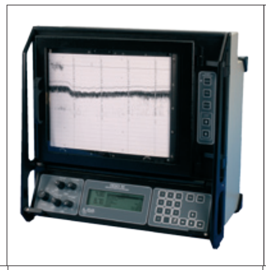
Single-beam Echosounders

Single-beam echosounders (SBES) are commonly used in navigation (most larger vessels have at least a simple echosounder on board) and in hydrographic surveys. Our SBES product surveys in 1998, 2001 and 2005 showed a growing supply for these products. I would have thought that SBES would have become a commodity. How wrong I could be! The results of this product survey show that users have a wide selection to choose from when searching for an SBES. It appears that many manufacturers have created niche markets, with specifications adapted to usage (deep, shallow water), mode of operation and integration in the work process.

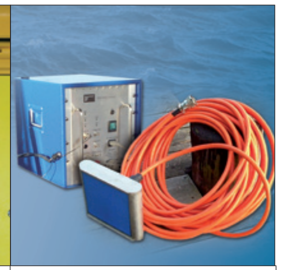
The physical working principles of an SBES have not changed since our last product survey and the described parameters such as frequency, pulse length and rate, beam angle and power output remain a leading factor in the use (depth and resolution) of an SBES. Most developments since the last product survey have been in the integration in the work process. Computers and PDAs have become much smaller, software is based more on visual interpretation, and communication with external systems has been facilitated by wireless and cabled ethernet, and USB.
We hope this product survey helps you to choose the best system for your applications. The details listed here form only a concise overview of the instruments. A PDF of the full survey is available for download from our website (www.hydro-international.com).
And there is more! From now on, you will be able to compare your views on products through our website; and with a few clicks you can select some of the products in which you are interested and view their details side by side. In addition, you will find a box for your comments on a particular item of equipment underneath every product on our website, so you can inform each other about your experiences. After all, you're our expert!

Ronald Koomans, contributing editor

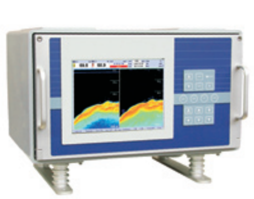


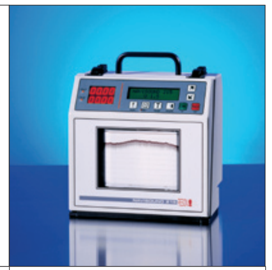

Company	ATLAS Hydrographic GmbH	ATLAS Hydrographic GmbH
Year of initial development	2002	2005
Product	ATLAS DESO 30, 210kHz SW6014 & 33kHz SW6028	ATLAS DESO 350M, 210kHz SW6014 & 33kHz SW6028
Physical description		
Max. power consumption (W)	50	35
Power (DC, AC)	11-28VDC or 115/230VAC	11-28VDC or 115/230VAC as an option
Weight (in air) and dimensions (w x h x d) of transducer/ transceiver	SW6014: 0.7kg without cable, 14.5kg with 33m cable; 11cm Ø, 13cm height SW6028: 4.5kg without cable, 13.5kg with 33m cable; 18.4cm Ø, 17cm height	SW6014: 0.7kg without cable, 14.5kg with 33m cable; 11cm Ø, 13cm height SW6028: 4.5kg without cable, 13.5kg with 33m cable; 18.4cm Ø, 17cm height
Weight and dimensions (w x h x d) of display and logging unit	16kg; 44.3cm x 44.4cm x 27.5cm	14kg; 44cm x 53cm x 21.5cm
Portability of logger (rack, desktop, portable)	Desktop	Portable
Mode of operation		
Software platform (Windows, other)	Standalone, ATLAS DESO CONTROL (scope of supply)	ATLAS DESO CONTROL (scope of supply)
Depth range of operation (m)	1.0-6,000	0.5-600
Frequency range (kHz)	Low: 3.5-50 High: 100-750 (Manual tuning in 1kHz steps)	Low: 24-50 High: 100-750 (Manual tuning in 1kHz steps)
Number of frequencies supported simultaneously	2	2
Power output of transducer at standard frequencies	1.5-2kW @ low; 0.3-1kW @ high	0.5kW @ low; 0.4kW @ high
Beam angles (along and across)	18° @ 33kHz; 9° @ 210kHz	18° @ 33kHz; 9° @ 210kHz
