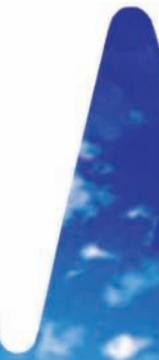


MULTI-CHANNEL EDDY CURRENT



FLAW DETECTOR

VD-ОКО-01



PURPOSE



VD-OKO-01 universal multi-channel eddy current flaw detector is intended for solving a wide range of tasks of eddy current flaw detection in such branches of industry as:

- **AIRCRAFT**

testing of aeronautical engineering parts (wheel disks, skin, turbine blades, multilayered constructions etc.), testing of holes using rotary ECP (eddy current probe);

- **RAIL TRANSPORT**

testing of rail components and car units (parts of wheel pair and axlebox unit, load trolleys, refrigerated carriages and coaches, automatic coupler etc.);

- **OIL-AND-GAS**

testing of pipelines, pressure vessels etc.;

- **CHEMICAL**

testing of pipelines, industrial tanks etc.;

- **POWER**

testing of steam generator pipes by inner reentrant ECP, collectors etc.;

- **ENGINEERING**

testing of rods, wire, metalwares, forming rolls, sheet metals, metal parts of bearing structures etc.

FLAW DETECTOR ADVANTAGES

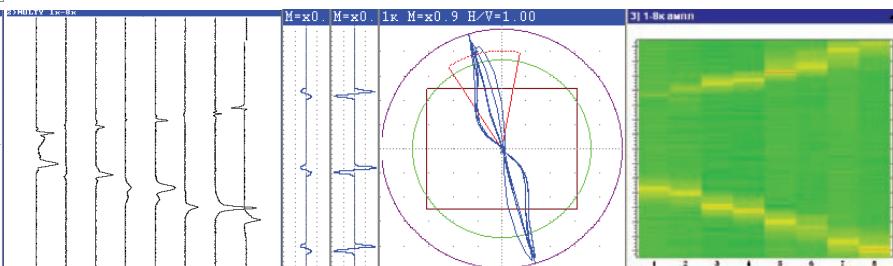
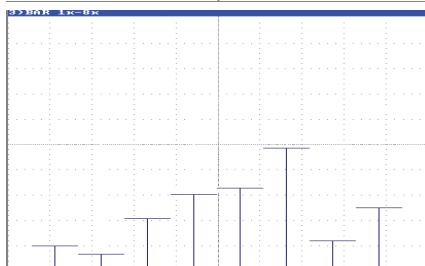
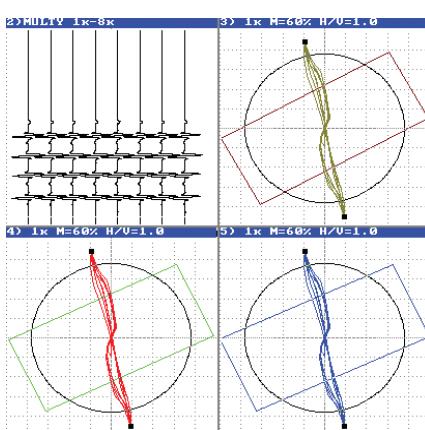
- high efficiency due to flaw detector multi-channeling;
- possibility of flaw detector application during mechanized and automated testing execution;
- exclusion of human factor influence (if it is used as a part of mechanized testing system);
- possibility of the evaluation of defect depth and length, and also light and sound flaw alarm.
- operation simplicity due to the intuitive interface;
- registration of all testing results and extended capacities of data analysis.

FLAW DETECTOR DISTINCTIVE FEATURES

- large color high-contrast TFT display;
- ALARM system:
16 three-color LEDs, sound alarm;
- various scanning units manipulation;
- USB slave;
- possibility of up to two encoders connection;
- possibility of software application for different testing tasks: testing of pipe bodies, rolled metals, wheel pairs, rods and wires etc.

