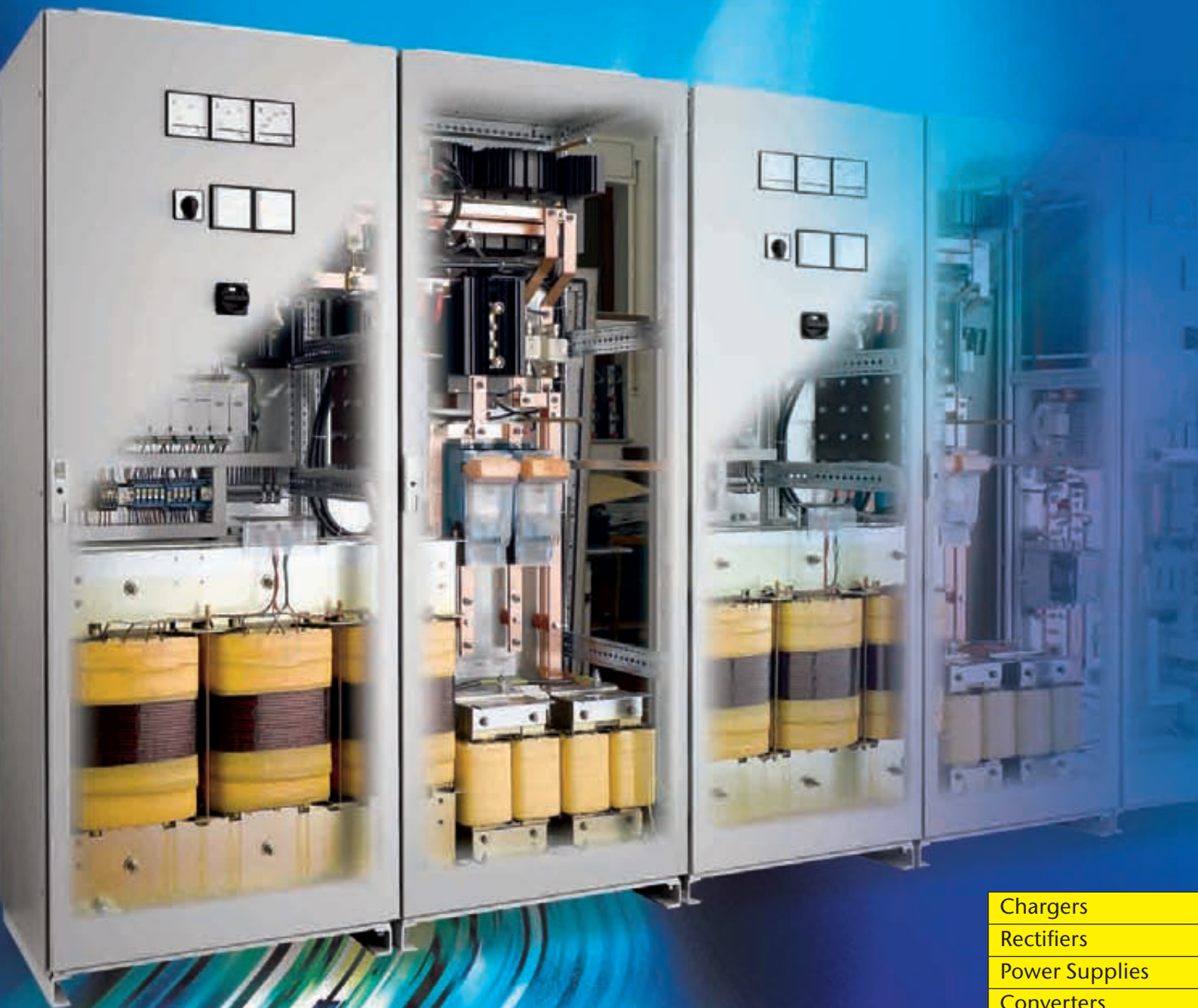


SCHAEFER

Power Conversion Systems

Your solution designed and manufactured in Germany



Chargers
Rectifiers
Power Supplies
Converters
Inverters
Systems

SCHAEFER

workforce Schäfer Elektronik, a German company, was founded in 1969 and has grown to a dedicated workforce of 140 people.

experience Thanks to decades of experience in design and manufacturing of power supplies, Schaefer offers a large variety of products, options, and enhancement features. In the field of high power requirements, Schaefer has achieved and continues to command a leading position.

client orientation Consultation and co-operation between the Schaefer team and the client / clients' representatives or consultants, aims to choose or adapt a Schaefer solution to the clients' needs.

flexibility With the production located next to the development department an optimum reaction can be accomplished during all stages of a project. Hence the client gets tailor-made solutions for large or small quantity requirements.

reliability Schaefer power solutions are used for applications which often demand a high level of reliability under severe environmental conditions such as, but not limited to:

- Power generation plants
- Oil & Gas industry
- Desalination plants
- Chemical plants
- Industrial automation
- Telecommunication
- Transport on board & way side
- Military industry



quality Development guidelines, arduous selection of industrial components regarding their load criteria and temperature performance as well as many test procedures during all steps of production ensure the highest product quality. In addition, Schaefer pursues a full supplier management according to ISO 9001 which guarantees permanent improvement of the products especially within the turbulent market of electronic components.

contact Through headquarters in Germany, a local branch office in the UAE and an international network of representatives, Schaefer can offer prompt technical support worldwide.



