MASTERSCAN SERIES
700M & D70
HIGH PERFORMANCE NARROW BAND DIGITAL ULTRASONIC FLAW DETECTORS

Simplicity  |  Capability  |  Reliability
The Sonatest heritage in product design and Masterscan name has always assured the technician of robust instrument construction combined with exceptional performance. The Masterscan series carries the baton of all these desirable features, but now, thanks to innovative internal redesign, new features can be added and upgrades performed in the working environment, reducing downtime and increasing working flexibility. High levels of near surface resolution, penetrating power (450V pulser - square and spike) and excellent signal to noise ratio are key functions in the Masterscan range. Typical applications are Weld Fabrication, Corrosion Detection, Composite Inspection, Bond Testing, Forgings & Castings, Power Generation (including EMATS) and general UT inspection.

Masterscan Series Features

- Configurable on-board software.
- Customizable & Intuitive Menus
- Split DAC/AVG
- Angle Measurement Mode.
- Dryscan Capability
- Field Upgradeable
- Encoded B-Scan
- A-Scan Fade.
- 4GByte on-board memory.
- USB Interface for PC import/export.

High Visibility Display

For any flaw detector the display is a crucial element. The Masterscan series has a color transflective VGA display, providing high visibility in any lighting conditions. Maximum readability is achieved through adjustable brightness and the choice of 9 color palettes, including a black-on-white LCD emulation mode. Simplicity reigns with the enhanced user interface and a full screen A-scan display is available at the touch of a button, so that every detail of the A-scan can be easily seen.

3Rs - Reliable, Rugged & Robust

The ability to perform in harsh environments with proven reliability is an important aspect of flaw detector ownership. Maximum operational time is promoted by outstanding battery performance, up to 16 hours from full charge for Masterscan and 12 hours for D-70. The Masterscan's enclosure is constructed using automotive grade impact resistant materials and is designed to meet IP67 standards, offering excellent water resistance. Explosive Testing MIL810-G standards have been passed, together with environmental testing which has confirmed the instrument fully functioning at temperatures above 55°C.
NEW – Corrosion Software Option
Thickns measurement is a major application of the Mastersan series and good data logging tools are essential to productivity. The popular Block/Location/Reading–Number format is available as standard. With the Corrosion Software option, users can create and populate two-dimensional grids of readings, with A-Logs, B-Scans, historical readings and notes optionally attached to each thickness log.

AWS
With this option enabled, measurements of Indication Level (IL), Attenuation Factor (AF), and Indication Rating (IR) are calculated and displayed in accordance with AWS D1.1.

TCG
With the Time-Controlled Gain (TCG) option, the gain of the receiver can be varied along the beam path, to compensate for beam-spread and attenuation. This brings equivalent reflectors at different depths to equal heights on the A-scan and allows a simple gate to act as the reporting level for the inspection. TCG can be generated from reference echoes in the same way as DAC, or can be converted from a pre-existing DAC curve.

Dryscan Mode
The Dryscan option adds a tuned pre-amplifier to the received signal, allowing comparative transmission testing of composite materials which cannot be inspected using traditional techniques. Used in conjunction with soft-tip and roller probes, no couplant is required, so honeycomb structures or carbon fibre panels are easily assessed for delaminations and disbonds.

Features

UTLity / UTLity Pro (Data Management Software)
UTLity software provides everything you need to manage your inspection data. The Standard version is FREE with every instrument and gives you the ability to view, move and manage Calibrations, A-Scans, B-Scans and Thickness Logs both on the instrument and on your PC. With UTLity you can also create customized inspection report templates, cut and paste information to other applications, and create printable pdf documents.

- Load, store, manage files both on the PC and on a connected flaw detector
- Save, analyze, color code & export Thickness logging data to spreadsheets/asset management software.
- Update the Flaw Detector Software & Firmware as and when updates become available on our website.

UTLity Pro is the “professional” version and works in conjunction with the Corrosion Software option, providing the end user with the ability to create and manage inspection plans, location notes, historical thickness readings and other asset management information as required.

- Set up Inspection plan (grid) templates, notes and labels.
- Import previous readings into an inspection plan
- Export inspection plan data to spreadsheets and plant maintenance databases.
DAC
Up to 20 reference points can be used to construct a digital DAC curve. The user can choose whether the DAC curve or Gate 1 is used as the monitoring level. Echo amplitude can be displayed as either dB DAC, % DAC, or % Full Screen Height.

Library of DAC Curves
There are pre-programmed dB levels corresponding to
- ENI714 (-6dB, -14dB)
- ASME (-2dB, -6dB, -10dB)
- JIS DAC (+6dB, -6dB, -12dB)
Any of the available levels can be used as monitor gate. The level selected for monitoring is highlighted in a different color to the other curves on screen.

Customisable DAC
Up to 3 custom curves can be used in addition to the pre-programmed library. The user can enter custom levels between +/- 20dB for each of the 3 curves. In this way, all international Standards are supported.

