SKS B2 100 GD 69/11 - MA PB

SKiiP stack

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

Ordering No. 08800565
Description SKS B2 100 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 2013GB172-4DW, 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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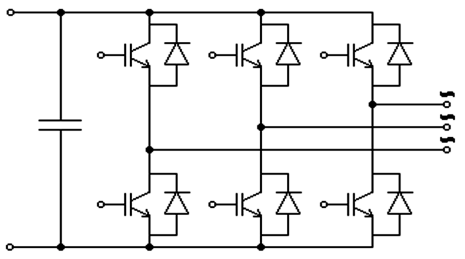

B6CI

Absolute maximum ratings [1]			
Symbol	**Conditions**	**Values**	**Unit**
$I_{OUT\ MAX}$	Maximum permanent output current	**1 000**	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						TAMBIENT=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 TJ<150°C, ambient air temperature = 40°C, air extraction according to thermal data page 2		**1 100**		V_{DC}
$I_{OUT\ RATED}$	Rated output current			**1 000**		A_{RMS}
$I_{OUT\ OVL}$	Overload output current			**1 100**		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			**1 200**		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			**11 200**		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)		**5**		min
C_{DC}	Capacitor bank capacity		**8,4**		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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- 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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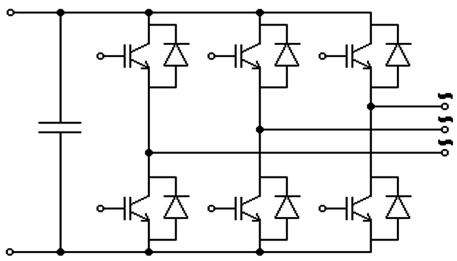
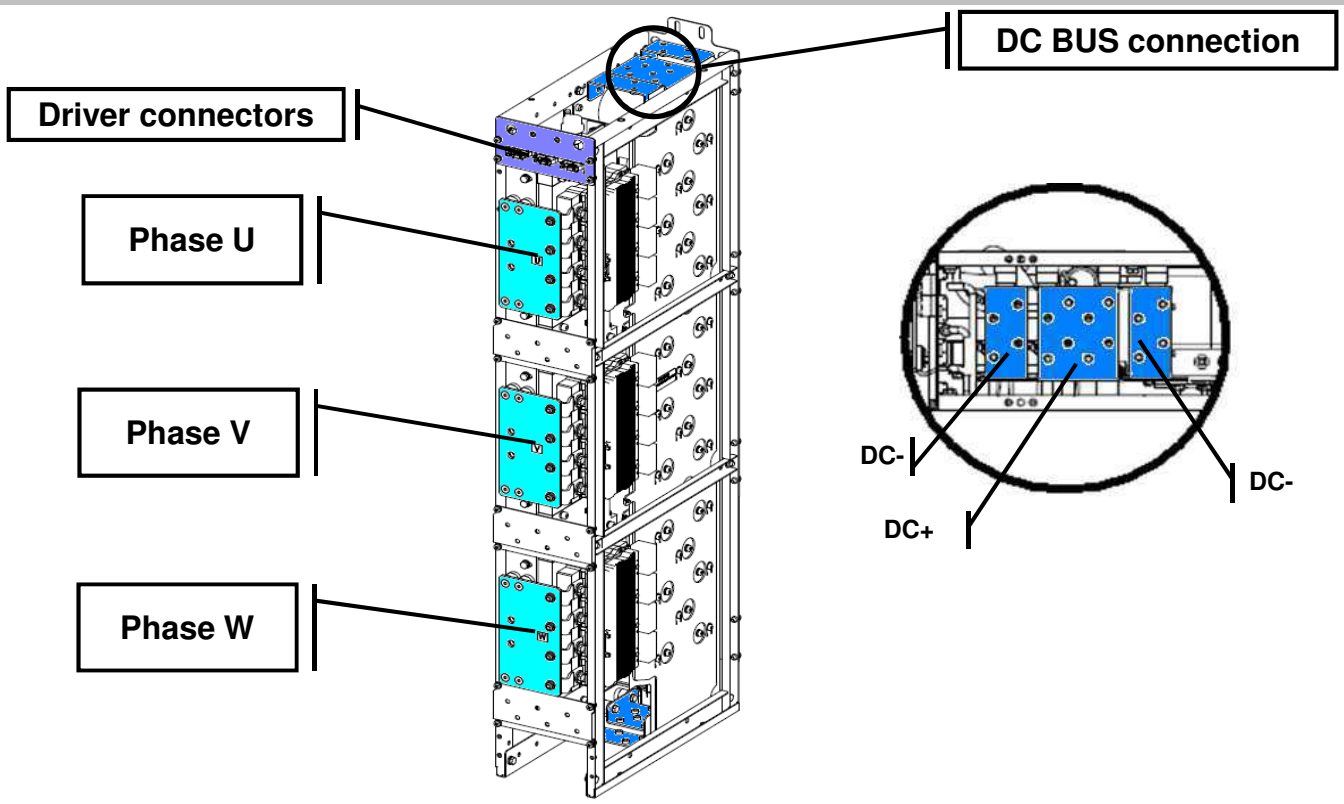


