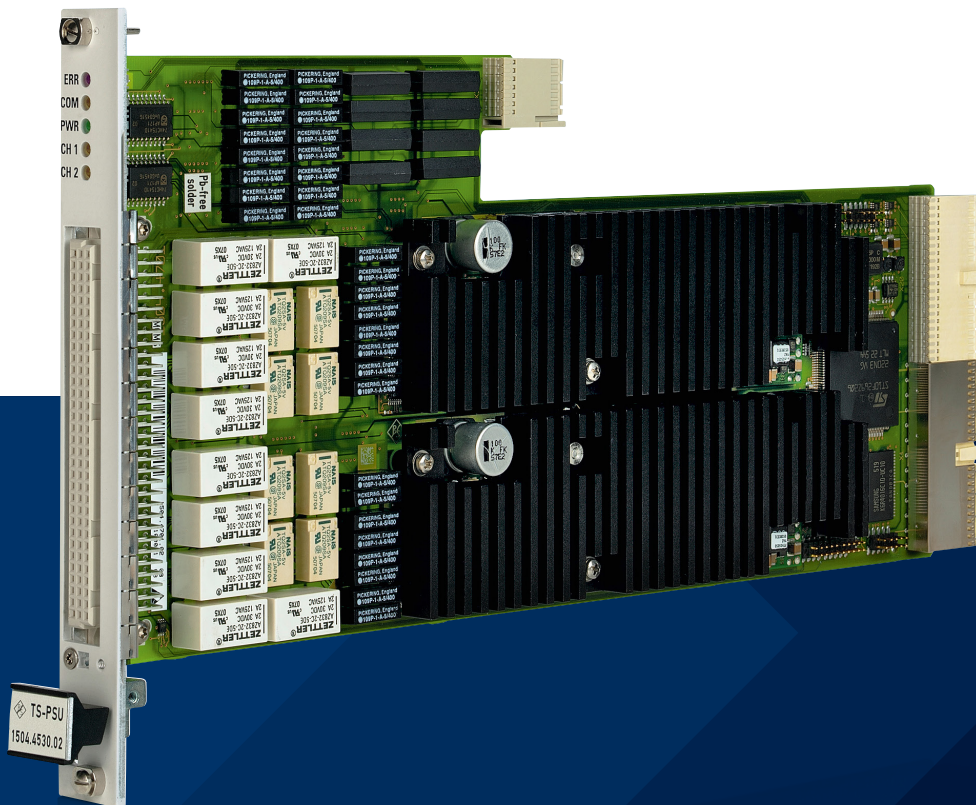


R&S® TS-PSU POWER SUPPLY/LOAD MODULE

Four-quadrant source with integrated
measurement unit



Product Brochure
Version 02.00

ROHDE & SCHWARZ

Make ideas real



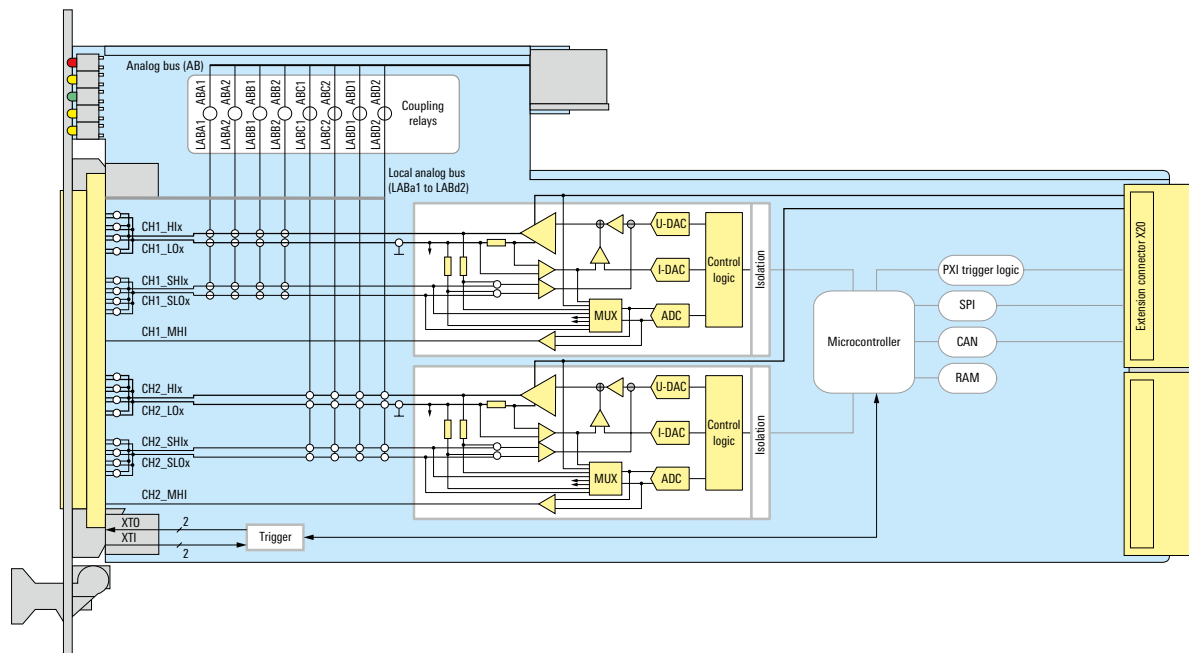
AT A GLANCE

The R&S®TS-PSU is a power supply and load module with two independent, floating channels. Designed for four-quadrant operation, the module can be used for functional tests (FCT) as well as in-circuit tests (ICT).

Key facts

- ▶ Four-quadrant source
 - Bipolar
 - Usable as a voltage or current source
- ▶ Electronic load simulation of 20 W per channel
- ▶ Two independent, floating channels of up to ± 50 V, 3 A, 50 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

