

## 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	Output Current Max. mA	Input Current 115VAC, 60Hz		Max. capacitive Load μF	Efficiency (typ.) @Max. Load %
			@Max. Load mA(typ.)	@No Load mA(typ.)		
	VDC					
AKF-15S05	5	3000	290	30	3900	75
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 <sub>PP</sub> of Vo
		Other Output Models	---	0.8	1.0	%V <sub>PP</sub> 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	Foldback, 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 55024, 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

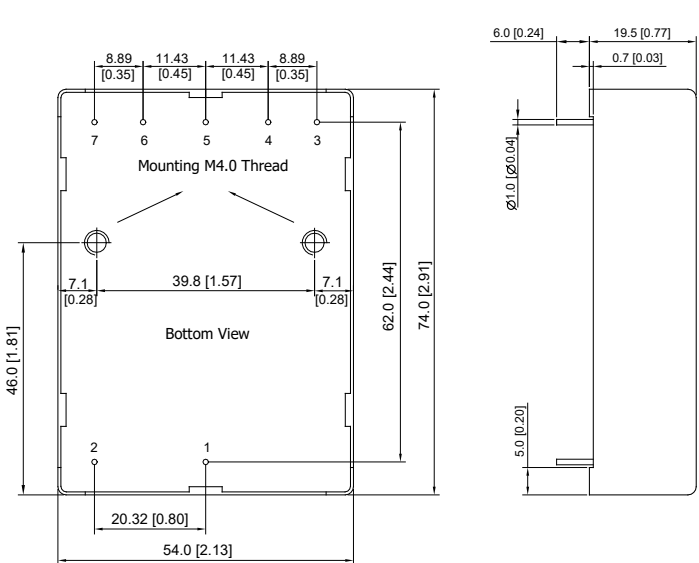
### Environmental Specifications

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

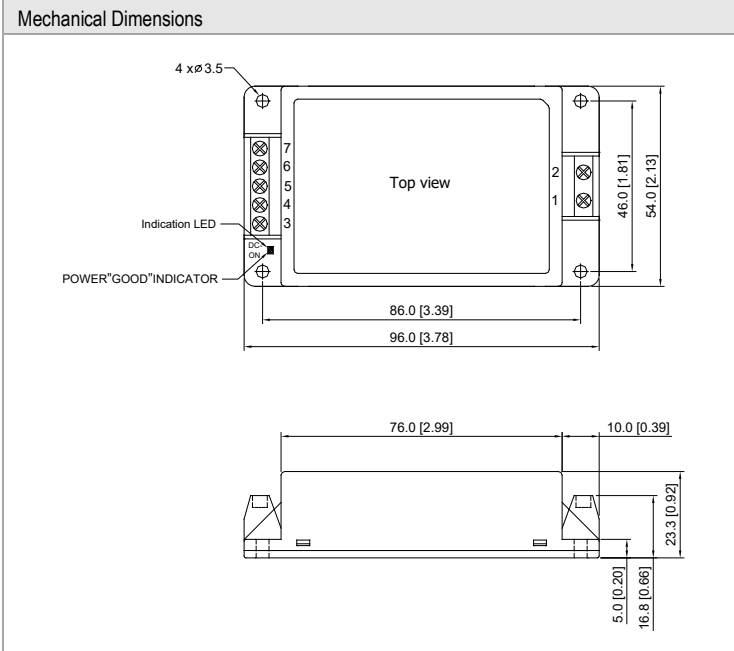
### Package Specifications PCB Mounting

Mechanical Dimensions		Pin Connections				
		Pin	Single	Dual (D12,D15)	Dual (D512)	Triple
		1	AC(N) – AC Neutral			
		2	AC(L) – AC Line			
		3	No Pin			-Vout3
		4	-Vout	-Vout	-Vout2	Common
		5	No Pin	Common	+Vout2	+Vout2
		6	+Vout	+Vout	-Vout1	-Vout1
		7	No Pin		+Vout1	+Vout1
<p>▶ All dimensions in mm (inches)                      ▶ Tolerance: ±0.5 (±0.02)                      ▶ Pin pitch tolerance: ±0.25 (±0.01)                      ▶ Pin diameter <math>\varnothing</math> 1.0 ±0.1 (0.04±0.004)</p>						

