SKS C 120 GDD 69/11 – A3A MA B1C

SKiiP stack

SKiiPRACK® - Type 3A

3-phase IGBT converter

This stack can be used as a 2Q 3-phase inverter or a 4Q converter. All values are valid for 2Q and 4Q configurations unless otherwise specified.

Ordering No. 08769360
Description 4Q / SKS C 120 GDD 69/11 – A3A MA B1C
2Q / SKS C 240 GD 69/11 – A3A MA B1C

Features

- Designed in regard to EN50178 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)
- High power AC drives

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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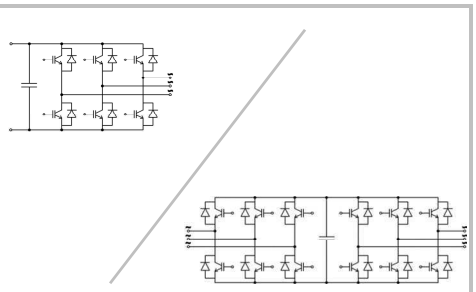
Before using the converter, please read carefully the SKiiPRACK® user manual.

Absolute maximum ratings 1)			
Symbol	**Conditions**	**Values**	**Unit**
$I_{IN\ MAX}$	Maximum permanent input current (4Q only)	**1 200**	A_{RMS}
$I_{OUT\ MAX}$	Maximum permanent output current	**2 400**	A_{RMS}
$V_{IN\ MAX}$	Maximum input voltage (4Q only)	**760**	V_{AC}
$V_{OUT\ MAX}$	Maximum output voltage	**760**	V_{AC}
$V_{BUS\ MAX}$	Maximum DC Bus voltage	**1 200**	V_{DC}
$F_{IN\ MAX}$	Inverter input frequency (4Q only)	**100**	Hz
$F_{OUT\ MAX}$	Inverter output frequency	**100**	Hz
$F_{SW\ MAX}$	Maximum switching frequency	**5**	kHz

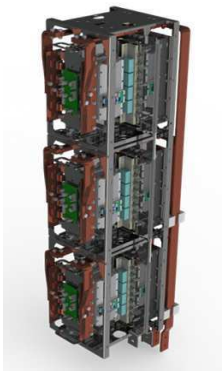
Electrical characteristics: application example						$T_{AMBIENT}$=40°C unless otherwise specified	
Symbol	**Conditions**		**min**	**typ**	**max**	**Unit**
AC phase Grid						
$I_{OUT\ RATED}$	Rated output current (4Q)	V_{BUS} = 1 100 V_{DC} T_{INLET} = 45°C, 50% glycol Flowrate = 12 L/min per cell T_J < 125°C Air extraction according to thermal data page 2		**1 200**		A_{RMS}
$I_{OUT\ RATED}$	Rated output current (2Q)			**2 400**		A_{RMS}
$I_{OUT\ OVL}$	Overload output current (4Q)			**1 320**		A_{RMS}
$I_{OUT\ OVL}$	Overload output current (2Q)			**2 640**		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 (4Q)			**1 430**		kW
P_{OUT}	Rated output power (2Q)			**2 870**		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			**14 160**		W
η 2)	Efficiency at rated current			**99**		%
AC phase Generator (4Q only)						
$I_{IN\ RATED}$	Rated input current	V_{BUS} = 1 100 V_{DC} T_{INLET} = 45°C, 50% glycol Flowrate = 12 L/min per cell T_J < 125°C Air extraction according to thermal data page 2		**1 200**		A_{RMS}
$I_{IN\ OVL}$	Overload input 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		**20**		**100**	Hz
PF	Power factor			**-1**		-
$P_{LOSS\ INV}$ 2)	Losses at rated current			**14 160**		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)		**6**		min
C_{DC}	Capacitor bank capacity		**14,0**		mF
LTE	Calculated LTE of the capacitors with forced air cooling		**100**		kh

Stack Insulation					
Crd	Minimum creepage distance	**8,7**			mm
Cld	Minimum clearance distance	**7,1**			mm
Visol	Chassis / Power stage AC/DC (insulation test voltage DC, 5 s)	**-4 200**		**4 200**	V_{DC}
Visol12	SKiiP driver only, output 1 / output 2 (AC, rms, 2 s)			**1 500**	V
dv/dt	SKiiP driver only, secondary to primary side			**75**	kV/µs



