Sherlog Kit Mate

SDT200 receiver

User's Instruction Manual

The information herein is believed to be accurate to the best of our knowledge.

Due to continued research and development, specifications of this product can change without prior notice.

In this manual, *SDT International n.v. s.a.* is named SDT.

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Summary

First and foremost

1 Foreword

1.1 PURPOSE OF THE MANUAL

This User's Manual is designed as an educational guide and reference tool for anyone who wishes to use the *Sherlog Kit Mate* for its intended purposes. Inside you will find information pertaining to:

- The description and functionality of the equipment.
- Its many uses.
- How to care for and maintain the equipment.

Recommendations relative to the declaration of compliance to the European Community's regulations, the guarantee and the different areas of application are included into this User's Manual.

SDT produces this User's Manual with the sole purpose of supplying simple and accurate information to the user. **SDT** shall not be held responsible for any misinterpretation of this User's Manual. Despite our efforts to provide an accurate manual, it may contain technical errors. If in doubt, contact your local **SDT** distributor for clarification. While every effort was made to present a true and accurate text, modifications and/or improvements to the product described herein can be made at any time without corresponding changes being made to this User's Manual.

Please read this User's Manual carefully, and file it in a safe place for future reference. All requests and warnings of this User's Manual must be followed in order to maximize the value of your investment. This User's Manual and its contents remain the inalienable property of SDT. The information herein is believed to be accurate to the best of our knowledge.

1.2 OPERATOR SAFETY

The operator must take all necessary precautions when using the equipment in high risk areas (under high noise levels, high light and radiation levels, extreme temperature conditions, chemical corrosive elements, etc.).

The user must be particularly vigilant when entering enclosed zones (holds, silos) where a risk of asphyxiation or lack of oxygen is possible. There is no likelihood of direct consequences for the hearing capacities of the operator.

The instrument **MAY NOT** be used inside any classified zone requiring explosion proof equipment. When required to make measurements in areas where an explosive atmosphere might exist, operators should be aware of the fact that the SDT200 receiver and the SDT 8 MS transmitter are not intrinsically safe. However, and for use in explosive atmospheres, SDT has developed the SDT200 Ex-proof version but same is not covered by the present manual.

1.3 END OF LIFE DESTRUCTION OF THE EQUIPMENT

When the equipment becomes obsolete, the internal battery pack must be removed from the equipment, and must be disposed of in such a way that conforms to the environmental laws of the country where the equipment is located.

The outer casing and other internal components may be destroyed by the appropriate specialized organizations.

The mandatory stipulations of applicable law take precedence over the contents of this User's Manual.

Description of the Sherlog Kit Mate

2 Description of the Sherlog Kit Mate

The complete Sherlog Kit Mate which contains:

SDT200 receiver assembly

- 1 x SDT200 receiver with rubber protection.
- 1 x Battery loader for SDT200 receiver.
- 1 x Flexible sensor 820 mm for SDT200 receiver (tube + flex).
- 1 x extension accessories for SDT200 receiver (threaded tip and rubber tip).
- 1 x Headphones, noise isolating.
- 1 x Y plug connector for headphones.
- 1 x USB flash drive for data transfer from SDT200 receiver to PC.
- 1 x Cable USB Length 1.5 m.

SDT 8 MS transmitter

- 1 x SDT 8 MS transmitter, multi-setting, with battery.
- 1 x Leather case for SDT 8 MS.
- 1 x Spare battery pack for SDT 8 MS.
- 1 x Battery loader for SDT 8 MS.
- 1 x Battery loader adapter for SDT 8 MS.
- 1 x Screw driver for the SDT 8 MS battery cover.

Others

- 1 x Calibration certificate.

- A copy of the current type approval certificates can be found on our website www.sdt.eu

Certificates

3 Certificates

3.1 CLASS TYPE APPROVAL

According to IACS UR-Z17, the ultrasonic tightness testing equipment used by Class Service Suppliers for testing the weathertight integrity of hatch covers should be class type approved.

Like its predecessor – the SDT Sherlog TA – both the Sherlog Kit Cadet (with SDT200 receiver) and Sherlog Kit Master (with SDT270 receiver) have been developed in order to meet with Class criteria for Type Approval. Both equipments have the necessary features on board to comply with, and exceed, Class type approval requirements. The high quality of SDT equipment reassures ship owners and their managers that their ships have been inspected with state of the art equipment that meets with the highest industry standards.

3.2 THE CALIBRATION CERTIFICATE

The SDT200 receiver must be recalibrated every year. A copy of the Calibration Certificate is available in the Appendixes section.

3.3 THE CERTIFICATE OF QUALIFICATION

A certificate of qualification is obtained after having successfully passed the theoretical and practical on- board training program. The validity of the certificate is limited to three years. A copy of the Calibration Certificate is available in the Appendixes section.

