RLC series

RESONANT CIRCUIT LOAD

Resonant circuit load RLC 35000/2.5

The relating standards:*

IEC/EN 62116
VDE 0126-2
VDE 4105
UL 1741
IEEE 1547.1
CEI 0-21

****** The RLC series can be used for certain tests within these standards. Additional equipment might be required. For detailed information, please contact sales@spitzenberger.de.*

- ✓ Operation mode RLC enables resonant circuit tests according to IEC/EN 62116:2008-09 and DIN V VDE V 0126-1-1:2006-02 (item 6.5.2./anti islanding test)
- ✓ Optional mode “R” to increase the sink power of the voltage source (APS series of 4-quadrant amplifiers)
- ✓ Free combinations of R, L and C loads to simulate different load conditions
- ✓ RLC control via webinterface and interface commands
- ✓ Test and evaluation software available

UNIVERSAL AC LOAD FOR SIMULATION AND TESTING

TYPICAL TEST SETUP

The EUT (solar inverter) is supplied by the PV-Simulator. The AC output of the EUT is connected to the grid simulator (APS) and also to the RLC load. At the start of the test, the EUT is operated without the connected RLC load (S2 open, S1 closed). As soon as the EUT started and is operating in a stable condition, S2 is closed and the R, L and C components are set according to the required test conditions. The remaining power (real and reactive power) into the grid simulator (APS) is measured and the load is fine-tuned accordingly. Once the load has been successfully balanced, the grid simulator (APS) is switched off (S1 is opened). The trigger signal generated by S1 triggers a measurement to determine the time required for the EUT to switch off.
A typical test setup is shown below in figure 1.

