SUPOR

Super Idea for Ultrasonic Inspection

SIUI

Ultrasound Inspection

Ultrasound phased array (PA) and Time Of Flight Diffraction (TOFD), two of the new NDT technologies, have become one important development trend in current industrial ultrasound flaw detection.

The SUPOR ultrasonic flaw detector represents SIUI's continuous pursuit and innovation in ultrasound phased array (PA) and Time Of Flight Diffraction (TOFD) technologies, which incorporate many latest technologies such as ultrasound flaw detection, computer, electronics, mold tooling and craftwork, with which a perfect combination is achieved on the system.

Phased Array Technology

About PAUT

The Phased Array technology is based on the use of probes made up of individual elements that can be independently driven. By electronically shifting the timing of phased array probe elements, the ultrasound beam can be steered and focused.
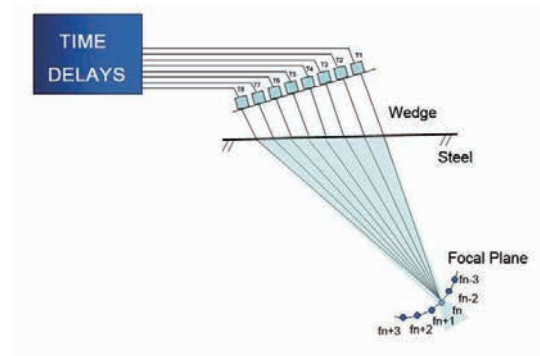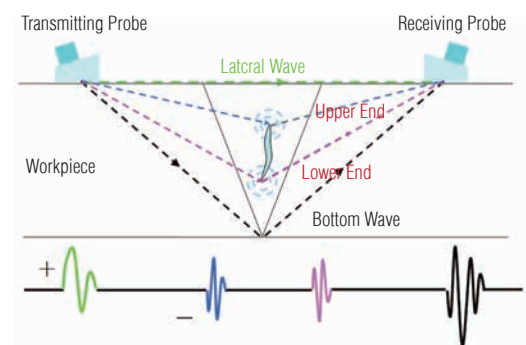

Benefits of PAUT

- High Inspection Sensitivity
- Fast Inspection Efficiency
- Strong Inspection Capacity
- Accurate Flaw Positioning
- Visual Inspection Result
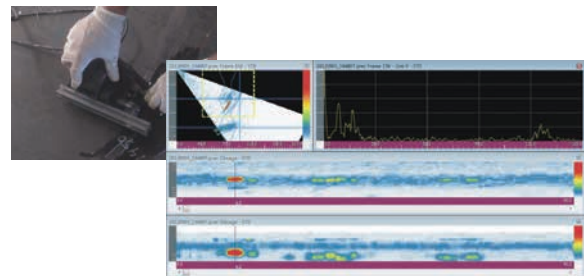

TOFD Technology

About TOFD

TOFD (Time of Flight Diffraction): It is an ultrasound inspection method based on ultrasound diffraction, instead of wave amplitude. The basic feature is working with T/ R probes.

Benefits of TOFD

- Accurate sizing of defects
- Detection is independent of type and orientation of flaws
- Rapid scanning
- High probability of detection

*EN-12668-1 compliant
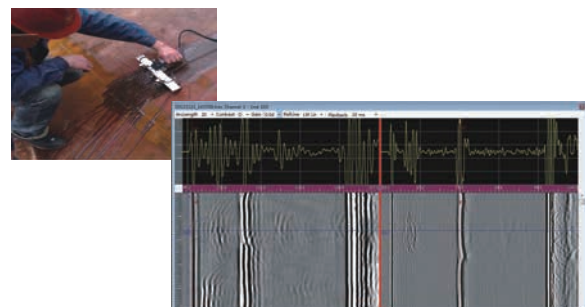
In Continuous Pursuit of Excellence, SIUI Releases Phased Array and TOFD Ultrasonic Flaw Detector

TOFD with Conventional UT

PA & TOFD with Conventional UT

PA with Conventional UT

New generation of ultrasonic flaw detector from SIUI, with modular design and more powerful functions. The SUPOR represents the persistent fine tradition of SIUI: innovative technology, advanced process, small size, lightweight, powerful functions and easy operation.

