

## Specifications:

### Number of channels

1, 5, or 10 in max. 20 multiplexed cycles

### Pulse repetition frequency

4 to 20,000 Hz, proportionally for each cycle, e.g. max. 5,000 Hz when using four cycles

### Pulser

Spike pulse 100 V, 400 V  
Charging capacitor 1 nF, 220 pF,  
Rise time < 10 ns

### Wide-band filter (-3 dB)

0.2 - 30 MHz / 10 - 30 MHz / 1 - 10 MHz

### Narrow-band filter

1 / 2 (2.25) / 4 (5) / 10 / 15 MHz

### Gain

0 - 110 dB, variable in steps of 0.5 dB

### Fine setting of gain

1 dB, continuously variable in 10 steps

### Rectifier

Full-wave, negative and positive half-wave,  
RF mode

### Reject

Linear, 0 - 80% screen height, variable in steps

### TCG

40 dB with max. 6 dB/ $\mu$ s

### DAC/TCG

Distance-amplitude curve (DAC) or TCG line with up to 16 reference echoes per cycle, multiple DAC mode with up to four additional curves at variable spacings from the reference curve, individual curve for each cycle possible

### Backwall echo attenuation

Full dynamic range of 110 dB available thanks to parallel amplifiers

### Sound velocity

500 - 15,000 m/s, manually variable or selectable from table

### Digital upsampling

At 400 MHz in real time, 9 bits

### Display size / resolution

12.1" TFT SVGA, 800 x 600 pixels  
(only USIP 40 Rack)

### Display

A-scan with 512 or 1024 pixels, range 1 mm to 15 m in steps of 0.1 mm, pulse delay -10 mm to 15 m in steps of 0.1 mm, display start with initial pulse or interface echo

### A-scan memory

Saved and currently active A-scan can be superimposed.

### Traces

Several A-scan windows can be opened from different or identical cycles having different display ranges.

### Evaluation gates

Variable bar-type representation modes for each cycle independent of one another, showing start, width, and threshold of gate. Four evaluation gates can be used, of which 1 as echo start gate, one threshold per gate (coincidence or anticoincidence selectable), flaw suppression per counter (1 - 16), trigger: initial pulse or interface echo, width 0.1 mm to 15 m in steps of 0.1 mm, start 0 mm to 15 m in steps of 0.1 mm

### Amplitude resolution

0.5 % of display range

### Thickness measurement resolution

2.5 ns corresponding to 0.007 mm at a sound velocity of 5,920 m/s

### Thickness measurement modes

Measurement between initial pulse or interface echo and gates A, B or C, or between gates A and B, start/stop at zero crossing (selection of phase independently for start and stop), flank or echo peak, tolerance monitor with 4 thickness values min. and max. per cycle

### Data output

For readings max. amplitude or min./max. thickness value  
For alarm signals threshold or min./max. thickness value

### Analog outputs

10, user-programmable for cycle and readings (active/min./max.), wall thickness/echo amplitude 0 to 10 V, 12-bit resolution

### Alarm outputs

16, user-programmable for cycle and threshold, for flaw threshold via TTL (coincidence/anticoincidence), for thickness tolerance monitor via TTL with range overflow and underflow

### Test data release

4 inputs, user-programmable for each test channel

### Encoder inputs

3, for quadrature or pulse/direction, compression of ultrasonic data on path grid

### Setup parameters for each cycle

Gain / frequency filter / gate start / gate width / gate threshold / gate IF start / rectify / reject / display delay / display range / flaw suppression counter / TCG / DAC / thickness measurement mode, sound velocity, UT mode

### Units

mm, inch or  $\mu$ s

### Dialog languages

English, German (standard). The user is able to configure his own language.

### Connections

Probes Lemo 00, BNC as an alternative;  
RF output Lemo 00; I/O 1 Sub D 37-pin plug connector; I/O 1 Sub D 25-pin plug connector; sync. Sub D 9-pin plug connector  
Only Rack version:  
Mouse and keyboard via PS2; serial interface Sub D 9-pin plug connector; 2 x USB

### Network

Ethernet - TCP/IP, 100 MB/s

### Mains operation

Via internal power supply (85 - 265 VAC); power consumption 40 W (USIP 40 Rack) or 24 W (USIP 40 Box), inlet connector for non-heating apparatus

