Data sheet

Version 02.00

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Analog Source and Measurement Module R&S®TS-PSAM

Scanning multimeter and data acquisition unit

- Floating measurement unit
- DC measurement ranges 10 mV to 125 V, 1 µA to 1 A
- AC rms measurement ranges 20 mV to 90 V, 100 µA to 1 A
- Resistance measurement ranges 1 Ω to 10 MΩ, 2-wire and 4-wire
- Measurement synchronization via PXI clock and trigger
- 16-bit A/D converter, max. sampling rate 200 ksamples/s, on-board memory
- Floating DC source
- Adjustable voltage and current limits, ±5 V, 100 mA
- Four-quadrant operation
- Fast settling time
- Sense lines
- Discharge circuit
- Up to 125 V discharge voltage
- Discharge current 400 mA max.
- Analog measurement bus access to 8 bus lines
- LabWindows/CVI device driver support
- GTSL test software library in DLL format
- EGTSL test software library for in-circuit test

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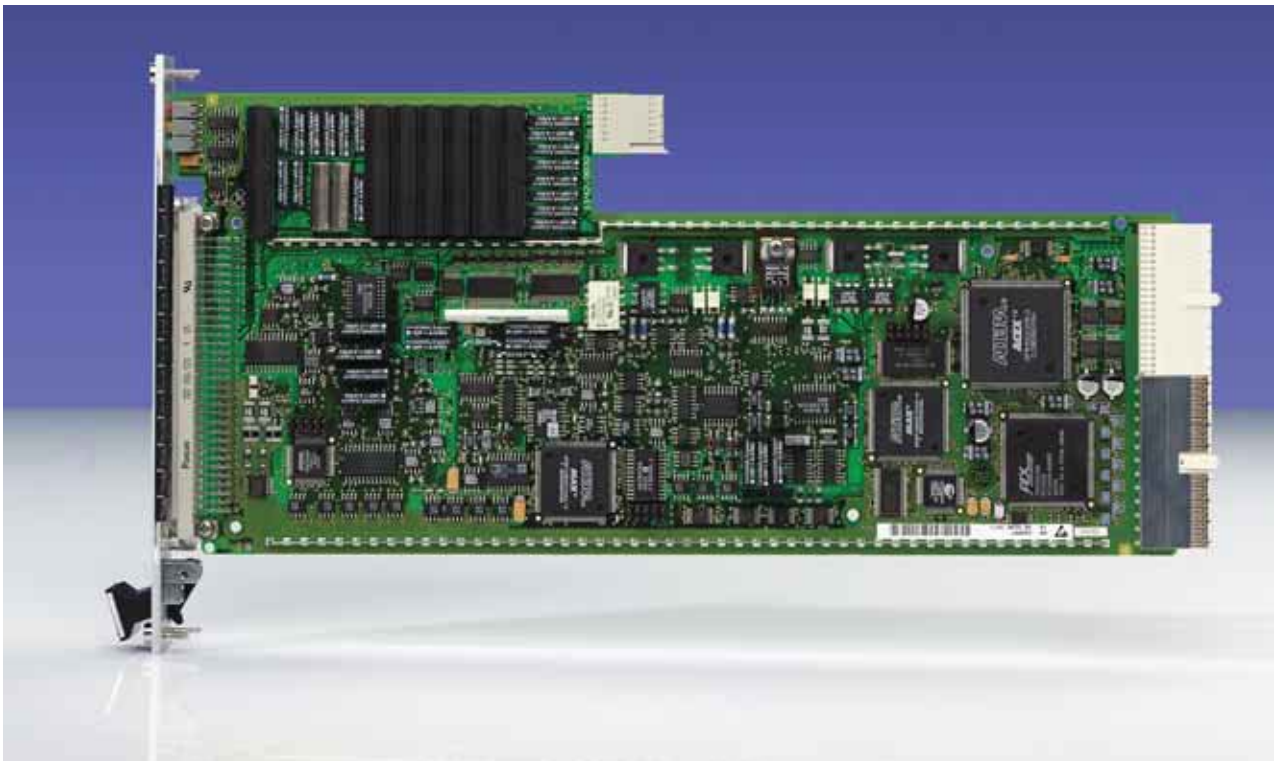


