

## GEM\_013, \_015, \_017, \_020 FAMILY

### Green Power Easy Module®

- ▶ Electrically insulated metal frame
- ▶ 3000 V<sub>RMS</sub> insulation voltage
- ▶ Line voltage range up to 500 V<sub>RMS</sub>
- ▶ High reliability
- ▶ Modularity
- ▶ Broad choice of circuit configurations
- ▶ Fully customizable
- ▶ Broad range of accessories
- ▶ Cost effective solution
- ▶ Suitable for heavy duty applications

#### Description

This new family of high power modules brings to the high power applications the same compactness, ease of use and scalability of the lower power semiconductor modules. In addition to these typical features (i.e. standard dimensions, electrical insulation, various circuit types, etc.) the new Green Power Easy Module (GEM) family includes many features aimed to simplify their adoption allowing the end users to focus on their core business. These features include:

- embedded air cooling system (heatsink and fan)
- optimised snubber circuits
- pulse transformer modules
- ducted heat flow.

The GEM family can be used for most of the converter circuits like single and three phase bridges, AC-switches, motor brakes, double wye rectifiers, current source inverters, etc.. Their application range covers all low and high line voltage applications (up to 500 V<sub>RMS</sub>) such as: electroplating, motor drive, induction heating, welding, temperature control, electrolysis, UPS, etc.

#### Maximum Ratings

Parameters	Part number				Conditions	Units
	GEM_013	GEM_015	GEM_017	GEM_020		
I <sub>T(AV)</sub>	135	156	170	200	180° cond, half sine T <sub>a</sub> = 40 °C	A
I <sub>T(RMS)</sub>	212	245	267	314	180° cond, half sine T <sub>a</sub> = 40 °C	A
I <sub>TSM</sub>	5.5	7	8.5	15	50 Hz, T <sub>j</sub> = T <sub>jmax</sub> , V <sub>R</sub> = 0 V	kA
I <sub>TSM</sub>	5.8	7.4	9.0	15.8	60 Hz, T <sub>j</sub> = T <sub>jmax</sub> , V <sub>R</sub> = 0 V	kA
I <sup>2</sup> t	151	245	361	1125	50 Hz, T <sub>j</sub> = T <sub>jmax</sub> , V <sub>R</sub> = 0 V	kA <sup>2</sup> s
I <sup>2</sup> t	138	223	329	1024	60 Hz, T <sub>j</sub> = T <sub>jmax</sub> , V <sub>R</sub> = 0 V	kA <sup>2</sup> s
V <sub>DRM</sub> /V <sub>RRM</sub>	1600	400	1600	400	T <sub>j</sub> = T <sub>jmax</sub>	V
T <sub>jmax</sub>	125	125	125	125		°C

Part Number	V code	VDRM VRRM max repetitive reverse and off-state blocking voltage [V]	IDRM IRRM @ Tjmax [mA]	VL(RMS) maximum suggested RMS line voltage [V]
GEM_015 GEM_020	04	400	50	115
GEM_013 GEM_017	12 16	1200 1600	50 50	400 500

**On-State Characteristics**

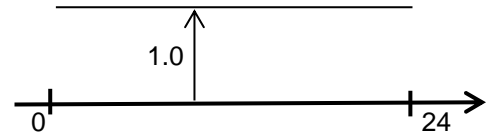
Parameters	GEM_013	GEM_015	GEM_017	GEM_020	Conditions	Units
V <sub>T(TO)</sub> Threshold voltage	1	0.85	0.9	0.87	T <sub>j</sub> = T <sub>jmax</sub>	V
r <sub>T</sub> On-state slope resistance	0.8	0.5	0.650	0.238	T <sub>j</sub> = T <sub>jmax</sub>	mΩ
I <sub>H</sub> Holding current, max	600	300	600	600	T <sub>j</sub> = 25°C	mA
I <sub>L</sub> Latching current, typ	1000	600	1000	1000	T <sub>j</sub> = 25°C	mA
P <sub>MAX</sub> Max power losses					T <sub>A</sub> = 40°C	W

