Data Storage Tags (DSTs)

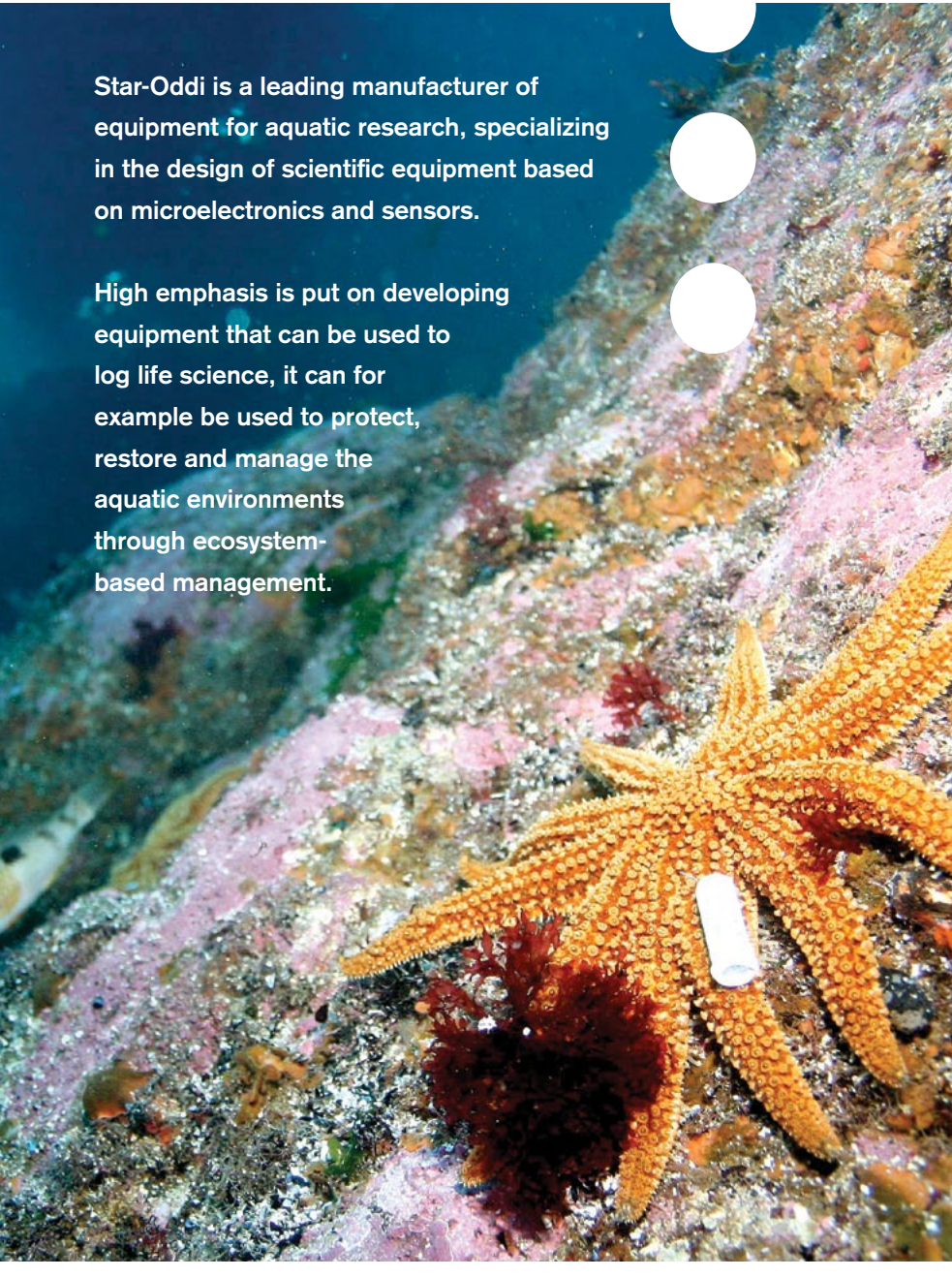
ADVANTAGES AT A GLANCE

- Small data loggers
- Available in four different sizes
- Biocompatible material
- Long battery life

STAR ODDI

Logging Life Science

www.star-oddi.com



Star-Oddi is a leading manufacturer of equipment for aquatic research, specializing in the design of scientific equipment based on microelectronics and sensors.