TECHNICAL SPECIFICATION AND SERVICE FUNCTIONS OF THE INSTRUMENT

- flaw detector sensitivity threshold on artificial defects, such as "slit" on the calibration block:
length _____ 2 mm;
depth _____ 0,05 mm;
opening _____ from 2 mm.
- operating frequency
setup range _____ from 50 Hz to 2 MHz;
- generator output voltage
(double amplitude) _____ from 0,5 V to 16 V;
- adjusted gain range _____ 52 dB;
- digital filtering, 3 filter types:
Bandpass, Differential, Averaging.
- electronic instrument duct consists of 1 physical channels with possible multiplexing using outer commutator.
- possibility of 4 multiplex units connection;
- connection of up to 32 channels to one multiplex unit;
- external synchronization;
- LED (4 LEDs) and sound flaw alarm;
- automatic (phase) tuning out from the influence of operating gap (no more than 3 mm) and inhomogeneity of electromagnetic properties of testing object;
- possibility of connection and operation of ECP of the following types:
 - differential ECP;
 - differential ECP connected according to the bridge scheme;
 - differential transformer ECP with grounded centerpoint;
 - differential transformer ECP;
 - absolute (parametric) ECP;
 - absolute transformer ECP.
- eddy current signal display in various views;
- display of 4 areas on one page;
- MULTY mode - band charts each of which





corresponds to a specific channel are displayed in one area;

- complex plane (XY) - allow to detect defects among interferences by analyzing the signal form;
- 2D - mode of two-dimensional defect display;
- bar diagram (BAR).
- time of flaw detector operation mode - up to 1 minute;
- storing of instruments setups and testing results on compact-flash memory card;
- mode of two-way connection with PC via USB port (for inputting the information from the flaw detector memory into PC and possibility of this data printing as well as setups loading from PC into the flaw detector memory);
- encoder connection option;
- four independent frames of automatic flaw alarm (ALARM) for each display area;
- evaluation of defect depth and length;

- channels mixing option;
- possibility of signal display color selection for each channel and channels mix separately;
- autozap function;
- built-in clock and calendar;
- screen backlight;
- screen brightness control;
- reception path overload check;
- check of flaw detector memory fill;
- storage battery discharge level indication;
- friendly multi-language interface;
- time of continuous flaw detector operation with the fully charged storage battery - at least 8 hours;
- flaw detector is powered from the following sources:
- EPU with rated voltage of 12 V and rated capacity of 9 A h;
- AC mains with voltage from 187 V to 242 V, with frequency (50 ± 1) Hz.

PERFORMED CONFIGURATIONS

By creating special scanners for VD-OKO-01 instrument, it is possible to solve effectively the flaw detection tasks of metal units and parts in various branches of industry. As a result, VD-OKO-01 flaw detector complete with scanners is

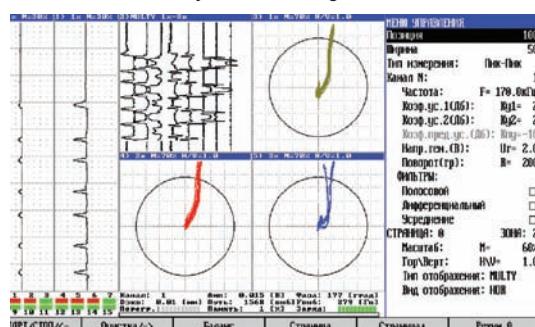
a universal mechanized complex of non-destructive testing.

Today, VD-OKO-01 eddy current flaw detector, together with scanners, solves the following tasks of eddy current flaw detection:

TESTING OF PIPELINES AND SHEET PRODUCTS

The series of VD-SCANNER multi-channel scanners on the basis of VD-OKO-01 flaw detector is intended for carrying out mechanized eddy current testing of radial surfaces with

different curvature radii in order to detect surface defects, such as longitudinal and transverse cracks, folds, scabs etc.

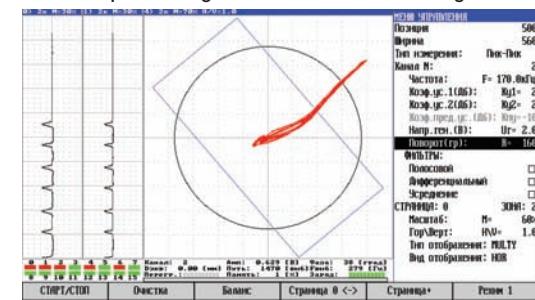


Production crack of 0,76 mm in depth and up to 60 mm in length detected during straight-line-seam pipe testing

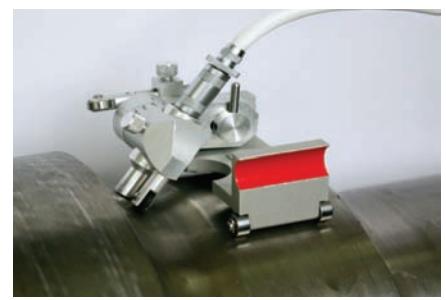
TESTING OF FILLET TRANSITIONS AND RADIAL SURFACES

SKV-GP scanners family is intended for performing 100% mechanized testing of fillet

transitions with various curvature radius on radial surfaces.



