TCL40 Series

FiDUS
power in motion...

40 Watts

- Compact size 2 x 3 x 0.91”
- 40W Convection cooled
- 55W+ Peak power for 3 seconds
- IT & medical safety approvals
- EN55022 Level B conducted & radiated
- -20 to +70°C Operation
- 10 Year warranty

The TCL40 series of compact open frame AC-DC power supplies offer 40W of convection cooled power in a 2” x 3” package. The series has IT and medical safety approved versions to cater for a wider range of applications and has a 55W+ peak power capability available for 3 seconds. Outputs are available from 12 to 48V and all come with a FiDUS 10 year warranty.

Dimensions:

2 x 3 x 0.91” (50.8 x 76.2 x 23.1mm)

Models & Ratings

INSTALLATION ADVICE PG5

Model Number	Output Power	Output voltage	Output Current		Efficiency (3)
			Convection	Peak (2)	
TCL4012	40W	12V	3.33A	4.7A	84%
TCL4015	40W	15V	2.66A	3.8A	84%
TCL4024	40W	24V	1.66A	2.4A	85%
TCL4028	40W	28V	1.42A	2A	85%
TCL4036	40W	36V	1.11A	1.6A	85%
TCL4048	40W	48V	0.83A	1.16A	86%
TCL4012-M(1)	40W	12V	3.33A	4.7A	84%
TCL4015-M(1)	40W	15V	2.66A	3.8A	84%
TCL4018-M(1)	40W	18V	2.22A	3.2A	84%
TCL4024-M(1)	40W	24V	1.66A	2.4A	85%
TCL4028-M(1)	40W	28V	1.42A	2A	85%
TCL4036-M(1)	40W	36V	1.11A	1.6A	85%
TCL4048-M(1)	40W	48V	0.83A	1.16A	86%

Notes

1. Add suffix ‘-M’ for medical version
2. For 3 seconds, duty cycle <10%, average power not exceeding 40W
3. Typical at 100% load.
4. Loom kit available, see ‘Installation Advice’ page 5

Key specifications

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
AC Input range	90		264	VAC	No derating
Operating temperature	-20		70	°C	Derate linearly from 100% power at 50°C to 50% power at 70°C.
Efficiency	84		86	%	
Dimensions	2 x 3 x 0.91” (50.8 x 76.2 x 23.1mm)				
EMC	EN55022 Level B Conducted and Radiated. EN61000-3 and EN61000-4, harmonics, flicker, Surge, EFT, ESD, conducted and radiated,				
Safety	Standard models: IEC/UL/CSA/EN 60950-1: 2nd edition, CE. ‘-M’ models: IEC/UL/CSA/EN 60601-1: 3rd edition, CE				

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Input

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Input voltage	90		264	VAC	No derating
Input frequency	47		63	Hz	
Power factor					EN61000-3-2 class A compliant
Inrush current		<30		A	115 VAC cold start at 25°C
		<60			230 VAC cold start at 25°C
No load input power			0.5	W	
Earth leakage current		<300		uA	Class II construction

Output

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Output voltage	12		48	VDC	See Model & Ratings table
Set point accuracy			±1.6	%	
Line regulation			±0.5	%	
Load regulation			±1	%	
Minimum load	0			%	
Transient response			4	%	Recovery within 1% within 500 µs for 25% step
Ripple & Noise		100		mVpp	12 to 18V output
		150			24 to 48V output
Hold up time		18		mS	At rated load and 115VAC
Overload / Short circuit protection					Trip & restart. Automatic recovery
Overvoltage protection					Latch off

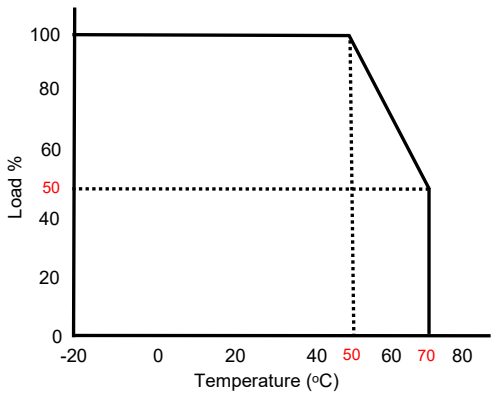
General

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency	84		86	%	See models & Ratings table
Isolation: Input to Output	4000			VAC	
Input to Ground	1500			VAC	
Output to Ground	1500			VAC	
Power density			7.3	W/In^3	
MTBF	470			kHrs	MIL-HDBK-217F, rated load, 50°C
Weight		88.5		g	

