STAR ODDI
Logging Life Science

BabEnviro

5 February 2014

LOGGING LIFE SCIENCE

- 20 years expertise in sensor technology
- Serving an array of research industries

Aquatic and ocean

Biomedical

Animal tagging

Food and beverage

Pipeline

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Our markets worldwide

Ocean and freshwater research

Animal tagging

Food and beverage research

Biomedical research

Wide customer base

-Products from Star-Oddi used in all continents

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NOAA

NINA
Norwegian Institute for Nature Research

NASA

HAVFORSKNINGSINSTITUTTET
INSTITUTE OF MARINE RESEARCH

Fisheries and Oceans Canada

HAFRANNSÓKNASTOFNUNIN

National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

MOTE MARINE LABORATORY

USDA
United States Department of Agriculture

IRD
Institut de recherche pour le développement

JAMSTEC
JAPAN AGENCY FOR MARINE-EARTH SCIENCE AND TECHNOLOGY

Greenland Institute of Natural Resources
Pinngortitaleriffik · Grønlands Naturinstitut

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Food and beverage

Among our customers:

STAR ODDI
Logging Life Science

Biomedical research

Among our customers

novo nordisk®

gsk GlaxoSmithKline

Freie Universität Berlin

EMD MILLIPORE

NVI
nederlands vaccin instituut

Sensor offering in DSTs

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Temperature

Pressure (depth)

Tilt

Conductivity (salinity)

Magnetic (+compass)

Light intensity

Heart rate

- **Accuracy:**
  - Temperature +/-0.1°C
  - Depth +/-0.4% of range
  - Tilt +/-3°
  - Salinity +/- 1PSU

Magnetic +/-100 nT
Compass +/-15°
Light +/-25 lux

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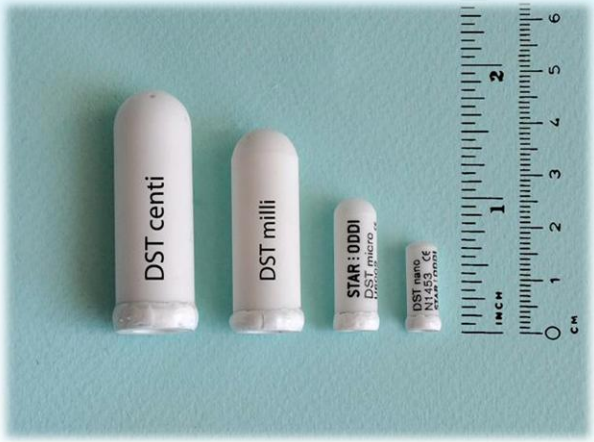
OUR CORE COMPETENCE



Comprehensive DST offering,
in ceramic housing

SMALL AND RELIABLE SENSORS

Starmon temperature recorders,
in plastic and titanium housing
for extreme conditions

Data Storage Tags
- high performance in small size

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- Small loggers. Four different sizes:
  - CENTI, MILLI, MICRO, NANO
  - NANO only 6 mm x 17 mm
- Various depth calibration ranges
- Battery life from <1 to 7 years, depending on size of logger
- Battery not replaceable
- Housings can be custom marked

Research applications
-Aquatic environments

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- Stand-alone loggers on moorings, buoys and deployment lines
  - Environmental monitoring in oceans, rivers and lakes
- Use on fishing gear and underwater equipment
- Fish and marine animals tagging projects

Animal tagging projects

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Centi sized DST

- Small and practical with high pressure tolerance

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Size (mm)	Features
46 x 15	Available types: • **Centi-T (Temperature)** • **Centi-TD (Temperature-Depth)** • **CTD (Conductivity-Temperature-Depth)** • **Tilt (3-D tilt)** • **Magnetic (compass, 3-D tilt)** Advantages: •Pressure/depth with logic feature to start/stop recordings • High pressure calibration available up to 3000 m • Shallowest is 30 m except for CTD which is 100 m • Long battery life up to 7 years

Centi sized DST

- Small and practical with high pressure tolerance

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Size (mm)	Features
46 x 15	**Specifications:** • Depth acc. +/-0.4 FS (+/-0.6% FS for 800 m+) • Temperature accuracy +/-0.1°C • Salinity accuracy +/-1 PSU • Tilt accuracy +/-3° • Compass accuracy +/-15° • Option for memory extension in DST centi

Easy to attach

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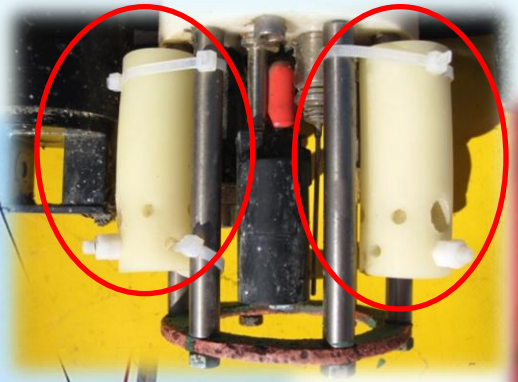
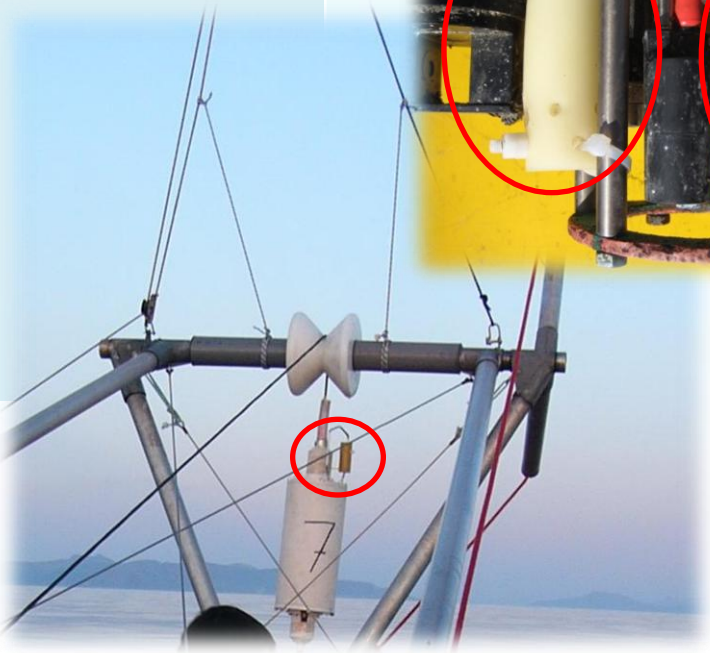
Main researches

Mainly environmental monitoring on:

