

Advanced Alarm Performance

Reduce false alarms and nuisance alarms without delaying actionable alarms





ALARMS: CRITICAL FOR PATIENT SAFETY, CHALLENGING FOR CLINICIANS

While responding to actionable alarms is critical to prevent patient injury or death, the frequency of false and nuisance alarms can increase workload and desensitize clinicians to all alarms, often putting patients at significant risk.

Many pulse oximeters perform well with patients who are not moving with good peripheral perfusion, but during motion and low perfusion conventional pulse oximetry can freeze, zero out, or falsely alarm.

Various alarm approaches can reduce the frequency of alarms, but clinicians must be vigilant so they don't unknowingly delay notification of actionable alarms.



According to the ECRI Institute, patient alarms are one of the top technology hazards in hospitals today



MASIMO ALARM SOLUTIONS

Masimo SET® pulse oximetry offers advanced alarm performance, including:



MEASURE-THROUGH MOTION AND LOW PERFUSION PULSE OXIMETRY

- > True alarm detection at 97%¹
- > False alarm prevention at 95%¹

EVIDENCE-BASED ALARM MANAGEMENT

- > Earlier alarm notification without extending averaging during challenging conditions
- > Evidence-based alarm settings to avoid nuisance alarms while enabling notification of actionable alarms

ADAPTIVE THRESHOLD ALARM™

- > Adjusts audible alarm threshold to the patient's baseline SpO₂ value
- > Reduces nuisance alarms while maintaining visual alarms based on fixed threshold settings

ADVANCED PREDICTIVE ALARMS

- > Detect multiple transient desaturation events that may predict respiratory failure with 3D Desat Index Alarm™²
- > Detect critical changes in peripheral perfusion with 3D Perfusion Index Alarm™^{3,4}

These Masimo SET solutions work together to significantly reduce false alarms and nuisance alarms without delaying actionable alarms, freeing clinicians to focus on patient care



Because Masimo alarm solutions significantly reduce false and nuisance alarms without delaying actionable alarms, clinicians can intervene when a Masimo device alarms

¹ Shah N et al. *Journal of Clinical Anesthesia*. 2012. In press.

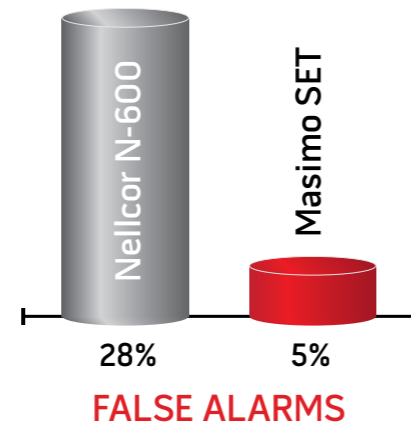
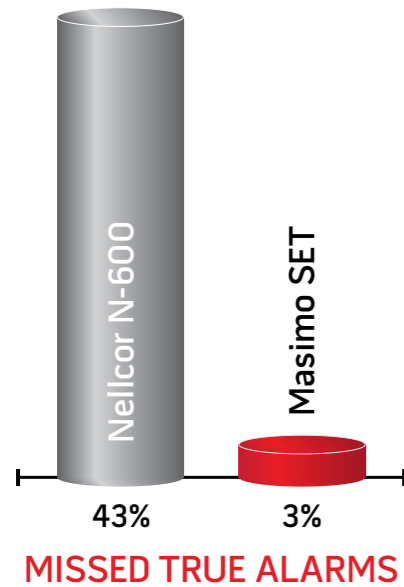
² Wong MW et al. *Journal of Trauma, Injury, Infection, and Critical Care*. 2004; 56(2):356-362.

³ De Felice et al. *Pediatric Critical Care*. 2008;(9)2:203-208.

⁴ Ginasar et al. *Acta Anaesthesiol Scand*. 2009; 53:1018-1026.