B6CI

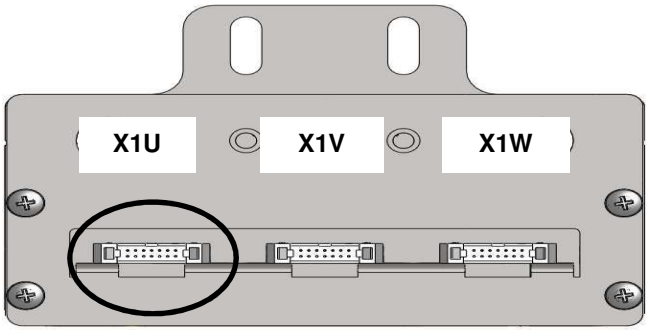
Environmental conditions					$T_{AMBIENT}$=40°C unless otherwise specified
Characteristics	**Conditions**	**min**	**typ**	**max**	**Unit**
Climatic					
Ambient temperature 3)	Storage: IEC 60721-3-1, class 1K2 Transportation: IEC 60721-3-2, class 2K2	**-25**		**60**	°C
	Operation: IEC 60721-3-3, class 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**		-
Mass	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 pressure drop 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

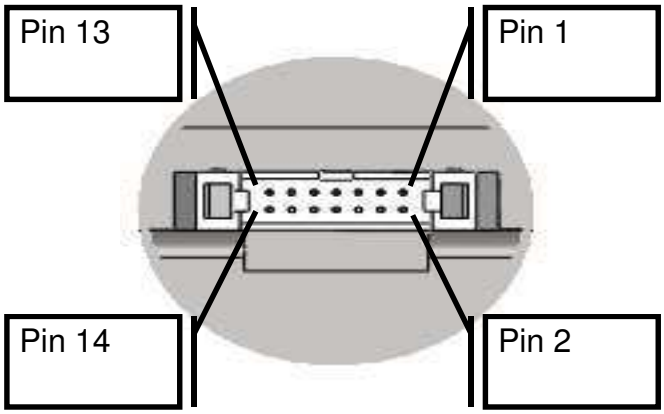
Gate Driver Characteristics					$T_{AMBIENT}$=25°C unless otherwise specified
Symbol	**Conditions**	**min**	**typ**	**max**	**Unit**
Gate Driver / controler data					
V_S	supply voltage non stabilized	**13**	**24**	**30**	V
I_S	V_{S2} = 24 V, F_{SW} in kHz, I_{RMS} in A	**$330 + 55 \times F_{sw} + 0.00035 \times I_{RMS}^2$**			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					
HB_I	Analogue current signal HB_I	**245**	**250**	**255**	$A.V^{-1}$
$I_{TRIP\ SC}$	Over current trip level ($I_{analogue}$ OUT=10V)	**2 450**	**2 500**	**2 550**	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





