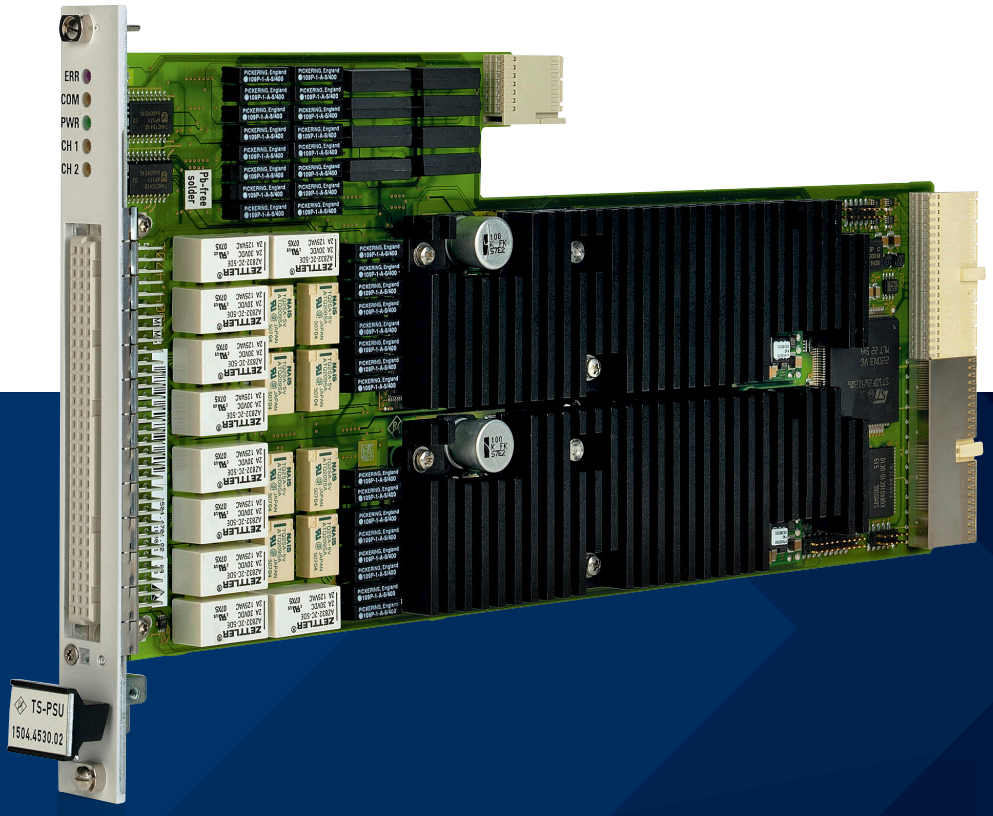
R&S®TS-PSU12
POWER SUPPLY/LOAD MODULE

Four-quadrant source with integrated measurement unit



Product Brochure
Version 03.00

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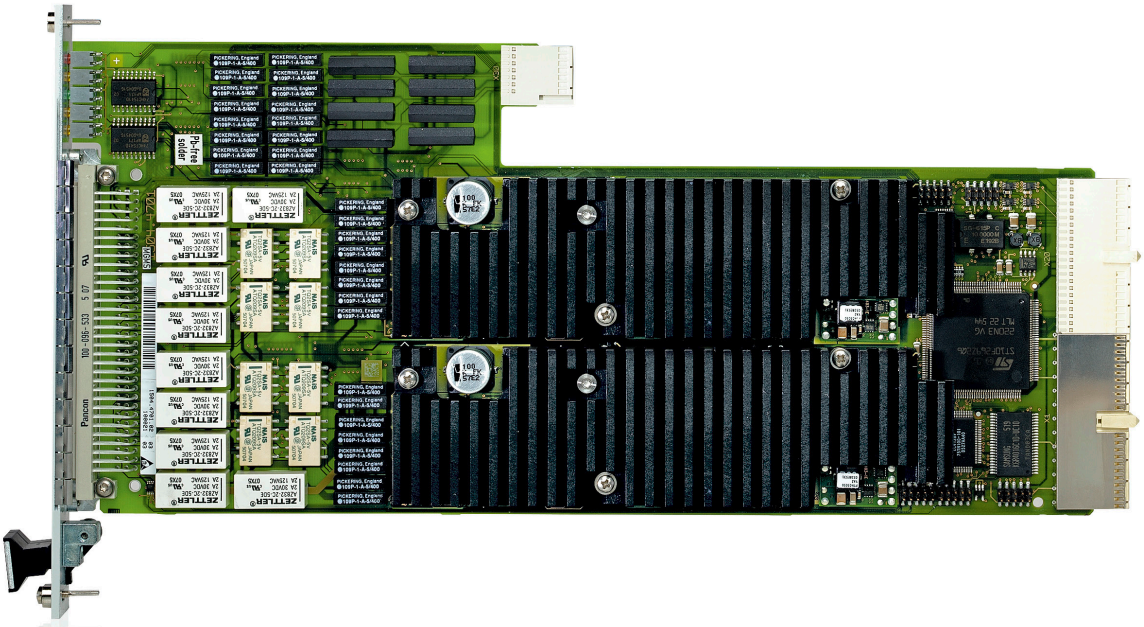
AT A GLANCE

