



GEM_018,....,_031 QUAD SCR MODULES

Green Power Easy Module

- ▶ Electrically insulated metal frame
- ▶ Extremely high power density
- ▶ 3000 V_{RMS} insulation voltage
- ▶ Line voltage range up to 800 V_{RMS}
- ▶ High reliability
- ▶ Modularity
- ▶ Fully customizable
- ▶ Broad range of accessories
- ▶ Cost effective solution
- ▶ Suitable for heavy duty applications



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
- optimised snubber circuits
- pulse transformer modules
- ducted heat flow.

Maximum ratings of single thyristor

Part number Parameters	GEM_018	GEM_027	GEM_031	GEM_025	GEM_028	Conditions	Units
	$I_{T(AV)}$	186	275	310	258		
$I_{T(RMS)}$	292	432	487	405	441	Air velocity = 5 m/s	A
I_{TSM}	6	8.5	16	7.5	11	50 Hz, $T_j = T_{jmax}$, $V_R = 0\text{ V}$	kA
I_{TSM}	6.3	9.0	16.9	7.9	11.6	60 Hz, $T_j = T_{jmax}$, $V_R = 0\text{ V}$	kA
I^2t	180	361	1280	281	605	50 Hz, $T_j = T_{jmax}$, $V_R = 0\text{ V}$	kA ² s
I^2t	164	329	1165	256	551	60 Hz, $T_j = T_{jmax}$, $V_R = 0\text{ V}$	kA ² s
V_{DRM}/V_{RRM}	1600	1600	1800	2200	2800	$T_j = T_{jmax}$	V
T_{jmax}	125	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_018	12	1200	50	400
GEM_027	16	1600	50	500
GEM_031	18	1800	100	550
GEM_025	22	2200	50	700
GEM_028	28	2800	100	800

On-State Characteristics

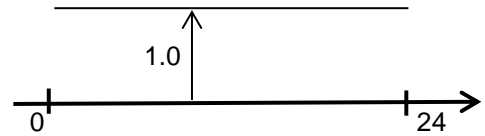
Parameters	GEM_018	GEM_027	GEM_031	GEM_025	GEM_028	Conditions	Units
V _{T(RO)} Threshold voltage	1.0	0.9	1.0	1.0	1.1	T _j = T _{jmax}	V
r _T On-state slope resistance	0.80	0.65	0.33	0.72	0.40	T _j = T _{jmax}	mΩ
I _H Holding current, max	600	300	300	300	300	T _j = 25°C	mA
I _L Latching current, typ	1000	700	1000	1000	1000	T _j = 25°C	mA
P _{MAX} Max power losses	1018	1478	1555	1461	1555	T _A = 40°C	W

Triggering Characteristics

Parameters	GEM_018	GEM_027	GEM_031	GEM_025	GEM_028	Conditions	Units
V _{GT} Gate trigger voltage	3.5	3	2.5	3.5	2.5	T _j = 25°C, V _D = 5V	V
I _{GT} Gate trigger current	150	200	250	300	250	T _j = 25°C, V _D = 5V	mA
P _{GM} Peak gate power dissipation	10	10	15	10	15	Pulse width 1 ms	W
P _{G(AV)} Average gate power dissipation	2	2	4	2	4		W
I _{FGM} Peak gate current	3	3	8	3	8		A
V _{FGM} Peak gate voltage (forward)	20	20	20	20	20		V
V _{RGM} Peak gate voltage (reverse)	5	5	5	5	5		V

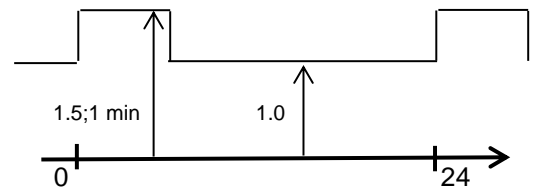
Switching Characteristics

Parameters	GEM_018	GEM_027	GEM_031	GEM_025	GEM_028	Conditions	Units
di/dt Critical rate of rise of on-state current	200	200	400	200	400	T _j = T _{jmax}	A/μs
dV/dt Critical rate of rise of off-state voltage	500	500	1000	500	1000	T _j = T _{jmax}	V/μs
t _q Turn-off time, typ	200	200	200	200	200	T _j =T _{jmax} , I _T =1000A di/dt=-20A/μs V _R =50V dV/dt=20V/μs	μs



