

ULTRASONIC FLAW DETECTOR **UD 3-71** +TOFD VERSION



CE

CE MARKING
EN 12668-1 Compliant



www.ndt.com.ua

PURPOSE

UD3-71 flaw detector is an ultrasonic general-purpose flaw detector which is intended for:

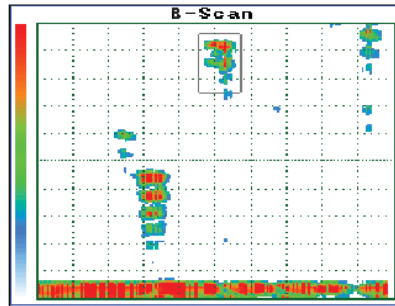
- manual non-destructive testing of products for detection of defects such as discontinuity and inhomogeneity of material in raw stock, finished items, in-process goods, welded, soldered, bolt, riveted and other joints;
- measurement of defects depth and other coordinates;
- measurement of various items thickness at one-way access to them;
- measurement of signals (reflected from defects) amplitudes ratio;

- measurement of equivalent defects dimensions;
- assessment of sound velocity in sundry materials.

Flaw detector is able to test materials and products with sound velocity from 1500 m/s to 15 000 m/s.

UD3-71 ultrasonic flaw detector provides the testing of weld joints and base materials, and also thickness measurement of monometals, bimetals in correspondence with the regulatory documents requirements in various industrial sectors.

UD3-71 additionally has TOFD technique option.



UD3-71 FLAW DETECTOR ADVANTAGES

- Min. instrument dimensions - no more than 188 x 107 x 78 mm - assure high instrument ergonomics and operation simplicity.
- Various A-scan display forms: RF/full wave/+half wave/-half wave.
- Dynamic change of generating path characteristics depending on the switched-on frequency filters.
- Information display forms: A-scan, B-scan, corrosion map.
- USB slave.
- Flaw detector can be operated at the ambient temperature from minus 30 to +50 °C.
- Flaw detector case protection level from solid bodies and water penetration corresponds to IP65; flaw detector is also resistant to ionizing radiation impact and is meant for operation in increased humidity conditions.
- Optionally flaw detector can be configured with removable storage battery.
- Availability of two independent measurement gates with the defects alarm system (sound and light) by each gate. At the same time, every gate has

THREE GOING-OFF LEVELS:

"ACCEPTANCE";
"REGISTRATION";

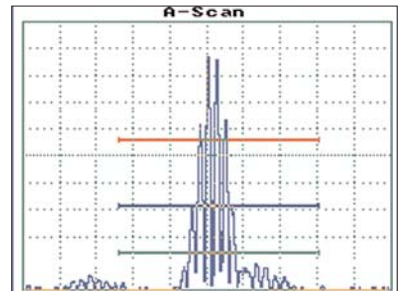
"SEARCH" are marked on the flaw detector screen in "RED", "BLUE" and "GREEN" color.



The colors of light ALARM by every gate correspond to them. Application of three-level gates makes it possible to estimate the risk of detected defects.

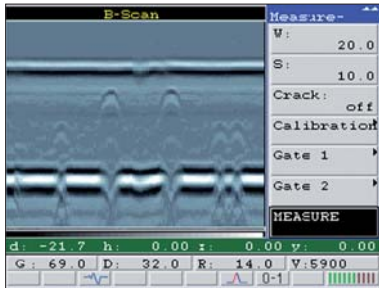
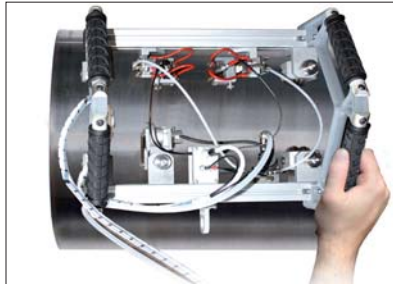
- The sound alarm going-off level is set up by an operator by a specific gate.
- The mode (when the preset level is transcended or not) is set up by an operator for every gate independently.

