Datasheet Series QL



Model	QL30V	′30C64			
Order no.	27-057	-000-01			
Basic operating modes		CC, CP, CR, CV			
Standard interfaces		RS-232, USB, LAN, CAN			
Voltage range			-30 V 30 V		
Current range			-64 A 64 A		
Resistance range		0.0234 9.38 Ω			
Power	Power		1920 W		
Rise/fall time CC, CV 1)		120 µs			
Bandwidth		3 kHz			
Adjustable int. resistance CC ²⁾		0.938 Ω ∞			
Adjustable int. resistance CV		0 0.234 Ω			
Output terminals rear 3)		FKS25/10-SM10			
Power consumption	Power consumption		3020 VA		
Mains voltage ⁴⁾		1/N/PE AC 230 V 50 60 Hz			
Mains voltage toggleable		-			
Noise max. ca. ⁵⁾		76 dB(A)			
Weight ca.		92 kg			
Housing ⁶⁾		19" - 14 U			

- 1. Rise and fall times are from 10 ... 90 % and 90 ... 10 % of the positive current or voltage setting range in "fast" regulation speed. Tolerance ±20 %. Measured with short-circuited output terminals (current) or with open output terminals (voltage). Other loads may increase rise times. Rise/fall time in "slow" regulation speed: approx. 2 ms.
- 2. Value is entered as conductance in S.
- 3. BPK4-30L: Touch-protected binding posts for 4 mm laboratory jacks and stripped wires with diameter up to 4 mm, max. 30 A BPK4-60L: Touch-protected binding posts for 4 mm laboratory jacks and stripped wires with diameter up to 6 mm, max. 60 A FKS25/10-SM10: Flat copper bars 25 x 10 mm vertical with hole for screw M10
- 4. Mains voltage tolerance: ±10 %.
- 5. Measured on the front from distance of 1 m. $\,$
- 6. 1 U = 44.45 mm.

