



Version  
01.01

February  
2007

# R&S® CompactTSVP Test and Measurement Chassis

## R&S® TS-PCA3

Open test platform based on CompactPCI and PXI

- ◆ Modular instrument chassis for CompactPCI and PXI modules
- ◆ Standard 19" rack-mount 4 HU enclosure for 3 HU CompactPCI
- ◆ CompactPCI backplane conforming to PICMG 2.0 Rev. 3.0 specification
- ◆ Rear I/O support for easy system cabling (IEEE 1101.11-1998)
- ◆ Sophisticated analog measurement bus subsystem
- ◆ Support of PXI trigger concept
- ◆ 14 peripheral slots for versatile instrumentation
- ◆ Seamless test adaptation by using standardized adapter components
- ◆ Simple and efficient module connection concept
- ◆ Easily expandable ATE switching
- ◆ High pincount switching expansion by cascading an R&S® PowerTSVP chassis
- ◆ Cost-effective peripheral control via CAN
- ◆ Rohde & Schwarz's overall commitment to industrial standards



**ROHDE & SCHWARZ**



## Product introduction

The R&S® CompactTSVP concept represents true innovation in state-of-the-art PC-based instrumentation while offering traditional capabilities found in high-performance ATE systems. The versatile platform accelerates the adoption of CompactPCI and PXI in all major fields of industrial test-and-measurement applications.

With its large number of CompactPCI/ PXI slots and the tight integration of ATE functionality provided by Rohde & Schwarz instrumentation and switching modules, the R&S® CompactTSVP is the ideal platform for highly productive system engineering.

Compact units are used to configure complex ATE functionality which can be interfaced to DUTs by the standardized test receiver concept that provides multiple application flexibility and easy handling on the factory floor.

Unique data-acquisition and stimulation modules provide floating potential measurements and DUT stimulation.

The R&S® CompactTSVP open test platform from Rohde & Schwarz was developed as an all-in-one solution that is well suited for test and measurement applications in development, production and servicing of telecommunications and automotive electronics.

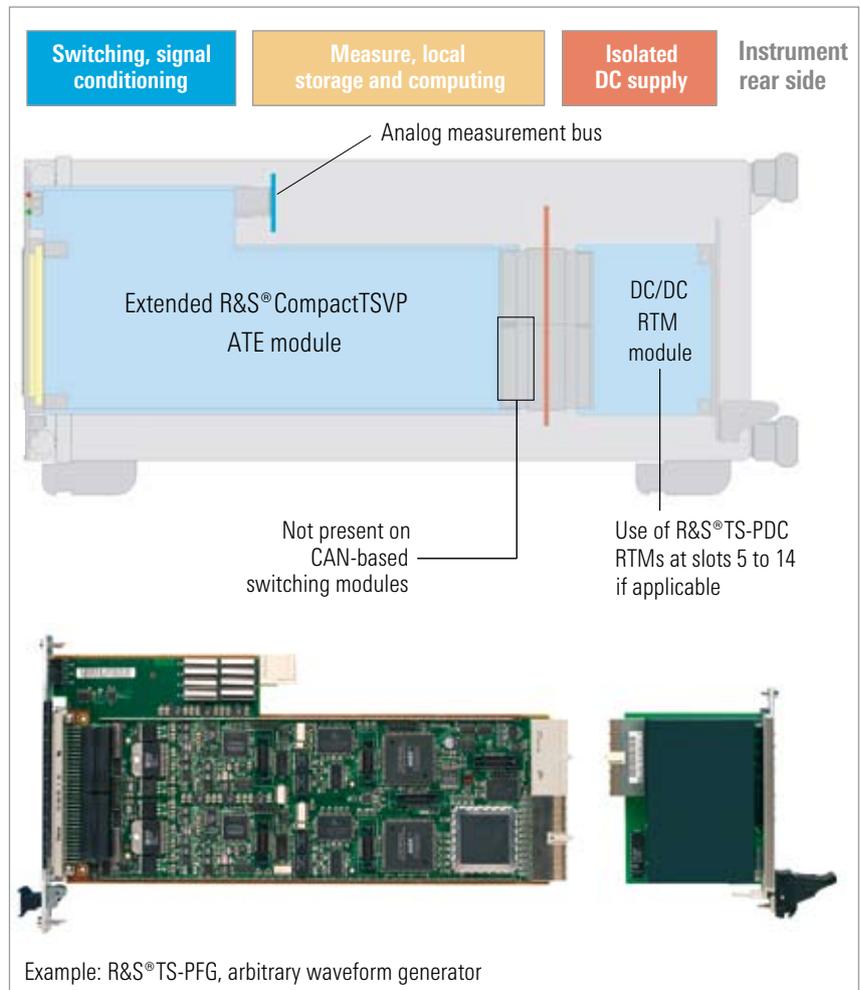
As an industrial ATE platform, the R&S® CompactTSVP product line features ICT (in-circuit test) as a modular hardware and software option for creating powerful and affordable manufacturing test systems.

