



PXI
CompactPCI
CAN
Industrial Platform
ICT
Functional Test

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Signal Analyzer Module R&S® TS-PAM

Eight-channel waveform analyzer

- ◆ Two fully independent, floating acquisition units with operating voltage up to 125 V DC
- ◆ Acquisition modes with up to eight single-ended or four differential channels
- ◆ High sampling rate of 20 Msample/s for two channels
- ◆ Multichannel signal recording for up to eight channels at 5 Msample/s
- ◆ Synchronous acquisition of eight programmable comparator signals and PXI trigger
- ◆ Wide dynamic range with 14-bit resolution
- ◆ Input ranges from ± 0.2 V DC to ± 100 V DC (measurement voltage max. 125 V)
- ◆ 3:1 relay multiplexer per channel
- ◆ 2×1 Msample memory depth
- ◆ Analog and digital trigger signals
- ◆ Analog measurement bus access to eight bus lines
- ◆ Selftest capabilities
- ◆ Soft front panel support for immediate deployment
- ◆ LabWindows/CVI driver support
- ◆ GTSL test software library in DLL format



ROHDE & SCHWARZ



Product introduction

The Signal Analyzer Module R&S®TS-PAM is a CompactPCI/PXI module which takes up only one slot in the R&S®CompactTSVP (Test System Versatile Platform).

The module contains two fully independent and floating acquisition units which can have different ground reference levels. Each unit contains four input channels with a 3:1 relay multiplexer per channel in the front connector.

Due to its wide dynamic range with 14-bit resolution, high sampling rate of up to 20 Msample/s and the deep on-board data buffer, the R&S®TS-PAM handles many applications of a sampling voltmeter, a counter or a digital oscilloscope in the fields of automotive, military and communications electronics.

The programmable measurement range and flexible multichannel acquisition permit a variety of signal configurations to be measured. Comprehensive trigger capabilities and single-ended or differential inputs enable flexible data acquisition particularly in production testing:

- ◆ Multichannel data acquisition
- ◆ Waveform analysis
- ◆ Timing analysis
- ◆ Mixed signal oscilloscope
- ◆ High side current measurements

In high-speed sampling mode, the input signal can be acquired with optimal time resolution for waveform and timing analysis.

Additionally, the results of the remaining input signals compared with programmable thresholds can be acquired synchronously to build a mixed signal scope.

The multichannel mode is used if parallel signals have to be recorded and analyzed or timing relationships between signals have to be determined.

Sampling modes and frequencies can be selected independently for each acquisition unit.

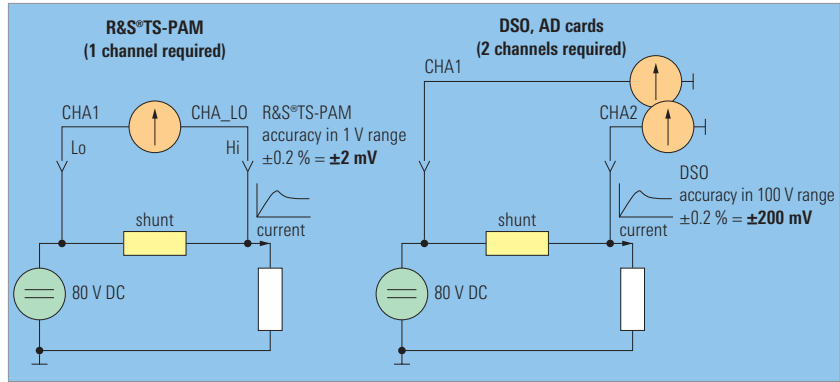
The input signal sensitivity is programmable for each input channel so that high-level signals of 100 V and low-level signals of some millivolts can be acquired in parallel. Especially precision highside current shunt measurements or low-level signals requiring high noise suppression can benefit from the differential input mode of the R&S®TS-PAM. Two single-ended channels can be used to form a differential input channel with high common mode rejection.

The floating measurement technology enables the card to support single-channel measurements on high voltage potentials with nearly 100 times better precision than is possible with standard DSOs or data acquisition cards.

Up to 32 test signals can be directly applied to the front connector of the module. The integrated 3:1 relay multiplexer of each channel and the eight local analog bus inputs reduce adaptation cost and increase the total count of channels with high bandwidth.

