ALS Brake Pro

Install Guide
(22.10.2022)

V1.0 – Initial version
V1.1 – Add new connector information
V1.2 – V2 Dimensions Added
V1.3 – Information about emissivity

www.alsense.eu

Table of Contents

1. Introduction

Thank you for purchasing the ALS Brake Pro. The following guide is aimed at providing an overview of the typical install process and configuration steps.

2. Specifications

SENSOR	Number of Channels	8/4 (8 default)
	Sample Rate	1-50Hz (10Hz default)
	FOV	110°
	Battery	250 mAh (built-in charger)
	Autonomy	15 hrs (track use)
	Dimensions	64 x 42 x 17.5 mm
	Accuracy	1°C
	Emissivity	0.01 – 1 (0.83 default)
	IP Rating	IP65
RECEIVER	Supply Voltage	5 – 20V
	Supply Current	50 mA
	Connector	ASL006-05PN-HE
	Mating Connector	ASL606-05SN-HE (mating)
	CAN	2.0A (11bit identifier)
	Bit Rate	500kbps/1Mbps (500kbps default)

3. Quick Install

a. Initial Setup

First step after receiving the product is putting the sensors on charge using the supplied cables and any USB adapter (including external batteries).

b. Receiver – Installation

The receiver comes with a professional motorsport connector (ASL006-05PN-HE). Its mating connector part number is ASL606-05SN-HE (mating). Pinout:
1. GND (Black)
2. 12V (Red)
3. CAN Low (Blue)
4. CAN High (White)

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.
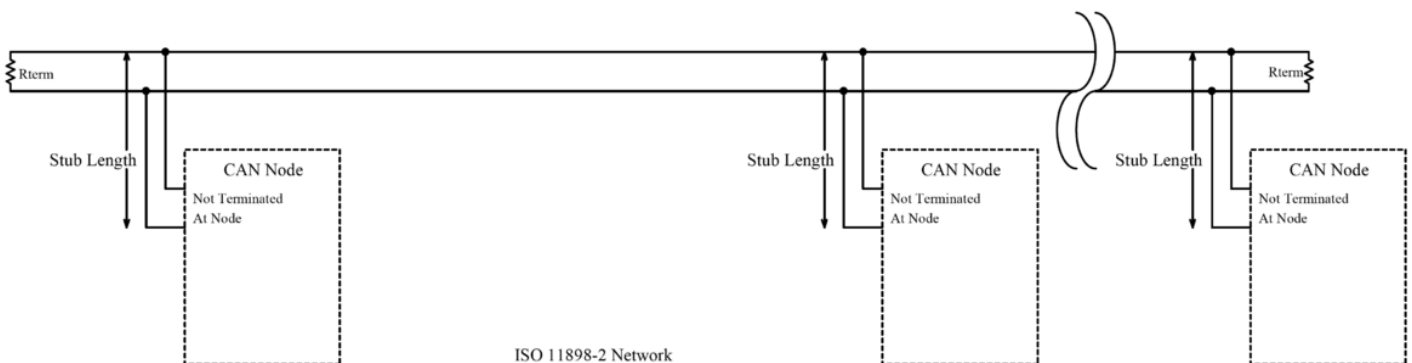
Always use twisted paired cable for CAN Low and CAN High wiring as it greatly improves the signal's tolerance to electrical noise. Also try and keep wiring stubs (cables going from the main CAN bus lines to individual devices) at a minimum.

c. Configuration

Full information on configuring the parameters of the units can be found in section **Configuration**

d. Power-up

The system can now be powered up. After doing so, the STATUS LED on the receiver should turn blue and, after the configuration period passes, green. This signals that the device is transmitting data over CAN.