## R&S® CompactTSVP module formats and features

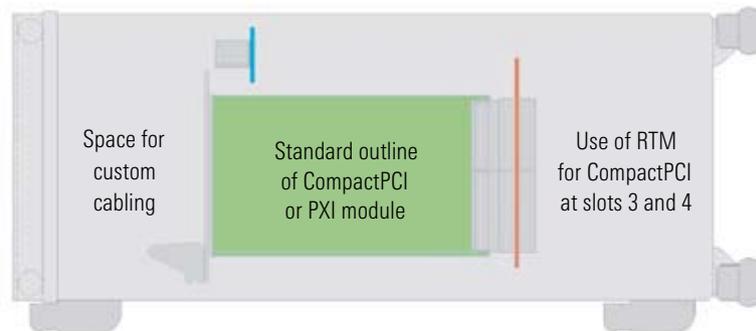
The main objective behind the R&S® CompactTSVP is to offer an inherently flexible and cost-effective modular test and measurement platform. The performance of the platform product should be sophisticated enough that even VXI test system applications can be addressed by the platform technology. Although tight integration and electronic miniaturization help when building powerful devices with smaller footprints, available board space is still a major issue. The board space of a 3 HU CompactPCI or PXI module is the same as the Eurocard mechanical packaging measuring 160 mm x 100 mm (length x height), and the application-specific space is reduced by the CompactPCI bus interface chip and circuitry. Therefore, the R&S® CompactTSVP module format was extended by 130 mm in length to bring primary switching and signal conditioning on board.

Core functionalities such as A/D conversion, storage and computing are combined into a comprehensive environment. For the analog frontends of floating measurement units, the isolated power supply is provided by a DC/DC conversion module that uses the space of the CompactPCI standardized RTM section (rear transmission module). The concept benefits from double board space versus PXI one-slot Eurocard modules.

The isolated R&S®TS-PDC DC supply modules are placed behind the backplane as a thermal barrier to prevent the measurement modules from heating up and provides high thermal stability of measurements over the full temperature range. The module is included at no extra cost in every measurement module that requires a floating DC supply.



### The general concept of the R&S® CompactTSVP module format



### Deployment of commercially available CompactPCI or PXI modules

For various application requirements such as special interface functionality or additional test and measurement modules, the R&S® CompactTSVP is interoperable with commercially available 3 HU CompactPCI and PXI products.

This allows users to take advantage of technology advances in the mainstream industrial PC industry as well as imaging and test and measurement products for dedicated application requirements. PXI modular instrumentation can be used including features that provide advanced timing and triggering capabilities.

