

SKS B2 140 GDD 69/12 U – A11 MA PB



SKiiP stack

SEMISTACK® Renewable Energy - Size W2

4-Quadrant 3-phase IGBT converter

Ordering No. 08800588

Description SKS B2 140 GDD 69/12 U – A11 MA PB

Features

- Designed in regard to EN50178 recommendations 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 & voltage sensors
- Water cooling

Typical Applications

- Wind generators (SG and DFIG)
- Solar inverters

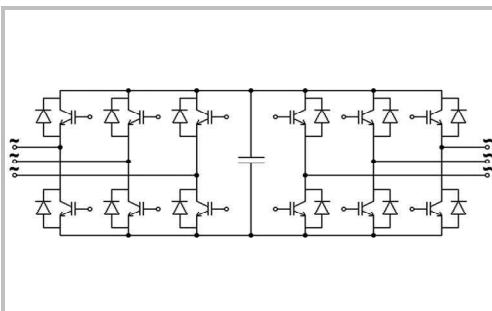
Footnotes

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.



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Absolute maximum ratings ¹⁾

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

Electrical characteristics

T_{AMBIENT}=40°C unless otherwise specified

Symbol	Conditions		min	typ	max	Unit	
AC phase Grid							
I _{OUT RATED}	Rated output current	V _{BUS} =1250 V _{DC} , T _{INLET} = 45°C, 50% glycol Flowrate = 16 L/min T _j <150°C Ambient temperature = 40°C air extraction according to thermal data page 2		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 OUT}	Inverter switching frequency				2		kHz
F _{OUT}	Output frequency				50		Hz
PF	Power factor				1		-
P _{LOSS INV} ²⁾	Losses at rated current				18 200		W
η ²⁾	Efficiency at rated current			99		%	

AC phase Generator

$I_{IN\ RATED}$	Rated input current	$V_{BUS} = 1250\ V_{DC}$ $T_{INLET} = 45^{\circ}C$, 50% glycol Flowrate = 16 L/min $T_j < 150^{\circ}C$ ambient temperature = 40°C air extraction according to thermal data page 2	1 400	A_{RMS}
$I_{IN\ OVL}$	Overload input current		1 540	A_{RMS}
t_{OVL}	Overload duration		60	s
T_{OVL}	Time between 2 overloads		10	min
V_{IN}	Input voltage		620 690 760	V_{AC}
P_{IN}	Rated input power		1 670	kW
$F_{SW\ IN}$	Rectifier switching frequency		2	kHz
F_{IN}	Input frequency		50	Hz
PF	Power factor		-1	-
$P_{LOSS\ REC}^{2)}$	Losses at rated current		17 600	W
$\eta^{2)}$	Efficiency at rated current	99	%	

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}
$\tau_{d5\%}$	Discharge time of the capacitors (V _{DC} < 60 V)		6		min
CDC	Capacitor bank capacitance		16,2		mF
LTE	Calculated LTE of the caps with forced air cooling			100	kh

Stack Insulation

Crd	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

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SKiiP stack

SEMISTACK® Renewable Energy - Size W2 4-Quadrant 3-phase IGBT converter

Ordering No. 08800588

Description SKS B2 140 GDD 69/12 U – A11 MA PB

Features

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- 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 & voltage sensors
- Water cooling

Typical Applications

- Wind generators (SG and DFIG)
- Solar inverters

Footnotes

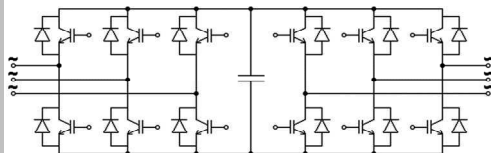
³⁾ the user shall ensure that the ambient air is sufficiently ventilated to avoid hot spots.

