15, 30, 50 Watt AC-DC (DC-DC) Converters Convert Simply

RoHS Compliant

Features

Universal input range 100 - 240 VAC nominal
Additional DC input 90 - 250 V
Single output 5.1, 12, 24, or 48 VDC
Class I equipment

- RoHS lead-solder-exempt compatible
- Extremely compact design
- Battery charger versions
- Operating ambient temperature range –10 to 50 °C with convection cooling
- Short-circuit and no-load proof

Safety according to IEC/EN 60950, UL 1950, and UL 508 [2]

[1] LOK
[2] LOS/LOR

Description

The Convert Simply front-end converters represent a family of 15, 30, and 50 watt DIN-rail mountable AC-DC converters for use as rectifiers or battery chargers. Plastic casing, compact size, and high reliability make the LOS, LOR, LOK4000 Series an excellent choice for space-critical applications, where a DIN-Rail mountable AC-DC converter is required. The universal input range and a built-in input filter allow flexible operation in a wide variety of electronic equipment and enables worldwide connection to the mains.

The converters are available as rectifiers with 12 V, 24 V, or 48 V single output and as battery chargers for 12 V, 24 V, or 48 V batteries. The output voltage of LOK converters can be adjusted via the R input.

Safety approvals fully comply with worldwide requirements.

Applications

Typical applications are: powering building controls, factory automation, industrial controls, instrumentation, electromagnetic drives, fans, and other DC loads.

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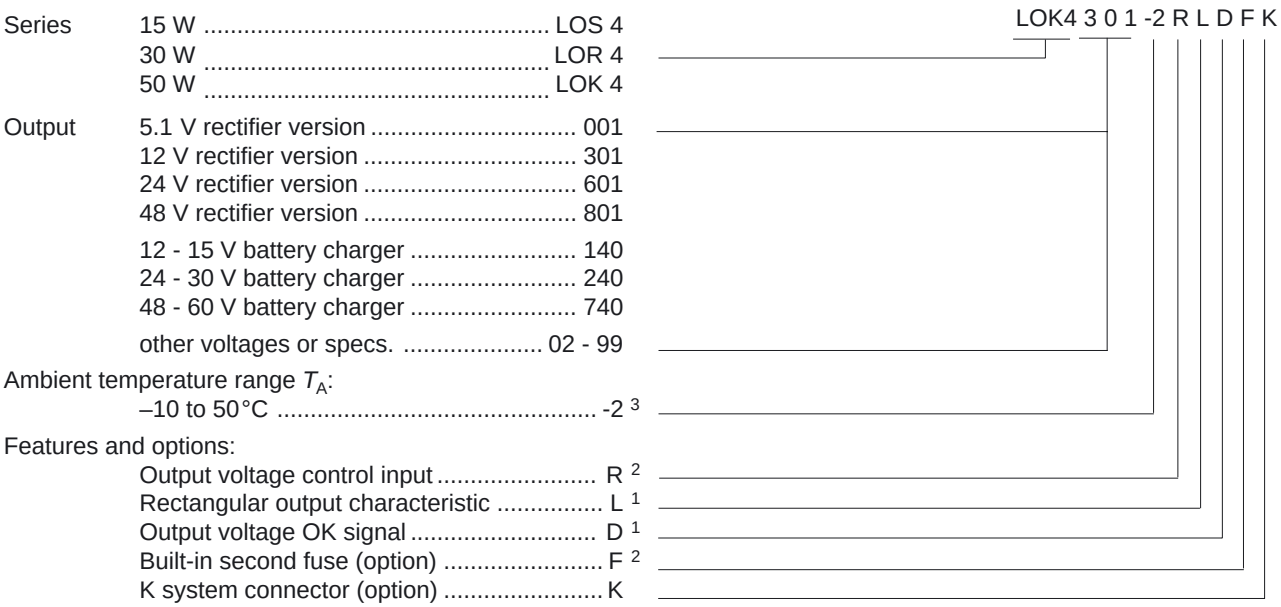
Model Selection

Table 1: Type survey

Output $V_{o\,nom}$ [VDC]	Output $I_{o\,nom}$ [A]	Operating input voltage[1]	Rated power[1] T_A = 50 °C $P_{o\,tot}$ [W]	Efficiency[5] η_{typ} [%]	Model	Options[4]
5.1	5.2	85 - 264 VAC 47 - 63 Hz 90 - 250 VDC	26	70	LOK4001-2RLD	F[2], K
12	1.25		15	74	LOS4301-2	
12	2.5		30	80	LOR4301-2	
12	4		48	82	LOK4301-2R	
12 - 12.8[3] - 15	3.6		49	82	LOK4140-2RLD	
24	0.65		15	76	LOS4601-2	
24	1.25		30	82	LOR4601-2	
24	2		48	82	LOK4601-2R	
24 - 25.7[3] - 30	1.8		49	82	LOK4240-2RLD	
48	1		48	82	LOK4801-2R	
48 - 51.4[3] - 60	0.9		49	81	LOK4740-2RLD	

