SKS B2 120 GD 69/11 - MA PB

SKiiP stack

SEMISTACK® Renewable Energy - Size W2
Two Quadrant 3-phase IGBT inverter

Ordering No. 08800415
Description SKS B2 120 GD 69/11 - MA PB

Features

- Designed in regard to EN50178 and UL508C recommendations
- Designed for a 600 x 600 x 2000 mm cabinet
- Embedded SKiiP® Technology 3
- SKiiP 2403GB172-4DW, Trench 3 1700V IGBT, CAL3 diode
- Integrated current and temperature 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

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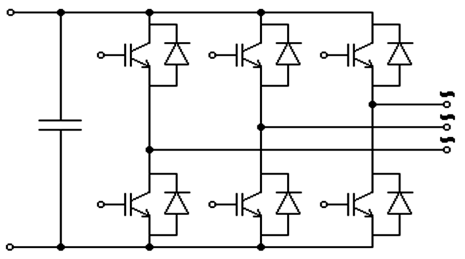

B6CI

Absolute maximum ratings [1]			
Symbol	**Conditions**	**Values**	**Unit**
$I_{OUT\ MAX}$	Maximum permanent output current	**1 200**	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	**1 200**	V_{DC}
$F_{OUT\ MAX}$	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<125°C, ambient air temperature = 40°C, air extraction according to thermal data page 2		**1 100**		V_{DC}
$I_{OUT\ RATED}$	Rated output current			**1 200**		A_{RMS}
$I_{OUT\ OVL}$	Overload output current			**1 320**		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			**1 430**		kW
F_{SW}	Inverter switching frequency			**2**		kHz
F_{OUT}	Output frequency			**50**		Hz
PF	Power factor			**1**		-
$P_{LOSS\ INV}$ [2]	Losses at rated current			**13 840**		W
η [2]	Efficiency at rated current			**>99**		%

DC Bus					
V_{BUS}	Rated DC voltage applied to the capacitor bank		**1 100**		V_{DC}
$V_{BUS\ MAX}$	Max DC voltage applied to the caps bank (max 30% of LTE)			**1 200**	V_{DC}
$\tau_{d5\%}$	Discharge time of the capacitors (V_{DC} < 60 V)		**7**		min
C_{DC}	Capacitor bank capacity		**10,0**		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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Footnotes