Specifications

Input

Voltage	230 VAC $\pm 10\%$, 1-phase or 400 VAC $\pm 10\%$, 3-phase (other voltages upon request)
Frequency	50 or 60 Hz $\pm 5\%$
Current	see tables of page 6/7
Protection	by fuse

Output

Nominal voltage	see tables of page 6/7 (other voltages upon request), adjustable from 90 – 120 % of U_{nom}
Line regulation ($\pm 10\%$)	$\pm 0.5\%$
Load regulation (10 – 90 %)	$\pm 1\%$
Dynamic load (10-90-10 %)	$\pm 10\%$ typical
Ripple	$\leq 5\%$ rms without battery, optional: $< 2\%$ rms or 2 mV frequency weighted
Nominal current	see tables of page 6/7, electronic current limitation adjustable from 60 – 105 % of I_{nom}
Overload protection	short circuit protected by fuse, optional: by electronic fuse
Charging characteristic	IU acc. to DIN 41773 for Pb batteries / DIN 41774 for NiCd batteries
Charging voltage	
- float	2.23 – 2.27 V/cell for Pb batteries / 1.4 V/cell for NiCd batteries
- equalize	2.35 – 2.4 V/cell for Pb batteries / 1.55 V/cell for NiCd batteries
- boost (manual activated)	2.7 V/cell for Pb batteries / 1.7 V/cell for NiCd batteries

General

Efficiency	
- Series QE	78 – 90 %
- Series QD	82 – 92 % for models < 48 VDC 85 – 95 % for models ≥ 48 VDC
Operating temperature	-10 to $+40^\circ\text{C}$, optional up to $+65^\circ\text{C}$
Humidity	up to 95 % RH, non-condensing
Altitude	up to 1000 m asl
Cooling	natural convection
Audible noise	50 – 70 dB(A) depending on power
Safety / Construction	acc. to EN/IEC 61010-2-201; EN/IEC 61010-1
EMI	acc. to EN 55022, class A
Enclosure	
- Protection category	IP20 acc. to EN 60529, optional up to IP55
- Color	RAL 7035, others upon request
Transformer	acc. to IEC 76 / IEC 14 / EN 60591 / DIN VDE 0532

Type test certificates

Battery charger

Type: QE 48/85
 Input: 230 VAC, 1-phase, 50 Hz
 Output: 48 VDC, 85 A
 Environment: IP 42,
 100% output power rating at +55°C
 environmental temperature



	
	Zertifikat Nummer Certificate No. EL-0410-06310-000 Type Test Approval Certificate
Seite Page 1 von 1 of 1 Certificate	
Ausstellungsdatum: Date of Issue Gültigkeit: Expiry Date	01.12.2004 01.12.2009
Genehmigungsinhaber: License Holder Fertigungsstätte: Manufacturing Plant	Schübe Elektrotechnik GmbH Odenwiese 17 D-71889 Aulheim, Germany Schübe Elektrotechnik GmbH Odenw. 17 D-71889 Aulheim, Germany
Geprüft nach: Tested according to	IEC 146-1-1:1997 Part 1-1: Specifications of a test requirements, Semiconductor converters, General requirements and test methods-converter
Zertifiziertes Produkt: Certified Product Bezeichnung: Type Designation	Battery charger QE 48/85 230 V AC, 50 Hz, 18 A, 1P/2P Primary circuit 48 VDC, 85 A Secondary circuit Test mark: Schübe
Referenz auf Nemko Test Report No.: Referring to Nemko Test Report No.:	00-0410-06310-001 vom / dated 2004-10-01
Zertifizierungsstelle Certification Institute  Dipl.-Ing. JFH John Hoffmann	
<small>Nemko GmbH & Co. KG • Nordstr. 38 • D-70207 Plönz Nemko Testing and Certification</small>	

	
	Zertifikat Nummer Certificate No. EL-0410-06311-000 Type Test Approval Certificate
Seite Page 1 von 1 of 1 Certificate	
Ausstellungsdatum: Date of Issue Gültigkeit: Expiry Date	01.12.2004 01.12.2009
Genehmigungsinhaber: License Holder Fertigungsstätte: Manufacturing Plant	Schübe Elektrotechnik GmbH Odenwiese 17 D-71889 Aulheim, Germany Schübe Elektrotechnik GmbH Odenw. 17 D-71889 Aulheim, Germany
Geprüft nach: Tested according to	IEC 146-1-1:1997 Part 1-1: Specifications of a test requirements, Semiconductor converters, General requirements and test methods-converter
Zertifiziertes Produkt: Certified Product Bezeichnung: Type Designation	Battery charger QD 110/75 400 V AC, 50 Hz, 18 A, 3P/4P Primary circuit 110 VDC, 75 A Secondary circuit Test mark: Schübe
Referenz auf Nemko Test Report No.: Referring to Nemko Test Report No.:	00-0410-06311-001 vom / dated 2004-10-01
Zertifizierungsstelle Certification Institute  Dipl.-Ing. JFH John Hoffmann	
<small>Nemko GmbH & Co. KG • Nordstr. 38 • D-70207 Plönz Nemko Testing and Certification</small>	

Battery charger

Type: QD 110/75
 Input: 400 VAC, 3-phase, 50 Hz
 Output: 110 VDC, 75 A
 Environment: IP 42,
 100% output power rating at +55°C
 environmental temperature

Submittal of chargers to an independent laboratory for Type Test Certification has been required for both small and large capacity chargers.

