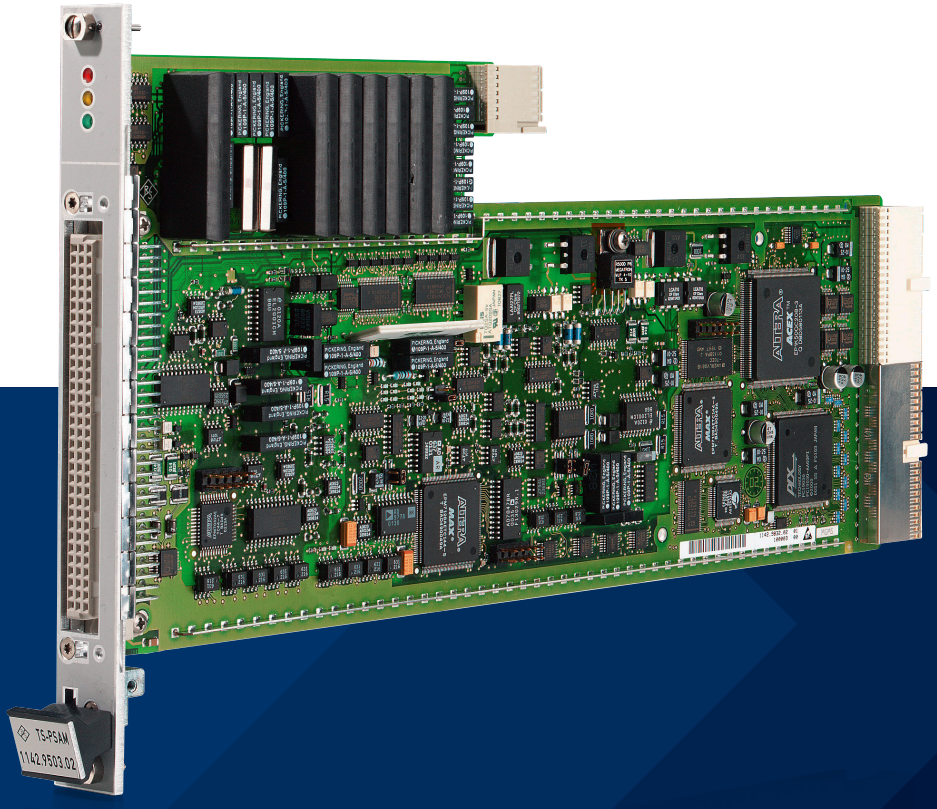
R&S®TS-PSAM
ANALOG SOURCE AND MEASUREMENT MODULE

Scanning multimeter and data acquisition unit



Product Brochure
Version 04.00

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AT A GLANCE

The R&S®TS-PSAM analog source and measurement module is a PXI module which takes up only one slot in the R&S®TSVP test system versatile platform.