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

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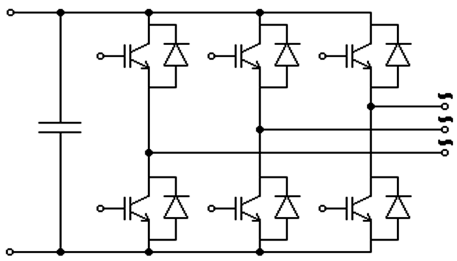
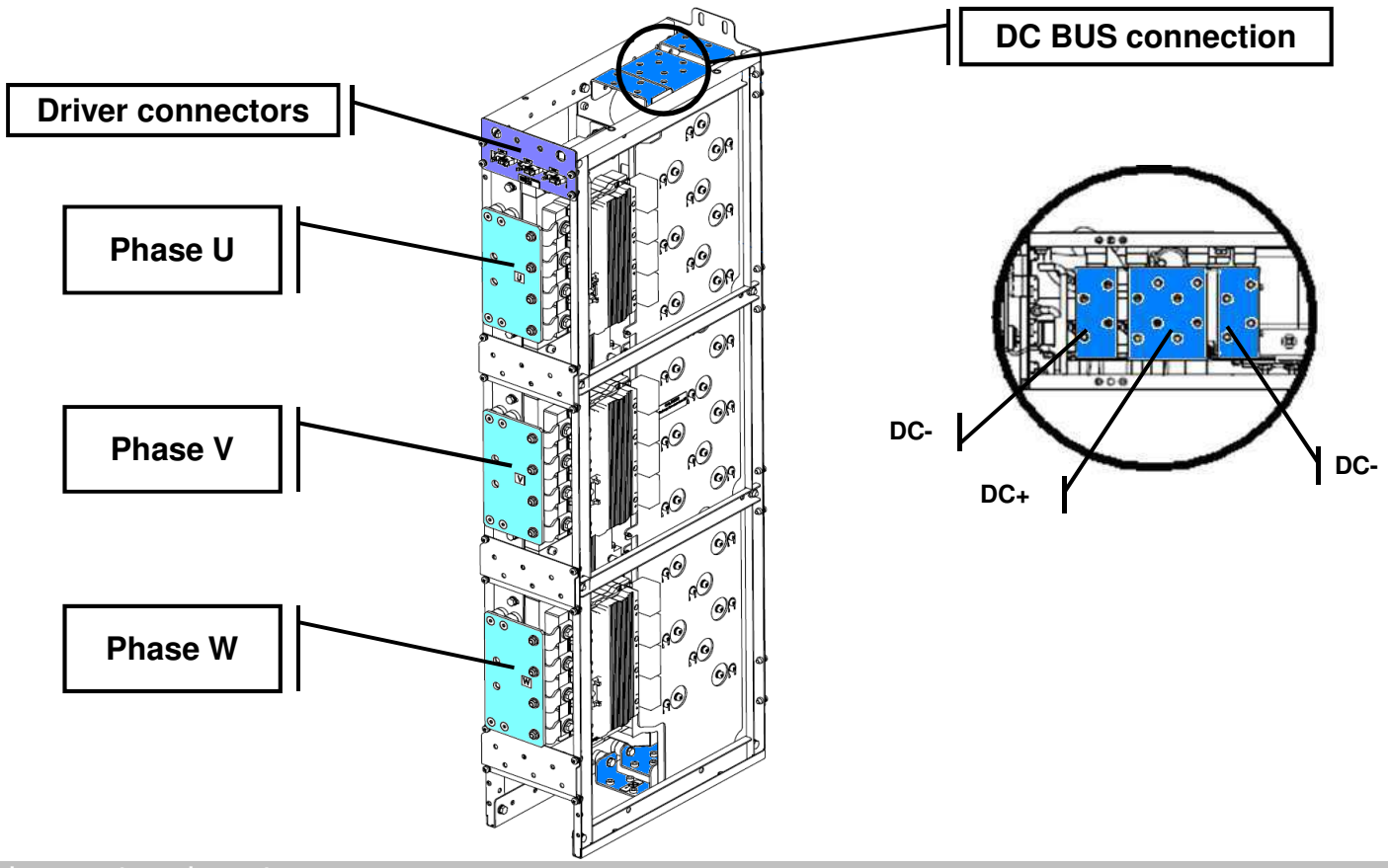


B6CI

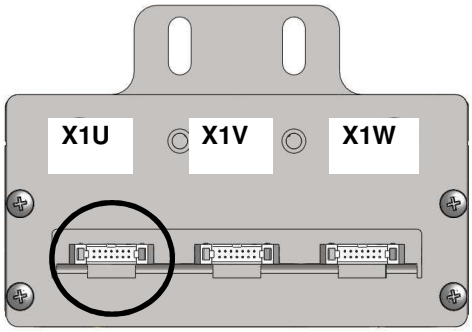
Environmental conditions		$T_{AMBIENT}$=40°C unless otherwise specified			
Characteristics	**Conditions**	**min**	**typ**	**max**	**Unit**
Climatic					
Ambient temperature 3)	Storage: IEC 60721-3-1, class 1K2 Transportation: IEC 60721-3-2, class 2K2	**-25**		**60**	°C
	Operation: IEC 60721-3-3, class 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**		-
Weight	3-phase inverter, with cable plate terminal and no DC bus connection		**98**		kg
Thermal data					
$\Delta V/\Delta t_{WATER}$	Water flow of the 3-phase inverter	**8**	**16**	**35**	L/min
ΔP_{WATER}	Water drop pressure of the inverter, with male and female connectors, 50% glycol, 16 L/min		**580**		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

