

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

The system consists of 4 battery powered sensors, designed to measure pressure, board temperature, tyre carcass temperature, rim temperature and humidity. These are fitted to a wheel rim in each corner of the car sending data over an RF link to a compact receiver. Sampling rates increase automatically depending on tyre conditions and the sensor will shut down below a threshold pressure to preserve battery life.

The sensors have an RF wake-up feature, allowing individual sensors to be manually triggered to start transmitting data in selected operating modes upon request. This feature allows the user to test the sensors battery and functionality whilst not fitted to a tyre.

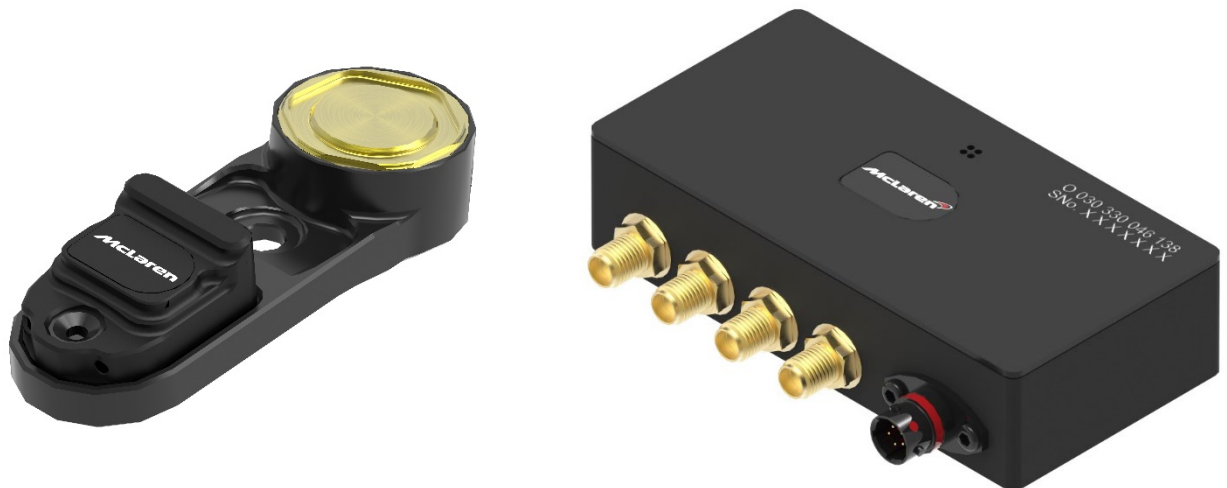
An antenna is mounted in each corner of the vehicle (preferably in the wheel arch). The sensors send data over an RF link, via the corner mounted antennas to the centrally located compact receiver. The receiver then processes the data and is able to output a pressure, temperature and battery voltage reading for each corner of the car.

The system incorporates a corner recognition strategy to determine the location of each sensor on the vehicle. The corner learning/recognition system locks the sensor serial number to the corner position and the sensor becomes active once the car is moving at race pace. The receiver will learn and lock which sensor is fitted to each corner of the car; for this corner recognition system to work correctly, all wheels must be fitted with a working sensor.

A single receiver unit is used for receiving data messages from all tyre sensor.

The sensors and receiver are given a unique team ID number restricting data visibility

This receiver system is compatible with all McLaren Applied tyre pressure sensor variants.



PRODUCT SUMMARY

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SENSOR WITH REPLACABLE BATTERY

ELECTRICAL

- Supply voltage 2.8 – 3.6 V (lithium thionyl chloride battery)
- Sensor lifetime: 3 years
- Battery Life > 250,000 transmissions
- Transmission and Battery diagnostics in transmitted data
- Battery voltage measured on full load
- Transmission rate: Governed by rate of change of pressure, temperature and rotation of the wheel. Structured to preserve battery life.
- Serial number identification through internal UHF RFID tag
- Customer replaceable battery

MEASUREMENT SPECIFICATIONS

Tyre Pressure

- Pressure ranges:
 - 1.3 – 3.1Bar absolute
 - 1.3 – 5.0Bar absolute
 - 1.3 – 8.0Bar absolute
- Transmission threshold 1.3Bar absolute.
- Pressure accuracy 0.2%FS typ 0.375% FS maximum
- Self-compensated over temperature range

Tyre Carcass Temperature

- Infrared multipoint temperature sensor
- Object temperature: 0°C to +200 °C
- Field of view: 120°
- Temperature resolution: 0.78°C/bit
- Temperature accuracy: $\pm 3^{\circ}\text{C}^{(1)}$
- Repeatability: $\pm 1^{\circ}\text{C}$
- 5 tyre temperature points: (T1 – T5)⁽²⁾

Board Temperature

- On board PTC temperature sensor
- Temperature sensor range -10°C to +194°C
- Temperature accuracy: $\pm 0.8^{\circ}\text{C}$
- Temperature resolution 0.8°C/bit

Rim Temperature

- On board single point IR rim temperature
- Rim temperature: -20°C to +200 °C
- Rim temperature accuracy:
 - 0°C to 50°C = $\pm 1^{\circ}\text{C}$
 - 50°C to 120°C = $\pm 2^{\circ}\text{C}$
 - 120°C to +160°C = $\pm 3^{\circ}\text{C}$
- Rim temperature resolution: 0.05372°C/bit
- For best results the area under the sensor should be painted matte black.

