

# CON-HP-E

## PROGRAMMABLE HIGH POWER CONVERTER



POSITIVE PROBLEM SOLVING **+=**

The CON-HP-E provides up to 15kW of power in just a 3U high case. A 10 turn digitally encoded potentiometer allows for straight forward front panel operation.

The front panel display indicates all relevant output quantities simultaneously. Output values can be preset and read prior to releasing the output. ATE options are offered for system integration. Each unit has an RS-232, LAN and isolated analogue interface with user switchable ranges (0 - 5VDC / 0 - 10VDC) as standard. If computer control is required then any combination of integrated RS-485, GPIB and USB interfaces can be specified. An advanced model with constant power and master/slave operation is available on request.

- + Constant Voltage and Current Modes
- + Models up to 504kW on Request
- + Fixed or Programmable Outputs
- + Optional Computer Interfaces
- + Simple Front Panel Operation
- + Custom Input Options

# SELECTION TABLE

OUTPUT VOLTAGE	OUTPUT CURRENT					
	3kW Models	4kW Models	5kW Models	7kW Models	10kW Models	15kW Models
0 - 15V	0 - 250A	0 - 500A	0 - 500A	0 - 500A	0 - 750A	0 - 1000A
0 - 20V	0 - 250A	0 - 250A	0 - 250A	0 - 500A	0 - 500A	0 - 750A
0 - 25V	0 - 240A	0 - 240A	0 - 240A	0 - 480A	0 - 480A	0 - 600A
0 - 30V	0 - 234A	0 - 234A	0 - 234A	0 - 234A	0 - 400A	0 - 500A
0 - 35V	0 - 200A	0 - 200A	0 - 200A	0 - 200A	0 - 400A	0 - 430A
0 - 40V	0 - 175A	0 - 175A	0 - 175A	0 - 175A	0 - 350A	0 - 375A
0 - 45V	0 - 156A	0 - 156A	0 - 156A	0 - 156A	0 - 320A	0 - 340A
0 - 50V	0 - 140A	0 - 140A	0 - 140A	0 - 140A	0 - 280A	0 - 300A
0 - 60V	0 - 117A	0 - 117A	0 - 117A	0 - 117A	0 - 170A	0 - 250A
0 - 70V	0 - 100A	0 - 100A	0 - 100A	0 - 100A	0 - 150A	0 - 220A
0 - 80V	0 - 88A	0 - 88A	0 - 88A	0 - 88A	0 - 125A	0 - 190A
0 - 100V	0 - 70A	0 - 70A	0 - 70A	0 - 70A	0 - 100A	0 - 150A
0 - 150V	0 - 47A	0 - 47A	0 - 47A	0 - 47A	0 - 70A	0 - 100A
0 - 300V	0 - 24A	0 - 24A	0 - 24A	0 - 24A	0 - 35A	0 - 50A
0 - 600V	0 - 12A	0 - 12A	0 - 12A	0 - 12A	0 - 17A	0 - 25A
0 - 800V	0 - 9A	0 - 9A	0 - 9A	0 - 9A	0 - 13A	0 - 19A
0 - 1000V	0 - 7A	0 - 7A	0 - 7A	0 - 7A	0 - 10A	0 - 15A
0 - 1200V	0 - 5.8A	0 - 5.8A	0 - 5.8A	0 - 5.8A	0 - 9A	0 - 13A
0 - 1500V	0 - 4.7A	0 - 4.7A	0 - 4.7A	0 - 4.7A	7kW	0 - 10A

