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Specifications

This chapter provides the specifications of the waveform analyzer. *Product Description* (below) is a general description of the instrument. The *Specification Tables*, which begin on page 1–1, contain all the specifications.

Product Description

The TVS600 and TVS600A Waveform Analyzers are a family of C-size, two-slot VXI modules suitable for use in a variety of test and measurement applications and systems. Many key features are listed below:

- Eight standard configurations with full-featured, 1 MΩ/50 Ω inputs
- Maximum realtime digitizing rate up to 5 GSamples per second with an analog bandwidth up to 1 GHz. See Table 1–1 for details.

Table 1–1: Comparison of product features

Product	Input channels	Maximum sample rate	Analog bandwidth
TVS645 & TVS645A	4	5 GSamples/second	1 GHz
TVS641 & TVS641A	4	1 GSamples/second	250 MHz
TVS625 & TVS625A	2	5 GSamples/second	1 GHz
TVS621 & TVS621A	2	1 GSamples/second	250 MHz

- Maximum record length of 30,000 samples with 8-bit vertical resolution.
- Full programmability using a SCPI command set.
- Acquisition modes such as sample, envelope, and average.
- Internal triggering modes plus VXI backplane and external trigger sources.

Specification Tables

This section contains tables that list the specifications for the waveform analyzer. All specifications are guaranteed unless noted “typical.” Specifications that are marked with the ✓ symbol are checked in the *Performance Verification* section.

The performance limits in this specification are valid with these conditions:

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- The waveform analyzer must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described in these specifications.
- The waveform analyzer must have been calibrated/adjusted at an ambient temperature between +20° C and +30° C.
- The waveform analyzer must have had a warm-up period of at 20 minutes.
- The waveform analyzer must have had its signal-path-compensation routine (self cal) last executed after at least a 20 minute warm-up period at an ambient temperature within ±5° C of the current ambient temperature.

Table 1–2: Signal acquisition system

Characteristic		Description	
✓	Accuracy, DC Gain	±1.5% for full scale ranges from 20 mV to 100 V ±2.0% for full scale ranges <20 mV	
✓	Accuracy, DC Voltage Measurement	±(1.5% of input signal + 1% of full scale range) with instrument temperature within 5° C of the temperature when last Self Cal'ed and for input ranges ≥50 mV full scale	
✓	Accuracy, Delta DC Voltage Measurement	±(1.5% of input signal + 0.1% of full scale range) with instrument temperature within 5° C of the temperature when last Self Cal'ed	
✓	Accuracy, Offset[1]	*Full Scale Range Setting*	*Offset Accuracy*
		10 mV – 1 V	±[(0.2% × | offset |) + 1.5 mV + (6% × full scale range)]
		1.01 V – 10 V	±[(0.25% × | offset |) + 15 mV + (6% × full scale range)]
		10.1 V – 100 V	±[(0.25% × | offset |) + 150 mV + (6% × full scale range)]
✓	Analog Bandwidth, DC–50 Ω Coupled or DC–1 MΩ Coupled	*Full Scale Range Setting*	*Bandwidth[2]*
		10.1 V – 100 V	DC - 500 MHz (TVS625, TVS625A, TVS645 & TVS645A) DC - 250 MHz (TVS621, TVS621A, TVS641 & TVS641A)
		100 mV – 10 V	DC - 1 GHz (TVS625, TVS625A, TVS645 & TVS645A) DC - 250 MHz (TVS621, TVS621A, TVS641 & TVS641A)
		50 mV – 99.8 mV	DC - 750 MHz (TVS625, TVS625A, TVS645 & TVS645A) DC - 250 MHz (TVS621, TVS621A, TVS641 & TVS641A)

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Table 1-2: Signal acquisition system (cont.)