Functional block diagram



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-PSU not only acts as a power supply for DUTs, it is also capable of electronic load simulation. For example, the R&S®TS-PSU can be

used for testing the behavior of automotive control units by applying a defined load to their control outputs.

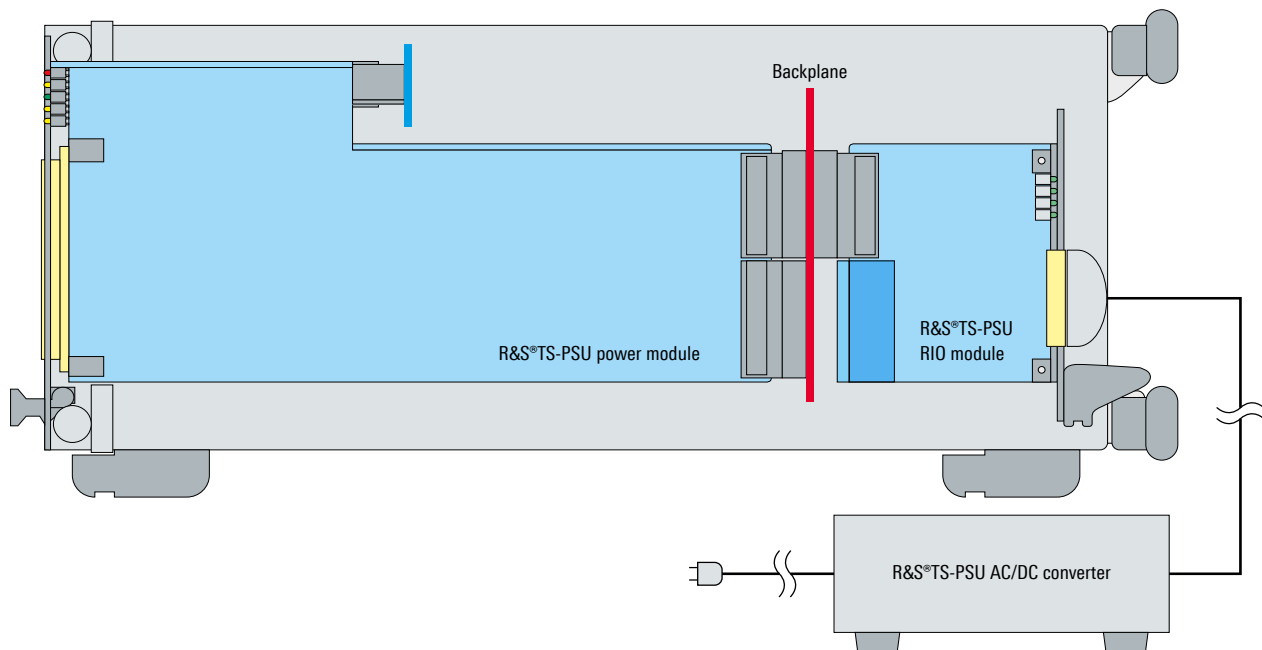
By external serial cascading of the two output channels, auxiliary voltages of up to 100 V can be generated during in-circuit tests (e.g. for testing Zener diodes or relays). As an additional feature, the output power of the module can be controlled by modulating the pulse width of the output voltage.