OUTPUT VOLTAGE	OUTPUT CURRENT						
	21kW Models	30kW Models	35kW Models	45kW Models	49kW Models	56kW Models	63kW Models
0 - 20V	0 - 1250A	0 - 1500A	0 - 1750A	0 - 2250A	N/A	N/A	N/A
0 - 25V	0 - 1000A	0 - 1250A	0 - 1500A	0 - 1800A	0 - 2000A	0 - 2250A	N/A
0 - 30V	0 - 700A	0 - 1000A	0 - 1200A	0 - 1500A	0 - 1650A	0 - 1900A	0 - 2100A
0 - 35V	0 - 600A	0 - 857A	0 - 1000A	0 - 1285A	0 - 1400A	0 - 1600A	0 - 1800A
0 - 40V	0 - 525A	0 - 750A	0 - 900A	0 - 1125A	0 - 1240A	0 - 1400A	0 - 1575A
0 - 45V	0 - 470A	0 - 666A	0 - 800A	0 - 1000A	0 - 1100A	0 - 1250A	0 - 1400A
0 - 50V	0 - 420A	0 - 600A	0 - 700A	0 - 900A	0 - 1000A	0 - 1150A	0 - 1260A
0 - 60V	0 - 350A	0 - 500A	0 - 600A	0 - 750A	0 - 840A	0 - 950A	0 - 1050A
0 - 70V	0 - 300A	0 - 425A	0 - 500A	0 - 640A	0 - 700A	0 - 800A	0 - 900A
0 - 80V	0 - 270A	0 - 375A	0 - 450A	0 - 560A	0 - 620A	0 - 700A	0 - 800A
0 - 100V	0 - 210A	0 - 300A	0 - 350A	0 - 450A	0 - 500A	0 - 560A	0 - 640A
0 - 150V	0 - 140A	0 - 200A	0 - 240A	0 - 300A	0 - 330A	0 - 380A	0 - 420A
0 - 300V	0 - 70A	0 - 100A	0 - 120A	0 - 150A	0 - 170A	0 - 190A	0 - 210A
0 - 600V	0 - 35A	0 - 50A	0 - 60A	0 - 75A	0 - 85A	0 - 95A	0 - 105A
0 - 800V	0 - 27A	0 - 37A	0 - 44A	0 - 56A	0 - 62A	0 - 70A	0 - 80A
0 - 1000V	0 - 21A	0 - 30A	0 - 35A	0 - 45A	0 - 49A	0 - 56A	0 - 63A
0 - 1200V	0 - 18A	0 - 25A	0 - 30A	0 - 37A	0 - 41A	0 - 47A	0 - 53A
0 - 1500V	0 - 14A	0 - 20A	0 - 24A	0 - 30A	0 - 33A	0 - 38A	0 - 42A

## CUSTOM OUTPUT MODIFICATIONS

You can specify your own nominal output voltage and current ranges outside of the selection table above. So if you needed to power a device which needs exactly 850V at 15kW, we can provide a new unit with exactly those output ranges often without increasing the lead time.

## MODEL PART NUMBERS

To request a specific model is simple. The CON-HP-E product family name precedes the requested nominal output power, followed by the nominal voltage. The example below shows how to create the part number for a 30kW/1500V unit.