Characteristic	Description		
	20 mV – 49.8 mV	DC – 600 MHz (TVS625, TVS625A, TVS645 & TVS645A) DC – 250 MHz (TVS621, TVS621A, TVS641 & TVS641A)	
	10 mV – 19.8 mV	DC – 500 MHz (TVS625, TVS625A, TVS645 & TVS645A) DC – 250 MHz (TVS621, TVS621A, TVS641 & TVS641A)	
Bandwidth, Analog, Selections	20 MHz, 250 MHz, and FULL		
Calculated Rise Time, typical[3] Typical full-bandwidth rise times are shown in the chart to the right	*Full Scale Range Setting*	*TVS621, TVS621A, TVS641 & TVS641A*	*TVS625, TVS625A, TVS645 & TVS645A*
	10.1 V – 100 V	900 ps	1.8 ns
	100 mV – 10 V	450 ps	1.8 ns
	50 mV – 99 mV	600 ps	1.8 ns
	20 mV – 49.9 mV	750 ps	1.8 ns
	10 mV – 19.9 mV	900 ps	1.8 ns
Crosstalk (Channel Isolation)	≥300:1 at 100 MHz and ≥100:1 at the rated bandwidth for the channel's sensitivity (Full Scale Range) setting, for any two channels having equal sensitivity settings		
✓ Delay Between Channels, Full Bandwidth	≤100 ps with equal Full Scale Range and Coupling settings at 25° C and ≤150 ps with equal Full Scale Range and Coupling settings for CH1 – CH3 and CH1 – CH4 above 35° C		
Frequency Limit, Upper, 20 MHz Bandwidth Limited, typical	20 MHz		
Frequency Limit, Upper, 250 MHz Bandwidth Limited, typical	180 MHz		
Input Channels, Number of	*Product*	*Channels*	
	TVS641, TVS641A, TVS645 & TVS645A	Four	
	TVS621, TVS621A, TVS625 & TVS625A	Two	
Input Coupling	DC, AC, or GND[4]		
Input Impedance, DC-1 MΩ Coupled	1 MΩ ±0.5% in parallel with 10 pF ±3 pF		
Input Impedance Selections	1 MΩ or 50 Ω		
Input Resistance, DC-50 Ω Coupled	50 Ω ±1%		
Input VSWR, DC-50 Ω Coupled	≤1.3:1 from DC – 500 MHz, ≤1.5:1 from 500 MHz – 1 GHz		
Input Voltage, Maximum, DC-1 MΩ, AC-1 MΩ, or GND Coupled	The greater of ±300 Vrms or 420 Vpeak DC, derated at 20 dB/decade above 1 MHz CAT II (see *Installation Category Descriptions* on page 1-12 for more information)		
Input Voltage, Maximum, DC-50 Ω or AC-50 Ω Coupled	5 V_{RMS}, with peaks ≤ ±25 V		

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Table 1-2: Signal acquisition system (cont.)

Characteristic	Description				
Lower Frequency Limit, AC Coupled, typical	≤10 Hz when AC-1 MΩ Coupled; ≤200 kHz when AC-50 Ω Coupled[5]				
⌐ Random Noise	*Bandwidth Selection*	*RMS Noise*			
	Full	≤(350 μV + 0.5% of the Full Scale Range)			
	250 MHz	≤(165 μV + 0.5% of the Full Scale Range)			
	20 MHz	≤(75 μV + 0.5% of the Full Scale Range)			
Range, Offset	*Full Scale Range Setting*	*Offset Range*			
	10 mV – 1 V	±1 V			
	1.01 V – 10 V	±10 V			
	10.1 V – 100 V	±100 V			
Range, Sensitivity (Full Scale Range), All Channels	10 mV to 100 V[6]				
Step Response Settling Errors, typical[7] The maximum absolute difference between the value at the end of a specified time interval after the mid-level crossing of the step, and the value one second after the mid-level crossing of the step, expressed as a percentage of the step amplitude. See IEEE std. 1057, Section 4.8.1, *Settling Time Parameters*.	*Full Scale Range Setting*	*± Step Response*	*Maximum Settling Error (%) at 20 ns*	*100 ns*	*20 ms*
	10 mV – 1 V	≤2 V	0.5%	0.2%	0.1%
	1.01 V – 10 V	≤20 V	1.0%	0.5%	0.2%
	10.1 V – 100 V	≤200 V	1.0%	0.5%	0.2%

1 **Net offset is the nominal voltage level at the waveform analyzer input that corresponds to the center of the A/D-Converter dynamic range. Offset accuracy describes the precision of the net offset voltage.**

2 **The limits given are for the ambient temperature range of 0° C to +30° C. Reduce the upper bandwidth frequencies by 5 MHz for each °C above +30° C. The bandwidth must be set to FULL.**

