MODSONIC®
(SINCE 1987)
Simplifying NDT

# IMAGING
# ULTRASONIC FLAW DETECTOR

**(ToFD, B-Scan & Modified C-Scan)**

## 'da Vinci delta'


### Ideal for Weld Inspection

Using ToFD technique in lieu of Radiography and Ultrasonic Pulse-Echo


### Ideal for Corrosion survey

Using A-Scan thickness gauging, encoded B-Scan and modified C-Scan.


### Ideal for Flaw Detection

Ranging from large castings and forgings to critical nuclear and aerospace parts.

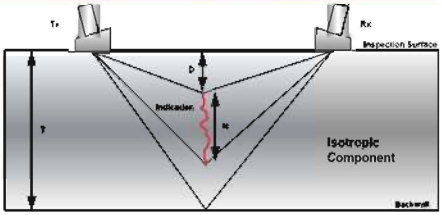
Battery compartment with quick release fastners

Neck strap for hands free use

Carrying handle

On the stand

Time-of-Flight-Diffraction is most powerful NDT technique for examination of welded joints . It involves one each of transmitting and receiving probes which are placed on either sides of the weld and moved along the length of the weld for scanning the cross-section of it . This method unlike pulse-echo technique which depends on ' reflected ' sound energy , depends on sound ' diffraction' which takes place at the tips of the defects when the sound energy is introduced into the material Unlike Pulse-echo method which is amplitude dependant this method measures the time-of-flight for the sound diffracting tips and using the simple geometry determines the depth from the surface or back-wall.




Thus the vertical height ( thro' wall length ) of the defect is known which is important to evaluate its criticality from fracture mechanics point of view Among the many advantages that ToFD technique offers main are its non-hazardous nature , higher speed of inspection, accurate sizing of the defects and digital recording of the inspection data The limitations are in terms of its inability to detect defects close to top and back wall. But these areas can be covered by pulse-echo shear wave inspection. ToFD is a very powerful emerging NDT method and in coming days it would replace radiographic testing in a large way.

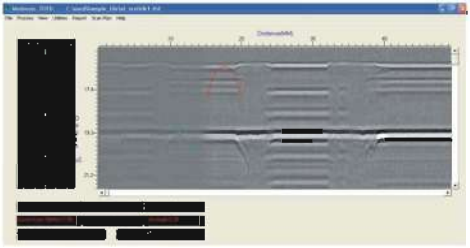
## About ToFD in ' da Vinci delta '

Brief Operation of ToFD in ' da Vinci delta ' : ' da Vinci delta ' as a Single Channel ( a pair of Transmitter and Receiver ) ToFD device is unique , simple-to-use and cost-effective . It is a high end conventional Pulse Echo Ultrasonic Flaw Detector with ToFD capability . Scanning , ToFD data collection and storing are to be performed without any additional peripheral like laptop etc . A pair of ToFD probes are to be connected to ' da Vinci delta ' and after the initial set up the scanning and data collection can begin with just press of a key . The collected ToFD data are to be stored in USB drive where they are stored in separate files with auto-incrementing file names. No computer is required till the job is over. Once it is over the data in USB drive are to be transferred on to a computer . AsalView software supplied with 'da Vinci delta ' enables joining of all the images in the data files into one continuous ToFD image. Then further analysis , defect location and defect sizing follows . Reporting can be done directly on to the image which can in turn be saved for further transmission .

## ToFD Data Collection and Storage in ' da Vinci delta '

>>**Scanplan** : Scanplan can be prepared using the special tool provided in AsalView software
>>**Display** : Real Time RF A-Scan data with auto-scrolling ToFD D-Scan image are displayed on the screen during data collection
>>**No. of Channels** : One Transmitter ( Tx) and one Receiver ( Rx)
>>**Position Encoding** : It can be Freerun ( Unencoded ) or with Encoder .It is single axis , Bi-directional
>>**Data Collection Step** : It is Selected Length divided by 1000 . Eg with 1 meter Selected Length Data Collection Step is 1mm
>> **Data Collection Length** . Can be selected from 500 mm to 10,000 mm.
>> **Averaging** : Averaging internally controlled based on Selected Range/PRF and Test Length.
>> **Data Storage** : Collected data can be stored on USB drive ( Pen Drive ) . Each data is stored in separate file with Auto Incrementing file name. USB drive of 8 GB is supported . Total of about 16 Kms of Weld length can be stored on 8 GB USB drive.