NOMINAL POWER  
**CON-HP-E 301500**  
NOMINAL VOLTAGE

## OPTIONS

CODE	DESCRIPTION
<b>OPERATING RANGES AND FEATURES</b>	
/2000V	Unit built with 2000V output
/HS	High speed model - secondary rise and fall time shortened by a factor of 10
/PR	Reversible output polarity (only in standby mode)
<b>OPERATING MODES</b>	
/HP	Advanced model with constant power mode and master/slave operation
<b>INPUT</b>	
/DC250	DC input of 250VDC $\pm 10\%$ [225VDC - 275VDC]
/DC300	DC input of 300VDC $\pm 10\%$ [270VDC - 330VDC]
/DC350	DC input of 350VDC $\pm 10\%$ [315VDC - 385VDC]
/DC400	DC input of 400VDC $\pm 10\%$ [360VDC - 440VDC]
/DC450	DC input of 450VDC $\pm 10\%$ [405VDC - 495VDC]
/DC500	DC input of 500VDC $\pm 10\%$ [450VDC - 550VDC]
/DC550	DC input of 550VDC $\pm 10\%$ [495VDC - 605VDC]
/DC600	DC input of 600VDC $\pm 10\%$ [540VDC - 660VDC]
/DC650	DC input of 650VDC $\pm 10\%$ [585VDC - 715VDC]
/DC700	DC input of 700VDC $\pm 10\%$ [630VDC - 770VDC]
/DC750	DC input of 750VDC $\pm 10\%$ [675VDC - 825VDC]
/DCXXX	Any nominal in the input range 250VDC - 750VDC $\pm 10\%$ [eg. 520VDC $\pm 10\%$ = 468 - 572VDC input]
<b>INTERFACES AND CONTROL</b>	
/ATE	No front panel control or display
/CE	TFT display
/IEEE488	IEEE 488.2 [GPIB] remote control interface on rear panel
/RS485	RS-485 remote control interface on rear panel
/USB	USB remote control interface on rear panel
<b>SAFETY AND PROTECTION</b>	
/DDS	Decoupling diode
/FD	Freewheeling diode
/LOCK-DC	Interlock for DC output
/POP	Passive overvoltage protection
/SC	Metal cover set with cable glands for input and output terminals
<b>ISOLATION</b>	
/IIO	Models up to 300V <sub>NOM</sub> built with increased 2000VDC isolation between DC-output and earth
<b>MECHANICAL</b>	
/CC	Conformal coating of PCBs (for the /HP version the /ATE option must also be selected)
/RUG	Ruggedised modifications to protect the unit against shock and vibration (for the /HP version the /ATE option must also be selected)
<b>FORM FACTOR AND ENCLOSURES</b>	
/LR	Integration into a 19" lab rack
/FC	Integration into a flightcase
<b>GENERAL SPECIFICATIONS</b>	
/3Y	3 year warranty
/5Y	5 year warranty

## CUSTOM OPTIONS

Around a third of our units are custom builds or modified in some way. So if you require a custom modification or option please let us know.

# OPERATING RANGES AND FEATURES

## STANDARD FEATURES

TECHNICAL DATA										
	0 - 15V	16 - 35V	36 - 70V	71 - 120V	121 - 350V	351 - 700V	701 - 900V	901 - 1150V	1151 - 1400V	1401 - 1500V
Static Regulation	±0.1 % of F.S.									
Line Regulation Voltage	±0.02 % F.S.									
Line Regulation Current	±0.02 % F.S.									
Load Regulation	±0.05 % F.S. ±20mV									
Load Regulation Current	±0.05 % F.S. ±20mA									
Dynamic Response [10%-90%]	Typically <3ms assuming an ohmic load									
Typical Voltage Ripple [p-p] 20MHz	40mV	80mV	140mV	140mV	900mV	350mV	350mV	400mV	850mV	900mV
Typical Voltage Ripple [p-p] 300kHz	15mV	35mV	60mV	60mV	400mV	250mV	250mV	300mV	500mV	550mV
Typical Voltage Ripple [rms] 20MHz	15mV	35mV	60mV	60mV	400mV	150mV	150mV	150mV	150mV	200mV
Typical Voltage Ripple [rms] 300kHz	10mV	25mV	40mV	40mV	300mV	100mV	100mV	100mV	100mV	150mV
Current Ripple [p-p]	<0.5 % of F.S. of I <sub>MAX</sub>									
Current Ripple [rms]	600mA	380mA	260mA	220mA	60mA	30mA	25mA	15mA	12mA	12mA
Rise Time [Full Load]	6ms	6ms	12ms	20ms	20ms	20ms	40ms	40ms	40ms	6ms
Rise Time [No Load]	5ms	5ms	10ms	10ms	10ms	10ms	10ms	20ms	20ms	5ms
Fall Time [Full Load]	15ms	15ms	20ms	20ms	40ms	50ms	60ms	80ms	100ms	25ms
Fall Time [No Load]	tf <5s at Va <60V				10s				15s	1s
Voltage Set-Value Accuracy	± 0.1% V <sub>MAX</sub>									
Current Set-Value Accuracy	±0.2% I <sub>MAX</sub>									
Relative Voltage Sense Accuracy	±0.5% V <sub>MAX</sub> (relative accuracy for worst case sense operation)									