B6CI B6CI + B6CI



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Ordering No. 08769360
Description 4Q / SKS C 120 GDD 69/11 – A3A MA B1C
2Q / SKS C 240 GD 69/11 – A3A MA B1C

Features
- Designed in regard to EN50178 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)
- High power AC drives

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

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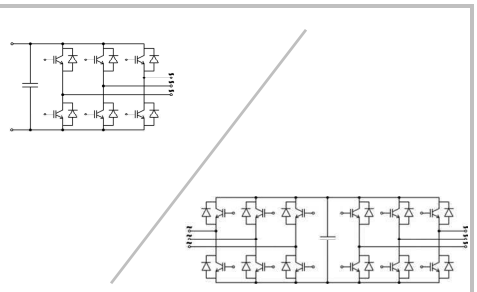
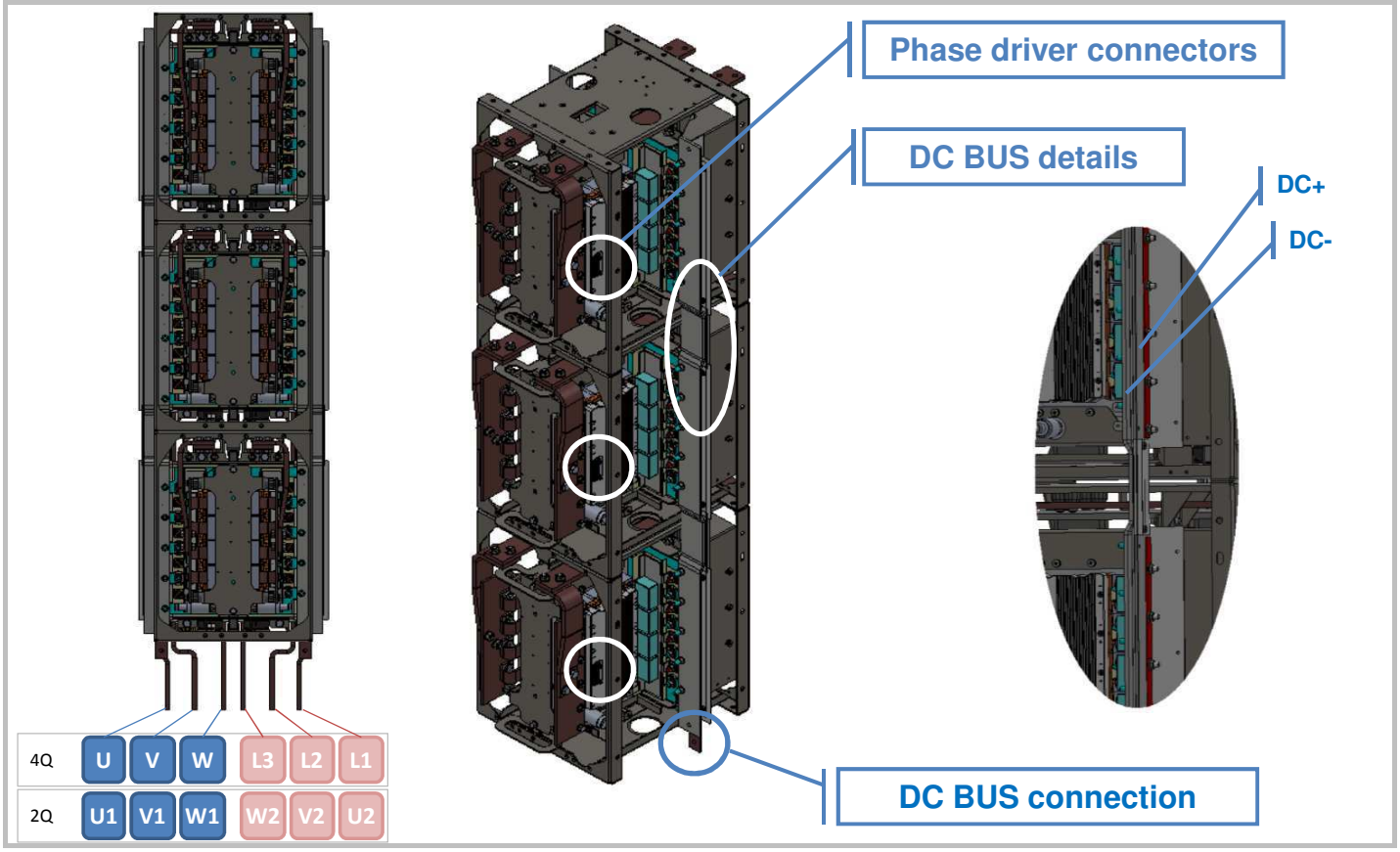
Environmental conditions		$T_{AMBIENT}$=40°C unless otherwise specified			
Characteristics	**Conditions**	**min**	**typ**	**max**	**Unit**
Climatic					
Ambient temperature 1)	IEC 60721-3, class 1K2&2K2 Storage & transportation	**-25**		**60**	°C
	IEC 60721-3-3, class 3K3 extended In operation	**-20**		**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			**4 000**	m
Protection degree	IEC 60529		**IP00**		-
Vibrations & Shocks	IEC 60721-3-2, Storage & transportation, 1 cell		**2M1**		-
	IEC 60721-3-3, in operation, 1 cell		**3M3**		-
Pollution degree	EN 50178		**2**		-
Mass	Cell		**80**		kg
	Full converter		**275**		kg
Thermal					
$\Delta V/\Delta t_{WATER}$	Water flow per cell	**8**	**12**	**24**	L/min
	Water flow per converter	**24**	**36**	**72**	L/min
ΔP_{WATER}	Pressure drop per cell, 50% glycol, 12 L/min		**130**		mbar
	Pressure drop per converter, 50% glycol, 36 L/min		**130**		mbar
Water pressure	Maximum water pressure permissible per cell		**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		**1**		ms^{-1}
V_{SUPPLY} [fan]	Capacitor DC fan operating voltage	**18**	**24**	**28**	V_{DC}
P_{FAN} per fan	Fan power consumption at typical voltage supply		**3,6**		W
LTE [fan]	Capacitor DC fan life time expectancy (L10 method)		**65**		kh