Depth resolution, accuracy	18cm ± 0.1% depth @ 12kHz; 10cm ± 0.1% depth @ 33kHz; 1cm ± 0.1% depth @ 210kHz	10cm ± 0.1% depth @ 33kHz; 1cm ± 0.1% depth @ 210kHz
Max. pulse sounding rate	25Hz	20Hz
Pulse length	Freely selectable up to 60 circles	Freely selectable up to 60 circles
Dynamic range (dB)	212	212
Are heave, pitch and roll corrections included?	Heave included; pitch and roll via data acquisition software	Heave included; pitch and roll via data acquisition software
Integration in work process		
Capable of being operated remotely (e.g. via PC)	Operated by PC with ATLAS DESO CONTROL	Operated by PC with ATLAS DESO CONTROL
Supported external data inputs (heave/roll/pitch, positioning)	DGPS, heave	DGPS, heave
Can events and annotations be marked?	Yes	Yes
Can sound velocity and temperature profiles be included in real time ?	Yes	Yes
Is real-time coupling to survey/post-processing software possible?	Yes	Yes
What data are displayed in real time (e.g. depth, classification, thickness)?	Digital depth and whole water column including sub-bottom layer	Digital depth and whole water column including sub-bottom layer
Data output options (e.g. raw data, transducer and motion-corrected depth, sea floor classification)	Depth data and whole water column echogram; sea floor classification in post-processing	Depth data and whole water column echogram; sea floor classification in post-processing
Data output formats	NMEA 0183, ATLAS DESO 25	NMEA 0183, ATLAS DESO 25
Data output for sea floor classification?	This is realised in our ATLAS DESO 3xx series echosounders by means of an evaluation of the echo reception amplitude inside the ATLAS DESO CONTROL sensor steering and control software. It does not output information about the bottom type itself. This has to be part of a third-party software such as QTC Impact & View	This is realised in our ATLAS DESO 3xx series echosounders by means of an evaluation of the echo reception amplitude inside the ATLAS DESO CONTROL sensor steering and control software. It does not output information about the bottom type itself. This has to be part of a third-party software such as QTC Impact & View
How are data displayed?	Graphical on paper, digital via TFT and digital via ATLAS DESO CONTROL	Digital via ATLAS DESO CONTROL
Connection possibilities	RS232, RS422, LAN	RS232, RS422, LAN
How are data internally logged?	Paper or hard disk	Hard disk
Main use of the system	Inland waterway, coastal and offshore surveying	Inland waterway and coastal surveying



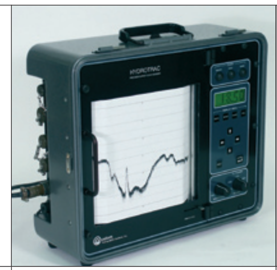
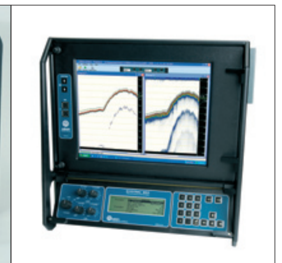


Company	ATLAS Hydrographic GmbH	BioSonics, Inc.	Bruttour International Pty Ltd	Bruttour International Pty Ltd	Innomar Technologie GmbH
Year of initial development	2005	1978	1999	2001	2002
Product	ATLAS DESO 35, 210kHz SW6014 & 33kHz SW6028	BioSonics DT-X Digital Scientific Echosounder System	CEESTAR	CEEDUCER Pro	SES-2000 compact
Physical description					
Max. power consumption (W)	50	50	6	8	250
Power (DC, AC)	11-28VDC or 115/230VAC	11-14VDC (5A max.), 87-264VAC (47-440Hz)	12VDC. Internal rechargeable battery, and/or external (nominal) 12VDC supply	12V. Internal rechargeable battery, and/or external (nominal) 12VDC supply	100-245VAC
Weight (in air) and dimensions (w x h x d) of transducer/ transceiver	SW6014: 0.7kg without cable, 14.5kg with 33m cable; 11cm Ø, 13cm height SW6028: 4.5kg without cable, 13.5kg with 33m cable; 18.4cm Ø, 17cm height	16kg (with transducer and cable). Transceiver: 43cm x 50cm x 19cm. Transducer: 18.5cm D x 16cm L	200kHz, 8° with 9m cable 1.2kg, 200kHz, 2.75° with cable 2.15kg, 200kHz, 8° + 30kHz, 19° 7.8kg with 9m cable	200kHz, 8° with 9m cable 1.2kg, 200kHz, 2.75° with 9m cable 2.15kg, 200kHz, 8° + 30kHz, 19° 7.8kg with 9m cable	25kg (incl. 20m cable); 30cm x 7cm x 26cm