## OPTIONS

CODE	DESCRIPTION
/2000V	Unit built with 2000V output
/HS	High speed model - secondary rise and fall time shortened by a factor of 10
/PR	Reversible output polarity (only in standby mode)

# OPERATING MODES

## STANDARD FEATURES

TECHNICAL DATA	
VI Mode	Voltage and current operation mode: voltage and current limit are programmable

## OPTIONS

CODE	DESCRIPTION
/HP	Advanced model with constant power mode and master/slave operation

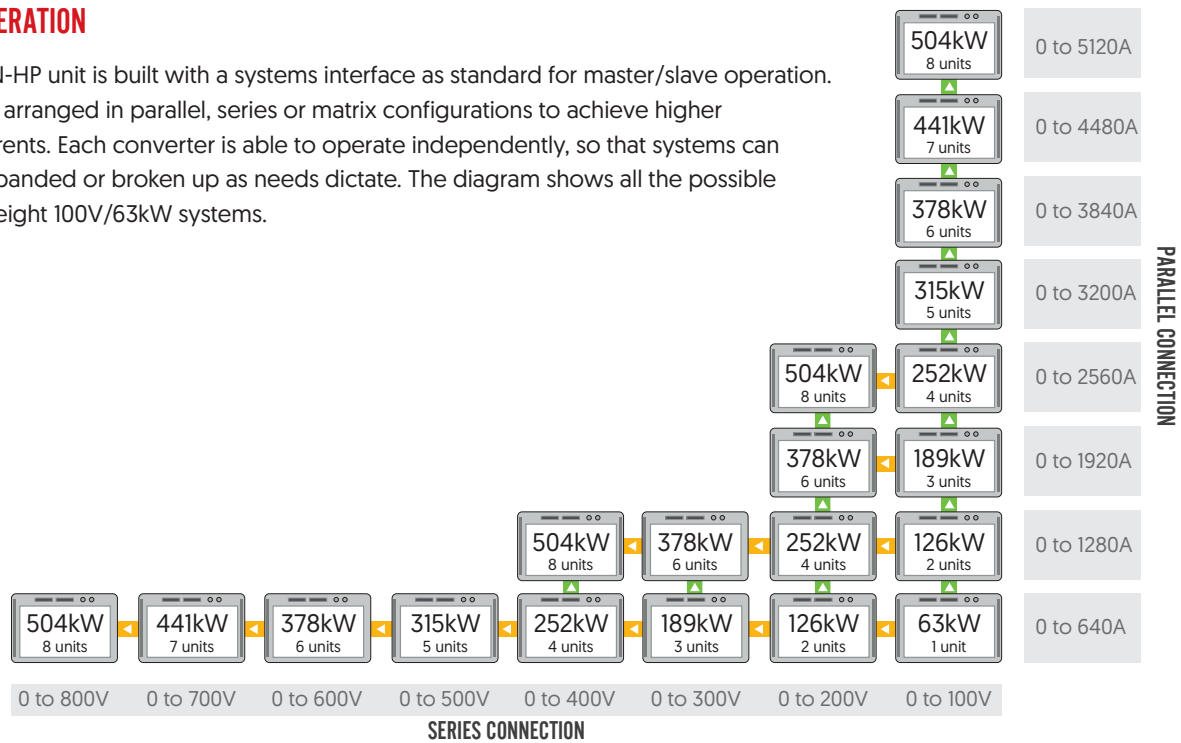
## ADVANCED MODELS (/HP)

Advanced CON-HP models are available which feature selection of additional features discussed below.



### MASTER/SLAVE OPERATION

Each advanced CON-HP unit is built with a systems interface as standard for master/slave operation. Up to 8 units can be arranged in parallel, series or matrix configurations to achieve higher output voltages/currents. Each converter is able to operate independently, so that systems can be reconfigured, expanded or broken up as needs dictate. The diagram shows all the possible configurations with eight 100V/63kW systems.



