A FORTEC GROUP MEMBER

DC-DC CONVERTER **AER75**

RAILWAY CONVERTER.

FOR PCB MOUNTING

HIGHLIGHTS

+ Output Power up to 75 Watts
+ Efficiency up to 92 %
+ Wide Input Range
+ Wide Temperature Range
+ RoHS compliance
+ According to EN50155
+ Remote On/Off

INPUT

Input Voltage Nominal	72,110 VDC

OUTPUT

Output Voltage	5, 12, 15, 24 V
Initial Set Accuracy	< 1 %*
Minimum Load	No minimum load
Short Circuit	Continuous short circuit proof
Line Regulation	± 0,2 %
Load Regulation	± 0,3 % (0 % - 100 % load)
Ripple & Noise	<1 % pk-pk, 20 MHz bandwidth
Start Time	35 ms
Max. Output Capacitance	See table page 2
Temperature Coefficient	± 0.02 %/°C

FEATURES

Remote On/Off	See page 6
Trim	± 10 %, See page 5

PROTECTION

Over Temperature Protection (OTP)	+110°C (baseplate)
Over Voltage Protection (OVP)	120-125% $V_{out\ nom}$
Over Current Protection (OCP)	See table page 2

GENERAL

Product Standard	EN 50155
Isolation	Input to Output 4200 VDC, Reinforced Input or Output to case 1500 VDC
Isolation Resistance	> 1000 MΩ (@ 500 VDC)
Isolation Capacitance	max. 3 nF (100 kHz, 1 V)
Switching Frequency	Typ. 320 kHz
Lead Temperature	260°C (1,5 mm from case for 10 sec.)
Dimensions [mm]	57,9 x 36,8 x 12,7
Weight	61 g
MTBF	143.800h acc. to MIL-HDBK-217F (GB,25°)
Fire & Smoke	EN 45545-2

ENVIRONMENTAL

Operating Ambient Temp.	-40°C to +80°C
Operating Base-Plate Temp.	-40°C to +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, FCC Part 15 , Class A**
Radiated Emissions	EN 55011, FCC Part 15, Class A**
ESD Immunity	EN 61000-4-2 Air ± 8 kV, Contact ±6 kV, 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 10 V/m, Criteria A
Safety	UL/cUL 60950-1 recognition (UL certificate), IEC/EN 60950-1(CB-report), IEC 60571

* For T_{amb} = 25°C, $V_{in\ nom}$, $I_{out\ nom}$
** In built-in condition our devices may show different EMC properties
*** See note 6 page 4

AUTRONIC Steuer- und Regeltechnik GmbH
Siemensstraße 17 · D-74343 Sachsenheim · Phone: +49(0)7147/24-0 · Fax: +49(0)7147/24-252 · e-mail: vertrieb@autronic.de · www.autronic.de
Specifications subject to change without notice · 11 75 11 7010 9 a00 · 12.2017

TECHNICAL DATA

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

SPECIFICATION Input 43 - 101 VDC (72 Vin nom) ; K = with Heatsink

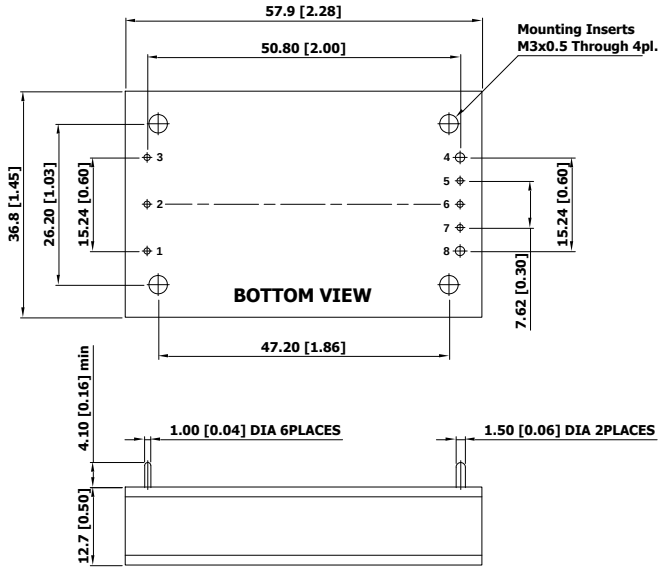
	TYPE		AER75-72S05 AER75-72S05K			AER75-72S12 AER75-72S12/K			AER75-72S15 AER75-72S15/K			AER75-72S24 AER75-72S24/K		
	ORDER NUMBER		11 75 11 7611 7 11 75 11 7614 1			11 75 11 7621 1 11 75 11 7624 4			11 75 11 7631 4 11 75 11 7634 7			11 75 11 7641 7 11 75 11 7644 1		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT	Input Voltage Operating	V	43...101											
	Input Voltage Range	V	43...165 (t ≤ 100 ms)											
	Under Voltage Turn-on (typical)	V	43											
	Under Voltage Turn-off (typical)	V	40											
	Input Current @ Full Load	mA		1170			1132			1132			1145	
	Input Current @ No Load	mA		50			45			45			55	
	Standby Input Current (typical)	mA	2,5											
	Reflected Ripple Current (typical)	mA	35											
OUTPUT	Output Voltage	V		5			12			15			24	
	Output Current (typical)	A		15			6,25			5			3,125	
	Output Power	W	75											
	Max. Capacitive Load	µF			25500			4400			2800			1100
	Efficiency @ Full Load	%		89			92			92			91	
	Short Circuit Current (typical)		hiccup mode 150 %, pulse approx 0,3 Hz, automatic recovery											
	Transient Response 75 % /100 % Load Step, Recovery Time< 250 µs	%	±5											