QL Series **Technical Data**

Basic operating modes CC+CV, CV+CV, CP+CV, CR+CV COmbined operating modes CC+CV, CV+CV, CP+CV, CR+CV DC source-sink energy storage device test internal resistance measurement list function adjustable internal resistance expactance simulation function rectangular function (salo in PWM mode) modulation (sine, triangle, square, arbitrary) data acquisition (internally or to USB (fash drive) save and recall of device settings watchdog in remote operation AC source (only 40 models) AC source (only 40 in CC, CV mode (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset Frequency range 10 C. The MHz, also mains synchronizable User interface 4, 3° TFT touch display Accuracy of setting 0C Current 20.2 % ±0.05 % Current 20.2 % ±0.05 % Essistance (at MI - 5 % of positive voltage range) Fower (at MI and III - 30 % of corresponde to the corresponder to the corresponding positive range to the corresponder to the corresponding positive range to the corresponding positive	Operating modes, functions					
Functions CC+CV, CV+CV, CP+CV, CR+CV Combined operating modes Functions DC source-sink energy storage device test internal resistance measurement list function adjustable internal resistance espacitiance simulation function rectangular function (asio in PWM mode) modulation (sine, triangle, square, arbitrary) data acquisition (internalty or to USB flash drive) save and recall of device settings watchdog in remote operation AC source (only 40 in CR, CV mode (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset Prequency range 10 c. Hz 10 kHz, also mains synchronizable User interface 4.3° TFT touch display Accuracy of setting Voltage \$\frac{\text{d}}{0.1 \%} \times \frac{\text{d}}{0.05 \%} Resistance (at MI = 5 \% and \text{d}) \times \frac{\text{d}}{0.05 \%} Resistance (at MI = 5 \% and \text{d}) \times \frac{\text{d}}{0.05 \%} \$\frac{\text{d}}{0.05 \%} \times \frac{\text{d}}{0.05 \%} Resolution \$\frac{\text{d}}{0.05 \%} \times \frac{\text{d}}{0.05 \%} Resolution \$\frac{\text{d}}{0.05 \%} \times \frac{\text{d}}{0.05 \%} \$\frac{\text{d}}{0.05 \%} \times \frac{\text{d}}	Basic operating					
Functions DC source-sink energy storage device test internal resistance measurement list function adjustable internal resistance capacitance simulation function rectangular function (also in PWM mode) modulation (sine, triangles, square, arbitrary) data acquisition (internally or to USB flash drive) save and recall of device settings watchdog in remote operation AC source (only 40 models) AC source (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset DL = 10 Hz, also mains synchronizable User interface 4.3" TFT touch display Accuracy of setting DC of setting voltage 4.0.1 % 10.1 % 10.1 % 10.2 % 10.3 % of corresponding positive range 20.3 % of current range 20.4 % 0-0 of positive voltage range 20.5 % Resolution 15 bits in each quadrant Ripple voltage Ripple current 2a. 0.4 % 0-0 of positive voltage range Ripple current 2a. 0.4 % 0-0 of positive voltage range Accuracy of setting AC (only 4-quadrant models) of setting of setting of corresponding positive range Voltage (RMS) 132 23 % 20.25 % Accuracy of adjustable protections of setting of corresponding positive range Current (RMS) 102 20.3 % of corresponding positive range Current protection 20.2 % 20.25 % Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage 20.1 % 20.2 % 20.05 % 20.05 % Current 20.2 % 20.05 % Current constant of remeasured value (real value) of corresponding positive range Voltage (RMS) 20.5 % 20.5 % 20.7 % 20.8 ±0.05 % 20.7 % 20.8 ±0.05 % 20.8 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±0.05 % 20.9 ±		CC, CP, CR, CV				
energy storage device test internal resistance measurement list function adjustable internal resistance capacitance simulation function rectangular function (also in PWM mode) modulation (sine, triangular, arpitrary) data acquisition (internally or to USB flash drive) save and recall of device settings watchdog in remote operation AC source (only 40 models) AC source (only 41 models) AC source (only 42 models) AC source (only with 4-quadrant with a significant models) AC source (only with 4-quadrant with a significant models) AC source (only with 4-quadrant with a significant models) AC source (only with 4-quadrant models) AC source (onl		CC+CV, CV+CC, CP+CV, CR+CV				
internal resistance measurement list function adjustable internal resistance capacitance simulation function rectangular function (also in PWM mode) modulation (sine, triangle, square, arbitrary) data acquisition (internally or to USB flash drive) save and recall of device settings watchdog in remote operation AC source (only 40 models) AC source (only 44 models) in CC, CV mode (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset of 1.1 Hz 10 kHz, also mains synchronizable User interface of setting of setting of corresponding positive range Voltage ± 0.1 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % ± 0.05 % Every final III > 0 % ± 0.05 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III > 0 % ± 0.05 % Every final III = 0 % ± 0.05 % Every final Ever	Functions	DC source-sink				
List function adjustable internal resistance capacitance simulation function rectangular function (also in PWM mode) modulation (sine, triangle, square, arbitrary) data acquisition (internally or to USB flash drive) save and recall of device settings watchdog in remote operation AC source (only 40 models) adjustable offset color watchdog in remote operation AC source (only with 4-quadrant models) adjustable offset requency range 0.1 Hz 10 kHz, also mains synchronizable User interface 4.3" TFI touch display Accuracy of setting of setting of corresponding positive range voltage doi: 10.1 % doi: 10.5 % doi: 10.1 % doi: 10.5 % doi: 10.1 % doi: 10.5 % doi: 10.1 % d			ement			
capacitance simulation function rectangular function (also in PVM mode) modulation (sine, triangle, square, arbitrary) data acquisition (internally or to USB flash drive) save and recall of device settings watchdog in remote operation AC source (only with 4-quadrant models) AC source (only 40 models) Frequency range 10			and the same of th			
