



# Datasheet

# Sensis Vibe Hemo Sensis Vibe Combo

# Recording and Information System for Hemodynamic and Electrophysiological Interventional Labs

[siemens-healthineers.com/de/angio/workplaces/sensis](https://siemens-healthineers.com/de/angio/workplaces/sensis)

# Sensis Vibe

## Recording and procedure data management system

Sensis Vibe Hemo and Sensis Vibe Combo are Siemens Healthineers recording and procedure data management system for interventional cardiology, electrophysiology, interventional radiology, and surgical procedures performed in a hybrid OR.

Sensis Vibe offers acquisition functionality for patient vital signs, invasive pressures and intracardiac ECG and the calculation of diagnostic parameters derived from these measurements.

In addition to recording these measurements and calculations, Sensis Vibe provides an intuitive and time-efficient tool for documenting procedure data during the case as well as in pre- and post-procedural holding areas.

The database for documentation is flexibly adaptable to the individual institution and supports consistency of procedure records with validation functionality.

Medical and administrative data documented in the Sensis Vibe database (also called SIS: Sensis Information System) is readily available for procedure reporting, which can be done either using Sensis Vibe's reporting functionality or by transferring Sensis Vibe's data to other IT systems.

# Highlights



## Hemodynamic Acquisition

Sensis Vibe Hemo is featuring Hemodynamic Acquisition functionality. It is delivered with a compact bedside signal input box, the HemoBox, which fulfills the hygienic requirements of a surgical environment.

The HemoBox can acquire standard vital signs as well as invasive pressures (up to four channels). From these acquired parameters, the hemodynamic software application on Sensis Vibe can derive several diagnostic parameters and compare them across conditions.

### Vital signs:

- Non-invasive blood pressure
- SpO<sub>2</sub> oxygen saturation
- etCO<sub>2</sub> concentration\*
- Surface ECG
- Skin Surface Temperature\*
- Respiration rate\* using Microstream™ MicroPod™/ NanoPod™ external etCO<sub>2</sub> Module

### Calculated and derived hemodynamic parameters:

- Pressure calculations
- Rate of pressure change (dp/dtmax)
- Gradients
- Fractional Flow Reserve (FFR)\*\*
- DFR™, a Boston Scientific algorithm
- Resting Pd/Pa
- Systolic Area Index (SAI)\*
- Shunts
- Cardiac output
- Valve area

- Work and power
- Cardiac index, flow and stroke volume
- Resistances
- Regurgitation



## Electrophysiology Acquisition\*

Sensis Vibe Combo is featuring Hemodynamic and Electrophysiology Acquisition functionality.

It is delivered with a different signal input unit, the ComboBox, which can acquire up to 96 bipolar IECG channels.

### Vital signs:

- Non-invasive blood pressure
- SpO<sub>2</sub> oxygen saturation
- etCO<sub>2</sub> concentration\*
- Surface ECG
- Respiration rate\* using Microstream™ MicroPod™/ NanoPod™ external etCO<sub>2</sub> Module

### Electrophysiology application:

- Customized display of baseline IECG with different colors, sweep speeds and lead set-ups
- Activation of stimulation on any configured signals with up to four channels, of which two can be active simultaneously
- Ablation parameters (duration, temperature, power, impedance)
- Mapping System interface\*\*

### Calculated and derived hemodynamic parameters:

- Equal to the HemoBox

\* Option; \*\* Option, please check combination with 3rd party systems

# Highlights

## Ease of Use

Sensis Vibe's core design principle is ease of use at every step of the procedure. Starting with a one-stop patient registration between Sensis and Artis, adaptable workflow support programs, an incidental documentation workflow and automated data consistency validation, Sensis Vibe supports its operators in focusing on what matters most: patient welfare.



## Interventional Suite Integration

Sensis Vibe is the central collection point for all cath lab data and is therefore tightly integrated with other equipment in the interventional lab.

Artis and Sensis Vibe systems have a bi-directional interface for the exchange of patient demographic data, X-ray snapshots and dose information.

Furthermore, Sensis Vibe can be operated from table-side via the Artis control modules. Hardware-wise, both the HemoBox and the ComboBox are designed to seamlessly blend into the exam room infrastructure with minimal physical impact.

In an electrophysiology setting, Sensis Vibe's integrative design reaches beyond the angio system to other important EP equipment: ablators, stimulators and mapping systems. Again, Sensis Vibe strives to be the central data collection node for these systems.

\* Option

# Highlights

## Procedure data management

Sensis Vibe's usability concept is designed around the idea that physiological measurements on the acquisition side and the documentation of the procedure need to be performed simultaneously.

FlashDoc\* is a documentation and data management tool for the interventional lab.

