

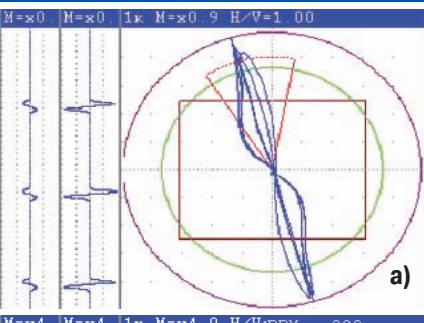
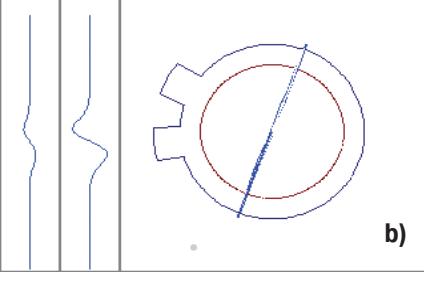
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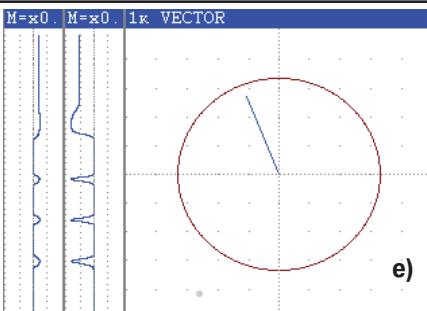
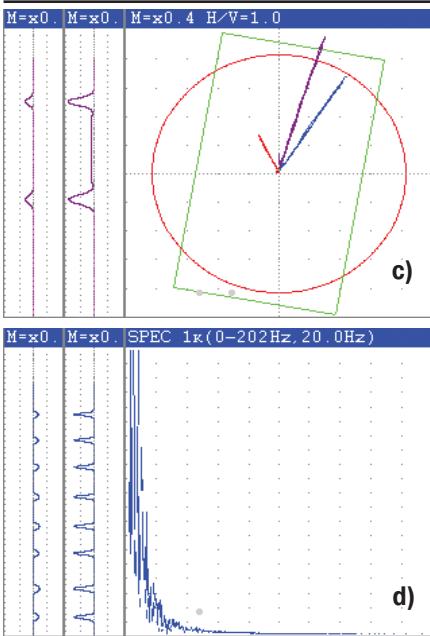


**EDDY CURRENT  
FLAW DETECTOR**

**VD3-71 NK-IVU**



PURPOSE	<p><b>VD3-71 eddy current flaw detector</b> is rated among the means of flaw detectors testing and evaluation and is intended for manual testing by eddy current technique for the presence of surface and subsurface defects such as material discontinuity (cracks, laps, cissings, fine cracks etc.).</p>
	<p><b>IT IS APPLIED IN THE FOLLOWING BRANCHES OF INDUSTRY:</b></p> <ul style="list-style-type: none"> <li>• AIRCRAFT <ul style="list-style-type: none"> <li>- testing of aeronautical engineering parts (wheel disks, covering, turbine blades, multilayered constructions, various holes etc.);</li> </ul> </li> <li>• RAIL TRANSPORT <ul style="list-style-type: none"> <li>- testing of rail components and car units (parts of wheel pair and axlebox unit, load trolley, refrigerated carriages and coaches, automatic coupler etc.);</li> </ul> </li> <li>• OIL-AND-GAS <ul style="list-style-type: none"> <li>- testing of pipelines, turbine blades of gas-distributing station, pressure vessels etc.;</li> </ul> </li> <li>• CHEMICAL <ul style="list-style-type: none"> <li>- testing of pipelines, industrial tanks etc.;</li> </ul> </li> <li>• POWER <ul style="list-style-type: none"> <li>- testing of steam generator pipes by inner reentrant eddy current probes (ECP), collectors etc.;</li> </ul> </li> <li>• ENGINEERING <ul style="list-style-type: none"> <li>- testing of rods, wire, metalwares, forming rolls, sheet metals etc.</li> </ul> </li> </ul>
FLAW DETECTOR ADVANTAGES	<ul style="list-style-type: none"> <li>• automatic tuning out from the influence of operating gap and of testing object electromagnetic properties inhomogeneity;</li> <li>• storage of a great number of setups and testing results in flaw detector memory;</li> <li>• advanced capabilities of data analysis due to the special-purpose software;</li> <li>• mode of two-way connection to PC via USB port (for the information input in PC from flaw detector memory and for this information printing as well as for setups loading from PC into flaw detector memory);</li> <li>• possibility of defect depth and length evaluation;</li> <li>• light and sound defect alarm;</li> <li>• operation simplicity due to the intuitive interface;</li> <li>• small weight and dimension indices.</li> </ul>
	