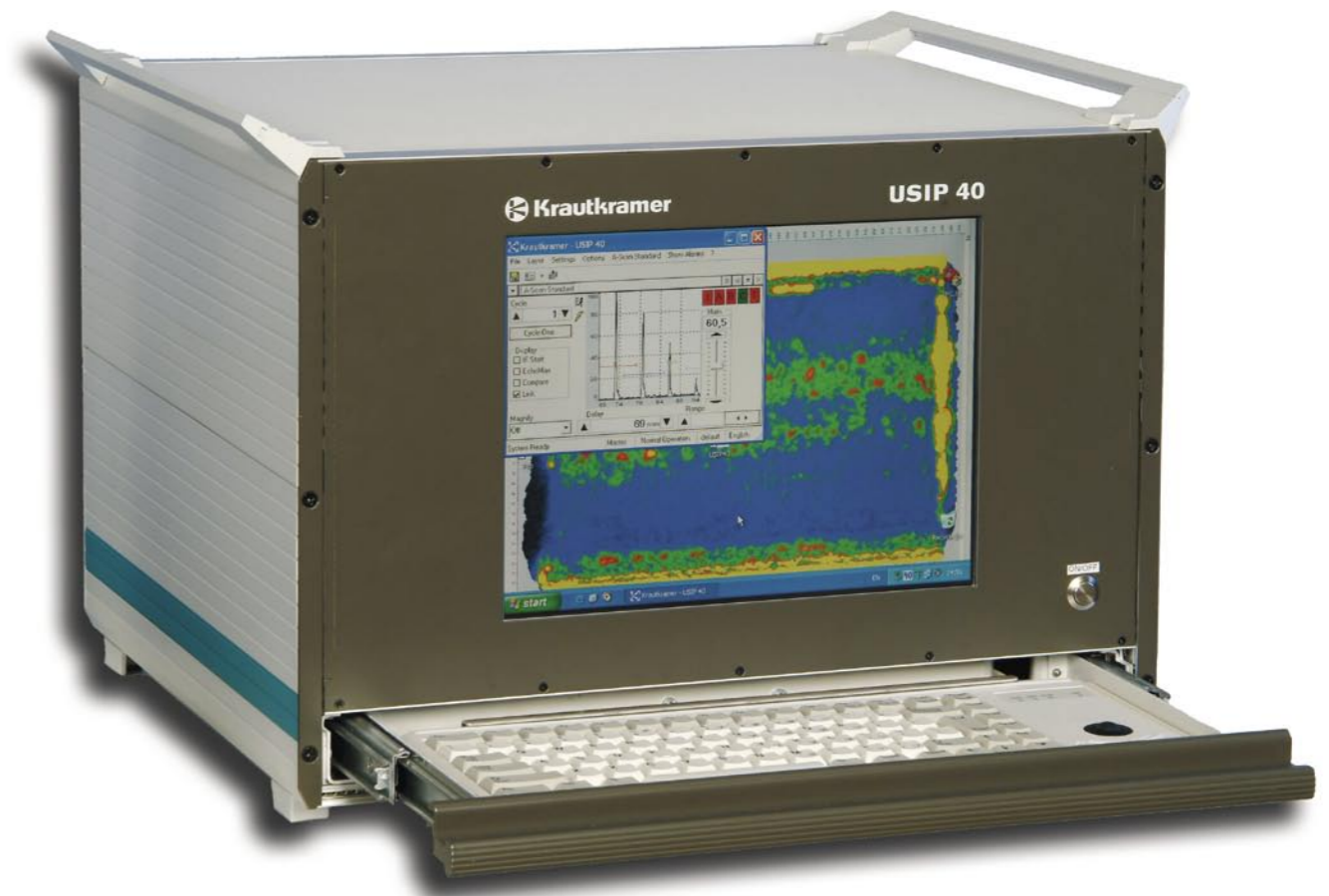
### Operating temperature

0 - 40 °C

### Size (HxWxD) and weight

USIP 40 Rack: 310 mm x 450 mm x 375 mm  
(7 HU), 16.5 kg  
USIP 40 Box: 135 mm x 450 mm x 430 mm  
(3 HU), 7 kg

## Krautkramer USIP 40 Multi-Channel Ultrasonic Systems Instrument for Automated Inspection Confidence



## Confidence

High inspection confidence and productivity are the two critical to quality elements that differentiate GE's Krautkramer USIP 40. Whether this need is based on fulfilling specific regulatory requirements, verifying the integrity of mission critical components or verifying that a process is within control, an operator must be confident in his inspection results.

