



## ECHOGRAF 1094

Multiplex Digital Ultrasonic Flaw Detector with 8 Test Channels

**KARL DEUTSCH**

# ECHOGRAPH 1094

## 8-fold multiplexer for stationary and mobile testing



The ECHOGRAPH 1094

### ECHOGRAPH 1094 –

**Multichannel, portable ultrasonic flaw detector with multiplex technique for stationary and mobile testing**

The flexible ultrasonic flaw detector ECHOGRAPH 1094 is a testing electronic for stationary and mobile testing. The device is based on the technique of the well-proven ECHOGRAPH 1090. In addition, the multiplex technique allows to control up to 8 test channels. During testing, all 8 A-scans are being displayed at the same time (overlay mode). The delay time of the transmitters and the adaptation of the amplifiers can be selected individually for each test channel or probe. While working in single-channel mode, the device provides evaluation of the flaws based on the DGS and DAC technique.



Rear panel with interfaces

### Multiplexer:

The multiplexer provides the possibility to connect one to eight probes to the ECHOGRAPH 1094. The flaw indication on the two monitor gates is shown individually for each test channel in the bottom area of the screen.



Port Control unit

### Port Control:

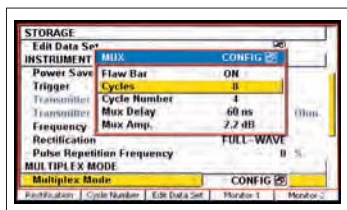
Optionally, an indication unit with an LED array can also be connected to the device. Thus, the flaw detection of the individual test channels can be clearly seen from a larger distance and under poor lighting conditions.



Direct keys for quick settings of important parameters

### Further advantages of the ECHOGRAPH 1094:

- The A-scan of each test channel is shown individually on the display in set-up mode, while in testing mode all channels are shown simultaneously
- Measuring of wall thickness possible (in single-channel mode)
- In multichannel mode supervision of wall thickness within a tolerance range. Generation of flaw signal when thicknesses are above or below the limits.
- Interfaces for flaw signals, trigger input and probes are located on the rear panel of the unit
- Important instrument settings can be accessed quickly via direct keys
- Delay time of the transmitter signals (up to 3800 ns) can be selected individually for each test channel
- Adaptation of the amplifier can be selected individually for each test channel from -11 dB to +11 dB
- Compact aluminium case for harsh environmental conditions
- Wizard for various instrument settings, e.g. for determination of probe delay, adjustment of screen display, etc.
- Reference A-scan can be displayed in the background
- Separate flaw outputs (monitor 1 and 2) for each test channel
- Easy instrument control (test release and flaw output) since only a single external control signal is required. The external input signal "PEN" enables the measurement.
- Freezable echo dynamics curve
- Pulse repetition frequency: 8 Hz to 3000 Hz
- Trigger: internal, external (input/output) and 1st echo
- In compliance with EN 12668-1



The operation is controlled by a convenient user interface. A special menu is provided for the multiplex operation.

### ORDER INFORMATION

Description	Order no.	Description	Order no.
ECHOGRAPH 1094 Basic 2K	1094.102	ECHOGRAPH 1094 SN AVG/DAC 2K	1094.322
ECHOGRAPH 1094 DAC 2K	1094.202	(extra low frequency version)	
ECHOGRAPH 1094 DGS/DAC 2K	1094.302	Port Control (flaw indication)	1094.601
ECHOGRAPH 1094 N DGS/DAC 2K	1094.312	additional channel for single element probes	1094.905
(low frequency version)		additional channel for dual element probes	1094.906
		upgrade RF output	1094.901

# The fields of application

## One device – three different fields of application

### Desktop device (single channel)

- Easy handling (similar to the ECHOGRAPH 1090 flaw detector)
- Probe connection at the front of the instrument
- Equipped with DGS and DAC
- Robust case made of aluminium



ECHOGRAPH 1094 (single channel)

### Mobile material testing

The compact design of the ECHOGRAPH 1094 enables mobile material testing. Mounted on a trolley which is equipped with probes, the instrument can be used, for example, for testing on sheet metal. The device is powered in this case by rechargeable batteries.

- Flaw indication is cycle decoded in bottom area of the screen  
panel 1 = flaw indication in monitor 1 (red indicator)  
panel 2 = monitor 2, e.g. used for back wall echo control (yellow indicator)
- Capacity of the rechargeable batteries according to individual requirements (e.g. 8 hours shift operation)
- Port Control unit (optional)  
additional flaw indication by LED's for use under poor lighting conditions



Ultrasonic testing on sheet metal by trolley (8 test channels)

### Stationary automated testing system

Due to the high pulse repetition frequency (max. 3 kHz), the ECHOGRAPH 1094 can also be used for automated testing in smaller systems.

