getemed

# Instructions for Use

## HeartX Analyzer

Rev. 8 | EN

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## Information about this Manual

This manual is published by GETEMED Medizin- und Informationstechnik AG Oderstr. 77, 14513 Teltow, Germany. The information in this manual applies to the Holter module of HeartX Viewer.

This manual contains the currently released content; further chapters may be added in later revisions.

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## Revision History

| Version | Date | Description of Changes |
|---|---|---|
| 01 | 27.01.2026 | Initial version |
| 02 | 13.03.2026 | New version for HeartX Analyzer 2.0.0. |
| 03 | 01.04.2026 | New version for HeartX Analyzer 2.1.0. |
| 04 | 29.04.2026 | New version for HeartX Analyzer 2.2.0. |
| 05 | 10.06.2026 | New version for HeartX Analyzer 2.3.0. |
| 06 | 16.07.2026 | New version for HeartX Analyzer 2.4.0. |
| 07 | 20.08.2026 | New version for HeartX Analyzer 3.0.0 |
| 08 | 21.10.2026 | New version for HeartX Analyzer 4.0.0 |

# 2 Safety Information

To work safely with the HeartX Viewer, please observe the precautions and notes below.

## 2.1 Meaning of the Signal Words

The terms "Warning" and "Caution" are used in these instructions for use to indicate risks and the severity of a hazard. A risk is defined as a source of possible injury to a person.

> **WARNING**
> Indicates a possible risk or an unsafe practice which, if not avoided, may result in death or serious injury.

> **CAUTION**
> Indicates a possible risk or an unsafe practice which, if not avoided, may result in minor injury or in damage to the product or to other property.

> **NOTE**
> Indicates application notes or other useful information to make sure that you can use the product to its full extent.

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# 3 HeartX Analyzer

## 3.1 General Notes

> **NOTE**
> The HeartX Analyzer analysis module does not make diagnoses on its own; it determines related and calculated values for ECG recordings. The resulting data can then be reviewed and edited by medical personnel.

## 3.2 Heart Rate Calculation

The heart rates are calculated for telemedical ECGs. All RR intervals that neither lie within nor cross a noisy region are used; R waves within a noisy region are discarded beforehand. The following values are calculated from the resulting RR intervals:

- **Minimum heart rate:** The mean of every 5 consecutive RR intervals is calculated. The largest of these mean values (in ms) is converted into beats per minute.
- **Maximum heart rate:** The smallest of these mean values (in ms) is converted into beats per minute.

- **Mean heart rate:** The mean is calculated over all RR intervals (in ms) and then converted into beats per minute.

A group of 5 RR intervals that contains an interval crossing a noisy region is skipped. All values are rounded to whole heart rates.

### 3.3 Rhythm Analysis

For telemedical ECGs, the RR intervals are additionally evaluated for bradycardia and tachycardia. RR intervals that cross a noisy region are not considered.

- **Bradycardia:** An ECG is classified as bradycardic when 5 consecutive RR intervals are each longer than 1,200 ms (≙ heart rate below 50 bpm).
- **Tachycardia:** An ECG is classified as tachycardic when 8 consecutive RR intervals are each shorter than 600 ms (≙ heart rate above 100 bpm).

The ECG is further analyzed for its rhythm with an AI-based model, which assigns every section of the ECG to one of the following categories:

- Atrial fibrillation
- Sinus rhythm
- Other rhythm
- Noise

Each section of the ECG is thus assigned a rhythm. The overall rhythm of the ECG is the rhythm with the largest total duration.

#### AFib Post-processing

Before output, the detected atrial fibrillation regions are post-processed in the following order:

1. Short interruptions within an atrial fibrillation episode are counted as part of the episode, so that one continuous episode is not split into several short ones. For this, atrial fibrillation regions separated by at most 4 s without atrial fibrillation are merged, provided there is no noise in between.
2. Atrial fibrillation regions shorter than 10 s are discarded. If the ECG then contains only a single atrial fibrillation region, it is only output if it has a minimum duration of 20 seconds.
3. Noisy regions are cut out of the remaining atrial fibrillation regions.