[1] Linear derating to 85% of $P_{o\,nom}$ below V_i = 105 VAC, 110 VDC
[2] LOK types only
[3] Setting voltage $V_{o\,set}$ for battery chargers with R-input left open-circuit.
[4] For minimum order quantities and lead times contact Power-One.
[5] Efficiency at $V_{i\,rated}$ and $I_{o\,nom}$

Part Number Description and Product Marking



[1] Battery chargers and LOK4001-2RLD
[2] LOK models only
[3] Up to 70 °C with derating

Examples: LOK4140-2RLD: AC-DC converter, battery charger version, providing 12 - 15 V/3.6 A at the output
LOK4601-2R: AC-DC converter, rectifier version, providing 24 V/2 A, 48 W at the output

Functional Description

The Convert Simply 15, 30, and 50 watt front-end modules are flyback converters with a fixed frequency of 100 kHz (LOK) or 130 kHz (LOR, LOS). The battery charger modules and the LOK4001-2RLD have a rectangular *V/I* output characteristic. The rectifier modules have overload protection working in a hiccup mode.

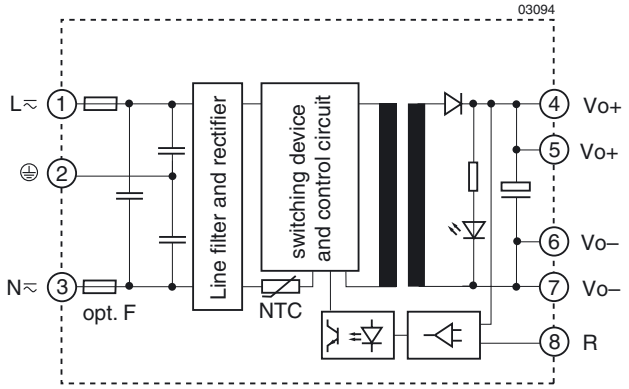


Fig. 1
Block diagram LOK4301, LOK4601 and 4801 (rectifier versions), all LOR and all LOS.

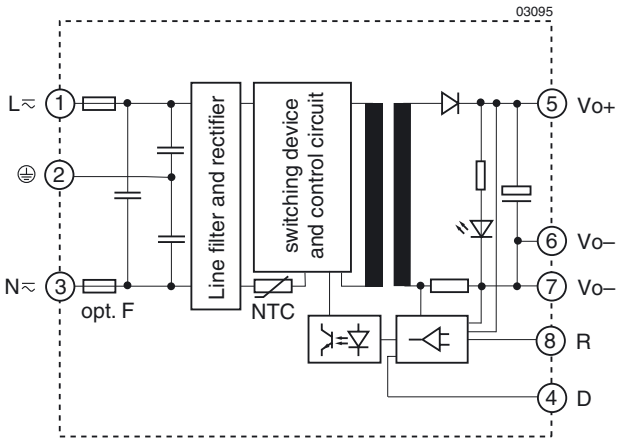


Fig. 2
Block diagram LOK4140, LOK4240 and LOK4740 (battery charger versions) and LOK4001- 2RLD.

Electrical Input Data

General Condition: T_A = 25 °C unless otherwise specified

Table 2: Input data

Characteristics		LOS	LOR	LOK	Unit
$V_{i\ rated}$	Rated input voltage range	100 - 240	100 - 240	100 - 240	VAC
$V_{i\ nom}$	Nominal input voltage	230	230	230	
V_i	Operating input voltage range	85 - 264	85 - 264	85 - 264	
		90 - 250	90 - 250	90 - 250	VDC
f_i	Nominal line frequency	50 - 60	50 - 60	50 - 60	Hz
I_i	Input current at 115/230 VAC [1]	0.3/0.15	0.52/0.26	0.8/0.4	A
$I_{i\ nl}$	Input current at 230 VAC and no load			0.035	
$I_{inr\ max}$	Peak inrush current at V_i = 230 V [2]	18	18	19	

[1] At $I_{o\ nom}$.
[2] Inrush current limitation by a 16 Ω NTC resistor.

Electrical Output Data

General Conditions: T_A = 25 °C unless otherwise specified. R input not connected.

Table 3a: Output data

Output			LOK4001-2RLD			LOS/LOR/LOK 4301-2(R)			LOS/LOR/LOK 4601-2(R)			LOK4801-2R			
Characteristics		Conditions	min	typ	max	min	typ	max	min	typ	max	min	typ	max	Unit
V_o	Output voltage $V_{o\,nom}$	$V_{i\,nom}$, 0.5 $I_{o\,nom}$		5.1			12			24			48		V
	V_o setting tolerance	R-input open-circuit			±1.5			±1.5			±1.5			±1.5	%
$V_{o\,adj}$	Adjustable voltage range	Units with feature R		4.5 - 5.5			10.8 - 13.2			21.6 - 26.4			43.2 - 52.8		V
$I_{o\,nom}$	Nominal output current	$V_{i\,min}$ - $V_{i\,max}$ LOS LOR LOK		- - 5.2			1.25 2.5 4.0			0.65 1.25 2.0			- - 1.0		A
v_o	Output voltage noise (BW = 20 MHz)	$V_{i\,nom}$, $I_{o\,nom}$, IEC 61200		50			100	150		100	150		200		mV_{pp}
	Static line/load regulation	$V_{i\,min}$ - $V_{i\,max}$, I_o = (0.1 - 1) $I_{o\,nom}$			±1			±1			±1			±1	%
$V_{o\,l}$	Dynamic load regulation	$V_{i\,nom}$, (0.1 × 0.9) $I_{o\,nom}$			±5			±2			±1.5			±1	
t_r	Transient recovery time	I_o = (0.1 × 0.9) $I_{o\,nom}$		4			4			4			4		ms
t_h	Hold-up time	115/230 VAC		14/90			14/90			14/90			14/90		
α_{Uo}	Temper. coefficient of V_o	$V_{i\,nom}$, $I_{o\,nom}$		±0.05			±0.05			±0.05			±0.05		%/K
f_s	Switching frequency			100			100[1]			100[1]			100		kHz