*Specific functions are subject to final order.

Superior Features

- Grouping Scanning: It can be divided into up to six groups for one PAUT probe for different inspections.
- Support two PAUT probes working simultaneously with grouping function.
- Modular design: Phased array module (16/32 channels), Phased array + TOFD module, Multi-channel TOFD module or conventional UT module…
- Simultaneous Inspection of PA & TOFD
- Optional software: TKY software, flat weld solution, angle weld solution, PA pipe girth weld solution.
- Velocity, Sensitivity, Delay, TCG calibration
- Weld simulation
- Scan setup wizard
- Real time A/B/C/D scan
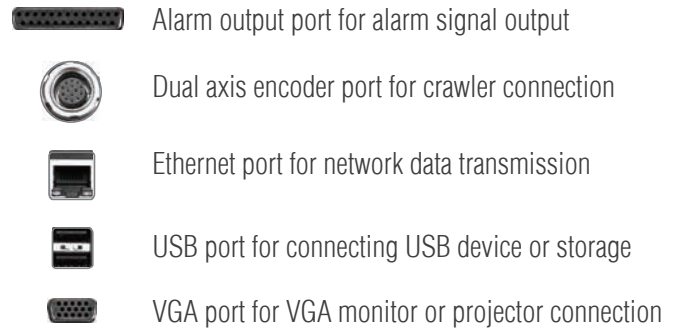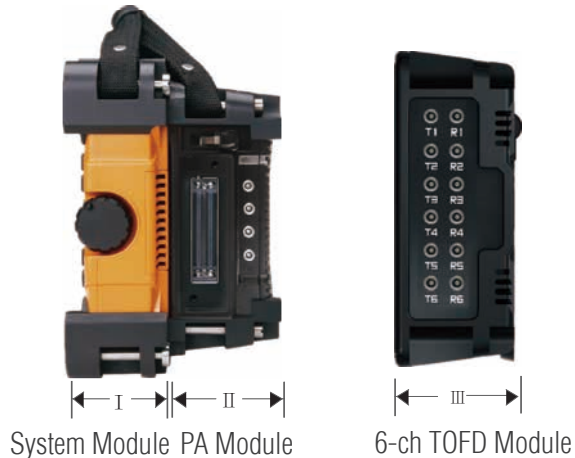- 8.4" touch screen LCD with resolution 800×600 pixels

Modular Design

SUPOR can work with multiple ultrasound imaging modules:

16:64 Phased Array with 2-ch conventional UT module+ optional 1 or 2-ch TOFD function;
32:128 Phased Array with 2-ch conventional UT module+ optional 1 or 2-ch TOFD function;
2/4/6 TOFD modules with conventional UT functions...

System Module PA Module   6-ch TOFD Module

Alarm output port for alarm signal output

Dual axis encoder port for crawler connection

Ethernet port for network data transmission

USB port for connecting USB device or storage

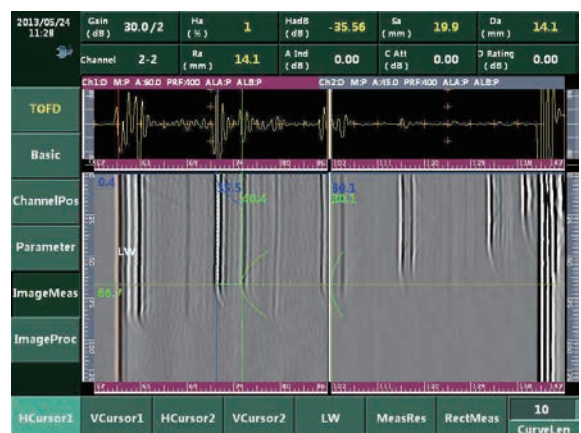VGA port for VGA monitor or projector connection

