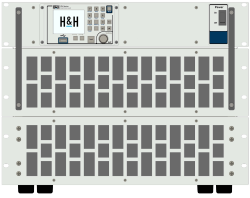
# Datasheet Series PLI

Höcherl & Hackl
The electronic load

| Model | PLI2306ZV |  |
|---|---|---|
| Order no. | 17-016-005-02 | |

| | |
|---|---|
| Basic operating modes | CC, CV, CR, CP |
| Standard interfaces | RS-232, USB, LAN, CAN |
| Max. input voltage Vmax | 60 V |
| Min. input voltage Vmin [1)] | 0.01 V |
| Max. load current Imax | 300 A |
| Continuous power | 2300 W |
| Short-time power [2)] | 5500 W |
| Voltage setting | 0 ... 60 V |
| Current ranges | 0 ... 300 A |
| Resistance ranges | 0.00666 Ohm ... 2.1506 Ohm |
| Power ranges continuous/short-time [3)] | 0 ... 5500 W |
| Rise and fall time fast / medium / slow [4)] | 20 / 150 / 2000 µs |
| Load terminals (front) [5)] | - |
| Load terminals (rear) [6)] | FKS25/10-SM10 |
| Mains voltage [7)] | 1/N/PE AC 230 V 50 ... 60 Hz |
| Mains voltage toggleable [8)] | - |
| Power consumption | 1500 VA |
| Noise max. ca. [9)] | 71 dB(A) |
| Weight ca. | 50 kg |
| Housing / 3D model [10)] | 19" - 8 U / PLI_M23 |
| Width x Height x Depth | 444 x 355 x 535 mm |

1. Minimum input voltage for maximum static load current.
2. Level and duration of the peak power depend on the previous power.
3. The setting range extends max. to the possible peak power.
4. Rise and fall times are defined of 10 % ... 90 % and 90 % ... 10 % of the maximum current (CC mode, fast regulation speed, tolerance ±20 %). Rise and fall time at setting "medium": ca. 150 µs, "slow": ca. 2 ms.
5. 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
   FKS20/5-SM8: Flat copper bars 20 x 5 mm vertical with hole for screw M8
   FKS25/8-SM10: Flat copper bars 25 x 8 mm vertical with hole for screw M10
   FKS25/10-SM10: Flat copper bars 25 x 10 mm vertical with hole for screw M10
   FKS40/12-SM12: Flat copper bars 40 x 12 mm vertical with hole for screw M12

Subject to modifications without notice, errors and omissions expected

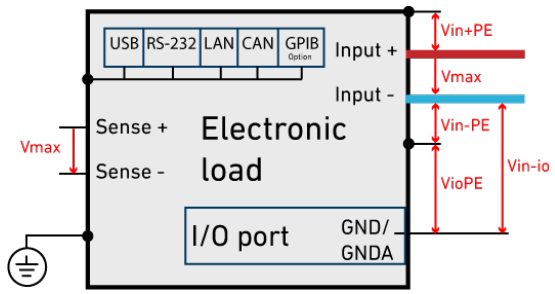
Models with copper bars (FKS) are delivered with safety covers.

6. 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
   FKS20/5-SM8: Flat copper bars 20 x 5 mm vertical with hole for screw M8
   FKS25/8-SM10: Flat copper bars 25 x 8 mm vertical with hole for screw M10
   FKS25/10-SM10: Flat copper bars 25 x 10 mm vertical with hole for screw M10
   FKS40/12-SM12: Flat copper bars 40 x 12 mm vertical with hole for screw M12
   Models with copper bars (FKS) are delivered with safety covers.
7. Mains voltage tolerance: ±10 %
8. Mains voltage tolerance: ±10 %
9. Measured on the front from distance of 1 m.
10. Largest width and depth without wiring. 1 U = 44.45 mm.