Humidity

- On board humidity sensor
- Humidity range: 0% to 100%
- Humidity accuracy: $\pm 2\%$
- Humidity resolution: 0.02442%/bit

RF Specification

- Modulation FM (FSK) encoded serial data
- Nominal frequency 433.0MHz
- Nominal baud rate 71kbps
- Transmission Range >5m
- Each sensor transmits a unique serial number
- All transmitted data is encrypted
- Internal Antenna design

Wake-up RF Specification

- Compatible with TPH5 handheld unit
 - order code O 030 330 046 191
- Nominal frequency: 868MHz
- Transmission range: >0.5m
- Wake up feature operational up to 95°C
- Provides ability to force a transmission mode.

MECHANICAL

- See attached drawings below
- Sensor weight <50g
- Sensor housing 2014 (HE15) aluminium alloy with black anodised surface finish

ENVIRONMENTAL

- Resistant to standard motorsport fluids
- Operating temperature +0°C to +140°C
- Compensated temperature +20 to +140°C
- Vibration 50 to 2500Hz @ 40g, 8 hrs per axis
- Shock 50g per axis, 1/2 sine for 11ms

⁽¹⁾ Measured at defined wheel to tyre distance with a $|T_o - T_a| < 50^{\circ}\text{C}$

⁽²⁾ IR-Array temperature points are software configurable at the production stage. Please Contact MAT to discuss the available options.

⁽³⁾ Before the sensor changes to a lower Tx rate it will continue the transmission during 10 seconds at the higher rate.

⁽⁴⁾ Rates quoted are for $V_{\text{supply}} = 3.6\text{V}$ and 25°C . Rates slow down linearly with increasing temperature and reducing V_{supply} . Rates are ≈ 0.63 quoted values under combined worst-case condition of $V_{\text{supply}} = 2.5\text{V}$ and temperature = 140°C .

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TYRE PRESSURE SENSING WITH CORNER RECOGNITION

RF MESSAGE FORMAT ⁽³⁾

Description	Pressure	Board Temp	Delta Pressure	Wheel rotation	Tx Rate ⁽⁴⁾	Message Sequence
Off Wheel storage	< 1.3Bar Absolute	NA	<20mBar/s	No	No Tx	No Tx
Inflated	> 1.3Bar Absolute	<40°C	<20mBar/s	No	1Hz (1s)	1,1,...
Inflated & heated	> 1.3Bar Absolute	>40°C	<20mBar/s	No	1Hz (1s)	1,1,...
Pressure change	NA	NA	>20mBar/s	No	2.0 Hz (0.5s)	1,1,...
Driving	NA	NA	NA	Yes	2.0 Hz (0.5s)	1,1,...

Message 1:

- Team ID
- Serial Number
- Sensor Type
- Message Type
- Pressure
- Board temperature
- Battery Voltage
- TX Life
- Accelerometer

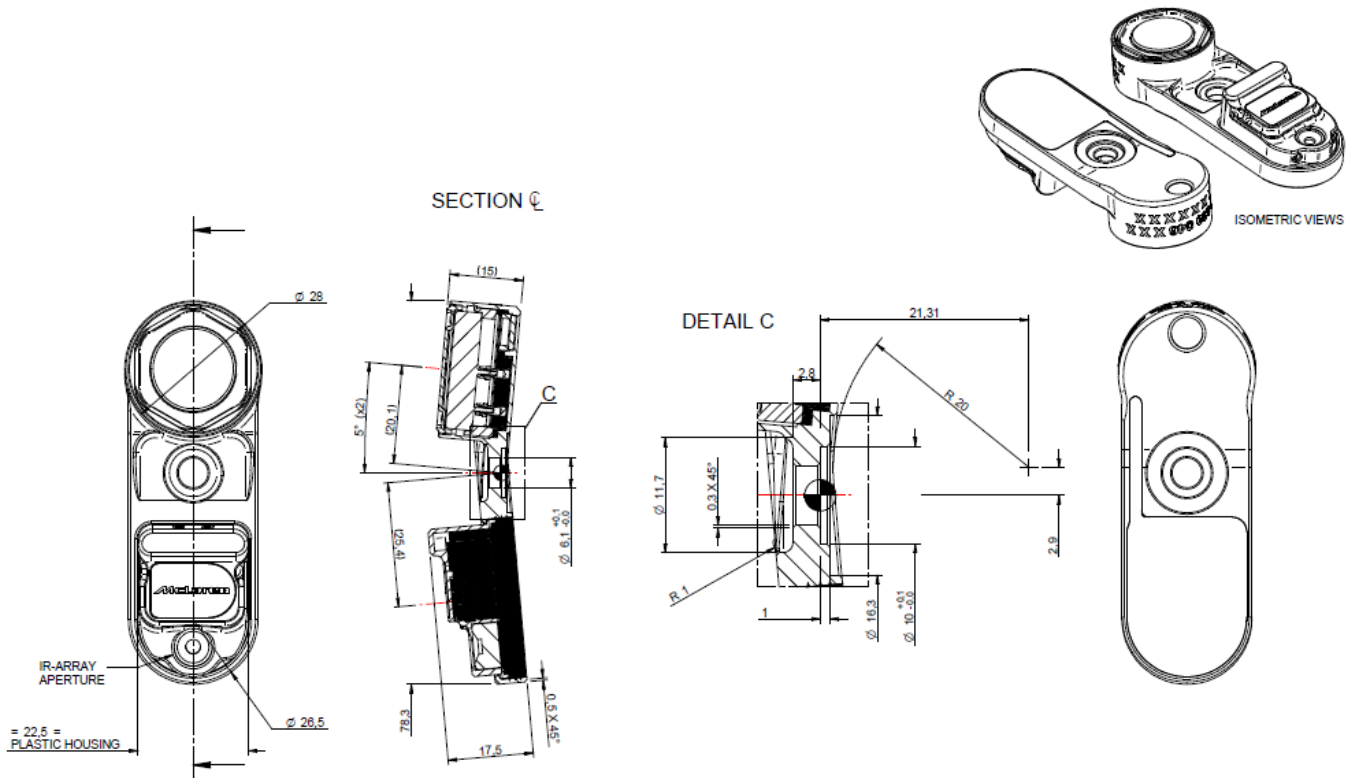
Message 2:

- Team ID
- Serial Number
- Sensor Type
- Message Type
- Carcass Temperature 1
- Carcass Temperature 2
- Carcass Temperature 3
- Carcass Temperature 4
- Carcass Temperature 5

Message 3:

- Team ID
- Serial Number
- Sensor Type
- Message Type
- Humidity
- Rim Temperature

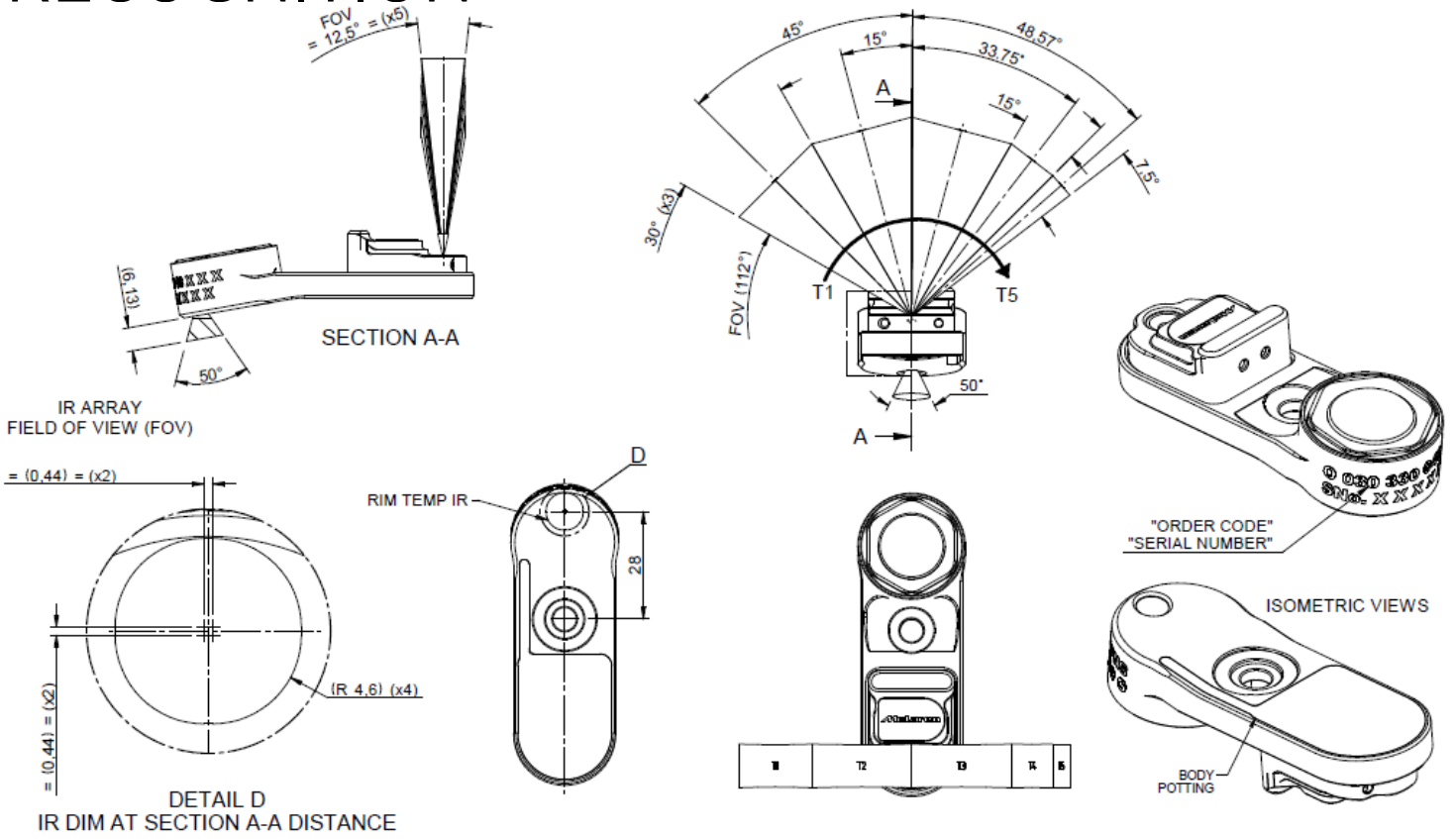
SENSOR DIMENSIONS



Order Code	Description	Pressure Range [bar]
O 030 330 046 229	5.0 Bar TPS5 Absolute Tyre Pressure sensor with IR Config #029	1.3 - 5.0