Features of Phased Array Module

- 16/32 channels for selection
- Bipolar transmit square wave, adjustable transmit voltage and pulse width
- Continuous receive dynamic focusing
- Multiple view display modes
- Data Analysis: image gate dynamic reconstruction
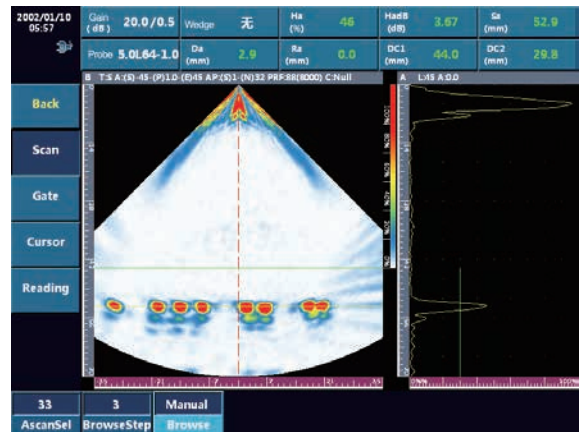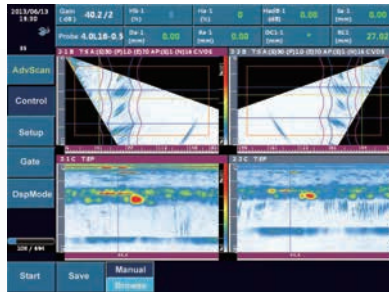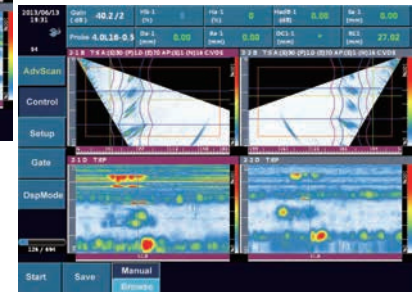

Features of TOFD Module

- Multi-channel TOFD function with 2/4/6 channels for selection
- 0.5MHz~20MHz band width
- Negative square wave transmit pulse, adjustable transmit voltage and pulse width
- Data Analysis: Lateral Wave / Bottom Wave Straightening,
- Lateral Wave/ Bottom Wave Filtering, Constrast Correction,
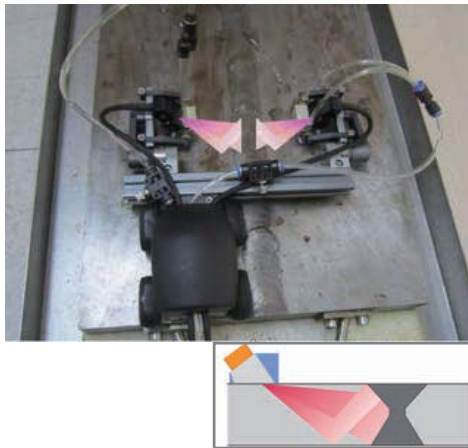- Gain Correction, Flaw Height and Length Measurement

Multi-Group Scanning


Two Groups of B+C Scans

Two Groups of B+D Scans

For one phased array probe, multi groups of element and multi angles can be applied for scanning at the same time, fully covering the welding area and enhancing the inspection efficiency.

In SUPOR, one phased array probe can be divided up to six groups for different inspection.

Two phased array probes can work simultaneously with grouping function to inspect from both sides of the welding, therefore enhancing the inspection efficiency and speed.

SUPOR with External Connector

Weld Simulation

Weld Simulation is to simulate how phased array ultrasound propagates in type V, Y or X flat panel butt weld, so as to help users know the beam coverage status and finish test process setup.

This function is used to complete testing process design for the specific testing of work pieces, including the beam coverage simulation and phased-array imaging parameter settings. By using this function, the user will find it easier to analyze, locate flaw signals and make sure each part of the test pieces meet the industrial welding standards.
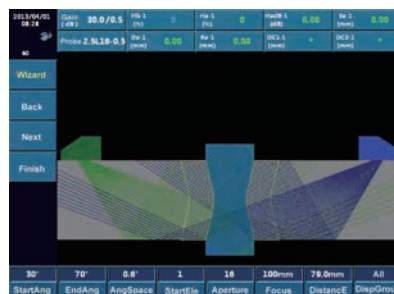
Beam Coverage Simulation Wizard
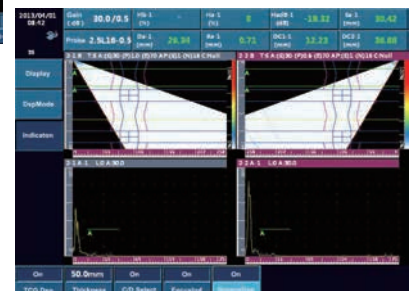
Weld Overlay Simulation