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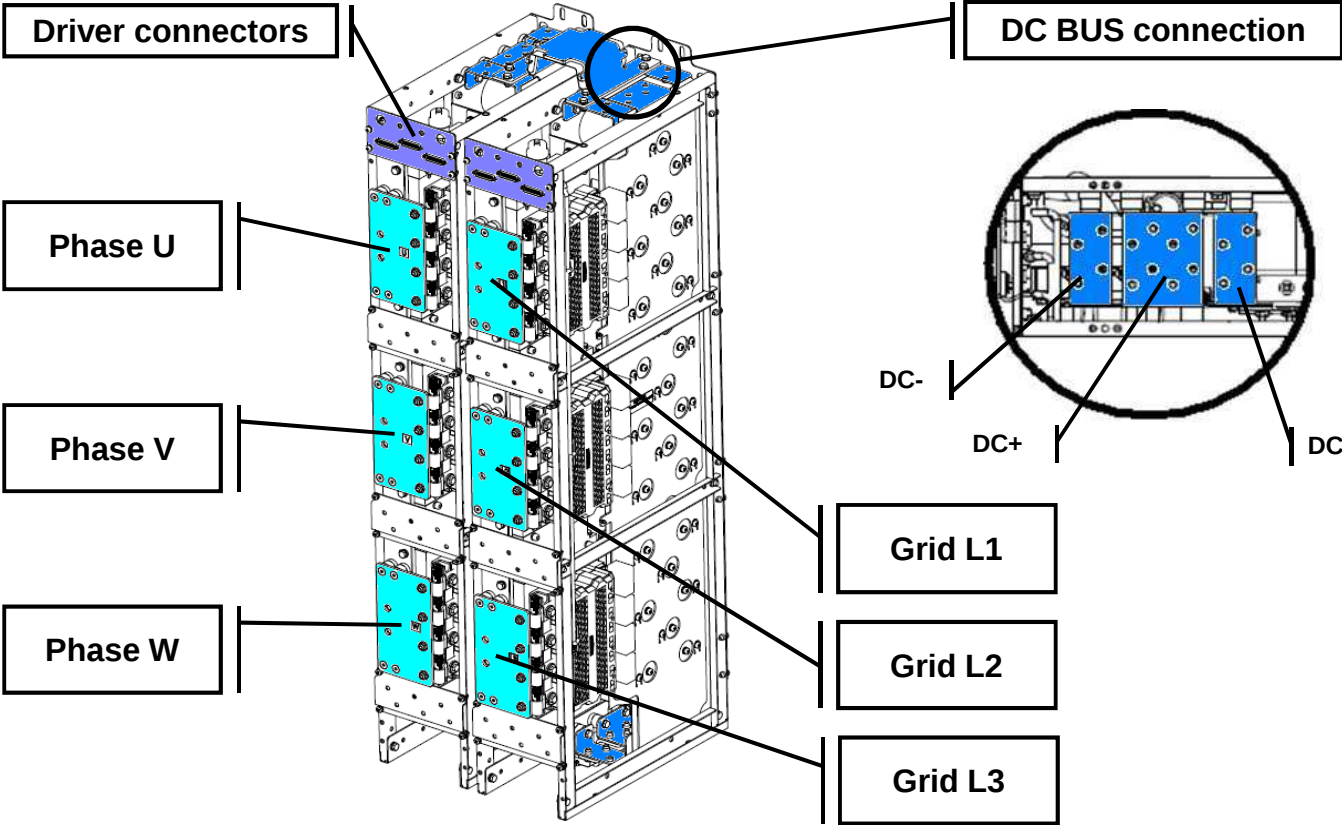
Environmental conditions		T _{AMBIENT} =40°C unless otherwise specified			
Characteristics	Conditions	min	typ	max	Unit
Climatic					
Ambient temperature 1)	IEC 60721-3, class 1K2&2K2 Storage & transportation	-25		60	°C
	IEC 60721-3-3, class 3K3 extended In operation	-20		55	°C
Humidity	IEC 60721-3-3, class 3K3 no condensation no icing	5		85	%
Mechanical					
Installation altitude	without derating			1 000	m
Max installation altitude	with derating			4000	m
Protection degree	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	SEMISTACK RE		106		kg
	4-Quadrant converter		214		kg
Thermal data					
$\Delta V/\Delta t_{\text{WATER}}$	Water flow per SEMISTACK RE	8	16	35	L/min
	Water flow per 4Q-converter	16	32	70	L/min
ΔP_{WATER}	Pressure drop per stack, with male and female connectors, 50% glycol, 16 L/min		340		mbar
	Pressure drop per 4Q-converter, with male and female connectors, 50% glycol, 32 L/min		340		mbar
Water pressure	Rated water pressure per SEMISTACK RE		3		bar
Coolant type	Recommended coolant		50% glycol / 50% water		-
T _{INLET}	Cooling water inlet temperature	-20	45	60	°C
Required cooling airflow	Snubbers, airflow direction bottom-top ³⁾		1		ms ⁻¹
V _{SUPPLY}	Capacitor DC fan operating voltage	16	24	30	V _{DC}
P _{FAN} per fan	Fan power consumption at typical voltage supply		90		W
LTE	Capacitor DC fan life time 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 _{DC}
IS2	per SKiiP®, V _{S2} = 24 V, F _{SW} in kHz, I _{RMS} in A	360 + 47×F _{SW} + 0.258×I _{RMS}			mA
ViT+	input threshold voltage HIGH	0.7 V _S			V _{DC}
ViT-	input threshold voltage LOW		0.3 V _S		V _{DC}
R _{in}	Input resistance		13		kΩ
C _{in}	Input capacitance		1		nF
Measurement & protection					
HB_I	Analogue current signal HB_I	353	360	367	A.V ⁻¹
I _{TRIP SC}	over current trip level (I _{analog} 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

