

Tyre Cavity Thermometer Type TCT_{v2}[®]

Product Data and Specification

(Provisional)

Applications:

Measurement of carcass temperature on the inner liner.

Establish presence of hot spots that can lead to early failure

Correlate temperature against load and speed

Correlate temperature with rolling resistance.

Features @ Advantages:

- Infra red thermopile sensor
- Installs securely inside the tyre
- Data immune from environmental noise
- Radio linked
- Radio controlled
- Robust design
- Retains wheel balance
- Tyres inflated as normal
- Wheels run to speeds of 200+ kph

Benefits:

- No thermocouple wires to fatigue fail
- No slip rings to carry data away from the wheel
- Delivers accurate data +/- 0.2 deg. C
- High resolution 0.02 deg C
- Saves time and money
- The same battery unit can power TCM, TCA or TCMA allowing temperature and NVH measurements to be made at the same time.

Figure 1. TCT installed on a rim



TCT is a remote controlled radio Thermometer designed to measure the temperature inside the tyre's cavity. At 1, 2 and 65 points from bead to bead.

A TCT system comprises two small curved aluminium modules, interconnecting umbilical cable, tablet P.C to transmit instructions, receive and display the data in real time.

The two aluminium modules are tensioned against the wheel hub by a stainless steel harness. The modules are connected by a multi-core umbilical cable that includes the antenna.

On standby the TCT battery lasts >10 days and when transmitting continuously >36 hours. It can be turned off between recordings to allow recording over several days.

The output file format is .csv which is easily read into products such as Matlab and Excel for further customer specific analysis.

The radio link range is dependant on wheel and body screening but is typically 5 - 10 metres.

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Figure 2. TCT Prototype module



The size of the TCT is currently identical to the TCM and TCA; the maximum practical size that can be squeezed under the bead of a 15 inch low profile road wheel/tyre. The hole is the portal through which the thermopile senses the temperature of the tyres inner surface.

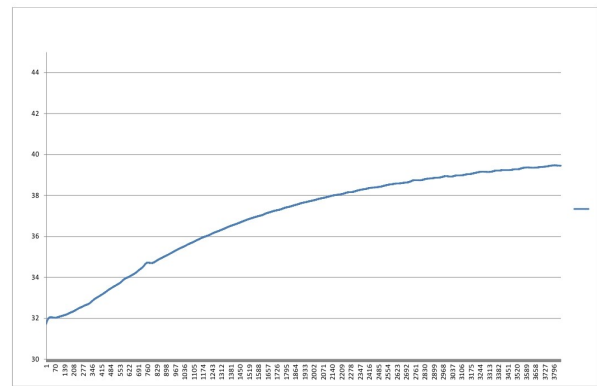
Fitting the TCT inside the tyre

Each TCT module has a harness of stainless steel wire rope attached to each end. The harness is terminated with an eyelet. The combined length of the TCT modules & harnesses allows fitting to wheel rim sizes from 13” upwards. The TCT modules are tensioned against the wheel hub using two good quality cable ties of appropriate length. The interconnecting antenna cable is located against the wheel hub & wire rope using four small cable ties.

Once the tyre is fitted and inflated the TCT when activated, using the radio key fob, will transmit the internal tyre temperature continuously.

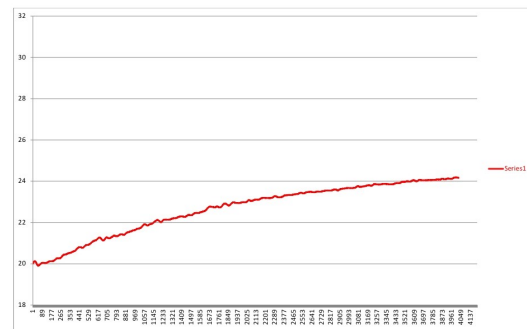
Operation of the system can be checked by warming the tyre at the point on which the TCT’s detector is focused. The temperature measured by the TCT will be seen to climb and then fall as the heat gun is switched on and off. Running in the laboratory on a steel road wheel at different speeds and loads will cause variations in the temperature distribution over the tyre. The TCT can be configured with a single, double, quad or 24 thermopiles; allowing a point, area or a complete section of tyre to be temperature mapped.

Figure 2. Temperature on the tire liner on the tread



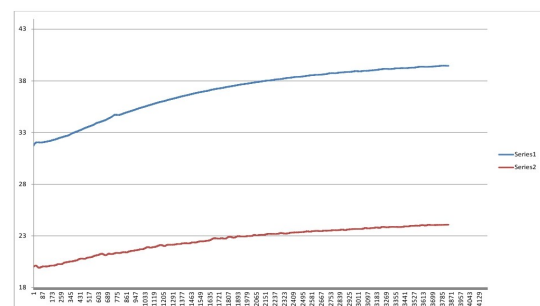
The ordinate (vertical axis) is plotted in degrees C from 30 to 44. The abscissa (horizontal axis) is plotted by sample number which corresponds to a total duration of 15 minutes.

Figure 3. Temperature on the tire liner on the side wall



The ordinate (vertical axis) is plotted in degrees C from 18 to 32. The abscissa (horizontal axis) is plotted by sample number which corresponds to a total duration of 15 minutes.

Figure 4. Comparison of tread and side wall temperatures



The ordinate (vertical axis) is plotted in degrees C from 18 to 44. The abscissa (horizontal axis) is plotted by sample number which corresponds to a total duration of 15 minutes. The Blue line is the tread temperature The Red line is the side wall temperature

The TCT is designed to be used in the harsh environment found inside an automotive tyre. The components of the TCT system are designed to cope with the normal shocks and inputs suffered by a tyre on a road vehicle.

Specifications*:

Accuracy	+/- 0.10 degrees C
Resolution	0.02 degrees C
Reading rate for all points scanned	200 milli seconds
Stability of measurement chain in isothermal conditions >	1 part in 10,000
Stand by period once installed in Tyre >	30 days
Operating time at a reading scan every 10 minutes	24 days
Operating time at a reading scan every 10 seconds	48 hours

Components supplied:

- TCT module with 1,2,4,8, 24 sampling points
- BATTERY module
- Base station receiver module with USB interface for users computer
- Software for Window PC to set up and receive the data
- Data file formatted to be read by Excel.

Power supply.....internal rechargeable battery

<i>Charge cycle</i>	
<i>Stand-by time</i>	10 days
<i>Continuous Transmit time</i>	30 hours
Typical combination.....8 days standby then operate for	12 hours
Predicted battery life.....	500 cycles

Radio Link

<i>Activation radio range</i>	15 metres
<i>Data transmission range</i>	> 15 metres

Accessories included

	<i>Number</i>
<i>Umbilical cable with integral antenna</i>	2
<i>Vehicle external magnetic mount for antenna</i>	1
<i>5 meter RF cable (magnetic mount to BNC)</i>	1
<i>Battery charger</i>	1

Three (3) Year Warrantee extendable to five (5) years

Fitting the TCT inside the tyre cavity and the environment inside the tyre are less than benign activities. To make TCT ownership as risk free as possible Bay Systems offers a three (3) year warrantee. This can be extended to five years @ 15% of current list price.

The guarantee covers the repair or replacement of the entire TCT system, provided no seal has been broken, for all failures except the destruction of the TCT due to detachment inside the wheel or damage caused by tyre fitting machines. In the case of tyre fitting and detachment inside the wheel a replacement TCT will be offered at a 40% reduction to current list price.

*** Specifications liable to change without notice. Please enquire to obtain the latest specification before placing your order.**

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