

SKS B2 140 GD 69/12 U - MA PB



SKiiP stack

SEMISTACK® Renewable Energy - Size W2

Two Quadrant 3-phase IGBT inverter

Ordering No. 08800564

Description SKS B2 140 GD 69/12 U - MA PB

Features

- Designed in regard to EN50178 and UL508C recommendations
- Designed for a 600 x 600 x 2000 mm cabinet
- Embedded SKiiP® Technology 4
- SKiiP 2414GB17E4-4DUW, Trench 4 1700V IGBT, CAL4 diode
- Integrated current, temperature and voltage sensors
- Water cooling

Typical Applications

- Wind generators (SG and DFIG)
- Solar Inverters

Footnotes

¹⁾ Absolute maximum ratings are values not to be exceeded in any case and do not imply that the stack can operate in all these conditions taken together.

²⁾ fan consumption and losses in air included

REMARKS

This technical information specifies semiconductor devices but promises no characteristics. No warranty or guarantee, expressed or implied is made regarding delivery, performance or suitability.

Absolute maximum ratings ¹⁾

Symbol	Conditions	Values	Unit
$I_{OUT\ MAX}$	Maximum permanent output current	1 400	A _{RMS}
$I_{IN\ MAX}$	Maximum permanent input current	1 800	A _{DC}
$V_{OUT\ MAX}$	Maximum output voltage	760	V _{AC}
$V_{BUS\ MAX}$	Maximum DC Bus voltage	1 300	V _{DC}
$F_{OUT\ MAX}$	Maximum inverter output frequency	100	Hz
$F_{SW\ MAX}$	Maximum switching frequency	5	kHz

Electrical characteristics: application example

T_{AMBIENT}=40°C unless otherwise specified

Symbol	Conditions		min	typ	max	Unit	
AC phase							
V _{BUS}	DC bus rated voltage	T _{INLET} =45°C, 50% glycol, Flowrate = 16 L/min T _J <150°C, ambient air temperature = 40°C, air extraction according to thermal data page 2		1 250		V _{DC}	
I _{OUT RATED}	Rated output current			1 400		A _{RMS}	
I _{OUT OVL}	Overload output current			1 540		A _{RMS}	
t _{OVL}	Overload duration			60		s	
T _{OVL}	Time between 2 overloads			10		min	
V _{OUT}	Output voltage			620	690	760	V _{AC}
P _{OUT}	Rated output power			1 670		kW	
F _{SW}	Inverter switching frequency			2		kHz	
F _{OUT}	Output frequency			50		Hz	
PF	Power factor			-1		1	-
P _{LOSS INV} ²⁾	Losses at rated current				18 200		W
η ²⁾	Efficiency at rated current				99		%

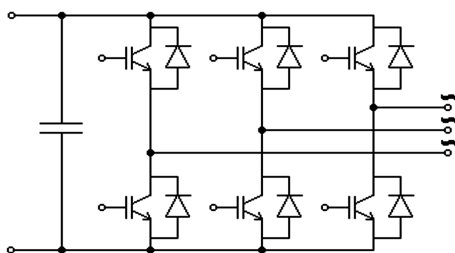
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Flowrate = 16 L/min
T_J<150°C,
ambient air temperature = 40°C,
air extraction according to thermal
data page 2

DC Bus

V_{BUS}	Rated DC voltage applied to the capacitor bank	1 250	V _{DC}
$V_{BUS\ MAX}$	Max DC voltage applied to the caps bank (max 30% of LTE)	1 300	V _{DC}
$t_{d5\%}$	Discharge time of the capacitors (V _{DC} < 60 V)	6	min
C_{DC}	Capacitor bank capacity	8,1	mF
LTE	Calculated LTE of the caps with forced air cooling	100	kh

