

FEATURES

- ▶ Fully Encapsulated Plastic Case for PCB, Chassis and DIN-Rail Mounting Version
- ▶ Universal Input 85-264VAC, 47-440Hz
- ▶ Single, Dual and Triple Outputs
- ▶ I/O Isolation 3000VAC with Reinforced Insulation
- ▶ Operating Ambient Temp. Range -25°C to +70°C
- ▶ Overload/Voltage and Short Circuit Protection
- ▶ EMI Emission EN55011/32 Class B Approved
- ▶ EMC Immunity EN 61000-4-2,3,4,5,6,8,11 Approved
- ▶ UL508 Safety Approval (Option) Specifically for Industrial Application
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval & CE Marking


PRODUCT OVERVIEW

The MINMAX AKF-15 series is a range of fully encapsulated AC-DC power supply modules. The product features EMI emission EN 55011/32 class B approved and EMS compliance to EN 61000-4 standard. This series comply with international standard pinout and input voltage range of 85-264VAC for worldwide markets. For industrial applications, the models for chassis mounting can also be supplied as option with UL508 approval. The AKF-15 series provide a better solution for many space critical applications in commercial and industrial electronic equipment.

Model Selection Guide

Model Number PCB Mounting	Output Voltage VDC	Output Current Max. mA	Input Current 115VAC, 60Hz		Max. capacitive Load μF	Efficiency (typ.) @Max. Load %
			@Max. Load mA(typ.)	@No Load mA(typ.)		
			AKF-15S05	5		
AKF-15S12	12	1250	275	30	2200	79
AKF-15S15	15	1000	275	30	2200	79
AKF-15S24	24	625	275	30	1000	79
AKF-15S48	48	310	273	30	680	79
AKF-15D12	±12	±650	275	30	#1500	79
AKF-15D15	±15	±500	275	30	#1500	79
AKF-15D512	5	1500	302	30	2000	72
	*12	625			1500	
AKF-15T512	5	2000	290	30	2200	74
	*12	200			1500	
	*-12	-200			1500	
AKF-15T515	*5	2000	284	30	2200	74
	*15	150			1500	
	*-15	-150			1500	

* Output voltage accuracy 4% max.

For each output

Input Specifications						
Parameter	Conditions / Model		Min.	Typ.	Max.	Unit
Input Voltage Range	All Models		85	---	264	VAC
Input Frequency Range			47	---	440	Hz
Input Voltage Range			120	---	370	VDC
Inrush Current	115VAC	Cold Start at 25°C	---	---	15	A
	230VAC		---	---	30	A

Output Specifications						
Parameter	Conditions / Model		Min.	Typ.	Max.	Unit
Output Voltage Accuracy			---	±1.0	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load		---	±0.5	±1.0	%
Load Regulation	Io=10% to 100%	Single Output Models	---	±0.5	±1.0	%
		Dual/ Triple Output Models	---	±2.5	±5.0	%
Cross Regulation- Dual Positives / Triple Output	Vo1	Measured output Io = 20% to 100% of rated load Other output(s) set at 50% of rated load	---	±1.0	---	%
	Vo2		---	±2.5	---	%
	Vo3		---	±2.5	---	%
Ripple & Noise	0-20 MHz Bandwidth	5VDC Output Models	---	1.5	1.8	%V _{PP} of Vo
		Other Output Models	---	0.8	1.0	%V _{PP} of Vo
Minimum Load			---	10	---	%Inom.
Over Voltage Protection	Zener diode clamp		---	120	---	% of Vo
Temperature Coefficient			---	±0.01	±0.02	%/°C
Overshoot			---	---	5	% Vout
Over Load Protection	Hiccup mode, auto-recovery		105	---	---	%Inom.
	(long term overload condition may cause damage)					
Short Circuit Protection	Hiccup mode, Automatic Recovery					

General Specifications						
Parameter	Conditions		Min.	Typ.	Max.	Unit
I/O Isolation Voltage	Input to Output, 60 Seconds		3000	---	---	VAC
I/O Isolation Resistance	500 VDC		100	---	---	MΩ
Switching Frequency			---	100	---	kHz
Hold-up Time			---	20	---	ms
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign		280,000			Hours
Safety Approvals	UL/cUL 60950-1 recognition(UL certificate), IEC/EN 60950-1(CB-report)					
	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)					
	UL/cUL 508 listed certificate					

