



SOUNDERGONOMICS

Education and Occupational Health

Samsung Z20 Ergonomic Evaluation



Samsung Z20 Ergonomic Evaluation

Ergonomics Meets AI: The Ultrasound Machine Designed for Comfort and Efficiency

The Challenge

Work-related musculoskeletal disorders (WRMSDs) are a prevalent and costly issue in sonography, affecting up to 90% of professionals over their careers¹. These injuries result from repetitive motions, sustained awkward postures, and physical strain during scanning, often leading to pain, restricted work time, or career-ending conditions. Despite advancements in equipment, many sonographers face significant ergonomic risks due to outdated techniques, prolonged workloads, and suboptimal work environments. This underscores the critical need for ergonomically designed ultrasound systems that prioritize user comfort and safety, enabling sonographers to deliver high-quality patient care while minimizing injury risks.

Introduction

The Samsung Z20 was rigorously evaluated against standards such as the **Industry Standards for the Prevention of Work-Related Musculoskeletal Disorders in Sonography (ISPWRMSDS)** and **ISO 9241-210**, according to anthropometric standards in North America. In every evaluated category, the Samsung Z20 either met or exceeded industry standards, and for some criteria, rendered them completely obsolete.



Setting New Ergonomic Standards

The Samsung Z20 is the newest ultrasound system in the line of Women's Imaging systems. With an AI driven software system, ultrasound exams can now be performed with up to 94% fewer keystrokes compared to previous models².

Ergonomics in ultrasound has traditionally focused on physical aspects of the machine. The Z20 ultrasound system marks a turning point in ultrasound machine development. Leading edge AI driven features redefine the way exams are performed and have created new industry benchmarks by eliminating many of the repetitive, physical motions required to operate traditional ultrasound systems.

Individual Customization and Usability

Each user can create a unique profile that allows them to customize the entire user interface. Like one's cell phone, the variations in customization are innumerable. In addition to auxiliary features like lighting color, name, and profile picture, each user can put their most frequently used buttons and controls within easy reach, exactly where they want them to be.

The system offers 11 customizable physical buttons on the main control panel, all within 3.5 inches of the trackball. Each user can assign a function to these buttons based on their preference and scan

habits. Each user's profile is tied to the physical buttons and the machine settings. No two users' layout will be the same, essentially giving each user their "own machine". These preferences can be easily transferred and copied to each Z20 for seamless room and schedule flexibility.

In addition to complete customization of the physical buttons on the control panel, the Z20 provides each user the ability to create customized maps for their grayscale and color images, with an additional subset of customization options for specialty organs such as the fetal heart, vasculature, brain, and spine.

Extensive customization of both hardware and software functions of the Z20 results in increased efficiency and the elimination of wasted motion and time "hunting and pecking" for buttons, dials, and controls that may not be intuitive or easy to access for the individual.

AI Driven Performance: The Future of Sonography

The Z20's AI-driven protocols reduce keystrokes and manual adjustments by up to 94%^[1] streamlining exams and significantly decreasing the time required for each scan. This efficiency minimizes repetitive strain while enabling sonographers to focus on critical image quality decisions.

At the conclusion of a study all images can be automatically reordered into the reading practitioner's order preference, eliminating cumulative repetitive motion strain at a computer by rearranging images into the desired order.



The Z20 user interface includes a 15.6" Touch Screen with 30 degree tilt and 11 customizable physical buttons on the main control panel, all within 3.5 inches of the trackball.