3.4 THE CERTIFICATE OF ORIGIN

The certificate of origin can be supplied on demand

The SDT200 receiver

4 SDT200 receiver

4.1 OPERATING PRINCIPLE OF THE SDT200

4.1.1 General

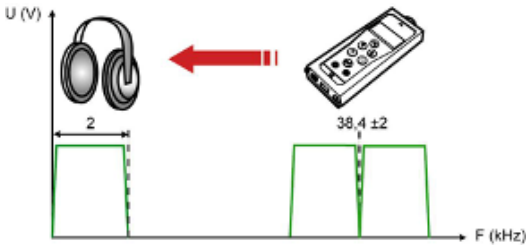
Ultrasonic waves are sound waves beyond the range of human hearing (>20 kHz). To be detected, we need to use an instrument like the SDT200, with the capability to receive ultrasonic frequencies and convert them to corresponding audible sounds.

Ultrasonic waves travel through gases (air), liquids (water, fuel) and solids (bearing housings) in a very directional nature; unlike audible sounds which disperse in all directions. Ultrasounds are low energy sound waves, therefore they are quickly absorbed by the medium through which they travel. Ultrasonic waves are generated by:

- Naturally occurring mechanical phenomena (friction of rotating equipment), pressure or vacuum leaks (pneumatic, gas, steam) or arcing and corona (electrical problems).
- Artificially by means of a transmitter (like the *SDT 200 mW* or the *SDT 8 MS* - 8 x 125 mW) for tightness testing.

4.1.2 Applying ultrasonic waves on the Sherlog

The *SDT200* detects ultrasonic signals, converts them to audible frequencies, and amplifies them. The challenge is to transpose the received signal, using the heterodyne technology, into an interpretable audible signal. This solution extends the ability of the human ear beyond the simple audible range and into the ultrasonic one.



The main function of the SDT200 is converting high frequency signals into audible.

4.1.3 SDT200 receiver features

The SDT200 receiver provides:

- Data storage
- Transfer software on USB flash drive (1).
- Sensor connector for external sensors.
- Build temperature sensor (2)

(1) Through the connector for PC.

(2) Only active after obtaining the required key from SDT.

4.1.4 Updating possibilities

Regularly and for different reasons, the software version from the SDT200 receiver will be updated, the most common reason being a technical improvement in the core software.

4.2 GETTING STARTED WITH THE SDT200

4.2.1 Charging the battery

The SDT200 uses an internal NiMH battery. The battery charger outlet will connect to a socket on the bottom side of the SDT200.

Due to the typical self-discharge rate of NiMH batteries it is recommended to charge the SDT200 battery at least every 3 months, even if it is not used.

It is recommended not to store the SDT200 with an uncharged battery for more than a few weeks. This would significantly reduce the battery life span.

Only use the charger provided by SDT.

The charging time will typically be 6 hours. When the LED of the charger is continuously green, the SDT200 battery is completely charged.

Like most batteries these days, leaving the SDT200 charging after the charger says it is charged does not hurt the battery – in fact it very slowly tops the charge up a little more.

You can charge the SDT200 switched off. You can also trickle charge the SDT200 switched on, so you can be using it to load and unload data, for example, and charge it at the same time.

SDT200 bottom side

SDT Universal charger for SDT200

A fully charged battery will give you about 8 hours of continuous use. This will vary of course depending upon your need to use the backlight and the power drain of certain external sensors that you might be using.

4.2.2 Turning on & turning off the SDT200

To turn on:

Press the ***Power button*** on the bottom right of the keypad. The status LED will shine dark blue. Then, a few seconds later you will see on the screen the SDT logo and the message “loading”. If you do not see this display your battery might be flat.

To turn off:

Push the ***Power button*** on the bottom right of the keypad. You will see the following display:

Confirm the device shut down by pressing the ***Enter button***.

4.2.3 Plug & unplug an external sensor

The SDT200 is equipped with a LEMO connector, used to plug external sensors.

It is a commonly used industrial connector, considered for its reliability and robustness. It have a sprung-loaded knurled barrel and mechanical polarisation to go only in one way round.

To plug a LEMO connector:

- Line up the red dot on the plug with the red mark on the connector.
- Insert the plug into the connector without any rotating movement.

When an external sensor is connected to the SDT200, it is automatically selected. Howerver, you can switch between available sensors using the ***F1 button***.

To unplug the LEMO connector

- Move up, towards the cable, the ring located on the bottom of the plug.
- Only pull the connector without any rotation.

Please, never pull on the cable itself.

4.3 FUNCTIONS REFERENCE GUIDE

4.3.1 Taking and storing an ultrasonic measurement

Select the desired ultrasonic sensor using the **F1 button** if necessary.

Activate or deactivate the laser pointer using the **F2 button**.

The display shows the measured data and its additional information described in the lower paragraphs, which are:

- Measured value.
- Measurement unit.
- Selected amplification level.
- Up and down arrows when a change of the amplification level is required.

