



Standard Specification for Alarm Signals in Medical Equipment Used in Anesthesia and Respiratory Care¹

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INTRODUCTION

Medical practice in hospitals is increasingly dependent on equipment for observation and treatment of patients. Sounds and lights are frequently used to indicate the patient's physiological status and the functional state of the equipment. The sounds used are frequently too loud and not sufficiently distinctive, and it is often difficult to identify which item of equipment is signalling. The purpose of this specification is to specify signals, both audible and visual, to be used to draw attention to the fact that equipment has detected a disturbance and to indicate the degree of urgency.

The content of this specification was developed with contributions from clinicians, engineers, applied psychologists, and musicians. Some of the criteria considered during development of the sounds included optimal signal recognition in a relatively noise-filled environment, maximum transmission of information at the lowest practical sound pressure level, ease of learning and retention by operators who have to respond to the various signals, and perceived urgency of the sounds.

1. Scope

1.1 This specification covers defining the characteristics and requirements of electrically generated alarm signals for use with medical equipment intended for use in anesthesia and respiratory care. It does not specify the condition that activates the alarms, nor does it specify the devices used for the production of audible and visual signals. This specification does not address informational sounds produced by devices such as ECG monitors, surgical lasers, and electrocautery units.

1.2 The values stated in SI units are to be regarded as the standard.

2. Referenced Documents

2.1 ISO Standard:

ISO 3744: Acoustics—Determination of Sound Power Levels of Noise Sources—Engineering Methods for Free-Field Conditions Over a Reflecting Plane²

2.2 IEC Standards:²

IEC 651 Sound Level Meters

IEC 73 Colors of Indicator Lights and Push-Buttons³

IEC 601-1 Medical Electrical Equipment—Part 1: General Requirements for Safety³

3. Terminology

3.1 Definitions:

3.1.1 *burst*—a group of pulses with a distinctive rhythm.

3.1.2 *burst amplitude*—the A-weighted sound pressure level of the maximum pulse in the burst measured in decibels.

3.1.3 *burst spacing*—the period of time between the start of the first pulse in one burst and the start of the first pulse in the next burst.

3.1.4 *clearly legible*—the visual attribute of information displayed by the equipment that allows the operator to discern (or identify) quantitative values or functions under a specific set of environmental conditions.

3.1.5 *discriminate*—the ability of an operator to perceive a qualitative difference among visual signals under a specific set of environmental conditions.

3.1.6 *flashing frequency*—the number of light flashes per unit of time.

3.1.7 *high priority alarm*—a combination of audible and visual signals indicating that immediate operator response is required.

¹ This specification is under the jurisdiction of ASTM Committee F29 on Anesthetic and Respiratory Equipment and is the direct responsibility of Subcommittee F29.15 on Harmonization of Alarms.

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² Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

³ Patterson, R. D., *Guidelines for Auditory Warning Systems on Civil Aircraft*, Civil Aviation Authority (UK) Paper 82017, 1982.