When using three-level gates it is possible to register echo-signals at different levels relative to the acceptance level. It will permit to record echo-signals from developing defects and monitor defects in the program of testing results viewing what is necessary for carrying



out ultrasonic testing (UT) of important objects. Three-level gates as well as convenient sound and light defect alarm system allow to assess the detected discontinuity dimensions quickly and qualitatively.

• **MODE OF TIME OF FLIGHT DIFFRACTION (TOFD) TECHNIQUE**



It is based on the measurement of propagation time of waves diffracted from the defect boundaries.

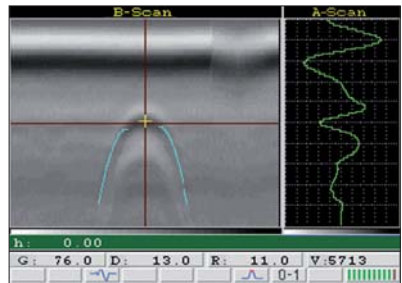
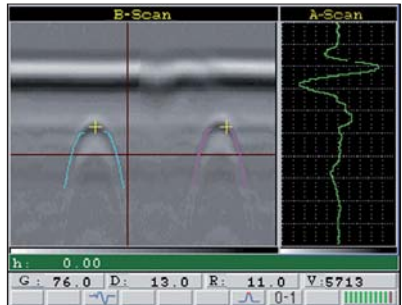
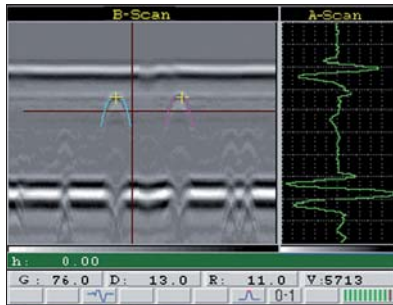
TOFD technique is performed by means of two probes, operating in separate mode. It is intended for manual testing of butt-welded joints, plane surfaces and pipes. A manual scanning device is used to provide a constant distance between the probes index points and to orient them relative to each other. There is also a function of information providing on ultrasonic probes position using encoder.

More precise determination of coordinates and dimensions of discontinuities, including cracks, is the main advantage of this technique. Today TOFD technique is applied for the testing of objects quality instead of conventional ones: radiation and ultrasonic pulse echo - techniques.

Such defects as discontinuities, incomplete fusion, cracks, porosity and slag inclusions can be detected and their characteristics can be determined by means of this technique.

TOFD TECHNIQUE ASSURES

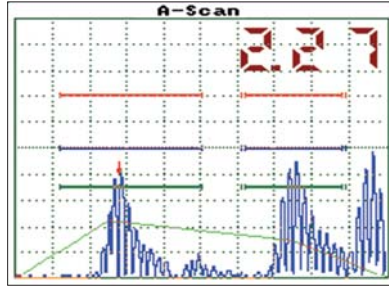
- Testing of welded joints per one scanning cycle.
- Testing of various dimension-types of welded joints.
- Determination of defects sizes without taking into account the amplitudes of diffracted signals.
- High sensitivity to all types of defects regardless of their orientation.



FUNCTIONAL CAPABILITIES

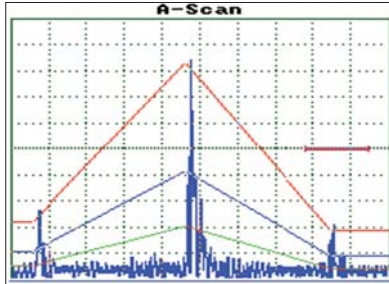
- Complete recording of data in A-Scan and RF B-Scan.
- Viewing of testing results in A-Scan and RF B-Scan.
- Usage of two standard cursors or two hyperbolic cursors.
- Selection of hyperbolic cursors constructing - automatic, manual.
- "Calibration" mode.
- Data scaling with reference to the first or second cursor.
- Determination of defect types and sizes in vertical plane and scanning plane when using hyperbolic cursors taking into account the phase of diffracted signals.