The manufacturer reserves the right to deviate from technical details given.



DIN EN ISO 9001 Certificate

Schaefer has been ISO 9001 certified since 1994. The certification is renewed after successful completion every 3 years.



Battery charger

Type: QD 110/800
Input: 415 VAC, 3-phase, 50 Hz
Output: 110 VDC, 800 A
Environment: IP 42,
100% output power rating at +55°C
environmental temperature

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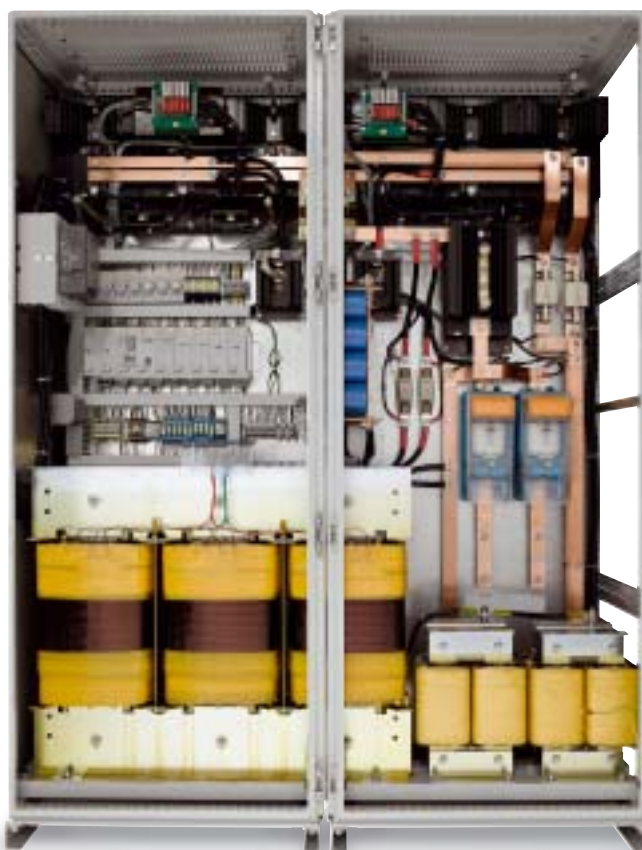


- **Input voltage:** 115 / 230 VAC, single phase, 50 / 60 Hz or 208 / 400 / 480 VAC, 3-phase, 50 / 60 Hz
- **Output voltage:** 12 / 24 / 48 / 60 / 72 / 110 / 220 / 400 VDC
- **Output current:** up to 3250 A
- **Output power:** 100 W - 500 kW

The thyristor-controlled power supplies and battery chargers present the conventional method of rectifying and controlling electric power. The advantages of thyristor-controlled units are given by a simple technical concept resulting in robustness and reliability.

Typical applications

- Power generation plants
- Switch gear stations
- Oil & Gas industry
 - pumping stations
 - valve stations
 - corrosion protection systems
 - DC systems
- Desalination plants
- Chemical plants
- Industrial automation
- Telecommunication
- Transport on board & way side
- Hospitals



Schaefer has the flexibility to tailor the output settings to suit the battery, be it nickel-cadmium batteries, flooded or valve regulated lead-acid batteries or any other selected to be within the power supply system. Each type of battery requires an individual charging characteristic which can be accomplished by the control cards. In addition, there is a number of options and accessories for individual configuration of the charger system.



Design Solutions

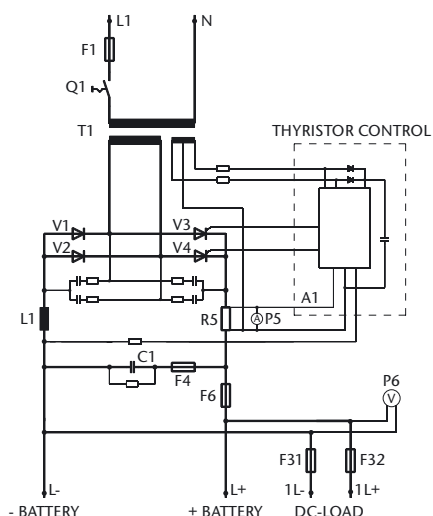
400 kW Aircraft Starter System

- 290 VDC Power Supply System
- Dual 700 A configuration
- For a highly inductive turbine load



200 kW DC Power Network

- 110 VDC Power Supply System
- Dual 800 A configuration
- Fully operational up to +55 °C
- IP42