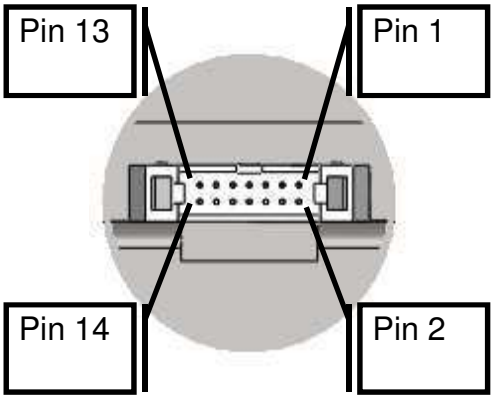
Gate Driver Characteristics			$T_{AMBIENT}$=25°C unless otherwise specified			
Symbol	**Conditions**		**min**	**typ**	**max**	**Unit**
Gate Driver / controler data						
V_S	supply voltage non stabilized		**13**	**24**	**30**	V
I_S	V_S = 24 V, F_{SW} in kHz, I_{RMS} in A			**330 + 55×F_{sw} + 0.00035×I_{RMS}^2**		mA
V_{iT+}	input threshold voltage HIGH		**12.3**			V
V_{iT-}	input threshold voltage LOW				**4.6**	V
R_{IN}	Input resistance			**10**		kΩ
C_{IN}	Input capacitance			**1**		nF
Measurement & protection						
I_{analog}	Analogue current signal			**250**		$A.V^{-1}$
$I_{TRIP\ SC}$	Over current trip level ($I_{analogue}$ OUT=10V)		**2450**	**2 500**	**2550**	A_{PEAK}
CMN_TMP	Analogue temperature signal Th < 80°C	min	**17 + 10.3×CMN_TMP**			°C
		typ		**19 + 10.5×CMN_TMP**		°C
		max			**20 + 10.5×CMN_TMP**	°C
CMN_TMP	Analogue temperature signal Th > 80°C	min	**26 + 8.8×CMN_TMP**			°C
		typ		**28 + 8.8×CMN_TMP**		°C
		max			**30 + 8.9×CMN_TMP**	°C
T_{TRIP}	Over temperature protection		**110**	**115**	**120**	°C

