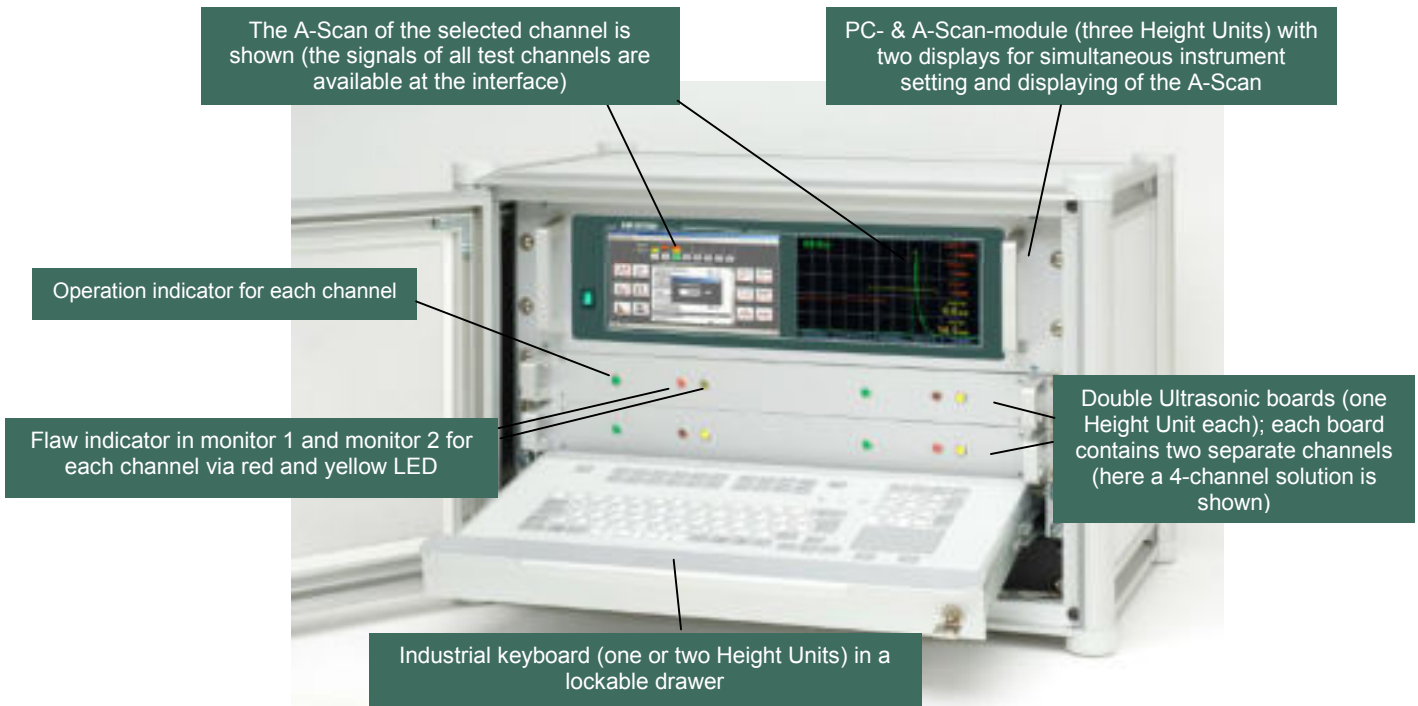# Product Information Ultrasonic Flaw Detector
ECHOGRAPH 1093

KARL DEUTSCH

Multi-Channel Ultrasonic Test Electronics for Compact Automated Ultrasonic Testing Systems

The ultrasonic flaw detector ECHOGRAPH 1093 has completely separate testing channels, which are controlled with the help of a higher-ranked host pc. This pc works as a user interface and helps the operator to configure the ultrasonic system. In measuring mode the host collects data, stores data and produces statistical evaluations. Each test channel has its own complete ultrasonic electronics with a maximum pulse repetition frequency up to 3.000 Hz. So each channel can drive its individual inspection task with its own parameter set. In consequence, the system electronics ECHOGRAPH 1093 is very flexible and fast. The device is especially suited for use in small automated inspection systems for the realisation of different inspection tasks (e.g. tube testing for longitudinal and transverse flaws and testing for lamination).

The A-Scan of the selected channel is shown (the signals of all test channels are available at the interface)

PC- & A-Scan-module (three Height Units) with two displays for simultaneous instrument setting and displaying of the A-Scan

Operation indicator for each channel

Flaw indicator in monitor 1 and monitor 2 for each channel via red and yellow LED

Double Ultrasonic boards (one Height Unit each); each board contains two separate channels (here a 4-channel solution is shown)

Industrial keyboard (one or two Height Units) in a lockable drawer

PC & A-Scan module from rear side with signal interfaces and power supplies for the different testing channels.

Two channel ultrasonic board from rear side with interfaces and connectors for the PC module and the probes.

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Clear Indication of monitor status separately for each channel

Operator interface for individual configuration of each channel (here channel resp. device 4, green marked, from altogether 8 channels)

Identification of the test task is separately editable for each channel

Often used parameters are directly accessible via function keys (F1 to F10)

All parameters are accessible via keyboard or mouse via the clear text menu

The access rights are divided into 3 levels. Level 1 is for the regular operator. With the help of a special level 2 and level 3 menu the supervisor is able to control, which parameters are accessible for the level 1 operator. So unintentional changes of important parameters can be avoided.

Correlation of the channels to the different inspection tasks. The text (comment) is freely editable. This informs the operator about the assignment between inspection task and testing channel. This text is also shown during the adjustment of the channel to be changed in the main menu (see above).

