ALS Tire Wired

Install Guide

(25.02.2021)

V1.1 – Changed connector to DTM06-4S
V1.2 - CAN Protocol Update (from firmware 0.130 onwards)

www.alsense.eu

Table of Contents

1. Introduction

Thank you for purchasing the ALS Tire Wired. The following guide is aimed at providing an overview of the typical install process for both a single sensor as well as for a complete set.

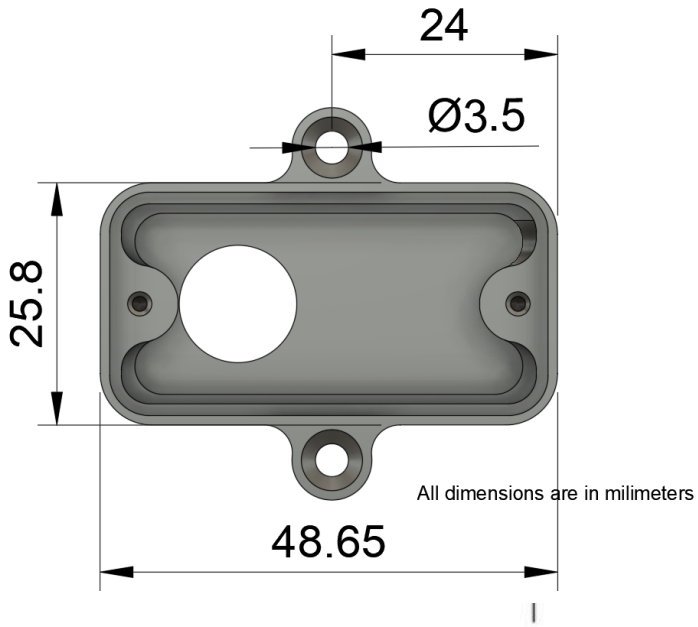
2. Specifications

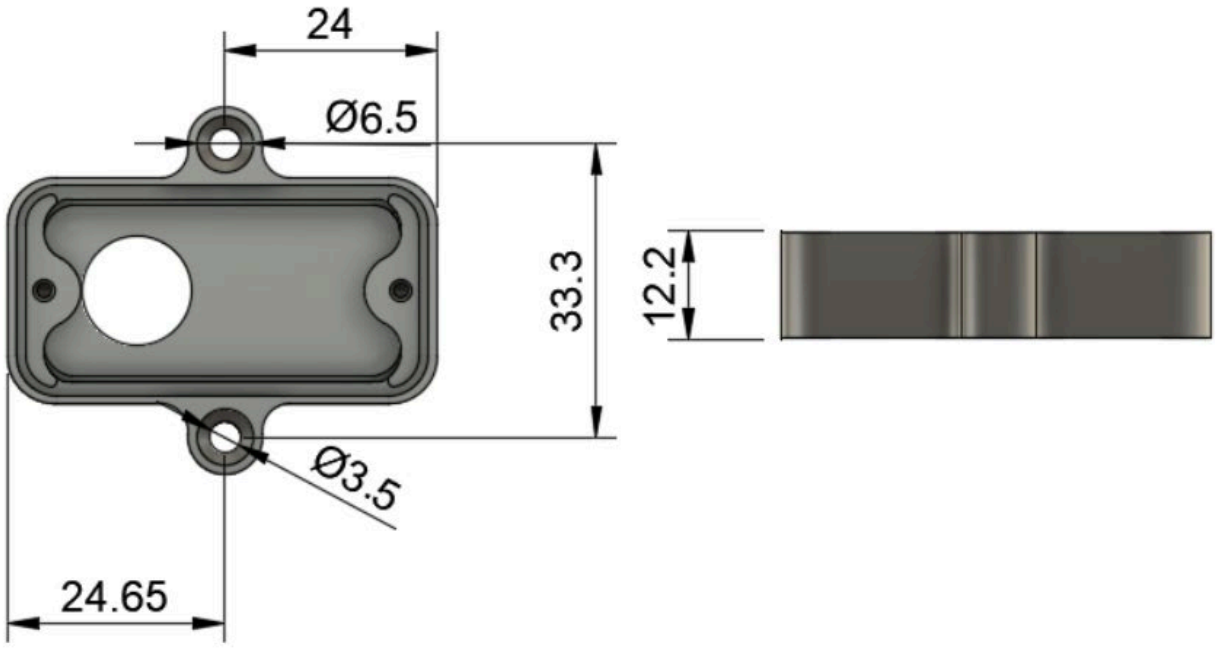
CAPABILITIES	Number of Channels	16/8/4/1 (16 default)
	Sample Rate	1-64Hz (20Hz default)
	FOV	110°
	Accuracy	1°C
	Emissivity	0.01 – 1 (0.75 default)
ELECTRICAL	Supply Voltage	5 – 20V
	Supply Current	15 mA
PHYSICAL	Dimensions	
	Weight	
	Protection Rating	IP66
CONNECTIVITY	Wiring	0.5m unterminated (DTM-4P optional)
	CAN	2.0A (11bit identifier)
	Bit Rate	500kbps/1Mbps (500kbps default)