Electrical connection



Drive connector assignment





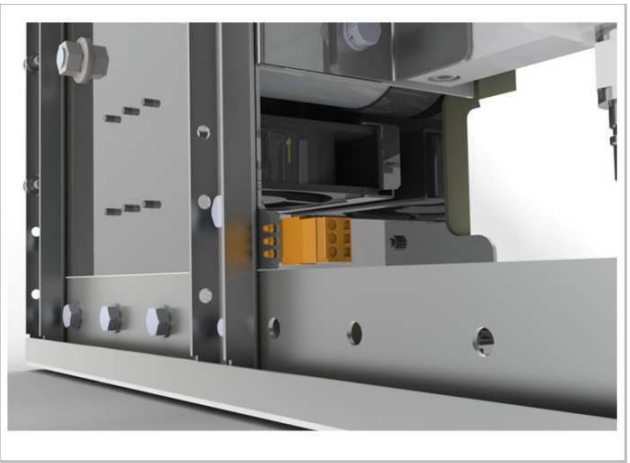
HE10-14 male connector

X1U, X1V, X1W

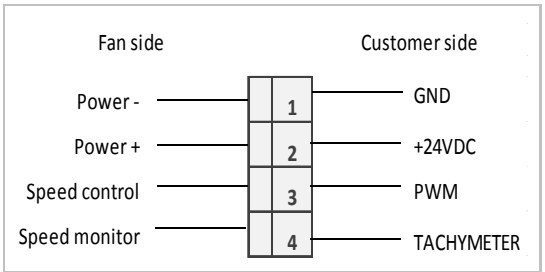
Pin	Signal	Remark
1	Shield	
2	BOT IN (2)	positive 15V CMOS logic; 10 kΩ impedance, don´t connect when using fiber optic
3	ERROR OUT (1)	LOW = NO ERROR; open Collector Output; max. 30 V / 15 mA don´t connect when using fiber optic, propagation delay 1 µs min. pulsewidth error-memory-reset 9 µs
4	TOP IN (2)	positive 15V CMOS logic; 10 kΩ impedance don´t connect when using fiber optic
5	Overtemp. OUT (1)	LOW = NO ERROR = ϑDCB < 115 + 5°C open collector Output; max. 30 V / 15 mA „low“ output voltage < 0,6 V „high“ output voltage max. 30 V
6	+ 24 VDC IN	24 VDC (SKiiP 2: 20 - 30 V, SKiiP 3: 13 - 30 V)
7	+ 24 VDC IN	don´t supply with 24V, when using +15 VDCIN supply voltage monitoring threshold 19,5 V
8	+15 VDC OUT	max. 50 mA auxiliary power supply when SKiiP system is supplied via pin 6/7
9	+15 VDC OUT	
10	GND	GND for power supply and GND for digital signals
11	GND	
12	Temp. analog OUT	max output current 5mA
13	GND aux	reference for analog output signals
14	I analog OUT	SKiiP 3 with Al2O3 ceramic substrate current actual value 8,0 V ⇔ 100 % IC @ 25 °C overcurrent trip level 10 V ⇔ 125 % IC @ 25 °C current value > 0 ⇔ SKiiP system is source current value < 0 ⇔ SKiiP system is sink SKiiP 3 with AlN ceramic substrate: refer to corresponding datasheet

1) Open collector output, external pull up resistor necessary
2) „high“ (max) 12,3 V, „low“ (min) 4,6 V; SKiiP 3: 1 nF capacitance added signal to GND