**Triggering Characteristics**

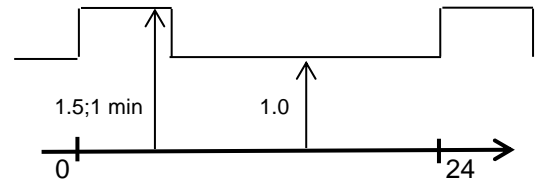
Parameters	GEM_013	GEM_015	GEM_017	GEM_020	Conditions	Units
V <sub>GT</sub> Gate trigger voltage	3.5	3	3	3.5	T <sub>j</sub> = 25°C, V <sub>D</sub> = 5V	V
I <sub>GT</sub> Gate trigger current	150	150	200	190	T <sub>j</sub> = 25°C, V <sub>D</sub> = 5V	mA
P <sub>GM</sub> Peak gate power dissipation	10	10	10	10	Pulse width 1 ms	W
P <sub>G(AV)</sub> Average gate power dissipation	2	2	2	2		W
I <sub>FGM</sub> Peak gate current	3	3	3	3		A
V <sub>FGM</sub> Peak gate voltage (forward)	20	30	20	20		V
V <sub>RGM</sub> Peak gate voltage (reverse)	5	5	5	5		V

**Switching Characteristics**

Parameters	GEM_013	GEM_015	GEM_017	GEM_020	Conditions	Units
di/dt Critical rate of rise of on-state current	200	200	200	200	T <sub>j</sub> = T <sub>jmax</sub>	A/μs
dV/dt Critical rate of rise of off-state voltage	500	500	500	500	T <sub>j</sub> = T <sub>jmax</sub>	V/μs
t <sub>q</sub> Turn-off time, typ	200	200	200	200	T <sub>j</sub> =T <sub>jmax</sub> , I <sub>T</sub> =1000A di/dt=-20A/μs V <sub>R</sub> =50V dV/dt=20V/μs	μs

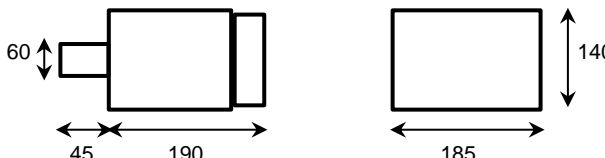

**Maximum IEC class 1 currents for typical circuit type**

Circuit Type	GEM_013	GEM_015	GEM_017	GEM_020	Conditions	Units
AC switch	302	349	381	458	T <sub>A</sub> = 40 °C delay angle = 0°	A
Center tap	270	313	341	410	T <sub>A</sub> = 40 °C delay angle = 0°	A
Two pulse bridge	270	313	341	410	T <sub>A</sub> = 40 °C delay angle = 0°	A
Six pulse bridge	391	455	491	603	T <sub>A</sub> = 40 °C delay angle = 0°	A
Double star with I.P. transf.	784	910	986	1204	T <sub>A</sub> = 40 °C delay angle = 0°	A

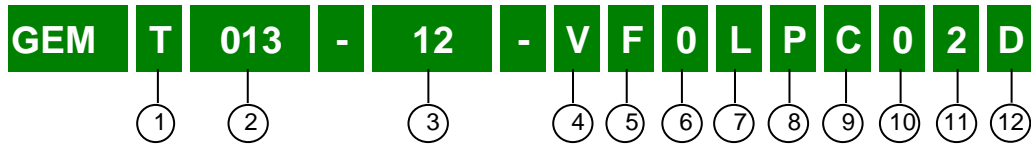

**Maximum IEC class 2 currents for typical circuit type**

Circuit Type	GEM_013	GEM_015	GEM_017	GEM_020	Conditions	Units
AC switch	218	251	279	335	T <sub>A</sub> = 40 °C delay angle = 0°	A
Center tap	195	225	250	300	T <sub>A</sub> = 40 °C delay angle = 0°	A
Two pulse bridge	195	225	250	300	T <sub>A</sub> = 40 °C delay angle = 0°	A
Six pulse bridge	280	330	365	448	T <sub>A</sub> = 40 °C delay angle = 0°	A
Double star with I.P. transf.	568	658	728	885	T <sub>A</sub> = 40 °C delay angle = 0°	A