## AsalView Software for ToFD Data Analysis and Reporting



### Image enhancement Tools

a) Images of multiple files can be joined /merged together or big image cab be split into smaller images.
b) Straightenning of D-Scan image manually or by Apex matching.
c) Data Lineanzation
d) Removal of Lateral and Backwall wave for improving surface resolution
e) Activation of Parabolic or Normal cursors
f) Signal Amplitude Correction can be done
g) Contrast and Brightness of the image can be altered for ease in interpretation
h) Zoom In / Zoom Out

### Reporting Tools

a) Overlay Display enables insertion of ' Note / Remark ' over the ToFD image.
b) The Defect Markup is useful for marking the defect with remark.
c) Whole image can be exported as Bitmap file (BMP).
d) A-Scan data can be exported for further analysis in text format.

# Other Salient Features

## Thickness/Corrosion Survey

- ✓ Encoded B-Scan
- ✓ Measurement resolution of 0.01mm
- ✓ Test Range : 2.5mm to 10 meters (Steel)
- ✓ Auto Tracking for immersion testing and thro' coating/Oxide Scale Thickness Measurement.
- ✓ Minimum thickness capture mode.
- ✓ Powerful 'Thickness Data Management Software' for thickness logging in Sequential, 2D and 3D file configurations.
- ✓ Dual independent gates with different colours for two separate measurements.

## Flaw Detection

- ✓ Colour coded skips/legs during weld inspection
- ✓ Peak Freeze/Active Echo Dynamic feature.
- ✓ Tuned Amplifier for better performance.
- ✓ RF display for better measurement accuracy and flaw characterization.
- ✓ Auto Calibration / Two point calibration.
- ✓ PRF down to 4 Hz for large objects / forgings to avoid phantom echoes.
- ✓ Simultaneous display of four measurement values.
- ✓ Frequency down to 250 KHz (0.25 MHz) for checking composites and highly attenuative materials
- ✓ Probe frequency upto 20 MHz for testing on low thicknesses and better sensitivity.

## Flaw Sizing

- ✓ Dynamic DAC, DGS/AVG,TCG features and AWS software (AWS D1.1/D1.5).
- ✓ DAC as per ASME, ASME III, JIS.

## Memory

- ✓ On-board memory of 500 A-scan, 20,000 thickness data, 50 B-scan, 50 set-ups.
- ✓ Virtual unlimited storage capacity extension thor' the use of USB removable disc (pen drive).

## Communication / General

- ✓ Rotary scroll knobs for analogue feeling.
- ✓ USB port for connectivity with PC and peripherals.
- ✓ World-class Li-Ion battery with option of using 6 normal C size alkaline batteries.
- ✓ VGA output for external monitor or video projectors / beamers.
- ✓ Complies to EN-12668 and ASTM E317.
- ✓ Five options of display background colours including black and white for day light viewing.
- ✓ All joints with gasket for IP sealing.
- ✓ On-board battery charger. Optional external charger

# Brief Technical Specification

## Pulser / Receiver

| | | |
|---|---|---|
| Test Range | : | 2.5mm to 10 meter (0.100 in to 400 in) (steel). |
| Velocity | : | 1000met /sec to 15,000 met./sec(40 in/millisec to 600 in/millisec). In Hot Key mode it has preset values |
| Delay | : | Variable from -10.0 to 2000 mm (-0.3 to 30 in) |
| Gain | : | 100dB calibrated gain adjustable in 0.1, 0.5, 1, 2, 6 or 12 dB step. |
| Rejection | : | 0 to 100% FSH with LED indicator. |
| Rectification | : | Full-wave, Half wave -ve, Half wave +ve and RF mode. |
| Frequency | : | It has tuned amplifier with four bands -<br>(a) 0.2 MHz to 1 MHz (b) 0.5 MHz to 4 MHz c) 0.8 MHz to 8 MHz d) 2 MHz to 20 MHz |
| Test Modes | : | Pulse echo and Transmit/Receive. |
| Transmitter | : | Transmission pulse Negative spike. (Pulse Rise Time < 10ns) and with selectable high (300 Vp) or low (250Vp) power |
| Damping | : | Damping high/low is selectable. (High =45 ohms, Low=345 ohms) |
| Connectors | : | BNC or LEMO (Size 1) factory optional. |
| PRF | : | 4Hz to 500Hz. Selection in 10 scalable steps. PRF can go down up to 4Hz when PRF is selected to 1. |
| Linearity deviation | : | Vertical : ±3%, Horizontal . ±0.5%. |

## Monitor

| | | |
|---|---|---|
| Monitor | : | Dual gate adjustable in 1% of Screen height with, Positive/Negative Logic, Gate Expand, Interface trigger modes. |
| Gate Expand | : | Expands Range to width of the gate. |