[1] LOR and LOS have 130 kHz.

Table 3b: Output data (battery charger models)

Output			LOK4140-2RLD			LOK4240-2RLD			LOK4740-2RLD			
Characteristics		Conditions	min	typ	max	min	typ	max	min	typ	max	Unit
V_o	Output voltage	$V_{i\,nom}$, 0.5 $I_{o\,nom}$ R-input open-circuit		12.84[1]			25.68[1]			51.36[1]		V
$V_{o\,adj}$	Adjustable voltage range			12.0 - 15.0			24.0 - 30.0			48.0 - 60.0		
$I_{o\,nom}$	Nominal output current	$V_{i\,min}$ - $V_{i\,max}$		3.6			1.8			0.9		A
v_o	Output voltage noise (BW = 20 MHz)	$V_{i\,nom}$, $I_{o\,nom}$ IEC 61204		100	150		100	150		200		mV_{pp}
	Static line/load regulation	$V_{i\,min}$ - $V_{i\,max}$ I_o = (0.1 - 1) $I_{o\,nom}$			±2[1]			±1[1]			±1[1]	%
$V_{o\,l}$	Dynamic load regulation	$V_{i\,nom}$, (0.1 × 0.9) $I_{o\,nom}$			±2[1]			±1.5[1]			±1[1]	
t_r	Transient recovery time	I_o = (0.1 × 0.9) $I_{o\,nom}$		4			4			4		ms
t_h	Hold-up time	115/230 VAC		14/90			14/90			14/90		
α_{Uo}	Temper. coefficient of V_o	$V_{i\,nom}$, $I_{o\,nom}$		±0.05[1]			±0.05[1]			±0.05[1]		%/K
f_s	Switching frequency			100			100			100		kHz

[1] R input left open-circuit.

Thermal Considerations

If an AC-DC converter is located in free, quasi-stationary air (convection cooling) at the indicated maximum ambient temperature $T_{A\,max}$ (see table: *Temperature specifications*) and is operated at its nominal input voltage and output power, the temperature measured at the *Measuring point of case temperature* T_C (see *Mechanical Data)* will approach the indicated value $T_{C\,max}$ after the warm-up phase. However, the relationship between T_A and T_C depends heavily on the conditions of operation and integration into a system. The thermal conditions are influenced by input voltage, output current, airflow, temperature of surrounding components and surfaces. $T_{A\ max}$ is therefore, contrary to $T_{C\,max}$, an indicative value only.

The relation between the maximum allowed output power $P_{o\,allowed}$ and the temperature T_A of the surrounding air is given in the figure below. The rates apply if the AC-DC converter is located in free, quasi-stationary air (convection cooling).

Note: Sufficient forced cooling allows T_A to be higher than the value given in the table if $T_{C\,max}$ according to the table is not exceeded.

Caution: The installer must ensure that under all operating conditions T_C remains within the limits that are stated in the table *Temperature specifications*.

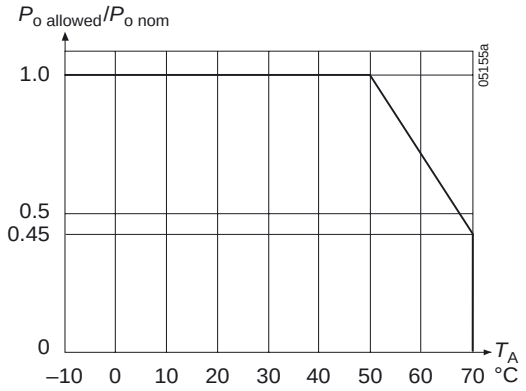


Fig. 4
Maximum allowed output power versus ambient temperature at V_i >105 VAC for LOK models.

Output Power at Low Input Voltage

The output power of LOK models must be derated at low input voltage, see figure below.