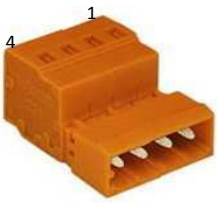
DC fan connection



Fan connection detail

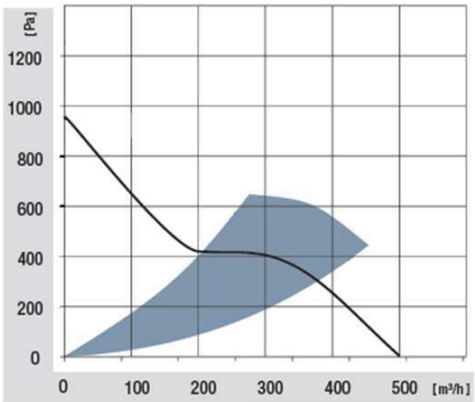


Fan connection detail

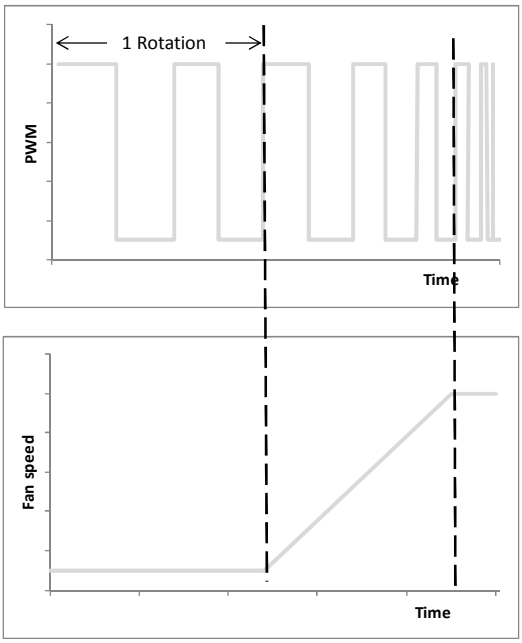


Pin	Designation
1	GND
2	+24VDC
3	PWM
4	MONITOR

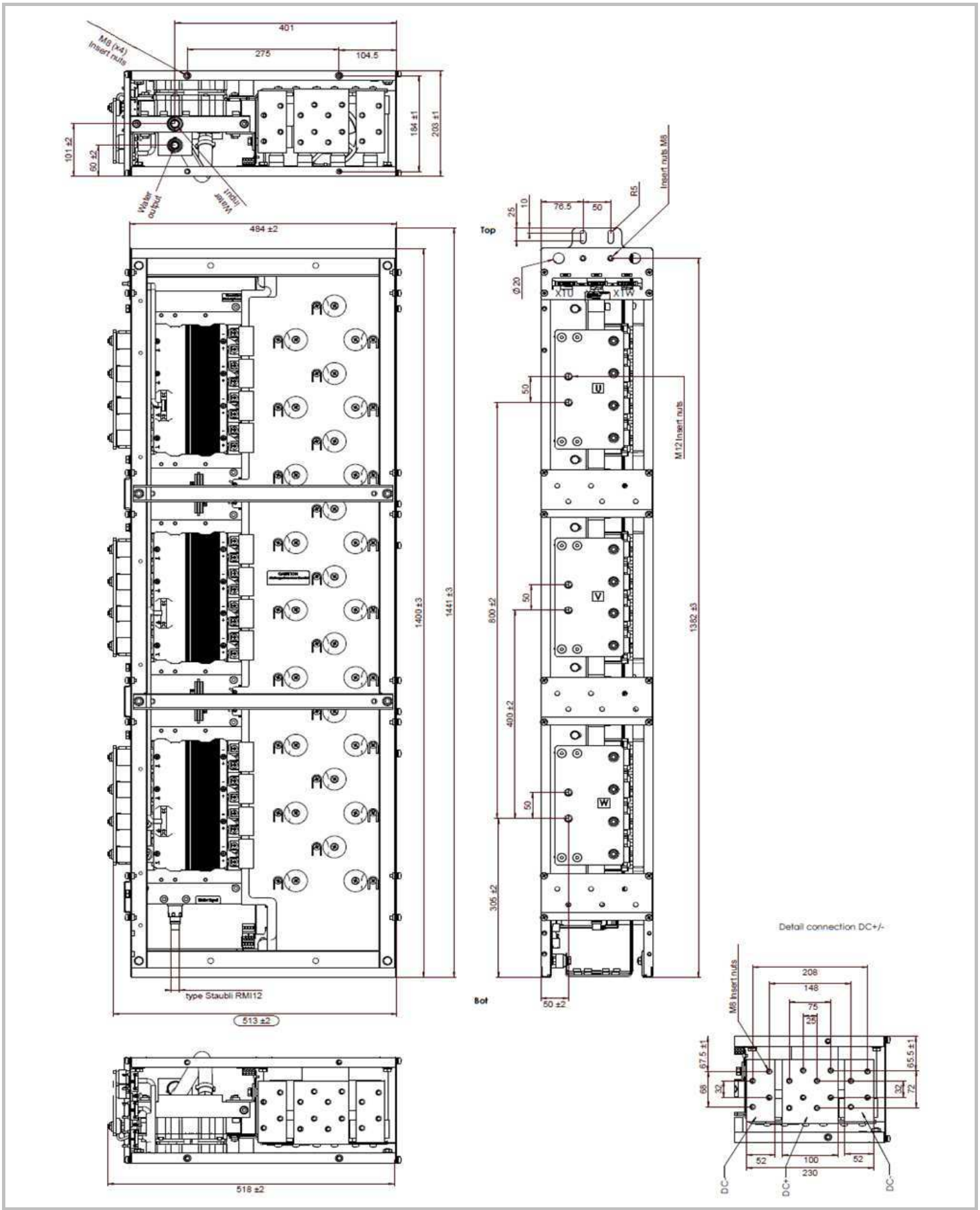