The R&S®TS-PSU12 is a power supply and load module with two independent, floating channels. Designed for four-quadrant operation, the module can be used in functional tests (FCT) as well as in-circuit tests (ICT). It is controlled via the CAN bus in the R&S®TSVP frames. Its innovative technology and versatile functionality make it ideal for applications in the field of automotive electronics.

Key facts

- Four-quadrant source
  - Bipolar
  - Usable as a voltage or current source
- Electronic load simulation of 6 W per channel
- Two independent, floating channels of up to ±12 V, 0.5 A, 5 W and separate sensing per channel
- Programmable current and voltage limiting
- Integrated voltage and current measurement unit per channel
- Output and recording of voltage and current profiles
- External triggering of source outputs and measurement channels
- Protection against overvoltage, overcurrent, overtemperature and short-circuits
- 4-to-1 relay multiplexer for force and sense lines of each channel
- Access to analog measurement bus via eight bus lines
- Control via CAN bus
- Self-test capabilities
- Device driver for LabWindows/CVI
- Generic test software library (GTSL) in DLL format
- Integration into enhanced GTSL (EGTSL) test software environment for in-circuit tests



PRODUCT INTRODUCTION

Due to its special design, the module ensures efficient powering of DUTs while taking up only a single slot.

A measurement unit is integrated in each supply channel. The voltage and current values can thus be read without an external instrument. Voltage drops that may occur on the supply lines can be compensated by external sensing.

Moreover, voltage and current profiles can be output or recorded. The various measurement sources can be monitored via the outputs (CHx_MHI, CHx_MLO) using a fast digitizer (e.g. R&S®TS-PAM).

Integrated 4-to-1 multiplexers are provided for the force and sense lines of each channel, which enables highly versatile signal routing and in many cases eliminates the need for additional switch modules.

In addition, each channel can be switched to four lines of the R&S®TSVP analog bus. Via this bus, the channels can be routed to other measurement and switch modules of the base unit without requiring any additional external wiring.

As a four-quadrant source, the R&S®TS-PSU12 not only acts as a power supply for DUTs but is also capable of electronic load simulation. For example, the R&S®TS-PSU12 can be used for testing the behavior of automotive control units by applying a defined load to their control outputs.

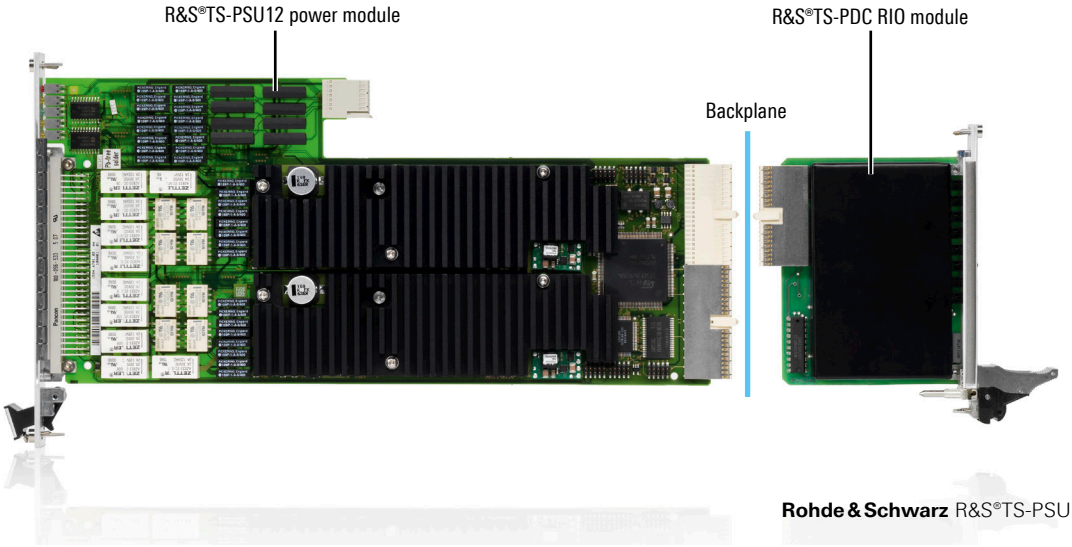
By external serial cascading of the two output channels, auxiliary voltages of up to 24 V can be generated during in-circuit tests (e.g. for testing Zener diodes or relays). As an additional feature, the output power of the module can be controlled by modulating the pulse width of the output voltage.