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION



alternative models, please contact McLaren Applied Technologies at sales@mcclaren.com

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

150° VALVE STUD MOUNTING KITS

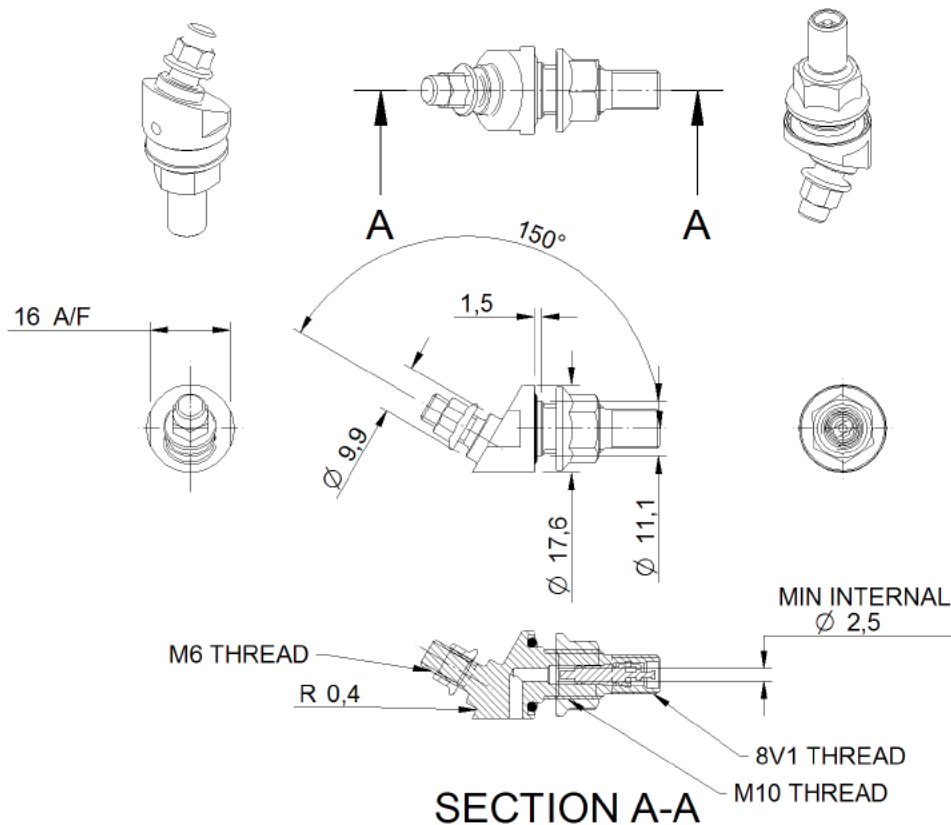
MECHANICAL

- M6 thread to sensor housing
- M10 thread for the interface locking against the rim
- Sealed with face seal 200-804 Viton O-Ring
- Smallest internal diameter 2.5mm
- 6AL4V titanium valve/stud
- Schrader valve core (fitted)
- M6 k-nut (see drawing sheet 5 for recommended torque to sensor body)
- 8V1 nut (see drawing sheet 5 for recommended torque to wheel rim)

ENVIRONMENTAL

- Resistant to standard motorsport fluids
- Operating temperature +10 to +135°C
- Vibration 50 to 2500Hz @ 40g, 8 hrs per axis
- Shock 50g per axis, 1/2 sine for 11ms

VALVE STUD DIMENSIONS



Dimensions in mm

For alternative models, please contact McLaren Applied Technologies at sales@mclaren.com

Order Code	Model Description
O 030 330 990 099	150° Tyre Valve Stud kit

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

RECEIVER WITH CORNER RECOGNITION



ELECTRICAL

- Supply voltage 8 to 16Vdc
- Supply current <50mA max at 12Vdc
- Can bus 2.0B active

MEASUREMENT SPECIFICATIONS

- Pressure resolution:
 - 3 Bar - 0.7326mBar/bit (0.0106psi/bit)
 - 5 Bar - 1.221 mBar/bit (0.0177psi/bit)
 - 8 Bar - 2mBar/bit (0.0290psi/bit)

RF Specification

- Modulation FM (FSK) encoded serial data
- Nominal frequency 433.0MHz
- Nominal baud rate 71kbps
- Antenna supplied. Can be mounted directly to receiver or connected via coax extension cable

MECHANICAL

- Weight <50g
- Aluminium alloy body, hard anodised and dyed black

ENVIRONMENTAL

- Resistant to standard motorsport fluids
- Operating temperature +10 to 85°C
- Vibration 100 to 1000Hz random spectrum for 2 hours in connector axis

100Hz	0.00395g2/Hz
200Hz	0.08573g2/Hz
300Hz	0.27121g2/Hz
650Hz	0.00482g2/Hz
1000Hz	0.01039g2/Hz

