

EPOCH 1000 Series

EPOCH 1000, EPOCH 1000iR, EPOCH 1000i



Conventional UT



Conventional UT with PA



Advanced Ultrasonic Flaw Detectors with Phased Array Imaging

EPOCH 1000 Series — Advanced Ultrasonic Flow Detectors with Phased Array Imaging



The EPOCH® 1000 Series Digital Ultrasonic Flow Detectors combines the highest level of performance for conventional portable flaw detection with the power of phased array imaging. The EPOCH 1000, 1000*i*R and 1000*i* feature a horizontal case style with full VGA display, knob and navigation arrows for parameter adjustment, and full EN12668-1 compliance. The advanced conventional ultrasonic functionality of the EPOCH 1000 series is augmented in the EPOCH 1000*i* with phased array imaging capabilities.

Key Features

- Available with Phased Array Imaging Package
- EN12668-1 compliant
- 37 digital receiver filter selections
- 6 kHz pulse repetition rate for high speed scanning
- Automatic phased array probe recognition
- Intuitive wedge delay and sensitivity calibration for all focal laws
- Programmable analog/alarm outputs
- IP66 environmental rating for harsh environments
- Horizontal design with navigation panel and knob parameter adjustment
- Digital high dynamic range receiver
- Full VGA sunlight readable display
- ClearWave® Visual Enhancement Package for conventional A-scan interpretation
- SureView® visualization feature
- Reference and measurement cursors
- Standard dynamic DAC/TVG
- Standard onboard DGS/AVG



Three instrument configuration levels to suit many inspection needs

EPOCH 1000

Advanced UT

The EPOCH® 1000 is an advanced conventional ultrasonic flaw detector that can be upgraded with phased array imaging at an authorized Olympus service center.



EPOCH 1000iR

Advanced UT + Phased Array Ready

The EPOCH 1000iR provides the same ultrasonic flaw detection capabilities as the EPOCH 1000 with the benefit of upgrading to phased array with simple field-remote activation.



EPOCH 1000i

Advanced UT + Phased Array Built-in

The EPOCH 1000i comes standard with the same advanced ultrasonic flaw detection capabilities as the EPOCH 1000 as well as with the benefits of a built-in phased array imaging package.



Field Remote
Upgradable,
Software

Factory Upgradable, Software and Hardware



Key Industries and Applications

- General weld inspection
- Crack detection and sizing
- Power generation inspections
- AWS D1.1/D1.5 weld inspection
- Casting and forging defect inspections
- DGS/AVG defect sizing
- In-line inspections
- Composite delamination and defect inspections
- Aerospace and maintenance
- Automotive and transportation

Advanced Conventional Ultrasound Upgradeable to Phased Array

The EPOCH® 1000, EPOCH 1000iR, and EPOCH 1000i provide advanced conventional ultrasound capabilities for both the standard and advanced level inspector. These portable instruments can also be integrated into small systems for high speed scanning and single channel imaging. They come standard with a host of high performance features, including a 6 kHz maximum Pulse Rate Frequency (PRF) with single-shot measurements for accurate high speed scanning applications, tunable square wave pulser with PerfectSquare™ technology, and comprehensive digital filter sets for exceptional signal-to-noise clarity.

Standard Features

- Adjustable Pulse Repetition Frequency (PRF): 5 Hz to 6 kHz
- Single-shot measurements in all standard modes
- Tunable Square Wave Pulser with PerfectSquare™ technology
- Programmable analog and alarm outputs
- Over 30 digital filter sets
- Digital high dynamic range receiver

Software Features

- **AWS Welding Rating** – This weld rating calculator provides a live AWS D1.1/D1.5 code compliant “D” value weld rating for gated flaw indications.
- **Onboard DGS/AVG** – The DGS/AVG flaw sizing technique uses calculated attenuation curves to aid operators in sizing potential defects. A vast onboard library of characterized probes allows you to quickly and easily setup a DGS/AVG curve and perform precise flaw sizing.
- **Interface Gate** – This optional third measurement gate allows real-time tracking of a variable interface echo to maintain consistent digital measurements.