Product introduction

The Analog Source and Measurement Module R&S®TS-PSAM is a CompactPCI/PXI module which takes up only one slot in the R&S®CompactTSVP (Test System Versatile Platform). The module contains a floating measurement unit, a programmable source and a discharge circuit. The components can be switched to the analog bus of the R&S®CompactTSVP by means of relays. The trigger logic of the measurement unit is linked to the PXI trigger lines of the backplane. Two trigger inputs and outputs are provided on the front-panel connector. Two level-programmable triggers can additionally be derived from the analog input signal. The scanning of multiple channels is already provided on board by two 4:1 relay multiplexers.

The module is used for general measurement tasks like a digital multimeter, for the in-circuit test (ICT) and the R&S®CompactTSVP selftest. As part of a functional test, the module can be used for voltage, current and resistance measurements.

In data acquisition mode, the module can capture waveforms with up to 200 ksample per second.

For the ICT, the following measurement tasks are performed by the R&S®TS-PSAM:

- Discharge of capacitors
- Contact test
- Continuity test
- Short-circuit test
- 2-wire and 4-wire resistance measurements (DC)

If necessary, the source and the measurement unit can be taken to ground or can be used independently of each other.

The power supply for floating instrument functionalities such as measurement unit and DC source is provided via an associated Rear I/O module (R&S®TS-PDC), which is included in the delivery.

When used together with the R&S®TS-PICT module, guarded impedance measurements can also be performed:

- Resistor, capacitor and inductance
- 3- and 6-wire impedance tests
- Diode and transistor test

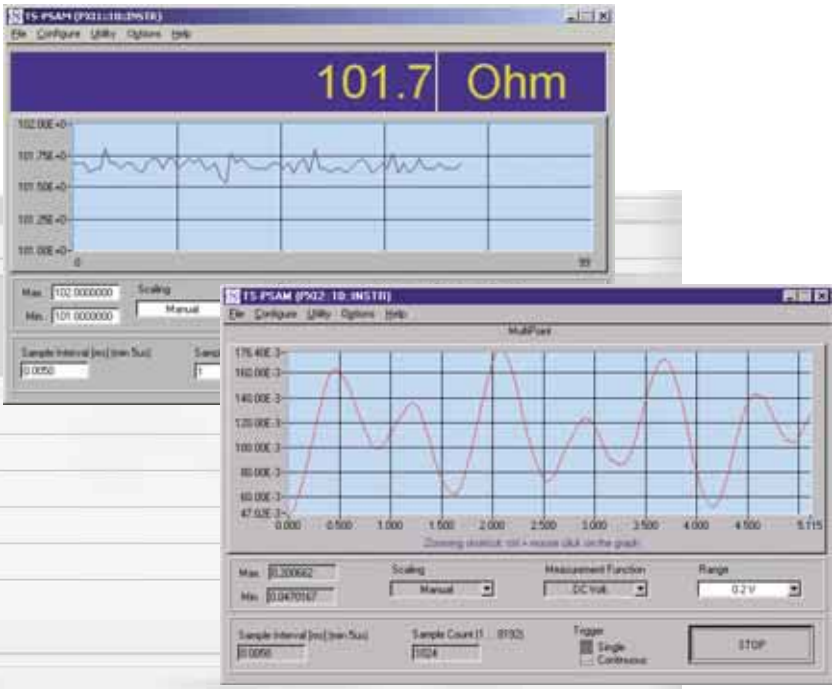
The DUT signals are connected from the Matrix Module R&S®TS-PMB to the Source and Measurement Module R&S®TS-PSAM via the analog measurement bus.

