AUTRONIC
A FORTEC GROUP MEMBER

DC-DC CONVERTER **AER03**

RAILWAY CONVERTER.

FOR PCB MOUNTING

HIGHLIGHTS

+ **Output Power up to 3 Watts**
+ **Efficiency up to 85 %**
+ **Wide Input Range**
+ **Wide Temperature Range**
+ **RoHS compliance**
+ **According to EN50155**

INPUT

Input Voltage Nominal	12/24 VDC, 36/48 VDC, 72/110 VDC

OUTPUT

Output Voltage	5, 12, 15 V and ±12, ±15 V
Initial Set Accuracy	< 1 %*
Output Voltage Balance	Dual Output, Balanced Loads typ.± 1 % Dual Output, Balanced Loads max. ± 2,0 %
Minimum Load	No minimum load
Short Circuit	Continuous short circuit proof
Line Regulation	± 0,5 %
Load Regulation	± 1 % (0 % - 100 % load)
Ripple & Noise	<1 % pk-pk, 20 MHz bandwidth**
Start Time	30 ms
Max. Output Capacitance	See page 2 and 3
Temperature Coefficient	± 0.02 %/°C

PROTECTION

Over Voltage Protection (OVP)	120-125% $V_{out\ nom}$
Over Current Protection (OCP)	See table page 2 and 3

GENERAL

Product Standard	EN 50155
Isolation	Input to Output 4200 VDC, Reinforced
Isolation Resistance	>1000 MΩ (@500 VDC)
Isolation Capacitance	typ. 1,5 nF (100 kHz, 1 V)
Switching Frequency	Typ. 170 kHz for 110 V_{in}; 285 kHz for other models
Lead Temperature	260°C (1,5 mm from case for 10 sec.)
Dimensions [mm]	31,8 x 20,3 x 12,0
Weight	15,4 g
MTBF	3.360.000h acc. to MIL-HDBK-217F (GB,25°)
Fire & Smoke	EN 45545-2

ENVIRONMENTAL

Operating Ambient Temp.	-40°C to +92°C
Operating Case Temp.	max. +105°C
Storage Temperature	-50°C to +125°C
Vibration / Shock / Bump	EN 61373, Cat. 1B

EMC & SAFETY

EMC Standard	EN 50121-3-2
Conducted Emissions	EN 55032/22, FCC Level A, Class A***
ESD Immunity	EN 61000-4-2 Air ± 8 kV, Contact ±6kV, Criteria A
Burst	EN 61000-4-4 ±2 kV, Criteria A****
Surge	EN 61000-4-5 ±2 kV, Criteria A****
Conducted Immunity	EN 61000-4-6 10 Vrms, Criteria A
Radiated Immunity	EN 61000-4-3 20 V/m, Criteria A
Power Frequency Magnetic Field Immunity	EN 61000-4-8, 3 A/m, Criteria A
Safety	UL/cUL 60950-1 recognition (UL certificate), IEC/EN 60950-1(CB-report), IEC 60571 UL/cUL 62368-1 recognition (UL certificate), IEC/EN 62368-1 (CB-report)

* For T_{amb} = 25°C, $V_{in\ nom}$, $I_{out\ nom}$
** 5 Vo, 12 Vo, 15 Vo = Measured with a 10 µF/25 V MLCC
24 Vo = Measured with a 4,7 µF/50 V MLCC
*** In built-in condition our devices may show different EMC properties
**** See note 4 page 4

TECHNICAL DATA

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

SINGLE OUTPUT

SPECIFICATION Input 9 - 36 VDC (12/24 Vin nom)

