

Diagnostics

The TOP 10 features of our sleep diagnostics devices.

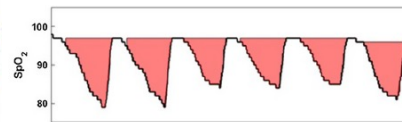
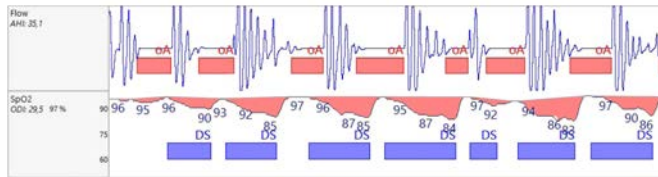


The latest analysis parameters

Hypoxic burden

Ascertaining the hypoxic burden in a sleep medicine assessment is a strong predictor for determining cardiovascular risk in the presence of concurrent obstructive sleep apnea.

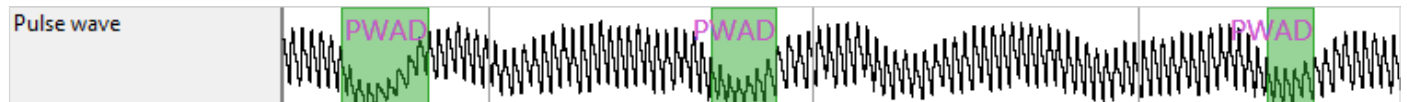
The OSA-specific hypoxic burden (HB) quantifies the depth, frequency, and duration of desaturations caused by respiratory events.



AHI	35.1/h
RDI	37.7/h
ODI	29.5/h
Hypoxic burden	66.8% min/h

PWAD

Reductions in pulse wave amplitude can be detected via the recorded pulse wave and may indicate potential sympathetic nervous system activations. This way, they can be associated with any respiratory or movement events that may occur simultaneously.



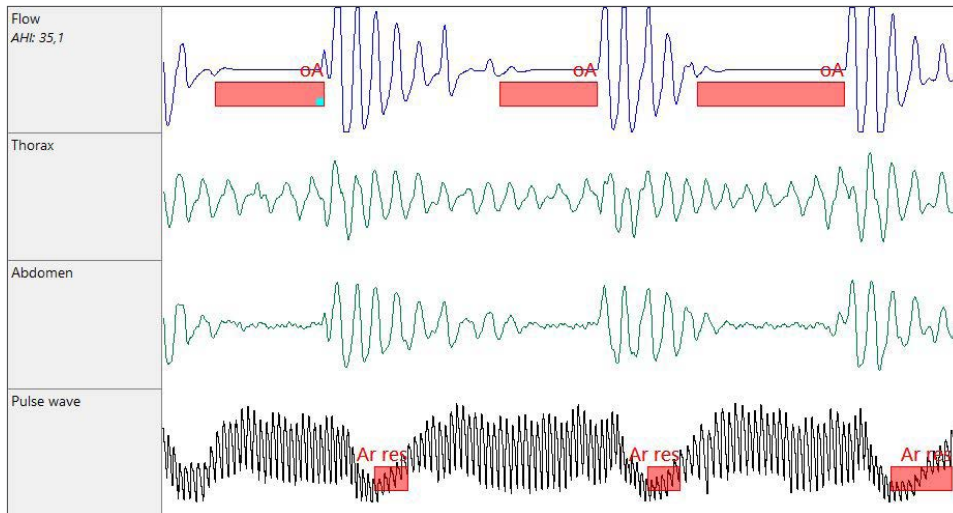
Delta HR

Delta HR describes the increase in heart rate that occurs in response to a respiratory event during sleep, making it a measure of the autonomic response.

Pulse wave amplitude drops

Pulse wave amplitude drops (PWAD) indicate increased activity of the sympathetic nervous system and may indicate fragmented sleep. The drops are generally associated with an acceleration in pulse transit time (PTT).

The amplitude drops can serve as additional information about stress reactions. In polygraphic measurements, they can likewise be used as surrogate parameters relating to cortical EEG arousal and support the determination of hypopneas and RERA.