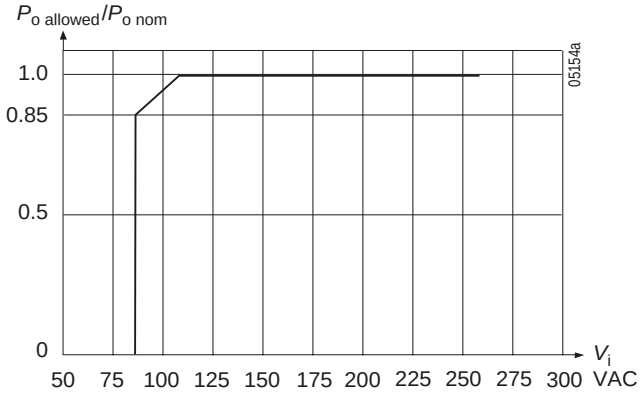


Fig. 3
Maximum allowed output power versus input voltage at T_A 50°C. for LOK models.

Output Protection

Battery charger versions LOK4140-, 4240-, LOK4740-2RLD, and the LOK4001-2RLD have a rectangular current limitation characteristic, which limits the output current to within 100 and 150% of $I_{o\,nom}$. The other models are protected against overload by a current limiting circuit, which shuts down the converter in overload condition. It automatically restarts after removal of the overload condition (hiccup mode).

All models are short-circuit and no-load proof.

Outputs Connected in Series

Two or more converters supplying the same or different output voltages may be connected in series. The value of the maximum output current to be taken is defined by that unit providing the lowest current limiting value. It should be assured that the outputs do not feed backwards into each other caused by their different rise/fall times at switch-on/off cycles by adding reverse polarity diodes across each output.

Parallel Operation

Only possible with battery charger versions.
The outputs of several battery charger models with equal output voltage (e.g. several LOK4240-2RLD) may be connected in parallel.

Auxiliary Functions

Adjustable Output Voltage (R input)

As a standard feature, the LOK units offer adjustable output voltage by using the control input R. If the R pin is left open-circuit, the output voltage is set to $V_{o\,nom}$. (see: *Output data*)

The R input is referenced to the secondary side of the converter. Adjustment of the output voltage is possible by means of either an external resistor or a voltage source.

a) Adjustment by means of an external resistor R_{ext1}:

Depending upon the value of the required output voltage, the resistor shall be connected

either: Between the R terminal and Vo– to achieve an output voltage adjustment range of approximately
V_o = 90 - 100 % $V_{o\,nom}$.(LOK4301, 4601 and 4801 types)

$$R_{ext1} \approx 4\ k\Omega \bullet \frac{V_o}{V_{o\,nom} - V_o}$$

or: Between the R terminal and Vo+ to achieve an output voltage range of approximately V_o = 100 - 110% $V_{o\,nom}$ for rectifier versions and 100 - 125% $V_{o\,nom}$ for battery chargers.

$$R_{ext2} \approx 4\ k\Omega \bullet \frac{(V_o - 2.5\ V)}{2.5\ V \bullet (V_o/V_{o\,nom} - 1)}$$

b) Adjustment by means of an external voltage V_{ext} between Vo– and R terminal to achieve an output voltage adjustment range of approx. 90 - 110% $V_{o\,nom}$ (LOK 4301, 4601 and 4801 types), 93 - 117% $V_{o\,nom}$ for battery chargers.

$$V_{ext} \approx \frac{V_o \bullet 2.5\ V}{V_{o\,nom}}$$

Attempting to adjust the output below this range will cause the converter to shut down (hiccup mode).

Note: Applying an external control voltage >3 V may damage the converter.

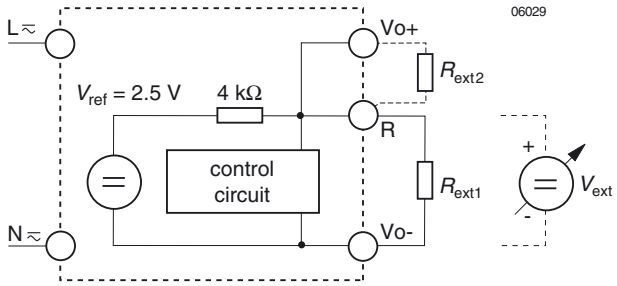


Fig. 5
Output voltage control by means of the R-input

Output Voltage OK (D Output)

The D-output is referenced to Vo– and monitors the output voltage V_o. If V_o drops below $V_{o\,t}$, the D-output will be disabled (open-collector circuit). The circuitry works independently of the input voltage and can therefore be used as battery-low indicator.

Table 4: Output Voltage OK signal

Conditions		LOK4001-2RLD		LOK4140-2RLD		LOK4240-2RLD		LOK4740-2RLD		Unit
		min	max	min	max	min	max	min	max	
$V_{o\,t}$	setting	4.4	4.8	10.5	11.5	21	23	42	46	V
V_D	V_o - $V_{o\,t\,min}$		60		60		60		60	
	$V_o > V_{o\,t\,max}$ I_D < 50 mA		0.6		0.6		0.6		0.6	

Battery Charging/Temperature Sensor

The LOK 4140/4240/4740 are designed to charge lead-acid batteries. For optimum battery charging and extended life time of the battery an external temperature sensor may be connected to the R-input. The sensor should be mounted as close as possible to one of the poles of the battery.

Depending upon the cell voltage and the temperature coefficient of the battery, different temperature sensors are available. For more information please see: *Temperature Sensors* (Accessory Products on the Web Site) or contact Power-One.