Scan Setup Wizard

Velocity Calibration

- Smart wizard, which can guide users to finish imaging setup easily and improve inspection speed.
- Calibration wizard is to calibrate key performance parameters of phased-array, including velocity, delay, sensitivity and TCG.
- The step-by-step menu guides users to perform all the calibration procedures easily.

Sensitivity Calibration

Delay Calibration

TCG Calibration

Management

Work Piece Management

Probe Management

Wedge Management

Encoder Management

Storage Management

- Easy-to-use interface to make work piece, probe, wedge, encoder and storage managements more convenient.
- In the work piece management, the shape of the work piece is simulated and detailed parameters are listed for reference.
- The user may manage probe and wedge parameters via probe and wedge management.
- Follow the wizard, the user can finish encoder simple operation, calibration and test quickly.
- Parameters, screenshot and data can be easily managed in the storage management to enhance the inspection efficiency.

SuporUp PC Software

SuporUp is a PC-based software for

● Checking data file: check the phased array or TOFD files transferred from SUPOR.

● Measuring data analysis: measure and analyze the phased array or TOFD files.

● Generating measurement reports: input the file information and the measurement result of phased array or TOFD files to a specific
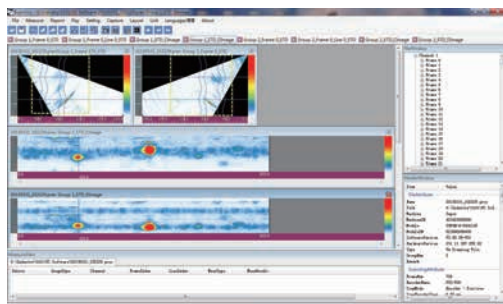
file to generate the test report.
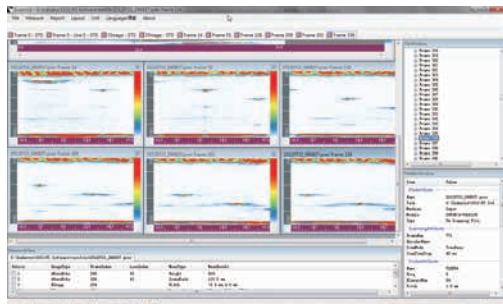
Multiple B-scan
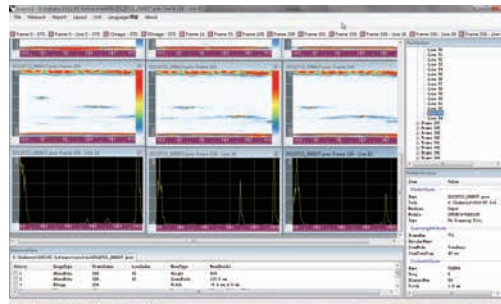
Multiple A+B Scan

Display Mode

SuporUp provides several display modes for selection; users can use different display modes during inspection or analysis with flexibility.

Change the size and position of the region of interest, and the software will re-construct C/D scan images automatically.

Phased Array Measurement
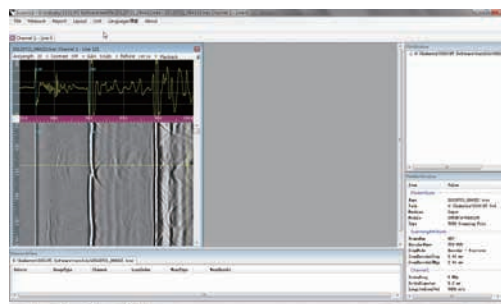
TOFD File Measurement

Management

For phased array files, SuporUp can

● Perform width, height and rectangle measurement on the phased-array B/C/D image.

● Perform height, sound path, vertical distance and horizontal distance measurement on the A-scan echo.