Maximum IEC class 1 currents for typical circuit type

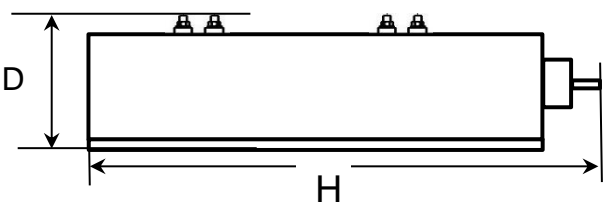
Circuit Type	GEM_018	GEM_027	GEM_031	GEM_025	GEM_028	Conditions	Units
AC switch	415	614	692	577	629	T _A = 40 °C delay angle = 0°	A
Center tap	371	549	619	517	563	T _A = 40 °C delay angle = 0°	A
Two pulse bridge	371	549	619	517	563	T _A = 40 °C delay angle = 0°	A
Six pulse bridge	532	780	897	734	816	T _A = 40 °C delay angle = 0°	A
Double star with I.P. transf.	1070	1572	1798	1479	1634	T _A = 40 °C delay angle = 0°	A



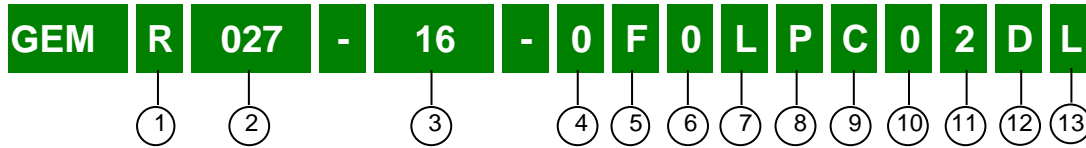
Maximum IEC class 2 currents for typical circuit type

Circuit Type	GEM_018	GEM_027	GEM_031	GEM_025	GEM_028	Conditions	Units
AC switch	330	525	603	494	548	T _A = 40 °C delay angle = 0°	A
Center tap	295	470	539	442	490	T _A = 40 °C delay angle = 0°	A
Two pulse bridge	295	470	539	442	490	T _A = 40 °C delay angle = 0°	A
Six pulse bridge	421	665	780	627	709	T _A = 40 °C delay angle = 0°	A
Double star with I.P. transf.	842	1339	1561	1260	1419	T _A = 40 °C delay angle = 0°	A

Thermal and mechanical characteristics

Parameters	GEM_018	GEM_027	GEM_031	GEM_025	GEM_028	Conditions	Units
T _{jmax} Max operating junction temperature	125	125	125	125	125		°C
T _{stg} Storage temperature	-40 +70	-40 +70	-40 +70	-40 +70	-40 +70		°C
R _{thJA} Thermal resistance (junction to ambient)	0.334	0.230	0.219	0.233	0.219	Air velocity = 5 m/s	°C/W
F Mounting torque - GEM to panel (+/- 10%)	7	7	7	7	7	M6 mounting screw	N·m
	14	14	14	14	14	M8 mounting screw	N·m
m Mass, typ						with FAPC options	kg
MTTR Mean Time To Repair	8	8	8	8	8		minutes
Overall dimensions							
D Depth	200						mm
H Height	570						mm
W Width	103						mm