For Holter ECGs, atrial fibrillation regions for which the model is not sufficiently certain are additionally discarded. The shorter the region, the higher the required certainty: from 80 % for very short regions to 50 % for very long regions.

The AFib result of a telemedical ECG is positive if at least one atrial fibrillation region remains after this post-processing. It is determined independently of the overall rhythm.

#### Data Sets

The following databases were used to train and optimize the model:

- PTB-XL
- Shaoxing Long-Term AF Database
- European ST-T Database
- MIT-BIH Malignant Ventricular Ectopy Database
- MIT-BIH Atrial Fibrillation Database
- CPSC2021
- 2017 PhysioNet/CinC Challenge
- GETEMED's own data set of annotated telemedical and long-term ECGs

Because several databases are used, the data contains ECG recordings from different ECG recorders. In total, 95,379 (28,117 atrial fibrillation, 51,519 sinus rhythm, 15,743 other rhythm) different 10-second ECG strips from these databases were used.

#### Model Architecture

The rhythm model is a learning model based on the transformer architecture. The model evaluates the ECG in 60-second windows that are shifted in steps of 15 s, and categorizes the rhythm (atrial fibrillation, sinus rhythm, other rhythm, noise). For each section of the ECG, the predictions of all windows covering that section are averaged. This yields the rhythm regions of the entire ECG.

1. First, the model uses a series of convolution layers to extract features from the input data.
2. The convolution layers are followed by the transformer part of the model.
3. The data is then passed through several transformer layers into a linear model, which serves as the classifier.

## 3.4 Noise Detection

The analysis determines the noisy regions of an ECG recording.

- **Telemedical ECGs:** The noisy regions are the regions that the rhythm model classifies as noise. In addition, regions where the signal is in saturation or shows no amplitude, and regions with an open lead on all channels, are marked as noise. A section shorter than 5 s that lies between noisy regions is also marked as noise.
- **Holter ECGs:** The noisy regions are determined by the AI model for beat detection, which assesses the signal quality in addition to detecting the heartbeats. Regions where the signal is in saturation or shows no amplitude, and regions with an open lead on all channels, are excluded from the rhythm analysis.

Gaps in the recording (sections without signal) are treated like noisy regions. Signal sections between gaps that are shorter than 4 s are not analyzed for their rhythm.

## 3.5 R Trigger and Beat Detection

For telemedical ECGs, HeartX Analyzer detects the R waves (beat detection). The detected R waves are used for the further calculations (e.g. of the heart rates).

For Holter ECGs, heartbeats are additionally classified as normal (N) or ventricular (V). The model used for this is described below:

### Data Sets

Internal as well as external data sets were used to train, optimize and validate the heartbeat model. On the one hand, GETEMED's own data set of annotated Holter ECGs is used. On the other hand, established reference databases were used, in particular the MIT-BIH Arrhythmia Database (MITDB), the MIT-BIH Noise Stress Test Database (NSTDB) and the AHA (American Heart Association) Database (AHADB).

The data sets contain annotated heartbeats with position information and classification (e.g. normal or ventricular). For training, ECG recordings are segmented into fixed time windows, within which all heartbeats are considered with their respective position and class.

### Model Architecture

An AI-based learning model based on a transformer architecture is used for beat detection and classification. The model processes ECG strips and detects the individual heartbeats in them, including their position in time and their classification (normal or ventricular).

The ECG signals are first divided into smaller sections (patches) and transferred into a compact feature representation by means of convolution layers. A downstream transformer encoder models the temporal dependencies in the signal before the final detection and classification of the heartbeats takes place.

The model works end-to-end, which means that it processes the raw signal directly and requires no separate, rule-based pre-processing steps for QRS detection. This makes robust and consistent beat detection possible even with varying signal quality.