Gate Driver Characteristics			$T_{AMBIENT}$=25°C unless otherwise specified			
Symbol	**Conditions**		**min**	**typ**	**max**	**Unit**
Gate Driver / controler data						
V_{S2}	supply voltage non stabilized		**13**	**24**	**30**	V_{DC}
I_{S2}	VS2 = 13V - 30 V , F_{SW} in kHz, I_{AC} in A		**$330 + 55 \times F_{SW} + 0.00035 \times I_{AC}^2$**			mA
ViT+	input threshold voltage HIGH		**12.3**			V_{DC}
ViT-	input threshold voltage LOW				**4.6**	V_{DC}
R_{IN}	Input resistance			**10**		kΩ
C_{IN}	Input capacitance			**1**		nF
Measurement & protection						
HB_I	Analogue current signal I analog OUT		**245**	**250**	**255**	$A.V^{-1}$
I_{TRIPSC}	over current trip level (Ianalog 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

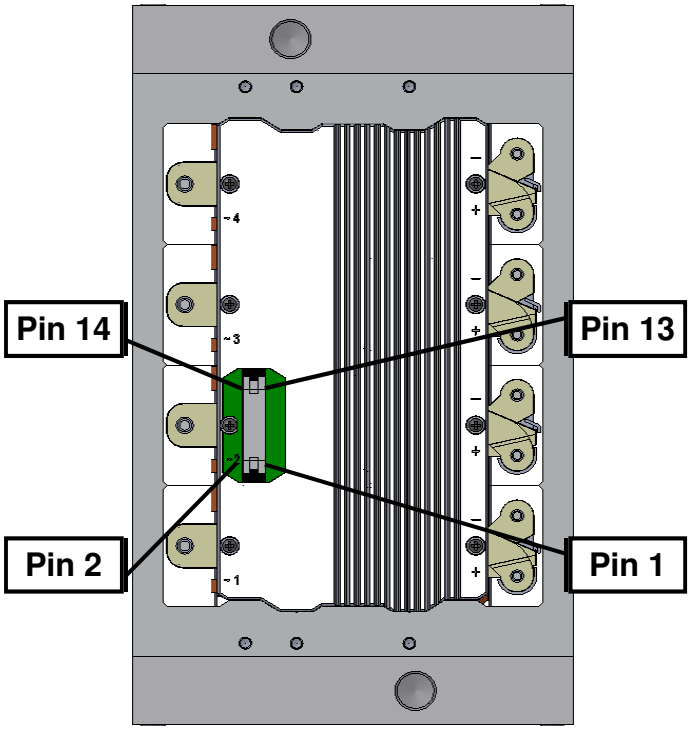


B6CI B6CI + B6CI

Electrical connection



Phase Driver connector assignment

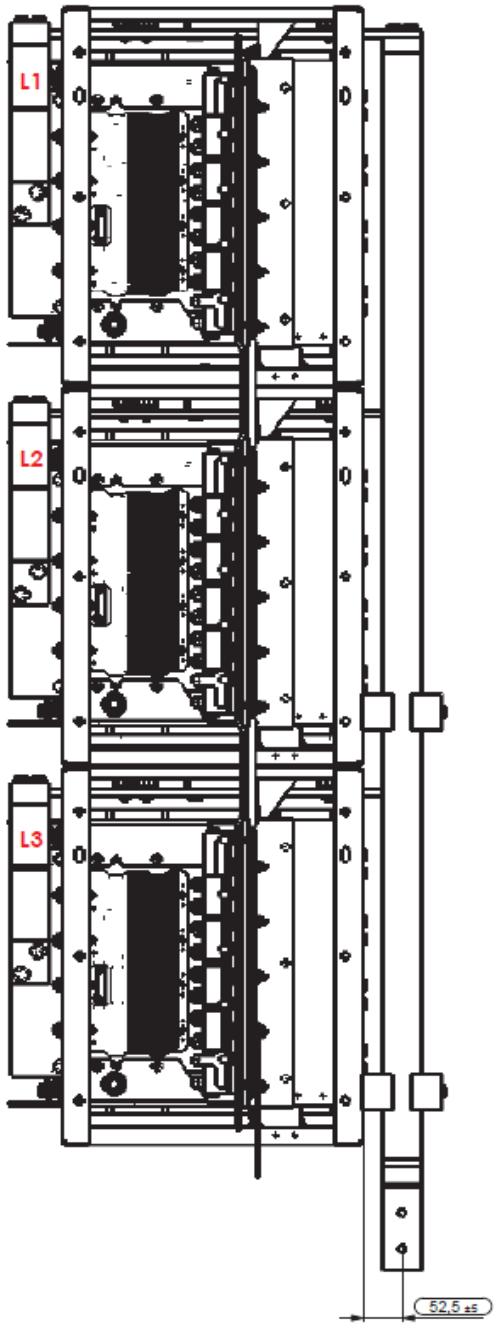


HE10-14 male connector

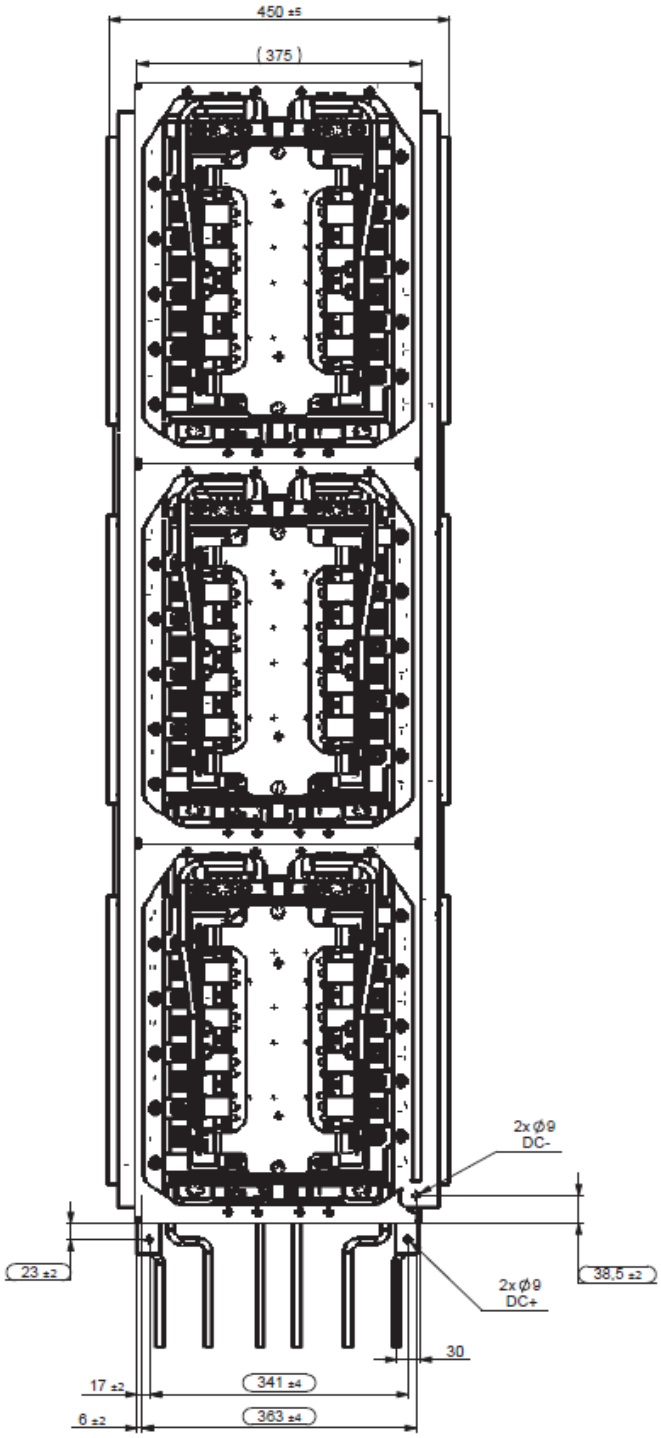
X1●

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 V_{DC} supply
7	+ 24 VDC IN	24 V_{DC} supply supply voltage monitoring threshold 19,5 V
8	+15 VDC OUT	max. 50 mA auxiliary power supply
9	+15 VDC OUT	
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

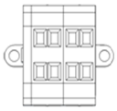
1) Open collector output, external pull up resistor necessary added signal to GND



RIGHT SIDE VIEW



FRONT VIEW



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

DC FAN CONNECTION (6 times)

