

## ACOUSTIC TRANSMITTER

# DEPTH AND TEMPERATURE



The Thelma Biotel DT transmitter is a low-power and versatile platform for depth and temperature measurements. It can measure down to 290 meters and can be made to present high resolution in any range of interest. The transmitter is produced in four different capsule diameters and with a wide range of battery packs, allowing optimization in size and operational life.

## FEATURES

- ◉ Depth resolution up to 0.54 cm
- ◉ Available in 7.3, 9, 13 and 16mm capsules
- ◉ Long operational lifetime



## DEPTH

The depth sensor can be produced with a set of different depth range alternatives depending on the maximum depth and resolution required. It is capable of measuring depths down to 290 m, but may withstand pressure down to 500 m. The highly sensitive pressure sensor is capable of precision up to 0.54 cm, and calibrated to a static offset of less than  $\pm 50$  cm.

## TEMPERATURE

Temperature sensing is commonly used in the range 0.0°C to 25.5°C with 0.1°C resolution, but a wider temperature range is supported and may be customized to suit special needs.

## SPECIFICATIONS

### Depth

Max measured depth:	290 m
Max survival depth:	500 m
Resolution:	0.0054 m
Max offset:	0.5 m

### Temperature

Min temperature:	0°C
Max temperature:	25.5°C
Max survival depth:	500 m
Resolution:	0.1°C

### Sensor Combinations



DEPTH



TEMPERATURE



ACTIVITY



TILT

# DEPTH SENSOR

The pressure sensor is located at the top of the transmitter and measurements are taken through a small port in the epoxy moulding. The sensor is rated to withstand a maximum absolute pressure of 50 Bar, or approximately 500 m depth. Pressure beyond this may rupture and damage the sensor. The sensor is well protected for normal use and handling, but we propose to avoid long immersion in solvents. 70% ethanol dip and wipe is the preferred disinfection procedure.

## Transmitted Depth Value

Limitations in the transmitter protocols may require the high-resolution sensor value to be truncated to a single byte of information. 7 different standard depth ranges are offered to provide flexibility for different use cases. Here resolution may be traded for greater depth range.

All Thelma Biotel depth transmitters measure absolute pressure and are calibrated to 1000 mBar atmospheric pressure at surface level. Variations in atmospheric pressure should be accounted for. An atmospheric pressure of for example 1030 mBar will without correction, add 30 cm. The following equation takes this into consideration when converting transmitted values to depth:

$$\text{depth [m]} = \text{transmit value} \times \text{resolution} - \frac{(P_{\text{atm}} [\text{mBar}] - 1000)}{100}$$

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

# TEMPERATURE SENSOR

The on-board temperature sensor measures temperature with high precision, but is normally limited by code types allowing only a single byte of data. To preserve resolution the temperature is therefore mapped to a value between 0 ( $T_{\text{min}}$ ) and 255 ( $T_{\text{max}}$ ).

$$\text{resolution} = \frac{(T_{\text{max}} - T_{\text{min}})}{255}$$

As a default, the temperature is encoded using the parameters as shown in the table. User defined maximum and minimums may be implemented for temperature measurements beyond the standard bounds.

$T_{\text{min}}$ [°C]	$T_{\text{max}}$ [°C]	Resolution [°C]
0.0	25.5	0.1

Conversion from transmitted value to temperature is done using the following.

$$\text{temperature [°C]} = (\text{transm.value} \times \text{resolution}) + T_{\text{min}}$$

Should the measured temperature fall outside the maximum and minimum limits it will be capped and transmitted as 255 and 0 respectively.