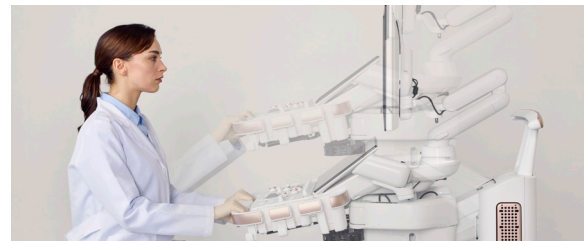
SOUNDERGONOMICS

Workflow Efficiency and Real Time Assistance

- Live ViewAssist obtains and labels up to 47 structures, measures up to 46 key structures of the appropriate fetal anatomy, and marks the image complete on the EzCheck™ checklist. If a superior view is scanned over it automatically obtains, measures and labels the new image, and removes the lowest quality one of the previous three. Live ViewAssist™ image quality was rated as comparable to those obtained by manual scanning and demonstrated similar performance in populations with different BMI distributions. The user has the option to accept or overwrite any images and measurements taken.
- EzCheck™ tracks the exam protocol as images are taken and checks them off as images are obtained. At the end of the study the user is notified of any images that have not been obtained. This eliminates the user scrolling through the images to ensure they have not missed any. Exam quality and patient experience improve because studies will not have to be repeated or patients called back due to an incomplete exam.
- ViewAssist™ provides a zoomed in view of the margins/borders of a structure being measured, next to the live image, so the sonographer can more easily place calipers at the exact border. This reduces the keystrokes necessary to zoom in and out, sometimes multiple times, to ensure a structure is measured accurately.

Cart Design: Accommodating Every User

- The cart height ranges from 30.5 inches to 41.75 inches, comfortably fitting users from the 5th percentile female (5' tall) to the 95th percentile male (6'1" tall) in either a sitting or standing position.
- The control panel swivels 180 degrees, slides forward and backward 10.5 inches, turns 90 degrees, and boasts a 15.6" LCD touchscreen with 30 degrees of tilt for easy viewing from a standing or sitting position. This full range of motion allows sonographers to maintain neutral neck, shoulder, wrist and forearm positions.
- For seated users, the cart provides ample clearance, which measures 23.4 inches of clearance from the built-in footrest to the handle. This surpasses the industry standard by providing an additional 17% clearance for the shortest users and 9% for the tallest, ensuring comfort across diverse body types.



System adjustments to accommodate a full spectrum of user heights.



EzCheck is an AI-driven feature powered by Deep Learning technology that automatically identifies and captures the required views during live scanning.



SOUNDERGONOMICS



27" OLED monito with 360-degree rotation to reduce eye strain.

Advanced Display Technology

- The touch screen feature allows the user to, in real time, cast a duplicate view of the live image to both the touch screen in front of them, and the monitor simultaneously, which has a 360-degree rotation capability. This feature creates the leading edge standard for eliminating neck and back strain when multiple parties are viewing an image.
- The 27" OLED monitor reduces haze by 35% compared to LCD, provides high resolution views, and eliminates eye strain in bright lighting environments. This renders traditional anti-glare standards obsolete, as the monitor ensures visibility from all angles and positions.
- Fonts, colors, and sizes are all customizable, exceeding all OSHA standards for screen readability.

Mobility and Transport

- Dual electronic push button controls for brakes and 2- and 4-wheel mobility are present on both the front and rear of the machine, simplifying repositioning. This innovation not only exceeds mobility standards but also provides the option of steering and maneuvering the machine from either side.
- The Mobile Sleep function increases efficiency with a 72% time savings on boot up from Sleep Mode (60% on boot up and 75% on shut down).



Dual electronic push button controls for brakes and 2- and 4-wheel mobility are present on both the front and rear of the machine.

	Booting Time	Shut Down
Regular On/Off	80 seconds	20 seconds
Mobile Sleep	32 seconds	15 seconds



Volume transducers



Abdomen, Obstetrics,
Gynecology, Urology



Abdomen, Obstetrics,
Gynecology, Urology



Obstetrics, Gynecology,
Urology

Linear array transducer



Abdomen, Musculoskeletal,
Small Parts, Vascular,
Obstetrics, Pediatric

Curved array transducers



Abdomen, Obstetrics,
Gynecology, Musculoskeletal,
Pediatric, Vascular, Urology



Abdomen, Obstetrics,
Gynecology, Musculoskeletal,
Pediatric, Vascular, Urology

Endocavity transducers



Obstetrics, Gynecology,
Urology



Obstetrics, Gynecology,
Urology

Transducer Design: Lightweight and Balanced

Endo cavity scanning can be particularly strenuous on the body and is often cited as an exam that produces discomfort or pain.