rectangular function (also in PWM mode) modulation (sine, triangle, square, arribrary) data acquisition (internally or to USB flash drive) save and recall of device settings watchdog in remote operation AC source (only 40 models) in CC, CV mode (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset in CD, CV mode (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset Verent of Setting Setting Frequency range 10 User interface 4,3**TFT touch display Accuracy of setting Voltage ±0.1 % ±0.05 % ±0.05 % ±0.05 % Exercised of corresponding positive range ±1.4 % ±0.05 % ±0.3 % of current range ±0.4 % ±0.7 % ±0.1 % ±0.1 % ±0.1 % ±0.1 % ±0.1 % ±0.2 % ±0.25 % * * * * * * * * * * * * * * * * * *						
modulation (sine, triangle, square, arbitrary) data acquisition (internally or to USB flash drive) save and recall of device settings watchdog in remote operation AC source (only 4Q models) in CC, CV mode (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset Frequency range 10 User interface 4,3" TFT touch display Accuracy of setting DC of setting Voltage 0.1 Hz 10 kHz, also mains synchronizable 1.1 % 1.0.2 % 1.0.5 % Current 1.0.2 % 1.0.5 % Current 1.0.2 % 1.0.3 % of curresponding positive range 2.0.3 % of current range 1.0.3 % of current range 1.0.3 % of current range 1.0.3 % of corresponding positive range 1.0.3 % of corresponding positive range 1.0.3 % of current range 1.0.4 % p-p of positive voltage range 1.0.2 % 1.0.2 % 1.0.2 % 1.0.2 5 % 1.0						
save and recall of device settings watchdog in remote operation AC source (only 40 models) AC source (only with 4-quadrant models) AC source (only 40 models) in CC, CV model (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset Frequency range 10.1 Hz 10 kHz, also mains synchronizable User interface 4.3" TFT touch display Accuracy of setting DC		modulation (sine, triangle, s	quare, arbitrary)			
watchdog in remote operation AC source (only 40 models) In CC, CV mode (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset I set interface I setting Of corresponding positive range Voltage Vol		· · · · · · · · · · · · · · · · · · ·				
AC source (only 4Q models) in CC, CV mode (sine, triangular, square, sawtooth, arbitrary range values are peak values for V and I adjustable offset 0.1 Hz 10 kHz, also mains synchronizable User interface 4.3° TFT touch display Accuracy of setting DC of setting 0.1 Hz 10 kHz, also mains synchronizable ±0.1 % ±0.05 % Current ±0.2 % ±0.05 % Resistance (at NI > 5 % of positive voltage range) Power (at NI and III > 30 % of corresponding positive range voltage range) **Dower (at NI and III > 5 % and correspo, pos. range) (at IVI and III > 5 % and correspo, pos. range) (at IVI and III > 5 % and to.7 % ±0.25 % Resolution 15 bits in each quadrant Ripple voltage 0.4 % p-p of positive voltage range Ripple current ca. 0.4 % p-p of positive voltage range Accuracy of setting AC (only 4-quadrant models) of setting of corresponding positive range Voltage (RMS) 1121 ±3 % ±0.25 % Accuracy of adjustable protections of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Power is calculated from current and voltage Power is calculated from current and voltage Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Ext. control signal to 5.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.1 % Current (watchdog in remote operation				
range values are peak values for V and I adjustable offset Verenterface 4,3" TFT touch display Accuracy of setting DC of setting Voltage ±0.1 % ±0.05 % Current ±0.2 % £0.3 % of curresponding positive range ±1.4 % ±0.3 % of current range ±0.1 % ±0.1 % ±0.1 % ±0.3 % of current range * * * * * * * * * * * * *	10 / 1 / 0					
Adjustable offset 0.1 Hz 10 kHz, also mains synchronizable 4.3" TFT touch display		_				
User interface		adjustable offset				
Accuracy of setting DC Voltage			synchronizable			
Voltage ±0.1 % ±0.05 % Current ±0.2 % ±0.05 % Resistance (at N/ 5 % of positive voltage range) Power (at N/ and N/ 5 % of positive voltage range) Power (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ and N/ 5 % and <30 % of corresp. pos. range) (at N/ 4 % p-p of positive voltage range) Resolution 15 bits in each quadrant models) Voltage (RMS) 1120 ±3 % ±0.25 % Current (RMS) 1120 ±3 % ±0.25 % Accuracy of adjustable protections Of setting Of corresponding positive range						
Voltage ±0.1 % ±0.2 % ±0.05 % Resistance (at IV) 5 % of positive voltage range Power (at IVI and III > 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and III > 5 % and < 30 % of corresp. pos. range) (at IVI and	Accuracy of setting DC		.f			
Current ±0.2 % ±0.05 % Resistance (at IVI > 5 % of positive voltage range) Power (at IVI > 5 % of positive voltage range) ### ±0.35 % ±0.1 % ±0.25 % ### ±0.2	Voltage	•				
Resistance (at IVI > 5 % of positive voltage range) Power (at IVI and III > 30 % of corresp. pos. range)						
±1.4 % ±0.3 % of current range		±0.2 70	±0.00 %			
Power (at IVI and III > 30 % of corresp. pos. range) (at IVI and III > 5 % and 30 % of corresp. pos. range) # ±0.35 % # ±0.7 % # ±0.25 % # ±0.05 % # ±0.10 % # ±0.05 % # ±0.10 % # ±0.05 % # ±0.10 % # ±0.05 % # ±0.10 % # ±0.05 % # ±0.10 % # ±0.05 % # ±0.10 % # ±0.05 % # ±0.10 % # ±0.05 % # ±0.10 %	(at $ V > 5$ % of positive	±1.4 %	±0.3 % of current range			
(at IVI and III) > 30 % of corresp. pos. range) (at IVI and III) > 5% and 30 % of corresp. pos. range) Resolution	voltage range)					
of corresp, pos. range) (at IV land III) > 5 % and (30 % of corresp, pos. range) ±0.7 % ±0.25 % Resolution 15 bits in each quadrant Ripple voltage ca. 0.4 % p-p of positive voltage range Ripple current ca. 0.4 % p-p of positive voltage range Accuracy of setting AC (only 4-quadrant models) Of setting of corresponding positive range Voltage (RMS) 1120 ±3 % ±0.25 % Current (RMS) 1121 ±3 % ±0.25 % Accuracy of adjustable protections Of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC Of measure value (real value) of corresponding positive range Voltage ±0.1 % ±0.2 % ±0.05 % £2.2 % ±0.05 % £2.2 % ±0.05 % £2.2 % ±0.05 % £2.2 %						
Resolution 15 bits in each quadrant Ripple voltage ca. 0.4 % p-p of positive voltage range Ripple current ca. 0.4 % p-p of positive voltage range Accuracy of setting AC (only 4-quadrant models) of setting of corresponding positive range Voltage (RMS) 11:21 ±3 % ±0.25 % Current (RMS) 11:21 ±3 % ±0.25 % Accuracy of adjustable protections of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Ext. control signal ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4	of corresp. pos. range)	±0.35 %	±0.1 %			
