

DC-DC CONVERTER ACR120/Ks,Ksl,Ksl-O

RAILWAY CONVERTER

FOR CHASSIS MOUNTING



HIGHLIGHTS

- + Output Power up to 150 Watts
- + Efficiency up to 93 %
- + Wide Input Range
- + Wide Temperature Range
- + Hold-up-time > 10 ms
- + RoHS compliance
- + According to EN5155

INPUT

Input Voltage Nominal	24, and 110 VDC
Input Voltage Operating	16,8 – 30,0 VDC and 77,0 – 137,5 VDC
Input Voltage Range	14,4 – 34,0 VDC and 66,0 – 154,0 VDC (t ≤ 1,0 sec.) (Class C1)
No Load Input Current	See table page 2

OUTPUT

Output Voltage	12 V / 24 V / 48 V (other voltages on request)
Initial Set Accuracy	<2 % (no load)
Minimum Load	No minimum load
Short circuit	Continuous short circuit proof
Line Regulation	<0,5 %
Load Regulation	<2 % (0 % - 100 % load)
Ripple & Noise	<2 % pk-pk, 20 MHz bandwidth
Start Time	<200 ms at 24 Vin and 900 ms at 110 Vin
Max. Output Capacitance	2000 uF x I _{out nom} , 3000 uF for 48 V version
Temperature Coefficient	<0.01 % / °C

FEATURES

Active Reverse Polarity Protection	Max. 160 V at 110 Vin, max. 30 V at 24 Vin
Active Inrush Current Limitation	Max. 6 A at 110 Vin, max. 24 A at 24 Vin (at t > 100 µs) <0,1 A²s
Hold-up-time	>10 ms (at P _{out} ≤ 120 W, 110 Vin (Class S2)) >10 ms (at P _{out} ≤ 100 W, 24 Vin (Class S2))
Enable	See page 7
Tracking	See page 7
Adjust	See page 7

PROTECTION

Over Voltage Protection (OVP)	110-130% V _{out nom} .
Over Current Protection (OCP)	See table page 2
Over Temperature Protection (OTP)	Shutdown at +105-110 °C PCB-temp. with about 5 °C hysteresis and auto recovery. +110-115 °C for Ksl-O

* +70 °C continuously, +85 °C max. 10 minutes at full load (baseplate temp. must not exceed +90 °C)

** In built-in condition the devices may show different EMC properties.

GENERAL

Product Standard	EN 50155:2021
Isolation	2200 VDC Input to Output 2200 VDC Input to Case (PE) 750 VDC Output to Case (PE)
Pollution Degree	PD2 according to EN 50124-1:2017
Switching Frequency	Typ. 120 kHz
Dimensions [mm]	113,5 x 35 x 46 see page 5
Weight	Approx. 320 g, approx. 170 g for Ksl-O
MTBF	21,8 Mio h, field data
Fire & Smoke	EN45545-2:2020:A1:2023

ENVIRONMENTAL

Operating Ambient Temp.	-40 °C to +85 °C* (Class OT4 + ST1, ST2)
Storage Temperature	-55 °C to +100 °C
Rapid Temperature Variation	Class H1
Altitude	Up to 2000 m
Vibration / Shock / Bump	EN 61373:2010, Cat. 1B

EMC

EMC Standard	EN 50121-3-2:2016 + A1:2019
Conducted Emissions	EN 55011:2025, Class A**
ESD Immunity	EN 61000-4-2:2009, level 3 (6 kV/8kV), Crit. A
Burst	EN 61000-4-4:2012, level 3 (2 kV), Crit. A
Surge	EN 50121-3-2:2016 + A1:2019 Crit. B, EN 61000-4-5:2014+A1:2017 Crit. B
Conducted Immunity	EN 61000-4-6:2014, level 3 (10V), Crit. A
Radiated Immunity	EN 61000-4-3:2020, 20V/m, Crit. A
Safety	IEC 62368-1:2020+A11:2020

TECHNICAL DATA

For $T_{amb} = 25^{\circ}\text{C}$, $V_{in\ nom}$, $I_{out\ nom}$ unless otherwise specified