- Moorings
- Deployment lines
- Buoys and arrays

Also used for:
- Fishing gear studies
- Fish tagging
- Boreholes
- Oil pipelines





Plastic protective housings for DSTs
- adds flexibility and protects

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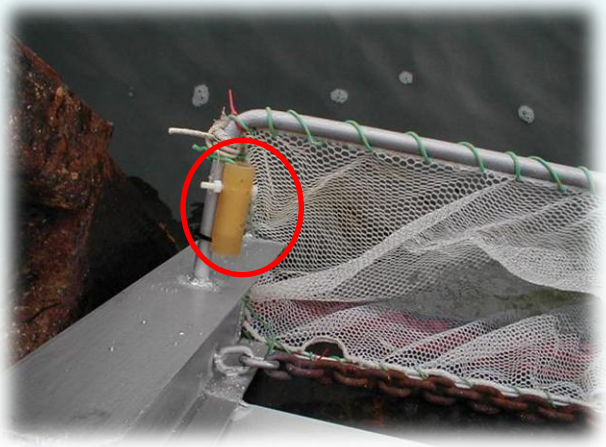
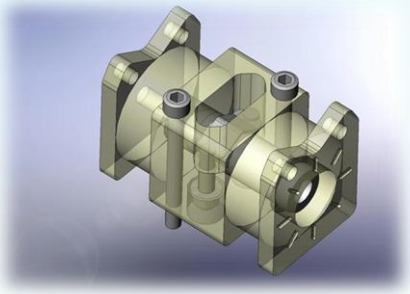
- Specially designed housings to:
  - Give more flexible mounting options
  - Protect the data logger against harsh knocks
  - Keep tilt and magnetic DSTs fixed inside housing (adjustable housing)





Smaller DST sizes – temperature depth

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Milli size

Micro size

Nano size

DSTs	Size (mm)	Features
Milli	38.4 x 12.5	• Available with a 20 m calibration range which gives the best possible depth accuracy of +/-8 cm • Option for large FLASH memory • Milli-L - economical pricing •DST milli PU (0-80°C) displays PU and CO2 values in FoodStar.
Micro	25,4 x 8,3	•Tagging of small fish and temperature monitoring in animals
Nano	17 x 6	• World's smallest logger • Implantation in animals and industry use

Starmon temperature recorder

- great durability and high accuracy

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- Used as a submersible temperature logger in oceans, rivers and lakes
- Robust plastic or titanium housing
- Deep water application – 11 km
- Temperature accuracy +/-0.05°C
- Long battery life >10 years (replaceable battery)

Plastic (400 m depth)
or titanium housing (11 km depth)

Starmon – flexibility in mounting

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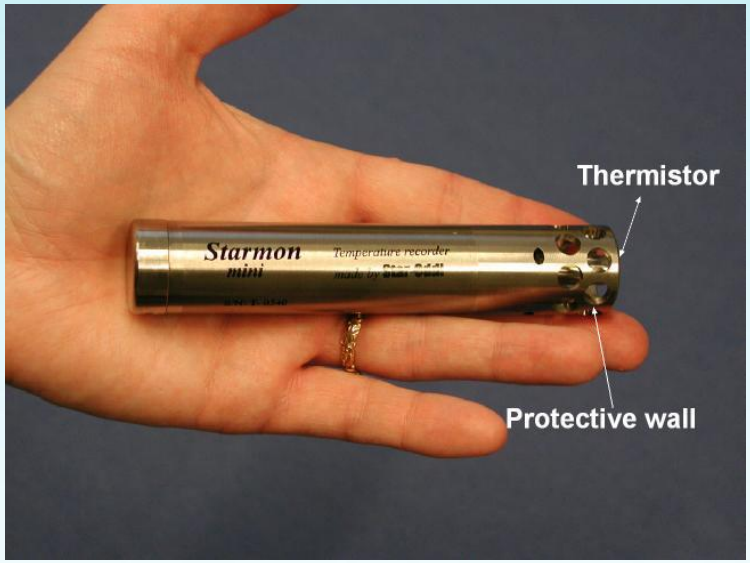
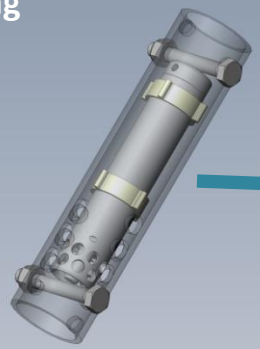
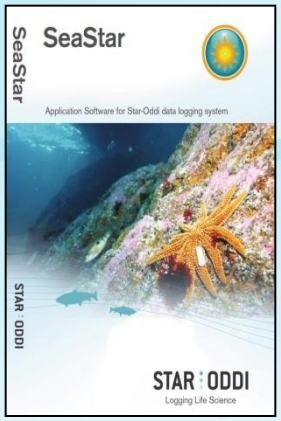