Model designation (example): QE 24 / 20

single phase input
nominal output voltage [V]
max. output current [A]

enclosure size ¹⁾	nominal output voltage						approx. line current ²⁾ [A]	approx. weight ³⁾ [kg]
	12 V	24 V	48 V	60 V	110 V	220 V		
	max. output current [A]							
R2	4	2.5	1.2	1	—	—	0.6	12
	6	4	2.5	2	1	—	1	14
	9	6	—	—	—	—	1.4	15
	12	8	4	3.5	2	1	1.6	18
	16	11	—	—	—	—	2	22
R3	22	14	7	6	3.2	1.6	2.7	26
	30	20	10	8	5	2.5	4	28
	36	25	12.5	10	6	3	5	31
R4	50	32	16	14	8	4	6.5	40
	60	40	20	18	10	5	8	46
R5	80	55	30	25	14	7	11	60
	110	75	40	35	18	9	15	73
R5+	—	100	55	45	25	12.5	20	88
	—	130	70	60	32	16	26	98

¹⁾ Larger size may be required for optional equipment.

²⁾ Line current is referred to nominal input voltage of 230 VAC.

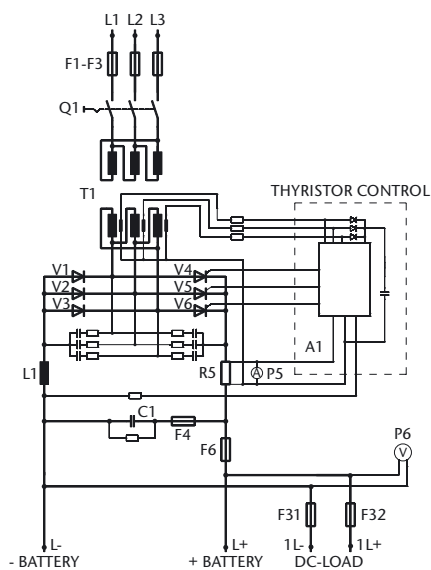
³⁾ Weight is referred to thyristor-controlled rectifier on a mounting plate without enclosure.

Enclosures

wall-mounted enclosure designation	weight (empty) [kg]	height	width	depth
		dimensions [mm]		
R2	9	300	380	210
R3	12	380		
R4	17	600		
R4+	26	380		
R4T	22	600	600	350
R5	31	760		
R5+	38			

floor-mounted enclosure designation	weight (empty) [kg]	height*	width	depth
		dimensions [mm]		
R6	66	1200	600	400
R6+	80		800	
R7	127		600	
R7+	150	1800	800	500
R8	147		600	
R8+	175		800	
R9	250	2000	1200	600

*) The height of the base frame, elevated roof and suspension eyes is to be added, if needed.



Model designation (example): QD 60 / 32

three phases input
nominal output voltage [V]
max. output current [A]

enclosure size ¹⁾	nominal output voltage					approx. line current ²⁾ [A]	approx. weight ³⁾ [kg]
	24 V	48 V	60 V	110 V	220 V		
	max. output current [A]						
R4	25	12	10	5	2.5	1.1	48
	40	20	16	8	4	2	62
R5	60	30	25	12	6	3	74
	80	40	32	16	8	4	78
	100	50	40	20	10	5	85
R5+	125	60	50	25	12	6	95
R6	160	80	65	32	16	8	130
	200	100	80	40	20	10	150
R6+	240	120	100	50	25	11	180
	300	150	120	60	30	14	260
R7	350	170	140	70	35	16	310
	400	200	160	80	40	19	340
R7+	500	250	200	100	50	24	390
	600	300	240	120	60	28	420
R8	700	350	280	140	70	33	450
R8+	800	400	320	160	80	38	510
R9	1000	500	400	200	100	48	620
2 x R8+	1200	600	500	250	120	57	680
	1600	800	600	300	150	76	740
	2000	1000	800	400	200	95	780
	2250	1125	900	500	250	120	920
	2750	1375	1100	600	300	142	1000
	3250	1625	1300	700	350	166	1180
2 x R9	—	1800	1450	800	400	190	1300
	—	2250	1800	1000	500	238	1450
	—	—	2750	1500	750	356	1630
3 x R9	—	—	—	2000	1000	475	1875
4 x R9	—	—	—	—	2000	950	2390

¹⁾ Larger size may be required for optional equipment.

²⁾ Line current is referred to nominal input voltage of 3 x 400 VAC.

³⁾ Weight is referred to thyristor-controlled rectifier on a mounting plate without enclosure.

