PM.

A total of 139 ventricular ectopic beats were detected (0% of total beats). 24 ventricular beats were isolated, there were 19 couplets, and 77 beats in 19 total ventricular runs. 9 of the runs were episodes of ventricular tachycardia (>= 4 beats in length, >80 bpm), the longest ventricular run was 10 beats in length with a rate of 135 bpm at 9:55 AM and the fastest ventricular run had a rate of 158 bpm and was 6 beats in length at 12:53 PM.

Version 2.7.0 | 2.7.0   CardioDay® v2.7

Hourly Summary

The Hourly Summary is presented in a tabular format, with each hour featuring the following details:

- The duration of analyzed ECG data in minutes for each recorded hour.
- The count of QRS complexes per hour.
- Hourly statistics for heart rate, including the minimum, maximum (averaged over one minute), and the average heart rate.
- The number of pauses lasting >2.00 seconds per hour.
- Hourly counts for isolated ventricular/supraventricular beats.
- The number of ventricular/supraventricular couplets per hour.
- The count of ventricular/supraventricular runs with three or more beats, encompassing ventricular/supraventricular triplets, runs, and tachycardia. Additionally, this includes the maximum beat count of the run and the maximum heart rate within the run.

Name:	**General, Demo**		Date of Birth: **12/30/1928**		Date:	**2/25/2021**
ID number:	**1234503**		Gender: **M**		Channel: **1+2**	Page: **12/13**

Hourly Summary

| Hour	Min.s Used	#QRS's	Heart Rate Min. (bpm)	Heart Rate Ave. (bpm)	Heart Rate Max. (bpm)	Pauses	Ventricular Iso	Ventricular Cplt	Ventricular Runs (>=3)	Ventricular Max Run (beats)	Ventricular Max Rate (bpm)	Supraventricular Iso	Supraventricular Cplt	Supraventricular Runs (>=3)	Supraventricular Max Run (beats)	Supraventricular Max Rate (bpm)
12	18	1857	100	105	**123**	0	3	0	0	0	0	1	0	0	0	0
13	60	6209	99	103	110	0	5	0	0	0	0	2	0	0	0	0
14	60	4906	70	82	98	0	**61**	0	0	0	0	4	1	0	0	0
15	60	5734	87	96	102	0	20	0	0	0	0	0	0	0	0	0
16	60	5843	89	97	121	0	37	0	0	0	0	3	0	0	0	0
17	60	5772	90	96	103	0	54	0	0	0	0	3	0	0	0	0
18	60	**6339**	99	106	119	0	9	0	0	0	0	1	1	0	0	0
19	60	6104	98	102	111	0	9	0	0	0	0	2	0	0	0	0
20	60	6015	91	100	109	0	8	0	0	0	0	1	0	0	0	0
21	60	5687	91	95	105	0	15	0	0	0	0	2	0	0	0	0
22	60	5399	67	90	101	0	18	0	0	0	0	1	0	0	0	0
23	60	4252	64	71	84	0	10	0	0	0	0	4	**2**	0	0	0
00	60	4449	65	74	99	0	7	0	0	0	0	5	0	0	0	0
01	60	4776	65	80	105	0	8	0	0	0	0	**11**	0	0	0	0
02	60	4102	62	68	93	0	0	0	0	0	0	6	0	0	0	0
03	60	4634	64	77	101	0	3	0	0	0	0	5	0	0	0	0
04	60	4071	62	68	83	0	1	0	0	0	0	5	0	0	0	0
05	60	3925	**59**	65	80	0	0	0	0	0	0	7	0	0	0	0
06	60	4835	61	81	99	0	3	0	0	0	0	5	0	0	0	0
07	60	5378	78	90	101	0	8	0	0	0	0	4	0	0	0	0
08	57	5283	85	93	119	0	29	**1**	0	0	0	3	0	0	0	0
xx	xx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
xx	xx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
xx	xx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1215	105570	59	88	123	0	308	1	0	0	0	75	4	0	0	0

Heart Rate Diagram including Minimum and Maximum Heart rate

The HR Diagram + Min/Max minute displays the Heart rate Trend in the upper part of the screen. The trend is displayed with three different colors.
The blue line in the middle represents the heart rate's average values per minute. The top red line represents the maximum value of the heart rate per minute. In order to reduce interference, the moving average of the individual values is taken over approximately 10 beats. The bottom green line represents the minimum values per minute, which have been averaged in the same way.