Signal from crack on the fillet transition with radius of 25 mm and depth of 0,54 mm detected during field inspection of forming roll



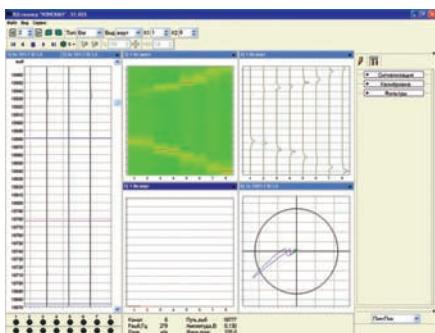
Carrying out of 100% eddy current testing of forming rolls using VD-OKO-01 flaw detector and special scanning units allows to evaluate the damage rate of both roll working surface and fillet transitions

ADDITIONAL SOFTWARE

Specialty application-dependent software for processing the testing results of VD-OKO-01 universal eddy current flaw detector 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;
- possibility of automatic scrolling of the stored defectogram at different speeds;
- possibility of the displayed results type changing, namely the display of raw data in the mode:
 - MULTY; – 2D; – XY.
- digital testing results processing with the usage of filters:
 - Bandpass, Differential, Averaging.

The data received during inspection can be processed using digital filtering algorithms. This may improve signal/noise ratio, single out useful signal component or reject signals from interfering factors (zero drift, arm shake, testing object

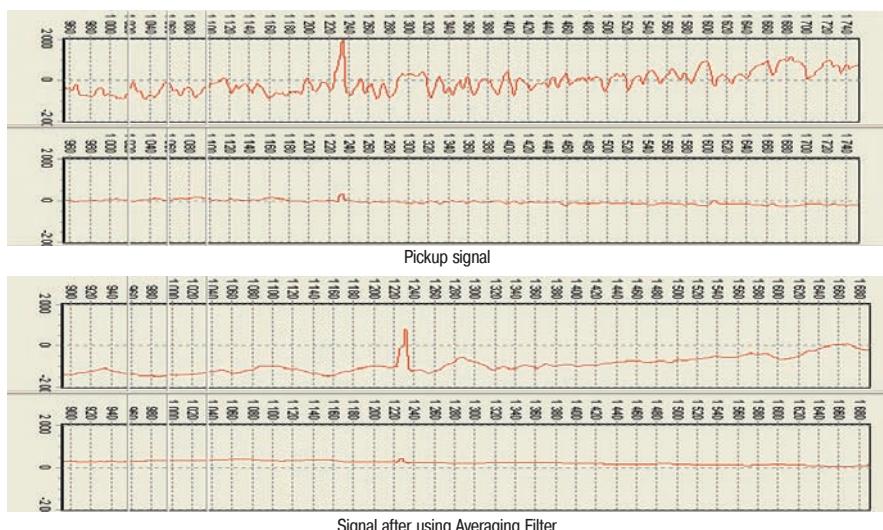
- geometry change etc.)
- filters parameters setup;
- ALARM unit setup;
- calibration;
- zooming, preset area changing, convenient diagrams scrolling;
- defect depth evaluation;
- output of the table with detected defect data, notably:
 - channel number via which ALARM went off;
 - defect position coordinate;
 - amplitude and phase of signal having transcended the threshold level;
 - defect depth;
- printing of eddy current testing report with the display of signals from defect.