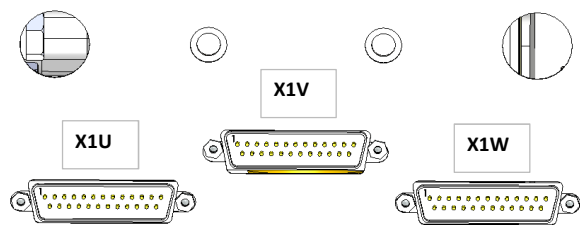


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Electrical connection



Phase Driver connector assignment



PWR_GND	14	•	1	PWR_Vs
PWR_GND	15	•	2	PWR_Vs
PWR_GND	16	•	3	PWR_Vs
CMN_GND	17	•	4	CMN_DIAG
CMN_GPIO	18	•	5	CMN_HALT
CMN_TEMP_GND	19	•	6	CMN_TEMP
CMN_DCL_GND	20	•	7	CMN_DCL
HB_BOT	21	•	8	HB_TOP
HB_GND	22	•	9	HB_RSRVD
HB_I_GND	23	•	10	HB_I
CAN_Low AUX_0B	24	•	11	AUX_0A CAN_High
Reserved AUX_1B	25	•	12	AUX_1A Reserved
		•	13	SHLD_GND

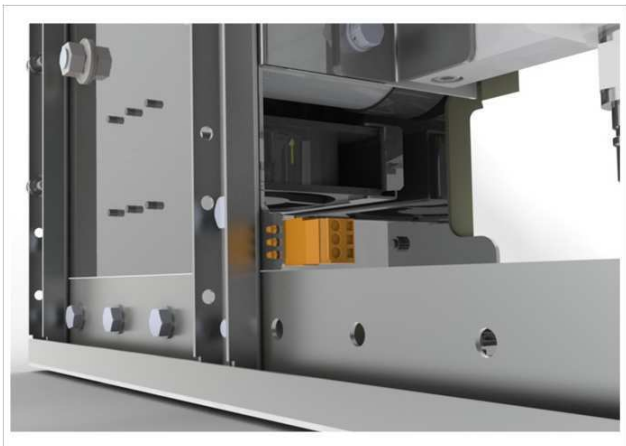
Mounting screw = shield = GND

Sub-D 25 pin male connector

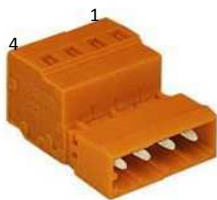
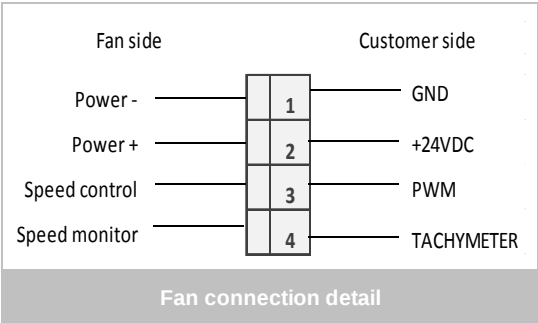
X1U, X1V, X1W, X1L1, X1L2, X1L3

Pin	Signal	Remark
1		
2	PWR_Vs	Power Supply
3		
14		
15	PWR_GND	Ground for PWR_Vs
16		
4	CMN_DIAG	Reserved
17	CMN_GND	Ground for CMN_DIAG, CMN_HALT, CMN_GPIO
5	CMN_HALT	Digital input/output, bidirectional status signal
18	CMN_GPIO	Digital input/output, general purpose IO
6	CMN_TEMP	Temperature signal out
19	CMN_TEMP_GND	Ground for CMN_TEMP
7	CMN_DCL	DC-link voltage out
20	CMN_DCL_GND	Ground for CMN_DCL
8	HB_TOP	Switching signal input for HB high side IGBT
21	HB_BOT	Switching signal input for HB low side IGBT
9	HB_RSRVD	Reserved
22	HB_GND	Ground for HB_TOP, HB_BOT, HB_RSRVD
10	HB_I	Current sensor out
23	HB_I_GND	Ground for HB_I
11	AUX_0A	CAN interface INPUT/OUTPUT HIGH
24	AUX_0B	CAN interface INPUT/OUTPUT LOW
12	AUX_1A	Reserved
25	AUX_1B	Reserved
13	SHLD_GND	GND