Stack Insulation

Crđ	Minimum creepage distance	11	mm	
Cld	Minimum clearance distance	9.4	mm	
Visol	Chassis / power stage AC/DC (insulation test voltage DC, 5s)	-4 200	4 200	V _{DC}
dv/dt	SKiiP driver only, secondary to primary side		75	kV/μs



B6CI

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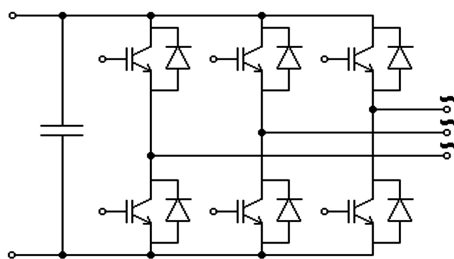
³⁾ the user shall ensure that the ambient air is sufficiently ventilated to avoid hot spots.

REMARKS

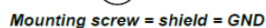
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Environmental conditions		T _{AMBIENT} =40°C unless otherwise specified			
Characteristics	Conditions	min	typ	max	Unit
Climatic					
Ambient temperature ³⁾	Storage: IEC 60721-3-1, class 1K2 Transportation: IEC 60721-3-2, class 2K2	-25		60	°C
	Operation: IEC 60721-3-3, class 3K3 extended	-20		55	°C
Humidity	IEC 60721-3-3, class 3K3 no condensation no icing	5		85	%
Mechanical					
Installation altitude	without derating			1 000	m
Max installation altitude	with derating			4 000	m
Ingress protection	IEC 60529		IP00		-
Vibrations & Shocks	IEC 60721-3-2, Storage & transportation		2M1		-
	IEC 60721-3-3, in operation		3M3		-
Pollution degree	EN 50178		2		-
Mass	3-phase inverter, with cable plate terminal and no DC bus connection		106		kg
Thermal data					
$\Delta V/\Delta t_{\text{WATER}}$	Water flow of the 3-phase inverter	8	16	35	L/min
ΔP_{WATER}	Water pressure drop of the inverter, with male and female connectors, 50% glycol, 16 L/min		340		mbar
Water pressure	Rated water pressure per inverter		3		bar
Coolant type	Recommended coolant		50% glycol / 50% water		-
T _{INLET}	Cooling water inlet temperature	-20	45	60	°C
Required cooling airflow	Airflow direction bottom to top on snubbers ³⁾		1		m.s ⁻¹
V _{SUPPLY}	Fan DC voltage supply	16	24	30	V _{DC}
P _{FAN}	Fan power consumption at typical voltage supply		90		W
LTE	Capacitor DC fan lifetime expectancy (L10 method)		57		kh

Gate Driver Characteristics		T _{AMBIENT} =25°C unless otherwise specified			
Symbol	Conditions	min	typ	max	Unit
Gate Driver / controller data					
V _S	supply voltage non stabilized	19.2	24	28.8	V
I _S	V _{S2} = 24 V, F _{SW} in kHz, I _{RMS} in A	360 + 47×F _{SW} + 0.258×I _{RMS}			mA
V _{IT+}	input threshold voltage HIGH	0.7 V _S			V
V _{IT-}	input threshold voltage LOW		0.3 V _S		V
R _{IN}	Input resistance		13		kΩ
C _{IN}	Input capacitance		1		nF
Measurement & protection					
H _{B_I}	Analogue current signal H _{B_I}	353	360	367	A.V ⁻¹
I _{TRIP SC}	Over current trip level (I _{analogue} OUT=10V)	3 525	3 600	3 675	A _{PEAK}
CMN_TEMP	Analogue temperature signal	Min.	30 + 11.3×CMN_TEMP		°C
		Typ	30 + 12×CMN_TEMP		°C
		Max	30 + 12.7×CMN_TEMP		°C
T _{TRIP}	Over temperature protection	128	135	142	°C
CMN_DCL	DC-link voltage analog signal	130	134	138	V.V ⁻¹
V _{DCtrip}	Overvoltage trip level	1300	1340	1380	V