Protective housing



Working with SeaStar

- the application software



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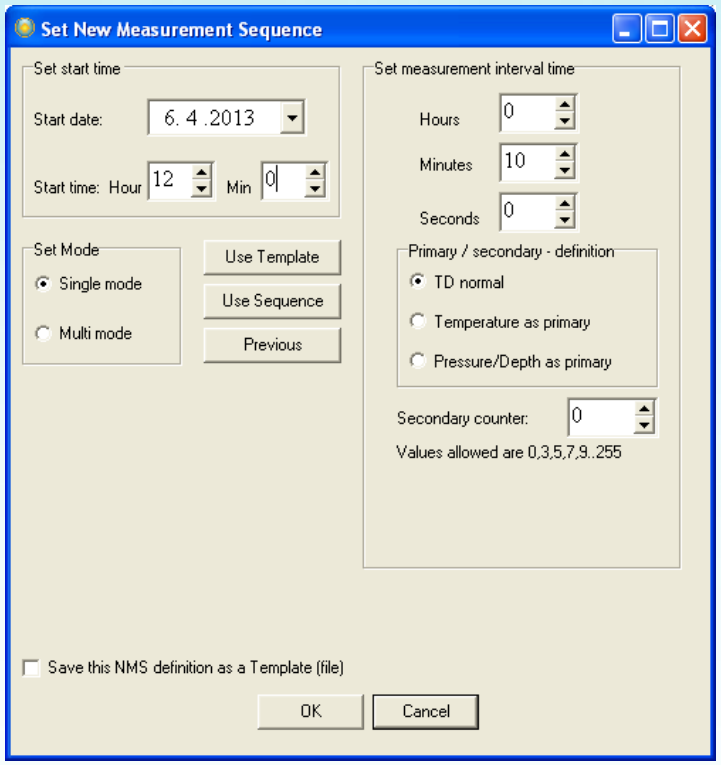
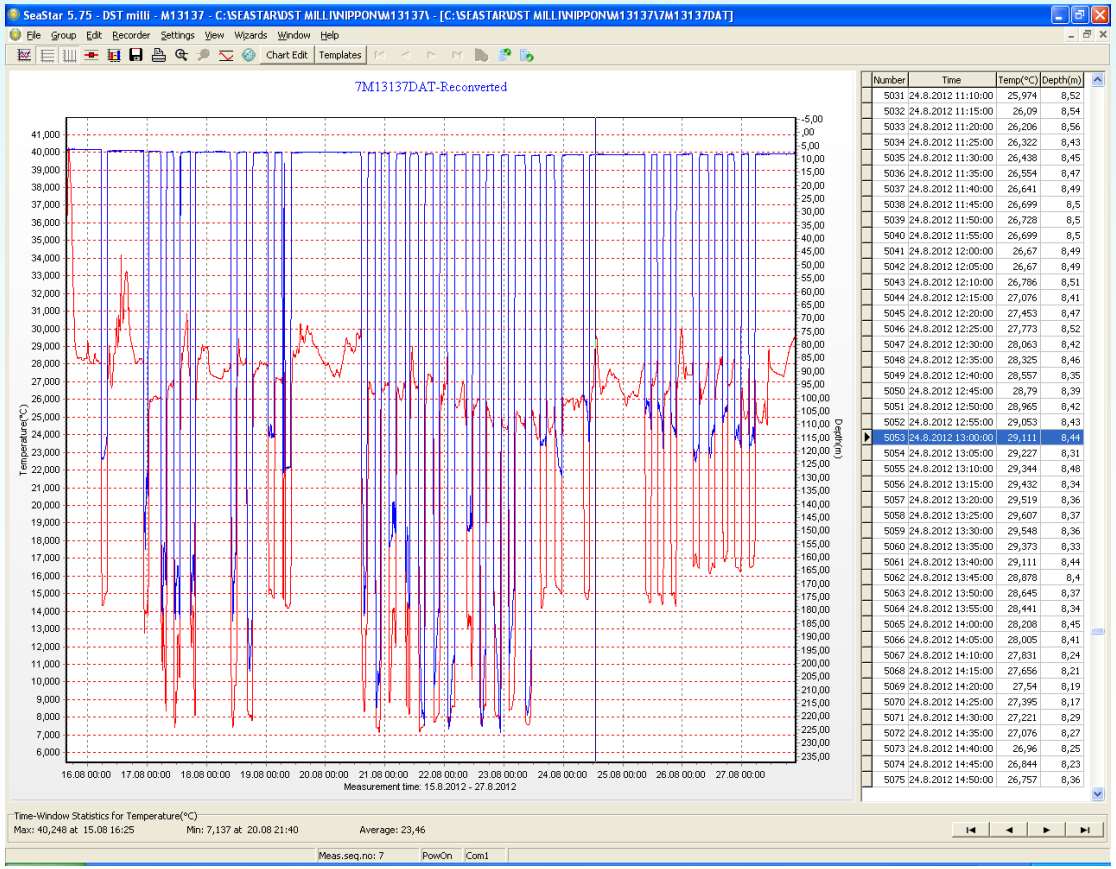
Logging Life Science





Graph and table in SeaStar

-Salinity, temperature & depth

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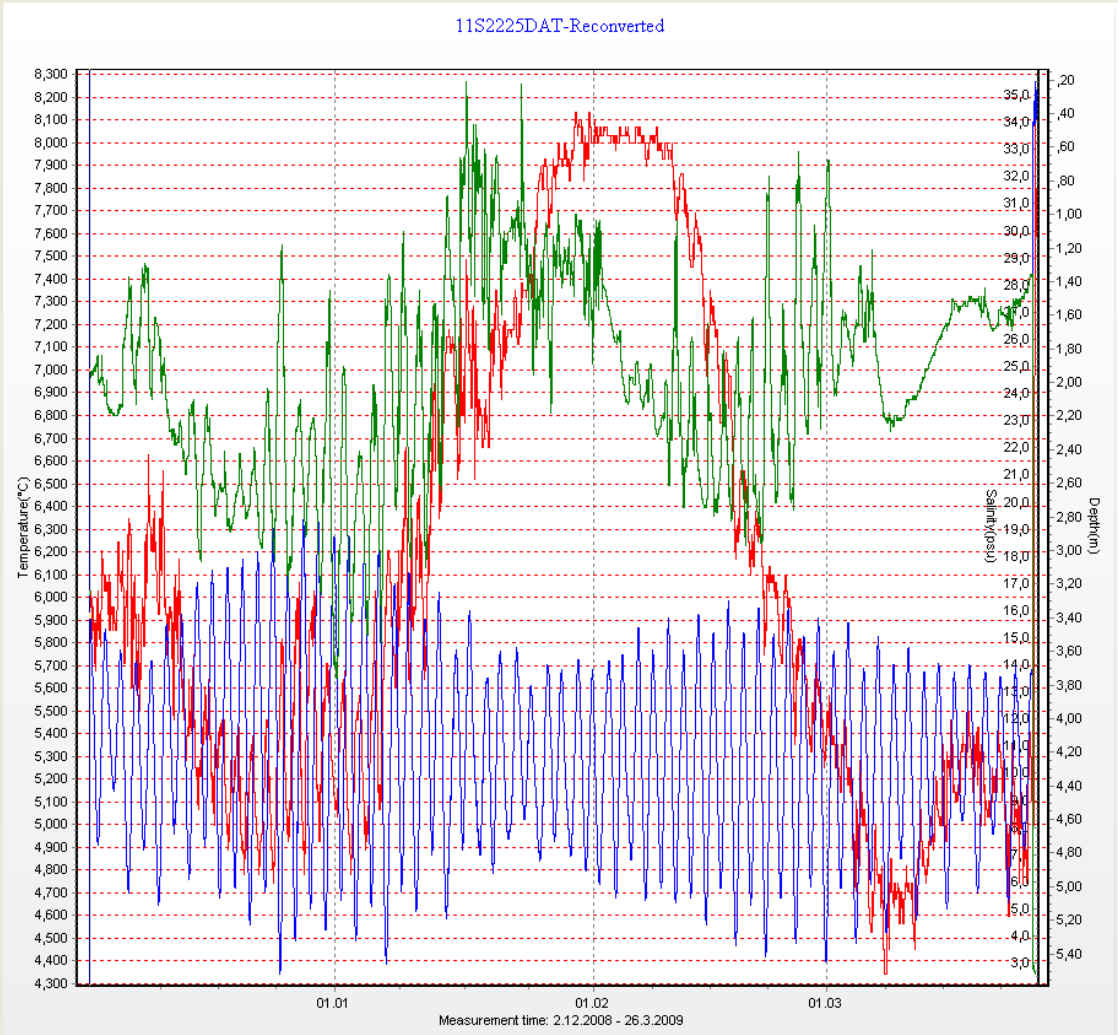
SeaStar 5.75 - DST CTD - S2225 - C:\SEASTAR\DST CTD\RONNIE SNYDER\S2225\ - [C:\SEASTAR\DST CTD\RONNIE SNYDER\S2225\11S2225DAT]