The measured value

The measured value is shown in the middle of the screen.

The measurement unit

The measurement unit is shown on the right side of the display, such as **dBµV** when the equipment is used in US / Sherlog Mode.

The amplification level

The amplification level **A**varies on a scale from **10**to **90** dB.

Due to logarithmic characteristics, each and every time the **A** level is increased (decreased) by **10** (next or previous step), the gain is multiplied (divided) by approximately 3.

For example:

- **`A = 40`** -> Gain = **`100`**.
- **`A = 50`** -> Gain = **`300`**.

Understandably, when the ultrasonic level is high, little amplification is needed. When the ultrasonic level is very low (small leaks), the amplification required will be high.

When, in presence of a source of ultrasounds, the SDT200 receiver must be adjusted to an optimal **A**level. The SDT200 receiver assists you on the screen by means of the ⬆ and ⬇ arrows at the right side of the screen. The adjustment of the optimal **A**level is obtained by pressing  to increase or by pressing  to decrease.

- ⬆ indicates that the amplification level is too low and that a higher amplification level should be selected.
- ⬇ indicates that the amplification level is too high and that a lower amplification level should be selected.

The equipment is ready to take a correct measurement when the amplification indicator disappears from the screen. Whenever the amplification value is not properly adjusted, the SDT 200 will not make a correct measurement and a 0-reading will be shown on the display whilst the amplification indicator will be pointing upwards ⬆

Last but not least, it must also be understood that the amplification level determines the **minimal** dBµV measurement that the SDT200 receiver will consider for a set level. For example, at **A = 40**, the instrument will display all measurements above 29 dBµV and will **not** display sounds lower than 29 dBµV.

The table below indicates the correlation between the different amplification levels, the gain and the correspondent minimal sound level in dBµV.

A	10	20	30	40	50	60	70	80	90
Gain	3	10	30	100	300	1000	3000	10 000	30 000
Min (1)	59	49	39	29	19	9	-0.4	-7	-7.5

For the above mentioned reasons, one now understand why when measuring an Open Hatch Value (OHV), the SDT200 receiver detects an important ultrasonic output volume generated by the multi-transmitter, which requires an adjustment of the optimal amplification level.

But when one is seeking for minor to very small leaks, the amplification level **must** be set at the max. level, i.e. 90 in order to detect even the smallest leaks. The scale above shows that at those **A**levels, the SDT200 receiver will display values of minimal **-7.5** dBµV. No leak can then remain undetected.

Measurement settings

Press the F3 button to enter the measurement settings menu.

Adjust the acquisition time using Up and Down arrowbuttons.

If the acquisition time is set to 0 second, the RMS, Max RMS, Peak and Crest Factor are refreshed every 250 milliseconds. This mode enables the operator to take data on the fly.

If the acquisition time is set at 1 second or more, the RMS, Peak and Crest Factor will be calculated over the complete acquisition time. The Max RMS will be the highest sub RMS reached over the complete acquisition time. Each sub RMS is calculated during 250 milliseconds. The maximum acquisition time is 10 seconds.

Use the F1 button to save the settings as preferred configuration

Use the F2 button to load the settings associated to the preferred configuration

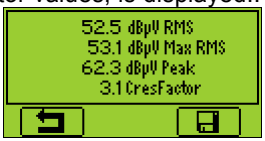
Use the F3 button to go back to the ultrasound measurement screen using the modified settings. Note that the preferred configuration is reloaded at startup of the SDT200.

Getting data

Press the M button:

- To freeze RMS and Max RMS values when the acquisition time is set to 0 second.
- To start the acquisition when the acquisition time is set to 1 second or more.

  At the end of the acquisition time, a screen detailing RMS, Max RMS, Peak and Crest factor values, is displayed.:



Press the **F3 button** or the Store button to save the data (or the **F1 button** to come back to the measurement screen without saving the data)

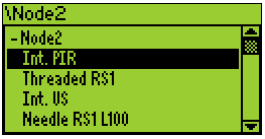
Then choose the desired memory location using the **Up and Down arrow buttons** and confirm by pressing the **Enter button**.

4.3.2 Review measurements stored in the SDT200

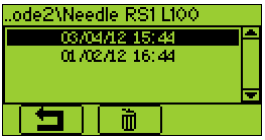
- From the Measurement screen press the ***Enter button*** to access the Main Menu.
- Use the arrow buttons to highlight the Node Tree icon: 
- Press the ***Enter button*** to display the list of memory locations:

Note: the "+" sign placed before a memory location means it contains recorded measurements.