## Overview of the R&S® CompactTSVP components

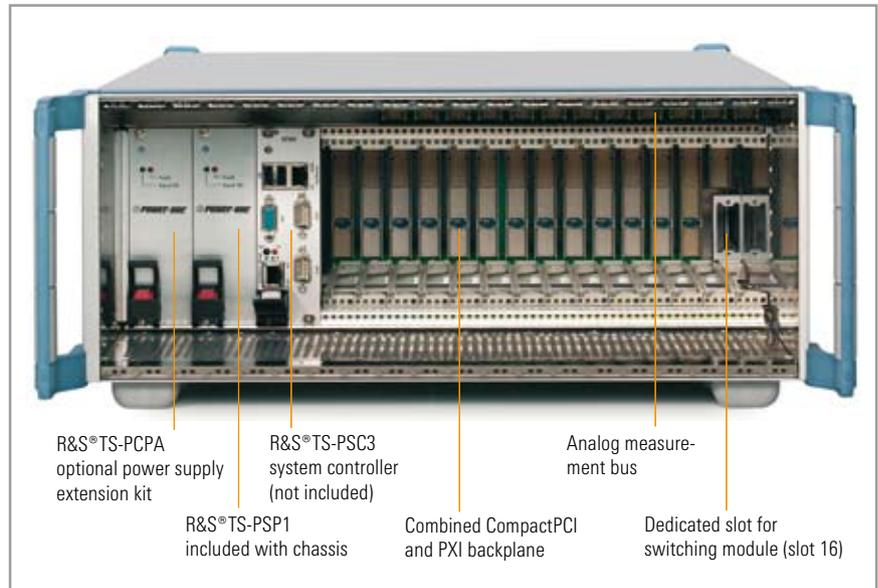
### Analog measurement bus

The analog measurement bus offers short routing of signals to the measurement modules and electrical immunity to the digital PCI backplane.

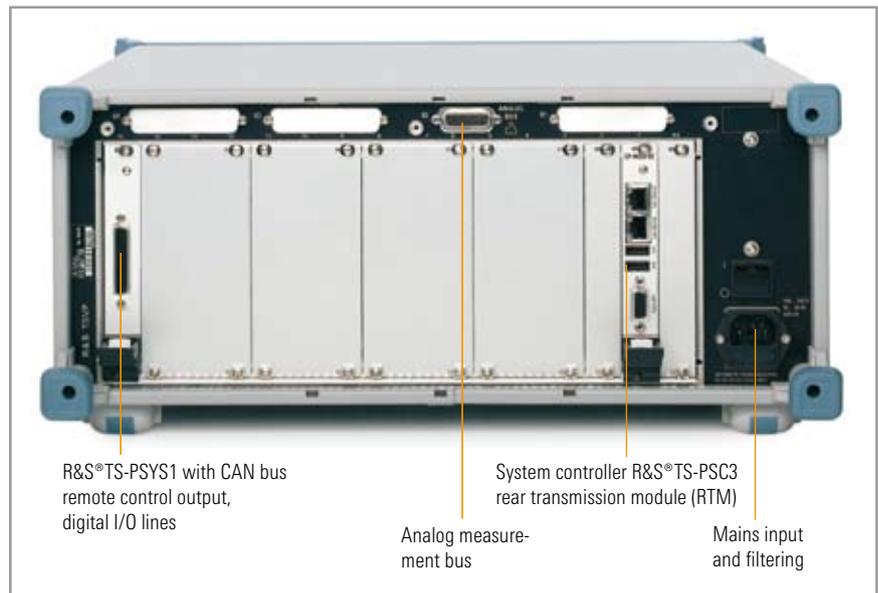
The eight lines of the system-wide analog measurement bus are available at all peripheral slots. They are used to temporarily interconnect DUT signals routed via switching modules and various measurement or stimulus modules that have access to the analog measurement bus.

The implementation is a physically dedicated backplane located 160 mm from the digital CompactPCI/PXI backplane.

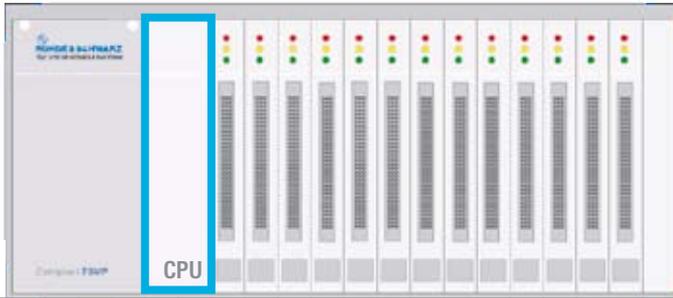
The multilayer backplane implements three-dimensional shielding with adjacent ground lines for optimized signal quality and seamless signal interconnection. The connectors to the modules are implemented as modified C-module connectors (2 mm metric system). The highly sophisticated handling of analog signals led to the interconnection solution for the R&S® CompactTSVP analog bus. The analog bus is located directly above the front connector area where space is provided for on-board signal conditioning and signal routing by means of coupling relays for the analog bus.