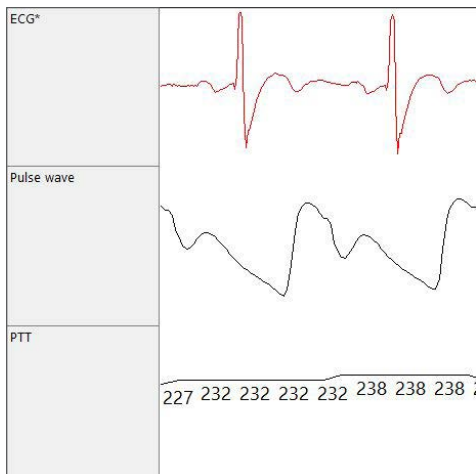


This excerpt of a screen shows three obstructive apneas. A clear pulse wave amplitude drop can be seen simultaneously with the end of respiratory events; the MSV software detects this as (autonomic) respiratory arousal.

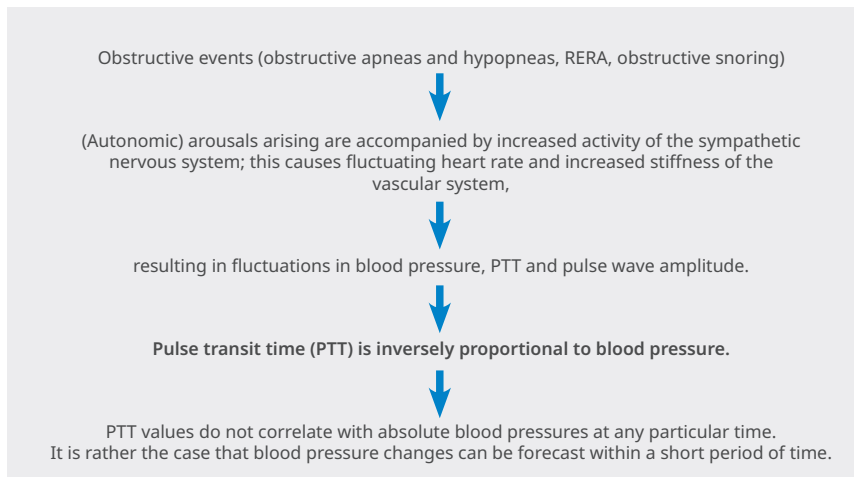
Pulse transit time (PTT)

Pulse transit time determines how long the arterial pulse wave needs to cover the distance from the left aortic valve to a peripheral end point. A change in vascular stiffness, due to increased activity of the sympathetic nervous system for example, has a direct impact on pulse transit time and allows the recording of both so-called autonomic arousals and, indirectly, blood pressure changes. These should be considered as inversely proportional to PTT.

Löwenstein Medical's Sonata PSG system is capable of determining PTT on the basis of the ECG and pulse wave signals.



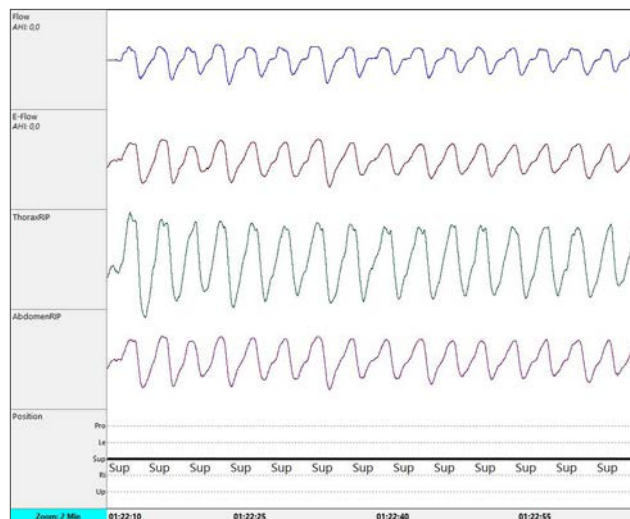
The R-wave of the ECG signal is used as the starting point for calculating PTT. The leading edge of the pulse wave marks the end point. PTT is output in milliseconds.



