



## SERIES: VHK150W | DESCRIPTION: DC-DC CONVERTER

### FEATURES

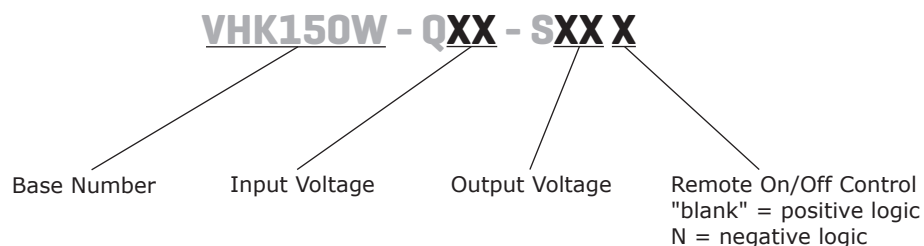
- up to 150 W isolated output
- rugged metal enclosure with integrated heat sink
- 4:1 input range (9~36 Vdc, 18~75 Vdc)
- single output from 5~48 Vdc
- 1,500 Vdc isolation
- over current, over temperature, over voltage, and short circuit protections
- remote on/off
- efficiency up to 90%



MODEL	input voltage range	output voltage	output current max	output power max	ripple and noise <sup>1</sup> max	efficiency typ
	(Vdc)	(Vdc)	(A)	(W)	(mVp-p)	(%)
VHK150W-Q24-S5	9 ~ 36	5	25	125	100	87
VHK150W-Q24-S12	9 ~ 36	12	12.5	150	150	86
VHK150W-Q24-S15	9 ~ 36	15	10	150	150	86
VHK150W-Q24-S24	9 ~ 36	24	6.5	156	240	86.5
VHK150W-Q24-S28	9 ~ 36	28	5.4	150	280	87
VHK150W-Q24-S48	9 ~ 36	48	3.12	150	480	84
VHK150W-Q48-S5	18 ~ 75	5	25	125	100	90
VHK150W-Q48-S12	18 ~ 75	12	12.5	150	150	88
VHK150W-Q48-S15	18 ~ 75	15	10	150	150	88
VHK150W-Q48-S24	18 ~ 75	24	6.5	156	240	87.5
VHK150W-Q48-S28	18 ~ 75	28	5.4	150	280	89
VHK150W-Q48-S48	18 ~ 75	48	3.12	150	480	87

Note: 1. Ripple and noise are measured at full load, 20 MHz BW with 10µF tantalum capacitor and 1µF ceramic capacitor across output.

### PART NUMBER KEY



## INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage	24 Vdc input models	9	24	36	Vdc
	48 Vdc input models	18	48	75	Vdc
under voltage shutdown	24 Vdc input		8.8 8		Vdc Vdc
	48 Vdc input		17 16		Vdc Vdc
CTRL <sup>1</sup>	positive logic	models ON (>3.5 Vdc or open circuit)			
		models OFF (0~1.8 Vdc)			
	negative logic	models ON (0~1.8 Vdc)			
		models OFF (>3.5 Vdc or open circuit)			
filter	pi filter				
input fuse	30A time delay fuse for 24 Vin models, 15A time delay fuse for 48 Vin models				

Note: 1. Open collector refer to -Vin

## OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	5 V output models			30,000	μF
	12 V output models			12,500	μF
	15 V output models			10,000	μF
	24 V input, 24 & 28 V output models			1,800	μF
	48 V input, 24 & 28 V output models			2,200	μF
	48 V output models	47		1,000	μF
line regulation <sup>2</sup>	measured from high line to low line			±0.2	%
load regulation <sup>2</sup>	measured from full load to zero load			±0.2	%
voltage accuracy <sup>2</sup>				±1.5	%
adjustability			±10		%
switching frequency			250		kHz
transient response	25% step load change			500	μs
temperature coefficient			±0.03		%/°C

Note: 2. A 47 μF aluminum capacitor is required on the output for 48 Vdc output models.

## PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous				
over current protection	% nominal output current	110		140	%
over voltage protection		115		140	%
over temperature protection	shutdown		110		°C

## SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	for 1 minute: input to output; input to case; output to case	1,500			Vdc
isolation resistance		10			MΩ
RoHS	2011/65/EU (CE)				

## ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		85	°C
storage temperature		-55		105	°C

## MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	4.23 x 4.01 x 1.50 (107.5 x 101.76 x 38.0 mm)				inch
case material	steel and aluminum extrusion				
weight			502		g

## MECHANICAL DRAWING

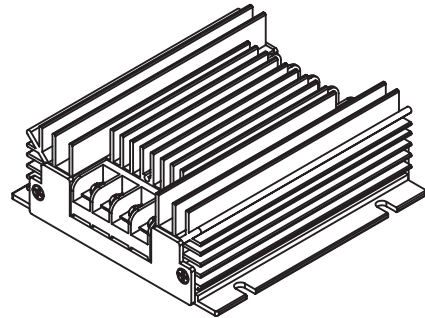
units: inch[mm]

tolerance: X.XX = ±0.02[±0.5]  
 X.XXX = ±0.010[±0.25]

wire range: 22~12 AWG

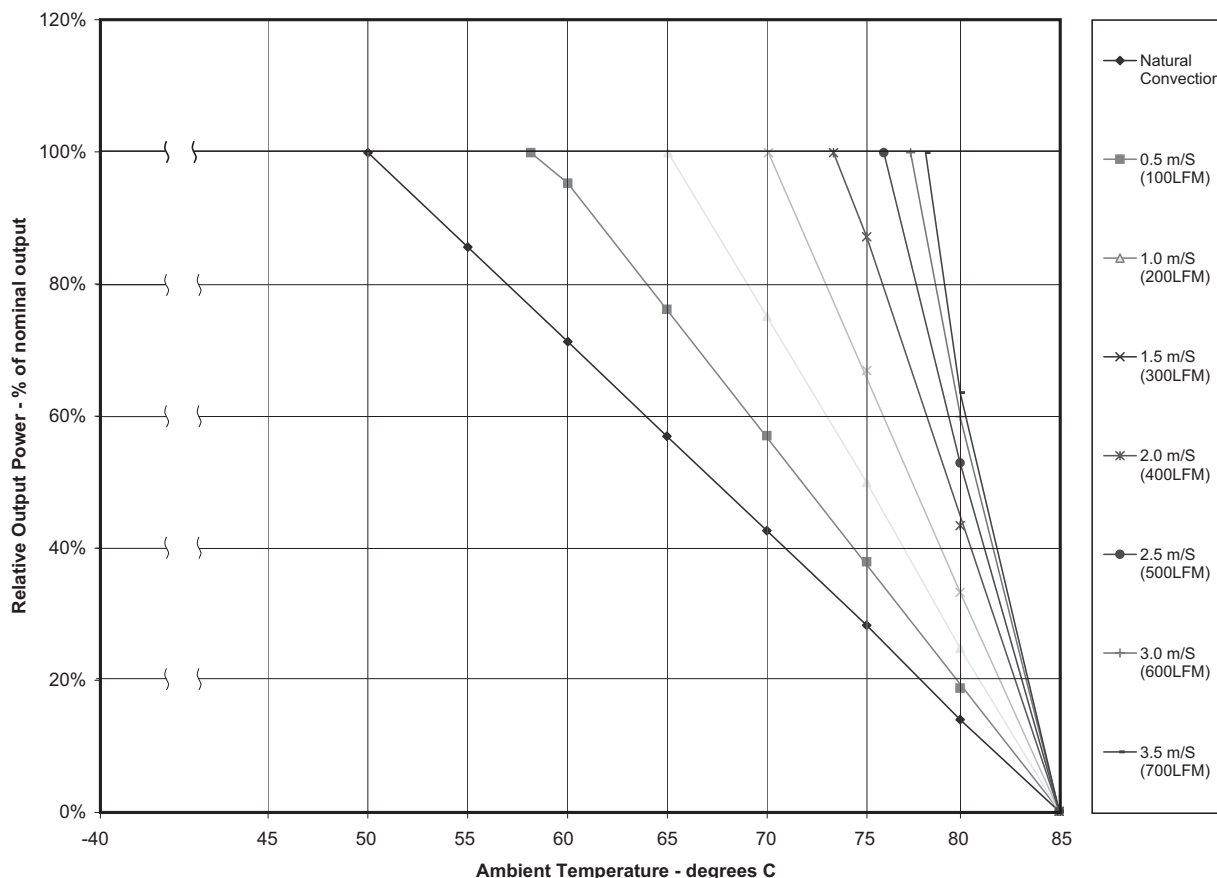
screw size: #6-32

PIN CONNECTIONS	
PIN	FUNCTION
1	-Vo
2	-S
3	trim
4	+S
5	+Vo
6	case
7	on/off
8	-Vin
9	+Vin