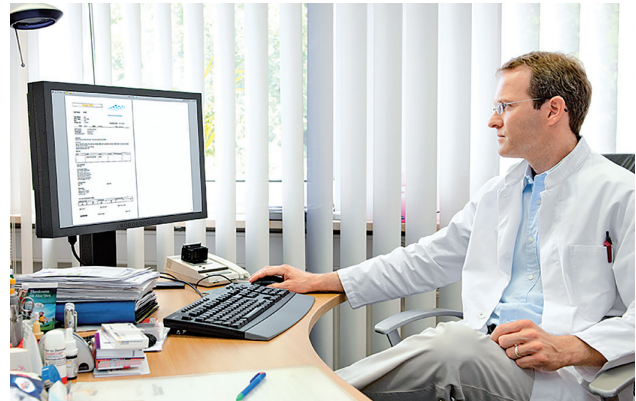
Entries to the flexibly adaptable Sensis Vibe database (Sensis Information System) are made via a single point of data entry, the QuickAdd field.

On the acquisition unit, the data is then displayed in a structured, time-stamped CaseLog where details of an event or entry can be edited.

Data can also be captured and edited on satellite Report Workstations\*, for example in holding areas, inside the examination room or even in offices distant from the interventional lab. This software turns a PC into a Sensis Vibe database client.

FlashDoc-equipped acquisitions systems and report workstations are equipped with a pdf report generator.

A report template is automatically populated with procedure data at the end of a study and can then be edited with comments on Sensis Vibe systems or any office PC and sent to other stakeholders.



## IT Integration

Data captured with Sensis Vibe pre-cath, during the procedure and after the case is stored in an institution-adapted Sensis Information System (SIS) database.

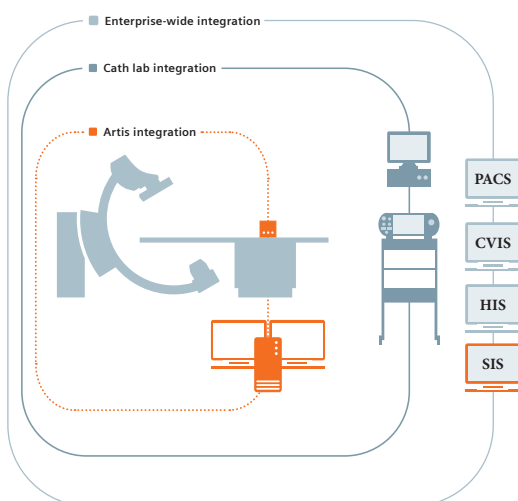
Integration with hospital IT infrastructure using industry standard interfaces for seamless information integration and reduce clinical and billing errors.\*

- Demography integration with ADT systems
- Receives orders
- Receives LAB ACT values from POC
- Automatic documentation of consumables and devices (integration with inventory systems)
- Distribution of reports structured and non-structured
- Integration with billing systems
- Archival of acquired signal data on PACS (using DICOM)

Sensis Vibe can transfer data via following interface languages.

- ASCII flat file
- XML
- DICOM
- HL7\*

\* Option



# Table of contents

|                                                            |    |                                                                                            |    |
|------------------------------------------------------------|----|--------------------------------------------------------------------------------------------|----|
| Sensis computer                                            | 7  | Stimulator interface (for ComboBox only)                                                   | 17 |
| Minimum UPS requirements<br>(uninterruptible power supply) | 8  | Electrical data for stimulation via Sensis                                                 | 17 |
| Minimum printer requirements                               | 8  | Detection of stimulation pulse train<br>through the ComboBox                               | 18 |
| Bar code reader                                            | 8  | Recording and logging of pulse sequences                                                   | 18 |
| Signal input box                                           | 9  | Ethernet communication interfaces                                                          | 18 |
| Environment                                                | 9  | The Sensis Information System                                                              | 19 |
| Signal input box and catheter input pod                    | 9  | The Sensis Client-Server Solution                                                          | 19 |
| Mounting                                                   | 9  | Sensis Master SW Package                                                                   | 19 |
| ECG                                                        | 10 | Sensis Client SW Package                                                                   | 20 |
| Sweep speed                                                | 10 | Sensis Post-Processing Workstation SW Package                                              | 20 |
| ICEG (for ComboBox only)                                   | 11 | Sensis Report Workstation SW Package                                                       | 20 |
| Sweep speed                                                | 11 | Sensis Report Editor                                                                       | 20 |
| Invasive blood pressure                                    | 12 | Sensis Information System High-end Master Server                                           | 20 |
| Non-invasive blood pressure (NIBP)                         | 13 | Virtual Sensis Information System Virtual Server<br>appliance                              | 21 |
| SpO <sub>2</sub>                                           | 13 | Sensis HL7 Engine                                                                          | 21 |
| Respiration (from capnography)                             | 14 | Minimum requirements for the PC<br>with installed Sensis Report<br>Workstation SW packages | 21 |
| Cardiac output (thermodilution method)                     | 15 |                                                                                            |    |
| Vital signs alarms                                         | 15 |                                                                                            |    |
| Signal outputs                                             | 16 |                                                                                            |    |
| QRS trigger                                                | 16 |                                                                                            |    |
| Serial communication interfaces<br>(ComboBox only)         | 16 |                                                                                            |    |