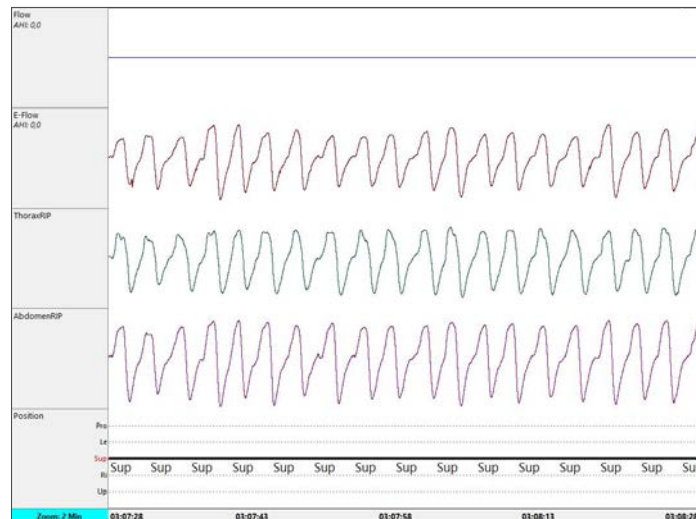
E-Flow

In the event that the flow signal is lost during a sleep diagnostic measurement night (e.g. due to patient movement), the MSV software offers the E-Flow feature.

For any completed measurement, the E-Flow signal can be calculated and analyzed after the event on the basis of the thoracic and abdominal signals.



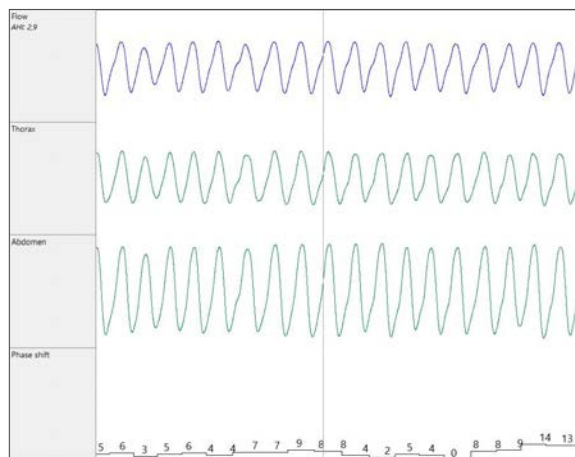
This excerpt from a recording shows a flow signal and, underneath it, also the calculated E-Flow.



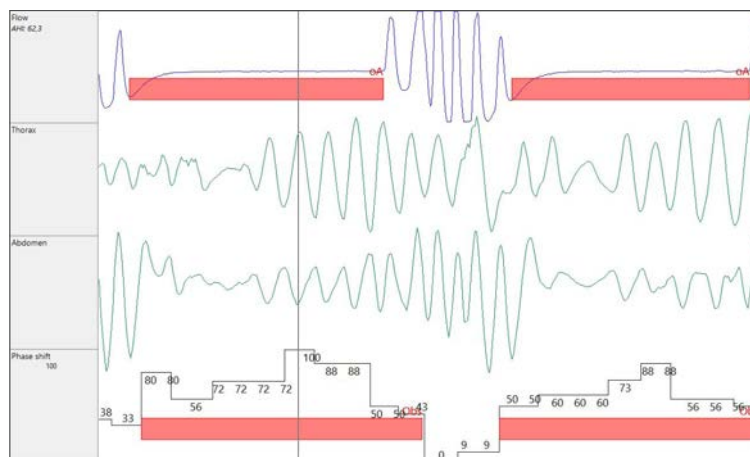
This excerpt from a recording shows where a flow signal has been lost (zero line) and, underneath it, also the calculated E-Flow.

Phase T-A

The MSV software analyzes phase coherence between the thoracic and abdominal respiratory curves. The so-called paradoxical/ reverse breathing which often occurs in patients with obstructive symptoms is apparent in a phase shift of these two signals and is output in the software in the form of the Phase T-A (T for “thorax”, A for “abdomen”).



This excerpt of a curve shows a section with no phase shift. Signal values are shown in the Phase T-A to make the visualization clearer. These values represent phase shift in %. Zero % indicates absolute phase coherence.