For TOFD files, SuporUp can

● Perform length measurement, straightening, filter, recovery, local zoom, SAFT,

contrast adjustment and gain post processing on the TOFD image.

Reporting

Detection echoes, curves or parameters may be losslessly stored to SuporUp facilitating report editing and data management.

Screenshot and detailed info can be transferred to Microsoft Word for customized reporting. The user can add company logos and inspection specific information including all relevant inspection settings to make a full report.
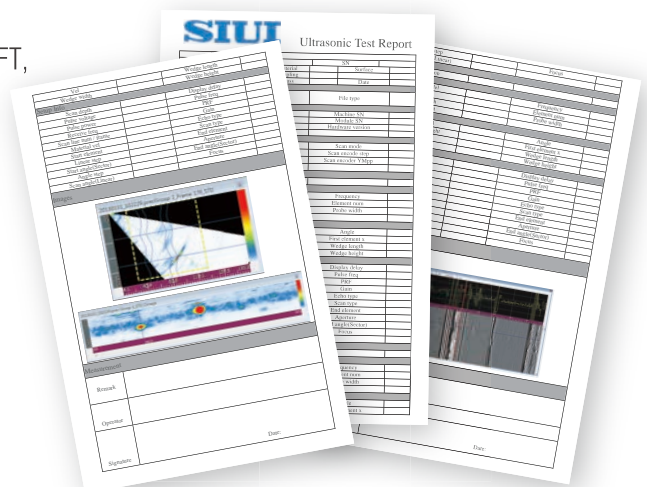
Optional Software

Flat Weld Solution

This solution is suitable for flat butt weld and pipe girth weld inspection.

● Automatically simulate various welds with different groove types to make simulation closer to the on-site weld shape.

● Professional wizard operation mode facilitates operators finish phased array setup.

● Assisted positioning (RayTracing) flaw measurement and report generation functions are available.
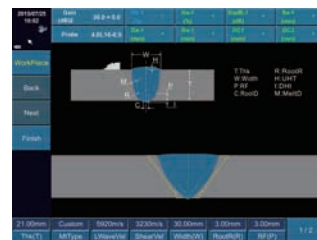

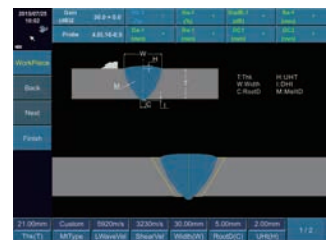New Weld Type Selection
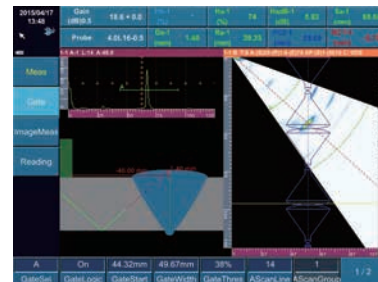
RayTracing (A+B+R scan)
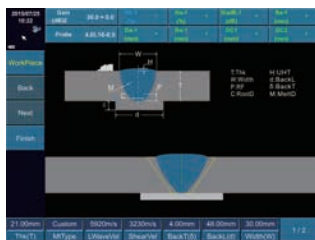
Y-weld with backing

Asymmetric Weld

U-Weld

Single V-Weld

● Eight types of weld groove: V, Half V, Y, X, U, I, Y with backing, Asymmetric Welds.

● Quick setup of weld parameters: thickness, material type, groove width, root clearance, up/down reinforcement, fusion simulation, heat-affected zone, as well as workpiece edit, delete, add and rename.

Angle Weld Solution

Suitable for angle welds in ocean platform and oil & gas steel structure.

● Automatically simulate real angle weld shape based on parameters input.

● Simulate sound beam coverage in six different probe positions.