If more channels are needed, the R&S®TS-PAM functionality can be routed to the Rohde & Schwarz switching cards using the internal analog measurement bus of the R&S®CompactTSVP.

The R&S®TS-PAM allows continuous data storage to the deep on-board memory with pre- and post-triggering capability.



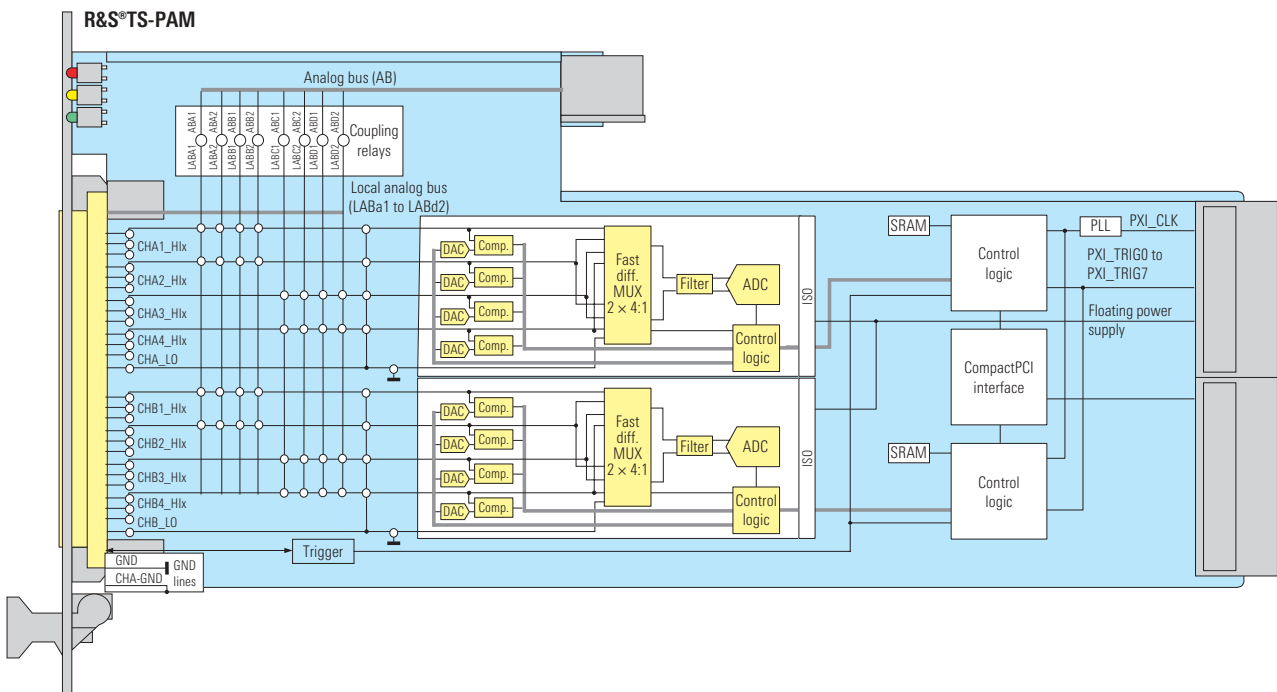
Floating measurement example

Trigger signals can be received and generated to synchronize multiple instruments such as signal sources or digital measurement modules in complex application scenarios. Each input channel can be used as a flexible trigger source with programmable level and edge selection.

Additionally, eight PXI trigger signals and two dedicated local digital trigger inputs at the front connector of the module can be selected.

The trigger condition and sampling frequency can be selected separately for each acquisition unit, allowing slow and fast signals to be measured in parallel with optimal timing.

Each acquisition unit has four separate programmable comparator references for triggering or mixed signal data acquisition.