DC fan speed control



Characteristic pressure drop vs air flow



Speed control behavior



Dimensions

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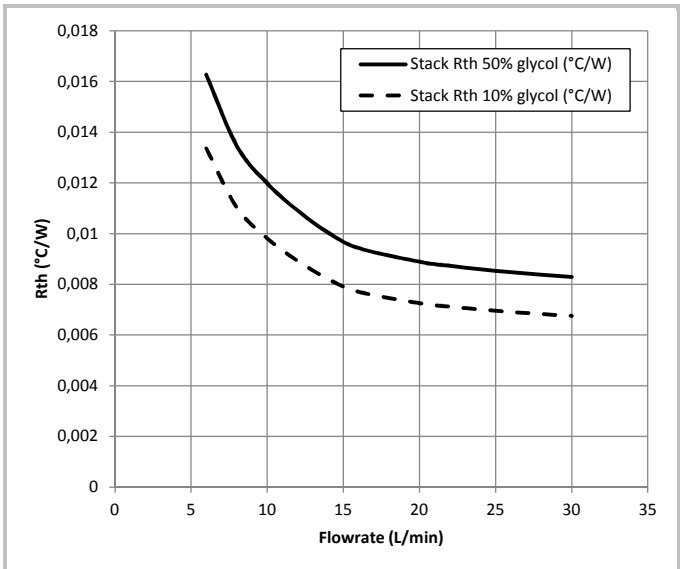
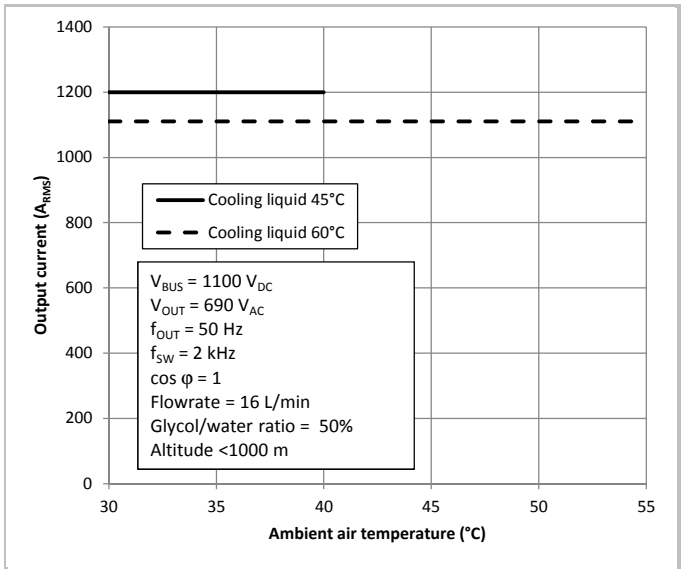
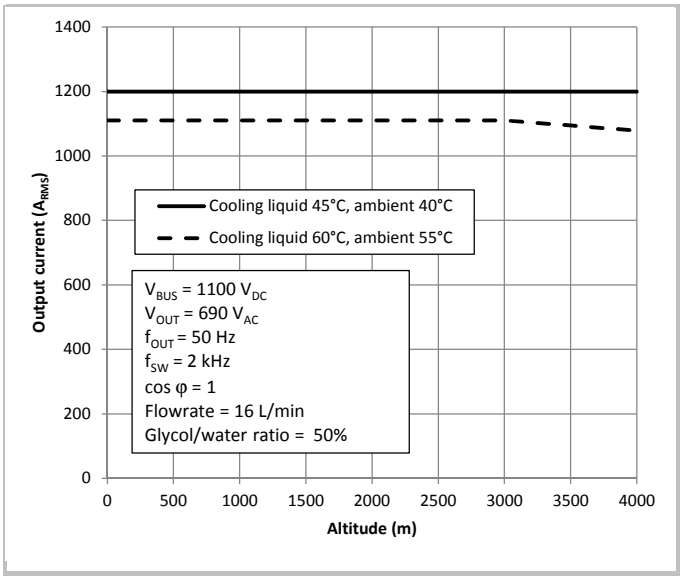


