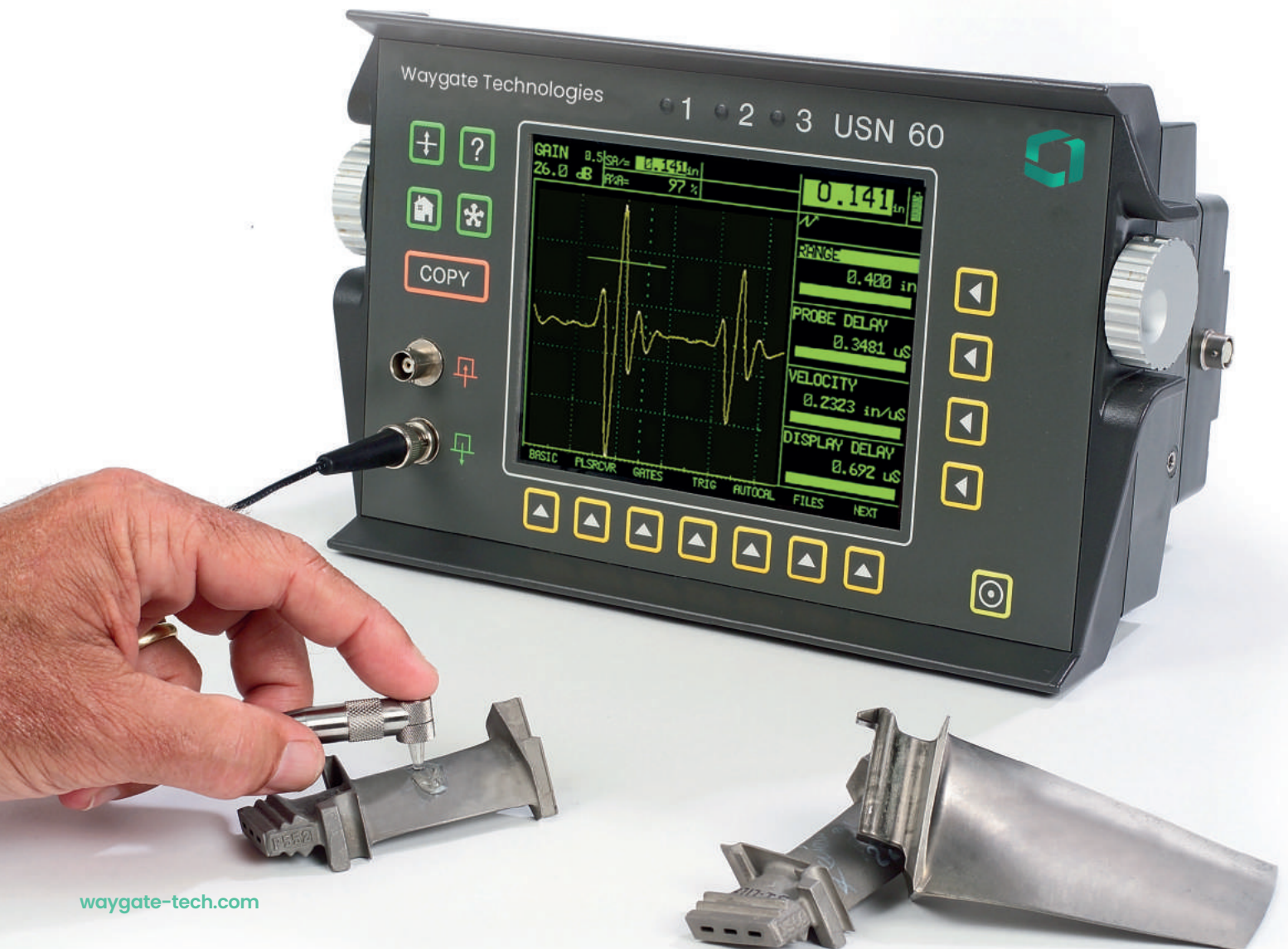


Krautkramer USN 60/60L

Portable ultrasonic flaw detectors

Waygate Technologies has optimized its USN 60 series for use in direct sunlight and operation at extreme temperatures. These new characteristics make the instruments ideally suited for outdoor use with its increased long battery operation time.