● When RayTracing function is on, the software can auto analyze and judge the workpiece flaw situation, record flaw image and measurement result, and generate test report.
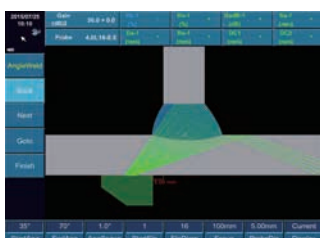
Flange Simulation
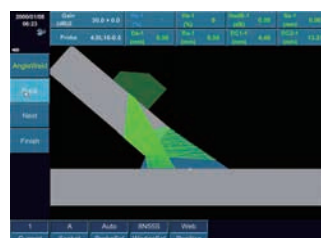
Web Simulation

T-weld Simulation

RayTracing (A+B+C+R scan)

Optional Software

Pipe Girth Weld Solution

● This solution is suitable for testing welds of small diameter pipes with outside diameters ranging from 20.32-114.3mm (0.84-4.5 inch).

● By offering features of V-groove and Y-groove weld making, beam coverage simulation, as well as inserted wedge and link assembly guide table, the solution helps users to finish testing of small diameter pipes quickly.

On-site Application
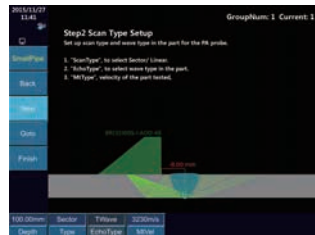
Scan Type Setup

Focal Law Setup

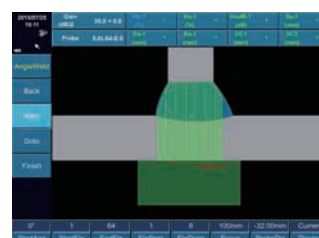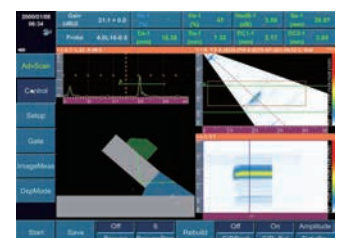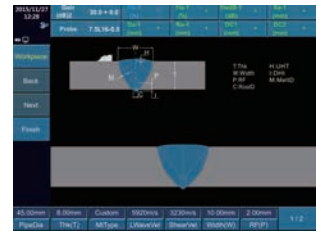Workpiece Setup

TKY Software
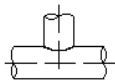
T-K-Y Weld Joints

Conventional ultrasonic inspection on T-K-Y weld joints face these problems: complicate procedure, difficult defect position, heavy workload, low defection efficiency and so on. In order to solve problems above, SIUI combines phased array technology with computer -aided technology and develop our unique TKY software, which is perfectly used for PAUT of critical T-K-Y weld joints.

Y-shape weld joints cut from a huge pipe
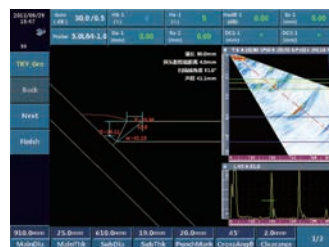
Sample with short cross-drilled holes of different diameters along the weld direction

On-site application in the offshore oil engineering

Workpiece Setup

Simulation Interface
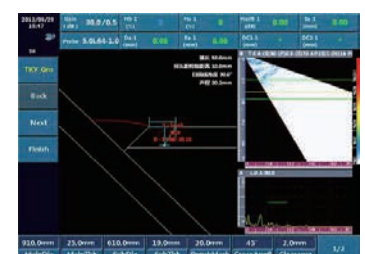
Scan Interface

Typical Applications

SUPOR is designed to increase productivity in various inspection situations. It is suitable for inspection flaw position and size, which can be widely used for various detection demands, such as weld inspection, gas pressure welding on rail, pressure vessel inspection, stainless steel and PE pipe inspection...

Corrosion Inspection
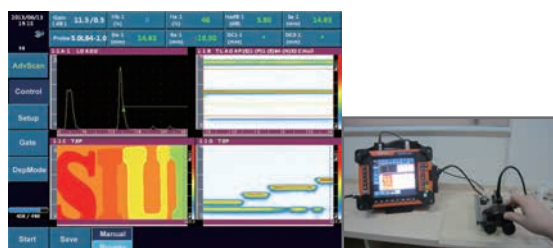
● Linear Scan Image on Flat Panel Engraved with SIUI logo.