Dynamic DAC
The wide dynamic DAC range can be used for better measurement resolution of distant echoes. The height of the DAC curves can be adjusted using the Reference Gain control. The relationship between DAC curve and reference indications is preserved throughout and the additional T-loss control manages transfer loss from test-block to specimen.

DAC to TCG
A DAC curve can be converted to a TCG curve, and back again. The conversion uses the reference points already collected and preserves the reference gain for the left-most reference point, so that all reference echoes are set to 80% FSH.

PLUS! In case your Sonatest flaw detector ever needs a software update, UTility can collect the latest version over the internet and upgrade your Flaw detector without ever having to return it to a service centre.
Masterscan Specifications (subject to change without notice)

Test Range
0-1mm (0.04in) up to 0-20,000 mm (787 in) in steel at 5930m/s (19455 f/s)

Velocity
256 - 8000 m/s continuously variable.

Probe Zero
0 to 1000 µs

Delay
0-20000m (800in) in steel at 5930m/s.

Gain
0 to 110dB adjustable in 0.1, 0.5, 1, 2, 6, 14 and 20dB steps

Test Modes
Pulse echo and transmit/receive.
Single Crystal, Double Crystal and Pitch-Catch.

Damping
50 and 400 Ohm damping selectable.

Pulsar
100-450V -ve spike and square wave.

PRF.
Adjustable 5Hz to 5kHz. External sync also available.

Screen Update Rate
60Hz

Rectification
RF, Full wave, half-wave and -ve half-wave.

Frequency Range
8 selectable filter bands
i) 100kHz - 500kHz ii) 200kHz - 800kHz
iii) 0.4MHz - 1.6MHz iv) 1.4MHz - 3MHz
v) 3MHz - 8MHz vi) 7MHz - 15MHz
vii) 9MHz - 21MHz viii) 16 MHz - 22 MHz (Wideband)

System Linearity
Vertical = 0.5% Full Screen Height (FSH).
Horizontal = ±0.2% Trace Full Screen Height (FSW).

Reject (Selective)
Up to 100% Linear reject
Or
Up to 50% Suppressive reject

Units
Metric (mm), inch (in) or microseconds.

Display
Color Transflective VGA (640 x 480) TFT
Display area 185.16 x 87.27 mm (457 x 343 in).
A-Scan Area: 400 x 590 pixels (normal), 460 x 620 (FS).
Colors: 9 color options with variable brightness.

Gate Monitor
Two independent gates for measurement and monitoring.

Zoom
Expands range and delay to cover the area set by Gate 1 start & width controls.

AGC
Automatic Gain Control; automatically sets the signal in Gate 1 to
a level between 10% and 90% FSH, tolerance between 5% and 20%.

Measurement Modes

Mode 1
Signal monitor. Gate alarms can be active but no measurements are displayed.

Mode 2
Depth and amplitude of first signal in gate.

Mode 3
Echo-Echo distance measurements.

Mode 4
Trigonometric display of beam-path, surface distance (including X-offset) and depth of indication from the inspection surface together with echo amplitude. Curved surface correction can be applied for convex and concave surfaces.

Mode 5
Gate to Gate distance measurement.

Mode 6
Flank to Flank.

Mode 7
Beam Angle, calculated from beampath, hole radius and hole centre depth.

Measurement Display
Live display and updates on screen at 3 times per second.
Large display of a single measurement available.

Contour
Trailing-Edge slew-rate control to reduce half cycles in rectified modes. Selectable from one of 6 levels.

Waveform Smoothing
Select from:
- i) None (both min and max values are displayed in the A-Scan)
- ii) Fill (Min values set to baseline value, produces a solid A-San)
- iii) Smooth (min values ignored, produces a clear outline A-Scan)

Persistence
Causes previous A-scans to "fade out" at a user-determined rate.

Auto-Cal
Provides automatic calculation of velocity and probe zero from 2 reference echoes.

Reference Waveform
Displays a previously stored A-log in a color different from the active display; enabling a quick visual check of the differences.

Clock
Built in, battery-backed RTC keeps time and date.

Internal Memory
4GByte storage available for A-scans, panels, T-logs, B-logs etc.
50000 Panels, 200000 A-Logs, 300000 B-Charts, 400000 T-Logs

Active Peak Memory
Retains all A-scans on screen for echo-dynamic pattern analysis, with the active A-scan displayed in a separate color.

Notes
Alphanumeric labelling for panel stores, A-logs, B-logs etc.

Display Freeze
Hold the current waveform on screen for off-line processing.

Help Key
Shows software and hardware information.

Language Support
Multiple languages are selectable from a list including:
English, French, Spanish, Russian, Chinese (Modern). Others are available on request.

Encoder Connection
Lemo min 4-pin connector (D70)
D-Sub 15 connector (700M)

Video Output
Standard on 700M. Factory Option on D-70.

Proportional Outputs
Available on 700M.

External Sync
Available on 700M.

USB Connection
Internal storage shown as Memory Device.

Transducer Sockets
BNC or LEMO (factory option).