EMC Specifications					
Parameter	Standards & Level			Performance	
EMI	Conduction	EN 55011, EN 55032,		Class B	
	Radiation	EN 61000-6-4, EN 61000-6-3			
EMS	EN 55035, EN 61000-6-2, EN 61000-6-1				
	ESD	EN61000-4-2 air ± 8kV, Contact ± 4kV			B
	Radiated immunity	EN 61000-4-3 10V/m			A
	Fast transient	EN 61000-4-4 ±2kV			B
	Surge	EN 61000-4-5 ±1kV			B
	Conducted immunity	EN 61000-4-6 10Vrms			B
	PFMF	EN 61000-4-8 30A/m			A
	Dips	EN 61000-4-11 30% 10ms			B
	Interruptions	EN 61000-4-11 >95% 5000ms			C

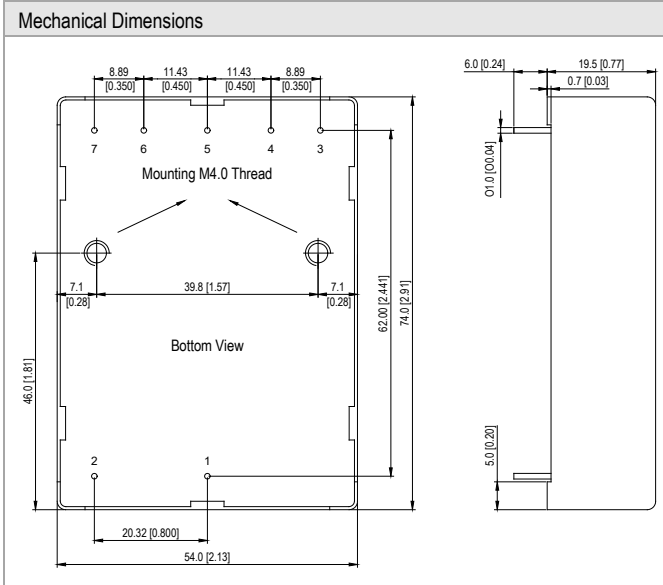
Environmental Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating Ambient Temperature Range		-25	---	+70	°C
Power Derating	+50°C to +70°C	0.563			W / °C
Storage Temperature Range		-40	---	+85	°C
Thermal Shutdown	Shutdown, Internal IC Junction Temperature	---	140	---	°C
	Automatic Recovery, Internal IC Junction Temperature	---	65	---	°C
Humidity (non condensing)		---	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)		---	---	260	°C

Notes

- 1 All Specifications typical at Ta=+25°C, resistive load, 115VAC, 60Hz input voltage and after warm-up time rated output current unless otherwise noted.
- 2 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 3 These power modules require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage the power supplies however they may not meet all listed specifications.
- 4 Other input and output voltage may be available, please contact MINMAX.
- 5 Specifications are subject to change without notice
- 6 The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

