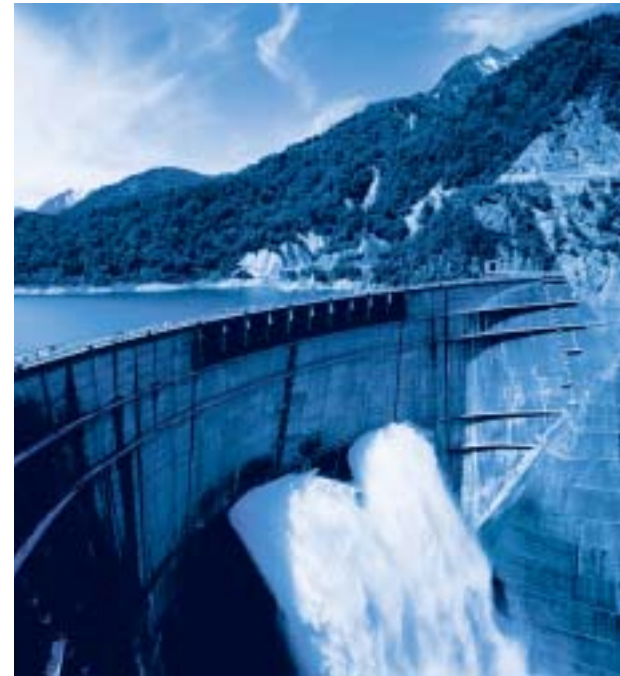


- **Input voltage:** 115 / 230 VAC, single phase, 50 / 60 Hz
or 208 / 400 / 480 VAC, three phases, 50 / 60 Hz
- **Output voltage:** 12 / 24 / 48 / 60 / 72 / 110 / 220 / 400 VDC
- **Output current:** up to 3250 A
- **Output power:** 100 W - 500 kW

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 stations
- Sub-stations
- Switch gear stations
- Chemical plants
- Railway on-board
- Railway trackside
- Pipeline systems
- Hospitals



Depending on the application, nickel-cadmium batteries, flooded or valve regulated lead-acid batteries are used for energy storage in 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.



Specifications

Input

Voltage..... 230 VAC ±10 %, 1-phase or
400 VAC ±10 %, 3-phase
(other voltages upon request)
Frequency 50 or 60 Hz ±5 %
Current..... see table
Protection..... by fuse

Output

Nominal voltage see table (other voltages upon request),
adjustable from 90 – 120 % of U_{nom}
Line regulation (±10 %) ±0.5 %
Load regulation (10 – 90 %) ... ±1 %
Dynamic load (10-90-10 %) .. ±10 % typical
Ripple..... ≤5 % rms without battery, optional:
<2 % rms or 2 mV frequency weighted
Nominal current see table, 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

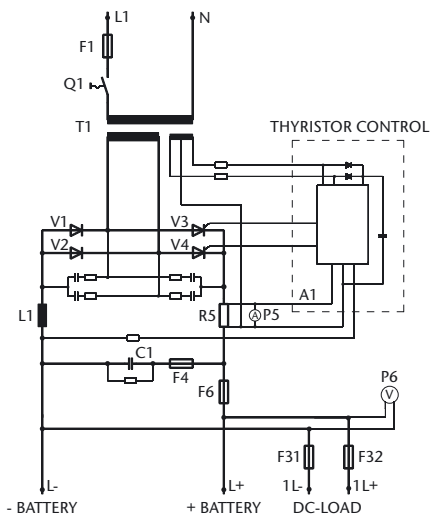
General

Efficiency
- Series QE 78 – 90 %
- Series QD 82 – 92 % for models <48 VDC
85 – 97 % for models ≥48 VDC
Operating temperature..... –10 to +40 °C, optional up to +65 °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 DIN / EN 60950-1: 2003
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



Thyristor-controlled power supplies and battery chargers	Page
▶ Series QE, thyristor-controlled rectifiers with 1-phase input	106
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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		
R2	max. output current [A]							
	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
R3	16	11	–	–	–	–	2	22
	22	14	7	6	3.2	1.6	2.7	26
	30	20	10	8	5	2.5	4	28
R4	36	25	12.5	10	6	3	5	31
	50	32	16	14	8	4	6.5	40
R5	60	40	20	18	10	5	8	46
	80	55	30	25	14	7	11	60
R5+	110	75	40	35	18	9	15	73
	–	100	55	45	25	12.5	20	88
	–	130	70	60	32	16	26	98

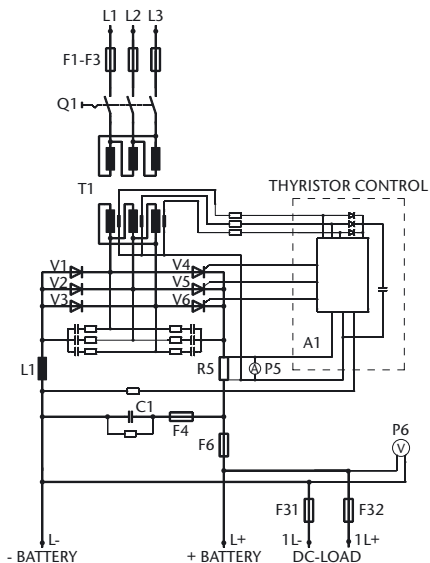
- ¹⁾ Larger size may be required for optional equipment.
- ²⁾ Line current is referred to nominal input voltage of 230 VAC.
- ³⁾ Weight is referred to thyristor-controlled rectifier on a mounting plate without enclosure.

Enclosures

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

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

*) 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		
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
2 x R9	3250	1625	1300	700	350	166	1180
	–	1800	1450	800	400	190	1300
	–	2250	1800	1000	500	238	1450
3 x R9	–	–	2750	1500	750	356	1630
	–	–	–	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

analog or micro-processor-controlled

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

Interface card RS 232 for supervision

Battery

- MCB, MCCB or isolator
- deep discharge protection

DC distribution panel

wired acc. to customer's specification

Mechanics / environment

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

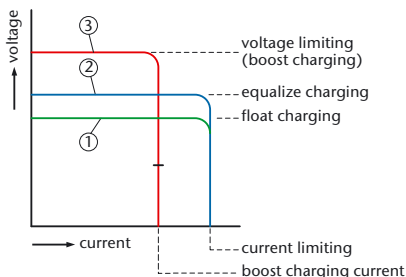
Converters and Inverters

- switchmode DC/DC converters from 50 W to 30 kW
- switchmode DC/AC inverters, frequency converters and static switches from 200 VA to 30 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.

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	Voltage of one or more phases drops below an adjustable level.	
	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.	