

Tyre Cavity Thermometer Type TCT[®] v8 March 2020

Figure 1. TCT installed on a rim



Product Data and Specification

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

Update Finite Element Tyre models

Features @ Advantages:

- Infra red thermopile sensor (pyrometer)
- 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
- Battery can be recharged inside wheel
- Continuous recording over days/weeks/months
- Resolutions = from single spot to 64 pixels
- Field of view ranges from 40-60-120 degrees
- Spot temperatures over 14-20-60 degrees
- Sensor carriers for vertical and 45 degree angles
- Excel based analysis software included.

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 allowing temperature and NVH measurements to be made at the same time.

TCT is a remotely controlled precision pyrometer array designed to measure the tyre liner's temperature. The TCT is mounted on the rim in the same way as TCM (microphone), see figure 1, using a stainless steel harness. The temperatures are measured at intervals of one second or any longer interval. The projected field of view for the pyrometer (fov) is 40, 60 & 120 degrees, set in a vertical carrier, is shown at figures 2. The fov for a 120 sensor mounted in a 45 degree carrier is shown in figure 3. The TCT's with these sensors mounted can be seen in figures 4 & 6.

A TCT system comprises two small curved aluminium modules connected using an umbilical cable. A tablet P.C transmits instructions and receives the data in real time.

Continuously transmission for >24 hours is achieved without recharging the battery. For longer term trials the battery can be recharged whilst inside the wheel.

The output file's format is .csv which is easily read into the supplied analysis software and can be read into many other analysis tools, such as MATLAB.

The radio link's range is dependant on the amount of wheel and vehicle screening of the radio signal. In the laboratory the range is typically 5 - 10 metres, line of sight.

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Figure 2. fov coverage of 40, 60 & 120 sensors mounted in 90 degree carrier

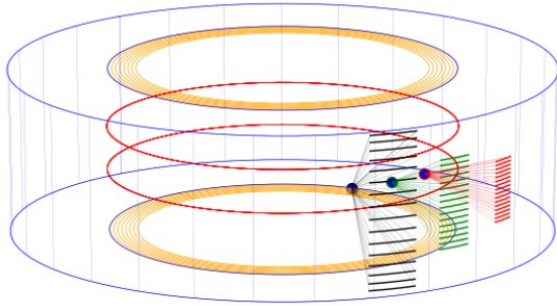


Figure 3. fov coverage of 120 deg fov sensor mounted in 45 deg carrier

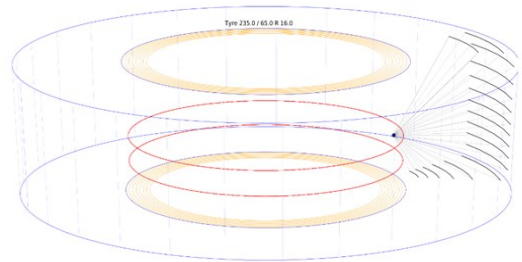


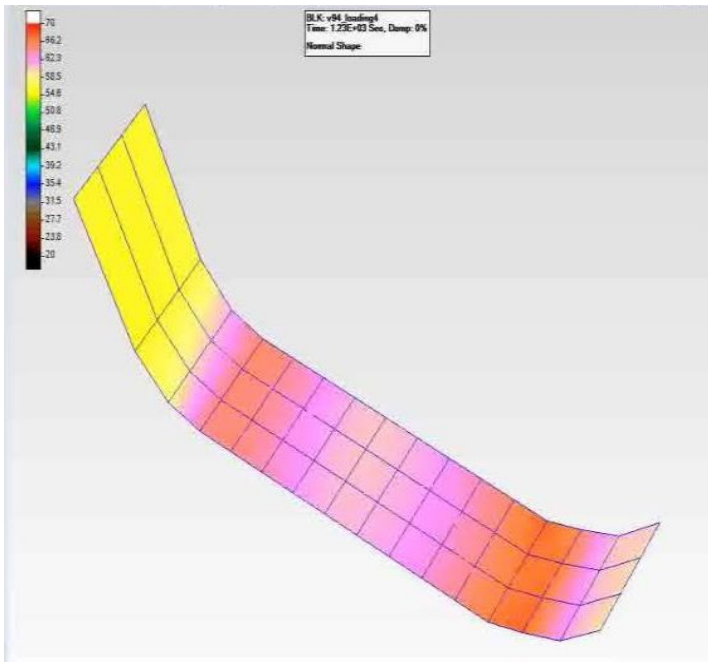
Figure 4. TCT with 120 fov sensor, vertical



Figure 5. TCT with 60 fov sensor, 45 degree angle



Figure 6. Temperature mapping



The ability to map the measured data onto a tyre shaped surface can be achieved using optional products, an example of the temperature profile across a van tyre is shown at figure 6.

Fitting the TCT inside the tyre

Each TCT is supplied with a stainless steel harness. The combined length of the TCT modules & harness allows fitting to wheel rim sizes from 13" upwards. The TCT modules are tensioned against the wheel hub using two good quality nylon or stainless steel cable ties of appropriate length and strength. The interconnecting umbilical cable is tied back against the wire harness using four small cable ties. Once the tyre is fitted and inflated the TCT will transmit tyre temperatures from all sensor positions at specified intervals from once per second and slower. The battery voltage and capacity remaining is also transmitted with each data packet.

The TCT can be configured with a one or two sensors each with multiple thermopiles allowing an individual point, area or a complete section of tyre to be temperature mapped.

To enable end of production line testing the TCT can be built into a test rim. A 5.6v power supply can be fed by simple slip rings to trickle charge the battery. In this way uninterrupted operation is guaranteed.

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 fitted to a road vehicle.

Specifications*:

Accuracy	+/- 0.20 degrees C
Resolution	0.02 degrees C
Reading rate for all points scanned	1 second
Stability of measurement chain in isothermal conditions >	1 part in 10,000
Stand by period once installed in Tyre	indefinite when used with optional in wheel power
Operating time at a reading scan every 10 minutes	30+ hours and infinite with optional in wheel power
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Operating time at a reading scan every 1 seconds	20+ hours (depending on internal battery status)

Components supplied:

TCT module with 1 or 2 sensors sampling points giving 1 to 65 measured points.

Choice of field of view of sensors (fov) 14 deg, 40 deg, 60 deg and 120 degrees

Internal sensor carrier angle either vertical or at 45 degrees.

Battery module with two output connectors allowing two measurement modules to be powered.

Tablet PC acting as receiver

Software for Window PC to compensate the raw data and provide temperature mapping

Data file formatted to be read by Excel or any user analysis program that can accept a .csv file

Accessories included

	Number
<i>Umbilical cable with integral antenna</i>	2
<i>Battery charger</i>	1

Options:

In wheel powering - requires minimal modification to the rim to achieve an earthing point for the battery module.

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. 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, the damaged TCT must be returned.

TCT uses Blue Tooth Low energy radio technology certified for the EU; operate only in test cells and private test tracks where RF regulations differ from EU)

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

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