Interface Gate with Gate 1 and Gate 2 Tracking

- **Dynamic DAC/TVG** – This standard features allows fast and dynamic creation of DAC curves using reference reflectors, as well as single-button switching from DAC to TVG mode. Includes ASME, ASME-III, JIS, 20% to 80% DAC, Custom, and TVG Table.



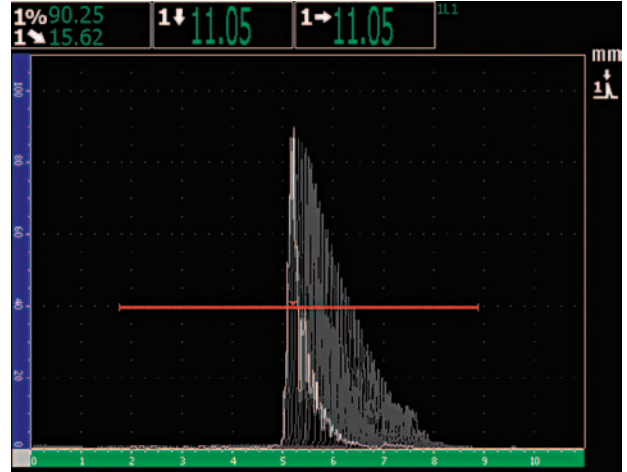
Dynamic DAC/TVG Mode

ClearWave™ Conventional Ultrasound Visual Enhancements

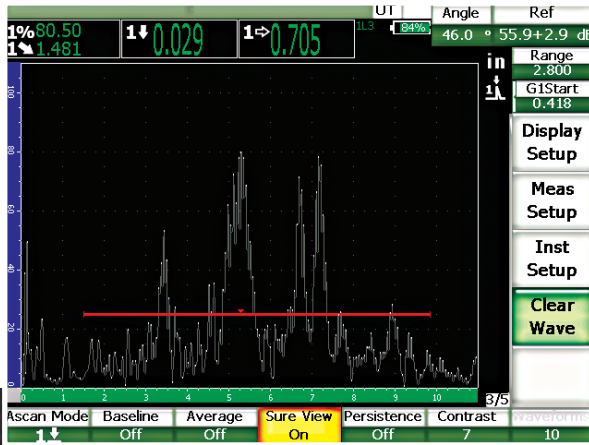
The EPOCH® 1000 series features a new and exciting set of visual enhancement capabilities to improve the quality and ease of detection in advanced applications.

- **Composite A-scan** – This feature uses all A-scans acquired in between screen update rates (multiple A-scans when PRF > 60 Hz) to draw a composite A-scan based on the maximum envelope of all acquired A-scans. This feature increases confidence of visual detection when scanning quickly.
- **Max Amplitude** – This feature displays only the acquired A-scan with the highest gated amplitude reading between screen updates.
- **Min Thickness** – This feature displays only the A-scan representing the minimum thickness reading between screen updates.
- **Averaged A-scan** – This feature allows you to view an average of acquired A-scans. Averaging in 2x, 4x, 8x, 16x, 32x, and 64x.

- **Baseline Break** – This feature displays “zero-cross” points as lines connecting individual A-scan lobes to the baseline in full wave rectified mode.
- **Persistence Mode** – This feature retains previously acquired A-scans on the instrument display for a user-selectable duration. This feature provides visual ‘memory’ of an inspection for short periods of time for enhanced visual detection.



Persistence Mode Screen



SureView®

This feature emulates the functionality of analog CRT displays, allowing you to visualize peak indications from reflectors by adding a point of light along the A-scan trace where every peak occurs.



Phased Array Imaging Package with Advanced Conventional Ultrasound

The EPOCH® 1000i provides powerful conventional ultrasonic and phased array flow detection in a portable, rugged instrument. It allows increased probability of detection of flaws, better visualization of areas of interest and increases inspection efficiency by allowing a single setup to view A-scans at multiple angles (focal laws), eliminating the need for multiple probes and wedges. You can still rely on the exceptional conventional performance of the EPOCH 1000 while gaining all the benefits from the phased array capabilities of the EPOCH 1000i. The EPOCH 1000i allows you to perform code-compliant inspections according to conventional standards with the advantages of phased array to increase accuracy and efficiency.