PART-NUMBERING SYSTEM

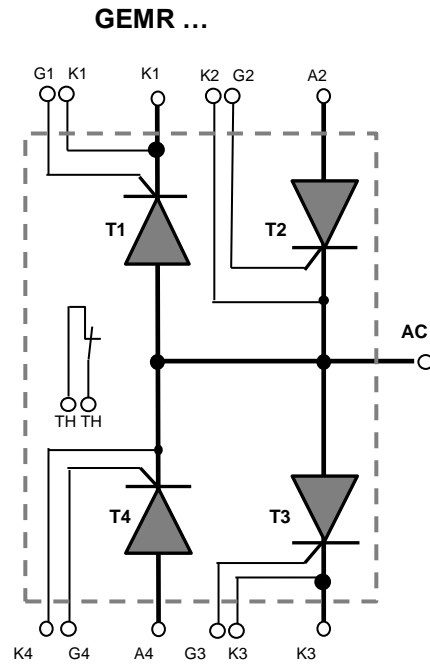


- ① Circuit configuration
- ② GEM average current / 10
- ③ GEM blocking voltage / 100
- ④ 0 = No fan
- ⑤ 0 = No fuse - F = With fuse protection
- ⑥ 0 = No standard busbar available for this module; please contact factory in case of specific need
- ⑦ 0 = No anti-parallel busbar - L = Anti-parallel busbar
- 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)
- ⑬ 0 = No current transformer - L (R) = Sirio current transformer on the Left side (or on the Right side)

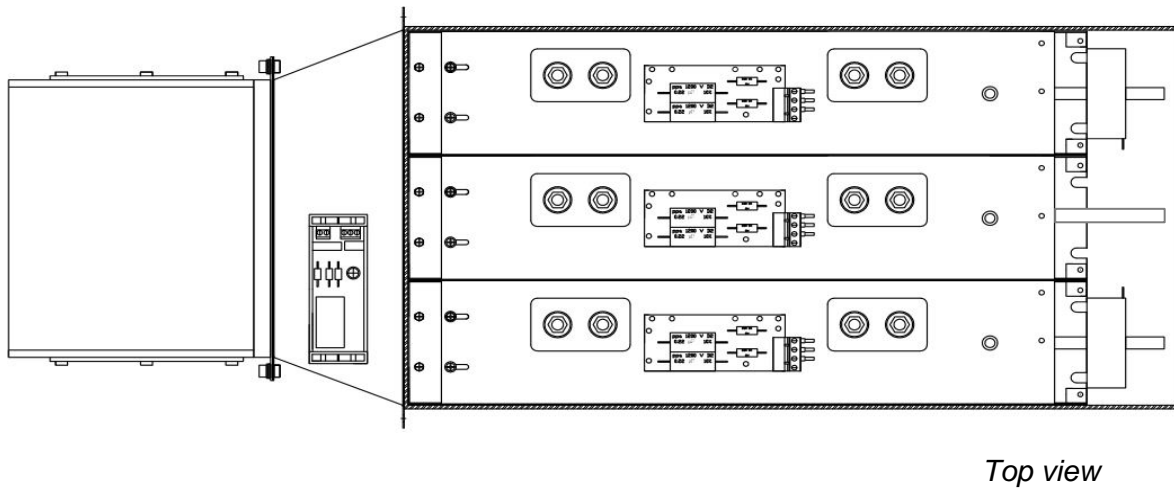
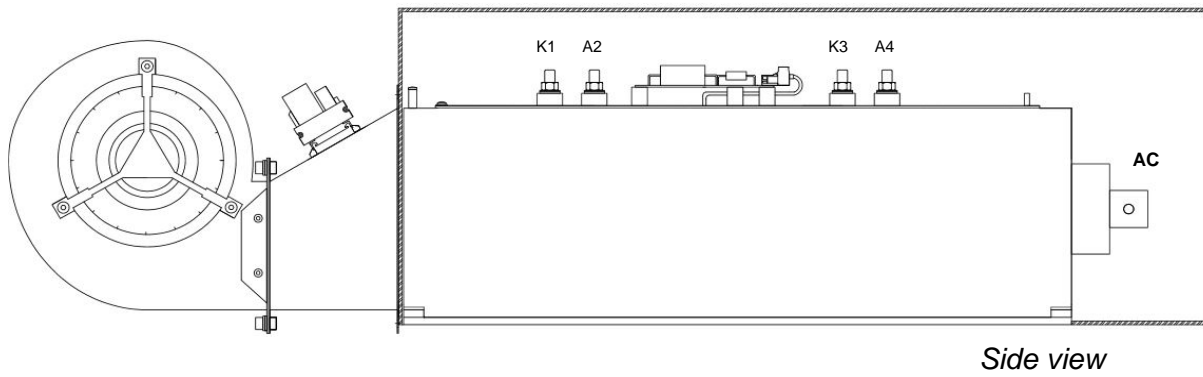
* Pulse transformer GT001 (dual) or GT002 (single) depending on the circuit configuration.
For pulse transformer characteristics see their specific datasheets.