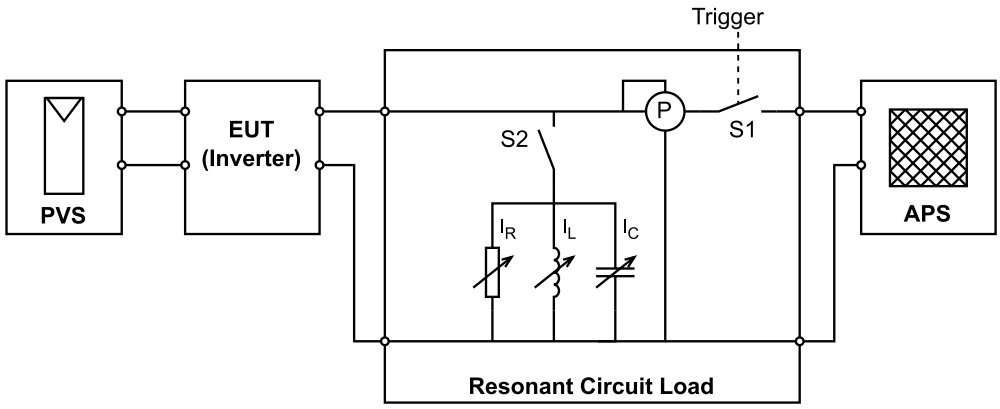

Fig. 1: Typical test setup

TOUCHSCREEN USER INTERFACE

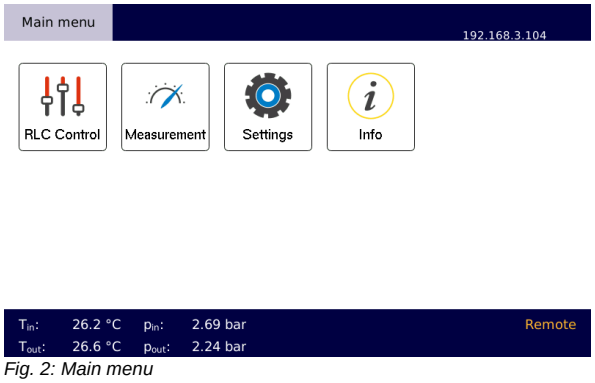

Fig. 2: Main menu

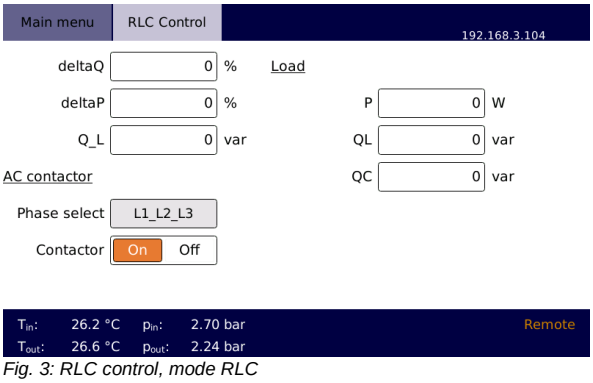

Fig. 3: RLC control, mode RLC

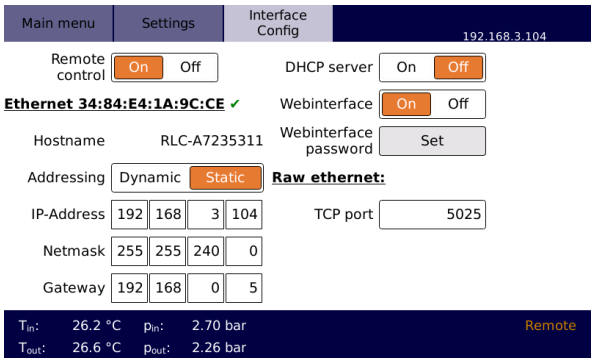

Fig. 4: Interface configuration

SOFTWARE CONTROL

Command interface

- ✓ Easily integrate the device into your own software applications
- ✓ Remote control commands are based on the SCPI standard