DC fan connection

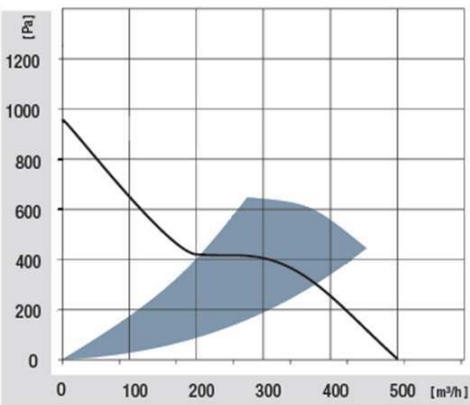


Fan connection detail

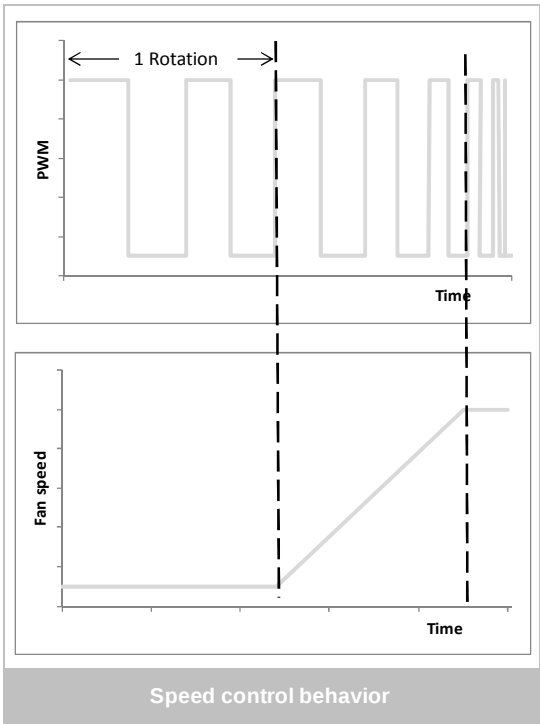