Input

- MCB, MCCB or isolator
- soft-start

Output

- parallel operation
- redundant operation
- overload protection by electronic fuse
- 6 or 12-pulse performance
- filtering up to 0.1 % pp (corresponding to 0.035 % rms) or 2 mV frequency weighted
- voltage stabilization

Control

IU characteristic acc. to DIN 41773 and 41774

- manual selection of charging characteristic (float / equalize / boost)
- automatic selection of charging characteristic with timer
- temperature compensated charging voltage

Supervision

analogue or micro-processor-controlled

- input voltage
- output voltage
- battery circuit
- ground insulation failure
- over temperature
- fuses

Interface card

- RS 232
- LAN
- TCP/IP
- others available on request

Battery

- MCB, MCCB or isolator
- deep discharge protection

DC distribution panel

wired acc. to client's specification

Mechanics / environment

- enclosures, IP 20 up to IP 55, for charger and / or batteries
- analogue or digital meters
- operating temperature up to +65 °C (standard -10 to +40 °C)
- tropical protection
- earthquake-proof
- vermin-proof

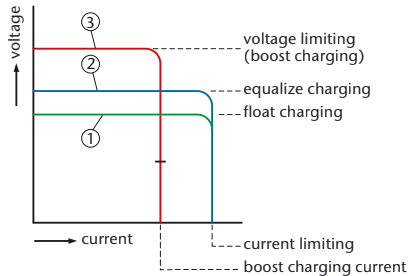
Converters and Inverters

- switchmode DC/DC converters from 50 W to 40 kW
- switchmode DC/AC inverters, frequency converters and static switches from 200 VA to 36 kVA



Control

Thyristor-controlled units provide constant output voltage with current limiting according to the IU characteristic:



- ① Curve 1 shows Constant Voltage / Constant Current operation, both values are adjustable by trim-potentiometer.
- ② Curve 2 shows Equalize Charge operation with the constant voltage level increased by a certain amount, adjustable by trim-potentiometer. This mode of operation is started manually by pressing a push button or automatically, when the battery voltage has dropped below a certain level. It is terminated manually or by electronic timer.
- ③ Curve 3 shows Boost Charge operation with the current programmed by a knob and with adjustable voltage limiting. It is started manually only, as attention must be paid not to overcharge the battery. It is terminated manually or by electronic timer. If the voltage limit is reached the charger operates with constant voltage while the current decreases with the battery being filled up more and more.

Additionally, the charger can be equipped with the option "temperature compensated charging voltage". In case of high battery temperature the charging voltage will be automatically reduced.

It should be noted that the calibration settings are made through cooperation / recommendation with the battery manufacturer, or alternatively as per client instruction. The Schaefer engineering team would also support the selected settings if so required, upon submittal of the application details.

Supervision

The charger and battery may be monitored through the use of a variety of plug-in design Supervision Cards. They have LEDs to indicate alarm detection. Additionally, a LED panel is available, typically mounted on the front door of the enclosure. Potential free contacts are provided for remote alarm. A timer circuit for delaying the alarm, or an electronic memory for storing the alarm until it is reset, by pressing a push button, is optionally available.

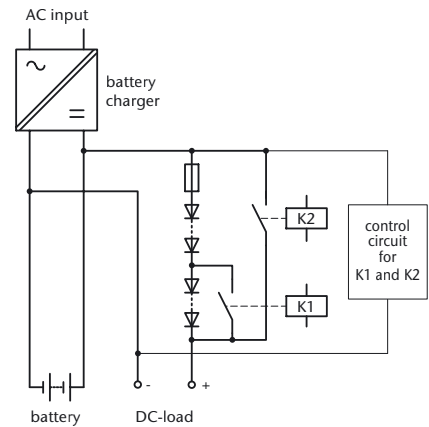
Supervised	Alarm	Alarm Criteria / Utilization
Input	Mains Failure/ AC low voltage	Voltage of one or more phases drops below an adjustable level.
	Mains Failure/ AC high voltage	Voltage of one or more phases exceeds an adjustable level.
	AC Fuse Failure	Voltage drop across the charger input fuse(s) exceeds a certain value.
Output	DC High Voltage	Load or battery voltage exceeds an adjustable level. The alarm signal can be used to INHIBIT (turn off) the charger or for disconnecting the load by means of a contactor.
	DC Low Voltage	Battery voltage drops below an adjustable level. In order to avoid deep discharge of the battery, a contactor could be activated for disconnecting the load.
	Charger Failure	No current flows at low battery voltage.
Battery	Battery Circuit Failure	Deviation of voltage symmetry of two battery sections with respect to a centre point. An initial asymmetry can be compensated by adjustment. The circuit detects conditions such as short circuit of cells, line interruption or poor quality connections between cells.
Ground Insulation	Ground Insulation Failure	Current from the positive or negative pole to ground exceeds an adjustable level, typically ± 4 mA.
Temperature	Over Temperature	High temperature may be sensed externally, internally or at semiconductors.
Fuse	DC Fuse Failure	Voltage drop across the charger output fuse, capacitor fuse or load fuse exceeds a certain value.

Output voltage stabilization

The output voltage of a battery charger with parallel connected battery varies substantially with the charging condition of the battery. For many applications, however, the load circuit requires a better stabilized voltage which can be accomplished by, but not limited to the following examples:

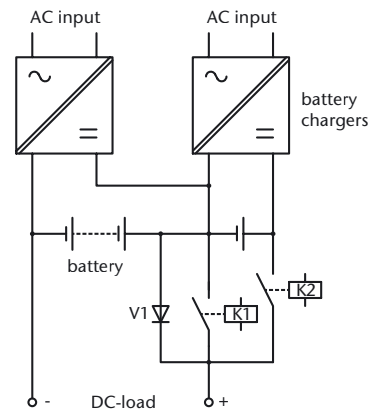
Voltage dropping diodes

Interconnected between the battery and load, voltage dropping diodes reduce the voltage to within load tolerance. They are short-circuited by one or more contactors if a partial reduction, or no voltage reduction, is needed. A control circuit senses the battery voltage and energizes the contactors. Voltage dropping diodes cause substantial power losses as the excess voltage is absorbed by the diodes. However, due to the simplicity this method is frequently used, especially if the voltage reduction is needed during the short periods of high-rate charging only.