# Technical Data

| Sensis computer                                                                             |                                                                                                                                     |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Control room monitors</b>                                                                | One for real-time waveforms, one for operator dialog                                                                                |
| Size, resolution                                                                            | 19" TFT, 1280 x 1024 pixels                                                                                                         |
|                                                                                             | 21.3" TFT, 1600 x 1200 pixels                                                                                                       |
| <b>Exam room monitors</b>                                                                   | One or two for real-time waveforms and/or operator dialog.<br>Optionally one extra examination room monitor for realtime waveforms. |
| Size, resolution                                                                            | 19" TFT, 1280 x 1024 pixels                                                                                                         |
|                                                                                             | 21.3" TFT, 1600 x 1200 pixels                                                                                                       |
| Minimum computer specification (used for acquisition system and postprocessing workstation) |                                                                                                                                     |
| CPU                                                                                         | Intel Core i5-8500 CPU, 3,000 GHz, 6 Cores                                                                                          |
| RAM                                                                                         | 2 x 8 GByte DDR4-2666 RAM modules                                                                                                   |
|                                                                                             | 16 GByte total, dual-channel configuration preferred                                                                                |
| Disk drive (Hemo, Combo)                                                                    | Main drive: 512 GB SATA SSD                                                                                                         |
|                                                                                             | Service drive: 1 TB HDD                                                                                                             |
| Network (Hemo, Combo)                                                                       | 3 x 1000 Base-T Ethernet ports                                                                                                      |
| Operating System                                                                            | Microsoft Windows 10                                                                                                                |



# Technical Data

## Minimum UPS\* requirements (uninterruptible power supply)

Certified according to at least one of the following standards:

UL 1778; EN 62040–1; CSA 22.2 no. 107.3; UL listed

Runtime

Minimum of 5 min.

Minimum number of protected outlets

6

The UPS must be able to output sinus curves in both power and battery modes.

Total Power Rating

Hemo: 250 VA (Minimum)

Combo: 750 VA (Minimum)

Types: 100 V – 120 V, 220 V – 240 V; 50/60 Hz

## Minimum printer requirements

Print resolution (black)

≥ 600 dpi

Printer technology

Laser

Network ready

The following should be configured on the printer, at a minimum:  
100 base T Ethernet standard (or faster), IP address, gateway & DNS setting

Minimum system requirements/  
Compatible operating systems

Windows 10

Media sizes supported

A4, Letter

Standard memory

Black 64 MB, color 256 MB

## Bar code reader\*

Maximum radio-frequency band BT Class 1, 433 MHz – 910 MHz

\*Option



# Technical Data

## Signal input box

|                                |                                                                                |                     |                     |
|--------------------------------|--------------------------------------------------------------------------------|---------------------|---------------------|
| Dimensions (H x D x W) approx. |                                                                                | Hemo                | Combo               |
|                                | PC                                                                             | 100 x 338 x 381 mm  | 100 x 338 x 381 mm  |
|                                | Signal input box                                                               | 147 x 230 x 80 mm   | 205 x 335 x 180 mm  |
|                                | Video distribution box                                                         | n.a.                | 530 x 390 x 146 mm  |
|                                | UPS 230 V*                                                                     | 260 x 337 x 171 mm  | 260 x 337 x 171 mm  |
|                                | UPS 120 V*                                                                     | 440 x 450 x 86.5 mm | 440 x 450 x 86.5 mm |
| Weight                         | PC                                                                             | 7 kg                | 7 kg                |
|                                | Signal input box                                                               | 1 kg                | 7 kg                |
|                                | Video distribution box                                                         | n.a.                | 20 kg               |
|                                | UPS*                                                                           | 19.3 kg             | 19.3 kg             |
| Patient isolation              | Floating inputs with defibrillation protection (isolated input), type CF or BF |                     |                     |
| Mains power                    | According to IEC regulations class I                                           |                     |                     |
| Mains voltage                  | 100 – 120 V; 50/60 Hz ~<br>220 – 240 V; 50/60 Hz ~                             |                     |                     |
| Power consumption              | Hemo:                                                                          | 250 VA, max.        |                     |
|                                | Combo:                                                                         | 750 VA, max.        |                     |

## Environment

|                           |                                    |                           |
|---------------------------|------------------------------------|---------------------------|
| Operating conditions      | Temperature:                       | + 10 °C to + 35 °C        |
|                           | Relative humidity:                 | non-condensing, 20 – 75 % |
|                           | Pressure:                          | 70 – 106 kPa              |
| Operation altitude        | Less than or equal to 3000 meters  |                           |
| Pollution degree          | 2                                  |                           |
| Material group            | IIIb                               |                           |
| Overvoltage category      | II                                 |                           |
| Oxygen rich environment   | No                                 |                           |
| Liquid ingress protection | IPX4 (HemoBox) and IPX1 (ComboBox) |                           |

## Signal input box and catheter input pod

|                                                    |                                             |
|----------------------------------------------------|---------------------------------------------|
| Catheter input pod cable                           | Catheter input pod to signal input box, 2 m |
| Cable signal input box to control room / Sensis PC | Max. 30 m                                   |

