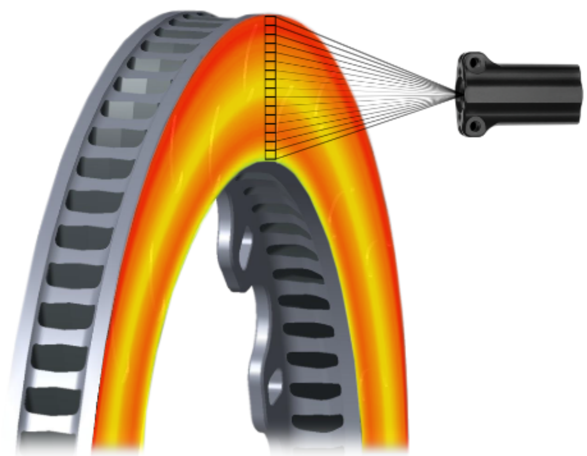
The Izze-Racing Multichannel Brake Infrared Temperature Sensor is specifically designed to measure the highly transient surface temperature of a brake rotor at multiple points, making it possible to acquire the time-based temperature distribution across a rotor's surface in order to evaluate & optimize 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 1100˚C, using CAN 2.0A protocol, enclosed in a compact IP66 rated aluminum enclosure.



SENSOR SPECIFICATIONS

Temperature Measurement Range, T_o	-20 to ≈1100˚C, steel -20 to ≈900˚C, carbon
Package Temperature Range, T_p	-20 to 85˚C
Accuracy	< ±2.0% FS
Uniformity	±1.0% FS T_{sensor} < 85˚C
Noise Equivalent Temperature Difference, NETD	0.8˚C 32Hz, ε = 0.85
Field of View, FOV	60˚x 8˚
Number of Channels	16, 8, or 4
Sampling Frequency	100, 64, 32, 16, 8, 4, 2, or 1Hz
Thermal Time Constant	2 ms
Emissivity	0.01 to 1.00 (steel = 0.55, carbon = 0.85)
Spectral Range	8 to 14 μm

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	< 16.0 g
L x W x H (max)	37.6 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 (configurable)
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

Infrared Temp, CH 1		Infrared Temp, CH 2		Infrared Temp, CH 3		Infrared Temp, CH 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

Infrared Temp, CH 5		Infrared Temp, CH 6		Infrared Temp, CH 7		Infrared Temp, CH 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

Infrared Temp, CH 9		Infrared Temp, CH 10		Infrared Temp, CH 11		Infrared Temp, CH 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

Infrared Temp, CH 13		Infrared Temp, CH 14		Infrared Temp, CH 15		Infrared Temp, CH 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:

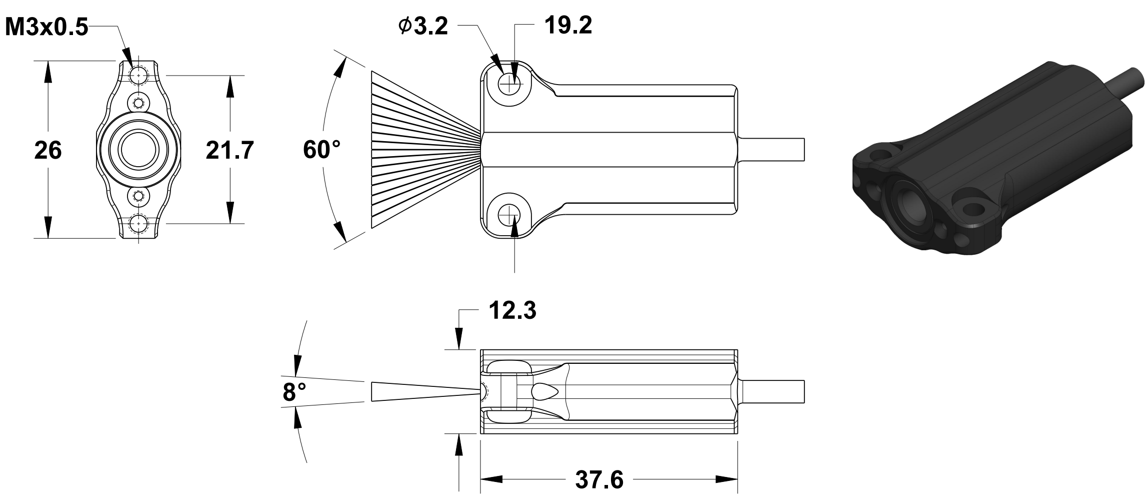
CAN ID: Current Base ID

Programming Constant		New CAN Base ID (11-bit)		Emissivity	Sampling Frequency	Channels	Bite Rate
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 2 = 2Hz 3 = 4Hz 4 = 8Hz 5 = 16Hz 6 = 32Hz 7 = 64Hz 8 = 100Hz	40 = 4 Ch 80 = 8 Ch 160 = 16 Ch	1 = 1 Mbit/s 2 = 500 kbit/s 3 = 250 kbit/s 4 = 100 kbit/s