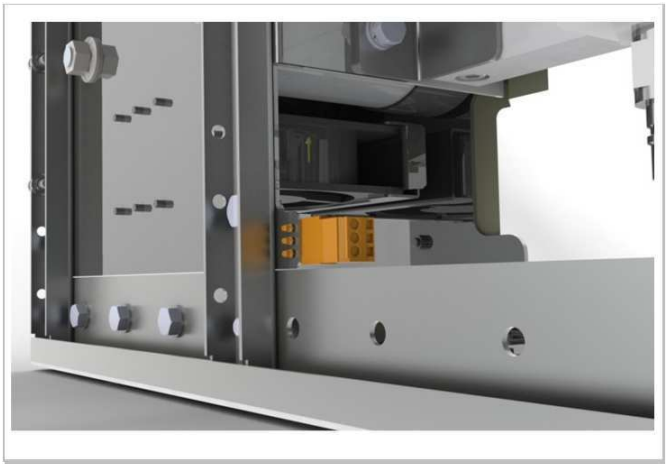
HE10-14 male connector

X1U, X1V, X1W

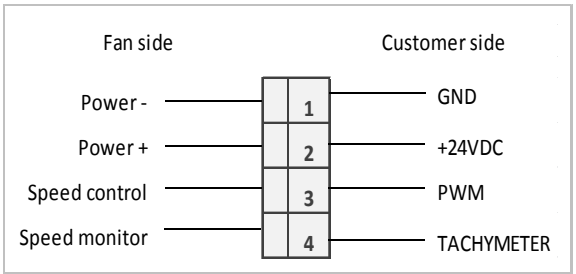
Pin	Signal	Remark
1	Shield	
2	BOT IN (2)	positive 15V CMOS logic; 10 kΩ impedance, don´t connect when using fiber optic
3	ERROR OUT (1)	LOW = NO ERROR; open Collector Output; max. 30 V / 15 mA don´t connect when using fiber optic, propagation delay 1 µs min. pulsewidth error-memory-reset 9 µs
4	TOP IN (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
9	+15 VDC OUT	SKiiP system is supplied via pin 6/7
10	GND	GND for power supply and
11	GND	GND for digital signals
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