## DERATING CURVES

VHK150W Power Derating Curves At Nominal Input



## TEST CONFIGURATION

Figure 1

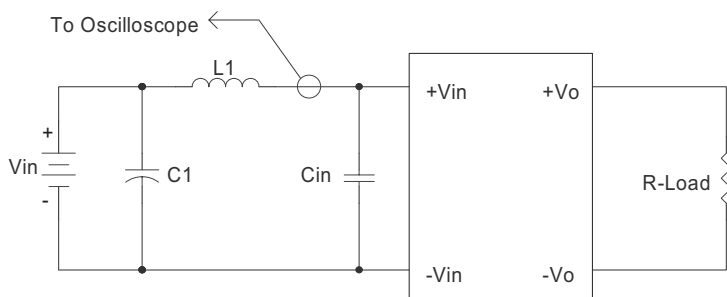


Table 1  
External Components

24 Vdc input models	
L1	1.2μH
C1	220μF, ESR < 0.1Ω at 100 KHz
Cin	330μF, ESR < 0.7Ω at 100 KHz
48 Vdc input models	
L1	12μH
C1	220μF, ESR < 0.1Ω at 100 KHz
Cin	33μF, ESR < 0.7Ω at 100 KHz

Note: Input reflected-ripple current is measured with an inductor L1 and Capacitor C1 to simulate source impedance.