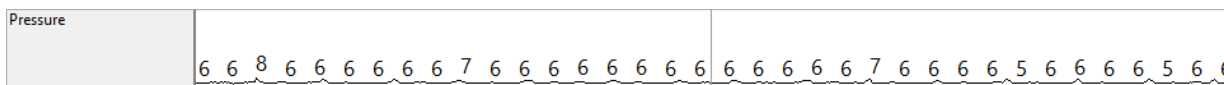


The vertical line set in the first obstructive apnea indicates a clear complete phase shift between thorax and abdomen. In parallel, a value of 100 % is shown in the Phase T-A; this visualizes the phase shift of 180° and thus the paradoxical/reverse breathing which has occurred during the obstruction.

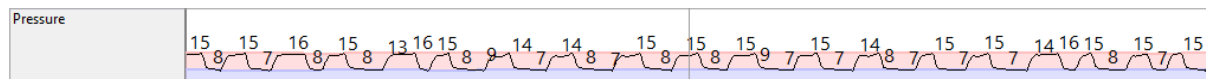
The red event highlighted in the Phase T-A channel simply indicates the obstruction, it does not inform reporting.

Automatic pressure detection (CPAP-BiLevel)

MSV software automatically analyzes recorded pressure signals with respect to the type of CPAP or BiLevel therapy used.



Example of a CPAP pressure curve



Example of a BiLevel pressure curve

Pressure range EPAP to IPAP
Pressure range EPAP

The pressure curve is displayed in color to enable quick identification of an analyzed BiLevel pressure. The two colored areas indicate the EPAP and IPAP pressure levels.

The corresponding analyzed pressure is automatically used for generating the report.

Pressure Distribution				
CPAP [mmHg]	Time [mm:ss] [%]	AHI [Per hour]	RDI [Per hour]	ODI [Per hour]
4	147:00 (35)	5,7	5,7	2,9
5	74:16 (18)	12,9	12,9	8,1
6	66:58 (16)	17,9	17,9	8,1
7	42:17 (10)	14,2	14,2	7,1
8	29:09 (7)	18,5	18,5	2,1

Example of a CPAP pressure table

Evaluation IPAP-EPAP				
IPAP / EPAP [cmH ₂ O]	Time [mm:ss] [%]	AHI [Per hour]	RDI [Per hour]	ODI [Per hour]
12 / 6	21:03 (7)	0,0	2,8	0,0
13 / 7	49:16 (15)	1,2	1,2	0,0
14 / 7	46:42 (15)	2,6	3,9	0,0
15 / 7	12:16 (4)	0,0	0,0	0,0
16 / 7	21:30 (7)	8,4	13,9	0,0
15 / 8	11:57 (4)	0,0	0,0	20,1

Example of a BiLevel pressure table

Individual evaluation criteria

The evaluation criteria of MSV sleep diagnostic software offer a high level of transparency and can be viewed at any time. They can be individually configured for automatic analysis and saved. This allows for easy adaptation to customer-specific requirements.

Evaluate Criteria

Patient type: **Adult**

Setting parameters

☐ Evaluation period

☒ Flow

☐ SpO2

☐ Pulse

☐ Breathing motion

☐ Snoring

☐ Leg

☐ ECG

☐ RRsys

☐ EEG

☐ Artifact

☐ External

☐ PCO2

☐ Pressure

☐ Automatic creation of channels

Threshold value of Flow

Apnea [%]

10,0

Minimum [sec]

10

Maximum [sec]

120

☐ Apnea only at desaturation

Hypopnea [%]

70

Minimum [sec]

10

Maximum [sec]

180

Max. respiratory rate [1/min]

60

Required follow-up events:

☒ Desaturation

☒ Arousal

☐ Automatic Differentiation of Hypopnoeas

Max. distance [sec]

10

Apnea/Hypopnea - Event:

10

Combine [sec]

2

Cheyne-Stokes:

Min. no. breathings

4

Min. interval CSB [sec]

45

Max. interval CSB [sec]

75

CSB: Number min.

