

*TIRESCAN*<sup>™</sup> Tire Pressure Measurement System

The *TireScan*<sup>™</sup> system is a unique tool used to capture tire footprint pressure patterns. Tire footprints can be captured statically or dynamically and are displayed as high resolution, multi-colored images of the tire contact pressure pattern in real time. The system's intuitive, application specific graphing and image analysis software enables quantitative and qualitative analysis of the tire footprint.

#### TireScan System Families

- 1) Passenger, Bus & Truck Ruggedized Systems - TVR8404, TVR8406, TVR8408
- 2) Passenger, Bus & Truck Non-Ruggedized Systems -TV8404, TV8406, TV8408
- 3) Truck & Bus Systems - TV7101, TV8001
- 4) Additional Available Truck & Agricultural Sensors - 5400NH, 5400NQ, 7101Q, 7200N, 7200NQ, 8001Q

#### Key Features (Benefits):

- Fast, accurate, and repeatable measurements
- Dynamic recording and playback
- Graphing and data analysis capabilities
- Real-time viewing
- Measure void ratio
- Durable & reusable sensors
- Thin & incompressible dimensional stability is key for repeatable measurements
- Suitable for lab and field testing
- Integrated external triggering & synchronization
- Tested & proven by dozens of tire manufacturers worldwide

#### **APPLICATIONS:**

- Tire footprint pressure pattern evaluation
- Tread design
- Manufacturing quality assurance
- Vehicle suspension analysis
- Competitive benchmarking

### TIRE TYPES:

- Passenger
- BusTruck
- Agricultural
- ATV Motorcycle

Aircraft

Racing



## **General Sensor Specifications**

SensorTechnology	Resistive
Accuracy	± 5%
Pressure Range	0-2,068 kPa (0-300 psi)
Thickness	0.2 mm (0.008 in.) Not compressible

### Data Acquisition Electronics Specifications

Ambient Temperature	-40° to 60°C (-40° to 140°F)
Ambient Humidity	5% to 90% RH
<b>Connection</b> Type	USB 2.0
Cable Length	4.57 m (15 ft) standard (Up to 30.48 m (100 ft) available)
Power Supply	110-240 VAC 50/60 HZ 60W IEC320

## PASSENGER, BUS & TRUCK RUGGEDIZED SYSTEMS:

The Ruggedized *TireScan* system includes *VersaTek*<sup>®</sup>metal scanning electronics enclosures, a sensor mounting platform and leading and trailing drive plates. The data acquisition electronics enclosures are designed to withstand harsh testing environments and provide protection from dirt and debris. Leading and trailing drive plates provide a smooth ride across the sensor mounting platform allowing for accurate data acquisition.











### SENSOR SPECIFICATIONS:

System Model	TVR8404	TVR8406	TVR8408
Sensing Area	268.2 mm x 317.0 mm (10.56 in. x 12.48 in.)	268.2 mm x 317.0 mm (10.56 in. x 12.48 in.)	402.3 mm x 433.2 mm (15.84 in. x 17.06 in.)
# of Sensing Elements	36,608	82,368	133,408
Spatial Resolution (X,Y)	1.50 mm x 1.50 mm (0.060 in. x 0.060 in.)	1.00 mm x 1.00 mm (0.040 in. x 0.040 in.)	1.10 mm x 1.10 mm (0.045 in. x 0.045 in.)
Scanning Rate (Hz)	106	71	29
# of Handles	4 (2 pairs)	6 (3 pairs)	8 (4 pairs)
Visual Output			

### DATA ACQUISITION ELECTRONICS:

The Ruggedized *TireScan* system includes data acquisition electronics that easily connect to a PC or laptop's USB port. The electronics are capable of scanning the sensor at a rate up to 106 Hz, ensuring all dynamic events are captured. The system also includes a Hub that provides external triggering and synchronization. Simply connect a BNC cable to the *VersaTek* Hub and your device and set up the External Trigger Synch software feature.



The *VersaTek* Hub collects data from the *VersaTek* Handles and sends it over to the PC via USB.

The *VersaTek* Ruggedized Handle (VR2) connects to the *Tekscan* sensor tab to scan the sensor as pressure is applied. Additionally, the housing provides tension to hold the sensor flat to the sensor mounting plate and keeps the sensor properly aligned.

## PASSENGER, BUS & TRUCK NON-RUGGEDIZED SYSTEMS:

The *TireScan* Non-Ruggedized systems are for use in controlled environments where dirt and debris are not present. Optional metal electronic enclosures are available to protect the handle.