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-PSU power supply/load module is supplied with the following components:

- ▶ **R&S®TS-PSU power module**
Plug-in card to be inserted at the front of the base unit
- ▶ **R&S®TS-PSU RIO module**
Plug-in card to be inserted at the rear of the base unit (behind the R&S®TS-PSU power module, in the same slot)
- ▶ **R&S®TS-PSU AC/DC converter**
External power supply of the R&S®TS-PSU power module (to be connected to the R&S®TS-PSU RIO module)

Block diagram of the R&S®TS-PSU 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 100 V for Zener diodes)
- ▶ Charge/discharge tests (e.g. by defined discharging of batteries)

SELF-TEST AND DIAGNOSTICS FOR RELIABLE OPERATION

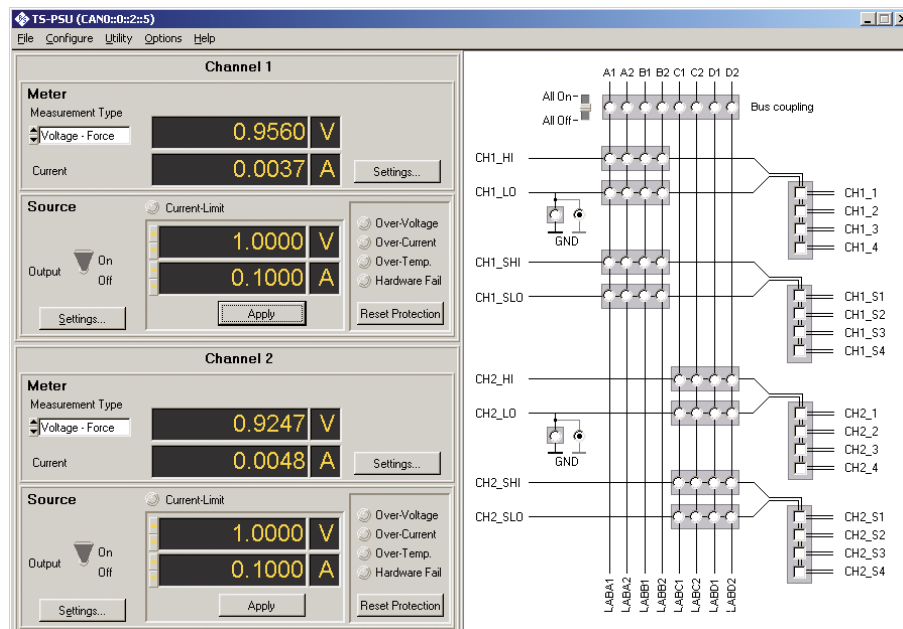
The built-in self-test capability of the module ranges from fast diagnostics to a fully automatic test of all relays and switching paths (R&S®TS-PSAM required).

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.

SOFTWARE SUPPORT

The R&S®TS-PSU 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.