GEM modules are not covered by the Low Voltage Directive (LVD) 2014/35/EU because, according to LVD Guidelines, they are components "the safety of which can only, to a very large extent, be assessed taking into account how they are incorporated and for which a risk assessment cannot be undertaken".

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

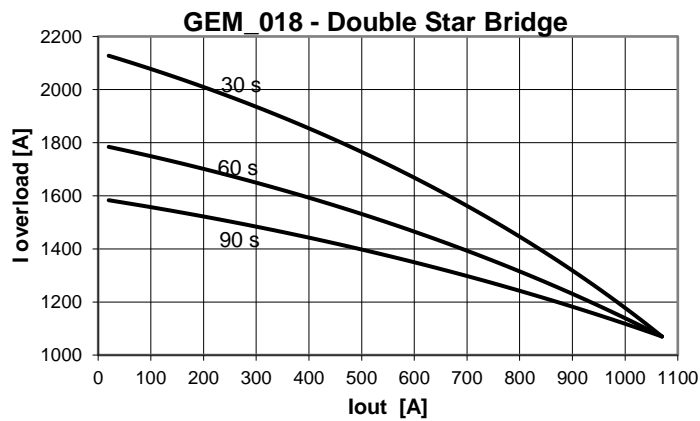
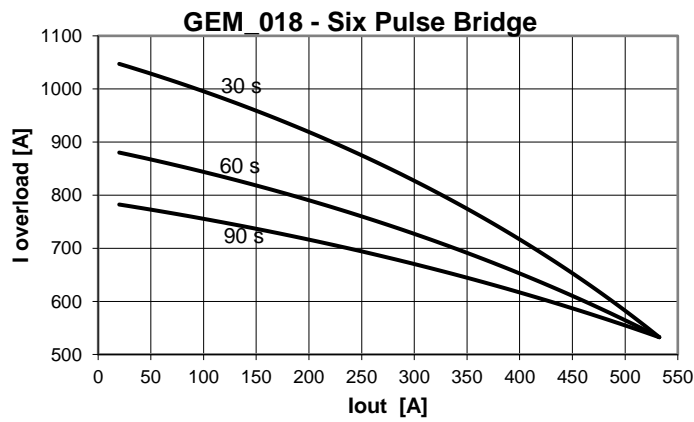
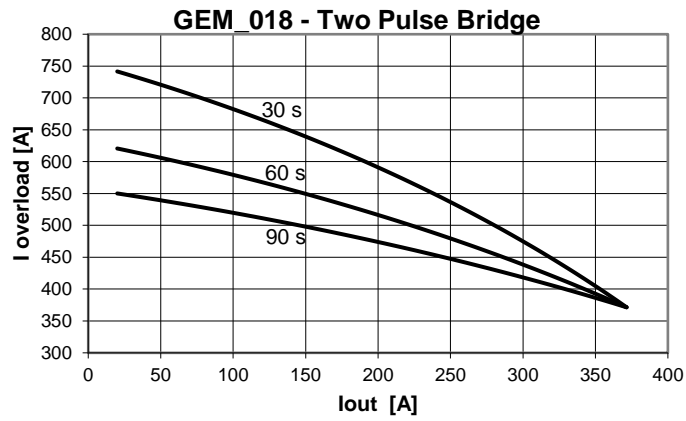