### Morphology Clusters

For Holter ECGs, the heartbeats of a recording are additionally grouped into morphology clusters by the shape of their QRS complex. Beats with a comparable QRS morphology receive the same cluster index. This way, a reviewer can assess a few representative morphologies instead of every single beat.

- The cluster index is stored per heartbeat in the cluster field of the beat results.
- Cluster indices only apply within one recording. The same index in two recordings does not denote the same morphology.
- A heartbeat whose shape matches no established cluster receives a reserved outlier value instead of a cluster index: 998 for a normal beat (N), 999 for a ventricular beat (V). These two values never denote a cluster.
- If a recording is analyzed in several consecutive blocks, a later block can merge clusters or assign earlier outlier beats to a cluster. The cluster indices of beats that have already been analyzed can therefore change with every new block.
- The grouping changes neither the beat classification (N or V) nor the event analysis.

Morphology clusters are only assigned under the following conditions:

- The first block of a recording starts at the beginning of the recording. Every further block continues seamlessly at the end of the previously analyzed block, without a gap and without overlap. A block that does not meet this condition, or that would restart a recording that has already been analyzed, is rejected with an error message.
- The blocks of a recording are published in order. A block that finishes early waits for its predecessor.
- A recording that combines several separately recorded segments (multi-day recording) is rejected with an error message before the analysis starts. A single continuous recording that lasts longer than one day is supported.

### 3.6 Event Analysis

The event analysis is not intended for making a diagnosis on its own; it supports the physician in the review. An event that is not detected does not necessarily mean that no corresponding event is present.

The event analysis is performed for Holter ECGs. Based on the beat detection, the cardiological events below are determined.

**Reference RR interval:** The reference RR interval is the weighted mean of the last 20 RR intervals between two normal beats outside noisy regions. Once 20 intervals have been collected, a new interval between 0.8 and 1.15 times the current reference is weighted fully, a shorter interval or one up to 1.6 times the reference with 0.2, and a longer interval with 0.05. After a noisy region longer than 300 s, it is discarded and recalculated from the following intervals.

**Supraventricular beats (S):** The beat detection classifies beats as normal (N) or ventricular (V). The event analysis reclassifies a normal beat as supraventricular (S) if its RR interval is shorter than 0.75 times the reference RR interval, the preceding beat is a normal or supraventricular beat, the reference RR interval is already formed from 20 intervals, and the beat does not lie within atrial fibrillation. Beats whose type was set by the user are not reclassified. Beats marked as artifacts are disregarded in the event analysis.

- **Ventricular tachycardia:** At least four consecutive ventricular beats with a beat rate of more than 100 bpm.
- **Ventricular run:** At least four consecutive ventricular ectopic beats that do not meet the criteria of a ventricular tachycardia.
- **Ventricular triplet:** Exactly three consecutive ventricular ectopic beats.
- **Ventricular couplet:** Exactly two consecutive ventricular ectopic beats.
- **Ventricular bigeminy:** Alternating pattern of a normal beat and a ventricular ectopic beat over at least three consecutive cycles. The pattern begins with a normal beat and comprises an even number of beats.
- **Ventricular ectopic beat (PVC)**: Single ventricular ectopic beat. A ventricular ectopic beat that is part of a ventricular bigeminy is not additionally reported as a single PVC.
- **Pause:** Prolonged RR interval that corresponds to at least the defined pause threshold of 2000 ms. Detection is independent of the beat type (N, V or S). Pauses longer than 60 s are not reported. An RR interval that spans a beat marked as an artifact and overlaps a noisy region is not counted as a pause.
- **NN delay (arrhythmia):** NN interval between two consecutive normal beats that is at least 1.4 times the reference RR interval, without a pause being present. If a preceding RR interval exists, the sum of both intervals must also be at least 2.4 times the reference RR interval. In addition, the following criteria must be met:
  - No supraventricular or ventricular beats may lie between the two normal beats.