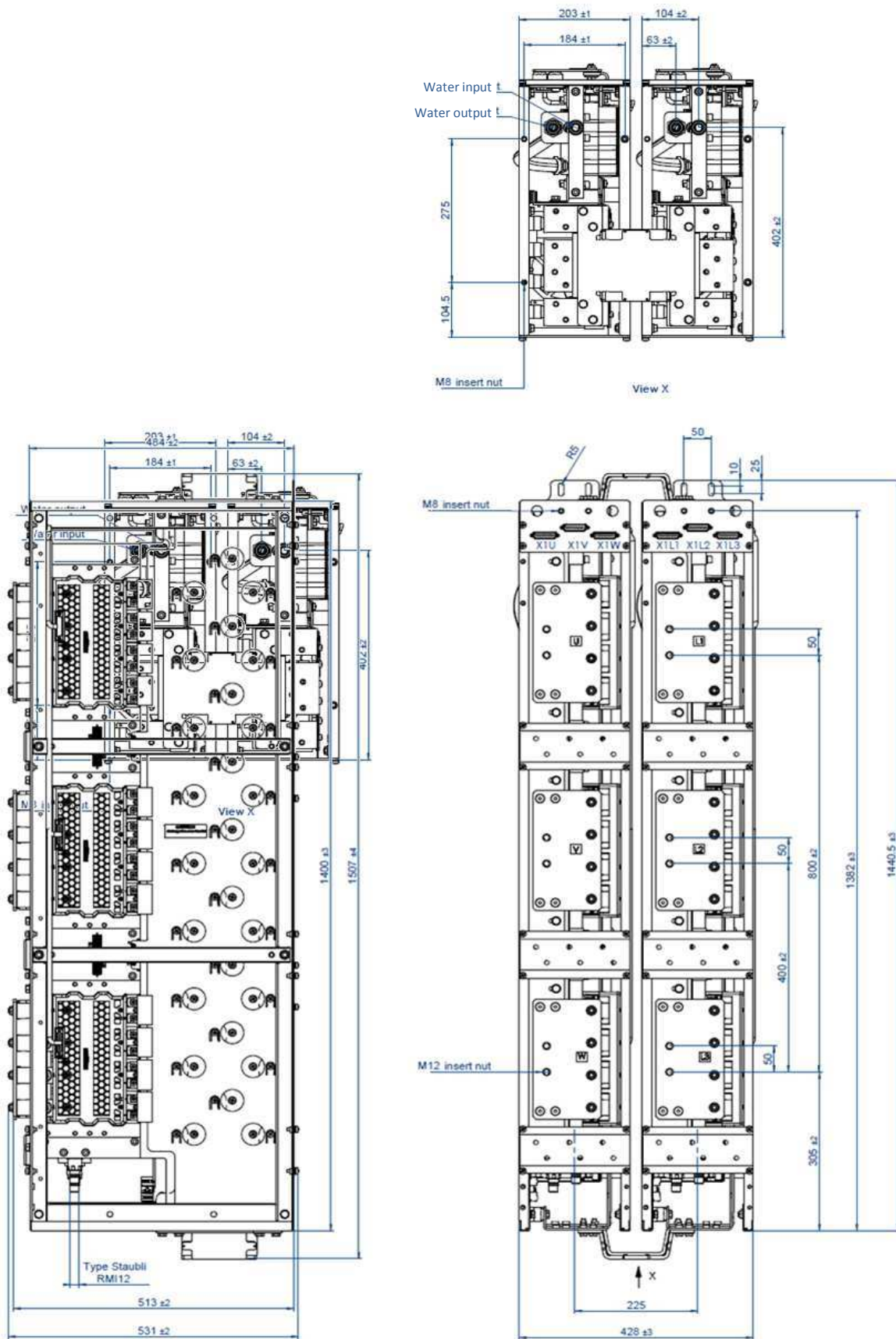
Pin	Designation
1	GND
2	+24VDC
3	PWM
4	MONITOR