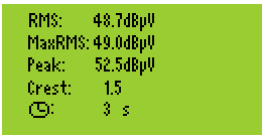
- Select the desired memory location using **Up and Down arrow buttons**. Expand the memory location using the **Right arrow button**. The saved measurements are filtered regarding the sensor used:



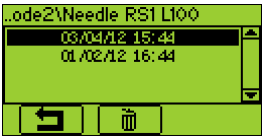
- Select the desired sensor using **Up and down arrow buttons**. Display the list of saved measurements by using the **Right arrow button**. The data are filtered according to the recording time stamp:



- Select a time stamp by using the **Arrow Buttons**, then and press the **Enter button** to visualize the data:



- Press the **F1 button** to come back to the list of recording timestamps:

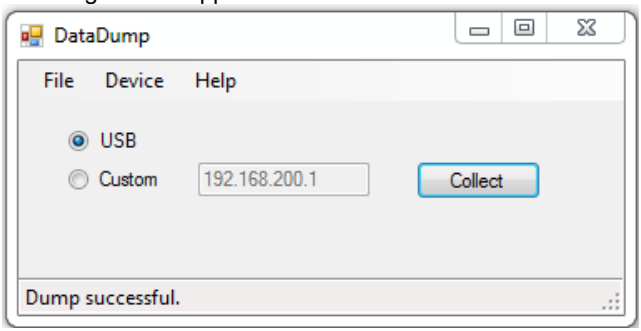


- To delete a recording, select its timestamp using the **Up and down arrow buttons** and press the **F2 button**.
- To come back to the measurement screen, press a few times the **F1 button**.

4.3.3 Download and erase stored data with DataDump

Before continuing this section you must have installed the DataDump Application and the SDT200 USB driver. Do not connect your SDT200 device to your computer before installing the SDT200 USB driver.

Your SDT200 must be switched on with the Measurement screen loaded. Then connect the SDT200 to a USB socket of your computer using the Mini-USB/USB cable provided by SDT.Start DataDump Application on your computer, the following screen appears:

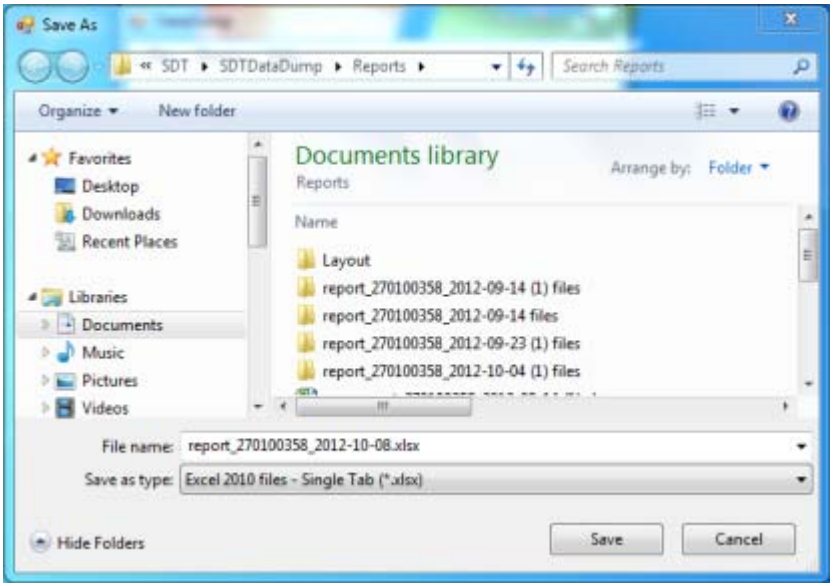


Verify the ***USB radio button*** is ticked then click on ***Collect***.

The following screen appears.

You can choose, by clicking on "Save as type field", to save the report as an xml file (open by your web browser) or as an xls file (open by MS Excel).

You can also choose the name of the report and its destination.



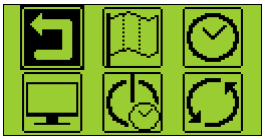
Click on Save. DataDump will generate and open the report:

4.3.4 Erasing SDT200 memory with SDT DataDump

From the SDT DataDump main window, select the menu **Device** and choose the option **Delete all device Data**.

4.3.5 Changing SDT200 device settings

- To access the Main menu, press the Enter button.
- Use the arrow buttons to highlight the Settings icon: 
- Press the Enter button to access the Settings menu:



- Use the **arrow buttons** to select the desired icon and the **Enter button** to select the desired setting.
  -  Language icon: change device interface language (English, Nederlands, Français, Deutsch, Italiano or Español).
  -  Date and time icon: set date, time and their format
  -  LCD icon: adjust the screen contrast and the operating time of the backlight
  -  Auto power down icon: adjust the time before device auto power down when it is unused.
  -  Reset icon: force a factory reset of the SDT200 device. Note that this does not erase saved measurements.
  -  Escape icon: to get back to the main menu. In the main menu, to get back to the measurements screen, press the **F1 button**

- To modify the parameters of the selected setting :
  - Use the **Up and Down arrow buttons** to switch form one field to another.

- Use the **Left and Right arrow buttons** to modify the value of the selected field.
- Use the **Enter button** to save the changes and return to the previous menu.
- Use the **F1 button** to go back to the previous menu without saving the changes.