    - Regions with atrial fibrillation are not considered. If the criteria for a pause and for an NN delay are met at the same time, only the pause is marked.

- **Supraventricular tachycardia:** At least four consecutive supraventricular beats in which the beat rate is continuously more than 100 bpm. A single normal beat can be included in the tachycardia if it is preceded by at least four supraventricular beats and followed by at least four supraventricular beats.
- **Supraventricular run:** At least four consecutive supraventricular ectopic beats that do not meet the criteria of a supraventricular tachycardia. A single normal beat can be included in the run if it is preceded by at least four supraventricular beats and followed by at least four supraventricular beats.
- **Supraventricular triplet:** Exactly three consecutive supraventricular ectopic beats.
- **Supraventricular couplet:** Exactly two consecutive supraventricular ectopic beats.
- **Supraventricular bigeminy:** Alternating pattern of a normal beat and a supraventricular ectopic beat over at least three consecutive cycles. The pattern begins with a normal beat and comprises an even number of beats.
- **Supraventricular ectopic beat (PAC):** Single supraventricular ectopic beat. A supraventricular ectopic beat that is part of a supraventricular bigeminy is not additionally reported as a single PAC.
- **Bradycardia:** At least four consecutive normal or supraventricular beats whose RR intervals are each longer than 1200 ms (≙ beat rate of less than 50 bpm). None of the beats may lie within atrial fibrillation or a noisy region.

#### Removal of Noisy Events

After detection, events are removed in the following cases:

- An event is removed if it overlaps a noisy region or a gap in the recording.
- As an exception, a pause is only removed if it lies completely within a noisy region; if it overlaps a gap, it is removed as well.

### 3.7 ECG Channels

The rhythm analysis and the beat detection are performed on channels 1 and 3 for the HeartX Recorder. For all other Holter recorders, channels 1 and 2 are used for this.

For 2-channel ECGs from the PhysioMem PM 100 (telemedical ECGs), a third channel is calculated from the sum of the first two channels and taken into account in the subsequent analyses.

### 3.8 Metrics

The following metrics refer to the AI model for the rhythm analysis (version: 0.0.1.184) and to the heartbeat detection and classification (version 1.5.0.3).

#### 3.8.1 Metrics on Validation Data

Below are the metrics achieved on the validation data. The validation data is part of the initial data set and was obtained after the process of splitting into training and validation data. The data was used to optimize the model.

| Initial data set | Accuracy | F1 score |
|---|---|---|
| PTB-XL | 90.1 % | 92.9 % |
| Shaoxing | 93.8 % | 94.2 % |
| Long-Term AF Database | 83.0 % | 84.9 % |
| European ST-T Database | 82.3 % | 90.3 % |
| MIT-BIH Malignant Ventricular Ectopy Database | 35.7 % | 39.4 % |
| MIT-BIH Atrial Fibrillation Database | 91.3 % | 91.2 % |
| CPSC2021 | 99.7 % | 99.9 % |
| 2017 PhysioNet/CinC Challenge | 49.2 % | 50.3 % |
| GETEMED's own data set of annotated long-term ECGs | 75.1 % | 78.4 % |
| GETEMED's own data of annotated telemedical ECGs | 87.0 % | 88.5 % |

#### 3.8.2 Metrics on Test Data

Below are the metrics achieved on the independent test data sets. These data sets were not used to train or optimize the model.

**Telecare data set (recorder: CardioMem CM 100)**

| Metric | Result |
|---|---|
| Accuracy | 94.0 % |
| F1 score | 94.5 % |
| Atrial fibrillation - sensitivity | 75.0 % |
| Atrial fibrillation - specificity | 95.3 % |

**MDT data set (recorder: PhysioMem PM 100)**

| Rhythm | Correctly detected |
|---|---|
| Sinus rhythm | 495 / 499 |
| Atrial fibrillation | 496 / 538 |
| Other rhythm | 3 / 12 |

#### 3.8.3 IEC 60601-2-47: AFib Analysis

Below are the results of the AFib analysis on the MIT-BIH Arrhythmia Database (Gross).

| Metric | Result |
|---|---|
| Duration (positive predictive value) | 89 % |
| Duration (sensitivity) | 97 % |
| Episode (positive predictive value) | 78 % |
| Episode (sensitivity) | 77 % |

The table refers to 44 ECG recordings.