Dimensions

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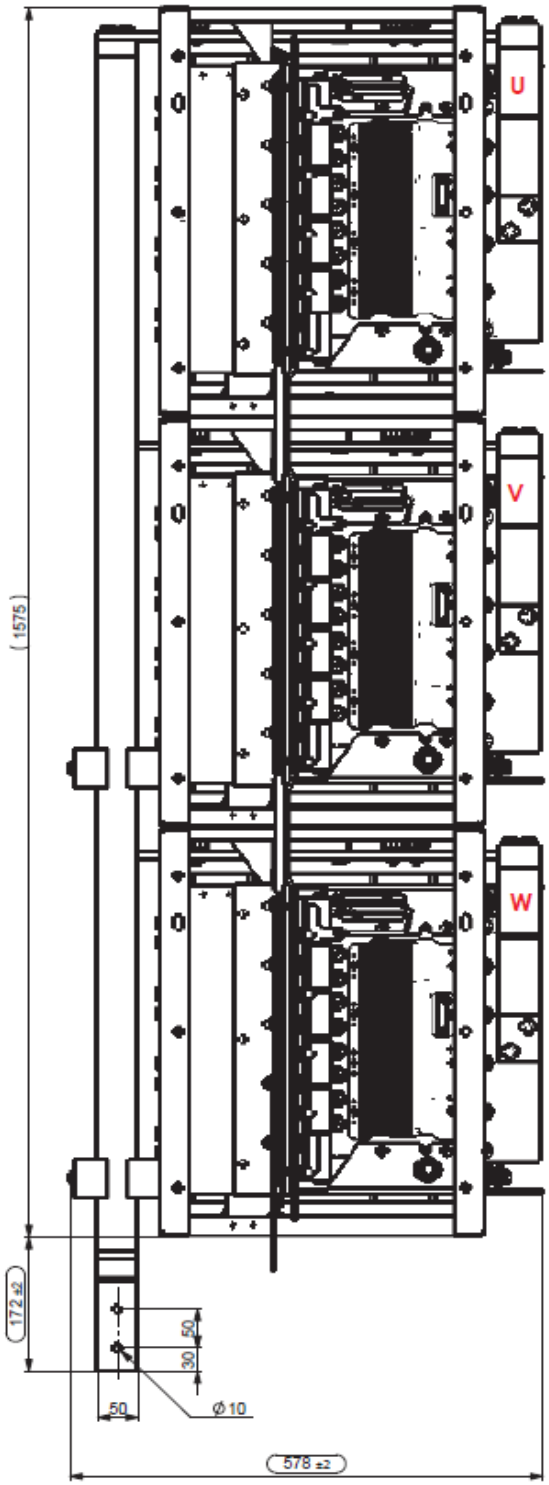
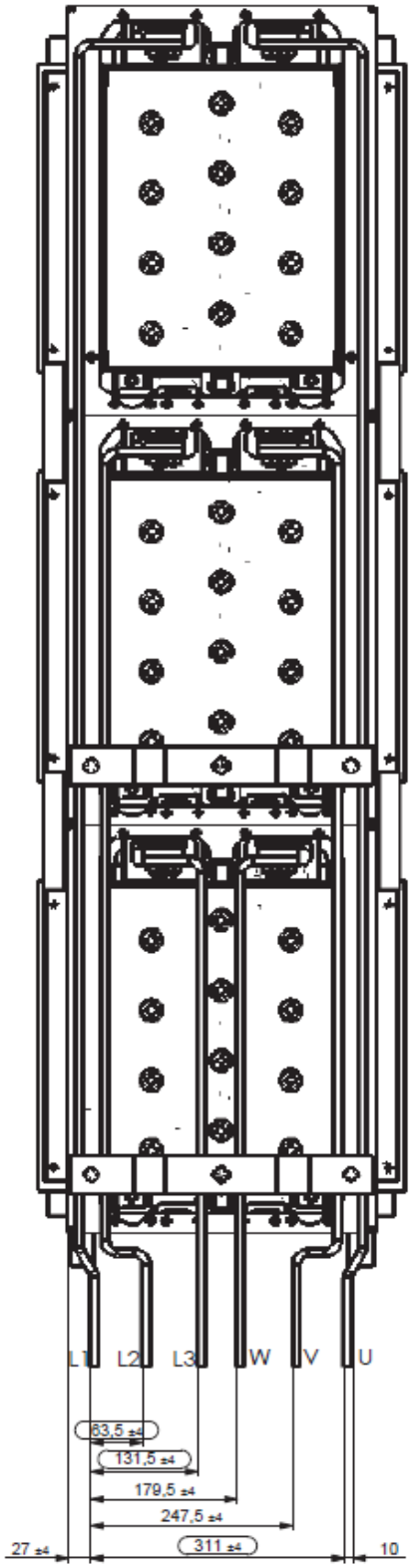