3 **Rise time (rounded to the nearest 50 ps) is calculated from the bandwidth when Full Bandwidth is selected. It is defined by the following formula:**

$$Rise\ Time\ (ns) = 450 \div BW\ (MHz)$$

4 **GND input coupling disconnects the input connector from the attenuator and connects a ground reference to the input of the attenuator.**

5 **The AC Coupled Lower Frequency Limits are reduced by a factor of 10 when 10X passive probes are used.**

6 **The sensitivity ranges are 10 mV to 100 V full scale, switching in a 1-2-5 sequence of coarse settings. Between these coarse settings, you can adjust the sensitivity with a resolution equal to 1% of the more sensitive coarse setting. For example, between the 500 mV and 1 V ranges, the sensitivity can be set with 5 mV resolution.**

7 **The Full Bandwidth settling errors are typically less than the percentages from the table.**

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Table 1-3: Timebase system

Characteristic	Description
✓ Accuracy, Long Term Sample Rate and Delay Time	±100 ppm over any interval ≥1 ms
Accuracy, Trigger-to-Trigger Measurement (TVS600A models only)	±100 ps + (timebase accuracy x reading))
Range, Extended Realtime Sampling Rate	5 S/s to 10 MS/s in a 1-2.5-5 sequence
Range, Realtime Sampling Rate	
TVS621, TVS621A, TVS641 & TVS641A	20 MS/s to 5 GS/s on all channels simultaneously in a 1-2.5-5 sequence
TVS625, TVS625A, TVS645 & TVS645A	20 MS/s to 1 GS/s on all channels simultaneously in a 1-2.5-5 sequence
Record Length	256, 512, 1024, 2048, 4096, 8192, 15,000 30,000 (extended realtime sampling mode only)
Time Stamping	125 ns resolution 0.1% variance
Digitized Bits, Number of	8 bits

Table 1-4: Trigger system

Characteristic	Description	
✓ Accuracy (Time) for Pulse Glitch or Pulse Width Triggering	*Time Range*	*Accuracy*
TVS600 models only	1 ns to 1 μs	±(20% of Setting + 0.5 ns)
	1.02 μs to 1 s	±(204.5 ns + 0.01% of Setting)
TVS600A models only: limits are valid when using a time-base reference frequency of 10 MHz ±0.01%	2 ns to 500 ns	±(20% of Setting + 0.5 ns)
	520 ns to 1 s	±(104.5 ns + 0.01% of Setting)
✓ Accuracy (DC) for External Trigger Level	±(5% + 150 mV) for signals having rise and fall times ≥20 ns	
✓ Accuracy (DC) for Internal Trigger Level, DC Coupled	±[(2% × | Setting) | + 0.03 of Full Scale Range + Offset Accuracy)] for signals having rise and fall times ≥20 ns	
Holdoff, Variable Main Trigger, typical[1]	For all sampling rates, the minimum holdoff is 250 ns and the maximum holdoff is 12 s; the minimum resolution is 8 ns for settings ≤1.2 μs	
Input, External Trigger, typical	50 Ω input resistance; ±5 V (DC + peak AC) maximum safe input voltage; DC coupled only	
Range, Delayed Trigger Time[2]	16 ns to 250 s	
Range, Delta-Time, Slew-Rate Triggering	1 ns to 1 second	
Range, Events Delay	1 to 10,000,000	

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Table 1-4: Trigger system (cont.)

Characteristic	Description		
Ranges, (Setup/Hold Times) for Setup/Hold Violation Trigger	*Feature*	*Minimum*	*Maximum*
	Setup time[3]	-100 ns	100 ns
	Hold time[4]	1 ns	102 ns
	Setup + Hold time[5]	2 ns	NA
Range (Time) for Pulse Glitch and Pulse Width Triggering	2 ns to 1 s		
Range (Time) for Time-Qualified Runt Triggering (TVS600A models only)	2 ns to 1 s		
Range, Trigger Level	*Source*	*Range*	
	Any Channel	±100% of full scale range	
	External Input	±1 V	
Range, Trigger Point Position	Minimum: 0 Maximum: 30,000		
Resolution, Trigger Level	0.02% of full scale for any Channel source and 2 mV for the External Input source		
Resolution, Trigger Position	One sample interval at all sample rates		
Sensitivities, Events Delay, DC Coupled, typical	10% of full scale, from DC to 500 MHz, for Full Scale Range settings >100 mV and ≤10 V at the BNC input		
Sensitivities, Logic-Type Trigger (TVS600A models only)	10% of full scale, from DC to 500 MHz, for Full Scale Range settings >100 mV and ≤10 V at the BNC input		
Sensitivities, Pulse-Type Runt Trigger, typical	10% of full scale, from DC to 500 MHz, for Full Scale Range settings >100 mV and ≤10 V at the BNC input		
Sensitivities, Pulse-Type Trigger Width and Glitch, typical	10% of full scale, for Full Scale Range settings >100 mV and ≤10 V at the BNC input		