- **TIME CORRECTED GAIN (TCG) MODE**



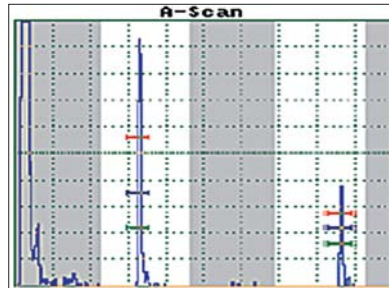
TCG level is set up in the point grid connected by linear sections, i.e. it is possible to set sundry TCG curve forms - piecewise-linear, step etc. TCG level corresponds to the signal attenuation in the given point relative to the set gain value. This option allows to test long-length items and items made from materials with great attenuation, it is also used for sensitivity setup when testing weld joints with wall thickness of more than 12 mm.

- **DAC AMPLITUDE CURVES MODE**



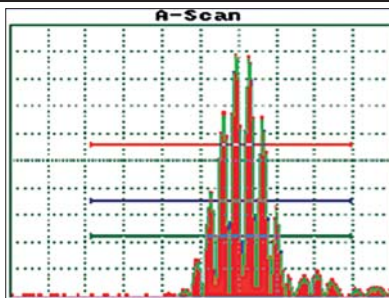
DAC mode is an alternative to TCG mode and enables to plot the curve which connects points (corresponding to signals peaks) on the screen, and also to plot up to 2 additional curves which is the preset value dB distant from the base one. DAC mode also allows quick and convenient TCG curve plotting.

- **“LEGS MARKING” MODE**



“Legs marking” mode helps to imagine the detected defect location in the testing item in the same direction as ultrasonic beams (straight and multiple-reflected beam).

- **“PEAK” MODE**

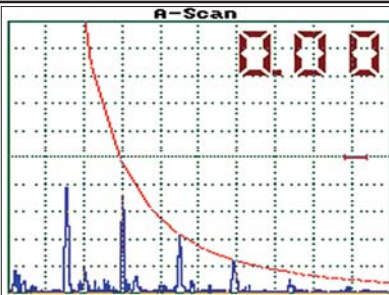


“Peak” mode is indispensable during small defects search, operation in unstable acoustic

coupling conditions. Upon that, the current signal value is displayed on the screen concurrently with the max. signal envelope of all observable echo-signals (displayed in red color). This mode is applied for max. echo-signal amplitude determination and conditional length estimation. It can be used for testing results registration both for rejected and in-order items, what will confirm the presence or absence of defects throughout the whole scanning perimeter.

Thus, “Peak” mode application increases results reliability and reduces testing time.

- **MEASUREMENT OF EQUIVALENT DEFECTS DIMENSIONS (DGS DIAGRAMS)**



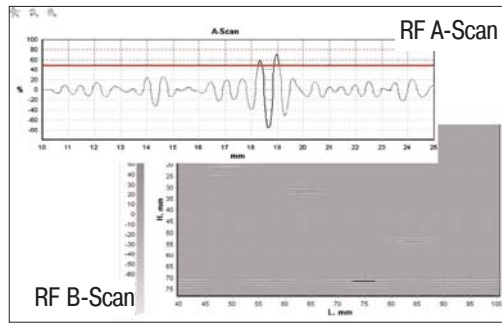
UD3-71 flaw detector distinctive feature is the measurement of equivalent defects dimensions.

Using DGS diagrams UD3-71 flaw detector enables to measure equivalent defects dimen-

sions in the range from 0,8 to 20,0 mm (equivalent defect diameter) with relevant error which does not exceed 15 %.

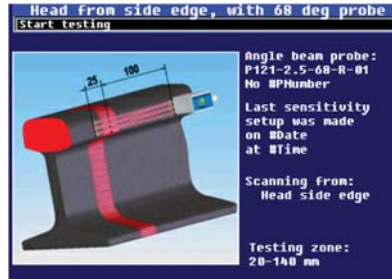
Availability of the algorithm (built in flaw detector software) of automatic plotting of DGS diagrams for various probes types makes it possible to analyze the received data quickly and qualitatively and determine equivalent dimensions of the detected discontinuities with their further registration. To save the time which is used for the instruments setup, UD3-71 instrument software contains the function of automatic TCG curve plotting by DGS diagram plotted for a specific probe.