	TYPE		AER03-24S05			AER03-24S12			AER03-24S15		
	ORDER NUMBER		11 75 11 0321 6			11 75 11 0322 1			11 75 11 0323 5		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT	Input Voltage Operating	V	9...36								
	Input Voltage Range	V	9...50 (t ≤ 1 sec)								
	Under Voltage Turn-on (typical)	V	9								
	Under Voltage Turn-off (typical)	V	7,5								
	Input Current @ Full Load	mA		156			149			147	
	Input Current @ No Load (typical)	mA	9								
OUTPUT	Output Voltage	V		5			12			15	
	Output Current (typical)	mA		600			250			200	
	Output Power	W	3								
	Max. Capacitive Load	µF			680			330			220
	Efficiency @ Full Load	%		80			84			85	
	Short Circuit Current (typical)		hiccup mode 150 %, pulse approx 0,7 Hz, automatic recovery								
	Transient Response 75 % / 100 % Load Step, Recovery Time< 500 µs	%	±5								

SPECIFICATION Input 18 - 75 VDC (36/48Vin nom)

	TYPE		AER03-48S05			AER03-48S12			AER03-48S15		
	ORDER NUMBER		11 75 11 0351 6			11 75 11 0352 1			11 75 11 0353 5		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT	Input Voltage Operating	V	18...75								
	Input Voltage Range	V	18...100 (t ≤ 1 sec)								
	Under Voltage Turn-on (typical)	V	18								
	Under Voltage Turn-off (typical)	V	16								
	Input Current @ Full Load	mA		78			75			74	
	Input Current @ No Load (typical)	mA	5								
OUTPUT	Output Voltage	V		5			12			15	
	Output Current (typical)	mA		600			250			200	
	Output Power	W	3								
	Max. Capacitive Load	µF			680			330			220
	Efficiency @ Full Load	%		80			83			84	
	Short Circuit Current (typical)		hiccup mode 150 %, pulse approx 0,7 Hz, automatic recovery								
	Transient Response 75 % / 100 % Load Step, Recovery Time< 500 µs	%	±5								

SPECIFICATION Input 40 - 160 VDC (72/110 Vin nom)

	TYPE		AER03-110S05			AER03-110S12			AER03-110S15		
	ORDER NUMBER		11 75 11 0371 3			11 75 11 0372 7			11 75 11 0373 2		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT	Input Voltage Operating	V	40...160								
	Input Voltage Range	V	40...170 (t ≤ 1 sec)								
	Under Voltage Turn-on (typical)	V	40								
	Under Voltage Turn-off (typical)	V	37								
	Input Current @ Full Load	mA		34			32			32	
	Input Current @ No Load (typical)	mA	3								
OUTPUT	Output Voltage	V		5			12			15	
	Output Current (typical)	mA		600			250			200	
	Output Power	W	3								
	Max. Capacitive Load	µF			680			330			220
	Efficiency @ Full Load	%		80			84			84	
	Short Circuit Current (typical)		hiccup mode 150 %, pulse approx 0,7 Hz, automatic recovery								
	Transient Response 75 % / 100 % Load Step, Recovery Time< 500 µs	%	±5								

TECHNICAL DATA

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

DUAL OUTPUT

SPECIFICATION Input 9 - 36 VDC (12/24 Vin nom)

	TYPE		AER03-24D12			AER03-24D15		
	ORDER NUMBER		11 75 11 0324 9			11 75 11 0325 4		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max
INPUT	Input Voltage Operating	V	9...36					
	Input Voltage Range	V	9...50 (t ≤ 1 sec)					
	Under Voltage Turn-on (typical)	V	9					
	Under Voltage Turn-off (typical)	V	7,5					
	Input Current @ Full Load	mA		151			149	
	Input Current @ No Load (typical)	mA	9					
OUTPUT	Output Voltage	V	±12			±15		
	Output Current (typical)	mA	±125			±100		
	Output Power	W	3					
	Max. Capacitive Load	µF			220#			220#
	Efficiency @ Full Load	%		83			84	
	Short Circuit Current (typical)		hiccup mode 150 %, pulse approx 0,7 Hz, automatic recovery					
	Transient Response 75 % / 100 % Load Step, Recovery Time< 500 µs	%	±5					