**Thermal and mechanical characteristics**

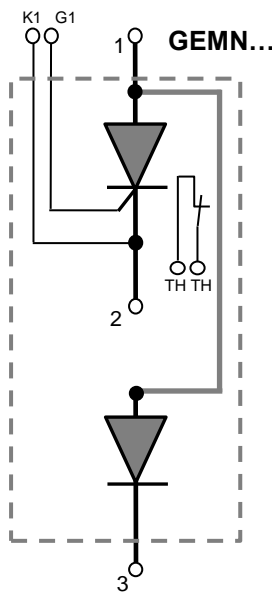
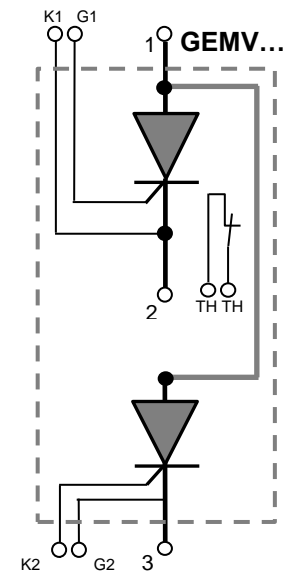
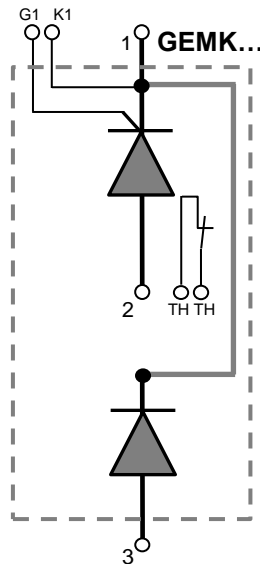
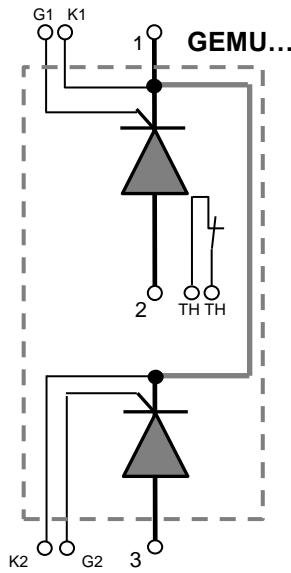
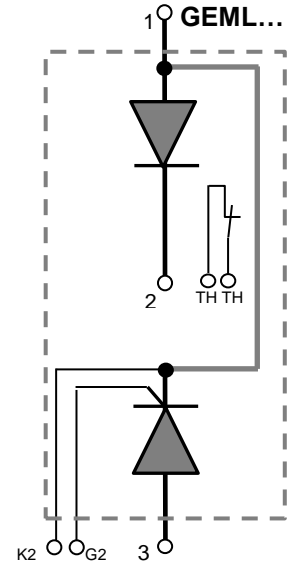
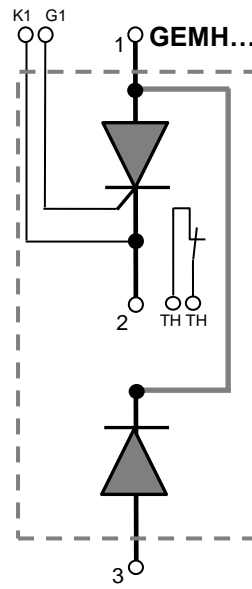
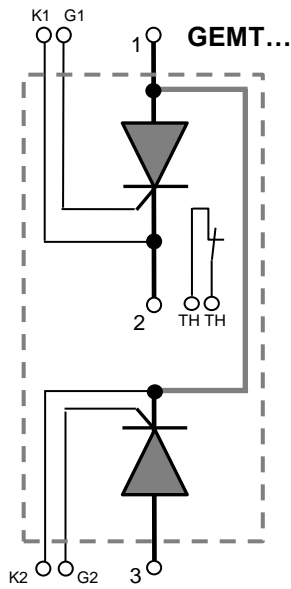
Parameters	GEM_013	GEM_015	GEM_017	GEM_020	Conditions	Units
T <sub>jmax</sub> Max operating junction temperature	125	125	125	125		°C
T <sub>stg</sub> Storage temperature	-40 +70	-40 +70	-40 +70	-40 +70		°C
R <sub>thJA</sub> Thermal resistance (junction to ambient)	0.495	0.52	0.42	0.42	DC operation	°C/W
F Mounting torque - GEM to panel (+/- 10%)	7	7	7	7	M6 mounting screw	N·m
	14	14	14	14	M8 mounting screw	N·m
m Mass, typ	3.5	3.5	3.5	3.5	with FAPC options	kg
Overall dimensions						mm