DC fan speed control



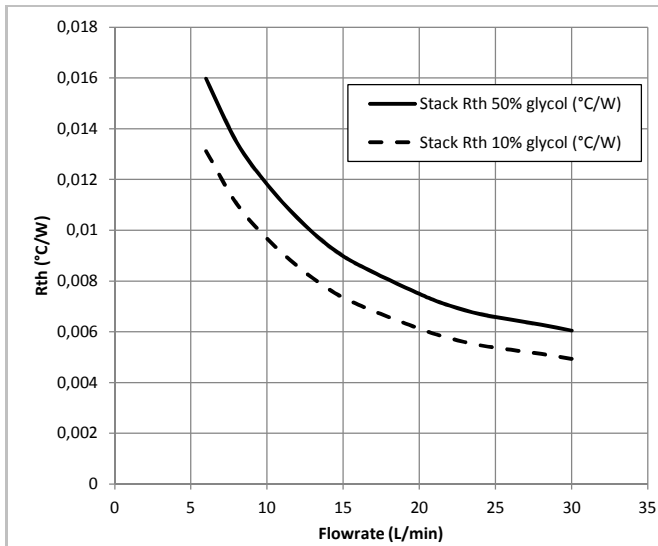
Characteristic pressure drop vs air flow



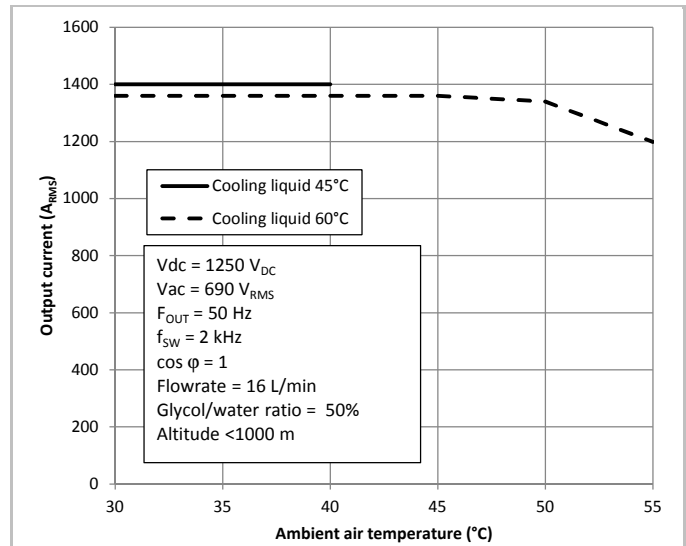


Dimensions

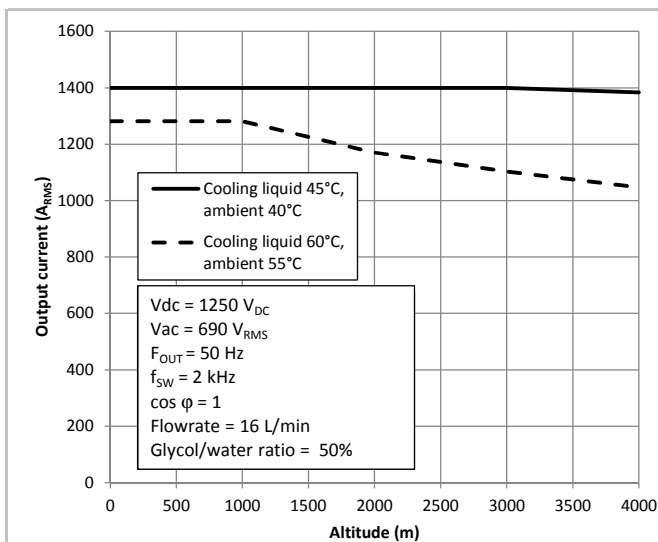
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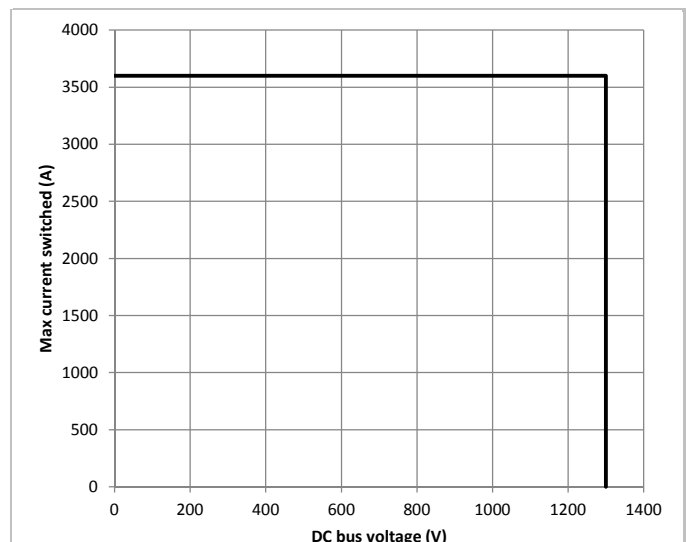
$R_{th, \text{SinkWater}}(\text{stack})$ vs. Liquid Flow (per stack)