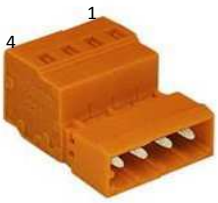
DC fan connection



Fan connection detail

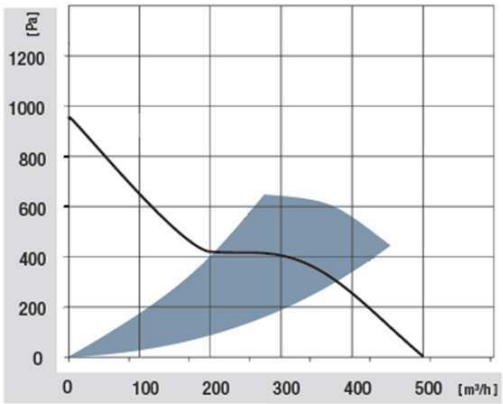


Fan connection detail

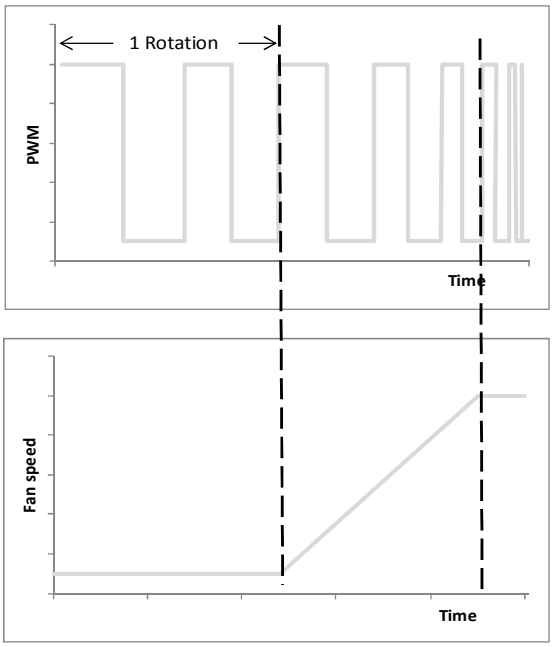


Pin	Designation
1	GND
2	+24VDC
3	PWM
4	MONITOR

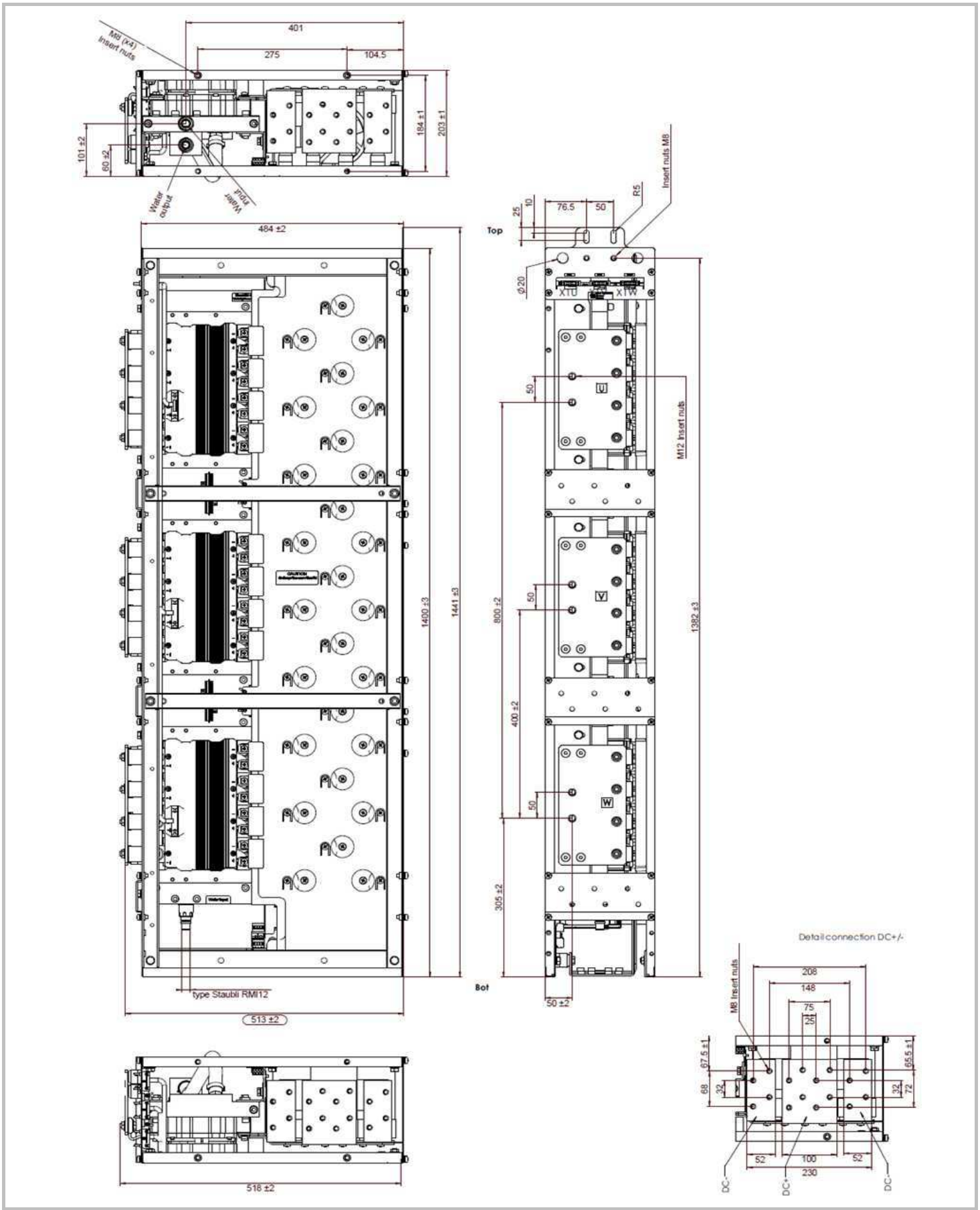
