Hybrid Power

General Solution

Charger and Module(s)

- Innovative in energy storage & Power Electronics
- Custom-made solutions
- Complete solution: storage & Power Electronics
- Design and system integration

Features

- Long life cycle and life time
- CAN-bus interface
- Current sensing
- Specifications can be customized
- Programmable DC/DC charge
- Approved for heavy-duty shock and vibration norms

Mechanical Data

Charger
Length x Width x Height
137 x 270 x 75 mm (w/o connector lengths)
Approx. 3,0 kg

Module
Length x Width x Height
646 x 155 x 81 mm (w/o connector lengths)
Approx. 9,5 kg

Applications

- UPS wind turbine pitching
- Product storage AGV
- UPS

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AC/DC Charger Specifications

Symbol	Parameter	Description	Value	Unit
	General			
P_r	Rated power	@S_r 320VDC, I_{charge} 3A	1,0	kW
P_{max}	Max. power		2,4	kW
f_r	Switching frequency		20	kHz
η_r	Efficiency		>90	%
	Primary side			
U_{pr}	Rated voltage		400	V AC ±10%
$U_{p,max}$	Max. operating voltage		440	V AC
	Secondary side			
U_{sr}	Output voltage		160 up to 480	V DC
$U_{s,max}$	Max. operating voltage		500	V DC
I_{charge}	Charge current		Up to 5	A
	Energy demand			
	Control voltage		24	V DC ±10%
	Control current		0,5	A

Capacitor Module Specifications

Symbol	Parameter	Description	Value	Unit
	Capacitance			
C_s	Rated capacitance		5,47	F
	Tolerance capacity		+20/-0	%
	Voltage			
U_{NOM}	Nominal charging voltage		160	V DC
U_{MAX}	Max. operating voltage		172,8	V DC
U_{ISO}	Isolation voltage		600	V DC
	Resistance			
ESR_{DC}	Internal resistance		200	mΩ
	Environment			
T_a	Operating temperature range		-40 till +65	°C
$T_{STORAGE}$	Storage temperature range		-40 till +70	°C
	Protection class		IP40	
	Power (cells only)			
P_d	Rated power density	@V_r and ESR,DC_{max}*	8,01	kW/kg
P_{max}		@V_{max} and ESR,AC*	9,35	kW/kg

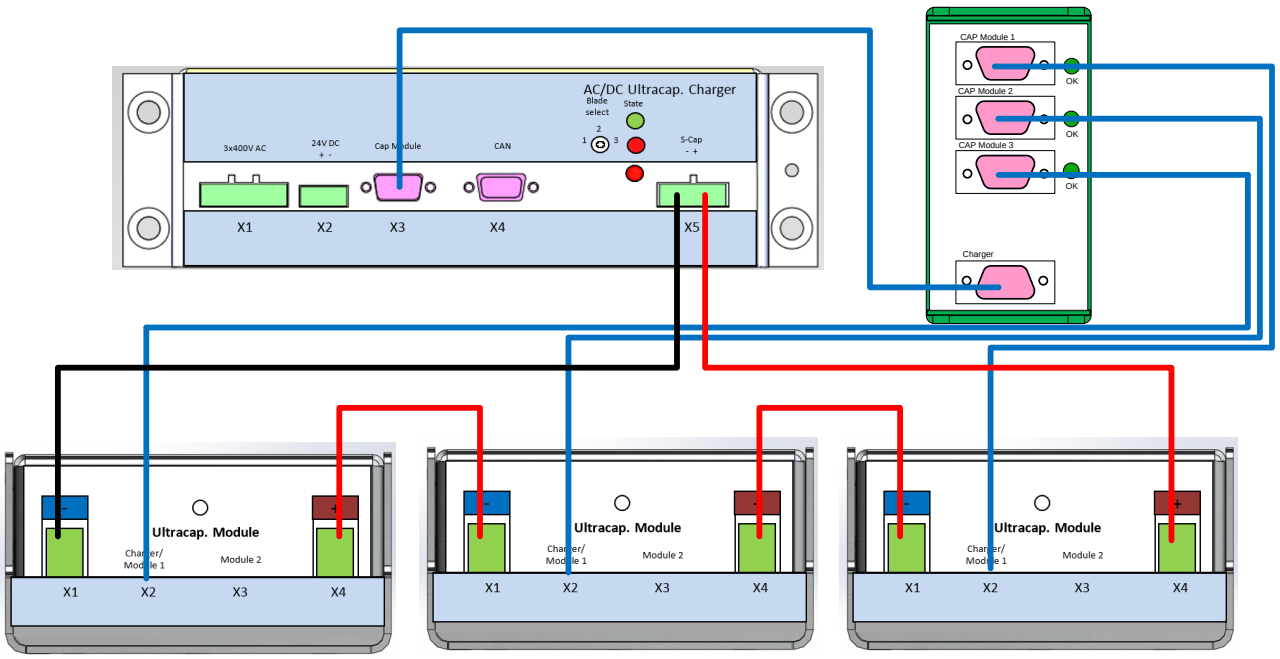
Symbol	Parameter	Description	Value	Unit
	Power (cells in module housing)			
P_d	Rated power density	@V_r and ESR,DC_{max}*	3,26	kW/kg
P_{max}		@V_{max} and ESR,AC*	3,79	kW/kg
	Energy (module)			
E_{max}	Energy density	@V_{max}	2,4	kW/kg
E_{ava}	Available energy	Between V_{max} and ½ V_{max}	17,8	Wh
	Current			
I_{AVG}	Rated continuous current		25	A
I_{LEAK}	Leakage current		0,3	mA

