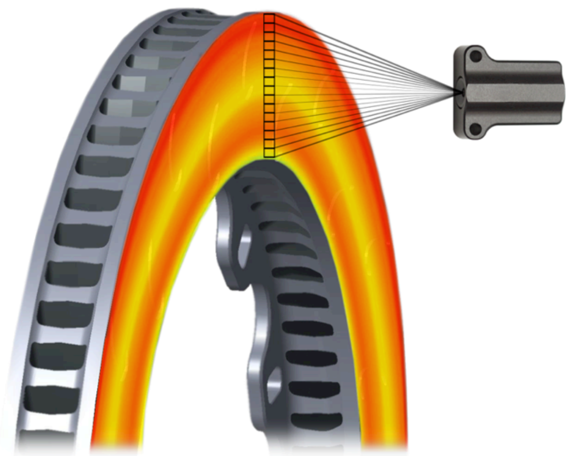
The Izze-Racing Multichannel Brake Infrared Temperature Sensor is specifically designed to measure the highly transient surface temperature of a brake rotor at multiple points, making it possible to acquire the time-based temperature distribution across a rotor's surface in order to evaluate & optimize the pad pressure distribution, cooling efficiency, braking efficiency, and hot spot formation from thermoelastic instabilities.

The sensor is capable of measuring temperature at 16, 8, or 4 points at a sampling frequency of up to 100Hz, object temperature between -20 to 950˚C, using CAN 2.0A protocol, enclosed in a compact IP66 rated aluminum enclosure, and priced to be affordable to all tiers of motorsport.



SENSOR SPECIFICATIONS

Temperature Measurement Range, T_o	-20 to 950˚C
Package Temperature Range, T_p	-20 to 85˚C
Accuracy	< ±2.0% FS
Uniformity	±1.0% FS for -20˚C < T_p < 85˚C
Noise Equivalent Temperature Difference, NETD	0.8˚C at 32Hz, ε = 0.85
Field of View, FOV	60˚x 8˚
Number of Channels	16, 8, 4, or 1
Sampling Frequency	100[1], 64[1], 32, 16, 8, 4, 2, or 1Hz
Thermal Time Constant	2 ms
Emissivity	0.01 to 1.00 (default = 0.55)
Spectral Range	8 to 14 μm

1 – Optional Extra, 100Hz limit

ELECTRICAL SPECIFICATIONS

Supply Voltage, V_s	5 to 8 V
Supply Current, I_s (typ)	30 mA
Features	• Reverse polarity protection • Over-temperature protection (125˚C)

MECHANICAL SPECIFICATIONS

Weight	20 g
L x W x H (max)	36.6 x 26.0 x 12.3 mm
Protection Rating	IP66

CAN SPECIFICATIONS

Standard	CAN 2.0A (11-bit identifier), ISO-11898
Bit Rate	1 Mbit/s
Byte Order	Big-Endian / Motorola
Data Conversion	0.1˚C per bit, -100˚C offset, unsigned
Base CAN ID's (Default)	LF Sensor: 1220 (Dec) / 0x4C4 (Hex) RF Sensor: 1225 (Dec) / 0x4C9 (Hex) LR Sensor: 1230 (Dec) / 0x4CE (Hex) RR Sensor: 1235 (Dec) / 0x4D3 (Hex)
Termination	None

CAN ID: Base ID

Channel 1		Channel 2		Channel 3		Channel 4	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+1

Channel 5		Channel 6		Channel 7		Channel 8	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+2

Channel 9		Channel 10		Channel 11		Channel 12	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+3

Channel 13		Channel 14		Channel 15		Channel 16	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

CAN ID: Base ID+4

Sensor Temperature		Unused		Unused		Unused	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4 (MSB)	Byte 5 (LSB)	Byte 6 (MSB)	Byte 7 (LSB)

WIRING SPECIFICATIONS:

Wire	26 AWG M22759/32, DR25 jacket
Cable Length (typ.)	500 mm
Connector	None

Supply Voltage, V_s	Red	(twisted)
Ground	Black	
CAN +	Blue	(twisted)
CAN -	White	

SENSOR CONFIGURATION:

To modify the sensor's configuration, send the following CAN message at 1Hz for at least 10 seconds and then reset the sensor by disconnecting power for 5 seconds:

CAN ID: Current Base ID

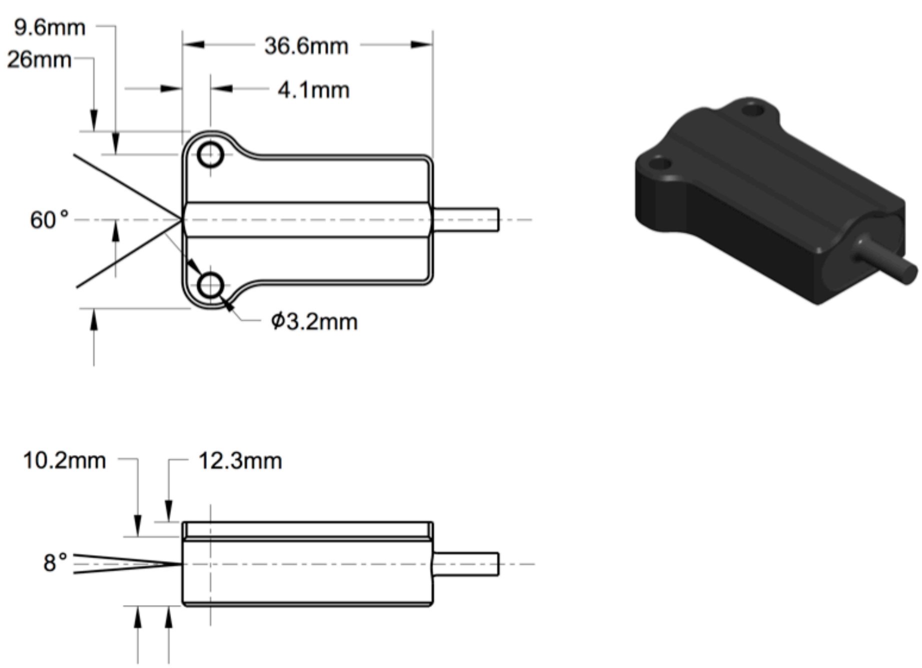
Programming Constant		New CAN Base ID (11-bit)		Emissivity	Sampling Frequency	Channels	
Byte 0 (MSB)	Byte 1 (LSB)	Byte 2 (MSB)	Byte 3 (LSB)	Byte 4	Byte 5	Byte 6	Byte 7
30000 = 0x7530		1 = 0x001 ⋮ 2047 = 0x7FF		1 = 0.01 ⋮ 100 = 1.00	1 = 1Hz 5 = 16Hz 2 = 2Hz 6 = 32Hz 3 = 4Hz 7 = 64Hz[1] 4 = 8Hz 8 = 100Hz[1]	40 = 4Ch 80 = 8Ch 160 = 16Ch	