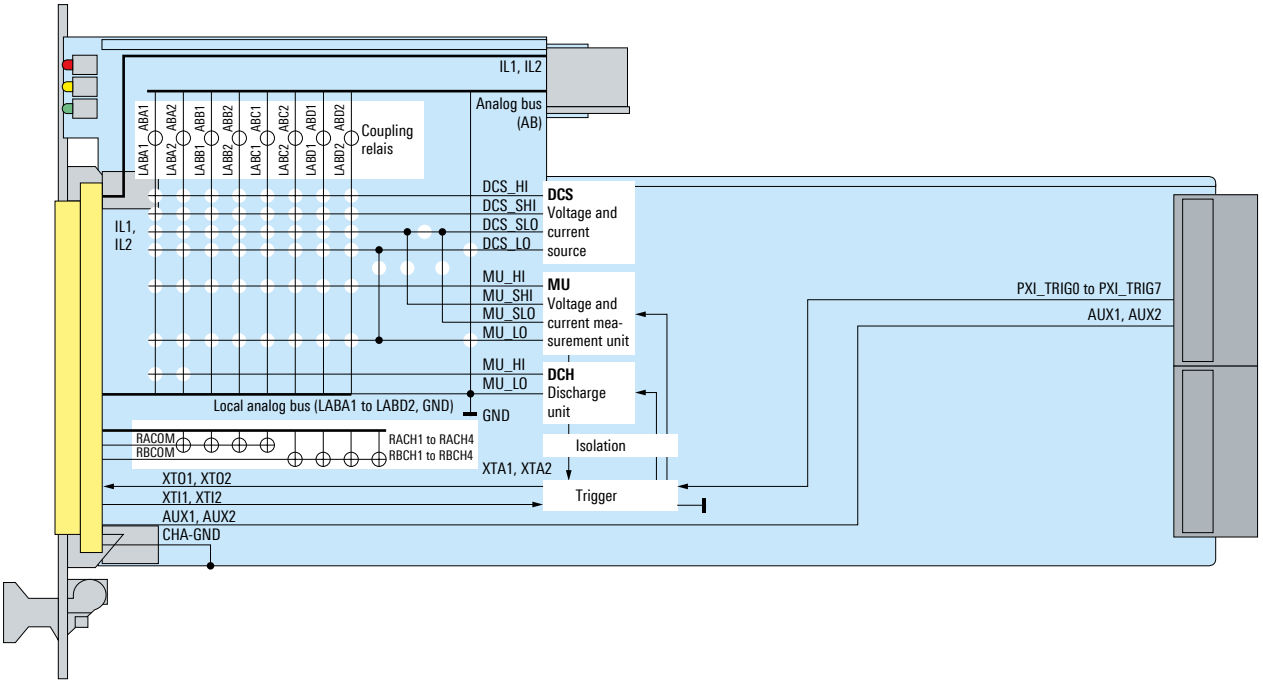
Key facts

- Floating measurement unit
- DC measurements up to 120 V, up to 1 A
- AC measurements up to 50 V (RMS), up to 1 A (RMS)
- Resistance measurement ranges from 1 Ω to 10 MΩ, 2-wire and 4-wire
- Measurement synchronization via PXI clock and trigger
- 16 bit A/D converter, maximum sampling rate 200 ksample/s, onboard 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 120 V discharge voltage
- Discharge current 400 mA maximum
- Analog measurement bus access to eight bus lines
- LabWindows/CVI device driver support
- Generic test software library (GTSL) in DLL format
- Enhanced generic test software library (EGTSL) for in-circuit test

Product introduction

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®TSVP 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 onboard by two 4:1 relay multiplexers.

Functional block diagram



TYPICAL APPLICATIONS

The module is used for general measurement tasks, such as a digital multimeter, for the in-circuit test (ICT) and the R&S®TSVP self-test. 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 R&S®TS-PMB matrix module to the R&S®TS-PSAM source and measurement module via the analog measurement bus.

The careful approach to handling analog signals leads to the interconnection solution of the R&S®TSVP analog bus. The eight-line analog bus is located directly above the front-connector area where space is provided for onboard 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.