Package Specifications PCB Mounting



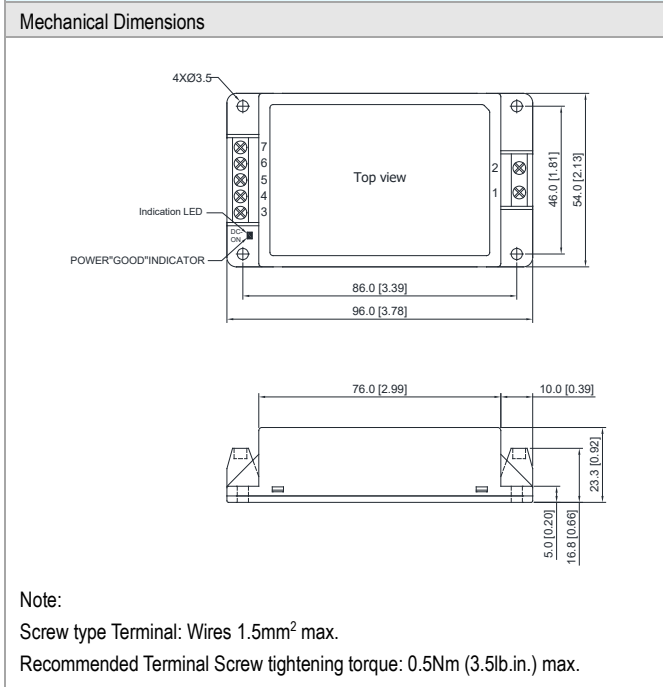
Pin Connections					
Pin	Single	Dual (D12,D15)	Dual (D512)	Triple	Diameter mm (inches)
1	AC(N) – AC Neutral				Ø 1.0 [0.04]
2	AC(L) – AC Line				Ø 1.0 [0.04]
3	No Pin			-Vout3	Ø 1.0 [0.04]
4	-Vout	-Vout	-Vout2	Common	Ø 1.0 [0.04]
5	No Pin	Common	+Vout2	+Vout2	Ø 1.0 [0.04]
6	+Vout	+Vout	-Vout1	-Vout1	Ø 1.0 [0.04]
7	No Pin		+Vout1	+Vout1	Ø 1.0 [0.04]

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: ± 0.5 (± 0.02)
- ▶ Pin pitch tolerance: ± 0.25 (± 0.01)
- ▶ Pin diameter tolerance: $X.X \pm 0.1$ ($X.XX \pm 0.004$)

Physical Characteristics

Case Size	: 74.0x54.0x19.5mm (2.91x2.13x0.77 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Copper Alloy
Weight	: 135g

Package Specifications Chassis Mounting with screw terminal (order code suffix C)



Connections				
Terminal	Single	Dual (D12,D15)	Dual (D512)	Triple
1	AC(N) – AC Neutral			
2	AC(L) – AC Line			
3	NC			-Vout3
4	-Vout	-Vout	-Vout2	Common
5	NC	Common	+Vout2	+Vout2
6	+Vout	+Vout	-Vout1	-Vout1
7	NC		+Vout1	+Vout1

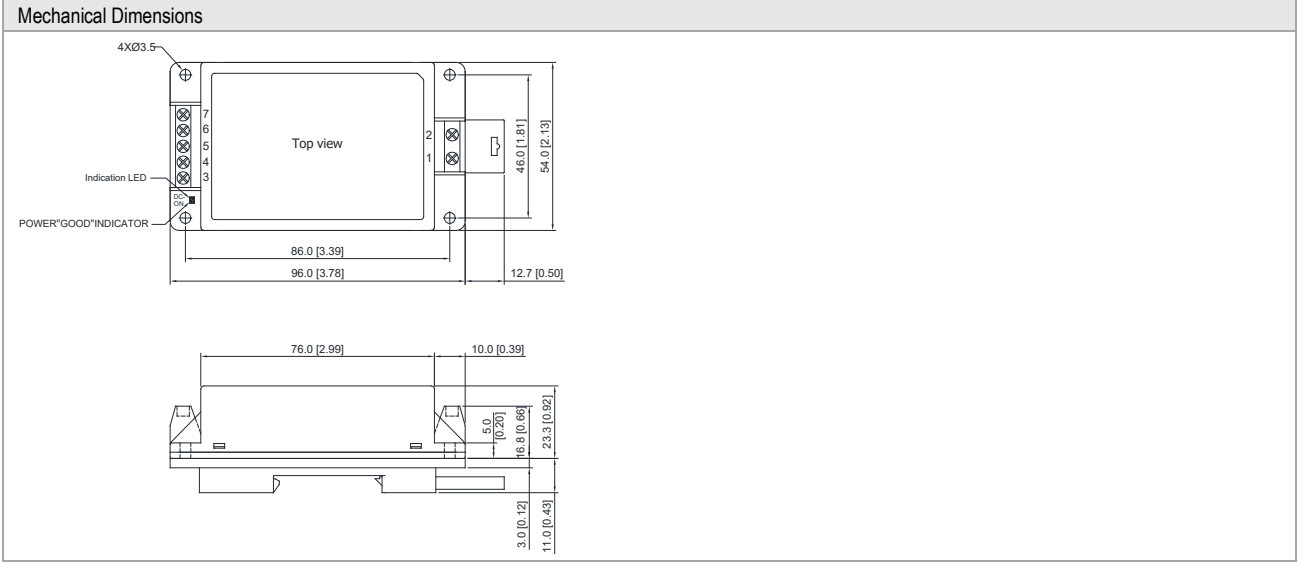
NC: No Connection

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: $X.X \pm 0.5$ ($X.XX \pm 0.02$)
 $X.XX \pm 0.25$ ($X.XXX \pm 0.01$)
- ▶ Pin pitch tolerance: ± 0.25 (0.01)