#### 3.8.4 IEC 60601-2-47: Heart Rate Calculation

**HeartX Analyzer (Holter)**

| Metric | AHA | MIT | NST | Overall |
|---|---|---|---|---|
| RMS (Root-Mean-Squared Error) / % | 11.01 | 8.95 | 12.26 | 10.45 |

**HeartX Analyzer (Telemedical)**

| Metric | AHA | MIT | NST | Overall |
|---|---|---|---|---|
| RMS (Root-Mean-Squared Error) / % | 15.15 | 10.57 | 12.95 | 13.45 |

The table refers to 134 ECG recordings.

#### 3.8.5 IEC 60601-2-47: Beat Detection and Classification

**HeartX Analyzer (Holter)**

**Aggregated**

| Metric | Gross | Average |
|---|---|---|
| Q Se [%] | 99.4 | 99.2 |
| Q +P [%] | 99.5 | 99.4 |
| V Se [%] | 89.9 | 94.2 |
| V +P [%] | 89.8 | 86.3 |
| V FPR | 1.0 | 1.2 |

**AHA**

| Metric | Gross | Average |
|---|---|---|
| Q Se [%] | 99.8 | 99.7 |
| Q +P [%] | 100.0 | 100.0 |
| V Se [%] | 87.9 | 95.0 |
| V +P [%] | 94.3 | 90.8 |
| V FPR | 0.5 | 0.7 |

**MIT**

| Metric | Gross | Average |
|---|---|---|
| Q Se [%] | 99.9 | 99.9 |
| Q +P [%] | 100.0 | 100.0 |
| V Se [%] | 96.8 | 98.1 |
| V +P [%] | 78.3 | 76.3 |
| V FPR | 2.0 | 2.2 |

**NST**

| Metric | Gross | Average |
|---|---|---|
| Q Se [%] | 93.5 | 93.6 |
| Q +P [%] | 93.6 | 93.3 |
| V Se [%] | 86.0 | 79.2 |
| V +P [%] | 98.1 | 90.4 |
| V FPR | 0.2 | 0.2 |

The table refers to 134 recordings.

**HeartX Analyzer (Telemedical)**

**Aggregated**

| Metric | Gross | Average |
|---|---|---|
| Q Se [%] | 95.39 | 95.38 |
| Q +P [%] | 98.26 | 97.94 |

**AHA**

| Metric | Gross | Average |
|---|---|---|
| Q Se [%] | 94.49 | 94.18 |
| Q +P [%] | 98.76 | 98.38 |

**MIT**

| Metric | Gross | Average |
|---|---|---|
| Q Se [%] | 98.05 | 98.26 |
| Q +P [%] | 99.34 | 99.27 |

**NST**

| Metric | Gross | Average |
|---|---|---|
| Q Se [%] | 92.48 | 92.57 |
| Q +P [%] | 90.33 | 90.21 |

The table refers to 134 recordings.

> **NOTE**
> The HeartX Analyzer shows variable performance when analyzing different rhythms. For example, the classification of ECGs with atrial flutter may be less accurate. The similarities in the ECG patterns of atrial flutter and atrial fibrillation can lead to atrial flutter being incorrectly identified as atrial fibrillation. Users should be aware of this imprecision and interpret results accordingly.

#### 3.8.6 IEC 60601-2-47: Analysis Shutdowns

If the signal quality is insufficient for a satisfactory analysis, the analysis is paused by the noise detection. The following table shows the analysis shutdown metrics determined in accordance with IEC 60601-2-47:2012, section 201.12.1.101.1.5.2.