Available with a standard 16:16 configuration and upgradable to 16:64 configuration via software, the EPOCH 1000i also includes many sizing features to aid in flaw inspections. The instrument comes standard with A-scan and S-scan reference and sizing cursors for flaw size evaluation. The EPOCH 1000i also provides DAC/TVG capabilities for every focal law, allowing flaw characterization of a selected A-scan based on an acquired DAC curve.



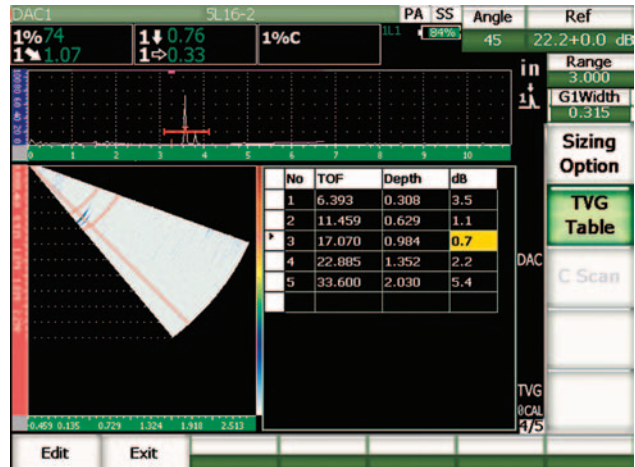
EPOCH 1000i/Phased Array Specifications	
Focal Laws	61
Maximum Elements	64 elements
Maximum Active Aperture	16 elements
Video Filtering	Off, Low, High
Display Modes	A-scan, S-scan, E-scan, C-scan, A-scan plus image
Image Update Rate	60 Hz update for all A-scans; 20 Hz update for all images

Combined A-scan and S-scan Views

The EPOCH 1000i features a familiar combined A-scan and S-scan view, showing the user an image representing A-scan data from all angles between two user-defined start and end values. Each individual angle, referred to in general as Focal Laws, can be selected to display a live A-scan. This allows you to detect and characterize potential defects at multiple angles at a single time using phased array imaging.

Standard DAC/TVG for All Focal Laws

The EPOCH 1000i comes standard with DAC/TVG for all focal laws. This allows the you to acquire a DAC curve or create a TVG setup from known reflectors for all defined angles/focal laws at once. After completing this setup, you can use the S-scan image to detect potential defects at various focal laws.

