

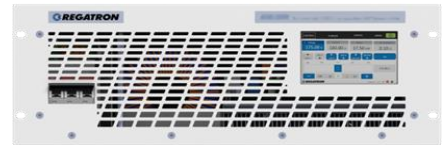
G5.RSS.9.60.338

Programmable Regenerative DC Source Sink

- 9 kW
- 60 V (SELV)
- 338 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}	60 V
Current	limited by P_{max}	-338...338 A
Autorange factor		
Figure 1	$U_{max} \times I_{max} / P_{max}$	2.25
Master-slave / multi-device configuration		parallel
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	16
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	15 A _{rms}
	@nominal 3× 415 VAC	14 A _{rms}
	@nominal 3× 440 VAC	13 A _{rms}
	@nominal 3× 460 VAC	13 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	$P_{max} @ U_{max}$	94%
	$P_{max} @ I_{max}$	92%
Standby power	active/reactive @400 V/50 Hz	27 W / 1 kvar
Isolation	AC terminals to PE	900 VDC
	AC to DC terminals	640 VDC
Input insulation test voltage	line to case/logic	3100 VDC (2 s)
Protective earth conductor current	According to IEC 60990	<4 mA @150 Hz
Touch current unweighted	output ON/OFF	≤1.5 mA / 3 mA (typ.)
Touch current weighted	output ON/OFF	≤0.8 mA / 2.8 mA (typ.)
Input filter discharge		
to <60 V	L-PE / L-L	<10 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, $R_{max} @ U_{max}$; $R_{min} @ U_{min}$	0.005...85.2 Ω

DC Operation (continued)

Internal resistance simulation	programmable	0...473 mΩ
Min. voltage normal sink mode		
Figure 2	@I _{max}	6 V
	@10% I _{max}	5.5 V
Min. voltage LV sink mode		
Figure 2	@I _{max}	1 V
	@10% I _{max}	0.5 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	0.04% FS
	voltage	0.025% FS
	voltage sense	0.025% FS
	current full range 1 kHz Filter @30% U _{max}	0.03% FS
	current low range (<10% FS) 1 kHz Filter @90% U _{max}	0.003% FS
	resistance @I _{max} 1 kHz Filter	0.035% FS
HMI touchpanel meter resolution	programming/reading	0.01 V 0.01 A
Output capacitance	X-capacitor LowCap X-capacitor HighCap Y-capacitor @DC	530 μF 12410 μF 163 nF
Ripple, voltage	output voltage ripple (10 Hz...3.8 MHz): V _{rms} LowCap, ohmic load 90% P _{max} , 90% U _{max} , CV mode	≤0.2% FS
	output voltage ripple (10 Hz...3.8 MHz): V _{rms} HighCap, ohmic load 90% P _{max} , 90% U _{max} , CV mode	≤0.15% FS
Ripple, current	output Current ripple (10 Hz...3.8 MHz): A _{rms} LowCap, ohmic load 90% P _{max} , CC mode	≤0.06% FS @90% I _{max}
Noise	noise (4.1 kHz...3.8 MHz): V _{pp} LowCap, ohmic load 90% P _{max} , 90% U _{max} , CV mode	≤0.9% FS
	noise (4.1 kHz...3.8 MHz): V _{pp} HighCap, ohmic load 90% P _{max} , 90% U _{max} , CV mode	≤0.6% 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
Temperature coefficient		
At constant line and load conditions		
	voltage	≤0.005% FS/°C
	voltage sense	≤0.007% FS/°C
	current	≤0.005% 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})	≤220 μs
	voltage step (0...33% U _{max} / 30% P _{max})	≤155 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 @low inductance	50 μs
	current step (-90...-10% I _{max} , @33% U _{max}) 10...90% of step @low inductance	50 μs
	current step (10...90% I _{max} , @33% U _{max}) 10...90% of step @low inductance	50 μs
Transient response time		
Load step, ohmic load, HighCap		
	CV, recovery within 2% set voltage 0...90% P _{max} @90% U _{max}	50 μs

DC Operation (continued)

Transient response time <i>Load step, ohmic load, HighCap</i>	CV, recovery within 0.5% set voltage 45...90% P_{max} @90% U_{max}	$\leq 50 \mu s$
Transient response time <i>Load step, ohmic load, LowCap</i>	CC, recovery within 2% of set current 45...90% P_{max} @90% I_{max}	$\leq 230 \mu s$
Voltage drop <i>while load switching on HighCap mode</i>	-90...90% P_{max} @90% U_{max} @rate 675 A/100 μs	5 V
	45...90% P_{max} @90% U_{max} @rate 675 A/100 μs	4 V
Voltage overshoot <i>while load switching off HighCap mode</i>	90...90% P_{max} @90% U_{max} @rate 675 A/100 μs	5 V
	90...45% P_{max} @90% U_{max} @rate 675 A/100 μs	4 V
Pulsating load <i>max. load ripple current sine max. amplitude</i>	allowed ripple @ worst case @ 30% U_{max} @10 kHz / 30% U_{max}	HighCap 3% I_{max} @8 kHz LowCap 10% I_{max} @8 kHz HighCap 3% I_{max} LowCap 11% I_{max}
Max. ripple <i>DC+ to PE / DC- to PE</i>	 max. allowed ripple V_{rms} ≤ 2.8 kHz: 450 V_{rms} > 2.8 kHz: $((1.26 \times 10^6)/f + 5) V_{rms}$	≤ 1 kHz: 450 V_{rms} 2.8 kHz: 450 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	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 0.4 dB / 5.6 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 -3.4 dB / 5.9 dB 145 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	196 k Ω 196 k Ω open
Ballast resistor DC power port	@output off no RPP or RPP closed	2.9 k Ω
Resistance	DC+/DC- output to PE X713 jumper inserted DC+/DC- output to PE X713 jumper removed	9.5 M Ω open
Absolute maximum ratings	Voltage	88 VDC
Output insulation test voltage	output to case/logic	1090 VDC (2 s)