1 **Main Trigger is controlled with the TRIGger:A commands.**

2 **Delayed Trigger is controlled with the TRIGger:B commands.**

3 **Positive numbers define times before the clock edge and negative numbers define times after the clock edge.**

4 **Positive numbers define times after the clock edge and negative numbers define times before the clock edge.**

5 **The algebraic sum of the setup and hold time set by the user.**

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Table 1–4: Trigger system (cont.)

Characteristic	Description		
Sensitivity, Edge-Type Trigger, DC Coupled[6]	The minimum signal levels required for stable edge triggering of an acquisition when the source is DC-coupled.		
	Products	*Trigger Source*	*Sensitivity*
	TVS625, TVS625A, TVS645 & TVS645A	Any Channel	3.5% of Full Scale Range from DC to 50 MHz, increasing to 10% of Full Scale Range at 1 GHz
	TVS621, TVS621A, TVS641 & TVS641A	Any Channel	3.5% of Full Scale Range from DC to 50 MHz, increasing to 10% of Full Scale Range at 250 MHz
	All models	External	25 mV from DC to 50 MHz, increasing to 50 mV at 100 MHz
Sensitivity, Edge-Type Trigger, Not DC Coupled, typical	*Trigger Coupling*	*Typical Signal Level for Stable Triggering*	
	AC	Same as the DC-coupled limits for frequencies above 60 Hz; attenuates signals below 60 Hz	
	High Frequency Reject	One and one-half times the DC-coupled limits from DC to 30 kHz; attenuates signals above 30 kHz	
	Low Frequency Reject	One and one-half times the DC-coupled limits for frequencies above 80 kHz; attenuates signals below 80 kHz	
	Noise Reject	Three times the DC-coupled limits	
Time, Minimum Pulse or Rearm, and Minimum Transition Time, for Pulse-Type Triggering, typical	For Full Scale Range settings >100 mV and ≤10 V at the BNC input		
	Pulse Class	*Minimum Pulse Width*	*Minimum Rearm Width*
	Glitch	2 ns	2 ns + 5% of Glitch Width Setting
	Width	1 ns	2 ns + 5% of Width Upper Limit Setting
TVS600A models only	Runt Time-qualified	2 ns 2 ns	2 ns 8.5 ns + 5% of Width Setting
TVS600A models only	Slew Rate	600 ps[7]	8.5 ns + 5% of Delta Time Setting

6 Delayed Trigger has the same specifications as Main Trigger.

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Table 1–4: Trigger system (cont.)

Characteristic	Description			
Time, Minimum Pulse or Rearm, for Events Delay Triggering, typical	The following chart shows the minimum values for input range settings >100 mV and ≤10 V at the BNC input			
	Triggering Type	*Minimum Pulse Width*	*Minimum Rearm Time*	*Minimum Time Between Channels*[8]
	Events Delay	1 ns (for either + or – pulsewidths)	N/A	2 ns
	Logic	N/A	1 ns	1 ns
Trigger Position Error, Edge Triggering, typical	*Acquisition Mode*		*Trigger Position Error*[9]	
	Sample, Average		±(1 Sample Interval + 1 ns)	
	Envelope		±(2 Sample Intervals + 2 ns)	

7 **For slew rate triggering, this is actually the minimum transition time defined t be the time the test signal spends between the two trigger threshold settings.**

8 **For Events Delay, the time is the minimum time between a main and delayed event that will be recognized if more than one channel is used. For Logic, time between channels refers to the length of time a logic state derived from more than one channel must exist to be recognized.**

9 **The trigger position errors are typically less than the values given here. These values are for triggering signals having a slew rate at the trigger point of ≥5% of full scale/ns.**