Additionally the ECG curves for the minutes with the highest and lowest heart rates averaged over one minute are displayed.

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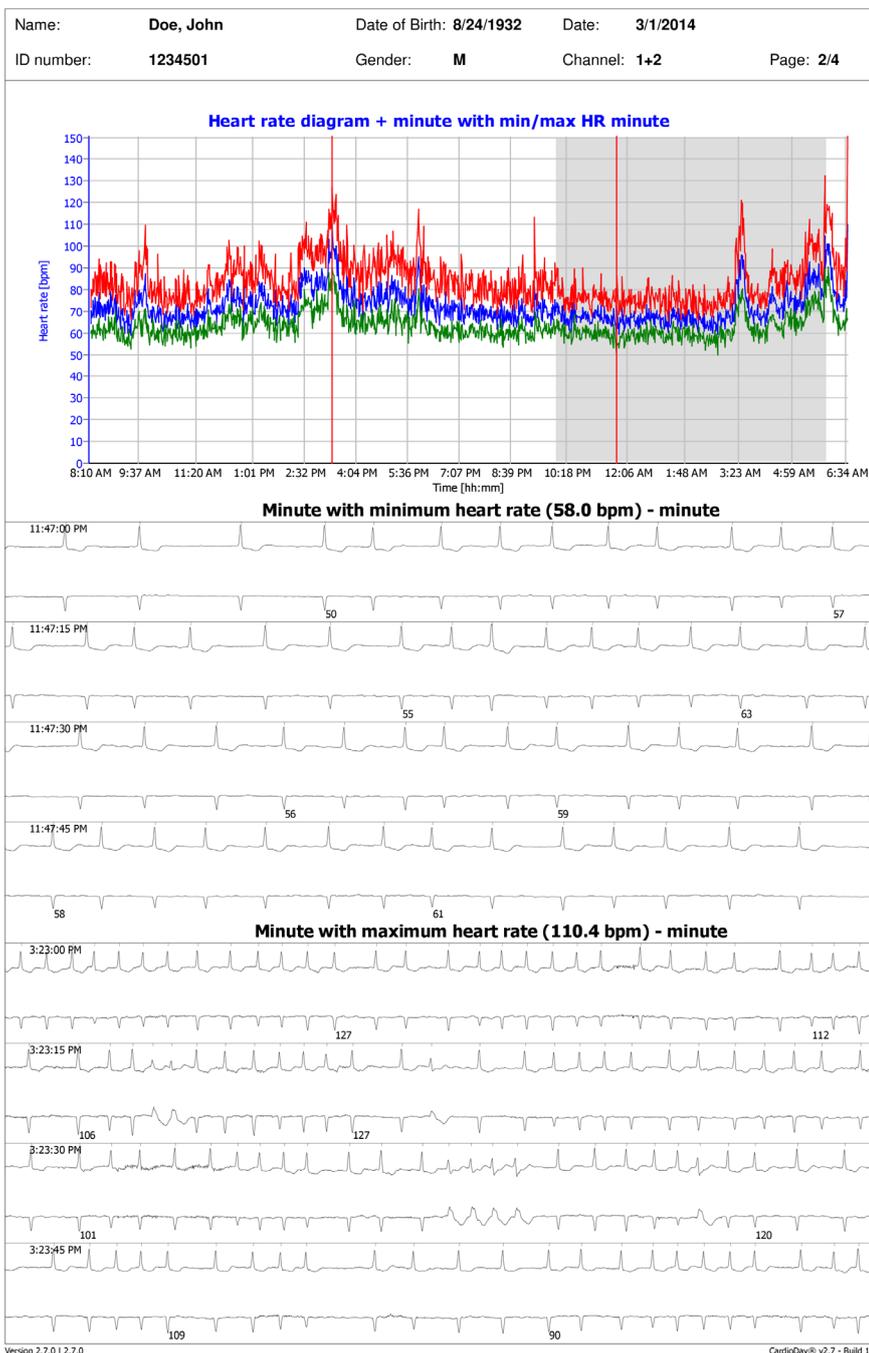
Lorenz plot