4.3.6 Device Info

- From the Measurements screen press the ***Enter Button*** to access the ***Main Menu***
- Use the arrow buttons to highlight the Device Info icon: 
- Press the ***Enter Button*** to display device information:
  - The version of your instrument (screen 1)
  - Its calibration date (screen 2)
  - The serial number of the battery and its remaining capacity (screen 4)
  - The device and PCB serial numbers, the firmware version (screen 5)
- Use the **Up and down arrow buttons** to switch between the different screens. Push the **F1 button** to go back to the main menu and push once again the **F1 button** to go back to the measurements screen.

Complies with the DNV Approval Program n°403,

Using the SDT200 receiver for an ultrasonic hatch cover tightness test

survey procedure approved by IACS in July 1997

5 Performing an ultrasonic hatch cover tightness test

5.1 POSITIONING THE SDT 8 MS TRANSMITTER

For instructions concerning the SDT 8 MS transmitter, please read the dedicated SDT 8 MS user manual.

5.2 STARTING A SURVEY PROCEDURE

Note: Prior to starting a new survey, ensure that all settings are adjusted to the specific survey and personal requirements.

5.2.1 Carrying out an on-site functional test

It is mandatory to proceed to an on-site test in order to check the full functionalities of the measuring chain (multi-transmitter, receiver, headphones and external sensor).

Proceed as follows:

Put the multi-transmitter selector switch on position 1.

Bring the sensor close to any of the eight transducers and measure the dBµV value, which should not be lower than 95 dBµV.

If the emitted signal of one of the transducers is lower than 95 dBµV:

- The transducer has a failure.
- Possible presence of dust, debris or grease in the transducer.
- The battery is unloaded.

Repeat this for all of the eight transducers.

5.2.2 Measuring the Open Hatch Value

Prior to testing the tightness of hatch covers it is recommended to measure the OHV (Open Hatch Value) for the hold to be tested. Therefore the multi-transmitter is to be placed (**switched on**) in the center of either the tank top or tween deck of the hold in question or on top of the cargo in the open uncovered hold. The OHV measurement is then to be made at hatch coaming level pointing down the receiver's sensor to the multi-transmitter. Alternatively, and depending on the hold design, the OHV can be taken from an access hatch (provided there

are no obstructions between the transmitter and the operator's SDT 200 (e.g. trunks, …)

Important note: operators should always carry out the test with the same sensor (internal or flex) with which they have taken the OVH. Switching of sensor during the test will result in non-conforming test readings/measurements.

Whilst taking the OHV, the operator will have the possibility to adjust the headphone sound level of the OHV so that the max sound of the OHV is not too loud for comfort.

5.2.3 Finding tightness issues

Proceed as follows:

1. Direct the flexible sensor to the area to be controlled.
2. As the position of leaky spots/areas is unknown, it is recommended that the operator increases the amplification level until the maximum level is reached. The equipment will now be extremely sensitive and allow the operator to pick up the slightest variations in sound in way of the hatch cover sealing system.
3. When the hatch covers and openings giving access to the hold are properly closed, the operator will either hear no sound at all, or might hear the typical bi-sonic sound as a slight background noise. Any variation in sound and significant change of the value displayed on the SDT200 screen indicates a sealing problem which should be investigated further.
4. When approaching a leaky spot, the bi-sonic sound will steadily increase in volume until it reaches a peak sound. The measured value will increase accordingly. Thanks to the directionality of ultrasonic waves, the place where the peak value is heard and measured will be the origin of the leak.
5. The difference between the measured value and the OHV gives an objective indication of the compression status.
6. At the end of the test it is recommended to take another OHV. This value should be more or less the same as the OHV taken before the hatch cover test. Doing so will confirm proper functioning of the equipment since the start up to completion of the test on the hatch in question. If the OHV is significantly different, it indicates that a problem occured during the test (low battery, damaged sensor,...) and the test is to be considered invalid.

Note: Normally, tests will be carried out with the flexible sensor because this adds to the comfort of the operator. However, be aware of the fact that changing from sensor during the test will result in different measurements, depending on

the size of the sensor used (internal sensor, flex,…). If necessary to switch from sensor (due to breakdown of the sensor in use). It is therefore recommended to have a spare flexible sensor in the kit.

Technical specifications

6 Technical specifications

6.1 MEASUREMENT INSTRUMENT

Function	Multifunction receiver.
Display	Graphic LCD with backlighting (128 x 64)
Keyboard	12 function keys
Built-in sensors	Ultrasonic sensor Infrared temperature sensor (according to the version)
External sensors	Through specific connector (Lemo 7 pins).
Data Logger	- 100 Measurement Nodes (measurement points) - Total 4000 Measurements (measurements data)
Communication	USB interface
Software for transferring data from the device to the PC	DataDump Application
Battery pack (*)	Rechargeable battery type: 8 cell, 4.8 V, NiMH (Nickel Metal Hydride) Nominal capacity: 4.4 Ah Life span: 500 to 1,000 charge/discharge cycles Autonomy: 6 to 7 hours Protections: short-circuit, reverse polarity and temperature protected
Auto power down	Auto power down after preset time
Operating temperature	-15 °C to +60 °C / 14 °F to 140 °F non condensing
Housing	Extruded aluminium
Weight	770 g / 27 oz.
Dimensions	226 x 90 x 40 mm / 8.90 x 3.54 x 1.57 inches (L x W x H)
Headphones	noise isolating, NRR 25 dB (tested in an accredited NVLAP laboratory).