Example of application - 3P Regen bridge realized with three GEMR modules

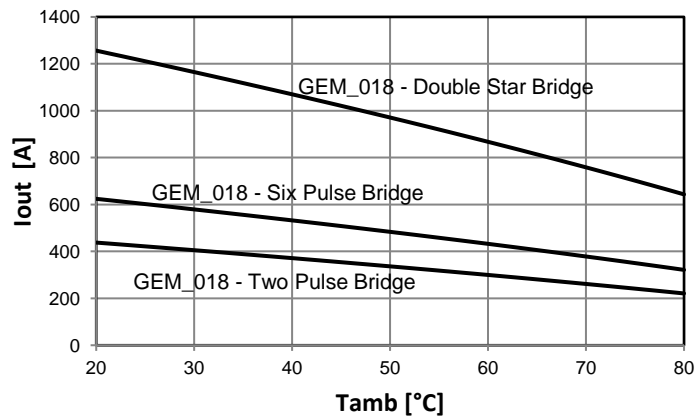


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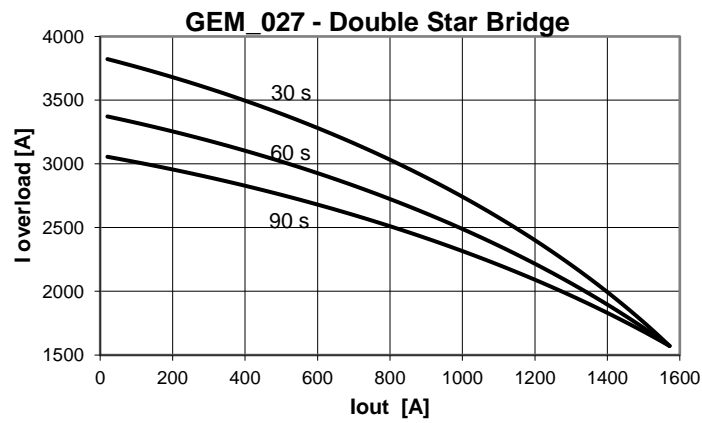
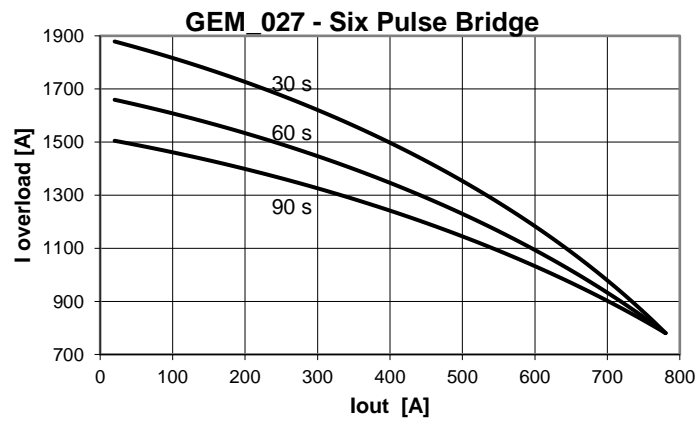
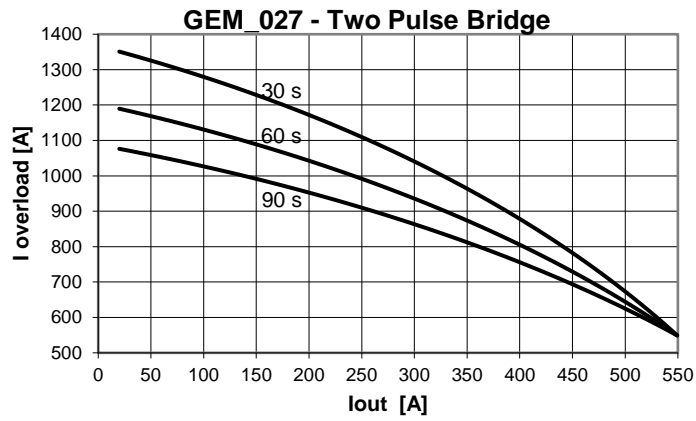
Overload capability at different overload time - Tamb = 40 °C