### 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 with Tin Plate Over Nickel Subplate
Weight	: 135g

**Package Specifications Chassis Mounting (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

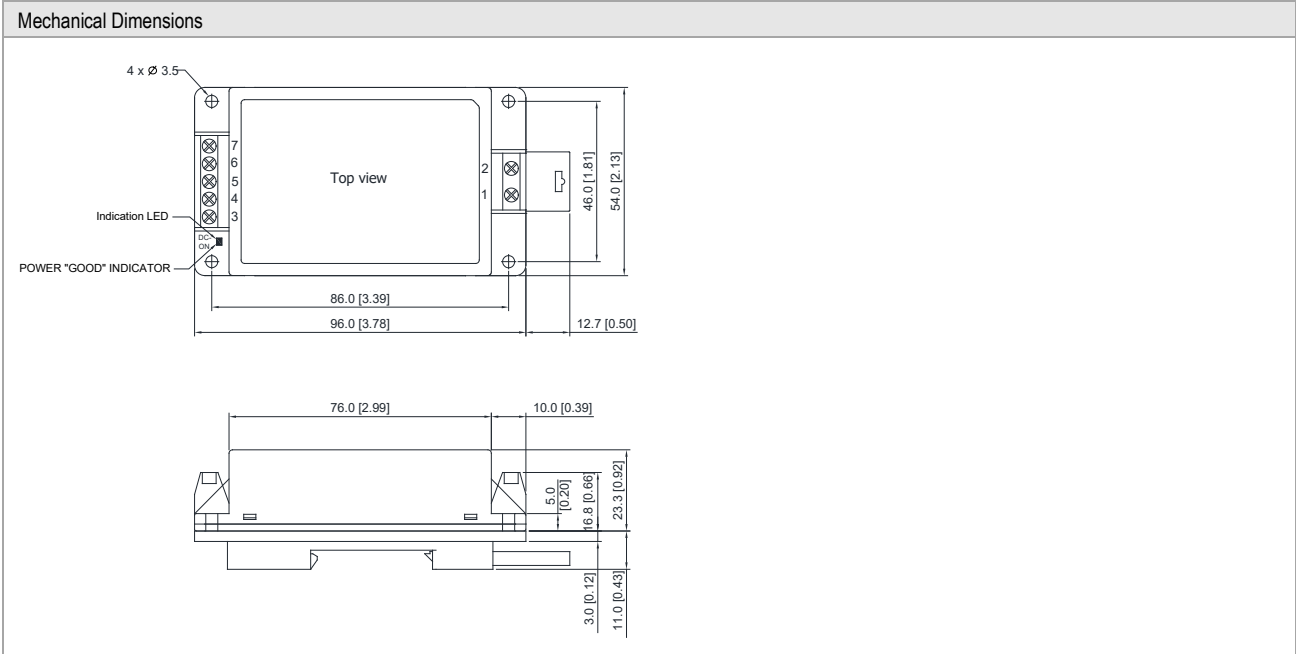
NC: No Connection

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

**Physical Characteristics**

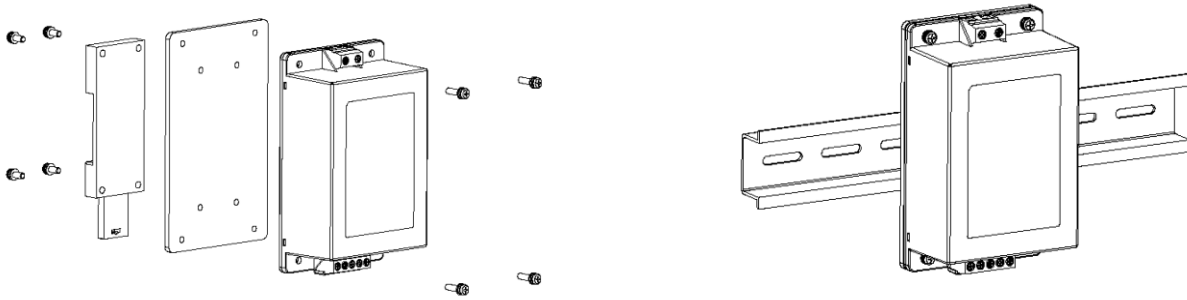
Case Size	: 96.0x54.0x23.3mm (3.78x2.13x0.92 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 132g

**Package Specifications with DIN Rail Mounting Bracket (order code 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

**DIN-Rail Mounting Kit**

**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	---	---