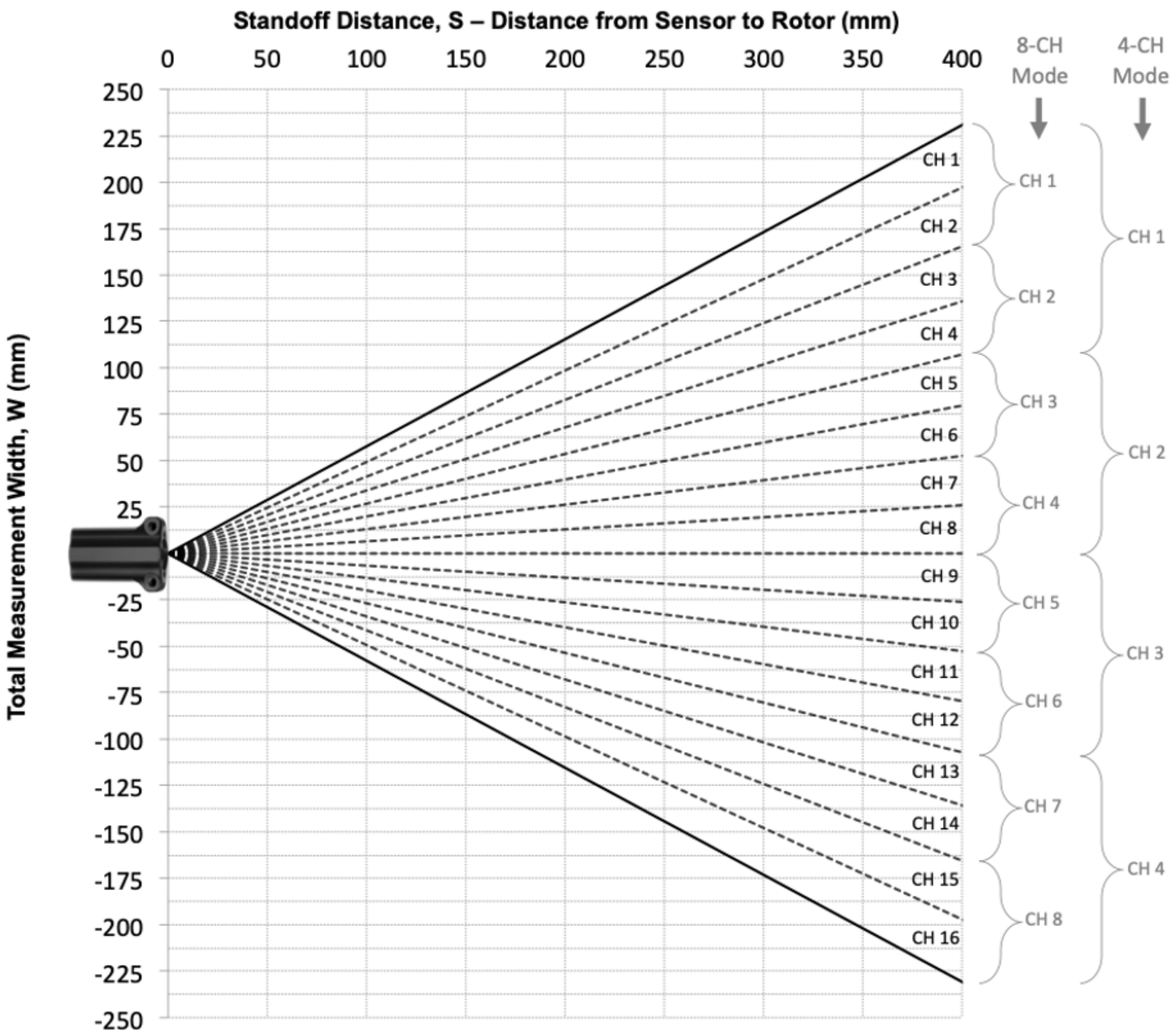
CAN messages should only be sent to the sensor during the configuration sequence.
DO NOT continuously send CAN messages with the same Base CAN ID to the sensor.

DIMENSIONS:

60° Field-of-View, IRTS-60-V3



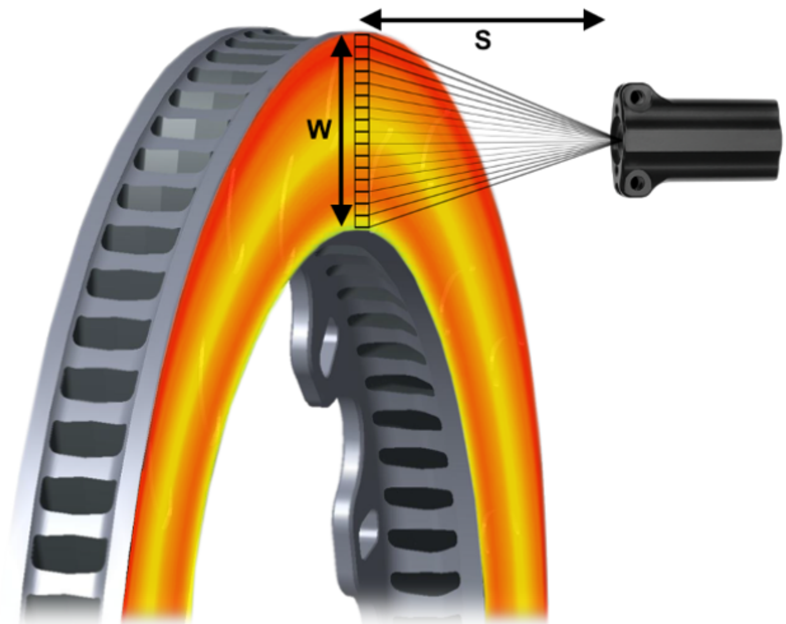
60˚ Field-of-View, IRTS-60-V3:



(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.



The sensor's temperature is transmitted via a CAN message (see page 2) and should be monitored. The sensor's temperature should ideally never exceed 85˚C, but excursions < 125˚C are survivable.

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 cotton swab with isopropyl alcohol.

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

    - The exact 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 utmost 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.