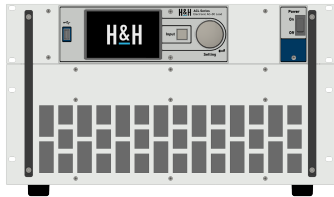


# Datasheet Series ACL

<b>Model</b>	<b>ACLT4228</b>	
<b>Order no.</b>	<b>25-001-000-01</b>	
<b>Basic operating modes</b>	CC, CR, CP, CV	
<b>Standard interfaces</b>	RS-232, USB, LAN, CAN	
<b>Number of phases</b>	3	
<b>Frequency</b>	DC, 40 ... 1000 Hz per phase	
<b>Maximum AC input voltage VmaxAC</b>	280 V AC per phase	
<b>Maximum DC input voltage VmaxDC</b>	400 V DC per phase	
<b>Minimum input voltage Vmin<sup>1)</sup></b>	6 V per phase	
<b>Maximum current Imax</b>	10 A per phase	
<b>Maximum peak current Ipeak</b>	40 A per phase	
<b>Power</b>	1400 W per phase	
<b>Resistance</b>	0.6 ... 396 Ω per phase	
<b>Rise/fall time<sup>2)</sup></b>	15 μs per phase	
<b>Load terminals<sup>3)</sup></b>	PH7/10.16-ST76	
<b>Power consumption</b>	480 VA	
<b>Mains voltage Mains voltage switchable</b>	1/N/PE AC 230 V 50 ... 60 Hz 1/N/PE AC 115 V 50 ... 60 Hz	
<b>Noise max. ca.<sup>4)</sup></b>	72 dB(A)	
<b>Weight ca.</b>	41 kg	
<b>Housing / 3D model<sup>5)</sup></b>	19" - 6 U / ACL_M2	
<b>Installation Depth<sup>6)</sup></b>	479 mm	
<b>Width x Height x Depth</b>	482 x 282 x 523 mm	

1. Minimum input voltage for maximum static load current.
2. Rise and fall times are from 10 ... 90 % and 90 ... 10 % of maximum current (CC mode, tolerance ±20 %).
3. SBUS4-32: Touch-protected sunk binding post for 4 mm banana plugs / max. 32 A.  
PH3/7.62-ST41: Phoenix plug strip 3-pole / Grid dimension 7.62 mm / max. 41 A.  
=> incl. mating connector from PHOENIX CONTACT (Phoenix order no.: 1777846)  
PH3/10.16-ST76: Phoenix plug strip 3-pole / Grid dimension 10.16 mm / max. 76 A.  
=> incl. mating connector from PHOENIX CONTACT (Phoenix order no.: 1967469)  
PH3/15-ST125: Phoenix plug strip 3-pole / Grid dimension 15 mm / max. 125 A.  
=> incl. mating connector from PHOENIX CONTACT (Phoenix order no.: 1762602)  
PH7/10.16-ST76: Phoenix plug strip 7-pole / Grid dimension 10.16 mm / max. 76 A.  
=> incl. mating connector from PHOENIX CONTACT (Phoenix order no.: 1967508)
4. Measured at the front in distance of 1 m.
5. 1 U = 44.45 mm. Detailed dimensions by means of 3D models at [www.hoecherl-hackl.com/downloads](http://www.hoecherl-hackl.com/downloads).

