

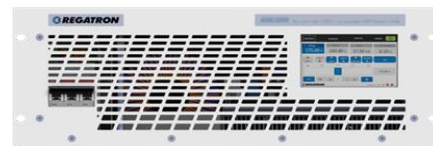
G5.RSS.9.500.54

Programmable Regenerative DC Source Sink

- 9 kW
- 500 V
- 54 A

Features

- Bidirectional power supply
- High dynamics
- Energy regeneration
- G5.Control operating SW + API



Key Values

Power		9 kW
Voltage DC	limited by P_{max}	500 V
Current	limited by P_{max}	-54...54 A
Autorange factor		3
Figure 1	$U_{max} \times I_{max} / P_{max}$	
Master-slave / multi-device configuration		series, parallel, mixed
Max. number of devices in system		44
Max. number in parallel		44
Max. number in series	with midpoint earthing limited by output isolation to PE	6
Case		19" / 4U

AC Lineside Rating

Mains connection type	delta	3L + PE (no neutral necessary)
Rated voltage		3× 380...480 VAC ±10%
Rated current	@nominal 3× 380 VAC	15 A _{rms}
	@nominal 3× 400 VAC	14 A _{rms}
	@nominal 3× 415 VAC	14 A _{rms}
	@nominal 3× 440 VAC	13 A _{rms}
	@nominal 3× 460 VAC	12 A _{rms}
	@nominal 3× 480 VAC	12 A _{rms}
Rated frequency		50 / 60 Hz
Power factor	@ P_{max}	0.99
THDi	@90% P_{max}	≤3%
Inrush current		<33 A _{rms}
Efficiency	$P_{max} @ U_{max}$	95%
	$P_{max} @ I_{max}$	94%
Standby power	active/reactive @400 V/50 Hz	27 W / 1 kvar
Isolation	AC terminals to PE	900 VDC
	AC to DC terminals	1500 VDC
Input insulation test voltage	line to case/logic	3100 VDC (2 s)
Protective earth conductor current	According to IEC 60990	<7 mA @50 Hz
Touch current unweighted	output ON/OFF	≤1.7 mA / 2.6 mA (typ.)
Touch current weighted	output ON/OFF	≤0.7 mA / 2.5 mA (typ.)
Input filter discharge		
to <60 V	L-PE / L-L	<20 s
	with option XCD	<1 s

DC Operation

Operation modes		source, sink, bidirectional
Voltage regulation	CV	0...100% U_{max}
Current regulation	CC	-100...100% I_{max}
Power regulation	CP	-100...-5% / 5...100% P_{max}
Programmable load	CR, $R_{max} @ U_{max}$, $R_{min} @ U_{min}$	0.19...3333 Ω

DC Operation (continued)

Internal resistance simulation	programmable	0...18519 mΩ
Min. voltage normal sink mode		
Figure 2	@I _{max}	15 V
	@10% I _{max}	8 V
Min. voltage LV sink mode		
Figure 2	@I _{max}	3 V
	@10% I _{max}	2 V
Static accuracy		
At 25 °C ambient temperature, constant line / load conditions, after 1h warm up time in voltage on state, normal distribution (k=2)		
	power @I _{max} 1 kHz Filter	0.03% FS
	voltage	0.01% FS
	voltage sense	0.01% FS
	current full range 1 kHz Filter @30% U _{max}	0.025% FS
	current low range (<10% FS) 1 kHz Filter @90% U _{max}	0.003% FS
	resistance @I _{max} 1 kHz Filter	0.025% FS
HMI touchpanel meter resolution	programming/reading	0.01 V 0.01 A
Output capacitance	X-capacitor LowCap X-capacitor HighCap Y-capacitor @DC	12 μF 222 μF 125 nF
Ripple, voltage		
	output voltage ripple (10 Hz...3.8 MHz): V _{rms} LowCap, ohmic load 90% P _{max} , 90% U _{max} , CV mode	≤0.06% FS
	output voltage ripple (10 Hz...3.8 MHz): V _{rms} HighCap, ohmic load 90% P _{max} , 90% U _{max} , CV mode	≤0.02% FS
Ripple, current		
	output Current ripple (10 Hz...3.8 MHz): A _{rms} LowCap, ohmic load 90% P _{max} , CC mode	≤0.15% FS
Noise		
	noise (4.1 kHz...3.8 MHz): V _{pp} LowCap, ohmic load 90% P _{max} , 90% U _{max} , CV mode	≤0.4% FS
	noise (4.1 kHz...3.8 MHz): V _{pp} HighCap, ohmic load 90% P _{max} , 90% U _{max} , CV mode	≤0.1% FS
Stability/drift		
8h, after 1h warm up time in output on state, at constant line input, load and temp. conditions		
	voltage	≤0.01% FS
	voltage sense	≤0.01% FS
	current	≤0.01% FS
	current low range (-10%...10% FS)	≤0.01% FS
Temperature coefficient		
At constant line and load conditions		
	voltage	≤0.005% FS/°C
	voltage sense	≤0.007% FS/°C
	current	≤0.005% FS/°C
	current low range (<10% FS) 1 kHz Filter	≤0.003% FS/°C
Rise/fall time (10...90% of step)		
Voltage set-value step, const. ohmic load, LowCap		
	voltage step (0...90% U _{max} / 90% P _{max})	≤180 μs
Rise/fall time (10...90% of step)		
Current set-value step, const. voltage, LowCap		
	current step (-90...90% I _{max} , @33% U _{max}) 10...90% of step / settling time	20 μs / 190 μs
	current step (-90...-10% I _{max} , @33% U _{max}) 10...90% of step / settling time	20 μs / 70 μs
	current step (10...90% I _{max} , @33% U _{max}) 10...90% of step / settling time	20 μs / 70 μs
Transient response time		
Load step, ohmic load, HighCap		
	CV, recovery within 0.5% set voltage 0...90% P _{max} @90% U _{max}	≤160 μs