## PART-NUMBERING SYSTEM



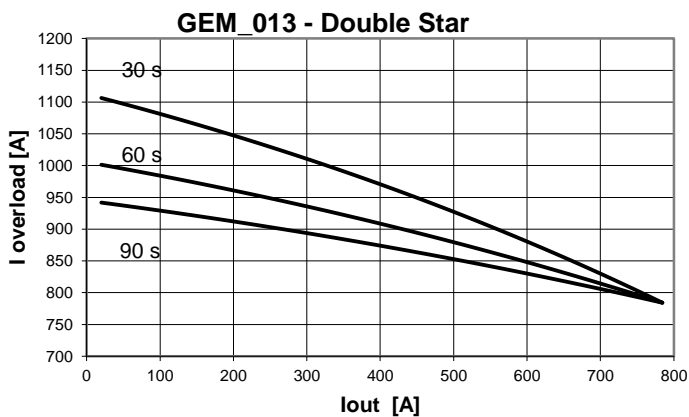
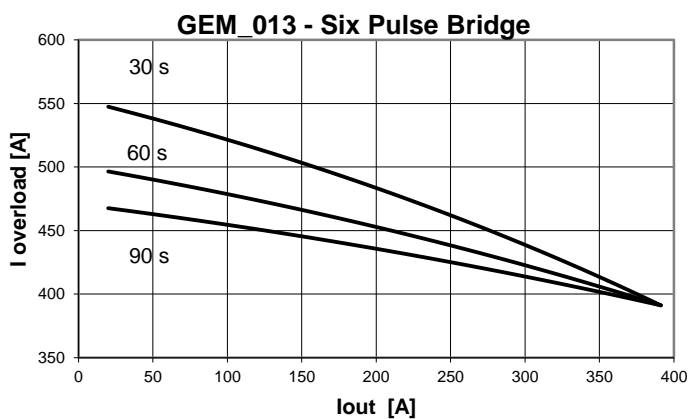
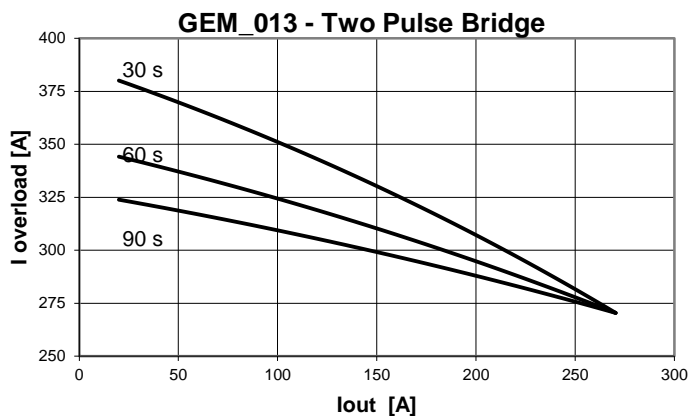
- ① Circuit configuration
- ② GEM average current / 10
- ③ GEM blocking voltage / 100
- ④ 0 = No fan - V = With 230 VRMS fan - W = With 115 VRMS fan
- ⑤ 0 = No fuse - F = With fuse protection
- ⑥ 0 = No standard busbar available for this module; please contact factory in case of specific need
- ⑦ 0 = No anti-parallel busbar - L = Anti-parallel busbar
- ⑧ 0 = No pulse transformer - P = With pulse transformer \*
- ⑨ 0 = No fan loss detection module - C = With fan loss detection module
- ⑩ 0 = No SCR fault detection module - S = SCR fault detection module (for AC-switch circuits)
- ⑪ 0 = No snubber - 1 = One snubber - 2 = Two snubbers
- ⑫ 0 = No fan-on-demand thermo-switch - D = Fan-on-demand thermo-switch (trip point 50 °C)

\* Pulse transformer GT001 (dual) or GT002 (single) depending on the circuit configuration. For pulse transformer characteristics see their specific datasheets.