Weight and dimensions (w x h x d) of display and logging unit	5kg; 45cm x 8.9cm x 32.5cm	Notebook computer of user choice	2.75kg	3.7kg	23kg; 30cm x 35cm x 40cm
Portability of logger (rack, desktop, portable)	Rack mount or portable	Portable, rack optional	Portable	Portable	Portable
Mode of operation					
Software platform (Windows, other)	ATLAS DESO CONTROL (scope of supply)	Windows	Windows	Windows	Windows
Depth range of operation (m)	2-11,000	1.000	0.3-99.99	0.3-99.99	0.5-400
Frequency range (kHz)	Low: 3.5-50 High: 100-1,000 (Manual tuning in 1kHz steps)	38, 70, 120, 200, 420, 1,000	200 + 30	200 + 30	100; 5-15
Number of frequencies supported simultaneously	3	Up to 4, multiplexed and programmable	2, 200 and/or 30kHz	2, 200 and/or 30kHz	2
Power output of transducer at standard frequencies	Up to 4kW @ low; 0.3-1kW @ high	< 1kW	80W (peak)	80W (peak)	15kW @ 100kHz
Beam angles (along and across)	18° @ 33kHz; 9° @ 210kHz	6° or 10° (38kHz)	200kHz, 8°, cone; 200kHz 2.75°, cone; or 30kHz, 19°, cone	200kHz, 8°, cone; 200kHz, 2.75°, cone; or 30kHz, 19°, cone	3.6° for all frequencies (100kHz, 5-15kHz)
Depth resolution, accuracy	18cm ± 0.1% depth @ 12kHz; 10cm ± 0.1% depth @ 33kHz; 1cm ± 0.1% depth @ 210kHz	2cm	1cm ± 0.02% depth	1cm ± 0.02% depth	2cm ± 0.02%
Max. pulse sounding rate	25Hz	30Hz	6Hz	6Hz	50Hz
Pulse length	Freely selectable up to 60 circles	0.1-1.0ms	N/A	N/A	0.07-0.8ms
Dynamic range (dB)	212	> 130	N/A	N/A	168
Are heave, pitch and roll corrections included?	Heave included; pitch and roll via data acquisition software	Optional: heading, pitch, roll	Yes, only heave used	Yes, only heave used	Heave correction with external heave sensor
Integration in work process					
Capable of being operated remotely (e.g. via PC)	Operated by PC with ATLAS DESO CONTROL	Yes	No	No	Yes
Supported external data inputs (heave/roll/pitch, positioning)	DGPS, heave	None	Heave, roll & pitch - only heave used; tide; GPS positioning g in NMEA GGA + VTG	Heave, roll & pitch - only heave used; tide; GPS positioning g in NMEA GGA + VTG. External depth to 999.9m accepted for logging	Heave and positioning
Can events and annotations be marked?	Yes	Yes	No	Events: yes; annotations: no	Yes
Can sound velocity and temperature profiles be included in real time ?	Yes	No	Yes, based on manual input of velocity	Operator-selectable auto function based on transducer temperature sensor and salinity	Sound velocity in real time via RS-232; full SVP offline
Is real-time coupling to survey/post-processing software possible?	Yes	No	Yes	Yes	Yes
What data are displayed in real time (e.g. depth, classification, thickness)?	Digital depth and whole water column including sub-bottom layer	Depth, echo strength, position	Depth	Depth, position, amount of siltation	Depth, dual-channel echo plot
Data output options (e.g. raw data, transducer and motion-corrected depth, sea floor classification)	Depth data and whole water column echogram; sea floor classification in post-processing	Raw acoustic data samples; post-processing for all variables other than depth	Raw data, corrected data, transducer motion corrected	Raw data, corrected data, transducer motion corrected; DGPS position	Envelope data of all channels, motion-corrected depth of all channels
Data output formats	NMEA 0183, ATLAS DESO 25	BioSonics DT-4, ICES HAC format	CEESTAR, NMEA, Odom and Atlas	CEESTAR, NMEA, Odom and Atlas	NMEA, Deso, Echotrac, SEG-Y, XTF, Innomar