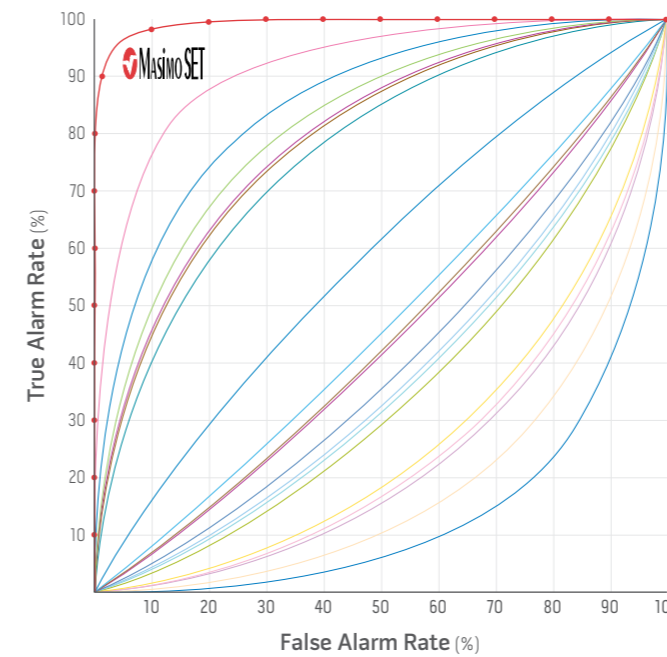
CLINICALLY PROVEN IN MORE THAN 100 INDEPENDENT AND OBJECTIVE STUDIES

False alarms with conventional pulse oximetry occur because these technologies do not work reliably under challenging clinical conditions, including patient motion and low peripheral perfusion. Masimo SET Measure-through Motion and Low Perfusion pulse oximetry works where and when you need it.



This study measured the occurrence rate of missed true events during 40 low blood oxygen episodes and false alarms during 120 fully oxygenated episodes, during conditions of motion, and with no alarm delays.¹

TRUE & FALSE SpO₂ ALARM RATE OF MASIMO SET vs. 19 COMPETING PULSE OXIMETRY TECHNOLOGIES²



- Masimo SET**
- Philips 24C
- Philips CMS-B
- Datex-Ohmeda 3740
- Nellcor N-395
- Datex-Ohmeda AS-3
- Datex-Ohmeda 3800
- Datex-Ohmeda 3900
- Nellcor N-200
- Philips CMS
- Nellcor N-295
- GE 8000
- Novamatrix MARS
- Nellcor NPB-190
- Nellcor NPB-180
- Novamatrix 520A
- Spacelabs 90308
- Nonin 8600
- BCI 3304
- Criticare 5040

“Masimo SET is advantageous because even though it significantly reduces false alarms, it doesn't do that by ignoring physiological changes.”

CHRISTIAN POETS, MD
Director, Neonatal Intensive Care
Medical School, Hannover, Germany



¹ Shah N et al. *Journal of Clinical Anesthesia*. 2012. In press.

² Barker SJ. *Anesth Analg*. 2002;95(4):967-972.

EVIDENCE-BASED ALARM MANAGEMENT

Separating nuisance alarms from actionable alarms lets you maximise clinical efficiency without sacrificing patient safety

While SpO₂ and pulse rate values are displayed continuously, pulse oximeters alarm based on user-defined settings, including alarm thresholds, averaging time, and notification delays.

Masimo has analysed more than 32 million data points from 10 hospital floors to help clinicians make evidence-

based decisions about SpO₂ alarm settings to reduce nuisance alarms while preserving actionable alarms.

The result is earlier alarm notification without extending averaging during challenging conditions and evidence-based alarm settings that allow you to reduce nuisance alarms while preserving actionable alarms.