FLAW DETECTOR DISTINCTIVE FEATURES	<ul style="list-style-type: none"> <li>• ALARM system: 4 three-color LEDs, sound alarm;</li> <li>• possibility of operation in two-frequency mode;</li> <li>• possibility of encoder and eddy current rotary scanner connection;</li> <li>• color high-contrast TFT display;</li> <li>• USB slave;</li> <li>• possibility of low-temperature instrument version (minus 30 °C).</li> </ul>
TECHNICAL SPECIFICATION AND SERVICE FUNCTIONS OF THE INSTRUMENT	<p><b>a)</b> </p> <p><b>b)</b> </p> <ul style="list-style-type: none"> <li>• detection of defects with depth - 0,05 mm and with opening - 0,002 mm;</li> <li>• operating frequency setup range - from 0,5 kHz to 6 MHz;</li> <li>• generator output voltage (double amplitude) - from 0,5 V to 8 V;</li> <li>• adjusted gain range - 52 dB;</li> <li>• signal phase change (signal rotation range from 0° to 360° with a step of 1°, 10°, 100°);</li> <li>• digital signal filtering (there are 5 filter types: low-pass, high-pass, bandpass, differential, averaging);</li> <li>• eddy current signal display in various types: <ul style="list-style-type: none"> <li><b>a)</b> complex plane - allows to single out defects among interferences by analyzing the signal waveform;</li> <li><b>b)</b> circular scan - intended for eddy current rotary scanner operation and enables to locate defects in the testing hole;</li> <li><b>c)</b> two channels mixing mode, can be used for interfering factors rejection and reduction of their influence on testing results (for mixing an operator can select one of 5 algorithms: addition, subtraction, addition with horizontal inversion, addition with vertical inversion and product);</li> </ul> </li> <li>• spectral representation - applied when solving special-purpose tasks, for example, when adjusting filters for dynamic testing execution;</li> <li>• vector representation - one straight line (vector) is displayed in the area; its one end is the center, its another end indicates the current signal value.</li> <li>• time of flaw detector operating mode setup - no more than 1 minute.</li> <li>• possibility of signal display color selection for every channel and mix separately;</li> <li>• autozap function;</li> <li>• built-in clock and calendar;</li> <li>• screen light and screen brightness control;</li> <li>• amplifying channel overload alarm;</li> <li>• storage battery discharge level indication;</li> <li>• possibility of connection and operation of probes of the following types: <ul style="list-style-type: none"> <li>- differential ECP;</li> <li>- differential ECP connected according to the bridge scheme;</li> <li>- differential ECP of transformer type with center point earth;</li> <li>- differential ECP of transformer type;</li> </ul> </li> </ul>

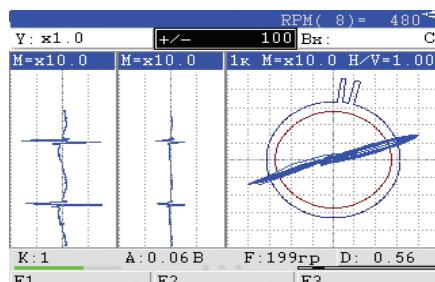


- absolute (parametric) ECP;
- absolute ECP of transformer type.
- possibility of eddy current rotary scanner connection for the testing of holes and special-purpose scanners;
- user-friendly multi-language interface;
- time of continuous flaw detector operation with the fully charged storage battery - at least 8 hours;
- total average lifetime - at least 10 years;
- flaw detector is powered from the built-in storage battery with rated voltage of 12 V and rated capacity of 2500 mAh;

- weight of flaw detector with storage battery - no more than 0,8 kg;
- flaw detector overall dimensions - no more than 188 x 107 x 78 mm.