SPECIFICATION Input 18 - 75 VDC (36/48 Vin nom)

	TYPE		AER03-48D12			AER03-48D15		
	ORDER NUMBER		11 75 11 0354 9			11 75 11 0355 4		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max
INPUT	Input Voltage Operating	V	18...75					
	Input Voltage Range	V	18...100 (t ≤ 1 sec)					
	Under Voltage Turn-on (typical)	V	18					
	Under Voltage Turn-off (typical)	V	16					
	Input Current @ Full Load	mA		75			75	
	Input Current @ No Load (typical)	mA	5					
OUTPUT	Output Voltage	V	±12			±15		
	Output Current (typical)	mA	±125			±100		
	Output Power	W	3					
	Max. Capacitive Load	µF			220#			220#
	Efficiency @ Full Load	%		83			83	
	Short Circuit Current (typical)		hiccup mode 150 %, pulse approx 0,7 Hz, automatic recovery					
	Transient Response 75 % / 100 % Load Step, Recovery Time< 500 µs	%	±5					

SPECIFICATION Input 40 - 160 VDC (72/110 Vin nom)

	TYPE		AER03-110D12			AER03-110D15		
	ORDER NUMBER		11 75 11 0374 6			11 75 11 0375 1		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max
INPUT	Input Voltage Operating	V	40...160					
	Input Voltage Range	V	40...170 (t ≤ 1 sec)					
	Under Voltage Turn-on (typical)	V	40					
	Under Voltage Turn-off (typical)	V	37					
	Input Current @ Full Load	mA		33			32	
	Input Current @ No Load (typical)	mA	3					
OUTPUT	Output Voltage	V	±12			±15		
	Output Current (typical)	mA	±125			±100		
	Output Power	W	3					
	Max. Capacitive Load	µF			220#			220#
	Efficiency @ Full Load	%		83			85	
	Short Circuit Current (typical)		hiccup mode 150 %, pulse approx 0,7 Hz, automatic recovery					
	Transient Response 75 % / 100 % Load Step, Recovery Time< 500 µs	%	±5					

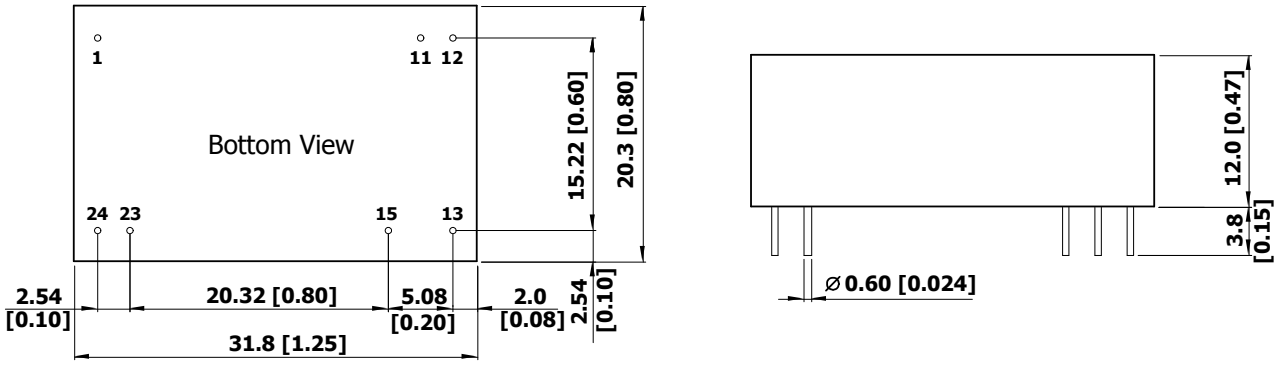
For each output

TECHNICAL DATA

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

MECHANICAL DETAILS

1. Dimensions are in mm [inches].
2. Tolerance: X.X±0.5 (X.XX±0.02)
   X.XX±0.25 (X.XXX±0.01)
3. Pin diameter Ø 0.6 ±0.05 (0.024±0.002)