This page shows the RR Lorenz plot. Each RR interval on the ordinate is plotted against its previous RR interval on the abscissa. Furthermore, the frequency distribution of the RR interval pairs displayed is color-coded, allowing the detection of rhythm problems at a glance. The upper graphic shows the Lorenz plot from all beats whereas the lower graphic displays the Lorenz plot from just the normal (N) beats.

Name:	**AFib, Demo**	Date of Birth:	**21/07/1913**	Date:	**03/03/2015**
ID number:	**1234502**	Gender:	**M**	Channel: **1+2**	Page: **4/9**

RR Lorenz plot (RR<= 1800 ms) from all beats

RR Lorenz plot (RR<= 1800 ms) from all normal beats

Version 2.5.1 | 2.0.1   CardioDay® V2.5 SP1
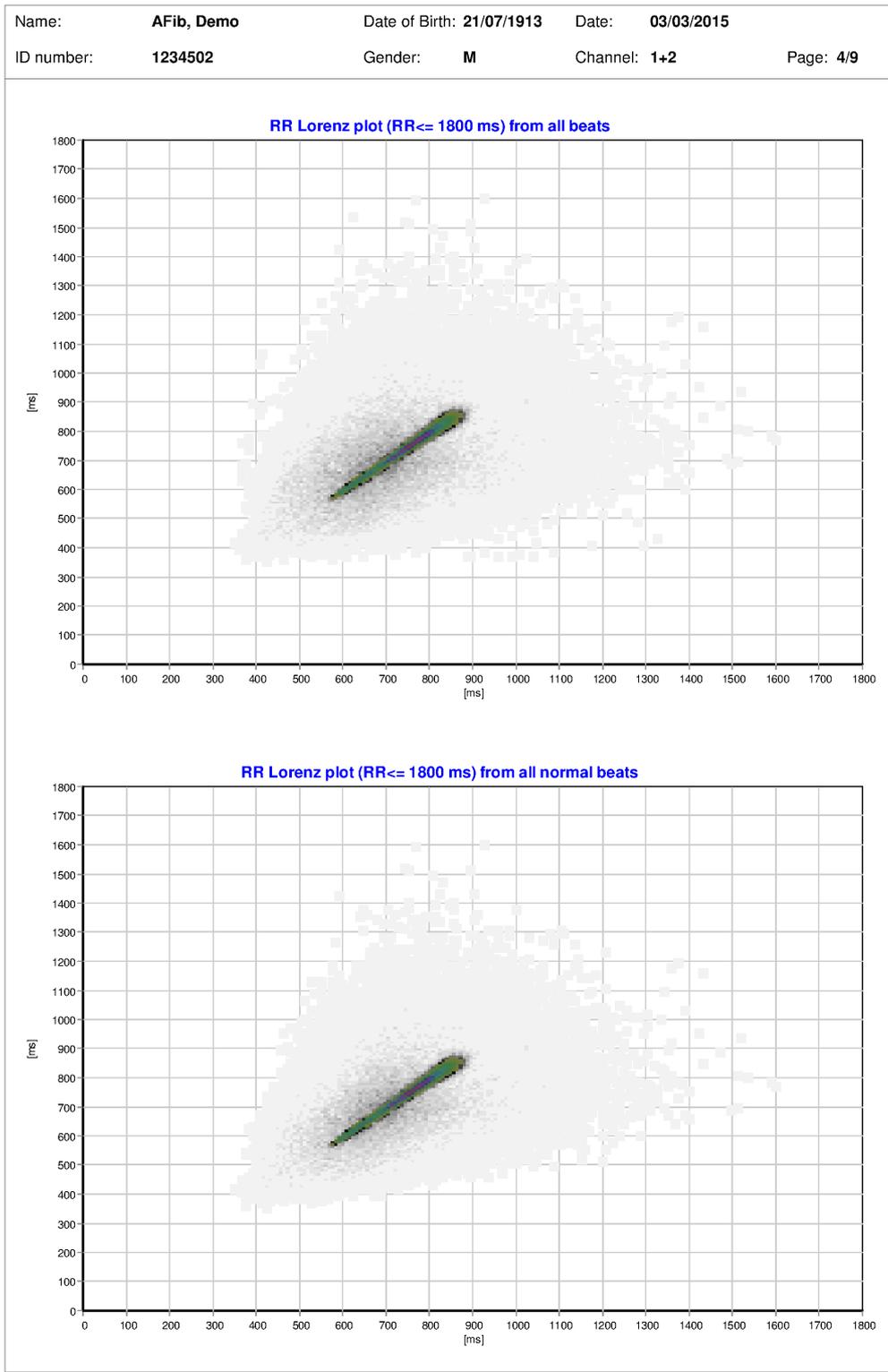
AFib statistics