CABLE & CONNECTIONS

Connector version

- Single channel connector – ASX002-05PN

CONNECTION	PIN NUMBER
Power +	1
Ground	2
CAN +	3
CAN -	4
Not Connected	5

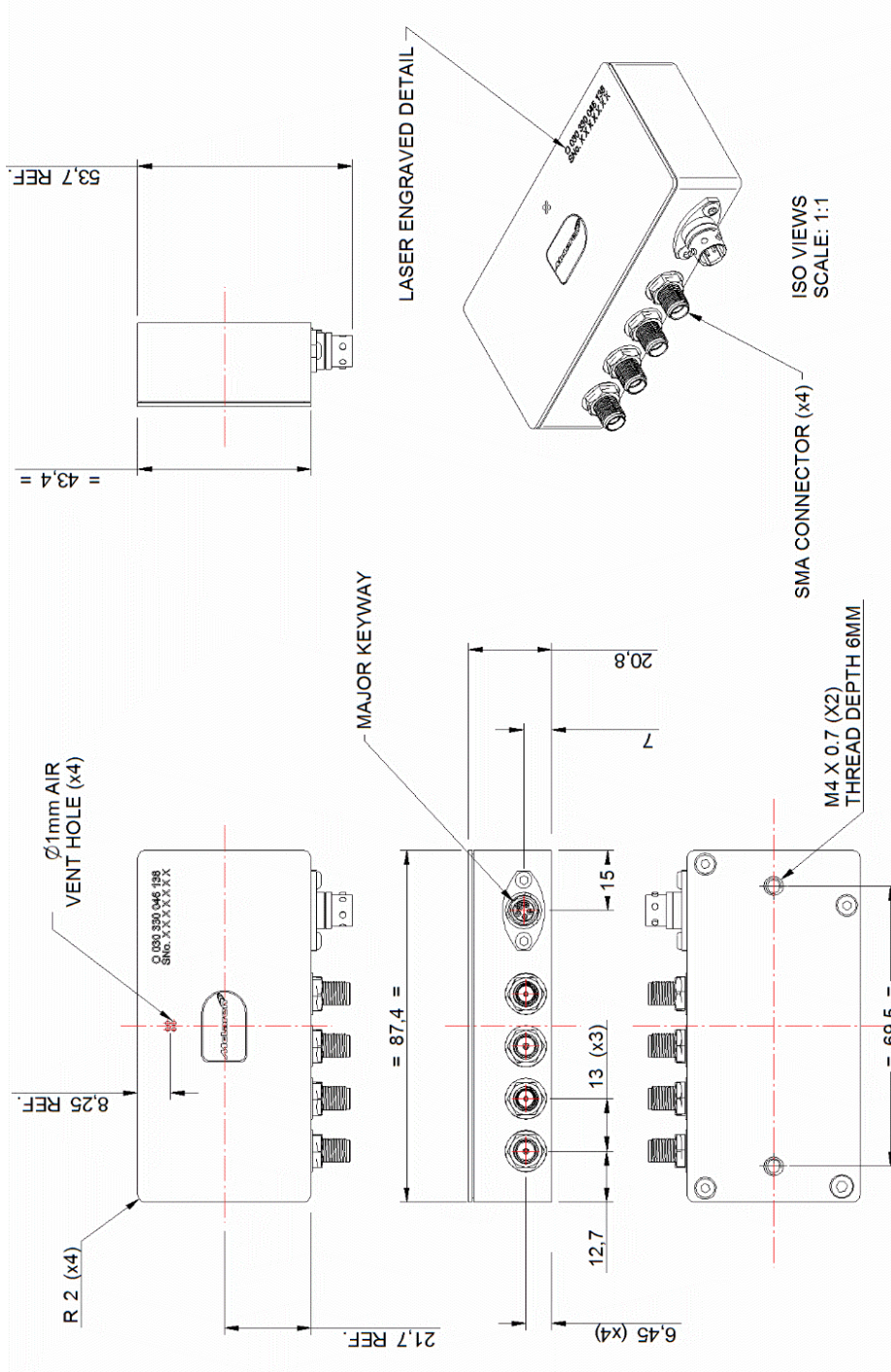
Antenna SMA Connection

CONNECTION	
Case	RF ground
Centre	RF in

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

RECEIVER DIMENSIONS



Order Code	Model Description		
	Description	Connection	Cable Length
O 030 330 046 138	433MHz 4 Channel Receiver with corner recognition	Connector	n/a

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

ANTENNAS



ELECTRICAL

- Small low profile Helical antenna
- Omni directional
- Designed to operate at 433.0MHz
- A good electrical connection must be maintained between the antenna aluminium base and car mounting surface