Data output for sea floor classification?	This is realised in our ATLAS DESO 3xx series echosounders by means of an evaluation of the echo reception amplitude inside the ATLAS DESO CONTROL sensor steering and control software. It does not output information about the bottom type itself. This has to be part of a third-party software such as QTC Impact & View	Post-processing only	No	No	No
How are data displayed?	Digital via ATLAS DESO CONTROL	Visual echogram, digital depth and position. Echo envelope on oscilloscope	Digital	Digital and LCD dual-channel graphical depth profile	Dual-channel echo plot, colour, b&w, signal view
Connection possibilities	RS232, RS422, LAN	Ethernet	RS232 serial	RS232 serial, ethernet, optional Bluetooth	USB, TCP/IP, GPS, compass, custom RS232 devices, HP printer, thermal printer, analogue and trigger signal
How are data internally logged?	Hard disk	Depends on notebook computer. Solid-state drive internal to echosounder system option	No logging	Solid-state, 50 hours	Hard disk
Main use of the system	Inland waterway, coastal and offshore surveying	Habitat assessment (bathymetry, substrate classification, vegetation assessment and biological biomass)	Bathymetry, siltation surveys	Bathymetry, siltation surveys	Bathymetric survey, sub-bottom survey, geological/geophysical survey, dredging, pipeline detection, archaeological object detection

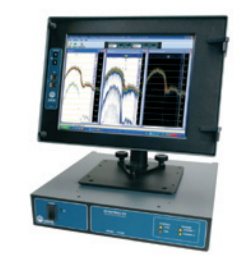
								
Company	**Knudsen Engineering Ltd**	**Knudsen Engineering Ltd**	**Knudsen Engineering Ltd**	**Kongsberg**	**Kongsberg**	**L-3 Communications ELAC Nautik GmbH**	**L-3 Communications ELAC Nautik GmbH**	**Ohmex Ltd**
Year of initial development	2008	2007	2007	1998	2001	□	□	2005
Product	MiniSounder	Chirp 3200	Chirp 3260	EA400	EA600	HydroStar 4300	HydroStar 4900	SonarMite
Physical description								
Max. power consumption (W)	20	100	180	ca. 70	ca. 70	≤ 40	≤ 200	0,25
Power (DC, AC)	12-30VDC	12-30VDC or 85-265VAC	85-265VAC	Both	Both	11-36VDC (AC optionally by external power supply)	115V/230VAC	DC. Internal rechargeable batteries
Weight (in air) and dimensions (w x h x d) of transducer/transceiver	Less than 3kg; 26cm x 16cm x 9cm	10kg; 19" 3U rack case	25kg; 19" 5U rack case	5kg; 11cm x 24cm x 28cm	5kg; 11cm x 24cm x 28cm	e.g. 4.3kg (LSE 218); 20cm x 12cm x 16cm	0.5 to 265kg, transducer-type dependent; e.g. Ø 60.2cm x 19cm (LSE 179, 12kHz), Ø 13.2cm x 10.5cm (LSE 313, 200kHz)	2kg
Weight and dimensions (w x h x d) of display and logging unit	N/A	N/A	N/A	Standard PC or laptop	Standard PC or laptop	17kg; 47cm x 35cm x 21cm	42kg with housing, 50.5cm x 40cm x 59cm; 25kg for integration into 19" rack, 6HU	1kg
Portability of logger (rack, desktop, portable)	Rack, desktop or portable PC	Rack, desktop or portable PC	Rack, desktop or portable PC	Portable splash-proof version available		Portable	Rack or desktop	PDA, PC or remote
Mode of operation								
Software platform (Windows, other)	Windows	Windows	Windows	Windows	Windows	ELAC development	Windows embedded	Win Mobile, XP, Vista
Depth range of operation (m)	0-2,000	0-8,000	Full ocean depth 10,000+	0.1-3,500	0.1-12,000	5, 10, 25, 50, 100, 250, 500, 1,000	10, 25, 50, 100, 250, 500, 1,000, 3,000, 6,000, 10,000	0.3-75
Frequency range (kHz)	24-210	3.5-210	3.5-210	33-710	12-710	200 or 200/30. Others on request	12, 15, 30, 50, 100, 200, 400, 1,000. Choice of frequency on request	235
Number of frequencies supported simultaneously	1	4	4	4	4	2	2	1