The modules can be connected in series, parallel and series parallel to fit the system requirements (voltage, power and energy). With more than two modules, a ''monitoring board'' is needed to combine the module OK- and temperature signals.

Typical Installation

Many different configurations are possible. Up to three modules can be placed in series to fit the system voltage. Two strings can be placed to fit the system energy and/or power demand.

The following figure is showing a typical configuration for a 480 V DC application.



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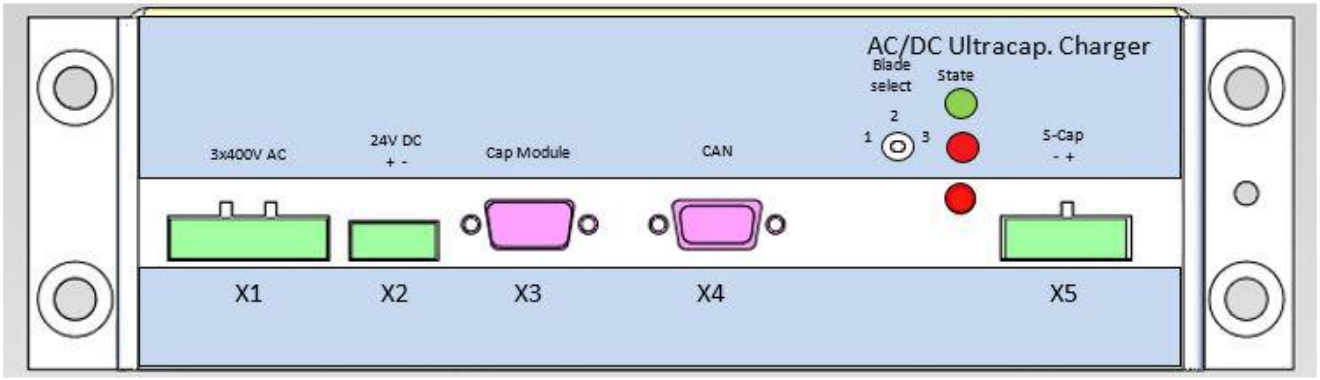
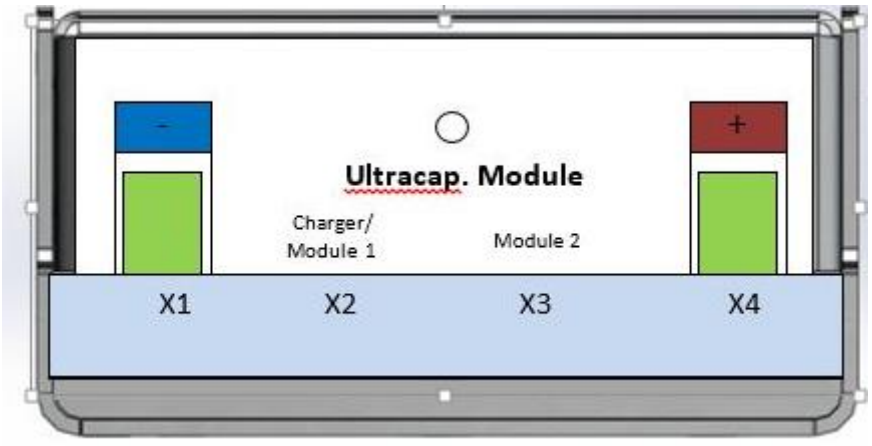
Power inputs / outputs