## EMC RECOMMENDED CIRCUITS

### EN55022 CLASS A

Figure 2  
Recommended Circuit for EN55022 Class A

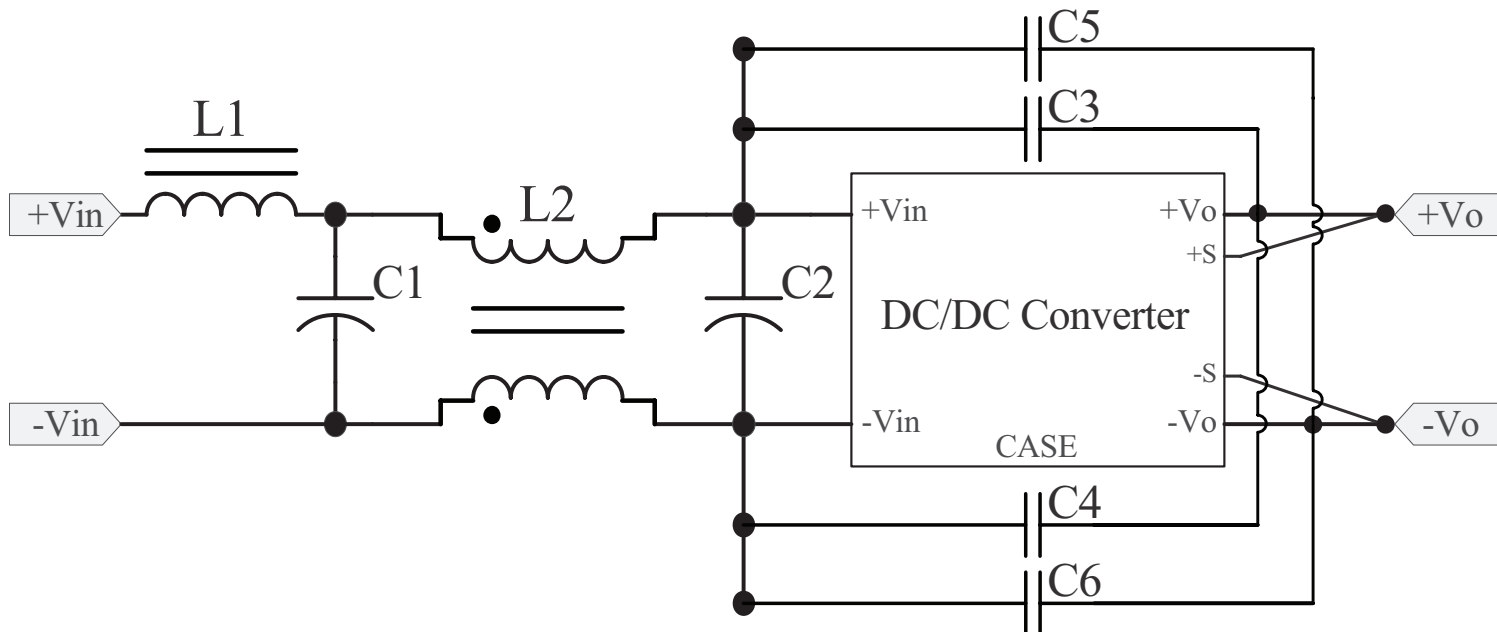


Table 2  
Class A Recommended Components

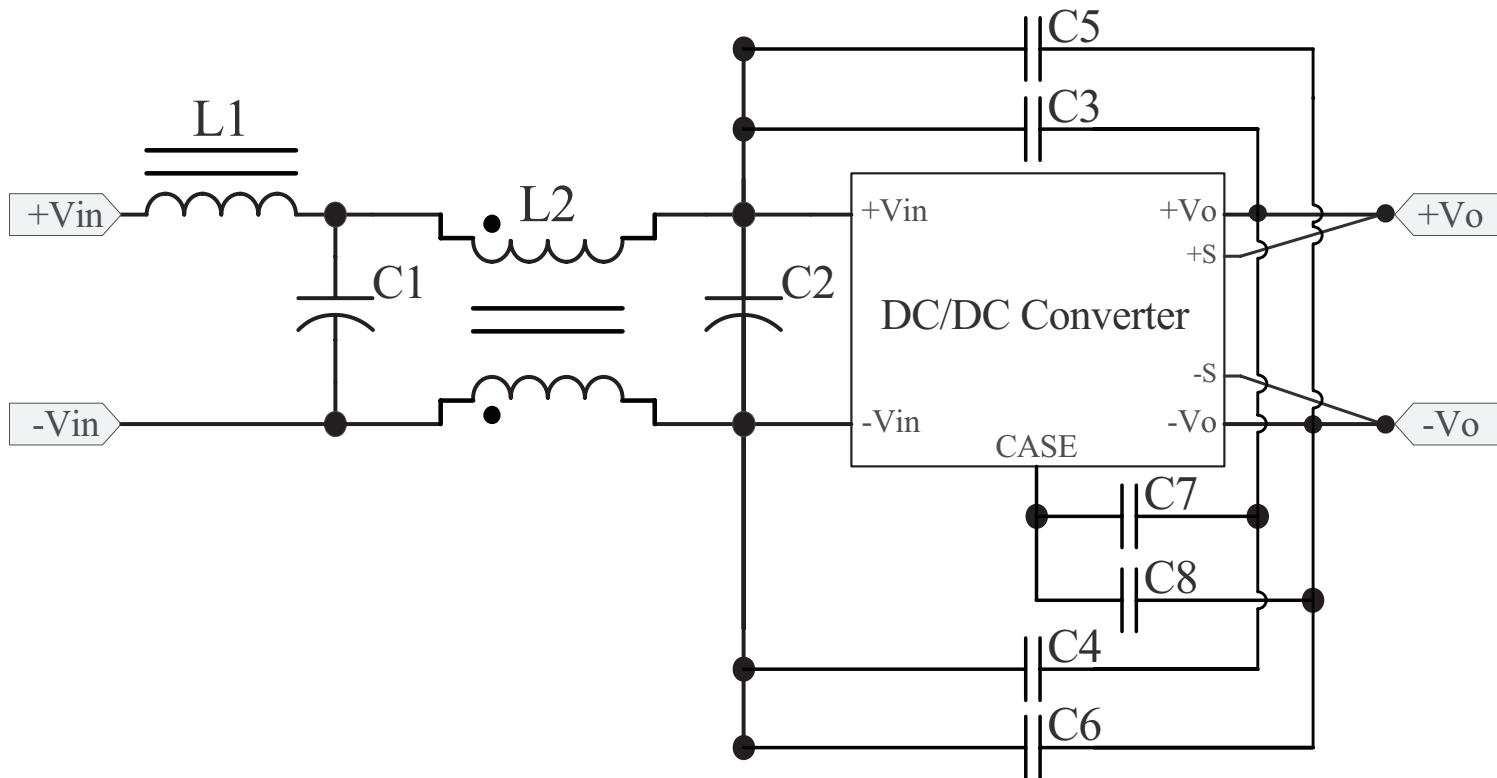
Model	C1 <sup>1</sup>	C2 <sup>1</sup>	C3 <sup>2</sup>	C4 <sup>2</sup>	C5 <sup>2</sup>	C6 <sup>2</sup>	L1	L2
VHK150W-Q24-S5	100 μF/50 V	100 μF/50 V	NC	NC	NC	NC	SHORT	0.5 mH
VHK150W-Q24-S12	100 μF/50 V	100 μF/50 V	NC	NC	NC	NC	SHORT	0.5 mH
VHK150W-Q24-S15	100 μF/50 V	100 μF/50 V	NC	NC	NC	NC	SHORT	0.5 mH
VHK150W-Q24-S24	100 μF/50 V	100 μF/50 V	680 pF	680 pF	470 pF	680 pF	SHORT	0.5 mH
VHK150W-Q24-S28	100 μF/50 V	100 μF/50 V	2200 pF	NC	680 pF	2200 pF	SHORT	0.6 mH
VHK150W-Q24-S48	100 μF/50 V	100 μF/50 V	1000 pF	NC	470 pF	1000 pF	SHORT	0.6 mH
VHK150W-Q48-S5	47 μF/100 V	47 μF/100 V	NC	NC	NC	NC	SHORT	0.5 mH
VHK150W-Q48-S12	47 μF/100 V	47 μF/100 V	NC	680 pF	NC	NC	SHORT	0.5 mH
VHK150W-Q48-S15	47 μF/100 V	47 μF/100 V	680 pF	1000 pF	NC	NC	SHORT	0.5 mH
VHK150W-Q48-S24	47 μF/100 V	47 μF/100 V	680 pF	680 pF	470 pF	680 pF	SHORT	0.5 mH
VHK150W-Q48-S28	47 μF/100 V	47 μF/100 V	2200 pF	NC	680 pF	2200 pF	SHORT	0.6 mH
VHK150W-Q48-S48	47 μF/100 V	47 μF/100 V	2200 pF	1500 pF	1500 pF	2200 pF	SHORT	0.5 mH