The careful approach to handling analog signals leads to the interconnection solution of the R&S®CompactTSVP analog bus. The 8-line analog bus is located directly above the front-connector area where space is provided for on-board signal conditioning and signal routing by coupling relays. A large number of DUT signals can be routed to the R&S®TS-PSAM via the switching modules and the analog measurement bus.

Software support

A LabWindows/CVI DMM driver according to the IVI standard is available for the multimeter functions of the module. All other functional groups of the hardware are served via specific driver extensions. Function panels and online help are available as common features for the LabWindows/CVI driver.

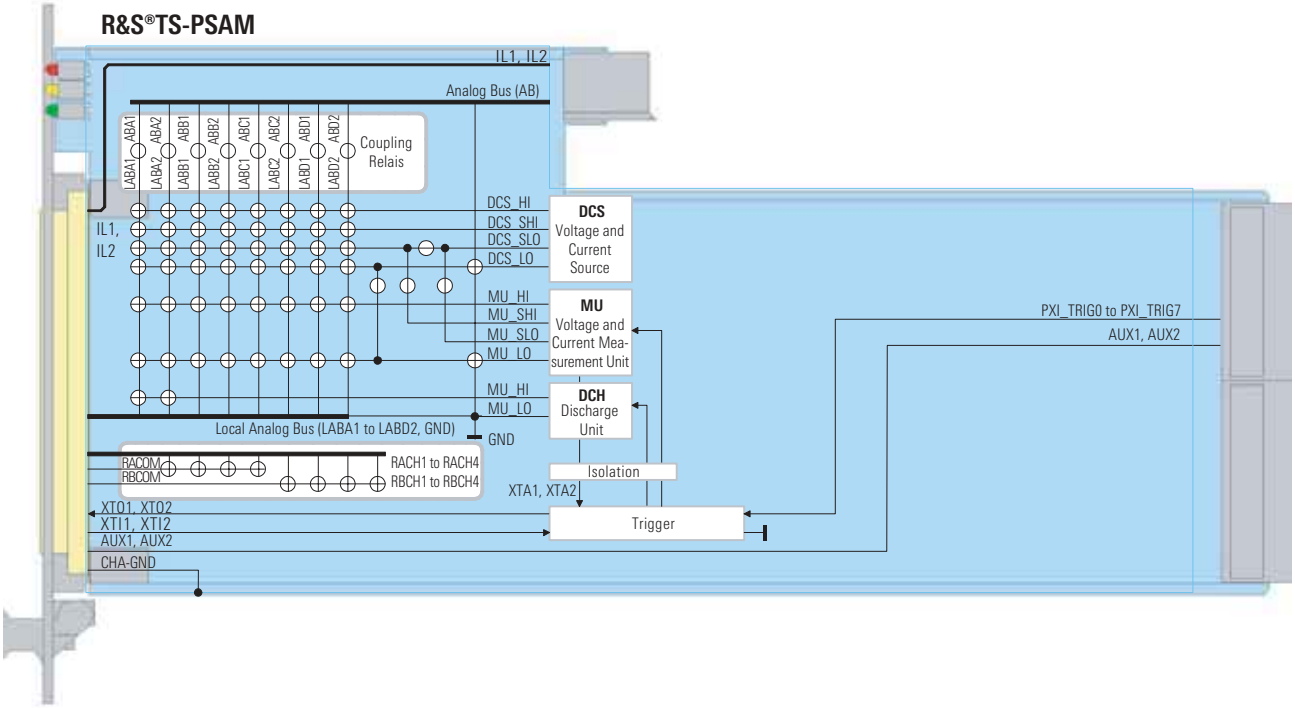
The ICT is performed with a dedicated software package named EGTSL (Enhanced Generic Test Software Library).



Security by selftest and diagnostic features

The built-in selftest capability of the module ranges from fast diagnostics to the complete, automated evaluation of all relays and switching paths. Diagnostic LEDs on the front panel speed up system integration and allow proper operation to be determined at a glance. In the R&S®CompactTSVP selftest, the R&S®TS-PSAM is used as the measurement unit to test other modules and components in the chassis.