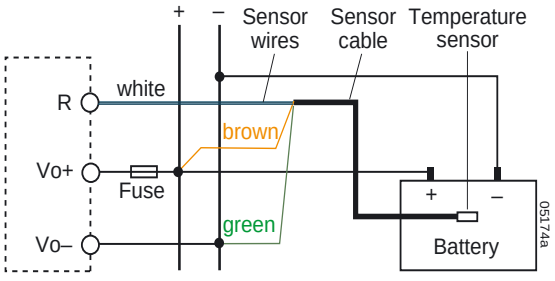


Fig. 6
Voltage setting by a temperature sensor, wiring diagram

If no sensor is used, the float charge voltage should be adjusted with a suitable resistor connected to the R input (see: *Adjustable Output Voltage*).

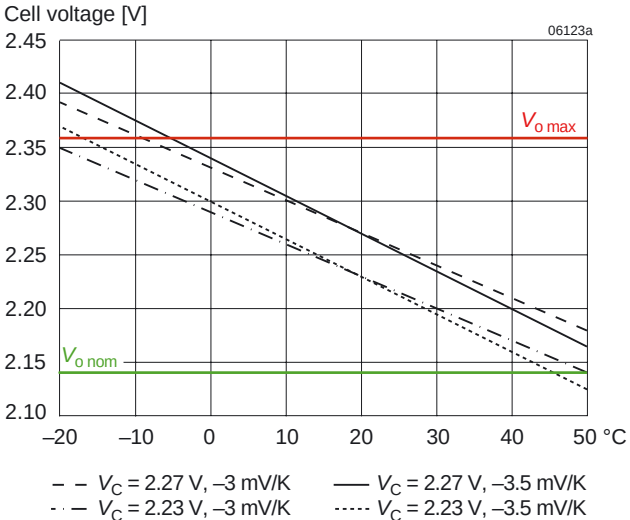


Fig. 7
Float charge voltage for defined temperature coefficients.

Electromagnetic Compatibility (EMC)

Immunity

A metal-oxide VDR together with the input fuse and the input filter form an effective protection against high input transient voltages, which typically occur in most installations. The LOS, LOR, and LOK series have been successfully tested to the following specifications:

Table 5: Immunity type tests

Phenomenon	Standard [1]	Level	Coupling mode [2]	Value applied	Waveform	Source imped.	Test procedure	Per-form.[3]
Electrostatic discharge	IEC/EN 61000-4-2	2	air discharge	8000 V_p	1/50 ns	330 Ω	10 positive and 10 negative discharges	B
Electromagnetic field	IEC/EN 61000-4-3	2	antenna	3 V/m	AM 80% 1 kHz	n.a.	80…1000 MHz 900 MHz 1800 MHz	B
Electrical fast transients/burst	IEC/EN 61000-4-4	3	direct, i/⏚, +i/–i	2 kV_p	bursts of 5/50 ns 2.5/5 kHz over 15 ms; burst period: 300 ms	50 Ω	60 s positive 60 s negative transients per coupling mode	B
Surge	IEC/EN 61000-4-5	3	i/⏚	2 kV_p	1.2 / 50 µs	12 Ω	5 pos. and 5 neg. surges per	A
		2	+i/–i	1 kV_p		2 Ω		
Conducted disturbances	IEC / EN 61000-4-6	2	box	3 VAC	AM 80% 1 kHz	150 Ω	0.15 - 80 MHz	A

[1] Related and previous standards are referenced in: *Technical Information: Standards*
[2] i = input, o = output, ⏚ = PE case.
[3] A = Normal operation, no deviation from specifications, B = Normal operation, temporary deviation from specs possible.

Emission

Internal input filtering keeps the conducted noise of the converters within the frequency range of 10 kHz to 30 MHz below level B according to EN 55011 and EN 55022 standards.

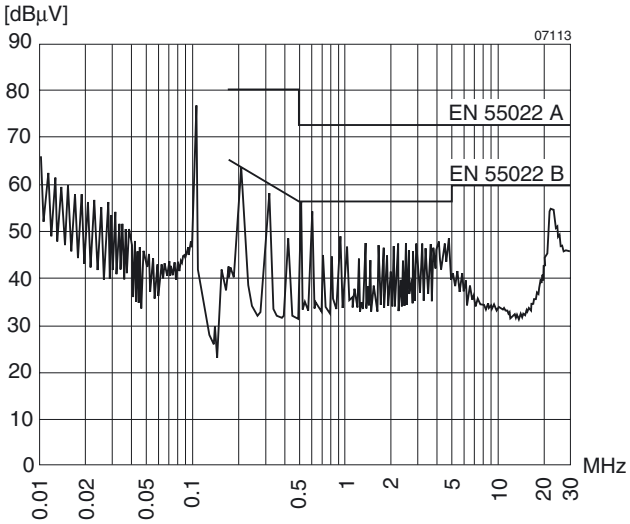


Fig. 8
Typical conducted disturbances (quasi-peak) at the input measured according to EN 55011/55022 at $V_{i\ nom}$ and $I_{o\ nom}$. LOK4601-2R, V_i = 230 VAC.