EXAMPLES OF DIGITAL FILTERING APPLICATION IN SIGNALS PROCESSING PROGRAM:

- **AVERAGING FILTER**

Specialty application-dependent software for processing the testing results of VD-OKO-01 universal eddy current flaw detector serves for

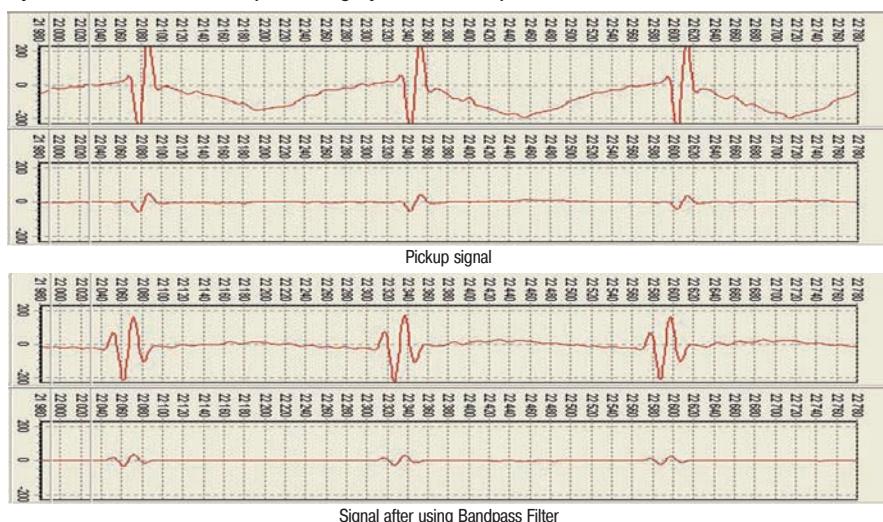
functionality extension and instrument operation ease increase. This program provides operation with the data stored on PC.



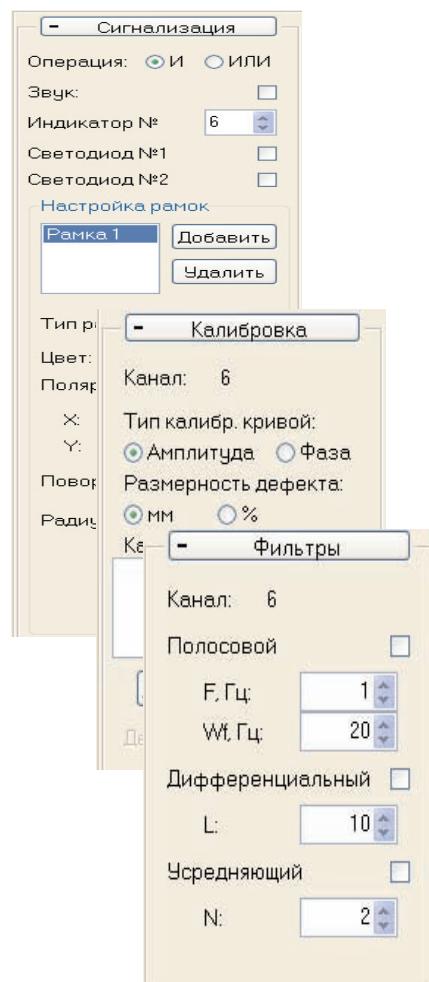
- **BANDPASS FILTER**

Signals received during testing of rotary cylinder sleeve with further processing by band-

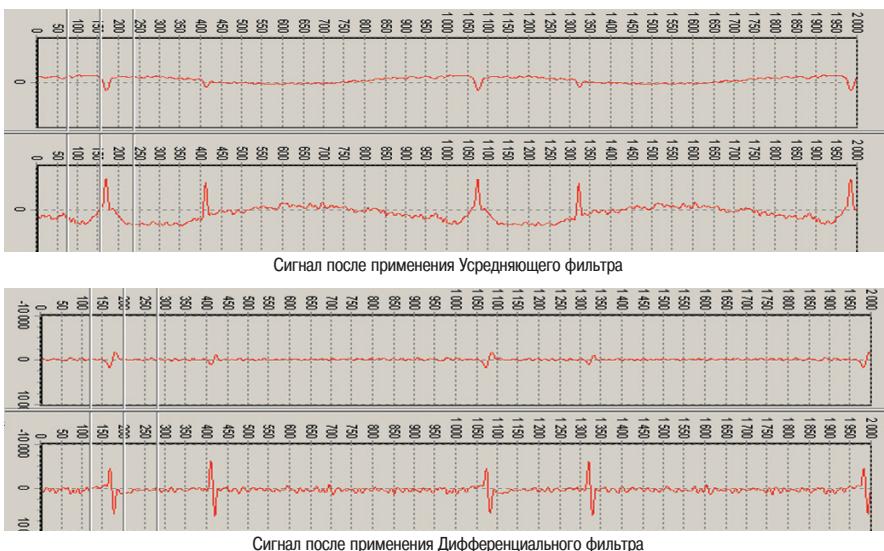
pass filter allow to suppress lowpass harmonic component related to the sleeve rotation.