Resolution 15 bits in each quadrant Ripple voltage ca. 0.4 % p-p of positive voltage range ca. 0.4 % p-p of positive voltage positive range ca. 0.4 % p-p of positive range carried value (range) carried positive range carried positiv		0.5.07	0.05.0/			
Ripple voltage ca. 0.4 % p-p of positive voltage range Ripple current ca. 0.4 % p-p of positive voltage range Accuracy of setting AC (only 4-quadrant models) of setting of corresponding positive range Voltage (RMS) 11 21 ±3 % ±0.25 % Current (RMS) 11 22 ±3 % ±0.25 % Accuracy of adjustable protections of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Current ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Europe discontinuation of RMS measurement and voltage Final management and voltage Final management and voltage accuracy of display No. of dec. places 4	range)		±0.25 %			
Ripple current ca. 0.4 % p-p of positive voltage range Accuracy of setting AC (only 4-quadrant models) of setting of corresponding positive range Voltage (RMS) 1121 ±3 % ±0.25 % Current (RMS) 1122 ±3 % ±0.25 % Accuracy of adjustable protections of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Voltage protection 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Ext. control signal ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Euron of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Euron (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4						
Accuracy of setting AC (only 4-quadrant models) of setting of corresponding positive range Voltage (RMS) 11 21 ±3 % ±0.25 % Current (RMS) 11 22 ±3 % ±0.25 % Accuracy of adjustable protections of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Ext. control signal ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4						
of setting Voltage (RMS) 11 21 ±3 % ±0.25 % Current (RMS) 11 21 ±3 % ±0.25 % Accuracy of adjustable protections of setting Of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) Voltage ±0.1 % ±0.05 % Current ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 μs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement AC Time constant of RMS measurement AC Ca. 500 ms Accuracy of display No. of dec. places 4						
Voltage (RMS) 11 21 ±3 % ±0.25 % Accuracy of adjustable protections of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Current ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4	Accuracy of Setting Ac					
Current (RMS) 112) ±3 % ±0.25 % Accuracy of adjustable protections of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Current ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4	Voltago (PMC) 1) 2)					
Accuracy of adjustable protections of setting of corresponding positive range Current protection ±0.2 % ±0.05 % Voltage protection 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) Voltage ±0.1 % ±0.05 % Current ±0.2 % ±0.05 % Current ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) Time constant of RMS measurement Accuracy of display No. of dec. places 4						
Of setting Current protection ±0.2 % ±0.05 % Voltage protection 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) Voltage ±0.1 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Ext. control signal ±0.2 % ±0.1 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) Voltage (RMS) ±0.5 % ±0.1 % ±0.1 % current (RMS) ±0.5 % ±0.1 % current (RMS) ±0.5 % ±0.1 % ca. 500 ms Accuracy of display No. of dec. places 4			20.20 /0			
Current protection ±0.2 % ±0.05 % Voltage protection ±0.1 % ±0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Ext. control signal ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4	Accuracy of aujustable	,	of corresponding positive range			
Voltage protection #0.1 % #0.05 % Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage #0.1 % #0.05 % Current #0.2 % #0.05 % Ext. control signal #0.2 % #0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) #0.5 % #0.1 % Current (RMS) #0.5 % #0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4	Current protection	-	1 31 3			
Resolution 13 bits in each quadrant Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Current ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4						
Accuracy of measurement DC of measured value (real value) of corresponding positive range Voltage			10.00 70			
of measured value (real value) of corresponding positive range Voltage ±0.1 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 μs, triggerable Accuracy of measurement AC Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4		,				
Voltage ±0.1 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4	Accuracy of incasulen					
Current ±0.2 % ±0.05 % Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4	Voltage					
Ext. control signal ±0.2 % ±0.1 % Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4						
Resistance is calculated from current and voltage Power is calculated from current and voltage Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement Accuracy of display No. of dec. places 4	Ext. control signal	±0.2 %	±0.1 %			
Resolution 15 bits in each quadrant Sampling time 200 µs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4		is calculated from current a	nd voltage			
Sampling time 200 μs, triggerable Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4	Power	*				
Accuracy of measurement AC of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4	Resolution	*				
of measured value (real value) of corresponding positive range Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4	Sampling time	200 μs, triggerable				
Voltage (RMS) ±0.5 % ±0.1 % Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4	Accuracy of measurement AC					
Current (RMS) ±0.5 % ±0.1 % Time constant of RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4						
Time constant of RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4						
RMS measurement ca. 500 ms Accuracy of display No. of dec. places 4		±0.5 %	±0.1 %			
No. of dec. places 4		ca. 500 ms				
	Accuracy of display					
Accuracy of measurement DC/AC ±1 digit of display value	No. of dec. places	4				
accuracy of measurement bor Ac ±1 digit of dispidy value	Accuracy	accuracy of measurement D	OC/AC ±1 digit of display value			