Webinterface

- ✓ Monitor and control the connected device via a web browser

SPS InverterTest

- ✓ Anti Islanding Test

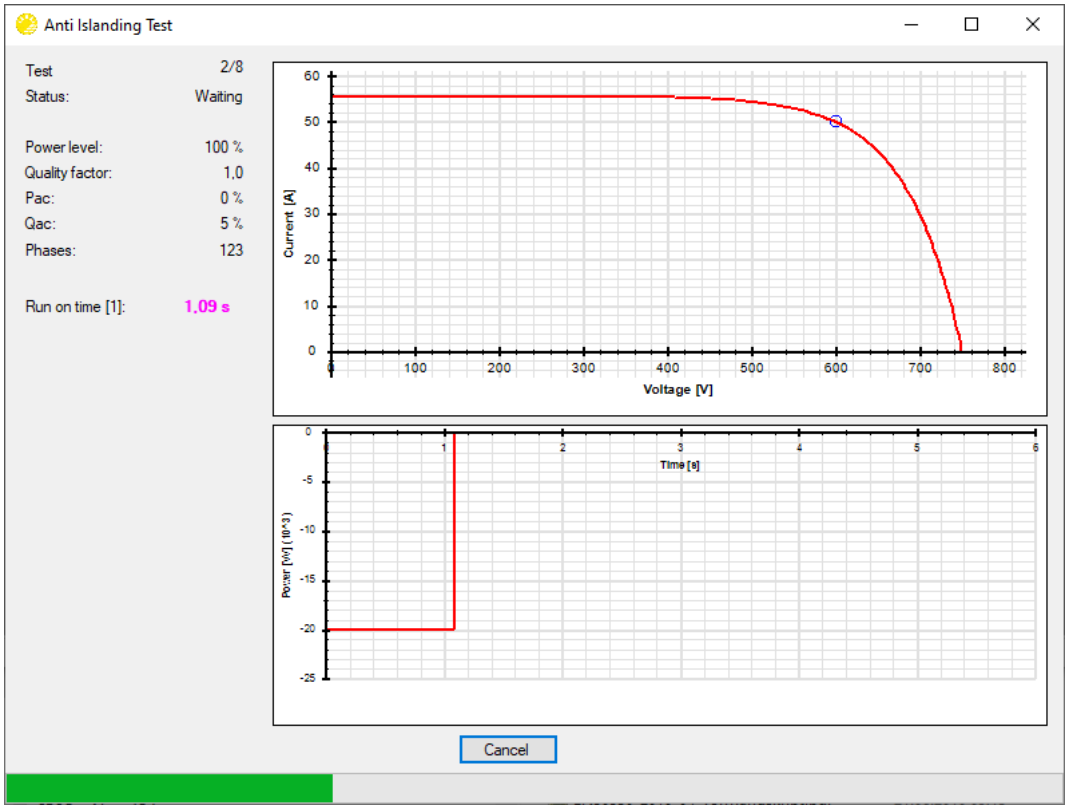

Fig. 5: Anti Islanding Test software

TECHNICAL DATA - GENERAL

		RLC
Nominal voltage *(RMS)*		230 V
Maximum voltage *(RMS)*		270 V
Frequency range		50 Hz ... 60 Hz
Trigger output		+5 V, digital - low (S1 closed) / high (S1 opened)
Operation modes		manual / remote software
Protection circuits		overvoltage / overtemperature
Protection circuits water cooling		overtemperature / differential pressure
Internal control unit		
	Display	7.0" touchscreen (17.8 cm, resolution 800 x 480)
	User interface	touchscreen / front panel button / incremental encoder webinterface
Interface		Ethernet 100 Mbit/s (HiSLIP SCPI) USB 2.0 Host
Power supply *(±10 %, 50/60 Hz)*		230 V
Ambient temperature		+10 °C up to +40 °C
Storage temperature		-25 °C up to +60 °C
Relative humidity		non condensing, max. 80 % for temperature < 31 °C, decreasing linearly to 50 % at 40 °C
Ingress protection		IP20

THE RLC TYPE GLOSSARY

RLC	1000	/2.5	/SM

Resonant circuit load

Real power capability (W)
1000 / 4000 / 7000 / 12500 / 21000 / 35000
70000 / 100000 / 150000 / 175000

Relation between real power and reactive power
reactive power = 1.0 / 2.0 / 2.1 / 2.5 times the real power

Sink mode
/SM = sink mode capability
left out = no

TECHNICAL DATA – RLC series

		RLC 1000/1.0 (/SM)	RLC 1000/2.5 (/SM)
Real power / sink mode power (/SM) *(at nominal voltage)*		0 ... 1000 W	
Resolution real power		2 W	
Reactive power inductive		0 ... 1000 var	0 ... 2500 var
Reactive power capacitive		0 ... 1000 var	0 ... 2500 var
Resolution reactive power		10 var	
RLC values	*R*	50 Ω ... 40 kΩ	
	L	140 mH ... 25 H	56 mH ... 25 H
	C	22 nF ... 100 µF	22 nF ... 200 µF
Cooling		forced air cooling	
Housing		plug-in unit, light grey (RAL 7035)	
	RLC load approx. dimensions (H x W x D)	19", 9 U 400 x 483 x 650 mm	
Weight	*single phase approx.* *three phase approx.*	tbd	

TECHNICAL DATA – RLC series

		RLC 4000/1.0 (/SM)	RLC 4000/2.5 (/SM)
Real power / sink mode power (/SM) *(at nominal voltage)*		0 ... 4000 W	
Resolution real power		10 W	
Reactive power inductive		0 ... 4000 var	0 ... 10000 var
Reactive power capacitive		0 ... 4000 var	0 ... 10000 var
Resolution reactive power		12.5 var	
RLC values	*R*	11 Ω ... 10 kΩ	
	L	27.4 mH ... 13.5 H	13.8 mH ... 13.5 H
	C	0.1 µF ... 300 µF	0.1 µF... 700 µF
Cooling		forced air cooling	
Housing		rack, light grey (RAL 7035)	
	RLC load approx. dimensions *single phase (H x W x D)* *three phase (H x W x D)*	19", 42 U 2120 x 600 x 1050 mm 2120 x 600 x 1050 mm	19", 42 U 2120 x 600 x 1050 mm 2120 x 1200 x 1050 mm
Weight	*single phase approx.* *three phase approx.*	tbd	tbd

TECHNICAL DATA – RLC series

		RLC 7000/1.0 (/SM)	RLC 7000/2.5 (/SM)
Real power / sink mode power (/SM) *(at nominal voltage)*		0 ... 7000 W	
Resolution real power		10 W	
Reactive power inductive		0 ... 7000 var	0 ... 17500 var
Reactive power capacitive		0 ... 7000 var	0 ... 17500 var
Resolution reactive power		12.5 var	
RLC values	*R*	6 Ω ... 10 kΩ	
	L	18.4 mH ... 13.5 H	8 mH ... 13.5 H
	C	0.1 µF... 600 µF	0.1 µF... 1.2 mF
Cooling		forced air cooling	
Housing		rack, light grey (RAL 7035)	
	RLC load *approx. dimensions* *single phase (H x W x D)* *three phase (H x W x D)*	19", 42 U 2120 x 600 x 1050 mm 2120 x 1200 x 1050 mm	
Weight	*single phase approx.* *three phase approx.*	tbd	