• **RF SIGNAL DISPLAY**



To measure precisely the item thickness and defects coordinates, the undetected RF (radiofrequency) signal is used what enables to assure the measurement resolution of 0,01 mm. Two modes of the point selection on the signal oscillogram by which the measurements are taken (automatic and manual) are provided in the instrument.

• **SPECIAL PROGRAM INTERFACE MODE**



This mode is applied for solving special-purpose tasks. For example, when testing various single-type parts or when the part has many testing areas. For solving this task "Special program interface" system is used in UD3-71. The necessary standard setups and program interface of "Special program interface" enter flaw detector from PC. The input setups are protected from illegal change by NDT inspector (operator).

• **MODE OF CONNECTION TO PC**

Mode of connection to PC is essential for data transmission from the flaw detector memory to the computer memory and vice-versa. It is used for transmitting "A-scans" and "B-scans" to PC for reports creation on the basis of testing results or databases.

If required, the user can input setups for specific testing types in flaw detector from PC via in-built USB port what considerably reduces the time of flaw detector preparation for testing execution.

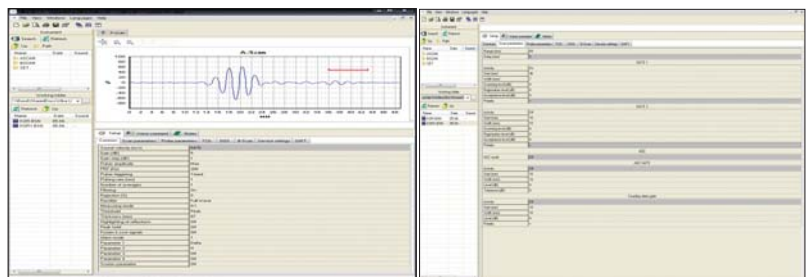
ADDITIONAL SOFTWARE

Ultra UDx-7x - the program intended for processing testing results of UD3-71 ultrasonic flaw detector and serves for functionality extension and increase of instrument operation comfort. The present program assures operation with the data stored on PC

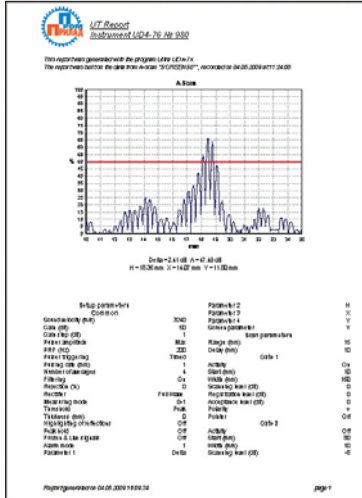
Memory elements operation enables to perform the following functions:

- **VIEW:** setups, A-Scans and B-Scans
- **CREATION AND EDITING:** Setups
- **REPORT PRINTING BY:** A-Scans and B-Scans

	B-Scans
A-Scans	Setups



● **REPORT PRINTING BY:
A-Scans and B-Scans**



UT Report
Inspection: LUKA-76 No. 15

This report was generated with the program Ultra UT v.7. The report was saved on the hard drive in folder "C:\UT", timestamped on 30.03.2007 at 11:13:16