Software control panel



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 DIN41612, 96 pins		
Tolerances of specified values apply under the following conditions	recommended calibration interval		1 year		
	temperature 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 DC		
Maximum output power per channel	source mode		50 W		
	sink mode		20 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			±50 V and ±15 V		
Resolution			16 bit + sign		
Line regulation			0.1%		
Load regulation in external sense mode	10% to 90%		0.1%		
Ripple + noise			typ. 6 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: $t = (\Delta V \times 0.32) / (3.5 - I_{\text{actual}})$ 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, 3 A		
Resolution	effective bits		16 bit		
Accuracy of DC stimulus unit					
Stimulus range	Voltage		Current		
	15 V	50 V	10 mA	100 mA	3 A
Resolution	230 µV	780 µV	0.39 µA	3.7 µA	115 µA
Error limits	0.2% + 15 mV	0.2% + 50 mV	0.4% + 20 µA	0.4% + 200 µA	0.4% + 6 mA
Measurement channels					
Type			built-in, one measurement channel per power supply/load channel		
Measurement source			voltage, current, external voltage		
Voltage range			50 V		
Current ranges			10 mA, 100 mA, 3 A		
Resolution	effective bits		16 bit		
Sampling mode	sample clock		max. 10 kHz		
	sample memory		10 000 sample		

Specifications

Accuracy of measurement unit

	Measurement range	Resolution	Error limits, average ^{1), 2)}	Error limits, sampling mode ^{1), 2)}
Voltage	50 V	1.56 mV	0.1% + 50 mV	0.1% + 50 mV
Current	10 mA	0.38 μ A	0.4% + 20 μ A	0.4% + 80 μ A
	100 mA	3.7 μ A	0.4% + 200 μ A	0.4% + 800 μ A
	3 A	114 μ A	0.4% + 6 mA	0.4% + 24 mA