## Mounting

|                    |                                                                                                                                                                                                       |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catheter input pod | On tableside Modura rail (10 mm x 25 mm)                                                                                                                                                              |
| Signal input box   | ComboBox: On dedicated holder with Artis installation**<br>HemoBox: On tableside Modura rail (10 mm to 25 mm) or on IV Pole (diameters 19 mm to 38 mm), standard VESA 75 mounting interface available |

\* Option; \*\* see Operator Manual

# Technical Data

## ECG

|                            |                                                                                                                            |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------|
| ECG                        | Electrodes R, L, F, N and C1 to C6 (RA, LA, LL, RL and V1 to V6)<br>Available leads I, II, III, aVR, -aVR, aVF, aVL, V1-V6 |
| Sampling rate              | 2000 samples/s                                                                                                             |
| Heart rate detection range | 15 – 300 beats/min                                                                                                         |
| Cycle length               | 200 – 4000 ms                                                                                                              |
| High-pass filter           | 0, 0.05, 0.15, 0.5 Hz                                                                                                      |
| Low-pass filter settings   | HemoBox 25, 35, 40, 50, 100, 120, 200, 300 Hz                                                                              |
|                            | ComboBox 25, 35, 40, 50, 100, 120, 200, 300, 400, 525 [none] Hz                                                            |
| Notch filter               | 50/60 Hz                                                                                                                   |
| Lead-off indication        | Each lead                                                                                                                  |
| Lead-off detection         | DC lead-off detection                                                                                                      |
| Sensitivity                | 1, 2, 5, 10, 20, 50, 100, 200, 500 or 1000 mm/mV                                                                           |
| Input signal range         | HemoBox $\pm 600$ mV                                                                                                       |
|                            | ComboBox $\pm 1.2$ V                                                                                                       |
| Output signal range        | $\pm 30$ mV                                                                                                                |
| Noise                      | HemoBox $< 20 \mu\text{V}_{\text{p-p}}$ (0.05 Hz to 200 Hz)                                                                |
|                            | ComboBox $< 15 \mu\text{V}_{\text{p-p}}$ (0.05 Hz to 200 Hz)                                                               |
| CMRR                       | $> 94$ dB                                                                                                                  |
| Resolution                 | $> 1 \mu\text{V}$                                                                                                          |

## Sweep speed

|           |                                          |
|-----------|------------------------------------------|
| Real-time | 400, 200, 150, 100, 50, 25, 12.5, 5 mm/s |
| Review    | 400, 200, 150, 100, 50, 25, 12.5, 5 mm/s |

# Technical Data

## ICEG (for ComboBox only)

|                              |                                                                                           |
|------------------------------|-------------------------------------------------------------------------------------------|
| Catheter input pod           | For IECG catheter cables with 2 mm touch-proof pins compatible with Multi-Contact sockets |
| Electrode inputs             | 64 or 96                                                                                  |
| Output AC range              | $\pm 30$ mV                                                                               |
| Output DC range              | $\pm 80$ mV                                                                               |
| Noise                        | $< 15$ $\mu$ Vp-p (20 - 400 Hz)                                                           |
| Frequency range              | DC – 525 Hz                                                                               |
| Sampling rate                | 2000 samples/s                                                                            |
| Input signal range           | $\pm 600$ mV, $\pm 1.2$ V for stimulated channels                                         |
| Resolution (AC)              | 1 $\mu$ V                                                                                 |
| Resolution (DC)              | 6.25 $\mu$ V                                                                              |
| High-pass filter             | 0, 0.05, 0.15, 0.5, 1, 20, 30, 40, 50, 60, 70, 80 Hz                                      |
| Low-pass filter              | 100, 200, 300, 400, 500, 525 [none] Hz                                                    |
| Notch filter                 | 50/60 Hz                                                                                  |
| Bipolar leads                | Between any 2 inputs                                                                      |
| Unipolar leads               | Referenced to Wilson central terminal or any other IECG electrode input                   |
| Stimulator switching         | To any IECG electrode pair                                                                |
| CMRR                         | $> 100$ dB                                                                                |
| Caliper measurement accuracy | $\pm 1$ ms                                                                                |

## Sweep speed

|                     |                                                           |
|---------------------|-----------------------------------------------------------|
| Beat-triggered view | 400, 200, 150, 100, 50, 25 mm/s (EP only)                 |
| ES-triggered view   | 800, 600, 400, 200, 150, 100, 50, 25, 12.5 mm/s (EP only) |

# Technical Data

| Invasive blood pressure |                                                                                                                                                                                                                        |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pressure inputs         | 4                                                                                                                                                                                                                      |
| Measurement range       | – 50 to 400 mmHg (If IBP input is provided from an FFR pressure measurement device, the measurement range may be further limited by the FFR device.<br>Please consult the IBP range specifications of the FFR device.) |
| Transducers             | 5 $\mu$ V/V/mmHg                                                                                                                                                                                                       |
| Filters                 | Low pass 10, 15, 20, 25, 30 Hz; notch filter 50/60 Hz                                                                                                                                                                  |
| Zero balance            | $\pm$ 50 mmHg transducer offset                                                                                                                                                                                        |
| Range                   | 10, 20, 40, 100, 200 or 400 mmHg                                                                                                                                                                                       |
| Noise                   | < 0.32 mmHg (DC to 30 Hz)                                                                                                                                                                                              |
| Frequency range         | DC to 30 Hz                                                                                                                                                                                                            |
| Accuracy                | $\pm$ 4mmHg or $\pm$ 4%, exclusive of transducer                                                                                                                                                                       |
| Resolution              | 1 mmHg                                                                                                                                                                                                                 |
| Sampling rate           | 2000 samples/s                                                                                                                                                                                                         |