The two output channels can be controlled via external trigger signals or internal PXI trigger lines to synchronize them with other instruments. Conversely, each channel can generate trigger events.

The R&S®TS-PSU12 power supply/load module is supplied with the following components:

- **R&S®TS-PSU12 power module**
  Plug-in card to be inserted at the front of the base unit
- **R&S®TS-PDC RIO module**
  Plug-in card to be inserted at the rear of the base unit (behind the R&S®TS-PSU12 power module, in the same slot)

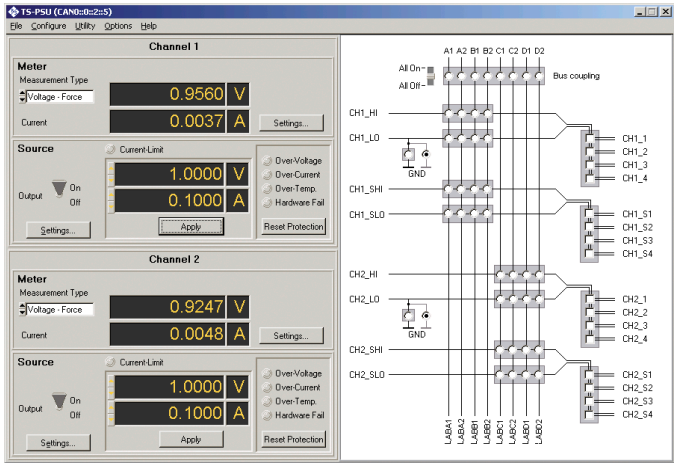
R&S®TS-PSU12 components installed in the R&S®TSVP