Accuracy of trigger vo	ltage and current			
Trigger voltage	±1 % of positive voltage range			
Trigger current	±1 % of positive current range			
Sampling time	200 μs			
Dynamic function LIST				
Operating modes	CC, CV, CR, CP			
No. of settings	max. 300, with corresponding ramp, dwell and sample times			
Dwell time 1)	200 μs 1,000 s			
Ramp time 1)	0 1,000 s			
Resolution	200 μs			
Accuracy of setting times	±0.02 %			
Delay at triggered start	max. 300 μs			
Dynamic function rect	angular			
Operating modes	CC, CV			
No. of levels	2			
Pulse times ¹⁾ , resolution	1 μs 9,999.999 ms, resolution 1 μs			
Accuracy of setting times	±0.02 %			
Dynamic function PWN	4			
Operating modes	CC, CV			
No. of levels	2			
Frequency 1), resolution	0.1 Hz 10 kHz, resolution 0.1 Hz			
Accuracy of frequency	±0.02 %			
Duty cycle, resol.	1 99 %, resolution 1 %			
Dynamic function mod	lulation			
Operating modes	CC, CV			
Waveforms	Sine, square, triangular, arbitrary (1,024 points)			
Frequency 1), resol.	0.1 Hz 10 kHz, resolution 0.1 Hz			
Accuracy of frequency	±0.01 %			
Modulation depth	0 100 %			
Capacitance simulatio	n function			
Capacitance	10 mF 99999,99 F			
Data acquisition				
to external USB flash dri	10			
Sampling time	0.1 30.0 s, resolution 0.1 s			
Measurement data	timestamp, voltage, current			
No. of measurement				
points	limited by flash drive memory capacity			
File format	.csv			
to internal memory				
Sampling time	200 μs 1,000 s, resolution 200 μs, synchronized with dynamic function			
Measurement data	timestamp, voltage, current			
No. of meas. points	max. 40,000			
Settings memory	Settings memory			
No. of memory positions	9, selectable (incl. programmed list) 1 for last device settings at power-off or power failure			
I/O port: inputs and outputs				
Inputs	analog setting I and V with -5 0 5 V or -10 0 10 V analog protection setting I or V with -10 0 10 V output activation operating mode CC/CV control speed selection slow/fast remote shut-down			