## EXAMPLES OF FLAW DETECTOR APPLICATION

- BOLT HOLES TESTING WITH THE HELP OF THE EDDY CURRENT ROTARY SCANNER

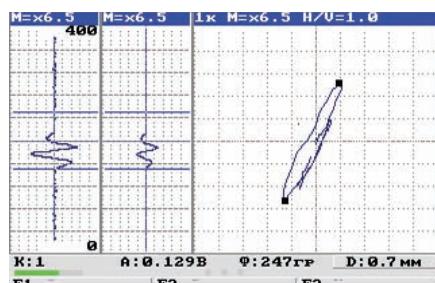


The view of the signal from a natural defect such as a crack with depth of 0,56 mm in the aircraft wheel bolt hole



Circular scan permits an operator to locate the defect in the hole

- CASTING TESTING

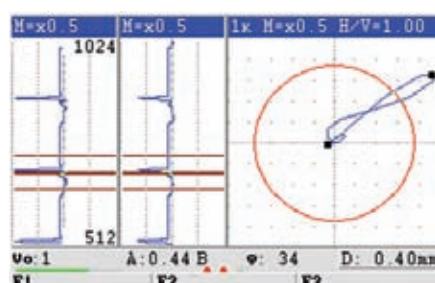


Fatigue crack 0,7 mm deep detected during testing of 18-100 model bolster



Usage of special-purpose PN-12-MDF 01 and PN-09-MDF 01 probes in protective cases together with ALARM units and digital signal processing will allow to eliminate the influence of interfering factors such as roughness, edge effect, ECP separation from the testing object surface etc.

- VARIOUS-PURPOSE PIPELINES TESTING



Fold 0,4 mm deep detected during longitudinal pipe testing



Carrying out of the main or confirmatory pipe body testing with the usage of VD3-71 flaw detector will enable to evaluate the pipe damage level and its further operability

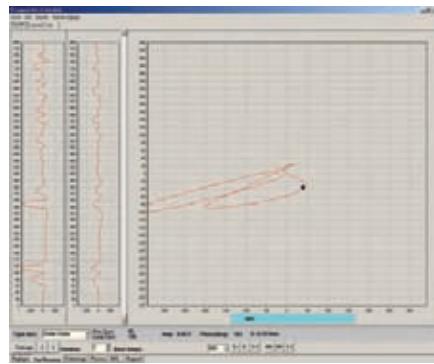
## SOFTWARE

Specialty application-dependent software for processing of VD3-71 universal eddy current flaw detector testing results serves for functionality extension and instrument operation ease increase. This program provides operation with the data stored on PC

## MAIN ADVANTAGES OF PROGRAM APPLICATION ARE:

- convenient view of testing results by each channel (Channel №1, Channel №2 and Mix);
- digital testing results processing with the usage of filters: Lowpass, Highpass, Bandpass, Differential, Averaging;
- filter parameters setup, display zoom changing, calibration curves creation, ALARM levels setup etc.;

Collected data can be processed using digital filtering algorithms. This can improve signal/noise ratio, single out useful signal component or reject signals from interfering factors (zero drift, arm shake, testing object geometry change etc.)