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



Specifications

Application in 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 and specified values apply under the following conditions:

Period:	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.

DC voltage source (DCS)

Floating source	working voltage 125 V max.
Output voltage	–5 V to +5 V
Resolution	typ. 200 µV
Accuracy[1]	0.2 + 5 mV
Maximum output current	100 mA
Source impedance	see current limiting

[1] Accuracy: ±(% of set value + absolute value).
Temperature coefficient: ±(0.1 * accuracy)/°C.

Current limiting

Range	Resolution	Accuracy[1]	Output characteristic (sense lines not connected)
100 µA	2 nA	0.25 + 1 µA	10 kΩ max.
1 mA	20 nA	0.25 + 5 µA	1 kΩ max.
10 mA	200 nA	0.25 + 50 µA	100 Ω max.
100 mA	2 µA	0.25 + 100 µA	10 Ω

[1] Accuracy: ±(% of set value + absolute value).
Temperature coefficient: ±(0.2 * accuracy)/°C.

Measurement unit (MU)

Floating measurement unit	working voltage 125 V max.
Waveform sampling rate	200 ksamples/s max.
Memory	8 ksample

Voltage

Range	Resolution	Input characteristics	Accuracy, averaging [1), 2)]	Accuracy, no averaging [1), 3)]
10 mV[4)]	0.4 µV	>100 MΩ	0.02 + 80 µV	0.02 + 150 µV
20 mV[4)]	0.8 µV	>100 MΩ	0.02 + 80 µV	0.02 + 150 µV
50 mV[4)]	2 µV	>100 MΩ	0.02 + 80 µV	0.02 + 150 µV
100 mV	4 µV	>100 MΩ	0.02 + 100 µV	0.02 + 200 µV
200 mV	8 µV	>100 MΩ	0.02 + 100 µV	0.02 + 200 µV
500 mV	20 µV	>100 MΩ	0.02 + 100 µV	0.02 + 250 µV
1 V	40 µV	>100 MΩ	0.02 + 160 µV	0.02 + 400 µV
2 V	80 µV	>100 MΩ	0.02 + 320 µV	0.02 + 800 µV
5 V	0.2 mV	>100 MΩ	0.02 + 0.8 mV	0.02 + 1.6 mV
10 V	0.4 mV	>100 MΩ	0.02 + 1.6 mV	0.02 + 3.2 mV
20 V	0.8 mV	10 MΩ	0.02 + 3.2 mV	0.02 + 6.4 mV
50 V	2 mV	10 MΩ	0.02 + 8 mV	0.02 + 16 mV
100 V	4 mV	10 MΩ	0.02 + 16 mV	0.02 + 32 mV
200 V[5)]	8 mV	10 MΩ	0.02 + 64 mV	0.02 + 128 mV

[1] Accuracy: ±(% of reading + absolute value).
Temperature coefficient: ±(0.1 * accuracy) / °C.

[2] Average 100 samples, measuring time 20 ms, filter 400 Hz.

[3] Waveform recording 1 ksample to 8 ksample, no averaging, filter 40 kHz.

[4] Measurement Low GND-referenced.

[5] Input signal 125 V max.