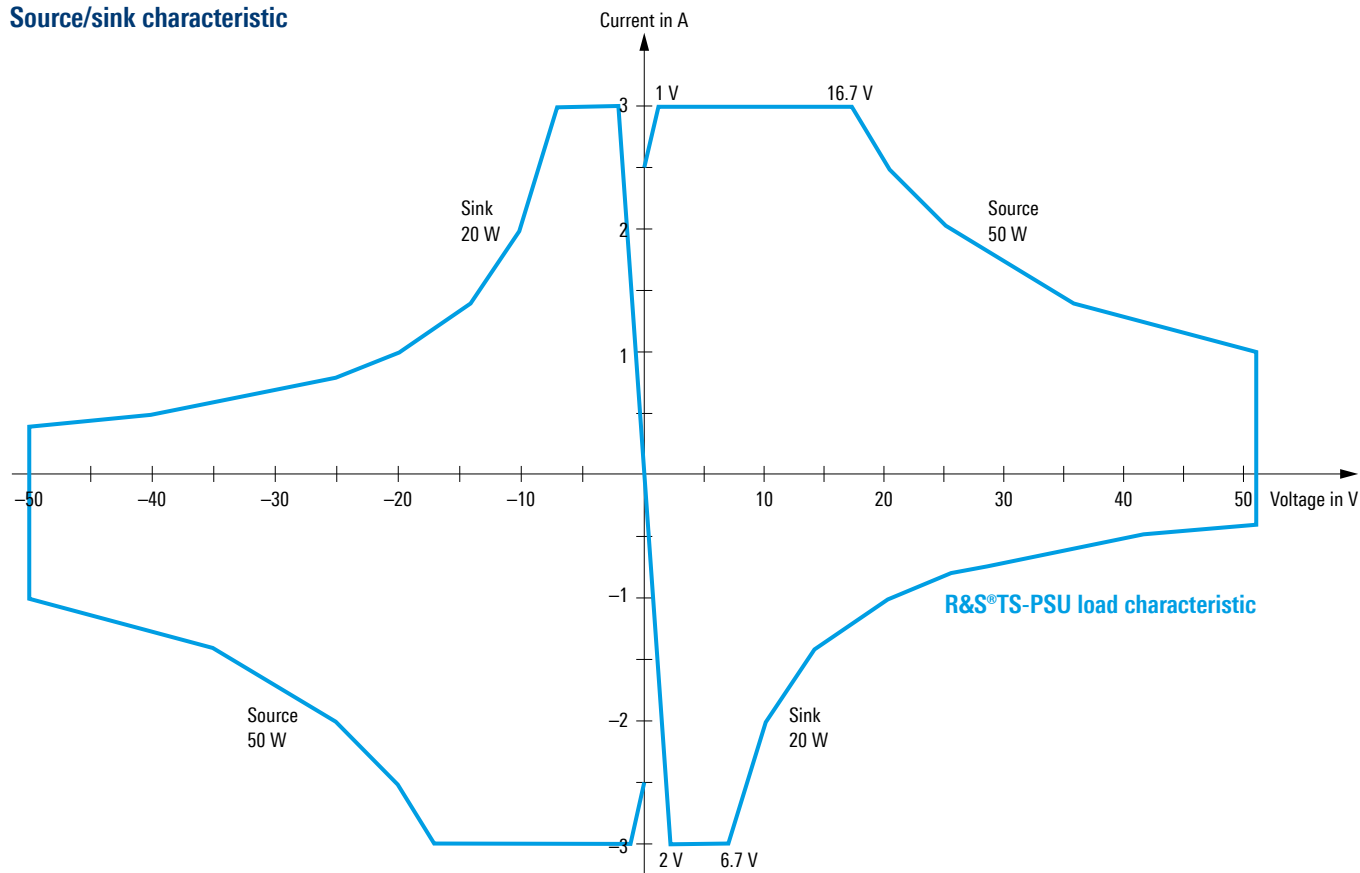
Miscellaneous

Protection	overvoltage, overtemperature, shorted outputs, sense lines shorted or inverted	typ. 5 V voltage rise
Inhibit		electronic on/off within 200 μ s
Pulse-width modulation (PWM)		pulse width \geq 50 μ s, frequency \leq 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

Rohde&Schwarz analog measurement bus		8 lines
Coupling relays	local bus to global bus	8
	switching voltage	max. 120 V DC, 50 V AC (RMS)
	switching current	max. 1.0 A
	switching power	max. 10 W DC/10 VA (RMS)
Relay multiplexer	one for each force and sense channel	4-to-1 DPST
	switching voltage	120 V DC, 50 V AC (RMS)
	switching current	3.0 A
	switching power	60 W DC/250 VA (RMS)

Source/sink characteristic



Specifications		
General data		
Power consumption	from R&S®TSVP frame	max. +5 V/1 A
	from AC supply via R&S®TS-PSU AC/DC converter	max. 190 W
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 EN60068-2-78
Altitude	operating	up to 2000 m
Mechanical resistance		
Vibration	sinusoidal	in line with EN60068-2-6, 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 EN60068-2-64, 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: ▶ EN61326-1 (industrial environment) ▶ EN61326-2-1 ▶ EN55011 Group 1, Class A
Electrical safety	EU: in line with Low Voltage Directive 2014/35/EC	applied harmonized standard: EN61010-1
	USA	applied standard: UL61010
	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-PSU power module	316 mm × 174 mm × 20 mm (12.4 in × 6.8 in × 0.8 in)
	R&S®TS-PSU RIO module	130 mm × 128 mm × 20 mm (5.1 in × 5.0 in × 0.8 in)
	R&S®TS-PSU AC/DC converter	235 mm × 115 mm × 65 mm (7.1 in × 4.5 in × 2.6 in)
Weight	R&S®TS-PSU power module	0.55 kg (1.2 lb)
	R&S®TS-PSU RIO module	0.12 kg (0.27 lb)
	R&S®TS-PSU AC/DC converter	1.63 kg (3.59 lb)
Calibration		12 months

¹⁾ Accuracy: ±(% of set value + absolute value); temperature coefficient: ±(0.1 × accuracy)/°C.

²⁾ Average of 1000 sample, measuring time 100 ms.

ORDERING INFORMATION

Designation	Type	Order No.
Power supply/load module	R&S®TS-PSU	1504.4530.02

Service that adds value

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

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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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