Power
Lithium Ion 14.4V battery pack. Typically 16 hours for Masterscan and 12 hours for D-70. Indication of battery charge status.
Recharge time 3-4 hrs. Battery can be charged separately.
Mains pack optional.

Charge
100-240 VAC, 50-60 Hz.

Environmental
Designed to meet IP67

Temperature
Operating -10°C to 55°C (-14°F to 131°F).
Storage -40°C to 75°C (-40°F to 167°F).

Size
D-70: H172mm x W238mm x D70mm (6.77in x 9.37in x 2.75in)
700M: H145mm x W255mm x D145mm (5.7in x 10 in x 5.7in).

Weight
Masterscan D-70: 1.7 kg (3.7lbs) with battery.
Masterscan 700M: 2.5kg (5.5lbs) with battery.

Warranty
2 year

Extended Warranty
Sonacover - extended 5 year warranty, including 4 calibrations.

Calibration Standard
EN12668-1-2010 (Detailed Specification available on request).

Standards
Vibration to 5145-5 Proc 1 Annex C Fig 6
Shock 516.5 Proc 1 15g/6ms
Explosive atmospheres – MIL-STD 810D
Method 5115 Procedure I

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## Sizing Techniques & Software Options

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<tr>
<th>Sizing Technique</th>
<th>Description</th>
<th>Standard or Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DAC</strong></td>
<td>Defined by up to 20 reference points or converted from TCG curve and digitally drawn on the screen. DAC curves meet the requirements of EN, ASME, JIS and many other standards. Custom DAC curves can be selected. DAC dynamic range can be extended by automatically adjusting the reference curve to match the reference gain. Scanning Gain and T-Loss available as separate controls. Amplitude readout is selectable between %FSH, % DAC or relative dB.</td>
<td>Standard</td>
</tr>
<tr>
<td><strong>TCG</strong></td>
<td>Time corrected or “Swept” gain, defined by up to 20 reference points or converted from a DAC curve. All points converted to 80% screen height.</td>
<td>Option</td>
</tr>
<tr>
<td><strong>Backwall Echo (BEA) Attenuation</strong></td>
<td>0-40dB attenuation applied to the latter part of the time base, to improve the detectability of defects near the back wall and the loss of BWE due to porosity.</td>
<td>Option (requires TCG)</td>
</tr>
<tr>
<td><strong>AWS</strong></td>
<td>Built-in calculation and display of factors and parameters required by AWS D11</td>
<td>Option</td>
</tr>
<tr>
<td><strong>AVG/DGS</strong></td>
<td>Enables the calculation of pseudo “DAC” curve and equivalent reflector size of UT indications, based on user input of transducer parameters.</td>
<td>Option</td>
</tr>
<tr>
<td><strong>API</strong></td>
<td>On-board flaw sizing method in accordance with API 5UE.</td>
<td>Option</td>
</tr>
<tr>
<td><strong>Interface Trigger (IFT)</strong></td>
<td>Unlocks the interface trigger gate controls, which hold off the A-Scan acquisition and display until an interface echo is detected within a specific range and amplitude. Used for the elimination of water-path.</td>
<td>Option</td>
</tr>
<tr>
<td><strong>Corrosion/B-Scan Software Option</strong></td>
<td>Enables complex inspection plans to be uploaded from a PC using the on board Utility software. Features include 2 dimensional thickness logging, storing A-Logs and B-Logs with thickness values, taking multiple readings per location and note creation for each grid location. B-Scan option available to display bar-graph views of thickness readings taken by Gate 1 against distance or time.</td>
<td>Option (includes B-Scan)</td>
</tr>
<tr>
<td><strong>Dryscan Function</strong></td>
<td>Tuned low frequency pre amplifier for dry-coupled techniques such as bond checking and delaminations in composite materials.</td>
<td>Option</td>
</tr>
<tr>
<td><strong>Split DAC &amp; DGS/AVG</strong></td>
<td>Adds up to 3 zones of added gain (+12dB, +24dB) to the DAC or DGS/AVG curve to enable single-pass scanning of large sections and attenuative materials. Conforms to EN583-2-2001.</td>
<td>Option</td>
</tr>
</tbody>
</table>

## Masterscan Standard Kit

Masterscan 700M or D-70 Digital Flaw Detector  
Battery, Charger, charger mains cable.  
Certificate of Conformance  
Carry Bag.  
UTLity & USB cable.  
Display Window Cover.  
Ultrasonic Couplant.

**Site Pack Option (D-70 only)**  
Sitescan Standard Kit  
Rugged Shipping Case  
Airplane carry on size  
488 mm x 386 mm x 229mm  
19.2 in x 15.2 in x 9.0 in  
Centre of Gravity Bracket  
Webbing Bracket  
Magnetic Bracket  
Webbing/two Karabiners strap/hook

**Rubber Boot Accessory**  
Customised Rubber “shell” that fits around the instrument for extra protection and insulation. (D-70 only)

**UTLity Pro (Advanced User Software)**  
Advanced user software, partners with the Corrosion Software Option enhancing data manipulation, presentation and analysis.