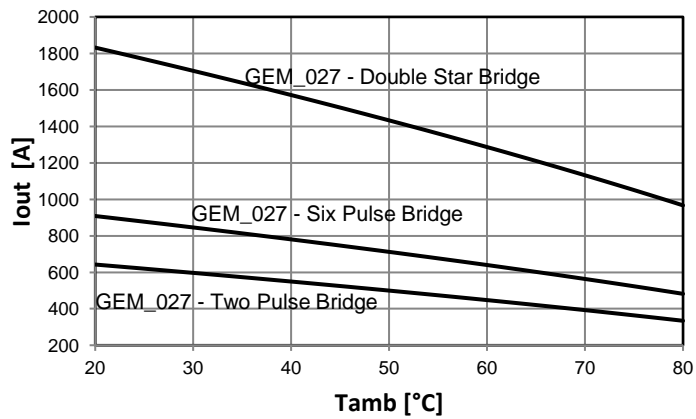
Max output vs Tamb



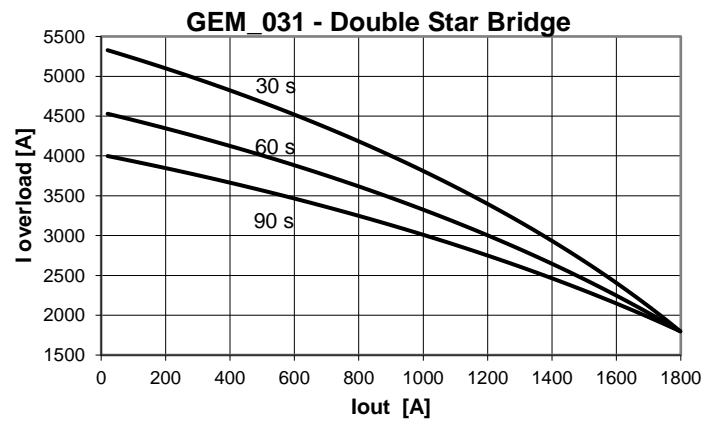
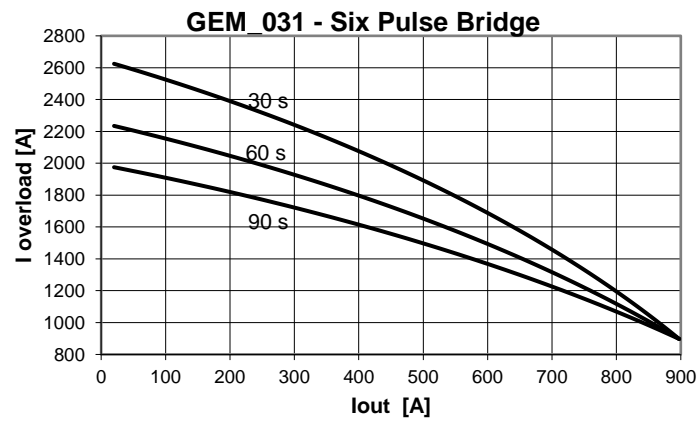
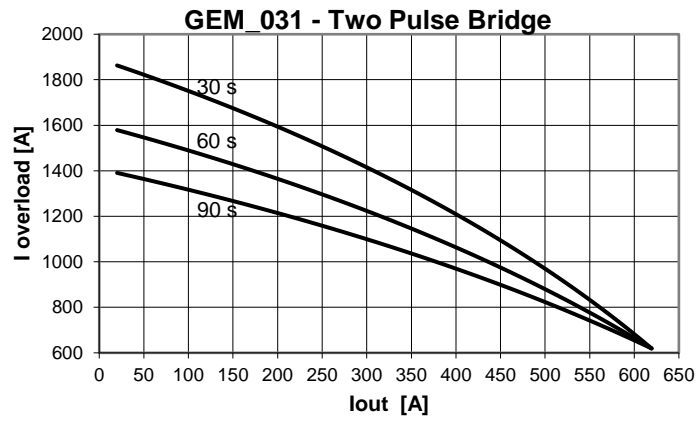
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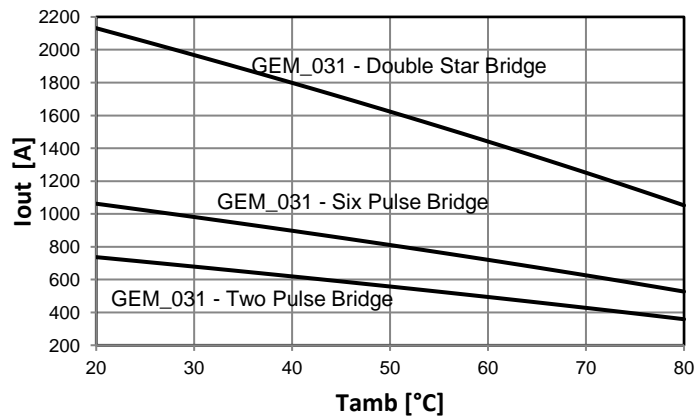