QUICK-FINDER

Order No.	Typ	Vout	Vin	Connector	IP Rating	Notes
72 31 12 0229 7	ACR120/Ks	12	24	vertical	20	Housing, with pin cover
72 31 24 0229 3	ACR120/Ks	24	24	vertical	20	Housing, with pin cover
72 31 24 0243 3	ACR120/KsI-O	24	24	horizontal	00	Open frame
77 31 12 0522 4	ACR120/Ks	12	110	vertical	00	Housing
77 31 12 0529 5	ACR120/Ks	12	24	vertical	20	Housing, with pin cover
77 31 24 0522 9	ACR120/Ks	24	110	vertical	00	Housing
77 31 24 0529 1	ACR120/Ks	24	110	vertical	20	Housing, with pin cover
77 31 24 0528 6	ACR120/KsI	24	110	horizontal	00	Housing
77 31 24 0543 1	ACR120/KsI-O	24	110	horizontal	00	Open frame
77 31 48 0529 2	ACR120/Ks	48	110	vertical	20	Housing, with pin cover

SPECIFICATION Input 14,4 - 34 VDC

	TYPE	ACR120/Ks (with pin cover)	
	ORDER NUMBER	72 31 12 0229 7	
INPUT	CHARACTERISTIC	Unit	
	Input Voltage Nominal	V	24
	Input Voltage Range	V	14,4...34
	Under Voltage Turn-on	V	15...16,5
	Under Voltage Turn-off	V	13...14,3
	Input Current @ Full Load	A	5,0
	Input Current @ No Load	A	0,04
	Input Current Disabled Mode	mA	7
	Recommended External Fuse	A	10 T
OUTPUT	Output Voltage Nominal	V	12
	Output Current Nominal	A	9
	Output Power	W	108
	Efficiency @ Full Load (typical)	%	91
	Output Current limit	A	10...12,5
	Short Circuit Current (typical)	A	19 (pulse approx. 1Hz)*
	Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms	mV	±240

* Pulsating current time duration 50 ms

TECHNICAL DATA

For $T_{amb} = 25^{\circ}C$, $V_{in nom}$, $I_{out nom}$ unless otherwise specified

SPECIFICATION Input 14,4 - 34 VDC

	TYPE		ACR120/Ks (with pin cover)	ACR120/Ksl-O
	ORDER NUMBER		72 31 24 0229 3	72 31 24 0243 3
	CHARACTERISTIC	Unit		
INPUT	Input Voltage Nominal	V	24	24
	Input Voltage Range	V	14,4...34	14,4...34
	Under Voltage Turn-on	V	15...16,5	15...16,5
	Under Voltage Turn-off	V	13...14,3	13...14,3
	Input Current @ Full Load	A	5,5	4,4
	Input Current @ No Load	A	0,04	0,04
	Input Current Disabled Mode	mA	7	7
	Recommended External Fuse	A	10 T	8 T
OUTPUT	Output Voltage Nominal	V	24	24
	Output Current Nominal	A	5	4
	Output Power	W	120	96
	Efficiency @ Full Load (typical)	%	91	91
	Output Current limit	A	6,5...8,5	5,2...7
	Short Circuit Current (typical)	A	11 (pulse approx. 1Hz)*	7 (pulse approx. 1Hz)*
	Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms	mV	±480	±480

* Pulsating current time duration 50 ms

SPECIFICATION Input 66 - 154 VDC

	TYPE		ACR120/Ks	ACR120/Ks (with pin cover)
	ORDER NUMBER		77 31 12 0522 4	77 31 12 0529 5
	CHARACTERISTIC	Unit		
INPUT	Input Voltage Nominal	V	110	
	Input Voltage Range	V	66...154	
	Under Voltage Turn-on	V	67,0...76,0	
	Under Voltage Turn-off	V	58,0...66,0	
	Input Current @ Full Load	A	1,45	
	Input Current @ No Load	A	0,04	
	Input Current Disabled Mode	mA	4	
	Recommended External Fuse	A	3,15 T	
OUTPUT	Output Voltage Nominal	V	12	12
	Output Current Nominal	A	12	12
	Output Power	W	144	144
	Efficiency @ Full Load (typical)	%	92	92
	Output Current limit	A	13...17	13...17
	Short Circuit Current (typical)	A	30 (pulse approx.. 1Hz)*	30 (pulse approx.. 1Hz)*
	Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms	mV	±240	±240

* Pulsating current time duration 50 ms

TECHNICAL DATA

For $T_{amb} = 25^{\circ}\text{C}$, $V_{in\ nom}$, $I_{out\ nom}$ unless otherwise specified