Subject to modifications without notice, errors and omissions expected

| Operating modes | | | | |
|---|---|---|---|---|
| Basic operating modes | CC, CV, CR, CP | | | |
| Combined operating modes | CC+CV, CR+CC+CV, CP+CC+CV, CV+CC | | | |
| **Accuracy of setting** | | | | |
| | of setting | | of corresponding range | |
| Voltage | ±0.2 % | | ±0.05 % | |
| Current | ±0.2 % | | PLI MR in R1 ±0.1 %, others ±0.05 % | |
| Resistance (at 5 % to 100 % of voltage range) | ±1.4 % | | ±0.3 % of current range | |
| Power (at V and I > 30 % of range) | PLI EC ±1 % | others ±0.35 % | PLI EC ±0.3 % | others ±0.1 % |
| Power (at V and I > 5 % and < 30 % of range) | ±2 % | ±0.7 % | ±0.75 % | ±0.25 % |
| Resolution | 14 bits | | | |
| **Accuracy of adjustable protections** | | | | |
| | of setting | | of corresponding range | |
| Overcurrent protection | ±1.4 % | | ±0.3 % | |
| Undervoltage protection | ±1.4 % | | ±0.3 % | |
| Resolution | 12 bits | | | |
| **Accuracy of measurement slow** | | | | |
| | of measured value (real value) | | of corresponding range | |
| Voltage | ±0.01 % | | ±0.005 % | |
| Current | ±0.2 % | | PLI MR in R1 ±0.1 %, others ±0.05 % | |
| Resistance | is calculated from current and voltage | | | |
| Power | is calculated from current and voltage | | | |
| Resolution | 23 bits | | | |
| Sampling time | 250 ms, not triggerable | | | |
| **Accuracy of display** | | | | |
| Number of decimal places | 5 | | | |
| Accuracy | Accuracy of measurement slow ±1 digit of the display value | | | |
| **Accuracy of measurement fast** | | | | |
| | of measured value (real value) | | of corresponding range | |
| Voltage | ±0.1 % | | ±0.05 % | |
| Current | ±0.2 % | | PLI MR in R1 ±0.2 %, others ±0.1 % | |
| External control voltage | ±0.2 % | | ±0.1 % | |
| Resistance | calculated from voltage and current values | | | |
| Power | calculated from voltage and current values | | | |
| Resolution | 16 Bit | | | |
| Sampling time | 200 µs ... 1000 s | | | |
| **Accuracy of trigger voltage and current** | | | | |
| Voltage | ±1 % of range | | | |
| Current | ±1 % of range | | | |
| **Dynamic function (LIST)** | | | | |
| No. of load levels | max. 300, with ramp and dwell time setting | | | |
| | min. | | max. | |
| Dwell time | 200 µs | | 1000 s | |
| Ramp time | 0 s | | 1000 s | |
| Resolution | 200 µs | | | |
| Accuracy of the setting times | ±0.02 % | | | |
| Delay at triggered start | max. 300 µs | | | |

| Data acquisition | | |
|---|---|---|
| **to external USB flash drive** | | |
| Sampling time | 0.5 to 30 s, resolution 0.1 s | |
| Measurement data | timestamp, voltage, current | |
| No. of measurement points | limited by USB memory capacity | |
| File format | .csv | |
| **to internal memory** | | |
| Sampling time | 200 µs ... 1000 s, resolution 200 µs, synchronized with dynamic function | |
| Measurement data | timestamp, voltage, current | |
| No. of measurement points | max. 40,000 | |
| **Settings memories** | | |
| No. of user settings | 9, selectable (incl. programmed list)<br>1 for last device settings at power-off or power fail | |
| **I/O port: accuracy of analog control 0 ... 10 V** | | |
| | of setting | of corresponding range |
| Voltage | ±0.2 % | ±0.1 % |
| Current | ±0.2 % | PLI MR in R1 ±0.2 %, others ±0.1 % |
| Resistance (at V > 5 % of Vmax) | ±1.6 % | ±0.4 % of current range |
| Power (at V and I > 30 % of max. value) | ±0.55 % | ±0.2 % |
| Power (at V and I > 5 % and < 30 % of max. value) | ±0.9 % | ±0.35 % |
| Overcurrent protection | ±1 % | ±0.4 % |
| Undervoltage protection | ±1 % | ±0.4 % |
| | Input resistance of analog inputs >10 kΩ | |
| **I/O port: accuracy of analog monitor outputs 0 ... 10 V** | | |
| | of analog signal of real value | offset voltage |
| Voltage | ±0.2 % | ±15 mV |
| Current | ±0.2 % | ±15 mV |
| | load capacity minimal 2 kΩ | |
| **I/O port: permissible voltages** | | |
| | standard I/O port | isolated I/O port (option PLI06) |
| Vin-io (GND - neg. load input) | PLIxxxxZV: must be galvanically isolated<br>all others: max. 2 V [1] | PLIxxxxZV: max. 2 V[1]<br>all others: max. 800 V[1] |
| VioPE (GND - PE) | max. 125 V [1] | max. 125 V [1] |



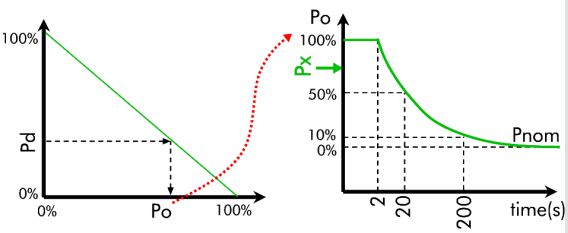

The specified accuracies refer to an ambient temperature of 23 ±5 °C. The specified accuracies are valid when the sense lines are connected and when the unit is connected to undisturbed voltages (ripple and noise < 0.1 %). At voltages with higher disturbance values the accuracy can change for the worse.

