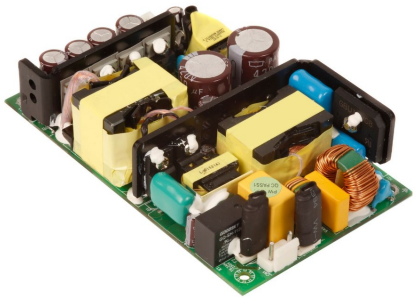
VKL280 Series

FiDUS
power in motion...

280 Watts

- 210W Convection / 280W Fan cooled
- Low profile 3 x 5 x 1.18”
- Latest approvals IEC62368-1 and IEC60601-1
- EN55022 Level B conducted & radiated
- 5V Standby 0.5A
- -20 to 70°C Operation



The VKL280 series of AC/DC power supplies is designed for use in both IT and medical applications. 280W (210W convection cooled) of power are achieved from a low profile 3” x 5” package. Units are available with output voltages between 12 and 54V and also come with a 5V standby and 12V fan rail. The VKL280 boasts high efficiency of over 92% and all units come with a FiDUS 3 year warranty.

Dimensions:

5 x 3 x 1.18” (127 x 76.2 x 30mm)

Models & Ratings

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Model Number	Output Power[1]	Output voltage	Output Current		Standby Rail	Fan Output	Efficiency[3]
			Convection	Forced Air[2]			
VKL28012T[4]	280W	12V	17.5A	23.33A	5V/0.5A	12V/0.3A	92%
VKL28024	280W	24V	8.75A	11.66A	5V/0.5A	12V/0.3A	92%
VKL28028	280W	28V	7.5A	10A	5V/0.5A	12V/0.3A	92%
VKL28048	280W	48V	4.375A	5.83A	5V/0.5A	12V/0.3A	92.5%
VKL28054	280W	54V	3.88A	5.18A	5V/0.5A	12V/0.3A	92.5%

Notes

1. Max power, fan cooled
2. Requires 18 CFM
3. 100% load at 230VAC
4. ‘T’ - Terminal block output connector required on 12V version
5. Add suffix ‘T’ for terminal block output connectors, or suffix ‘M’ for Mini Fit output connector. E.g VKL28054M
6. Loom kits available, see ‘Installation Advice’ pg5

Key specifications

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
AC Input range	90		264	VAC	No derating
Operating temperature	-20		70	°C	See derating graph
Efficiency	>91% typical at full load, 230VAC				
Dimensions	5 x 3 x 1.18” (127 x 76.2 x 30mm)				
EMC	EN55022 Level B conducted and radiated. EN61000-3 and EN61000-4, harmonics, flicker, Surge, EFT, ESD, conducted and radiated,				
Safety	IEC60601-1 3.1 edition, ES60601-1 +A1, EN60601-1 3.1 edition, IEC/EN62368-1 2nd Ed + A11, UL62368-1, CAN/CSA C22.2 No. 62368-1 CE				

Input

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Input voltage	90		264	VAC	No derating
Input frequency	47		63	Hz	
Power factor	>0.95 at 115VAC. >0.90 at 230VAC at full load				EN61000-3-2 class A compliant
Input current (rms)			3.5	A	At 115VAC
			2		At 230VAC max
Inrush current			<30	A	115VAC cold start at 25°C
			<60		230VAC cold start at 25°C
No load input power			0.5	W	Using 5V standby mode
Earth leakage current		<213		uA	At 264VAC. Touch current 74uA

Output

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Output voltage	12		54	VDC	See Model & Ratings table
Set point accuracy			±3	%	12 and 24V outputs
			±2		28 to 54V outputs
Line regulation			±1	%	
Load regulation			±5	%	
Minimum load	0			%	
Transient response			10	%	Maximum deviation (20mS for 10%-100% load change)
Ripple & Noise	12V output 150mV. 24V output 240mV. 28V output 280mV. 48V output 300mV. 54V output 400mV.			mV(Vp-p)	All models measured with 0.1uF ceramic and 47uF electrolytic capacitor. 20 MHz bandwidth.
Hold up time		>10		ms	At full load, 115VAC
Overload protection	105		150	%	
Short circuit protection					Trip and restart. Automatic recovery
Overvoltage protection	105		140		Latching type, AC recycle to reset