Power output of transducer at standard frequencies	1kW @ 24kHz; 1kW @210kHz	2kW @ 3.5kHz; 2kW @12kHz; 1kW @ 33kHz; 1kW @ 210kHz	Up to 10kW	1-2kW	1-2kW	0.8kW @ 30kHz	2kW @ 12kHz; 0.2kW @ 200kHz	1W @ 235kHz
Beam angles (along and across)	Transducer dependent	Transducer dependent	Transducer dependent	Varies	Varies	8°x8° @ 200kHz; 8° x 8°/24° x 24° @ 200kHz/30kHz	14° x 12° @ 12kHz; 12° x 12° @ 200kHz	2°-8° (DSP controlled)
Depth resolution, accuracy	1cm, 0.1%	1cm, 0.1%	1cm, 0.1%	1cm	1cm	1cm @ 50m, 10cm @ 250m; 2.5%	1cm @ 25m, 10cm @ 250m, 100cm @ 10,000m, 1% scale accuracy	0.01m RMS
Max. pulse sounding rate	20Hz	10Hz	10Hz	25Hz	25Hz	10Hz	4Hz @ 10m range; 50mHz @ 10,000m range	5Hz
Pulse length	Up to 4ms	Up to 64ms	Up to 64ms	64μs to 4ms	64μs to 16ms	0.3-3ms	0.1-100ms	Varies
Dynamic range (dB)	96	96	96			90	92-109	N/A
Are heave, pitch and roll corrections included?	Heave only	Heave only	Heave only	Yes	Yes	N/A	Yes	N/A
Integration in work process								
Capable of being operated remotely (e.g. via PC)	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Supported external data inputs (heave/roll/pitch, positioning)	Heave and positioning	Heave and positioning	Heave and positioning	Yes	Yes	Heave and positioning	VRU, DGPS, CTD	Position data
Can events and annotations be marked?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can sound velocity and temperature profiles be included in real time ?	No	No	No	Yes	Yes	No, manual sound velocity setting via menu	Yes	Yes
Is real-time coupling to survey/post-processing software possible?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
What data are displayed in real time (e.g. depth, classification, thickness)?	Digitised depth and full echogram	Digitised depth and full echogram	Digitised depth and full echogram	Depth, along-track slope, second layer detection with high/low frequency	Depth, along-track slope, second layer detection with high/low frequency	Depth	Depth, sediment classification as option	Depth and QA
Data output options (e.g. raw data, transducer and motion-corrected depth, sea floor classification)	Raw data, heave corrected, draft corrected	Raw data, heave corrected, draft corrected	Raw data, heave corrected, draft corrected	Raw, corrected echogram data	Raw, corrected echogram data	Heave-corrected depth	Heave-corrected depth	Depth and QA
Data output formats	NMEA, XTF, ASCII, binary	SEG-Y, NMEA, XTF, ASCII, binary	SEG-Y, NMEA, XTF, ASCII, binary	NMEA, xyz (xtf forthcoming)	NMEA, xyz (xtf forthcoming)	NMEA or proprietary	NMEA or proprietary	ASCII, NMEA
Data output for sea floor classification?	Yes	Yes	Yes	Separate sw	Separate sw	N/A	N/A	N/A
How are data displayed?	Digitised depth and full echogram (raw and heave-corrected)	Digitised depth and full echogram (raw and heave-corrected)	Digitised depth and full echogram (raw and heave-corrected)	Standard PC screen	Standard PC screen	Thermal recorder, digital display	Digital display	Visual graph and numeric text
Connection possibilities	USB (network and RS232 via PC)	USB (network and RS232 via PC)	USB (network and RS232 via PC)	USB, network, RS232, printer	USB, network, RS232, printer	RS422, RS232	8 x RS422, network, network printer, monitor	Bluetooth, USB, RS232
How are data internally logged?	Data logged on control PC	Data logged on control PC	Data logged on control PC	Hard disk	Hard disk	N/A	Internal HDD up to 168 hours	Solid-state
Main use of the system	Shallow-water survey	Deep-water survey and sub-bottom profiling	Full ocean depth and sub-bottom profiling	Hydrographic survey, shallow-water side-scan	Hydrographic survey	Survey echosounder	Survey echosounder	Portable surveying