SPECIFICATION Input 66 - 160 VDC (110 Vin nom) ; K = with Heatsink

	TYPE		AER75-110S05 AER75-110S05/K			AER75-110S12 AER75-110S12/K			AER75-110S15 AER75-110S15/K			AER75-110S24 AER75-110S24/K		
	ORDER NUMBER		11 75 11 7711 9 11 75 11 7714 3			11 75 11 7721 3 11 75 11 7724 6			11 75 11 7731 6 11 75 11 7734 9			11 75 11 7741 9 11 75 11 7744 3		
	CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT	Input Voltage Operating	V	66...160											
	Input Voltage Range	V	66...250 (t ≤ 100 ms)											
	Under Voltage Turn-on (typical)	V	66											
	Under Voltage Turn-off (typical)	V	63											
	Input Current @ Full Load	mA		766			749			749			758	
	Input Current @ No Load	mA		40			35			35			50	
	Standby Input Current (typical)	mA	2,5											
	Reflected Ripple Current (typical)	mA	35											
OUTPUT	Output Voltage	V		5			12			15			24	
	Output Current (typical)	A		15			6,25			5			3,125	
	Output Power	W	75											
	Max. Capacitive Load	µF			25500			4400			2800			1100
	Efficiency @ Full Load	%		89			91			91			90	
	Short Circuit Current (typical)		hiccup mode 150 %, pulse approx 0,3 Hz, automatic recovery											
	Transient Response 75 % /100 % Load Step, Recovery Time< 250 µs	%	±5											

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 1.0 ±0.05 (0.04±0.002)
4. Pin diameter Ø 1.5 ±0.05 (0.06±0.002)



Case Material: Aluminum Frame with Black Anodized Coating
Top Side Base Material: Aluminum Plate
Bottom Side Base Material: Non-conductive Black Plastic Base Plate
Potting Material: Epoxy (UL94-V0)

PINNING

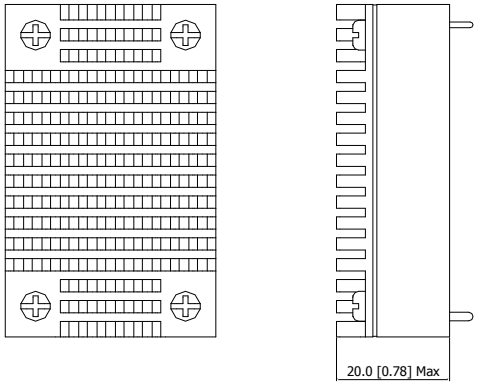
Pin	Function
1	$+V_{in}$
2	Remote On/Off
3	$-V_{in}$
4	$-V_{out}$
5	-Sense*
6	Trim
7	+Sense*
8	$+V_{out}$

* If remote sense not used the +sense should be connected to +output and -sense should be connected to –output
Maximum output deviation is 10 % inclusive of trim

MECHANICAL DETAILS

Heatsink (Option –HS)

The advantages of adding a heatsink are:
1. To improve heat dissipation and increase the stability and reliability of the DC/DC converters at high operating temperatures.
2. To increase operating temperature of the DC/DC converter, please refer to Derating Curve.

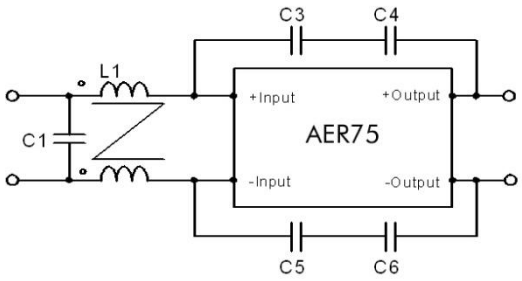


Heatsink Material: Aluminum
Finish: Black Anodized Coating
Weight: 13 g

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. Ripple & Noise measurement with a 1 μF MLCC and a 10 μF Tantalum Capacitor.
4. Other input and output voltage may be available, please contact factory.
5. Part number for heat sink only MT-HS1.
6. To meet EN 61000-4-4 & EN 61000-4-5 by adding a capacitor across the input pins. Suggested capacitor: 470 μF/200 V.
7. **It is necessary to parallel a capacitor across the input pins under normal operation. Minimum Capacitance: 68 μF/ 200 V.**
8. That "natural convection" is about 20 LFM but is not equal to still air (0 LFM).
9. Specifications are subject to change without notice.