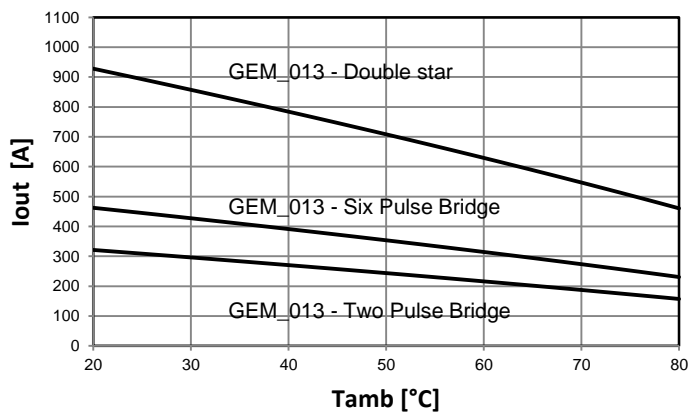


In the interest of product improvement Green Power Solutions reserves the right to change any specification given in this data sheet without notice.

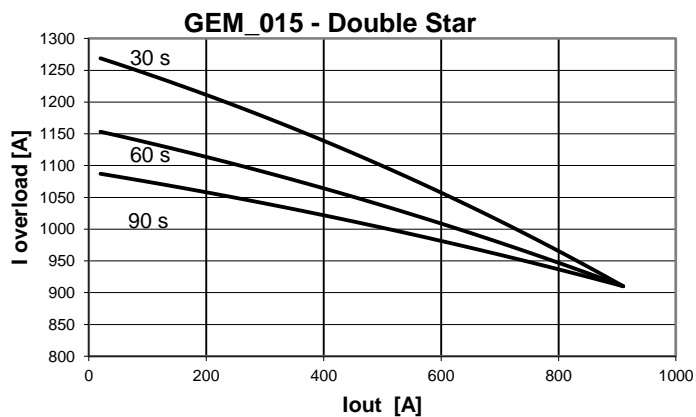
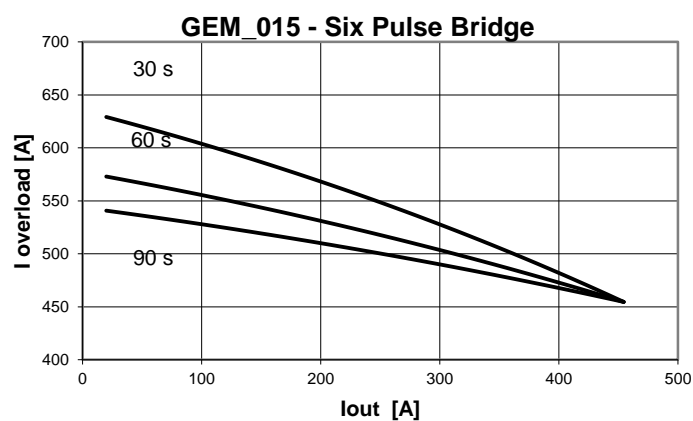
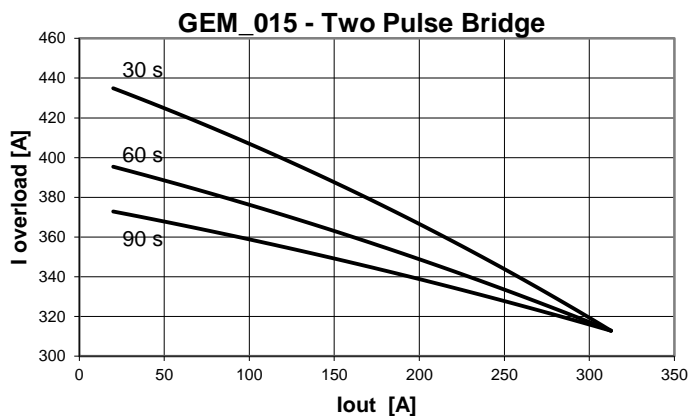
Overload capability at different overload time - Tamb = 40 °C