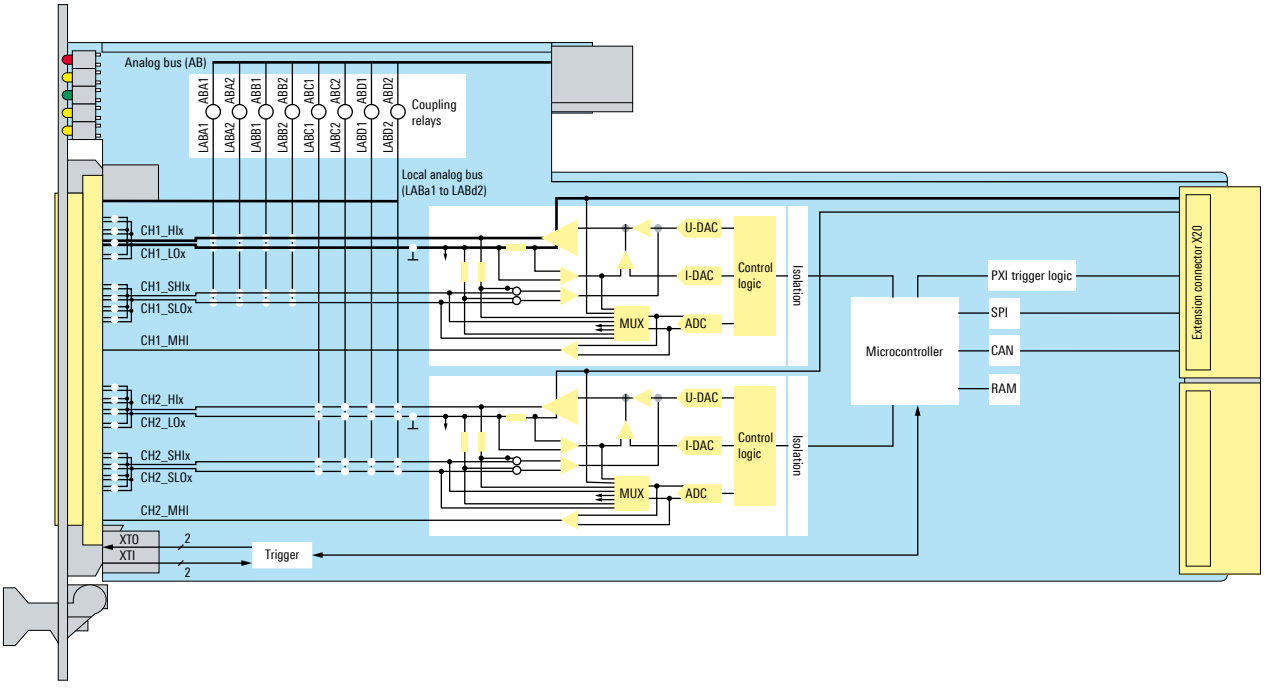
TYPICAL APPLICATIONS

- High-performance voltage and current supply in functional tests
- Recording of current/voltage characteristics of the DUT being powered
- Electronic load simulation
- Auxiliary voltage source for in-circuit tests (e.g. up to 24 V for Zener diodes)
- Charge/discharge tests (e.g. by defined discharging of batteries)

Software control panel for the R&S®TS-PSU12



Power module



SOFTWARE SUPPORT

The R&S®TS-PSU12 power supply/load module is supplied with an IVI-compliant LabWindows/CVI driver, which offers control panels and online help as standard features. Alternatively, all functions for configuring the channels and measurement units can be called via the GTSL DC power supply library.

SELF-TEST AND DIAGNOSTICS FOR RELIABLE OPERATION

The built-in self-test capability of the module ranges from fast diagnostics to a fully automatic test of all relays and switching paths (requires R&S®TS-PSAM).

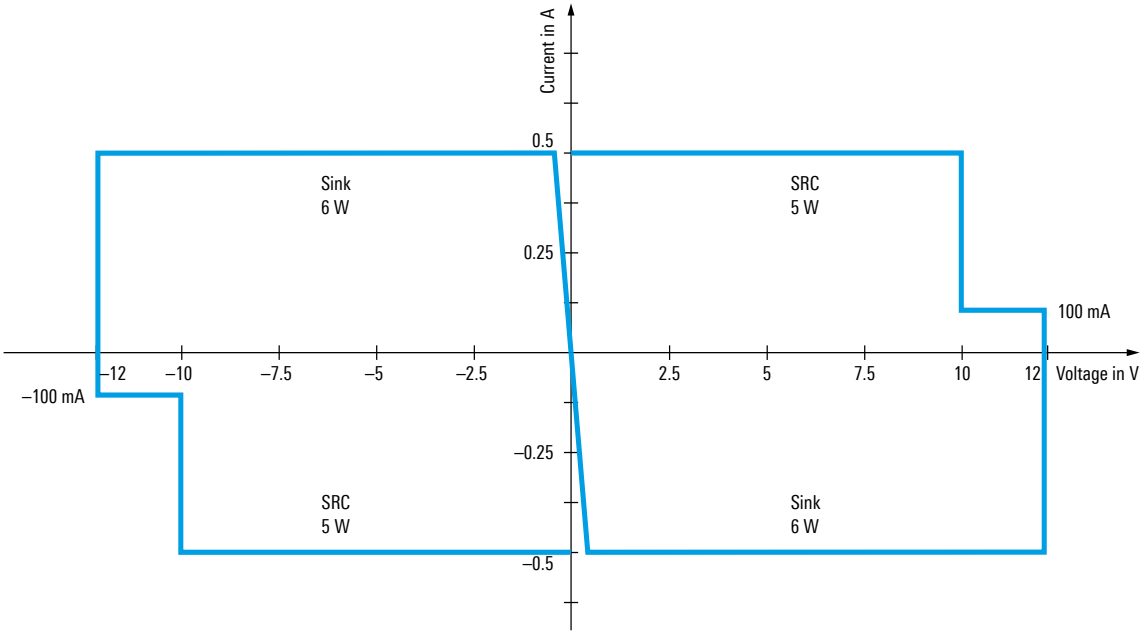
Diagnostic LEDs on the front panel make system integration faster and easier. The user can see at a glance whether the module is in proper working order.