Connector	Application	Value
X1	Main Supply	3x 400V AC / 1A
X2	Auxiliary supply	24V DC
X3	Capacitor Signals	Connect to monitoring board ''charger'' or module 1
X4	CAN-bus	CAN-open, communication (status, warnings and error) with extern main-control or PLC
X5	Ok-BC2	0V DC to 500V DC



Connector	Application	Value
X1	Capacitor negative	
X2	Capacitor signals	
X3	2nd capacitor	
X4	Capacitor positive	



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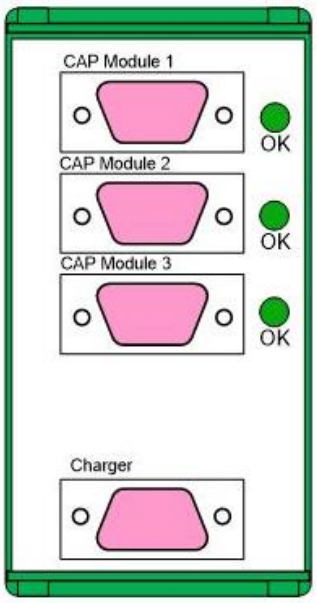
Monitoring Board

Connector	Application	Value
CAP module 1	Capacitor signal	Temperature & OK-bit; Connect to CAP module 1 ''X2''
CAP module 2	Capacitor signal	Temperature & OK-bit; Connect to CAP module 2 ''X2''
CAP module 3	Capacitor signal	Temperature & OK-bit; Connect to CAP module 3 ''X2''
Charger	Status CAP modules	Highest temperature & OK signal; Connect to charger ''X3''



Signal inputs / outputs AC/DC Charger

X1 main supply

Pin	Function
1	L1
2	L2
3	L3

X2 Auxiliary supply

Pin	Function
1	+ 24V
2	0V

X3 capacitor signals connected to cap-module 1

Pin	Function
1	Monitoring loop cap-module 1 positive
2	Monitoring loop cap-module 1 negative
3	Temperature cap-module 1
4	Monitoring loop cap-module 2 positive
5	Monitoring loop cap-module 2 negative
6	Temperature cap-module 2
7	Auxiliary supply positive
8	Auxiliary supply negative
9	Temperature ground