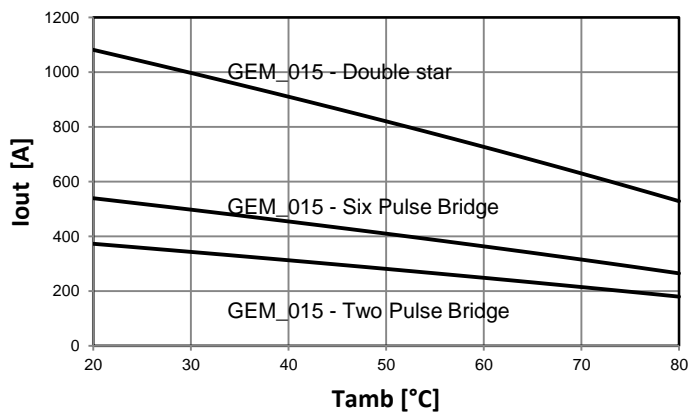
Max output vs Tamb



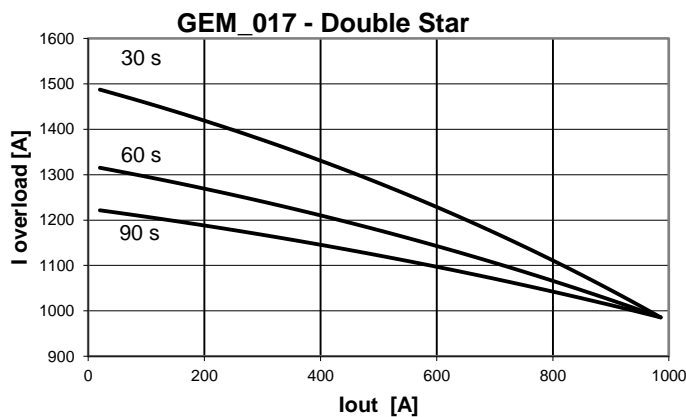
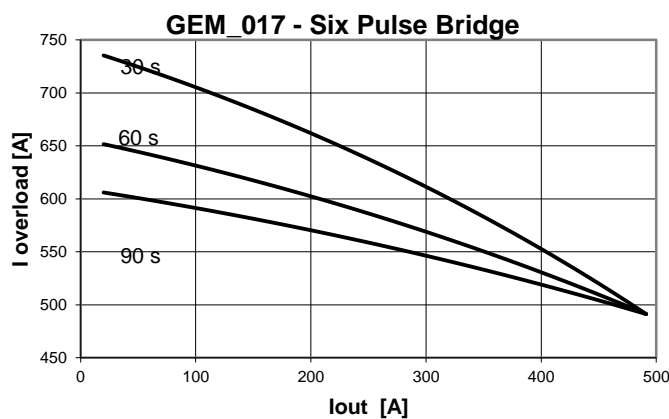
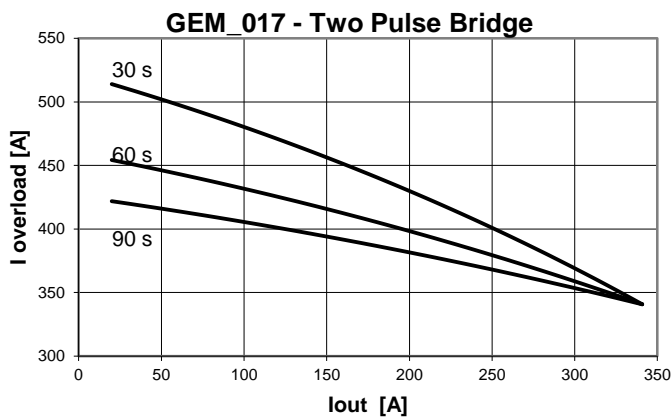
Overload capability at different overload time - Tamb = 40 °C