● Corrosion Inspection on Oil Drill Pipe
(Thickness: 9-10mm, diameter: 79mm)

Copper Bar Inspection

● C-scan on copper bar with two φ 1 short cross-drilled holes
（depth: 0.5mm）
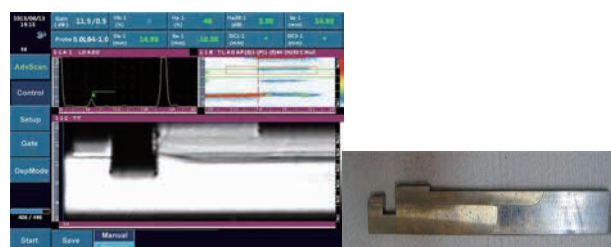
● C-scan on copper bar with groove

Weld Inspection
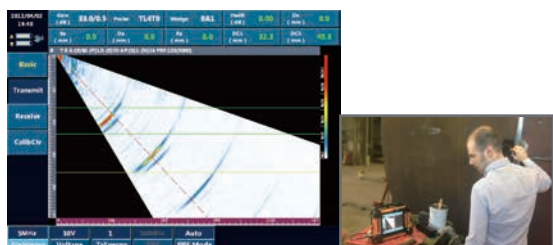
TOFD Inspection
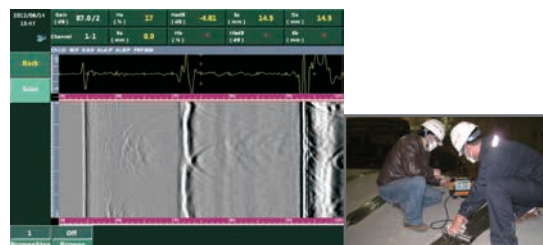
Specifications

General Technical Specification	
Display Screen	8.4'' TFT LCD, 800×600 pixels, 60Hz refresh rate, touch screen
Dimension (W×H×D)	310mm×220mm×150mm
Weight	6 kg with battery
Battery	Smart lithium battery, 2 pcs.
Battery Capacity	7.5 Ah/pc, operation time more than 3 hours.
External Power Supply for Adaptor	AC 100V～240V 50Hz/60Hz
Adaptor Output	15V DC
Power	70VA
Data Storage	2G internal memory
Input / Output	
USB Connector	2 pcs
Ethernet Connector	1 pc
Video Output	VGA port
Encoder Connector	1 pc
Alarm Connector	1 pc
Environment Tests	
Operation Temperature	0℃～40℃
Storage Temperature	-20℃～60℃

Technical Specification for 32:128 Phased Array + 2-ch TOFD

|	Conventional UT	Phased Array
System		
No. of Channel	2	32
Probe Connector	LEMO 00	Tyco
No. of Probe Connector	4 pcs	1 pc
Max. Supporting Elements	4	128
Pulser		
Pulser	Spike, Square	Bi-polar square
PRF	100Hz～2000Hz	100Hz～8000Hz
Pulse Voltage	50V～500V, min. step 1V	2V～110V, min. step 2V
Pulse Energy	——	4 levels
Pulse Width	10ns～600ns	2~10MHz
Damping	4 levels	——
Pulser Delay	——	0μs～20μs, resolution 5ns
Pulser Focusing	——	Single point focusing
Receiver		
Gain	0dB～110dB, step: 0.5/2/6/12	0～80dB, step: 0.1/0.5/2/6/12
Bandwidth	0.5MHz～15MHz	0.5MHz～15MHz
A/D Sampling Rate	200MHz	50MHz
Rectification	Positive, negative, full, RF	Positive, negative, full, RF, video filter
Receiver Delay	——	0μs～20μs, resolution 2.5ns
Receiver Focusing	——	200MHz hardware real-time dynamic focusing, maximum range: 1008 foci per scan line
Filter	16 levels	4 levels
Reject	0%～80%	——
Scan		
Scan Type	A / TOFD	A/S/L/C/D
Scan Group	2 groups, UT or TOFD	6 groups, Phased Array
Image Wizard	Available	Available
Trigger Mode	Time-based / Encoder	Time-based / Encoder
Scan Length	Max. 2m	Max. 5m
Focal Laws	——	Max. 512 lines
Scan Angle Range	——	-89°～+89°