readable digital input (by SCPI command)

control input (activates I/O port)

trigger input

The specified accuracies refer to an ambient temperature of 23 ±5 °C. The specified accuracies are valid when the sense lines are connected. At voltages with higher disturbance values the accuracy can change for the worse.

1. The applicable time or frequency range is limited by the bandwidth of the respective device.

2. at 50 ... 60 Hz

3. only -10 V ... 0 ... 10 V

- positive/negative DC voltage or RMS value of a sinusoidal AC voltage

Technical Data

Digital input level	logical low: 0 0.8 V, logical high: 3 30 V			
Outputs	analog voltage monitor output -10 0 10 V analog current monitor output -10 0 10 V output activation state status output for upper protection value V or I status output for lower protection value V or I trigger output			
Digital output level	logical low: 0 0.8 V logical high: 5 V/24 V selectable, max. 10 mA (push-pull)			
I/O port: accuracy of ana	alog control -5 0 5 V or -1	10	0 10 V	
	of setting	of	corresponding positive range	
Voltage	±0.2 %	±C	0.1 %	
Current	±0.2 %	±C	0.1 %	
Resistance (at V > 5 % of positive voltage range)	±1.6 %	±0.4 % of current range		
Power (at V and I > 30 % of corresp. pos. range) (at V and I > 5 % and < 30 % of corresp. pos. range)	±0.55 % ±0.9 %		0.2 % 0.35 %	
Current protection ³⁾	±1 %	±0.4 %		
Voltage protection ³⁾	±1 %	±0.4 %		
	input resistance of analog	inp	outs >10 kΩ	
I/O port: accuracy of ana	alog monitor outputs -10 0	1	0 V	
	of analog signal of actual value	off	fset voltage	
Voltage	±0.2 %	±15 mV		
Current	±0.2 %	±15 mV		
	permissible load > 2 kΩ			
I/O port: permissible vol	tages			
	standard I/O port		isolated I/O port (option QLO6)	
Vout-io (GND - neg. output)	max. 2 V ⁴⁾		max. 125 V ⁴⁾	