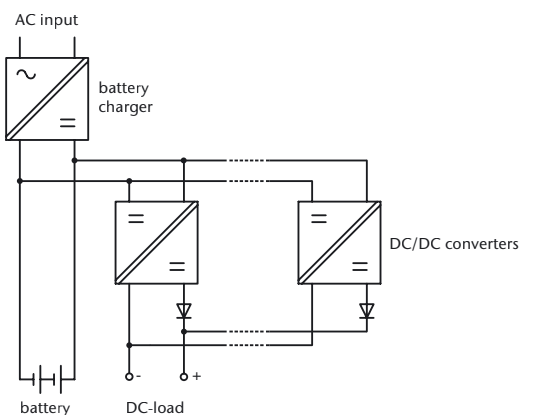
Systems with main and end cells

An alternative solution, occasionally used for high power systems is to split the battery into main and end cells. As during operation both sections are differently discharged individual chargers are needed. During normal operation, with the battery fully charged, the load circuits are connected via contactor K1 to the main cells. During mains failure the battery voltage decreases, contactor K1 opens and K2 connects the load to the entire battery. The diode maintains the current flow during switch-over. K1 and K2 are electronically controlled by a circuit that senses either the battery or the AC mains voltage.



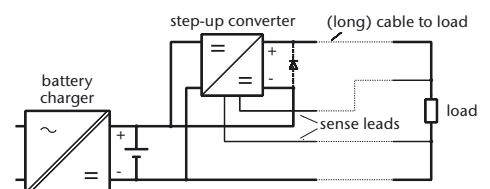
Switchmode DC/DC converters

Supplied from the DC bus, a galvanically isolated, fully regulated supply is delivered to the load. The inherent reliability can be added to by parallel configuration, as multi redundant, fault tolerant.



Switchmode step-up converters

DC/DC converters in series with the battery supply the output load. This solution, undoubtedly cost effective and most efficient in both power and space requirement, adds to the battery voltage only under discharge condition.

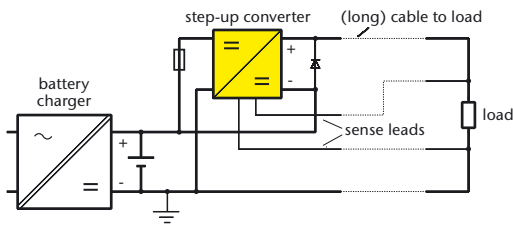


Further details are given on the next page.



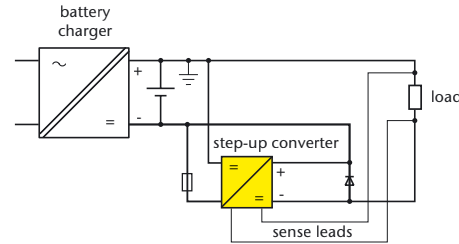
Step-up converter with common negative line

The following circuit diagram shows a step-up converter which can be grounded on the negative side. The voltage will be added at the positive side and the negative line is common for input and output.



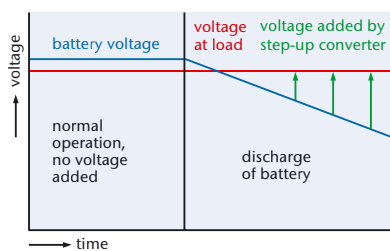
Step-up converter with common positive line

The following circuit diagram shows a step-up converter which can be grounded on the positive side. The voltage will be added at the negative side and the positive line is common for input and output.



Operation diagram

- During normal operation no voltage needs to be added and the converter runs with a minimum of power losses. The voltage at the load is slightly reduced as the current flows through the bypass diode. The bypass diode also allows the replacement of the step-up converter and should therefore be installed externally.
- During battery discharge the converter adds the voltage that is needed to maintain the required output voltage level.
- The maximum voltage to be added is normally less than 20 % of the total voltage. Therefore, the step-up converter needs to be designed for only 20 % of the total power.



The photo shows a system consisting of three step-up converters with input and output fuses installed in a sub-rack, designed for

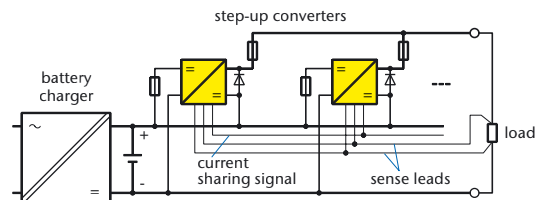
- Input: 40 – 56 VDC (battery)
- Output: 0 – 10 VDC (step-up voltage) @ 3 x 100 A, output voltage regulated to 50 V
- Size: 266 mm H x 600 mm W x 350 mm D

The output voltage stabilization has achieved an energy efficiency of 98%.