DC Operation (continued)

Transient response time <i>Load step, ohmic load, LowCap</i>	CC, recovery within 2% of set current 45...90% P_{max} @90% I_{max}	$\leq 250 \mu s$
Voltage drop <i>while load switching on</i> <i>HighCap mode</i>	-90...90% P_{max} @90% U_{max} -90...90% P_{max} @33% U_{max} 45...90% P_{max} @90% U_{max}	$\leq 2.0\%$ FS $\leq 4\%$ FS $\leq 0.6\%$ FS
Voltage overshoot <i>while load switching off</i> <i>HighCap mode</i>	90...-90% P_{max} @90% U_{max} 90...-90% P_{max} @33% U_{max} 90...45% P_{max} @90% U_{max}	$\leq 2\%$ FS $\leq 5.0\%$ FS $\leq 0.5\%$ FS
Pulsating load <i>max. load ripple current sine</i> <i>max. amplitude</i>	allowed ripple @ worst case @ 30% U_{max} @10 kHz / 30% U_{max}	HighCap 26% I_{max} @5 kHz LowCap 17% I_{max} @7 kHz HighCap 37% I_{max} LowCap 18% I_{max}
Max. ripple <i>DC+ to PE / DC- to PE</i>	max. allowed ripple V_{rms} ≤ 1 kHz: 1050 V_{rms} > 1 kHz: $((1.26 \times 10^6)/f+5) V_{rms}$	≤ 1 kHz: 1050 V_{rms} 2 kHz: 630 V_{rms} 5 kHz: 250 V_{rms} 10 kHz: 130 V_{rms} 20 kHz: 65 V_{rms} 50 kHz: 30 V_{rms} 80 kHz: 20 V_{rms}
Protection	OVP (over voltage protection) OCP (over current protection) OPP (over power protection) OTP (over temperature protection)	programmable programmable programmable ✓
Output discharge <i>to <60V</i>	active discharge enabled active discharge disabled	< 1 s < 60 s
Small signal modulation <i>Voltage Controller LowCap mode</i>	frequency CV, CC	0...10 kHz
Small signal modulation <i>Voltage Controller LowCap mode</i>	modulation range V_{rms} sine @10 kHz attenuation @5 kHz / 10 kHz op. point: 90% U_{nom} + 5% U_{nom} ampl. phase lag analog input to voltage out	0...5% FS -0.2 dB / 6 dB 130 μs
Small signal modulation <i>Current controller LowCap mode</i>	modulation range A_{rms} sine @10 kHz attenuation @5 kHz / 10 kHz op. point: 90% I_{nom} + 5% I_{nom} ampl. phase lag analog input to current out	0...5% FS 2 dB / 3.7 dB 110 μs
Sense voltage compensation		Programmable $U_{out} + U_{drop}$ limited by $U_{out,max}$
Sense input impedance	@operation @output off @output off "measurement at voltage-off" disabled	632 k Ω 632 k Ω open
Ballast resistor DC power port	@output off no RPP or RPP closed	70 k Ω
Resistance	DC+/DC- output to PE X713 jumper inserted DC+/DC- output to PE X713 jumper removed	22 M Ω open
Absolute maximum ratings	Voltage Current Power DC+/DC- output to PE	550 VDC 59 VDC 10 kW 1500 VDC
Output insulation test voltage	output to case/logic	3400 VDC (2 s)