DC fan speed control



Characteristic pressure drop vs air flow



Speed control behavior



Dimensions

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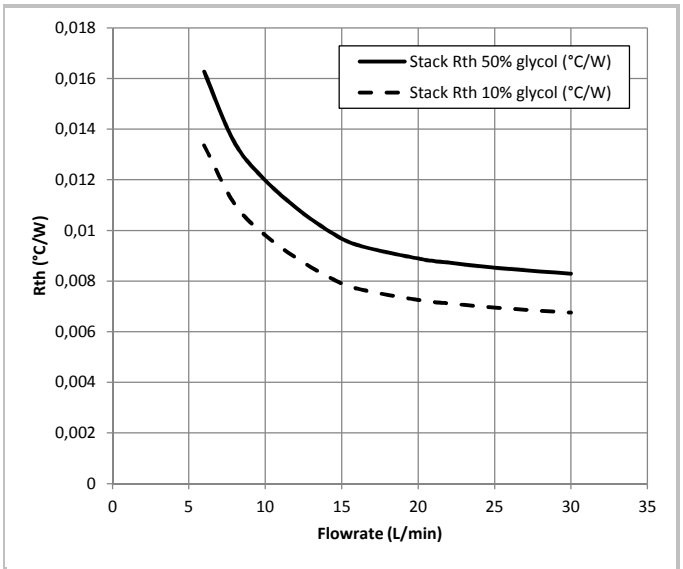
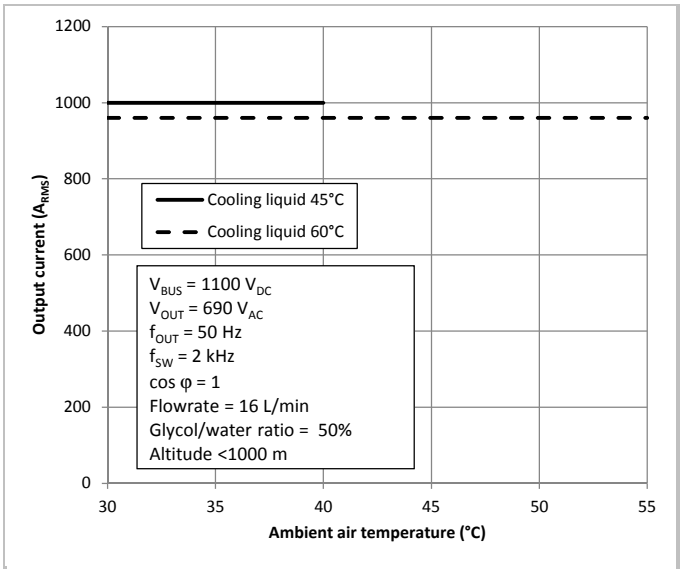
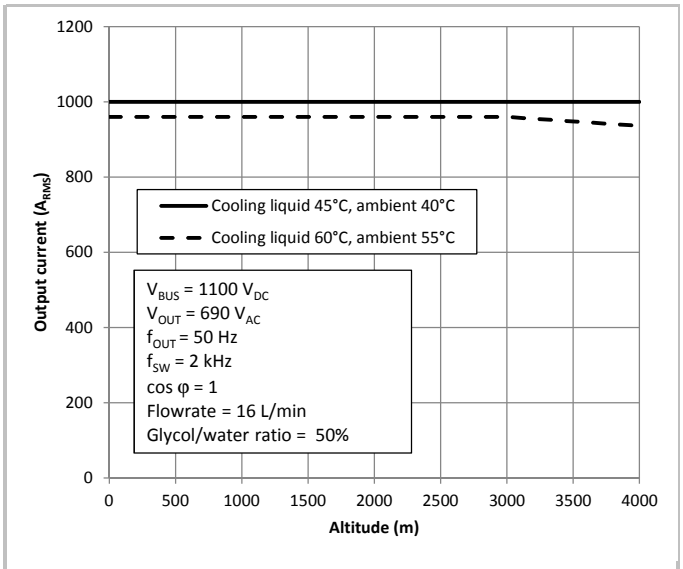