File Group Edit Recorder Settings View Wizards Window Help

Chart Edit | Templates



Number	Time	Temp(°C)	Depth(m)	Salinity(psu)
1	2.12.2008 14:30:00	6,029	3,37	24,9
2	2.12.2008 14:45:00	6,029	3,37	24,9
3	2.12.2008 15:00:00	6,029	3,37	24,9
4	2.12.2008 15:15:00	6,029	3,38	24,9
5	2.12.2008 15:30:00	6,029	3,4	24,9
6	2.12.2008 15:45:00	6,029	3,38	24,9
7	2.12.2008 16:00:00	6,029	3,4	24,8
8	2.12.2008 16:15:00	6,029	3,4	24,8
9	2.12.2008 16:30:00	5,994	3,41	24,8
10	2.12.2008 16:45:00	5,994	3,41	24,8
11	2.12.2008 17:00:00	5,994	3,43	24,8
12	2.12.2008 17:15:00	6,029	3,43	24,8
13	2.12.2008 17:30:00	5,994	3,44	24,8
14	2.12.2008 17:45:00	5,994	3,45	24,8
15	2.12.2008 18:00:00	5,994	3,47	24,7
16	2.12.2008 18:15:00	5,994	3,47	24,7
17	2.12.2008 18:30:00	5,994	3,48	24,7
18	2.12.2008 18:45:00	5,959	3,48	24,7
19	2.12.2008 19:00:00	5,959	3,51	24,7
20	2.12.2008 19:15:00	5,994	3,53	24,6
21	2.12.2008 19:30:00	5,994	3,53	24,7
22	2.12.2008 19:45:00	5,959	3,54	24,7
23	2.12.2008 20:00:00	5,994	3,56	24,7
24	2.12.2008 20:15:00	5,959	3,57	24,7
25	2.12.2008 20:30:00	5,959	3,57	24,7
26	2.12.2008 20:45:00	5,959	3,6	24,7
27	2.12.2008 21:00:00	5,959	3,61	24,7
28	2.12.2008 21:15:00	5,959	3,63	24,7
29	2.12.2008 21:30:00	5,959	3,63	24,7
30	2.12.2008 21:45:00	5,959	3,63	24,7
31	2.12.2008 22:00:00	5,959	3,66	24,7
32	2.12.2008 22:15:00	5,853	3,66	24,8
33	2.12.2008 22:30:00	5,817	3,69	24,7
34	2.12.2008 22:45:00	5,817	3,71	24,7
35	2.12.2008 23:00:00	5,817	3,72	24,7
36	2.12.2008 23:15:00	5,853	3,74	24,7
37	2.12.2008 23:30:00	5,853	3,75	24,8
38	2.12.2008 23:45:00	5,853	3,77	24,8
39	3.12.2008 00:00:00	5,888	3,78	24,7
40	3.12.2008 00:15:00	5,888	3,8	24,7
41	3.12.2008 00:30:00	5,888	3,81	24,7
42	3.12.2008 00:45:00	5,888	3,83	24,7
43	3.12.2008 01:00:00	5,923	3,86	24,8
44	3.12.2008 01:15:00	5,959	3,86	24,8
45	3.12.2008 01:30:00	5,959	3,89	24,8

Time-Window Statistics for Temperature(°C)
Max: 8,27 at 26.03 Min: 4,341 at 07.03 Average: 6,125

Meas.seq.no: 11 PowOn Com1

Graph and table in Seastar

-Compass, tilt, temperature & depth

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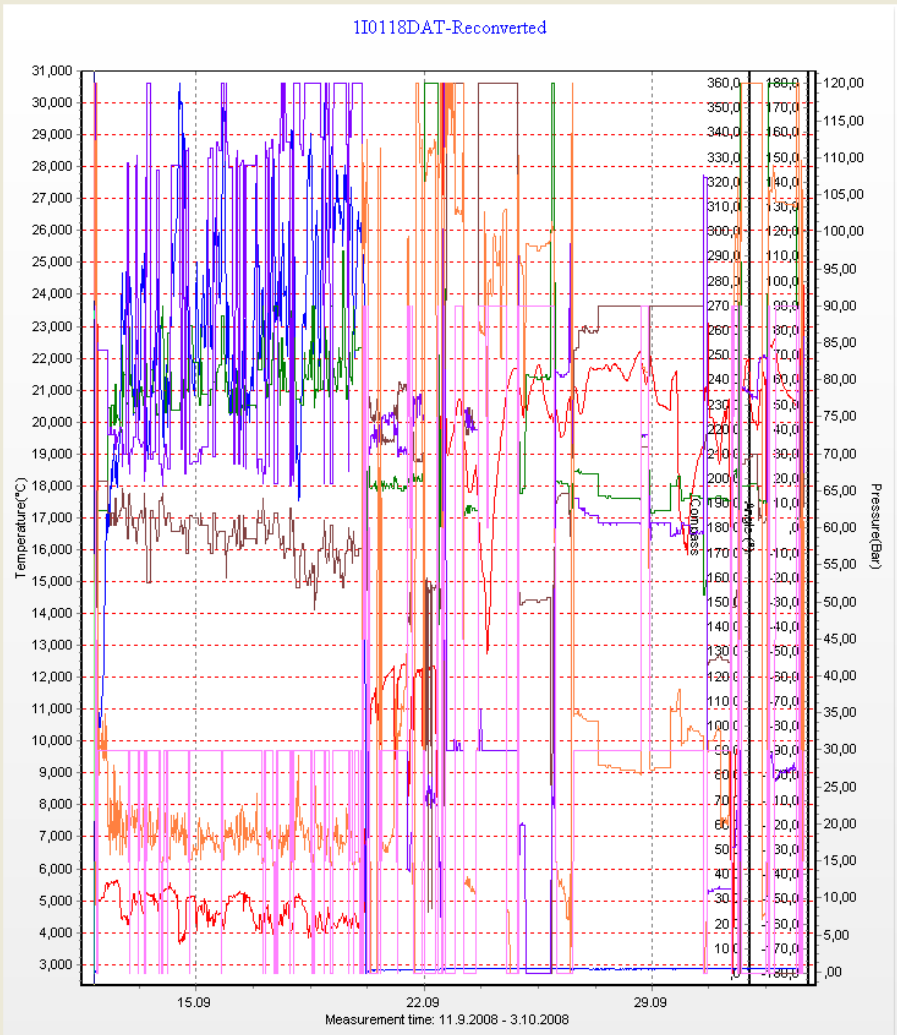
SeaStar 5.75 - DST comp-tilt - I0118 - C:\SEASTAR\DST COMP-TILT\I0118\ - [C:\SEASTAR\DST COMP-TILT\I0118\I0118DAT]