(*) for optimum performance, this battery pack is equipped with an electronic management system (includes digital serial number, capacity and temperature management).

6.2 INTERNAL ULTRASONIC SENSOR

Function / type	Open type ultrasonic sensor
Bandwidth (-6 dB)	±2 kHz at -6 dB
Frequency	40 kHz ± 1 kHz
Sensitivity (40 kHz)	-65 dB/V/µbar at 40 kHz
Total beam angle	55° typical at -6 dB

6.3 FLEXIBLE SENSOR

Bandwidth (-6 dB)	2 kHz at -6 dB
Frequency	40 kHz ± 1 kHz
Sensitivity (40 kHz)	-65 dB/V/µbar at 40 kHz
Length	550 mm or 820 mm (without cable)
Diameter	13 mm external, 10 mm internal
Cable length	Coiled 0.5 to 2.0 m

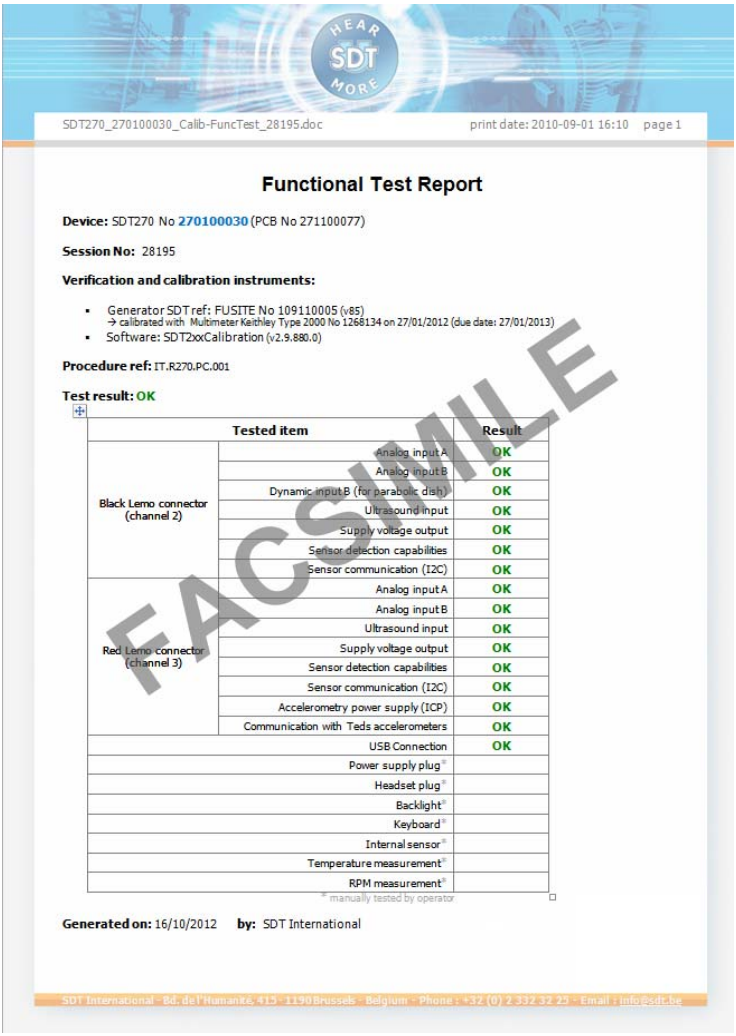
6.4 BATTERY CHARGER

For optimum performance, this charger is microprocessor controlled.

Charger type	Specific for SDT200NiMH battery pack.
Power supply	230 VAC or 110 VAC +15 % / -10 % 50/60 Hz
Output voltage	+4.0 or 8.5 V DC (depends on operating mode)
Current	1000 mA maximum
Protections	temperature protected, limit set at 60°C / 140 °F
Status indicator	Two color LED type. • Green LED is continuously lit: battery is fully charged • Green LED flashes evenly: normal charge • One red flash every 5 seconds : Battery Voltage error • Two red flashes every 5 seconds: Over temperature error • Three red flashes every 5 seconds: Timeout full charge • Four red flashes every 5 seconds: Timeout Rapid charging • Five red flashes every 5 seconds: Timeout Activate charging • Six red flashes every 5 seconds: 1 Wire communication error
Isolation	Double isolation.
Weight	300 grams / 10.6 ounces
Housing	PPE.