With the receiver powered and transmitting data over CAN, the next step is turning on the sensors which should've been fully charged by now. One at a time, please remove the magnetic override. After removing the magnetic override, within **60 seconds,** the corresponding LED on the receiver should turn green, signaling that the sensor has linked with the receiver. Please repeat this step for all the sensors in your kit.
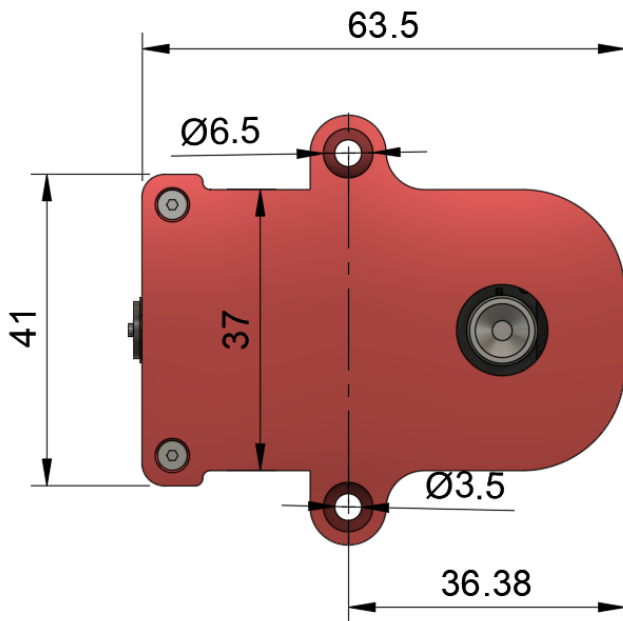
After ~1 minute, each sensor will start transmitting data and the corresponding LED on the receiver should blink green.

4. Physical Installation

Before installing the sensor in its final position, please ensure that the sensor is correctly linked with the receiver!
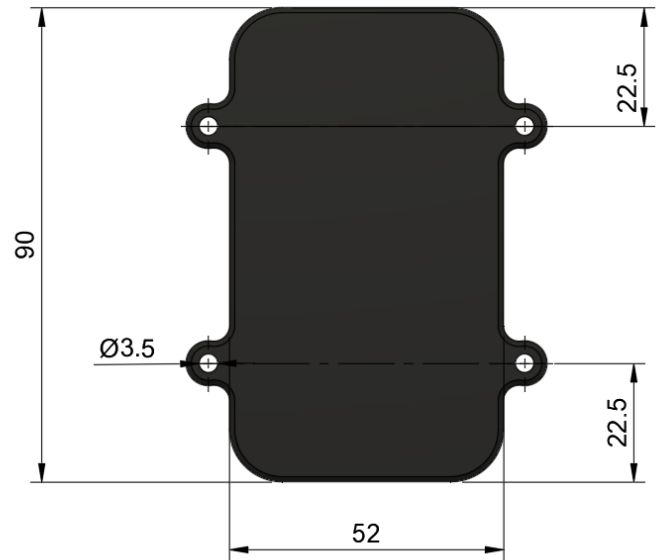
All dimensions in mm

Figure 1 – Mounting (sensor – left, receiver – right)

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 sensors away from 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 brake 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.

After installing the sensor in its final position, please check that the corresponding LED on the receiver continues blinking green. If the LED turns red it means that the sensor went outside of range and a range extender option should be used. Please get in touch with us for more details.

For best wireless range please ensure that the receiver and sensors are all oriented vertically.

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

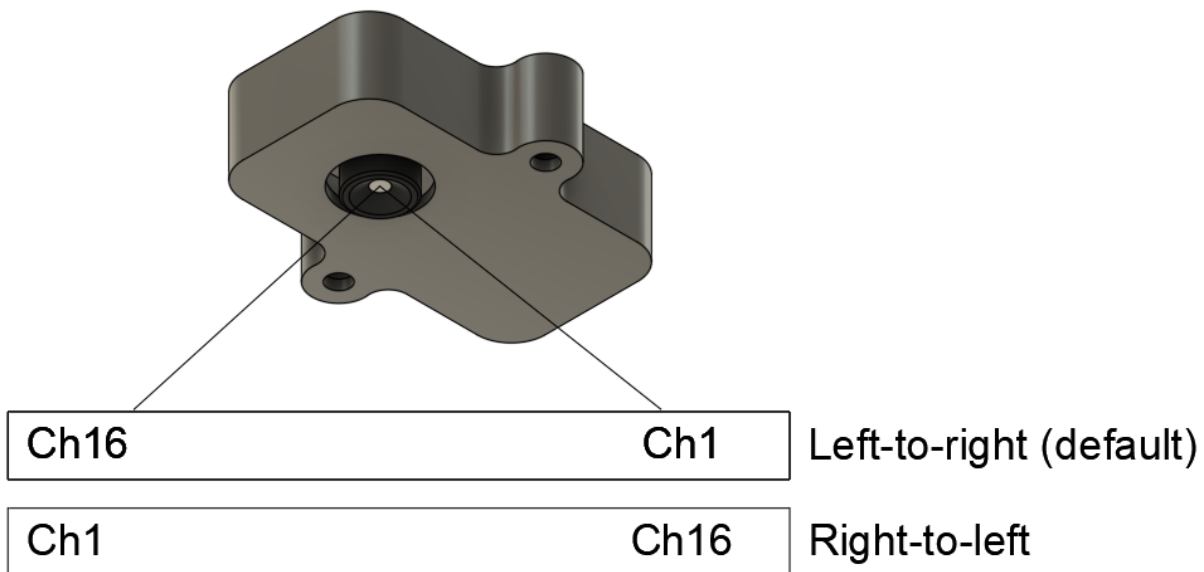| Ch16	Ch1	Left-to-right (default)
Ch1	Ch16	Right-to-left