High emphasis is put on developing equipment that can be used to log life science, it can for example be used to protect, restore and manage the aquatic environments through ecosystem-based management.

FISH AND MARINE ANIMAL RESEARCH

With Star-Oddi's focus on small sized loggers, high pressure survival up to 3000m and long battery life up to 7 years, the DSTs are designed in size and shape for implantation or external tagging of fish and marine animals.
DSTs are used in analyzing the tagged animal's migration, distribution, feeding and spawning behavior, vertical/horizontal movements or geographic location.

The loggers can be fastened externally or implanted in the animal. The DST housing is made of alumina, a biocompatible ceramic material that is not recognized as a foreign object by the animal.

ENVIRONMENTAL AND EQUIPMENT MONITORING

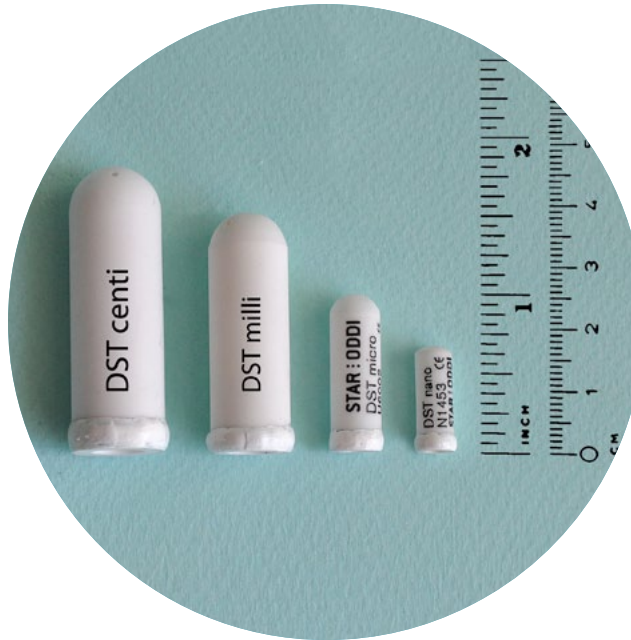
Star-Oddi's DSTs are widely used as stand-alone loggers for environmental monitoring or attached to fishing gear or other underwater equipment. All measured data is stored in the logger's internal memory. When the logger is retrieved after the measuring period, recorded data is uploaded in the supporting software where it can be viewed and analyzed in graphic and tabular form. The same logger can be reused as long as the battery lasts.

SENSORS

- TEMPERATURE
- PRESSURE (DEPTH)
- CONDUCTIVITY (SALINITY)
- TILT
- MAGNETIC FIELD STRENGTH (COMPASS)
- LIGHT INTENSITY

SMALL SIZED LOGGERS

The DST product family features four different sizes: **centi, milli, micro and nano**. The DST loggers vary in size, memory size, battery life and sensors.



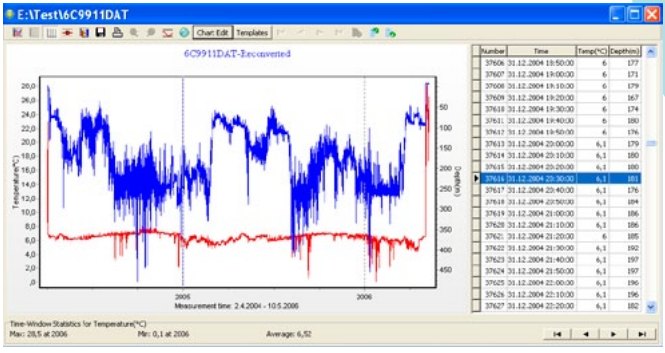
SEASTAR - GRAPHIC SUPPORTING SOFTWARE

SeaStar is the application software for starting the DSTs, downloading and analysing data. The user sets the start time, start date and sampling interval in SeaStar before starting the logger. Sampling interval can be set in second(s), minute(s) and/or hour(s). There is an option to take burst measurements and get up to 10 recordings per second.