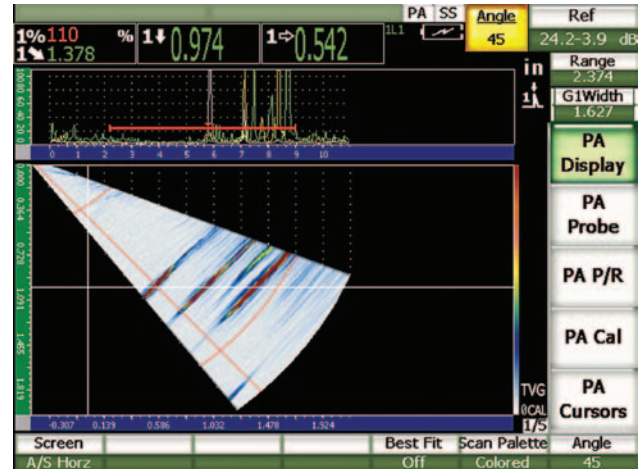


Phased Array DAC Edit Mode

Phased Array Features for Manual Imaging Inspections



Multi-Angle Phased Array Mode



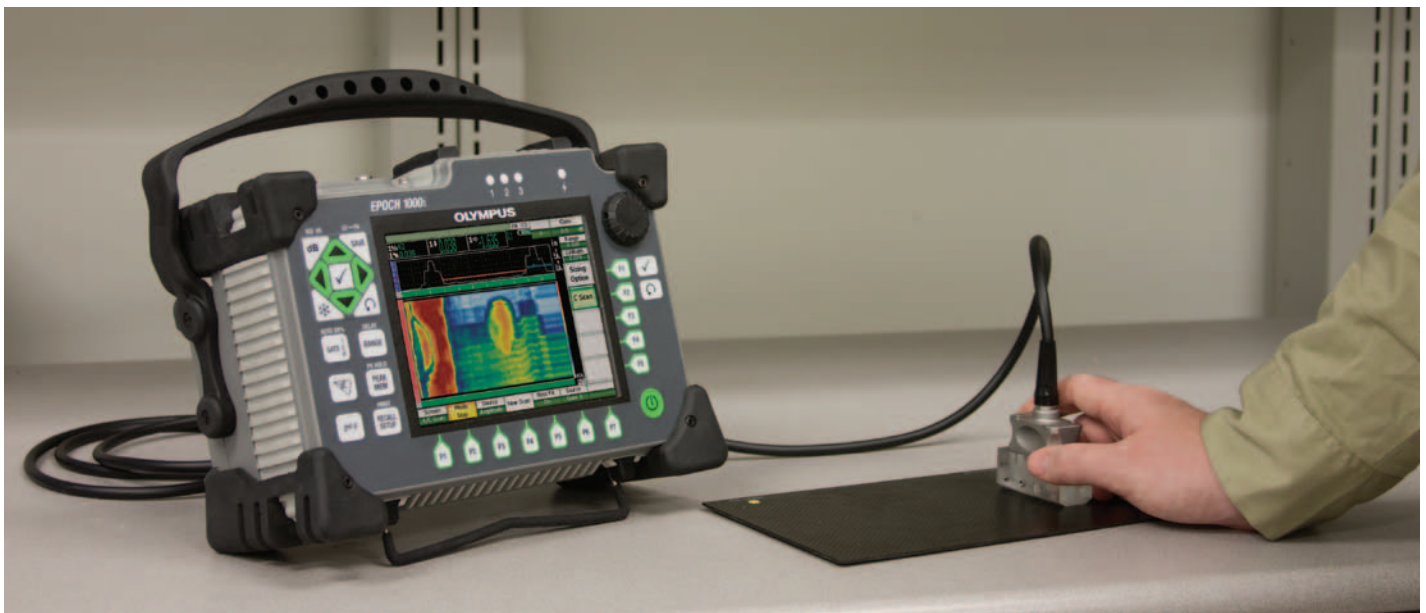
AWS WELD RATING" - AWS "D" Weld Rating displayed for 60 degree focal law

AWS Weld Rating

The EPOCH® 1000*i* comes with an AWS D1.1/D1.5 weld rating calculator. In conjunction with Olympus' AWS rated phased array transducer, this allows you to use imaging capabilities for flaw detection, while sizing flaws at 45°, 60° and 70° with conventional A-scan technique, and also view the D value for weld rating on screen for any selected A-scan (focal law).

EPOCH 1000*i* Multi-Angle

The EPOCH 1000*i* phased array mode includes a new feature called Multi-Angle. This feature allows you to designate any three angles, or focal laws, available in the sector scan as "visible" focal laws. The A-scans from each of the three designated angles are then overlaid on top of each other in the A-scan window, allowing you to view all three A-scans at the same time. Each individual angle is color coded for ease of use. This feature is perfect for inspectors using conventional sizing methods requiring evaluation at 45, 60 and 70 degrees.