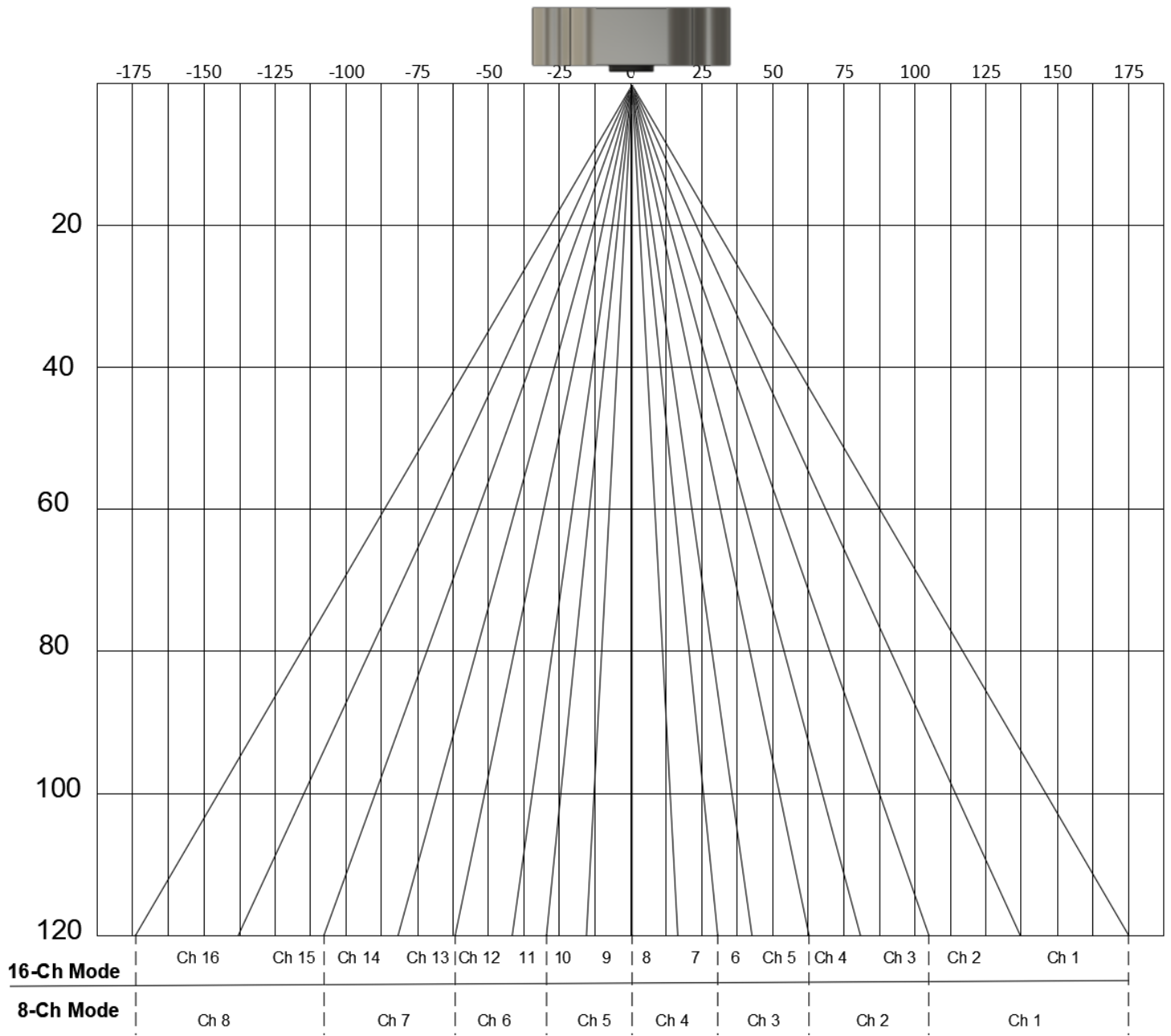*Figure 1 - Channel assignment / sensor data order*