Notes: 1. Aluminum capacitor  
2. Ceramic capacitor

## EMC RECOMMENDED CIRCUITS (CONTINUED)

### EN55022 CLASS B

**Figure 3**  
Recommended Circuit for EN55022 Class B



**Table 3**  
Class B Recommended Components

Model	C1 <sup>1</sup>	C2 <sup>1</sup>	C3 <sup>2</sup>	C4 <sup>2</sup>	C5 <sup>2</sup>	C6 <sup>2</sup>	C7 <sup>2</sup>	C8 <sup>2</sup>	L1	L2
VHK150W-Q24-S5	220 μF/50 V	220 μF/50 V	680 pF	NC	NC	NC	NC	NC	3 μH	0.5 mH
VHK150W-Q24-S12	220 μF/50 V	220 μF/50 V	680 pF	680 pF	NC	NC	NC	NC	3 μH	0.5 mH
VHK150W-Q24-S15	220 μF/50 V	220 μF/50 V	680 pF	NC	NC	NC	NC	NC	3 μH	0.5 mH
VHK150W-Q24-S24	220 μF/50 V	220 μF/50 V	1000 pF	1000 pF	470 pF	680 pF	470 pF	330 pF	3 μH	0.5 mH
VHK150W-Q24-S28	220 μF/50 V	220 μF/50 V	2200 pF x2	1000 pF	470 pF	2200 pF x2	470 pF	470 pF	3.4 μH	0.6 mH
VHK150W-Q24-S48	220 μF/50 V	220 μF/50 V	2200 pF x4	1000 pF	1000 pF	2200 pF x4	NC	NC	3.4 μH	0.6 mH
VHK150W-Q48-S5	120 μF/100 V	120 μF/100 V	NC	680 pF	NC	NC	NC	NC	3 μH	0.5 mH
VHK150W-Q48-S12	120 μF/100 V	120 μF/100 V	NC	680 pF	NC	NC	NC	NC	3 μH	0.5 mH
VHK150W-Q48-S15	120 μF/100 V	120 μF/100 V	1000 pF	1000 pF	470 pF	1000 pF	330 pF	680 pF	3 μH	0.5 mH
VHK150W-Q48-S24	120 μF/100 V	120 μF/100 V	1000 pF	1000 pF	470 pF	1000 pF	330 pF	680 pF	3 μH	0.5 mH
VHK150W-Q48-S28	120 μF/100 V	120 μF/100 V	1000 pF	1000 pF	470 pF	1000 pF	470 pF	470 pF	3.4 μH	0.6 mH
VHK150W-Q48-S48	82 μF/100 V	120 μF/100 V	2200 pF + 470 pF	1500 pF	1000 pF	2200 pF + 470 pF	NC	NC	SHORT	0.5 mH