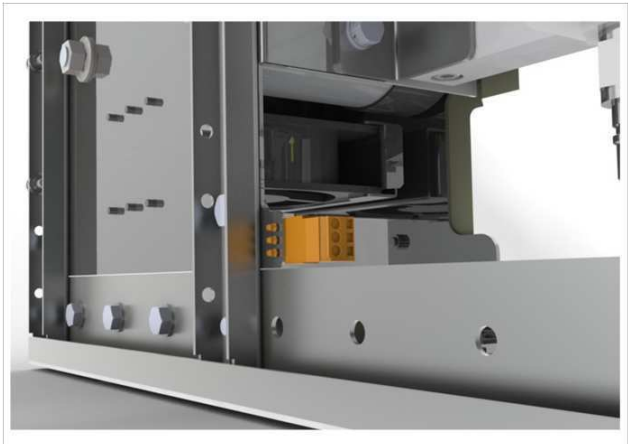
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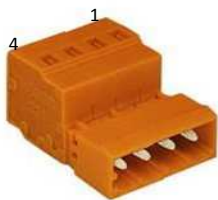
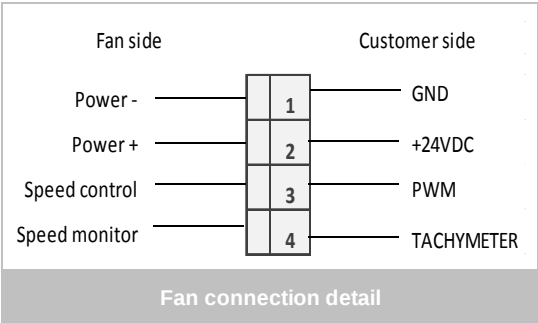
X1U, X1V, X1W