Figure 2 - Visual Representation of channel assignments

5. Operation & Charging

Each sensor has a 250mAh battery that can be charged using the built-in connector. When in use, it allows for up to 15 hours of track time.

Low battery indication – the sensor will notify the user that it's approaching the end of its battery life (3% state-of-charge) by flashing the receiver's LED yellow, instead of green, as usual.

Charging is done using the cables supplied from any USB port. External batteries can be used as well. A full charge takes around 90 minutes.

There's also a battery indication when powering up the sensor (after removing the magnetic overrides).

- **Quick Flash –** low battery
- **Slow flashes** – each flash will signify 10% of battery life (i.e. 5x flashes will mean the sensor has 50% battery life remaining)

Preserving battery life when not in use – while active, the sensors continuously send data to the receiver, draining the battery. When not in use, they can be deactivated by placing a magnet in a similar position to the ones in the charging dock. Alternatively, the sensors can be placed in their carrying case which has the magnets pre-fitted. Please confirm that they have been deactivated by checking the corresponding LED on the receiver to turn red.

Demo units need to be placed in the charging dock or magnetically deactivated while charging!

6. Factory Reset

In some scenarios you might need to reset the network and configuration parameters of the receiver or the sensors. The following scenarios are instances when a factory reset is required:

- **Changing the order of the sensors connected to a receiver**
- **Connecting a new sensor to an existing network**

Factory resetting the receiver
- Expose the PCB by removing the two mounting screws in the case
- Ensure it is powered (STATUS LED is blue or green)
- Press & hold the control button (S1) for around 10s.

Factory resetting a sensor
- Ensure it is powered and has enough battery life. Please make sure no magnetic override is present.
- Press & hold the control button until the status LED briefly turns on.

7. 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	0x200	Base CAN ID for all messages sent from the sensor
Emissivity	0.83	Lowering the emissivity increases the brake temperature. 0.83 – recommended for ceramic brakes 0.55 – recommended for normal steel brakes
Sample Rate	10 Hz	Sampling and reporting rate for the sensor
Number of Channels	8	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

		11	new configuration parameters can be sent.

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

Typical Configuration Procedure:

1. The parameters for the whole system are configured by sending configuration messages to the receiver. The sensors retrieve those parameters on power-up.
2. Ensure the receiver is powered and with correct CAN connectivity to the device you're using to transmit CAN messages from.
3. If you are 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.
4. Form the configuration messages (*CFG_REQ_1/2*) in your CAN transmit tool and, if valid, you will receive back a response (*CFG_RSP_1*)/2 to confirm the new settings.
5. Power cycle the receiver and reset (**not factory reset**) each sensor to make sure it received its updated configuration. Resetting the sensor means simply putting the magnetic override next to it, keeping it for 1-2 seconds, then removing it.

8. Troubleshooting / FAQ

Situation 1: Sensor's LED lighting up red
a. Make sure the sensor has been fully charged.
b. Bring the sensor near the receiver. Try resetting it using the magnetic override.
c. Try bringing it back to factory settings using the steps described in section **Factory Reset**
d. If this happens during use, try

Situation 2: 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 3: 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)

9. 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 Brake Pro CAN Protocol
V1.0

Updated 7.04.2020

A. Default CAN Specifications

1. Base Id: 0x100
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:
1	New Base Id LSB		Byte 0 - 0x03 Byte 1 - 0x10
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 50 Hz (Values outside this range are replaced with the closest valid one)
4	Sensor 1 Data Order	= Value	0 - temperatures are output right to left 1 - temperatures are output left to right
5	Sensor 2 Data Order	= Value	
6	Sensor 3 Data Order	= Value	
7	Sensor 4 Data Order	= Value	