**HeartX Analyzer (Holter)**

**Aggregated**

| Metric | Gross | Average |
|---|---|---|
| Beats missed [%] | 0.2 | 0.3 |
| N missed [%] | 0.2 | 0.2 |
| V missed [%] | 0.4 | 0.5 |

**AHA**

| Metric | Gross | Average |
|---|---|---|
| Beats missed [%] | 0.0 | 0.1 |
| N missed [%] | 0.0 | 0.0 |
| V missed [%] | 0.2 | 0.4 |

**MIT**

| Metric | Gross | Average |
|---|---|---|
| Beats missed [%] | 0.1 | 0.1 |
| N missed [%] | 0.1 | 0.1 |
| V missed [%] | 0.0 | 0.0 |

**NST**

| Metric | Gross | Average |
|---|---|---|
| Beats missed [%] | 2.2 | 2.2 |
| N missed [%] | 2.2 | 2.2 |
| V missed [%] | 2.4 | 2.5 |

**Analysis shutdown duration**

| Database | Seconds |
|---|---|
| Aggregated | 4038 |
| AHA | 3498 |
| MIT | 67 |
| NST | 473 |

The table refers to 134 recordings.

### 3.8.7 IEC 60601-2-47: Heart Rate and RR Interval Variability (HRV)

Below are the results for the heart rate and for the heart rate and RR interval variability in accordance with 201.12.1.101.2.3.3.

**HRV/RR variability – noise floor (synthetic data)**

| Metric | Trial 1 | Trial 2 | Trial 3 | Noise Floor |
|---|---|---|---|---|
| RR in ms (mean) | 1000 | 1000 | 1000.0011 | 1000.0011 |
| SDNN in ms | 7.1135 | 7.1135 | 7.1127 | 7.1135 |
| SDANN in ms | 0 | 0 | 0.0039 | 0.0039 |
| NN50 | 0 | 0 | 0 | 0 |
| pNN50 in % | 0 | 0 | 0 | 0 |
| RMSSD in ms | 12.5387 | 12.5428 | 12.5379 | 12.5428 |
| VLF in ms² | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| LF in ms² | 0.8432 | 0.8472 | 0.8418 | 0.8472 |
| HF in ms² | 16.4953 | 16.44 | 16.5055 | 16.5055 |

**HRV/RR variability – ECG data with recorder**

| Metric | 3932400057 | 3932400098 | 3932400107 | Noise Floor |
|---|---|---|---|---|
| RR in ms (mean) | 999.9591 | 999.9453 | 999.9568 | 999.9591 |
| SDNN in ms | 5.2302 | 3.9678 | 5.1003 | 5.2302 |
| SDANN in ms | 0.1965 | 0.0138 | 0.1981 | 0.1981 |
| NN50 | 2 | 0 | 2 | 2 |
| pNN50 in % | 0.0023 | 0 | 0.0023 | 0.0023 |
| RMSSD in ms | 8.3435 | 6.8014 | 8.0964 | 8.3435 |
| VLF in ms² | 0.6037 | 0.0017 | 0.6695 | 0.6695 |
| LF in ms² | 3.6037 | 0.3428 | 3.8804 | 3.8804 |
| HF in ms² | 9.5081 | 5.8594 | 9.309 | 9.5081 |

**HRV/RR variability – digital test patterns (device measurements)**

| Metric | Test pattern 2 | Test pattern 3 | Test pattern 4 | Test pattern 5 |
|---|---|---|---|---|
| RR in ms (mean) | 799.3372 | 997.6268 | 2987.3345 | 1493.4571 |
| SDNN in ms | 24.7614 | 49.4828 | 197.8184 | 98.8551 |
| SDANN in ms | 0.0488 | 0.0511 | 1.1448 | 98.037 |
| NN50 | 0 | 0 | 23357 | 0 |
| pNN50 in % | 0 | 0 | 80.7614 | 0 |
| RMSSD in ms | 29.1015 | 30.5645 | 122.1174 | 0.4825 |
| VLF in ms² | 0.0043 | 0.0176 | 14750.4419 | 1634.7576 |
| LF in ms² | 0.0068 | 2430.4888 | 4722.6594 | 0.0244 |
| HF in ms² | 557.8364 | 1.4022 | 7.3883 | 0.0271 |