Case Material: Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material: Tinned Copper

PINNING

Pin	Single Output	Dual Output
1	$+V_{in}$	$+V_{in}$
11	No Pin	Common
12	$-V_{out}$	No Pin
13	$+V_{out}$	$-V_{out}$
15	No Pin	$+V_{out}$
23	$-V_{in}$	$-V_{in}$
24	$-V_{in}$	$-V_{in}$

NOTES

1. Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
2. Transient recovery time is measured to within 1% error band for a step change in output load of 75 % to 100 %.
3. We recommend to protect the converter by a slow blow fuse in the input supply line.
4. To meet EN61000-4-4 & EN61000-4-5 an external capacitor across the input pins is required.
   Suggested capacitor: 24XXX: CHEMI-CON KY Series 470 µF/50 V.
   48XXX: CHEMI-CON KY Series 330 µF/100 V.
   110XXX: CHEMI-CON KXG Series 220 µF/250 V.
5. Other input and output voltage may be available, please contact factory.
6. That "natural convection" is about 20 LFM but is not equal to still air (0 LFM).
7. Specifications are subject to change without notice.

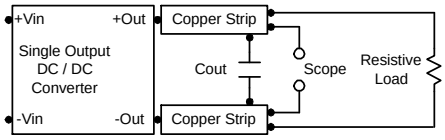
Installation instructions:
The converters have to be installed according to the guidelines currently in force, like other open electronic component assemblies. Attention must be paid to sufficient ventilation, carry off heat, fastening and protection against accidental contact. Case temperature must not exceed +105°C. See Power Derating Curve and note 6.
Fault protection: The converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input a time-lag fuse corresponding to IEC 60127-2 (see note 3). Pay attention on sufficient current source in case of short circuit.

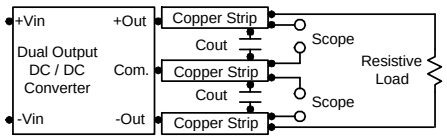
APPLICATION NOTES

TEST SETUP

Peak-to-Peak Output Noise Measurement Test

Refer to the output specifications or add 4,7 µF capacitor if the output specifications undefine Cout. Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20 MHz. Position the load between 50 mm and 75 mm from the DC/DC Converter.





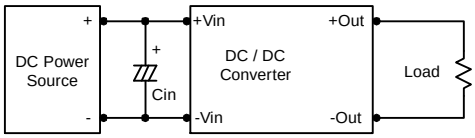
TECHNICAL NOTES

Overload Protection

To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

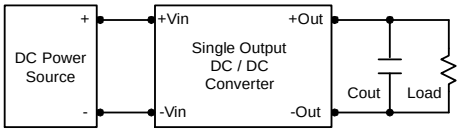
Input Source Impedance

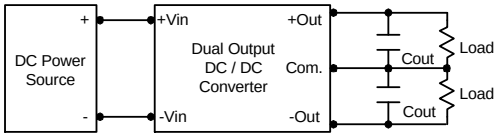
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1 Ω at 100 kHz) capacitor of 4,7 µF for the 24 V input devices, a 2,2 µF for the 48 V devices and a 1 µF for the 110 V devices.



Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 4,7 µF capacitors at the output.



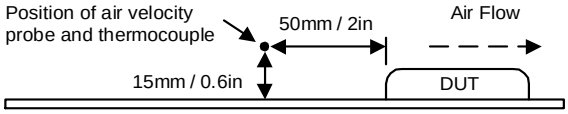


Maximum Capacitive Load

The AER03 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. The maximum capacitance can be found in the data sheet.

Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 105°C. The derating curves are determined from measurements obtained in a test setup.



Parameter	
Cooling Test	Compliance to IEC/EN60068-2-1
Dry Heat	Compliance to IEC/EN60068-2-2
Damp Heat	Compliance to IEC/EN60068-2-30

POWER DERATING CURVE