### SENSOR SPECIFICATIONS:

System Model	TV8404	TV8406	TV8408
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# of Handles	4	6	8
Visual Output			

### DATA ACQUISITION ELECTRONICS:

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## TRUCK & BUS SYSTEMS:

The *TireScan* Truck & Bus systems are for use with larger tires where the spatial resolution of the tire sensor does not need to be as fine. Optiona metal electronic enclosures are available to protect the handle.



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### SENSOR SPECIFICATIONS:

System Model	TV7101	TV8001
Sensing Area	487.7 mm x 447.0 mm (19.20 in. x 17.60 in.)	292.6 mm x 268.2 mm (11.52 in. x 10.56 in.)
# of Sensing Elements	8,448	8,448
Spatial Resolution(X,Y)	5.1 mm x 5.1 mm (0.200 in. x 0.200 in.)	3.0 mm x 3.0 mm (0.120 in. x 0.120 in.)
Scanning Rate (Hz)	159	173
# of Handles	2	2
Visual Output		

### DATA ACQUISITION ELECTRONICS:

The *TireScan* system includes data acquisition electronics that easily connect to a PC or laptop's USB port. The electronics are capable of scanning the sensor at a rate up to 173 Hz, ensuring all dynamic events are captured. The system also includes a Hub that provides external triggering and synchronization. Simply connect a BNC cable to the *VersaTek* Hub and your device and set up the External Trigger Synch software feature.

8-Port <i>VersaTek</i> Hub	<i>VersaTek</i> Handle	Metal Handle Enclosure
GROUND JACK .84 [21.2] 4.15 [105.4] 	Push to <b>RECORD</b> static & dynamic pressure events directly in the software 0.65 [16.5] 0.65 [16.5] Conveniently opens up a <b>NEW REAL-TIME WINDOW</b> , making it easy to record multiple events	
7.73 [196.3] 7.73 [196.3] 7.73 [196.3] 7.73 [196.3] 7.73 [196.3] 7.73 [196.3] 1.39 [35.4] 5HIELDED RJ45 JACK X8 CHANNELS	5.10 [129.4] Sensor Inserted Here 1.30 [33.0] 180 [4570]	The Metal Handle Enclosure holds the <i>VersaTek</i> Handle to protect from outside environment. ( <i>NOTE: Optional system add-on</i> )
The <i>VersaTek</i> Hub collects data from the <i>VersaTek</i> Handles and sends it over to the PC via USB.	The <i>VersaTek</i> Handle connects to the <i>Tekscan</i> sensor tab to scan the sensor as pressure is applied.	

# LARGE AGRICULTURAL & OFF-ROAD SENSORS:

The *TireScan* Large, Agricultural & Off-Road sensors are meant for larger tire applications. A system can be customized to fit your application needs using one of the sensors below. (See *TireScan* Truck & Bus for Data Acquisition Electronics specifications.)



### SENSOR SPECIFICATIONS:

System Model	5400NH	5400NQ	7101Q
Sensing Area	1734.1 mm x 1768.1 mm (68.27 in. x 69.61 in.)	1156.0 mm x 1768.1 mm (45.51 in. x 69.61 in.)	975.4 mm x 894.1 mm (38.40 in. x 35.20 in.)
# of Sensing Elements	10,608	7,072	33,792
Spatial Resolution (X,Y)	17.0 mm x 17.0 mm (0.669 in. x 0.669 in.)	17.0 mm x 17.0 mm (0.669 in. x 0.669 in.)	5.1 mm x 5.1 mm (0.200 in. x 0.200 in.)
Scanning Rate (Hz)	258	285	160
# of Handles	6	4	8
Visual Output			$\langle \langle \cdot \rangle$

## LARGE AGRICULTURAL & OFF-ROAD SENSORS: (CONT.)

7200N







### SENSOR SPECIFICATIONS:

System Model	7200N	7200NQ	8001Q
Sensing Area	625.9 mm x 704.1 mm (24.64 in. x 27.72 in.)	1251.7 mm x 1408.2 mm (49.28 in. x 55.44 in.)	536.4 mm x 585.2 mm (21.12 in. x 23.04 in.)
# of Sensing Elements	8,712	34,848	33,792
Spatial Resolution	7.1 mm x 7.1 mm (0.280 in. x 0.280 in.)	7.1 mm x 7.1 mm (0.280 in. x 0.280 in.)	3.0 mm x 3.0 mm (0.120 in. x 0.120 in.)
Scanning Rate (Hz)	191	191	175
# of Handles	2	8	8
Visual Output			

# Key Software Features:

*TireScan* provides the tools for more comprehensive and higher quality analysis than ordinary pressure sensing technologies. *TireScan* software displays the pressure distribution data in multiple formats for superior analysis. The user has the option to create and customize graphs from the corresponding "movie" data or export as an ASCII file for use with other programs.