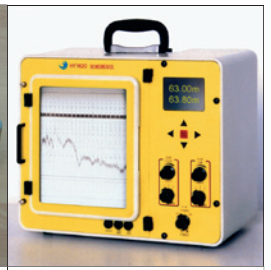
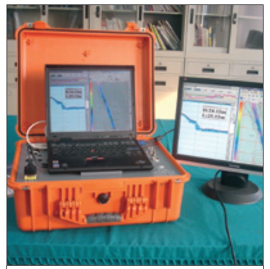





Company	**Ohmex Ltd**	**Ohmex Ltd**	**RESON**	**RESON**	**RESON**	**Seafloor Systems, Inc.**	**Teledyne Odom Hydrographic Systems**	**Teledyne Odom Hydrographic Systems**
Year of initial development	2007	2005	2000	2001	2006	2003	1996	2000
Product	SonarM8	SCS900 Sonar	NS 205, NS 210, NS 215	NS 410, NS 415, NS 420	NS 600 Series	Hydrolite-TM	Hydrotrac	Echotrac MKIIIP, DF3200
Physical description								
Max. power consumption (W)	0,25	0,25	24	60	60-75	0.25 (mw at 10v)	30	36
Power (DC, AC)	9-35VDC	DC. Internal rechargeable batteries	10-28VDC. External AC converter available	10-28VDC, 110-230VAC	Transceiver: 24VDC (22-28VDC) Panel PC: 24VDC	DC. Internal rechargeable batteries	11-28VDC (standard)	110 or 220VAC, or 24VDC, 50 watts
Weight (in air) and dimensions (w x h x d) of transducer/transceiver	1kg	2kg	5.5kg; 27.3cm x 27.8cm x 11,5cm	15kg; 35.5cm x 41cm x 23.4cm	5.5kg; 27.5cm x 35cm x 12.5cm (per transceiver module)	2kg	11.25kg; 41.9cm x 36.8cm x 20.3cm	15.9kg; 45cm x 45cm x 30cm
Weight and dimensions (w x h x d) of display and logging unit	1kg	1kg	Above includes paper display/logging unit	Above includes paper display/logging unit	11kg; 44.4cm x 48.3cm x 10cm	4kg	11kg; 41.9cm x 36.8cm x 20.3cm	16kg; 45cm x 45cm x 30cm
Portability of logger (rack, desktop, portable)	PDA, PC or remote	Trimble SCS900 application	Portable	Portable, 19'' rack mount	19'' rack mount, desk or stand	PDA, PC or remote	Desktop	Desktop
Mode of operation								
Software platform (Windows, other)	Win Mobile, XP, Vista	Win Mobile, Vista, Tablet PC	N/A	N/A	Windows	Windows	Proprietary	Proprietary
Depth range of operation (m)	0.3-75	0.3-75	0.2-600 (NS 205: 0.5-100)	0.2-1,200	0.2-1,200 (DS model: 6,000)	0.3-75	0.2-600 max.	0.2-6,000
Frequency range (kHz)	235	235	Standard 28-35 and 190-225. Others available on request: 15-600	28-35 and 190-225. Others available on request: 15-600	28-35 and 190-225. Others on request: 15-600. DS model: 12/15 or 15/24	200	24, 33, 200, 210, 340	3-1,000
Number of frequencies supported simultaneously	1	1	1-2	1-2	1-4	1	1	2
Power output of transducer at standard frequencies	1W @ 235kHz	1W @ 235kHz	0.3kW @ 200kHz	0.3W @ 200kHz	0.45kW @ 200kHz; 2kW @ 12/15kHz	1W @ 200kHz	0.4kW @ 24kHz	2.4kW @ 24kHz
Beam angles (along and across)	4°-8° (DSP controlled)	2°-8° (DSP controlled)	Transducer dependent; select from RESON's extensive range of hydrographic transducers	Transducer dependent; select from RESON's extensive range of hydrographic transducers	Transducer dependent; select from RESON's extensive range of hydrographic transducers	2°-8° (DSP controlled)	3°, 4°, 9° @ 200kHz; 19° @ 33kHz; 10°, 20° @ 24kHz	3°, 4°, 9° @ 200kHz; 19° @ 33kHz; 10°, 20° @ 24kHz; 20° @ 12kHz
Depth resolution, accuracy	0.02m RMS	0.01m RMS	Resolution: 1cm (NS 210 & NS 215), 10cm (NS 205 and for ranges > 600m). Accuracy: 1cm @ 200kHz, 7cm @ 33kHz	Resolution: 1cm. Accuracy: 1cm @ 200kHz, 7cm @33kHz	Resolution: 1cm. Accuracy: 1cm @ 200kHz, 7cm @ 33kHz, 15cm @ 15kHz, 20cm @ 12kHz	1cm	1cm	1cm
Max. pulse sounding rate	5Hz	5Hz	NS 205: 5Hz; NS 210: 20Hz; NS 215: 20Hz/10Hz	NS 410: 20Hz; NS 415: 20/10Hz; NS 420: 20Hz	20Hz	6Hz	20Hz	20Hz
Pulse length	Varies	Varies	4 to 256 cycles	4 to 256 cycles	4 to 256 cycles	Variable	Up to 500ms	Up to 5ms
Dynamic range (dB)	N/A	N/A				N/A	80	86
Are heave, pitch and roll corrections included?	N/A	N/A	Heave correction input on NS210 and NS215	Heave input for all models	Heave input for all models	N/A	Heave with MRU	Heave with MRU