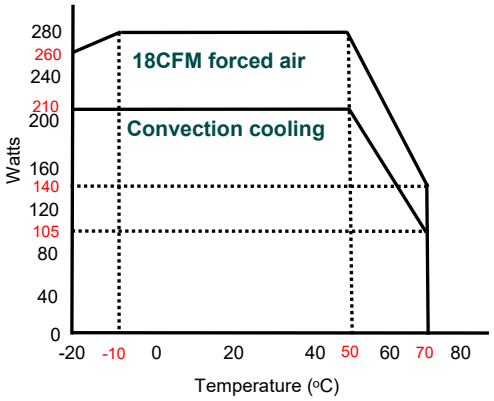
General

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	>91% typical at full load, 115VAC				
Isolation: Input to Output	4000			VAC	
Input to Ground	1500			VAC	
Output to Ground	1500			VAC	
Switching frequency	85		100	kHz	
Power density			15.8	W/In^3	
MTBF		>250		KHrs	As per MIL-HDBK-217F, 25°C GB
Weight		350		g	

Environmental

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating temperature	-20		70	°C	Derating from 50°C, see derating graph
Storage temperature	-20		85	°C	
Cooling	210W convection / 280W fan cooled (18CFM)				
Temperature coefficient			±0.01	%/°C	
Humidity	0		90	% RH	Non condensing

Derating curve



EMC: Emissions

	Standard	Test level	Criteria	Notes & Conditions
Conducted	EN55022	B		
Radiated	EN55022	B		
Harmonic current	EN61000-3-2	Class A		
Voltage flicker	EN61000-3-3			

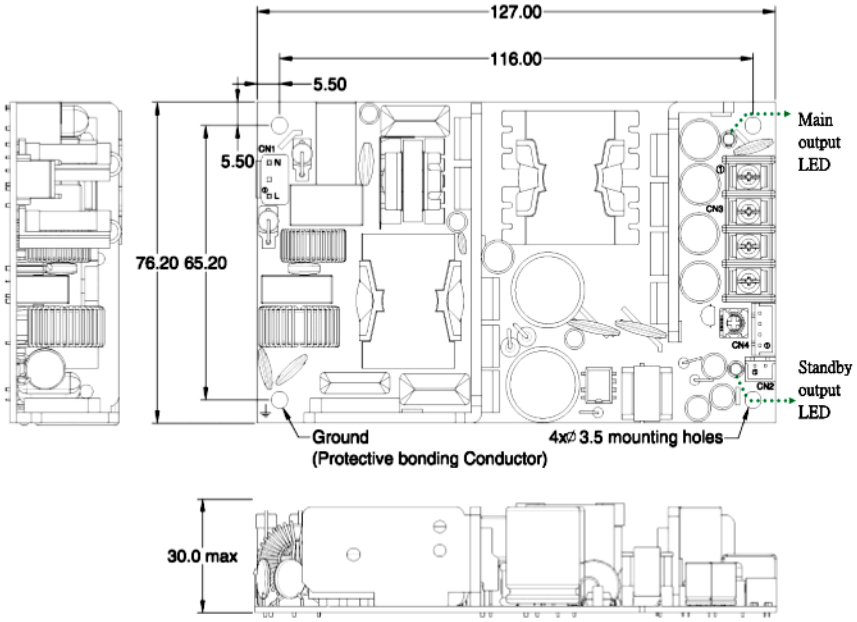
EMC: Immunity

	Standard	Test level	Criteria	Notes & Conditions
ESD	EN61000-4-2	3	A	
Radiated	EN61000-4-3	4	A	
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation Class 3	A	
Conducted	EN61000-4-6	2	A	
Magnetic Fields	EN61000-4-8	4	A	Tested: 30A/m at 50Hz

