DAMI C-09

MIA (mechanical impedance analysis)
flaw detector for aviation materials

1 APPLICATION

Multifunctional flaw detector **DAMI-C09** is a portable instrument to manage manual and automated non-destructive testing by impedance, eddy-current and impact methods.

DAMI-C09 can be applied in shipbuilding, airspace, automotive, construction and other industries to test products both in production and in operation.

DAMI-C09 in impedance testingmode:

1.1 The instrument implements methods of impedance testing based on register of alternationsin mechanical oscillation generation mode in a transducer rod, which is contacting with the test object surface when alternating of mechanical impedance of the test zone.

1.2 It is intendedfor evaluation of structures and body parts made of integral composite materials and cellular structures for presence of any bond defects and delamination.

1.3 Operation principle. Drive pulse generator (DPG) is applied to driving piezoelement of impedance transducer (IMT), as a result the mechanical oscillation are driven in the rod of impedance transducer connected through spot contact with the test piece. In the presence of flaws in the area close to the surface, oscillation mode in the rod alters causing alternation of the signal in the IMT measuring element. The received signal from measuring piezoelement of IMT is evaluated by amplitude-phased method. When exceeding of the preset threshold level (which is set with a gate) an alarm of the automatic defect signal (ADS) sounds. The reading of the signal received from the test piece is displayed on the instrument screen in a graphic form and (or) recorded on nonvolatile memory of the device.

DAMI-C09 in eddy-currentmode:

2.1 The device supports eddy-current flaw detection method. It's based on registering of changes in the electromagnetic field of eddy currents induced by an exciting coil in an electrically conductive test object.

2.2 Designed for non-destructive testing of parts made of non-magnetic and ferromagnetic metals and alloysfor surface defects such as cracks, delaminations, laps, shells, nonmetallic inclusions, as well as for evaluating the structure of the testmaterial.

2.3 The voltage of drive pulse generator is fed to an exciting coil of the eddy current transducer (ECT), as a result of which eddy currents are excited in the test material. If there are any flaws close to the surface, the eddy current path changes,which leads to a change in the signalinduced in the measuring coils of ECT. The received signal from the measuring coils of the ECT is analyzed by the amplitude-phase method. If the set threshold of operation (set by the gate) is exceeded, an automatic defect signaling systemsounds. Reading (interpretation) of the received signal from the test object is displayed on the device screen in a graphic form and (or) is recorded in non-volatile memory of the device.

DAMI-C09 in impactmode:

3.1 The instrument manages flaw-detection by impact methods, based on registration in changes of transducer impactorrebound time, which gives normalized impacts on the surface of the test object when the mechanical impedance of the test zone changes.

3.2 It is intended for diagnostics of structures and hull parts made of solid compositemat erialsorhoneycombstructuresto search forglue line defects anddelamination.

3.3 Operation principle. Voltage of the pulseris fed to solenoid of impact transducer (IMT), therefore the transducer impactor with the receiving piezoelectric element and corundum protector at the end makes a normalized impact on the testing surface and adrive pulse generates on the receiving piezoelement. If a flaw is closetothesurface,the drive pulsewave form on the receiv ing piezoelectric element changes. The received signal from the receiving piezoelectric element of the IMT is analyzed and if the set threshold of operation (set by the gate) is exceeded, an automatic defect signaling system sounds. Interpretation of the received signal from the test object is displayed on the device screen in a graphic form and (or) is recorded in non-volatile memory of the device.

Generator parameters in impedance testing mode	
Nominal values of drive pulseamplitude at resistive load of 150 Ohm, V	9
Relative error in excitation pulse amplitude setting,%	±20%
Drive pulse form	Sinusoidal
Rated frequency of probe pulse, kHz (smooth adjustment)	0,1 ...40
Adjustable number of intervals in probe pulse	1 ... 8
Frequency of probe pulse, Hz, not less than	100÷500

Receiver parameters in impedance testing mode	
Maximum receiver sensitivity at nominal frequencies of 0.1, 10, 100, and 1000 kHz, mV, not worse	1
Receiver bandwidth, kHz	0,1 ... 100
Gain adjustment increment, dB, not more than	1
Operating mode	Dual-element / Single element