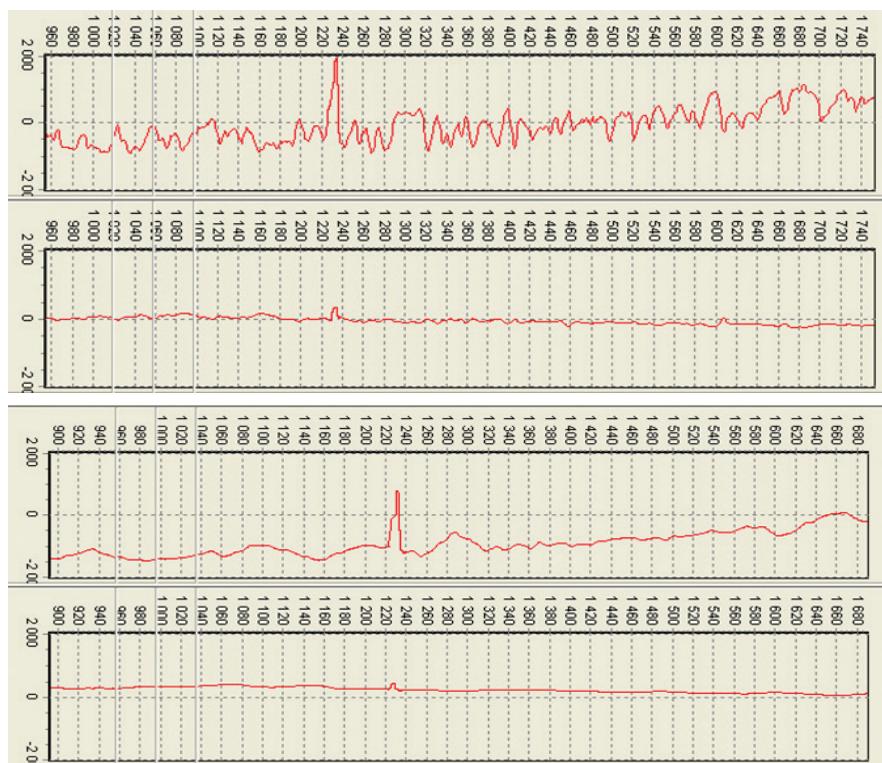


## EXAMPLES OF DIGITAL FILTERING APPLICATION IN SIGNALS PROCESSING PROGRAM:

### • AVERAGING FILTER

Averaging filter operation is similar to lowpass filter operation, its aim is to remove high-frequency noise present in the signal and, thereby, increase signal/noise ratio. As a rule, it is applied when operating on high gains.

Pickup signal

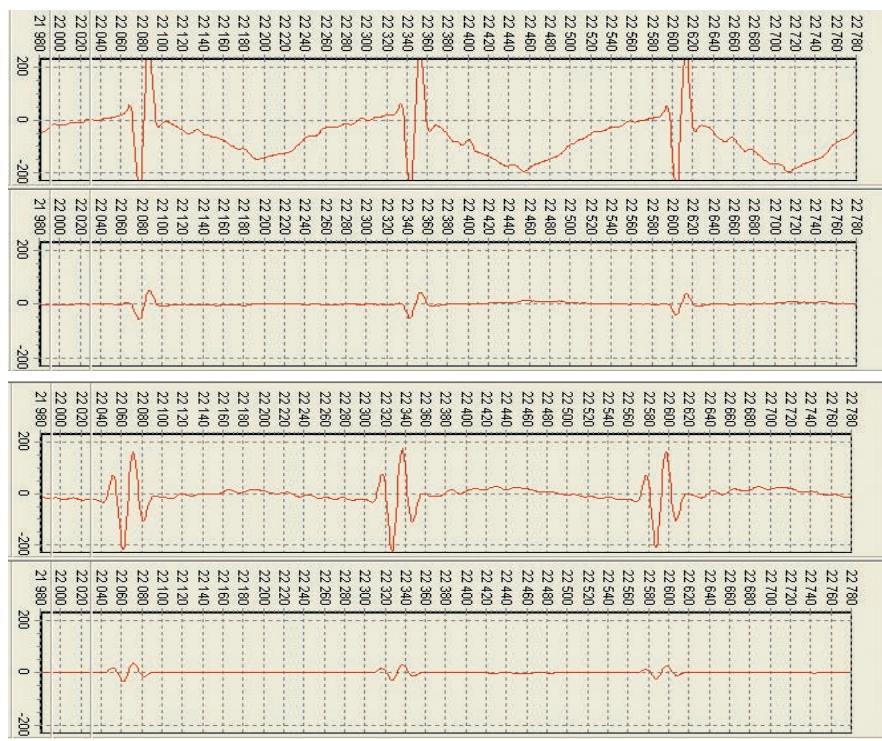


Signal after using Averaging Filter

### • BANDPASS FILTER

Signals received during testing of rotary cylinder sleeve with further processing by bandpass filter which allows to suppress lowpass harmonic component related to the sleeve rotation.