Safety Approvals

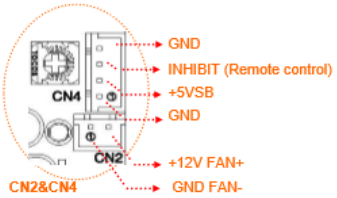
	Safety standard	Notes & Conditions
UL	ES60601-1 + A1, UL/CSA/CAN 62368-1	
CB	IEC60601-1 3.1 edition, IEC62368-1 2nd Ed +A11	
TUV	EN60601-1 3.1 edition, IEC62368-1 2nd Ed +A11	
CE		2011/65/EU RoHS Directive and 2014//EC Low voltage directive
Means of protection	2 x MOPP (Primary to Secondary) 1 x MOPP (Primary to Ground) 1 x MOPP (Secondary to Ground)	
Equipment protection class		Class I

Mechanical Details

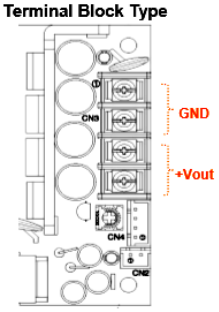


CN1: Input Connector [2]	
Pin	Function
1	AC Line
2	AC Neutral

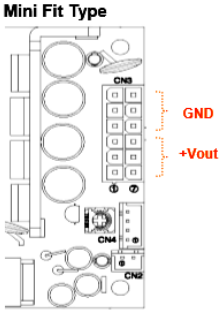
CN2: FAN Output [3]	
Pin	Function
1	GND FAN-
2	+12V FAN+



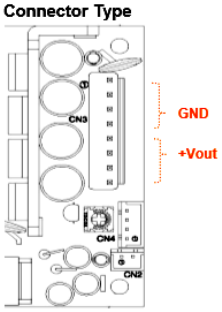
Terminal Block Type



Mini Fit Type



Connector Type



CN4: Remote Control & Standby Supply [4]	
Pin	Function
1	GND
2	+5VSB
3	INHIBIT (Remote Control)
4	GND

CN3: Connector Type (Standard) [5]			
Pin	Function	Pin	Function
1	GND	5	+Vout
2	GND	6	+Vout
3	GND	7	+Vout
4	GND	8	+Vout

CN3: Terminal block (T) [6]	
Pin	Function
1	GND
2	GND
3	+Vout
4	+Vout

CN3: Mini Fit (M) [7]			
Pin	Function	Pin	Function
1	+Vout	7	+Vout
2	+Vout	8	+Vout
3	+Vout	9	+Vout
4	GND	10	GND
5	GND	11	GND
6	GND	12	GND

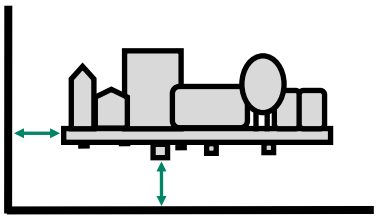
Notes

1. All dimensions in mm
2. CN1 AC Input header: JST B2P3-VH mating part JST VHR-3N.
3. CN2 Fan header: JST B2B-XH-A mating part JST XHP-2
4. CN4 Remote Control header: JST B4B-XH-A mating part JST XHP-4 Inhibit high or floating out put is enabled, if connected to GND output is disabled
5. CN3 Standard header: JST B8P-VH-B mating part JST VHR-8N
6. CN3 Terminal block—4-pole terminal block, pitch: 8.25mm, rate 20A/300V or equivalent
7. CN3 Mini fit header: 12 PIN mini fit, pitch 4.2mm. Molex 39-28-1123 or equivalent mates with Molex 39-01-2120

VKL280 Series

Installation Advice

Safety

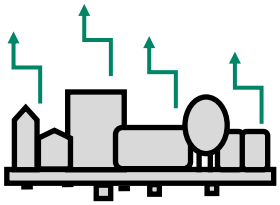


On installation customers must consider the required creepage and clearance distances between the PSU and the end-equipment enclosure. These distances vary depending on the installation class and safety standard requirements.