Various

Case dimensions	H × W × D	179 × 483 × 673 mm
Figure 3	without terminals	7" × 19" × 26 1/2"
Weight		40 kg / 88 lbs
AC terminals		
	screw terminals	screw terminals for 6...25 mm ² wires
DC terminals		output bars for M8 bolts
Communication interface		Ethernet (max. 800 × 16 bit/s), USB (max. 450 × 16 bit/s)
	speed depending on bus load	
Enclosure	rating	IP20
Option cards	# of free slots	2

Analog Inputs

Number of inputs		4
Resolution		16 Bit
Sampling rate		48 kS/s
Input voltage range	selectable	-10...10 V; -5...5 V; 0...5 V; 0...10 V
Accuracy		bipolar range: ±0.1%, unipolar range: ±0.2%
Input impedance		1 MΩ (typ.)
Absolut max. input voltage		±30 VDC
Input filter		2nd order low pass filter, cutoff frequency: 15 kHz
Delay analog in to power out		89 μs (typ.)
Temperature coefficient		0.02% FS/°C

Analog Outputs

Number of outputs		4
Resolution		16 Bit
Update rate		48 kS/s
Settling time		10 μs (typ.)
Output voltage range	selectable	-10...10 V; -5...5 V; 0...5 V; 0...10 V
Accuracy		±0.2%
Output impedance		0.5 Ω (typ.)
Max. output current	short-circuit proof	20 mA
Delay power out to analog out		42 μs (typ.)
Temperature coefficient		0.02% FS/°C

Digital I/O

Number of digital inputs/outputs	programmable (each can be used as input or output)	6
Output voltage supplied for digital I/O		24 VDC (-15% / +20%)
Digital input characteristic		IEC 61131-2 Type 1
Digital input filter		3.2 ms (10 μs, 1 ms, and 10 ms factory configurable)
Max. voltage digital inputs		30 VDC
Sampling rate digital inputs		1 kS/s
Digital output type		high-side switch
Load type		ohmic, inductive, lamp load
Max total output current all channels		0.65 A
Max output current per channel	short-circuit proof	0.625 A
Digital output switching time		T _{ON} : 64...120 μs, T _{OFF} : 90...170 μs
Update rate digital outputs		1 kS/s

Relay Outputs

Number of relay outputs		2 x SPST (NO), 1 x SPDT
Load type		ohmic, inductive, lamp load
Max. switching voltage		30 VDC
Max. switching current		SPST: 3 A, SPDT: 1 A
Switching time		20 ms (typ.)

Ambient

Operating altitude	above sea level above 1000 m, slight temp. derating possible	≤2000 m
Operating temperature	with airfilter	-5...50 °C -5...40 °C
Storage temperature		-25...70 °C
Installation	IEC 60721-3-3	indoor, air-conditioned in protected 19" switch cabinet
Orientation	storage, installation, operation	upright
Relative humidity	non-condensing	0...95%
Vibration	IEC 60068-2-6	Test Fc
Cooling		direct forced air, front to back
Acoustic noise level 1 m dist. front (typ.)	90% P _{max} , 90% I _{max} @25 °C ambient 90% P _{max} , 90% I _{max} @40 °C ambient	≤54 dB ≤71 dB

Standards

Protection class	EN 62477-1	1
Degree of pollution	EN 60664-1	2
Overvoltage category	mains input, EN 60664-1 / EN 62477-1 other interfaces	III 2
Area of application		industrial
Approval		CE Marking, UKCA
EN 62477-1:2012 + A11:2014 + A1:2017 + A12:2021	Low Voltage Directive 2014/35/EU	✓
BS EN 62477-1:2012 + A11:2014 + A1:2017 + A12:2021	Electrical Equipment (Safety) Regulations 2016	✓
EN 61010-1:2010	Low Voltage Directive 2014/35/EU	✓
BS EN 61010-1:2010	Electrical Equipment (Safety) Regulations 2016	✓
EN ISO 13849-1:2015	w/o ISR with ISR 2-channel with ISR 2-channel and external safety relay	- up to PL c up to PL e
EN 61000-6-4:2007 A1:2011 / EN61000-6-4:2019	Directive 2014/30/EU EMC emission (industrial)	✓
BS EN 61000-6-4:2007 A1:2011 / BS EN61000-6-4:2019	Electromagnetic Compatibility Regulations 2016 EMC emission (industrial)	✓
EN 61000-6-2:2005 / EN 61000-6-2:2019	Directive 2014/30/EU EMC immunity (industrial)	✓
BS EN 61000-6-2:2005 / BS EN 61000-6-2:2019	Electromagnetic Compatibility Regulations 2016 EMC immunity (industrial)	✓
EN 61000-3-11:2017	Electromagnetic compatibility (EMC). Part 3-11: Equipment rated ≤75A	✓
BS EN 61000-3-11:2017	Electromagnetic compatibility (EMC). Part 3-11: Equipment rated ≤75A	✓
EN 61000-3-12:2011	Electromagnetic compatibility (EMC) – Part 3-12: Equipment rated > 16 A and ≤ 75 A	✓
BS EN 61000-3-12:2011	Electromagnetic compatibility (EMC) – Part 3-12: Equipment rated > 16 A and ≤ 75 A	✓
EN 61326-1:2013	Directive 2014/30/EU EMC industrial level A	✓
BS EN 61326-1:2013	Electromagnetic Compatibility Regulations 2016 EMC industrial level A	✓
EN IEC 63000:2018	RoHS Directive	✓
BS EN IEC 63000:2018	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012	✓
EMV-ILA 01-03b	Emission 9...150 kHz test stand area	✓