### REDUNDANCY

To ensure minimal disruption, redundancy is provided when operating multiple CON-HP units in master/slave. Values set on the master unit are multiplied by number of units in series or parallel [e.g. if you have three converters in parallel and set 10A on the master unit, each unit will provide 10A for a combined 30A total]. If a unit device fails, the remaining converters continue to provide their pre-assigned output [e.g. in the example above each converter will would provide 10A for a combined 20A total should one converter fail]

### SOFT INTERLOCK

A soft interlock circuit is provided with all advanced CON-HP models. This allows users to connect the unit to an external safety device such as an emergency stop. This feature requires a high signal (+10V) to be present between two pins, otherwise the output will be shutdown.

### LARGE LCD DISPLAY

A large LCD display indicates all relevant output quantities simultaneously. Output values can be preset and read prior to releasing the output. If preferred the unit can be built with a blank front panel (option /ATE). The LCD screen cannot be combined with conformal coating (/CC) or ruggedised (/RUG) options, so the units must be built with a blank front panel to choose them.

### SD CARD OPTION

An SD card slot can be specified on order with the CON-HP. This is a useful feature to enable the power system to follow pre-determined voltage and current curves. Data is programmed on a PC using text or .WAV formats. It can then be simply transferred to an SD card and recalled from the front panel of the CON-HP.

The data card can also be used for data logging. Output values can be recorded at intervals of 1 sec to 71 mins. The front panel display indicates when the unit is logging data and will alert the user when the memory card becomes full.

# INPUT



## USER CHOSEN INPUT VOLTAGE

Each CON-HP-E is built with any user chosen nominal input voltage from the selection table below. The XXX at the end of each part number is replaced with the three digit nominal input voltage you require. If none of the standard voltages are suitable, then you can specify any nominal input voltage in the range of 250VDC - 750VDC  $\pm 10\%$ . For example, if you chose a CON-HP-E 520-560, then the DC-DC converter would be built with a 560VDC nominal, with input range of 504VDC – 616VDC.

### INPUT SELECTION TABLE

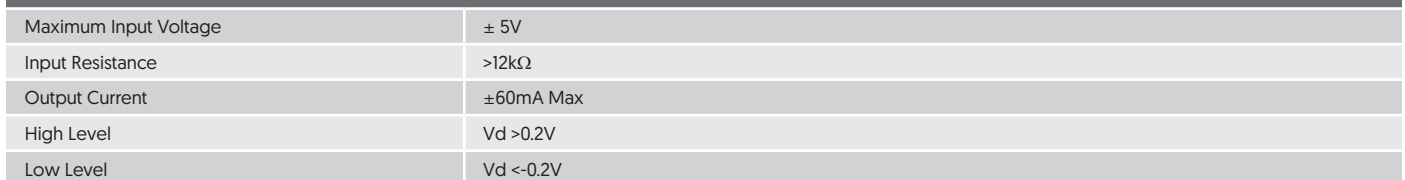
CODE	DESCRIPTION
/DC250	DC input of 250VDC $\pm 10\%$ [225VDC - 275VDC]
/DC300	DC input of 300VDC $\pm 10\%$ [270VDC - 330VDC]
/DC350	DC input of 350VDC $\pm 10\%$ [315VDC - 385VDC]
/DC400	DC input of 400VDC $\pm 10\%$ [360VDC - 440VDC]
/DC450	DC input of 450VDC $\pm 10\%$ [405VDC - 495VDC]
/DC500	DC input of 500VDC $\pm 10\%$ [450VDC - 550VDC]
/DC550	DC input of 550VDC $\pm 10\%$ [495VDC - 605VDC]
/DC600	DC input of 600VDC $\pm 10\%$ [540VDC - 660VDC]
/DC650	DC input of 650VDC $\pm 10\%$ [585VDC - 715VDC]
/DC700	DC input of 700VDC $\pm 10\%$ [630VDC - 770VDC]
/DC750	DC input of 750VDC $\pm 10\%$ [675VDC - 825VDC]
/DCXXX	Any nominal in the input range 250VDC - 750VDC $\pm 10\%$ (eg. 520VDC $\pm 10\%$ = 468 - 572VDC input)