**R&S® CompactTSVP platform components and building blocks**



**The rear of the R&S® TS-PCA3 contains system interfaces and supply modules**



Bus	Slot	A1	A2	A3	A4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CompactPCI						■	■	■													
PXI						■	■	■													
CAN bus								■													
Analog bus								■													
Rear I/O								■													
DC/DC rear I/O								■													
Power supplies								■													

**System backplane architecture of the R&S® TS-PCA3**

**Versatile backplane architecture**

The R&S® CompactTSVP Test and Measurement Chassis R&S® TS-PCA3 comprises the control backplane which provides 14 peripheral slots according to the CompactPCI specification PICMG 2.0 Rev. 3.0 with CompactPCI rear I/O support for RTM modules. Additionally, 11 slots are extended to support special features of PXI (PCI eXtensions for Instrumentation).

The CompactPCI standard 32-bit design makes it possible to route module-specific signals via the RTM concept to the rear side of the test platform without special cabling. To enable this important flexibility, slots 3 and 4 therefore support the RTM feature instead of PXI.

The rear side cabling is truly beneficial when deploying a 19" rack-mountable standard test adapter, which is available for the R&S® CompactTSVP as a set of off-the-shelf products, ready for use in production test applications. Slots 5 to 15 cover the PXI features for triggering and a high precision system clock of 10 MHz for synchronization.

The backplane concept offers maximum flexibility for integrating either the ATE instrumentation modules of the

R&S® CompactTSVP product line or common off-the-shelf CompactPCI-based products.

**Variable power backplane**

The R&S® CompactTSVP chassis offers space for two power supply slots which are implemented as CompactPCI power interfaces according to the PICMG 2.11 Rev. 1.0 standard.

The power interface at slots A3 and A4 is equipped with one R&S® TS-PSP1 module which is included as a system power supply for the R&S® TS-PCA3. The adjacent slots A1 and A2 can be used to extend the available power by means of the R&S® TS-PCPA extension kit, which includes one power supply unit, backplane extension and cabling.

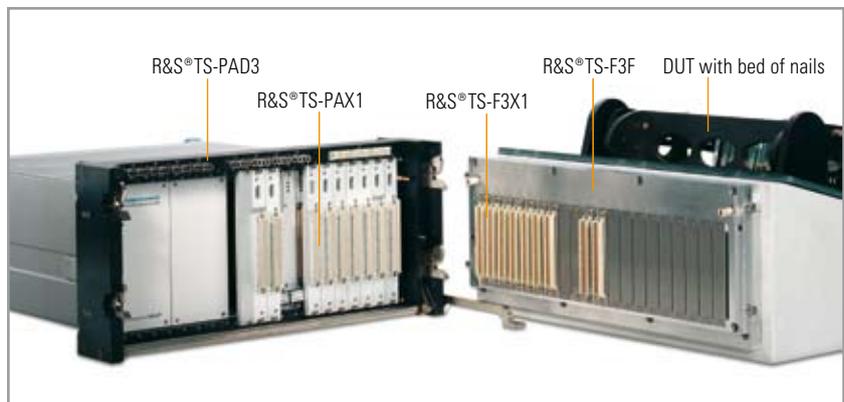
This feature can be used for optimized availability or current sharing for fully equipped chassis configurations that require an extended power budget.

**Cooling considerations for secure operation**

The CompactPCI slot area is equipped with four radial low-noise fans. The fans are mounted above the slot area and deliver consistent airflow from bottom to top. The fans are temperature-controlled, and the temperature inside the R&S® CompactTSVP chassis is measured at four locations. For additional fans inside the chassis, e.g. above the rear I/O area, two additional supply connectors are available on the backplane.