With default programming all parameters are recorded at the same time. It is possible to define different sampling intervals for the parameters (primary and secondary parameters/parameter pairs with different sampling frequency). In selected types it is possible to have several measurements per second (burst).

DSTs can also be programmed with up to 7 different sampling intervals. These intervals can then be defined in a preferred order within a measurement sequence. Number of measurements are defined for each interval. The measurement sequence is repeated until the memory is full or the logger retrieved. Programming several sampling intervals in a sequence can be useful when more/fewer measurements are needed at certain time periods.

Recorded data is uploaded in SeaStar where the results can be analyzed in graphic and tabular form along with date and time. The logger can be reprogrammed and reused as long as the battery lasts. SeaStar reports an estimated battery life upon connection with a DST.



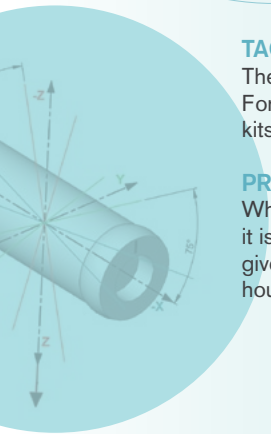
SeaStar software

COMMUNICATION BOX

The Communication Box works as an interface for data transfer between the DST and a PC. Communication between a DST and the Communication Box is wireless. The Communication Box is connected to a PC using either a USB or RS-232C 9 pin serial cable. When a logger is connected to a PC the logger is powered through the Communication Box and is not using its internal battery.

DSTs are being used in various fields and studies, such as:

- **Marine and freshwater monitoring for biological and environmental studies**
- **Behavioral monitoring of fishing gear and underwater equipment**
- **Geothermal well logging**
- **Fish and marine animal tagging projects**
- **Quality control in manufacturing processes**



TAG HOLDER KITS

There is a wide range of accessories for Star-Oddi products available. For external tagging of fish we provide special fastening and tag holder kits that make the tagging process easier and safer.

PROTECTIVE HOUSINGS FOR FLEXIBLE MOUNTING OPTIONS

When DSTs are used as standalone loggers in harsh environments it is advised to use protective housings to protect the loggers and to give more flexible mounting options. Star-Oddi offers plastic protective housings for all logger sizes.

Tag holder

PUR H housing

Tilt protective housing

START/STOP RECORDING LOGIC FEATURE

For depth monitoring it is possible to predefine a depth limit where recordings start when above and stop when below that limit. This is especially useful when logging on fishing gear to save on memory size when logger is on deck.

EXTENDED CALIBRATION

It is possible to calibrate most of our loggers outside of standard ranges. If you have any special requests contact our sales department.

PERSONAL SERVICE

Customers are Star-Oddi's best advisors. We are always looking for new ideas and ways to improve our products. Please contact us if you have any suggestions for us.

STAR-ODDI LTD.

Founded in Iceland in 1985, Star-Oddi has become recognized as one of the world's leading manufacturers of technology for research and industrial use.

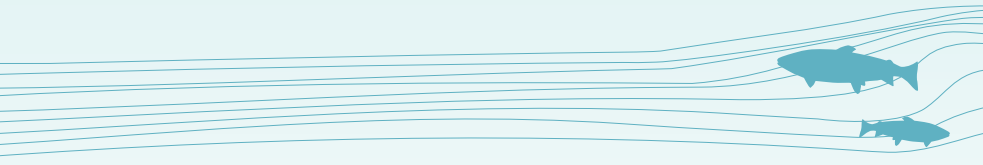
Since 1993, Star-Oddi has been manufacturing the Data Storage Tag (DST), a miniature data logger. DSTs are ideal for various types of research where small reliable loggers are needed. Star-Oddi operates in the global marketplace. Our mission is to provide unique, reliable and innovative research tools to scientists collecting data on animals and aquatic environments.