The architecture of the USIP 40 instrument is based on extensive use of digital signal processing technology coupled with high performance ultrasonic hardware. This combination provides real time A-scan digitization, measurement results and the ultimate in data imaging capability. The result is a computer based system that provides the ultimate in automated ultrasonic testing confidence. The USIP 40 allows complex multi-channel inspections accomplished with relative ease, affording dramatic improvements in inspection repeatability and reproducibility as compared with analog and previous digital instruments. This combination of hardware and software is controlled through a single user interface offering a complete test solution.

### EchoMAX - Never miss a shot!

EchoMAX offers the ultimate in A-scan display for a reliable Echo visualisation. Analog instruments had the ability to show every A-scan measurement but brightness of the CRT, especially in sunlight or low replate applications, made viewing defects difficult. Early digital flaw detectors easily solved the brightness issue but did not have the ability to display an A-scan image of each and every ultrasonic measurement.

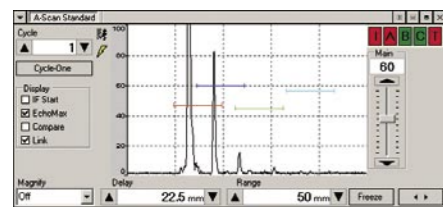


Fig. 1: A-Scan with EchoMAX

This problem existed because the update rate of the display could not keep up with the pulse repetition frequency (PRF) of the ultrasonic system. As a result the instrument may or may not display the A-scan showing the defect. This made operator set-up on a calibration standard very difficult, especially in rotating tests like full body pipe inspection. Without the ability to see the maximum echo response from a defect the operator could not adjust gain or gate settings when passing the defect standard through at test speed.

The USIP 40 instrument completely digitizes the A-scan of each ultrasonic pulse. GE's exclusive Krautkramer EchoMAX feature employs advanced algorithms to display the actual defect with every alarm condition ensuring real time visual alarm verification. The operator can be confident that he will never miss a shot and has the ability to change gain and gate settings while passing his defect standard through at full test speed (Fig. 1).

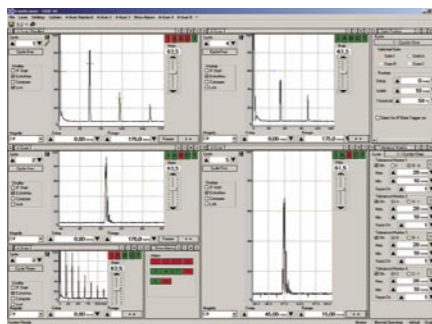


Fig. 2: Multi A-Scan

### Multi A-Scan

Some instruments offer the ability to view several channels of A-scans on the screen. The negative to this approach is that all channels must be viewed with one range and delay setting and rarely do the channels show each channel's gate settings.

The USIP 40 Multi A-Scan feature allows the operator to simultaneously view up to ten channels of ultrasonic data on the same screen with each A-scan being independently controlled. This unique feature allows each A-scan to have independent range and delay settings complete with colored bar gates. Since each A-scan window is independently controlled the operator can size the A-scan windows as big or small as needed (Fig. 2). In addition to displaying multiple channels, the Multi A-Scan feature allows the user to simultaneously display two A-Scans from the same channel and cycle using different display ranges. You can now display an overall A-Scan and inspect details within a specific range at the same time (Fig. 3).

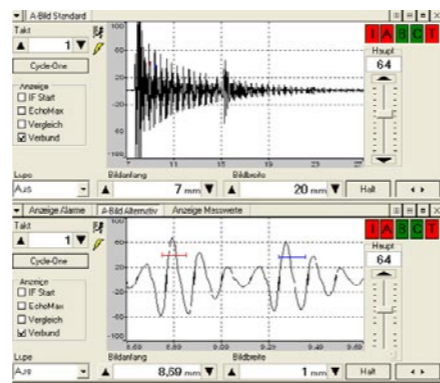


Fig. 3: Simultaneous A-Scan application with different calibration ranges from the same cycle

## Productivity

### Multi Cycle Operation

An individual USIP 40 can be configured with 1, 5 or 10 ultrasonic channels depending on the users needs. In addition to this channel flexibility, the USIP 40 provides up to 20 distinct ultrasonic setups (cycles) to automatically drive single or multiple channels complete with DAC or TCG compensation during an inspection sequence. Since each cycle is an independent setup, the gain and gate positions can be varied between cycles allowing multiple tests to be performed with a single probe (Fig. 4).