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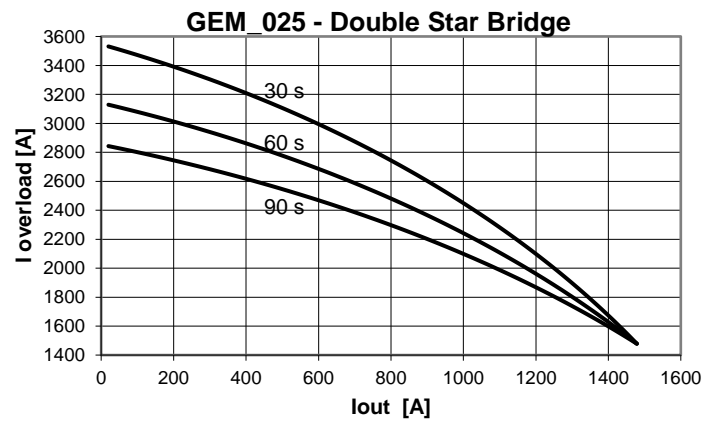
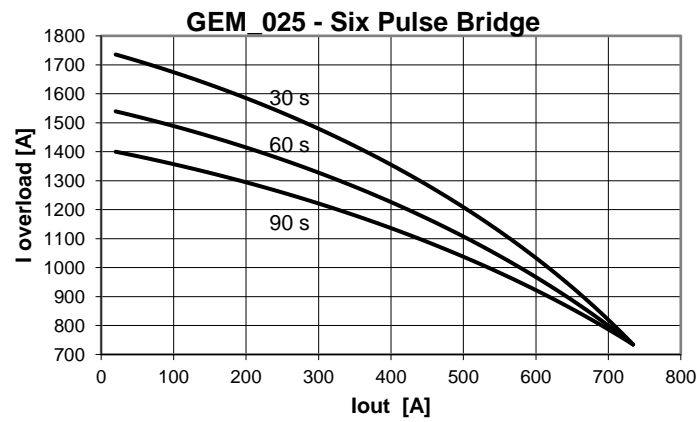
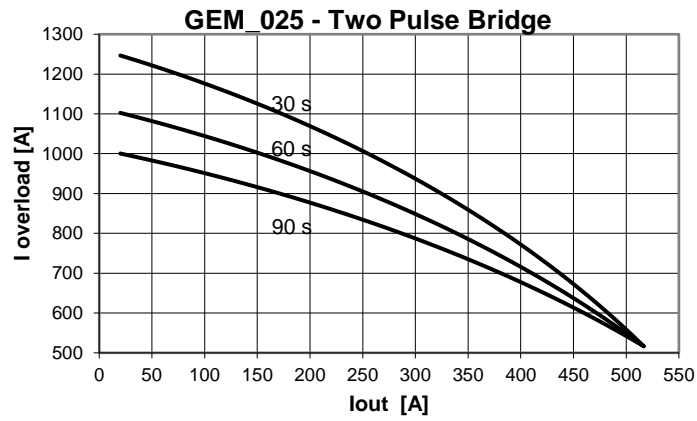
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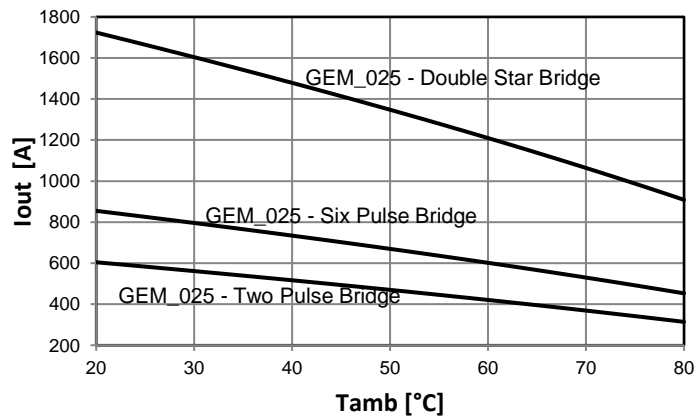