SPECIFICATION Input 66 - 154 VDC

	TYPE		ACR120/Ks	ACR120/Ks (with pin cover)	ACR120/Ksl	ACR120/Ksl-O
	ORDER NUMBER		77 31 24 0522 9	77 31 24 0529 1	77 31 24 0528 6	77 31 24 0543 1
	CHARACTERISTIC	Unit				
INPUT	Input Voltage Nominal	V	110			
	Input Voltage Range	V	66...154			
	Under Voltage Turn-on	V	67,0...76,0			
	Under Voltage Turn-off	V	58,0...66,0			
	Input Current @ Full Load	A	1,45			
	Input Current @ No Load	A	0,04			
	Input Current Disabled Mode	mA	4			
	Recommended External Fuse	A	3,15 T			
OUTPUT	Output Voltage Nominal	V	24	24	24	24
	Output Current Nominal	A	6,25	6,25	6,25	4
	Output Power	W	150	150	150	96
	Efficiency @ Full Load (typical)	%	93	93	93	93
	Output Current limit	A	7,2...9,0	7,2...9,0	7,2...9,0	7,2...9,0
	Short Circuit Current (typical)	A	16 (pulse approx. 1Hz)*	16 (pulse approx. 1Hz)*	16 (pulse approx. 1Hz)*	16 (pulse approx. 1Hz)*
	Transient Response 25 % / 75 % Load Step Recovery Time < 1 ms	mV	±480	±480	±480	±480

* Pulsating current time duration 50 ms

SPECIFICATION Input 66 – 154 VDC

	TYPE		ACR120/Ks (with pin cover)			
	ORDER NUMBER		77 31 48 0529 2			
	CHARACTERISTIC	Unit				
INPUT	Input Voltage Nominal	V	110			
	Input Voltage Range	V	66...154			
	Under Voltage Turn-on	V	67,0...76,0			
	Under Voltage Turn-off	V	58,0...66,0			
	Input Current @ Full Load	A	1,48			
	Input Current @ No Load	A	0,02			
	Input Current Disabled Mode	mA	4			
	Recommended External Fuse	A	3,15 T			
OUTPUT	Output Voltage Nominal	V	48			
	Output Current Nominal	A	3,13			
	Output Power	W	150			
	Efficiency @ Full Load (typical)	%	92			
	Output Current limit	A	3,3...4,2			
	Short Circuit Current (typical)	A	10 (pulse approx. 1Hz)*			
	Transient Response 25 % / 75 % Load Step Recovery Time < 5 ms	mV	±800			