Calibration		
Range	0 mm～1000mm	0 mm～1000 mm
Material Velocity	500 m/s～15000 m/s	500 m/s～15000 m/s
Display Delay	——	0 mm～1000 mm
Probe Delay	0 us～19.99 μs	——
Auto Calibration	Velocity, probe delay, angle	Velocity, delay, sensitivity, TCG, horizontal zero
Gate		
Test Point Selection	Peak / Flank	Peak / Flank / J Flank
Measurement	Dual gates: to measure echo amplitude, sound path, horizontal distance, vertical distance, distance between gates.	Three gates: to measure echo amplitude, sound path, horizontal distance, vertical distance. Two measurement cursors: It can measure horizontal & vertical position and distance between cursors on the image.
Gate Start	Full range	
Gate Width	Full range	
Gate Height	10～90%	
Measurement		
Curve Function	DAC	TCG
Auxiliary Function	Peak memory, AWS D1.1/D1.5, auto gain	Auto gain
Alarm Signal	sound alarm	sound alarm
Display Measure Value	8 positions can be user-defined.	
Data Analysis	LW/BW straightening, LW/BW removal, defect height and length measurement, contrast adjust, gain adjust.	Image gate dynamic reconstruction
Testing Index		
Time Base Linearity	≤0.5%	——
Vertical Linearity	≤3%	——
Attenuator Precision	20dB±1dB	——
Dynamic Range	≥32dB	——

Specifications

Technical Specification for 6-ch TOFD or 6-ch Conventional UT

Imaging Mode	Conventional UT
System	
Channel	6
Probe Connector Type	LEMO 00
Probe Connector Number	12 pcs
Max. Supporting Elements	12
Pulser	
Pulser	Spike, square
PRF	100Hz～2000Hz
Pulse Voltage	50V～500V, min. step 50V
Pulse Width	10ns～600ns
Damping	4 levels
Receiver	
Gain	0dB～110dB, step: 0.5/2/6/12
Bandwidth	0.5MHz～15MHz
A/D Sampling Rate	200MHz
Rectification	Positive, Negative, Full, RF
Filter	16 levels available
Reject	0%～80%
Scan	
Scan Type	A/TOFD
Image Wizard	Available
Trigger Mode	Time-based / Encoder
Scan Length	Max. 2m
Calibration	
Range	0mm～1000mm
Material Velocity	500m/s～15000m/s
Display Delay	-10 mm～10000 mm
Probe Delay	0 us～19.99 µs
Auto Calibration	Velocity, probe zero, angle
Gate	
Test Point Selection	Peak / flank
Measurement	Dual gates: to measure echo amplitude, sound path, horizontal distance, vertical distance, distance between gates.
Gate Start	Full range
Gate Width	Full range
Gate Height	10～90%
Measurement	
Curve Function	DAC
Auxiliary Function	A-scan echo freeze, auto calibration, angle measurement, peak memory, parameter output, AWS D1.1/D1.5, USB storage, curve surface correction.
Alarm Signal	Sound alarm
Display Measure Value	8 positions can be user-defined.
Data Analysis	LW/ BW straightening, LW/ BW removal, defect height and length measurement, contrast adjust, gain adjust
Testing Index	
Time base Linearity	≤0.5%
Vertical Linearity	≤3%
Attenuator Precision	20dB±1dB
Dynamic Range	≥32dB

Software
SuporUp PC Software
Basic version and advanced version available.
Basic version function: For Phased Array or TOFD measurement, analysis, report generation.
Optional Software
Phased array pipe girth weld solution
Phased array flat weld solution
Phased array angle weld solution
TKY software for PAUT of critical T-K-Y weld joints.

SIUI

Shantou Institute of Ultrasonic Instruments Co., Ltd.

Add: #77, Jinsha Road, Shantou 515041, Guangdong, China
Tel: +86-754-88250150 Fax: +86-754-88251499
E-mail: siui@siui.com   Website: http://www.siui.com

CE

Specifications and appearance are subject to change without prior notice.
DCY2.781.EN.SUPOR. CY/7D08