VioPE (GND - PE)		- PE)	max. 125 V ⁴⁾		max	max. 125 V ⁴⁾	
		USB RS-	232 LAN CAN GPI	B Output		Vout+PE	_
			Output -		- 1	Vmax	_
	Vmax	Sense + Sense -	Source-S			Vout-PE VioPE	Vout-io
	(•	I/O port	GND/			_
					_		

Max. output voltage Vmax	see model overview			
Min. output voltage Vmin	see model overview			
Output: permissible voltages				
	standard I/O port isolated I/O port (option QLO6)			
Vout-PE (neg. output - PE)	max. 125 V ⁴⁾	max. 125 V ⁴⁾		
Vout+PE (pos. output - PE)	Vmax + max. 125 V ⁴⁾	Vmax + max. 125 V ⁴⁾		
Power				
Nominal power	see model overview (at Ta = 21 °C)			
Derating	-1.2 %/°C for Ta > 21 °C			

>50 k Ω when output is off

Protection and monitoring				
Protective devices	overcurrent overtemperature			
Monitoring	overvoltage indication			
Terminals				
Output	see model overview			
Sense	PH4/3.5-ST8, see starting at page 123			
Operating conditions				
Operating tempe- rature	5 40 °C			
Stock temperature	-25 65 °C			
Max. operating height	2,000 m above sea level			
Pollution degree	2			
Overvoltage category of mains	п			
Max. humidity	80 % at 31 °C, linear decreasing to 50 % at 40 °C			
Min. distance rear panel to wall or other objects	70 cm			
Cooling	temperature-controlled air cooling			
Noise, weight	see model overview			
Mains voltage	see model overview			
Mains cable	length max. 3 m cross-section of mains leads min. 1 mm²			
Power consumption	see model overview			
Housing				

Size	see model overview
Color front rear top, side panels	RAL7035 (light grey) stainless steel RAL7037 (dusty grey)
Safety and EMC	
Protection class	1
Measuring category	O (CAT I according to EN 61010:2004)
Electrical safety	DIN EN 61010-1 DIN EN 61010-2-030
EMC	DIN EN 61326-1 DIN EN 55011 DIN EN 61000-3-2 DIN EN 61000-3-3
Standard interfaces	
Data interfaces	RS-232, USB, LAN, CAN
I/O port	standard (not isolated)
Available options	
Data interface QL02	GPIB
Hardware extensions QL06 QL14	galvanically isolated I/O port heavy-weight castors for models from 5 U
Calibration, warranty	
FCC-QLxx	Factory Calibration Certificate, twice for free after registration
Recommended cali- bration interval	2 years
Warranty	2 years

Technical data of production series B, rev. 6. Subject to technical changes without notice.

The specified accuracies refer to an ambient temperature of 23 ±5 °C. The specified accuracies are valid when the sense lines are connected. At voltages with higher disturbance values the accuracy can change for the worse.

- The applicable time or frequency range is limited by the bandwidth of the respective device. at 50 ... 60 Hz only $-10\,V$... 0 ... 10 V positive/negative DC voltage or RMS value of a sinusoidal AC voltage

Output

Output resistance