File Group Edit Recorder Settings View Wizards Window Help

Chart Edit | Templates



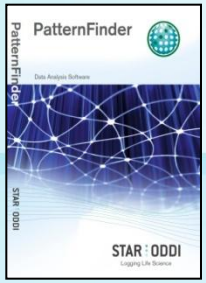
Number	Time	Temp(°C)	Press(Bar)	Tilt-X(°)	Tilt-Y(°)	Tilt-Z(°)	Comp.H(°)	Comp.4p(°)
1	11.9.2008 21:00:00	23,248	0,21	180	-26	-118	0	0
2	11.9.2008 21:30:00	23,737	0,17	4	5	74	55	90
3	11.9.2008 22:00:00	26,752	0,02	-15	-81	180	314	270
4	11.9.2008 22:30:00	24,57	0,19	9	16	66	360	0
5	11.9.2008 23:00:00	23,248	0,16	6	19	79	360	0
6	11.9.2008 23:30:00	22,961	0,2	7	19	72	31	0
7	12.9.2008 00:00:00	4,942	22,36	7	19	72	61	90
8	12.9.2008 00:30:00	5,014	34,96	7	19	72	99	90
9	12.9.2008 01:00:00	5,014	32,45	7	19	72	89	90
10	12.9.2008 01:30:00	5,014	33,46	7	19	72	92	90
11	12.9.2008 02:00:00	5,05	35,52	7	19	72	90	90
12	12.9.2008 02:30:00	5,086	37,27	7	19	72	92	90
13	12.9.2008 03:00:00	5,086	37,43	7	19	72	102	90
14	12.9.2008 03:30:00	5,086	39,53	7	19	72	88	90
15	12.9.2008 04:00:00	5,086	40,59	7	19	72	86	90
16	12.9.2008 04:30:00	5,194	45,06	7	19	72	94	90
17	12.9.2008 05:00:00	5,337	53,68	7	19	72	87	90
18	12.9.2008 05:30:00	5,409	55,98	7	19	72	105	90
19	12.9.2008 06:00:00	5,552	60,34	7	19	72	96	90
20	12.9.2008 06:30:00	5,552	63,48	7	19	72	76	90
21	12.9.2008 07:00:00	5,373	59,43	49	6	38	64	90
22	12.9.2008 07:30:00	5,516	63,13	49	6	38	55	90
23	12.9.2008 08:00:00	5,445	60,23	49	6	38	60	90
24	12.9.2008 08:30:00	5,516	63,68	49	6	38	48	90
25	12.9.2008 09:00:00	5,516	63,53	41	1	41	71	90
26	12.9.2008 09:30:00	5,552	67,92	41	1	41	57	90
27	12.9.2008 10:00:00	5,587	65,28	50	6	38	70	90
28	12.9.2008 10:30:00	5,552	67,08	50	6	38	54	90
29	12.9.2008 11:00:00	5,587	71,07	50	6	38	55	90
30	12.9.2008 11:30:00	5,48	71,21	42	1	40	84	90
31	12.9.2008 12:00:00	5,587	66,73	42	1	40	80	90
32	12.9.2008 12:30:00	5,552	68,67	58	12	32	60	90
33	12.9.2008 13:00:00	5,623	65,98	58	12	32	50	90
34	12.9.2008 13:30:00	5,587	69,82	43	1	38	68	90
35	12.9.2008 14:00:00	5,587	65,48	46	3	35	70	90
36	12.9.2008 14:30:00	5,623	67,18	46	3	35	56	90
37	12.9.2008 15:00:00	5,48	70,46	44	5	39	66	90
38	12.9.2008 15:30:00	5,409	72,3	44	5	39	48	90
39	12.9.2008 16:00:00	4,978	74,76	39	7	41	76	90
40	12.9.2008 16:30:00	4,543	82,2	39	7	41	64	90
41	12.9.2008 17:00:00	4,433	88,41	39	7	41	65	90
42	12.9.2008 17:30:00	4,397	94,43	43	9	40	61	90
43	12.9.2008 18:00:00	4,433	90,2	74	16	25	48	90
44	12.9.2008 18:30:00	4,506	86,23	53	13	34	61	90
45	12.9.2008 19:00:00	4,506	86,53	62	8	30	57	90

Time-Window Statistics for Temperature(°C)
Max: 30,62 at 22.09 Min: 2,72 at 01.10 Average: 13,42

Meas.seq.no: 1 | PowOn | Com1

PatternFinder software

- when analysing large amount of data



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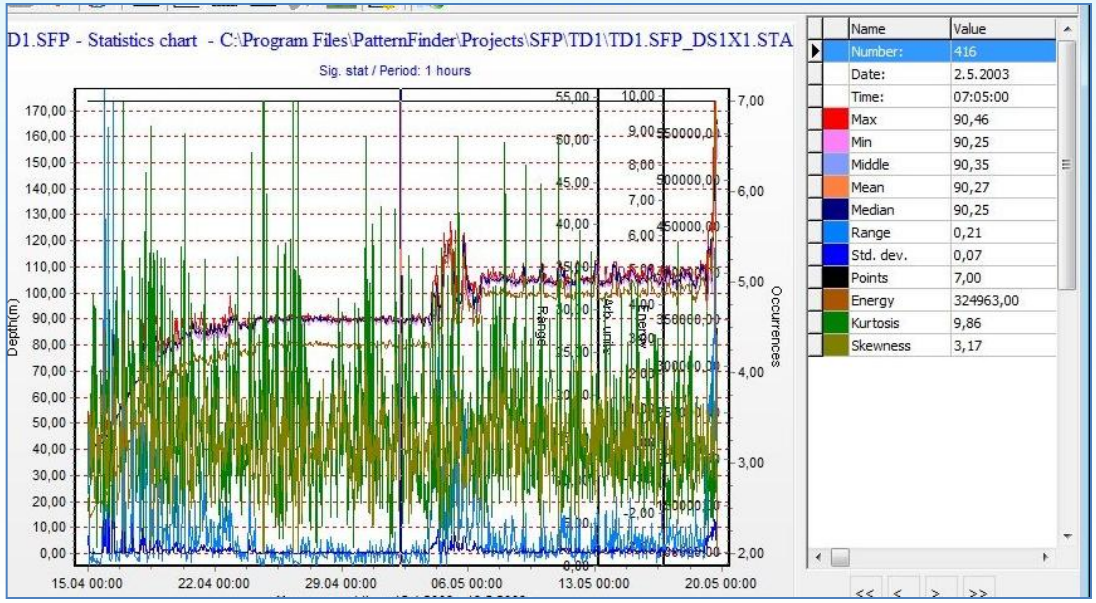
- Analyze any time-series data from any instrument
- Import text format data