Depending on the applications challenges, you have the choice between the USN 60 and the USN 60L version.



The USN 60 series:

Outstanding ultrasonic performance

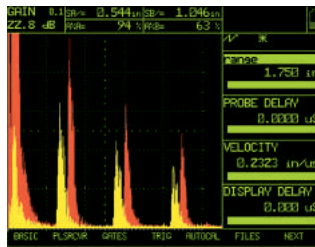
The combination of the rugged USN durability, 11 hours of battery operation, fast rotary knob operation, outstanding ultrasonic performance, and the "square wave pulser" form a powerful portable ultrasonic inspection tool.



Optimized outdoor use design

The USN 60/USN60L flaw detectors are especially designed to be used outdoors:

- Extreme temperature use (-20°C to +55°C/-4°F to 130°F)
- Easy to view in direct sunlight
- 11 hours battery operation



Vibrant colors

- Hi-resolution color LCD display produces "Analog Look and Performance" echo dynamics.
- 4 selectable vibrant display color schemes to match lighting conditions.
- Gates and gate functions are color coded for easy identification and fast adjustment.

User preferred features

- Simple operation with fast rotary knob adjustments; gain is always directly accessible with the left-hand rotary knob and lockable.
- Auto CAL makes calibration fast and easy.
- 15 Hz to 6 kHz (spike mode) PRF and 15 Hz to 2 kHz (square mode) PRF (pulse repetition frequency).
- 2 independent gates monitor amplitude and soundpath distance for both flaw detection and thickness measurement applications.
- 250 KHz to 25 MHz frequency range.
- RF display mode enhances signal evaluation and bond inspection of dissimilar materials.
- 4 selectable damping settings (50, 75, 150, 500 ohms) for optimum probe performance.

- 1 mm to 28 m (0.040" to 1100") range (in steel) covers thin to lengthy acoustically clean materials.
- dB REF key evaluates subsequent echoes gain value and amplitude against the highest echo in Gate A (reference echo) when activated.
- IF (Interface) gate option for automatic start of the display, gate A, gate B, and/or DAC/TCG for immersion testing applications.
- VGA output option provides an easy way to connect to a PC monitor or PC projector for viewing by large audiences or training purposes.
- RF output option outputs the raw RF waveform via a standard Lemo connector for further analysis.
- BEA (Backwall Echo Attenuator) option allows independent gain control of the region under gate B for backwall echo monitoring.
- 19" rack mount model.

Wide range of applications

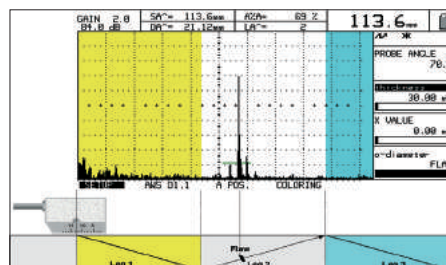
A 6 kHz pulse repetition frequency, real-time analog and TTL outputs makes the USN 60 flaw detectors series ideal for a wide range of automated systems testing applications. The exclusive SmartView feature displays even the shortest echoes for critical scanning and rotating part inspections.

The quality, durability, dependability and ease of use that you have come to expect of Krautkramer's popular USN Series of instruments remains. From rugged field inspections to high resolution thin measurements, long acoustically clean materials, and immersion systems, the USN 60 flaw detector family extends the range of applications that a portable instrument can perform. Furthermore the selectable 450V Square Wave Pulser satisfies a wide range of tough-to-penetrate applications, such as difficult to penetrate metallic applications and especially non-metals inspection like composite materials.