# Technical Data

## Non-invasive blood pressure (NIBP)

|                       |                                           |                     |
|-----------------------|-------------------------------------------|---------------------|
| Pressure range        | For heart rate                            | 40 – 200 beats/min: |
|                       | Adult Systolic:                           | 40 – 260 mmHg       |
|                       | Adult MAP:                                | 26 – 220 mmHg       |
|                       | Adult Diastolic:                          | 20 – 200 mmHg       |
|                       | Neonatal Systolic:                        | 40 – 130 mmHg       |
|                       | Neonatal MAP:                             | 26 – 110 mmHg       |
|                       | Neonatal Diastolic:                       | 20 – 100 mmHg       |
| Resolution            | 1 mmHg                                    |                     |
| Method of measurement | Oscillometric with step deflation         |                     |
| Reading accuracy      | ANSI/AAMI SP10, EN1060-4, and ISO 81060-2 |                     |

## SpO<sub>2</sub>

|                                                        |                                 |
|--------------------------------------------------------|---------------------------------|
| Oxygen saturation range                                | 0 % – 100 %                     |
| Saturation ( SpO <sub>2</sub> ) Accuracy <sup>1)</sup> |                                 |
| No motion <sup>2) 3)</sup>                             | 70% to 100% ± 2 digits          |
| Low Perfusion <sup>4)</sup>                            | 70% to 100% ± 2 digits          |
| Motion <sup>2) 5)</sup>                                | 70% to 100% ± 3 digits          |
| Amplitude                                              | min. 0.3 % modulation           |
| Sensors                                                | for use with NONIN sensors only |

<sup>1)</sup> Saturation accuracy varies by sensor type. Please refer to the instructions for use provided with the sensor to be used.

<sup>2)</sup> For details, consult Nonin's clinical accuracy reports.

<sup>3)</sup> Non-motion specifications are shown for the 8000AA, 8000SM, 8000J, 6000A, 8000R, and 8000FC sensors.

<sup>4)</sup> Reading accuracy in the presence of low perfusion (detected IR pulse modulation amplitude of less than 0.03%) was validated using signals supplied by a patient simulator. SpO<sub>2</sub> values were varied across the monitoring range over a range of weak signal conditions and compared to the known true saturation of the input signals.

<sup>5)</sup> Motion performance was validated during a controlled hypoxia blood study. Subjects performed rubbing and tapping movements 1-2 cm in amplitude with aperiodic intervals (randomly changing) with an approximate frequency of 1 Hz. Applicability: 8000AA and 8000SM sensors.

# Technical Data

## Respiration (from capnography)

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Patent references           | The capnography component of this product is covered by one or more of the following US patents: 6,428,483; 6,997,880; 6,437,316, 7,488,229; 7,726,954 and their foreign equivalents. Additional patent applications pending.                                                                                                                                                                                                                                                                                                                                                                                    |         |
| Method                      | Microstream non-dispersive infrared (NDIR) spectroscopy to continuously measure the amount of CO <sub>2</sub> during every breath, the amount of CO <sub>2</sub> present at the end of exhalation (etCO <sub>2</sub> ) and during inhalation (FiCO <sub>2</sub> ), and the respiratory rate for neonates, pediatric and adult patients.                                                                                                                                                                                                                                                                          |         |
| Respiration rate range      | 0 – 150 bpm (breaths/minute)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |
| Resolution                  | 1 mmHg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |
| Respiration rate accuracy   | 0 – 70 bpm:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ± 1 bpm |
|                             | 71 – 120 bpm:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ± 2 bpm |
|                             | 121 – 150 bpm:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ± 3 bpm |
| Respiration rate resolution | 1 breath/minute                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |         |
| etCO <sub>2</sub> range     | 0 – 150 mmHg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |
| Accuracy                    | CO <sub>2</sub> partial pressure at sea level:<br>0 – 38 mmHg ± 2 mmHg, 39 – 150 mmHg ±<br>(5 % of reading + 0.08 x (reading – 39 mmHg))<br>Response time 9 s<br>Note: Accuracy applies for breath rates of up to 80 bpm.<br>For breath rates above 80 bpm, accuracy is 4 mmHg or ± 12 % of reading whichever is greater, for EtCO <sub>2</sub> values exceeding 18 mmHg. This is tested according to and is compliant with capnography standard. To achieve the specified accuracies for breath rates above 60 breaths/minute, the Microstream® FilterLine H Set for Infant/Neonatal (p/n 006324) must be used. |         |
| Resolution                  | 1 mmHg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |

## Skin surface temperature (for HemoBox only)

|                                                  |                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode of operation                                | Direct mode only                                                                                                                                                                                                                                                                           |
| Measurement site                                 | Skin surface                                                                                                                                                                                                                                                                               |
| Temperature probes                               | YSI (Measurement Specialties) 400 series<br>Sensor types:<br>409A: reusable, adult<br>427: reusable, pediatric                                                                                                                                                                             |
| Measurement range                                | 10.0 °C to 45.0 °C (50.0 °F to 113.0 °F)                                                                                                                                                                                                                                                   |
| Accuracy                                         | ± 0.1 °C (± 0.2 °F)<br>(Note: Overall temperature measurement accuracy will also depend on the accuracy of the temperature probe itself. Please consult the datasheet of the temperature probe(s) used for accuracy specification. The temperature parameter does not require calibration) |
| Minimum Measuring Time / Transient Response Time | 20 seconds                                                                                                                                                                                                                                                                                 |

# Technical Data

## Cardiac output (thermodilution method)

|                                |                                            |
|--------------------------------|--------------------------------------------|
| Injectate temperature          | – 5 °C to + 27 °C                          |
| Measurement range              | 0.1 to 25 l/min                            |
| Blood temperature              | 25 °C to 43 °C                             |
| Blood Measurement Accuracy     | +/- 0.1 °C exclusive of Swan-Ganz catheter |
| Injectate Measurement Accuracy | +/- 1 °C                                   |

## Vital signs alarms

|                                                                                              |
|----------------------------------------------------------------------------------------------|
| Alarms on HR, NBP, SpO <sub>2</sub> , Respiration, etCO <sub>2</sub> and IBP (arterial line) |
| Visible alarm in control and examination room, audible alarm in examination room             |
| Configurable alarm settings for Adult, Pediatric, and Neonatal mode                          |



# Technical Data

## Signal outputs

|                        |                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------|
| Analog output channels | 2                                                                                            |
| Isolation              | Analog output in signal input box: IEC 60601-1 basic, only for connection to medical devices |
| ECG                    | I, II, III, V1 – V6 only                                                                     |
| Pressure               | P1 – P4                                                                                      |
| ICEG                   | Any bipolar or unipolar (ComboBox only)                                                      |
| Scale factor           | 1 V/mV $\pm$ 5 % (ECG and ICEG); 10 mV/mmHg $\pm$ 6 % (pressure)                             |
| Voltage limits         | $\pm$ 4 V                                                                                    |
| Bandwidth              | 0.5 – 75 Hz (ECG)<br>40 – 525 Hz (ICEG)<br>0 – 32 Hz (Pressure)                              |
| Output impedance       | < 100 ohm (max load capacity: 10k ohm/100 nF)                                                |
| Noise                  | < 35 mVp-p                                                                                   |
| Max delay              | 25 ms                                                                                        |

## QRS trigger

|                  |                                                           |
|------------------|-----------------------------------------------------------|
| Level            | Positive, TTL (available in the signal input box)         |
| Isolation        | IEC 60601-1 basic, only for connection to medical devices |
| Max delay        | 25 ms                                                     |
| QRS pulse length | 50 ms $\pm$ 0.5 ms                                        |

## Serial communication interfaces (ComboBox only)

|             |                                                 |
|-------------|-------------------------------------------------|
| RF ablaters | Please check combination with 3rd party systems |
|-------------|-------------------------------------------------|

# Technical Data

## Stimulator interface (for ComboBox only)

If you intend to connect a stimulator to Sensis, this stimulator must conform to the following interface specification. The user is responsible for combining medical devices.

|                           |                                                                        |
|---------------------------|------------------------------------------------------------------------|
| Device classification no. | IEC Class 2b, Type CF, defibrillation-proof cardiac floating equipment |
|---------------------------|------------------------------------------------------------------------|

## Electrical data for stimulation via Sensis

|                                         |                                                                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. of channels                         | Four separate bipolar stimulation input channels available for connection to external stimulator. The four inputs can be individually switched by software to any IECG patient connection. |
| Emergency pacing                        | Direct connection for emergency pacing available<br>(Stimulation channel 1 is directly routed to emergency stim ± pins of CIP)                                                             |
| Pacing modes                            | Unipolar and bipolar pacing (for unipolar WCT cannot be used as a reference)                                                                                                               |
| Physical interface to stimulator        | 2 mm touch-proof banana plugs (3 or 10 m cable length).                                                                                                                                    |
| Input voltage                           | ± 100 V                                                                                                                                                                                    |
| Input current                           | ± 100 mA                                                                                                                                                                                   |
| Pulse width                             | > 0.05 ms                                                                                                                                                                                  |
| Repetition rate                         | > 0.1 ms                                                                                                                                                                                   |
| Impedance                               | Serial: < 45 ohm<br>(each pole, < 2*45 ohm each stimulation channel)<br>Parallel: > 1 MOhm                                                                                                 |
| Pulse deformation (amplitude and width) | < 10 % (when routed through Sensis)                                                                                                                                                        |