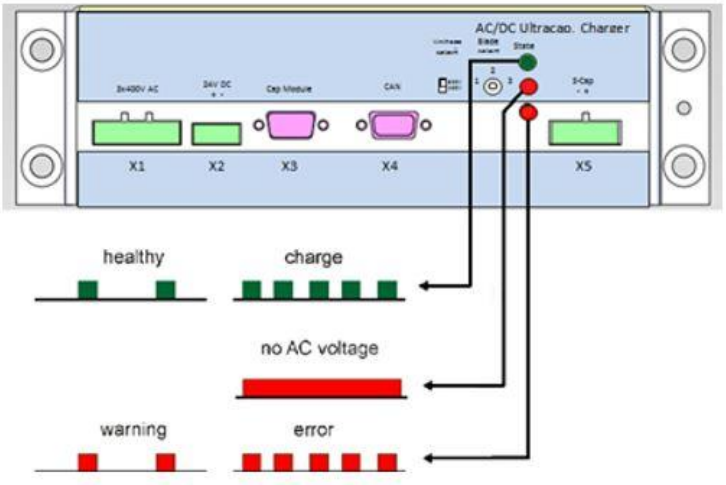
X4 CAN-bus

Pin	Function
2	CAN L
3	CAN GND
4	Termination H
5	Termination L
7	CAN H
1, 6, 8, 9	NC

X5 DC-out

Pin	Function
1	- DC out
3	+ DC out

LED signal-status



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Signal inputs / outputs Capacitor Module

X1 DC out

Pin	Function
1	- DC out
2	- DC out

X2 capacitor signals connected to charger

Pin	Function
1	Monitoring loop cap-module 1 positive
2	Monitoring loop cap-module 1 negative
3	Temperature cap-module 1
4	Monitoring loop cap-module 2 positive
5	Monitoring loop cap-module 2 negative
6	Temperature cap-module 2
7	Auxiliary supply positive
8	Auxiliary supply negative
9	Temperature ground

X3 capacitor signals connected to cap-module 2

Pin	Function
1	Monitoring loop cap-module 2 positive
2	Monitoring loop cap-module 2 negative
3	Temperature cap-module 2
4	NC
5	NC
6	NC
7	Auxiliary supply positive
8	Auxiliary supply negative
9	Temperature ground

X4 + DC – out

Pin	Function
1	+ DC out
2	+ DC out

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Connectors – Charger

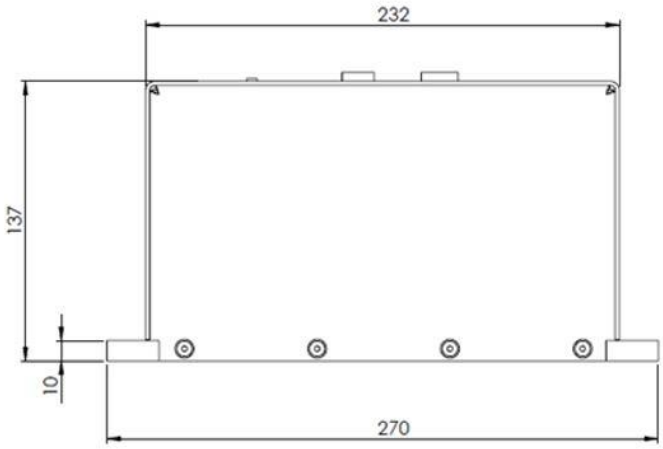
Connector	Application	Order No.	Make	Spec.
X1	Main supply 400V AC	1939756	Phoenix contact	GFKC 2,5/3-STF-7,62
X2	Auxiliary supply 24V DC	1851232	Phoenix contact	FK-MCP 1,5/2-STF-3,81
X3	Capacitor signals			
X4	CAN-bus			
X5	DC output 160 V DC	1939743	Phoenix contact	GFKC 2,5/2-STF-7,62

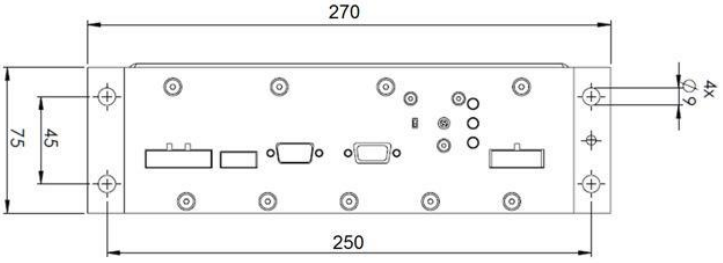
Connectors – Module

Connector	Application	Order No.	Make	Spec.
X1	Capacitor negative	1718481	Phoenix contact	SPC 5/2-STCL-7,62
X2	Capacitor signals			
X3	2nd capacitor			
X4	Capacitor positive	1718481	Phoenix contact	SPC 5/2-STCL-7,62