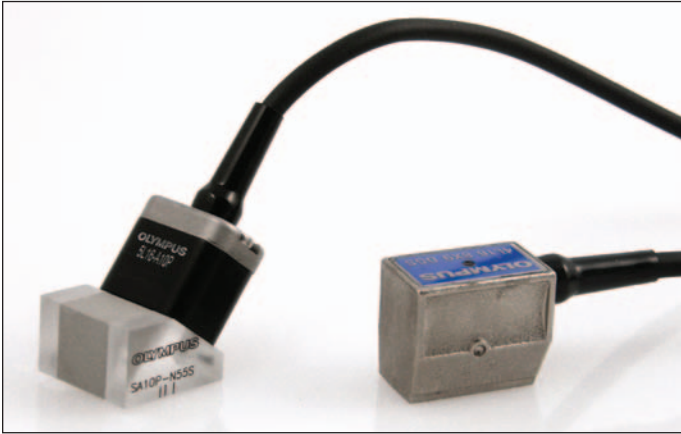


Linear E-scan and C-scan

This optional software feature expands the EPOCH 1000*i* to a 16:64 configuration and allows electronic scans (E-scans) as well as manual C-scan imaging. Linear E-scans are collected using up to a 64 element probe, with a maximum active aperture of 16 elements. You may simultaneously view A-scan data with E-scan or C-scan images.

C-scan imaging is created by accumulating image data from the programmed E-scan. This manual C-scan image provides both Time of Flight (TOF) and amplitude data from two independent measurement gates. Data source and type can be adjusted dynamically after the scan is acquired, and cursors are available for scan analysis.

EPOCH 1000i Phased Array Probe Series



The EPOCH® 1000i supports a new series of phased array probes to meet the demands of critical inspections. These probes include specialized probes for specific code compliance and standard weld inspection probes, including removable or integral wedge phased array probes.

Fast Switch from Conventional to Phased Array

The EPOCH 1000i is compatible with all standard single element transducers in conventional mode. Switching between conventional UT and phased array inspection is as easy as the press of a button. The EPOCH 1000i features a high-speed transition from UT to PA mode, allowing you to easily combine conventional UT and phased array inspections.

Ordering Information

Numbering systems used to order standard phased array probes.

5L16-9.6x10-A10P-P-2.5-OM



Frequency

2.25 = 2.25 MHz
5 = 5.0 MHz
10 = 10 MHz

Array Type

L = Linear

Number of Elements

16 = 16 Elements

Active Aperture

Active aperture in mm

Elevation

Elevation in mm
Example 10 = 10 mm

Probe Type

A = angle beam with external wedge
DGS1 = DGS inspection/Atlas (AVG probe)
AWS1 = AWS Inspection

Casing Type

Casing type for a given probe type

Cable Type

P = PVC outer
M = Metal armor outer

Cable Length

Cable length in m
2.5 = 2.5 m
5 = 5 m
10 = 10 m

Connector Type

OM = OmniScan® connector

Probes*

Probe Description	Item Number	Usage/Code Compliance	Frequency (MHz)	Number of Elements	Pitch	Active Aperture (mm)	Elevation (mm)	Dimensions in mm (in.) L x W x H		
2.25L8-A10P	U8330663	General Purpose	2.25	8	1.2	9.6 x 10	10	22.5 (0.89)	15.6 (0.61)	20 (0.79)
5L16-A10P	U8330661		5.0	16	0.6	9.6 x 10	10	22.5 (0.89)	15.6 (0.61)	20 (0.79)
10L16-A10P	U8330662		10	16	0.6	9.6 x 10	10	22.5 (0.89)	15.6 (0.61)	20 (0.79)
2.25L16-AWS1	U8330660	AWS D1.1/D1.5	2.25	16	1.0	16 x 16	16	37.6 (1.48)	25.4 (1.0)	17.8 (0.70)
2L8-DGS1	U8330598	Integral Wedge/ DGS-AVG	2.0	8	1.0	8 x 9	9	27.3 (1.07)	16.8 (0.66)	22.3 (0.88)
4L16-DGS1	U8330597		4.0	16	0.5	8 x 9	9	27.3 (1.07)	16.8 (0.66)	22.3 (0.88)
5L64-A12	U8330593	General Purpose	5.0	64	0.6	38.4 x 10**	10	22.5 (0.89)	44.6 (1.76)	20 (0.79)

*All probes supplied with 2.5 meter cable and OmniScan style connector. For other variations contact Olympus NDT.