Various

Case dimensions <i>Figure 3</i>	H × W × D without terminals	179 × 483 × 673 mm 7" × 19" × 26 1/2"
Weight		44 kg / 97 lbs
AC terminals	screw terminals	6...25 mm ² (AWG 10...4) wires
DC terminals		output bars for M12 bolts
Communication interface	speed depending on bus load	Ethernet (max. 800 × 16 bit/s), USB (max. 450 × 16 bit/s)
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...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...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 or with G5.PAC.DCAC.1	-5...40 °C -5...30 °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

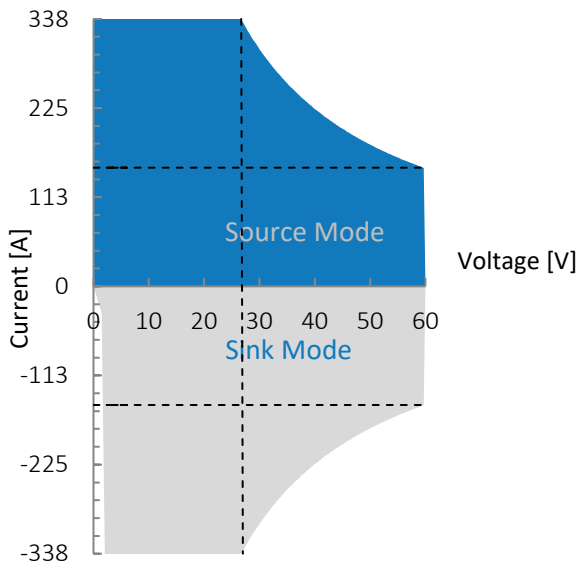


Figure 1: G5.RSS.9.60.338, voltage / current operating area.

X-axis zoom source-sink @low voltage

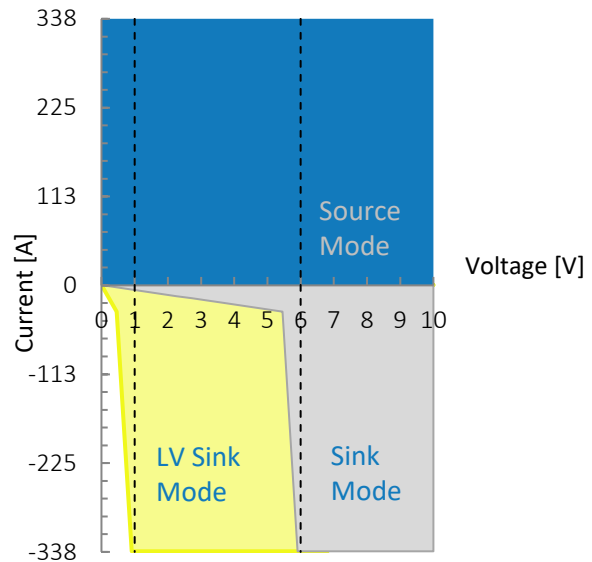


Figure 2: Normal sink mode in grey area down to 5.5(6) V.
To use the LV Sink mode (yellow area), the upper voltage limit has to be lowered,
- to 2 V for sink down to 0.5(1) V (yellow area)
- to 26 V or higher for sink down to 5.5(6) V (grey area)
- any other value between 2 V and 26 V
will lead to a minimum sink voltage between 0.5(1) V and 5.5(6) V.

Dimensions

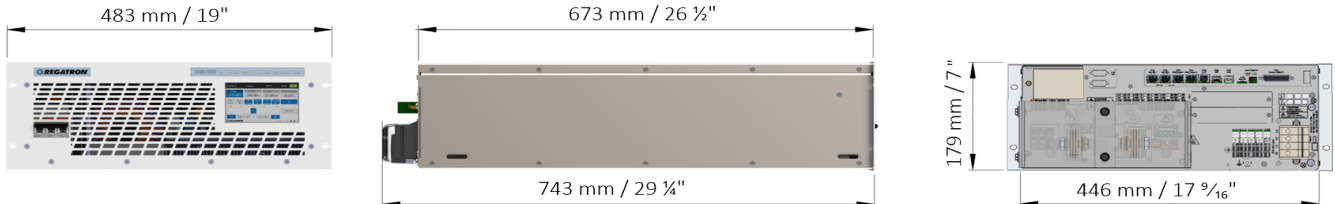


Figure 3: Front, right hand side and rear view. 19-inch module with 4 units in height.
Add 83 mm / 3 1/4" to case depth for DC cover or 184 mm / 7 1/4" for DC+AC cover.

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:

HEIDEN
COMPETENCE IN POWER

HEIDEN power GmbH Phone: +49-8196-9988-0
Am Wiesengrund 1 Fax: +49-8196-998877
86932 Pürgen / Germany
info@heidenpower.com | www.heidenpower.com