Key Features

- Periodic statistics analysis
- Signal filtering and operations
- Overlay graphs
- Event analysis
- Pattern analysis

Import of data in PatternFinder

- Example: 22 years of temp data from a salmon river

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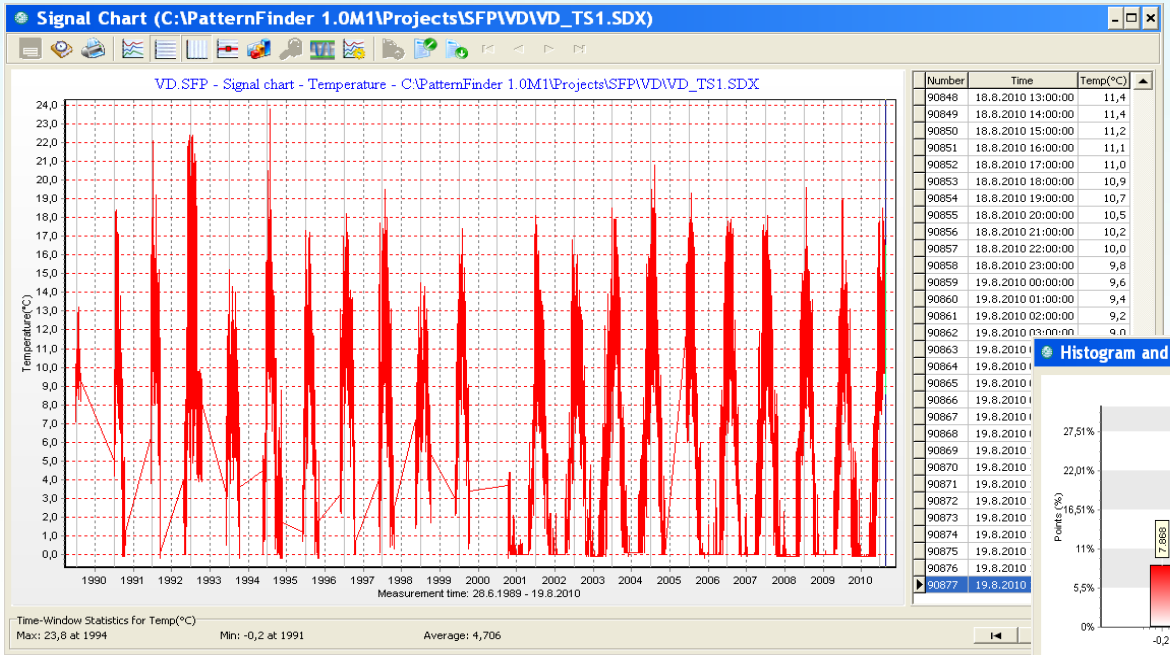
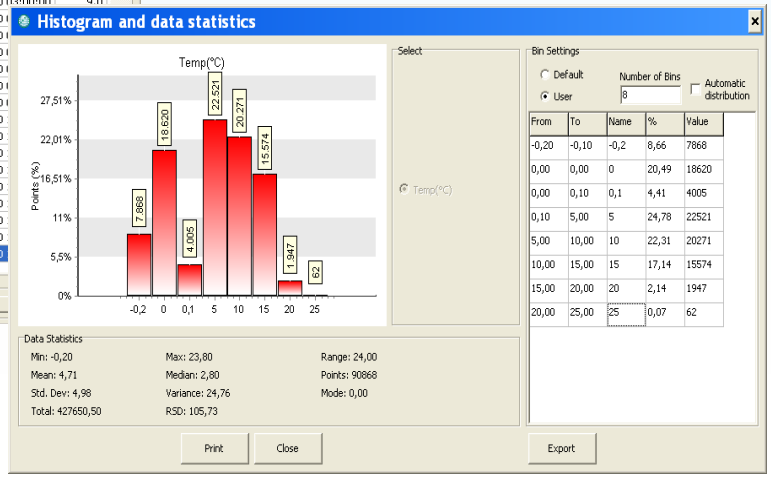
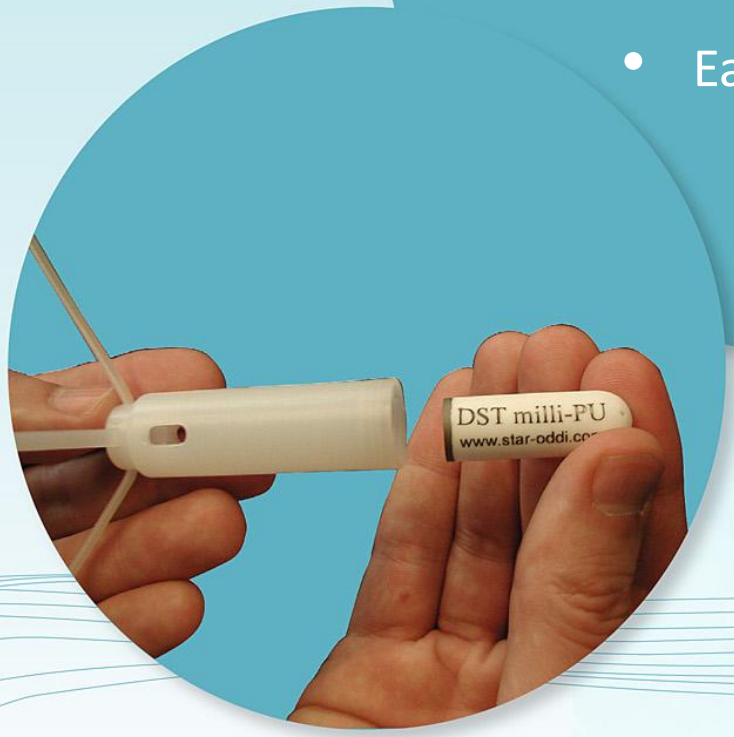
- Creation of one graph from multiple data recordings
- Seasonal statistics analysis
- Monthly averages comparisons





Small and practical pasteurisation logger

- No external device
- Accurate measurements inside the container
- Monitor throughout the manufacturing process
- Easy to use