CONNECTIONS

Antenna Female SMA Connection

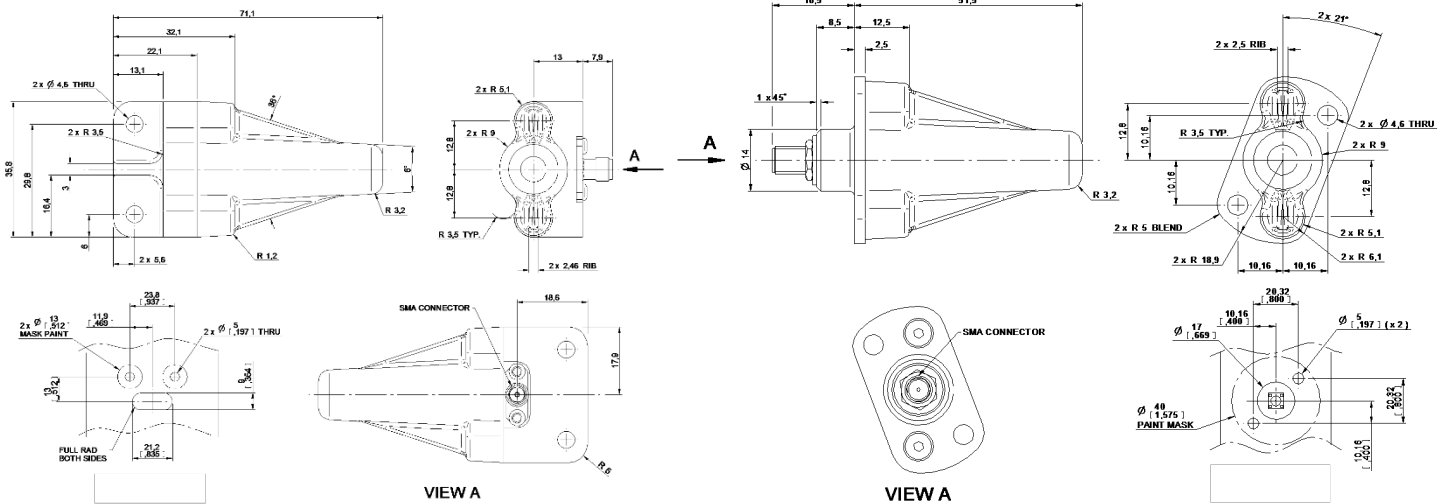
Case	RF ground
Centre	RF out

MECHANICAL

- Antenna weight 38g
- Antenna cover PA66 GF30 Nylon
- Antenna base HE30 aluminium alloy

ENVIRONMENTAL

- Resistant to standard Motorsport fluids
- Operating temperature +10 to +120°C
- Vibration 50 to 2500Hz @ 40g 8hrs per axis
- Shock 50g(max), 1/2sine for 11ms, 5 times per axis



All Dimensions in mm

Order Code	Model Description	
	Description	Connection
O 030 330 990 105	Straight Receiver Antenna	SMA Female
O 030 330 990 106	Right angled Receiver Antenna	SMA Female

For alternative models, please contact McLaren Applied Technologies at sales@mclaren.com

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

CONNECTION CABLES

CABLE & CONNECTIONS

Cable

- Coaxial cable
- Cable length see order code

ANTENNA CONNECTOR SMA SOCKET

Case	RF ground
Centre	RF in

DEUTSCH CONNECTOR / FLYING LEADS CABLES

CABLE & CONNECTIONS

Cable

- 55 spec 26 AWG unshielded cable
- Cable length see order code

FLYING LEAD

CONNECTION	WIRE COLOUR
Power +	RED
Ground	BLACK
CAN +	BLUE
CAN -	WHITE

CONNECTORS

- Single channel connector – ASX002-05SN

CONNECTION	PIN NUMBER
Power +	1
Ground	2
CAN +	3
CAN -	4
Not Connected	5

- Single channel connector – 9 PIN D-SUB

CONNECTION	PIN NUMBER
Not Connected	1
CAN '-'	2
Not Connected	3
Not Connected	4
Not Connected	5
Not Connected	6
CAN '+'	7
Not Connected	8
Not Connected	9

Connection pin 2 and 7 bridged with 120Ω resistor

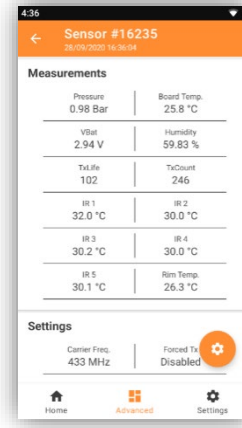
Order Code	Model Description		
	Description	Connection	Cable Length
O 030 330 990 076	Antenna extension lead	SMA Male – SMA Female	1000mm
O 030 330 990 104	Antenna extension lead	SMA Male – SMA Female	2000mm
O 030 330 990 110	Antenna extension lead	SMA Male – SMA Male	4000mm
O 030 330 990 081	CAN/Power mating connector lead	ASX002-05SN – D-Sub	1000mm
O 030 330 990 123	CAN/Power Lead	Flying Lead – D-Sub	500mm

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PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

HANDHELD READER



This Handheld control unit is designed to accompany the Tyre Pressure Monitoring System (TPMS). The unit is portable and provides the system with some user friendly and enhanced features.

The handheld unit communicates with the rim fitted sensors over 868MHz and allows the user to wake the sensor, force a transmission mode, and monitor the latest pressure and temperature data from the sensors.