Functional block diagram of the R&S®TS-PAM

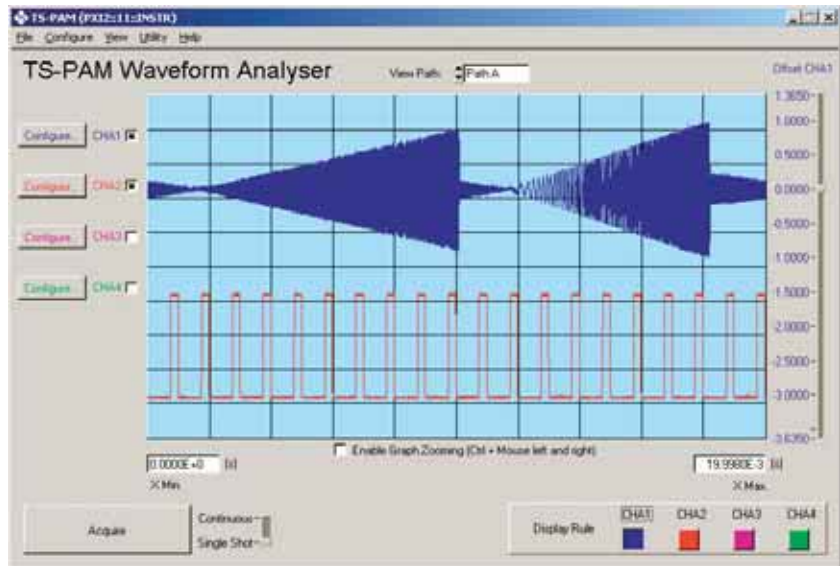
Software support

A LabWindows/CVI driver conforming to the IVI standard is available for the analyzer functions of the module. All other functional groups of the hardware are operated via specific driver extensions.

Functional panels and online help are available as common features for the LabWindows/CVI driver, which is available as a DLL file and ready to be used in various programming environments.

A free-of-charge signal analysis library, which is shipped with the R&S® CompactTSVP, allows digital signal processing and waveform analysis after data acquisition:

- ◆ Voltage average, RMS
- ◆ Max and min values (absolute and relative), peak, peak – peak
- ◆ Frequency, period duration
- ◆ Rise and fall time of slopes
- ◆ Pulse width
- ◆ Event counting (slopes, maxima, minima)
- ◆ Time measurement between events
- ◆ Waveform comparison
- ◆ Calculation of reference and limit curves
- ◆ Loading and storing in files
- ◆ Display of curves with reference and markers
- ◆ Separate Audio Library R&S®TS-LAA available to support the functions
- ◆ RMS calculation
- ◆ Single-/multitone frequency response
- ◆ Distortion
- ◆ Filters (lowpass, highpass, bandpass, bandstop, ITU-R weighted/unweighted)



Software front panel of the R&S® TS-PAM

Security by selftest and diagnostic features

The built-in selftest capability of the module ranges from fast diagnostics to the complete, automated evaluation of input levels, trigger lines and all switching paths.

Using the on-board reference voltage sources, the module selftest can perform a static check of each input channel. A comprehensive dynamic module test is possible via the analog bus in conjunction with the R&S®TS-PSAM module.

Diagnostic LEDs on the module front panel speed up system integration and allow proper operation to be determined at a glance.

Specifications

Application on the R&S®TSVP platform	
R&S®CompactTSVP	1 slot required
Interface	
Control bus	CompactPCI/PXI
DUT connector (front)	DIN 41612, 96 pins
Rear I/O connector	CompactPCI, 110 pins
Tolerances of specified values apply under the following conditions	
Recommended calibration interval	1 year
Temperature range	23 °C ±5 °C
Additional error specified by the temperature coefficient in the range	5 °C to 18 °C and 28 °C to 40 °C
Acquisition units	2, independent, floating
Number of channels	
Single-channel mode	2 (1 per unit)
Multichannel mode	8 (4 per unit)
Reference	differential, floating COM, GND
Input configurations	single-ended or differential (2 channels needed)

Number of inputs	32
Static multiplexing	one 3:1 relay multiplexer per channel
R&S®CompactTSVP analog measurement bus	4 of 8 lines per channel
Timing control	
Sample rate	
Single-channel mode	20 sample/s to 20 Msample/s
Multichannel mode	5 sample/s to 5 Msample/s
Reference clock	PXI clock of R&S®TS-PCA3, 10 MHz
Accuracy	±(1.5 ppm + 1 ppm/year)
Input characteristics	
Input bandwidth	4 MHz
Lowpass filter	400 Hz, 100 kHz, full BW, digital filter (software) Butterworth IIR 8th order, $f = 0.2 \times$ sample rate
Crosstalk (typ.)	<10 V, range -70 dB ≥10 V, range -50 dB at 1 MHz
Input impedance	
0 V to 5 V	1 MΩ or >10 MΩ
10 V to 100 V	1 MΩ
Coupling	DC
Input potential	floating, 2 different ground potentials
Isolation (unit-unit, unit-earth)	125 V DC
Overvoltage protection	±200 V DC