Current

Range	Resolution	Input characteristics	Accuracy, averaging [1), 4)]	Accuracy, no averaging [1), 5)]
1 µA	0.04 nA	[2)]	0.2 + 2 nA	0.2 + 100 nA
2 µA	0.08 nA	[2)]	0.2 + 4 nA	0.2 + 100 nA
5 µA	0.2 nA	[2)]	0.2 + 10 nA	0.2 + 100 nA
10 µA	0.4 nA	[2)]	0.1 + 10 nA	0.1 + 300 nA
20 µA	0.8nA	[2)]	0.1 + 20 nA	0.1 + 300 nA
50 µA	2 nA	[2)]	0.1 + 50 nA	0.1 + 300 nA
100 µA	4 nA	[2)]	0.1 + 100 nA	0.1 + 500 nA
200 µA	8 nA	[2)]	0.1 + 200 nA	0.1 + 500 nA
500 µA	20 nA	[2)]	0.1 + 500 nA	0.1 + 1000 nA
1 mA	40 nA	[2)]	0.1 + 1000 nA	0.1 + 2000 nA
2 mA	80 nA	[2)]	0.1 + 2000 nA	0.1 + 4000 nA
5 mA	0.2 µA	[2)]	0.1 + 5 µA	0.1 + 10 µA
10 mA	0.4 µA	[2)]	0.1 + 10 µA	0.1 + 20 µA
20 mA	0.8 µA	[2)]	0.1 + 20 µA	0.1 + 40 µA
50 mA	2 µA	[2)]	0.1 + 50 µA	0.1 + 100 µA
100 mA	4 µA	[2)]	0.1 + 100 µA	0.1 + 200 µA
200 mA	8 µA	[3)]	0.5 + 200 µA	0.5 + 400 µA
500 mA	20 µA	[3)]	0.5 + 500 µA	0.5 + 1000 µA
1 A	40 µA	[3)]	0.5 + 1000 µA	0.5 + 2000 µA

[1] Accuracy: ±(% of set value + absolute value).
Temperature coefficient: ±(0.2 * accuracy)/°C.

[2] Active current measurement via current/voltage amplifier.

[3] 0.5 Ω shunt.

[4] Average 100 samples, measuring time 20 ms, filter 400 Hz.

[5] Waveform recording 1 ksample to 8 ksample, no averaging, filter 40 kHz.

RMS measurements

The specified accuracy only applies to sinewave signals in the frequency range 20 Hz to 50 kHz.
The accuracy is attained only if the input level amounts to at least 10% of full scale deflection.

AC voltage (RMS)

Range	Frequency range	Accuracy[1]
20 mV	20 Hz to 50 Hz	2.5 + 100 µV
	50 Hz to 10 kHz	1.0 + 100 µV
	10 kHz to 20 kHz	1.5 + 100 µV
	20 kHz to 50 kHz	2.5 + 100 µV
50 mV	20 Hz to 50 Hz	2.5 + 150 µV
	50 Hz to 10 kHz	1.0 + 150 µV
	10 kHz to 20 kHz	1.5 + 150 µV
	20 kHz to 50 kHz	2.5 + 150 µV
100 mV	20 Hz to 50 Hz	2.5 + 200 µV
	50 Hz to 10 kHz	1.0 + 200 µV
	10 kHz to 20 kHz	1.5 + 200 µV
	20 kHz to 50 kHz	2.5 + 200 µV
200 mV	20 Hz to 50 Hz	2.5 + 500 µV
	50 Hz to 10 kHz	1.0 + 500 µV
	10 kHz to 20 kHz	1.5 + 500 µV
	20 kHz to 50 kHz	2.5 + 500 µV
500 mV	20 Hz to 50 Hz	2.5 + 500 µV
	50 Hz to 10 kHz	1.0 + 500 µV
	10 kHz to 20 kHz	1.5 + 500 µV
	20 kHz to 50 kHz	2.5 + 500 µV
1 V	20 Hz to 50 Hz	2.5 + 1 mV
	50 Hz to 10 kHz	1.0 + 1 mV
	10 kHz to 20 kHz	1.5 + 1 mV
	20 kHz to 50 kHz	2.5 + 1 mV
2 V	20 Hz to 50 Hz	2.5 + 2.5 mV
	50 Hz to 10 kHz	1.0 + 2.5 mV
	10 kHz to 20 kHz	1.5 + 2.5 mV
	20 kHz to 50 kHz	2.5 + 2.5 mV
5 V	20 Hz to 50 Hz	2.5 + 5 mV
	50 Hz to 10 kHz	1.0 + 5 mV
	10 kHz to 20 kHz	1.5 + 5 mV
	20 kHz to 50 kHz	2.5 + 5 mV
10 V	20 Hz to 50 Hz	2.5 + 10 mV
	50 Hz to 10 kHz	1.0 + 10 mV
	10 kHz to 20 kHz	1.5 + 10 mV
	20 kHz to 50 kHz	2.5 + 10 mV
20 V	20 Hz to 50 Hz	2.5 + 25 mV
	50 Hz to 10 kHz	1.0 + 25 mV
	10 kHz to 20 kHz	1.5 + 25 mV
	20 kHz to 50 kHz	2.5 + 25 mV
50 V	20 Hz to 50 Hz	2.5 + 50 mV
	50 Hz to 10 kHz	1.0 + 50 mV
	10 kHz to 20 kHz	1.5 + 50 mV
	20 kHz to 50 kHz	2.5 + 50 mV
100 V[2]	20 Hz to 50 Hz	2.5 + 100 mV
	50 Hz to 10 kHz	1.0 + 100 mV
	10 kHz to 20 kHz	1.5 + 100 mV
	20 kHz to 50 kHz	2.5 + 100 mV