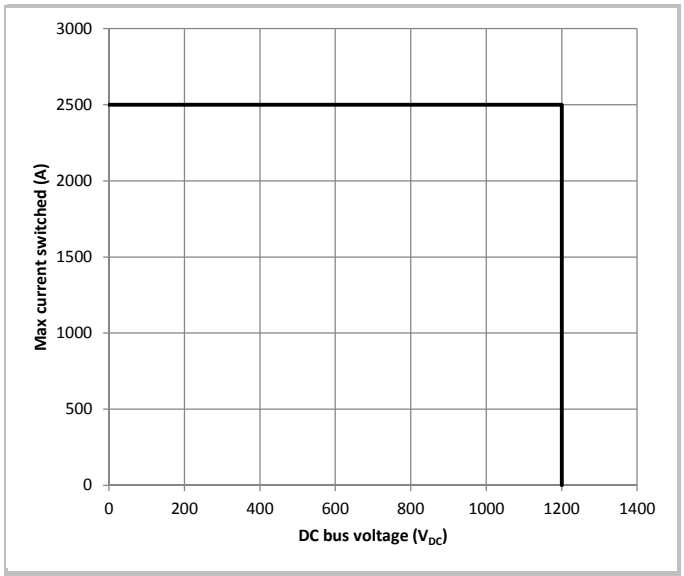
$Rth_{SinkWater}$(stack) vs. Liquid flow



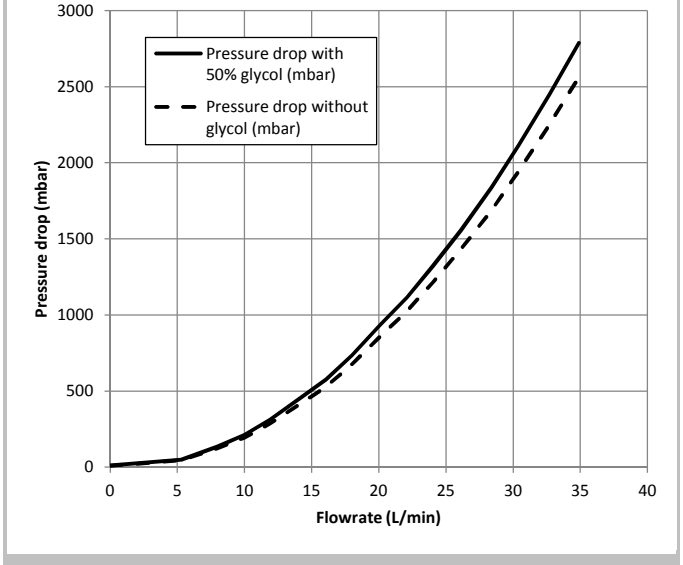
Permanent output current vs. Ambient Temperature



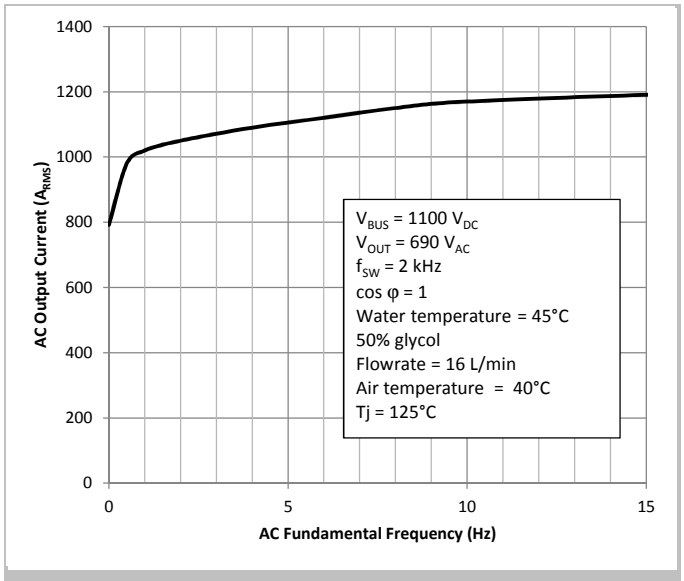
Permanent output current vs. Altitude



Safe Operating Area



Pressure Drop vs Flowrate



Permanent output Current vs. Output frequency