# Datasheet Series ACL

6. Installation depth without wiring.

<b>Operating modes</b>		
Basic operating modes	CC, CV, CR, CP	
<b>Frequency</b>		
Frequency range	DC, 40 ... 1,000 Hz	
Synchronization time	1 ... 5 periods of input signal	
Synchronization time for rapidly changing frequencies or when connecting the input voltage	<b>Synchronization to input/extern</b>	<b>Pre-synchronization to line voltage</b>
	max. 500 ms	0 ms
<b>Accuracy of voltage setting<sup>1)</sup></b>		
	<b>of setting</b>	<b>of corresponding range</b>
Voltage		
DC	±0.5 %	±0.1 %
AC	±1 %	±0.2 %
<b>Accuracy of current setting<sup>1)</sup></b>		
	<b>of setting</b>	<b>of corresponding range</b>
Current		
DC	±0.2 %	±0.15 %
40 ... 400 Hz	±0.5 %	±0.3 %
> 400 Hz	±0.75 %	±0.5 %
Resolution	14 bits	
Total harmonic distortion <sup>2)</sup>		
40 ... 400 Hz	<2 %	
> 400 Hz	<4 %	
<b>Accuracy of resistance setting<sup>1)</sup></b>		
	<b>of setting</b>	<b>of corresponding range</b>
Resistance <sup>3)</sup>	±1.5 %	±1 % of resistance range ±0.3 % of current range
<b>Accuracy of power setting<sup>1)</sup></b>		
	<b>of setting</b>	<b>of corresponding range</b>
Power <sup>4)</sup>		
DC, 40 ... 400 Hz	±1 %	±0.25 %
> 400 Hz	±1.5 %	±0.3 %
Power <sup>5)</sup>		
DC, 40 ... 400 Hz	±3 %	±0.5 %
> 400 Hz	±5 %	±2.5 %
Resolution	calculated from resolutions of voltage and current measurement and current setting	
<b>Rise and fall time</b>		
CC mode	see model overview	
CP, CV mode	DC	ca. 10 ms
	AC	ca. 1 s
<b>Accuracy of adjustable protections</b>		
	<b>of setting</b>	<b>of current range</b>
Overcurrent protection	±1 %	±0.2 %
Resolution	12 bits	
<b>Waveforms (Resolution: 360 points in 1° steps)</b>		
Sine	as fundamental waveform	
Arbitrary waveforms	based on sine, triangle or rectangle, editable pointwise	
Harmonics	2 <sup>nd</sup> to 25 <sup>th</sup> Harmonics in variable proportions superimposable to the fundamental wave	
Crest factor	1.4142 ... 4.0 with automatic amplitude correction	
Phase cut	-180 ... 180°	

Phase shift	-180 ... 180° (only in combination with crest factor or phase cut, no capacitive or inductive load)	
<b>Measurement functions</b>		
Numeric display	rms value voltage, rms value current, resistance, active power, apparent power, reactive power, frequency, power factor, crest factor	
Graphical display	last period of current and voltage with 360 points, temporal progression of rms values of voltage, current and/or power of focused channel	
<b>Accuracy of measurements/display</b>		
	<b>of measured (real) value</b>	<b>of corresponding range</b>
Voltage		
DC	±0.2 %	±0.05 % ±1 digit
AC	±0.3 %	±0.1 % ±1 digit
Current		
DC	±0.2 %	±0.1 % ±1 digit
40 ... 400 Hz	±0.5 %	±0.3 % ±1 digit
> 400 Hz	±0.75 %	±0.5 % ±1 digit
Resolution	16 bits	
Resistance	calculated from voltage and current	
Power	calculated from voltage and current	
Sampling time	200 µs, triggerable	
Frequency	±0.1 % ±0.1 Hz	
<b>Dynamic function (LIST)</b>		
Number of load levels	max. 300, with corresponding ramp and dwell times	
	<b>min.</b>	<b>max.</b>
Dwell time	200 µs	1.000 s
Ramp time	0 s	1.000 s
Resolution	200 µs	
Accuracy of setting times	±0.02 %	
Delay at triggered start	max. 300 µs	
<b>Data acquisition</b>		
<b>to external USB flash drive</b>		
Sampling time	0.5 ... 30 s, resolution 100 ms	
Measurement data	timestamp, voltage, current	
Number of measurement points	limited by USB memory capacity	
Dateifformat	.csv	
<b>to internal memory</b>		
Sampling time	200 µs ... 1,000 s, resolution 200 µs, static or synchronized with LIST function	
Measurement data	timestamp, voltage, current	
Number of measurement points	max. 40,000	
<b>Settings memory</b>		
Number of user settings	9, selectable (incl. programmed waveform and List) 1 for last settings at power-off or power fail	
<b>I/O port (option ACL06): control inputs and outputs</b>		
Control inputs	mode selection load input on - off selection of control source (internal, external) input mode (AC, DC) synchronization source (input, line, extern) synchronization input remote shut-down trigger input (low-active)	
Dig. input level	logical low: 0 ... 0.8 V, logical high: 3 ... 30 V	

The specified accuracies refer to an ambient temperature of 23 ±5 °C. The specified accuracies are valid when the sense lines are connected and when the unit is connected to undisturbed voltages (ripple and noise < 0.1 %). At voltages with higher disturbance values the accuracy can change for the worse.