3. Physical Installation

Before installing the sensor in its final position, please ensure that:

1. All the necessary configuration parameters have been set (number of channels and order, emissivity, startup delay time). We can perform these for you if you get in touch with us before shipping or using the 'Notes' field in the checkout process.
2. There are provisions for installing the required 120 Ω CAN bus termination resistors. Please see section '**3. Electrical Installation**' for further details





The sensor should be mounted in its final position using the mounting holes situated on the sides of the housing. For temporary installs we've successfully used 3M Dual-Lock tape, but extra care should be employed when using such a solution.

We do recommend placing the sensor on the tire's leading edge (so as to not get hit by debris) and avoiding direct exposure to significant heat sources (i.e. exhausts).

The IR sensor has a horizontal FOV of 110°. As the sensor is placed further away, the maximum width of the tire increases. Please consult the table and the graph below or get in touch if you have any questions. Please consult 'Figure 1' in order to determine how to orient the sensor.

Maximum Tire Width (mm)	Mounting Distance (mm)
100	35
150	52
225	79
250	88
275	96
300	105
350	123
400	140

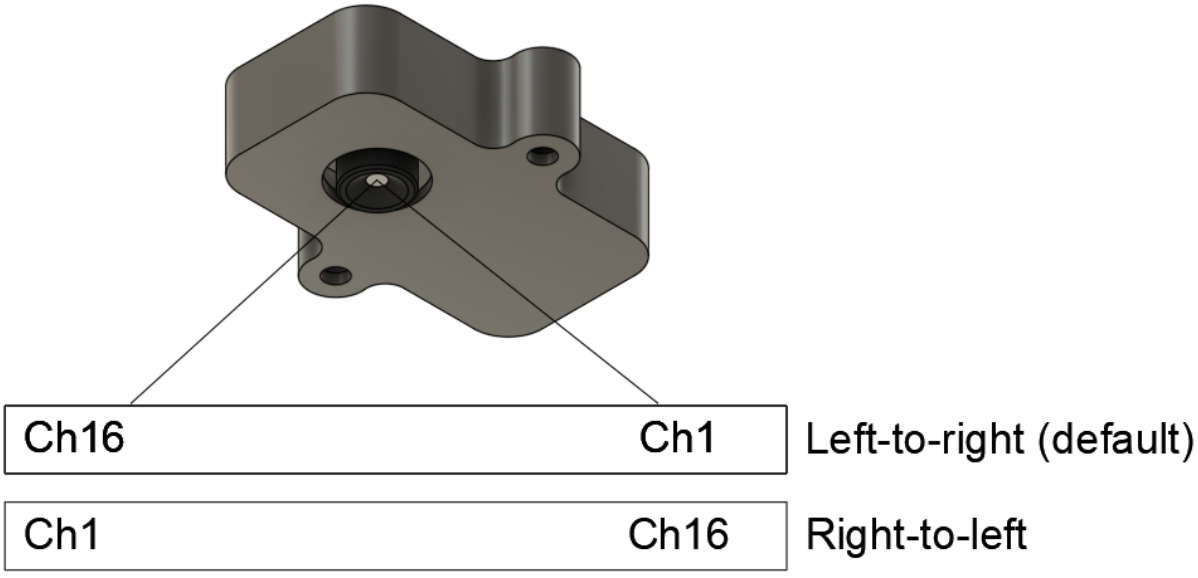


Figure 1 - Channel assignment / sensor data order

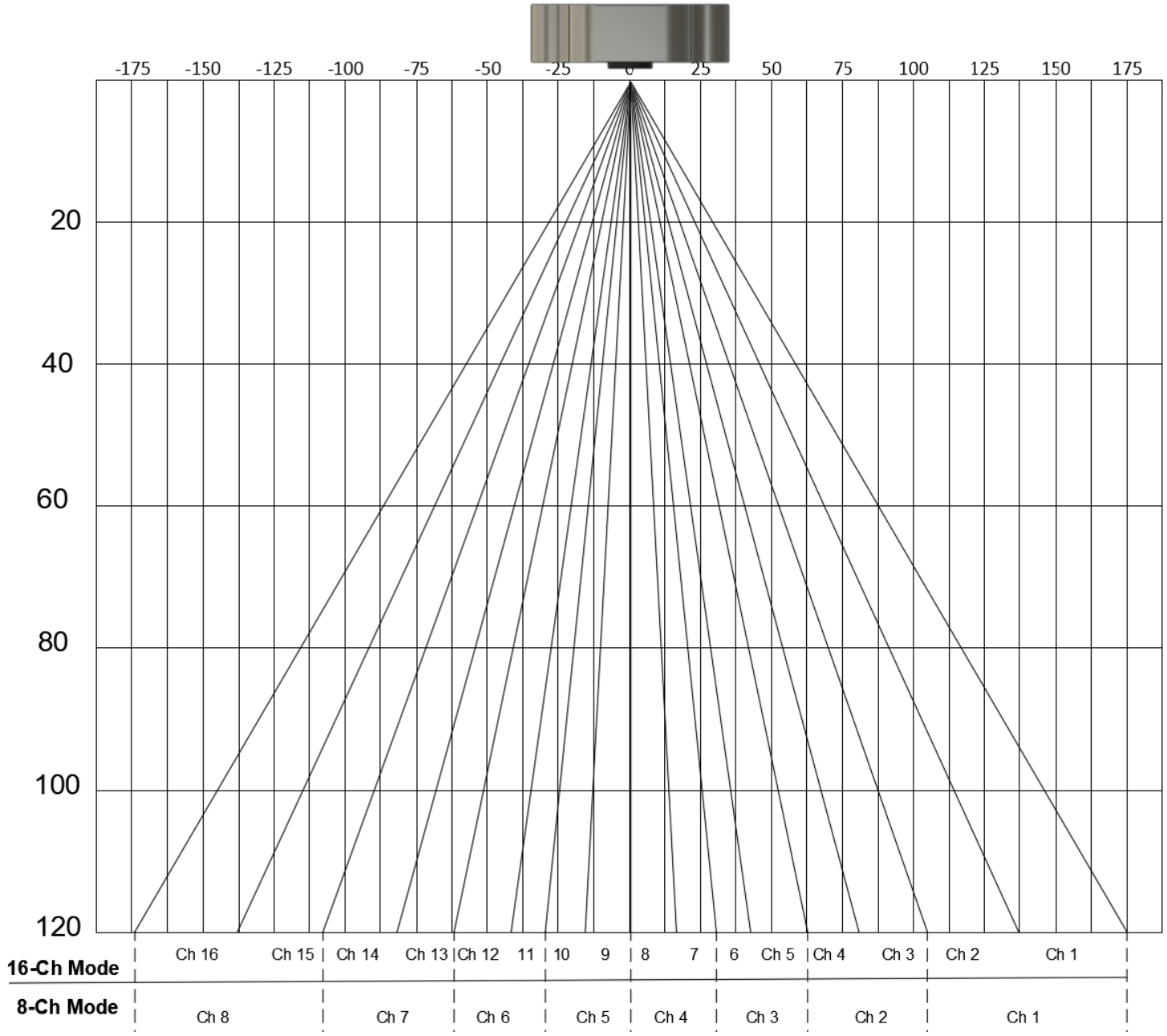


Figure 2 - Visual Representation of channel assignments

4. Electrical Installation

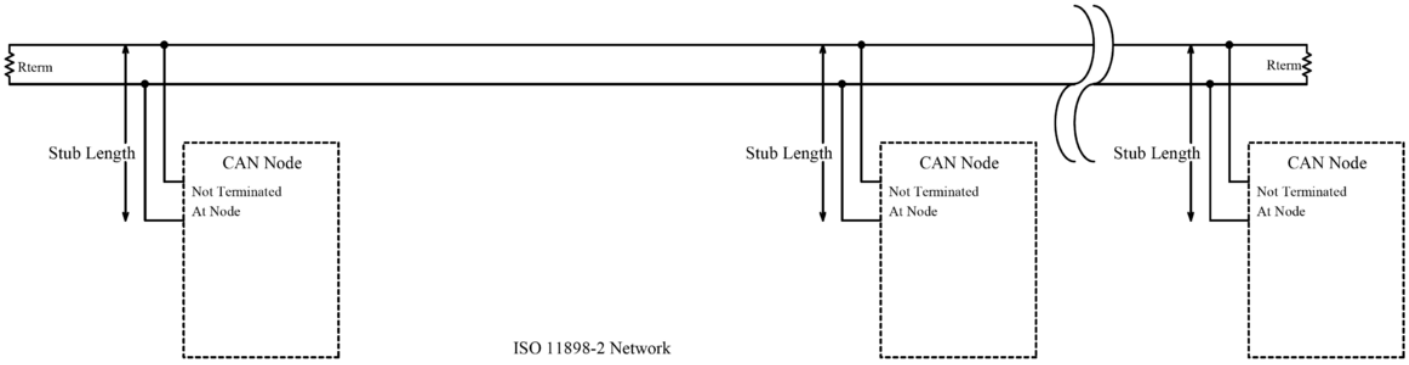
Depending on the option you have ordered, the sensor will come with either an unterminated end or a DTM06-4S connector. The mating connector is **DTM04-4P**

a. Unterminated
   - 12V – Orange / White
   - GND – Green / White
   - CAN Low – Blue / White
   - CAN High – White

b. DTM06-4S
   - Pin 1 – GND
   - Pin 2 – 12V
   - Pin 3 – CAN Low
   - Pin 4 – CAN High

CAN Connectivity

Every CAN bus network requires two 120 Ohm resistors placed at each end, as the diagram below (Rterm = 120 Ohms) shows. If you are not familiar with CAN bus, we recommend that you consult with a professional. Incorrect installation can damage the devices or produce unsatisfactory performance.



Each ALS Tire Wired sensor has a built-in 120 Ohm resistor that can be activated by soldering a jumper on the board. This can be done by us, before shipping, so please get in touch. We generally recommend installing the resistor externally as it provides more flexibility.