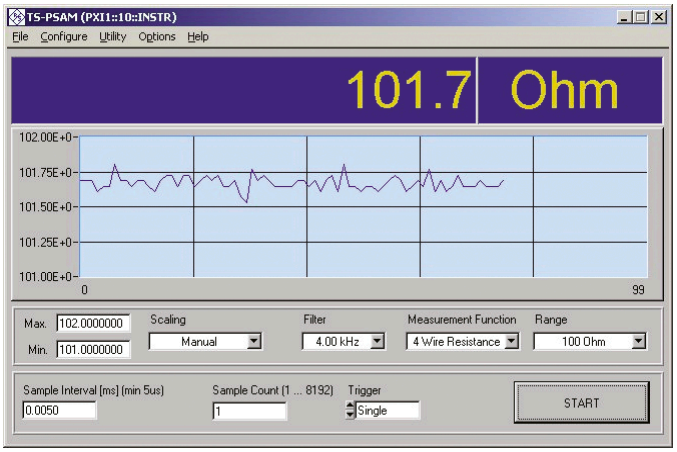
SOFTWARE SUPPORT

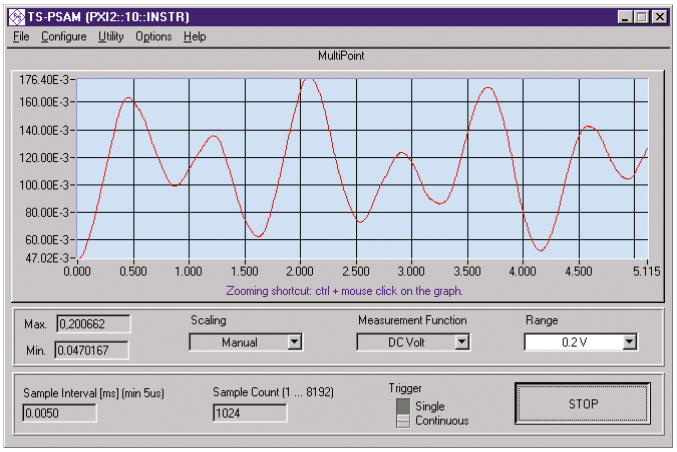
A LabWindows/CVI DMM driver in line with the IVI standard is available for the multimeter functions of the module. All other functional groups of the hardware are served via specific driver extensions. Function panels and online help are available as common features for the LabWindows/CVI driver.

The ICT is performed with a dedicated software package named EGTSL.

SECURITY THROUGH SELF-TEST AND DIAGNOSTIC FEATURES

The built-in self-test 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®TSVP self-test, the R&S®TS-PSAM is used as the measurement unit to test other modules and components in the chassis.





SPECIFICATIONS

Application in R&S®TSVP platform		
PXI module		1 slot required
Interface		
Control bus		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 due to temperature coefficient	±(0.1 × uncertainty)/°C for a valid autocorrection period and in ambient temperature ranges from +5 °C to +18 °C and +28 °C to +40 °C	

DC voltage source (DCS)			
Floating source		working voltage	max. 120 V DC
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
Current limiting range	Resolution	Accuracy [1]	output characteristic (sense lines not connected)
100 µA	2 nA	0.25 + 1 µA	max. 10 kΩ
1 mA	20 nA	0.25 + 5 µA	max. 1 kΩ
10 mA	200 nA	0.25 + 50 µA	max. 100 Ω
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	max. 120 V DC	
Waveform sampling rate			max. 200 ksample/s	
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 sample, measuring time 20 ms, filter 400 Hz.
[3] Waveform recording from 1 ksample to 8 ksample, no averaging, filter 40 kHz.
[4] Measurement Low GND-referenced.
[5] Input signal max. 120 V DC.

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

[1)] Input characteristics: Active current measurement via current/voltage amplifier.
[2)] Input characteristics: 0.5 Ω shunt.
[3)] Accuracy: ±(% of set value + absolute value). Temperature coefficient: ±(0.2 accuracy)/°C.
[4)] Average 100 sample, measuring time 20 ms, filter 400 Hz.
[5)] Waveform recording from 1 ksample to 8 ksample, no averaging, filter 40 kHz.

Measurement unit (MU)		
RMS measurements		
The specified accuracy only applies to sinewave signals in the frequency range from 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

Measurement unit (MU)		
Range	Frequency range	Accuracy [1]
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 sample, measuring time 20 ms, filter 40 kHz.
[2] AC input signal max. 50 V AC (RMS).

Measurement unit (MU)		
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

Measurement unit (MU)		
Range	Frequency range	Accuracy [1]
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 sample, measuring time 20 ms, function AC.