If Atrial fibrillation is present in a recording an additional page is included in the pdf report that shows the AFib episodes, marked in the heart rate trend, a list of AFib episodes including the information start, end, duration and mean heart rate of the coresponding episode. Furthermore, an ECG sample of the beginning of the first episode is displayed.
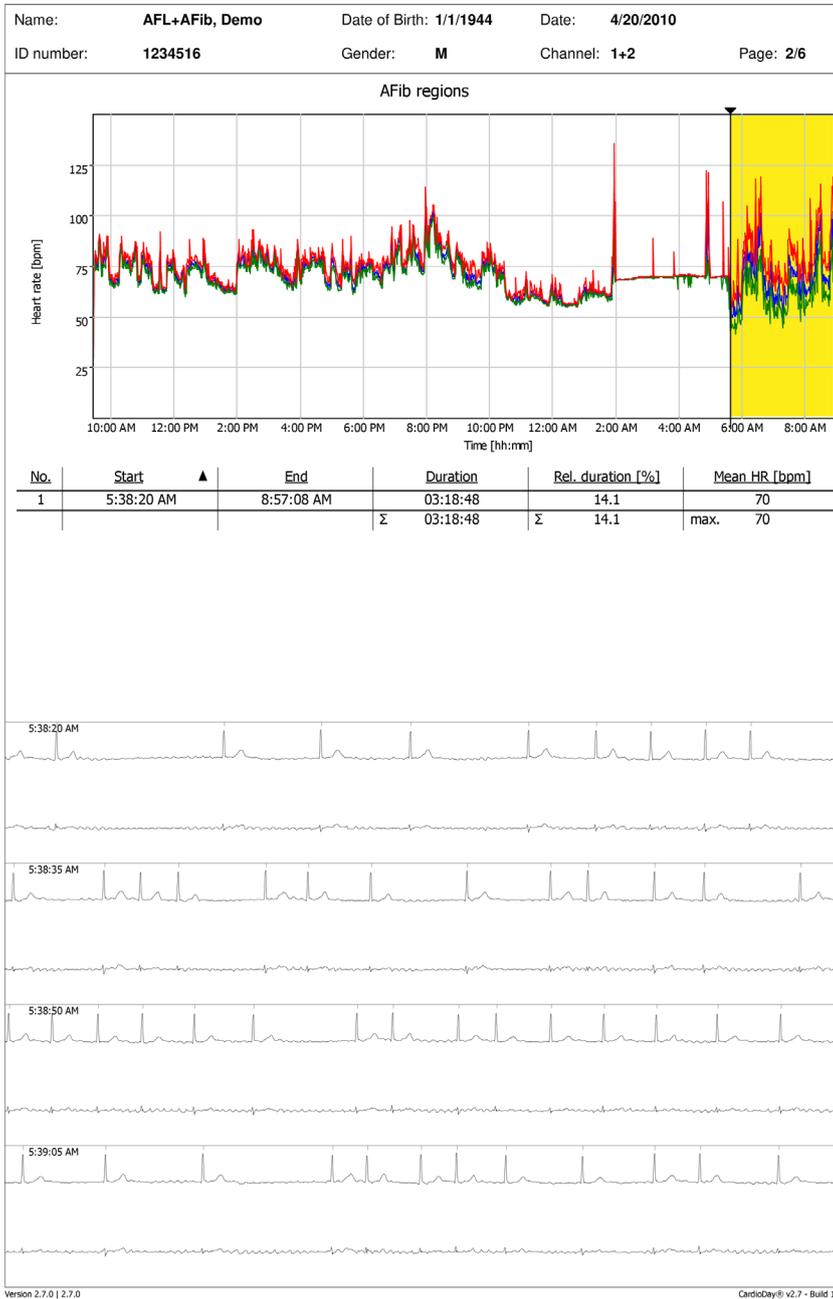
1 minute + 25mm/s strip