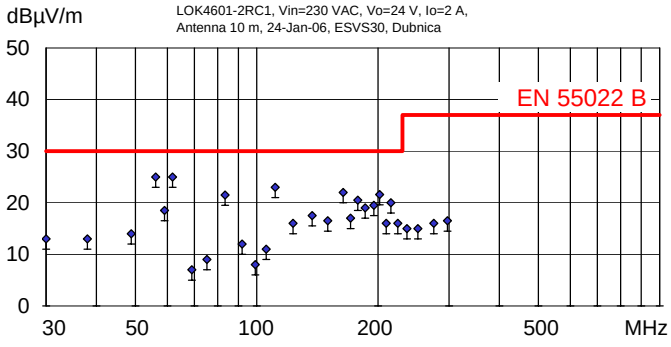


Fig. 9
Radiated disturbances measured according to EN 55011/55022 at $V_{i\ nom}$ and $I_{o\ nom}$. LOK4601-2R, V_i = 230 VAC.

Immunity to Environmental Conditions

Table 6: Mechanical stress

Test Method		Standard	Test Conditions		Status
Ca	Damp heat steady state	IEC/EN 60068-2-78 MIL-STD-810D section 507.2	Temperature: Relative humidity: Duration:	40 $^{\pm 2}$ °C 93 $^{+2/-3}$ % 21 days	Converter not operating
Ea	Shock (half-sinusoidal)	IEC/EN 60068-2-27 MIL-STD-810D section 516.3	Acceleration amplitude: Bump duration: Number of bumps:	15 g_n = 147 m/s^2 11 ms 18 (3 each direction)	Converter operating
Eb	Bump (half-sinusoidal)	IEC/EN 60068-2-29 MIL-STD-810D section 516.3	Acceleration amplitude: Bump duration: Number of bumps:	10 g_n = 98 m/s^2 11 ms 6000 (1000 each direction)	Converter operating
Fc	Vibration (sinusoidal)	IEC/EN 60068-2-6 MIL-STD-810D section 514.3	Acceleration amplitude: Frequency (1 Oct/min): Test duration:	0.15 mm (10 - 60 Hz) 2 g_n = 20 m/s^2 (60 - 150 Hz) 10 - 150 Hz 3.75 h (1.25 h each axis)	Converter operating

Table 7: Temperature specifications

Characterisitcs		Conditions	min	max	Unit
T_A	Ambient temperature	Operational [1]	–10	50	°C
T_C	Case temperature		–10	80	
T_S	Storage temperature	Non operational	–40	85	

[1] See: *Thermal Consideration*.

Table 8: MTBF Values

MTBF	Type	Ground benign T_C = 40 °C	Ground fixed T_C = 40 °C	Ground fixed T_C = 70 °C	Ground mobile T_C = 50 °C	Unit
According to MIL-HDBK-217F, Notice 2	LOK	1 600 000	400 000	200 000	120 000	h

Mechanical Data

Dimensions in mm.

Weight:

LOS/LOR: approx. 0.25 kg

LOK: approx. 0.35 kG

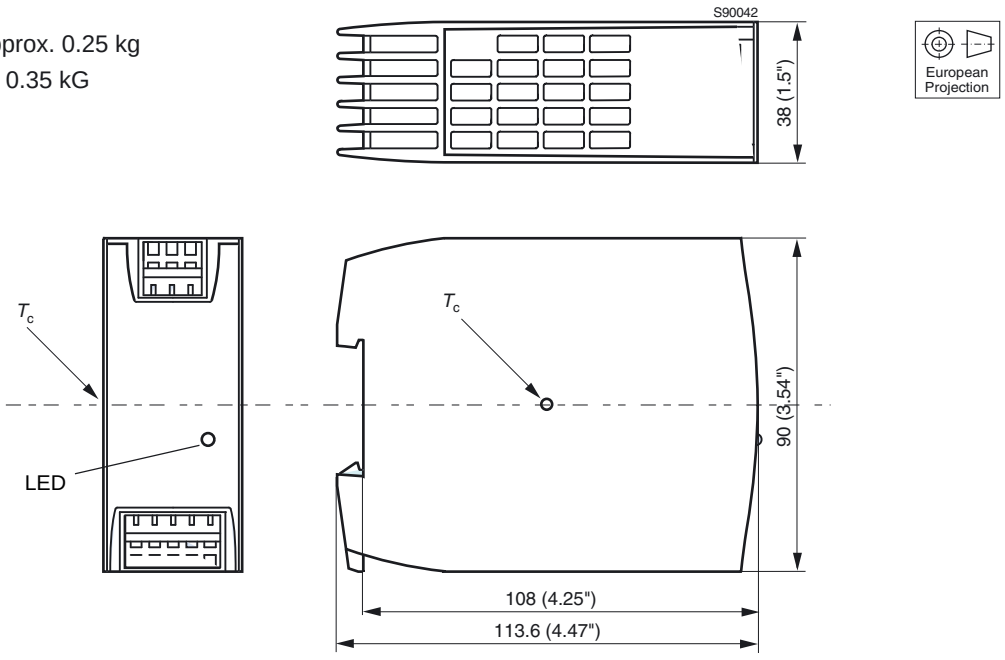


Fig. 10
Case

Safety and Installation Instructions

Terminal Allocation

The terminal allocation table defines the electrical potentials of the AC-DC converters. For mechanical positions of the terminals see: *Mechanical Data*.