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

# Technical Data

| I/O port: control outputs and inputs | |
|---|---|
| Outputs | activation state load input (low active)<br>status overload (OV, OCP, OPP, OTP, low active)<br>trigger output (low active)<br>programmable logic output (by SCPI command) |
| Output level | selectable, 3.3 V, 5 V, 12 V or externally programmable up to 30 V |
| Control inputs | activation state load input (low active)<br>operating mode selection<br>trigger input (high active)<br>readable logic input (by SCPI command)<br>control input (activates the analog signals, low active)<br>remote shut-down (low active) |
| input level | 3 ... 30 V |

| Input | | |
|---|---|---|
| Input resistance | > 50 kΩ when load input is off<br>diode function at reverse polarity up to nominal current, except ZV models | |
| Input capacity | see model overview | |
| Parallel operation | up to 5 devices in Master-Slave operation | |
| Max. input voltage | see model overview | |
| Min. input voltage | see model overview | |
| **Input: permissible voltages** | | |
| | **standard I/O port** | **isolated I/O port (option PLI06)** |
| Vin-PE (neg. load input - PE) | max. 125 V [1] | PLIxxxxZV: max. 125 V[1]<br>all others: max. 800 V[1] |
| Vin+PE (pos. load input - PE) | Vmax + max. 125 V[1] | PLIxxxxZV: Vmax + max. 125 V[1]<br>all others: Vmax + max. 800 V[1] |
| **Power** | | |
| Continuous power | see model overview (at Ta = 21 °C) | |
| Derating | -1.2 %/°C for Ta > 21 °C | |
| Overload capability (short-time power) | see model overview<br>The max. possible overload Po depends on the temperature of the device and therefore on the previously consumed continuous power Pd. The possible overload duration depends on the value of the overload Px. | |




| Protection and monitoring | |
|---|---|
| Protective devices | overcurrent<br>overpower<br>overtemperature |
| Monitoring | overvoltage indication<br>reverse polarity indication<br>undervoltage indication (if the input voltage is too low for the set current) |
| **Terminals** | |
| Load input | see model overview |
| Sense | PH2/7.62-BU16 |

| Operating conditions | |
|---|---|
| Operating temperature | 5 ... 40 °C |
| Stock temperature | -25 ... 65 °C |
| Max. operating height | 2,000 m above sea level |
| Pollution degree | 2 |
| Overvoltage category of mains | II |
| 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 | 3-stage air cooling, up from 3200 W variably controlled |
| Noise. weight | see model overview |
| Mains voltage<br>with option PLI18 | see model overview<br>11 ... 15 V DC |
| Mains cable | length max. 3 m<br>cross-section of mains leads min. 1 mm² |
| Power consumption | see model overview |

| Housing | |
|---|---|
| Color<br>Front<br>Rear<br>Top, side panels | <br>RAL7035 (light grey)<br>stainless steel<br>RAL7037 (dusty grey) |
| **Safety and EMC** | |
| Protection class | 1 |
| Measuring category | O (CAT I according to EN61010:2004) |
| Electrical safety | DIN EN 61010-1<br>DIN EN 61010-2-030 |
| EMC | DIN EN 61326-1<br>DIN EN 55011<br>DIN EN 61000-3-2<br>DIN EN 61000-3-3 |
| **Standard interfaces** | |
| Data interfaces | RS-232, USB, LAN, CAN |
| I/O port | standard I/O port (not isolated) |
| **Available options** | |
| Data interfaces<br>PLI02 | <br>GPIB |
| Mechanical options<br>PLI10<br>PLI11<br>PLI12<br>PLI13<br>PLI14 | <br>19" installation kit for 1 device with ½ 19", 2 U<br>19" installation kit for 2 devices with ½ 19", 2 U<br>19" installation kit for 1 device with 19", 2 U<br>19" installation kit for 1 device with 19", 3 U<br>heavy-load castors (5 U and upwards) |
| Function enhancement<br>PLI21<br>Accuracy | <br>MPPT function with activation code<br>see accuracy of measurement fast |
| Hardware extensions<br>PLI06 | <br>galvanically isolated I/O port |
| PLI16-06<br>PLI16-12<br>Accuracy<br>Load current<br>Activation<br>Activation time | Charger Starter Interface (CST) for 60 V models (6...60 V)<br>Charger Starter Interface (CST) for 120V models (6...120V)<br>±1 % ±200 mV<br>max. 0.1 A<br>can be coupled with activation state of load input<br>0.1 ... 100 s ±0.3 s |
| PLI17 | switch box for external load activation via I/O port |
| DC mains supply<br>PLI18<br>PLI19 | <br>12 V DC mains supply (only for PLI14xx)<br>12 V DC mains supply (only for PLI32xx with housing extension to 5 U, toggling by mains selection switch) |
| **Calibration, warranty** | |
| FCC-PLIxx | Factory Calibration Certificate, twice for free |
| Warranty | 2 years |

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