Tools for easy weld inspection

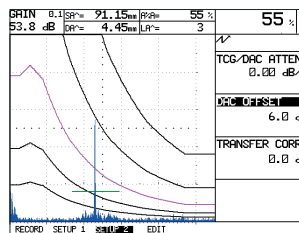
- Color leg allows easy identification of leg and skip distances for weld inspection.
 - GRID mode dynamically changes bands of display background colors for each leg.
 - A-SCAN mode dynamically changes the color for each leg of the "live" A-Scan
- Weld rating calculation simplifies the rating of weld indications according to AWS Specification D1.1. (Formula $D = A - B - C$).
- Trigonometric flaw location function with curvature correction automatically calculates depth, surface distance, and sound path to flaw along with the leg of the inspection when using angle beam probes. All TOF measurements can be displayed in mm, inches or μ s.
- SmartView function along with variable persistence freeze modes displays the most important information (relevant shot) for a test.
- Real time (single shot) analog and TTL outputs handle a wide range of automated systems applications.
- Choose from four freeze modes: ALL, Peak Std, Compare or Envelope for optimum waveform evaluation and comparison.
- Three variable persistence modes are selectable in Freeze Envelope to visually assist flaw detection and evaluation for scanning and moving part inspections.
- Compare frozen reference wave-forms to live A-Scans in different colors to easily interpret test results.



"Color Leg" indicator displays the legs of the angle beam inspection in different colors

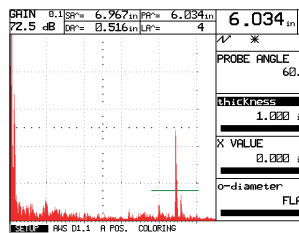
Tools for easy defect sizing

- 40 dB dynamic DAC/TCG Option corrects for distance/ amplitude variations from material loss and beam spread with ability to edit or insert recorded echoes individually. Up to four DAC curves can be drawn on the screen at one time to show +/- dB curves in addition to the originally recorded DAC curve.



Tools for easy defect sizing Multiple curve DAC shows recorded DAC curve in magenta with 4 additional curves based upon dB Offset feature for added flaw sizing assistance. TCG Attenuation and Transfer Correction features make it very versatile for use on other materials and surface conditions.

- DGS (Distance Gain Size) option displays a curve for a particular equivalent reflector size. The ERS (Equivalent reflector size) function automatically calculates the corresponding equivalent reflector diameter in mm or inches for any echo in the measurement gate.



Four digital reading boxes at top display trigonometric calculations for weld inspection.

(SA soundpath to flaw in gate A, PA projection distance to flaw in gate A, DA depth to flaw in gate A and LA leg of inspection that flaw occurs in gate A)

Square wave pulser with tunable pulse width solves composite testing applications.



Options

DAC/TCG option

Multiple curve DAC (Distance Amplitude Curve)/TCG (Time Corrected Gain) for echo amplitude adjustment and evaluation, 40 dB dynamic range, 12 dB/ μ s slope, record up to 16 points, recorded points are individually editable, new points can be inserted. Display four additional curves based upon dB offset feature from originally recorded DAC curve. TCG attenuation and transfer correction features enable use on other materials and surface conditions.

IF (Interface) gate option

For automatic start of the display, gate A, gate B, and/or DAC/TCG for immersion testing applications.

DGS option

Displays a curve for a particular equivalent reflector size as a function of the distance from the probe to the reflector for 25 narrowbanded probes. The ERS (Equivalent Reflector Size) function automatically calculates the corresponding equivalent reflector diameter in mm or inches for any echo in the measurement gate.

BEA Backwall Echo Attenuator option

Allows independent gain control of the region under gate B for backwall echo monitoring.

VGA output option

Provides an easy way to connect to a PC monitor or PC projector for viewing by large audiences or training purposes.

RF output option

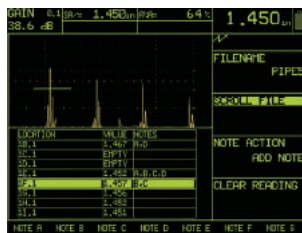
Outputs the raw RF waveform via a standard Lemo #00 connector for further analysis.