DST milli PU

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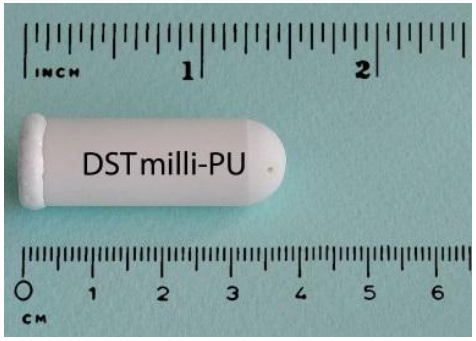
DSTs	Size (mm)	Features	Main researches
Milli-PU	38.4 x 12.5	Available types: • **Milli PU-T (Temperature)** • **Milli PU-TD (Temperature-Pressure)** • **Features:** • Temperature calibration range up to 80°C •Pressure calibration up to 10 bar • Temp accuracy +/-0.1°C, pressure accuracy +/-0.04 bar **Advantages:** • The bottle can be closed with the logger inside-more accurate •Low start-up cost	Used for: • Used in different types of beverages, mainly beer • Quality control during tunnel pasteurization in breweries. • Improving biological stability of the final product • R&D container research • Packaging and logistics • Quality assurance during transport



Accessories

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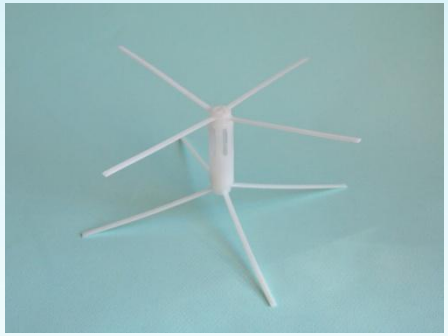
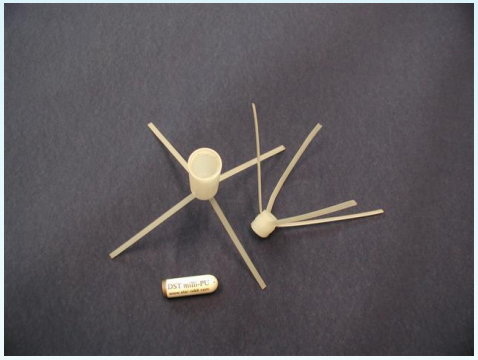
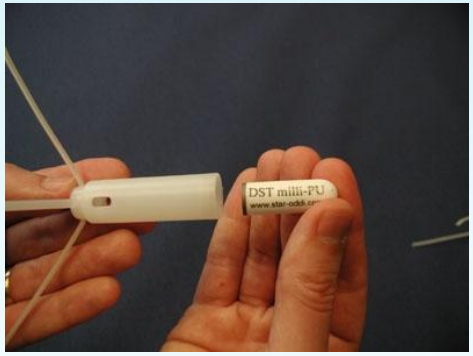
- Specially designed spider bracket to:
  - Keep the bottle in an approximate central position – more accurate





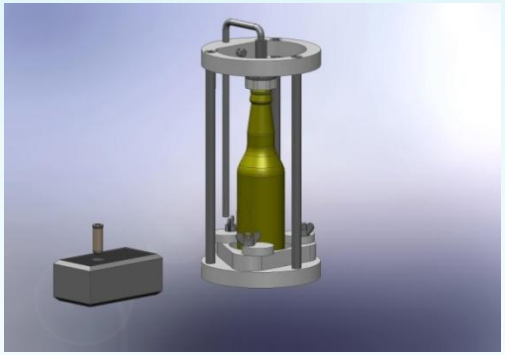


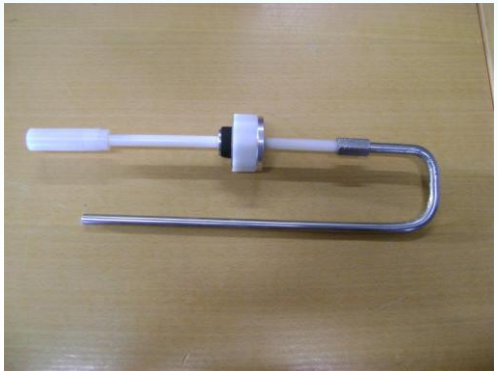
Accessories

- Specially designed bottle tray:
  - For easily identifying the test bottle in production line

Local brewerie solution:

Star-Oddi solution:





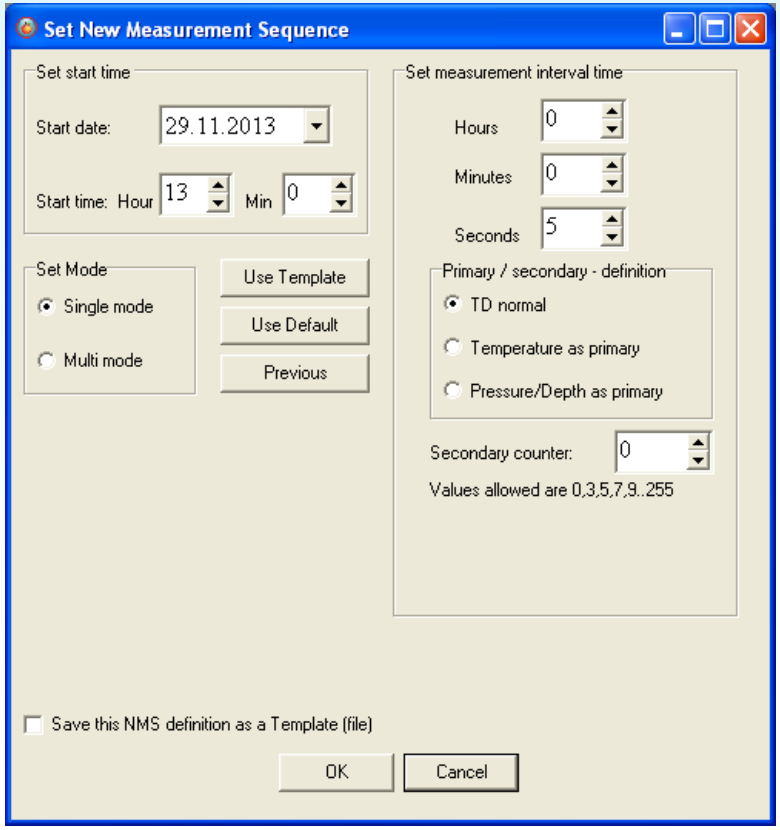
DST communication via com box

- Three lights: red for power, yellow for connection, green for DST
- DST inserted into the communication box – green light appears
- RF wireless communications with DST
- Connects to a PC using either 9 pin serial RS232 and USB
- DST can be reused as long as battery lasts