- Testing channels can be chosen according to individual requirements (2 to 8 test channels)
- Later adaptation to altered test conditions is possible by upgrading\* with additional test channels
- Overlay mode: during testing, all 8 A-scans are being displayed at the same time.
- Easy instrument control (test release and flaw output) since only a single external control signal is required. The external input signal "PEN" enables the measurement.
- Separate flaw outputs (monitor gate 1 and 2 for each test channel) (evaluation by external electronics or PLC control)

\* upon demand



ECHOGRAPH 1094 with Port Control and 8 test channels

## Technical Data

DISPLAY	
Type of display	<ul style="list-style-type: none"> <li>• colour LCD screen</li> <li>• transmissive/transreflective</li> <li>• daylight suitable</li> <li>• background illumination</li> </ul>
Size of display	143.4 mm x 79.3 mm
Resolution	400 x 240 pixels
Size of A-scan	142 mm x 73.5 mm

A-SCAN DISPLAY AND DIGITISATION	
Image refresh rate	50 Hz
A-scan display	<ul style="list-style-type: none"> <li>• normal image</li> <li>• zoom over monitor 1 (envelope curve)</li> <li>• filled echoes (inverse)</li> <li>• zoom over monitor 1</li> <li>• frozen</li> <li>• echo dynamics curve</li> </ul>
RF display	possible across the entire time-base range
Rectification	positive, negative, full-wave, without rectification (RF)
Zoom	monitor range (monitor 1) to full screen width

# ECHOGRAPH 1094

## Technical Data (continued)

MEASURING RANGES	
Time base range	2.5 to 4850 mm (steel)
Sound velocity	100 to 15000 m/s in 1 m/s steps
Delayed time base range	0 to 3000 mm in 0.1 mm steps
Linearity of time base	± 0.5 % of screen width

TRANSMITTER	
Number of transmitters	2 (one each for resolution and power)
Shape of transmitter pulse	uni-directional (negative) needle pulse
Transmitter damping	10, 50, 220, without [Ω]/multiplex mode: fixed value
Pulse repetition frequency	8 Hz to 3000 Hz (depending on measuring length, adjustable from -85 % to +50 % in 1 % steps)
Trigger	internal, external, 1st echo

AMPLIFIER AND ATTENUATOR	
Number of frequency ranges	3 (LF, RF and broadband setting)
Adjustable amplification	99.9 dB in 0.1-1-2-6-12-20 dB steps

ECHO EVALUATION, DETERMINATION OF FLAW SIZE	
Output of echo amplitude (valid for both monitors)	<ul style="list-style-type: none"> <li>• % height of screen</li> <li>• dBabs</li> <li>• dBrel (at least DAC version required)**</li> <li>• mmFBH (DGS/DAC version)**</li> </ul>
Output of echo transit time	<ul style="list-style-type: none"> <li>• sound path</li> <li>• depth</li> <li>• projection distance as well as reduced projection distance</li> <li>• resolution 0.1 mm steel</li> </ul>

MONITORS	
Number of monitors	2 (for all test channels)
Response time	with pulse repetition frequency (max. 3000 Hz)
Operation modes	normal, inverse, off
Range	<ul style="list-style-type: none"> <li>• gate start: 0 to 4000 mm in 0.1 mm steps</li> <li>• gate width: 0 to 3000 mm in 0.1 mm steps</li> </ul>
Switching outputs (for both monitors)	<ul style="list-style-type: none"> <li>• level: TTL (5 V), low active, <math>Z_A = 100 \Omega</math></li> <li>• holding time: max. 12 ms</li> </ul>
Optical indication	2 LED's on the front panel (alarm tone) 16 LED's with Port Control*

MISCELLANEOUS	
Languages	German, English (switchable)

MULTIPLEX OPERATION	
Flaw indication	On/Off
Test channels	1 to 8 (number of channels selectable)
Trigger delay	0 to 3800 ns, 15 ns steps
Amplitude modulation	-11 dB to +11 dB, 1 dB steps

INPUTS AND OUTPUTS	
Flaw signals	TTL level (5 V) and analogue output (optional)
USB interface	USB 1 interface for PC connection and to print via PC connection
VGA output	for an external monitor
Input and output for synchronisation	TTL level (5 V), low active, trigger threshold approx. 2 V, trigger on and off as standard
Test result	TTL level

STORAGE	
A-scan	current A-scan by FREEZE function
Internal memory	224 data sets incl. A-scans, parameters, real time clock

POWER SUPPLY	
Mains operation	<ul style="list-style-type: none"> <li>• by an external power supply (order no. 1808.502)               <ul style="list-style-type: none"> <li>- 85 to 264 VAC, 47 to 63 Hz</li> <li>- output: 12 VDC</li> <li>- operating temperature: 0 °C to +50 °C</li> <li>- storage temperature: -40 °C to +85 °C</li> <li>- max. 95 % air humidity</li> </ul> </li> <li>• by 12 VDC direct current (e.g. car battery)</li> </ul>
Automatic switch-off	in case of low voltage of mains or battery

MECHANICS	
Size (H x W x D)	130 mm x 330 mm x 340 mm
Weight	4.3 kg
Connecting sockets	<ul style="list-style-type: none"> <li>• 2 x Lemo 1 (for probes)</li> <li>• PC interface: USB 1</li> <li>• D-sub port (9 pin) trigger signal (input)</li> <li>• D-sub port (9 pin) analogue flaw output</li> <li>• D-sub port (25 pin) flaw output TTL</li> <li>• VGA output (15 pin)</li> <li>• 16 BNC connectors for probes</li> <li>• socket for 12 V power supply (3 pin)</li> </ul>

\* option \*\* in single-channel mode

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