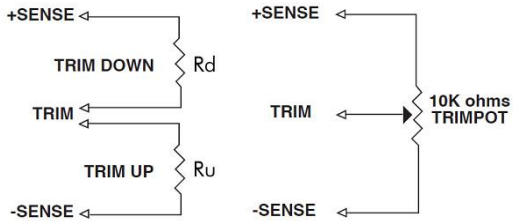
RECOMMENDED FILTER FOR EN 55011& EN 55032



Model Type	L1	C1	C3	C4	C5	C6
AER75-72SXX	450 μH/450 μH	CHEMI-CON KXG Series 68 μF/200 V	2200 pF/3 kV	2200 pF/3 kV	2200 pF/3 kV	2200 pF/3 kV
AER75-110SXX						

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below



AER75-XXS05 Trim Table

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	138.88	62.41	36.92	24.18	16.53	11.44	7.79	5.06	2.94	1.24	kOhms
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	106.87	47.76	28.06	18.21	12.30	8.36	5.55	3.44	1.79	0.48	kOhms

AER75-XXS12 Trim Table

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	413.55	184.55	108.22	70.05	47.15	31.88	20.98	12.80	6.44	1.35	kOhms
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	351.00	157.50	93.00	60.75	41.40	28.50	19.29	12.37	7.00	2.70	kOhms

AER75-XXS15 Trim Table

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	530.73	238.61	141.24	92.56	63.35	43.87	29.96	19.53	11.41	4.92	kOhms
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	422.77	189.89	112.26	73.44	50.15	34.63	23.54	15.22	8.75	3.58	kOhms

AER75-XXS024 Trim Table

Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	598.66	267.78	157.49	102.34	69.25	47.19	31.44	19.62	10.43	3.08	kOhms
Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	487.14	218.02	128.31	83.46	56.55	38.61	25.79	16.18	8.70	2.72	kOhms

REMOTE ON/OFF

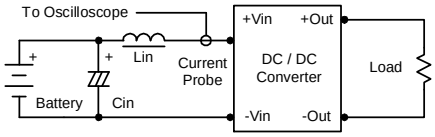
Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal. The switch can be an open collector or equivalent. A logic low is 0 V to 1,2 V. A logic high is 3,5 V to 12 V. The maximum sink current at the on/off terminal (Pin 2) during a logic low is -500 µA.
When not in use, leave Remote pin not-connected.

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	3,5 V ~ 12 V or Open Circuit				
Converter Off	0 V ~ 1,2 V or Short Circuit				
Control Input Current (on)	Vctrl = 5,0 V	---	0,5	---	mA
Control Input Current (off)	Vctrl = 0 V	---	-0,5	---	mA
Control Common	Referenced to Negative Input				
Standby Input Current	Nominal Vin	---	2,5	---	mA

TEST SETUP

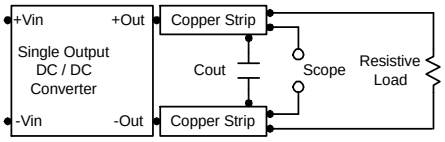
Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with a inductor Lin (4,7 µH) and Cin (220 µF, ESR < 1 Ω at 100 kHz) to simulate source impedance. Capacitor Cin offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



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

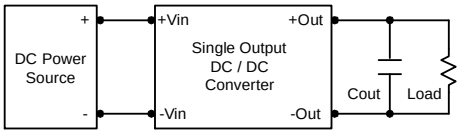
To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

Overvoltage Protection

The output overvoltage clamp consists of control circuitry, which is independent of the primary regulation loop, that monitors the voltage on the output terminals.
The control loop of the clamp has a higher voltage set point than the primary loop. This provides a redundant voltage control that reduces the risk of output overvoltage.
The OVP level can be found in the output data.

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.

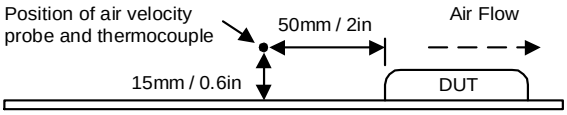


Maximum Capacitive Load

The AER75 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 output data.

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.