For **Class I** installations there should be 3-4mm between any part of the PSU and any earthed metal part of the enclosure. 3mm is acceptable for IT applications, 4mm required for medical applications. In Class I installations the PSU earth point must be connected to system safety ground.
For **Class II** installations distances may need to be increased if being installed into a surrounding metal enclosure.
Ensure consideration of components on the underside of the PCB or low lying spills when measuring clearance distances between the PSU and the end-equipment. Also top surface especially in tight enclosures such as 1U boxes. An insulation material can be used between PSU and metal if smaller gap required.

FiDUS recommends installing the PSU on 6mm stand offs typically, but check the distances.

EMC

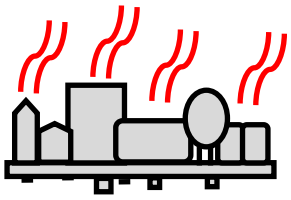


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that can be done to optimise EMC performance either as best practice, or if you are struggling for compliance:

1) Connect all marked EMI ground points to earth. Often these are combined with the safety earth point (in class I installations), but on some power supplies there may be additional earth tags or mounting points.
2) Minimise the length of input/output wiring where possible and try to maintain max distance of the conductors from the PSU, to prevent noise pick up. Avoid bundling input and output cables together. A common component to avoid placing wiring near is the PFC inductor in power factor corrected power supplies.
3) Apply additional filtering before the PSU input (ensure consideration of which frequencies there are issues with before selecting a filter).
4) When using an open frame PSU, mount the supply on a metal plate and connect EMI mounting points.
5) In multi circuit systems, decouple the circuits locally.
6) Ferrites added between the PSU and system input connector and/or the DC output cables can help in reducing radiated noise issues in systems. If seen, issues are commonly in the 30-150MHz area.

For more detailed assistance, if you still have any concerns with compliance, please get in contact with our Engineering department who are on hand to assist with any queries.

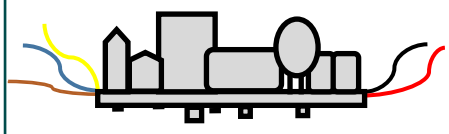
Thermal



Thermal management is an important consideration when thinking about equipment service life. Electrolytic capacitors within the PSU wear with time and are typically the first end-of-life failure. Keeping the operation temperature of key components within the PSU, such as the electrolytic capacitors, as low as possible is paramount. As a general rule, for every 10°C drop in the operating temperature of the electrolytic capacitators you double their lifetime, and thus the lifetime of the power supply. When looking at thermal performance it is helpful to test under a worst-case set of conditions, to ensure component temperatures are in an acceptable range for the required service life. Then consider the impact of operational time, load and temperature profile to estimate a more realistic lifetime for your PSU.

Also, many FiDUS power supplies offer a *Peak Power* rating to provide for customers with pulsing loads. When using a peak power capability customers must consider:
1) Peak duration rating: the maximum length of time the peak can be drawn for
2) Duty cycle: the frequency with which the peak can be drawn. (e.g. 10% duty cycle, 1 second on:9 seconds off)
3) Average power value: datasheets will state the maximum average power acceptable with peak power PSUs.
If any of these elements are exceeded the supply may overheat, with performance and lifetime suffering as a result.

Connectivity



All FiDUS Power engineering samples requested will arrive with a free of charge loom kit for ease of testing.

The loom kit connects to the input/output terminals of the PSU and provides the customer with bare wire ends to connect with.

The loom kits can also prove advantageous for ease of installation in production. Please contact sales if you are interested in including the loom kit in your quotation.
Alternatively the input/output connector and mating part details can be found in the attached table.

	Part Number	Mating Part
Input	All: JST B2P3-VH	All: JST VHR-3N
Output	24-54V: JST B8P-VH-B 12V & 'T' option: Screw terminals 'M' option: Molex 39-28-1123	24-54V: JST VHR-8N 'M' option: Molex 39-01-2120
Loom Kit	24-54V standard: VKL280 LK 12V & 'T' option: VKL280 12V LK	