** Represents all 64 elements. Only 16 or fewer elements can be active at one time

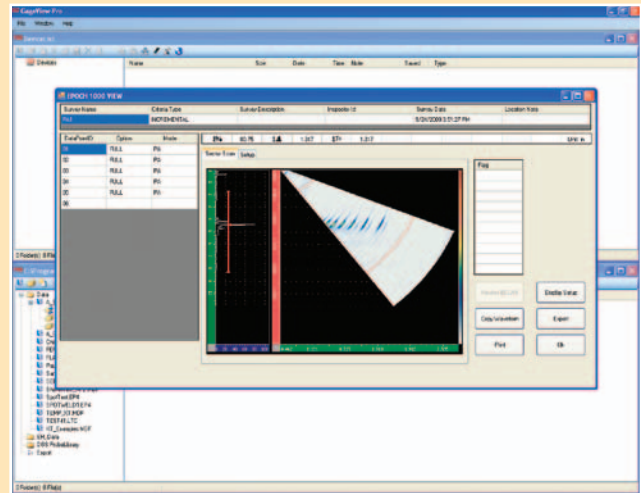
Wedges

Wedge Number	Item Number	Matching Probe (s)	Nominal Refracted Beam Angle (in steel)	Sweep (°)	Probe Orientation	Dimensions in mm (in.) L x W x H		
SA10P-0L	U8720704	2.25L8-A10P, 5L16-A10P, 10L16-A10P	0° LW	-30 to 30	Normal	25.4 (1.0)	23.1 (0.91)	20 (0.79)
SA10P-N55S	U8720705	2.25L8-A10P, 5L16-A10P, 10L16-A10P	55° SW	30 to 70	Normal	23 (0.91)	23.2 (0.91)	14.2 (0.56)
SAWS1-0L	U8700264	2.25L16-AWS1	0° LW	-30 to 30	Normal	38 (1.49)	37.6 (1.48)	40 (1.57)
SAWS1-N60S	U8720552	2.25L16-AWS1	55° SW	30 to 70	Normal	45.3 (1.78)	38 (1.49)	30.3 (1.19)
SA12-0L	U8720549	5L64-A12	0° LW	-30 to 30	Normal	61.8 (2.43)	23 (0.91)	53.4 (2.1)
SA12-N55S	U8720547	5L64-A12	55° SW	30 to 70	Normal	58 (2.28)	23 (0.91)	23 (0.91)

Data Management and Accessories

GageView® Pro Data Management

The EPOCH® 1000 series is fully compatible with Olympus' standard portable instrument PC interface program, GageView Pro. Through the GageView Pro interface program, inspectors can download inspection data, review measurements on a PC, export measurements and calibration data to common spreadsheet programs, back up calibration and inspection data from the instrument, and perform basic operations such as instrument firmware upgrades and screen captures.



Data Logger and Documentation

The EPOCH 1000 Series sophisticated data logger is designed for easy data capture for reporting of images, measurements and calibration information. The data logger features dedicated calibration files with quick recall capability for fast setup adjustment, as well as storage of inspections files with either full data or basic image and measurement captures for quick reporting purposes. The EPOCH 1000 Series can also export or directly print data from files in a report format.

Accessories

The EPOCH 1000 series has many available accessories to allow full functionality of various features.

- EPXT-C-VGA-6 (U8779019):** VGA output cable
- EP4P/C-USB-6 (U8840084):** USB client cable
- EP1000-C-RS232-6 (U8779197):** RS-232 communications cable
- EP1000-C-26OUT-6 (U8779018):** Hardware I/O cable (alarm outputs triggering)
- EP1000-C-9OUT-6 (U8779017):** Hardware I/O cable (analog output)
- EP4/CH (U8140055):** Chest harness
- EPXT-EC-X:** External battery charger
- EPXT-BAT-L (U8760021):** Extra battery (lithium-ion)
- EP1000-TC-S (U8764078):** Small Transport Case
- EP1000-TC-L (U864079):** Large Transport Case



Small Transport Case (P/N: EP1000-TC-S)



Large Transport Case (P/N: EP1000-TC-L)

Rugged. Portable. Meets the Demands of the Toughest Inspection Environments.