3

DC fan connection

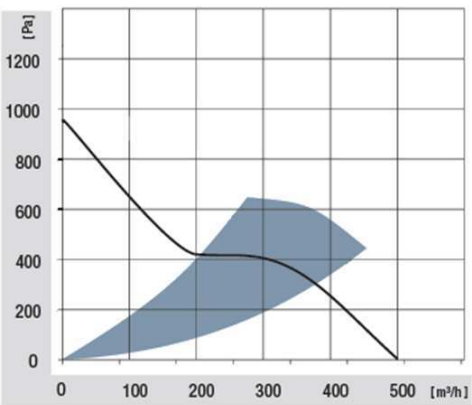


Fan connection detail

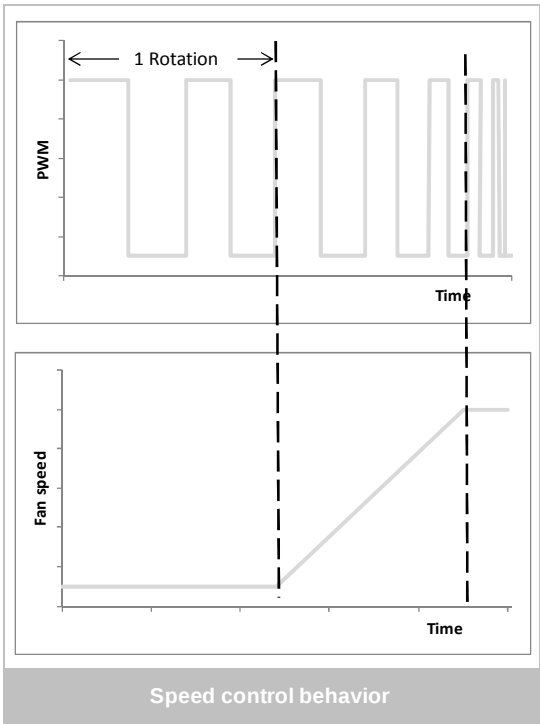


Pin	Designation
1	GND
2	+24VDC
3	PWM
4	MONITOR

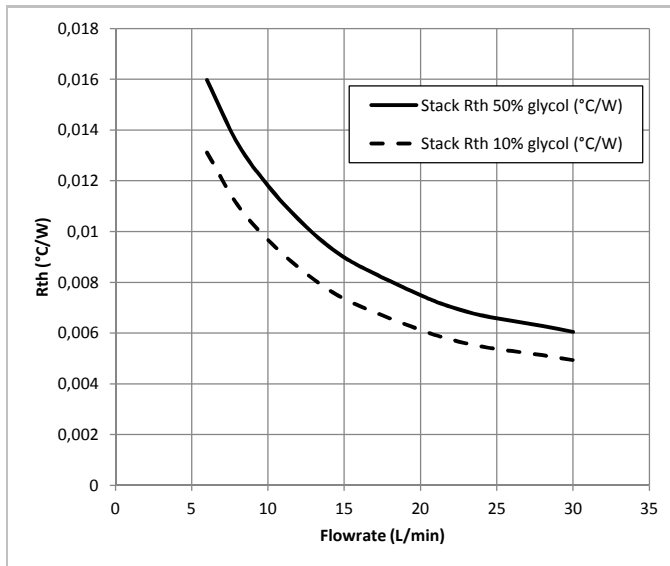
DC fan speed control



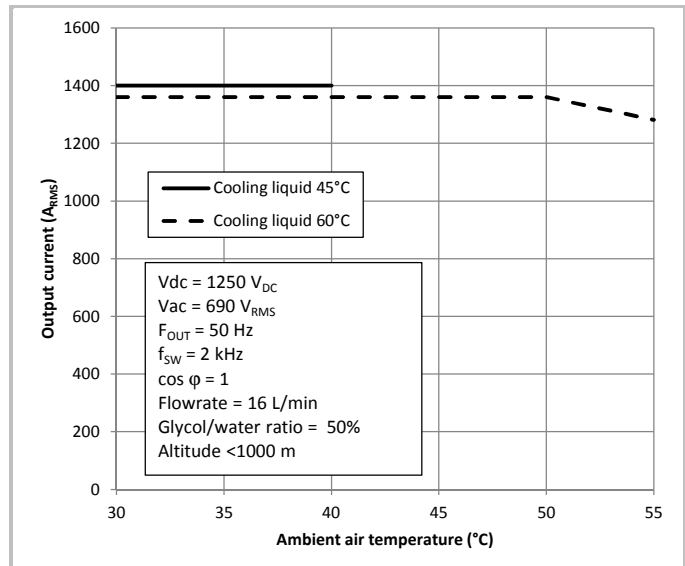
Characteristic pressure drop vs air flow



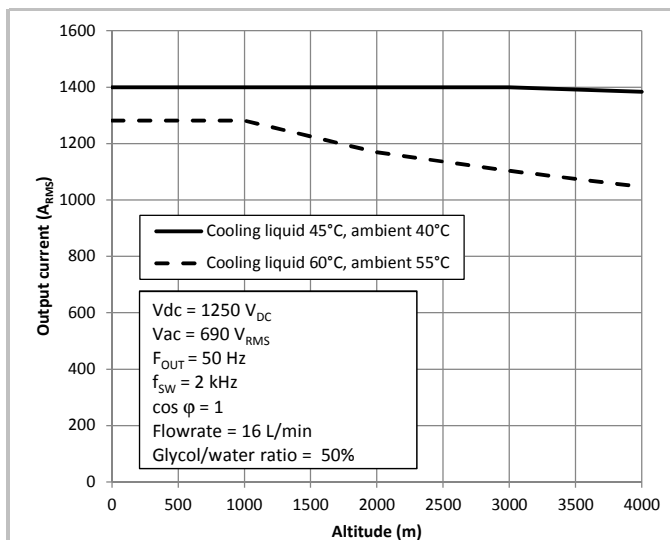
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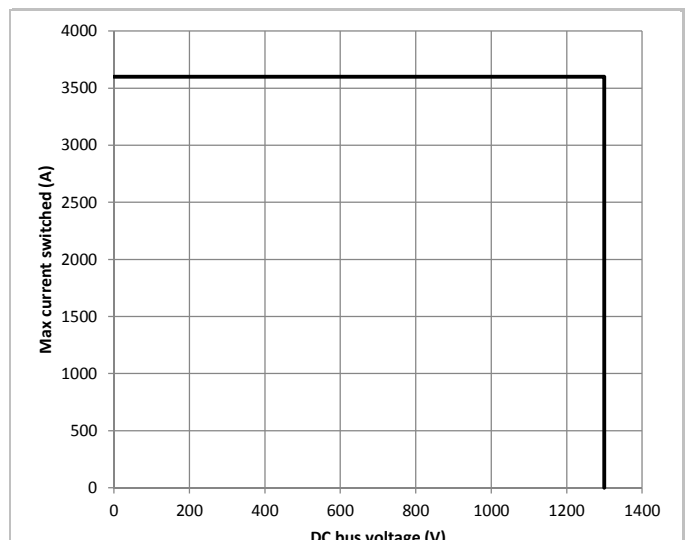
$R_{th, \text{sink-water (stack)}}$ vs. Liquid Flow