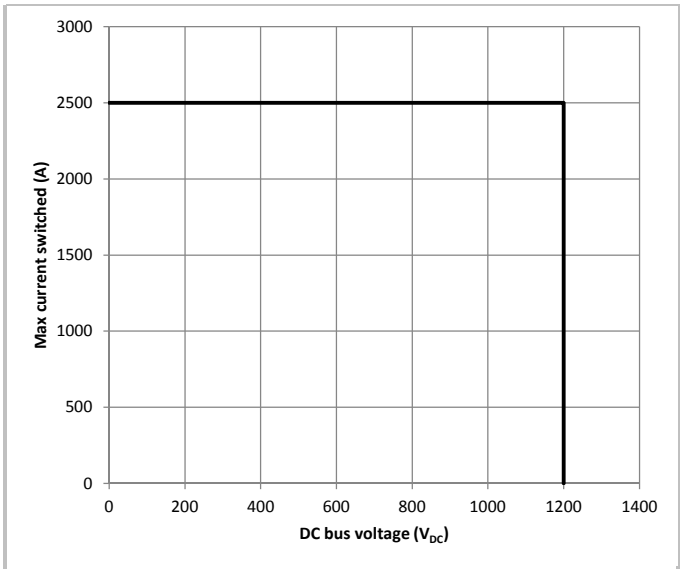
$Rth_{sink-water}$(stack) vs. Liquid Flow



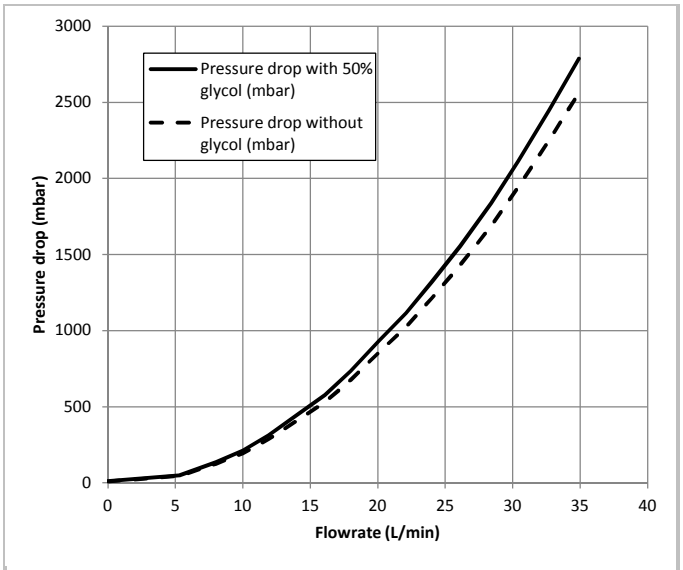
Permanent Output Current vs. Ambient Temperature



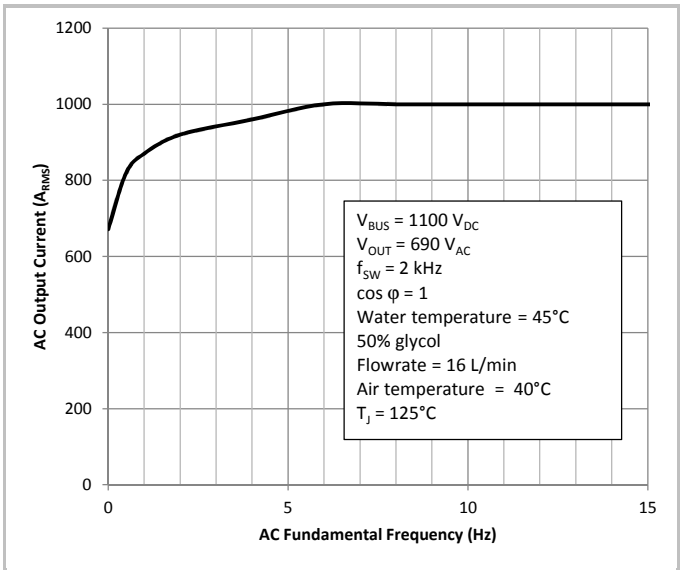
Permanent Output Current vs. Altitude



Safe Operating Area



Pressure Drop vs. Flowrate



Permanent Output Current vs. Output Frequency