Operating area

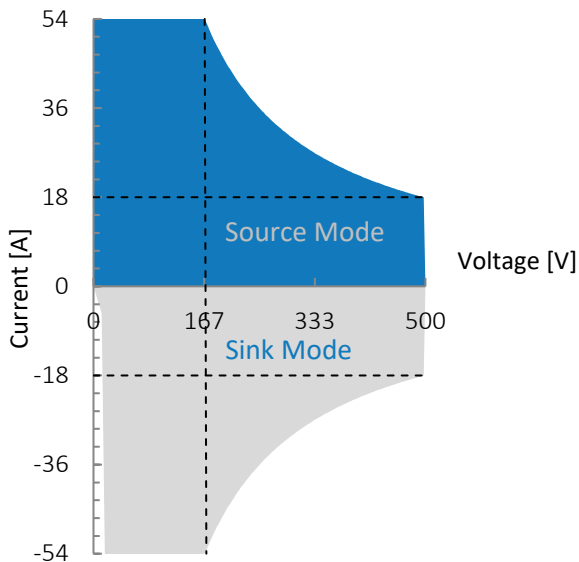


Figure 1: G5.RSS.9.500.54, voltage / current operating area.

X-axis zoom source-sink @low voltage

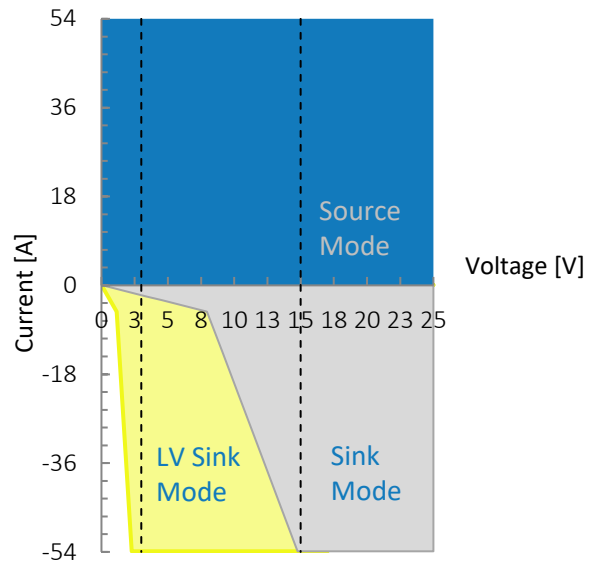


Figure 2: Normal sink mode in grey area down to 8(15) V.
To use the LV Sink mode (yellow area), the upper voltage limit has to be lowered,
- to 10 V for sink down to 2(3) V (yellow area)
- to 166 V or higher for sink down to 8(15) V (grey area)
- any other value between 10 V and 166 V
will lead to a minimum sink voltage between 2(3) V and 8(15) V.

Dimensions

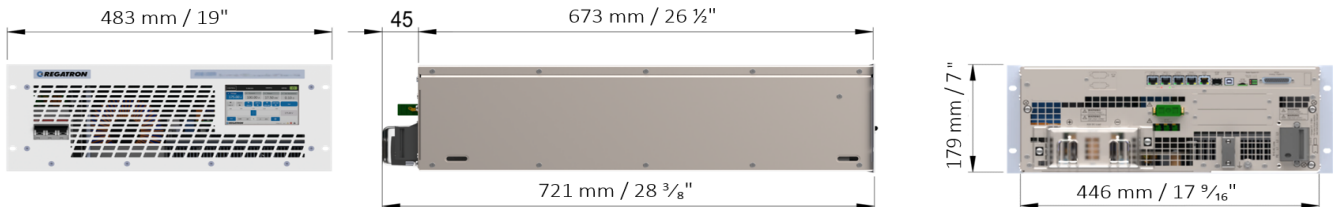


Figure 3: Front, right hand side and rear view. 19-inch module with 4 units in height.
Add 74 mm / 2 7/8" to case depth for protective cover.

For further information to included features see related product description <PD_G5.RSS....> on www.regatron.com
This product is developed, produced and tested according to ISO 9001 by REGATRON.

For detailed technical information, contact your local sales partner:

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