1) Accuracy: ±(% of reading + absolute value).
Temperature coefficient: ±(0.1 * accuracy) /°C.
Average 100 samples, measuring time 20 ms, filter 40 kHz.

2) AC input signal max. 90 V rms.

AC current (RMS)

Range	Frequency range	Accuracy[1]
100 µA	20 Hz to 50 Hz	2.5 + 500 nA
	50 Hz to 10 kHz	1.0 + 500 nA
	10 kHz to 20 kHz	1.5 + 500 nA
	20 kHz to 50 kHz	2.5 + 500 nA
200 µA	20 Hz to 50 Hz	2.5 + 1.25 µA
	50 Hz to 10 kHz	1.0 + 1.25 µA
	10 kHz to 20 kHz	1.5 + 1.25 µA
	20 kHz to 50 kHz	2.5 + 1.25 µA
500 µA	20 Hz to 50 Hz	2.5 + 2.5 µA
	50 Hz to 10 kHz	1.0 + 2.5 µA
	10 kHz to 20 kHz	1.5 + 2.5 µA
	20 kHz to 50 kHz	2.5 + 2.5 µA
1 mA	20 Hz to 50 Hz	2.5 + 5 µA
	50 Hz to 10 kHz	1.0 + 5 µA
	10 kHz to 20 kHz	1.5 + 5 µA
	20 kHz to 50 kHz	2.5 + 5 µA
2 mA	20 Hz to 50 Hz	2.5 + 12.5 µA
	50 Hz to 10 kHz	1.0 + 12.5 µA
	10 kHz to 20 kHz	1.5 + 12.5 µA
	20 kHz to 50 kHz	2.5 + 12.5 µA
5 mA	20 Hz to 50 Hz	2.5 + 25.0 µA
	50 Hz to 10 kHz	1.0 + 25.0 µA
	10 kHz to 20 kHz	1.5 + 25.0 µA
	20 kHz to 50 kHz	2.5 + 25.0 µA
10 mA	20 Hz to 50 Hz	2.5 + 50 µA
	50 Hz to 10 kHz	1.0 + 50 µA
	10 kHz to 20 kHz	1.5 + 50 µA
	20 kHz to 50 kHz	2.5 + 50 µA
20 mA	20 Hz to 50 Hz	2.5 + 125 µA
	50 Hz to 10 kHz	1.0 + 125 µA
	10 kHz to 20 kHz	1.5 + 125 µA
	20 kHz to 50 kHz	2.5 + 125 µA