Measurement unit (MU)

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	max. 0.5 V	100 mA
1 Ω to 10 Ω	0.5 [1]	CS	max. 0.2 V	10 mA
10 Ω to 100 Ω	0.5 [1]	VS	0.2 V	max. 25 mA
100 Ω to 1 kΩ	0.5 [1]	VS	0.2 V	max. 2.5 mA
1 kΩ to 10 kΩ	0.5 [1]	V	0.2 V	max. 1 mA
10 kΩ to 100 kΩ	1 [1]	V	0.2 V	max. 0.1 mA
100 kΩ to 1 MΩ	1 [1]	V	1 V	max. 0.1 mA
1 MΩ to 10 MΩ	1 [1]	V	5 V	max. 0.1 mA

[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	max. 120 V DC
Overvoltage protection	max. 200 V DC
Maximum discharge current	typ. 400 mA
Synchronization	
Trigger units	4 logical blocks
Trigger inputs per unit	8 × PXI, 2 × front connector (TTL), 2 × 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 × PXI, 2 × front connector (TTL)
Analog measurement bus and relay multiplexer	
Analog measurement bus access	8 busses
Relay scanner	2 × 4-to-1 multiplexer
Maximum voltage DC/AC	120 V/50 V (RMS)
Maximum current	1 A/1 A (RMS)
Maximum switching power	10 W/10 VA

General data		
Power consumption		+5 V/5.8 A, +3.3 V/0.2 A, max. 30 W incl. R&S®TS-PDC
Environmental conditions		
Temperature	operating temperature range	+5 °C to +40 °C
	storage temperature range	–10 °C to +60 °C
Damp heat		+40 °C, 80 % rel. humidity, steady state, in line with EN 60068-2-78
Altitude	operating	up to 2000 m
Mechanical resistance		
Vibration	sinusoidal	in line with EN 60068-2-6, frequency range: 5 Hz to 55 Hz, displacement: 0.3 mm (peak-to-peak) (1.8 g at 55 Hz), frequency range: 55 Hz to 150 Hz, acceleration: 0.5 g constant
	random	in line with EN 60068-2-64, 8 Hz to 500 Hz, acceleration 1.2 g (RMS); 5 min/axis
Shock		shock test in line with MIL-STD-810G, method 516.6, procedure I: shock response spectrum ramp 6 dB/octave up to 45 Hz, 45 Hz to 2000 Hz: max. 40 g
Product conformity		
Electromagnetic compatibility	EU: in line with EMC Directive 2014/30/EC	applied harmonized standards: ► EN 61326-1 (industrial environment) ► EN 61326-2-1 ► EN 55011 Group 1, Class A
Electrical safety	EU: in line with Low Voltage Directive 2006/95/EC	applied harmonized standard: EN 61010-1
	EU: in line with Low Voltage Directive 2014/35/EC	applied harmonized standard: EN 61010-1
	USA	applied standard: UL 61010
	Canada	applied standard: CSA-C22.2 No. 61010-1
RoHS	EU: in line with the restriction of the use of hazardous substances in electrical and electronic equipment 2011/65/EU	compliant; applied harmonized standard: EN IEC 63000
Dimensions	W × H × D	316 mm × 174 mm × 20 mm (12.44 in × 6.85 in × 0.79 in)
Weight	incl. R&S®TS-PDC (140 g/0.3 lb)	0.51 kg (1.12 lb)
Recommended calibration interval		12 months

ORDERING INFORMATION

Designation	Type	Order No.
Module, including R&S®TS-PDC	R&S®TS-PSAM	1142.9503.02

Service that adds value

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

Rohde&Schwarz

The Rohde&Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test&measurement, technology systems and networks&cybersecurity. Founded more than 85 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

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Sustainable product design

- Environmental compatibility and eco-footprint
- Energy efficiency and low emissions
- Longevity and optimized total cost of ownership

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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R&S®TS-PSAM Analog Source and Measurement Module
Data without tolerance limits is not binding | Subject to change

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