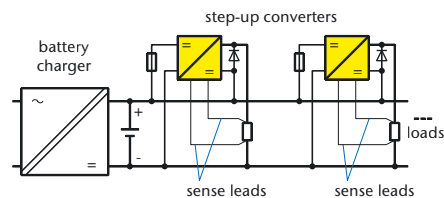
Parallel operation of step-up converters

For more power or redundancy, step-up converters may be connected in parallel with active current sharing, individually protected by fuses at the input and decoupling diodes or fuses at the outputs. Such systems have already been realized for 2,000 Amps.



Individual load supply

For applications that require individually stabilized voltages across the loads, the step-converters will be connected as shown in the following drawing and may be of different power ratings.



- **Input voltage:** 10 - 800 VDC
- **Output voltage:** up to 800 VDC
- **Output current:** up to 500 A
- **Output power:** 50 W - 40 kW
- **Additional outputs:** 5 / 12 / 15 / 24 VDC upon request

Features

- continuous short circuit protection
- overvoltage protection
- thermal shutdown with auto-restart ¹⁾
- operational from -40 to +75 °C
- industrial grade components
- compact and robust design

Plug-in modules for 19" sub-racks with natural convection

POWER ²⁾ [WATTS]	WIDTH [TE]	DEPTH [mm]	HEIGHT [U]
50	10	160	3
150	10 or 14		
250	21		
500	42		
400	21	220	3
600	28		
800	42		
200	10	160	6
400	14		
600	21		
1200	42		
850	21	220	6
1250	28		
1700	42		
2500	56		
1600	21	300	6
2500	28		
5000	56		

1 TE = 5.08 mm, 1 U = 44.45 mm

High power modules with fan cooling

POWER ²⁾ [kW]	WIDTH [inch]	DEPTH [mm]	HEIGHT [U]
5 / 7.5 / 10	19"	600	4
6 / 8 / 12	19"	360 or 460 ¹⁾	6 or 9 ²⁾
22	19"	600	8
30	19"	600	12

High power modules with water cooling

POWER ²⁾ [kW]	WIDTH [inch]	DEPTH [mm]	HEIGHT [U]
8/15/30/40	19"	600	5 / 5 / 9 / 11

19" = 482.6 mm, 1 U = 44.45 mm

Specifications:

Input

Immunity	
- Fast transients	acc. to EN 61000-4-4 level 3
- Surges	acc. to EN 61000-4-5 level 3

Output

Line regulation (±10%)	0.1%
Load regulation (10-90%)	0.2%
Ripple and noise	< 1% + 30 mV pk-pk
Overload protection	current limited to 105-110% of full load
Overvoltage protection	OVP switches off module with automatic return to operation
Remote sense	up to 3 V per wire

General

Efficiency	80 - 95% typical for low input / output voltage: 75% typical
Operating temperature	-20 to +75 °C optional: -40 to +75 °C above +50/55 °C derating 2.5%/°C
Storage temperature	-40 to +85 °C
I/O isolation voltage	2100 VDC ($V_{in} < 60$ VDC) 3500 VDC ($V_{in} > 60$ VDC)
Safety	acc. to EN/IEC 61010-2-201; EN/IEC 61010-1
EMI	acc. to EN 55022, class A optional: class B
Connector	H15 acc. to DIN 41612 or terminals / bolts / bars

Options

- Inrush current limiting
- Input polarity protection
- Output decoupling diode for redundant / parallel operation
- Active current sharing for parallel operation
- Remote on / off (inhibit)
- Output programmable via analogue signal
- Monitoring of input and output voltage
- RS232 or IEEE488 interface
- Wall mount, chassis mount or DIN rail mount
- Increased mechanical strength
- Tropical protection

¹⁾ applicable to power ratings > 800 Watts

²⁾ for low input and output voltages there will be less power in relation to the size

³⁾ depending on output current



- **Input voltage:** 115 / 230 VAC, single phase (with or without PFC) or 200 / 400 / 480 VAC, three phases
- **Output voltage:** up to 800 VDC
- **Output current:** up to 500 A
- **Output power:** 50 W - 40 kW
- **Additional outputs:** 5 / 12 / 15 / 24 VDC upon request

Features

- continuous short circuit protection
- overvoltage protection
- thermal shutdown with auto-restart ¹⁾
- operational from -40 to +75 °C
- industrial grade components
- compact and robust design

Plug-in modules for 19" sub-racks with natural convection

POWER ²⁾ [WATTS]	WIDTH [TE]	DEPTH [mm]	HEIGHT [U]
50	10	160	3
150	10 or 14		
250	21		
500	42		
400	21	220	3
600	28		
800	42		
200	10	160	6
400	14		
600	21		
1200	42		
850	21	220	6
1250	28		
1700	42		
2500	56		
1600	21	300	6
2500	28		
5000	56		