Always use twisted paired cable for CAN Low and CAN High wiring as it greatly improves the signal's tolerance to electrical noise. Also try and keep wiring stubs (cables going from the main CAN bus lines to individual devices) at a minimum. Our sensors come with a 0.5m cable, it's generally ok to have another 0.5m in addition to that.

5. Configuration

If you haven't requested a custom configuration for the sensors in your order, the **default** settings are as follows, along with a short description of what their function is:

Parameter	**Default Value**	**Function**
CAN Base ID	0x300 (for a one sensor order) – Front Left 0x320 – Front Right 0x340 – Rear Left 0x360 – Rear Right	Base CAN ID for all messages sent from the sensor
Emissivity	0.75	Lowering the emissivity increases the tire temperature. Suggested values depending on mounting distance: • 50mm – 0.86 • 150mm – 0.8 • 200 – 0.77
Sample Rate	20 Hz	Sampling and reporting rate for the sensor
Number of Channels	16	Number of channels used for sampling
Sensor Data Order	Left to Right ***[Figure 1]***	Channel numbering direction when looking at the sensor's camera
CAN Bit Rate	500 kbps	

Initial Configuration Delay	60 seconds	The delay, in seconds, between the sensor powering up and it starting to send temperature data over CAN. This is when new configuration parameters can be sent.