Table 9: Terminal allocation

Terminal	Electrical	LOK/LOR/LOS
1	Input	L~
2	Protective earth	⏚
3	Input	N~
4	D/Output (positive)	D/+
5	Output (positive)	+
6	Output (negative)	–
7	Output (negative)	–
8	R input or open	R/n.c.

Standards and Approvals

The converters correspond to class I equipment. All models are UL recognized according to UL 1950, UL recognized for Canada to CAN/CSA C22.2 No. 950-95 and TÜV, approved to IEC/EN 60950 standards.

LOR and LOS are UL 508-listed components.

The converters have been evaluated for:

- Building in
- Double or reinforced insulation or an earthed part between input and output.
- Basic insulation between input and earth
- Functional insulation between output and earth
- The use in a pollution degree 2 environment
- Connecting the input to a primary circuit with overvoltage category II.

The converters are subject to manufacturing surveillance in accordance with the above mentioned standards.

For details see the Declaration of Conformity (last 2 pages).

Protection Degree

IP 20: All models.

Installation Instructions

These converters are components, intended exclusively for inclusion within other equipment by an industrial assembly operation or by professional installers. Installation must strictly follow the national safety regulations in compliance with the enclosure, mounting, creepage, clearance, casualty, markings and segregation requirements of the end-use application.

Connection to the system shall be according to *Terminal allocation* and *Mechanical Data*. Check for hazardous voltages before altering any connection.

Ensure that a converter failure (e.g. by an internal short-circuit) does not result in a hazardous condition. See also *Safety of operator accessible output circuit*.

The phase input (L~) is internally fused by a 1.6 A slowblow type. It is not customer-accessible. This fuse is designed to protect the unit in case of overcurrent. Option F or external fuses in the wiring to one or both input pins (L~ and/or N~) may therefore be necessary to ensure compliance with local requirements.

A second fuse in the wiring to the terminal N~ is needed if:

- Local requirements demand an individual fuse in each source line
- Neutral and earth impedance is high or undefined
- Phase and neutral of the mains are not defined or cannot be assigned to the corresponding termials (L~ to phase and N~ to neutral).

Note: Do not open the converters, or guarantee will be invalidated.

Make sure that there is sufficient air flow available for convection cooling. This should be verified by measuring the case temperature when the unit is installed and operated in the end-use application. The maximum specified case temperature $T_{C\,max}$ shall not be exceeded.

Isolation

The electric strength test is performed in the factory as routine test in accordance with EN 50116 and IEC/EN 60950and should not be repeated in the field. Power-One will not honor any guarantee/warranty claims resulting from electric strength field tests.

Caution: Testing by applying AC voltages will result in high and dangerous leakage currents flowing through the Y-capacitors (see fig. *Block diagram).*

Table 10: Isolation

Characteristic		Input to protective earth	Input to output	Output to protective earth	Unit
Electric strength test voltage	Actual factory test 1 s	2.1	2.1 [1]	1.4	kVDC
	AC test voltage equivalent to actual factory test	1.5	1.5 [1]	1.0	kVAC
Insulation resistance at 500 VDC		>300	>300	>100	MΩ

[1] In accordance with EN 50116 and IEC/EN 60950 only subassemblies are pre-tested with 4.3 kVDC or 3.0 kVAC.

Leakage Currents in AC-DC Operation

Leakage currents flow due to internal leakage capacitance and RFI suppression Y-capacitors. The current values are proportional to the mains voltage and nearly proportional to the mains frequency and are specified at an input voltage of 264 V (50 Hz) where phase, neutral and protective earth are correctly connected as required for class I equipment.

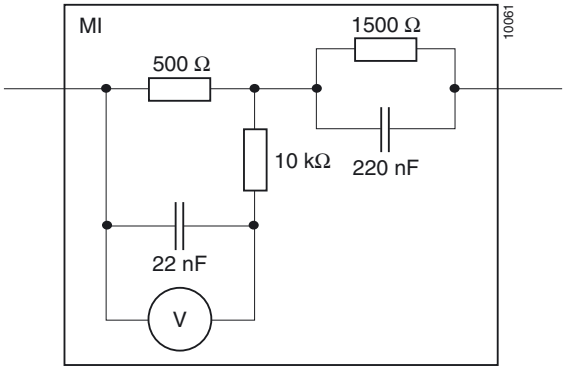


Fig. 11
Measuring instrument (MI) for earth leakage current tests according to IEC/EN 60950.

Under test conditions the leakage current flows through a measuring instrument (MI) as described in fig. *Measuring instrument for earth leakage current tests*, which takes into account impedance and sensitivity of a person touching accessible parts. The current value is calculated by dividing the measured voltage by 500 W. If inputs and/or outputs of LOS, LOR, or LOK models are connected in parallel, their individual leakage currents are added.