TECHNICAL DATA – RLC series

		RLC 12500/1.0 (/SM)	RLC 12500/2.5 (/SM)
Real power / sink mode power (/SM) *(at nominal voltage)*		0 ... 12500 W	
Resolution real power		10 W	
Reactive power inductive		0 ... 12500 var	0 ... 31250 var
Reactive power capacitive		0 ... 12500 var	0 ... 31250 var
Resolution reactive power		12.5 var	
RLC values	*R*	3.8 Ω ... 10 kΩ	
	L	11.1 mH ... 13.5 H	4.3 mH ... 13.5 H
	C	0.1 µF... 800 µF	0.1 µF... 2 mF
Cooling *(three phase)*		water cooling	
	water connection	G 1"	
	max. water outlet temperature	60 °C	
	min. differential water pressure	0.5 bar	
	max. water pressure	6 bar	
Housing		rack, light grey (RAL 7035)	
	RLC load *approx. dimensions* *single phase (H x W x D)* *three phase (H x W x D)*	19", 42 U 2120 x 600 x 1050 mm 2120 x 1200 x 1050 mm	
Weight	*single phase approx.* *three phase approx.*	tbd	tbd 1200 kg

TECHNICAL DATA – RLC series

		RLC 21000/1.0	RLC 21000/2.5
Real power *(at nominal voltage)*		0... 21000 W	
Resolution real power		10 W	
Reactive power inductive		0 ... 21000 var	0 ... 52500 var
Reactive power capacitive		0 ... 21000 var	0 ... 52500 var
Resolution reactive power		12.5 var	
RLC values	*R*	2.4 Ω ... 10 kΩ	
	L	6.7 mH ... 13.5 H	2.8 mH ... 13.5 H
	C	0.1 µF... 1.4 mF	0.1 µF... 3.2 mF
Cooling *(single phase)*		water cooling	
	water connection	G 3/4"	
	max. water outlet temperature	60 °C	
	min. differential water pressure	0.5 bar	
	max. water pressure	6 bar	
Housing		rack, light grey (RAL 7035)	
	RLC load *approx. dimensions* *single phase (H x W x D)* *three phase (H x W x D)*	19", 42 U 2120 x 600 x 1050 mm 3 x 2120 x 600 x 1050 mm	
Weight	*single phase approx.* *three phase approx.*	tbd	

TECHNICAL DATA – RLC series

		RLC 35000/1.0	RLC 35000/2.5
Real power *(at nominal voltage)*		0 ... 35000 W	
Resolution real power		10 W	
Reactive power inductive		0 ... 35000 var	0 ... 87500 var
Reactive power capacitive		0 ... 35000 var	0 ... 87500 var
Resolution reactive power		12.5 var	
RLC values	*R*	1.3 Ω ... 10 kΩ	
	L	4 mH ... 13.5 H	1.6 mH ... 13.5 H
	C	0.1 µF... 2.4 mF	0.1 µF... 5.6 mF
Cooling *(single phase)*		water cooling	
	water connection	G 1"	
	max. water outlet temperature	60 °C	
	min. differential water pressure	0.5 bar	
	max. water pressure	6 bar	
Housing		rack, light grey (RAL 7035)	
	RLC load *approx. dimensions* *single phase (H x W x D)* *three phase (H x W x D)*	19", 46 U 2320 x 600 x 1050 mm 3 x 2320 x 600 x 1050 mm	
Weight	*single phase approx.* *three phase approx.*	tbd	850 kg tbd