**Test adapter accessories**

To accelerate incorporation of the R&S® CompactTSVP into production test environments in a quick and cost-effective manner, an entire set of mass-interconnection support products has been created. The platform modules are equipped with a 96-pin DIN 41612 connector which is easy to handle and is convenient for wiring. The interfacing of the R&S® TS-PAD3 test adapter receiver frame to the R&S® TS-F3F test adapter connector frame is implemented by the R&S® TS-PAX1 modular connector carriers on the test instrument side and the R&S® TS-F3X1 connector carriers on the adapter side.



**Test adapter accessories**

### Serial system control module with CAN bus

To allow relay-based switching modules offered as part of the R&S® CompactTSVP product family to be deployed, the backplane is additionally equipped with a CAN (controller area network) serial communication bus at slots 5 to 16. The low-noise and interference-resistant CAN bus ensures high reliability and high signal quality.

In addition, the interfaces for switching modules have been simplified significantly while still providing sufficient performance for setting up switching paths using mechanical relays.

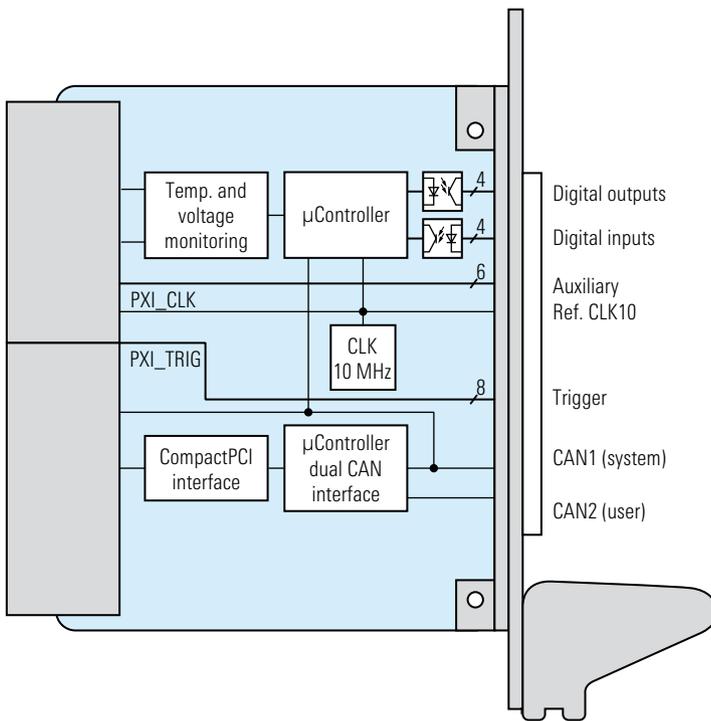
In line with Rohde & Schwarz's overall commitment to industrial standards, various reliable and high-performance serial communication standards are available to choose from.

One straightforward approach is the deployment of a CAN bus, which has been used successfully in automotive electronics for many years.

The interface is physically implemented as a CompactPCI-based R&S® TS-PSYS1 RTM module, located at the rear side of

slot 15. The module is included with the R&S® TS-PCA3 and contains additional system administration functionalities such as temperature monitoring and digital I/O lines to interface automation devices with 24 V digital I/O levels.

The R&S® TS-PSYS1 is used to configure and control the internal R&S® CompactTSVP modules which are based on the CAN bus and all modules of the R&S® PowerTSVP extension chassis (which is based solely on the cost-efficient CAN bus).



**Block diagram of the CAN bus system control module R&S® TS-PSYS1**

## The R&S®PowerTSVP for switching applications

The R&S®PowerTSVP chassis was created to be a cost-efficient subsystem for switching applications. It can be used to build systems ranging from dedicated switching instruments up to complex switching applications inside test and measurement systems.