* Pulsating current time duration 10 ms

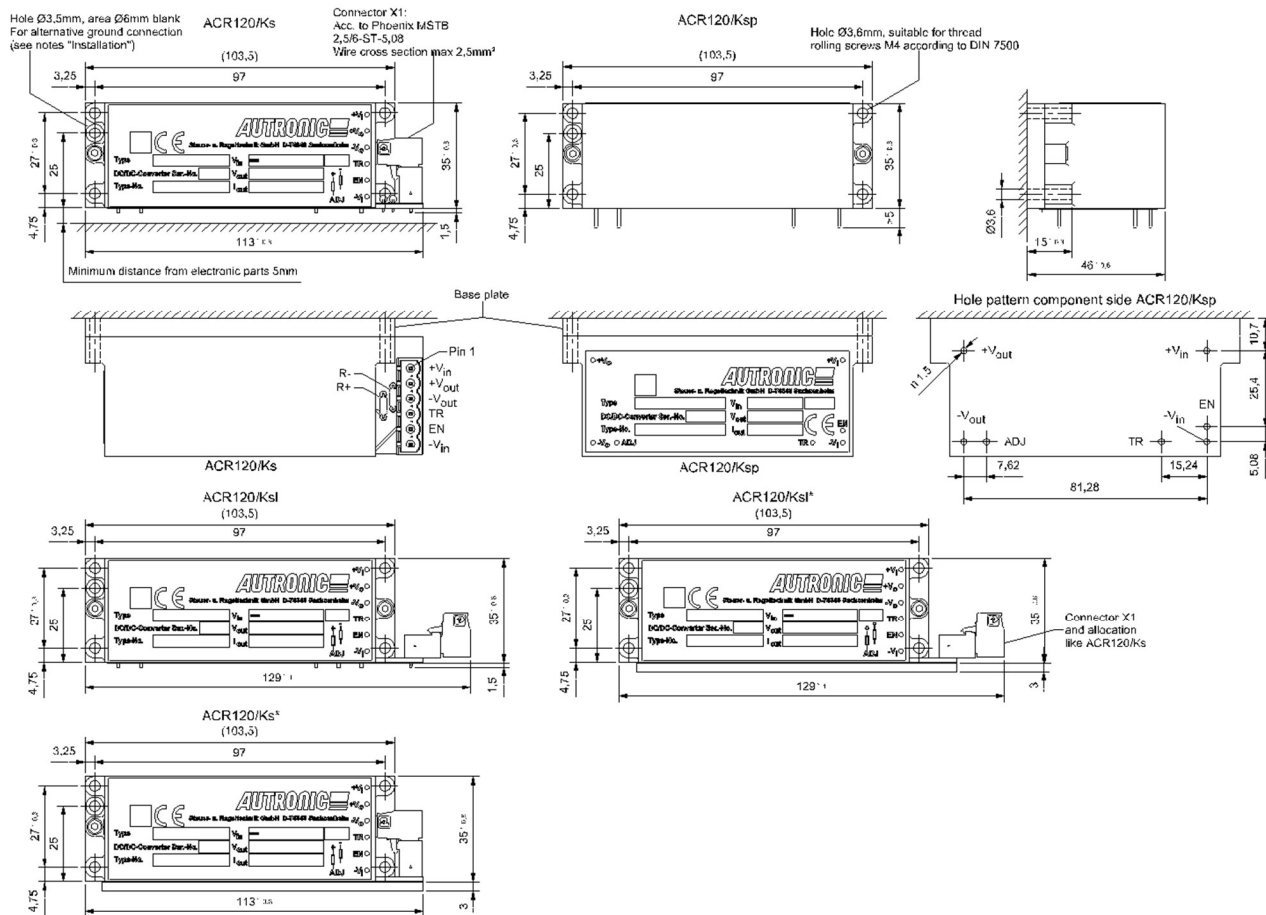
TECHNICAL DATA

For $T_{amb} = 25^{\circ}\text{C}$, $V_{in\ nom}$, $I_{out\ nom}$ unless otherwise specified

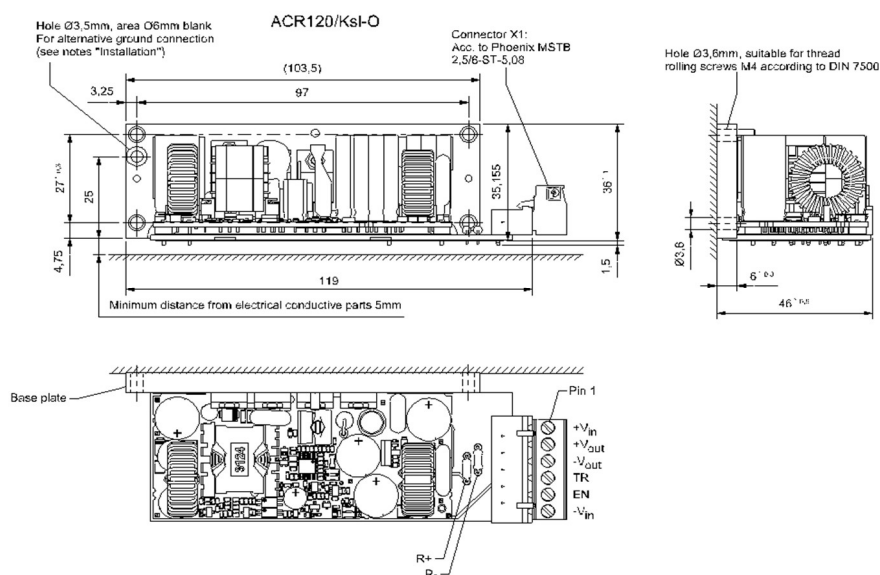
MECHANICAL DETAILS

- Dimensions are in mm
- Unless otherwise specified, general tolerances $\pm 0,5$ are for values in brackets (XX)
Values not in brackets are according to ISO-2768-1m

Coating Class: PC2, Lackwerke Peters ELPEGUARD SL 1307-FLZ/2
Protection Degree: PD2



*For models with pin cover



Resin compound: Polyurethane blue, UL94-V0, EN45545-2:2020:A1:2023

Production acc. to IPC-A-610 610 (exception bonding, coating may show differences to requirements)

TECHNICAL DATA

For $T_{amb} = 25^{\circ}\text{C}$, $V_{in\ nom}$, $I_{out\ nom}$ unless otherwise specified

PINNING

Pin		Function
X10-1	$-V_{out}$	$+V_{in}$
X10-2	$+V_{out}$	$+V_{out}$
X10-3	TR	$-V_{out}$
X10-4	$+V_{in}$	TR
X10-5	$-V_{in}$	EN
X10-6	PE	$-V_{in}$