SPECIFICATIONS

Specifications		
Application in the R&S®TSVP platform	CAN bus controlled	1 slot required
Interface		
Control bus		CAN 2.0B (1 Mbit/s)
DUT connector (front)		in line with DIN 41612, 96 pins
Tolerances of specified values apply under the following conditions	recommended calibration interval	1 year
	remperature range	+23 °C ±5 °C
	additional error indicated by the temperature coefficient in the range [1]	+5 °C to +18 °C and +28 °C to +40 °C
Output channels		
Number of channels		2 (independent, floating)
Source type		four-quadrant
Maximum operating voltage		120 V
Maximum output power per channel	source mode	5 W
	sink mode	6 W
Sampling mode	profiles	voltage, current
	sample clock	max. 10 kHz
	memory, voltage profile	10 000 sample
	memory, current profile	10 000 sample
Output voltage		
Type		bipolar
Voltage range		±12 V
Resolution		16 bit + sign
Line regulation		0.1 %
Load regulation in external sense mode (10 % to 90 %)		0.1 %
Ripple + noise		typ. 4 mV (RMS) at 20 MHz bandwidth
Settling time (10 % to 90 %/90 % to 10 %), resistive load only	range 10 mA/100 mA	100 µs
	range ≤ 1.3 A/15 V	100 µs
	range ≤ 0.4 A/50 V	100 µs
	other ranges	formula: $t = (\Delta V \times 0.32)/(3.5\ I_{actual})$ ms
Load transient recovery time (10 % to 90 %)		100 µs
Polarity switching time		typ. 200 µs
Recovery time from short		max. 10 ms + settling time
Remote sensing		compensation for 2.0 V per lead
Output current		
Type		source/sink
Current ranges		10 mA, 100 mA, 500 mA
Resolution (effective bits)		16 bit
Accuracy of DC stimulus unit	Voltage	Current
Stimulus range	12 V	10 mA, 100 mA, 500 mA [2]
Resolution	230 µV	0.39 µA, 3.7 µA, 29 µA
Error limits	0.2 % + 15 mV	0.4 % + 20 µA, 0.4 % + 200 µA, 0.4 % + 1.5 mA
Measurement channels		
Type		built-in, one measurement channel per power supply/load channel
Measurement source		voltage, current, external voltage
Voltage range		12 V
Current ranges		10 mA, 100 mA, 500 mA
Resolution (effective bits)		16 bit

Specifications		
Sampling mode	sample clock	max. 10 kHz
	sample memory	10000 sample
Accuracy of measurement unit	Voltage	Current
Measurement range	12 V	10 mA, 100 mA, 500 mA
Resolution	1.56 mV	0.38 µA, 3.4 uA, 28 uA
Error limits, average [1), 3)]	0.1% + 50 mV	0.4% + 20 µA, 0.4% + 200 µA, 0.4% + 1.5 mA
Error limits, sampling mode [1), 3)]	0.1% + 50 mV	0.4% + 80 µA, 0.4% + 800 µA, 0.4% + 6 mA
Miscellaneous		
Protection		overvoltage, overtemperature, shorted outputs, sense lines shorted or inverted: typ. 5 V voltage rise
Inhibit		electronic on/off within 200 µs
Pulse-width modulation (PWM)		pulse width ≥ 50 µs, frequency ≤ 10 kHz
Remote sensing		switch-selected
Paralleled outputs		not allowed
Cascaded outputs		allowed, external jumper required
Trigger lines		8 PXI, 2 XTI, 2 XTO
Isolation (signal to signal, signal to earth)		120 V DC
Analog measurement bus and relay multiplexer		
Analog measurement bus		8 lines
Coupling relays		8, local bus to global bus
	switching voltage	120 V DC, 50 V AC (RMS)
	switching current	max. 1.0 A
	switching power DC (RMS)	10 W/10 VA
Relay multiplexer		4-to-1 DPST (one for each force and sense channel)
	switching voltage	120 V DC, 50 V AC (RMS)
	switching current	3.0 A
	switching power DC (RMS)	60 W/250 VA

Source/sink characteristic



Specifications		
General data		
Power consumption		max. +5 V/6 A (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 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)	R&S®TS-PSU12 power module	316 mm × 174 mm × 20 mm (12.4 in × 6.8 in × 0.8 in)
	R&S®TS-PDC RIO module	130 mm × 128 mm × 20 mm (5.1 in × 5.0 in × 0.8 in)
Weight	R&S®TS-PSU12 power module	0.55 kg (1.2 lb)
	R&S®TS-PDC RIO module	0.14 kg (0.3 lb)
Recommended calibration interval		12 months

[1] Accuracy: ±(% of set value + absolute value); temperature coefficient: ±(0.1 × accuracy)/°C.
[2] Maximum output voltage = 10 V.
[3] Average of 1000 sample, measuring time 100 ms.

ORDERING INFORMATION

Designation	Type	Order number
Power supply/load module, including R&S®TS-PDC	R&S®TS-PSU12	1504.4530.03

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