#### 3.8.8 IEC 60601-2-47: Event Analysis

The following metrics refer to the event analysis in accordance with IEC 60601-2-47. Ventricular and supraventricular runs are compared as whole events (run by run), distinguished into couplets (2 beats), short runs (3-5 beats) and long runs (6 beats or more). Supraventricular single beats are compared beat by beat.

**HeartX Analyzer (Holter)**

**Ventricular runs — Aggregated**

| Metric | Gross | Average |
|---|---|---|
| Couplet Se [%] | 47.4 | 71.0 |
| Couplet +P [%] | 87.3 | 72.9 |
| Run 3-5 Se [%] | 44.2 | 56.1 |
| Run 3-5 +P [%] | 75.6 | 72.0 |
| Run >=6 Se [%] | 39.2 | 68.9 |
| Run >=6 +P [%] | 53.4 | 80.9 |

**Ventricular runs — AHA**

| Metric | Gross | Average |
|---|---|---|
| Couplet Se [%] | 60.0 | 84.9 |
| Couplet +P [%] | 90.6 | 76.9 |
| Run 3-5 Se [%] | 45.9 | 80.7 |
| Run 3-5 +P [%] | 89.8 | 86.0 |
| Run >=6 Se [%] | 40.5 | 86.5 |
| Run >=6 +P [%] | 68.8 | 89.1 |

**Ventricular runs — MIT**

| Metric | Gross | Average |
|---|---|---|
| Couplet Se [%] | 27.9 | 48.1 |
| Couplet +P [%] | 76.6 | 62.7 |
| Run 3-5 Se [%] | 28.9 | 31.5 |
| Run 3-5 +P [%] | 22.6 | 47.1 |
| Run >=6 Se [%] | 30.8 | 27.8 |
| Run >=6 +P [%] | 15.8 | 50.0 |

**Supraventricular runs — Aggregated**

| Metric | Gross | Average |
|---|---|---|
| Couplet Se [%] | 34.4 | 22.1 |
| Couplet +P [%] | 97.9 | 83.3 |
| Run 3-5 Se [%] | 21.5 | 25.3 |
| Run 3-5 +P [%] | 96.0 | 62.3 |
| Run >=6 Se [%] | 23.4 | 15.7 |
| Run >=6 +P [%] | 92.5 | 74.1 |

**Supraventricular runs — MIT**

| Metric | Gross | Average |
|---|---|---|
| Couplet Se [%] | 34.4 | 22.1 |
| Couplet +P [%] | 97.9 | 83.3 |
| Run 3-5 Se [%] | 21.5 | 25.3 |
| Run 3-5 +P [%] | 96.0 | 62.3 |
| Run >=6 Se [%] | 23.4 | 15.7 |
| Run >=6 +P [%] | 92.5 | 74.1 |

**Supraventricular single beats — Aggregated**

| Metric | Gross | Average |
|---|---|---|
| SVEB Se [%] | 57.7 | 33.2 |
| SVEB +P [%] | 52.8 | 55.5 |
| SVEB FPR [%] | 1.8 | 2.3 |

**Supraventricular single beats — MIT**

| Metric | Gross | Average |
|---|---|---|
| SVEB Se [%] | 57.7 | 33.2 |
| SVEB +P [%] | 52.8 | 55.5 |
| SVEB FPR [%] | 1.8 | 2.3 |

The ventricular runs refer to 122 ECG recordings (AHA and MIT), the supraventricular metrics to 44 ECG recordings (MIT).

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