The analog measurement bus from the R&S®TS-PCA3 architecture routes general-purpose signals from switching modules to various measurement and stimulus instruments integrated in the R&S®CompactTSVP.

The analog bus lines from an R&S®TS-PCA3 chassis are connected to an R&S®TS-PWA3 extension chassis for switching by means of the R&S®TS-PK01 cable.

The R&S®PowerTSVP (product name R&S®TS-PWA3) is an industrial chassis including one power supply, with space

for an additional power supply in adherence to the identical concept for the R&S®TS-PCA3. The serial control backplane provides 16 slots for CAN-based R&S®TSVP modules and includes PXI trigger support.

The CAN bus remote control is implemented as the R&S®TS-PSYS2 interface module which is part of the R&S®PowerTSVP.

Cascading an R&S®PowerTSVP extension chassis to an R&S®CompactTSVP chassis only requires the connection between the R&S®TS-PSYS2 CAN bus slave interface to the R&S®TS-PSYS1 CAN bus master interface inside the R&S®CompactTSVP. This remote connection is provided as an accessory product as well (product name R&S®TS-PK02, cable from R&S®TS-PSYS1 to R&S®TS-PSYS2).

Power switching and the inter-connection of external power supplies and electronic loads to DUTs are provided via the optional R&S®TS-PSM1

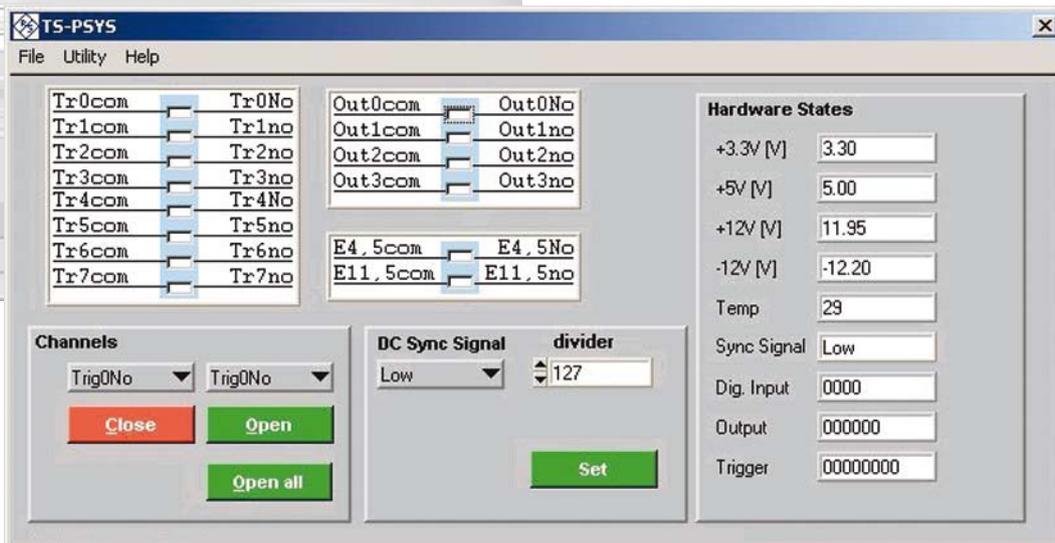
power switching module which is a CAN-based module and suitable for both the R&S®CompactTSVP and the R&S®PowerTSVP.

Power signal handling is usually not possible inside laboratory equipment. With a remote power-switching unit such as the R&S®PowerTSVP, it is possible to prepare adaptations close to the DUT power signals or adjacent to power supplies and loads.

## Software support

The R&S®TS-PSYS1 system control module is configured and controlled by a device driver based on the Virtual Instrument Software Architecture (VISA). Function panels and online help are available as common features for the LabWindows/CVI driver software.

As with every modular instrumentation product in the R&S®CompactTSVP family, a soft front panel is provided.