# INTERFACES AND CONTROL

### TECHNICAL INFORMATION

ANALOGUE INTERFACE (STANDARD)	
Digital Outputs (CV, Standby, Error)	Output type: Open collector with pull-up resistor 10k $\Omega$ after +5 V $I_{SINKMAX}$ : 50 mA
Digital Inputs (Ext. Control, Standby)	Input resistance: 47k $\Omega$ Maximum input voltage: 50V High level: $V_{IN} > 2V$ Low level: $V_{IN} < 0.8V$
Analog Outputs (Xmon)	Output resistance: 100 $\Omega$ Minimum permissible load resistance: 2k $\Omega$ Minimum load resistance for $\pm 0.1\%$ accuracy: 100k $\Omega$
Analog Inputs (Xset)	Input resistance: 1M $\Omega$ Maximum permissible input voltage: 25V
Reference Voltage	Reference voltage $V_{REF}$ : 10V $\pm 10$ mV Output resistance: $< 10 \Omega$ Maximum output current: 10 mA (not short-circuit-proof)
5 V – Supply Voltage	Output voltage: 5V $\pm 300$ mV Maximum output current: 50 mA (not short-circuit-proof)
Set Value Accuracy [V/A] When Using Internal Ref.	$\pm 0.5\%$
Programming Response Time	$< 10$ ms
RS-232 INTERFACE (STANDARD)	
Signal Inputs (Rx, D, CTS)	Maximum input voltage: $\pm 25V$ Input resistance: 5 k $\Omega$ (Type) Switching thresholds: $V_H < -3V$ , $V_L > +3V$
Signal outputs (Tx, D, RTS)	Output voltage (at $R_L > 3k\Omega$ ): min $\pm 5V$ , Type $\pm 9V$ , max $\pm 10V$ Output resistance: $< 300\Omega$ ; Short circuit current: Type $\pm 10$ mA

## STANDARD CON-HP-E LED SCREEN



## STANDARD SOFTWARE

Voltage and current values can be controlled through the GUI. A sequence function allows for more complex DC waveforms to be implemented directly through the software.



# SAFETY AND PROTECTION

## STANDARD FEATURES

TECHNICAL DATA	
Over Voltage Protection	Adjustable between 0 % and 120 % of full voltage range
Over Current Protection	Limited by the current setpoint
Over Temperature Protection	If the internal heat sink temperature rises above 90°C the device will automatically shut down
Under Voltage Lock Out	If the set limit is reached then the device will automatically shut down

## OPTIONS

CODE	DESCRIPTION
/DDS	Decoupling diode
/FD	Freewheeling diode
/LOCK-DC	Interlock for DC output
/POP	Passive overvoltage protection
/SC	Metal cover set with cable glands for input and output terminals

# ISOLATION

## STANDARD FEATURES

TECHNICAL DATA	
Isolation [Between Primary and Secondary]	3000VAC
Isolation [Between DC-Output and Earth]	500VDC [0-300V models]   2000VDC [301-1500V models]
Isolation [Between Primary and Earth]	2150VDC

## OPTIONS

CODE	DESCRIPTION
/IIO	Models up to 300V <sub>NOM</sub> built with increased 2000VDC isolation between DC-output and earth

# MECHANICAL

## STANDARD FEATURES

AMBIENT CONDITIONS	
Cooling	Forced air, front to back
Operating Temperature	0 to 50°C
Storage Temperature	-20°C to 70°C
Humidity	<80%
Operating Altitude	<2000m
Fan Noise	42 – 43 dB



## MECHANICAL OPTIONS

CODE	DESCRIPTION
/CC	Conformal coating of PCBs (for the /HP version the /ATE option must also be selected)
/RUG	Ruggedised modifications to protect the unit against shock and vibration (for the /HP version the /ATE option must also be selected)

## HIGHLIGHTED OPTIONS



## RUGGEDISED MODIFICATIONS (/RUG)

Modifications can be made to the CON-HP-E to ensure suitability in harsh conditions by providing protection against shock and vibration. This is often ideal for companies who regularly need to move equipment to different sites, to mitigate the risk of any potential transit damage.