Please consult *Appendix A: ALS Tire Wired CAN Protocol* for complete information on the CAN protocol.

Typical Configuration Procedure:

1. Ensure the sensor is powered and with correct CAN connectivity to the device you're using to transmit CAN messages from.
2. If you're using a device with CAN sniffing capabilities, please confirm that, after powering the sensor, you're seeing the *SYS_INFO_1* CAN (Base CAN ID + 0x08) message come in every 5 seconds during the initial configuration delay.
3. Form the configuration message (*CFG_REQ_1*) in your CAN transmit tool and, if valid, you'll receive back a response (*CFG_RSP_1*) to confirm the new settings. These get applied after a power cycle.

6. CAN Temperature Data Decoding

The complete format of temperature data reported by the sensor is described in *Appendix A: ALS Tire Wired CAN Protocol*. The formula to calculate each individual channel is as follows:

Temperature_Value = (Byte 0 * 256 + Byte 1) / 10 - 200°C

7. Troubleshooting / FAQ

Situation 1: Not getting any data in my CAN dash/logger

a. Use a multimeter to check that the sensor is getting 12V on its power supply pins.
b. Double check wiring and make sure your CAN stubs' length is not more than 150cm. Ensure the correct 120 Ohm termination resistors are installed. If possible, simplify the connectivity by wiring the sensor directly to a CAN sniffer.
c. If your CAN logger/dash allows you to, check that CAN receive count is increasing.
d. Double-check the configuration parameters on your CAN dash/logger.
   - Baud rate
   - CAN Ids
   - Formulas and byte order

Situation 2: Can you suggest an USB-CAN configuration tool?

a. We're working on our configuration tool with a dedicated interface for our products. Please keep in touch if you're interested in purchasing one.
b. CAN BUS Analyzer Tool (Microchip, APGDT002)
c. PCAN-USB (requires DB9 wiring adaptor)

8. Support

Please make sure to check the downloads section of our support page as it provides the product's datasheet and configuration files for the most common CAN dashboards/loggers. Extra help can be obtained using our built-in ticket support system or directly via phone.

Downloads: https://www.alsense.eu/downloads/
Support Tickets: https://alsense.eu/osticket/ or email help@alsense.eu
Phone: +40 372 916 373

Appendix A: ALS Tire Wired CAN Protocol
V1.0

Updated 12.01.2020

A. Default CAN Specifications

1. Base Id
   - FL - 0x300
   - FR - 0x320
   - RL - 0x340
   - RR - 0x360
2. Baud Rate: 500kbps

B. System Configuration

Name: CFG_REQ_1
Direction: To Device
CAN Id: <Base Id>

Byte	Name	Formula	Description
0	New Base Id MSB		New Base ID for CAN messages. Requires a power cycle. I.e. 0x310 would be: Byte 0 - 0x03 Byte 1 - 0x10
1	New Base Id LSB		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 64 Hz (Values outside this range are replaced with the closest valid one)
4	Sensor Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right
5	Initial Configuration Duration (seconds)	= Value	Duration for the “Initial Configuration” phase. In seconds. Minimum value is 10s.
6	CAN Baud Rate	= 0 - 500kpbs 1 - 1Mbps	Any value different than ‘0’ or ‘1’ will make the system default to 500kbps.
7	Number of Channels	= Value	1/4/8/16 (Invalid values are replaced with ‘4’)

Name: CFG_RSP_1

Direction: From Device
CAN Id: <Old Base Id> + 0x01

Byte	Name	Formula	Description
0	New Base Id MSB		New Base ID for CAN messages. Requires a power cycle. I.e. 0x310 would be: Byte 0 - 0x03 Byte 1 - 0x10 **0xFF & 0xFF for default address**
1	New Base Id LSB		
2	Emissivity	= Value / 100	I.e., setting to 75 is 0.75
3	Sample Rate	= Value	1 - 64 Hz (Values outside this range get truncated to the closest valid one)
4	Sensor Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right
5	Initial Configuration Duration (seconds)	= Value	Duration for the “Initial Configuration” phase. In seconds. Minimum value is 10s.
6	CAN Baud Rate	= 0 - 500kpbs 1 - 1Mbps	Any value different than ‘0’ or ‘1’ will make the system default to 500kbps.
7	Number of Channels	= Value	1/4/8/16 (Invalid values are replaced with ‘16’)

The device echoes back the settings sent in the first message. <Base Id> is still the one previous to the change. New settings are applied after a power cycle.