50 mA	20 Hz to 50 Hz	2.5 + 250 µA
	50 Hz to 10 kHz	1.0 + 250 µA
	10 kHz to 20 kHz	1.5 + 250 µA
	20 kHz to 50 kHz	2.5 + 250 µA
100 mA	20 Hz to 50 Hz	2.5 + 500 µA
	50 Hz to 10 kHz	1.0 + 500 µA
	10 kHz to 20 kHz	1.5 + 500 µA
	20 kHz to 50 kHz	2.5 + 500 µA
200 mA	20 Hz to 50 Hz	2.5 + 1.25 mA
	50 Hz to 10 kHz	1.0 + 1.25 mA
	10 kHz to 20 kHz	1.5 + 1.25 mA
	20 kHz to 50 kHz	2.5 + 1.25 mA
500 mA	20 Hz to 50 Hz	2.5 + 2.5 mA
	50 Hz to 10 kHz	1.0 + 2.5 mA
	10 kHz to 20 kHz	1.5 + 2.5 mA
	20 kHz to 50 kHz	2.5 + 2.5 mA
1 A	20 Hz to 50 Hz	2.5 + 5 mA
	50 Hz to 10 kHz	1.0 + 5 mA
	10 kHz to 20 kHz	1.5 + 5 mA
	20 kHz to 50 kHz	2.5 + 5 mA

[1] Accuracy: ±(% of reading + absolute value).
Temperature coefficient: ±(0.1 * accuracy) / °C.
Average 100 samples, measuring time 20 ms, function AC.

Resistance measurement

Resistance measurements are performed with the DC voltage source and the measurement unit. Two-wire and four-wire measurements can be performed. Depending on the range, two different methods are used.

Range	Accuracy	Mode[3]	Source voltage	Source current
0.1 Ω to 1 Ω	1+5 mΩ[2]	CS	0.5 V max.	100 mA
1 Ω to 10 Ω	0.5[1]	CS	0.2 V max.	10 mA
10 Ω to 100 Ω	0.5[1]	VS	0.2 V	25 mA max.
100 Ω to 1 kΩ	0.5[1]	VS	0.2 V	2.5 mA max.
1 kΩ to 10 kΩ	0.5[1]	V	0.2 V	1 mA max.
10 kΩ to 100 kΩ	1[1]	V	0.2 V	0.1 mA max.
100 kΩ to 1 MΩ	1[1]	V	1 V	0.1 mA max.
1 MΩ to 10 MΩ	1[1]	V	5 V	0.1 mA max.

[1] Accuracy: ±% of reading.
Temperature coefficient: ±(0.1 * accuracy)/°C.

[2] Accuracy: ±(% of reading + absolute value).
Temperature coefficient: ±(0.1 * accuracy)/°C.

[3] CS: 4-wire, current injection, voltage measurement.
V: 2-wire, voltage injection, current measurement.
VS: 4-wire, voltage injection, current measurement.

Discharge unit (DCH)

Input voltage	125 V max.
Overvoltage protection	200 V DC max.
Max. discharge current	typ. 400 mA

Synchronization

Trigger units	4 logical blocks
Trigger inputs per unit	8 x PXI 2 x front connector (TTL) 2 x analog input signal
Pattern per unit	12 bit, 3 states (high, low, don't care)
Slope per unit	programmable
Delay per unit	50 ns to 100 s
Trigger outputs	8 x PXI 2 x front connector (TTL)

Analog measurement bus and relay multiplexer

Analog measurement bus access	8 busses
Relay scanner	2 x 4-to-1 multiplexer
Max. voltage DC/AC	125 V / 125 V rms
Max. current	1 A / 1 A rms
Max. switching power	10 W / 10 VA

General data

Power consumption	+5 V / 5.8 A, +3.3 V / 0.2 A, 30 W max. incl. R&S®TS-PDC
EMC compliance	compliant with 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-288800D, 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	+5 °C to +40 °C
Permissible	0 °C to +50 °C
Storage	–40 °C to +70 °C
Humidity	+40 °C, 95 % rel. humidity
Dimensions in mm	316 x 174 x 20
Weight	0.45 kg (0.75 kg incl. R&S®TS-PDC)
Recommended calibration interval	1 year

Ordering information

Analog Source and Measurement		
Module including R&S®TS-PDC	R&S®TS-PSAM	1142.9503.02
Platform R&S®CompactTSVP	R&S®TS-PCA3	1152.2518.02

Certified Quality System ISO 9001 DQS REG. NO 1954 QM

Certified Environmental System ISO 14001 DQS REG. NO 1954 UM

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