LEFT SIDE VIEW



REAR VIEW

Dimensions

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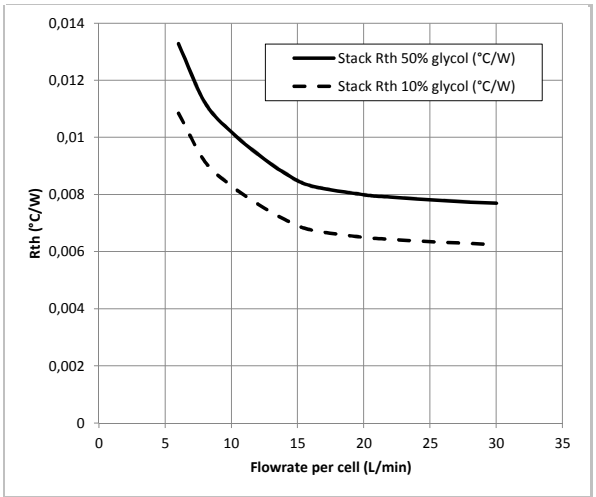
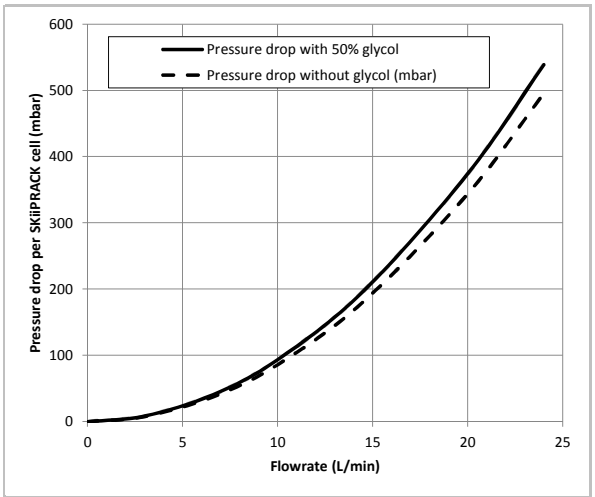
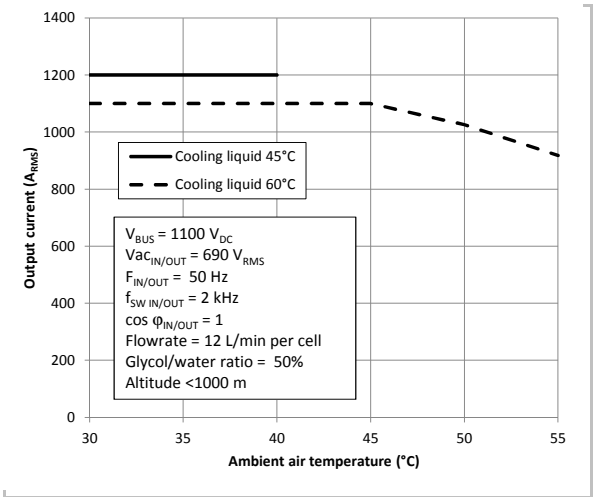


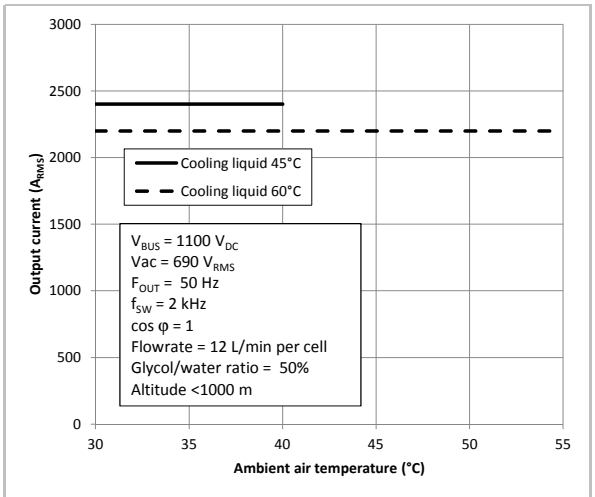
$Rth_{SINK-WATER}$(stack) vs. Liquid Flow



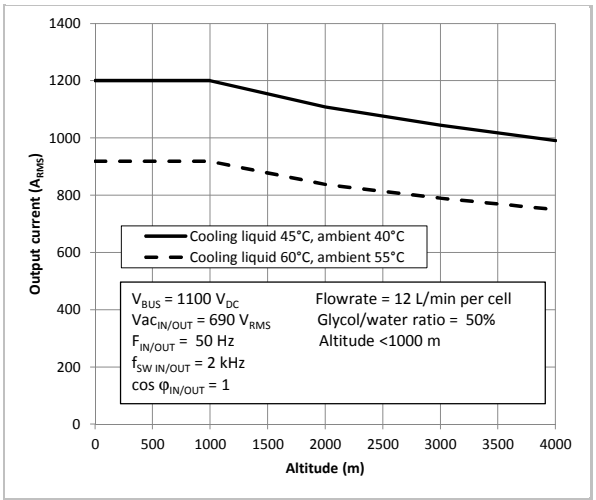
Pressure Drop vs. Flowrate (per cell)