Integration in work process								
Capable of being operated remotely (e.g. via PC)	Yes	Yes	Yes - using NaviSound Control Centre Utility	Yes - using NaviSound Control Centre Utility	Full remote control via NaviSound Control Centre	Yes	No	Yes
Supported external data inputs (heave/roll/pitch, positioning)	Position data	RTK GPS, Total Stations	Heave and GPS input (selected models)	Heave and GPS	Heave and GPS	Positioning	Yes	Yes
Can events and annotations be marked?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can sound velocity and temperature profiles be included in real time ?	Yes	Yes	Average speed of sound	Average speed of sound	Sound velocity profile compensation with built-in editor software	Yes	Sound velocity	Sound velocity
Is real-time coupling to survey/post-processing software possible?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
What data are displayed in real time (e.g. depth, classification, thickness)?	Depth and QA	Cut/fill, position, volumes	Depth, heave correction and graphical printout of sounding	Depth, heave correction and graphical printout of sounding	Depth, heave correction and graphical sounding record	PDA display of depth, position and QA	Bottom trace	Fluff, consolidated and sub-bottom
Data output options (e.g. raw data, transducer and motion-corrected depth, sea floor classification)	Depth and QA	Full report generator	Graphic sounding data, depth data, GPS loop-through. Output to optional equipment	Graphic sounding data, depth data, GPS loop-through. Output to optional equipment	Graphic sounding data, depth data, GPS loop-through. Output to optional equipment	Depth and QA	Serial, motion, corrected	Envelope, serial, unfiltered raw data
Data output formats	ASCII, NMEA	User-defined	NMEA, DESO25, NaviSound, Graphic Trace format	NMEA, DESO25, NaviSound, Graphic Trace format	NMEA, DESO25, NaviSound, Graphic Trace format	NMEA, ASCII	NMEA, DESO 25, Odom	NMEA, DESO 25, Odom
Data output for sea floor classification?	N/A	N/A				N/A	N/A	Yes
How are data displayed?	Visual graph and numeric text	Visual graph and numeric text	Depth on LCD display, sounder graphics on 11cm thermal paper record	Depth on LCD display, sounder graphics on 21cm thermal paper record	PC/flat screen display or laptop	Visual graph and numeric text	Paper chart and digital depth displays	Paper or LCD and digital depth displays
Connection possibilities	Bluetooth, USB, RS232	Bluetooth, USB, RS232, WiFi, ethernet	RS232	RS232	RS232, panel PC: RS232C; USB 2.0; LAN; LPT	RS232, USB, Bluetooth	RS232	Ethernet, RS232
How are data internally logged?	N/A	Solid-state	N/A	N/A	Hard disk	Solid-state	N/A	Hard drive with LCD module
Main use of the system	Fixed small-boat installation	Construction surveying	Hydrographic surveys, dredging surveys where highly portable paper-output survey grade sounder is required	Hydrographic surveys, dredging surveys where portable paper-output survey grade sounder is required	Hydrographic surveys, mini-multi-channel system, deep-water surveys	Shallow-water bathymetric surveys	Hydrographic surveys	Hydrographic surveys



Company	Teledyne Odom Hydrographic Systems	Valeport Ltd	Wuxi Haiying-Cal Tec Marine Technology Co., Ltd	Wuxi Haiying-Cal Tec Marine Technology Co., Ltd	Wuxi Haiying-Cal Tec Marine Technology Co., Ltd
Year of initial development	2002	2002	2002	2004	2005
Product	Echotrac CV-300	Midas Surveyor	HY1600	HY1620	Digital Echosounding System
Physical description					
Max. power consumption (W)	36	2,4	30	50	100