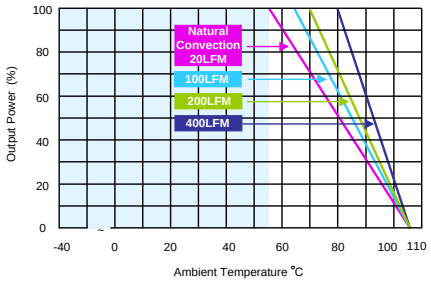


Parameter	Conditions / Model	Min.	Max.		Unit
			without Heatsink	with Heatsink	
Operating Temperature Range	AER75-72S12, AER75-72S15	-40	56	61	°C
Natural Convection (see note 8 page 4)	AER75-72S24		49	55	
Nominal Vin, Load 100 % Inom.	AER75-110S12, AER75-110S15				
(for Power Derating see relative Derating Curves)	AER75-110S24		43	48	
	AER75-72S05, AER75-110S05		36	42	
Thermal Impedance	Natural Convection without Heatsink	7,5	---		°C/W
	Natural Convection with Heatsink	6,8	---		
	100 LFM Convection without Heatsink	6,1	---		
	100 LFM Convection with Heatsink	4,1	---		
	200 LFM Convection without Heatsink	5,3	---		
	200 LFM Convection with Heatsink	3,3	---		
	400 LFM Convection without Heatsink	3,9	---		
	400 LFM Convection with Heatsink	2,2	---		

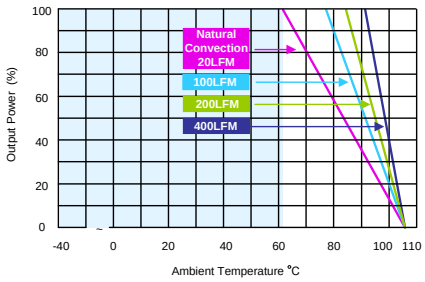
DESCRIPTION OF FEATURES

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

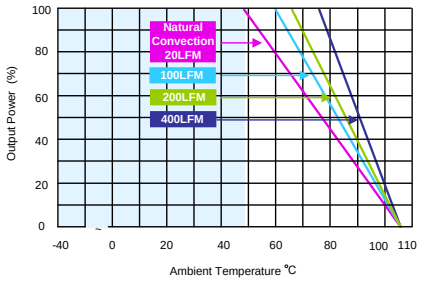
POWER DERATING CURVE



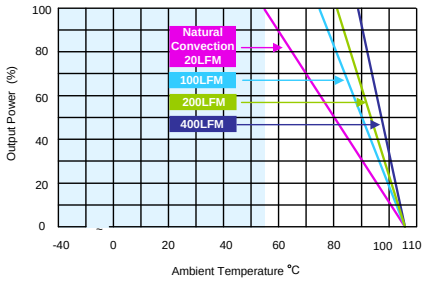
AER75-72S12, AER75-72S15 Derating Curve without Heatsink



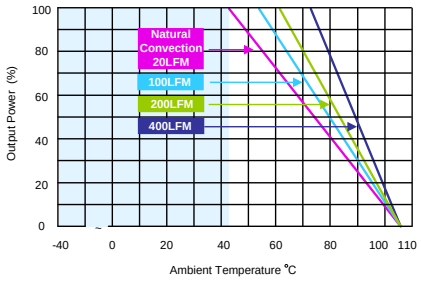
AER75-72S12, AER75-72S15 Derating Curve with Heatsink



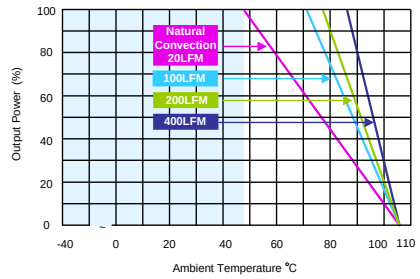
AER75-110S12,AER75-110S15, AER75-72S24
Derating Curve without Heatsink



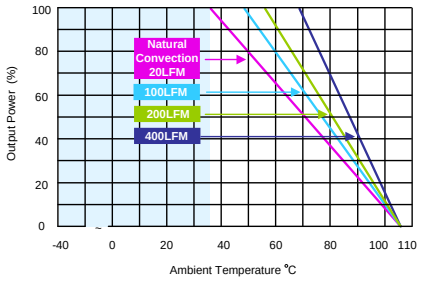
AER75-110S12,AER75-110S15, AER75-72S24
Derating Curve with Heatsink



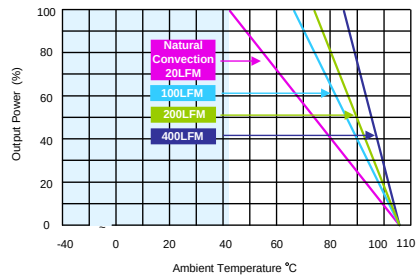
AER75-110S24 Derating Curve without Heatsink



AER75-110S24 Derating Curve with Heatsink



AER75-72S05, AER75-110S05 Derating Curve without Heatsink



AER75-72S05, AER75-110S05 Derating Curve with Heatsink