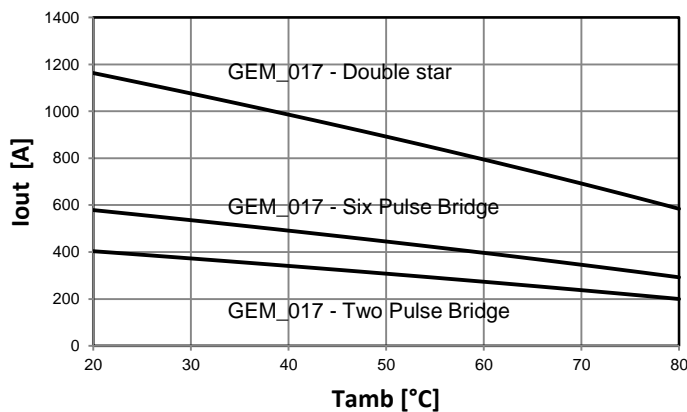
Max output vs Tamb



Overload capability at different overload time - Tamb = 40 °C

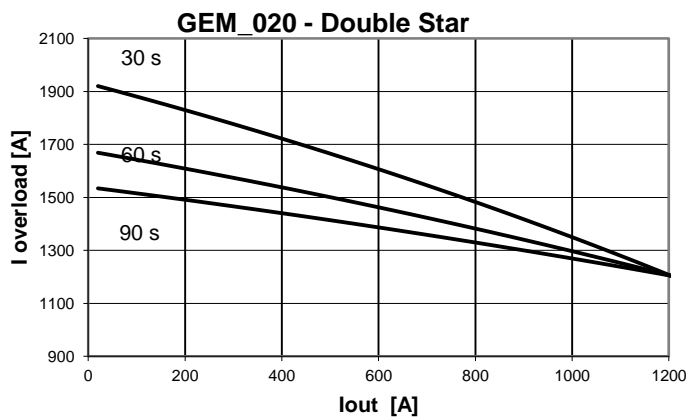
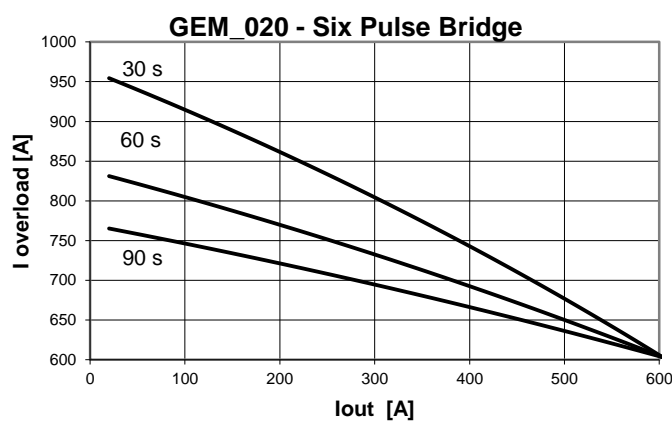
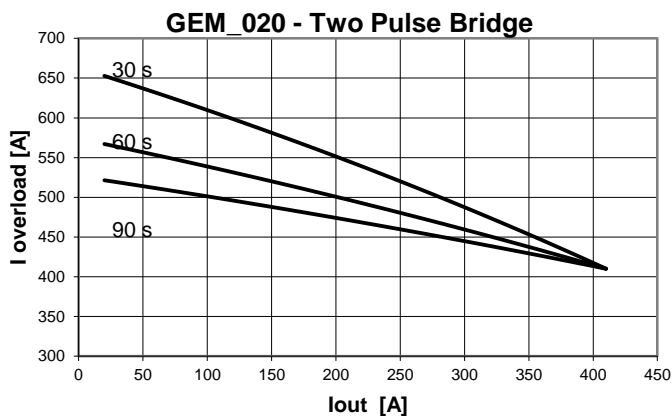


Max output vs Tamb





Overload capability at different overload time - Tamb = 40 °C



Max output vs Tamb