Environmental

Parameter	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating temperature	-20		70	°C	Derate linearly from 100% power at 50°C to 50% power at 70°C.
Storage temperature	-40		85	°C	
Cooling					Convection cooled
Temperature coefficient			0.05	%/°C	
Humidity	5		95	%RH	Non-condensing
Operating altitude			5000	M	

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			

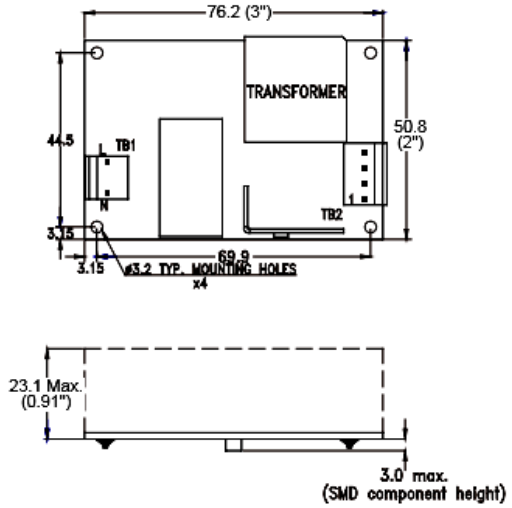
EMC: Immunity

	Standard	Test level	Criteria	Notes & Conditions
ESD	EN61000-4-2	3	A	±6kV contact, ±8kV air
Radiated	EN61000-4-3	3	A	10V/m
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation Class 3	A	
Conducted	EN61000-4-6	3	A	
Dips and interruptions	EN61000-4-11	Dips: 30% 10ms, 60% 100ms, 95% 5000ms. Perf criteria A,C,C		

Safety Approvals

	Safety standard	Notes & Conditions
UL	UL 60950-1: 2nd edition, CSA22.2 No. 60950-1: 2nd edition UL 60601-1: 3rd edition. CSA22.2 No. 60601-1: 3rd edition	Medical safety only for (-M) models, IT only for standard models
CB	IEC 60950-1: 2nd edition IEC 60601-1: 3rd edition	Medical safety only for (-M) models, IT only for standard models
TUV	EN60950-1: 2nd edition EN60601-1: 3rd edition	Medical safety only for (-M) models, IT only for standard models
CE		2011/65/EU RoHS Directive and 2014/35/EU Low voltage directive
Means of patient protection	Input to Output: 2 x MOPP Input to Ground: 1 x MOPP Output to Ground: 1 x MOPP	
Equipment protection class		Class II

Mechanical Details



Input Pin Connections (TB1)	
Pin	**Function**
L	Live
N	Neutral

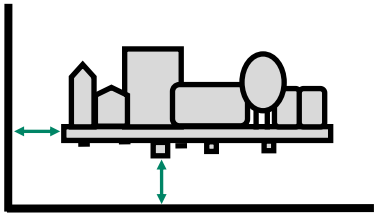
Output Pin Connections (TB2) [5]	
Pin	**Function**
1	Vout
2	Vout
3	GND
4	GND

Notes

1. All dimensions in mm (inches)
2. Mounting hole: 44.5 x 69.9mm
3. Recommended: if available, connect PSU to metal sheet beneath the PSU via the EMI ground.
4. TB1: Input header: Molex 09-65-2029 mating part: Molex 09-50-1023
5. TB2: Output header Molex 09-65-2048 mating part: Molex 09-50-1041

Installation Advice

Safety

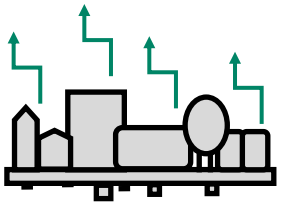


On installation customers must consider the required creepage and clearance distances between the PSU and the end-equipment enclosure. These distances vary depending on the installation class and safety standard requirements.

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

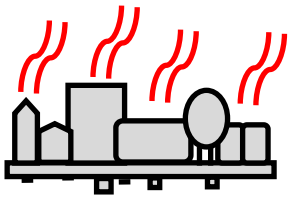


Conducted and radiated emissions compliance is a common application consideration. It is important to remember that even when using a properly filtered PSU, an application may still not achieve compliance if it is not designed to minimise emissions. That being said, there are a number of things that 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.

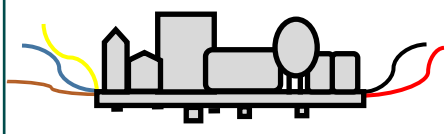
Thermal



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 Number
Input	Molex 09-65-2029	Molex 09-50-1023
Output	Molex 09-65-2048	Molex 09-50-1041
Loom Kit	TCL40 LK	