THE STORY BEHIND THE NAME:

THE SAGA OF STAR-ODDI (STJÖRNU-ODDI)

Oddur Helgason lived and worked in Flatey, Skjalfanda, in northern Iceland in the twelfth century. He was a hired labourer on a farm and stood out because of his outstanding knowledge. He used a lot of his time analyzing the movements of the sun, moon and stars resulting in his nickname Star-Oddi.

Star-Oddi's work is considered to be one of the greatest engineering achievements of the Viking Age. His research enabled Vikings to sail over long distances and find their way back home. Scientists have shown that he made remarkably exact observations, centuries ahead of his time.



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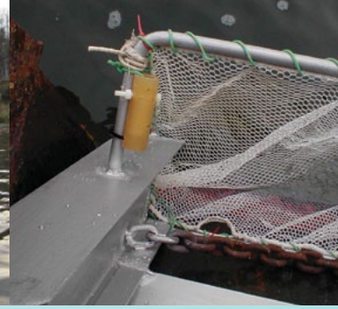

DST TECHNICAL SPECIFICATIONS

	DST nano-T	DST micro - T/TD	DST milli -T/TD	DST milli - L	DST centi - T/TD	DST CT	DST CTD	DST tilt	DST magnetic
Sensors	Temperature	Temperature, pressure (depth) Available in temperature only	Temperature, pressure (depth) Available in temperature only	Temperature, pressure (depth)	Temperature, pressure (depth) Available in temperature only	Conductivity (salinity), temperature	Conductivity (salinity), temperature, pressure (depth)	Tilt (3-D), temperature, pressure (depth)	Magnetic field strength (3-D) (compass heading), tilt (3-D) temperature, pressure (depth)
Size: diameter x length	6mm x 17.5mm	8.3mm x 25.4mm	13mm x 38.4mm	13mm x 38.4mm	15mm x 46mm	15mm x 46mm	15mm x 46mm	15mm x 46mm	15mm x 46mm
Weight (in air / in water)	1.3g / 0.8g	3.3g / 1.9g	9.2g / 5g	9.2g / 5g	19g / 12g	21g / 13g	21g / 13g	19g / 12g	19g / 12g
Battery life	9 months*	18 months*	3 years*	3 years*	7 years*	4 years*	4 years*	4 years*	3 years*
Memory type	Non-volatile EEPROM	Non-volatile EEPROM	Non-volatile EEPROM	Non-volatile EEPROM	Non-volatile EEPROM	Non-volatile EEPROM	Non-volatile EEPROM	Non-volatile EEPROM	Non-volatile EEPROM
Memory capacity / size of one measurement (bytes)	7,872 bytes / temperature 1.5 bytes	65,214 bytes / temperature 1.5 bytes, pressure 1.5 bytes	130,750 bytes / temperature 1.5 bytes, pressure 1.5 bytes	130,750 bytes / temperature 1.5 bytes, pressure 1.5 bytes	261,819 bytes / temperature 1.5 bytes pressure 1.5 bytes	392,478 bytes / conductivity-temperature 3 bytes	392,478 bytes / conductivity-temperature-pressure 4,5 bytes	392,379 bytes / temperature-pressure 3 bytes, tilt 6 bytes	392,379 bytes / temperature-pressure 3 bytes, compass (MFS)-tilt 12 bytes
Memory extension option	16,062 bytes		1,048,046 bytes (FLASH memory)	1,048,046 bytes (FLASH memory)	786,099 bytes (EEPROM memory)				
Fastest possible sampling	1 sec.	1 sec.	1 sec.	1 sec.	0,1 sec.	1 sec.	1 sec.	0,2 sec.	1 sec.
Data resolution	12 bits	12 bits	12 bits	12 bits	12 bits	12 bits	12 bits	12 bit / 14 bit	12 bits / 14 bits
