

FLAW DETECTORS FOR ULTRASONIC TESTING OF RAILS AND WELDS



EN 12668-1 Compliant



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PURPOSE

Series of UDS2-73MR, UDS2-77 and UD3-71 flaw detectors is intended for ultrasonic testing of railway track and welded rail joints.

UDS2-73 MR ultrasonic double rail flaw detector:

Double rail flaw detector is capable of testing both rails of the railway track at a time for defects detection along the running surface and entire

rail section excluding the rail foot flanges and also is intended for conformity testing of separate rail sections using manual probes.

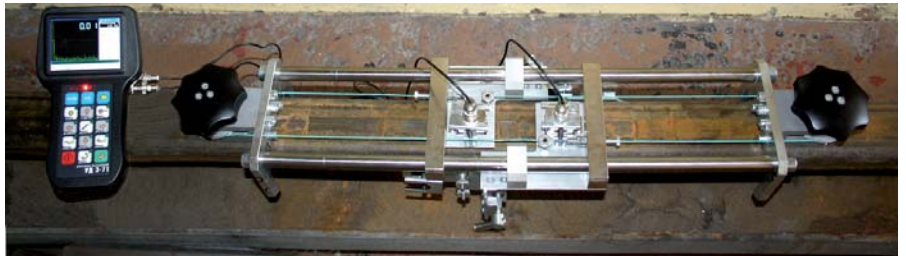


UDS2-77 ultrasonic single rail flaw detector:



Single rail flaw detector is capable of testing only one of the rails at a time for defects detection along the running surface and entire rail section excluding the rail foot flanges and also is intended for conformity testing of separate rail sections and welds using manual probes.

UD3-71 ultrasonic flaw detector for the testing of welded rail joints with a set of manual probes and USR-01 scanner (Tandem Rig):



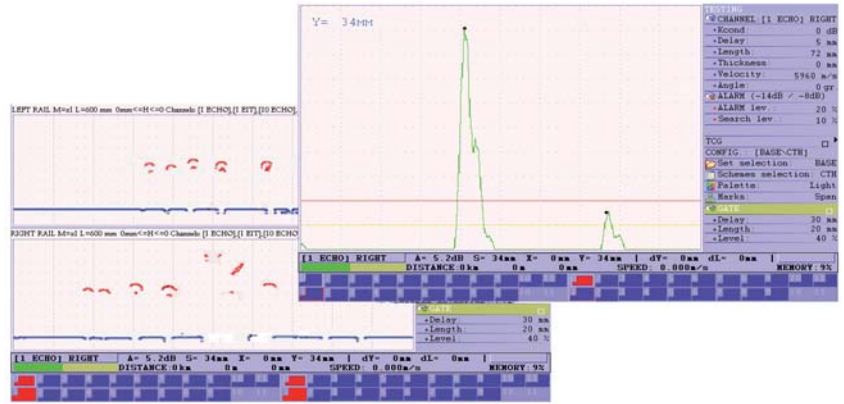
Intended for re-testing of various type rails laid down in a track and also is used to carry out the before welding testing of end sections of new and used rails and welded joints.

ADVANTAGES OF FLAW DETECTORS

UDS2-73 MR, UDS2-77

- Rail complete sounding (excluding the foot flanges), due to the flaw detector multi-channeling.
- Built-in standard setups for channels operation.
- Defining the traveled distance and speed during the complete testing.
- Real-time display of testing results in B-scan mode (by 4 channels).
- Sounding and storing the information in every millimeter of traveled distance via all channels is provided in the flaw detector.
- Recording the testing results at different sensitivity levels.
- Registration of all testing results and advanced capabilities of data analysis.
- Application of the flaw detector with the base sounding scheme allows to detect all types of fatal defects, appearing while rail track maintenance.

Fig. Displaying the testing results in A-scan and B-scan modes on the flaw detector screen



ADVANTAGES OF UD3-71 FLAW DETECTOR

- High brightness color TFT display.
- Internal memory (Micro SD card 8 Gb) for saving the testing setups and testing results.
- Special Test Rig for Tandem Testing Technique.
- Direct digital display of depth and distance of flaws.
- Compact and light weight (0.9 Kg).

DISTINCTIVE FEATURES OF UDS2-73MR AND UDS2-77 FLAW DETECTORS

- Large high brightness color TCH display.
- Synchronization by encoder.
- Result display: A-scan, B-scan.
- Number of channels for complete testing: 26;(13 for UDS2-77).
- Number of channels for manual testing - 2.
- Techniques and schemes for rail head sounding.
- Application of base and additional schemes for rail sounding:
 - Pulse echo technique by angle-beam

probes for testing of gauge and field face sides along and against the movement.

- Pulse echo by angle-beam probes for testing of the rail head center along and against the movement.
- Echo-mirror technique by angle-beam probes for testing of the rail head center along and against the movement.
- Echo-mirror for testing of gauge and field face sides along and against the movement.