HiSPD High Speed Digital Output option

Outputs amplitude or thickness values 20 times faster than RS 232 port.

Documentation and recording

- Store and preview a minimum of 200 user-named data sets with A-Scans for quick recall and instrument setup.
- UltraDOC 4 software program for bi-directional communication with a PC for easy storage of data sets with A-scan and documentation of test results.
- UltraMATE™ software program simplifies the transfer, storage, analysis, and documentation of thickness data.
- Reports with A-Scans are output directly to a variety of printers.
- Alphanumeric thickness datalogger for flexible, convenient storage of thickness readings in linear, grid, or custom-



linear file structures with user-input filenames, location I.D.'s, notes, memo, and header fields.

Technical specifications USN 60/USN 60L

Range USN 60	0.040" to 1100" (1 mm to 28 m) at steel velocity; range selectable in fixed steps or continuously variable
Range USN 60L	range is 0.040" to 480" (1 mm to 12 m)
Material velocity	Continuously adjustable from 0.0394 to 0.6299 inches/ μ s (1000 to 16,000 m/s); 65 selectable material velocities
Display delay	-20 to 3498 μ s in steel (dependent on range)
Probe delay/zero offset	0 to 999.9 μ s
Damping	50, 75, 150, 500 ohms
Gain	0 to 110 dB adjustable in selectable steps 0.1, 0.5, 1.0, 2.0, 6.0, user definable, and locked
Test modes	Pulse echo, dual, and thru-transmission
Pulsar	Square wave excitation pulse
Pulse voltage (Square wave pulser mode)	50 to 450 V scrollable in 10 V adjustments
Pulse width (Square wave pulser mode)	Tunable from 50 to 1000 ns in 10 ns adjustments
Pulse energy (Spike mode)	Low, high
Pulse repetition frequency USN 60	Autolow, autohigh, manually adjustable from 15 to 6000 Hz (spike mode) and 15 to 2000 Hz in square wave mode, in 5 Hz increments, external trigger (spike mode only)
Pulse repetition frequency USN 60L	Limited to 2000 Hz in both spike and square wave mode
Bandwidth (amplifier bandpass)	0.25 to 25 MHz with 10 selectable settings including broadband
Gate monitors	Two independent flaw gates controllable over entire sweep range
Measurement modes	Zero-to-first, multi-echo with selectable flank or peak detection
Rectification	Positive halfwave, negative halfwave, fullwave, RF
Reject (suppression)	0 to 80% linear
Units	Inch, millimeter, or microsecond selectable
Operating temperature	-20° to 55°C (-4° to 130°F); -25° to 70°C (-13° to 158 ° F) storable
Languages	Selectable English, German, French, Spanish, Italian, Portuguese, Norwegian, Swedish, Finnish, Danish, Dutch, Russian, Czech, Romanian, Slovakian
Probe connectors	BNC or Lemo selectable at order
Keypad	International symbols
Battery power	Lithium Ion battery pack; NiMH, NiCad or alkaline cells substitutable
Battery life	11 hours on Li-Ion battery pack
Size	11.1" W x 6.75" H x 6.25" D (282 x 171 x 159 mm)
Weight	6.6 lbs. (3.0 kg) Li-Ion battery; 3.5 lbs.(1.6 kg) without battery
Color leg	Easy identification of leg and skip distances for angle beam inspection in A-scan or grid background colors
Weld rating calculation	Simplifies the rating of weld indications according to AWS specification D1.1, (formula D=A-B-C)
Warranty	2 year conditional warranty on parts and labor; free 2nd year contingent upon return of unit within 13 months of purchase for recertification
Dust proof/dripping water proof	As per IEC 529 specification for IP54 classification
Compliance	EMC/EMI: EN 55011:2007, EN 61000-6-2:2005