TECHNICAL DATA – RLC series

		RLC 70000/2.0
Real power *(at nominal voltage)*		0 ... 70000 W
Resolution real power		10 W
Reactive power inductive		0 ... 140000 var
Reactive power capacitive		0 ... 140000 var
Resolution reactive power		50 var
RLC values	*R*	0.7 Ω ... 10 kΩ
	L	1 mH ... 3.37 H
	C	0.1 µF... 9.6 mF
Cooling *(single phase)*		water cooling
	water connection	G 1 1/2"
	max. water outlet temperature	60 °C
	min. differential water pressure	0.5 bar
	max. water pressure	6 bar
Housing		rack, light grey (RAL 7035)
	RLC load *approx. dimensions* *single phase (H x W x D)* *three phase (H x W x D)*	19", 42 U 1866 x 1200 x 1050 mm 3 x 1866 x 1200 x 1050 mm
Weight	*single phase approx.* *three phase approx.*	tbd

TECHNICAL DATA – RLC series

		RLC 100000/1.0	RLC 100000/2.1
Real power *(at nominal voltage)*		0 ... 100000 W	
Resolution real power		10 W	
Reactive power inductive		0 ... 100000 var	0 ... 210000 var
Reactive power capacitive		0 ... 100000 var	0 ... 210000 var
Resolution reactive power		50 var	
RLC values	*R*	0.5 Ω ... 10 kΩ	
	L	1.3 mH ... 3.37 H	0.64 mH ... 3.37 H
	C	0.1 µF... 7 mF	0.1 µF... 14 mF
Cooling *(single phase)*		water cooling	
	water connection	G 1 1/2"	
	max. water outlet temperature	60 °C	
	min. differential water pressure	0.5 bar	
	max. water pressure	6 bar	
Housing		rack, light grey (RAL 7035)	
	RLC load *approx. dimensions* *single phase (H x W x D)* *three phase (H x W x D)*	19", 46 U 2044 x 1200 x 1050 mmm 3 x 2044 x 1200 x 1050 mm	
Weight	*single phase approx.* *three phase approx.*	tbd	

TECHNICAL DATA – RLC series

		RLC 150000/1.0	RLC 150000/2.1
Real power *(at nominal voltage)*		0 ... 150000 W	
Resolution real power		10 W	
Reactive power inductive		0 ... 150000 var	0 ... 315000 var
Reactive power capacitive		0 ... 150000 var	0 ... 315000 var
Resolution reactive power		50 var	
RLC values	*R*	0.3 Ω ... 10 kΩ	
	L	0.88 mH ... 3.37 H	0.44 mH ... 3.37 H
	C	0.1 µF... 10.4 mF	0.1 µF... 22.4 mF
Cooling *(single phase)*		water cooling	
	water connection	G 1 1/2"	
	max. water outlet temperature	60 °C	
	min. differential water pressure	0.5 bar	
	max. water pressure	6 bar	
Housing		rack, light grey (RAL 7035)	
	RLC load *approx. dimensions* *single phase (H x W x D)* *three phase (H x W x D)*	19", 46 U 2044 x 1200 x 1050 mm 3 x 2044 x 1800 x 1050 mm	
Weight	*single phase approx.* *three phase approx.*	tbd 1600 kg	tbd

TECHNICAL DATA – RLC series

		RLC 175000/1.0	RLC 175000/2.1
Real power *(at nominal voltage)*		0 ... 175000 W	
Resolution real power		10 W	
Reactive power inductive		0 ... 175000 var	0 ... 367500 var
Reactive power capacitive		0 ... 175000 var	0 ... 367500 var
Resolution reactive power		50 var	
RLC values	*R*	0.23 Ω ... 10 kΩ	
	L	0.74 mH ... 3.37 H	0.35 mH ... 3.37 H
	C	0.1 µF... 12 mF	0.1 µF... 24.6 mF
Cooling *(single phase)*		water cooling	
	water connection	G 1 1/2"	
	max. water outlet temperature	60 °C	
	min. differential water pressure	0.5 bar	
	max. water pressure	6 bar	
Housing		rack, light grey (RAL 7035)	
	RLC load *approx. dimensions* *single phase (H x W x D)* *three phase (H x W x D)*	19", 46 U 2044 x 600 x 1050 mm 3 x 2044 x 600 x 1050 mm	19", 46 U 2044 x 1800 x 1050 mm 3 x 2044 x 1800 x 1050 mm
Weight	*single phase approx.* *three phase approx.*	tbd	

OPTIONS AND ACCESSORIES

Options		
OPT.01	IEEE488	Not in combination with OPT.02
OPT.02	RS232	Not in combination with OPT.01
SM	Sink mode	Increase APS sink mode capability

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