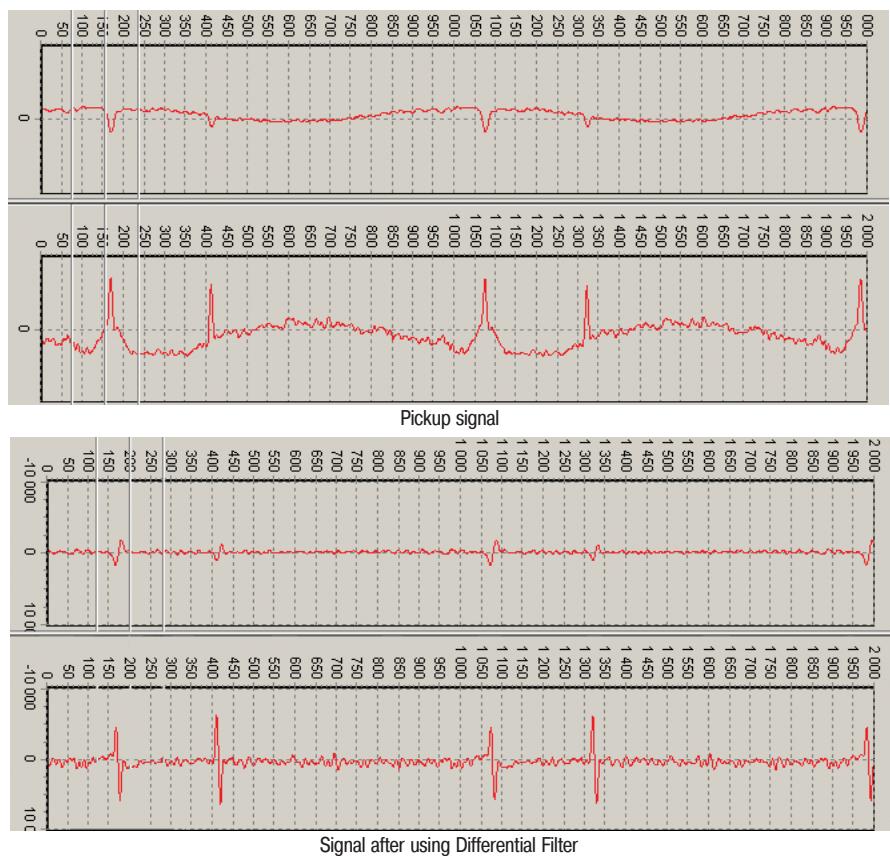
Pickup signal



Signal after using Bandpass Filter

- DIFFERENTIAL FILTER**

In a number of cases when the signal from the interfering factor has a pronounced periodic character, it can be efficiently eliminated (or minimized) with the help of differential filter.



- DETECTED DEFECT DATA OUTPUT, NOTABLY:**

- coordinate of defect location on defectogram;
- signal amplitude and phase;
- defect depth.

Generated electronic report contains all main data on the performed testing, in particular:

- information about organization, NDT division and NDT inspector who carried out testing;
- testing object name;

- all parameters of flaw detector setup in the moment of testing execution;
- parameters of the signal from the defect (amplitude, phase), defect depth;
- the signal from the defect in a complex plane and on strip diagrams;
- testing execution date.

It is possible to create other reporting forms by agreement with the Customer.

## MAIN TECHNICAL SPECIFICATIONS

• Frequency range	kHz	from 0,5 to 6000;
• Gain	dB	52;
• Probe supply voltage	B	0,5; 1; 2; 4; 8;
• Filter	Hz	Lowpass from 1 to 5000; Highpass from 1 to 5000; Bandpass filter; Differential; Averaging
• Connected ECP		Differential and absolute ECP;
• Digital zoom		from 0,1 to 10, with a step of 0,1
• Phase rotation	°, degr	from 0 to 360
• ECP connector		4 - pin LEMO
• Signal trace time	sec	from 1 to 10
• Display		Color LCD
• Screen resolution	pixel	320 x 240
• A-scan size, W x H	pixel	320 x 204
• Screen size	inch	2,756 x 1,969
	mm	70 x 50
• Signal display modes		Complex plane - X(y); Time scan - X(t), Y(t); Vector - A(t); Circular scan - X(y)+O; Range - F(t).