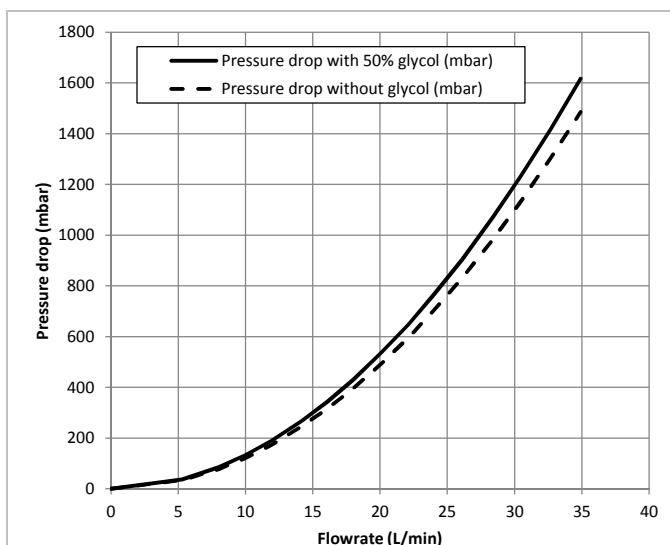
Permanent Output Current vs. Ambient Temperature



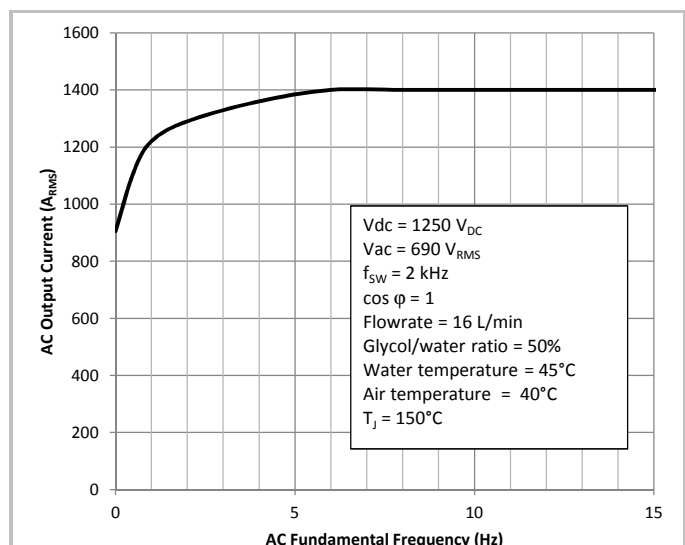
Permanent Output Current vs. Altitude



Safe Operating Area



Pressure Drop vs Flowrate



Permanent Output Current vs. Output Frequency