ELECTRICAL

- Rechargeable, removable Lithium-Ion battery: 10050 mAh, 3.6 V
- Up to 18 hours in intensive use
- 4.7" HD capacitive touch screen
- Adjustable LED backlight, Daylight readable, Gorilla glass 3, usage with gloves supported
- Available charging station ⁽⁴⁾

FEATURES

- ISO 18000-63 (EPC Class 1 Gen2v2)
- Max. ERP 2 W (33dBm)

DISPLAYED MEASUREMENTS

- Absolute pressure
- Board Temperature
- Battery Voltage
- Humidity
- Tx Life Count
- Tx Count
- 5 x Tyre carcass temperatures
- Rim temperature
- Maximum sensor temperature
- Estimated number of battery changes

WAKE UP OPTIONS

- Ability to wake the sensor and force "driving mode" for ten seconds.
- Ability to force the sensor into any operating mode. ⁽²⁾

RF SPECIFICATION

- Compatible with TPS5 sensors
- ETSI 868MHz
- Team ID restricted data ⁽¹⁾

MECHANICAL ⁽³⁾

- (H) 214 x (W) 87/72 x (D) 135/29 mm
- Weight 650g

ENVIRONMENTAL

- Resistant to standard motorsport fluids
- Standard Operating Temperature -20°C to +55°C
- Storage Temperature -20°C to +60°C
- Charging Temperature 0° to +45°C
- Relative Humidity 10-95% non-condensing
- Environmental Sealing – IP65
- Drop/Impact Resistance 1.6m

- ⁽¹⁾ FIA special available to view data from all teams
⁽²⁾ This option should be used with caution to preserve battery life.
⁽³⁾ Final design might differ from image displayed
⁽⁴⁾ Charging over desktop charger (0 to 80 %) 4 hours

Order Code	Model Description
O 030 330 046 191	TYRE PRESSURE AND TEMPERATURE HANDHELD

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

GARAGE RECEIVER

ELECTRICAL

- Supply voltage 5Vdc (USB)
- Supply current <500mA max at 5Vdc (USB)
- Compatible with USB 1.1, USB 2.0, and USB 3.0

MEASUREMENT SPECIFICATIONS

- Pressure resolution:
 - 3 Bar - 0.7326mBar/bit (0.0106psi/bit)
 - 5 Bar - 1.221 mBar/bit (0,0177psi/bit)
 - 8 Bar - 2mBar/bit (0.0290psi/bit)

RF SPECIFICATION

- Modulation FM (FSK) encoded serial data
- Nominal frequency 433.0MHz
- Nominal baud rate 71kbps
- Antenna supplied. Can be mounted directly to receiver or connected via coax extension cable

SOFTWARE

- For use with TPMSuite
- Require PEAK PCAN drivers to be installed

CONNECTION DEFINITION

- USB Cable, length - 750mm
- Antenna connector SMA socket

ANTENNA CONNECTOR SMA SOCKET

Case	RF ground
Centre	RF in

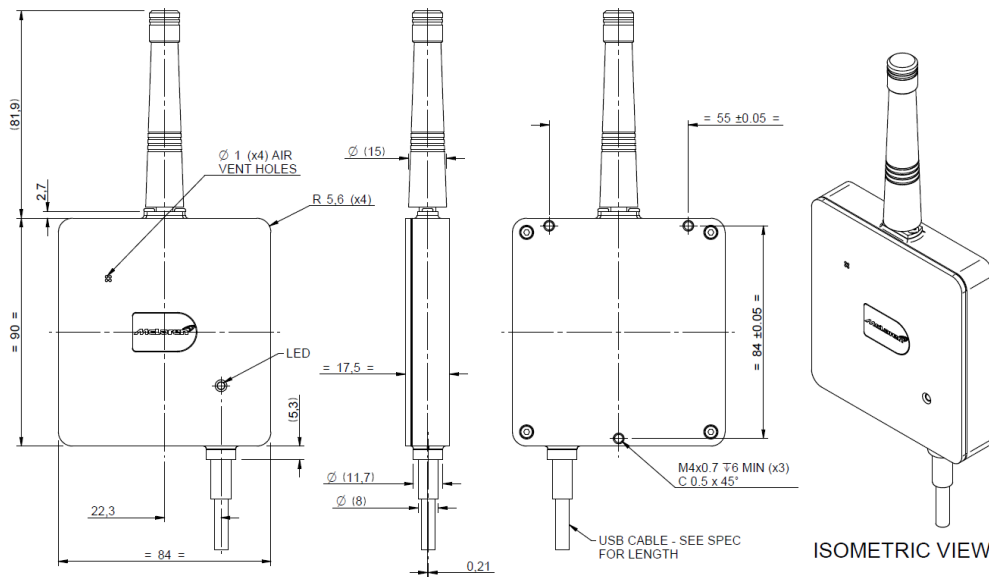
ENVIRONMENTAL

- Resistant to standard motorsport fluids
- Operating temperature +10 to 85°C
- Vibration 100 to 1000Hz random spectrum for 2 hours in connector axis

100Hz	0.00395g2/Hz
200Hz	0.08573g2/Hz
300Hz	0.27121g2/Hz
650Hz	0.00482g2/Hz
1000Hz	0.01039g2/Hz

MECHANICAL

- Weight <200g
- Aluminium alloy body, hard anodised and dyed black



Order Code	Model Description		
	Description	Connection	Cable Length
O 030 330 990 125	Garage Receiver 433MHz	USB	750mm

PRODUCT SUMMARY

TYRE PRESSURE SENSING WITH CORNER RECOGNITION

TPMSuite Garage monitoring Software

CONFIGURATIONS

- Configure receiver diagnostic CAN ID
- Configure receiver diagnostic message tx rate
- Select between a multiplexed or non-multiplexed message
- Enable the receivers permit list
- Configure the CAN ID sensor data is transmitted on.
- Save configurations

PERMIT LIST

- Populate a permit list with serial numbers and CAN ID.
- Export and Import permit lists