Apendixes

7 Copies of certificates



SDT270_270100030_Calib-FuncTest_28195.doc print date: 2010-09-01 16:10 page 1

Functional Test Report

Device: SDT270 No **270100030** (PCB No 271100077)

Session No: 28195

Verification and calibration instruments:

- Generator SDT ref: FUSITE No 109110005 (v85)
  → calibrated with Multimeter Keithley Type 2000 No 1268134 on 27/01/2012 (due date: 27/01/2013)
- Software: SDT2xxCalibration (v2.9.880.0)

Procedure ref: IT.R270.PC.001

Test result: OK

Tested item		Result
Black Lemo connector (channel 2)	Analog input A	OK
	Analog input B	OK
	Dynamic input B (for parabolic dish)	OK
	Ultrasound input	OK
	Supply voltage output	OK
	Sensor detection capabilities	OK
	Sensor communication (I2C)	OK
Red Lemo connector (channel 3)	Analog input A	OK
	Analog input B	OK
	Ultrasound input	OK
	Supply voltage output	OK
	Sensor detection capabilities	OK
	Sensor communication (I2C)	OK
	Accelerometry power supply (ICP)	OK
	Communication with Teds accelerometers	OK
USB Connection		OK
Power supply plug*		
Headset plug*		
Backlight*		
Keyboard*		
Internal sensor*		
Temperature measurement*		
RPM measurement*		

* manually tested by operator

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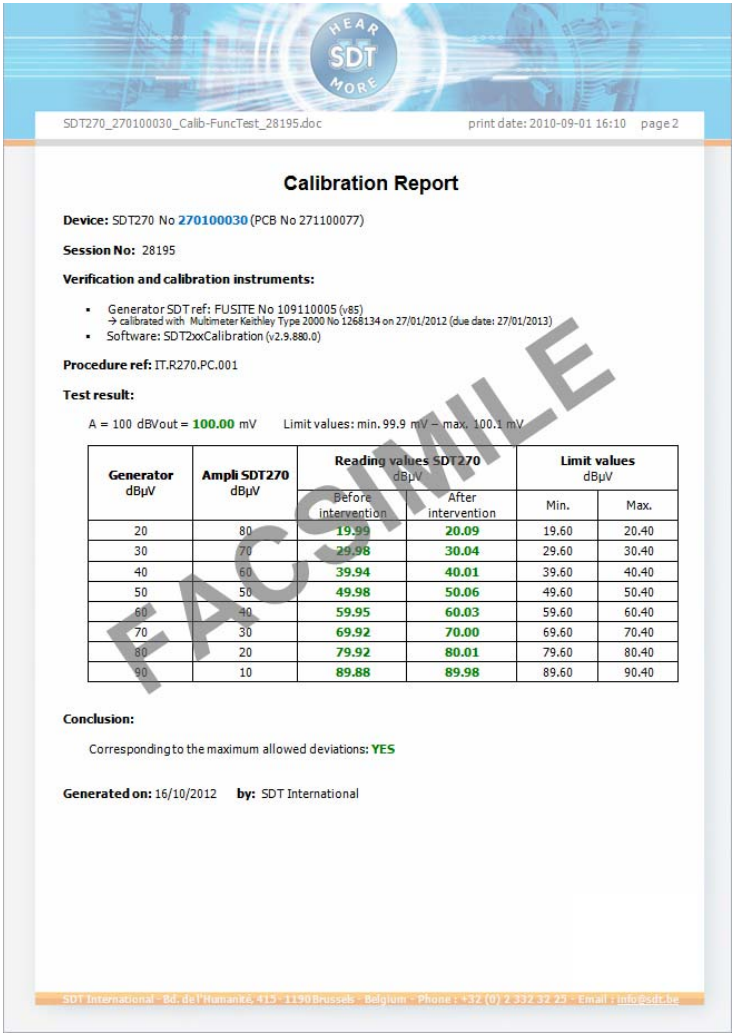
Copy of a Functional Test Report



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Calibration Report

Device: SDT270 No **270100030** (PCB No 271100077)

Session No: 28195

Verification and calibration instruments:

- Generator SDT ref: FUSITE No 109110005 (v85)
  → calibrated with Multimeter Keithley Type 2000 No 1268134 on 27/01/2012 (due date: 27/01/2013)
- Software: SDT2xxCalibration (v2.9.880.0)

Procedure ref: IT.R270.PC.001

Test result:

A = 100 dBVout = **100.00** mV Limit values: min. 99.9 mV – max. 100.1 mV

Generator dBµV	Ampli SDT270 dBµV	Reading values SDT270 dBµV		Limit values dBµV	
		Before intervention	After intervention	Min.	Max.
20	80	**19.99**	**20.09**	19.60	20.40
30	70	**29.98**	**30.04**	29.60	30.40
40	60	**39.94**	**40.01**	39.60	40.40
50	50	**49.98**	**50.06**	49.60	50.40
60	40	**59.95**	**60.03**	59.60	60.40
70	30	**69.92**	**70.00**	69.60	70.40
80	20	**79.92**	**80.01**	79.60	80.40
90	10	**89.88**	**89.98**	89.60	90.40

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Conclusion:

Corresponding to the maximum allowed deviations: **YES**

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Copy of a Calibration Report.