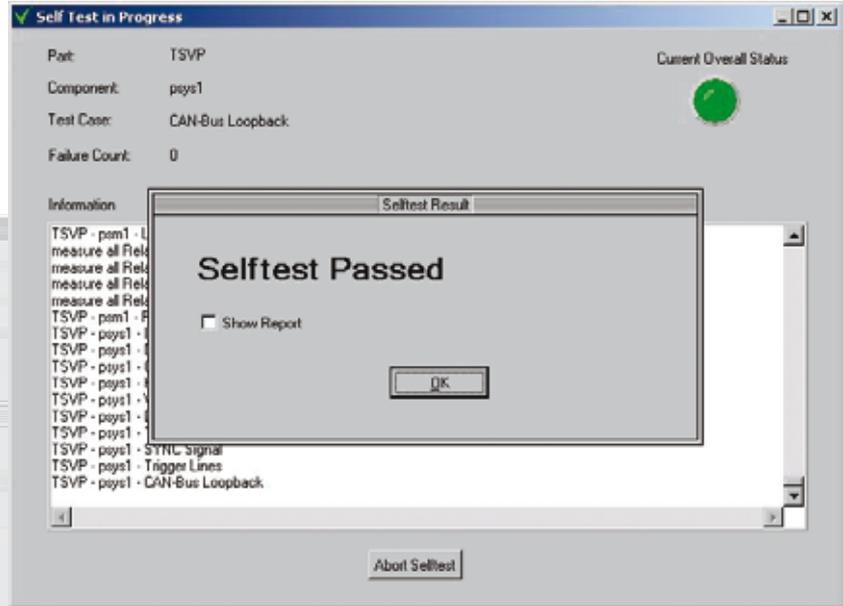


Soft front panel of the R&S®TS-PSYS1 system control module

## Security by selftest and diagnostics features

The built-in selftest capability of the system control module R&S®TS-PSYS1 includes automated evaluation of module functionality including a CAN bus loopback test, diagnostics for temperature monitoring and digital I/O lines. The system-wide selftest of the R&S®CompactTSVP is performed by using the R&S®TS-PSAM digital multimeter module as the measurement unit to test other modules and components in the chassis.

The comprehensive selftest software concept provides ready-to-run selftest sequences for every R&S®CompactTSVP platform product.



**A comprehensive selftest program is provided for the R&S®TS-PSYS1 module**

## System Layout

 <p>R&amp;S®TS-PCA3 CompactTSVP</p>	 <p>R&amp;S®TS-PCA3 CompactTSVP</p>
<p>The R&amp;S®CompactTSVP chassis with an embedded computer as a system controller for modular instrumentation. With its 14 peripheral slots, medium pincount ATE systems (automated test equipment) can be built as a „one-box“ approach.</p>	<p>Medium pincount ATE with external general-purpose PC using transparent PCI link via standardized StarFabric interface. Standard PC equipment and exotic extensions may be present, though the user may want to keep the external PC. The StarFabric interface does not require special software drivers and does not slow down the system.</p>
 <p>R&amp;S®TS-PCA3 CompactTSVP</p> <p>R&amp;S®TS-PWA3 PowerTSVP</p> <p>CAN</p>	 <p>R&amp;S®TS-PWA3 PowerTSVP</p>
<p>The combination of the R&amp;S®CompactTSVP and the R&amp;S®PowerTSVP (product name R&amp;S®TS-PWA3) stands for high performance and high pincount ATE systems. For high power applications, the parts of a system that handle signals with high currents or high voltages can be separated at a safe distance from the R&amp;S®TS-PCA3 as a dedicated measurement unit.</p>	<p>Medium pincount ATE with an external standard PC using a third-party CAN bus interface to control the R&amp;S®PowerTSVP chassis R&amp;S®TS-PWA3. The CAN interface can be based on various standard interfaces such as USB to CAN or a PCI standard PC board. With this application scenario, right-sized switching applications can be used for various requirements ranging from general-purpose signals, high power load and power supply switching up to RF switching.</p>