MONITORING

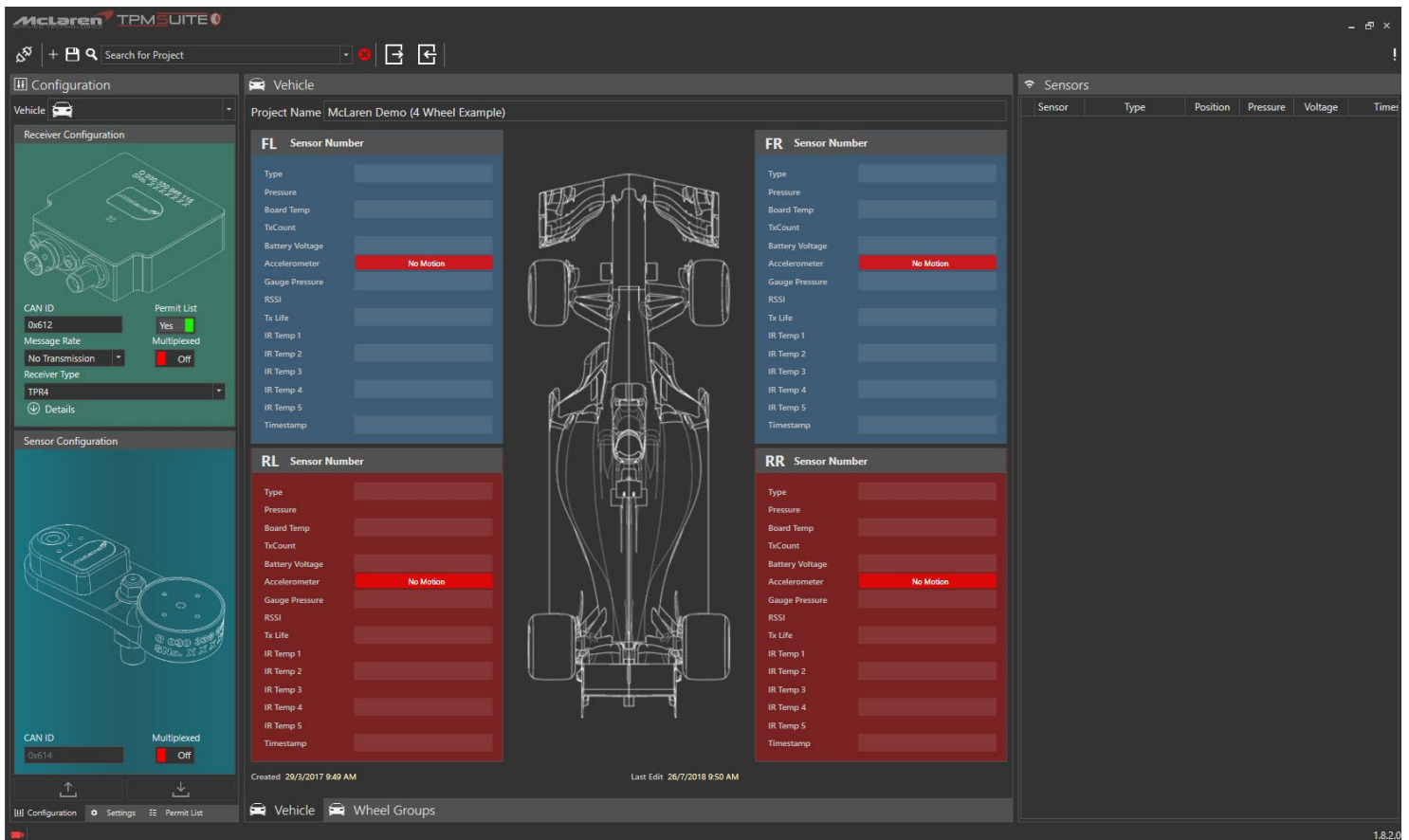
- Monitor a list of multiple sensors that the receiver can see.
- Option to drag 4 specific sensors onto the main screen for corner monitoring.

WHEEL GROUPS

- Allows you to display all the tyres in your garage rack

DOCUMENTATION

- A separate user manual is available upon request



The screenshot displays the McLaren TPM Suite software interface. The main window is titled 'McLaren TPM SUITE' and shows a 'Configuration' panel on the left and a 'Vehicle' panel on the right. The 'Configuration' panel includes 'Receiver Configuration' and 'Sensor Configuration' sections. The 'Receiver Configuration' section shows a CAN ID of '0x612', a message rate of 'No Transmission', and a receiver type of 'TPR4'. The 'Sensor Configuration' section shows a CAN ID of '0x614' and a multiplexed status of 'Off'. The 'Vehicle' panel shows a 'Project Name' of 'McLaren Demo (4 Wheel Example)' and a central diagram of a car chassis. Four sensor configuration panels are visible: 'FL Sensor Number', 'FR Sensor Number', 'RL Sensor Number', and 'RR Sensor Number'. Each panel lists various sensor types (Pressure, Board Temp, TxCount, Battery Voltage, Accelerometer, Gauge Pressure, RSSI, Tx Life, IR Temp 1-5, Timestamp) and has a 'No Motion' indicator. The 'Sensors' panel on the right shows a table with columns for Sensor, Type, Position, Pressure, Voltage, and Time.