Sensor data

# CALCULATIONS

THELMABIOTEL
let the fish talk to you

03/2023 - r1.0

# TABLE OF CONTENTS

# ACTIVITY

## Equation:

**Activity = slope x transmit data + Intercept [unit]**

## Example parameters:

**Slope** = 0.013588
**Intercept** = 0
**Unit** = $m/s^2$
**Activity minimum** = 0 $m/s^2$ (transmit data min = 0)
**Activity maximum** = 3.465 $m/s^2$ (transmit data max = 255)
**Measurement** = RMS

The above parameters can be found in your delivery note/specifications sheet

Following values are used for **standard activity sensor transmitters**:

**Slope** = 0.013588 **Intercept** = 0

## Example calculation, **standard activity sensor**:

| Date and time (UTC) | ID | Data | Protocol |
|---|---|---|---|
| 2020-11-04T00:00:06.894Z | 71 | 2 | S256-69kHz |
| **2020-11-04T00:03:17.894Z** | **71** | **2** | **S256-69kHz** |
| 2020-11-04T00:11:44.894Z | 71 | 1 | S256-69kHz |
| 2020-11-04T00:15:40.894Z | 71 | 10 | S256-69kHz |

Calculation of **highlighted line** in standard example dataset above:

Slope: 0.013588 $m/s^2$
Intercept: 0
Data: 2

Applied in equation:
Activity = (0.013588 x 2 + 0) $m/s^2$
Activity = 0.027176 $m/s^2$

**For custom sensor transmitter calculations, please check delivery note / specifications, or contact mail@thelmabiotel.com**

# DEPTH

## Equation:

**Depth = slope x transmit data + Intercept [unit]**

## Example parameters:

**Slope** = 0.5098
**Intercept** = 0
**Unit** = m
**Depth minimum** = 0 m (transmit data min = 0)
**Depth maximum** = 130 m (transmit data max = 255)

The highlighted parameters above can be found in your delivery note/specifications sheet

Following values are used for **standard depth sensor transmitters**:

**Slope** = See standard depth range table below

**Intercept** = 0

## Example calculation, **standard depth sensor**:

| Date and time (UTC) | ID | Data | Protocol |
|---|---|---|---|
| 2016-11-04T00:00:06.894Z | 45 | 117 | S256-69kHz |
| **2016-11-04T00:03:17.894Z** | **45** | **117** | **S256-69kHz** |
| 2016-11-04T00:11:44.894Z | 45 | 125 | S256-69kHz |
| 2016-11-04T00:15:40.894Z | 45 | 123 | S256-69kHz |

Calculation of **highlighted line** in standard example dataset above:

Slope: 0.5098
Intercept: 0
Data: 117

Applied in equation:
Depth = (0.5098 x 117 + 0) m
Depth = 60 m

| Max Depth [m] | Resolution [m] |
|---|---|
| 25.5 | 0.1000 |
| 51 | 0.2000 |
| 63.75 | 0.2500 |
| 86.7 | 0.3400 |
| 100 | 0.3922 |
| 130 | 0.5098 |
| 290 | 1.1373 |

**Table 1. Standard** depth range alternatives

**For custom sensor transmitter calculations, please check delivery note / specifications, or contact mail@thelmabiotel.com**

# INCLINATION

## Equation:

**Tilt = slope x transmit data + Intercept [unit]**

## Example parameters:

**Slope** = 1
**Intercept** = 0
**Unit** = °
**Tilt minimum** = 0 ° (transmit data min = 0)
**Tilt maximum** = 180 ° (transmit data max = 180)

The above parameters can be found in your delivery note/specifications sheet

Following values are used for **standard inclination sensor transmitters**:

**Slope** = 1 **Intercept** = 0

## Example calculation, **standard tilt sensor**:

| Date and time (UTC) | ID | Data | Protocol |
|---|---|---|---|
| 2018-11-04T00:02:09.894Z | 65 | 45 | S256-69kHz |
| **2018-11-04T00:08:20.894Z** | **65** | **46** | **S256-69kHz** |
| 2018-11-04T00:13:54.894Z | 65 | 46 | S256-69kHz |
| 2018-11-04T00:17:38.894Z | 65 | 47 | S256-69kHz |

Calculation of **highlighted line** in standard example dataset above:

Slope: 1
Intercept: 0
Data: 46

Applied in equation:
Tilt = (1 x 46 + 0) °
Tilt = 46 °

***NOTE**: The tilt output from the inclination sensor is measured relative to a fixed zero/baseline. The 0° tilt or baseline can be set by the user or from the factory using a magnet command sequence.*

**For custom sensor transmitter calculations, please check delivery note / specifications, or contact mail@thelmabiotel.com**

# MORTALITY

## Equation:

**CurrentTiltAngle = slope x transmit data + Intercept [unit]**

## Example parameters:

**Slope** = 1
**Intercept** = 0
**Unit** = °
**CurrentTiltAngle minimum** = 0 ° (transmit data min = 0)
**CurrentTiltAngle maximum** = 180 ° (transmit data max = 180)

The above parameters can be found in your delivery note/specifications sheet

Following values are used for **standard mortality sensor transmitters**:

**Slope** = 1 **Intercept** = 0

## Example calculation, **standard mortality sensor**:

| Date and time (UTC) | ID | Data | Protocol |
|---|---|---|---|
| 2018-11-04T00:02:09.894Z | 53 | 3 | S256-69kHz |
| **2018-11-04T00:08:20.894Z** | **53** | **122** | **S256-69kHz** |
| 2018-11-04T00:09:27.894Z | 54 | 120 | S256-69kHz |
| 2018-11-04T00:09:30.894Z | 54 | 119 | S256-69kHz |

Calculation of **highlighted line** in standard example dataset above:

Slope: 1
Intercept: 0
Data: 122

Applied in equation:
**CurrentTiltAngle** = (1 x 122 + 0) °
**CurrentTiltAngle** = 122 °

***NOTE**: The orientation output from the mortality sensor is measured relative to a dynamic zero/baseline. The 0° orientation or baseline is slowly updated over time so that the transmitter can move inside the animal.*

**For custom sensor transmitter calculations, please check delivery note / specifications, or contact mail@thelmabiotel.com**

# TEMPERATURE

## Equation:

**Temperature = slope x transmit data + Intercept [unit]**

## Example parameters:

**Slope** = 0.1
**Intercept** = 0
**Unit** = °C
**Temperature minimum** = 0 °C (transmit data min = 0)
**Temperature maximum** = 25.5 °C (transmit data max = 255)

The above parameters can be found in your delivery note/specifications sheet

Following values are used for **standard temperature sensor transmitters**:

**Slope** = 0.1 **Intercept** = 0

## Example calculation, **standard temperature sensor**:

| Date and time (UTC) | ID | Data | Protocol |
|---|---|---|---|
| 2018-11-04T00:02:09.894Z | 148 | 56 | S256-69kHz |
| **2018-11-04T00:08:20.894Z** | **148** | **57** | **S256-69kHz** |
| 2018-11-04T00:13:54.894Z | 148 | 58 | S256-69kHz |
| 2018-11-04T00:17:38.894Z | 148 | 61 | S256-69kHz |

Calculation of **highlighted line** in standard example dataset above:

Slope: 0.1
Intercept: 0
Data: 57

Applied in equation:
Temperature = (0.1 x 57 + 0) °C
Temperature = 5.7 °C

**For custom sensor transmitter calculations, please check delivery note / specifications, or contact mail@thelmabiotel.com**

# CONDUCTIVITY

## Equation:

**Conductivity = slope x transmit data + Intercept [unit]**

## Example parameters:

**Slope** = 10
**Intercept** = 0
**Unit** = µS/cm
**Conductivity minimum** = 0 µS/cm (transmit data min = 0)
**Conductivity maximum** = 2500 µS/cm (transmit data max = 250)

The above parameters can be found in your delivery note/specifications sheet

Following values are used for **standard conductivity sensor transmitters**:

**Slope** = 10 **Intercept** = 0

## Example calculation, **standard conductivity sensor**:

| Date and time (UTC) | ID | Data | Protocol |
|---|---|---|---|
| 2018-11-04T00:02:09.894Z | 2 | 143 | S256-69kHz |
| **2018-11-04T00:08:20.894Z** | **2** | **146** | **S256-69kHz** |
| 2018-11-04T00:13:54.894Z | 2 | 158 | S256-69kHz |
| 2018-11-04T00:17:38.894Z | 2 | 167 | S256-69kHz |

Calculation of **highlighted line** in standard example dataset above:

Slope: 10
Intercept: 0
Data: 146

Applied in equation:
Conductivity = (10 x 146 + 0) µS/cm
Conductivity = 1460 µS/cm

**For custom sensor transmitter calculations, please check delivery note / specifications, or contact mail@thelmabiotel.com**

# SALINITY

## Equation:

**Salinity = slope x transmit data + Intercept [unit]**

## Example parameters:

**Slope** = 1
**Intercept** = 0
**Unit** = ppt
**Salinity minimum** = 0 ppt (transmit data min = 0)
**Salinity maximum** = 42 ppt (transmit data max = 42)

The above parameters can be found in your delivery note/specifications sheet

Following values are used for **standard conductivity sensor transmitters**:

**Slope** = 1 **Intercept** = 0

## Example calculation, **standard salinity sensor**:

| Date and time (UTC) | ID | Data | Protocol |
|---|---|---|---|
| 2018-11-04T00:04:10.894Z | 21 | 20 | S256-69kHz |
| **2018-11-04T00:10:43.894Z** | **21** | **22** | **S256-69kHz** |
| 2018-11-04T00:14:32.894Z | 21 | 30 | S256-69kHz |
| 2018-11-04T00:18:45.894Z | 21 | 25 | S256-69kHz |

Calculation of **highlighted line** in standard example dataset above:

Slope: 1
Intercept: 0
Data: 22

Applied in equation:
Salinity = (1 x 22 + 0) ppt
Salinity = 22 ppt

**For custom sensor transmitter calculations, please check delivery note / specifications, or contact mail@thelmabiotel.com**

THELMABIOTEL
03/2023 - r1.0