1. The accuracy applies for the specified frequencies. At higher frequencies the accuracy decreases.
2. Measured at I<sub>max</sub>. THD increases at lower currents.
3. At 5 % V<sub>max</sub> < V < 100 % V<sub>max</sub> and 5 % I<sub>max</sub> < I < 100 % I<sub>max</sub>.
4. At V > 30 % V<sub>max</sub> and I > 30 % I<sub>max</sub>.
5. At V < 30 % V<sub>max</sub> or I < 30 % I<sub>max</sub>.

## Technical Data

Control outputs	load input activation state (low-active) status overload trigger output programmable output
Dig. output level	logical low: 0 ... 0.8 V, logical high: 5 V/24 V selectable, max. 10 mA (push-pull)

### I/O port (option ACL06): accuracy analog control 0 ... 10 V for current

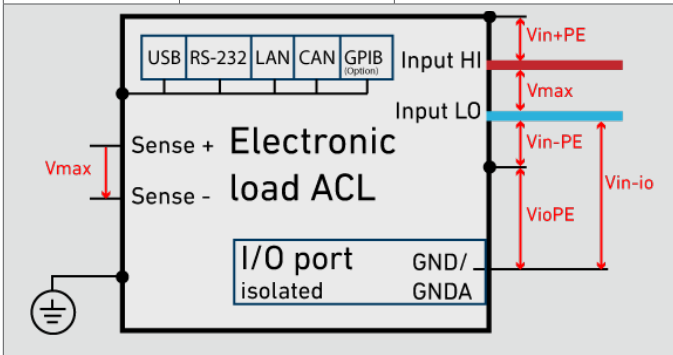
	of setting	of corresponding range
Current		
DC	±0.2 %	±0.1 %
40 ... 400 Hz	±0.5 %	±0.3 %
> 400 Hz	±0.75 %	±0.5 %
Input resistance of analog inputs >10 kΩ		

### I/O port (option ACL06): accuracy analog monitor signals 0 ... 7 V / 0 ... 10 V for voltage and current

	of analog signal of real value	offset voltage
Voltage		
DC, 40 ... 400 Hz	±0.3 %	±15 mV
>400 Hz	±0.5 %	±20 mV
Current		
DC, 40 ... 400 Hz	±0.5 %	±30 mV
>400 Hz	±0.75 %	±50 mV
Maximum load capacity 2 kΩ. Analog monitor outputs as proportional AC curve or RMS value, selectable		

### I/O port (option ACL06): permissible voltages

	AC mode The external circuit is mains voltage up to 500 V AC with overvoltage category II.	DC mode The external circuit is a DC voltage derived from mains voltage with overvoltage category II.
Vin-io (GND - Input LO)	max. 600 V AC	max. 800 V DC
VioPE (GND - PE)	max. 100 V AC	max. 100 V DC



### Input

Input resistance	> 50 kΩ at deactivated load input
Input capacity	see model overview
Parallel operation	up to 3 devices in Master-Slave operation
Max. input voltage Vmax	see model overview
Min. input voltage Vmin for max. current	see model overview

### Input: permissible voltages

Vin-PE (Input LO - PE)	max. 500 V <sup>1)</sup>
Vin+PE (Input HI - PE)	max. 500 V <sup>1)</sup>

Power	
Continuous power	see model overview (at TA = 21 °C)
Derating	-1.2 %/°C for TA > 21 °C
Protection and Monitoring	
Protective devices	overcurrent overpower overtemperature
Monitoring	overvoltage undervoltage (if the input voltage is too low for the set current)
Terminals	
Load input	see model overview
Sense	Phoenix PH2/7.62-BU16
Operating conditions	
Operating temperature	5 ... 40 °C
Stock temperature	-25 ... 65 °C
Max. operation height	2,000 m over sea level
Pollution degree	2
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	see model overview
Mains voltage	see model overview
Mains cable	length max. 3 m cross-section of mains leads: 10 A cold device plug: (IEC C13): min. 1 mm <sup>2</sup> 16 A cold device plug: (IEC C19): min. 1.5 mm <sup>2</sup>
Power consumption	see model overview

### Housing

Dimensions, weight	see model overview
Color	front panel RAL7035 (light grey) rear panel stainless steel side panels, top RAL7037 (dusty grey)

### Safety and EMV

Protection class	1
Measuring category	CAT II
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	-

### Available options

Data interface	
ACL02	GPIB interface
Hardware extensions	
ACL06 ACL14	galvanically isolated I/O port castors

### Calibration, warranty

FCC-ACLxx	Factory Calibration Certificate, twice for free
Warranty	2 years

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

Technical data of production series B, rev. 5. Subject to technical changes without notice.