Generator parameters in eddy-current mode	
Nominal values of drive pulse amplitude at resistive load of 150 Ohm, V	9
Relative error in drive pulse amplitude setting,%	±20%
Drive pulse form	Sinusoidal
Rated frequency of drive pulse, kHz (smooth adjustment)	0,1 ... 1000
Adjustable number of intervals in probe pulse	1 ... 8
Frequency of probe pulse, Hz, not less than	100÷500

Receiver parameters in the eddy-current mode	
Maximum receiver sensitivity, mV, not worse	1
Receiver bandwidth, kHz	0,1 ... 100
Gain adjustment increment, dB, not more than	1
Operating mode	Dual-element / Single element

Generator parameters at shock testing mode	
Nominal values of drive pulses amplitude at resistive load of 25 Ohm, V	+5
Relative error in drive pulses amplitude setting,%	±20%
Drive pulse form	Rectangle
Polarity of drive pulses	Positive
Frequency of drive pulses, Hz, not less than	1÷5
Repetition frequency adjustment increment of drive pulses, Hz	1

Receiver parameters in the shock testing mode	
Maximum receiver sensitivity, mV, not worse	1
Receiver bandwidth, kHz	0,1 ... 100
Gain adjustment increment, dB, not more than	1
Operating mode	Dual-element / Single element

MAIN TECHNICAL PARAMETERS OF **DAMI-C09**

Parameter	Value
Conditional sensitivity in impedance testing mode, mm x mm (size of detectable delamination imitation on calibration blockTS-2)	12x12
Conditional sensitivity in eddy current testing mode, mm (minimum depth of detected cut on eddy current calibration blocks(included in delivery set))	0,2
Conditional sensitivity in impact testing mode, mm x mm (size of detectable imitation of delamination on calibration block TS-2)	20x20
Types of flaw detection signaling	Light, sound
Signal processing when testing	Amplitude-phase and phase

Parameter	Value
Testing speed, measurements per second	100-500
Working position of the device	Any convenient for the operator
Scanner settings: Permissible relative error limit in defectcoordinate determination,%, not more than Permissible relative error limit in defect sizemeasurement for flaws of 12mm x 12mm and larger,%, not more than	 5 30
Operating temperature, °C	from -20 to +45
Relative humidity of ambient air,%, no more than	98 at 35°C
DAMI-C09 dust and moisture protection class	IP54
Average recharge time, h, not more than	6
Average lifetime (excluding probes, scanner and battery), years, not less than	5
Mean time between failures (if proper maintenance), h, not less than	10000
AC Power: - voltage, V - frequency, Hz	 110-240 50-60
Power consumption AC, VA, not more	15
Continuous operation time of DAMI-C09 when powered by AC 110/220 V, 50/60 Hz, h, not less than	24
Battery power (DC): - voltage, V - capacity,Ah	 12 6,8

Parameter	Value
Battery life, h, not less than	8
Power consumption from built-in battery, mA, no more than	500
Monitor: - type - resolution	TFT 320x240
Weight without battery, probe and scanning device, kg, not more than	1,0

DELIVERY SET

Item	Quantity	
Flaw detector multifunctional DAMI-C09, mainmodule	1	Basic set
AC adapter	1	
Rechargeable battery	1	
USB cable	1	
Headphones	1	
Lemo10-Lemo10 cable for operation with any probe	1	
Single element impedance probe PADI-8-02	1	
Calibration block TS-2	1	
Flaw detector multifunctional DAMI-C09. Manual (VLNG990109PE)	1	Standard set
CD: - DAMI-C09 method; - «DAMI-C09 operator`s workstation» (Win 2000, XP, Vista)	1	
Carrying bag	1	

Probes, calibration blocks and scanners, depending on the operation mode (by request)		
Name	Quantity, pcs.	Comment
Single element impedance probe PADI-8-02	1	For impedance testing mode
Dual element impedance probe PC-1	1	
Eddy current probe VTP-2-02	1	For eddy current testing mode
Eddy current probe VTP-3-02	1	
Eddy current probe VTP-4-02	1	
Eddy current calibration block RSA-0,2-0,5-1,0	1	
Eddy current calibration block RSS-0,2-0,5-1,0	1	
Eddy current calibration block RST-0,2-0,5-1,0	1	
Eddy current calibration block RSSS-0,2-0,5-1,0	1	For impact testing mode
Impact probeUDP-10-02E	1	
Scanning device «Slider M2»		Flawimaging