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Main menu as well as submenus are shown in clear text. So all menus are very comprehensible without reading the instruction manual.

The picture shows a four-channel system, were channel 4 is adjusted.
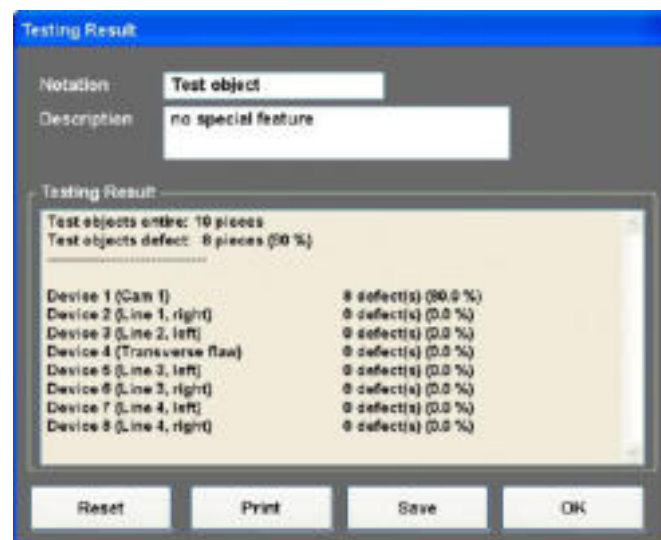
Customer-specific evaluation of the test results; here the example for a statistical evaluation per batch in tabulated form. A graphical evaluation of the echo height.

and...
- ... each channel is extensible with a multiplexer
- ... selectable colours for the A-Scan
- ... freezable echo dynamics curve
- ... Trigger: freewheeling, global, external (input /output) and 1st echo (immersion testing)
- ... suppression counter for all monitors
- ... single shot evaluation with full PRF
- ... large external monitor for A-Scan display available (option)
- ... evaluation with DAC method
- ... specifications acc. to EN 12668-1

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Technical Data

DISPLAY

Quantity	2 (PC-menu, A-Scan)
Screen type	TFT monitor
Screen size	7" diagonal
Resolution	800 x 480 pixels
Scale	Electronically generated, switchable
Scale division (for A-Scan display)	➢ coarse: 10-fold horizontal, 5-fold vertical ➢ fine: 50-fold horizontal, 25-fold vertical

A-SCAN-DISPLAY AND DIGITIZATION*

Image refresh rate	50 Hz
A-Scan display	➢ normal display (envelope curve) ➢ filled echoes ➢ echo dynamics curve
RF display	For the entire testing range
Rectification	Without (RF), full wave, positive, negative
Suppression	Adjustable: 0 – 99% screen height in 1%-steps (linear)
A/D converter	9-bit
Digitization method	Direct, with A/D-converter
Sampling rate	80 MHz
Sampling error for digitization	$< \pm 0.5\%$ screen height at 4 MHz
Response time (display)	< 20ms

MEASURING RANGES*

Testing range	2.5 – 4850 mm steel
Sound velocity	100 – 15000 m/s in 1 m/s steps
Delay	0 – 3000 mm in 0.1 mm steps
Linearity of time axis	$\pm 0.5\%$ of screen width

TRANSMITTER*

Numbers of transmitters	2 (resolution and power)
Pulse shape	Unipolar (negative) needle pulse
Transmitter damping	10, 50, 220 [Ω], without
Pulse repetition frequency (PRF)	Up to 3000 Hz
Trigger	Freewheeling, global, external

AMPLIFIER AND ATTENUATOR*

Frequency ranges	3 (settings: LF-, RF- and broadband)
Adjustable gain	100 dB in 0.1-1-2-6-12-20 dB steps

FLAW EVALUATION (ON DISPLAY)*

Evaluation of echo height (for both monitors)	➢ % screen height (% SH) ➢ dBrel (for DAC-version)
Flaw position	➢ sound path ➢ depth ➢ projection distance and shortened projection distance ➢ resolution 0.1 mm steel

MONITORS*

Number of monitors	2
Response time	With PRF (max. 3 kHz)
Operation modes	normal, inverse, off
Setting range	➢ monitor start: 0 to 4000 mm in 0.1 mm steps ➢ monitor width: 0 to 3000 mm in 0.1 mm steps
Statistical noise suppression	0 – 250 pulses
Signal output for each channel	➢ 2 x flaw outputs TTL ➢ 2 x analogue outputs (programmable with depth or amplitude or wall thickness or further parameters on request)
Optical indication	2 luminescent diodes on front panel

STORAGE

Parameter set	➢ separately for each channel ➢ entire configuration for all test channels
Test results	Storage is customer-specific
Hard-disk drive	160 GByte

INPUTS, OUTPUTS

Inputs	D-Sub socket for up to 16 customer-specific control signals
Outputs	D-Sub socket for up to 16 customer-specific flaw signals
Interfaces	➢ auxiliary interface for external printer ➢ RS 232 interface ➢ USB 2 (3 to 10 free interfaces) ➢ 2 x Ethernet

MISCELLANEOUS

Measuring units	mm
Date and time	Built-in real-time clock
Languages	German, English (switchable)

POWER SUPPLY

Mains operation	➢ 85 – 264 V AC, 47 – 63 Hz ➢ operation temp.: 0 °C to +50 °C ➢ allowed humidity: 0 to 95%

DIMENSIONS, WEIGHT ETC.

Dimensions	19" rack / height in compliance with configuration
Protection class	IP 20 (IP 54 on request)
Weight	Depending on the configuration
Number of channels	8 (more channels on request)

* valid for each channel

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