The EPOCH® 1000 Series is designed to meet the IP66 environmental rating. Tested for shock, vibration, explosive atmosphere, and wide temperature range, these instruments can withstand operation in harsh inspection conditions. Some of the EPOCH 1000 Series' other key physical features include:

- Large, full VGA (640x480) resolution color transfective display for optimum viewing in low or bright lighting conditions
- Rugged rubber handle for easy carrying
- Durable instrument-mounted D-rings for chest harness use
- Front and rear stands for table-top or steep inclined viewing
- USB Client and Host ports for PC communication, direct printing and communication with peripheral devices
- VGA output for presentations, training, and remote instrument monitoring
- Programmable analog outputs, alarm outputs, and RS-232 communication
- Standard internal, rechargeable lithium ion battery



General Specifications

Overall Dimensions (W x H x D)	252 mm x 177 mm x 107 mm (9.92 in. x 6.97 in. x 4.2 in.)
Weight	3.67 kg (8.1 lb), including lithium-ion battery
Keypad	English, International, Japanese, Chinese
Languages	English, Spanish, French, German, Japanese, Chinese, Russian, Italian, Polish
Transducer Connections	BNC or Number 1 LEMO
Data Storage	Onboard up to 10,000 IDs with waveform, standard 4 GB compact flash card (removable)
Battery Type	Single lithium-ion rechargeable standard
Battery Life	8 hours (conventional UT mode); 7 hours (phased array mode)
Power Requirements	AC Mains: 100 VAC to 120 VAC, 200 VAC to 240 VAC, 50 Hz to 60 Hz
Display Type	Full VGA (640 x 480 pixels) Transfective Color LCD, 60 Hz update rate
Display Dimensions (W x H, Diag.)	132.5 mm x 99.4 mm, 165.1 mm (5.2 in. x 3.9 in., 6.5 in.)

Inputs/Outputs

USB Ports	1 USB Client, 3 USB Host ports
RS-232	Yes
Video Output	VGA output standard
Analog Output	4 analog outputs, Selectable 1V/10V Full Scale, 4 mA max
Alarm Output	6 alarm outputs, 5V TTL, 10 mA
Trigger I/O	Trigger input 5V TTL; trigger output, 5 V TTL, 10 mA
Encoder Inputs	2-axis encoder line (quadrature) conventional UT only

Environmental Ratings

IP Rating	Designed to meet requirements of IP66
Explosive Atmosphere	Tested to MIL-STD-810F, Method 511.4, Procedure 1. Atmosphere defined per NFPA 70, Article 500 as Class I, Division 2, Group D.
Shock Tested	IEC 600689-2-27, 60 g's, 6 µsec Half-Sine, 18 Axes total
Vibration Tested	Sine vibration, IEC 60068-2-6, 5 Hz to 150 Hz @ 0.03 in. or 2 g's Displacement Amplitude, 20 sweep cycles
Operating Temperature	-10 °C to 50 °C (-14 °F to 122 °F)
Battery Storage Temperature	-20 °C to 60 °C (-4 °F to 140 °F)
Battery Recharge Temperature	0 °C to 40 °C (32 °F to 104 °F)

