

## TPMS Comparison

<b>Sensor/Transmitter</b>	<b>Tyron</b>	<b>SmarTire</b>	<b>Wabco</b>	<b>PressurePro</b>
Internal	<ul style="list-style-type: none"> <li>• Rim mounted</li> <li>• Valve mounted</li> <li>• Tyron band mounted</li> </ul>	Rim mounted	None	None
External	<ul style="list-style-type: none"> <li>• Flow-through valve stem mounted</li> <li>• Sensor-on-cap</li> </ul>	None	Sensor mounted to valve using a pneumatic hose	Valve stem mounted
RF Modulation: ASK	Yes	Yes	Yes	Yes
RF Modulation: FSK	Yes	No	No	No
Battery Life	8 yr	6 yr	5 yr	2 yr
LF Initiation	Yes - Internal models	Yes	No	No
Temperature Monitoring	Yes	Yes	No	No
Heartbeat Transmission	<ul style="list-style-type: none"> <li>• Every 3 minutes when vehicle is in motion</li> <li>• Every 2 hours when vehicle is parked</li> </ul>	<ul style="list-style-type: none"> <li>• Every 3 to 5 minutes when vehicle is in motion</li> <li>• No transmission when vehicle is parked</li> </ul>	<ul style="list-style-type: none"> <li>• Every 15 minutes when pressure is in range</li> <li>• Every 30 seconds when pressure losses or varies</li> </ul>	<ul style="list-style-type: none"> <li>• Constantly transmit signals after sensor is pressurized</li> </ul>
Event Driven Transmission	<ul style="list-style-type: none"> <li>• Slow leak detection</li> <li>• Rapid pressure change</li> <li>• Temperature increase</li> <li>• Initial vehicle movement</li> </ul>	<ul style="list-style-type: none"> <li>• Slow leak detection</li> <li>• Rapid pressure loss</li> <li>• Initial vehicle movement</li> </ul>	<ul style="list-style-type: none"> <li>• Slow leak detection</li> <li>• Rapid pressure loss</li> <li>• Vehicle movement</li> </ul>	<ul style="list-style-type: none"> <li>• Rapid pressure loss</li> <li>• Vehicle movement</li> </ul>
Data Transmitted	<ul style="list-style-type: none"> <li>• Pressure</li> <li>• Temperature</li> <li>• ID – 32 bit</li> </ul>	<ul style="list-style-type: none"> <li>• Pressure</li> <li>• Temperature</li> <li>• ID</li> </ul>	<ul style="list-style-type: none"> <li>• Pressure</li> <li>• ID</li> </ul>	<ul style="list-style-type: none"> <li>• Pressure</li> <li>• ID</li> </ul>
Status Transmitted	<ul style="list-style-type: none"> <li>• Sensor in sleep mode</li> <li>• LF trigger flag</li> <li>• Sensor in normal mode</li> <li>• Slow air leak</li> <li>• Pressure change</li> <li>• Tire motion</li> <li>• Battery low</li> </ul>	<ul style="list-style-type: none"> <li>• LF trigger flag</li> <li>• Slow air leak</li> <li>• Pressure change</li> <li>• Tire motion</li> <li>• Battery low</li> </ul>	<ul style="list-style-type: none"> <li>• Slow air leak</li> <li>• Pressure change</li> <li>• Tire motion</li> <li>• Battery low</li> </ul>	<ul style="list-style-type: none"> <li>• Pressure change</li> <li>• Tire motion</li> <li>• Battery low</li> </ul>