- Real-time display of pressure distribution data in 2D & 3D
- Record and play-back pressure "movies"
- Plot pressure, area, and force data over time and distance
- Displays surface area & void ratio of tire footprint
- Export data to ASCII or AVI files
- View and compare multiple tests simultaneously
- Save recording as an FSX "movie" file



Displaying the peak forces as a tire rolls across a sensor



Above: 2D pressure distribution image of a tire footprint showing Perimeter Area, Contact Area, and Cross Sectional Pressure Profile of the tire. It also shows the Length and Width of the tire footprint.

SENSEL A	RFA 1.3064	5 mm2			
NOISE TH	RESHOLD 3	- 11111a			
SECONDS	PER FRAM	AE 0.02			
MICRO SE	CONDO	0.02			
EXTENDED	COMPRE	SSION 3			
TIME 7/2/	2010 11:26	21.33AM			
SATURATI	ON PRESS	URE 1674.84	KPa		
CALIBRAT	ION POINT	1 3.11376	(KNewtons)	362876 (Ra	wy Sum) 96
CALIBRAT	ION MODE	1 Point	(internation)	over of the	in sound so
CAL FPL 1	700				
CAL FPC	1 700				
CAL FPS	1-1				
CAL RSI 1	362876				
CAL RSC	1 362876				
CAL SM 1	9661				
CAL CMO	10				
CALIBRAT	ION INFO	C:\Users\ca	ladro\Deskt	op\8408 p	assenger e
SENSITIVI	TY Low-3				
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START_FR END_FRAI COMMEN ASCII_DA1 1 2 3 4 5 6 7	AME 1 ME 139 Time TA @@ 0.02 0.04 0.06 0.08 0.11 0.12	(Absolute 7/2/2013 1 7/2/2013 1 7/2/2013 1 7/2/2013 1 7/2/2013 1 7/2/2013 1 7/2/2013 1	Row (mm) 219.28 270.02 272.76 270.2 268.4 267.32 266.68	Col (mm) 0.57 0.57 0.98 1.32 2.02 2.92 3.88	Force 82 584 1416 3285 6123 9812 14123
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*TireScan* data exported to ASCII displayed in a spreadsheet.



When a box is drawn around an image, the software will automatically find the perimeter of the tire. The area of the total foot print is compared to the area making contact with the sensor to calculate the void ratio.

# SENSOR EQUILIBRATION:

All *TireScan* systems include a sensor equilibration device. The equilibration process normalizes all the sensing elements on the sheet, improving the accuracy and extending the lifespan of the sensor. The sensor is inserted between a flat backing plate and air filled bladder that is inflated to apply a uniform pressure to the active area of the sensor.



All *TireScan* equilibration devices require Pneumatic (compressed air) and can apply a maximum uniform pressure of 100 psi (689 kPa) to a sensor. An equilibrator is included in a system purchase (model dependant on system).

Sustam Madal	Equilibration Device Models			
System Model	PB100H	PB100T	PB100T-1	
TVR8404		Х		
TVR8406		Х		
TVR8408		Х		
TV8404	Х		*	
TV8406	Х		*	
TV8408			Х	
TV7101	Х		*	
TV8001	Х		*	
* Sensors compatibile with PB100H Equilibrator will fit into PB100T-1 Equilibrator				

#### Why Equilibration?

Over time and through repeated loading, individual pressure sensing elements will eventually start to vary somewhat in sensitivity. The equilibrator applies a uniform pressure across the face of the sensor, allowing the software to easily see and quantify these variations. A digital compensation factor is automatically created and applied to each individual sensing element.



Sensor in Equilibrator before software equilibration is performed



Sensor in Equilibrator after software equilibration is performed

# Related Products & Options:

#### Tire Bead

In addition to measuring tire footprint pressure patterns, *TireScan* is also capable of measuring tire bead pressure profiles. Please refer to the Sensor Catalog for a list of sensor models recommended for tire bead pressure measurements.



Above: 2D output and plot of the tire bead contact pressure profile. The pressure profile is plotted from outside the tire, past the flange and bead, to inside the tire. The tire bead sensor shows the pressure on the bead at different points in the rotation. This allows for verification of good seal design on both sides of the tire. The tire bead sensor is compatible with slip rings for use while tire is spinning.

#### Analog Input

External data can be recorded and analyzed by *TireScan* software via USB-6008, an analog to digital input module (priced separately). Data from an analog sensor can now be evaluated against tactile sensor data in *TireScan*.

- Load cell connected to analog input channels can be used for real-time calibration of TireScan sensor
- Plot external sensor data against sensor pressure, area, and force data
- Export and import external analog data into TireScan



Optional USB-6008 Analog/Digital to USB converter



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Analog input and Tekscan data



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