Fig. Pulse echo techniques for the rail head testing

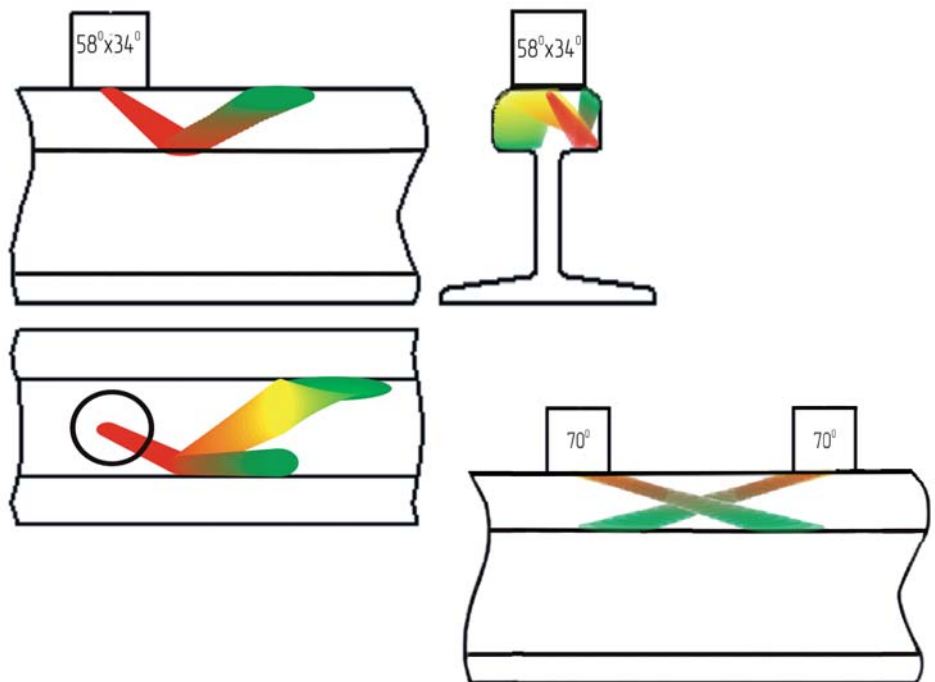


Fig. Echo-mirror techniques for the rail head testing

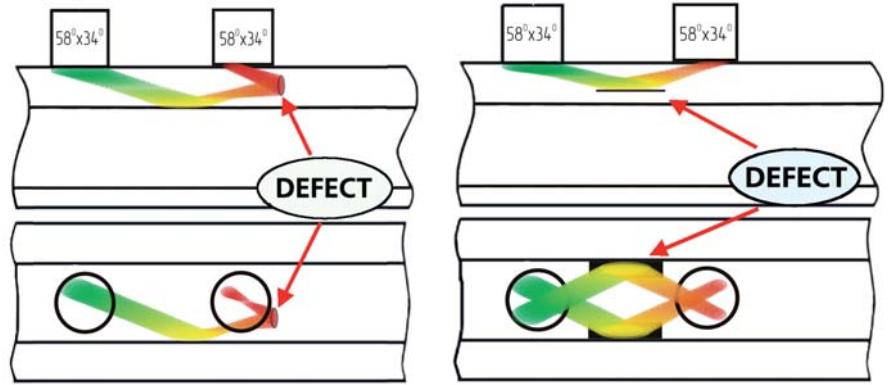
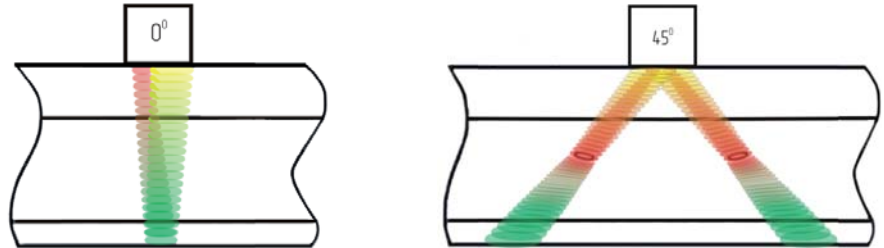


Fig. Pulse echo techniques for the rail web and foot testing



- Techniques and schemes for the web sounding and its projection into the foot:
 - pulse echo and echo-images techniques for detection of longitudinal horizontal cracks with

straight - beam double-crystal probe;
 – pulse echo technique for detection of transverse cracks and testing of weld joints with angle-beam probe.