## Specifications

<b>Control backplane</b>	
Bus systems	CompactPCI/PXI, 32-bit, 33 MHz according to PICMG 2.0 Rev. 3.0 CAN 2.0b, 1 MBit PXI trigger bus, 8 signals
Slots 1 and 2	1 CPU for CompactPCI, with rear I/O module
Slots 3 and 4	2 peripherals for CompactPCI, CPCI RTM (rear transmission module)
Slots 5 to 15	11 peripherals for CompactPCI/PXI, R&S®DC/DC RTM
Slot 16	1 peripheral for CAN-bus-controlled
Slots A3 and A4	1 power supply for CompactPCI, P47 connector (2 slots wide)
Slots A1 and A2	2 extensions such as for redundant power supply, DUT supply
<b>System control module</b>	
	R&S®TS-PSYS1 rear I/O interface for CompactPCI to CAN bus (2 CAN 2.0b) 4 digital outputs, PhotoMOS relay, 42 V, 200 mA 4 digital inputs, optocoupler, 2.4 V to 42 V, 5 mA 2 switchable ext. supply voltages 4.5 V at 0.5 A, 11.5 V at 0.5 A 8 switchable ext. PXI trigger inputs/ outputs 5 monitoring lines: temperature, 3.3 V, 5 V, +12 V, -12 V buffered PXI clock 10 MHz, ±(1.5 ppm + 1 ppm/year)
<b>Analog measurement bus backplane</b>	
Analog bus lines	8 (breakout connector at rear side)
Voltage	max. 125 V peak
Current	max. 1 A
Bandwidth	typ. 40 MHz (3 dB)
Crosstalk	typ. <-60 dB (100 kHz) typ. <-45 dB (1 MHz) typ. <-26 dB (10 MHz)
<b>AC power supply</b>	
AC power supply module	modular device for standard CompactPCI power interface, 250 W, P47 connector
Input voltage	100 V to 240 V ±10% (AC)
Input frequency	50 Hz to 60 Hz ±5%
Power consumption	max. 250 VA
Output voltages	+3.3 V, 40 A +5 V, 40 A +12 V, 5.5 A -12 V, 2 A

<b>General data</b>	
Temperature	
Operating range	0 °C to +50 °C
Storage range	-40 °C to +70 °C
Humidity	+40 °C, 95% rh, noncondensing
Cooling	4 fans, low-noise, temperature-controlled
Electromagnetic compatibility	compliant with EMC directive 89/336/EEC and EMC standard EN 61326
Electrical safety	CE, DIN EN 61010-1
Mechanical resistance (nonoperating mode)	
Vibration, sinusoidal	meets IEC 1010-1, EN 61010-1, MIL-T-28800 D class 5, 5 Hz to 150 Hz, max. 2 g at 55 Hz, 55 Hz to 150 Hz, 0.5 g const.
Vibration, random	meets DIN IEC 60068-2-64 10 Hz to 300 Hz, acceleration 1.2 g rms
Shock	meets MIL-STD-810D 40 g shock spectrum
Dimensions (W x H x D)	465 mm x 193 mm x 517 mm (19"; 4 HU)
Rack-mount kit	standard BW2000 brackets
Weight	
Base unit	11 kg
With typical options	18 kg

## Ordering information

Designation	Type	Order number
R&S®CompactTSVP Test and Measurement Chassis	R&S®TS-PCA3	1152.2518.02
<b>Related products</b>		
R&S®PowerTSVP	R&S®TS-PWA3	1157.8043.02
System controller, embedded computer recommended	R&S®TS-PSC3	1134.2503.06
Power supply, spare part	R&S®TS-PSP1	1501.0457.02
Power supply extension kit, includes power backplane and cabling	R&S®TS-PCPA	1165.1509.02
Analog bus extension cable	R&S®TS-PK01	1166.4147.02
CAN bus control cable for extension with R&S®PowerTSVP	R&S®TS-PK02	1166.4160.02
RF shielding kit	R&S®TS-PSK1	1157.9004.02
<b>Test adapter products</b>		
Receiver frame	R&S®TS-PAD3 R&S®TS-PAX1	1061.8566.02 1157.9404.02
Fixture frame	R&S®TS-F3F R&S®TS-F3X1	1157.9504.02 1157.9604.02



**ROHDE & SCHWARZ**

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)