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Receiver/Display/ Monitor/ECU	<b>Tyron</b>	<b>SmarTire</b>	<b>Wabco</b>	<b>PressurePro</b>
Separate Receiver & Display	Yes	Yes	Yes	No
One-Piece Monitor	Yes	No	No	Yes
Handheld Monitor	Yes – rechargeable battery operated	No	No	No
Automatic Configuration	<ul style="list-style-type: none"> <li>• External system auto-configure based on sorted sensor ID</li> </ul>	<ul style="list-style-type: none"> <li>• Not supported in standard model</li> </ul>	No	No
LCD Display with Graphic and Icons	<ul style="list-style-type: none"> <li>• Tractor/trailer graphic with tire icon</li> <li>• Temperature reading in °C or °F</li> <li>• High temperature icon</li> <li>• Pressure reading in Bar or PSI</li> <li>• 4-level tire pressure icon: flat, low, full, over-inflated.</li> <li>• Low battery icon</li> <li>• No signal icon (dead or missing sensor)</li> <li>• Green/red LED light</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicle graphic with tire icon</li> <li>• Temperature reading</li> <li>• Pressure reading</li> <li>• Low battery icon</li> <li>• Missing sensor icon</li> <li>• Status light</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicle chassis graphic with tire icon</li> <li>• Pressure reading in Bar or PSI</li> <li>• Pressure loss graphic</li> <li>• Wrench graphic</li> <li>• Tire pump graphic</li> <li>• STOP light</li> <li>• SLOW light</li> </ul>	<ul style="list-style-type: none"> <li>• No LCD – use LED display</li> <li>• Tire indicator</li> <li>• Pressure reading</li> <li>• Status light</li> </ul>
Continuous Display	<ul style="list-style-type: none"> <li>• Continuously displaying tire readings, one-by-one.</li> <li>• Changeable back to On/Off</li> </ul>	No	No	No
All Tire Pressure Display	<ul style="list-style-type: none"> <li>• One model shows 4 tires</li> <li>• A new model shows up to 12-tire info per screen, will be available Oct. 2007.</li> </ul>	No	No	No
Adjustable Pressure and Temperature Warning Threshold Setup	<ul style="list-style-type: none"> <li>• Per axle tractor tire low pressure threshold</li> <li>• Tractor tire high pressure threshold</li> <li>• Trailer tire low pressure threshold</li> <li>• Trailer tire high pressure threshold</li> <li>• High temperature threshold</li> </ul>	<ul style="list-style-type: none"> <li>• Per axle tractor tire low pressure threshold</li> <li>• Tractor tire high pressure threshold</li> <li>• Trailer tire low pressure threshold</li> <li>• Trailer tire high pressure threshold</li> </ul>	<ul style="list-style-type: none"> <li>• Tractor tire low pressure threshold</li> <li>• Trailer tire low pressure threshold</li> </ul>	<ul style="list-style-type: none"> <li>• User must setup a tire pressure as baseline</li> <li>• Issue low pressure warning at 12.5% under baseline</li> <li>• Issue very low pressure warning at 25% under baseline</li> <li>• Thresholds not changeable</li> </ul>

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Technologies	Tyron	SmarTire	Wabco	PressurePro
Tire Monitoring	<ul style="list-style-type: none"> <li>• Proprietary technologies in all areas of tire monitoring</li> <li>• Do not use Application Specific Integrated Circuit (ASIC)</li> </ul>	<ul style="list-style-type: none"> <li>• Use ASIC developed by SensorNor – the ASIC incorporates basic tire monitoring functionalities but lacks flexibility</li> </ul>	<ul style="list-style-type: none"> <li>• Proprietary technologies</li> <li>• Use ASIC</li> </ul>	<ul style="list-style-type: none"> <li>• No in-house engineers</li> <li>• System was developed by Llectronix, a contract engineering and manufacturing firm.</li> </ul>
Wireless Technologies	<ul style="list-style-type: none"> <li>• Proprietary technologies in all RF areas</li> </ul>	<ul style="list-style-type: none"> <li>• Original technologies were acquired from TRW</li> </ul>		
Communication Interface	<ul style="list-style-type: none"> <li>• J1939</li> <li>• RV-C, an improved J1939</li> <li>• UART/RS232</li> <li>• I<sup>2</sup>C</li> </ul>	<ul style="list-style-type: none"> <li>• J1939</li> </ul>	<ul style="list-style-type: none"> <li>• J1939</li> </ul>	No
Telematic Integration	<ul style="list-style-type: none"> <li>• Integrated with telematic providers such as PeopleNet</li> <li>• Will integrate with major telematic providers</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated with Saucon</li> </ul>	No	No
Customized TPMS Solution	<ul style="list-style-type: none"> <li>• US based</li> <li>• Able to apply extensive TPMS experiences to suit customer applications</li> <li>• Specialize in rapid prototyping new developments</li> </ul>	<ul style="list-style-type: none"> <li>• Canada based</li> <li>• Resource limitation might affect developing good solutions for the customer</li> </ul>	<ul style="list-style-type: none"> <li>• Germany based</li> <li>• Customization and new development coordination would be difficult</li> <li>• European solutions are always expensive</li> </ul>	<ul style="list-style-type: none"> <li>• No in-house R&amp;D team</li> <li>• Difficult and expensive to outsource development</li> </ul>