Consistent notification of alarms, even during challenging conditions

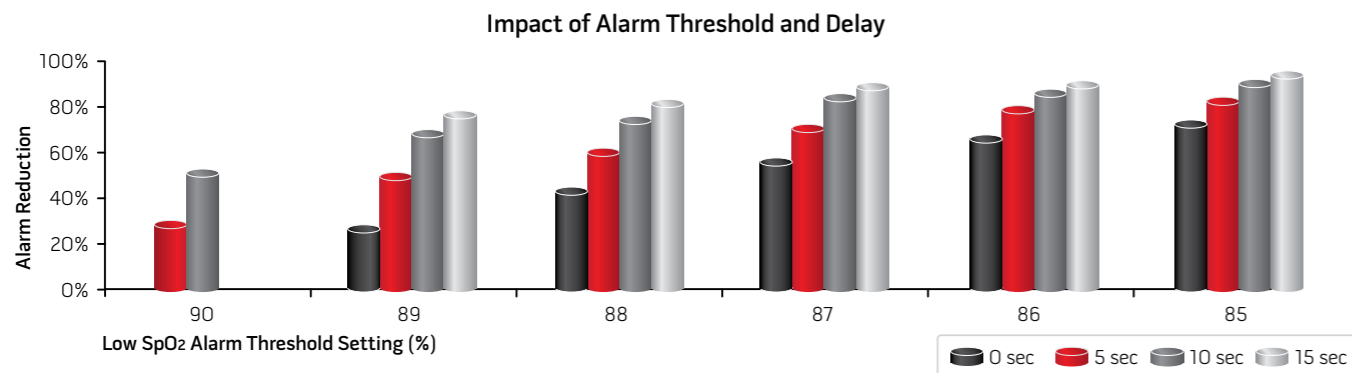
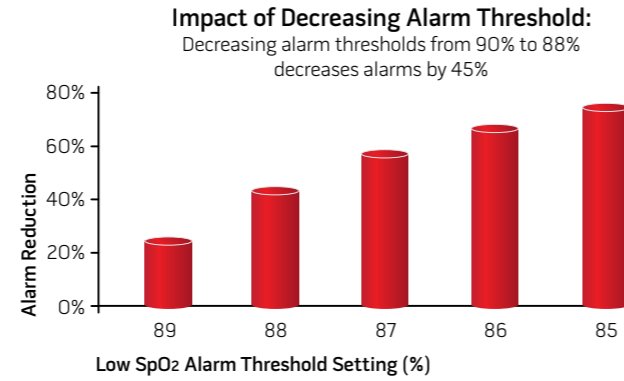
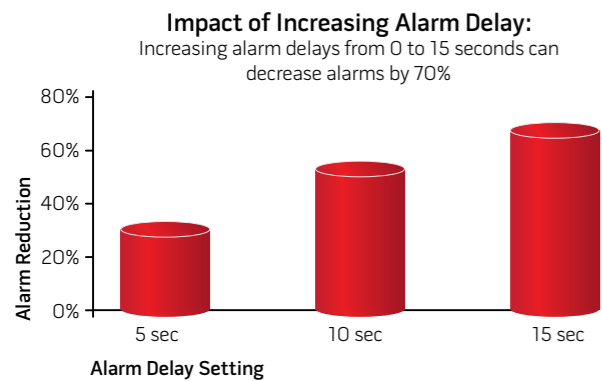
The goal of alarm settings should be to enable actionable alarms while avoiding nuisance alarms, defined as true SpO₂ or pulse rate values that don't require clinician intervention.

Other pulse oximeters extend averaging from 10 seconds to 50 seconds during challenging conditions.¹ Increasing averaging when SpO₂ or pulse rate are changing will, by definition, delay notification of potentially actionable alarms.

Because Masimo SET can measure through motion and low perfusion, SpO₂ and pulse rate averaging can remain fixed, providing clinicians with consistent and reliable notification of alarm conditions.

No matter where default alarm settings are configured, Masimo Rapid DeSat™ setting enables immediate notification of any significant drop in SpO₂ values, overriding other alarm settings.

INCREASING DELAYS AND DECREASING THRESHOLDS SIGNIFICANTLY REDUCE NUISANCE ALARMS



Together, decreasing the low SpO₂ alarm threshold from 90% to 88% and adding a 15 second delay will decrease nuisance alarms by 85%

EVIDENCE-BASED ALARM SETTING RECOMMENDATIONS:

- > Set alarm thresholds according to patient conditions and clinician needs
- > Set alarm delays based on patient severity, with longer delays for patients requiring lower-intensity surveillance monitoring
- > Consider lowering alarm thresholds to reduce nuisance alarms
- > Alarm settings are always customisable for the care area and the patient



¹ Nellcor N-600 Directions for Use.