Notes: 1. Aluminum capacitor  
2. Ceramic capacitor

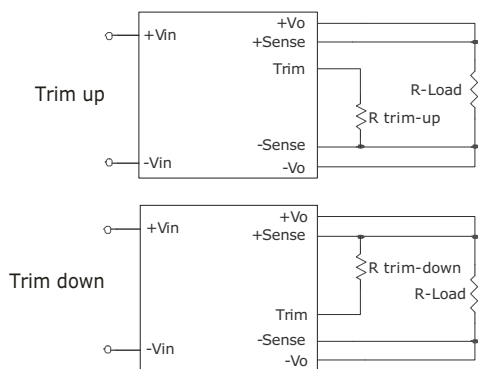
## APPLICATION NOTES

### 1. Output Voltage Trimming

Leave open if not used.

**Figure 4**

Application Circuit for Trim pin



### Formula for Trim Resistor

$$R_{trim - up} = \left( \frac{R_1(V_r - V_f(\frac{R_2}{R_2 + R_3}))}{V_o - V_{o, nom}} \right) - \frac{R_2 R_3}{R_2 + R_3} \text{ (k}\Omega\text{)}$$

$$R_{trim - down} = \frac{R_1(V_o - V_r)}{V_{o, nom} - V_o} - R_2 \text{ (k}\Omega\text{)}$$

Note:  $R_{trim-up}$  is the external resistor in k $\Omega$   
 $R_{trim-down}$  is the external resistor in k $\Omega$   
 $V_{o, nom}$  is the nominal output voltage  
 $V_o$  is the desired output voltage  
 $R_1, R_2, R_3,$  and  $V_r$  are internal (see Table 4).

**Table 4**

Vout (Vdc)	R1 (k $\Omega$ )	R2 (k $\Omega$ )	R3 (k $\Omega$ )	Vr (V)	Vf (V)
5	2.32	3.3	0	2.5	0
12	9.1	51	5.1	2.5	0.46
15	12	56	8.25	2.5	0.46
24	20	100	7.5	2.5	0.46
28	23.7	150	6.2	2.6	0.64
48	36	270	5.1	2.5	0.46

Note: 1. All specifications are measured at Ta=25°C, nominal input voltage and full output load unless otherwise specified.

## REVISION HISTORY

rev.	description	date
1.0	initial release	10/11/2006
1.01	new template applied	12/21/2011
1.02	misc. updates and corrections	03/13/2012
1.03	updated mechanical drawing	03/27/2012
1.04	V-Infinity branding removed	09/06/2012
1.05	added 28 V output models	11/05/2012
1.06	misc. updates, added 5 V output models for both 24 and 48 V inputs	11/16/2012
1.07	updated spec	03/14/2013
1.08	added trimming and EMI information	12/17/2013
1.09	updated spec	01/05/2015
1.10	updated derating curves	06/18/2015

The revision history provided is for informational purposes only and is believed to be accurate.



**CUI INC**<sup>®</sup>

**Headquarters**  
20050 SW 112th Ave.  
Tualatin, OR 97062  
**800.275.4899**

Fax 503.612.2383  
**cui.com**  
techsupport@cui.com

CUI offers a two (2) year limited warranty. Complete warranty information is listed on our website.

CUI reserves the right to make changes to the product at any time without notice. Information provided by CUI is believed to be accurate and reliable. However, no responsibility is assumed by CUI for its use, nor for any infringements of patents or other rights of third parties which may result from its use.

CUI products are not authorized or warranted for use as critical components in equipment that requires an extremely high level of reliability. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.