\* Option

# Technical Data

## Detection of stimulation pulse train through the ComboBox

|                                   |                                                                                                                                                                                                                                                              |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Signal amplitude                  | Constant voltage stimulation (CVS): – 10 V to – 500 mV, + 500 mV to + 10 V<br>Constant current stimulation (CCS): 1 – 20 mA at 500 ohms load (resulting voltage must be within the constant voltage stimulation (CVS) specification).                        |
| Pulse width                       | 0.5 – 5 ms                                                                                                                                                                                                                                                   |
| Pulse repetition rate             | One single pulse or a sequence of pulses with:<br>100 ms < repetition rate < 1500 ms                                                                                                                                                                         |
| Extrastimulus pulse sequence rate | Detects 1-4 extra stimulation pulses (which deviate by more than $\pm 5$ ms from the first interval) under the condition that they are preceded by 4 – 12 pulses in the drive train (that deviate less than or equal to $\pm 5$ ms from the first interval). |
| Continuous stimulation            | Detects a continuous stimulation sequence if the sequence starts with at least 13 pulses with repetition rate deviation of less than $\pm 5$ ms.                                                                                                             |
| Time resolution                   | Intervals between pulses are reported with 5 ms resolution.                                                                                                                                                                                                  |

## Recording and logging of pulse sequences

All pulse sequences are logged as events in the event log, all pulse sequences not identified as either extrastimulus or continuous stimulation are logged as dynamic stimulation. Waveforms during pulse sequence are automatically recorded with at least 10 s pre-storage and 30 s post-storage.

## Ethernet communication interfaces

|                            |                                                 |
|----------------------------|-------------------------------------------------|
| X-ray systems              | Siemens Healthineers Artis systems              |
| Mapping systems            |                                                 |
| Patient monitors           |                                                 |
| Hospital network           |                                                 |
| Material management system | Please check combination with 3rd party systems |

\* Option

# Technical Data

## The Sensis Information System

The Sensis Information System assists cardiologists, cardiac nurses, technologists and cath lab managers with comprehensive data access and workflow-oriented tools in their daily reporting and administrative tasks. Sensis Vibe new user interaction concept prominently features FlashDoc. Targeting optimal ease of use, FlashDoc includes three core components – QuickAdd, CaseLog, and smart Sensis Information System (SIS).

## The Sensis Client-Server Solution

The Sensis Information System is a network-based solution capable of connecting one or several Sensis recording systems, Sensis post-processing workstations, as well as reporting workstations. Sensis Vibe's new local cache of the acquisition system stores and moves the information onto the information system database automatically. Potential license adjustments might be required due to Windows Server licensing. We advise the customer to double-check the licensing between the server and the client(s) to ensure the licensing is correct.

## Sensis Master SW Package

Includes the following software packages:

### The Sensis Documentation

Supports cardiology personnel with inputting and handling administrative data (e.g., catheters and drugs) in a customized and structured way. Supports a wireless barcode reader to scan consumables.

### The Sensis Report Generator

Supports cardiologists in creating pdf reports for examinations performed in the cath lab and increases the efficiency of their workflow.

### The Sensis Communication Manager

Supports cath lab personnel in defining and managing data export to other systems (ASCII or HL7\* format or reports in DOC/RTF/PDF format).

### The Sensis Security Manager

Access to the database and the various data management and administration tools is controlled by password security levels that can be customized by an administrator.

### The Sensis Backup Manager

Intuitive user interface supports cardiologists in all of today's backup tasks such as scheduled activation of backup procedures or restoring tasks for the database.

### SQL Server IoT 2019

Store all measured data as well as manually entered information in the Sensis Master database.

### The Sensis Configuration Manager

Supports cardiology personnel in configuring general system parameters and settings. For example, new study types can be defined and added here and also associated with a set of input clusters and/or report templates.

The Configuration Manager also contains a service logbook.

*Note: The Sensis Master SW package is required only once in a multi-lab environment and can be installed on a Sensis recording system or a dedicated Sensis Information System server.*

\*Option

# Technical Data

## Sensis Client SW Package\*

This package offers Sensis Information System functionality for additional Sensis recording systems. The Sensis Client SW package contains the Sensis Documentation and the report generator. A client software package connects an additional Sensis recording system to the Sensis Information System. (Prerequisite: A dedicated Sensis Information System server or a Sensis recording system with Sensis Information System Master package exists in the cath lab).

---

## Sensis Post-Processing Workstation SW Package\*

The Sensis post-processing workstation allows you to review waveforms, values, events and results after a procedure is over. It is also possible to edit, modify and recalculate different data.

---

### Hemo+EP post-processing workstation\*

The Sensis Hemo+EP post-processing workstation allows you to review completed electrophysiology and hemodynamic studies from the Sensis recording system on an additionally connected remote workstation. It is also possible to edit, modify and recalculate different electrophysiology and hemodynamic data such as interval measurements, annotations, waveforms, values, events and results.

---

## Sensis Report Workstation SW Package\*

The package offers Sensis Information System functionality for reporting workstations. The Sensis Report Workstation SW package contains the Sensis Documentation and the report generator. The report workstation package connects a desktop PC to the Sensis Information System. (Prerequisite: A dedicated Sensis Information System server or a Sensis recording system with Sensis Information System Master package exists in the cath lab).