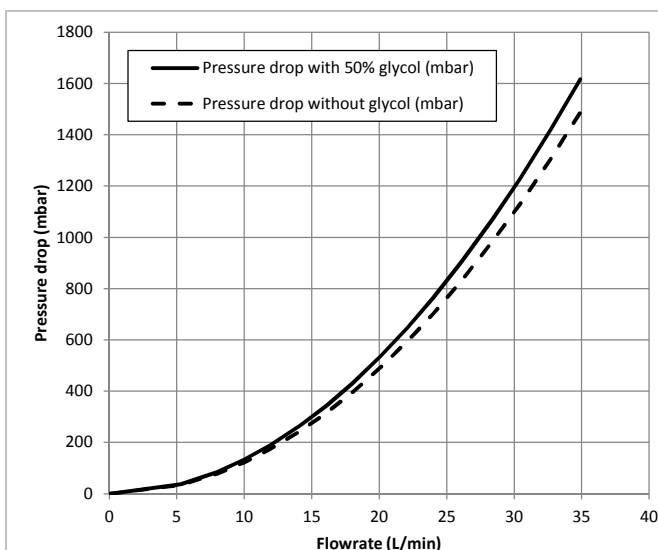
Permanent Output Current vs. Ambient Temperature



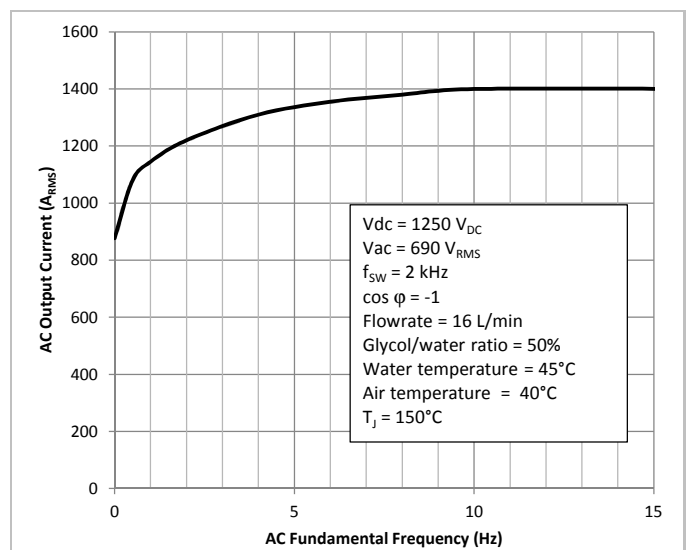
Permanent Output Current vs. Altitude



Safe Operating Area



Pressure Drop vs. Flowrate (per stack)



Permanent Output Current vs. Output Frequency