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 (0x200)**
1	New Base Id LSB		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 50 Hz (Values outside this range get truncated to the closest valid one)
4	Sensor 1 Data Order	= Value	0 - temperatures are output left to right 1 - temperatures are output right to left
5	Sensor 2 Data Order	= Value	
6	Sensor 3 Data Order	= Value	
7	Sensor 4 Data Order	= Value	

Name: CFG_REQ_2
Direction: To Device
CAN Id: <Base Id> + 0x02

Byte	Name	Formula	Description
0	Initial Configuration Duration (seconds)	= Value	Duration for the "Initial Configuration" phase. In seconds. Minimum value is 10s.
1	CAN Baud Rate	= 0 - 500kpbs 1 - 1Mbps	Any value different than '0' or '1' will make the system default to 500kbps.
2			
3			
4			
5			

6			
7			

Name: CFG_RSP_2
Direction: From Device
CAN Id: <Old Base Id> + 0x03

Byte	Name	Formula	Description
0	Initial Configuration Duration (seconds)	= Value	
1	CAN Baud Rate	= 0 - 500kpbs 1 - 1Mbps	Any value different than '0' or '1' will make the system default to 500kbps.
2			
3			
4			
5			
6			
7			

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 power cycle of both the ITM Receiver and of the individual sensors (by using the magnetic pad)

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> + 0x10
Time Interval: Every 5s

Byte	Name	Formula	Description

0	Receiver FW Major		
1	Receiver FW Minor		
2	Emissivity	= Value / 100	I.e. setting to 75 is 0.75
3	Sample Rate	= Value	1 - 50 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	Channel	= Value	Wireless channel number
6	Reserved		
7	Reserved		

C. Data Reporting

Name: DATA_SENS_INFO
Direction: From Device
Description: Sent once for each sensor, after it joins, before it begins reporting.
CAN Id: <Base Id> + 0x50
Time Interval: Once

Byte	Name	Formula	Description
0	Sens 1 FW Major		
1	Sens 1 FW Minor		
2	Sens 2 FW Major		
3	Sens 2 FW Minor		
4	Sens 3 FW Major		
5	Sens 3 FW Minor		
6	Sens 4 FW Major		
7	Sens 4 FW Minor		

After the <Initial Configuration Delay> expires, the following messages will be sent over CAN.

4 x DATA_TEMPS_1 (first four temperature channels for each sensor)
4 x DATA_TEMPS_2 (last four temperature channels for each sensor)
1 x SENS_SUMMARY_1/2 (information about battery state and signal strength)

Name: DATA_TEMPS_1
Direction: From Device
CAN Id: <Base Id> + 0x20 + <Sensor Index (1...4) - 1> * 2
Time Interval: Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Chan 0 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 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> + 0x21 + <Sensor Index (1...4) - 1> * 2
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:

1	Chan 4 LSB		-200 *C -> 6300* C with 0.1 *C per bit. I.e. 88.9*C => 2889 MSB: 0x0B LSB: 0x49
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_SENS_SUMMARY_1
Direction: From Device
CAN Id: <Base Id> + 0x40
Time Interval: Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Sens 1 SoC	= Value	0 - 100% reading for each sensor's battery level
1	Sens 2 SoC	= Value	
2	Sens 3 SoC	= Value	
3	Sens 4 SoC	= Value	
4	Sens 1 LQ	= Value	Indication for each sensor's wireless signal strength. Please consult the product manual for acceptable figures.
5	Sens 2 LQ	= Value	

6	Sens 3 LQ	= Value	
7	Sens 4 LQ	= Value	

Name: DATA_SENS_SUMMARY_2
Direction: From Device
CAN Id: <Base Id> + 0x41
Time Interval: Depending on <Sample Rate>

Byte	Name	Formula	Description
0	Sens 1 Transmit Rate	= Value	0 - 100 reading for each sensor's number of messages sent per second
1	Sens 2 Transmit Rate	= Value	
2	Sens 3 Transmit Rate	= Value	
3	Sens 4 Transmit Rate	= Value	
4	Reserved		
5	Reserved		
6	Reserved		
7	Reserved		