---

## Sensis Report Editor\*

Sensis Vibe Template Editor is a SW tool which enables the customer to create report templates for the Sensis Vibe system.

---

## Sensis Information System High-end Master Server\*

This package includes the Sensis Master Software package and a dedicated networked computer. Minimum SIS High-end Server specification: Intel Xeon E5 or equivalent, 8 GB RAM, 6 x 300 GB (hot swappable, RAID 5) and 1 TByte (RAID 0) disk drive, 1 GBit Ethernet, redundant power supply, Windows Server Windows Server IoT 2019 (64-bit) (Dell T340) operating system

---

\* Option

# Technical Data

## Virtual Sensis Information System Virtual Server appliance\*

The SIS Master SW package is also available as a virtual appliance for a VMware virtual machine environment. As a precondition VMware Virtual machine version 8 (which supports VMware ESX/ESXi 5.5 and later) has to be available.

Minimum Requirement: 1 Virtual socket and 12 cores per socket, RAM min. 16 GB, 2 virtual disks (C: 100 GB, F: 100 GB). vTPM must be installed and configured to use the BitLocker data encryption option. The virtual SIS server SW is provided as an OVA archive file. To use the BitLocker option for encrypting the Virtual Machine, the VMware Virtual machine image has to be upgraded to hardware revision 14. The VMware ESX/ESXi environment must be version 6.7 or later to support vTPM.

## Sensis HL7 Engine\*

Workflow and communication support to an external HIS/CIS/CDMS is provided via HL7 interface.

The Sensis Information System supports charge capture, meaning that billing data, e.g. consumables, personnel, or procedures in the Sensis Information System database can be mapped to the correct billing codes and then exported to an external HIS/CIS/CDMS for processing.

With this bidirectional interface, patient demographics can be imported, and billing and clinical data can be exported.

The Sensis HL7 Engine is installed on the computer with the Sensis Master SW package.

## Minimum requirements for the PC with installed Sensis Report Workstation SW packages

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU        | 32 bit (x86) or 64 bit (x64) processor 1 GHz or faster                                                                                                                                                                                                                                                                                                                                                                                          |
| RAM        | 32-bit: 1 GB RAM or higher<br>64-bit: 2 GB RAM or higher                                                                                                                                                                                                                                                                                                                                                                                        |
| Storage    | 32-bit: at least 16 GB available hard disk space<br>64-bit: at least 20 GB available hard disk space                                                                                                                                                                                                                                                                                                                                            |
| Video card | DirectX9 compatible graphics device with drivers supporting WDDM1.0 or higher                                                                                                                                                                                                                                                                                                                                                                   |
| Network    | Network connection (Ethernet or WLAN)<br>Free USB port for license dongle                                                                                                                                                                                                                                                                                                                                                                       |
| Software   | Software Windows 10 (32-bit or 64-bit) Pro, Enterprise, Enterprise LTSB Editions<br>Microsoft Office 2013, 2016 (32-bit Office only, Office 365 is not supported)<br>Adobe Acrobat Reader<br>Not all applications compatible with Windows 7 or Windows 10 64-bit systems<br>Microsoft .NET Framework 3.5: Make sure Microsoft .NET Framework version 3.5 is not only installed but also enabled on the computer<br>Microsoft Report Builder V15 |
| Other      | Dual monitor configuration supported<br>Can run in parallel with ACOM.PC on same PC                                                                                                                                                                                                                                                                                                                                                             |

\* Option

On account of certain regional limitations of sales rights and service availability, we cannot guarantee that all products included in this brochure are available through the Siemens Healthineers sales organization worldwide. Availability and packaging may vary by country and are subject to change without prior notice.

Some/All of the features and products described herein may not be available in the United States or other countries.

The information in this document contains general technical descriptions of specifications and options as well as standard and optional features that do not always have to be present in individual cases.

Siemens Healthineers reserves the right to modify the design, packaging, specifications and options described herein without prior notice.

Please contact your local Siemens Healthineers sales representative for the most current information.

In the interest of complying with legal requirements concerning the environmental compatibility of our products (protection of natural resources and waste conservation), we recycle certain components.

Using the same extensive quality assurance measures as for factory-new components, we guarantee the quality of these recycled components.

Note: Any technical data contained in this document may vary within defined tolerances. Original images always lose a certain amount of detail when reproduced.

Caution: Federal law restricts this device to sale by or on the order of a physician.

Sensis Vibe Hemo VD15C  
Sensis Vibe Combo VD15C

Sensis Vibe refers to both "Sensis Vibe Hemo" and "Sensis Vibe Combo".

---

**Siemens Healthineers Headquarters**

Siemens Healthineers AG  
Siemensstr. 3  
91301 Forchheim, Germany  
Phone +49 9191 18-0  
siemens-healthineers.com

**Manufacturer**

Siemens Healthcare GmbH  
Henkestr. 127  
91052 Erlangen  
Germany