Mechanical data – Charger

Length x Width x Height:	137 x 270 x 75 mm (w/o connector lengths)
Weight:	3,0 kg
Housing:	IP40 (connector IP20)
Mounting:	DIN rail mounting on l x h side





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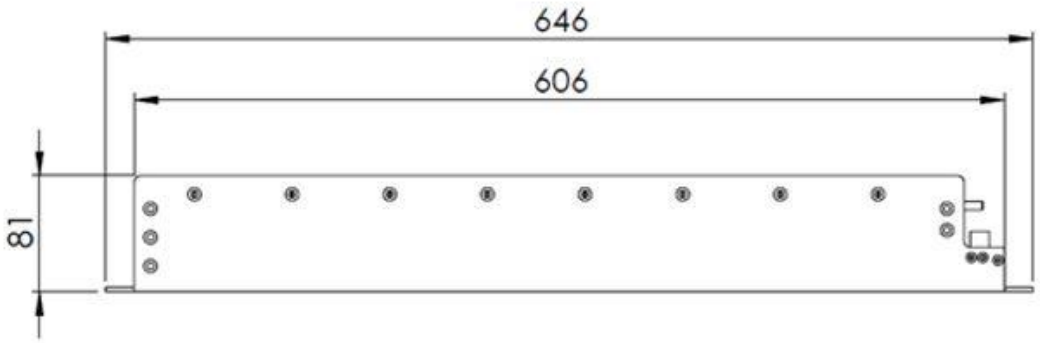
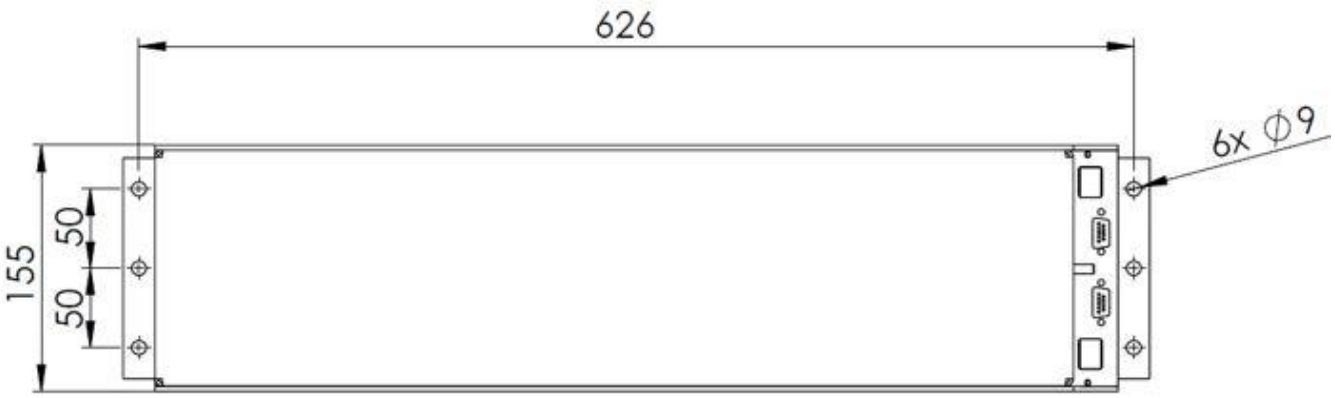
Mechanical data – Module

Length x Width x Height:	646 x 155 x 81 mm
Weight:	9,5 kg
Housing:	IP40 (connector IP20)
Mounting:	DIN rail mounting on l x w side





Certifying Tests

Description	Conditions
IEC60068	Shock and vibration
EN 61000	Electric Magnetic Compatibility (EMC)
	Temperature test -40°C till 60°C