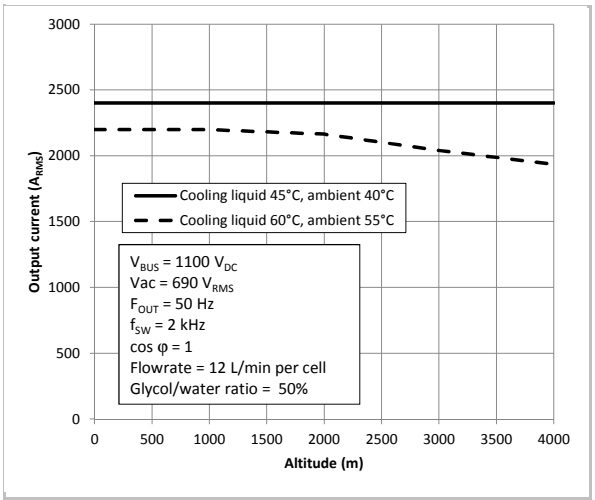
Permanent Output Current vs. Ambient Temperature (4Q)



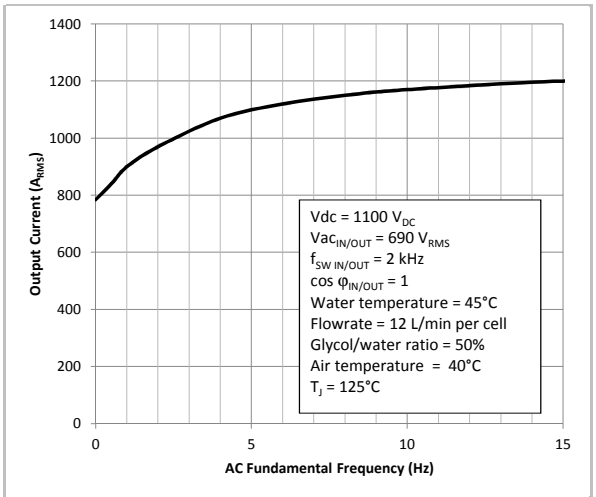
Permanent Output Current vs. Ambient Temperature (2Q)



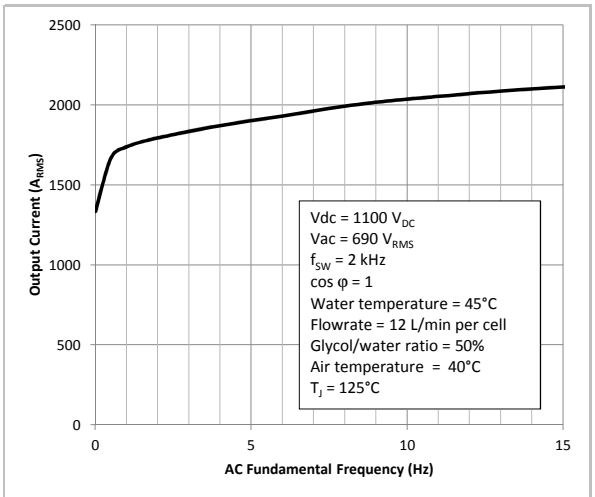
Permanent Output Current vs. Altitude (4Q)



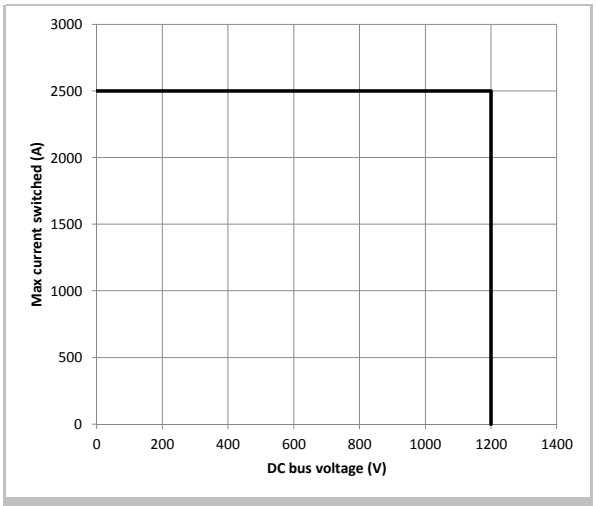
Permanent Output Current vs. Altitude (2Q)



Permanent Output Current vs. Output Frequency (4Q)



Permanent Output Current vs. Output Frequency (2Q)



Safe Operating Area (per SKiiP)