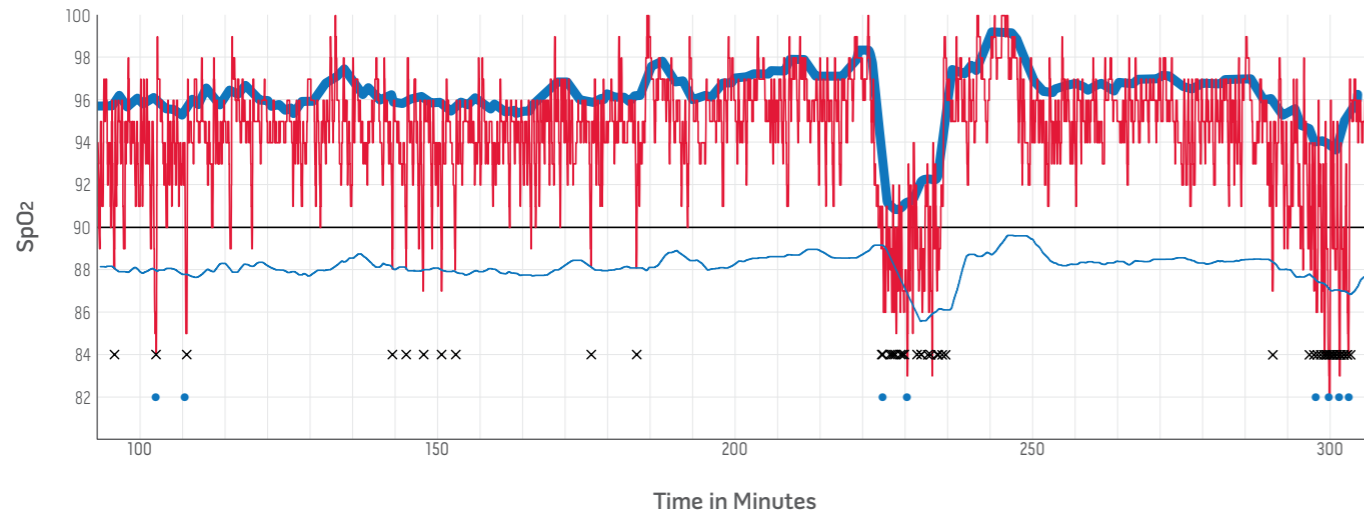
ADAPTIVE THRESHOLD ALARM™

Actionable alarm notification

Masimo's innovative Adaptive Threshold Alarm helps reduce nuisance alarms by automatically adjusting the audible alarm to the patient's baseline. Adaptive Threshold Alarm is an optional setting with a simple on/off activation in the alarms setting menu.

ADAPTIVE THRESHOLD IMPACT ON ALARM FREQUENCY IS DEPENDENT UPON:

- > Alarm Threshold Setting
- > Rapid Desat Setting
- > Patient Baseline SpO₂



█ Baseline x Fixed Threshold Alarm Event — Adaptive Threshold
— SpO₂ • Adaptive Threshold Alarm Event — Fixed Threshold

5 hr patient SpO₂ trend (red) showing SpO₂ baseline (bold blue) and Adaptive Threshold Alarm (light blue) with the alarm delays set to 10 seconds.

ADAPTIVE THRESHOLD ALARM IMPACT ON ALARM OCCURRENCE:

An analysis of 32 million data points showed Adaptive Threshold Alarm reduced audible alarm occurrence by 86% at a low SpO₂ alarm setting of 90%, which represents a significant improvement over a standard 15-second delay.

Low SpO ₂ Alarm Setting (with No Alarm Delay, Rapid Desat Off)	Reduction in Alarm Occurrence		
	Standard Alarm (15 sec delay, Rapid Desat off)	Standard Alarm (15 sec delay, Rapid Desat at 10%)	Adaptive Threshold Alarm (15 sec delay, Rapid Desat at 10%)
90%	70%	68%	86%
88%	85%	83%	92%
85%	94%	94%	96%