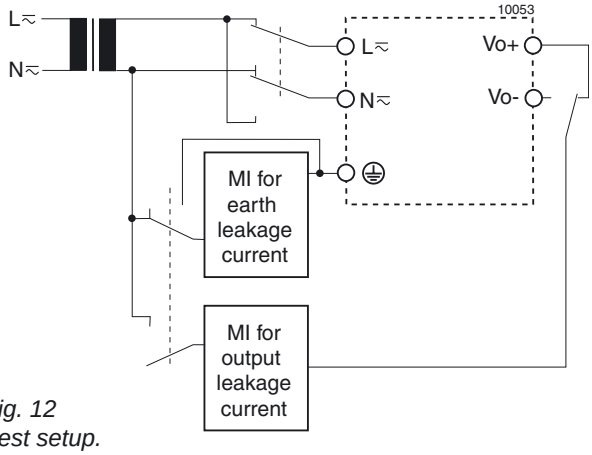


Fig. 12
Test setup.

Table 11: Leakage currents

Characteristic		LOK	Unit
Maximum earth leakage current	Permissible according to IEC/EN 60950	3.5	mA
	Specified value at 264 V, 50 Hz	1.0	
Maximum output leakage current	Permissible according to IEC/EN 60950	0.25	
	Specified value at 264 V, 50 Hz	0.035	

Safety of Operator-Accessible Output Circuit

If the output circuit of an AC-DC converter is operator accessible, it shall be a SELV circuit according to the IEC/EN 60950 related safety standards.

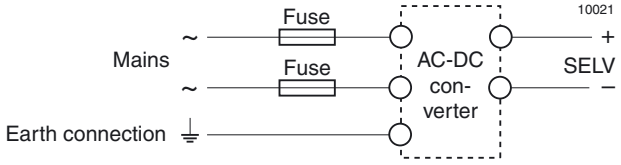


Fig. 13
Schematic safety concept.
Use fuses and earth connection as per *Installation Instructions* and table *Safety concept leading to a SELV output circuit*.

The following table shows a possible installation configuration, compliance with which causes the output circuit of an LOS, LOR, or LOK4000 converter to be a SELV circuit according to IEC/EN 60950 up to a configured output voltage (sum of nominal voltages if in series or +/– configuration) of 36 V.

However, it is the sole responsibility of the installer to assure the compliance with the relevant and applicable safety regulations.

Table 12 : Safety concept leading to a SELV output circuit

Conditions	AC-DC converter	Installation	Result
Nominal Supply voltage	Grade of insulation between input and output, provided by the AC-DC converter	Measures to achieve the resulting safety statuts of the output circuit	Safety statuts of the AC-DC converter output circuit
Mains ≤250 VAC	Double or reinforced	Earth connection [1] and installation according to the applicable standards	SELV circuit

[1] The earth connection of terminal no. 2 has to be provided by the installer according to the relevant safety standards, e.g. IEC/EN 60950

Description of Options

Option F: Built-in Second Fuse

A built-in second fuse in the neutral input line enables safe connection to the mains where phase and neutral are not defined or cannot be identified as e.g., in the case of plug and socket connection to the mains via Schuko-plugs, see also *Installation Instruction.*

Option K: System Connectors

For installation into systems using preassembled harnesses the converters are available with connectors fitted with screw terminals. The system connectors are UL-listed and approved for currents up to 10 A. Wire cross-sections: Solid wires 1.5 mm^2 (AWG14), stranded wires 1 mm^2 (AWG16).

NUCLEAR AND MEDICAL APPLICATIONS - Power-One products are not designed, intended for use in, or authorized for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems without the express written consent of the respective divisional president of Power-One, Inc.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.

EC Declaration of Conformity

We

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declare under our sole responsibility that all **LOS/LOR/LOK series** AC-DC (DC-DC) converters carrying the CE-mark are in conformity with the provisions of the Low Voltage Directive (LVD) 73/23/EEC of the European Communities.

Conformity with the directive is presumed by conformity wih the following harmonized standards:

- EN 61204: 1995 (= IEC 61204: 1993, modified)
  Low-voltage power supply devices, DC output - Perfomance characteristics and safety requirements

- EN 60950: 2000 (= IEC 60950: 1999) for LOS/LOR models
  EN 60950-1: 2001 (= IEC 60950-1: 2001) for LOK models
  Safety of information technology equipment.

The installation instructions given in the corresponding data sheet describe correct installation leading to the presumption of conformity of the end product with the LVD. All these regulators are components intended exclusively for inclusion within other equipment by an industrial assembly operation or by professional installers. They must not be operated as stand alone products.

Hence conformity with the Electromagnetic Compatibility Directive 89/336/EEC (EMC Directive) needs not to be declared. Nevertheless, guidance is provided in most product application notes on how conformity of the end product with the indicated EMC standards under the responsibility of the installer can be achieved, from which conformity with the EMC directive can be presumed.

Uster, 1 Sept. 2005

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