FoodStar software
- for data analysis and starting the DST

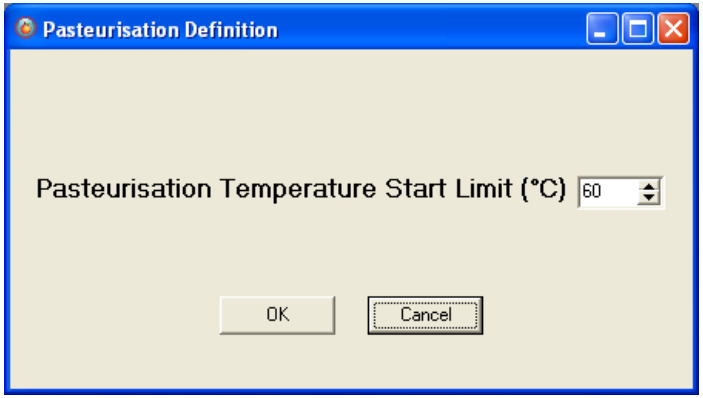
STAR ODDI
Logging Life Science

- Start date & time and sampling interval is defined
- Data retrieved into the software
- Data analysis and option to export data



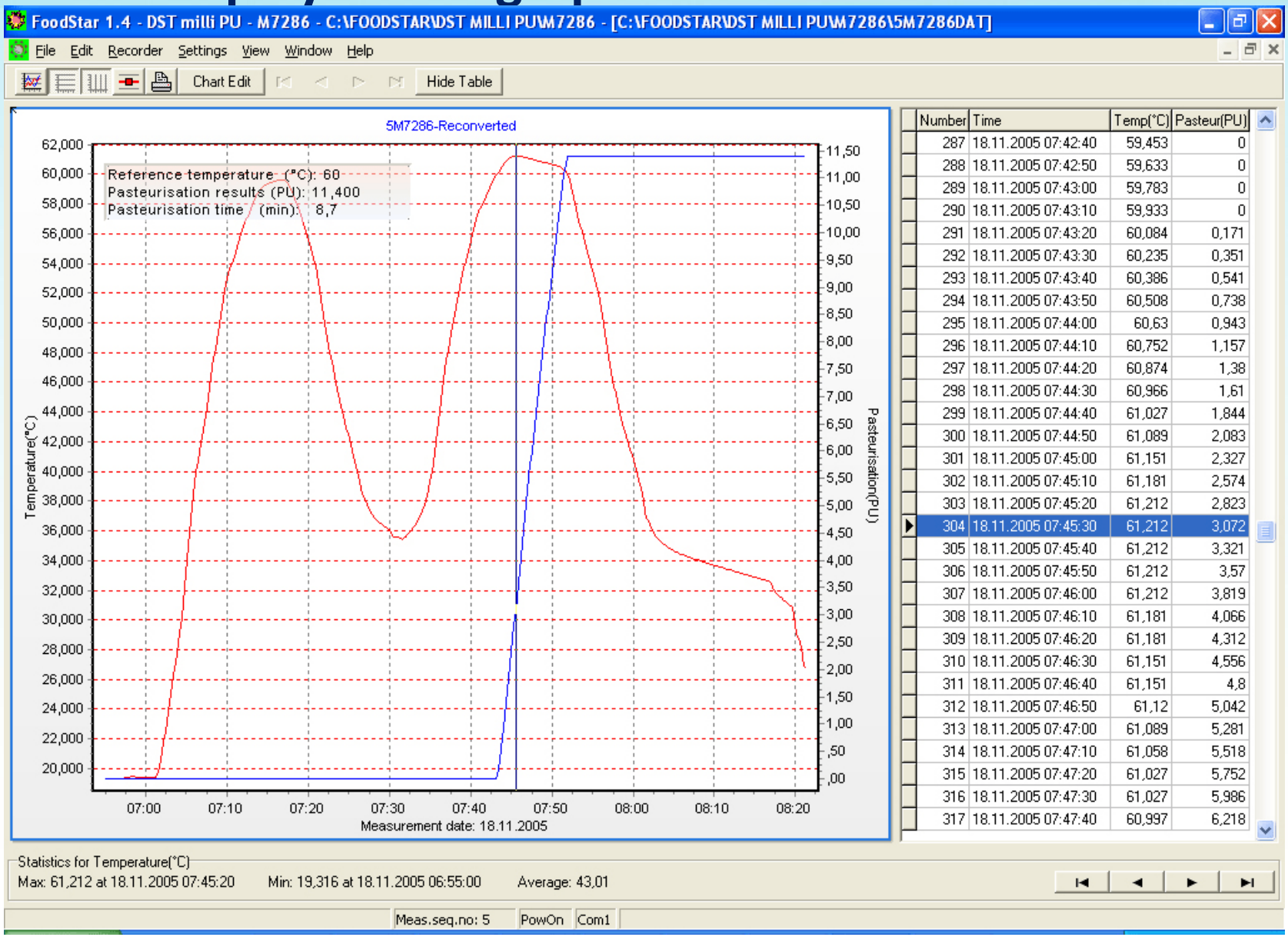
- Gives time stamped data on:

-Accumulated PU value
(1 PU for 1 minute @ 60 C)
-Temperature
-Pressure
-CO2



FoodStar
- data displayed in a graph and table

STAR ODDI
Logging Life Science



Number	Time	Temp(°C)	Pasteur(PU)
287	18.11.2005 07:42:40	59,453	0
288	18.11.2005 07:42:50	59,633	0
289	18.11.2005 07:43:00	59,783	0
290	18.11.2005 07:43:10	59,933	0
291	18.11.2005 07:43:20	60,084	0,171
292	18.11.2005 07:43:30	60,235	0,351
293	18.11.2005 07:43:40	60,386	0,541
294	18.11.2005 07:43:50	60,508	0,738
295	18.11.2005 07:44:00	60,63	0,943
296	18.11.2005 07:44:10	60,752	1,157
297	18.11.2005 07:44:20	60,874	1,38
298	18.11.2005 07:44:30	60,966	1,61
299	18.11.2005 07:44:40	61,027	1,844
300	18.11.2005 07:44:50	61,089	2,083
301	18.11.2005 07:45:00	61,151	2,327
302	18.11.2005 07:45:10	61,181	2,574
303	18.11.2005 07:45:20	61,212	2,823
304	18.11.2005 07:45:30	61,212	3,072
305	18.11.2005 07:45:40	61,212	3,321
306	18.11.2005 07:45:50	61,212	3,57
307	18.11.2005 07:46:00	61,212	3,819
308	18.11.2005 07:46:10	61,181	4,066
309	18.11.2005 07:46:20	61,181	4,312
310	18.11.2005 07:46:30	61,151	4,556
311	18.11.2005 07:46:40	61,151	4,8
312	18.11.2005 07:46:50	61,12	5,042
313	18.11.2005 07:47:00	61,089	5,281
314	18.11.2005 07:47:10	61,058	5,518
315	18.11.2005 07:47:20	61,027	5,752
316	18.11.2005 07:47:30	61,027	5,986
317	18.11.2005 07:47:40	60,997	6,218

Next steps & future support

STAR : ODDI
Logging Life Science

- BabEnviro marketing activities
- Support from SO: sample kit, brochures, pictures etc.

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