- Defect alarm (alarm)
- Frame:** position by coordinates X and Y: 32767...+32768, with a step of 1; 10; 100; 1000; 10000; frame width and height 10-32767, with a step of 1; 10; 100; 1000; 10000; frame turn 0-360 degr, with a step of 1; 10 or 100 degr.
- Circle:** position by coordinates X and Y: -32767...+32768, with a step of 1; 10; 100; 1000; circle radius 10-32768, with a step of 1; 10; 100; 1000
- Sector:** position by coordinates X and Y: -32767...+32768, with a step of 1; 10; 100; 1000; sector radius 10-32768, with a step of 1; 10; 100; 1000; sector turn 0-359 degr, with a step of 1; 10; 100 degr.; sector extent 0-180 degr, with a step of 1; 10; 100 degr. Optical and sound alarm;
- Memory for setups and testing results storage 1 Gb of memory.  
1 defectogram occupies - 6 Mb;  
1 setup occupies - 0,00355 Mb
- Multi-frequency operation 2 - frequency multiplexing;  
Independent control of both frequencies;  
Signals mix for unwanted effects rejection;
- Battery Storage battery Hi-MH 12B/2500 mA·h
- Operation time from the battery at least 8 hour
- Operating temperatures from -10 to +40 °C
- Protection from environmental impact IP 65 according to GOST 14254
- Overall dimensions 188 x 107 x 78 mm
- Weight with storage battery no more than 0,8 kg

PRODUCTION PROBES SERIES					
No	Probe type	Working surface size,	Working frequency band	Dimensions mm	Detectable flaws
<b>SURFACE PROBES</b>					
1	PN-05-MDF01	Ø 4	500-2000	Ø 13 x 35	Surface defects in various conducting materials (i.e. aluminum alloys, ferromagnetic and austenitic steels)  Surface and subsurface cracks pores, corrosion damages in aluminum alloys, ferromagnetic and austenitic steels etc.
2	PN-06-MDF01	Ø 5	500-1500	Ø 13 x 35	
3	PN-07-MDF01	Ø 6	300-600	Ø 13 x 35	
4	PN-08-MDF01	Ø 7	200-400	Ø 13 x 35	
5	PN-09-MDF01**	Ø 8	250-350	Ø 13 x 35	
6	PN-12-MDF01**	Ø 12	100-250	Ø 13 x 38	
7	PN-15-MDF01	Ø 13		Ø 15 x 50	
8	PN-15-MDF02	Ø 13	10-100	Ø 15 x 50	
9	PN-17-MDF01	Ø 15		Ø 17 x 50	
10	PN-33-MDF01	Ø 31	1-50	Ø 31 x 50	Surface and subsurface cracks pores, in aluminum alloys, and austenitic steels etc.
11	PN-6 x 8-TD01	6 x 8	900-1700	Ø 12.5 x 130	Surface cracks, pores, ferromagnetic steels. Is used for grooving testing.
12	PN-05-TD01	Ø 3	400-600	Ø 12.5 x 70	Surface cracks, pores, corrosion damages in aluminum alloys, ferromagnetic and austenitic steels etc.
13	PN-05-TD02	Ø 3	400-600	Ø 12.5 x 135	
<b>OD PROBES</b>					
14	PNN-37-16 TD01	Ø 16	30-70	Ø 50 x 55	Surface defects in ferromagnetic and austenitic steels, copper alloys, (brass, bronze). Are used for tubes and rods testing.
15	PNN-170-100 TD01	Ø 100	100-150	Ø 170 x 100	
<b>ROTATION PROBES</b>					
16	PNP-03x(5-6)*-TD01 PNP-03x(8.5-9.5)*-TD01 PNP-03x(17-18)*-TD01	Ø 3	2000-3000	Ø 6 x 55 Ø 9,5 x 55 Ø 18 x 55	Surface defects detection in aluminum alloys, ferromagnetic and austenitic steels, etc. Are used for holes inspection.
New probes according to the customers requirements specification is also possible					

\* -diameters of holes that can be tested with the probe

\*\* - probes in protective case with wear-resistant ceramic protector



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