Temperature range	-1°C to 40°C (30.2°F to 104°F)**	-1 to 40°C (30.2°F to 104°F)**	-1°C to 40°C (30°F to 104°F)**	-1°C to 40°C (30°F to 104°F)**	-1°C to 40°C (30°F to 104°F)**	-1°C to 40°C (30°F to 104°F)	-1°C to 40°C (30°F to 104°F)	-1°C to 40°C (30°F to 104°F)**	-1°C to 40°C (30°F to 104°F) **
Temperature resolution	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)	0.032°C (0.058°F)
Temperature accuracy	+/- 0.2 °C (+/- 0.36°F)	+/- 0.2 °C (+/- 0.36°F)	+/- 0.1°C (0.18°F)	+/- 0.1°C (0.18°F)	+/- 0.1°C (0.18°F)	+/- 0.1°C (0.18°F)	+/- 0.1°C (0.18°F)	+/- 0.1°C (0.18°F)	+/- 0.1°C (0.18°F)
Temperature response time	Time constant (63%) reached in 8 sec.	Time constant (63%) reached in 12 sec.	Time constant (63%) reached in 12 sec.	Time constant (63%) reached in 12 sec.	Time constant (63%) reached in 20 sec.	Time constant (63%) reached in 20 sec.	Time constant (63%) reached in 20 sec.	Time constant (63%) reached in 20 sec.	Time constant (63%) reached in 20 sec.
Standard depth/pressure ranges (user defined)		150m, 300m, 1000m	20m, 50m, 100m, 250m, 500m, 800m	20m, 50m, 100m, 250m, 500m, 800m	30m, 50m, 100m, 270m, 800m, 1500m, 2000m, 3000m		100m, 500m, 1200m, 2000m	30m, 50m, 100m, 270m, 800m, 1500m, 2000m, 3000m	30m, 50m, 100m, 270m, 800m, 1500m, 2000m, 3000m
Depth/pressure resolution		0.08% of selected range	0.03% of selected range	0.03% of selected range	0.03% of selected range		0.03% of selected range	0.03% of selected range	0.03% of selected range
Depth/pressure accuracy		+/- 0.5% of selected range	+/- 0.4% of selected range for 20m - 500m +/- 0.6% of selected range for 800m	+/- 0.8% of selected range	+/- 0.4% of selected ranges between 30m and 270m +/- 0.6% of selected ranges between 800m and 3000m		+/- 0.4% of selected ranges between 100m and 500m +/- 0.6% of selected ranges between 1200m and 2000m	+/- 0.4% of selected ranges between 30m and 270m +/- 0.6% of selected ranges between 800m and 3000m	+/- 0.4% of selected ranges between 30m and 270m +/- 0.6% of selected ranges between 800m and 3000m
Depth/pressure response time		Immediate	Immediate	Immediate	Immediate		Immediate	Immediate	Immediate
Standard conductivity ranges (user defined)						1) 3 to 37 mS/cm 2) 13 to 50 mS/cm 3) 0.3 to 5 mS/cm	1) 3 to 37 mS/cm 2) 13 to 50 mS/cm 3) 0.3 to 5 mS/cm		
Conductivity resolution						0.01 mS/cm	0.01 mS/cm		
Conductivity accuracy						+/- 1.5 mS/cm	+/- 1.5 mS/cm		
Salinity resolution						0.02 PSU	0.02 PSU		
Salinity accuracy						+/- 1 PSU***	+/- 1 PSU***		
Compass resolution									1°
Compass accuracy									+/- 15°
Tilt resolution								0.2°	0.2°
Tilt accuracy								+/- 3°	+/- 3°
Tilt range								+/-90°	+/-90°
Magnetic field strength range									0 to 2 gauss
Magnetic field strength resolution									30nT
Magnetic field strength accuracy									+/-100nT

***For a sampling interval of 10 min.** ****Outside ranges available upon request** *****Based on conductivity full scale accuracy at 24°C** **Specifications are subject to change without notice**