• DIFFERENTIAL FILTER

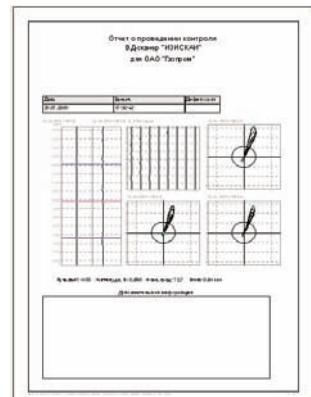
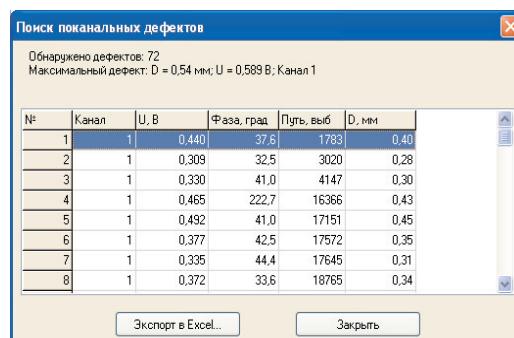


In a number of cases when the signal from the interfering factor has a pronounced periodic character, it can be efficiently eliminated (or minimized) with the help of differential filter.



Сигнал после применения Усредняющего фильтра

Сигнал после применения Дифференциального фильтра



MAIN TECHNICAL SPECIFICATIONS

- Overall dimension of flaw detector without a handle and with one eddy current unit and power unit no more than 330 x 180 x 140 mm
- Weight of flaw detector with one eddy current unit and power unit no more than 6 kg
- Keyboard Russian
- Languages Russian
- Number of eddy current units up to 4
- Number of channels in eddy current unit up to 32 channels
- Connectors types Lemo-14, DB-15
- Data storage flash card
- Operation time 8 hours
- Independent power source NiMH storage battery of rated voltage 12 V and rated capacity 9 A·h
- Power supply AC mains of voltage (220 V ± 10%) and frequency (50 ± 1) Hz
- Flaw detector electric power consumed from AC mains no more than 30 V·A
- Time of flaw detector operation mode setup no more than 1 min.
- Display NL8060BC21-03 (854 x 480 pixels)
- Screen dimensions (width, height, diagonal) 170x130 mm, 214 mm
- Warranty 1 year

INPUTS/OUTPUTS

- USB Port USB slave, USB host available
- RS - 232 available
- PS/2 two inputs
- Trigger I/O available

- Headphones available
- Encoder output single-coordinate encoder

RECEIVER

- Gain from 0 to 52 dB with a step of 1, 10 dB
- Input signal no more than 0,5 V from peak to peak
- Digital filters 3 digital filters: Bandpass, Averaging, Differential

MAIN METROLOGICAL PERFORMANCES

- Protection level in operation IP 64
- Ambient temperature from minus 10° to +40° C
- Atmospheric pressure from 84 to 106,7 kPa
- Relative humidity (93 ± 3) % at the temperature of 25 °C
- Flaw detector in shipping package is resistant to the influence of vibrations strokes with the peak shock acceleration value 98 m/s², impulse duration 16 ms, number of strokes 1 000 ± 10 for each direction
- Flaw detector retains its parameters when it is influenced by electromagnetic interferences which do not exceed the following norms harmonic interferences of magnetic field in the frequency band from 30 Hz to 50 kHz with the effective value of field intensity from 130 to 70 dB; harmonic interferences of electric field in the frequency band from 10 kHz to 30 MHz with the effective value of field intensity 120 dB
- Full average flaw detector lifetime no less than 10 years

PRODUCTION PROBES SERIES



No	Probe type	Working surface size,	Working frequency band	Dimensions mm	Detectable flaws
SURFACE PROBES					
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)
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 groovings 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 12.5x135	
OD PROBES					
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 170x100	
ROTATION PROBES					
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