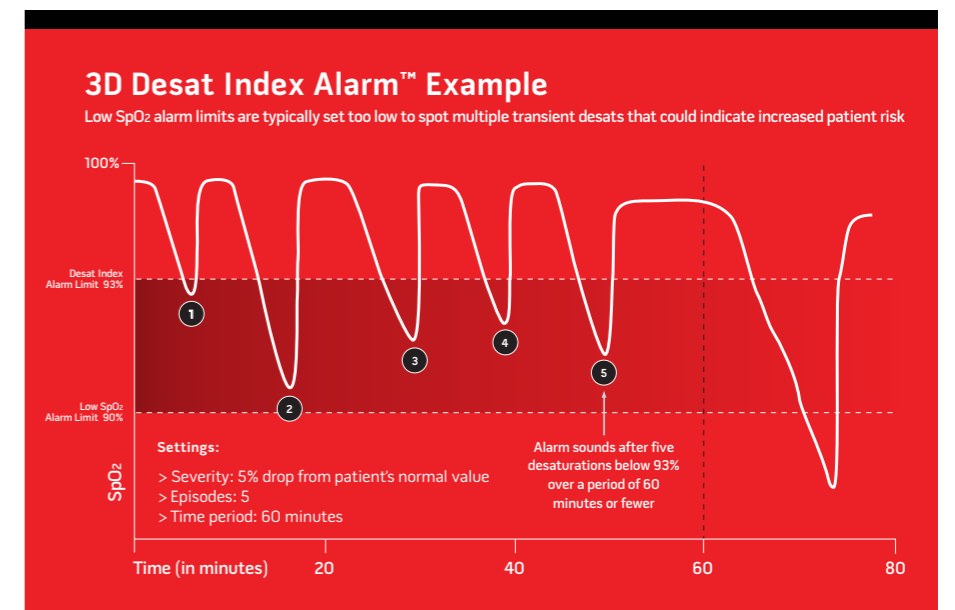
ADVANCED PREDICTIVE ALARMS

Designed to provide you with early notice of physiologic deterioration

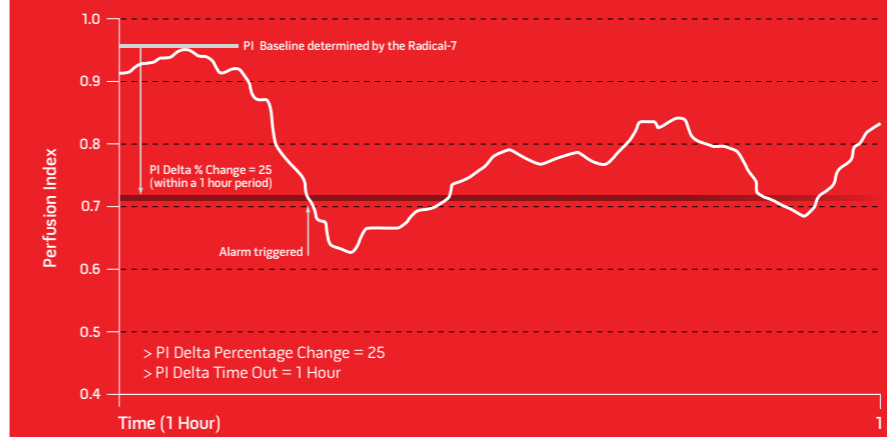
While standard SpO₂ and pulse rate alarms can sometimes provide a signal of deteriorating patient conditions, Masimo's advanced 3D alarms give you another dimension of advanced notification of parameter conditions that may precede clinically significant events.

POTENTIAL RESPIRATORY COMPROMISE

Multiple transient desaturation events over a short period may predict pending respiratory failure.¹ Masimo 3D Desat Index Alarm notifies clinicians of these patterns, which may identify patients at risk for respiratory depression such as patients receiving opioids for pain management.



3D PI Delta Alarm™ Example



POTENTIAL CARDIOVASCULAR COMPROMISE

Changes in peripheral perfusion may reflect significant underlying cardiovascular changes. Masimo 3D Perfusion Index (PI) Delta Alarm notifies clinicians of changes in peripheral perfusion, which may provide an early indication of risk in critically ill patients.^{2,3}

¹ Wong MW et al. *Journal of Trauma: Injury, Infection, and Critical Care*. 2004; 56(2):356-362.

² De Felice et al. *Pediatric Critical Care*. 2008;(9)2:203-208.

³ Ginasar et al. *Acta Anaesthesiol Scand*. 2009; 53:1018-1026.

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