SDT International sa-nv

Certificate of Qualification
nr. SDT0[redacted]

This is to certify that **Mr.** [redacted]

has, in accordance with Classification Societies Requirements i.e.

- DNV – Approval Programme N° 403, Standards for Certification N° 2.9 – May 2001
- IACS U.R. Z.17 Procedural Requirements for Service Suppliers Rev.5 – Feb. 2004,

attended the following theoretical and practical modules of the SDT-IMCS training course, accredited by the Nautical Institute. This training was given at the Hilton Dubai Jumeirah in UAE on 15th and 16th March 2006.

Module	Completed
Theoretical training on hatch covers & closing appliances	✓
Theoretical training on Ro-Ro access equipment & securing devices	
Theoretical training on Ultrasounds and with a SDT Sherlog TA	✓
Practical training with a Sherlog TA (survey data logging procedure and downloading on PC)	✓
On-Board training with a Type Approved Sherlog TA detector in combination with a Sherlog 8 multi-transmitter and external flexible sensor on the vessel **IRAN BORHAN** **IMO n°7360784** *in the port of Dubai Port Rachid.*	✓

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On completion of the training course, Mr. [redacted] has successfully passed the theoretical and practical examination and has therefore been certified as **"Certified Operator qualified for ultrasonic tightness testing with the Class Type Approved Sherlog TA "** of hatches.

This certificate is valid for a period of 3 years and expires on 01/04/2009.

Issued at Brussels on 28/03/2006.

For SDT International,
André Degraeve
Managing Director.

Training instructor,
Walter Vervloesem.

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Bankers: KBC 436-4131111-37 ▪ Fortis 293-0345531-72 ▪ CEE VAT : BE 0418.020.213 ▪ RPM Brussels

Copy of a Certificate of Qualification.

8 Warranty and responsibility limits

8.1 WARRANTY

8.1.1 Guarantee

Subject as hereinafter set out, **SDT** undertakes to remedy any defect of the equipment resulting from faulty materials or workmanship. The guarantee undertaking includes measures for repairing or replacing the equipment. This liability is limited to defects, which appear:

- For the battery and accessories (such as charger, headphones, sensors, …) within six (6) months from the delivery of the equipment to the customer,

- For the *SDT200* receiver and multi-transmitter within twenty-four (24) months from the delivery of the equipment to the customer.

On receipt of the customer's written notification falling within this guarantee **SDT** shall remedy the defect forthwith and at its own expense. The customer shall return to **SDT** the equipment, in which a defect covered by this guarantee has appeared, for repair or replacement by **SDT**, and the delivery to the customer of the equipment properly repaired or replaced shall be deemed to be a fulfillment by **SDT** of its obligations and a sole and exclusive remedy under this guarantee in respect of such defective equipment.

The customer shall bear the cost and risk of packing and transport of the defective equipment and of the repaired or replaced equipment between the place where the equipment is situated and **SDT** closest office.

SDT's liability shall apply only to defects that appear under the conditions of operation provided for by this User Manual and in proper use. It does not cover defects due to causes arising after delivery. In particular it does not cover defects arising from the customer's faulty maintenance, installation, handling, service or inspection or non-compliance with **SDT**'s instructions in this User Manual, in **SDT**'s Technical Specifications or given otherwise or from repairs, alterations or adjustments carried out without **SDT** prior written consent or from repairs, alterations or adjustments carried out improperly by the customer or arising from an accident, nor does it cover normal deterioration, wear and tear.

8.1.2 Limitation of liability

If the customer fails to give notice of a defect that falls within this guarantee during the above stated guarantee period, **SDT** shall be under no liability even in respect of defects due to causes existing before the expiry of the above stated guarantee period.

SDT liability under this guarantee shall in all cases be limited to fifteen per cent (15%) of the purchase price of the equipment. In addition, it is expressly agreed that the customer shall have no claim in respect of personal injury or of damage to property arising before, during or after the above stated guarantee period nor for loss of profit, loss of use or any other indirect, consequential, punitive, special or incidental damages of any kind, whether or not **SDT** has been advised of the possibility of such loss or damage.

8.2 RESPONSIBILITY LIMITS

Neither the company SDT International, nor any related company, will in any circumstances be liable for any damages, including, without limitation, damages for loss of business, business interruption, loss of information, defect of the equipment unit or its accessories, bodily harm, loss of time, financial or material loss or any other indirect or consequential loss arising out of the use, or inability to use this product, even when it has been warned of possible damages.

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