- The recommended weight limit for one-handed precision tools is 400 grams. The EV2-12 (volume 3D) transducer weighs 225 grams, and the EA2-11AR transducer weighs an impressive 95.74 grams. This puts the EV2-12 at 56% of the recommendation and the EA2-11AR at just 24% of the recommendation. With the contoured handle and a strategically placed thumb groove behind a molded hand guard, these transducers naturally put the hand into an adducted palmar grip. This grasp type provides greater precision control with less hand strain by transferring power from the fingers to the palm, which reduces the amount of force required by the shoulder for lateral pelvic scanning.
- Textured surfaces, such as the subtle pebbled texture on the CMV1-10 (volume 3D) transducer, support a palmar grip and decreased finger strain.

Cable Management

- Four fixed cord hooks plus 2 additional bungee-style cable holders secure the cord and distribute the weight more evenly, reducing pull and torque on the user's wrist.



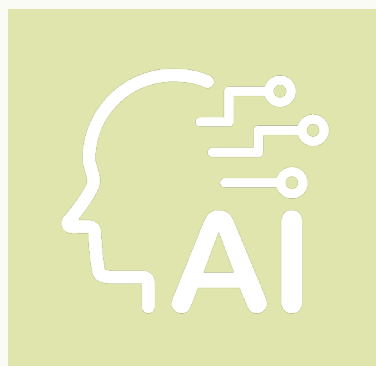
SOUNDERGONOMICS

Redefining Industry Standards

The Z20 is a system that does not just comply with existing ergonomic standards. It meets or exceeds 100% of all 37 standards in every evaluated category, distinguishing itself as a leader in ergonomic innovation. The Z20 met 38% (14/37) of the standards, exceeded 62% (23/37), and rendered 4 standards obsolete.

Features such as individual profiles with completely personalized customizable controls, a 27" OLED monitor, a cart that adjusts 4 directions, and AI supported protocols, all contribute to an advanced ultrasound system that fully supports the user. With meticulous detail and AI integration, the Z20 sets a new benchmark in sonography.

Meets or exceeds
100%
of all 37 standards



4 Standards rendered obsolete



[To learn more about Z20, please click this text or scan the QR code](#)

Conclusion

By addressing the physical challenges related to diagnostic medical sonography and optimizing workflow efficiency, the Z20 is the machine for healthcare facilities seeking to streamline exams and safeguard the well-being of their sonographers.



SOUNDERGONOMICS

References

1 Society of Diagnostic Medical Sonographers. (2016). INDUSTRY STANDARDS FOR THE PREVENTION OF WORK RELATED MUSCULOSKELETAL DISORDERS IN SONOGRAPHY. SDMS.

2 Data on file. Based on clinical analysis of 2nd trimester detailed anatomy exam; results may vary by user, system settings, and scanning conditions

Canadian Centre for Occupational Health and Safety. (2023). Hand Tool Ergonomics. CCOHS.

Department of Defense. (2019). Department of Defense Design Criteria Standard Human Engineering. Washington, D.C.: Department of Defense.

Feix, T., Romero, J., Schmiedmayer, H.-B., Dollar, A. M., & Kragic, D. (2016). The GRASP Taxonomy of Human Grasp Types. IEEE TRANSACTIONS ON HUMAN-MACHINE SYSTEMS, 66-77.

International Organization for Standardization. (2010). ISO 9241-210. Switzerland: ISO.

NC State University. (2006). NCSU Ergocenter. Retrieved from <https://multisite.eos.ncsu.edu/www-ergocenter-ncsu-edu/wp-content/uploads/sites/18/2016/06/Anthropometric-Detailed-Data-Tables.pdf>

Pheasant, S. (2003). Bodyspace: Anthropometry, ergonomics, and the design of work. Philadelphia: Taylor & Francis.

Z20 is the commercial brand name in the United States of America for the HERA Z20 product and is U.S. FDA 510(k) cleared - K241971.