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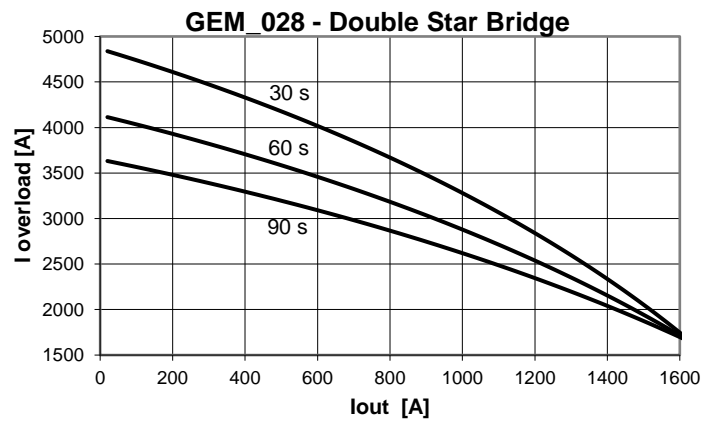
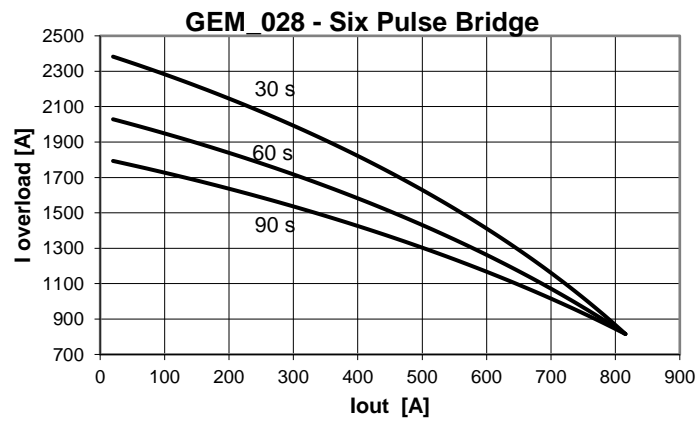
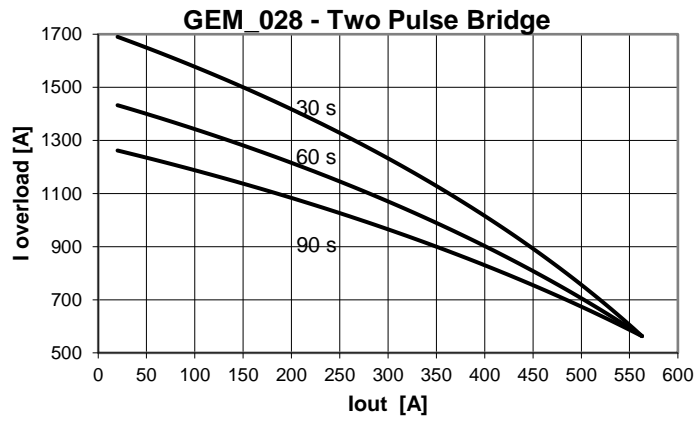
Overload capability at different overload time - Tamb = 40 °C



Max output vs Tamb



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



Max output vs Tamb