Table 1–5: Front-panel connectors

Characteristic	Description	
Arm Input	This input provides external arming capability with a BNC connector	
	Characteristic	*Limits*
	Arming Threshold Voltage	≤0.8 V
	Input Voltage Range	0 to 5 V_{pk}, TTL-compatible (arms on a switch closure to ground; internal pull-up resistor to +5 volts is provided)
	Latency	10 μs
	Minimum Pulsewidth	10 μs
Fiducial Input, typical[1]	This input provides fiducial input capability with a BNC connector; the polarity of the signal acquired is inverted with respect to the input	
	Characteristic	*Limits*
	Fiducial Amplitude	75 mV to 207 mV
	Input Impedance	0.01 μF in series with 50 Ω

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Table 1–5: Front-panel connectors (cont.)

Characteristic	Description		
	Input LF Attenuation	Attenuates signals below 100 MHz (high-pass time constant of 5 ns)	
	Input Sensitivity	*CH 1 Full Scale Range*	*Fiducial Full Scale Range*
		10 mV to 1 V	6 times the CH 1 Full Scale Range setting
		1.01 V to 10 V	0.6 times the CH 1 Full Scale Range setting
		10.1 V to 100 V	0.06 times the CH 1 Full Scale Range setting
	Input Voltage Range	±1 V	
	Maximum Input	2 V_{RMS}	
	Rise Time	*Products*	*Rise Time*
		TVS625, TVS625A, TVS645 & TVS645A	≤3.5 ns (10% to 90%)
		TVS621, TVS621A, TVS641 & TVS641A	≤4.0 ns (10% to 90%)
✓ Output, Reference	*Characteristic*	*Limits*	
	Output Voltage	8 V ±1%	
	Internal Frequency Reference	Frequency is 10 MHz ±0.015% Amplitude is ≥1 V_{p-p} into 50 Ω	
Probe Compensation, Output Frequency, typical	1 kHz ±25%		
✓ Probe Compensation, Output Voltage	0.5 V (base-top) ±1% into a ≥50 Ω load		
Serial Interface	This front panel-mounted 9-pin D connector provides a serial interface with the following pin assignments: 1 DCD 2 RXD 3 TXD 4 DTR 5 GND 6 DSR 7 RTS 8 CTS 9 No Connection		

1 **The FIDUCIAL Input signal should be a short-duration (≤3 ns), fast rise time (≤2 ns) pulse.**

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Table 1-6: VXI interface

Characteristic	Description	
Addressing	Dynamic autoconfigure	
Inputs, ECLTRG	Either of the two ECLTRG lines may be individually selected to arm or trigger an acquisition. Arming can occur on either sense of the ECL signal. Trigger can be specified to occur on either the high-to-low transition or the low-to-high transition.	
Inputs, TTLTRG	Any of the eight TTLTRG lines may be individually selected to arm or trigger an acquisition. Arming can occur on either sense of the TTL signal. Trigger can be specified to occur on either the high-to-low transition or the low-to-high transition.	
Interface Type	Message based (I4)	
Interrupts	Programmable interrupter level 1-7	
Outputs, ECLTRG	Either of the two ECLTRG lines can be driven by the following signals: ARM — The waveform analyzer is armed and waiting for a trigger ATR — Main trigger event has occurred BTR — Delayed trigger event has occurred CALC — DSP Calc function “TRG ()” evaluated TRue OPC — Operation pending complete	
Outputs, TTL	Each of the TTLTRG lines (TTLTRG0*-TTLTRG7*) can be driven by the following signals: ARM — The waveform analyzer is armed and waiting for a trigger ATR — Main trigger event has occurred BTR — Delayed trigger event has occurred CALC — DSP Calc function “TRG ()” evaluated TRue OPC — Operation pending complete	
Outputs, TTLTRG, Logic Levels	Based on the VXIbus Specification RULE B.6.17	
	Characteristic	*Limits*
	Vout(HI)	Determined by the mainframe termination; the TTL outputs are open collector
	Vout(LO)	≤0.6 V when sinking 48 mA
Outputs, TTLTRG, Logic Polarity	Normal polarity: Negative TRUE; high-to-low transition indicates the event occurred Inverted polarity: Positive TRUE; low-to-high transition indicates the event occurred	
Protocols	Word Serial (WSP) Fast Data Channel FDC TEK V2.1	
VXI	Complies with revision 1.4	