UDS2-73MR and UDS2-77 MAIN SPECIFICATIONS

Parameters	Value
• Overall dimensions of flaw detector without a handle and with one ultrasonic unit and power unit	no more than (1040 x 1640 x 1130) mm; in transport position, no more than (900 x 2060 x 600) mm
• Equipped flaw detector weight	no more than - 75 kg (21 kg for UDS2-77)
• Keypad	English, Russian
• Languages	English, Russian
• Number of multiplexer units (MUX)	4
• Number of ultrasonic channels	28 channels (14 for UDS2-77)
• Connectors	BNC, RS-19
• Data storage	Flash-card
• Independent power source	NiMH storage battery with rated voltage 12 V and rated capacity 17 A·h
• Operation time	8 hours
• Flaw detector consumed electric power	no more than 30 V·A
• Time of flaw detector operation mode setup	no more than 15 sec.
• Display type	800 x 480 pixels
• Screen dimensions (width, height, diagonal)	155 mm, 95 mm, 180 mm (7,5 inch)
• Warranty	1 year
INTERFACES	
• USB	USB-A (host), USB-B (slave)
• Trigger O	available
• Headphones	available
• Encoder output	single-coordinate encoder

MAIN METROLOGICAL PERFORMANCES

• Temporal instability of sensitivity of flaw detector reception path	0.5 dB for 8 hours of continuous operation
• Protection level in operation	IP 64
• Ambient temperature	from minus 40 ^o to plus 50 ^o C
• Atmospheric pressure	from 84 to 106,7 kPa
• Relative humidity	(93 ± 3) % at the temperature of 25 ^o C
• Full average flaw detector lifetime	no less than 10 years
• Non-failure operation	no less than 0,9 for 2000 h

PULSER

• Initial pulse type	short pulse of negative polarity
• Initial pulse frequency	one channel mode - 250 Hz; complete mode - no more than 1000 Hz
• Amplitude	180 V
• Duration	60 ± 10 ns
• Rising edge duration	no more than 20 ns
• Synchronization type	from the initial pulse, from the encoder

RECEIVER

• Gain	from 0 to 100 dB with a step of 0.1, 1, 10 dB
• Input signal	no more than 2 V from peak to peak
• Input reception path resistance	no more than 300 Ω
• Digital filter	1 standard digital filter with centre frequency of 2.5 MHz
• Rectifier	envelope

SETUPS MODE

• Measurements	mm
• Testing range	from 0 to 1000 mm, with a step of 1, 10, 100 mm
• Velocity	from 2000 to 8000 m/s, with a step of 1, 10, 100, 1000 m/s
• Probe zero	from 0 to 60 μs, with a step of 0.1, 1 μs
• Range delay	from 0 to 1000 μs, with a step of 1, 10, 100 μs
• Refracted angle	from 0 to 90 ^o , with a step of 10 ^o , 100 ^o

ALARM system

• Sound ALARM system	sound - separate for each rail and common (for a group of channels); range of pulse frequency setup of sound indicator of alarm system is from 0,5 to 5 kHz, with setup resolution 100 Hz
• Light ALARM	light - separate for each rail and common (via all sounding channels); visual by the screen - separate for each rail and each channel.

Measurement in A-Scan mode

• Displayed parameters	4 measuring parameters are displayed in a status bar <ul style="list-style-type: none"> • A - echo amplitude from the defect relative to the ALARM level, dB • S - distance "by the beam" to a defect • X - defect depth coordinate, mm • Y - defect depth coordinate, mm
• TCG curve	max. number of dots in a gate - 14, dynamic range -100 dB, vertically adjustable step -1 dB, horizontally adjustable step - 2 dB.

MEASUREMENTS IN B-Scan MODE

• "Raw" B-Scan	<ul style="list-style-type: none"> • A - max. echo amplitude from the defect relative to the screen center, dB • H - distance "by the beam" to defect, the echo signal from which has the max. amplitude, mm • dH - conditional length "by the beam", mm • L - coordinate along the scanning path to a defect, the echo-signal from which has the max. amplitude, mm • dL - conditional defect length, mm
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UD3-71 main specifications

Parameters	Value
• Test Range	1 - 6000 mm
• Velocity	1500 - 15000 m/s in steps 1, 10, 100, 1000 m/s
• Angle probe	0 - 90 °
• Delay	0 - 9999 mm depending on the set PRF value
• Gain	0 -100 dB in steps 0.1, 0.5, 1, 10
• Rejection	0 - 80 % FSH
• Rectification	Full wave, positive half wave, negative half wave, RF
• Receiver bandwidth	0.4 - 20 MHz (- 3 dB)
• Digital Frequency	0.4, 1, 1.25, 2, 2.5, 3, 4, 5, 6, 7, 8, 10, 15 MHz
• Test Modes	Pulse echo and transmit/receive.
• Connectors	BNC
• Measurement Gates measurement.	- 2 fully independent three-level gates for amplitude and TOFD measurement. - Special gate of Automatic gain control (AGC)
• Result display selected by the user.	A-scan, B-scan, simultaneous of up to 5 measured parameters
• DAC/TCG	- Number of points is 32. - Building TCG curve by DAC
• DGS	- automatic building of curve for different equivalent diameters - calibration at calibration blocks and testing objects. - building DGS curve by DAC
• Internal memory	Micro SD card 8 Gb is used for saving the testing setups and testing results
• Tandem Technique examination.	Special Test-Rig for tandem technique is provided for the Rail weld joint examination.
• Probe	Complete set of probes are provided for the Rail weld examination.
• Display dimension (WxH, diagonal)	70 mm x 50 mm
• Weight	0.8 kg
• Overall dimensions (HxWxL)	200 x 100 x 110 mm



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