Power (DC, AC)	110 or 220VAC, or 24VDC, 50 watts	Accepts 12 – 24vDC external input for running or charging. Draws approximately 200mA at 12v.	11-30VDC or 220VAC	24VDC or 220VAC	24VDC or 220VAC
Weight (in air) and dimensions (w x h x d) of transducer/transceiver	6.6kg; 43cm x 9cm x 42.3cm	210Khz-2.5Kg, 15 x 11 x 11c	1.5kg; ø8cm x 8cm	20kg; 41cm x 19cm x 11cm	20kg; 41cm x 19cm x 11cm
Weight and dimensions (w x h x d) of display and logging unit	9kg; 43cm x 30.1cm x 10.6cm	8.6Kg and 50 x 40 x 20cm	10kg; 40cm x 33cm x 19cm	12kg; 41cm x 33cm x 20cm	15kg; 53cm x 44cm x 21.5cm
Portability of logger (rack, desktop, portable)	Desktop or rack mount	Portable	Rack, desktop, portable	Rack, desktop, portable	Rack, desktop, portable
Mode of operation					
Software platform (Windows, other)	Proprietary	Windows	Other	Other	Windows XP
Depth range of operation (m)	0.2-6,000	100 m	0.3-300	0.3-2,000	0.3-2,000
Frequency range (kHz)	3-1,000	33 / 210	208	208/24	208/24
Number of frequencies supported simultaneously	3	2 - 210 and / or 33 Khz	1	2	2
Power output of transducer at standard frequencies	2.4kW @ 24kHz	140W at 210 Khz	0.1kW	0.6kW	0.6kW
Beam angles (along and across)	3°, 4°, 9° @ 200 kHz; 19° @ 33kHz; 10°, 20° @ 24kHz; 20° @ 12kHz	210 Khz, 7.5 degrees and 33 Khz, 16,5 degrees	8°	8°@ 208kHz; 22°@ 24kHz	8°@ 208kHz; 22°@ 24kHz
Depth resolution, accuracy	1cm	0.01m, greater of ±0.01m or ±0.02% reading	1cm ± 0.1% depth	1cm ± 0.1% depth @ 208kHz, 10cm ± 1% depth @ 24kHz	1cm ± 0.1% depth @ 208kHz, 10cm ± 1% depth @ 24kHz
Max. pulse sounding rate	20Hz	6Hz	20Hz	20Hz	20Hz
Pulse length	Up to 5ms	5 - 600 micro secs	0.05-0.4ms	0.05-0.4ms @ 208kHz; 0.15-3.2ms @ 24kHz	0.05-0.4ms @ 208kHz; 0.15-3.2ms @ 24kHz
Dynamic range (dB)	86	174 db	80	85	85
Are heave, pitch and roll corrections included?	Heave with MRU	Yes, only heave is used	Heave correction only	Heave correction only	Heave correction only
Integration in work process					
Capable of being operated remotely (e.g. via PC)	Yes	No	Yes	No	Yes
Supported external data inputs (heave/roll/pitch, positioning)	Yes	Heave, Gyro, GPS, Aux, Tide, SV & external echou sounder	Heave and positioning	Heave and positioning	Heave and positioning
Can events and annotations be marked?	Yes	Yes	Yes	Yes	Yes
Can sound velocity and temperature profiles be included in real time ?	Sound velocity	Yes	No	No	No
Is real-time coupling to survey/post-processing software possible?	Yes	Yes	Yes	Yes	Yes
What data are displayed in real time (e.g. depth, classification, thickness)?	Fluff, consolidated and sub-bottom	Depth, position, QA	Depth	Depth	Depth
Data output options (e.g. raw data, transducer and motion-corrected depth, sea floor classification)	Envelope, serial, unfiltered raw data	Raw and Corrected	Raw data, transducer and motion-corrected depth	Raw data, transducer and motion-corrected depth	Raw data, transducer and motion-corrected depth
Data output formats	NMEA, DESO 25, Odom	Ascii, NMEA, Odom, Atlas, DBS, DBT, GPS	DESO 25, Echotrac	NMEA, DESO 25, Echotrac DBT	NMEA, DESO 25, Echotrac DBT
Data output for sea floor classification?	Yes	No	No	No	No
How are data displayed?	Paper or LCD and digital depth displays	Digital via logger LCD	Back-lighted graphical LCD module	Back-lighted graphical LCD module	Echogram on PC screen
Connection possibilities	Ethernet, RS232	RS232 / USB	RS232	RS232	USB, RS232, printer
How are data internally logged?	Hard drive with LCD module	Solid state RAM 16Mbyte and 32 Mbyte	Thermal paper	Thermal paper	Hard disks
Main use of the system	Hydrographic surveys	Bathymetry, shallow water surveys	Precision survey	Precision survey	Precision survey