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Table 1–7: Power distribution and data handling

Characteristic	Description		
Current Requirements, TVS641, TVS641A, TVS645 & TVS645A	*Voltage*	*DC Current*	*Dynamic Current*
	+12 V	1.3 A	0.45 A
	+5 V	11.0 A	0.8 A
	-5.2 V	4.6 A	0.09 A
	-12 V	1.0 A	0.4 A
Current Requirements, TVS621, TVS621A, TVS625 & TVS625A	*Voltage*	*DC Current*	*Dynamic Current*
	+12 V	1.0 A	0.45 A
	+5 V	8.0 A	0.7 A
	-5.2 V	2.7 A	0.05 A
	-12 V	0.8 A	0.4 A
Nonvolatile Memory Retention Time, typical	Battery life is ≥5 years		
Power Requirements, typical	*Products*	*Power Requirements*	
	TVS641, TVS641A, TVS645 & TVS645A	106.5 Watts	
	TVS621, TVS621A, TVS625 & TVS625A	75.6 Watts	

Table 1–8: Environmental

Characteristic	Description
Airflow Resistance	≤0.204 mm H_2O air pressure with 6.6 l/s airflow
Altitude, Operating and Nonoperating	Operating: to 15,000 feet (4570 m) Nonoperating: to 40,000 feet (12,190 m)
Classification	This instrument is suitable for operation in Tektronix and MIL-T-28800E Class 5 environments, provide that it is operated in a mainframe which has been qualified for Class 5 environments and which imparts stresses to this module within the limits specified in this table. Nonoperating: to 40,000 feet (12,190 m)
Humidity, Operating and Nonoperating	To 95% relative humidity at or below +30° C; to 45% relative humidity up to +50° C
Temperature, Operating and Nonoperating	Operating: 0° C to +50° C for exterior air when operated in a mainframe with 15° C internal temperature rise Nonoperating: -40° C to +71° C

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Table 1-9: Certifications and compliances

Characteristic	Description
EC Declaration of Conformity – EMC	Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities[1]: EN 50081-1 Emissions: EN 55011 Class A Radiated and Conducted Emissions EN 60555-2 AC Power Line Harmonic Emissions EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity IEC 801-5 Power Line Surge Immunity[2] 1 To assure the product operates in conformance with the specifications listed above, the product must be used in a mainframe that is equipped with backplane shields that comply with Rule B.7.US of the VXI specification. 2 TVS600A models only.
Australian/New Zealand Declaration of Conformity – EMC	Complies with EMC provision of Radiocommunications Act per the following standard(s): AN/NZS 2064.1/2 Industrial, Scientific, and Medical Equipment: 1992 AN/NZS 3548 Information Technology Equipment: 1995
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC EN 61010-1:1993 Safety requirements for electrical equipment for measurement, control, and laboratory use
Approvals	UL3111-1 – Standard for electrical measuring and test equipment CAN/CSA C22.2 No. 1010.1 – Safety requirements for electrical equipment for measurement, control and laboratory use
Pollution Degree 2 (TVS600 models)	Do not operate in environments where conductive pollutants may be present.
Safety Certification of Plug-in or VXI Modules	For modules (plug-in or VXI) that are safety certified by Underwriters Laboratories, UL Listing applies only when the module is installed in a UL Listed product. For modules (plug-in or VXI) that have cUL or CSA approval, the approval applies only when the module is installed in a cUL or CSA approved product.
Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are: CAT III Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location CAT II[3] Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected CAT I Secondary (signal level) or battery operated circuits of electronic equipment 3 See *Input Voltage, Maximum, DC-1 MΩ, AC-1 MΩ, or GND Coupled* on page 1-3)

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Table 1–10: Mechanical

Characteristic	Description	
Construction Material	Chassis parts constructed of aluminum alloy; front panel constructed of plastic laminate; circuit boards constructed of glass laminate; cabinet is aluminum	
Weight	*Products*	*Weight*
	TVS641, TVS641A, TVS645 & TVS645A	2.6 kg (5 lbs 12 oz)
	TVS621, TVS621A, TVS625 & TVS625A	2.5 kg (5 lbs 8 oz)
Overall Dimensions	Height: 262 mm (10.3 in) Width: 61 mm (2.4 in) Depth: 373 mm (14.5 in)	

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