## CONFORMAL COATING OF PCBs (/CC)

The PCBs of the units are coated with a solution to protect against environmental conditions such as condensing humidity, as well as providing resistance against salt moisture. This option can also be combined with /RUG.

## FORM FACTOR AND ENCLOSURES

## STANDARD FEATURES

WEIGHTS AND DIMENSIONS	
3kW-7kW Models <sup>1</sup>	19" × 2U × 440mm (W × H × D), 14kg
10kW Models <sup>2</sup>	19" × 2U × 600mm (W × H × D), 26kg
15kW Models <sup>3</sup>	19" × 3U × 620mm (W × H × D), 26kg
21kW Models <sup>4</sup>	19" × 3U × 620mm (W × H × D), 37kg
30kW Models	19" × 6U × 620mm (W × H × D), 52kg
35kW Models <sup>5</sup>	19" × 6U × 620mm (W × H × D), 59kg
45kW Models <sup>6</sup>	19" × 6U × 620mm (W × H × D), 73kg
49kW Models	19" × 9U × 620mm (W × H × D), 85kg
56kW Models	19" × 9U × 620mm (W × H × D), 92kg
63kW Models	19" × 9U × 620mm (W × H × D), 99kg

<sup>1</sup> 4-5kW/15V models and 7kW models ≤25V have dimensions of 19" × 2U × 600mm. <sup>2</sup> Models ≤50V have dimensions of 19" × 3U × 620mm.

<sup>3</sup> 15V models have dimensions of 19" × 6U × 620mm. <sup>4</sup> Models ≤25V have dimensions of 19" × 6U × 620mm. <sup>5</sup> 20V models have dimensions of 19" × 9U × 620mm.

<sup>6</sup> Models ≤35V have dimensions of 19" × 9U × 620mm.

**DESKTOP UNITS**

On request, your choice of CON-HP-E can be built without rackmounting flanges for no extra cost. This allows the unit to be used on a desktop or bench.

## OPTIONS

Units can be treated to a laboratory rack or flight case integration. Having a programmable power system mounted into a flight case on castors is often advantageous, especially when several departments or test cells share the same equipment.

Multiple power systems can be fitted into the same flight case. Door hangers are fitted for convenience. Existing ETPS systems can also be retrospectively integrated into new flight cases where requested.

CODE	DESCRIPTION
/LR	Integration into a 19" lab rack
/FC	Integration into a flightcase



# GENERAL SPECIFICATIONS

## STANDARD FEATURES

EMC AND SAFETY STANDARDS	
Safety	EN 61010-1:2010+A1:2019
EMC	EN 61326-1:2013
RoHS	EN IEC 63000:2018
Standard Warranty	1 year

## OPTIONS

CODE	DESCRIPTION
/3Y	3 year warranty
/5Y	5 year warranty

Every effort is made to ensure that the information provided within this technical summary is accurate. However, ETPS Ltd must reserve the right to make changes to the published specifications without prior notice. Where certain operating parameters are critical for your application we advise that they be confirmed at the time of order. ETPS Ltd specialises in modifying its proven platforms to suit your needs. Please contact our office if your requirement is non-standard. Please note that your actual unit may differ from those shown.



“  
**WE ARE  
POSITIVE  
PEOPLE**  
”

ETPS engineer electronic power supply and testing systems. Our problem solving skills provide the spark of innovation to some of the world's leading technology brands.



Tel: +44 (0) 1246 452909  
Sales: 0800 612 95 75  
sales@etps.co.uk  
www.etps.co.uk

ETPS Ltd  
Unit 14, The Bridge  
Beresford Way, Chesterfield  
S41 9FG



**POSITIVE PROBLEM SOLVING**