C. System Information

SYS_INFO_1 is sent until the “Initial Configuration” period expires.

Name: SYS_INFO_1
Direction: From Device
CAN Id: <Base Id> + 0x08
Time Interval: Every 5s

Byte	Name	Formula	Description
0	FW Major		

1	FW Minor		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 64 Hz (Values outside this range get truncated to the closest valid one)
4	Initial Configuration Duration (seconds)	= Value	Number of seconds to allow at startup for configuration.
5	Sensor Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right
6	Num Chans	= Value	
7	Reserved		

D. Data Reporting

After the <Initial Configuration Delay> expires, the following messages will be sent over CAN (depending on the configured number of channels)

1 x DATA_TEMPS_1 (Temperature Channels 0 - 3)
1 x DATA_TEMPS_2 (Temperature Channels 4 - 7)
1 x DATA_TEMPS_3 (Temperature Channels 8 - 11)
1 x DATA_TEMPS_4 (Temperature Channels 12 - 15)
1 x DATA_SUMMARY (Sensor Information and Ambient Temperature)

Name: DATA_TEMPS_1
Direction: From Device
CAN Id: <Base Id> + 0x10
Time Interval: Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 0 MSB	= (Temp. Value + 200) * 10	The temperature reading is offset by 200* C and then multiplied by 10. This gives a usable reporting range of: -200 *C -> 6300* C with 0.1 *C per bit. I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
1	Chan 0 LSB		
2	Chan 1 MSB		
3	Chan 1 LSB		
4	Chan 2 MSB		
5	Chan 2 LSB		

6	Chan 3 MSB		
7	Chan 3 LSB		

Name: DATA_TEMPS_2
Direction: From Device
CAN Id: <Base Id> + 0x11
Time Interval: Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 4 MSB	= (Value + 200) * 10	The temperature reading is offset by 200* C and then multiplied by 10. This gives a usable reporting range of: -200 *C -> 6300* C with 0.1 *C per bit. I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
1	Chan 4 LSB		
2	Chan 5 MSB		
3	Chan 5 LSB		
4	Chan 6 MSB		
5	Chan 6 LSB		
6	Chan 7 MSB		
7	Chan 7 LSB		

Name: DATA_TEMPS_3
Direction: From Device
CAN Id: <Base Id> + 0x12
Time Interval: Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 8 MSB	= (Value + 200) * 10	The temperature reading is offset by 200* C and then multiplied by 10. This gives a usable reporting range of: -200 *C -> 6300* C with 0.1 *C per bit. I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
1	Chan 8 LSB		
2	Chan 9 MSB		
3	Chan 9 LSB		

4	Chan 10 MSB		
5	Chan 10 LSB		
6	Chan 11 MSB		
7	Chan 11 LSB		

Name: DATA_TEMPS_4
Direction: From Device
CAN Id: <Base Id> + 0x13
Time Interval: Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 12 MSB	= (Value + 200) * 10	The temperature reading is offset by 200* C and then multiplied by 10. This gives a usable reporting range of: -200 *C -> 6300* C with 0.1 *C per bit. I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
1	Chan 12 LSB		
2	Chan 13 MSB		
3	Chan 13 LSB		
4	Chan 14 MSB		
5	Chan 14 LSB		
6	Chan 15 MSB		
7	Chan 15 LSB		

Name: DATA_SUMMARY
Direction: From Device
CAN Id: <Base Id> + 0x14
Time Interval: Every 10s

Byte	Name	Formula	Description
0	FW Major		

1	FW Minor		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 64 Hz (Values outside this range get truncated to the closest valid one)
4	Reserved	= Value	
5	Sensor Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right
6	Num Chans	= Value	
7	Ambient Temperature	= Value + 100	Ambient temperature around the sensor