Physical Characteristics

Case Size	: 96.0x54.0x23.3mm (3.78x2.13x0.92 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 132g

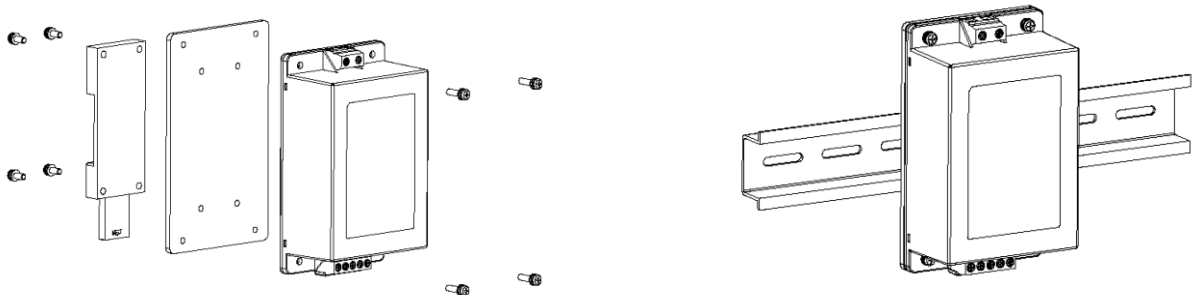
Package Specifications for screw terminal with DIN Rail Mounting (order code suffix AC-DIN-01)



Physical Characteristics

Case Size	: 96.0x54.0x23.3mm (3.78x2.13x0.92 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 186g

Screw terminal with DIN Rail Mounting



Note:

Recommended tightening torque: 0.35Nm (3.1lb.in.) max.

Order Code Table

PCB Mounting	Chassis Mounting	PCB Mounting With UL508	Chassis Mounting With UL508	With DIN Rail Mounting by two Order Code		Chassis Mounting with UL508 & DIN Rail Mounting by two Order Code	
AKF-15S05	AKF-15S05C	AKF-15S05ICE	AKF-15S05CICE	AKF-15S05C	AC-DIN-01	AKF-15S05CICE	AC-DIN-01
AKF-15S12	AKF-15S12C	AKF-15S12ICE	AKF-15S12CICE	AKF-15S12C	AC-DIN-01	AKF-15S12CICE	AC-DIN-01
AKF-15S15	AKF-15S15C	AKF-15S15ICE	AKF-15S15CICE	AKF-15S15C	AC-DIN-01	AKF-15S15CICE	AC-DIN-01
AKF-15S24	AKF-15S24C	AKF-15S24ICE	AKF-15S24CICE	AKF-15S24C	AC-DIN-01	AKF-15S24CICE	AC-DIN-01
AKF-15S48	AKF-15S48C	AKF-15S48ICE	AKF-15S48CICE	AKF-15S48C	AC-DIN-01	AKF-15S48CICE	AC-DIN-01
AKF-15D12	AKF-15D12C	AKF-15D12ICE	AKF-15D12CICE	AKF-15D12C	AC-DIN-01	AKF-15D12CICE	AC-DIN-01
AKF-15D15	AKF-15D15C	AKF-15D15ICE	AKF-15D15CICE	AKF-15D15C	AC-DIN-01	AKF-15D15CICE	AC-DIN-01
AKF-15D512	AKF-15D512C	---	---	AKF-15D512C	AC-DIN-01	---	---
AKF-15T512	AKF-15T512C	---	---	AKF-15T512C	AC-DIN-01	---	---
AKF-15T515	AKF-15T515C	---	---	AKF-15T515C	AC-DIN-01	---	---