EPOCH 1000 Series Conventional/Phased Array Specifications*

	EPOCH® 1000, EPOCH 1000/R, EPOCH 1000/I (conventional UT mode)	EPOCH 1000/I (PA mode)
Pulser		
Pulser Type	Tunable Square Wave	
PRF	5 Hz to 6000 Hz in 5 Hz increments	Manually adjustable. Maximum 1520 Hz
Energy Settings	50 V to 475 V in 25 V increments	40 V or 80 V
Pulse Width	Adjustable from 25 ns to 5,000 ns (0.1 MHz) with PerfectSquare™ Technology	Adjustable from 40 ns to 1000 ns with PerfectSquare™ Technology
Damping	50 Ω, 100 Ω, 200 Ω, 400 Ω	Not applicable
Pulser Delay	Not applicable	0 to 10 μs, 2.5 ns resolution
Receiver		
Gain	0 to 110 dB	0 to 80 dB
Maximum Input Signal	20 Vp-p	250 mVp-p per channel
Receiver Input Impedance	400 Ω ± 5%	50 Ω ± 10%
Receiver Bandwidth	0.2 MHz to 26.5 MHz @ -3 dB	0.5 MHz to 12.5 MHz @ -3 dB
Receiver Delay	NA	0 μs to 10 μs, 2.5 ns resolution
Digital Filter Settings	Standard filter set (EN12668-1 Test & Compliant): 7 filters Advanced filter set (not tested to EN12668-1): 30 filters	6 filters
Rectification	Fullwave, Positive Halfwave, Negative Halfwave, RF	
Reject	0 to 80% FSH with visual warning	
Amplitude Measurement	0% to 110% full screen height with 0.25% resolution	
Measurement Rate	Equivalent to PRF in all modes	
Calibration		
Automated Calibration	<ul style="list-style-type: none"> • Velocity, Zero Offset • Straight Beam (first back wall or echo-to-echo) • Angle Beam (Soundpath or Depth) 	<ul style="list-style-type: none"> • Velocity, Zero Offset, Sensitivity • Soundpath or Depth (Zero Offset)
Test Modes	Pulse Echo, Dual, or Through Transmission	Pulse Echo
Units	Millimeters, Inches, or Microseconds	
Range	3.26 mm to 25,000 mm (0.28 in. to 1000 in.) Longitudinal velocity in steel.	Up to 762 mm (30 in.), 30 laws. Longitudinal velocity in steel.
Velocity	635 to 15, 240 m/s (0.0250 to 0.6000 in/μs)	
Zero Offset	0 μs to 750 μs	Not applicable
Display Delay	-59 mm to 25,400 mm (-2.323 in. to 1000 in.)	0 to max range
Refracted Angle	0° to 85° in 0.1° increments	61 angular focal laws, 0.5°, 1.0, 1.5°, or 2.0° increments. Adjustable from -80° to +80°
Gates		
Measurement Gates	2 fully independent Gates for Amplitude and Time-Of-Flight Measurements	
Interface Gate	Optional, with Gate 1 and Gate 2 tracking	Not applicable
Gate Start	Variable over entire displayed range	
Gate Width	Variable from gate start to end of displayed range	
Gate Height	Variable from 2% to 95% full screen height	
Alarms	<ul style="list-style-type: none"> • Positive and negative threshold • Minimum depth 	<ul style="list-style-type: none"> • Positive and negative threshold (for selected focal law) • Minimum depth (for selected focal law)
Reference Cursors	2 reference cursors for A-scans	2 reference cursors for A-scans; 4 reference cursors for images
Measurements		
Displayed Measurement	6 locations available (manual or auto selection)	
Gate 1	Thickness, Soundpath, Projection, Depth, Amplitude, Time-Of-Flight, Min/Max Depth, Min/Max Amplitude	
Gate 2	Same as Gate 1	
IF Gate (optional)	Thickness	Not applicable
Echo-to-Echo	Standard. Choose between Gate2-1, Gate2-IF, Gate1-IF	Standard.
Other Measurements	Overshoot (dB) value for DGS/AVG, FBH (equivalent reflector size) for DGS/AVG, AWS D1.1/D1.5 rating (D), Reject Value	
DAC/TVG	Standard	
DAC Points	Up to 50 points, 110 dB dynamic range	Up to 20 points, 40 dB dynamic
Special DAC Modes	20% to 80% DAC, Custom DAC (up to 6 curves)	Not applicable
TVG Table	Up to 50 points, 110 dB dynamic range, compatible with IF Gate at all PRF settings	Up to 20 points, 40 dB dynamic
Curved Surface Correction	Standard. Tube or bar OD correction for angle beam measurements	



The EPOCH® Flaw Detector Family: The EPOCH flaw detector line features vertical and horizontal layout instruments that span the range of inspection capabilities from basic to advanced. The EPOCH 600 and EPOCH 1000 Series flaw detectors feature horizontal layout instruments for enlarged A-scan and image representation in a portable format, and provide an exceptionally high quality of digital flaw detection technology.

OLYMPUS NDT INC. is ISO 9001 and 14001 certified.

OLYMPUS®

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Mixed Sources
Product group from well-managed
forests, controlled sources and
recycled wood or fiber

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