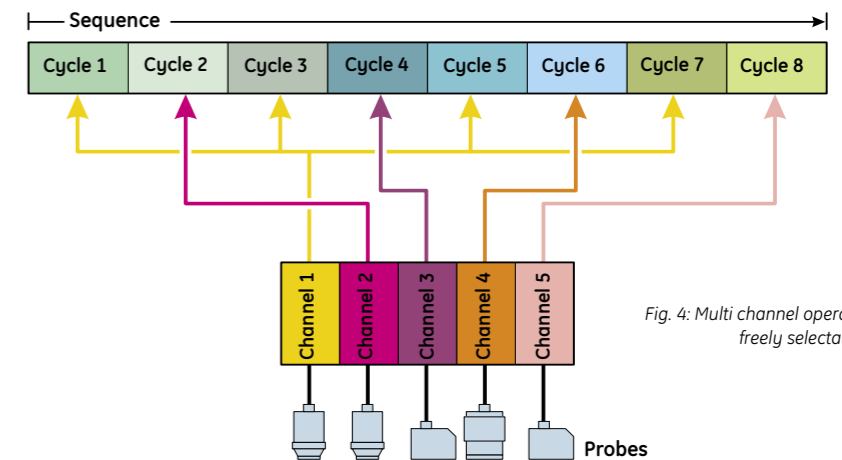


Fig. 4: Multi channel operation with freely selectable cycles

### Ethernet Enabled

Imagine a difficult inspection in one location being monitored or controlled by an engineer sitting at a computer in a very remote location. Also imagine one operator sitting at a control station monitoring several automated inspections at the same time. The USIP 40 makes both of these scenarios a reality without the performance disadvantages of signal strength loss due to cable lengths or remote preamplifiers. The hardware architecture of the USIP 40 includes a direct Ethernet connection to the ultrasonic circuitry providing a high-speed data link to remote computing devices running the USIP 40 control and acquisition software. This hardware platform offers the ability to locate the evaluation electronics thousands of feet, or even miles, away with no degradation to signal strength or response time.

### Application Specific GUI

An instrument display configured with the right information for a specific application. The software architecture of the USIP 40 instrument provides just that with its Microsoft Windows™ based operating environment. Each instrument control function is designed as a separate plug-in allowing the USIP 40 GUI to be configured to display only those functions relevant to a specific application or test (Fig. 5). Several levels of GUI can also be created with specific password protection to allow various users to have access to selected functionality. GE's USIP 40 provides the ability to select the controls that are needed for the test resulting in a much simpler user interface. These controls are all locked and password protected to ensure that only the administrator can access and make changes to the system.

### Wide fields of application

The USIP 40 enables you to easily solve most test problems no matter how demanding they are. The instrument's excellent ultrasonic features are especially well suited for application in:

- Automotive industry: piston testing, individual tests on safety-relevant components
- Aviation industry: testing of composite material as well as immersion and scanner testing
- Railroads: wheel and axle testing
- Power plants: weld inspection, multi-channel flaw detection and wall thickness measurement
- Metal producing industry: testing of castings and forgings
- Rolling mills: rail, bar, and tube testing
- Research: complex applications, e.g. composite materials, powder metals, bonds and joints, material properties, etc.

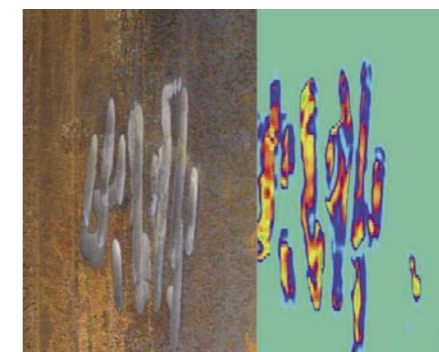
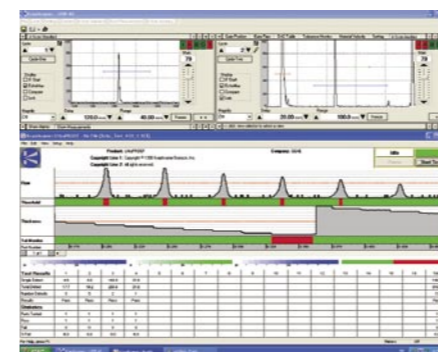


Fig. 5: User interface with applications