1 – Optional Extra, 100Hz limit

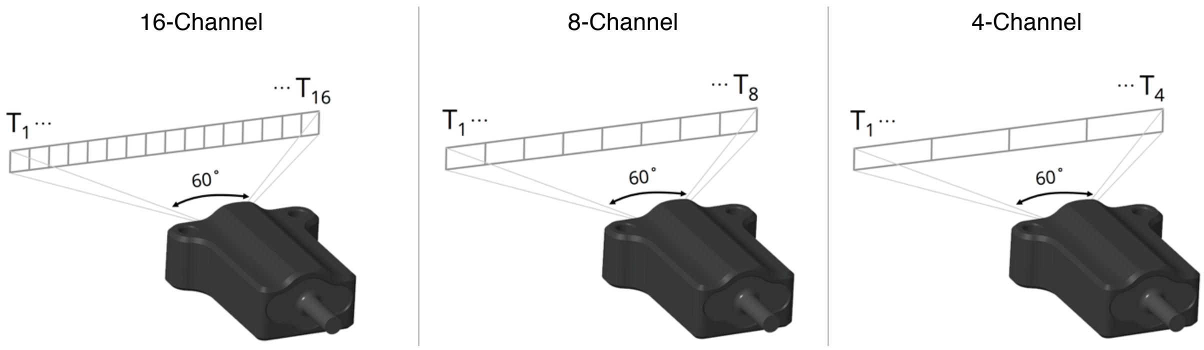
CAN messages should only be sent to the sensor during the configuration sequence.
DO NOT continuously send CAN messages to the sensor.

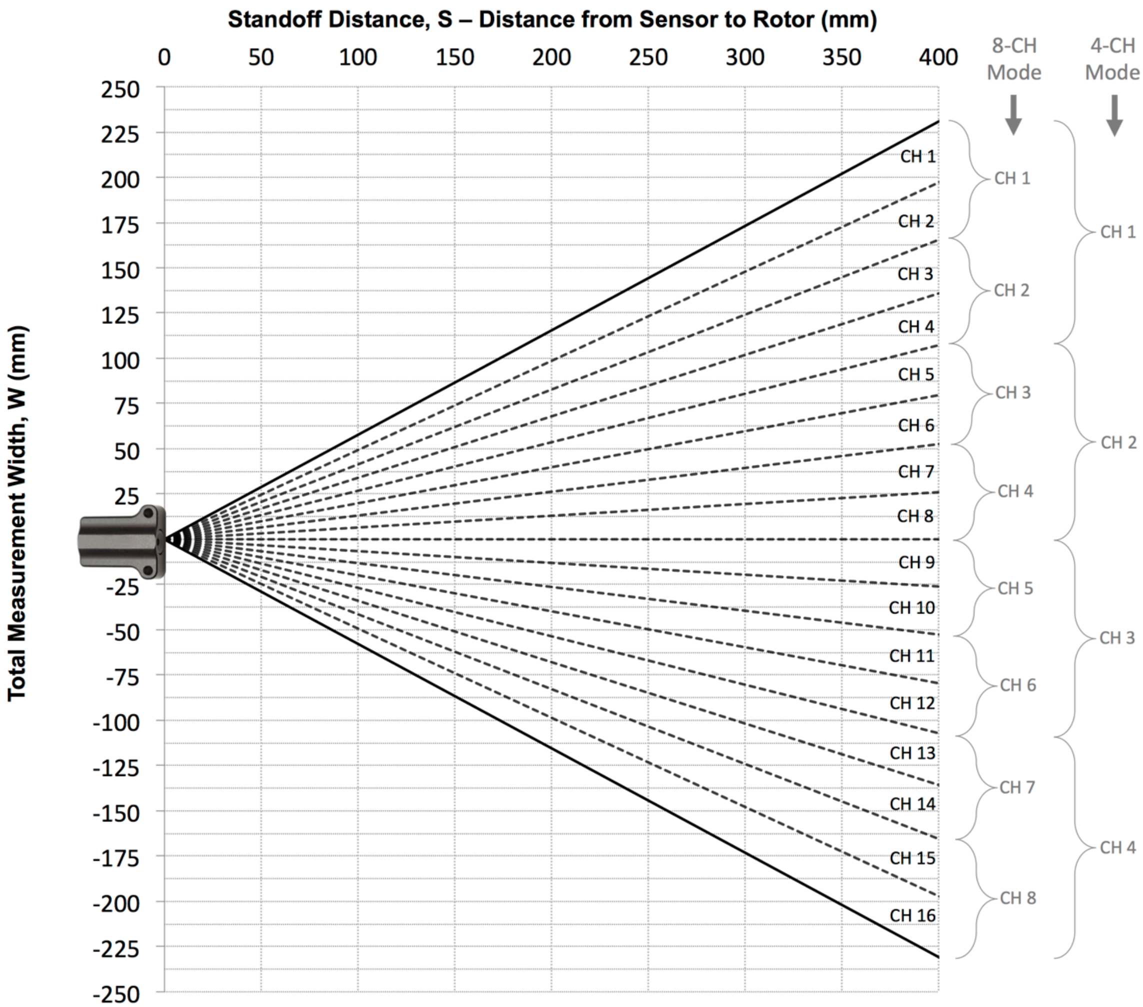
DIMENSIONS:

60° Field-of-View, IRTS-60-V2



Field of View (FOV):

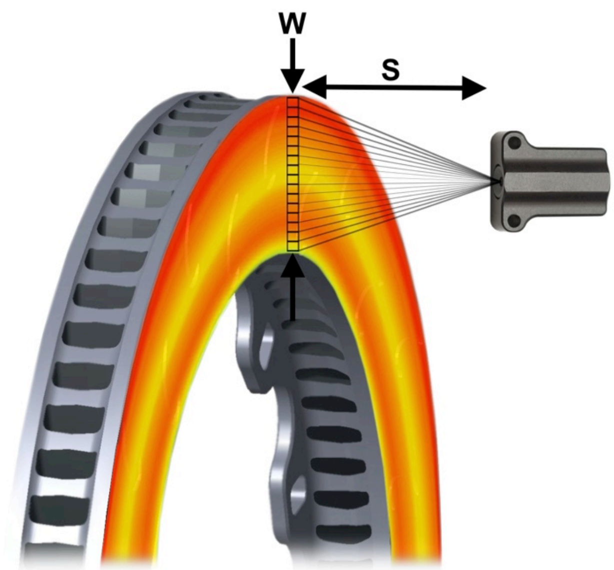




(Approximate. Angle offset (z-axis rotation) between -5˚ and +5˚, mounts should allow adjustment accordingly)

SENSOR PLACEMENT & INSTALLATION:

For most applications, the sensor should be placed such that its measurement width is along the radial axis of the rotor. An example is illustrated below. Note that W is the sensor's total measurement width and S is the standoff distance from the rotor's face to the sensor. Use the field of view graph on page 4 to approximate the standoff distance (S) for the total measurement width (W) needed.



Gold reflective tape is provided with each sensor and should be placed on any face of the sensor that is facing the rotor. An example is given below. The gold tape will help keep the sensor cool by reflecting – rather than absorbing – thermal radiation emitted by the brake rotor. The sensor's temperature is transmitted via a CAN message (see page 2) and should be monitored at all times. The sensor's temperature should never exceed 85˚C.

ADDITIONAL INFORMATION:

- Stated accuracy is under isothermal package conditions; for utmost accuracy, avoid abrupt temperature transients and gradients across the sensor's package.

- Periodically check the sensor's lens for contamination and, if necessary, clean the lens using a q-tip with isopropyl alcohol.

- An emissivity of 0.55 and 0.85 is a good starting point for cast iron and carbon rotors, respectively.

    - The emissivity of cast iron rotors is **not** constant and depends on many factors, such as: rotor temperature, oxide layer growth, surface roughness/grooves, pad material, arrangement of holes/slots, and rotational speed. Generally, the emissivity will increase with temperature; accordingly, an emissivity of 0.50 to 0.60 is a recommended starting point for rotor temperatures greater than 400˚C. It is the user's responsibility to calibrate the sensor if temperature accuracy is important.

- Noise Equivalent Temperature Difference (NETD) increases with increasing sampling frequency and decreasing emissivity:

    - Provided that brake rotor temperature is highly transient, it is usually advantageous to use a higher sampling frequency at the cost of increased noise.