Measurement accuracy DC, single-ended

Measurement range	Resolution	Input impedance	Gain error	Offset error ¹⁾²⁾ with digital filter		Offset error ¹⁾²⁾ without digital filter		Common mode error (CME)
				BW ≤ 100 kHz	full BW	BW ≤ 100 kHz	full BW	
±0.2 V	30 μV	>10 MΩ	0.1 %	400 μV	600 μV ³⁾	500 μV	1.2 mV ³⁾	0.1 %
±0.5 V	75 μV	>10 MΩ	0.1 %	500 μV	1 mV ³⁾	750 μV	2 mV ³⁾	0.1 %
±1 V	0.15 mV	>10 MΩ	0.1 %	1 mV	1.5 mV ³⁾	1.5 mV	3 mV ³⁾	0.2 %
±2 V	0.3 mV	>10 MΩ	0.1 %	2 mV	2 mV	2.6 mV	4 mV	0.2 %
±5 V	0.75 mV	>10 MΩ	0.1 %	5 mV	5 mV	6.5 mV	10 mV	0.2 %
±10 V	1.5 mV	1 MΩ	0.1 %	10 mV	10 mV	13 mV	20 mV	0.4 %
±20 V	3 mV	1 MΩ	0.1 %	20 mV	20 mV	26 mV	40 mV	0.4 %
±50 V	7.5 mV	1 MΩ	0.1 %	50 mV	50 mV	65 mV	100 mV	0.4 %
±100 V (max. 125 V)	15 mV	1 MΩ	0.1 %	100 mV	100 mV	130 mV	200 mV	0.4 %

¹⁾ Measurement low GND-referenced.

²⁾ Additional error in multichannel mode: ±0.1% of range.

³⁾ Additional error for sample rate >1 MHz: ±0.1% of range.

Measurement accuracy DC, differential

Overall accuracy = $1.4 \times$ accuracy DC + CME $\times (V1 + V2) / 2$

Synchronization, per unit	
Trigger inputs	4 × analog channels 1 × local trigger (TTL) 8 × PXI trigger bus
Slope	positive/negative
Level (analog trigger)	programmable, 12-bit
Pattern	13-bit combined
Delay	75 ns to 50 s
Trigger outputs	1 × local trigger (TTL) 8 × PXI trigger bus
On-board data buffering, per unit	
Memory size	1 Msample per acquisition unit
Storage mode	continuous recording of data incl. channel number, PXI and analog trigger states
Analog comparator/trigger	
Number of channels	4 per unit
Resolution	12-bit
Analog measurement bus and relay multiplexer	
R&S® CompactTSVP analog measurement bus	8 lines
Relay multiplexer (per channel)	3:1
Coupling relays	8, local bus to global bus
Switching voltage	125 V DC, 90 V rms max.
Switching current	1.0 A max.
Switching power DC/rms	10 W/10 VA max.
Isolation (ch – ch, ch – earth)	125 V DC

General data

Power consumption	typ. +5 V/5 A, +3.3 V/1.5 A incl. R&S®TS-PDC
EMC compliance	EMC directive 89/336/EEC and EMC standard EN 61326
Safety	CE, EN 61010 Part 1
Mechanical loading	
Vibration test, sinusoidal	5 Hz to 55 Hz: 2 g, MIL-T-28800D, class 5 55 Hz to 150 Hz: 0.5 g, MIL-T-28800D, class 5
Vibration test, random	10 Hz to 300 Hz, 1.2 g
Shock test	40 g, MIL-STD-810, classes 3 and 5
Temperature loading	
Operating temperature range	+5 °C to +40 °C
Permissible temperature range	0 °C to +50 °C
Storage temperature range	–40 °C to +70 °C
Humidity	+40 °C, 95 % rel. humidity
Dimensions	316 mm × 174 mm × 20 mm
Recommended calibration interval	1 year

Ordering information

Designation	Type	Order No.
Signal Analyzer Module (incl. R&S®TS-PDC)	R&S®TS-PAM	1158.0100.02
Open Test Platform R&S® CompactTSVP	R&S®TS-PCA3	1152.2518.02
Audio Library	R&S®TS-LAA	1166.4018.02

More information at
www.rohde-schwarz.com
 (search term: TS-PAM)



www.rohde-schwarz.com

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