2

RERA

☒ Automatic RERA Detection (Polysomnographie)

☒ Automatic RERA Detection (Polygraphie)

Flowlimitation

☐ Automatische Erkennung

Minimum [sec]

10

Maximum [sec]

180

Combine [breaths]

1

Averaging Respiratory Rate

New measurement [Sec]

0

☐ Manual scoring of events under minimum length not allowed

OK

Cancel

Help

Export

Import

Save

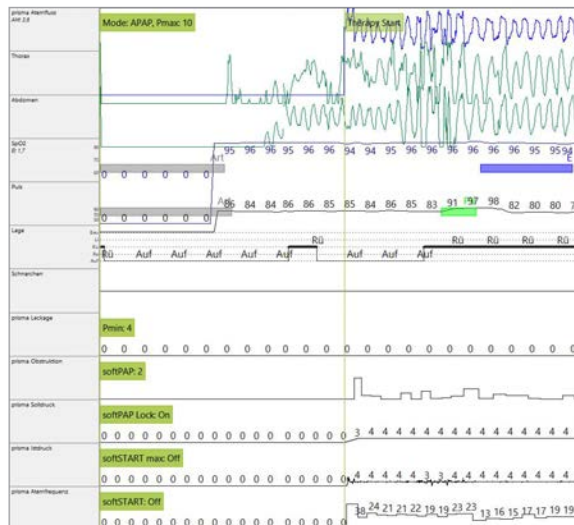
Original values

Define Evaluation Type

Bluetooth™ connectivity with therapy devices

The Bluetooth™ interface integrated in the Samoa and prisma SOFT/SMART devices (plus/max versions) allows the devices to connect and to communicate with one another. This makes it possible for both device platforms, polygraphy and therapy, to exchange patient therapy information wirelessly, delivering a comprehensive depth of information during the simultaneous use of both products.

When both products are used in parallel, values calculated and acquired live from the prisma device (e.g. flow, pressure, leakage, respiratory rate etc.) are transmitted to the Samoa device by Bluetooth™ and saved there at the same time as the polygraphy data and subsequently visualized when the measurement is read out. The prisma device also transmits status information about therapy settings and the course of therapy. The MSV software uses all the transmitted signals for analysis.



Synchronizer

The synchronizer function within the MSV software allows the subsequent merging of data from the prisma therapy device with data from the sleep diagnostic devices.

Scenario

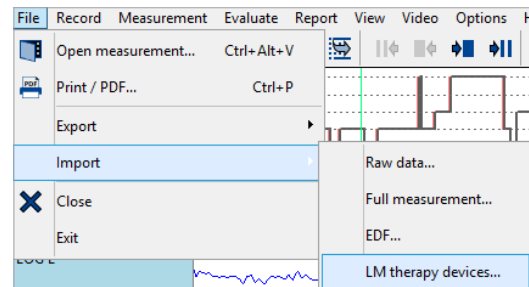
- Offline diagnostic measurements in a home patient setting using a prisma therapy device.
- Use of a T-adaptor on the patient's mask to record flow and pressure signals during a therapeutic diagnostic measurement.
- Note: Signal quality is highly dependent on factors such as potential mask leakage, so inaccuracies are common.

Request

Medical professionals request more information and a more precise informative value in terms of the therapy settings.

Solution

Detailed therapy data stored on the device's internal SD card can subsequently be merged with the simultaneously recorded diagnostic data.



10-20 Sonata Neuro module

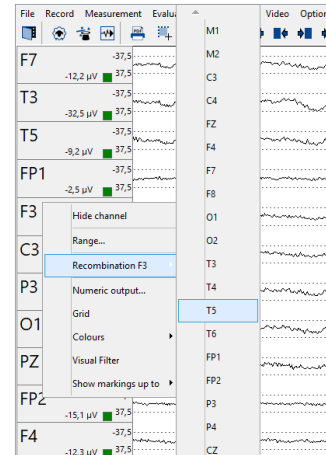
The Sonata PSG system offers a 10-20 neuro module for specific neurological requirements, which meets the standards of the internationally recognized 10-20 EEG system.

Despite its 21 EEG connections, the neuromodule is small, handy and can be applied directly to the patient.

The 10-20 neuro module is compatible with all Sonata systems and can be used modularly without any issues.



The option for subsequent EEG recombinations is implemented in the MSV software.





LÖWENSTEIN medical

Sales + Service

Löwenstein Medical
Arzbacher Straße 80
56130 Bad Ems, Germany
T. +49 2603 9600-0
F. +49 2603 9600-50
info@loewensteinmedical.com
loewensteinmedical.com



Dr. Fenyves und Gut Deutschland GmbH
Daimlerstr. 23
72414 Rangendingen, Germany



gba12209en2510

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