This shows the ECG sample strips of the detected events. For each event type that was found two sample strips are saved. Above the 25 mm/s strip a one minute period is displayed to show the pre and post time of the event.
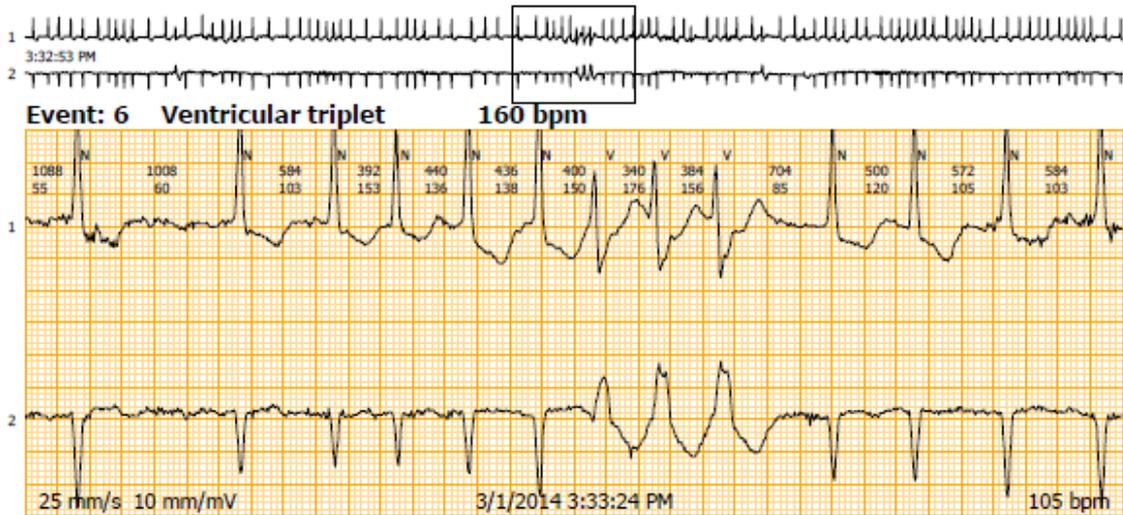
Full disclosure

To provide you the complete ECG raw data there is the full disclosure added as a last section to the pdf report. It will show one hour of ECG data per page.
For each minute row, the average heart rate is displayed on the right side. Additionally, if an event was detected, the event name is also displayed on the right side.