Activity	On	B-Scan view	Off
Start time	10	Distance to the weld (mm)	50
Width (mm)	10	Scanning step (mm)	10
Level (dB)	0	Color scheme	Color
Filter	0	Scanning type	Full Wave
Probe frequency (MHz)	2.5	Instrument	LUKA-76
Probe zero (mm)	0	Instrument's number	10
Probe zero (in)	0	Sound	On
Crack (mm)	0	Brightness (%)	Normal
Strength (Static crystal)	No	Extended range	On
Measurement	On	Visual contrast	On
Crack	On	Code 1 coefficient (subwaves)	50%
Acceptance level of equivalent diameter (mm)	0	Code 2 coefficient (subwaves)	50%
Acceptance level of equivalent area (mm ²)	0	Menu mode	30.03.2007
Acceptance screen level (dB)	0	Time	11:13:16
A. color	0	ECG	On
B. color	64.5	Activity	On
Curve	On	Curve	On
Crystal area (mm ²)	113	TCG curve mode	Off
Crystal diameter (mm)	12	Rs	0.5
Probe frequency (MHz)	2.5	R _{max}	0.5
Probe angle (°)	0	Level	dB
Probe zero (mm)	0	2	64.5
Probe zero (in)	0	3	92.5
Waveform sound level (mm)	64.5	4	0.0
Sound velocity (mm/s)	5900	5	0.0
Test piece	6400	6	0.0
Sound velocity (mm/s)	6400	7	0.0
Attenuation (dB/mm)	0	8	0.0
Attenuation (dB/in)	0	9	0.0
Coating correction (dB)	0	10	0.0
Other corrections (dB)	0	11	0.0
Search/offset calibration	Y	12	0.0
Gain (mm)	25	13	0.0
Range (mm)	100	14	0.0
Calibration block type	Flat Ref. Hole	15	0.0
Depth of the reflector (mm)	1	16	0.0
Distance of the reflector (in)	0	17	0.0
Sound velocity in the calibration block (mm/s)	5900	18	0.0
Attenuation in the calibration block (dB/mm)	0	19	0.0
Attenuation in the calibration block (dB/in)	0	20	0.0
B-Scan (B mode) measurements	0	21	0.0
Integration level (%)	23	22	0.0
B-Scan view	Off	23	0.0
Distance to the weld (mm)	50	24	0.0
Scanning	On	25	0.0
Color scheme	Color	26	0.0
Scanning type	Full Wave	27	0.0
B-Scan parameters	23	28	0.0
Registration level (%)	23	29	0.0

Report generated on 30.03.2007 11:13:16

TECHNICAL SPECIFICATIONS

parameters	units	values	parameters	units	values
• Max. scan range	inch	236,22	• Measurement resolution	inch	0,00039
	mm	6000		mm	0,1
• Min. scan range	inch	0,039	• Setups quantity		100
	mm	1	• Languages and interfaces		English, Russian, Chinese (additional languages are possible to the customer's order)
• Velocity in the material	inch/us	from 0,0025 to 0,0375	• Units		SI system units
	m/s	from 1500 to 15000	• Connection to PC		USB port
• Scan delay	inch	472,44	• Battery		Storage battery Hi-MH 12V/2500 mA·h
	mm	10000	• Operation time from the battery	hour	at least 8
• Probe zero	μs	from 0 to 100	• Power supply from AC network		single-phase network 230 V, 50 Hz
• Frequency range	MHz	from 0,4 to 20	• Screen		Color TFT
• Initial pulse frequency	Hz	from 30 to 1000	• Screen size, W x H	inch	2,756 x 1,969
• Operating modes		A-scan, B-scan		mm	70 x 50
• Gain	dB	from 0 to 100	• Screen resolution, W x H	pixel	320 x 240
• Signal detection		radio signal (without detection) double half-wave positive half-wave negative half-waves	• A-scan size, W x H x D	pixel	320 x 200
• Noises cutoff	%	from 0 to 80	• Overall dimensions	inch	8,27 x 3,94 x 4,33
• Gates		Two independent three-level measuring gates Two additional special gates		mm	188 x 107 x 78
• Measurement modes		Peak, Front	• Weight	lb	1,764
• Reconfigurable readings in A-scan		distance by the beam amplitude in gates defects depth coordinates equivalent defect dimensions	• Operating temperature	°F	from minus 22 to +122
• Defect alarm		Sound, light, visual		°C	from minus 30 to +50
			• Protection from environmental impacts		IP 65