## Memory

| | | |
|---|---|---|
| A-Scan memory | : | 500 Trace Patterns can be stored (with Note/Detail) which can be recalled, printed or transferred to PC via USB. Unlimited no. of A-Scan can be directly stored in USB Disk with auto file naming. |
| Calibration Set-up Memory | : | 50 different calibration set-ups can be Stored and Recalled |
| B-Scan memory | : | 50 B-Scan Patterns can be stored (with Note/Detail) which can be recalled, or transferred to PC via USB. Unlimited no of B-Scan can be directly stored in USB Disk with auto file naming |
| T-LOG | : | 20,000 readings can be stored in 20 different files. Five different types of templates are available for file creation. Stored readings can be recalled or transferred to PC via USB. Unlimited no. of Thickness readings can be stored in USB Disk with auto file naming. |

## Flaw Sizing

| | | |
|---|---|---|
| DAC | : | Dynamic DAC curve can be Digitally plotted (Smooth parabolic curve) on screen with selectable additional offset curves from 0 to 14 db in 0.1db selectable steps. DAC curve can be plotted using minimum 2 to maximum 10 points. |
| TCG | : | After plotting DAC, TCG (Time Corrected Gain) can be activated for equalizing echo heights |
| AWS | : | Built-in Software for evaluation of defect in accordance with AWS standards (AWA D1.1/D1.5) |
| DGS | : | Defect size evaluation based on 18 predefined probe data and one custom probe set-up per memory location. Defect size is directly displayed in ERS value. (Equivalent Reflector Size). |

## Measurements

| | | |
|---|---|---|
| Digital Read Out | : | Thickness/Depth can be displayed in digital readout when using a normal probe and Sound Path, Surface Distance and Depth of echo signals of GATEa / GATEb are directly displayed when angle probe is in use. Measurement point can be selected to be Peak or Flank. Echo height, ERS value, dB diff of DAC/DGS curve to signal height. Echo height with respect to DAC in terms of percentage or in dB can be measured. T-Minimum, Travel distance can be measured when encoder is connected and time of travel during Freerun B-Scan. |
| Measurement Unit | : | Metric or British unit of measurement is selectable |

## Communication

| | | |
|---|---|---|
| I/O Port | : | Optical Encoder can be connected to da Vinci alpha for positional detail. It can be used for Encoded B-Scan. |
| Printer Attachment | : | USB Printer (PCL3 compatible) |
| Video Output | : | VGA video signal output for connecting to monitor/LCD projector. |
| Software | : | dVaSoft Interface software for transferring A-Scan/B-Scan/T-LOG from da Vinci alpha to PC is supplied as standard equipment. It also creates sequential, 2D and 3D configured files for thickness logging |

## Display

| | | |
|---|---|---|
| Screen | : | High brightness Color TFT LCD Display. Display area 320 x 240 pixel (117 x 88 mm). Five different colors and Grid scheme options. Color leg facility for angle probe for easy interpretation of skip distance |
| Full Screen | : | By pressing Enter Key for a few seconds A-Scan can be displayed in Full Screen area. |
| Reference A-Scan | : | Reference A-Scan pattern of standard test object can be saved and recalled in the background for easy comparison during testing. |
| Freeze/Peak Freeze | : | A-Scan freeze, Peak Freeze, Active Echo dynamic available. |

## Digital

| | | |
|---|---|---|
| Update Rate | : | 60 Hz |

## Power

| | | |
|---|---|---|
| Power | : | Lithium-Ion Battery pack 10.8 VDC, 7.8 AH, gives 8 hours continuous operation from fully charged battery. Battery with the charge indicator/fuel gauge indicator, da Vinci alpha can also operate on 6 nos. of C type dry cells. |
| Battery Charger | : | Input voltage 100 to 240 VAC / 50 Hz |

## General

| | | |
|---|---|---|
| Temperature | : | 0 to 55° C. |
| Size | : | 170 x 260 x 110 mm (HxWxD) |
| Weight | : | 2.1 kg. with Battery |



(MKT/03/00)

**Manufactured and Marketed by:**

MODSONIC® (SINCE 1987)
Simplifying NDT

**MODSONIC INSTRUMENTS MFG. CO.(P) LTD.**

Plot No 33, Phase III, GIDC Industrial Estate, Naroda, Ahmedabad 382330 INDIA.
Tel. +91 (079) 2281 1217, 2281 3131, 2284 1294 Fax : + 91 (079)2282 0012
Email modsonic@modsonic.com Web site . www.modsonic.com