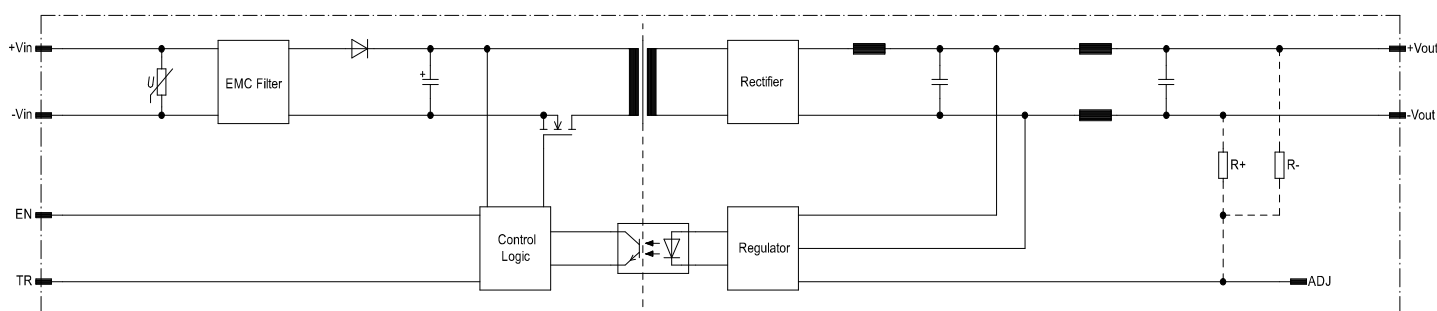
NOTES

Installation instructions:

The converters must be installed according to the guidelines currently in force, like other open electronic component assemblies. Attention must be paid to sufficient ventilation, carry off heat, fastening and protection against accidental contact. Plug in not under voltage. The mounting surface must be flat and able to remove the thermal energy of the baseplate (baseplate temperature must not exceed $+90^{\circ}\text{C}$). The converter has to be mounted, and the baseplate has to be grounded by using thread rolling screws M4 according to DIN 7500. An alternative connection to protective earth can be realized by a special mounting hole, which is free of anodizing surface.

Fault protection: For input protection a time-lag fuse corresponding to IEC 60127-2 must be installed. For recommended rating of the fuse refer to specification table above. Pay attention on sufficient current source in case of short circuit. In some applications two fuses would be necessary, one in each input line.

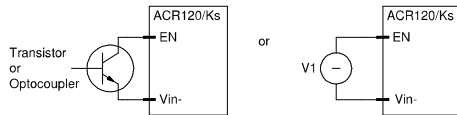
BLOCK DIAGRAMM



CHANGE HISTORY

ENABLE SIGNAL

The module may be disabled by pulling EN low with respect to the –Input. This may be done with an open collector transistor, relay, optocoupler or an external control voltage (V1).



Open collector:

Leakage current $\leq 100 \mu\text{A}$

Min. $V_{CE0} \geq 20 \text{ V}$

V1:

3...5 V (Enable active)

0...0,8 V (Enable inactive)

Pin sourcing current is 1mA max. at $V_{EN} = 0 \text{ V}$. Pin sinking current is 1mA max. at $V_{EV} = 5 \text{ V}$. When not in use, leave Enable pin not-connected.

ADJUST

The output voltage of the converter can be adjusted via fixed resistors, which can be added on the PCB, R+ or R- (see page 5).

Values for resistor R+ [kOhm]					Values for resistor R- [kOhm]				
	up 2%	up 4%	up 6%	up >7%	down 2%	down 4%	down 6%	down 8%	down <10%
ACR120 24/12 72 31 12 xxxx x	728	289	144	< 102	733	277	140	45	< 1
ACR120 24/24 72 31 24 xxxx x	575	195	70	< 35	815	305	166	43	< 1
ACR120 110/12 77 31 12 xxxx x	728	289	144	< 102	733	277	140	45	< 1
ACR120 110/24 77 31 24 xxxx x	574	195	70	< 35	815	305	166	43	< 1
ACR120 110/48 77 31 48 xxxx x	400	160	75	< 50	1500	670	400	270	< 90

When not in use, leave Adjust pin not-connected

TRACKING

If the TR pins of two or more converters are connected together, the output voltages in case of short-circuit or overload go synchronously down. This is necessary for parallel connection of up to 3 identical converters. For several types a minimum load is required for parallel connection. External adjustment of the output voltages could be necessary. Detailed information and recommendations on demand.

When not in use, leave Tracking pin not-connected.

APPLICATION NOTES

Revision	Date	Author	Modification
a05	2020-05-13	Eigner	Change for new Product Standard EN50155:2017
a06	2023-03-07	Eigner	New version 110V/48V12V added, several updates
a07	2026-04-20	Eigner	Minor corrections
a08	2026-07-21	Eigner	Date of standards updated, Quick-Finder added