1 TE = 5.08 mm, 1 U = 44.45 mm

High power modules with fan cooling

POWER ²⁾ [kW]	WIDTH [inch]	DEPTH [mm]	HEIGHT [U]
5 / 7.5 / 10	19"	600	4
6 / 8 / 12	19"	360 or 460 ¹⁾	6 or 9 ²⁾
22	19"	600	8
30	19"	600	12

High power modules with water cooling

POWER ²⁾ [kW]	WIDTH [inch]	DEPTH [mm]	HEIGHT [U]
8 / 15 / 30 / 40	19"	600	5 / 5 / 9 / 11

19" = 482.6 mm, 1 U = 44.45 mm

Specifications:

Input

Frequency	47 - 400 Hz
Immunity	
- Fast transients	acc. to EN 61000-4-4 level 3
- Surges	acc. to EN 61000-4-5 level 3

Output

Line regulation (±10%)	0.1%
Load regulation (10-90%)	0.2%
Ripple and noise	< 1% + 30 mV pk-pk
Overload protection	current limited to 105-110% of full load
Overvoltage protection	OVP switches off module with automatic return to operation
Remote sense	up to 3 V per wire

General

Efficiency	80 - 95% typical
Operating temperature	-20 to +75 °C optional: -40 to +75 °C above +50/55 °C derating 2.5%/°C
Storage temperature	-40 to +85 °C
I/O isolation voltage	3500 VDC
Safety	acc. to EN/IEC 61010-2-201; EN/IEC 61010-1
EMI	acc. to EN 55022, class A optional: class B
Connector	H15 acc. to DIN 41612 or terminals / bolts / bars

Options

- Inrush current limiting
- Automatic selection of 115 / 230 VAC input
- Power factor correction for single phase input
- Output decoupling diode for redundant / parallel operation
- Active current sharing for parallel operation
- Remote on / off (inhibit)
- Output programmable by analogue signal
- Automatic / manual selection of charging characteristic
- Temperature compensated charging voltage
- Monitoring of input and output voltage
- RS232 or IEEE488 interface
- Wall mount, chassis mount or DIN rail mount
- Increased mechanical strength
- Tropical protection



- **Input voltage:** 10 - 800 VDC or 115 / 230 VAC, single phase, 47 - 400 Hz or 200 / 400 / 480 VAC, three phases, 47 - 400 Hz
- **Output voltage:** 115 / 230 VAC, single phase or 200 / 400 / 480 VAC, three phases
- **Output frequency:** 50 / 60 / 400 Hz or programmable within 40 - 400 Hz
- **Output power:** 200 VA - 36 kVA

Features

- Sine wave
- Continuous short circuit protection
- Thermal shutdown with auto restart for inverters > 1 kVA
- Suitable for complex load
- Surge power capability
- Industrial grade components
- Compact and robust design
- Unsymmetrical load permissible for 3-phase systems

Modules with 1-phase output

POWER ¹⁾ [kVA]	DEPTH [mm]	WIDTH	HEIGHT
up to 0.6	160	42 TE	6 U
up to 1.2	220		
up to 1.6		56 TE	
up to 2.5	300		
up to 12 ²⁾	460	19"	

1 TE = 5.08 mm, 19" = 483 mm, 6 U = 267 mm

Modules with 3-phase output

POWER ^{1) 2)} [kVA]	DEPTH [mm]	WIDTH	HEIGHT
0.6 - 10	460	19"	6 U
up to 36	460	19"	3 x 6 U

¹⁾ for low input voltage there will be less power in relation to the size

²⁾ for power ratings > 3.6 kVA the transformer needs to be installed externally because of weight and size

Specifications:

Input

No-load input power	10 - 30 W
Immunity	
- Fast transients	acc. to EN 61000-4-4 level 3
- Surges	acc. to EN 61000-4-5 level 3

Output

Line regulation (±10%)	2% typical
Load regulation (10-90%)	1% typical, 3% max. (3% typ. 5% max. @ 400 Hz)
Distortion	3% typical (5% @ 400 Hz)
Overload protection (steady state)	current limited to 105% of full load
Short circuit protection	electronically limited to 3 x nominal current
Surge power	2 x nominal power for 1 sec.
Crest factor	approx. 3
Power factor	cos φ ≥ 0.7 inductive / capacitive

General

Efficiency	75 - 94% typical
Operating temperature	-20 to +75 °C optional: -40 to +75 °C above +55 °C derating 2.5%/°C
Storage temperature	-40 to +85 °C
I/O isolation voltage	3500 VDC
Safety	acc. to EN/IEC 61010-2-201; EN/IEC 61010-1
EMI	acc. to EN 55022, class A optional: class B
Connector	H15 and F24H7 acc. to DIN 41612 or terminals

Options

- Inrush current limiting
- Input polarity protection for DC input
- Automatic selection for 115 / 230 VAC input
- Power factor correction for single phase input
- Remote on / off (inhibit)
- Monitoring of input and output voltage
- Output programmable via analogue signal
- RS232 or IEEE488 interface
- Wall mount
- Increased mechanical strength
- Tropical protection
- Static Switch for uninterruptible power supply from 800 VA to 10 kVA



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